

# **ELECTRONIC INDUSTRIES**

A CHILTON PUBLICATION

*In this 19th Edition . . .*

**Transistor Interchangeability**

**Diode Similarity**

**Frequency Standards**

**Computer "Languages"**

**New Tube Chart**

**Complete contents pgs., 1-8**

**June**  
1961

**ALL REFERENCE & DIRECTORY ISSUE**

# ELECTROLYTIC CAPACITORS



TYPE DCM

**TYPE DCM**—Computer grade filter and energy storage capacitors. Generally used in DC circuitry where peak power requirements exceed the maximum output of the associated power supply. 500,000 mf at 1.5 WVDC to 800 mf at 450 WVDC.

**TYPE PL**—"Twist-tab" capacitors are available in Single, Double, Triple, and Quadruple Section. Primary applications are in TV and radios where long life and dependable performance at 85°C are mandatory under conditions of extreme ripple current and high surge voltages.

**TYPE MJ**—Motor starting capacitors engineered for maximum capacity per unit volume and extended life characteristics. 21-25 to 590-708 mfd. 110 to 320 Volts AC.

**TYPE BW**—Polarized electrolytic capacitors. Single, Double, and Triple Section. Comply with MIL-C-62A specifications.

**TYPE TR**—High reliability capacitors ideally suited for low frequency filter, bypass, and coupling applications in communications equipment and computers. Single, Double, and Triple Section. 2,000 mfd. at 6 VDC to 20-20-20 mfd. at 450 VDC.



TYPE TR



TYPE PL



TYPE MJ



TYPE BW

**SANGAMO**  
Electronic  
Capacitors  
and  
Inductive  
Components  
for  
miniaturization  
and  
high  
reliability

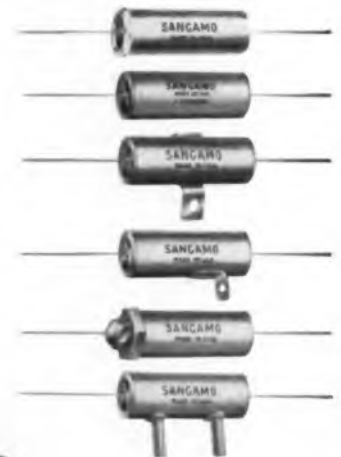
## PAPER CAPACITORS AC-DC

**TYPE 73**—Energy storage capacitors used as source of instantaneous very high current in the research field.

**TYPE 75**—Ballast and motor-run capacitors. For continuous AC duty in ambient temperatures up to 75°C. 1.0 to 30.0 mfd. 220 to 660 WVAC.

**TYPE 50**—Coupling and bypass capacitors operate under severe humidity conditions at temperatures between -55°C. and +85°C. .05 to 2.0 mfd. 600 and 1000 WVDC.

**TYPE 71**—Diactor impregnated and filled. High dielectric constant, high resistivity, and low power factor. Available in voltage ranges between 600 and 7,500 WVDC.



TYPE "S" SERIES

Hermetically sealed subminiature metal tubular capacitors using glass to metal solder-seal terminals. Operating temperature between -55°C and +125°C.

.001 to 1.0 mfd. 100 to 1000 WVDC.



TYPE 73



TYPE 75



TYPE 50



TYPE 71

# MICA CAPACITORS

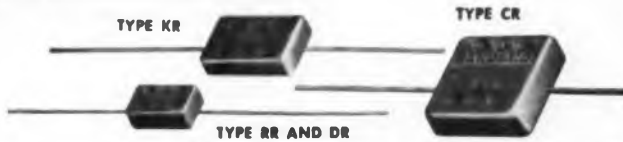
## WIRE LEAD TYPES

that meet MIL-C-5B requirements and are designed for use in electronic circuits.

**TYPE CR**—Silvered mica capacitors, 500 mmf to 16,000 mmf. 300 and 500 WVDC. 125°C.

**TYPE KR**—Extremely stable silvered mica capacitors. 5 mmf to 3,000 mmf. 300 and 500 WVDC. 125°C.

**TYPE RR AND DR**—Miniature silvered mica capacitors. 5 mmf to 560 mmf. 300 and 500 WVDC. 125°C.



## TRANSMITTING TYPES

that meet MIL-C-5B requirements, including insulation resistance, temperature coefficient, capacitance drift, humidity and life.



**TYPES F1, F2, F3**—Potted transmitting mica capacitors. 100 mmf to 1.0 mfd. 8,000 to 250 Peak Wkg. Volts.



**TYPE A**—Molded in low loss bakelite. 50 mmf to 60,000 mmf. 600 to 2500 WVDC.



**TYPE H**—India Ruby Mica Capacitors. 50 mmf to 30,000 mmf. 600, 1200, 2500 WVDC.



**TYPES G1, G2, G3, G4, G5**—Ceramic cased transmitting mica capacitors. 10 mmf to 100,000 mmf. 35,000 to 1,000 Peak Wkg. Volts.

### Basic Types:

### SILVERED MICA BUTTON<sup>TM</sup> TYPES



Hermetic sealed



Feed-through



Stand-off

Silvered mica button types are small and light in weight. Designed particularly for applications in high frequency circuits. Commercial and Military (MIL-C-10950).

# INDUCTIVE COMPONENTS



**Power Transformers** designed and produced for military airborne electronic equipment operating at high ambient temperatures.



**Band Pass Filters** designed for single-side-band carrier frequency communications equipment where frequency discrimination is used to separate four frequency bands.



**Saturable Reactors** designed for self-saturating magnetic amplifiers used in control applications.



**Low Pass Filters** designed for systems utilizing printed circuit construction techniques.

## NEWARK-SANGAMO MINIATURE CONTROLS



Gas Pressure Switches



Gas Density Switches

# SANGAMO

*can supply quantity production of a wide variety of inductive components to comply with your specific electrical and physical specifications. We invite inquiries concerning your design requirements and applications.*

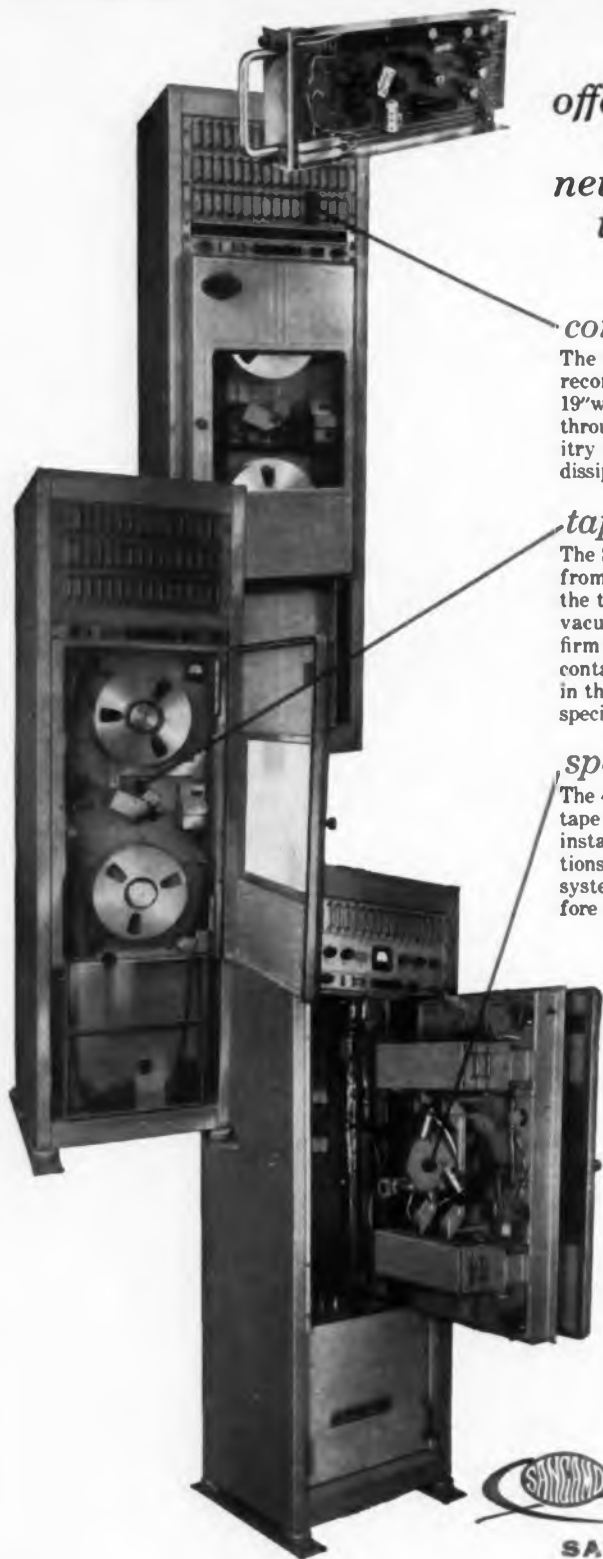


**SANGAMO  
ELECTRIC  
COMPANY**

SPRINGFIELD, ILLINOIS

Circle 2 on Inquiry Card

# SANGAMO 460-SERIES MAGNETIC TAPE INSTRUMENTATION



*offers  
a  
new concept  
in...*

## *compactness*

The 460-Series tape transport and a complete 14 track recorder/reproducer are contained in a single standard 19" w. x 71" h. cabinet. This unusual compactness is achieved through transistorized electronic circuitry. Solid state circuitry means greater reliability, reduced weight, lower heat dissipation, and lower power consumption.

## *tape handling*

The Sangamo recorder/reproducer can be changed instantly from reel to loop operation (250 feet) without re-handling the tape or making any changes in the transport. Exclusive vacuum tensioning and tape guiding provides gentle, but firm and precise control of tape position and head-to-tape contact. This design, in addition to a long tape path, results in the extremely low interchannel time displacement error specified.

## *speed control*

The 460-Series has exclusive wide-range, fast-response, Hare tape synchronized servo speed control. This control reduces instantaneous and long-term record-playback speed deviations to a level several times lower than other speed control systems. You get magnetic tape system accuracies heretofore considered unattainable.

### **SANGAMO 460-SERIES PERFORMANCE and CHARACTERISTICS**

**Start Time:** 1.0 second to synchronism @ 60 ips with servo speed control and 1" wide tape.

**Stop Time:** 1.0 second from 60 ips.

**Instantaneous Time Displacement Error:** Less than 25.0 microseconds (including flutter) @ 60 ips.

**Long Term Time Displacement Error:**  $\pm 0.01\%$  standard. Higher accuracies available.

**Interchannel Time Displacement Error:**  $\pm 2.0$  microseconds @ 60 ips between outside tracks on 1" tape.

**Servo Speed Control Range:**  $\pm 10\%$  nominal tape speed.

**Servo Speed Control Response:**  $\pm 15\%$  speed change per second.

**Tape Widths:** Standard sizes from  $\frac{1}{4}$  to 2".

**Reel Sizes:** 14" or smaller.

**Mounting:** 1 standard 19" equipment rack for a complete 14 track record/reproduce system with power supplies and servo speed control.

**Power Requirements:** 117 volts, 60 cps  $\pm 10\%$  single phase. All D C drives. 7.0 amperes load for 14 track system.

**Weight:** Approximately 600 pounds for 14 track system.



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# ELECTRONIC INDUSTRIES

Vol. 20, No. 6

June, 1961

Your

1961 All-Reference Issue with

ELECTRONIC INDUSTRIES' Annual Directory Listing

HERE 'TIS . . . our fourth annual All-Reference issue together with our nineteenth edition of the ELECTRONIC INDUSTRIES Directory. This year's volume contains many changes and new features and most of these have been made at the suggestion of you, our readers.

In the all-reference portion of this volume we have made every effort to position the editorial material on the right hand pages whenever possible. This, coupled with "key word identification" on each page, should facilitate locating technical reference data. We have also included an advertisers index by product so that you can quickly obtain technical information on any currently available products of special interest. We have retained and added to our consolidated index. This index lists all reference features that have appeared in the three previous June issues.

Last year our reference section provided technical specifications on the hundreds of different semiconductor diodes and transistors being manufactured. However, as we all know, many diode and transistor types are very similar electrically and mechanically. To enable engineers to quickly determine such similarities, we have included diode similarity and transistor interchangeability listings in this issue.

Another feature of interest is the summary of the new FCC standards on FM Stereo Broadcasting as released last month. The Ultrasonics Spectrum Chart together with its application information should interest many. These are but a few of the new editorial elements in this issue. Please note especially the all-reference content as listed on pages 2 and 3.

We believe that the concept of publishing an annual technical all-reference issue is of prime current importance and that it will become increasingly important in future years. This will be particularly true as the Electronic Industries expand their activities into new electronic markets. Accordingly, preparations and compilations for the 1962 edition are already under way. If you, after reviewing the contents of this issue (pages 2-8), feel that there are other areas of reference information that would be desirable or helpful, we would appreciate your writing to us. We shall make every effort to include such information in next year's issue!

For the first time this year, the directory listings are a direct print-out from a Univac computer. For the past several years we have been working toward an automated directory listing system. This program is now in hand. Our questionnairing time schedules are being changed to conform with the new requirements of this procedure and 1962 questionnaires will start into the mails next month.

This new system has enabled us to record information on 2500 additional companies over last year in the same number of editorial pages. All in all, the directory section provides information on more than 8,000 electronic companies. The directory listings obtained via Univac have been printed on yellow stock in this issue as another added feature to facilitate usage of this volume.

Concluding . . . we hope you like this issue! We'd appreciate your writing your views on how well we have fared on your behalf!

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## COMING EVENTS

Listing of major trade and engineering shows planned for the balance of 1961 and highlights of 1962. Information includes: dates, sponsoring organization and location. Events are grouped according to where they will be held—East, Mid-West and West. **Page 15**

## COMPONENTS

**ELECTRONIC HARDWARE**—"Sub-Panel Mounting Miniature Tube Laminated Sockets"—Sixth in a series which describes hardware for the electronic industry. Laminated miniature, noval, octal, loctal, cathode ray and glass tube sockets are listed in tabular form. Information includes: uses, types of material and known suppliers. **Page 236**

**VACUUM TUBES**—"New Receiving Tubes and Special Purpose Tubes"—A run-down on all new vacuum tubes, camera tubes, magnetrons, photo-

multipliers and Thyratrons released during the period June 1960 to May 1961. Technical specifications are included with primary applications. **Page 91**

## MARKETING INFORMATION

**PRINTED CIRCUITS**—"Selected Printed Circuit Boards"—Printed circuit boards are available with many types of laminates. To the newcomer this can be confusing. Here the possibilities have been condensed into the selection of one of two types. **Page 54**

**GOVERNMENT CONTRACT AWARDS**—A listing of the value of government electronic contract awards from Jan. to Dec. 1960 and for the first quarter of 1961. **Page 107**

**MILITARY PROCUREMENT**—"1961 Military Procurement Directory"—Listing the major procurement of-

fices of the Army, Navy and Air Force, with the names of procurement officers, phone numbers, locations and the categories of electronic gear for which they are responsible. **Page 115**

## SEMICONDUCTORS

**"1961 SEMICONDUCTOR REPLACEMENT GUIDE"**—Compiled for industry by the editorial staff of ELECTRONIC INDUSTRIES this guide is a composite chart based on information received from more than 50 domestic and foreign manufacturers. **FIRST SECTION**—Alphabetical listing of semiconductor manufacturers and the diodes and transistors they are currently making available. **SECOND EDITION**—Diode similarity guide of all types manufacturers indicated were either "direct replacements" or "nearest types." **THIRD SECTION**—1961 Transistor Interchangeability Guide. **Page 151**

# All-Reference Issue & Directory

## TECHNICAL DATA

**COMPANY LITERATURE** — "New Technical Data for Engineers" — Company bulletins, data sheets, catalogs and engineering specifications. Categorized, the material includes: Semiconductors, Electron Tubes, Ultrasonics, Microwave, Systems, Instruments & Meters and many others. **Page 487**

## STANDARDS

**"New Electronic Standards"** — Listing of the electronic standards issued during the 12-month period, June 1960 to May 1961, by ASTM, ASA, EIA and IRE are given. **Page 51**

**"Standard Frequency Stations"** — Increased space exploration requires extremely accurate time at widely separated earth locations. This article lists most of the standard frequency stations heard throughout the world. **Page 439**

**"FM Stereo Standards"** — Complete engineering data on the recent FCC approved standards for FM stereophonic transmission. **Page 445**

## COMPUTER

**"Languages Simplify Computer Science"** — New programming languages provide better understanding of computer operations. This article explains and illustrates time saving techniques for programming mathematical problems and business data. **Page 474**

## ULTRASONIC FREQUENCY SPECTRUM

**ULTRASONIC FREQUENCY CHART** — Detailed information on the fre-

quency ranges used in ultrasonic operations. Chart includes information on: transducer materials, power applications, instrumentation & sensing and general cleaning agents. **Page 457**

**"Potentiometers—Terms & Data"** — The potentiometer is a simple form of electro-mechanical transducer widely used by systems designers. Chief requirements of a practical potentiometer, terminology and engineering data are discussed. **Page 35**

**"Determining Waveguide Wavelength"** — Nomograph provides microwave engineers with a quick, easy method calculating any one of the three significant waveguide characteristics, when two are known. **Page 89**

**"Specific Material Applications"** — These tables present the results of a study performed to estimate component and materials characteristics under heavy irradiation. **Page 101**

**"The Electrically Variable Inductor"** — Many engineers are not aware of the existence of the electrically variable inductor. Others know of its existence but are not too familiar with its technical characteristics, or its many applications. **Page 144**

**"Shunt D.C. Regulator"** — Proper selection of a Zener diode for use in a shunt D.C. regulator circuit takes time. Included is a time saving step-by-step procedure, complete with equations and nomographs, to aid the engineer in his selection. **Page 320**

## DIRECTORY OF THE ELECTRONIC INDUSTRIES—Page 249

**"PRODUCT FINDING INDEX"** — A fast reference guide that enables you to find the product you want in the Product Directory—quickly. **Page 250**

**"PRODUCTS & MANUFACTURERS"** — Over 2000 specific product identifications listed under 82 major product sections. Alphabetical listings of manufacturers in each section tells who makes what. **Page 256**

**"MANUFACTURERS ALPHABETICAL INDEX"** — Alphabetical listing of names and addresses of more

than 8,500 electronic manufacturers. **Page 349**

**"BRAND & TRADE NAMES"** — More than 3,500 brand and trade names are identified with the firms using them on electronic equipment. **Page 401**

**"MANUFACTURERS REPRESENTATIVES"** — State-by-state listing of manufacturers' representatives active in the electronic industry. Information includes: territories covered, types of lines carried and whether they have warehousing facilities. **Page 413**

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### BATTERIES

Charts of battery characteristics compiled from NEMA information—June 1958.

### COLOR CODING

Markings on Electronic Components and Wiring—June 1958.

Color Coding Synchro Leads—June 1959.

### FILTERS

Filter Element Nomographs, High-Pass and Low-Pass Constant "K".

Filter Nomographs—June 1958.

Guide to RFI Filters—June 1960.

### GLOSSARIES

Automation, Guided Missile Terms—June 1958.

Common Electronic Abbreviations, Wire Terms, Plastics Terms—June 1959.

Testing Devices—Definitions, Chopper Terms—June 1960.

### GOVERNMENT ENGINEERING OPPORTUNITIES

Types of positions open, typical starting salaries, explanation of pay grades, potential earnings, etc., are described in the June 1958 issue.

### HARDWARE

The June 1959 issue has part 1 of a 3 part feature on fasteners, pins, rivets, etc., used extensively in the electronic industry.

The June 1960 issue has part 4 of a series on Tube and Transistor Sockets.

### MICROWAVE

Reflector Gain Chart—June 1958.

Graphs for Waveguide Calculations—June 1960.

### MILITARY PROCUREMENT

June 1958, June 1959 and June 1960 issues have a run-down on key Air Force, Army, and Navy personnel responsible for electronic procurement.

### MISSILES

June 1958, June 1959 and June 1960 issues have comprehensive surveys of guided missiles both operational and developmental. Included are: prime contractors and governmental officials responsible for procurement in this field.

### PLASTICS

Laminated Plastics (chart of NEMA grades and text), Epoxies (An introduction and properties chart)—June 1959.

### PRINTED CIRCUITS

Printed Circuit Glossary—June 1958.

### SEMICONDUCTORS

Silicon Semiconductor Devices (Includes basic theory of silicon diode)—June 1958.

Diode Specifications (Chart type listings)—June 1958.

International Silicon and Germanium Transistor Specifications (Chart type listings)—June 1958.

Semiconductor Circuit Symbols—June 1958.

Thermistors (Basic information, typical characteristics, circuit applications)—June 1959.

Transistor Specifications and Semiconductor Diode Specifications (Same presentation as in 1958)—June 1959.

Transistor Specifications and Semiconductor Diode Specifications (Same type charts as in 1958 & 1959)—June 1960.

### NEW ELECTRONIC STANDARDS

Standards issued during period June '57 to May '58—June 1958.

Standards issued June '58 to May '59—June 1959.

Standards issued June '59 to May '60—June 1960.

### STATISTICS

Radio-TV-Electronic Industries Statistics for the period 1957-1958. Government Contract Awards (fiscal year '57)—June 1958.

Radio-TV-Electronic Industries Statistics for the period 1958-1959. Government Contract Awards (fiscal year '58)—June 1959.

Radio-TV-Electronic Industries Statistics for the period 1959-1960. Government Contract Awards (fiscal year '59)—June 1960.

### SYNCHROS

Connections, Trouble Shooting, Locating External Wiring Problems—June 1958.

Zeroing Methods, Name Plates and Their Meaning, Color Coding Leads—June 1959.

Synchro Phase Shifters, Differential Synchro Connection Chart—June 1960.

### ELECTRON TUBES

New Receiving and Special Purpose Tubes (Issued during period from June '57 to May '58) includes photo-multipliers, thyratrons, magnetrons, camera tubes, etc.)—June 1958.

New Receiving and Special Purpose Tubes (Same as above except for period from June '58 to May '59—June 1959.

New Receiving and Special Purpose Tubes (Same as above except for period from June '59 to May '60)—June 1960.

### WIRE & CABLE

Printed Circuit Glossary, Color Coding—June 1958.

Wire and Cable Reference Section (Coaxial Cable Charts, Coil Winding Data Charts, AWG Chart, Wire Stranding Charts, Magnetic Wire Insulations, Useful Wire Formulae, Wire Conversion Tables)—June 1959.

Selecting and Winding Magnetic Wire, Selective Coaxial Cable—June 1960.

# ELECTRON TUBE NEWS

## ...from SYLVANIA

Put the advantages of  
Sylvania Strap Frame Grid Tubes  
to work in your design...

- High Gm/Ib Ratios
- Increased Gain
- Exceptional Stability, Uniformity
- Extremely Low Noise Figures
- Enhanced Reliability



**Now in 9 High-Performance Tube Types!**

Improve efficiency, performance! Minimize in-line rejects of end products! Reduce early-hour, in-warranty failures! Specify Sylvania Strap Frame Grid tube types.





**6DJ8**—sharp cutoff double triode designed for VHF cascode amplifier service and high-gain pre-amp service. Features Gm of 12,500  $\mu$ mhos, and low capacitance figures.



**3/4/6EH7**—semi-remote cutoff pentodes for IF amplifier service. -EH7 family features improved input characteristics for IF service in the 30 to 60MC range. Gm is 12,500  $\mu$ mhos.



**3/4/6EJ7**—sharp cutoff versions of the -EH7. -EJ7 family features a Gm of 15,000  $\mu$ mhos and a Gm:lb ratio of 1500.



**6ES8**—semi-remote cutoff double triodes designed for cascode VHF amplifier applications. Features Gm of 12,500  $\mu$ mhos, noise figure of 6.5db, excellent cutoff characteristics, high electrical stability, improved input loading resistance.



**2/3/6FQ5A**—semi-remote cutoff triode for VHF RF amplifier service at a B+ voltage of 135V. Features exceptionally low noise figure and high Gm:lb of 1350. Partial shield between grid and plate contributes to low capacitance. Employs dual cathode leads for reduced input loading.



**2/3/66K5**—gain-controlled triode designed for use as a VHF RF amplifier at a B+ of 135V. Also well suited for neutralized IF amplifier applications. Gm is 15,000  $\mu$ mhos; Gm:lb is 1300. Noise figure is 4.7db, obtained at 200MC (in optimized triode RF amplifier stage, noise matched).



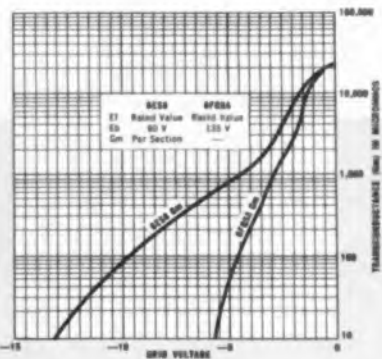
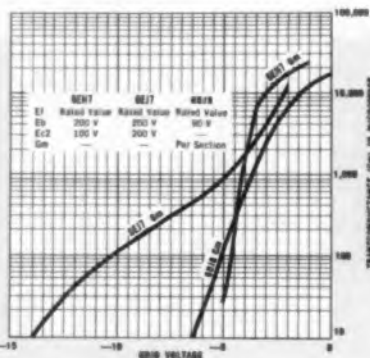
**6922**—ruggedized sharp cutoff double triode (electrically similar to 6DJ8) featuring Gm of 15,000  $\mu$ mhos. It is designed for use in cascode circuits, RF or IF amplifier, mixer or phase inverter stages or as a multivibrator and cathode follower in computers.



**7308**—ruggedized sharp cutoff double triode (electrically similar to 6DJ8) featuring shock and vibrational controls. Rated for Class A service.



**7803**—double triode (electrically similar to 6DJ8) designed for exceptional reliability in short continuous service under severe environmental conditions. In continuous Class C service at 175 MC, it provides 3.5 watts plate dissipation per section.



The highly refined Sylvania frame grid design lends itself readily to automated production techniques—providing unusually high operating uniformity and the economies of volume production. At Sylvania, sturdy lateral straps are automatically fabricated to rugged side rods, controlling strength and dimensions of the grid throughout life. Micas, therefore, are snugly fitted without detriment to grid dimensions. Mechanical strength is increased, noise and microphonics are appreciably decreased. Too, automated facilities achieve extremely high T. P. I. of exceptionally fine grid wire, tightly and precisely wound, accurately aligned. As a result, electrical stability, gain, Gm, and Gm:lb ratios are significantly improved.

Too, because Sylvania Strap Frame Grid possesses a "flat" minor grid dimension it is fitted with a planar-design cathode. This remarkable combination provides exceptional uniformity of grid to cathode spacing with

dramatic improvements in electron transit time, cutoff controls, uniformity of characteristics.

BIKINI CATHODE IMPROVES PERFORMANCE OF  
SYLVANIA 3/4/6EH7, 3/4/6EJ7, 6ES8

Sylvania-originated Bikini Cathode is a pre-cast film of emissive material bonded to the two major sides of a flat cathode sleeve. This remarkable design minimizes stray emission, assures uniform temperature and emission over the entire cathode surface, reduces possibility of grid-cathode shorts, improves tube longevity.

Examine the superior qualities of Sylvania Strap Frame Grid tube types for your design. Contact your Sylvania Sales Engineering Office, or for data on specific types, write Electronic Tubes Division, Sylvania Electric Products Inc., 1100 Main Street, Buffalo 9, N. Y.

AVAILABLE NOW FROM SYLVANIA!

# PANELESCENT<sup>®</sup>



Sylvania AN-150, 1 1/8" alpha-numeric, is diagrammed, right, to show the 14 segments that produce the complete English alphabet, 0-9 numerics and selected mathematical symbols.

# READOUTS

## • NUMERICS, ALPHA-NUMERICS

... wide range of patterns, sizes, mountings

PANELESCENT electroluminescent (EL) devices open a vast new future for creative design of readout displays. Outstanding features include: compact, flat area source of light • long life • absence of catastrophic failures, enabling planned maintenance • low power requirements • wide angle viewing • simplified circuitry.

Sylvania advances in EL techniques now make practicable character heights from 3/8" for numerics and 5/8" for alpha-numerics to 12". Multiple numerics or alpha-numerics are available formed on one substrate for in-line display. Sylvania techniques of packaging can provide several "plug-in" designs, to conform with your individual design requirements, offering optimum combinations of economy, compactness and ruggedness.

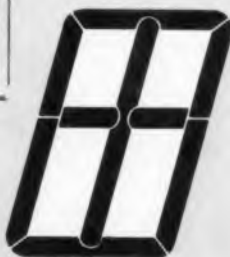
Sylvania X-Y Grid panels—for position-plotting displays—utilize conductive strips placed at right angles to each other. When the strips are excited a point of

## • X-Y GRID PANELS

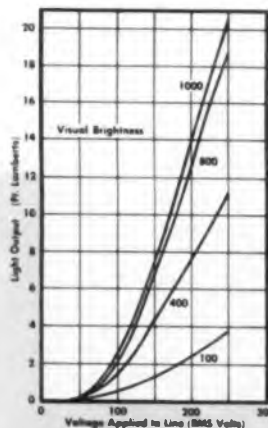
... wide range of sizes, resolutions

light is produced at the intersection. This point of light is moved by selective excitation of the strips. Sylvania X-Y panels, using a green phosphor, provide contrast ratios in the order of 15:1. Panels with active areas of 2 1/2" x 2 1/2" are now available with resolutions of as high as 50 lines/inch. Larger panels are also available.

Contact your nearest Sylvania Sales Engineering Office for further information. They'll be pleased to discuss your individual readout requirement. Or, send for the descriptive brochure, "Sylvania Electroluminescent Display Devices." Write Electronic Tubes Division, Sylvania Electric Products Inc., Dept. EL, 1100 Main St., Buffalo 9, New York.

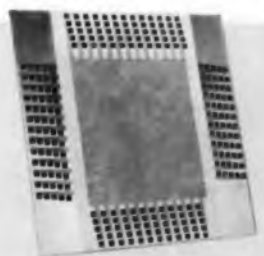


Sylvania MU-150, 1 1/4" numeric, is diagrammed, right, in actual size to show the 9 segments that produce a display of 0-9 numerics. Numeric characters are also available with as few as 7 segments.



Curves illustrate variation of PANELESCENT lamp brightness with voltage at varying frequencies.

® Panescent is a registered trade mark.



Sylvania X-Y Grid Panel, having a resolution of 50 lines/inch, is shown above.

# MICROWAVE DEVICE NEWS from SYLVANIA

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IN  
QUANTITY!



## BROADBAND FERRITE ISOLATORS

COAXIAL DEVICES / WAVEGUIDE DEVICES

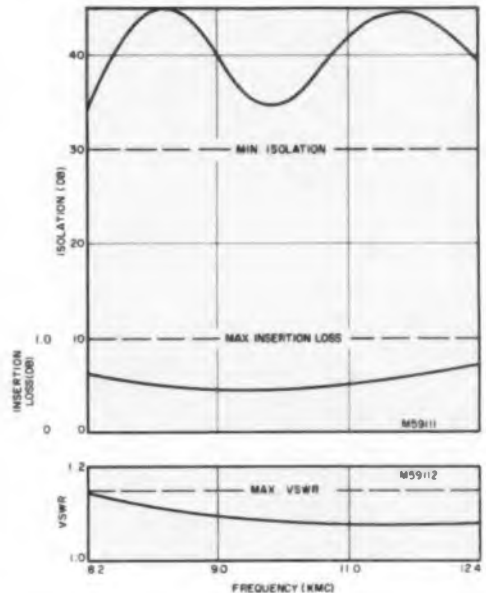
—from 1-11 GC

—from 3.95-26 GC

Sylvania offers a comprehensive line of coaxial and waveguide isolators—12 types, in all—featuring extraordinary isolation to insertion loss ratios as high as 30 to 1. Designed for wideband applications in such end-products as ECM and laboratory test equipment, they're extremely well suited for the reduction of VSWR and the elimination of anomalies caused by long line effects in oscillator outputs.

Your Sylvania Sales Engineer will be pleased to tell you more about the full line of *competitively priced* broadband coaxial and waveguide isolators. Ask him. For technical data, write Electronic Tubes Division, Sylvania Electric Products Inc., 1100 Main St., Buffalo 9, N. Y.

Typical performance characteristics of FD-522



BROADBAND COAXIAL ISOLATORS		Isolation (Min.) (db)	Insertion Loss (Max.) (db)	VSWR
Frequency	Types			
1.0-2.0	FD-1537	10	1.2	1.2
2.0-4.0	FD-151P	15	1.0	1.2
4.0-8.0	FD-1519	10	1.0	1.25
8.0-11.0	FD-1522W	30	1.0	1.4
BROADBAND WAVEGUIDE ISOLATORS				
3.95-5.85	FD-492	18	1.0	1.15
5.85-8.2	FD-502	20	1.0	1.15
7.05-10.0	FD-512	24	1.0	1.2
8.2-12.4	FD-522	30	1.0	1.15
10.0-15.0	FD-7530	30	1.0	1.15
12.4-18.0	FD-911	24	1.0	1.15
18.0-26.0	FD-531A	24	1.0	1.15
18.0-26.0	FD-531AF1	24	1.0	1.15

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You're assured of high uniformity from unit to unit within each shipment from Keystone and close adherence to the specified nominal values within your tolerances. Quality silvering techniques and extreme care in affixing leads assure good appearance and physical strength. The result is lower inspection costs and fewer assembled rejects for you.

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**price**

Keystone thermistor prices are realistic, and competitive. Our automated production methods and high manufacturing volume permit the most practical pricing policies. Service has never been better, quality has never been higher, and our efficiency has never been greater. Check us now.



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# EEOC PACKAGED CIRCUIT MODULES

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systems  
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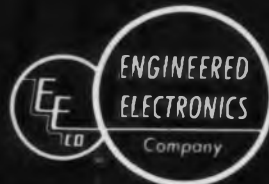
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# Coming Events for 1961 and 1962

*A listing of meetings, conferences, shows, etc., occurring during the balance of 1961 and 1962 that are of special interest to electronic engineers.*

## JUNE

### EAST

June 1: Mtg. Business Management Inst. (Eastern Section); American Univ., Washington, D. C.

June 5-7: 15th Annual Conv. & Exhibit, ASQC; Sheraton Hotel, Phila., Pa.

June 5-7: Annual Conv., Edison Electric Inst.; Waldorf Astoria, N.Y.C.

June 5-9: Nat'l. Plastics Exposition and Conf., SPI; Coliseum and Commodore Hotel, N.Y.C.

June 6-8: 15th AFCEA Annual Conv. & Show; Sheraton-Park Hotel, Washington, D. C.

June 8-10: 89th Annual Mtg. of Manufacturing Chemists' Assoc., Inc.; The Greenbriar, White Sulphur Springs, W. Va.

June 12-13: 3rd Nat'l. Symp. on RFI, IRE; Sheraton-Park Hotel, Washington, D. C.

June 14-15: 5th Annual Conf. Professional Group on Product Engineering and Production, IRE (PGPEP); Hotel Sheraton, Phila., Pa.

June 18-23: Summer General Mtg., AIEE; Statler Hall, Cornell Univ., Ithaca, N. Y.

June 26-28: 5th Nat'l. Conv. on Military Electronics, IRE (PGME); Shoreham Hotel, Washington, D. C.

June 26-28: Vacuum Metallurgy Conf.; New York Univ., N.Y.C.

### MIDWEST

June 4-9: Summer Mtg. Soc. of Automotive Engineers; Chase-Park Plaza Hotel, St. Louis, Mo.

June 14-16: Int'l. Symp. on Gas Chromatography, ISA; Michigan State Univ., Kellogg Ctr., E. Lansing, Mich.

June 14-16: Applied Mechanics Conf., ASME; Ill. Inst. of Tech., Chicago, Ill.

June 19-20: Spring Conf. on Broadcast and TV Receivers, Chicago Sec. IRE (PGBTR); O'hare Inn, Des Plaines, Ill.

June 26-30: Annual Mtg., ASEE; Univ. of Kentucky, Lexington, Ky.

### WEST

June 7-9: Semi-annual Mtg., American Rocket Society; Statler-Hilton Hotel, Los Angeles, Calif.

June 8-9: 1st Western Conf., NEMA; Biltmore Hotel, Los Angeles, Calif.

June 10-17: Conv. American Society of Medical Technologists; Olympic Hotel, Seattle, Wash.

June 11-14: 28th Annual Conv. Electrical Apparatus Service Assoc. (formerly Nat'l. Industrial Serv. Assoc.); Jack Tar Hotel, San Francisco, Calif.

June 11-15: Summer Annual Mtg., American Society of Mechanical Engineers; Statler Hilton Hotel, Los Angeles, Calif.

June 12-15: Int'l. Conf. on the Physics of Electronic and Atomic Collisions, AFOSR/SRYP, ONR, OOR; Univ. of Colo., Boulder, Colo.

June 20-23: 10th Annual Conv. & Trade Show, Nat'l. Community Television Assoc., Inc.; Jack Tar Hotel, San Francisco, Calif.

## JULY

### EAST

July 16-21: 4th Int'l. Conf. on Medical Electronics & 14th Conf. on Electrical Techniques in Medicine and Biology, IFME, JECMB, IRE (PGBME), AIEE, ISA; Waldorf Astoria Hotel, N.Y.C.

July 24-26: Nat'l. Symp. on FAA Air Traffic Control Facilities, EMEA; Mayflower Hotel, Washington, D. C.

### MIDWEST

July 16-20: Music Industry Conv. & Trade Show, Nat'l. Assoc. of Music Merchants, Inc.; Palmer House, Chicago, Ill.

July 22-25: Mtg., Conv. & Exhibits of the Nat'l. Audio-Visual Assoc.; Morrison Hotel, Chicago, Ill.

### WEST

July 3-8: Annual Mtg., Nat'l. Society of Professional Engineers; Olympic Hotel, Seattle, Wash.

July 31-Aug. 4: Differential Equations in Non-Linear Mechanics, AFOSR/Aeronautical Sciences Directorate, RIAS; Air Force Academy, Colo.

## AUGUST

### EAST

Aug. 6: Industrial Research Conf.; Columbia Univ., Arden House, Harman, N. Y.

Aug. 21-23: Int'l. Hypersonics Conf., ARS; Mass. Inst. of Technology, Cambridge, Mass.

Aug. 21-24: Photo-Conductivity Conf.; Cornell Univ., Ithaca, N. Y.

Aug. 27-30: Eastern Region Mtg., Nat'l. Assoc. of Electrical Distributors; Saranac Inn, Saranac, N. Y.

### MIDWEST

Aug. 23-25: Biennial Gas Dynamics Symp., ARS; Northwestern Univ., Evanston, Ill.

Aug. 27-Sept. 1: 6th Int'l. Conf. of Coordination Chemistry, AFOSR/-Chemical Sciences Directorate, AChS (Inorganic Chemistry Sec.); Wayne State Univ., Detroit, Mich.

### WEST

Aug. 1-3: 4th Western Reg. Mtg.,

AAS; Sheraton-Palace Hotel, San Francisco, Calif.

Aug. 19-24: Naval Aviation Mtg., IAS, U. S. Navy; San Diego, Calif.

Aug. 22-25: WESCON (Western Electronic Show & Conv.), WEMA, IRE (L.A. & S.F. Sec.); Cow Palace, San Francisco, Calif.

Aug. 28-Sept. 1: Int'l. Heat Transfer Conf., IAS, ASME, AIChE, ARACE, ChIE, EIC, SAE, IME & IChE (British), Univ. of Colo.; Univ. of Colorado, Boulder, Colo.

# STEMCO THERMOSTATS

*for precise, sensitive temperature control*

**1, TYPE S† adjustable.** Positive acting, single stud or nozzle mounting. Operation to 600°F. Rating: 16.6 amps at 115 VAC, 8.3 amps at 230 VAC. Spade, screw or formed terminals, various adjusting stems, etc. Bulletin 1000.

**2, TYPE S† non-adjustable.** Is similar both electrically and mechanically to adjustable Type S. Spade or screw type terminals. Bulletin 1000.

**3, TYPE SA† adjustable or non-adjustable.** Snap acting, electrically independent bimetal. Also single-pole, double-throw. Rated at 15 to 25 amps at 115-230 VAC only. Spade or screw terminals; single stud or nozzle mounting. Bulletin 2000.

**4, TYPE SM† manual reset.** Mechanically and electrically same as adjustable and non-adjustable Type SA except for manual reset feature. Bulletin 2000.

**5, TYPE A\* semi-enclosed.** Insulated, electrically independent bimetal disc gives fast response and quick, snap action control. Operation from -50° to 300°F. Lower or higher on special order. Various mountings and terminals. Rating: 4 to 15 amps at 115 VAC and 28 VAC/DC. Bulletin 3000.

**6, TYPE A hermetically sealed.** Electrically identical to semi-enclosed Type A. Temperatures from -50° to 300°F. Various enclosures and mountings, including brackets, available. For appliance, electronic, apparatus applications. Bulletin 3000-1.

**7, TYPE M†.** Positive acting, adjustable, for fry pans, skillets and other appliances. Fail-safe, open in low to 500°F in high. Rated at 1650 watts at 115 VAC. Bulletin 10,000.

**8, TYPE C† hermetically sealed or semi-enclosed.** Small, positive acting. Electrically independent bimetal strip for operation from -10° to 300°F. Rated approximately 3 amps, depending on application. Various terminals and mountings. Bulletin 5000.

**9, TYPE G\*.** Also available as manual reset. Used on laundry dryers, furnaces and other similar applications. Snap acting. Rated 7½ to 25 amps, 120-240 VAC. UL approved for operation to 300°F. Bulletin 3500.

**10, POTTED TYPES A\* & G\*.** For refrigeration, air conditioning, or applications requiring a sealed thermostat, the Types A and G are available with lead wires and epoxy sealed. Type GP is shown. Various mounting brackets. Bulletin 3160 for Type A, Bulletin 3560 for Type G.

**11, TYPE W† adjustable or non-adjustable.** Snap action bimetal strip type for operation to 300°F. Depending on duty, rated: 5 to 10 amps, 115 VAC. Screw or nozzle mountings; spade or screw terminals. Bulletin 4000.

**12, TYPE R† sealed, adjustable or non-adjustable.** Positive acting for operation to 600°F. Rated at 15 amps at 115 VAC, 4 amps at 230 VAC. Screw terminals. Bulletin 7000.

**13, TYPE M† semi-enclosed.** Electrically independent snap acting bimetal disc type for appliance and electronic applications from -50° to 300°F. Rating: 3 to 10 amps at 115 VAC and 28 VAC/DC. Virtually any type terminal. Bulletin 6000.

**14, TYPE M† hermetically sealed.** Electrically same as semi-enclosed Type M. Can be furnished with pin or solder-type terminals, wire leads and various mounting brackets. For operation from -50° to 300°F. Bulletin 6000.

**15, TYPE MX† semi-enclosed.** Snap acting to open on temperature rise. 2° to 6°F differentials available. Rated at 3 amps to 1 amp, depending on duty cycle, at 115 VAC and 28 VAC/DC. Various terminals, mountings, brackets, etc. Bulletin 6100.

**16, TYPE MX† hermetically sealed.** Snap acting miniature thermostats in circular enclosures or CR-7 cans. For avionic, aerospace, electronic and similar uses. Normal differentials 2° to 6°F; special order 1° to 4°F differentials available. Ratings same as Type MX semi-enclosed. Bulletin 6100.

Illustrations, for general information only, do not necessarily show size comparisons. Fully dimensioned and certified prints on request. Manufacturer reserves right to alter specifications without notice.

\*Refer to Guide 400 EO for UL or CSA approved ratings.  
†These thermostats covered by patents issued or applied for.

A-981A



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**THERMOSTATS**

## SEPTEMBER

## EAST

- Sept. 6-8: Joint Nuclear Instrumentation Symp., ISA, AIEE, IRE; N. Carolina State College, Raleigh, N. C.
- Sept. 6-8: Annual Mtg. (Joint) Assoc. of the U. S. Army, Army Aviation Assoc. of America; Sheraton-Park Hotel, Washington, D. C.
- Sept. 13-15: IRE Conf. on Technical-Scientific Communications, Nat'l. PGEWS and Phila. Sec. IRE; Bellevue-Stratford Hotel, Phila., Pa.
- Sept. 13-17: Nat'l. Hobby & Science Exposition; Coliseum, N.Y.C., N. Y.
- Sept. 14-15: Engineering Management Conf., ASME; Roosevelt Hotel, N.Y.C., N. Y.
- Sept. 20-21: Industrial Electronics Symp., IRE (PGIE), AIEE; Boston, Mass.
- Sept. 21-24: Aerospace Panorama, Air Force Assoc.; Trade & Conv. Ctr., Phila., Pa.

## MIDWEST

- Sept. 3-8: Nat'l. Mtg., ACS; Chicago, Ill.
- Sept. 6-8: Midwest Conf. on Fluid and Solid Mechanics; Kellogg Center, E. Lansing, Mich.
- Sept. 8-10: 1961 Chicago High Fidelity and Home Entertainment Show; Palmer House, Chicago, Ill.
- Sept. 13-15: Annual Mtg., Human Factors Society, Battelle Memorial Inst., N. American Aviation, Inc.; Ohio State Univ., Columbus, Ohio.
- Sept. 18-20: Annual Mtg., Standards Engineers Society; Hotel Sherman, Chicago, Ill.
- Sept. 24-29: Nat'l. Tech. Conf., Illumination Eng'g. Soc.; Chase-Park Plaza Hotel, St. Louis, Mo.
- Sept. 28-29: Nat'l. Conf. & Tech. Exhibit, American Production & Inventory Control Society; Pick-Congress Hotel, Chicago, Ill.

## WEST

- Sept. 5-8: 16th Nat'l. Conf. of the Assoc. for Computing Machinery and 1st Int'l. Data Processing Exhibit; Statler-Hilton Hotel, Los Angeles, Calif.
- Sept. 6-8: Nat'l. Symp. on Space Electronics & Telemetry, IRE (PGSET); Univ. of New Mexico, Albuquerque, N. M.
- Sept. 11-15: 16th Annual ISA Instrument-Automation Conf. & Exhibit; ISA; Los Angeles Memorial Sports Arena, Los Angeles, Calif.
- Sept. 11-15: Int'l. Industrial Conf., Stanford Research Inst., Nat'l. Industrial Conf. Board; Fairmont Hotel, San Francisco, Calif.
- Sept. 24-27: Nat'l. Power Conf., AIEE, ASME; San Francis Hotel, San Francisco, Calif.
- Sept. 25-28: Nat'l. Fall Mtg., American Welding Society; Hotel Adolphus, Dallas, Tex.

## OCTOBER

## EAST

- Oct. 2-4: 7th Nat'l. Communications Symp., IRE (PGCS); Utica, N. Y.
- Oct. 2-6: 90th Semiannual Conv., SMPTE; Lake Placid Club, Lake Placid, N. Y.
- Oct. 4-6: 1961 Semiannual Conv., American Soc. of Photogrammetry; Biltmore Hotel, N.Y.C.
- Oct. 9-10: Mtg., Basic Science Div. of the American Ceramic Soc.; Hotel Van Curler, Schenectady, N. Y.
- Oct. 9-11: Nat'l. Fall Conf. & Expos., Nat'l. Management Assoc., Bellevue-Stratford Hotel, Phila., Pa.
- Oct. 9-13: ARS Space Flight Report to the Nation, ARS; Coliseum, N.Y.C.
- Oct. 10-13: Annual AES Conv.; Hotel New Yorker, N.Y.C.
- Oct. 14: NAB Fall Conf.; Atlanta, Ga.
- Oct. 19-21: Fall Mtg., Nat'l. Soc. of Professional Engrs.; Roanoke Hotel, Roanoke, Va.
- Oct. 23-25: Conf. on Electrical Insulation, Nat'l. Academy, Nat'l. Academy of Sciences and Nat'l. Research Council; Pocono Manor, Pocono Manor, Pa.

## MIDWEST

- Oct. 1-5: Mtg., The Electrochemical Society, Inc.; Statler Hotel, Detroit, Mich.
- Oct. 2-3: Annual Mtg., Eng'g. Council for Professional Development; Louisville, Ky.
- Oct. 6-7: Annual North-Midwest Sec. Mtg., ASEE; Mich. College of Mining & Technology, Houghton, Mich.
- Oct. 8-10: Mtg., Int'l. Municipal Signal Assoc.; Netherland Hilton Hotel, Cincinnati, Ohio.
- Oct. 9-11: 17th Annual Nat'l. Electronics Conf., AIEE, IRE, Ill. Inst. of Tech., Northwestern Univ., Univ. of Ill.; International Amphitheatre, Chicago, Ill.
- Oct. 15-20: Fall General Mtg., AIEE; Detroit, Mich.
- Oct. 16-20: 1961 Nat'l. Safety Congress & Expos., NSC; Conrad Hilton Hotel, Chicago, Ill.
- Oct. 23-26: Fall Mtg., Metallurgical Society of AIME; Pick-Fort Shelby Hotel, Detroit, Mich.
- Oct. 23-27: Detroit Metal Show (43rd Nat'l. Metal Congress & Expos.), ASM; Cobo Hall, Detroit, Mich.
- Oct. 24-26: 1961 Michigan Industrial Electronics Expos., Electronic Rep-

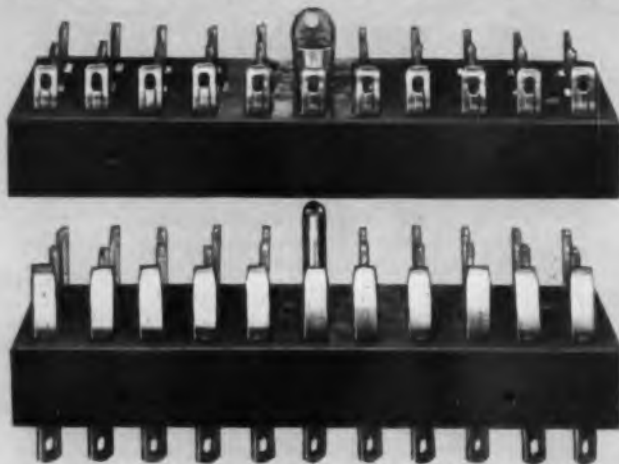
representatives, Inc.; Detroit Artillery Armory, Detroit, Mich.

- Oct. 25-26: 1961 Computer Applications Symp., Armour Research Foundation; Chicago, Ill.

## WEST

- Oct. 4-6: Process Industries Conf., ASME; Shamrock Hilton Hotel, Houston, Tex.
- Oct. 4-6: Western Regional Conf., Nat'l. Assoc. of Corrosion Engineers; Hotel Multnomah, Portland, Ore.
- Oct. 8-11: Fall Mtg., AIME, Society of Petroleum Engrs.; Dallas, Tex.
- Oct. 9-13: Nat'l. Aeronautic Mtg., SAE; Ambassador Hotel, Los Angeles, Calif.
- Oct. 10-12: 12th Nat'l. Conf. on Standards, ASA; Rice Hotel, Houston, Tex.
- Oct. 18-20: Nat'l. Assoc. of Educational Broadcasters Conf.; San Francisco, Calif.
- Oct. 18-20: Annual Mtg. Optical Society of America; Biltmore Hotel, Los Angeles, Calif.
- Oct. 25-28: Mtg., Electronics Div. ACS; Jack Tar Hotel, San Francisco, Calif.

# AN IMPROVEMENT



## THE NEW JONES MONOBLOC 300 SERIES CONNECTORS

- Simpler ... sturdier • Easy insertion and withdrawal
- Eliminates Moisture traps (No back plates)

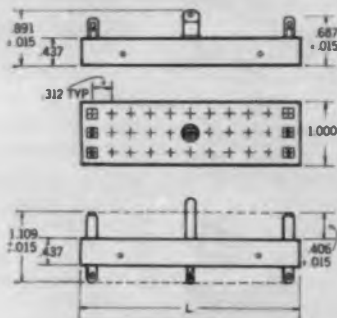
Completely interchangeable with the equivalent sizes of the standard 300 Series.

Can be supplied with hardware for either chassis mounting or cable application.

Insulation material is G.P. black ... pins are of cadmium plated brass ...

Contacts are of cadmium-plated phosphor bronze.

For further information, contact the Cinch sales office in your area.



### DIMENSIONAL DATA

Plug Part No.	Receptacle Part No.	No. of Pins or Contacts	Crystal or Polarizing Pin Position	Distances "L"
261 31 15 000	261 32 15 000	15	—	1.625
261 31 18 000	261 32 18 000	18	—	1.937
261 31 21 000	261 32 21 000	21	—	2.250
261 31 24 000	261 32 24 000	23	ø14	2.562
261 31 27 000	261 32 27 000	26	ø14	2.875
261 31 30 000	261 32 30 000	29	ø17	3.187
261 31 33 000	261 32 33 000	32	ø17	3.500

### SPECIFICATIONS

Recommended Withstanding Voltages:

A Adjacent terminals (5mm level) 2500 Volts (AC RMS)  
 B To ground (5mm level) 1750 Volts (DC)  
 C To ground (5mm level) 2250 Volts (AC RMS)  
 3300 Volts (DC)  
 Current rating 4.5 Amps  
 Contact resistance 015 Ohms (max.)  
 Insulation resistance 1,000 Megohms (min.)



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Centrally located plants at Chicago, Illinois; Shelbyville, Indiana; City of Industry, California, and St. Louis, Missouri

## NOVEMBER

## EAST

- Nov. 1-3: Mtg., Society for Experimental Stress Analysis; Hotel New Yorker, N.Y.C.
- Nov. 7-9: 8th Industrial Electric Expos., Electric League of Western Pa.; Penn-Sheraton Hotel, Pittsburgh, Pa.
- Nov. 14-16: 1961 Northeast Electronics Research & Eng'g. Mtg. (NEREM), IRE; Commonwealth Armory and Somerset Hotel, Boston, Mass.
- Nov. 20-21: 1961 Electron Devices Mtg., IRE (PGED); Shoreham Hotel, Washington, D. C.
- Nov. 26-Dec. 1: Winter Annual Mtg., ASME; Statler Hilton Hotel, N.Y.C., N. Y.
- Nov. 27-Dec. 1: 28th Expos. of the Chemical Industries; Coliseum, N.Y.C., N. Y.

Nov. 30-Dec. 2: Conf., Tech.-Progress in Communication, Wire & Cables Symp., U. S. Army (Sig. R&D Labs.); Berkeley-Carteret Hotel, Asbury Park, N. J.

## MIDWEST

- Nov. 2-3: 10th Annual Instrumentation Conf.; Louisiana Polytechnic Inst., Dept. of Eng'g., Rushton, La.
- Nov. 7-10: Packaging Machinery Mfgs. Institute Show of 1961; Cobo Hall, Detroit, Mich.
- Nov. 9-11: Mtg., Acoustical Society of America; Cincinnati and Dayton, Ohio.
- Nov. 9-11: 2nd Power Industry Computer Application Conf., AIEE; Chase Hotel, St. Louis, Mo.
- Nov. 14: Symp. on Electronic Systems Reliability (MAECON is scheduled only on even years), Kansas City Sec. IRE; Kansas City, Mo.

Nov. 30-Dec. 1: Conf. Professional Group on Vehicular Communications, IRE (PGVC); Hotel Leamington, Minneapolis, Minn.

## WEST

- Nov. 1-3: Plastics in Packaging and Eng'g. Exhib., North Texas Sec., SPE, Southwestern Div. Chap. SPHE; Sheraton-Dallas Hotel, Dallas, Tex.
- Nov. 2-3: Annual Mtg., AIME; Los Angeles, Calif.
- Nov. 6-8: Special Tech. Conf. on Non-Linear Magnetics, AIEE; Hotel Statler, Los Angeles, Calif.
- Nov. 9-10: Mtg., Operations Research Society of America; Jack Tar Hotel, San Francisco, Calif.
- Nov. 13-16: 7th Annual Conf. on Magnetism and Magnetic Materials, AIEE, AIP, ONR, IRE, Metallurgical Soc. of AIME; Hotel Westward Ho, Phoenix, Ariz.

## DECEMBER

## EAST

- Dec. 6-8: 65th Annual Cong. of American Industry, NAM; Waldorf Astoria, N.Y.C.
- Dec. 6-8: 19th Electric Furnace Conf. AIME; Penn-Sheraton Hotel, Pittsburgh, Pa.
- Dec. 12-14: 1961 Eastern Joint Computer Conf., Sheraton-Park Hotel, Washington, D. C.

Dec. 18: Wright Bros. Lecture, IAS; Washington, D. C.

Dec. 27-30: Annual Mtg., American Statistical Assoc.; Roosevelt Hotel, N.Y.C.

## MIDWEST

Dec. 1: Plastics Screw Injection Molding, Cleveland Sec. SPE;

Cleveland Eng'g. Soc. Bldg., Cleveland, Ohio.

## WEST

- Dec. 26-31: Annual Mtg. and Expos. of Science and Industry, American Assoc. for the Advancement of Science; Denver Hilton Hotel, Denver, Colo.
- Dec. 27-29: Mtg., American Physical Society; Los Angeles, Calif.

## FOREIGN

June 5-8: ISA Summer Instrument-Automation Conf. & Exhibit; Royal York Hotel and Queen Elizabeth Hall, Toronto, Ont., Canada.

June 12-17: Conf. on Components & Materials used in Electronic Eng'g., Institute of Electrical Engineers (British); Central Hall, Westminster, London, England.

June 12-25: Int'l. Electronic & Nuclear Energy Exhibition & Congress; Rome, Italy.

June 14: Plastics in Packaging, Quebec Sec. of SPE; Montreal, Quebec, Canada.

June 22-24: Mtg. American Physical Society; Mexico City, Mexico.

July 7-29: Russian Trade Fair; Earls Court, London, England.

Aug. 1-12: Sydney Trade Fair; Sydney, Australia.

Aug. 7-12: Melbourne Eng'g. Exhib.: Industrial Equipment, Services; Melbourne, Australia.

Aug. 23-Sept. 2: Nat'l. Radio & Television Fair; London, England.

Sept. 1-8: Int'l. FIRATO Exhib.: Radio, Television and Electronics; Amsterdam, Netherlands.

Sept. 4-9: 5th Int'l. Conf. on Ionization Phenomena in Gases, Technische Hochschule Karlsruhe; Munich, Germany.

Sept. 28-Oct. 1: Symp. on Radioactive Metrology, NPL, Advisory Comm. on Radioactive Standards, Sub-comm. on Measurements and Standards of Radioactivity of the U. S. Nat'l Research Council; Oxford, England.

Oct. 2-4: Canadian Electronic Conf., IRE (Canadian Region); Automot-

tive Bldg., Exhib. Park, Toronto, Ont., Canada.

Oct. 3-12: British Electronic Computer Exhib.; Olympia, London, England.

Oct. 23-24: Joint Mtg., Canadian Aeronautical Institute and Institute of Aerospace Sciences; Quebec., Canada.

Oct. 26-27: Semiannual Conf., American Society of Tool & Mfg. Engineers; Royal York Hotel, Toronto, Ont., Canada.

Nov. 8-10: Conf. on Non-Destructive Testing in Electrical Eng'g., Institution of Electrical Engineers (British); London, England.

Nov. 13-18: 9th Factory Equip. Exhib.; Earls Court, London, England.



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1. Thermofit sleeve
2. Disconnect
3. Sleeve positioned
4. After heating



IN **3** SECONDS

### **THERMOFIT** The Tubing With A Memory

Snap-on Disconnect Terminals can be insulated in less than three seconds with Thermofit heat-shrinkable sleeves. The terminal may then be engaged and disengaged repeatedly without damage to the sleeve. Thermofit provides reliable, outstanding lifetime insulation and is an economical solution for a difficult insulating problem.

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## Some Highlights of 1962

Jan. 9-11: 8th Nat'l. Symp. on Reliability & Quality Control, IRE; Statler-Hilton Hotel, Washington, D. C.

Jan. 24-26: 2nd Symp. on Thermophysical Properties, ASME; Princeton, N. J.

Feb. 13-15: Tutorial Inst. in Industrial Writing Improvement, American Industrial Writing Inst.; Hotel Statler-Hilton, Los Angeles, Calif.

Mar. 26-29: IRE International Convention; Coliseum & Waldorf-Astoria Hotel, New York, N. Y.

April 9-13: The Business Equipment Exposition, OEMI; McCormick Place, Chicago, Ill.

April 11-13: Annual Tech. Mtg. and Equipment Exposition, Institute of Environmental Sciences; Sheraton Towers Hotel, Chicago, Ill.

Apr. 18-20: 5th Annual Industrial Mutual Aid & Disaster Control Seminar, Nat'l Inst. for Disaster Mobilization; Shamrock-Hilton Hotel, Houston, Tex.

Apr. 20-22: 76th Annual Conv., Illinois Soc. of Professional Engrs.; Peoria, Ill.

April 30-May 9: Hanover Int'l Fair; Hanover, West Germany.

May 8-10: Electronic Components Conf., IRE, AIEE, EIA,

WEMA; Washington, D. C.

May 14-16: NAECON, IRE; Dayton, Ohio.

May 23-25: National Telemetering Conf., IRE, AIEE, IAS, ARS, ISA; Sheraton Park Hotel, Washington, D. C.

June 27-29: Conf. on Standards & Electronic Measurements, IRE, NBS, AIEE; NBS Boulder Labs, Boulder, Colo.

Aug. 21-24: WESCON, IRE, WEMA; Los Angeles, Calif.

Sept. 8-10: Chicago High Fidelity & Home Entertainment Show; Palmer House, Chicago, Ill.

Oct. 1-3: 8th National Communications Symp., IRE; Utica, N. Y.

Oct. 9-11: National Electronics Conf., IRE, AIEE, EIA, SMPTE; Chicago, Ill.

Oct. 15-19: 17th International Instrument-Automation Conf. & Exhibit, ISA; New York Coliseum, New York, N. Y.

Oct. 18-19: Electron Devices Meeting, IRE; Shoreham Hotel, Washington, D. C.

Nov. 13-15: NEREM, Northeast Res. & Eng. Mtg., IRE; Boston, Mass.

Dec. 4-7: Eastern Joint Computer Conf., IRE, AIEE, ACM, Bellevue-Stratford Hotel, Phila, Penna.

## Abbreviations

AAS—American Astronautical Society

ACS—American Ceramic Society

AChS—American Chemical Society

AES—Audio Engineering Society

AFCEA—Armed Forces Communications & Electronics Association

AFOSR—Air Force Office of Scientific Research

AICHE—American Institute of Chemical Engineers

AIEE—American Institute of Electrical Engineers

AIME—American Institute of Mining, Metallurgical & Petroleum Engineers

AIP—American Institute of Physics

ANS—American Nuclear Society

ARACE—American Refrigerating and Air Conditioning Engineers

ARS—American Rocket Society

ASEE—American Society for Engineering Education

ASM—American Society for Metals

ASME—American Society of Mechanical Engineers

EIC—Engineering Institute of Canada

EMEA—Electronic Maintenance Engineering Association

FAA—Federal Aviation Agency

IAS—Institute of Aerospace Sciences

ICbE—Institute of Chemical Engineers (British)

IFME—International Federation for Medical Electronics

IME—Institute of Mechanical Engineers (British)

IRE—Institute of Radio Engineers

ISA—Instrument Society of America

JECMB—Joint Executive Committee on Medicine and Biology

NAB—National Association of Broadcasters

NAM—National Association of Manufacturers

NEMA—National Electrical Manufacturers Association

NPL—National Physical Laboratory

ONR—Office of Naval Research

SAE—Society of Automotive Engineers

SMPTE—Society of Motion Picture & TV Engineers

## "CALL FOR PAPERS"

13th Annual Fall Conv. & Technical Exhibit of the Audio Engineering Society, Oct. 10-13, 1961, Hotel New Yorker, New York, N. Y. Some of the topics to be covered: Disc Recording, and Reproducing, Loudspeakers and Systems, Artificial Reverberation, Standards of Measurement and performance, Psychoacoustical Engineering and Bioacoustics. Deadline for abstracts of papers is August 15, 1961. Forward papers to: Hermon H. Scott, Chairman Convention Committee, AES, 111 Powder Mill Rd., Maynard, Mass.

International Conf. on Ionization of the Air, Oct. 16-17, 1961. Franklin Institute, Phila., Pa. Conf. will cover all aspects of air ionization. Deadline for 150 word abstracts is July 1, 1961. Deadline for completed manuscripts is August 1, 1961. Forward to: American Institute of Medical Climatology, 1618 Allengrove St., Phila., Pa.

East Coast Conf. on Aerospace and Navigational Electronics (ECCANE), Oct. 23-25, 1961. Lord Baltimore Hotel, Baltimore, Md. Conf. will emphasize engineering developments, electronic techniques, and scientific accomplishments related to missiles, aircraft and space vehicles. Deadline for 500 word abstracts is July 5, 1961. Deadline for complete papers is September 1, 1961. Forward abstracts (3 copies) to: William C. Vergara, Director, Advanced Research Dept., Bendix Radio, Towson 4, Md.

7th Annual Conf. on Magnetism and Magnetic Materials, Nov. 13-16, Hotel Westward Ho, Phoenix, Ariz. Deadline for abstracts is August 18, 1961. Forward to: Mr. Peter B. Myers, Motorola Semiconductor Products Div., 5005 E. McDowell Rd., Phoenix, Ariz.

Symp. on Electromagnetic Theory and Antennas, June 25-30, 1962, The Technical Univ. of Denmark. Copenhagen, Denmark. Papers will deal with: Electromagnetic fields in anisotropic media; Diffraction theory; Antenna pattern synthesis; and Quasi-static electromagnetic problems. Deadline for 800-1200 word 3 page summary is December 1, 1961. Forward to: Technical Program Committee, The Technical Univ. of Denmark, Oster Voldgade 10 G, Copenhagen K, Denmark.

2nd International Congress on Information Processing, Aug. 27-Sept. 1, 1962, Munich, Germany. All aspects of Information Processing and Digital Computers will be covered. Deadline for 500-1000 word abstracts is Sept. 15, 1961. Forward to: Dr. E. L. Harder, Chairman American Arrangements, Westinghouse Electric Corp., East Pittsburgh, Pa.

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## ELECTRONIC INDUSTRIES'

# 1961 Roster of Associations Serving the Electronic Industries

A listing of the technical and fraternal organizations for the professionally employed in the electronic arts and sciences. Shown

are the name of the organization; membership; mailing address; officers; date and location of the annual meeting; and objectives.

**ACOUSTICAL SOCIETY OF AMERICA**—3000 Members . . . 335 E. 45th St., New York 17, N. Y. . . . Robert W. Young, Pres.; Laurence Batchelder, Pres.-Elec. . . . Fall Meeting, Nov. 8-11, 1961, Cincinnati, Ohio . . . To increase and diffuse the knowledge of acoustics and promote its practical applications.

**AEROSPACE INDUSTRIES ASSOCIATION OF AMERICA, INC.**—107 Members . . . 610 Shoreham Bldg., Washington 5, D. C. . . . Orval R. Cook, Pres.; Harrison Brand, Jr., Secy.-Treas. . . . Meeting by invitation only. . . . National trade association of the aircraft, missile, and spacecraft manufacturing industries.

**AMERICAN ELECTROPLATERS' SOCIETY, INC.**—8000 Members . . . 443-445 Broad St., Newark 2, N. J. . . . Dr. W. Andrew Wesley, Pres.; John P. Nichols, Exec. Secy. . . . 48th Annual Conv., June 18-23, 1961, Statler-Hilton Hotel, Boston, Mass. . . . Advancement of the arts and sciences of electroplating, metal finishing and allied arts.

**AMERICAN INSTITUTE OF ELECTRICAL ENGINEERS**—56,000 Members . . . 33 W. 39th St., New York 18, N. Y. . . . Warren H. Chase, Pres.; Nelson S. Hibshman, Exec. Secy. . . . Summer General Meeting, Jan. 18-23, 1961, Cornell University, Ithaca, N. Y. . . . To further the arts of electrical engineering.

**AMERICAN INSTITUTE OF PHYSICS**—5 member societies, 2 assoc. member societies . . . 335 E. 45th St., New York 17, N. Y. . . . Wallace Waterfall, Sec.-Treas. . . . The advancement and diffusion of knowledge of the science of physics and its applications to human welfare.

**AMERICAN RADIO RELAY LEAGUE, INC.**—100,000 Members . . . 38 LaSalle Rd., West Hartford 7, Conn. . . . Goodwin L. Dosland, Pres.; John Huntoon, Secy.-Gen. Mgr. . . . National non-profit association of radio amateurs, promoting the interests of the hobby of amateur radio.

**AMERICAN SOCIETY FOR QUALITY CONTROL, INC.**—13,150 Members . . . 161 W. Wisconsin Ave., Milwaukee 3, Wis. . . . D. S. Chambers, Exec. Secy.; William P. Youngclaus, Jr., Admin. Secy. . . . 15th Annual Convention and Exhibit, June 5-7, 1961, Sheraton Hotel, Philadelphia, Pa. . . . To promote the science and profession of quality control.

**AMERICAN SOCIETY OF TOOL AND MANUFACTURING ENGINEERS**—41,000 Members . . . 10700 Puritan Ave., Detroit 38, Mich. . . . H. Dale Long, Pres.; H. Verne Loeppert, Treas. . . . To advance scientific knowledge in the field of tool and manufacturing engineering and through its members engaged in research, writing, publishing and disseminating such information.

**AMERICAN SOCIETY FOR TESTING MATERIALS**—10,500 Members . . . 1916 Race St., Philadelphia 3, Pa. . . . Thomas A. Marshall, Jr., Exec. Secy. . . . Annual Meeting, June 25-30, Chalfonte-Haddon Hall, Atlantic City, N. J. . . . The promotion of knowledge of the materials of engineering, and the standardization of specifications and the methods of testing.

**AMERICAN STANDARDS ASSOCIATION**—2200 companies, 123 trade associations . . . 10 E. 40th St., New York 16, N. Y. . . . F. H. Roby, Vice-Pres. . . . 12th National Conference on Standards, Oct. 10-12, Rice Hotel, Houston, Tex.; Annual Meeting of ASA, Dec. 16, Summit Hotel, New York, N. Y. . . . Coordination and integration of voluntary national standards work to establish uniform national standards approved by the ASA.

**ARMED FORCES COMMUNICATIONS & ELECTRONICS ASSOCIATION**—12,000 Members . . . 1624 Eye St., N. W., Washington 6, D. C. . . . Col. B. H. Oliver, Jr., Pres.; Col. W. J. Baird, Gen. Mgr. . . . June 6-8, 1961, Sheraton-Park & Shoreham Hotels, Washington, D. C. . . . A non-political, patriotic, non-profit organization whose main objective is to support national security through the cooperation of the military-industry team.

**ASSOCIATED POLICE COMMUNICATIONS OFFICERS INC.** . . . 2000 Members . . . 51 Government St., Mobile, Ala. . . . R. James Evans, Pres.; H. P. Black, Secy.-Treas. . . . Annual Conf., 1st week in Aug. . . . Police and public safety radio and communications.

**ASSOCIATION FOR APPLIED SOLAR ENERGY**—970 Members . . . Arizona State University, Tempe, Ariz. . . . Brig. Gen. H. Welmsley, Pres.; Frank L. Snell, Secy. . . . To gather, compile and disseminate information relating to solar energy.

**ASSOCIATION FOR COMPUTING MACHINERY**—over 3,000 Members . . . 14 E. 69th St., New York 21, N. Y. . . . Dr. Harry D. Huskey, Pres.; Mrs. Irene Hollister, Exec. Secy. . . . ACM 16th National Meeting Sept. 6-8, 1961, Statler Hilton Hotel, Los Angeles, Calif. . . . To advance the science of information processing and to promote the free interchange of information.

**ASSOCIATION OF ELECTRONIC PARTS AND EQUIPMENT MANUFACTURERS INC.**—145 Members . . . Suite 1500—11 So. La Salle St., Chicago 3, Ill. . . . Warren Stuart, Pres.; Kenneth C. Prince, Exec. Secy. . . . To treat all problems relating to sales and distribution of electronic items through distributors.

**AUDIO ENGINEERING SOCIETY, INC.**—2500 Members . . . P.O. Box 12, Old Chelsea Sta., New York 11, N. Y. . . . Dr. Harry F. Olson, Pres.; C. J. LeBel, Secy. . . . Oct. 10-13, Hotel New Yorker, New York, N. Y. . . . Society represents the profession whose field is the recording, transmission and reproduction of those frequencies audible to the human ear. Its objects are the advancement of the theory and practice of audio engineering and its closely related arts, and the dissemination of important information in this field.

**BROADCAST PIONEERS**—App. 1,400 Members . . . 589 Fifth Ave., New York 17, N. Y. . . . Sol Taishoff, Pres.; M. H. Shapiro, Exec. Secy. . . . Persons with long years of service in radio.

**ELECTRONIC INDUSTRIES ASSOCIATION**—350 Members . . . 1721 De Sales St., N. W., Washington 6, D. C. . . . L. Berkley Davis, Pres.; Leslie F. Muter, Treas. . . . Trade association for the electronics industry.

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Plus a companion  
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**ELECTRONIC REPRESENTATIVES ASSOCIATION**—780 Members  
600 S. Michigan Ave., Chicago 5, Ill. . . . Wally Shulan,  
Pres., Edward Stemm, Sec. . . . Annual Convention and Manage-  
ment Conf., Jan 23-27, 1962, Hollywood Beach, Fla. . . .  
The improvement and advancement of electronic manufacturers  
representatives

**FORESTRY, CONSERVATION COMMUNICATIONS ASSOC.**—2600  
State St., Salem, Ore. . . . Wm. F. Sanders, Pres.; Osal B. Capps,  
Secy.-Treas. . . . Meeting, July 18-21, 1961, Sacramento, Calif. . . .  
Development and progress of the art of Forestry, Conservation Com-  
munications in order to promote greater cooperation in the correla-  
tion of the work and activities of Forestry-Conservation agencies

**INSTITUTE OF AEROSPACE SCIENCES, INC.**—20,600 Members  
2 E. 64th St., New York 21, N. Y. . . . H. Guyford Stever, Pres.,  
Robert R. Dexter, Secy . . . To facilitate the interchange of  
technical ideas among aerospace scientists and engineers throughout  
the world and to encourage competent and qualified students to  
prepare themselves for active professional participation in the fields  
of the aerospace sciences.

**INSTITUTE OF HIGH FIDELITY MANUFACTURERS, INC.** — 85  
Members . . . 125 E. 23rd St., New York 10, N. Y. . . . R. V.  
Pepe, Pres., Gordon Gow, Secy. . . . 1961 New York High Fidelity,  
Sept. 13-17 . . . Trade Association representing the component  
manufacturers of high fidelity equipment

**INSTITUTE OF PRINTED CIRCUITS**—50 Companies . . . 27 E.  
Monroe St., Chicago 3, Ill. . . . R. L. Swiggett, Pres.; R. C. Rennie,  
Treas. . . . Meeting, Oct. 10-11, 1961, Sheraton Towers, Chicago,  
Ill. . . . To accelerate growth of printed circuits through tech-  
nological advancement and through expanding its applications and  
markets

**THE INSTITUTE OF RADIO ENGINEERS, INC.**—85,000 Members  
1 E. 79th St., New York 21, N. Y. . . . Lloyd V. Berkner,  
Pres.; George W. Bailey, Exec. Secy . . . Advancement of the  
theory and practice of radio and allied branches of engineering and  
of the related arts and sciences

**INSTRUMENT SOCIETY OF AMERICA**—13,000 Members . . . 313  
Sixth Ave., Pittsburgh 22, Pa. . . . Dr. Ralph H. Tripp, Pres.;  
William H. Kushnick, Exec. Dir. . . . ISA Fall Instrument-Auto-  
mation Conf. & Exh., Sept. 11-15, 1961, Biltmore Hotel, Memorial  
Sports Arena, Los Angeles, Calif.

**JOINT TECHNICAL ADVISORY COMMITTEE**—8 Members . . .  
1 E. 79th St., New York 21, N. Y. . . . Ralph L. Clark, Chrmn.;  
L. G. Cumming, Secy. . . . To assist the Federal Government and  
industry on electronic engineering matters on an engineering basis

**METAL POWDER CORE ASSOCIATION**—15 Members . . . Jack  
Webb, Pres.; Richard Ponemon, Director . . . Meeting, April 23-25,  
1962, Sheraton, Phila., Pa. . . . To develop standards, sponsor  
meetings, compile statistics for the metal powder core producing  
industry.

**NATIONAL ASSOCIATION OF BROADCASTERS**—2,767 Members  
1771 N. St., N. W., Washington 6, D. C. . . . Gov. LeRoy  
Collins, Pres.; Everett E. Revercomb, Secy.-Treas. . . . To foster  
and promote aural and visual broadcasting in all its forms

**NATIONAL ASSOCIATION OF ELECTRICAL DISTRIBUTORS**—1090  
Members . . . 290 Madison Ave., New York 17, N. Y. . . . To  
disseminate information on industry matters and to promote bene-  
ficial relationship among distributors

**NATIONAL ASSOCIATION OF MUSIC MERCHANTS, INC.**—1,386  
Members . . . 222 W. Adams St., Chicago 6, Ill. . . . Philip  
Werlein IV, Pres.; C. Gordon Mannah, Secy. . . . 1961 Music  
Industry Conv. and Trade Show, July 16-20, The Palmer House,  
Chicago, Ill. . . . To serve the interests of its members and those  
of the retail music industry

**NATIONAL ASSOCIATION OF RELAY MANUFACTURERS** — 37  
Member Companies . . . Box 6, Stillwater, Okla. . . . V. A.  
Hedlund, Pres.; Edward Bachorik, Secy. . . . To disseminate  
information and to develop industry standards.

**NATIONAL COMMUNITY TELEVISION ASSOCIATION, INC.**—450  
Members . . . 535 Transportation Bldg., Washington 6, D. C. . . .  
William Dalton, Pres. . . . 10th Anniversary Conv., June 19-23, 1961,  
San Francisco, Calif. . . . Service to community antenna television  
systems using master antenna-coaxial cable closed circuit TV  
distribution systems

**NATIONAL ELECTRICAL MANUFACTURERS ASSOCIATION**—521  
Member Companies . . . A.D.R. Fraser, Pres. . . . Western Conf.,  
June 8-9, 1961, Biltmore, Los Angeles, Calif. . . . To disseminate  
information and to develop industry standards

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1961 Assembly Meeting, Sept.-Oct. 1961, Miami, Fla. . . . To  
advance the art and science of aeronautics through the investiga-  
tion of all available or potential applications of the telecommunica-  
tion art, their coordination with allied arts and the adaptation  
thereof to aeronautics

**RADIO TECHNICAL COMMISSION FOR MARINE SERVICES**—220  
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ington 25, D. C. . . . G. R. McLeod, Exec. Secy. . . . To advance  
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bers . . . 1 E. 57th St., New York 22, N. Y. . . . George R.  
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Jan 30-Feb. 2, 1962. . . . Development and dissemination of  
technical information relating to plastics materials and plastics  
products

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ston Ave., New Providence, N. J. . . . H. R. Terhune, Pres.; R. F.  
Francoise, Secy. . . . Meeting, Sept. 18-19, 1961, Sherman Hotel,  
Chicago . . . To further standardization as a means of enhancing  
general welfare

**ULTRASONIC MANUFACTURERS' ASSOC.**—25 Members . . . 11  
West 42nd St., New York 36, N. Y. . . . S. Jacke, Pres.; James  
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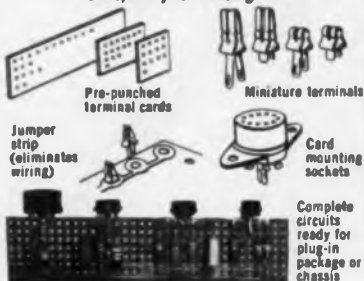
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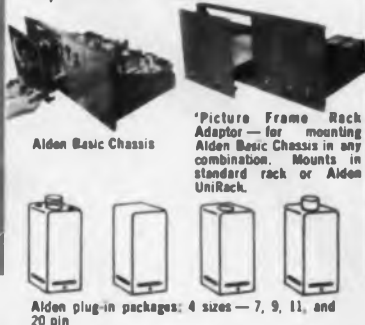
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3 VOLTS D-C		12 VOLTS D-C	
$\mu$ F	Diameter in Inches	$\mu$ F	Diameter in Inches
.1	.225	.047	.275
.22	.275	.1	.400
.47	.400	.22	.595
1.0	.595	.47	.840
2.2	.840		

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## PROFESSIONAL ENGINEERING GROUPS OF THE INSTITUTE OF RADIO ENGINEERS

**AEROSPACE AND NAVIGATIONAL ELECTRONICS**—Edgar A. Post, Chairman . . . East Coast Conf. on Aerospace & Navigational Electronics, Oct. 23-25, 1961, Baltimore, Md. . . . The application of electronics to operation and traffic control of aircraft and to navigation of all craft

**ANTENNAS & PROPAGATION**—Edward C. Jordan, Chairman—IRE International Conv., March 26-29, 1961, New York, N. Y. . . . Edward C. Jordan, Chairman . . . Technical advances in antennas and wave propagation theory and the utilization of techniques or products of this field

**AUDIO**—Cyril M. Harris, Chairman . . . IRE Int'l Conv., March 26-29, 1962, New York City . . . Technology of communication at audio frequencies and of the audio-frequency portion of radio-frequency systems, and the recordings and reproduction from recordings

**AUTOMATIC CONTROL**—John M. Salzer . . . Joint Automatic Control Conf., June 28-30, 1961, Boulder, Colo. . . . The theory and application of automatic control techniques including feedback control systems

**BIO-MEDICAL ELECTRONICS**—Herman P. Schwan, Chairman . . . 4th Int'l Conf. on Medical Electronics, July 16-21, 1961, New York City . . . The use of electronic theory and techniques in problems of medicine and biology.

**BROADCAST AND TELEVISION RECEIVERS**—Robert R. Thalner, Chairman . . . Chicago Spring Conf. on Broadcast & TV Receivers, June 19-20, 1961, Des Plaines, Ill. . . . The design and manufacture of broadcast and television receivers and components and activities related thereto

**BROADCASTING**—George E. Hagerty, Chairman . . . 11th Annual Broadcast Symp., Oct. 6-7, 1961, Washington, D. C. . . . Broadcast transmission systems engineering, including the design and utilization of broadcast equipment

**CIRCUIT THEORY**—Sidney Darlington, Chairman . . . Design and theory of operation of circuits for use in radio and electronic equipment.

**COMMUNICATION SYSTEMS**—Christian L. Engleman, Chairman . . . 7th Nat'l Communications Symp., Oct. 2-4, 1961, Utica, N. Y. . . . Radio and wire telephone, telegraph and facsimile in marine, aeronautical, radio-relay, coaxial cable and fixed station services.

**COMPONENT PARTS**—Floyd E. Wenger, Chairman . . . IRE Int'l Conv., March 26-29, 1962, New York City . . . Characteristics, limitation, applications, development, performance and reliability of component parts

**EDUCATION**—John G. Truxal, Chairman . . . Int'l Conf. on Electrical Eng'g Education, Sept. 6-13, 1961 . . . To foster improved relations between the electronic and affiliated industries and schools, colleges and universities

**ELECTRON DEVICES**—A. Kyle Wing, Jr., Chairman . . . Electronic Devices Meeting, Oct. 26-28, 1961, Washington, D. C. . . . Electron devices including particularly electron tubes, solid state devices, integrated electronic devices and energy sources

**ELECTRONIC COMPUTERS**—Arnold A. Cohen, Chairman . . . Eastern Joint Computer Conf., Dec. 12-14, 1961, Washington, D. C. . . . Activities devoted to design and operation of electronic computers

## ASSOCIATIONS

**ENGINEERING MANAGEMENT**—Theodore W. Jarmie, Chairman . . . 9th Annual Eng'g Management Conf., Sept. 14-15, 1961, New York City.

**ENGINEERING WRITING AND SPEECH**—John M. Kinn, Jr., Chairman . . . Nat'l Symp. on Engineering Writing & Speech, Oct. 16-17, 1961, E. Lansing, Mich. . . . The study, development, improvement and promotion of the techniques for preparing, organizing for use, processing, editing, collecting, conserving and disseminating any form of information in the electronics and related fields by and to individuals and groups by any method of communication.

**HUMAN FACTORS IN ELECTRONICS**—Robert R. Riesz, Chairman . . . IRE Int'l Conv., March 26-29, 1962, New York City . . . Development and application of human factors knowledge germane to the design of electronic equipment

**INDUSTRIAL ELECTRONICS**—J. E. Eiselein, Chairman . . . Industrial Electronics Sym., Sept. 20-21, 1961, Boston, Mass. . . . Activities devoted to electronics pertaining to control, treatment and measurement specifically in industrial processes.

**INFORMATION THEORY**—Paul E. Green, Jr., Chairman . . . IRE Int'l Conv., March 26-29, 1962, New York City . . . Information theory and its application in radio circuitry and systems.

**INSTRUMENTATION**—Clarence W. Little, Jr., Chairman . . . Joint Nuclear Instrumentation Symp., Sept., 6-8, 1961 . . . Measurements and instrumentation utilizing electronic techniques.

**MICROWAVE THEORY & TECHNIQUES**—Kiyoo Tomiyasu, Chairman . . . IRE Int'l Conv., March 26-29, 1962, New York City . . . Activities devoted to microwave theory, microwave circuitry and techniques, microwave measurements and the generation and amplification of microwaves

**MILITARY ELECTRONICS**—Edward G. Witting, Chairman . . . 5th Nat'l Conv. on Military Electronics, June 26-28, 1961, Washington, D. C. . . . Electronic sciences, systems, activities and services germane to the requirements of the military

**NUCLEAR SCIENCE**—Louis Constrell, Chairman . . . 8th Annual Nuclear Science Meeting; Symp. on Aerospace Nuclear Propulsion, Oct. 23-26, 1961 . . . Application of electronic techniques and devices to the nuclear field

**PRODUCT ENGINEERING & PRODUCTION**—Warren D. Novak, Chairman . . . 5th Nat'l Conf. on Product Engineering & Production, June 14-15, 1961 . . . New advances in methods, processes, materials and components in design and manufacture of electronic equipment.

**RADIO FREQUENCY INTERFERENCE**—Ralph M. Showers, Chairman . . . 3rd Nat'l Symp. on Radio Frequency Interference, June 12-13, 1961 . . . Origin, effect, control and measurement of radio frequency interference.

**RELIABILITY & QUALITY CONTROL**—P. K. McElroy, Chairman . . . Radio Fall Meeting, Oct. 30-31, 1961, Syracuse, N. Y. . . . Techniques of determining and controlling the quality of electronic parts and equipment during their manufacture

**SPACE ELECTRONICS & TELEMETRY**—Kenneth M. Uglow, Jr., Chairman . . . Nat'l Symp. on space electronics & telemetry, Sept. 6-8, 1961, Albuquerque, N. Mex.

**ULTRASONICS ENGINEERING**—David L. Arenberg, Chairman . . . IRE Int'l Conv., March 26-29, 1962, New York City . . . Ultrasonic measurements and communications, including underwater sound, ultrasonic delay lines and various chemical and industrial ultrasonic devices

**VEHICULAR COMMUNICATIONS**—Richard P. Gifford, Chairman . . . PGVC Conf., Nov. 30-Dec. 1, 1961, Minneapolis, Minn. . . . Communications problems in the field of land and mobile radio services, including public safety, public utilities, railroads, commercial and transportation, etc.

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## WIRE WOUND Miniature Power Resistors

Carefully designed, precision made under stringent quality controls for critical electronic circuits where space is at a premium.

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Resistance range from .05 ohm to 175K ohms, depending on type; tolerance range from .05% to .3%

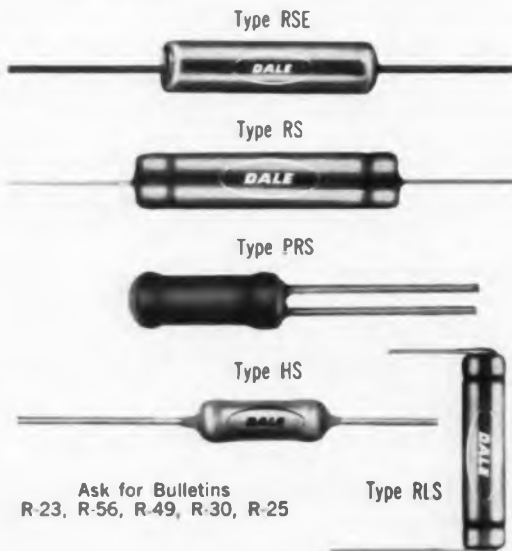
TYPE RS with axial leads in eight wattages— $\frac{1}{2}$ , 1, 2, 2.5, 3, 5, 7, 10; ten sizes.

TYPE HS with axial leads in eight wattages—1.25, 3.75, 3, 3.25, 4.25, 6.5, 9, 13; nine sizes.

TYPE PRS with parallel leads in four wattages—3, 5, 7, 10; five sizes.

TYPE RLS with radial leads in six wattages—1, 2, 3, 5, 7, 10; eight sizes.

TYPE RSE in metal housing for clip mounting; five wattages—2, 3, 5, 7, 10; seven sizes.



### Types NS - NLS

Non-inductive characteristics. Five wattages—2, 3, 5, 7, 10; six sizes. Resistance range from 1 ohm to 37K ohms, depending on size and type; tolerance range from .05% to 3%.

TYPE NS with axial leads; TYPE NLS with radial leads.

Ask for Bulletin R-34

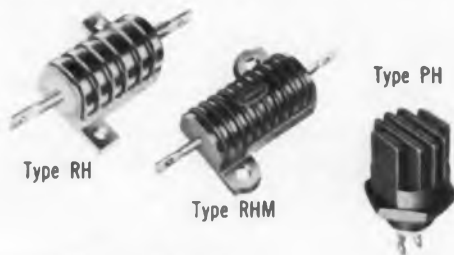
### Types RH - RHM - PH

Silicone sealed in aluminum metal housing. TYPE RH and RHM have tabs for mounting to heat sink; TYPE PH designed for mounting through hole in chassis or heat sink.

TYPE RH six wattages—5, 10, 25, 50, 100, 250; resistance range from 0.1 ohm to 175K ohms.

TYPE RHM-25—25 watts for unprecedented reliability.

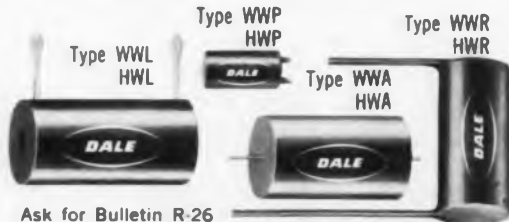
TYPE PH three wattages—10, 25, 100; resistance range from 0.1 ohm to 60K ohms. Tolerance range from .05% to 3%.



Ask for Bulletins R-21, R-36

### Types WW - HW

Precision, encapsulated, bobbin-type, non-inductive. HW prefix denotes high temperature characteristics. Rated at .1 watt to 2.5 watts, depending on size and type; resistance range from .1 ohm to 6 megohms; tolerance range from .02% to 3%. Available with axial leads, lugs, radial leads and parallel leads.



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(Available with Weldable Leads)

Carefully designed, precision made under stringent quality controls to assure stability and accurate, dependable performance in high frequency applications.

### Type DC

Resistance range from 1 ohm to 200 megohms; tolerance 1% or higher as specified. TYPE DC in seven wattages—1/10, 1/8, 1/4, 1/2, 1, 2, 5; ten sizes.



Type DC

Ask for Bulletin R-24

### Types MC - DCF - DCH (Insulated)

TYPE MC is a deposited carbon resistor completely insulated and protected from environmental and mechanical damage by molded housing; resistance range from 1 ohm to 50 megohms. Available in five wattages—1/8, 1/4, 1/2, 1, 2; five sizes in standard tolerance of 1%.

TYPE DCF has a new coating material which provides a completely insulated resistor, yet maintains sub-miniature size. Resistance range from 1 ohm to 50 megohms; six wattages—1/10, 1/8, 1/4, 1/2, 1, 2; nine sizes in standard tolerance of 1%.

TYPE DCH hermetically sealed in non-hygroscopic ceramic envelopes; seven wattages—1/10, 1/8, 1/4, 1/2, 1, 2, 5; ten sizes.

Type MC



Type DCF



Type DCH



Ask for Bulletins R-35, R-42, R-27

### Type MF

Combines advantages of Dale's molding techniques with advanced high vacuum metal film procedures. It has inherently good R.F. characteristics, low noise levels, high stability, complete insulation. Resistance range from 100 ohms to 4 megohms, depending on size; tolerance 1%. Five wattages—1/8, 1/4, 1/2, 1, 2; five sizes. Temperature coefficient  $\pm 50$  and  $\pm 100$  P.P.M.

Type MF



Ask for Bulletin R-43

## WIRE WOUND Trimmer Potentiometers

### Series 1200 - 1100 - 900 - 600 - 1500 - 5000

Produced under stringently controlled conditions to assure highest quality and reliability. Welded construction throughout; sealed to protect against moisture and potting compounds.

**SERIES 1200**—A truly outstanding miniature T-Pot; three terminal configurations for standard or printed circuit mounting; 10 to 50K ohms; 5% tolerance; 1 watt.

**SERIES 1100**—Miniature, high temperature; three terminal configurations for standard mounting; 10 to 100K ohms; 10% tolerance; 1 watt.

**SERIES 900**—Sub-miniature, three terminal configurations for standard or printed circuit mounting; 10 to 30K ohms; 5% tolerance; 1 watt.

**SERIES 600**—Sub-miniature; eight terminal configurations for standard, panel or printed circuit mounting; 10 to 30K ohms; 5% tolerance; 1 watt.

**SERIES 1500**—Miniature, nine terminal configurations for standard, panel or printed circuit mounting; 10 to 50K ohms; 5% tolerance, 1 watt.

**SERIES 5000**—New sub-miniature space saving, square configuration; 100 to 50K ohms; 5% tolerance; 1 watt.



Ask for Bulletins R-51, R-50, R-59, R-60, R-61

### Series 100 - 200 - 300

Designed to give excellent performance for normal circuit problems where economy is of prime importance, yet dependable performance is a necessity.

**SERIES 100**—Five terminal configurations; 10 to 50K ohms; 5% tolerance; rated at .8 watt.

**SERIES 200**—Five terminal configurations; 10 to 50K ohms; 10% tolerance; rated at .5 watt.

**SERIES 300**—Two terminal configurations; 100 to 20 K ohms; 15% tolerance; rated at .25 watt.

Ask for Bulletins  
 R-53, R-54, R-55



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A subsidiary of Hathaway Instruments, Inc.

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Weighing in at a scant .05 ounce, the  $\frac{1}{2}$ " dia. Trimpot® Model 3367 dissipates 0.5 watt, operates in 105°C heat, and holds residual end-setting resistance from 0 to 1.0%. It meets requirements for steady-state humidity and Mil Specs for sand, dust, salt spray and fungus. Designed for convenience, too, it has index points that let you check your setting at a glance.

Reliability well beyond the expected is made possible by the exclusive Bourns Silverweld® termination. Alloyed with multiple turns of the resistance wire, Silverweld eliminates vulnerable single-wire terminations, is virtually indestructible under thermal or mechanical stress. Units are 100% inspected, and subjected to the rigid double-check of the Bourns Reliability Assurance Program.

Model 3367 is available immediately from factory and distributor stocks with resistances of 100Ω to 20K. Your choice of printed circuit pins (spaced for interchangeability with more expensive devices) or solder lugs with bushing mount. Write for complete data and list of stocking distributors.



Exclusive designers and manufacturers of Trimpot® potentiometers. Pioneers in transducers for position, pressure and acceleration.



By **JOHN ARNOLD**  
 Engineering Manager of Components  
 Borg Equipment Division  
 Amphenol-Borg Electronics Corporation

# Potentiometers—Terms & Data

*The potentiometer is a simple form of electro-mechanical transducer which is widely used by systems designers.*

*As an aid to the engineer, the chief requirements of a practical potentiometer are set forth, terminology discussed, and valuable engineering data given.*

**T**HE potentiometer, or "Pot," is one of the most important components used for voltage and current control. Its applications range from simple potentiometer controls in radio and television receivers to high-precision types in scientific instruments, guidance systems and navigational equipment. Motors, bellows, pistons and other mechanical actuators employed in modern systems usually drive potentiometers—often a gang of more than one on a common shaft.

In concept and principle, the

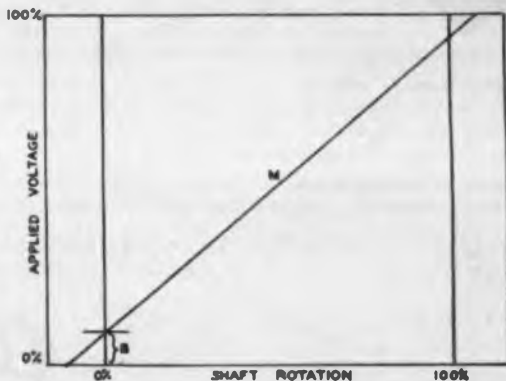
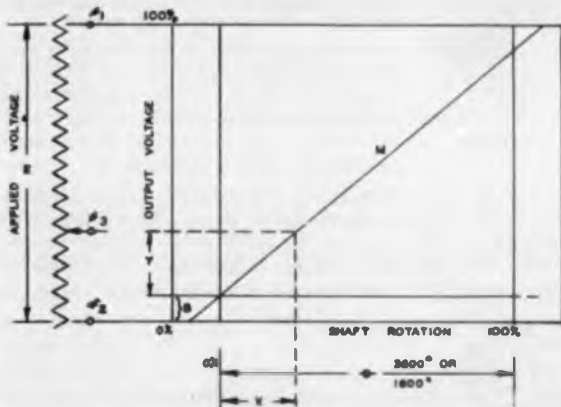
potentiometer is one of the simplest forms of electro-mechanical transducer. It consists of an extended resistance element associated with a point contact which moves along the length of the element. Its functions are reciprocal: It can define the mechanical position of the slider contact by means of an equivalent voltage or current signal, or establish the level of a signal as a response to the set position of the slider.

Practical design and mass production of a commercial, high precision potentiometer are attended

by formidable problems. Chief requirements of such a component are high accuracy, good resolution, absence of mechanical backlash, freedom from vibratory and self-generated electrical noise, practical power rating, stable temperature characteristics, close mechanical concentricities, low torque and long life. At times, one desirable feature must be sacrificed, if only in part, to achieve another. Engineers in search of a satisfactory potentiometer must analyze their special needs and specify the opti-

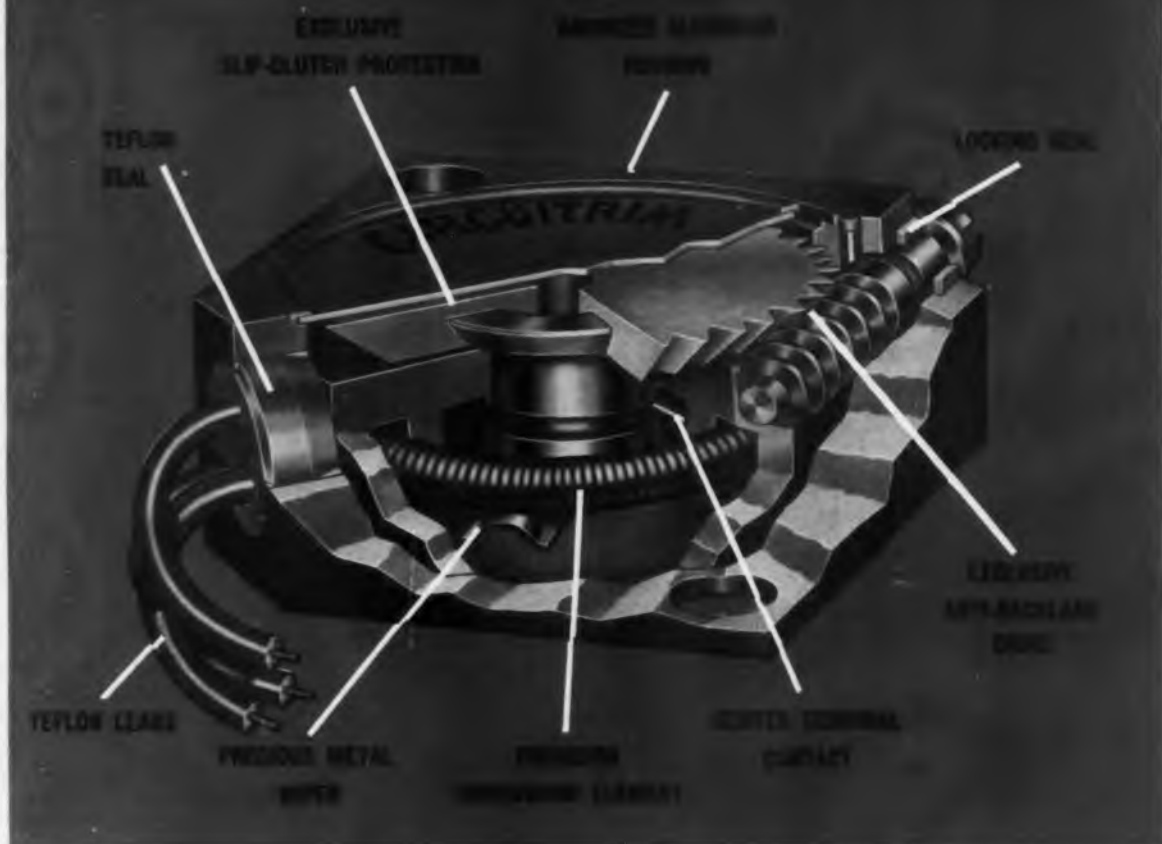
*(Continued on page 37)*

Fig. 1 (left). All forms of linearity are defined in terms of deviation from a straight reference line. Fig. 2 (right) Illustrates independent linearity. Position b is positive and the slope less than 100% of applied voltage at 100% shaft rotation.



In PRECISION POTENTIOMETERS

if it's news, expect it first from IRC



## EXPOSED... a reliable square trimmer design set it... forget it



**Superior shock and vibration characteristics** . . . made possible by an exclusive self-locking, anti-backlash gear. Once you set IRC's new  $\frac{1}{2}$ " square Circuitrim, forget it. The square trimmer remains at its set position even under conditions as severe as MIL-E-5272A, Procedure 1 vibration and MIL Standard 202 Method 202 shock test.

**Superior humidity characteristics** . . . pressure seals around leads and the drive screw make a lasting moisture barrier. Potting compound won't get in, silicone lubricant can't ooze out, even at the temperature extremes of dip soldering.

**Superior mechanical design** . . . fewer parts and inherently less noise. Rotation stops and slip clutch keep wiper from

traveling off end of winding and prevent mechanical abuse. 10 ohms to 50K ohms, 1 watt. Teflon leads standard; printed circuit terminals available.



### A NEW TRIMMER WITH INCREASED RELIABILITY ACHIEVED THROUGH SIMPLIFIED DESIGN.

Possesses the same quality electrical assembly as the  $\frac{1}{2}$ " square Circuitrim. This unique design has eliminated the complex mechanical linkage used for adjustment, thereby giving a quality reliable trimmer for your highly competitive applications. 10 ohms to 50K ohms, 1 watt.  $\frac{1}{2}$ " diameter.

Write for technical bulletins. International Resistance Company, 401 North Broad Street, Philadelphia 8, Pa.

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Leading supplier to manufacturers of electronic equipment



## Potentiometers (Continued)

mum in mechanical and electrical parameters.

### Terms and Definitions

Universal adoption of terms and definitions by the trade for precision pots is yet to come. Upon the final approval of MIL-12934-B as the official document for procurement to be used by the armed forces, uniformity of terminology will be promoted further. Terminology was approved by E.I.A. (formerly RETMA). Three other specifications of substantial importance are also in circulation, and specification writers often quote (with or without credit) from one or more. They are:

**NAS 710**—Issued as a National Aircraft Standard by the Aircraft Industry.

**MIL-R-19518 (SHIPS)**—Resistors, variable, wirewound, precision.

**MIL-R-19A**—Resistors, variable, wirewound (JAN).

### General Terms

**Precision variable resistor**—A mechanical-electric transducer dependent upon the relative position of a contact and a resistance element for its operation. It delivers a voltage output that is some function of applied voltage and contact-arm position.

**Cup**—A single mechanical section of a gang which may contain one or more electrical elements.

**Gang**—An assembly of two or more cups on a common operating shaft.

**Contact arm**—The mechanical input element of a variable resistor.

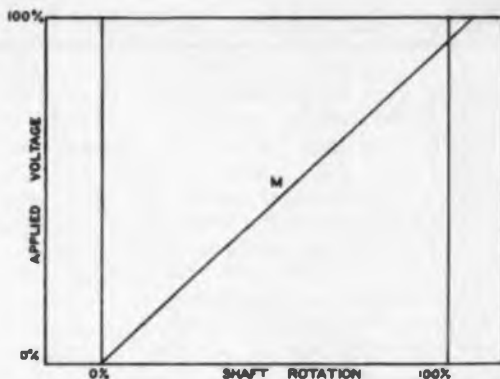
**Contact-arm position**—An indication of the relative position of the contact arm and some reference point.

**Terminal**—An external device used to provide electrical access to the variable-resistor resistance element.

**Integral resistor**—An internal or external resistor preconnected to the electrical element and forming an integral part of the cup assembly to provide a desired electrical characteristic.

**Test point**—An additional terminal used only to facilitate measurements.

Fig. 3. Illustrates zero-based linearity. Position b is restricted to zero and the slope is chosen to make the maximum deviation minimum.



### Input and Output Terms

**Total applied voltage**—The voltage applied between input terminals.

**Total variable output**—The difference in actual output between end points.

**Actual output**—The output between the contact-arm terminal and one input terminal.

**Total useful output**—The difference between total applied voltage and end-error voltage occurring at maximum effective travel.

### Total Resistance Terms

**Total resistance**—The resistance between end terminals with the contact arm positioned to give a maximum value.

**Total variable resistance**—The resistance encompassed by the actual effective travel.

### Travel

**Total mechanical travel**—The total travel of the contact arm between integral stops.

**Mechanical overtravel**—The contact-arm travel between each end point and its adjacent mechanical stop. (Mechanical overtravel is ap-

plicable only to units having integral mechanical stops.)

**Theoretical effective electrical travel**—The specified travel of the contact arm throughout which the variable resistor delivers its designed output function.

**Actual effective electrical travel**—The total travel of the contact arm between end points.

**Electrical overtravel**—The travel of the contact arm over which there is continuity between the contact and the resistance element beyond each end of the actual effective electrical travel.

**Electrical continuity travel**—The total travel of the contact arm over which electrical continuity is maintained. (The sum of the actual effective electrical travel and overtravels at the ends of the resistance element.)

**Flat zone**—Any portion of the actual effective electrical travel throughout which there is comparatively no change in output.

### Conformity and Linearities

*Independent (best straight-line)*

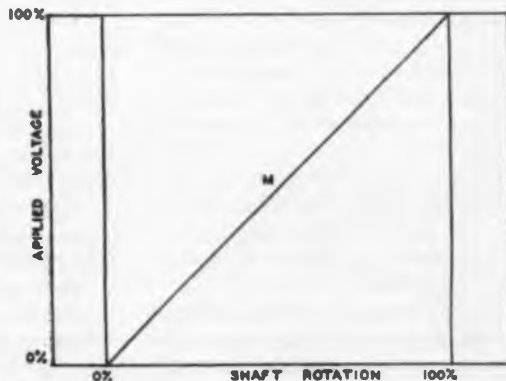


Fig. 4. Absolute linearity is illustrated. Position b equals zero and the slope is specified.

## Potentiometers (Continued)

**linearity**—The maximum deviation of the actual function characteristic from a straight reference line whose slope and position are chosen to minimize the maximum deviations over the actual effective electrical travel, or any specified portion thereof, expressed as a percentage of the total applied voltage.

**Zero-based (end-point) linearity**—The maximum deviation of the actual function characteristic from a straight reference line drawn through zero applied voltage at the starting end point, with its slope chosen to minimize the maximum deviation over the actual effective electrical travel, or any specified portion thereof, expressed as a percentage of the total applied voltage.

**Terminal linearity**—The maximum deviation of the actual function characteristic from a straight reference line or any specified portion thereof, extending between zero and total applied voltage over the actual effective electrical travel, expressed as a percentage of total applied voltage.

**Index-point linearity**—The maximum deviation of the actual function characteristic from a straight reference line or any specified portion of it, drawn through the specified index point and extending between zero and total applied voltage points which are separated by the theoretical or desired effective electrical travel, expressed as a percentage of the total applied voltage. A centertap is often an index-point.

### End-Point and Tap Terms

**End-point**—The last contact-arm position immediately following for which the first perceptible change of output voltage is observed, as the contact arm moves from the overtravel toward the resistance element.

**End resistance**—The resistance between the contact-arm terminal and an end terminal when the contact arm is positioned at the corresponding end point.

**Jumpoff resistance**—The magnitude of the initial resistance change as the contact arm is moved through

an end point toward the resistance element.

**Tap**—The connection made to the resistance element at any point.

**Tap location**—An indication of the relative position of a tap measured from the midpoint of the effective tap width to some reference point. (Commonly expressed in terms of resistance, voltage, or contact-arm position.)

**Effective tap width**—The total travel of the contact arm at the flat zone of a tap as the contact arm traverses that tapped region.

**Absolute minimum resistance**—The resistance measured between the contact-arm terminal and end terminal with the contact arm positioned to give a minimum value.

**Minimum resistance, at stop**—The resistance measured between the contact-arm terminal and an end terminal when the contact arm is positioned at the corresponding stop.

### Linearity and Conformity Terms

**Variable-resistor theoretical or desired function characteristic**—Defines the theoretical relationship between the electrical output and mechanical input. This intended relationship may be expressed graphically, by mathematical formula, or point-by-point data.

**Variable-resistor actual function characteristic**—The actual relationship measured between the electrical output and mechanical input.

**Slope**—The rate of change of output with contact-arm travel.

**Average slope**—The slope of the straight line joining the end points of the specified function, or the extremities of any specified portion of it.

**Deviation**—The plus or minus differences between the actual electrical output and the theoretical or desired electrical output for a given contact-arm position.

**Deviation percentage**—The ratio of the maximum deviation to the total applied voltage expressed as a percentage.

**Deviation slope**—The rate of change of deviation with contact-arm travel.

**Conformity**—The fidelity of the relationship between the actual function characteristic and the theoretical or desired function characteristic.

**Linearity**—A specific type of conformity where the theoretical or desired function characteristic is a straight line.

### Phasing, Tracking, and Indexing Terms

**Index point**—A specified point of reference of an electrical element fixed by a relationship between contact-arm position and voltage output.

**Master index point**—A single point of reference for a given resistor consisting of one or more cups, fixed by a known relationship between contact-arm position and voltage output, used to establish contact-arm position.

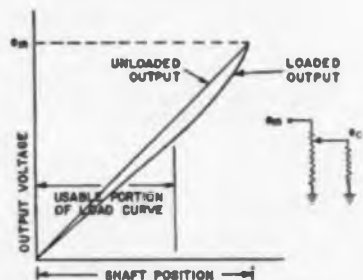


Fig. 5. Loading errors can be minimized by using only the relatively linear portion of the loaded potentiometer characteristic.

**Phasing**—The relative alinement of electrical elements of a ganged resistor.

**Phasing point**—A point of reference fixing the relationship between contact-arm position and voltage output for each electrical element in a gang.

**Phasing-point phasing**—The alinement of respective phasing points of electrical elements of a gang within a specified tolerance.

**Simultaneous conformity phasing**—The alinement of the actual voltage outputs of electrical elements of a gang to a common origin so that they fall within their respective tolerance bands.

**Voltage tracking error**—The difference at any point between the actual output voltages of commonly actuated similar electrical elements. It is expressed as a percentage of the single total voltage applied to them.

**Resistance tracking error**—The difference at any point between actual resistances, from brush to other terminal or far end of integral resistor, of commonly actuated electrical elements of similar function. The errors may be expressed in ohms or percentage of nominal total resistance, or in other mutually satisfactory units.

#### Resolution Terms

**Resolution**—The measure of precision to which the input or output of a precision variable resistor may be set.

**Resolution figure**—The maximum value of any form of resolution over the entire resistance element or any specified portion of it. (For linear windings, specify a resolution figure. For nonlinear windings, specify one or more resolution figures and the zone or zones over which they apply.)

**Resolution shorting effect**—The effect produced by the shorting of a number of turns of the effective electrical winding by the contact, thereby reducing the theoretical or desired voltage resolution to the actual voltage resolution.

**Theoretical angular resolution**—The design number of degrees of operating-shaft rotation per turn in a particular portion of rotation. **Actual angular resolution**—The actual number of degrees of operating-shaft rotation per voltage step in a particular portion of rotation.

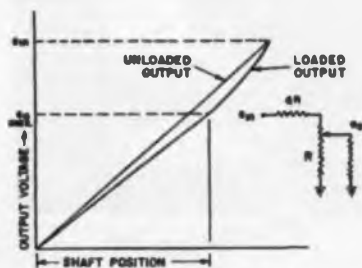


Fig. 6. Loading errors can be minimized by putting resistance in series with the input terminals of the potentiometer.

**Theoretical voltage resolution**—The design change in voltage per turn in a particular portion of the shaft rotation with unit voltage applied between end terminals.

**Actual voltage resolution**—The actual change in voltage per angular step in a particular portion of operating-shaft rotation with unit voltage applied between end terminals.

#### Linearity, General

The ultimate consideration in a precision potentiometer is accurate linearity. Choice of other parameters ordinarily revolves about this requirement. Linearity is properly defined in terms of deviation from a straight reference line. In a rotating potentiometer, this deviation can be defined as the plus or minus difference between the actual and theoretical outputs for a given shaft or contact position. It is best expressed as the percentage reckoned from the ratio of the maximum deviation to the total applied voltage.

Since all forms of linearity are defined in terms of deviation from a straight reference line, it becomes necessary to define this reference line mathematically in terms of voltage versus shaft rotation in a basic potentiometer circuit.

Such a circuit is depicted in Fig. 1. It becomes apparent that the percentage  $y$  of total applied voltage  $E$  at any given position of shaft rotation, between 0 and 100%, is determined by the equation

$$y = mx + b \quad (1)$$

where  $x$  is the rotation of the shaft expressed as a percentage of  $\theta$ . In other words,  $x = 100a/\theta$  where  $a$  equals any angle of shaft rotation expressed in degrees, and  $\theta$  is 100% of rotation less than  $360^\circ$  in a single turn unit,  $1080^\circ$  in a three-turn pot,  $3600^\circ$  in a 10-turn unit, etc. Thus  $m$  is the slope of the line  $y/x$  and  $b$  the intercept of the reference line with the applied voltage axis at zero shaft rotation.

#### Independent Linearity

Reference here is to Fig. 2 and Eq. 1.

By definition, the slope  $m$  and the position  $b$  are chosen to make the maximum deviations minimum, thus  $m$  and  $b$  cannot be specified. When independent linearity is specified in potentiometers,  $b$  will always be a positive quantity and the slope will be such that something less than 100% of the applied voltage will be obtained at 100% of shaft rotation. This makes it possible to trim the ends to a reference line from which at any given

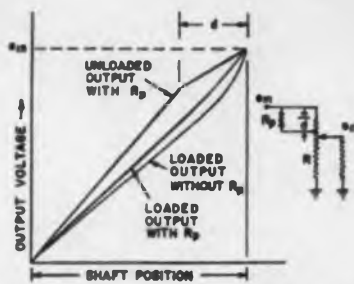


Fig. 7. Preloading the potentiometer with one or more external resistances is another method of correcting for loading error.

shaft position (between 0 and 100% rotation) the output voltage will not deviate beyond the specified linearity tolerance.

#### Zero-Based Linearity

Reference here is to Fig. 3 and Eq. 1.

By definition, the position  $b$  is restricted to zero and the slope  $m$  is chosen to make the maximum deviation, minimum. When zero based linearity is specified in potentiometers,  $b$  in Eq. 1 will always equal zero and the slope will be such that something less than 100% of the applied voltage will be obtained at 100% of shaft rotation.

This makes it possible to trim the 100% end to a reference line from which, at any given shaft position between 0 and 100% rotation, the output voltage will not deviate beyond the specified linearity tolerance.

#### Absolute Linearity

Absolute linearity refers to "The deviation from a straight reference line drawn through zero and total applied voltage points separated by the theoretical effective travel."

Once more, reference is to Eq. 1 and Fig. 4 and, by definition, slope  $m$  is specified and  $b$  equals zero. When absolute linearity is specified in potentiometers,  $b$  in Eq. 1 will always be zero and slope  $m$  will be unity since 100% rotation/100% output voltage = 1.

In application of absolute linearity units, no external trimming is required. Any value of  $x$  will produce an output voltage  $y$  equal to  $x$

# potpot

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DOVER, NEW HAMPSHIRE

## Potentiometers (Continued)

within the specified linearity tolerance. Expressed mathematically,  $x = y \pm$  linearity tolerance.

Advantages of absolute linearity are easily apparent. Trimmer resistors are dispensed with and the resultant economy of space, saving in skilled labor, and reduction in cost of additional selected components are considerable. Also, circuitry designed around absolutely terminal pots facilitates field replacement—there is no need for pretrimmed or "standardized" replacement components.

### Potentiometer Noise

Two types of noise may be encountered in a wirewound pot; vibrational or microphonic noise, and residual noises from several sources. Vibrational noise, while in effect electrical, is purely mechanical in cause. It is produced by the contact jumping away from the winding and thereby opening the contact circuit. Proper design of the contact arms, carefully calculated pressures, and close control of all structural resonances, will practically eliminate this class of noise. Resolution noise is a stepping voltage variation introduced by the contact transit across turns of resistance wire, and is inversely proportional to the resolution figure of a given pot. There are, however, residual noise effects which consist of sharp random voltage peaks generated between the moving contact surface and winding.

The principle cause of residual noise is foreign material (dirty windings, wear products, etc.), which intrude between contact surface and winding. Contact resistance fluctuations arising from such contamination are large, relatively stationary with respect to time, and independent of slider velocities.

The foregoing noise effects may be termed "passive." This type of noise is guarded against by foresighted design, scrupulously clean working conditions, and judicious use of long-wearing, and electro-mechanically compatible wire and contact materials. Units should be

carefully checked for contamination and assembled in dust-free, air-conditioned rooms.

Sources of "active" residual noise are not so simply analyzed. Fortunately, the resultant electrical disturbance in wirewound pots rarely exceeds, a small fraction of a millivolt. Active noise is self-generated voltage under three sets of conditions; galvanic or chemical action at the point of contact between slider and wire; thermojunctive effects, which depend on frictional or external heat; and triboelectrical phenomena, small voltages generated by abrasion of the contact upon the wire. Here again, noise is minimized by use of compatible materials, proven welding techniques, and optimum contact pressures.

Noise tolerances are most commonly expressed as an equivalent resistance. Some users appraise noise voltage-wise. In either case, unless otherwise specifically noted, evaluations of noise are made with a constant current of one ma. The noise figure is a quantitative measurement of the total residual and microphonic noise. It is defined as the total residual noise peak voltage divided by the source current. Source current and actuator velocity are always specified.

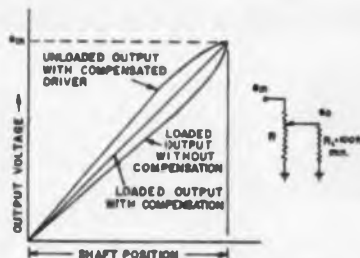


Fig. 8. Using compensated drive to offset loading error, 100 to 1 ratio.

The engineer can minimize noise effects by careful application. Resolution noise can be minimized by selection of optimum resistance values. Vibration noise, may be eliminated by judicious mounting of the pot. If noise is a serious

problem, it may be desirable to sacrifice long life for improved noise characteristics by increasing contact pressure. It may be possible to obtain a reduction in noise by connecting a capacitance between the contact and ground to filter out the noise. The practicability of this method is highly dependent on the characteristics and components of the system in which the pot is used.

### Loading Error

A linear pot will produce a theoretically linear function only when the total impedance is infinite, or in practice when it is nearly so, such as the grid of a tube.

Loading error is an important consideration in most applications. It is caused by current flow through the contact arm to a finite value of resistance connected to the output terminals of the pot. The magnitude of the loading error is determined by the magnitude of the current. This in turn is determined by the value of the load resistance and the position of the contact arm. The general equation for determining the percent loading error at any position of the contact arm is:

$$E = \frac{Ra^2(100 - a)}{10^4 L - Ra(100 - a)}$$

where  $E =$  % error,  $R =$  pot resistance in ohms,  $L =$  load resistance in ohms, and  $a =$  position of contact (% of total rotation).

It is apparent from the equation that loading error varies with contact position but equals zero at both 0 and 100% rotation. The maximum value of loading error occurs at approximately two-thirds rotation. A load resistance equal to 100 times that of the pot will produce a maximum loading error of about 0.15%.

There are several methods by which loading error may be minimized or corrected. In pot follow-up servo applications, the effect of loading error can be eliminated by loading the follow-up pot to the same degree that the control pot is loaded. However, with this method of correction, a linear dial used in conjunction with the servo will not indicate the correct reading.

Restricting the pot operating range will minimize loading error.

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7/8" diameter. 3 and 10-turn models. Resistances 10 to 40K (3-turn); 25 to 120K (10-turn).  $\pm 5\%$  standard linearity accuracy.  $-55^{\circ}\text{C}$  to  $+125^{\circ}\text{C}$  range. Request data sheets 160, 161.



**2400 SERIES ...**

Single-turn series. 7/8", 1-7/16", 2", 3" diameters. Resistances to 200K.  $\pm 1\%$  to  $\pm 5\%$  standard linearity accuracy.  $-55^{\circ}\text{C}$  to  $+125^{\circ}\text{C}$  range. Request data sheets 186, 189, 190, 191.



**205 SERIES ...**

1-3/4" diameter. 3 and 10-turn models. Resistances 10 to 50K (3-turn); 1.15 to 100K (10-turn).  $\pm 5\%$  to  $\pm 0.05\%$  standard linearity accuracy.  $-55^{\circ}\text{C}$  to  $+105^{\circ}\text{C}$  range. Request data sheets 131, 162.



**900 SERIES ...**

2" diameter. 3 and 10-turn models. Resistances 15 to 60K (3-turn); 25 to 100K (10-turn).  $\pm 5\%$  to  $\pm 0.05\%$  standard linearity accuracy.  $-55^{\circ}\text{C}$  to  $+125^{\circ}\text{C}$  range. Request data sheets 128, 129.



**1100 SERIES ...**

1-13/16" diameter. 10-turn. Economically priced. Resistances 25 to 100K.  $\pm 5\%$  to  $\pm 1\%$  standard linearity accuracy.  $-55^{\circ}\text{C}$  to  $+105^{\circ}\text{C}$  range. Low-cost precision. Request data sheet 132.



**2200 SERIES ...**

High-temperature, wirewound trimmer.  $-60^{\circ}\text{C}$  to  $+175^{\circ}\text{C}$  range. Each unit 100% tested against leakage. Resistances 10 to 50K. 1-1/4" length. 3 terminal types. Data sheet 173.



**900 SERIES ...**

High temperature, wirewound trimmer.  $-60^{\circ}\text{C}$  to  $+175^{\circ}\text{C}$  range. Sealed against leakage. Resistances 10 to 50K. Four terminal types. 1-1/4" length. Data sheet 196.



**902 SERIES ...**

Wirewound trimmer.  $-55^{\circ}\text{C}$  to  $+105^{\circ}\text{C}$  operating temperature. Resistances 10 to 50K. Three terminal types. 1-1/4" length. Economically priced. Request data sheet 172.



**903 SERIES ...**

Carbon film element trimmer.  $-55^{\circ}\text{C}$  to  $+105^{\circ}\text{C}$  range. Resistances 20K to 1 megohm. Three terminal types. 1-1/4" length. Economically priced. Request data sheet 172.

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**1300 SERIES ...**

Direct-reading—3, 4, 5-digit models. 10, 100, 1000 turns. 1.8" to 2-1/16" dia. Brake optional. Reduce reading errors with in-line numerals. Data sheets 135, 136.



**1320 SERIES ...**

Concentric-Scale type. 10-turns. 1-3/4" diameter. Finger-tip brake optional. Bright or satin chrome, gloss or dull black or combinations. Data sheet 138.



**1330 SERIES ...**

Direct-reading, digital type. 10-turns. High style design. Internal, red or white light. Choice of colors. 1-3/4" dia. Finger-tip brake optional. Data sheet 164.



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## Potentiometers (Concluded)

This can be done either by using only the relatively linear portion of the loaded pot characteristic (Fig. 5) or by putting resistance in series with the input terminals of the pot (Fig. 6). In both methods, the output voltage is reduced unless the input voltage can be increased proportionately.

Another method of correcting for loading error is by preloading the pot with one or more external resistances. Application of this method of correction utilizing a single external resistance is shown in Fig. 7. Other more elaborate means of correcting or eliminating loading errors involve the use of buffer or feedback amplifiers.

### Resolution

Resolution is a measure to which the input or output of a pot may be set. The resolution of a given pot is the maximum value of any form of resolution over the entire resistance element, or any specified portion of it. For linearly wound elements, a single resolution figure would be specified. Resolution may be expressed either as a voltage change per angular step, or in degrees of shaft rotation per voltage step.

The theoretical voltage resolution, often called "electrical," is the design change in voltage per turn with unit voltage applied between end terminals. The actual voltage resolution is the actual change in voltage per angular step under the same conditions of excitation.

The theoretical angular resolution, sometimes referred to as "mechanical," is a figure denoting the design number of degrees of shaft rotation per turn in a given pot winding. Actual angular resolution, in this case, will be the actual number of degrees of shaft rotation per voltage step.

This difference between the theoretical and actual voltage resolution figures is an effect introduced by the actuator contact in shorting a discrete number of turns of effective electrical winding. Resolution in pure design is a value equivalent to the reciprocal of the number of turns in a resistance winding and will improve in direct proportion

to any increase in this number. The contact, however, in practice will always be wider than a single turn of wire and will, therefore, short a discrete number of turns of the effective winding. It is this shorting effect which reduces the theoretical voltage resolution figure to an actual value. The shorting effect increases as wear broadens the contact surfaces. It is the responsibility of the designer to choose compatible, long-wearing metals for contact material, and to determine optimum dimensions and profiles for a maximum and enduring actual resolution figure.

Potentiometer resolution will always produce errors of approximate magnitude in positioning devices when potentiometers are used for data input or output. Usually, high-resolution windings are sufficient to reduce these adverse effects to a point of tolerability.

For a rule of thumb: "The higher the total resistance, the higher the resolution figure of a wirewound potentiometer."

### Power Rating

The power rating of a pot is determined by the ability of a given structure to dissipate its heat by conduction and/or convection, while maintaining the operating temperature below a point where permanent physical damage or functional degradation could ensue.

Derating power curves for high and low temperature pots have been arbitrarily set by industry and the armed services. These curves stipulate the amount of power that must be dissipated without exceeding some upper limit. This limit may vary from specification to specification. The upper limit is linearly dependent upon the ambient temperature of the adjacent atmosphere. In practice these curves are conventionally flat between 0°C and 25°C (or the specified normal reference temperature). Actually a potentiometer will dissipate even more power at temperatures below the base normal of the curve. Caution must be used not to exceed the voltage limits of the resistance windings. With the power rating then known, the maximum operat-

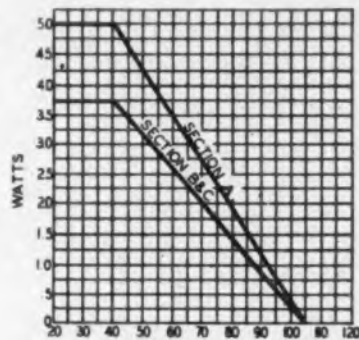


Fig. 9. Shows a power rating curve. Although power is derated linearly, current does not derate linearly.

ing voltage is determined according to Ohms law.

$$V = \sqrt{PR}$$

Where  $V$  equals maximum input voltage,  $R$  is total resistance and  $P$  is the rated power at operating temperature.

**Power Rating vs Current**—Although power is derated linearly from some basic ambient temperature to the maximum ambient temperature, current does not derate linearly. At the basic reference temperature, power rating can be converted to current rating in accordance with the formula:

$$I = \sqrt{P/R}$$

### Resistance Wire Alloys

The specific alloy and dimensions of the wire used in winding a potentiometer element are two variables in potentiometer design.

The components of the alloy determine its hardness and tensile strength (pot life), as well as its resistivity. The diameter of the wire is a further determinant of resistance for any given length, the resistance being inversely proportional to the square of the diameter. Diameters of winding wire range from 0.0006 to 0.025 inches.

The choice of one alloy over another is never arbitrary, except if they are equivalents manufactured by different suppliers. Each alloy has its special property or properties—low resistance, high resistance, oxidation resistance, hardness, low temperature coefficient of resistance, etc. No alloy has all the desirable characteristics.

# Glossary of Synchro Terms

Courtesy of Transcoil Div.  
of Daystrom, Inc.

**Acceleration at Stall (Theoretical)**—Computed value of servo motor angular acceleration calculated from motor stall torque and rotor moment of inertia. Sometimes called torque to inertia ratio.

**Ambient Temperature**—Temperature of the immediate surroundings of a component excluding its own effect.

**Backlash**—A position error between gears where the relative position of the output with respect to the input varies with direction of rotation.

**Block Diagram**—Simplified system diagram reducing each element to its transfer function and schematically representing it as a block.

**Breadboarding**—Construction of a system or portion of a system for the purpose of studying characteristics without any regard for size or appearance.

**Carrier Frequency**—Constant frequency upon which usable data is superimposed.

**Chopper**—Switch designed to operate at carrier frequency for the purpose of converting d-c data to square wave a-c data at the carrier frequency.

**Closed Loop**—A system where the output is fed back to the input for constant comparison.

**Controller**—The element or group of elements which receive data proportional to the difference between input and output and convert this data into power capable of restoring agreement between input and output.

**Corner Frequency**—Frequency where the open loop plot of gain versus frequency changes slope. For a servo motor, the product of this frequency in radians per second and the motor time constant equals unity.

**Critical Damping**—The point at which system damping is great enough to overcome all tendencies to oscillate.

**Damping Coefficient**—Ratio of actual damping to critical damping.

**Data Element**—Element which converts desired function into a signal of usable form.

**Dead Space**—Maximum deviation on either side of the point of agreement between input and output for which no corrective action will take place.

**Drag Cup**—Non-magnetic metal rotated in a magnetic field for generation of torque or voltage proportional to speed.

**Electrical Zero**—A standard synchro position where electrical outputs are at defined amplitudes and time phase.

**Environmental Testing**—Controlled testing of a component or system under each of the conditions which tend to affect its operation or life.

**Error**—Difference between output and input.

**Error Detector**—The element or group of elements which convert the difference between output and input of a system into usable form.

**Error Rate Damping**—Method of damping in which an additional signal proportional to the rate of change of error is introduced and added to the error signal for anticipatory purposes.

**Free Speed**—The angular speed of an energized motor under no-load conditions.

**Frequency Response**—Practical or mathematical observation of the ability of the output to follow the input, when the input is varied sinusoidally over a given frequency range.

**Gain Crossover Frequency**—Frequency at which the open loop system gain is unity or zero D.B.

**Harmonics**—Signals at some exact multiple of the fundamental carrier frequency.

**Hunting**—Condition where the output of a system oscillates back and forth from the position of agreement between output and input.

**Linearity**—The maximum deviation of any curve from the best straight line which can be drawn over its limits.

**Moment of Inertia**—Proportionally constant between applied torque and angular acceleration.

**Negative Feedback**—Subtracting some or all of an output from the input for desirable effects.

**Null, Error Detector**—Condition where zero in phase signal appears as an output from an error detector or error detectors.

**Null, Generator**—Output of generator when its rotating element is stationary.

**Open Loop**—Condition where efforts are made to make an output agree with an input without any direct comparison.

**Phase Crossover Frequency**—Frequency at which the open loop phase shift is a full 180 degrees.

**Potentiometer**—A resistive data element used to transform angular position into proportional voltage.

**Quadrature**—Any signal, or portion of a signal, 90 electrical degrees away from a signal in question.

**Rate Generator**—Proportional element which converts angular speed into constant frequency output voltage.

**Reversing Time**—Time required for a servo motor when fully powered to change from free speed in one direction to 63.2% of speed in the opposite direction.

**Rotor**—Member of any inductive device free to rotate.

**Sensitivity**—Maximum possible difference between output and input for which no corrective action will take place.

**Servo Amplifier**—Linear amplifier specifically designed to link error detector voltage to motor control phase at some higher voltage and power level.

**Servo Motor**—(a) Any motor used in a servomechanism to physically correct differences between input and output. (b) Two phase motor specifically designed for servo applications and having low torque to inertia ratio, sloping speed torque curve, and torque proportional to product of the voltages on each phase.

**Servomechanism**—A system in which the output is mechanically driven by the difference between the input and the output for the purpose of making the output agree with the input.

**Slip Clutch**—Protective device used in gear trains which isolates the load when it exceeds a pre-determined value.

**Split Gears**—Technique used in gear train design for minimizing backlash. Consists of splitting one gear of a pair in mesh and so connecting a spring between the two halves that pressure is exerted upon both sides of the driving teeth of the meshing gear.

**Stall Torque**—The torque produced at the rotor of an energized motor when the rotor is restrained from any motion.

**Stator**—Stationary member of any inductive device.

**Synchro**—An inductive device capable of transforming an angular position input into an electrical output or an electrical input into an angular output.

**Synchronous Motor**—A motor which is specifically designed for its rotor to follow exactly its rotating electrical stator field.

**Time Constant**—Time required for a function increasing at an exponential rate to reach 63.2% of its final value.

**Torque Constant**—Constant of proportionality between motor stall torque and control phase voltage, with motor fixed phase fully powered.

**Transfer Function**—The ratio between the output and the input of a single element or a group of elements in a system.

**Transformation Ratio**—Exact ratio between electrical output and electrical input under defined conditions.

**Undamped Natural Frequency**—System oscillatory frequency when all damping is removed.

**Velocity Log Error**—Log between input and output proportional to the rate at which the input is varying.

**Viscous Damping**—Utilization of reactive torque or force proportional to speed for braking action.

**Viscous Friction**—Friction proportional to angular or linear speed.

## MMI TRAINING COURSE

The Materials Management Institute and Industrial Education Institute will sponsor a series of three-day skill training courses in Value Engineering & Analysis. The course is for managers and technical specialists in engineering, production, purchasing, quality control, materials management, financing, and other functions concerned with product value and costs. The course will be conducted by Roy E. Fountain and John F. Prendergast. A feature of the workshop session is that registrants will work on specific problems brought from their own companies. For optimum benefit to participants and their companies, the classes will be strictly limited in size. For further information or reservations for this three-day skill training course on Value Engineering & Analysis, write Materials Management Institute, 221 Columbus Ave., Boston 16, Mass.

**SEMINAR SCHEDULE:** Boston, June 27-29, Hotel Kenmore; Los Angeles, July 18-20, Hotel Sheraton West; San Francisco, July 24-26, Hotel Sheraton Palace; Chicago, Sept. 6-8, Hotel Sheraton Blackstone; New York, Dec. 12-14, Hotel Belmont Plaza.

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# New Hughes Tonotron Tube for the space age



Unretouched photo of simulated display on face of H-1038 *multi-mode* Tonotron tube.

Now you can get clear, constant image displays of slow-scan TV transmissions from space vehicles, satellites, or earthbound subjects. The new Hughes *multi-mode* Tonotron\* storage tube, the most unique display device on the market, makes this possible. In addition to the excellent capabilities previously available from Tonotron tubes—controllable persistence and high brightness—these new *multi-mode* tubes offer the ability to selectively erase target information, present moving cursors on stored displays, and produce high resolution light or dark trace halftone images.

The Hughes *multi-mode* Tonotron tube can solve *your* display problems too. Write or wire today for full information.

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

\*Trademark, Hughes Aircraft Company

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VACUUM TUBE PRODUCTS DIVISION  
2020 Short Street, Oceanside, Calif.



**Dark Trace Writing:** For high-contrast, black-on-white, line or halftone displays with resolution over 125 lines per in.

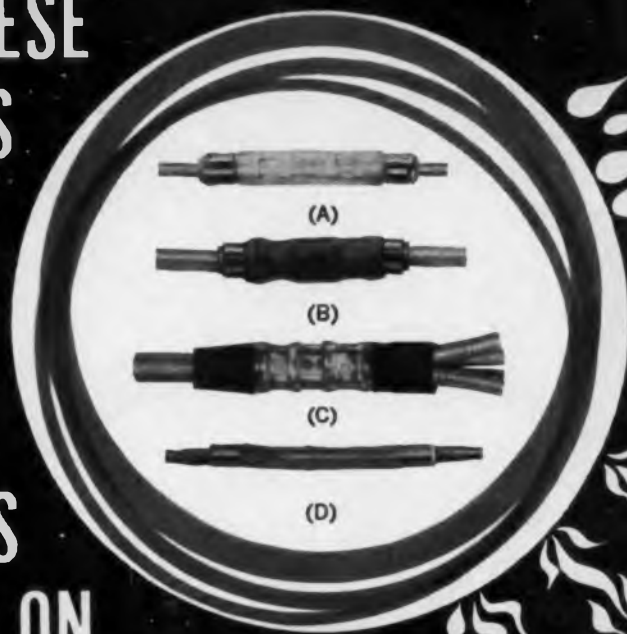


**Write-through:** Superimpose non-stored data like cursors, target markers, artificial horizons, maps, on stored displays.



**Selective Erasure:** Retains full brightness of entire display with high resolution. Eliminates unwanted information.

# THESE SPLICES HAVE THEIR SPACE SUITS ON



Splices in aircraft and missile circuitry must be dressed to weather the most withering kinds of high-altitude temperatures, moisture, vibration, shock, corona. AMP INCORPORATED splices are dressed for it, no matter what the environmental threat. High-altitude heat? AMP's **STRATO-THERM (A)** line of splices are designed to keep circuits intact at continuous temperatures to 1200°F. The post-insulated Strato-Therm splice (illustrated) has a Teflon® outer sleeve and silver-plated electrolytic copper inner sleeve, plus metal crimping rings, for full circumferential protection to solid, stranded or combination conductors. Splices available in materials to resist effects of high energy fuels compounded with Hydrazine and for connecting Chromaloy and Alumel cables. AMP's positive compression crimp insures electrical soundness. The insulated Strato-Therm splice is ideal for temperatures up to 550°F.

What about moisture breathing? The **CERTI-SEAL (B)** splice molds an all-nylon sleeve over the conductors, then compression-crimps tin-plated copper rings over the nylon, for positive moisture-proofing of more than 100 different insulation diameters. Protection for large wire sizes? The **AMPLI-NYL (C)** splice gives total nylon insulation to spliced wire in sizes #8-1/0 AWG; it will accommodate single-to-single, single-to-multiple, and multiple-to-multiple wire combinations. An airworthy splice for shielded wire? The **TERMA-SHIELD (D)** splice, for single or multiple connectors, is post-insulated with either nylon or Teflon. Conductors and shield braids are each crimped permanently and positively together, with insulation separating each conducting member. AMP is splice-conscious. It will pay you to consult with AMP where reliable space-age circuitry is the goal. Send for specific information on these AMP splices.

## AMP INCORPORATED

GENERAL OFFICES: HARRISBURG, PENNSYLVANIA


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# WHAT IT SAYS... ...IS!





Now! Individually calibrated  
meter scales give  
you highest accuracy—at  
no increase in cost!

New individual calibration of meter scales used in standard  instruments gives you commercial instrument accuracy approaching that of lab standards! Through a servo system, each calibration line on each instrument's meter face is located precisely and then printed. What the voltage actually is—you read! No preprinted approximate scales are used.

This new standard of  accuracy assures you that each voltmeter scale is calibrated to the exact characteristics of its individual meter movement. Scale tracking error is eliminated, and you get improved performance at the same moderate price.

Further, this calibration and inspection procedure at  automatically rejects faulty meter movements. Tracking characteristics of each meter movement are determined over its entire range, and rigid tolerance control assures optimum performance.

These are the first commercial voltmeters wherein the meter tracking error is eliminated. Check the specifications below for the meter which meets your requirement. You are assured of improved performance, with this source of error eliminated—plus all the other advantages you expect in  instruments: dependability, ruggedness, convenience. They're yours at no increase in cost.

This new standard of calibration is another part of 's continuing effort to produce more accurate, more dependable, more useful instruments for measurement . . . and to produce them at moderate cost for highest value to the user.

## Brief Specifications of the individually calibrated voltmeters



### 400H Vacuum Tube Voltmeter

**Voltage Range:** 0.1 mv to 300 v, 12 ranges  
**Frequency Range:** 10 cps to 4 MC  
**Accuracy:** With nominal line voltages from 103 to 127 v, overall accuracy is within  
 $\pm 1\%$  of full scale, 50 cps to 500 KC  
 $\pm 2\%$ , 20 cps to 1 MC  
 $\pm 3\%$ , 20 cps to 2 MC  
 $\pm 5\%$ , 10 cps to 4 MC  
**Price:** Cabinet, \$325.00; rack mount, \$330.00



### 400L Logarithmic Voltmeter

**Voltage Range:** 0.3 mv to 300 v, 12 ranges  
**Decibel Range:** -70 to +52 db, 12 ranges  
**Frequency Range:** 10 cps to 4 MC  
**Accuracy:** At nominal line voltage  $\pm 10\%$ , overall accuracy is within  
 $\pm 2\%$  of reading or  $\pm 1\%$  of full scale, whichever is more accurate, 50 cps to 500 KC  
 $\pm 3\%$  of reading or  $\pm 2\%$  of full scale, 20 cps to 1 MC  
 $\pm 4\%$  of reading or  $\pm 3\%$  of full scale, 20 cps to 2 MC  
 $\pm 5\%$  of reading 10 cps to 4 MC  
**Price:** Cabinet, \$325.00; rack mount, \$330.00



### 425A DC Microvolt-Ammeter

**Voltage Range:** Pos. and neg. voltages 10  $\mu$ v to 1 v full scale, 11 ranges  
**Accuracy:**  $\pm 3\%$  of full scale.  
**Ammeter:** Current range, pos. and neg., 10  $\mu$ ma to 3 ma, full scale, 18 ranges; accuracy  $\pm 3\%$  of full scale.  
**Price:** Cabinet, \$500.00; rack mount, \$505.00.



### 412A DC Voltmeter-Ohmmeter-Ammeter

**Voltage Range:** Pos. and neg. voltages 1 mv to 1,000 v full scale, 13 ranges  
**Accuracy:**  $\pm 1\%$  full scale on any range  
**Ammeter:** Current range, pos. and neg. currents from 1  $\mu$ a to 1 a full scale, 13 ranges; Accuracy  $\pm 2\%$  of full scale on any range.  
**Ohmmeter:** Resistance range, 1 ohm to 100 megohms center-scale, 9 ranges; accuracy  $\pm 5\%$  of reading, 0.2 ohm to 500 megohms  $\pm 10\%$  of reading, 0.1 to 0.2 ohm and 500 megohms to 5,000 megohms.  
**Price:** Cabinet, \$400.00; rack mount, \$405.00.

First to bring you individually calibrated VTVM's at no increase in cost!



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# DAYSTROM SQUARETRIM™ POTENTIOMETERS

THE  
WIDEST  
LINE



**Realities:** (1) Daystrom originated the square trimming pot, holds many basic patents on it, and offers advantages not obtainable with any other product; (2) we deliver 1,688 standard models of our Squaretrim precision potentiometers, thereby giving you greatest design latitude; (3) our specs are field proven and realistically derived from testing under environmental stress, not "ideal" lab conditions; (4) standard Squaretrims available with or without stops... special end values with stops available on order; (5) our huge new facility is the most modern of its kind in the world, producing thousands of pots per day. Check the specs, then the facts behind the specs, and you'll see why Daystrom delivers the best. Resistance values from 10Ω to 1 MEG. Units as small as 3/8" x 3/8" x 1/8". Meet or exceed all applicable military specifications.

## DAYSTROM ROTARY POTENTIOMETERS

GREATEST  
DESIGN  
ADVANTAGES



**Examples:** (1) The patented 341 Series ten-turn has zero backlash, finer resolution, and absolute continuity. Resistance ranges: from 1K to 600K. Power: 2.5 watts in still air. (2) The Gangable 319 Series permits phasing individual ganged pots in 15 or 20 seconds without disassembly! Resistance ranges, one unit: 100Ω to 200K. Power, one unit: 2 watts in still air. (3) The tiny 314 Series operates to 250°C, dissipates 3 watts in still air at 50°C! Case is only 1/2" x 1/2". Weight is only 10 grams. Resistance ranges: from 10Ω to 50K. (4) The 304 Series offers standard linearities of 0.3 to 3%, special order linearities as fine as 0.18%! Resistance ranges: from 10Ω to 50K. Power: 2 watts in still air.

*These are but a few of the advantages of Daystrom Squaretrim and Rotary Potentiometers. Call or write your Daystrom Supplier or the main office for complete specifications.*

**DAYSTROM**, INCORPORATED  
POTENTIOMETER DIVISION  
ARCHBALD, PENNSYLVANIA • LOS ANGELES, CALIFORNIA

All pots shown actual sizes.

# New Electronic Standards

*A listing of the electronic standards issued during the 12-month period, June 1960 to May, 1961, by the American Society for Testing Materials, the American Standards Association, the Electronic Industries Association, and the Institute of Radio Engineers are given. Copies of standards listed may be obtained by contacting the issuing group directly.*

## INSTITUTE OF RADIO ENGINEERS (IRE) STANDARDS

- 60 IRE 4.S1—Standards on Circuits: Definitions of Terms for Linear Signal Flow Graphs
- 60 IRE 4.S2—Standards on Circuits: Definitions of Terms for Linear Passive Reciprocal Time Invariant Networks
- 60 IRE 13.S1—Standards on Nuclear Techniques: Definitions for the Scintillation Counter Field
- 60 IRE 17.S1—Standards on Television: Methods of Testing Monochrome Television Broadcast Receivers
- 60 IRE 28.S1—Standards on Solid State Devices: Definition of Semiconductor Terms
- 60 IRE 28.S2—Standards Electrostatographic Devices
- 60 IRE 23.S2—Standards on Video Techniques: Measurement of Resolution of Camera Systems
- 54 IRE 21.S1—Supplement to IRE Standards on Graphical Symbols for Electrical Diagrams
- 61 IRE 15.S1—Standards on Radio Transmitters: Definition of Terms
- C8.40-1960—Synthetic Rubber Insulation for Wire and Cable, 90 C Operation, Specification for (ASTM D1523-60), \$.30
- C37.7-1960—Interrupting Rating Factors for Reclosing Service on Power Circuit Breakers, \$.50
- C78.705—48-inch (1.5 ampere) T-12 and PG-17 Rapid Start, Fluorescent Lamps (Proposed American Standard), \$.40
- C78.706—72-inch (1.5 ampere) T-12 and PG-17 Rapid Start, Fluorescent Lamps (Proposed American Standard), \$.40

## ELECTRONIC INDUSTRIES ASSOCIATION (EIA) STANDARDS

- JEDEC-16—Optical Characteristics of Cathode Ray Tube Screens, June 1960, \$.00
- JEDEC-17—Electron Tube Registration List, August 1960, \$.75
- JEDEC-18—Semiconductor Devices Registration List, August 1960, \$.00
- RS-154-B—Polarized Dry Aluminum Electrolytic Capacitors for General Use (Revision of RS-154-A), August 1960, \$.120
- RS-232—Interconnection of Data Terminal Equipment with a Communications Channel, May 1960, \$.50
- RS-233—Phasing of Receiver Loudspeakers, August 1960, \$.25
- RS-235—Color Code for Traveling Wave Tube Wired Leads, March 1960, \$.25
- RS-237—Minimum Standard for Labd-Mobile Communication Systems Using FM or PM in the 25-470 MC Frequency Spectrum, August 1960, \$.155
- RS-238—Phono Stylus Tips, \$.25
- RS-239—Electrical Rating Systems, \$.25
- ET-110-A—Designation System for Receiving Tubes, February 1960, \$.25

## AMERICAN STANDARDS ASSOCIATION (ASA) STANDARDS

- S4.1-1960—Mechanically-Recorded Lateral Frequency Records, Methods of Calibration of (58 IRE 19.S1), \$.60
- Y14-15-1960—Electrical Diagrams, Section 15 American Standard Drafting Manual, \$1.50
- C8.23-1960—Synthetic Rubber Insulation for Wire and Cable, 60 C Operation, Specification for (ASTM D755-58), \$.30
- CS.24-1960—Synthetic Rubber Insulation for Wire and Cable, 75 C Operation Specification for (ASTM D754-58), \$.30
- C8.26-1960—Natural Rubber Performance Insulation for Wire and Cable, 60 C Operation, Specification for (ASTM D353-58), \$.30
- C8.27-1960—Natural Rubber Heat-Resisting Insulation for Wire and Cable, 75 C Operation, Specification for (ASTM D469-58), \$.30
- C8.31-1960—General Purpose Neoprene Sheath for Wire and Cable, Specification for (ASTM D753-60), \$.30
- C8.32-1960—Heavy-Duty Black Neoprene Sheath for Wire and Cable, Specification for (ASTM D752-60), \$.30
- C8.37-1960—Ozone-Resisting Butyl Rubber Insulation for Wire and Cable, Specification for (ASTM D1352-60), \$.30
- C8.38-1960—Synthetic Rubber Heat- or Moisture-Resisting Insulation for Wire and Cable, Specification for (ASTM D1520-60), \$.30
- C8.39-1960—Synthetic Rubber Performance, Moisture-Resisting Insulation for Wire and Cable, Specification for (ASTM D1521-60), \$.30
- B 355-60 T—Specification for Nickel-Coated Soft or Annealed Copper Wire
- B 354-60 T—Definitions of Terms Relating to Uninsulated Electrical Conductors
- D 1805-60T—Recommended Practice for Estimating Relative Temperature Limits of Dielectric Liquids
- D 1807-60 T—Test for Refractive Index and Specific Optical Dispersion of Hydrocarbon Liquids.
- D 1806-60 T—Test for Refractive Index of Askarels
- D 1809-60 T—Test for Sampling Askarels
- D 1808-60 T—Test for Volume of Oil in Oil-Contaminated Askarels
- D 1810-60 T—Test for Specific Gravity of Askarels
- D 1811-60 T—Test for Free Shlorides in Askarels
- F 11-60 T—Recommended Practice for Testing Electron Tube Parts Using a Reference Planar Diode

## AMERICAN SOCIETY FOR TESTING MATERIALS (ASTM) STANDARDS

# Engineer for Value



## New Dielectric Gel Assures Protection Plus Easy Repairs

If value engineering is important to you, so is Dielectric Gel. This new "see-through" potting material offers all the advantages of other materials *plus* visual inspection and instrument testing . . . *plus* easy repair . . . *plus* fool-proof *repotting*.

A water white, medium viscosity liquid, Dielectric Gel readily surrounds components. It cures in place, forming a resilient mass with outstanding dielectric properties, good thermal stability and moisture resistance. No significant stresses are developed during or after cure. Serviceable from -60 to 200 C. Dielectric Gel protects potted components and circuits from

shock and vibration, other environmental extremes . . . is excellent for filling and impregnating capacitors, magnetic amplifiers, similar components and devices.

Circuits and components potted in Dielectric Gel can be checked both visually and by instrument. When probes are removed, Dielectric Gel heals itself. To replace a defective part you simply cut away the Dielectric Gel with a knife or scissors, replace the defective component and pour fresh Gel around the part. Result: Original high quality protection!

CIRCLE 21 ON READER SERVICE CARD

For 12-page manual, "Silicones for the Electronic Engineer", Write Dept. 4118



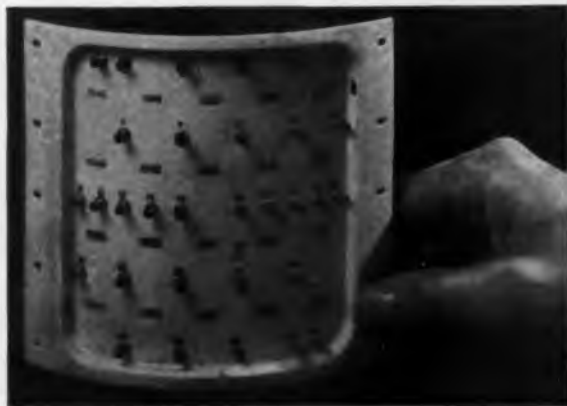
**Dow Corning**



# ...Specify Silicones

## No Heat-loosened Terminals Here

Repeated soldering does not loosen terminals mounted on silicone-glass laminate made with Dow Corning resins. Lightweight and rugged, silicone-glass laminates provide greater strength at elevated temperatures than many metals . . . keep their excellent dielectric properties despite storage, environmental aging, rapidly changing ambients, vibratory shock and high humidity. These are the reasons why Lear, Inc., Grand Rapids, Michigan selected silicone-glass laminate for the capacitor mounting board in their Stable Platform Model 2013J.



CIRCLE 22 ON READER SERVICE CARD

## Easy Way to Repair Encapsulations

It's easy to replace defective parts encapsulated in Silastic® RTV, the fluid silicone rubber that cures without heat. First, you cut a slit in the Silastic RTV jacket; second, replace the component; third, patch the cut by pouring fresh Silastic RTV over the repair . . . there's no measurable loss in dielectric properties or physical strength. Encapsulation with Silastic RTV offers these advantages, too: resistance to moisture, fungus, corrosive atmospheres, corona and ozone, excellent dielectric properties, good heat dissipation and an operating temperature range of -60 to 250 C. Silastic RTV assures top value protection.



CIRCLE 23 ON READER SERVICE CARD

## Heat-sink Sealant Ups Performance

When transistors and diodes are mounted with Dow Corning compound as the heat-sink sealant, heat dissipation improves up to 50%. That's because this grease-like silicone compound doesn't dry out, harden, melt or lose its initial properties from -70 to 200 C . . . even after long time exposure. Dow Corning silicone compound has excellent thermal conductivity and increases the heat transfer between diode-and-washer and washer-and-chassis . . . improves device performance. Applied to lead terminals and connector pins after soldering, Dow Corning compound protects against corrosion, corona and shorts.



CIRCLE 24 ON READER SERVICE CARD

**CORPORATION** MIDLAND, MICHIGAN

branches: ATLANTA BOSTON CHICAGO CLEVELAND DALLAS LOS ANGELES NEW YORK WASHINGTON, D.C.

**C**OPPER-CLAD laminates are being used in increasing quantities for the production of printed wiring in the electronics industry. Copper, which may be bonded to one or both sides of the laminate, is generally an electrolytically-produced foil having a minimum purity of 99.5%. In general, thickness ranges for copper run from 0.00068 in. to 0.0094 in.; the copper is most often used in thicknesses of 0.0014 in. (1 oz. per sq. ft.) and 0.0028 in. (2 oz. per sq. ft.).

The copper foil is bonded to the phenolic laminated plastic by means of an adhesive selected for the particular application. The laminating is done at temperatures of 300 to 350° F., and under pressures ranging from 1,200 to 1,800 psi. The copper is etched to reproduce a previously-designed circuit for a given electronic application.

Basic qualities of laminates used in printed circuitry include the following: high insulation resistance; low moisture absorption; low dissipation (power) factor; high bonding strength; good heat resistance; and good dimensional stability under varying temperature and climatic condition.

A great deal of cooperative work has been done between the Laminated Products Section of NEMA, ASTM, EIA, IPC and the Military. Their generous exchange of information on problems and developments within the industry has resulted in improved raw materials, production processes and quality control. These industry organizations have now reached the point of developing jointly a set of property specifications for copper-clad laminates.

A few years ago, it was common practice to consider the use of copper or aluminum surfaces on any one of fifteen or more possible base laminates; today, through cooperation within the industry, the field has narrowed to the use of copper on ten grades and of these only two are used in large quantities. It is proper to say that the art of the industry has matured.

"Printed Circuits"<sup>a</sup> a handbook published by IPC gives a useful glossary of terminology and definitions and contains valuable information on layout, design and related subjects. NEMA Standards<sup>b</sup> list the guaranteed property values for various copper-clad laminates. The information available in these two publications can be of invaluable assistance to newcomers in the production of printed circuit boards.

**Editor's Note:**

One of the problems of printed circuits is over-specification. Usually, when this is done the largest gain is in the cost of the board. With the number of trade organizations that are active in the laminate field, the designer would do well to stick to their standards instead of trying to create new ones.

We have noted the laminates that are available from the leading laminate manufacturers. To the uninitiated the number of types available is formidable. However, many of those listed are not for printed circuit boards. If the designer specifies a particular material, the laminate manufacturer will probably supply it to satisfy the customer . . . even if the material is not the best selection.

The material presented in this article shows that, generally, the designer can pick his material from two types. With these two being the recommended types, the designer would do well to consider these before specifying other types. While these two may appear to be higher priced they may actually be cheaper, because of higher production, than short runs of another type.

*Printed circuit boards are available with many types of laminates. To the newcomer this can be confusing. Here the possibilities have been condensed into the selection of one of two types.*

## Selected

A great deal of study shows that printed circuits demonstrate a high order of reliability. In most cases of rejected parts, the rejection has been because of appearance (color and/or cosmetic effect) and generally these rejected parts are perfectly satisfactory from operation standpoint. As additional experience is gained, the inspectors involved will become better qualified to make visual inspection and more emphasis will be placed on those properties which can be measured and recorded numerically.

Specification of the proper laminate aids reliability. The designer should evaluate laminate properties within three general areas as follows:

- (a) Electrical properties including insulation resistance, surface leakage, arc resistance, dielectric strength and dielectric constant,
- (b) Mechanical properties including flexural strength, impact strength and machinability,
- (c) Chemical properties including resistance to heat and moisture, dimensional stability, and resistance to etching solutions, plating baths and solvents. The glass-base grade is superior in mechanical properties and is, therefore, used in many military applications but there are innumerable applications where the paper-base

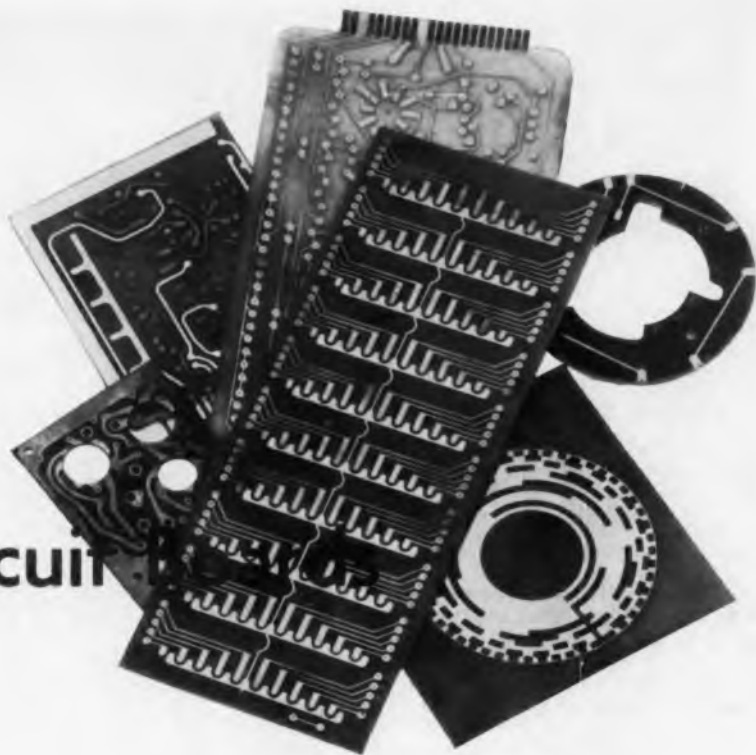
<sup>a</sup> Member, NEMA Technical Advisory Group.

<sup>a</sup> A publication of The Institute of Printed Circuits, 27 East Monroe Street, Chicago 3, Illinois.

<sup>b</sup> Publication LPI-1959 of the National Electrical Manufacturers Association of 155 East 44th Street, New York 17, New York.

By Dr. NORMAN A. SKOW  
Technical Director,<sup>o</sup>  
Synthane Corp.  
Oaks, Pa.

## Printed Circuit



laminates is entirely satisfactory. This is particularly true now that a new grade (NEMA designation FR-2) is available which is equivalent to XXXPC except that it is flame-retardant.

The ten types listed by the Military are shown in Table 1. In the trade these are generally known by their NEMA designation and these are also shown in the table. Of these ten types, the two used in large

volume are XXXPC and G-10. The properties of these two types are presented in Table II; the values shown are typical values and represent the average values for specific properties taken from a large number of tests and serve only as a general guide in design. These typical values are not to be considered as minimum or maximum specification values.

(Tables 1 & 2, on page 57)

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## Copper Clad Laminate Terms

**Insulation Resistance:** Surface and volume resistance between conductors; ionic contamination and insulation qualities of adhesive bond. Measured in megohms under usual conditions: 96 hrs. 90% humidity at 95°F. Should be high to avoid arcing, straying signals or breakdown under humid conditions.

**Arc Resistance:** Number of seconds of time laminate will withstand arcing before carbonizing. Should be high to avoid breakdown by an occasional arc of circuits carrying high currents.

**Dielectric Strength:** Measured perpendicular to laminate in VPM; the voltage the laminate will withstand before breakdown. Should be high to avoid breakdown in circuits carrying high voltages.

**Dielectric Constant:** Measured at 1 mc. Should be low to avoid signals being fed into sensitive circuits.

**Flexural Strength:** Laminate should have high fatigue resistance, be able to withstand deflection, torsion and vibration. Must be able to bend predetermined amount and yet return to original shape.

**Impact Strength:** Where jolts, jars and light shock loads are common, laminate should not splinter, break or delaminate.

**Moisture Resistance:** Water, corrosive atmospheres, acids and alkalis in moderate concentrations should have little or no effect on laminate. Moisture resistance should be high.

**Blister Resistance:** Pertains to strength of the adhesive and the thermal properties of the base laminate. When the components are mounted on the board ready for soldering, the solder should have no ill effects on the adhesion of foil to laminate or the laminate itself. The same is true of the etches in re-

moving the copper after circuit has been designed on the board.

**Machinability:** Whether the laminate can be punched cold or must be heated before punching. With tight tolerance circuits, a laminate which had to be heated and punched might, upon cooling, be out of tolerance.

**Dissipation Factor:** Amount of power dissipated in the form of heat in a circuit. Should be low so that circuit may operate at rated power.

**Heat Resistance:** Pertains to base laminate thermal properties. Laminate should be able to withstand high temps. and not warp, bend or delaminate.

**Dimensional Stability:** Laminate should retain its shape within tolerances, under conditions of high humidity, heat, coldness or sudden transfer from one condition to another. Should not unduly expand or contract.

# BREAK THROUGH

## in automatic logic circuit testing

Production of packaged module circuits gains new impetus with this major achievement! Now you can *automatically* test the operating characteristics of logic circuit modules, memory boards, component cards and similar units—with speed, precision and dependability.

The new Tape Programmed DIT-MCO Model 720 rapidly performs static and dynamic tests on active and passive modular circuits.

Tests that can be performed with the new Model 720 include:

- Logic circuit response to all logical combinations of DC input levels.
- Marginal tests to evaluate logic modules under conditions of lowered or raised supply levels in combination with lowered or raised signal input levels.
- Complete tests of conversion matrices for proper logic, levels.

The Tape Programmed DIT-MCO Model 720 will accurately test variables which are required to maintain  $\pm 0.5\%$  accuracy, and 3 digit tolerance values can be programmed. Provision is made for programming AC or DC sources and external signals through the tester.

Performance of this entirely new circuit analyzer is backed by the experience and reliability of DIT-MCO, Inc.—the nation's leader in automatic circuit testing.

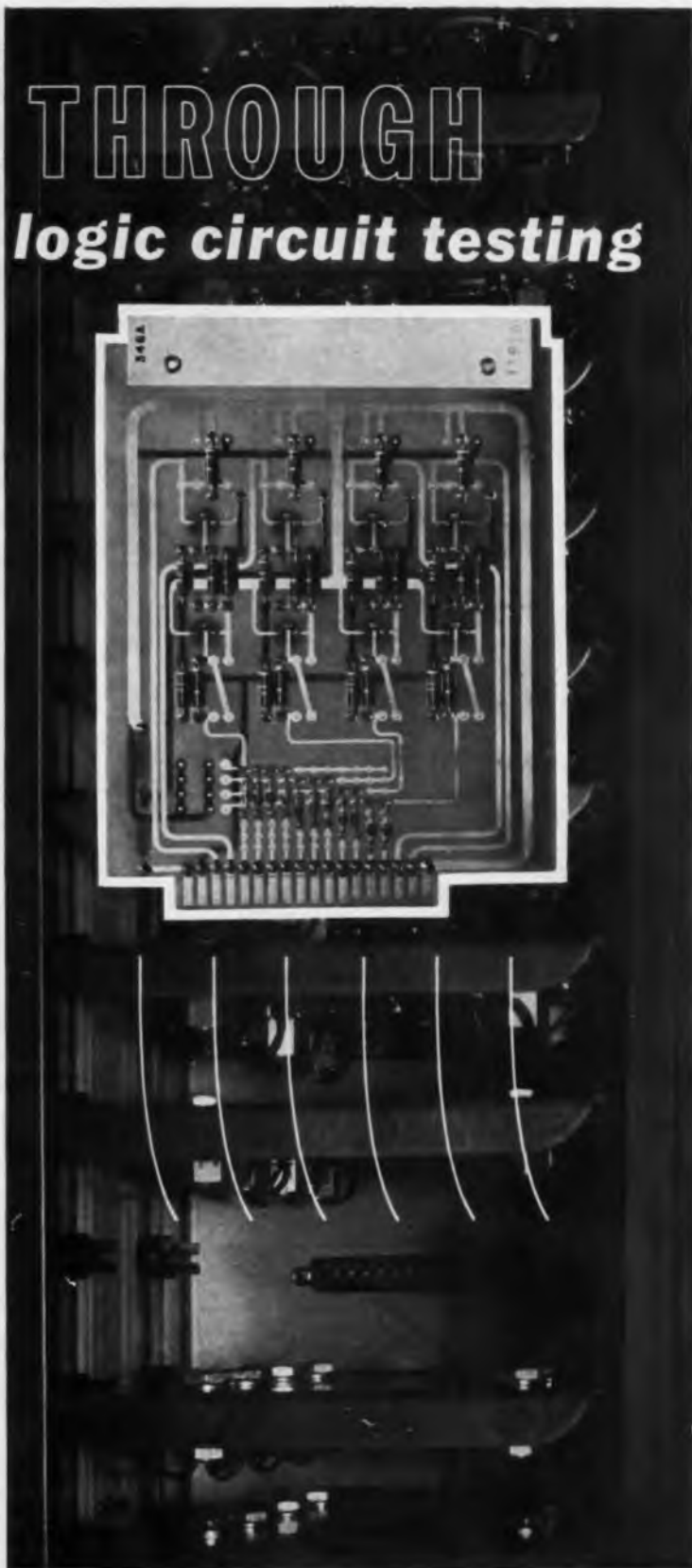
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**TABLE 1**  
**COPPER-CLAD LAMINATES**

Military Designation	NEMA, ASTM and EIA Designation	Description
PP	XXXP, XXXPC	Paper-base, phenolic resin
PX	FR3	Paper-base, epoxy resin, flame retardant
GE	G10	Glass fabric base, epoxy resin, general purpose
GB	G11	Glass fabric base, epoxy resin, temperature resistant
GF	FR4	Glass fabric base, epoxy resin, flame retardant
GH	FR5	Glass fabric base, epoxy resin, flame retardant, temperature resistant
GR	—	Glass mat base, epoxy resin, flame retardant
GM	G5	Glass fabric base, melamine resin
GS	G7	Glass fabric base, silicone resin
GT	—	Glass fabric base, polytetrafluoroethylene resin

**TABLE 2**  
**TYPICAL PROPERTY VALUES and CHARACTERISTICS**

	XXXPC	G10
<b>Flexural strength, psi</b>		
Lengthwise	18,000	70,000
Crosswise	18,000	80,000
<b>Compressive strength, flatwise, psi</b>	30,000	80,000
Izod impact, ft. lbs. per inch notch		
Edgewise, Lengthwise	0.4	12.0
Crosswise	0.35	10.0
<b>Tensile strength, psi</b>		
Lengthwise	10,000	35,000
Crosswise	9,000	30,000
<b>Modulus of elasticity in flexure, psi</b>		
Lengthwise	1,000,000	2,500,000
Crosswise	800,000	2,000,000
<b>Rockwell hardness, M scale</b>	90	110
<b>Cold flow (deformation under load) %</b>	0.8	0.01
<b>Specific gravity</b>	1.30	1.85
<b>Water absorption, %, 1/16" thick</b>	0.65	0.15
<b>Solvent resistance</b>	Good	Excellent
<b>Thermal Expansion, cm/cm/°C</b>	1.5x10 <sup>-6</sup>	0.5x10 <sup>-6</sup>
<b>Thermal Conductivity, cal./sec/cm<sup>2</sup>/°C/cm</b>	7x10 <sup>-4</sup>	10x10 <sup>-4</sup>
<b>Dielectric strength, V. P. M. Condition A</b>		
Step by step, perpendicular, 1/16"	500	500
<b>Dielectric breakdown, KV</b>		
Step by step, parallel, Condition A	70	70
Condition D-48/50	40	60
Condition D-48/50	4	100
<b>Arc resistance, seconds</b>		
<b>Insulation resistance, megohms, Condition C-96/35/90</b>	100,000	2,000,000
<b>Volume resistivity, megohm cm., Condition C-96/35/90</b>	1,000,000	10,000,000
<b>Surface resistance, megohms, Condition C-96/35/90</b>	50,000	1,000,000
<b>Dielectric constant, 1 megacycle</b>		
Condition A	4.0	4.6
Condition D-24/23	4.2	4.8
Condition D-48/50	4.6	5.0
<b>Dissipation Factor, 1 megacycle</b>		
Condition A	0.030	0.020
Condition D-24/23	0.032	0.025
Condition D-48/50	0.045	0.030
<b>Peel strength of foil, lbs. per inch</b>		
After temperature cycling		
1 ounce copper	7	10
2 ounce copper	9	12
After solder dip		
1 ounce copper	7	10
2 ounce copper	9	12
<b>Dip solder resistance, no blistering or delamination after</b>	10 sec. at 500°F. = 0.004	60 sec. at 500°F. = 0.005
<b>Thickness tolerance for 1/16" sheet</b>		
Warp or twist, %, for 1/16" sheet		
Copper one side	8	5
Copper two sides	3	2

**Methode Thru-Connected Printed Wiring Boards**

**HIGH**

**Reliability!**  
**Re-usability!**

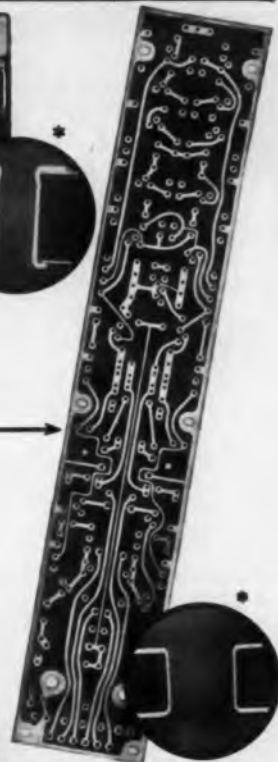


**Fused in Place Eyelets**

Solder flowed under flanges by high current electrode set dies using latest equipment improvements — fast, flexible, economical.

**Plated Thru Holes**

Using copper reduction techniques for sensitizing in conjunction with pre-clad laminates — compact, reliable, excellent component soldering and high component density.



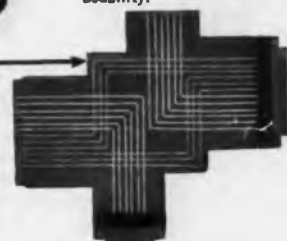
**Funnel Tubelets**

Funnel shaped tubelets — permit easy component insertion, repeated removal and re-mounting without damage to board or adhesion — maximum re-usability.



**New Three-Dee Sealed Harness**

Methode's new fully encapsulated multi-layer circuitry — permits unlimited cross-overs and taps, flexible, conformal, light and tough for interconnecting individual circuit cards or black boxes.



\*37 to one micro photographic cross-section view

Use the Best Prefabricated Wiring Technique for Your Requirement . . .

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**THERE IS NO SUBSTITUTE  
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Specify —  
**PERFORMANCE  
 PROVEN "MAG MOD"**

## MAGNETIC MODULATORS

Actual  
 Size



For complete  
 specifications and  
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 Miniature and Standard  
 Components, call or write.

Miniaturized design permits engineers to employ these new components in transistorized printed circuit assemblies and wafer type structures. All models offer maximum reliability, fully ruggedized construction and conform to MIL-T-27A specifications.

- COMPLETE RELIABILITY
- INFINITE LIFE
- FASTER RESPONSE TIME
- NEGLIGIBLE HYSTERESIS
- EXTREME STABILITY (Ambient Temp. Range from -75° to +135°C)
- COMPACT SIZE
- LIGHTWEIGHT

Typical circuit applications for Magnetic Modulators are algebraic addition, subtraction, multiplying, raising to a power, controlling amplifier gains, mechanical chopper replacement in DC to fundamental frequency conversion, filtering and low signal level amplification.

### GENERAL MAGNETICS • INC

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Send for Product Data Sheet No. 7

Remove activated and non-activated fluxes and other contamination from assembled printed-circuit boards with new ultrasonic cleaner using Freon® solvent. No trace of flux under "Black light" inspection; no trace of residual contamination; no damage to mounted components.

Will handle 300-500 boards per hour—board sizes up to 10 x 20 inches. Also available less conveyor for manual operation. Written quotation upon receipt of production volume and board sizes.

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*the stabilized  
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 for critical applications



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- Highest Capacitance Stability
- Stable operation up to 85° C (Polystyrene) and 200° C (Teflon)



### M.V. CAPACITORS

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### TYPE D CAPACITORS (MYLAR)®

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 METALLIZED  
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Circle 51 on Inquiry Card

# Shallcross

precision  
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## Standard 'Specials' in Shallcross Miniature Switches



**PRE-WIRED & HARNESSED SWITCHES**—Decks pre-wired before ganging to reduce your production costs and time.



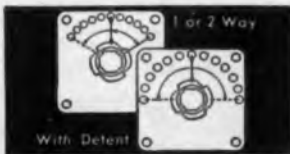
**GOLD PLATED CONTACTS & TERMINALS**—for the ultimate in maintaining low, stable contact resistance under corrosive conditions.



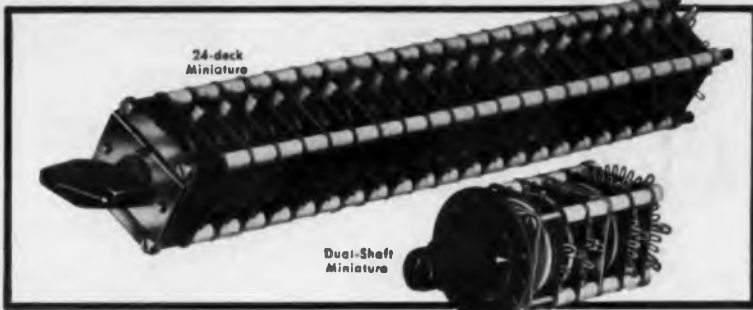
**PRINTED CIRCUIT TERMINALS**—available on single-deck or last deck of multi-deck switches.



**CLUSTER ARM ROTORS**—for progressive shorting or progressive-making circuits.



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## MAXIMUM CIRCUIT SWITCHING IN MINIMUM SPACE

Here's a positive approach to miniaturization—a way to handle more circuits per cubic inch! Conservatively estimated, over 650 circuits may be switched in only 38 cubic inches by a Shallcross Miniature Series switch . . . and with the quality and reliability only a button-contact, multi-leaf wiper arm switch can provide. In one recent application, the single 24-deck Shallcross Miniature switch shown above replaced four "subminiature" units.

Equally impressive space advantages are possible with dual concentric shaft versions of the Shallcross Miniature Series. Either shaft may

operate up to five of a total of ten decks. The inner shaft may also control a rheostat, variable capacitor, or other device.

If, in addition to size, switch quality is also your concern, the following highlights substantiate why Shallcross Miniature Switch users repeatedly specify these switches, and no others, for critical airborne, missile control, and computer applications.

**Low initial contact resistance**—less than 0.002 ohm.

**Stable contact resistance**—0.5 milliohm for 10,000 operations.

**Highly immune to vibration damage**—exceeds MIL-S-3786 requirements.

**Uncompromised material quality**—silver button contacts; silver alloy, multi-leaf, self-cleaning wipers; diallyl phthalate rotors; epoxy-laminate decks (filament woven with glass fiber).

**Designed to applicable MIL-S-3786 Specifications.**

**Minimum thermocouple effects**—similar materials for all current-carrying parts.

**Excellent RF characteristics.**

**Minimum depth**—1" first deck, 5/8" each additional deck.

**Maximum Versatility**—up to 32 positions, 1 to 4 poles, shorting or non-shorting in the same switch. 1 to 24 decks, ball detents, many special modifications.

For complete details, write for  
*Shallcross Switch Bulletin*

## Solenoid-Operated Switches



For indirect switching of complex circuits, or to avoid "over stepping" positions in critical circuits, most Shallcross Miniature Switches can be furnished with solenoid operation. Outline your circuit requirements for a prompt recommendation by Shallcross engineers.

**Shallcross Manufacturing Co.** Selma, North Carolina

Precision wirewound resistors, Switches, Instruments, Delay lines, Resistance networks, Audio attenuators.

*Authoritative Reference Data:*

# How to Specify Electronic Wire and Related Products...

from  
Alpha

...40 years of applied  
engineering know-how

**ALPHLEX TUBING:** Catalog contains complete description of the entire line of eight Alphlex tubing products. Applications and all pertinent engineering specifications are listed in easy-reading charts. Highlighting the catalog is the Alphlex line of Teflon Tubing — a high temperature tubing (260° C.)

**ALPHLEX ZIPPER TUBING:** The most up-to-date and complete engineering brochure on the Alphlex line of Zipper Tubing. Featured is complete information on all 5 types of Zipper Tubing, and the unique hand-tool that simplifies closing.

**SHIELDING AND BRAIDING:** Applications, descriptions and all engineering data on Alpha Shielding and Braiding. Specifications on the 3 different types, Flat Braid, Oval Commercial Braid and Tubular Braid to military spec QQ-B-575 are provided. A special glossary is included.

**ALPHLEX LACING CORDS AND TAPES:** Types, materials and finishes for Round, Flat Braided, and Government Spec Cords and Tapes are included in the brochure. Alpha stocks a complete line of Lacing Cord for immediate delivery.

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**ALL-NEW ALPHA ELECTRONIC WIRE AND CABLE CATALOG:** 52 pages of complete engineering information describing the entire Alpha line of over 6000 electronic wire, cable and tubing products. Included in this comprehensive book are Military Specification breakdowns, plus complete descriptions and applications of all Alpha products. The catalog highlights such new products as:

- Retractable Coil Cords and Extension Cord Sets
- Teflon Cables
- Heat Shrinkable Tubing
- Teflon Tubing
- Zipper Tubing
- Shielding and Braiding

A special section describes Alpha facilities such as Stripping, Cutting, Stripping, Tinning, Color Jackets, Short-Run Cables and the fabrication of Harnesses and Assemblies.

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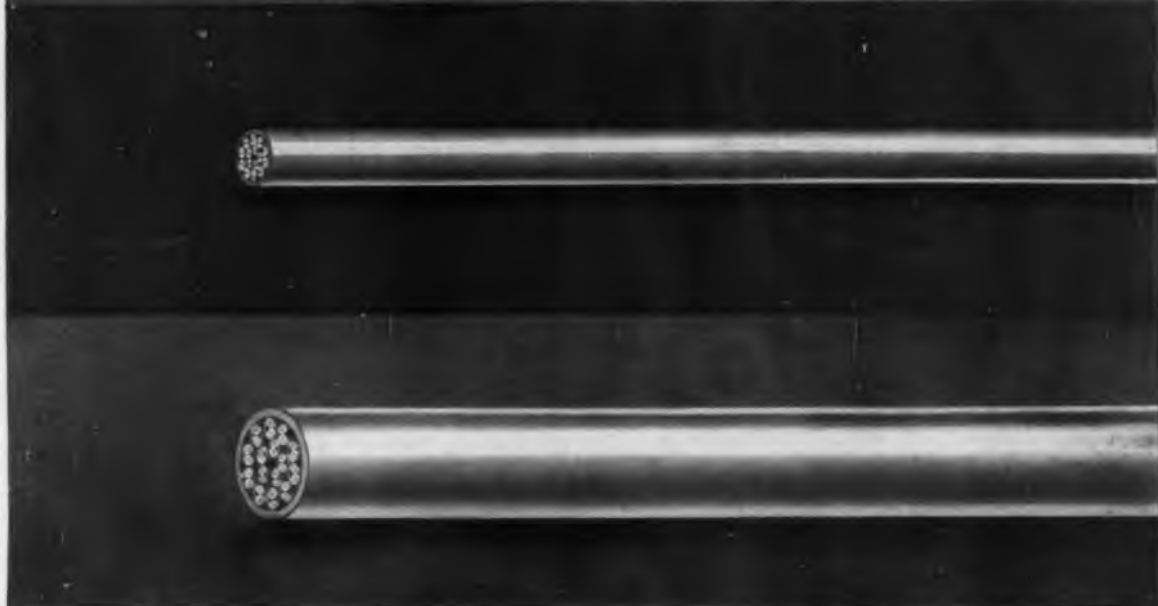


# WIRE & CABLE

## Technical specifications and applications for metallic wire

METALS & ALLOYS	CONDUCTIVITY (annealed)		TENSILE Hard	STRENGTH Soft	ELONGATION Soft	DENSITY lb/in <sup>3</sup>	SOLDER ABILITY	APPLICATIONS
	%	Range						
Aluminum 1199 EC	65 62		25,000	14,000	20	.098 .098	Poor Poor	Pig Tails Light Weight Conductors. Magnet Wire.
5056	29		85,000			.095	Poor	
Cadmium	25					.312	-	Fuse.
Copper ETP OFHC	102 101	100-104 100-104	68,000 75,000	34,000 38,000	25 30	.322 .323	Good Good	Conductors Conductors, Electron Tube Parts.
<b>COPPER ALLOYS</b>								
100 Cu Zr Cad. Copper 99 Cu 1 Cd	84 90		90,000 120,000	37,000 42,000	20 25	.322 .321	Good Good	High Temperature Conduct. High Cond. Resis. Wire; High Strength Conductors.
Chrome Copper 99 Cu 1 Cr	92		121,000	45,000	25	.321	Good	High Strength Conductors.
Signal Bronze 98 Cu ZSn P	38		110,000	55,000		.321	Good	
Silicon Bronze 98 Cu 2Si Mn	11		115,000	53,000		.316	Good	Resis. Wire,
Silicon Bronze 98 Cu 3Si 1 Mn	5.8	5.3-5.9	130,000	70,000		.308	Good	Resis. Wire,
Al. Bronze 98 Cu ZSn 2 Al	18	16-20	145,000	60,000	25	.308	Good	Resis. Wire.
Phos. Bronze 95 Cu 5Sn P	15	13-17	165,000	90,000		.320	Good	Resis. Wire,
Red Brass 85 Cu 15 Zn	36	34-38	120,000	52,000		.316	Good	Resis. Wire,
Low Brass 80 Cu 20 Zn	32	30-35	115,000	57,000	30	.313	Good	Wire Cloth, Resis. Wire,
Cartridge Brass 70 Cu 30 Zn	27	26-29	135,000	57,000	30	.308	Good	Resis. Wire
Ni. Silver 18% 65 Cu 17 Zn 18Ni Mn	6.2	5.8-6.6	120,000	68,000	25	.316	Fair	Resis. Wire,
Ni. Silver 12% 65 Cu 22 Zn 12Ni Mn	7.7	7.2-8.4	110,000	42,000	25	.310 .410	Fair	Resis. Wire,
Lead	8.3					.410	-	Fuse Wire,
Monel	3.6		160,000	85,000	25	.319	No	Cable Armor.
Nickel "A"	18		150,000	70,000	20	.321	Fair	Hi Temp Conductors.
Silver	108		40,000			.383	Ex	Conductor, Batteries,
Steel	10		240,000			.284	No	
Stainless - 302	2.4		270,000	110,000	30	.286	No	Reinforcing Wire,
Tin	16	15-16	32,000	-	40	.263	-	Fuse Wire.
Zinc	28		18,000	-	40	.260	Fair	Fuse Wire,
<b>COMPOSITES</b>								
Steel - Cu Coated	30	30	127,000	70,000	20	(.295)	Good	High Strength Conductors, Reinforcing Wire.
Steel - Cu Coated	40	40	90,000	50,000	20	(.296)	Good	High Strength Conductors, Reinforcing Wire.

# Which cable has the Beldfoil\*?

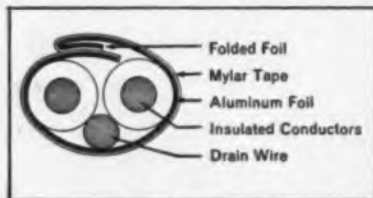


Both shielded cables have the same number of twisted pairs with identical AWG. But . . . the cable with exclusive Belden BELDFOIL is smaller in diameter.

**What does this mean to you?** It means that when you specify BELDFOIL, you are really buying extra space—extra conduit space, extra raceway space, extra console and rack space.

A new development by Belden—BELDFOIL shielding is 100% effective. It is a major development in quiet cables. BELDFOIL eliminates crosstalk and is superior for stationary or limited flexing at both audio and radio frequencies.

BELDFOIL shielding is a lamination of aluminum foil with Mylar which provides a high dielectric strength insulation that is lighter in weight, requires less space, and is usually lower in cost. For multiple-paired cables, with each pair separately shielded, the Mylar is applied *outside* with an *inward* folded edge.\*\* This gives 100% isolation between shields and adjacent pairs.



**For complete specifications, ask your Belden electronics jobber.**

\*Belden Trademark  
 Reg. U. S. Pat. Off.  
 \*\*Patent applied for



power supply cords • cord sets and portable cordage • electrical household cords • magnet wire • lead wire • automotive wire and cable • aircraft wires • welding cable

# Coil Winding Nomographs

By **HAROLD N. MILLER**

Vice President, Engineering  
Associated Research Inc.  
3758 West Belmont Ave.  
Chicago 18, Illinois

The design, or production engineer, is frequently faced with the problem of copying a given coil. He may also face the problem of estimating the material cost or amount of wire required for bid or production reasons when only mechanical information is available. Data usually includes: Mean diameter of the winding, width of the winding, wire size, length of wire, number of turns, and number of coils per pound of wire. Although the calculations could be performed using a set of wire tables and a slide rule, the following set of nomographs will generally give accurate results with quite a saving in time.

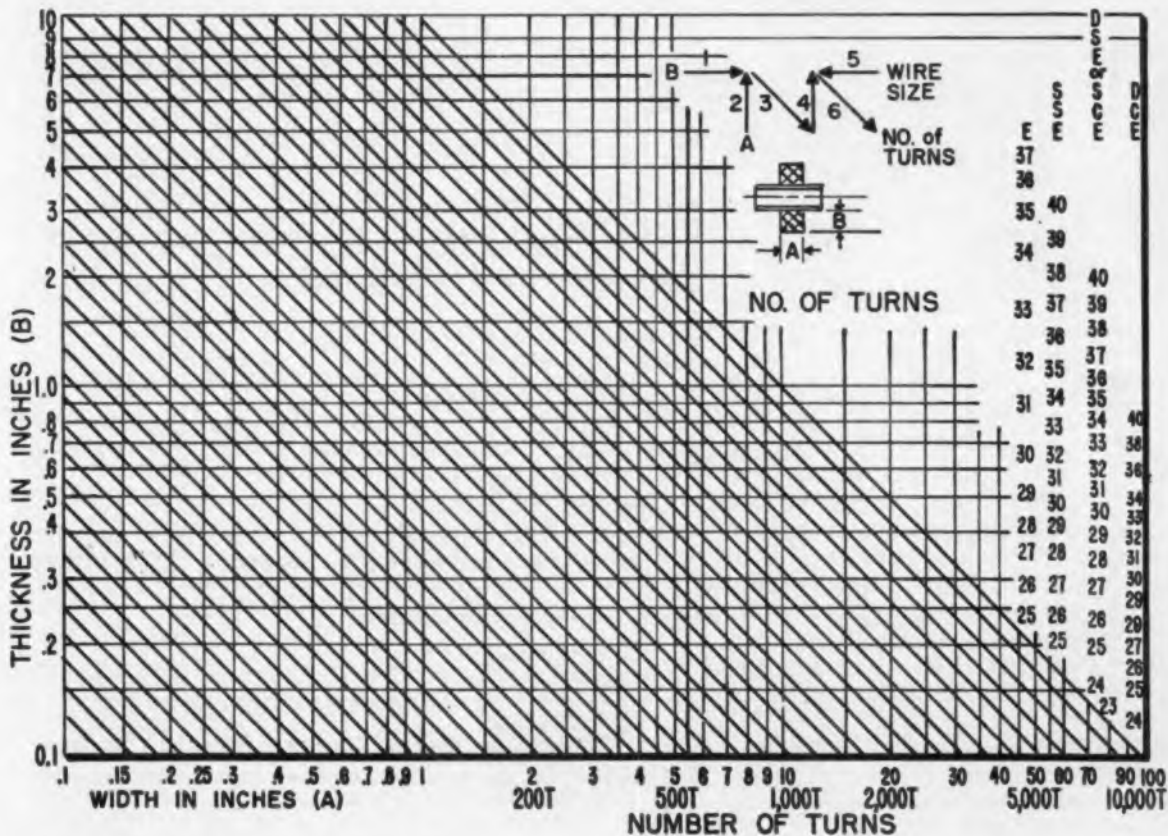
**Winding Length Nomograph**—Will give the third factor when any two of mean diameter, number of turns, or feet of wire are known.

**Coils Per Pound Nomograph**—Correlates wire size, number of feet of wire per coil, and number of coils

that can be made with a pound of wire. Values for enamel, SSE, DSE, SCE, and DCE insulation are tabulated, but values for other popular insulation may be readily interpolated.

**Number of Turns Nomograph**—Correlates winding width and thickness with wire size and number of turns. Entering the chart with any three of these functions will yield the fourth. Entering with any two functions will yield various combinations of the third and fourth to meet the entering conditions. The diagram on the nomograph indicates the proper method of entering and reading the chart.

These nomographs were used for a number of years in successfully estimating the cost of various size RF chokes in production lots of a few hundred to many thousands of pieces. They were also used in making single replacement chokes.





**NEW**  
1,000° F.  
**MGT**  
**WIRE and CABLE**  
• flexible  
• moisture resistant  
Write for technical data

# Save Time WITH Super-Temp

## TEFLON<sup>1</sup> OR SILICONE RUBBER INSULATED HIGH TEMPERATURE WIRE AND CABLE

**SUPER-TEMP HIGH TEMPERATURE WIRE AND CABLE CHART**  
ALL TEMPERATURES ARE CENTIGRADE

PRODUCTS	PRIMARY INSULATION			JACKET INSULATION								REMARKS	
	MATERIAL	COLOR PER MIL STD 104		OPERATING TEMPERATURE	TFE TEFLON TAPE WRAP	FEP TEFLON EXT.	FIBRE GLASS BRAID IMPREG.	PVC EXT.	NYLON EXT.	NYLON BRAID AND LACQUER	DACRON BRAID		POLY-ETHYLENE EXT.
		Solid	Striped										
CABLES Single & Multiconductor	TFE Teflon Ext. or Tape	✓	✓	-90°+260°	✓	✓	✓	✓	✓	✓	✓	✓	Any combinations of conductors and shielding available. Conductors and primary insulations per Mil-W-16878. Special conductors and wall thicknesses of insulations available. Bonding treatment of teflon primary or jacket insulations available. Shielded with Silver Plated or Tinned Copper.
	FEP Teflon Extruded	✓	✓	-90°+200°		✓	✓	✓	✓	✓	✓		
	Silicone Rubber	✓		-55°+200°		✓	✓	✓	✓	✓	✓	✓	
	PVC	✓	✓	-55°+105°				✓	✓		✓	✓	
COAXIAL CABLES	TFE Teflon Extruded	✓		-90°+260°	✓*	✓	✓*	✓	✓	✓	✓	✓	* Per Mil-C-17B
	FEP Teflon Extruded	✓		-90°+200°		✓	✓	✓	✓	✓	✓	✓	Special constructions and jackets available.
	Polyethylene Solid or Foam	✓		-55°+90°			✓	✓*	✓	✓	✓	✓*	Shielded with Silver Plated or Bare Copper.
AIRFRAME WIRES	TFE Teflon Tape and Imp. Glass	✓		-60°+205°		✓	✓			✓	✓		Per Mil-W-7139A Shields and jackets available.
	Silicone Rubber and Dacron	✓		-55°+150°			✓			✓	✓		Per Mil-W-8777A Shields and jackets available.
HOOK-UP WIRES	TFE Teflon Ext. or Tape	✓	✓	-90°+260°	Per Mil-W-16878 type E or EE, or thin wall or extra heavy wall								UL APPROVED
	FEP Teflon Ext. or Tape	✓	✓	-90°+200°	Produced to physical dimensions of Mil-W-16878 type E or EE								Special constructions available.
	Silicone Rubber	✓		-55°+200°	Per Mil-W-16878 type F or FF, special constructions								Twisting of two or more wires available.
	PVC	✓	✓	-55°+105°	Per Mil-W-16878 type B, C, or D with or without Nylon Jacket								Bonding treatment of teflon insulations available.
	TFE Teflon Film	✓		-90°+260°	Operating voltage 300 RMS—Solid conductors only								
MAGNET WIRES	TFE Teflon Film	✓		-90°+260°	Per Mil-W-19583 type III single, heavy, triple and quad. wall thickness								Tempering and bonding treatments available.
	Silicone and Isonel		Natural	-55°+155°	Per Mil-W-19583 type II single and heavy wall thickness								
	Mica Magnet Wire		Natural	-90°+350°	A special magnet wire for extremely high temperatures								Available with nickel clad copper conductors.

TEFLON<sup>1</sup> IS A TRADE NAME

**TEFLON TAPES:** Type B, sintered and bondable; Type B, unsintered; all sizes; Mil. Std. 104 colors.  
**TEFLON TUBING:** Extra flexible, tape wrapped. Mil. Std. 104 colors, solid or striped.

**American Super-Temperature Wires, Inc.**  
A Subsidiary of Haveg Industries, Inc., Wilmington, Del.  
32 West Canal Street, Winooski, Vermont • UNIVERSITY 2-9636  
General Sales Office: 195 Nassau St., Princeton, N. J. WAInut 4-4450  
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# MIL-R-19365C



## Across the Board!



### OHMITE

### “Dividohm<sup>®</sup>”

### Adjustable Resistors

**HIGHLIGHTS OF MIL-R-19365C**—This revised specification covers power-type, wire-wound, adjustable resistors from 1 to 15,000 ohms inclusive. Resistance tolerance is specified as  $\pm 5\%$  for all eight power ratings which are listed at right. The maximum continuous operating temperature is 350°C (Char. V).

MIL-R-19365C resistors are the tubular type with single-layer windings and lug-type terminals—two fixed and one adjustable.

Ohmite can supply all eight adjustable resistors to meet every requirement of MIL-R-19365C. Higher resistances using smaller wire sizes are available, also, to meet the performance requirements of this new MIL specification.

Write for Military Catalog 50B—the “Easy Way” to Order MIL Resistors.

**OHMITE MANUFACTURING COMPANY**  
3662 Howard Street, Skokie, Illinois

Rheostats Power Resistors Precision Resistors  
Variable Transformers Tantalum Capacitors  
Tap Switches Relays R.F. Chokes  
Germanium Diodes Micromodules

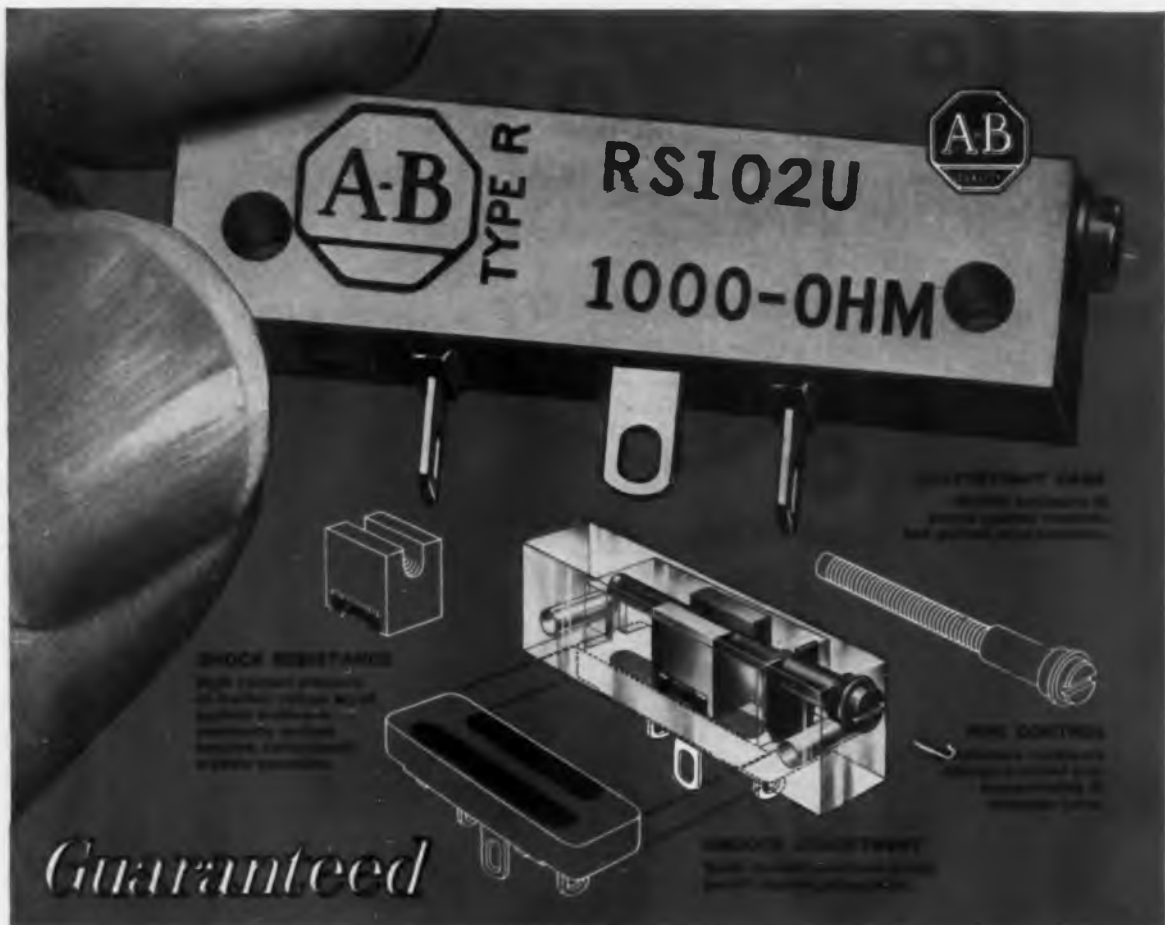


STANDARD MIL-R-19365C ADJUSTABLE RESISTORS

STYLE	WATTS	DIMENSIONS		OHMS	
		LENGTH	DIA.	MIN.	MAX.*
RX29	11	1¼"	7/16"	1	470
RX32	17	2"	9/16"	1	910
RX33	26	3"	5/8"	1	1,500
RX35	55	4"	29/32"	1	3,600
RX36	78	4"	13/16"	1	5,100
RX37	113	6"	15/16"	1	8,200
RX38	159	8"	15/16"	1	11,000
RX47	210	10½"	15/16"	1	15,000

\*0.004" Diameter wire.

Offering you complete availability of these MIL resistors so quickly is another indication of Ohmite's ability and desire to give industry the finest, most advanced resistance products with the best of service.



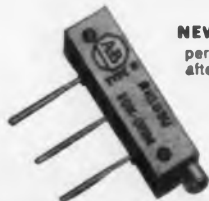
*Guaranteed*  
**Reliable**  
**Performance**  
 and  
**Stable**  
**Settings**

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In critical applications, Allen-Bradley Type R adjustable fixed resistors are *without equal*. For example, in recent tests\* Type R resistors successfully withstood acceleration, shock, and vibration *five times* better than the latest MIL Spec requirements. Such wide margin of safety is your assurance of complete reliability. Virtual indestructibility is obtained through an *exclusive* Allen-Bradley process in which the solid resistance elements and the insulating mounting are hot molded into one integral unit. The moving element is self-locking for absolutely stable settings. Also, the Type R control allows "stepless" adjustment of its resistance.

The molded case of the Type R control is watertight and dust-tight. Rated  $\frac{1}{4}$  watt at 70°C, these Type R controls are available in values from 100 ohms to 2.5 megohms.

\*Test Report #71801, Sept. 1960, United States Testing Company, Inc.



**NEW CUP GUARD**  
 permits adjustment  
 after encapsulation

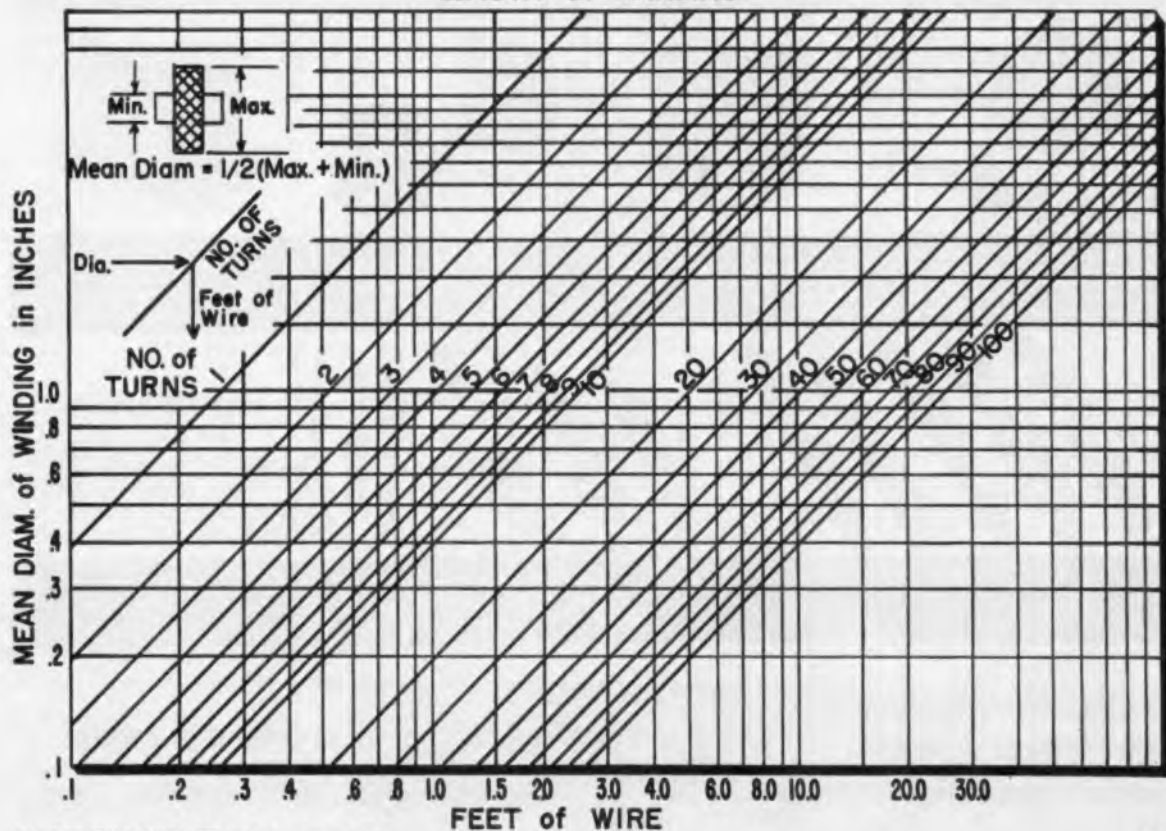
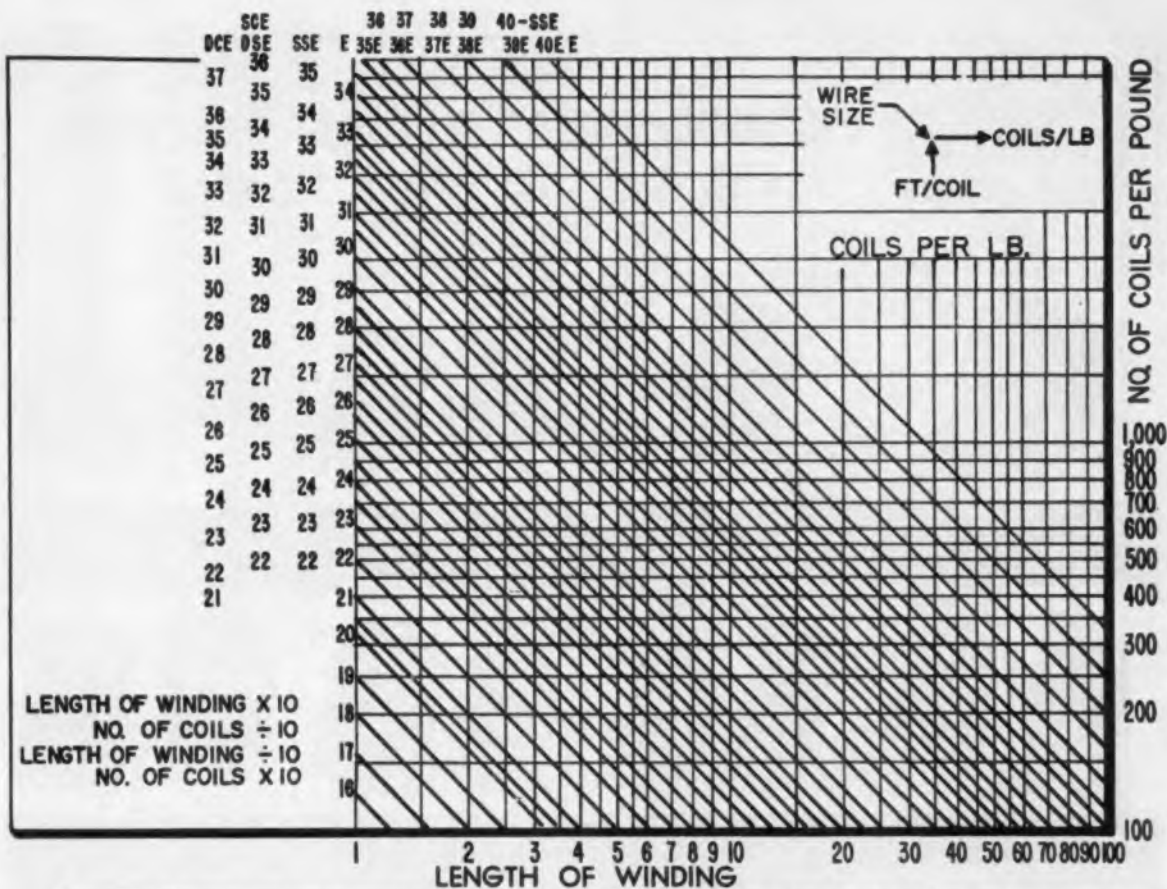


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 MOUNTING**  
 permits front of  
 panel adjustment

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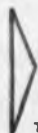
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*Above: Activation unit.*

*Below: Scintillation counter.*



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Analytical & Control Division

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That's why direct traverse trimmers tune so smoothly, without a snag to cause breakage just when you think the circuit is complete and ready to go.

That's why tuning cores never work loose and become microphonic.

That's why direct traverse capacitance values never change . . . even when you shock or vibrate the trimmer. *Plus the properties of glass.* We've added to this direct traverse design the many values of glass. No other material combines such high reliability with such low TC. Or such precision at such low cost. Let the specs speak for themselves:

TC	±50 to ±100
DC volts	1000
Dielectric strength	1500
Megohms, IR	10 <sup>6</sup>
Q factor, 50 MC	500

*Four models.* Where space is no problem, you'll look immediately for our standard direct traverse trim-

mers. They range from .5-3.0 to 1-12 uuf. Approximately 0.6 uuf change per turn.

When space is tight both in front of and behind your panel, you'll appreciate our petite mini-trimmers. Not only are the over-all dimensions small, but we throw in fixed cavity tuning which keeps the screw enclosed at all times. These range from 1-4.5 to 1-18 uuf with approximately 0.40 uuf change per turn.

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When you want to really get short *behind* the mounting panel, look at our precision direct traverse trimmers. Hardware in front is slightly longer than with the mini-trimmers, but we more than

make up for this with a short back-panel dimension. All the way from .8-4.5 to 1-30 uuf with about 0.50 uuf change per turn.

Try a direct traverse trimmer in your next circuit and see the difference for yourself. You can get complete specifications by writing to us at Corning Glass Works, 546 High Street, Bradford, Pa.

For orders of less than 1,000, you can get fast service from your local Corning distributor.

## What is a direct traverse trimmer and why?



**CORNING ELECTRONIC COMPONENTS**  
CORNING GLASS WORKS, BRADFORD, PA.

# a low cost miniature dc dpdt relay...\*



\*with the  
switching  
circuit  
above  
ground

The Elgin Advance  
VK Series relay  
pictured above in actual  
size, occupies less than 1/2  
square inch and is packed  
sufficiently low above ground to  
enable the relay to operate  
in a variety of DC coil voltage and  
enclosures. The switching circuit is  
insulated from the relay frame with silver  
clad, ensuring an absolute ground connection.

## Specifications

Contact arrangement: SPDT/DTT, SPST/DTT  
Contact rating: 2 amp/125V A.C. or 1 amp/250V D.C.  
Nominal power:  
SPDT: 1/2 watt nominal  
SPST: 1 watt nominal  
Case: 5/16" x 1/2" x 1/2" (max)  
Weight: 0.025 oz. (max)  
Enclosure: Open, plastic, metal, or other  
Mounting: Solder, stud, bolt, etc.

SEND FOR



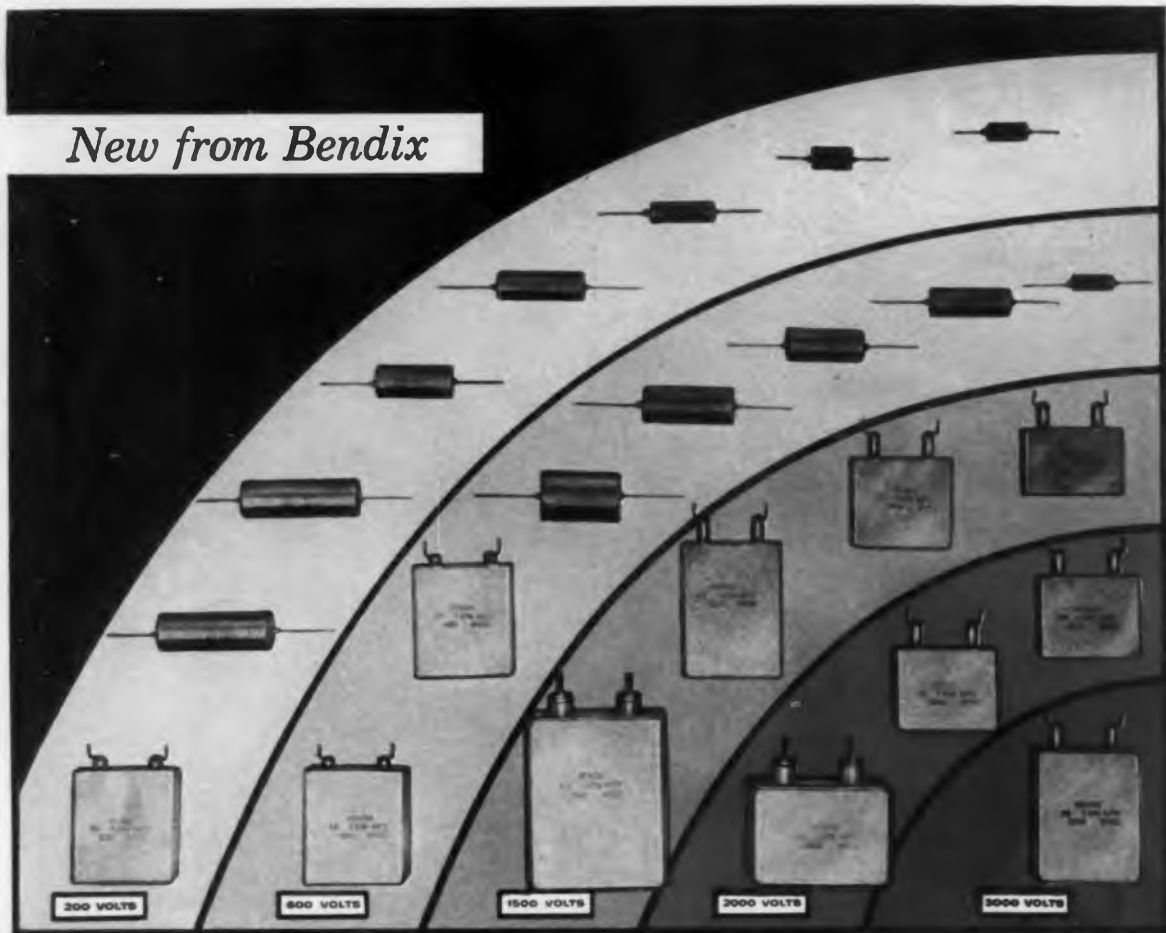
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The new series is designed and manufactured

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**Used for:**  
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have proved outstandingly accurate and dependable for the most critical thermal sensing and control applications in missiles, aircraft, ground support and undersea equipment.

*The Army Ballistic Missile Agency has for two years accepted Merc thermostats as standard temperature control items on all their missiles.*

Time after time, Vap-Air mercury tube thermostats have proved their exceptional ability to meet the most exacting specifications for thermal sensing and control. Small, lightweight, they are unaffected by altitude or moisture, can't arc or burn, can withstand 100-G shocks and 30-G vibration without loss of accuracy. They have fast response, close limit tolerances, wide operating ranges, and undeviating accuracy to provide millions of cycles of reliable operation. Mercs need only simple circuits, are adaptable to virtually any need.



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**DUCT-TYPE**



2.62 INCHES LONG

**SURFACE-TYPE**



2 INCHES LONG

**WELL-TYPE**

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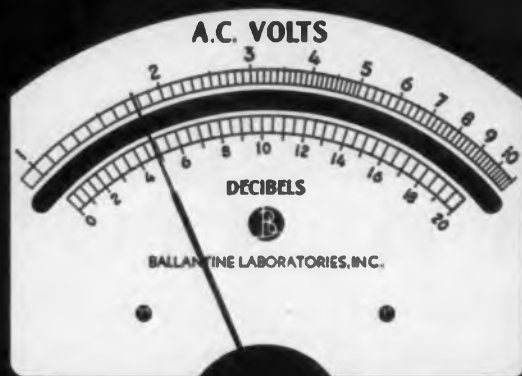
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MODEL	FREQUENCY RANGE	VOLTAGE RANGE	INPUT IMPEDANCE	ACCURACY	PRICE
300	10 cps-150 kc	1 mV-100 V	0.5 MΩ shunted by 30 pF	2%	\$220
3000	10 cps-250 kc	1 mV-1000 V	2 MΩ shunted by 15 to 25 pF	2%	\$255
300E	30 cps-100 kc	300 μV-300 V	2 MΩ shunted by 20 to 30 pF	2%	\$260
300E	10 cps-250 kc	1 mV-1000 V	2 MΩ shunted by 10 to 25 pF	1% 20 cps-20 kc, 1 mV-250 V; 2% elsewhere	\$315
302C Battery Operated	2 cps-150 kc	100 μV-1000 V	2 MΩ shunted by 10 to 25 pF	3% 5 cps-100 kc; 5% elsewhere	\$255
303A Peak Reading	5 cps-500 kc, sine waves. Pulses 0.5 μs up, and 5 pps up	1 mV-1000 V Peak or Peak-to-Peak	2 MΩ shunted by 5 to 15 pF	2% sine waves, 20 cps-200 kc; 4% elsewhere; 3% pulses above 3 μs and 100 pps; up to 5% elsewhere	\$415
310A	10 cps-2 Mc; 5 cps-4 Mc as a null detector	100 μV-100 V (Down to 40 μV as null detector)	2 MΩ shunted by 9 to 19 pF	3% 15 cps-1 Mc; 5% elsewhere	\$250
314 Wide Band	15 cps-6 Mc	1 mV-1000 V (100 μV-1 mV without probe)	11 MΩ shunted by 8 pF with probe, or 1 MΩ shunted by 25 pF without probe	3% 15 cps-3 Mc; 5% elsewhere	\$300
316 Infrasonic	0.05 cps-30 kc; 0.01 cps with corrections supplied	0.02 V-200 V Peak-to-Peak	10 MΩ shunted by 17 to 40 pF	3%	\$330
317 Wide Band	10 cps-11 Mc	300 μV-300 V	10 MΩ shunted by 7 pF with probe; 2 MΩ shunted by 11 to 24 pF without probe	2% 20 cps-2 Mc; 4% 10 cps-6 Mc; 6% 10 cps-11 Mc	\$495 with probe
320 True RMS	5 cps-500 kc	100 μV-320 V	10 MΩ shunted by 8 to 18 pF	3% 15 cps-150 kc; 5% elsewhere	\$445
330 True RMS	50 cps-20 kc	0.1 V-1199.9 V	2 MΩ shunted by 15 to 45 pF	1/4% 0.1 V-300 V, 100 cps-10 kc; 1/2% outside these limits	\$720

## ELECTRONIC TEST EQUIPMENT

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Battery-operated amplifier, 10x or 100x; 10 cps-150 kc; 5 MΩ input; 2% accuracy. \$115

### CALIBRATOR, Precision dc and ac

Model 420  
Provides precise output, rms, peak-to-peak, or dc, from 0-10 V; accuracy 1/4% with cal. chart. \$365

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Direct-reading of capacitance 0.01 pF to 12 μF; accuracy 2% above 0.1 pF. \$335

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Model 700  
Inverts dc as low as 10 μV and up to 100 V, to ac to be measured on any of VTVM's listed. \$365

### CONVERTER, Linear ac to dc

Model 710  
Converts ac to dc linearly over each decade, 1 mV-1000 V; 30 cps-250 kc; accuracy 1/4% 50 cps-10 kc, 1/2% 30 cps-50 kc, 1% above 50 kc. \$450

## LABORATORY STANDARDS

### A-T VOLTMETER

Model 300  
10 Mc to 1000 Mc; as laboratory standard for high voltage. NBS calibration not included in price. \$2,250

### H-F TRANSFER VOLTMETER

Model 302  
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### MICROPOTENTIOMETER

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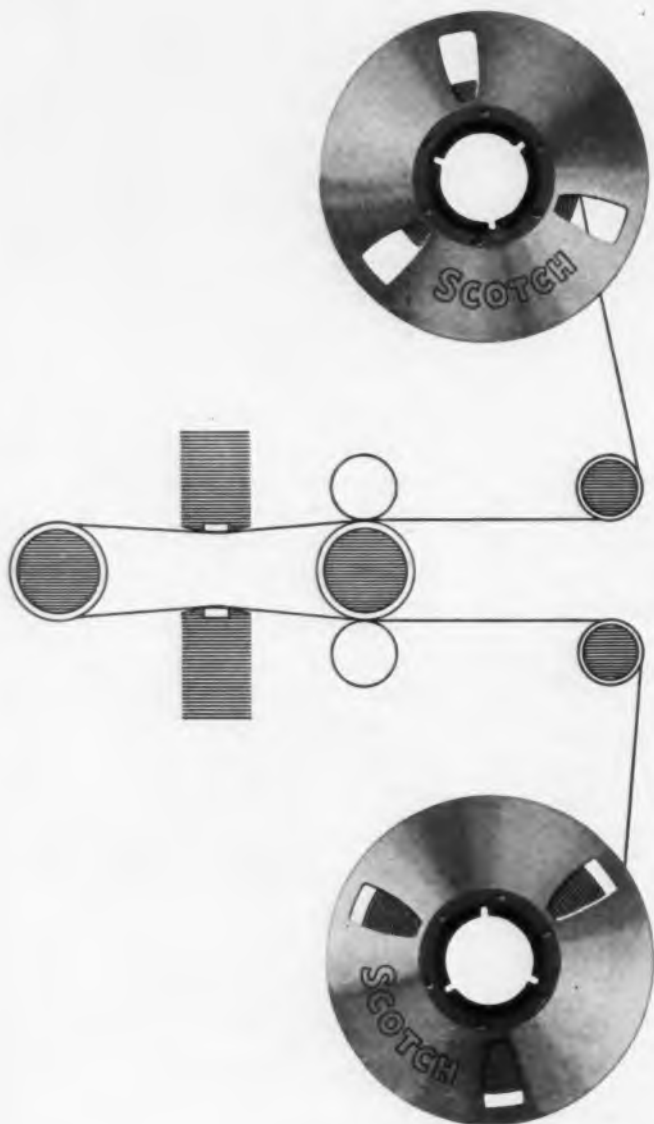
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*SCOTCH® BRAND High Resolution Tapes  
offer superior high frequency results*



IN INSTRUMENTATION Tapes, a good *bit* may well depend on the character of the magnetic coating—and the uniformity with which it is applied. At short wave lengths, the head responds only to the flux nearest it—thus, the thinner the coating, the more it concentrates flux in that narrow region next to the gap where the head can use it best.

“SCOTCH” BRAND High Resolution Tapes 457, 458 and 459 testify to the great skill “SCOTCH” BRAND experts have in laying down a thin uniform coating that results in intimate head-to-tape contact, as shown in the diagram. This famous trio of tapes reproduces the critical short wave lengths, offers the superior response and resolution that lets you pack more information to the inch.

Much of their fine performance at high frequencies rests with the famed “SCOTCH” BRAND high potency oxides and their higher magnetic retentivity. At optimum bias settings, the coating is about 50% more sensitive to short wave lengths than ordinary coatings.

These tapes give you three great bases on which to build toward miniaturization. No. 458, with a 1.5 mil polyester base, offers standard recording time and maximum strength. No. 459, with a 1.0 mil polyester base, gives 50% extra recording time. No. 457, with a .65 mil base of tensilized polyester, delivers twice the standard recording time. One of the key factors in the consistent performance of the “SCOTCH” BRAND High Resolution Tapes is their uniformity—from reel to reel and within the reel. All three tapes offer a uniformity in magnetic coating and base that goes far to eliminate errors in performance.

In producing uniform tapes for all applications, nothing replaces the years of experience offered by the “SCOTCH” BRAND research and manufacturing team—the same team responsible for most tape advances. So check the entire “SCOTCH” BRAND line: Heavy Duty Tapes 497, 498 and 499 outwear ordinary tapes 15 times, even under adverse operating conditions. High Output Tape 428 offers top output at low frequencies. Sandwich Tapes 488 and 489 wear 30 times as long as ordinary tapes, cut head wear and oxide rub-off. And more reels of Standard Tapes 408 and 403 have been sold than any other kind.

Your nearby 3M Representative serves as a convenient source of information in all major cities. Contact him or write Magnetic Products Div., 3M Company, Dept. MBR-61, St. Paul 6, Minn.

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**SCOTCH BRAND MAGNETIC TAPE**  
FOR INSTRUMENTATION

MINNESOTA MINING AND MANUFACTURING COMPANY

... WHERE RESEARCH IS THE KEY TO TOMORROW





# Here's why the NEW AO TRACE-MASTER is the world's finest 8-channel direct writing recorder!

American Optical Company, famous for precision instrumentation for 100 years, introduces an electronic direct-writing recorder of unique design, in which ultra-precise electromechanics has been combined with advanced electronics to achieve *truly superior performance.*

#### *Finest Writing Method Ever*

Unique direct-carbon-transfer writing method. Trace is uniformly black and up to four times thinner than that made by any other recorder. Minute variations in phenomena measured are more faithful, meaningful. Carbon trace cannot fade... may be easily reproduced.

#### *Finest Frequency-Amplitude Performance*

TRACE-MASTER'S multiple-feedback wide-range Driver circuitry, combined with the advanced pen-motor design, produces wider frequency response at larger amplitudes than any other recorder. TRACE-MASTER response is flat—with in 1%—from dc to 110 cps at 40 mm!

Band Amplitude Product (i.e. Bandwidth times Amplitude) is 5600...140 cps (3 db point) x 40mm!

#### *Finest Chart-Drive Facilities*

TRACE-MASTER provides widest chart-speed range...0.1 to 500 mm/sec...of any direct-writing recorder! Convenient

push-button selection. Take-up reel automatically stores full 1000 ft. record. Writing table tilts for easy chart annotations. Guide rails permit quick, easy paper-roll changes. Low cost chart paper makes practical protracted recording at high speeds.

#### *Finest Resolution, Linearity, Stability*

Thin carbon trace (thinner by 4 to 1 over most recorders) and high Band Amplitude Product (higher by 6 to 1 over other recorders) provide up to 24 times the resolving power or ability to detect short, sharp variations in the record. The superior linearity ( $\pm 1\%$ ) and stability in rectilinear presentation permit full use of this unexcelled resolution.

#### *Finest Systems Oriented Compatibility*

Fully transistorized circuitry...application of combined dc level and signal multiple feedback...complete interchangeability of modular signal-conditioning elements... are some of the features that make the AO TRACE-MASTER the world's finest 8-channel direct writing recorder.



*Entire channel easily accessible and completely interchangeable as single unit.*



*Platen tilts to convenient writing angle.*



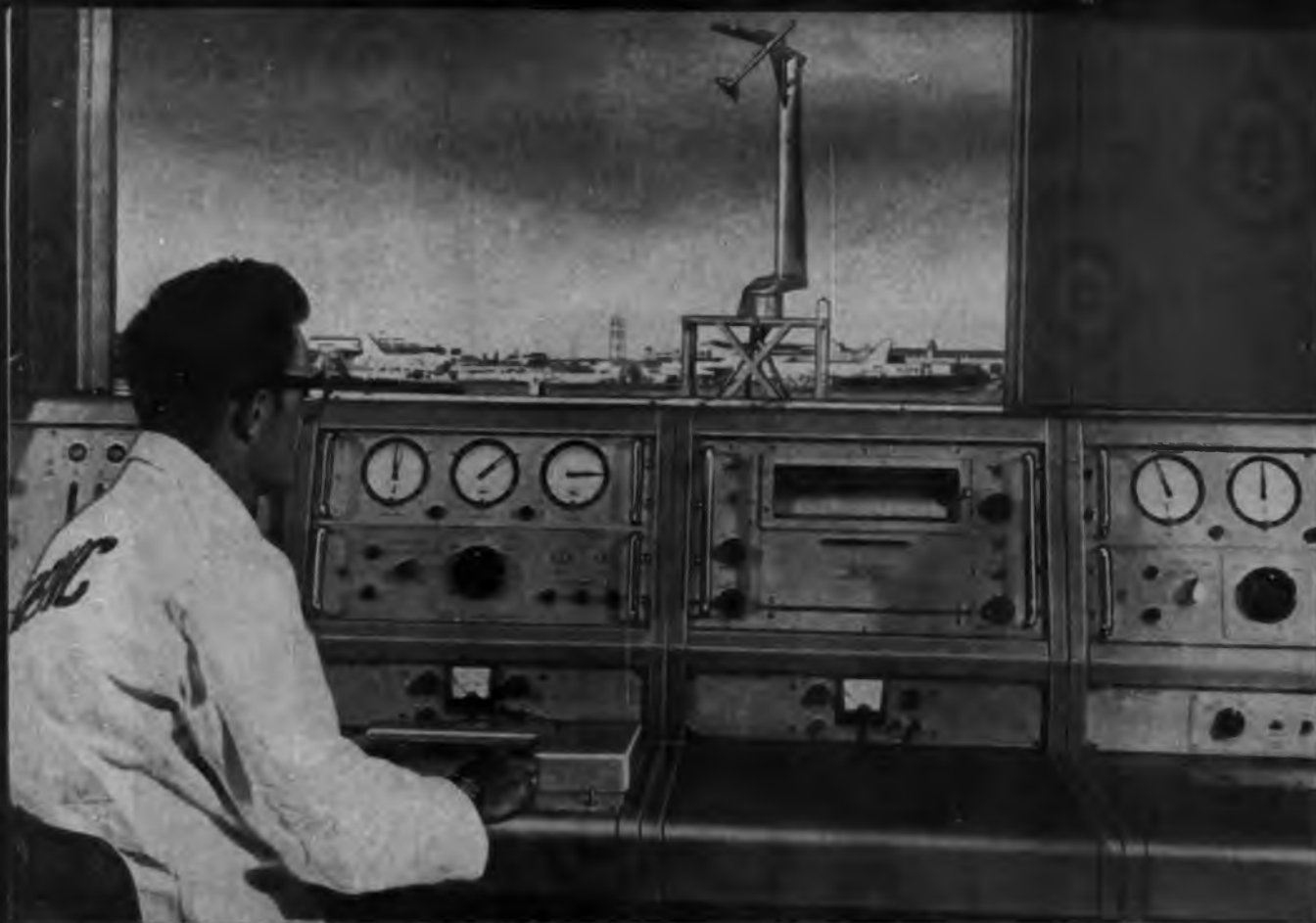
*Widest range chart speed... push-button selection through 0.1 mm/sec to 500 mm/sec.*

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**INSTRUMENT DIVISION, BUFFALO 15, NEW YORK**



Scientific-Atlanta antenna pattern recording console at Boeing Airplane Company, Wichita, Kansas, with Scientific-Atlanta model range tower in background.

## Advancing the Art of Aircraft Antennas

*Boeing uses versatile Scientific-Atlanta equipment to design and evaluate antennas for B-52H bombers*



A Boeing B-52H global bomber packs more total firepower than that expended by all the Allied and Axis bombers in World War II. Each B-52H will carry four Skybolt missiles plus a potent assortment of other weapons. Equipped with penetration aids, including electronic countermeasures (ECM) and decoys, the B-52H can strike as many as five military targets on a single mission. It is produced for the Air Force's Strategic Air Command at the Wichita, Kansas, Division of Boeing.

Obviously, the design of antennas for such an aircraft demanded nothing short of "state of the art." As it turned out, Boeing engineers advanced the state of the art in the design of ECM antennas for B-52Hs and B-47s. They were aided significantly by a new antenna test facility, consisting predominantly of Scientific-Atlanta equipment—including pattern recorders, wide range receivers, signal sources, and a model range tower.

The foremost advantage of Scientific-Atlanta instrumentation is *versatility*. Complete frequency coverage is provided with recordings proportional to voltage, power, or db in

either rectangular or polar coordinates. Owing to the equipment's wide frequency coverage, sensitivity, and flexibility, many other laboratory measurements can be made including calibration of microwave attenuators, insertion loss and gain measurements. These, and other features which enable Boeing to derive data faster and easier, have resulted in significant savings of research time.

There's one other point that should be mentioned. At Boeing's antenna test facility, Scientific-Atlanta's equipment has operated with good reliability. Whenever help is needed, Scientific-Atlanta engineers are there in a hurry.

*Scientific-Atlanta will accept full responsibility for the design, construction, and manufacture for any antenna test facility that suits your needs. For details, write*



**SCIENTIFIC-ATLANTA, INC.**

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Phone: TRinty 5-7291

Excellent employment opportunities exist for electronic, microwave and mechanical engineers.

Circle 42 on Inquiry Card

Circle 43 on Inquiry Card →

## MICROWAVE SPECTRUM ANALYZERS 10 to 100,000 mc

## FEATURING:

- 1 to 30 cps adjustable sweep rate
- Direct-reading UNIDIAL® tuning control, with no klystron modes to set
- High accuracy, resolution and sensitivity
- Frequency dial accuracy  $\pm 1\%$
- Non-contacting klystron cavity chokes for noiseless tuning
- Five-inch flat-face CRT
- Provision for use with Multi-pulse Spectrum Decoder (Model SD-1)

## TRANSISTORIZED MULTI-BAND, SINGLE UNIT SPECTRUM ANALYZER

Complete Frequency Coverage, From 10 to 40,880 mc



Model SA-84T

Completely transistorized lightweight unit.

Dispersion: 500 kc to 25 mc, adjustable

Resolution: 20 kc at all frequencies

Internal Marker:  $\pm 13$  mc

Power Input: 115/230 VAC, 50/60 cps or 12 VDC

Power consumption: when battery operated, 110 watts

Sensitivity:  $-50$  to  $-105$  dbm, depending on frequency.

Weight: 70 lbs. One half the weight of conventional vacuum-tube equivalent

Meets MIL-1-26600 for r-f interference



Model TSA

## DIRECT READING SPECTRUM ANALYZER

10 to 44,000 mc in 5 Plug-In Tuning Units

To test missiles, radar, microwave components, telemetering and multi-pulse transmission

## Features:

- Dispersion: 400 kc to 25 mc
- Resolution: 2 to 80 kc variable
- Attenuation: Continually variable
- Sensitivity:  $-50$  to  $-95$  dbm, depending on frequency
- Internal Marker:  $\pm 14$  mc



Model TSA-5

## COMBINATION SYNCHROSCOPE-SPECTRUM ANALYZER

10 to 44,000 mc in 5 Plug-In Tuning Units

## PROVIDES TIME AND FREQUENCY DISPLAYS



Time Display: Shows signal waveform



Frequency Display: Shows power vs. frequency

Bandwidth: 5 kc, 50 kc, 500 kc, 5 mc. Synchroscope sweep rate: 2, 10, 100, 1,000, 10,000 and 100,000  $\mu$ sec per screen diameter. Dispersion, Sensitivity and Internal Marker same as TSA.

Model TSA-W

## WIDE DISPERSION SPECTRUM ANALYZER

FOR NARROW AND WIDE PULSE ANALYSIS

10 to 44,000 mc in 5 Plug-In Tuning Units

Dispersion: 200 kc to 80 mc (2 ranges)  
Resolution: 2 to 80 kc variable  
Internal Marker:  $\pm 40$  mc  
Screen Display: Linear or log80 mc dispersion displays pulses narrow as 0.1  $\mu$  sec. For wide pulses, dispersion may be adjusted down to 200 kc.

## UNIVERSAL SPECTRUM ANALYZERS

Complete frequency coverage 10-40,880 mc in single self-contained units—no additional tuning units required. Expanded, direct-reading, slide rule dial



Model SA-84

- Dispersion: 10 to 55 mc: 500 kc to 5 mc, adjustable  
55 to 40,880 mc: 500 kc to 25 mc, adjustable
- Resolution: 20 kc
- Internal Marker: variable

Model SA-84W  
Wide Dispersion

- Dispersion: 10 mc to 240 mc: 10 mc to 240 mc to 40,880 mc: 80 mc
- Resolution: 2 kc to 80 kc variable
- Crystal controlled markers from 10 to 40,880 mc
- Log-linear display
- Accurately calibrated IF attenuator



## WIDE BAND SPECTRUM ANALYZER

Self-Contained Unit Covers 10 to 40,000 mc in 20 Bands

- Dispersion: 1 mc to 25 mc in narrow band  
5 mc to 4000 mc in wide band
- Resolution: 20 kc in narrow band  
1.5 mc in wide band
- Rapid band selection by means of illuminated push-button switches.
- Frequency marker up to 4000 mc.
- End-markers indicate frequency limits of each band.
- Center-marker permits switching from wide to narrow bands without hunting for r-f signal.
- Sensitivity:  $-50$  to  $-80$  dbm, depending on frequency.



Model WSA



Model DA-70

## 100 KMC SPECTRUM ANALYZER

Covers 50,000 mc to 100,000 mc in Three Bands

- Dispersion: Continuously adjustable from 50 mc to 1000 mc. Permits narrow pulse inspection.
- Resolution: 1 mc
- High intermediate frequency assures image rejection and prevents video detection.
- Frequency marker: for measuring frequency differences.
- Dial frequency Accuracy:  $\pm 1.0\%$
- Nominal Sensitivity:  $-50$  dbm for entire frequency range.

## MULTI-PULSE SPECTRUM SELECTOR



Model SD-1

Permits spectrum analysis of individual microwave pulses in a pulse group when used with any Polarad Spectrum Analyzer. Any pulse in a complex coded signal may be isolated for examination.

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**A GUIDE TO  
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TEST INSTRUMENTS**

**MICROWAVE RECEPTION**

**TRANSISTORIZED CALIBRATED FIELD INTENSITY RECEIVER**



**Model CFI**

**1,000 to 10,000 mc**

Four Interchangeable Plug-In Tuning Units Cover All Frequencies.

Transistorized, low power drain, ruggedized field intensity receiver provides accurate measurements of frequency and absolute power level of conducted or radiated microwave energy. Combines a Field Intensity Calibrator, a Monitor and Power Unit and a Calibrated Antenna System. The Model CFI covers 950 to 11,260 mc when used as a microwave receiver.

**FEATURES:**

- Built-in power inverter for use with 12 volt DC source.
- Direct-reading frequency dial.
- Output level: read directly in db.
- Audio, video and recorder outputs.
- AM, FM, CW and PULSE reception.
- One third lighter than equivalent vacuum-tube Field Intensity Receiver.
- Calibrated antenna system includes an omni-directional band antenna and separate directional antennas to match each tuning unit.

**Sensitivity:**  
—90 dbm.

**Frequency Dial Accuracy:**  
± 1%

**Maximum RF input:**  
3 volts

**Impulse Bandwidth:**  
1 mc, 5 mc and 8 mc

**Image and Spurious Response Rejection:**  
Better than 60 db

**CALIBRATED MICROWAVE FIELD INTENSITY RECEIVER**



**Model FIM**

**1,000 to 10,000 mc**

Two compatible tuning units under development will extend frequency to 20,000 mc.

Indicates Absolute Power Level By Comparing Input Signal Against Internally Generated Signal in A Single Unit.

Four Interchangeable Plug-In Tuning Units Cover All Frequencies.

- Only Microwave Field Intensity Receiver with self-contained signal generator which calibrates entire system under test at any level.

- First single microwave test system to determine radiated r-f interference and susceptibility.

- Front-panel meter indicates average, peak, slide-back peak or quasi-peak value of r-f signals. Outputs for video, audio and recorder.

- Direct-indicating peak VTVM for ease of frequency location of impulse noise.

- Single UNIDIAL® tuning control tunes both the receiver and signal generator.

- Calibrated antenna system includes an omni-directional broad band antenna and separate directional antennas to match each tuning unit.

**Frequency Dial Accuracy:**  
± 1%

**Maximum RF Input:**  
3 volts

**Sensitivity:**  
—80 dbm

**Impulse Bandwidth:**  
5 mc

**Image and Spurious Response Rejection:**  
Better than 60 db

**Attenuation:**  
0 to 80 db in steps of 1 db

**TRANSISTORIZED MICROWAVE RECEIVER**

Fully Transistorized Circuitry Ensures Low Power Drain and Rugged Construction. One-third lighter than equivalent vacuum-tube receiver.

**950 mc to 11,260 mc**

Four Plug-In r-f Tuning Units Cover All Frequencies.

Four Instruments In One.

- AM, FM, CW, MCW, Pulse receiver
- Field intensity receiver
- Pulse, pulse-time or pulse-position demodulator
- Sensitive power meter

- Power consumption when battery operated, 180 watts. Built in power inverter for use with 12 volt DC battery source

- AFC and AGC circuits
- Audio, video and recorder outputs.
- Output level: read directly in db

**Frequency Dial Accuracy:** ± 1%

**Impulse Bandwidth:**  
1 mc, 5 mc or 8 mc

**Image Rejection:** Better than 60 db

**Video Bandwidth:** 3.5 mc

**Sensitivity:** —90 dbm



**Model TR**

**MICROWAVE RECEIVER**

**400 to 84, 200 mc**

Nine Interchangeable Plug-In Tuning Units Cover the Frequency Range.

Four Instruments In One.

- AM, FM, CW, MCW Pulse receiver
- Field intensity receiver
- Pulse, pulse-time or pulse-position demodulator
- Sensitive power meter

For quantitative analysis of microwave signals, and monitoring of all types of radio and radar communication.

Features: UNIDIAL® control with direct-reading frequency dial. AFC and AGC. Audio, video, recorder and trigger outputs. Output level read directly in db.

**Frequency Dial Accuracy:** ± 1%

**I-F Bandwidth:** 3 mc



**Model R**

**Video Bandwidth:** 2 mc  
**Image Rejection:** Greater than 60 db to 11,260 mc

**Range of Linearity:** With AGC, 60 db  
**Sensitivity:** —55 to —90 dbm, depending on frequency

**ANTENNA PATTERN TUNING UNIT 2,000 to 75,000 mc**

Designed For Use With Model R Receiver

- External Mixer With Flexible Cable. May be located at or near antenna, any distance up to 75 feet from receiver.
- Internal electronic 1000 cps sweep allows direct operation into any standard make AC antenna pattern recorder.



**Model RW-T**

**TRANSISTORIZED  
MICROWAVE  
IMPULSE  
GENERATOR  
1,000 cps to  
10,000 mc**



**Model IC-120**

For use with microwave receivers when making field intensity measurements, as a signal source for spectrum analyzers, in noise measurements, and other applications. Generates 0.020 nanosecond pulses.

**CALIBRATED ANTENNAS  
1,000 to 10,000 mc  
and  
TEST ANTENNAS  
1,000 to 40,000 mc**



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**MICROWAVE SIGNAL GENERATION  
EQUIPMENT 500 to 50,000 mc**

500 to 21,000 mc. Polarad signal generators in this range feature: Continuously variable attenuators calibrated directly in —dbm. Internal pulse, FM and square wave modulation, external pulse and multi-pulse modulation. Delayed and undelayed sync outputs. UNIDIAL® tuning. Direct-reading frequency dials accurate to ± 1%. High stability non-contacting klystron cavity chokes for noiseless tuning and accurate calibration.

**UHF SIGNAL GENERATOR**

500 to 1,600 mc



**Model PMR**

Single unit covers entire frequency range.

Internal pulse (40-4,000 pps), and square wave modulation (10-10,000 pps.) Internal FM with interchangeable modulator.

Calibrated output: 0 dbm (1 mw) to —127 dbm.

**MICROWAVE SIGNAL GENERATOR**

10,000 to 21,000 mc



**Model PMK**

Two interchangeable generator units. Internal pulse and square wave modulation (10-10,000 pps.) Output to 10 mw. DIGITAL frequency indicator. Calibrated power outputs: +10 dbm (10 mw).

**MICROWAVE SIGNAL SOURCE**

1,050 to 11,000 mc

in 4 interchangeable tuning units.



**Model KSS**

A stable source of microwave energy at relatively high power output level. Internal square wave 10-10,000 pps. External pulse, square wave or FM modulation. Adjustable attenuator. Power output: 14 to 400 mw, depending upon frequency.

**ULTRA-BROADBAND MICROWAVE  
SIGNAL  
GENERATOR**

4,200 to 11,000 mc

in one instrument

**Model MSG-34**

Internal pulse and square wave modulation (10-10,000 pps.) 0 to —127 dbm attenuator output. DIGITAL frequency indicator.

**MICROWAVE  
SIGNAL  
GENERATOR**

4,450 to 11,000 mc

Two interchangeable r-f generator units.

Internal pulse and square wave modulation (10-10,000 pps.) 0 to —127 dbm attenuator output.



**Model PMX**

**MICROWAVE SWEEP GENERATOR  
FOR INSTANTANEOUS MICROWAVE  
ANALYSIS 1,000 to 16,000 mc**

At single frequency or over a wide range

In 5 interchangeable tuning units. Provides high-power microwave signal adjustable from single frequency to 2:1 frequency range. .001 to 100 cps sweep rate. Int. mod.: 1,000 cps and 456 kc square wave. Ext. mod.: square wave, FM and pulse.



**Model CSG**

**RAPID SCAN  
RATIO SCOPE**

**Model VS-2A**

Displays ratio of two input signals, gives visual plot of VSWR as function of frequency, at a single frequency or over an entire sweep range. Calibrated 7" CRT. For use with Model CSG.

**MICROWAVE SIGNAL GENERATORS**



**Model MSG**

Model	Frequency	Calibrated Power Output	Internal Pulse Modulation				FM deviation in mc minimum
			Internal Square Wave	Width in $\mu$ sec.	Pulse Repetition Rate in pps	Delay in $\mu$ sec.	
MSG-1	950-2,400 mc	1 mw (0 dbm)	40-4,000 pps	0.5-10	40-4,000	2.5-300	+2.5
MSG-1P*	950-2,400 mc	10 mw (+10 dbm)	10-10,000 pps	0.2-10	10-10,000	2-2,000	+2.5
MSG-1R	950-2,400 mc	1 mw (0 dbm)	10-10,000 pps	0.3-10	10-10,000	2-2,000	+2.5
MSG-2A	2,000-4,600 mc	1 mw (0 dbm)	40-4,000 pps	0.5-10	40-4,000	2.5-300	+2.5
MSG-2R	2,000-4,600 mc	1 mw (0 dbm)	10-10,000 pps	0.3-10	10-10,000	2-2,000	+2.5
MSG-2P*	2,000-4,600 mc	10 mw (+10 dbm)	10-10,000 pps	0.2-10	10-10,000	2-2,000	+2.5

\*Attenuator Accuracy: ±3 db between 0 and +10 dbm, ±2 db below 0 dbm.

**CODE MODULATED  
MULTI-PULSE  
MICROWAVE  
SIGNAL  
GENERATOR**

950 to 10,750 mc

in 4 interchangeable tuning units. Provides 5 independently adjustable pulse channels, each with variable pulse width and delay. Built-in precision oscilloscope.



**Model B**

**EHF SIGNAL GENERATORS AND SOURCES**

12,400 to 50,000 mc. Units in this range provide cw signals, 1,000 cps internal square wave, external modulation provisions, accurate frequency calibration.

EHF SIGNAL GENERATOR 18,000 to 39,700 mc, 7 plug-in units. Accurate power calibration. EHF SIGNAL SOURCE 18,000 to 50,000 mc, 9 plug-in units. High power output.

EHF SIGNAL GENERATOR Tuning Unit	Frequency Range	EHF SIGNAL SOURCE Tuning Unit
G1822-1	18,000 to 22,000 mc	S1822-1
G2225-1	22,000 to 25,000 mc	S2225-1
G2427-1	24,700 to 27,500 mc	S2427-1
G2730-1	27,270 to 30,000 mc	S2730-1
G3033-1	29,700 to 33,520 mc	S2933-1
G3336-1	33,520 to 36,250 mc	S3336-1
G3540-1	35,100 to 39,700 mc	S3540-1
	39,600 to 46,000 mc	S4046-1
	45,900 to 50,000 mc	S4650-1

Model SG-1218 Signal Generator and Model SS-1218 Signal Source. Available with a frequency range of 12,400 to 17,500 mc.



**EHF Signal  
Generators  
and Sources**

MAIL THIS CARD for specifications. Ask your nearest Polarad representative (in the Yellow Pages) for a copy of "Notes on Microwave Measurements."

**POLARAD ELECTRONICS CORP.**

8 G 12345

I WOULD LIKE MORE INFORMATION AND SPECIFICATIONS ON MODEL NUMBERS: (CIRCLE)

**SPECTRUM ANALYZERS**

TSA SA-B4 DA-70  
TSA-S SA-B4T WSA  
TSA-W SA-B4W SD-1

**SIGNAL GENERATORS**

PMR MSG-1 MSG-2P CSG  
PMK MSG-1P MSG-2R VS-2A  
MSG-34 MSG-1R EHF B  
PMX MSG-2A KSS

**RECEIVERS**

R RW-T CFI  
TR FIM IC-120

**LABORATORY EQUIPMENT**

PJ-1 SV-1 KLYSTRONS  
N-1 P-3 MP-1A  
K-200

MY APPLICATIONS ARE:

Name \_\_\_\_\_ Title \_\_\_\_\_  
Dept. \_\_\_\_\_ Company \_\_\_\_\_  
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A GUIDE TO  
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## MICROWAVE LABORATORY EQUIPMENT



Model PJ-1

### PULSE JITTER TESTER

#### Measures

**Relative jitter:** 5, 10 and 100 nano-seconds full scale

**Pulse width jitter:** 5, 10 and 100 milli-microseconds full scale

**Repetition rate jitter:** 5, 10 and 100 millimicroseconds and 1, 10 and 100 microseconds full scale

**Displays:** Jitter magnitude and Jitter waveform



Model SV-1

### SERVO-ANALYZER

Combines a precision multiple signal generator and oscilloscope. Feeds a modulated reference test signal through a servo, computer or other system circuit, and compares the response on a calibrated CRT scope. Tests amplitude, phase and transient response, response of magnetic and servo amplifiers, all AC and DC servo systems. Signal generator and oscilloscope may operate independently.

**Frequency Range:** .001 to 100 cps in 5 ranges.



Model K-200

### MICROWAVE TUBE TESTER

Tests both internal cavity and external cavity klystron tubes, pencil triodes, rocket tubes and lighthouse tubes. Operates as simply as conventional tube testers. Monitors cathode, anode, grid and reflector voltages and currents. Tests for shorts and filament continuity.

### CODED MULTI-PULSE GENERATOR

Provides up to five independently adjustable pulse channels for generation of precise coded multi-pulse trains. Each pulse can be independently pulse-time modulated by means of an external signal.

#### Modulation:

Group repetition rate,  
10-10,000 cps

Individual pulses, in group:  
Width: 0.2 to 2  $\mu$  sec.

Delay: 0 to 300  $\mu$  sec. in  
two steps

Provision for pulse-time  
modulation



Model MP-1A

### PRECISION NOISE GENERATOR

1,000 cps to 500 mc — 1 to 20 db

Provides stable, accurate noise output to measure directly the noise figure of vacuum-tube and transistor amplifiers and receivers in the 1,000 cps to 500 mc range.

**Dial Calibration:** Noise figure indicated directly in db

**Accuracy:**  $\pm 0.25$  db



Model N-1

### TRANSISTORIZED MICROWAVE POWER METER

10 to 40,000 mc

Model P-3

Measures absolute r-f power instantly. Line or internal battery operated. Rugged, weighs only 5 pounds. Five interchangeable thermistor mounts cover the frequency range. Direct readings in milliwatts or dbm. High sensitivity allows 0.01 milliwatt full-scale deflection; other ranges, up to 10 milliwatts full scale.



### ALL-CERAMIC REFLEX KLYSTRON TUBES

Polarad Tube Type	Frequency Range
ZV 1012	500 to 3,000 mc
ZV 1010	700 to 3,000 mc
ZV 1010X	950 to 2,800 mc
ZV 1021X	1,000 to 4,000 mc
ZV 1009	1,500 to 6,000 mc
ZV 1009X	1,700 to 5,000 mc
ZV 1011	4,000 to 11,000 mc



X Series Klystrons have 200 mw minimum output.

Maximum shock, vibration and heat resistance. Guaranteed for operation up to 250 °C; no cooling required. Low noise, stable and low microphonic operation.

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a copy of "Notes  
on Microwave  
Measurements."

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# Rigid Rectangular Waveguide Tables

## Electrical Characteristics

Type	Recommended operating range for TE <sub>10</sub> mode		Cut-off for TE <sub>10</sub> mode		Range in	Range in	Theoretical attenuation lowest to highest frequency 1/ (db/100 ft.)	Theoretical CW power rating lowest to highest frequency 2/ (megawatts)
	Frequency (kmc./sec.)	Wavelength (cm)	Frequency (kmc./sec.)	Wavelength (cm)				
RG-201/U	.425-.620	73.2 - 48.8	0.328	91.44	1.60-1.06	1.67-1.18	0.056-0.038	93.4 - 131.9
RG-202/U	.490-.740	60.0 - 40.0	0.393	76.20	1.57-1.05	1.62-1.17	0.069-0.050	67.6 - 93.3
RG-203/U	.640-.960	48.8 - 31.2	0.513	58.42	1.67-1.07	1.82-1.18	0.128-0.075	35.0 - 53.8
RG-204/U	.750-1.150	40.0 - 26.7	0.605	49.53	1.62-1.08	1.70-1.19	0.137-0.095	27.0 - 38.5
RG-205/U	.950-1.500	31.2 - 20.7	0.766	39.12	1.60-1.06	1.66-1.18	0.201-0.136	17.2 - 24.1
RG-69/U	1.12 - 1.70	26.79 - 17.65	0.908	33.04	1.62-1.07	1.70-1.18	0.317-0.212	11.9 - 17.2
RG-103/U	1.12 - 1.70	26.79 - 17.65	0.908	33.04	1.62-1.07	1.70-1.18	0.269-0.178	
RG-206/U	1.12 - 1.70	26.79 - 17.65	0.908	33.04				
RG-104/U	1.70 - 2.60	17.65 - 11.54	1.375	21.82	1.62-1.06	1.70-1.18	0.588-0.385	5.2 - 7.5
RG-105/U	1.70 - 2.60	17.65 - 11.54	1.375	21.82	1.62-1.06	1.70-1.18	0.501-0.330	
RG-207/U	1.70 - 2.60	17.65 - 11.54	1.375	21.82				
RG-112/U	2.1 - 3.0	14.3 - 10.0	1.737	17.27	1.65-1.158	1.78-1.22	0.877-0.572	3.1 - 4.53
RG-113/U	2.1 - 3.0	14.3 - 10.0	1.737	17.27	1.65-1.15	1.78-1.22	0.751-0.492	
RG-208/U	2.1 - 3.0	14.3 - 10.0	1.737	17.27				
RG-48/U	2.60 - 3.95	11.54 - 7.6	2.080	14.42	1.60-1.05	1.67-1.17	1.102-0.752	2.2 - 3.2
RG-75/U	2.60 - 3.95	11.54 - 7.6	2.080	14.42			0.940-0.641	
RG-167/U	2.60 - 3.95	11.54 - 7.6	2.080	14.42				
RG-49/U	3.95 - 5.85	7.60 - 5.13	3.155	9.51	1.60-1.08	1.67-1.19	2.08 - 1.44	1.4 - 2.0
RG-95/U	3.95 - 5.85	7.60 - 5.13	3.155	9.51			1.77 - 1.12	
RG-168/U	3.95 - 5.85	7.60 - 5.13	3.155	9.51				
RG-50/U	5.85 - 8.20	5.13 - 3.66	4.285	7.00	1.47-1.05	1.48-1.17	2.87 - 2.30	0.56 - 0.71
RG-106/U	5.85 - 8.20	5.13 - 3.66	4.285	7.00			2.45 - 1.94	
RG-169/U	5.85 - 8.20	5.13 - 3.66	4.285	7.00				
RG-51/U	7.05 - 10.00	4.25 - 3.00	5.260	5.70	1.49-1.05	1.51-1.17	4.12 - 3.21	0.35 - 0.46
RG-68/U	7.05 - 10.00	4.25 - 3.00	5.260	5.70			3.50 - 2.74	
RG-170/U	7.05 - 10.00	4.25 - 3.00	5.260	5.70				
RG-52/U	8.20 - 12.40	3.66 - 2.42	6.560	4.57	1.60-1.06	1.68-1.18	6.45 - 4.48	0.20 - 0.29
RG-67/U	8.20 - 12.40	3.66 - 2.42	6.560	4.57			5.49 - 3.83	
RG-171/U	8.20 - 12.40	3.66 - 2.42	6.560	4.57				
RG-91/U	12.40 - 18.00	2.42 - 1.67	9.490	3.16	1.53-1.06	1.55-1.18	9.51 - 8.31	0.12 - 0.16
RG-107/U	12.40 - 18.00	2.42 - 1.67	9.490	3.16			6.14 - 5.36	
RG-172/U	12.40 - 18.00	2.42 - 1.67	9.490	3.16				
RG-53/U	18.00 - 26.50	1.67 - 1.13	14.080	2.13	1.57-1.06	1.60-1.18	20.7 - 14.8	0.043-0.058
RG-66/U	18.00 - 26.50	1.67 - 1.13	14.080	2.13			13.3 - 9.5	
RG-121/U	18.00 - 26.50	1.67 - 1.13	14.080	2.13			17.6 - 12.6	
RG-173/U	18.00 - 26.50	1.67 - 1.13	14.080	2.13				
RG-96/U	26.50 - 40.00	1.13 - 0.750	21.100	1.423	1.59-1.05	1.65-1.17	21.9 - 15.0	0.022-0.031
RG-97/U	33.00 - 50.00	0.909-0.600	26.350	1.138	1.60-1.05	1.67-1.17	31.0 - 20.9	0.014-0.020
RG-98/U	50.00 - 75.00	0.600-0.400	39.900	0.752	1.60-1.06	1.67-1.17	52.9 - 39.1	0.0063-0.0090
RG-99/U	60.00 - 90.00	0.500-0.330	48.400	0.620	1.61-1.06	1.68-1.18	93.3 - 52.2	0.0042-0.0060
GROUP B (See Figure II)								
RG-138/U	90.00 - 140.00	0.330-0.214	73.840	0.406	1.63-1.05	1.72-1.17	152 - 99	0.0018 - 0.0026
RG-136/U	110.00 - 170.00	0.273-0.177	90.845	0.330	1.65-1.07	1.76-1.18	163 - 137	0.0012 - 0.0017
RG-135/U	140.00 - 220.00	0.214-0.136	115.750	0.259	1.65-1.05	1.76-1.17	308 - 193	0.00071-0.00107
RG-137/U	170.00 - 260.00	0.177-0.115	137.520	0.218	1.62-1.06	1.70-1.18	384 - 254	0.00052-0.00075
RG-139/U	220.00 - 325.00	0.136-0.092	173.290	0.173	1.57-1.06	1.60-1.18	512 - 348	0.00035-0.00047

NOTE: General requirements covered by MIL-W-85C.

1/Resistivity of brass -  $3.9 \times 10^{-6}$  ohm-cm, silver  $1.62 \times 10^{-6}$  ohm-cm, aluminum -  $2.83 \times 10^{-6}$  ohm-cm, magnesium -  $4.60 \times 10^{-6}$  ohm-cm.

2/Breakdown of air - 15,000 volts-per cm (safety factor of approximately 2 at sea level).

# RF PRODUCTS

## NEW DIMENSIONS IN RF CAPABILITY...

RF Products is a new division of Amphenol-Borg Electronics Corporation. It specializes in the design, manufacture and marketing of radio frequency components and assemblies under the widely known and highly respected trade names of Amphenol, DK and IPC.

### DK PRECISION-BUILT COAXIAL SWITCHES

RF Products can usually supply the coaxial switch you need from factory inventory. But if you have a special requirement that can't be met by one of our standard stocked switches, RF Products' engineering group is prepared to design the switch that will—and fast. Over 5000 different DK coaxial switch designs tailored to specific customers applications demonstrate the depth and creative capability of RF Products engineering staff.

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DK



Series 323 DK coaxial switches are compact high-density designs for complex multi-position, multi-pole switching.

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Pint-size Amphenol Subminax Coaxial Connectors feature full-size electrical characteristics.

RF Products offers a wider range of UG and commercial types of radio-frequency connector designs than any other manufacturer in the industry. Each Amphenol and IPC coaxial connector is engineered to satisfy all standards and most special requirements.

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RF Products can deliver from stock the largest selection of RG type cables in the world. Add this ability to Amphenol coaxial cable's hard-won reputation for engineering leadership—the first flexible cable to withstand continuous operation at 1000° F., for example—and you get an idea of RF Products' capability to serve you.

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There is an Amphenol Coaxial Cable to fit your requirement.

# RF PRODUCTS

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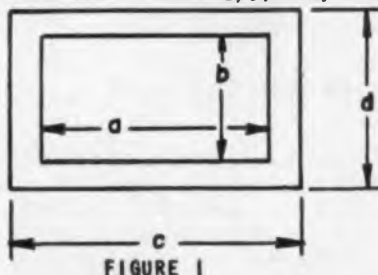


Physical Dimensions

Type	Material alloy	Inside			Outside			Wall thickness (nominal)	Maximum Allowable Eccentricity 1/	Maximum inner corner radius 2/
		Width (a)	Height (b)	Tolerance	Width (c)	Height (d)	Tolerance			
GROUP A (See Figure I)										
RG-201/U	Aluminum	18.000	9.000	±.020	18.250	9.250	±.020	.125	.010	1/8
RG-202/U	Aluminum	15.000	7.500	±.015	15.250	7.750	±.015	.125	.010	3/32
RG-203/U	Aluminum	11.500	5.750	±.015	11.750	6.000	±.015	.125	.010	3/32
RG-204/U	Aluminum	9.750	4.875	±.010	10.000	5.125	±.010	.125	.010	1/16
RG-205/U	Aluminum	7.700	3.850	±.010	7.950	4.100	±.010	.125	.010	1/16
RG-69/U	Copper	6.500	3.250	±.010	6.660	3.410	±.010	.080	.008	3/64
RG-103/U	Aluminum									
RG-206/U	Magnesium									
RG-104/U	Copper	4.300	2.150	±.008	4.460	2.310	±.008	.080	.008	3/64
RG-105/U	Aluminum									
RG-207/U	Magnesium									
RG-112/U	Copper	3.400	1.700	±.005	3.560	1.860	±.005	.080	.007	3/64
RG-113/U	Aluminum									
RG-208/U	Magnesium									
RG-48/U	Copper	2.840	1.340	±.005	3.000	1.500	±.005	.080	.006	3/64
RG-75/U	Aluminum									
RG-167/U	Magnesium									
RG-49/U	Copper	1.872	.872	±.005	2.000	1.000	±.005	.064	.004	1/32
RG-95/U	Aluminum									
RG-168/U	Magnesium									
RG-50/U	Copper	1.372	.622	±.004	1.500	.750	±.004	.064	.004	1/32
RG-106/U	Aluminum									
RG-169/U	Magnesium									
RG-51/U	Copper	1.122	.497	±.004	1.250	.625	±.004	.064	.004	1/32
RG-68/U	Aluminum									
RG-170/U	Magnesium									
RG-52/U	Copper	.900	.400	±.003	1.000	.500	±.003	.050	.004	1/32
RG-67/U	Aluminum									
RG-171/U	Magnesium									
RG-91/U	Copper	.622	.311	±.002	.702	.391	±.003	.040	.003	1/64
RG-107/U	Silver									
RG-172/U	Magnesium									
RG-53/U	Copper	.420	.170	±.002	.500	.250	±.003	.040	.003	1/64
RG-66/U	Silver									
RG-121/U	Aluminum									
RG-173/U	Magnesium									
RG-96/U	Silver	.280	.140	±.0015	.360	.220	±.002	.040	.002	1/64
RG-97/U	Silver	.224	.112	±.0010	.304	.192	±.002	.040	.002	.010
RG-98/U	Silver	.148	.074	±.0010	.228	.154	±.002	.040	.002	.008
RG-99/U	Silver	.122	.061	±.0005	.202	.141	±.002	.040	.002	.006
GROUP B (See Figure II)										
RG-138/U	Silver	.080	.040	±.0003	.156 Dia		±.001		.001	.0031
RG-136/U	Silver	.065	.0325	±.0025	.156 Dia		±.001		.001	.0015
RG-135/U	Silver	.051	.0255	±.0025	.156 Dia		±.001		.001	.0015
RG-137/U	Silver	.043	.0215	±.0020	.156 Dia		±.001		.0005	.0015
RG-139/U	Silver	.034	.0170	±.0020	.156 Dia		±.001		.0005	.0015

1/ The eccentricity of a waveguide is defined as one-half the difference between opposite wall thickness as measured at any cross-section perpendicular to the longitudinal axis.

2/ Minimum outer corner radius - 1/64 inch, maximum outer corner radius - 1/8 inch.





Most companies think there's only one way to design a klystron.



But Eimac knows there are three.

Some rf ranges and requirements call for an internal cavity klystron. Others, an external one. For still others, a combined internal-and-external cavity is best. That's why Eimac designs klystrons *all three ways*. (And why it has more high power klystrons operating throughout the free world than all other makers combined.) Fact is, that's how Eimac designs *every* tube: to meet your specific needs.

For data on Eimac klystrons shown above (4KP10,000SQ, internal cavity; 4K50,000LQ, external cavity; 5K210,000LQ, combined internal-and-external cavity) contact your Eimac representative or write: Power Klystron Division, Eitel-McCullough, Inc., San Carlos, Calif.



EIA-MIL Waveguide Dimensions

Type	EIA Designation	Material alloy	Category	Nominal inside dimensions (inches)	Nominal wall Thickness	For use with Flange type	Engineering Data
*RG-48/U	(WR284)	Copper	1	2.840 x 1.340	0.080	UG-53/U & 54A/U	
*RG-49/U	(WR187)	Copper	1	1.872 x 0.872	0.080	UG-149A & 148B/U	
*RG-50/U	(WR137)	Copper	1	1.372 x 0.622	0.064	UG-343A, 344/U	
*RG-51/U	(WR112)	Copper	1	1.122 x 0.497	0.064	UG-51, 52A/U	
*RG-52/U	(WR90)	Copper	1	0.900 x 0.400	0.050	UG-39, 40A/U	
*RG-53/U	(WR42)	Copper	1	0.420 x 0.170	0.040	UG-595, 596/U	
*RG-66/U	(WR42)	Silver	1	0.420 x 0.170	0.040	UG-595, 596/U	
*RG-67/U	(WR90)	Aluminum	1	0.900 x 0.400	0.050	UG-135, 136A/U	
*RG-68/U	(WR112)	Aluminum	1	1.122 x 0.497	0.064	UG-137A, 138/U	
*RG-69/U	(WR650)	Copper	1	6.500 x 3.250	0.080	UG-417/U	
*RG-75/U	(WR284)	Aluminum	1	2.840 x 1.340	0.080	UG-584, 585/U	
*RG-91/U	(WR62)	Copper	1	0.622 x 0.311	0.040	UG-419, 541/U	
*RG-95/U	(WR187)	Aluminum	1	1.872 x 0.872	0.064	UG-406A, 407/U	
*RG-96/U	(WR28)	Silver	1	0.280 x 0.140	0.040	UG-599, 600/U	
*RG-97/U	(WR22)	Silver	1	0.224 x 0.112	0.040	UG-383/U	
*RG-98/U	(WR15)	Silver	1	0.148 x 0.074	0.040	UG-385/U	
*RG-99/U	(WR12)	Silver	1	0.122 x 0.061	0.040	UG-387/U	
*RG-103/U	(WR650)	Aluminum	1	6.500 x 3.250	0.080	UG-418A/U	
*RG-104/U	(WR430)	Copper	1	4.300 x 2.150	0.080	UG-435A/U	
*RG-105/U	(WR430)	Aluminum	1	4.300 x 2.150	0.080	UG-437A/U	
*RG-106/U	(WR137)	Aluminum	1	1.372 x 0.622	0.064	UG-440A, 441/U	
*RG-107/U	(WR62)	Silver	1	0.622 x 0.311	0.040	UG-419, 541/U	
RG-109/U	(WR284)	Brass	S.P.	2.840 x 1.004		UG-509, 510/U	
RG-110/U	(WR137)	Brass	S.P.	1.372 x 0.487		UG-511, 512/U	
*RG-112/U	(WR340)	Copper	1	3.400 x 1.700		UG-553/U	
*RG-113/U	(WR340)	Aluminum	1	3.400 x 1.700		UG-554/U	
*RG-121/U	(WR42)	Aluminum	1	0.420 x 0.170	0.040	UG-597, 598/U	
RG-127/U	(WR650)	Laminated silver	S.P.	6.500 x 3.250		UG-933/U	Stainless steel outside; Silver inside
RG-132/U	(WR650)	Brass	S.P.	6.500 x 3.250		UG-979/U	
RG-135/U		Silver	1	0.051 x 0.0255			Circular O.D.
*RG-136/U		Silver	1	0.065 x 0.0325			Circular O.D.
*RG-137/U		Silver	1	0.043 x 0.0215			Circular O.D.
*RG-138/U		Silver	1	0.080 x 0.040			Circular O.D.
*RG-139/U		Silver	1	0.034 x 0.017			Circular O.D.
RG-163/U	(WR112)	Brass	S.P.	1.122 x 0.497			For use at extreme external pressures.
	(WR650)	Stainless steel	1	6.500 x 3.250		UG-954/U	Silver interior NT 14 ACM
*RG-167/U	(WR284)	Magnesium	1	2.840 x 1.340	0.080	UG-1196, 1197/U	
*RG-168/U	(WR187)	Magnesium	1	1.872 x 0.872	0.064	UG-1198, 1199/U	
*RG-169/U	(WR137)	Magnesium	1	1.372 x 0.622	0.064	UG-1200, 1201/U	
*RG-170/U	(WR112)	Magnesium	1	1.122 x 0.497	0.064	UG-1202, 1203/U	
*RG-171/U	(WR90)	Magnesium	1	0.900 x 0.400	0.050	UG-1204, 1205/U	
*RG-172/U	(WR62)	Magnesium	1	0.622 x 0.311	0.040	UG-1206, 1207/U	
*RG-173/U	(WR42)	Magnesium	1	0.420 x 0.170	0.040	UG-1208, 1209/U	
*RG-201/U	(WR1800)	Aluminum	2	18.000 x 9.000	0.125		
*RG-202/U	(WR1500)	Aluminum	2	15.000 x 7.500	0.125		
*RG-203/U	(WR1150)	Aluminum	2	11.500 x 5.750	0.125		
*RG-204/U	(WR975)	Aluminum	2	9.750 x 4.875	0.125		
*RG-205/U	(WR770)	Aluminum	2	7.700 x 3.850	0.125		
*RG-206/U	(WR650)	Magnesium	2	6.500 x 3.250	0.080		
*RG-207/U	(WR430)	Magnesium	2	4.300 x 2.150	0.080		
*RG-208/U	(WR340)	Magnesium	2	3.400 x 1.700	0.080		

\* General requirements are covered by MIL-W-85C.



PROGRESS IN MICROWAVES

New General Electric VTM's and TWT's . . .

# ADVANCE S- AND X-BAND TRANSMITTER CAPABILITIES

## Provide Higher Power in Lighter, Smaller Tubes

Four new General Electric power tubes—two voltage-tunable magnetrons and two traveling-wave tubes—have been designed to advance transmitter capabilities in S- and X-bands. All provide higher power in smaller, lighter, more compact packages for missile and airborne transmitter applications.

### HIGH EFFICIENCY, LIGHT WEIGHT VTM's

Designed primarily for space applications, the Z-5428 voltage-tunable magnetron achieves an efficiency of 35 percent in a tube weighing only 4.5 pounds. Moreover, it operates under severe shock and vibration conditions with only radiation cooling. Tests show the Z-5428 meets shock requirements of 40 G's for 11 milliseconds and vibration requirements of 5 to 25 cps at one quarter-inch double amplitude; and from 25 to 2000 cycles at 10 G's.

Equally efficient and compact, the Z-5424 provides high power (50 W min.) in an exceptionally light (4.5 pounds) VTM. And like the Z-5428, it is a complete r-f power package requiring only input and r-f output power connections.

Both VTM's can be linearly voltage-tuned without mechanical adjustment.

### HIGH-POWER, COMPACT TWT's

The two new high-power traveling-wave tubes are designed to

operate in series, one as the driver and one as the final amplifier in a pulsed high-power chain for X-band radar applications. They are compact, of metal-ceramic construction, and incorporate an advanced focusing system utilizing periodic permanent magnets requiring no temperature stabilization. The Z-3090 driver tube weighs only 15 pounds while the Z-3091 amplifier tube weighs 42 pounds with electrical connectors. Both tubes are ruggedized for airborne applications and can be mounted in any position.

These TWT's, as well as the new VTM's, are now available in sample quantities. Delivery in 90 to 120 days.

265-08

### FREQUENCY RANGES AVAILABLE\*

VTM's OSCILLATOR SERVICE	
Frequency (KMC)	P <sub>0</sub> (Min. CW)
2.2 - 2.3	10 W
2.5 - 3.5	10 W
2.9 - 3.2	50 W
5.17 - 5.42	10 W
TWT's AMPLIFIER SERVICE	
Frequency (KMC)	P <sub>0</sub> (Min. Peak)
3.4 - 5.9	25 KW
8.5 - 9.6	1 KW
8.5 - 9.6	50 KW
8.5 - 9.6	250 KW

\*These tubes can be scaled to meet specific frequency and power requirements.

**TO ORDER**, or obtain more information, contact your nearest Power Tube Sales office (telephone numbers listed below).

POWER TUBE DEPARTMENT

# GENERAL ELECTRIC

TELEPHONE TODAY—Syracuse, OL 2-5102 . . . New York City, WI 7-4065 . . . Clifton, N. J., GR 3-6387 . . . Washington, D. C., EX 3-3600 . . . Chicago, SP 7-1600 . . . Dayton, BA 3-7151 . . . Orlando, Fla., GA 4-6280 . . . Los Angeles, GR 9-7765

Circle 63 on Inquiry Card



Z-5424: 50 percent efficiency—2900 to 3200 mc.



Z-5428: Designed for space—2200 to 2300 mc.



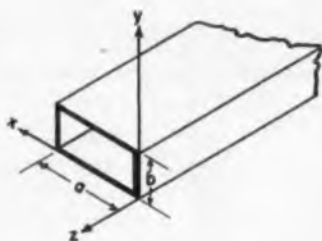
Z-3091: Periodic permanent-magnet focus high-power traveling-wave tube

**LOOK TO G-E POWER TUBE DEPARTMENT FOR:**

- Ignitrons
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- Metal-ceramic Tetrodes
- High-power Duplexers
- Klystrons
- Thermionic Converters
- Traveling-wave Tubes
- Harmonic Filters

# Useful Waveguide Formulas

Listed here are some of the more important formulas which may be used in waveguide calculations.



**Fields at Frequencies Above Cutoff**  
(Dominant mode in air filled rect. guide)

$$E_x = E_y = B_z = 0$$

$$E_y = A \frac{\omega \mu}{\pi} \sin \frac{\pi x}{a} \sin (\omega t - \beta z)$$

$$B_x = -A \cos \frac{\pi x}{a} \cos (\omega t - \beta z)$$

$$B_z = \frac{\beta}{\omega} E_y$$

$E$  = electric field intensity, abvolts/cm

$B$  = magnetic field intensity, gauss

$\omega/2\pi$  = frequency

$t$  = time

$A$  = an arbitrary constant of amplitude

$\beta$  = the phase constant (see below)

$a, x, y, z$  are as shown in drawing

**Guide Wavelength ( $\lambda_g$ )**

$$\lambda_g = \frac{\lambda}{\sqrt{1 - (\lambda/\lambda_c)^2}}$$

$\lambda$  = free-space wavelength

$\lambda_c$  = cutoff wavelength

**Phase Constant ( $\beta$ )**

$$\beta = \frac{2\pi}{\lambda_g} = \frac{2\pi}{\lambda} \sqrt{1 - \left(\frac{\lambda}{\lambda_c}\right)^2} = \sqrt{\frac{\omega^2}{c^2} - \frac{\pi^2}{a^2}}$$

$c$  = velocity of light

**Group & Phase Velocity**

$$\frac{\text{Phase velocity}}{\text{Velocity of light}} = \frac{v_p}{c} = \frac{\lambda_g}{\lambda} = \frac{1}{\sqrt{1 - (\lambda/\lambda_c)^2}}$$

**Cutoff Wavelength**  
(General case)

$$\lambda_c = \frac{2a}{\sqrt{(m^2) + (na/b)^2}}$$

$a$  &  $b$  = guide dimensions in drawing

$m$  = first subscript describing mode

$n$  = second subscript describing mode

## MICROWAVE SYMBOLS

- $\alpha$  Attenuation
- $\alpha_0$  Attenuation of air filled copper transmission line =  $0.35 \times 10^{-3}$  nepers/meter =  $0.3 \times 10^{-5}$  db/kilometer
- $\Gamma$  coefficient of reflection = -1 for short circuit = +1 for open circuit = 0 for matched load
- $\delta$  skin depth
- $\epsilon$  Dielectric constant
- $\epsilon_0$  Dielectric constant for air
- $\lambda$  Wavelength
- $\lambda_g$  Guide wavelength
- $\lambda_c$  Cutoff wavelength
- $\mu$  Permeability
- $\mu_0$  Permeability of air =  $4\pi \times 10^{-7}$  henries/meter
- $K$  Coupling coefficient
- $\rho$  Resistivity =  $1.74 \times 10^{-8}$  ohm-meters for copper
- $\sigma$  Electrical conductivity
- $\epsilon_0$  Permittivity of air =  $8.854 \times 10^{-12}$  farad/meter
- $v$  Velocity of propagation
- $v_0$  Velocity of propagation in air =  $2.998 \times 10^8$  centimeter/second =  $2.998 \times 10^8$  meters/second = 186,280 miles/second =  $11.808 \times 10^8$  inches/second
- $\phi$  Phase angle
- $\beta$  Phase constant
- $Z_0$  Characteristic impedance = 376.7 ohms for free space = 120 $\pi$
- D** Directivity
- P** Power
- V** Voltage
- I** Current
- R** Resistance
- C** Capacitance
- G** Conductance
- B** Susceptance
- X** Reactance
- Y** Admittance
- L** Inductance
- f** Frequency
- $\omega$  Angular frequency =  $2\pi f$
- Q** Figure of Merit of a resonator =  $\frac{2\pi \text{ energy stored}}{\text{energy dissipated per cycle}} = \frac{\Delta f}{f_0}$
- H** Magnetic vector
- E** Electric vector
- a** Broad waveguide dimension
- b** Narrow waveguide dimension
- z** Direction of propagation
- n** Mode designation (for TE<sub>10</sub>  $m = 1, n = 0$ )
- m** Mode designation (for TE<sub>10</sub>  $m = 1, n = 0$ )
- VSWR** Voltage Standing Wave Ratio
- PSWR** Power Standing Wave Ratio

## CUTOFF FREQUENCY CALCULATIONS

RECTANGULAR GUIDE		SQUARE GUIDE		CIRCULAR GUIDE	
Mode	Cutoff Wavelength	Mode	Cutoff Wavelength	Mode	Cutoff Wavelength
TE <sub>10</sub>	2a	TE <sub>10</sub>	2a	TE <sub>11</sub>	3.41a
TE <sub>01</sub>	a	TE <sub>01</sub>	2a	TM <sub>01</sub>	2.61a
TE <sub>20</sub>	a	TE <sub>11</sub>	1.4a	TE <sub>21</sub>	2.06a
TE <sub>11</sub>	0.89a	TM <sub>11</sub>	1.4a	TE <sub>01</sub>	1.64a
TM <sub>11</sub>	0.89a	TE <sub>20</sub>	a	TM <sub>11</sub>	1.64a

# Commercial Waveguides

Electronic Industries Association designation	Army-Navy type number*	outer dimensions and wall thickness	frequency range in kilomegacycles for dominant (TE 1,0) mode	cutoff wave-length $\lambda_c$ in centimeters for TE 1,0 mode	cutoff frequency $f_c$ in kilomegacycles for TE 1,0 mode	theoretical attenuation, lowest to highest frequency in db/100 ft	theoretical power rating in megawatts for lowest to highest frequency;
WR234B		23.000 x 11.900†	0.32 - 0.48	116.0	0.267		
WR2100		21.000 x 10.500†	0.35 - 0.54	106.0	0.282		
WR1800		18.000 x 9.000†	0.41 - 0.64	91.4	0.328		
WR1500		15.000 x 7.500†	0.47 - 0.75	78.3	0.383		
WR1160		11.500 x 5.750†	0.64 - 0.98	65.4	0.514		
WR875		10.000 x 5.125 x 0.125	0.75 - 1.12	49.6	0.606		
WR776		7.891 x 4.100 x 0.125	0.96 - 1.45	39.1	0.767		
WR680	RG-49 U	6.680 x 3.410 x 0.080	1.12 - 1.70	33.0	0.908	0.317 - 0.212	11.0 - 17.2
WR510		5.250 x 2.718 x 0.080	1.45 - 2.20	25.9	1.10		
WR430	RG-104 U	4.490 x 2.310 x 0.080	1.70 - 2.60	21.9	1.375	0.580 - 0.385	5.2 - 7.8
WR340		3.560 x 1.890 x 0.080	2.20 - 3.30	17.3	1.735		
WR284	RG-48 U	3.000 x 1.500 x 0.080	2.60 - 3.95	14.5	2.08	1.102 - 0.782	2.2 - 3.2
WR228		2.418 x 1.273 x 0.064	3.30 - 4.80	11.6	2.89		
WR187	RG-40 U	2.080 x 1.000 x 0.064	3.95 - 6.05	9.60	3.16	2.08 - 1.44	1.4 - 2.0
WR159		1.718 x 0.823 x 0.064	4.80 - 7.05	8.00	3.71		
WR137	RG-50 U	1.500 x 0.750 x 0.064	5.85 - 8.20	6.98	4.29	2.87 - 2.30	0.84 - 0.71
WR112	RG-81 U	1.250 x 0.625 x 0.064	7.55 - 10.00	6.70	6.26	4.12 - 3.21	0.38 - 0.46
WR90	RG-52 U	1.000 x 0.500 x 0.080	9.20 - 12.40	4.87	6.96	6.45 - 4.48	0.20 - 0.29
WR75		0.888 x 0.475 x 0.050	10.00 - 16.00	3.61	7.98		
WR62	RG-61 U	0.702 x 0.351 x 0.040	12.4 - 18.00	3.16	9.48	0.51 - 0.31	0.12 - 0.16
WR61		0.580 x 0.335 x 0.040	15.00 - 22.00	2.88	11.6		
WR42	RG-53 U	0.500 x 0.250 x 0.040	18.00 - 28.00	2.13	14.1	20.7 - 14.8	0.043 - 0.050
WR34		0.420 x 0.210 x 0.040	22.10 - 33.00	1.73	17.3		
WR28	RG-66 U (*)	0.360 x 0.220 x 0.040	28.50 - 40.00	1.42	21.1	21.0 - 18.0	0.022 - 0.031
WR22	RG-87 U (*)	0.304 x 0.182 x 0.040	33.00 - 50.00	1.14	26.3	31.0 - 29.0	0.014 - 0.020
WR19		0.268 x 0.174 x 0.040	40.00 - 60.00	0.955	31.4		
WR16	RG-68 U (*)	0.228 x 0.184 x 0.040	50.00 - 75.00	0.753	39.8	52.0 - 39.1	0.0063 - 0.0080
WR12	RG-90 U (*)	0.202 x 0.141 x 0.040	60.00 - 90.00	0.620	48.4	83.3 - 52.2	0.0042 - 0.0060
WR10		0.180 x 0.130 x 0.040	75.00 - 110.00	0.609	50.0		

\* Types are silver; unmarked types are brass.

† Inner dimensions only are specified.

‡ For these computations, the breakdown strength of air was taken as 15,000 v/cm. A safety factor of approximately 2 at sea level has been allowed.



## NEW BINARY DECODING DIGITAL READOUT

**Translates Direct—Coded Binary-to-Decimal and Alpha-numeric**

**Self-Decoding.** The new Bina-View Digital Readout accepts any BCD or teletype code up to six bits, does its own translating, and displays the proper character. There are no auxiliary translators, relays, or diodes required.

**Low Power.** The Bina-View Digital Readout may be operated with as little as ten milliwatts per bit of signal power. It may be connected directly into computers and other electronic equipment.

**Character Storage.** The Bina-View Digital Readout will continue to display the last character entered after the signal input power has been removed.

**Memory and Verification (Optional).** When required, contact closures may be provided for verification that the input signals have been properly accepted.

**Practical.** The Bina-View Digital Readout offers clear distinct characters, high even brightness, and wide viewing angle. Extremely durable and vibration-free, it is designed for thousands of hours of trouble-free operation.

Prices start at \$50.00 each

# BINA-VIEW

Now, with the new Bina-View, digital readouts take on an added dimension. Here is a readout that operates direct from binary input, has its own retentive memory, and offers one-plane in-line presentation. Realistically priced and designed with the user in mind, it is not to be confused with other readout devices on the market. The Bina-View Digital Readout fills the long-standing need for a fast, accurate, binary operated display in the fields of digital computers, missile checkout systems, ground support equipment, etc. Its ability to operate within a wide range of binary codes makes it the most versatile readout available today.

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 Engineers & Manufacturers of Fully Automatic Systems & Digital Readouts  
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Available in individual units or assemblies. Write today for complete detailed specifications.

Nomograph provides microwave engineers with a quick, easy method calculating any one of the three significant waveguide characteristics, when two of them are known.

## Determining Waveguide Wavelength

B. R. HATCHER

Chu Associates  
P. O. Box 387  
Whitcomb Ave.,  
Littleton, Mass.

THIS nomograph is used to determine the value of one of the variables: waveguide wavelength  $\lambda_g$ , free space wavelength  $\lambda_o$  (or frequency  $f$ ), or cutoff wavelength  $\lambda_c$ , when any two are known.

The vertical scale gives waveguide wavelength in centimeters. The horizontal one is for the cutoff wavelength. The points corresponding to the cutoff wavelength in the  $TE_{10}$  mode of the three common waveguides are also indicated. The sloping scale is calibrated in free space wavelengths and frequency.

### Example I

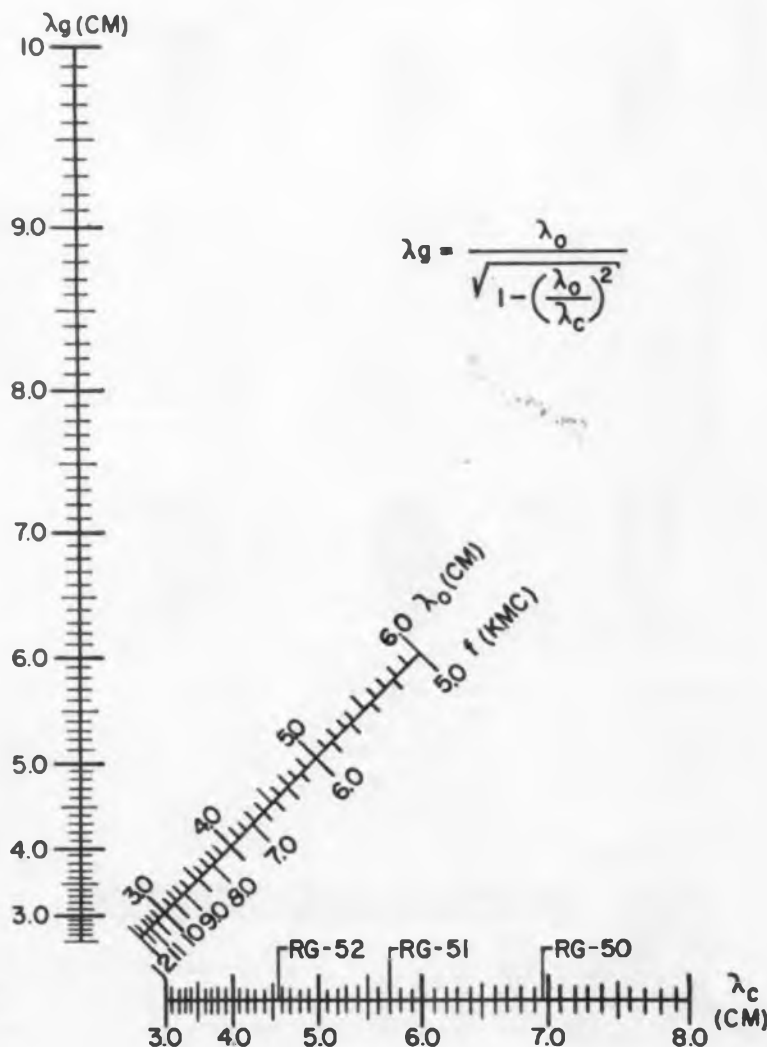
What is the waveguide wavelength at 6 KMC (5 cm. wavelength) in RG - 50 waveguide?

The straight line between the points  $f = 6$  KMC and RG - 50 on the  $\lambda_c$  scale is extended to intersect the  $\lambda_g$  scale. This intersection yields  $\lambda_g = 7.17$  cm.

### Example II

By measurement on an RG - 51 slotted line, the waveguide wavelength is found to be 6.5 cm. What is the frequency?

The straight line between 6.5 on the  $\lambda_g$  scale and RG - 51 on the  $\lambda_c$  scale intersects the  $f$  scale at 7.0 KMC.



# TUNG-SOL ELECTRON TUBES

The fully comprehensive Tung-Sol line of electron tubes fills virtually every requirement . . . from the most exacting military and industrial applications to the peak quality demands of modern entertainment electronics. A quality control network that's unparalleled plus unexcelled production know-how assure that high-volume production units exhibit the same superior performance and full-life dependability as the engineering samples.

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: Abbey Electronics, Toronto, Ont.



## VACUUM PULSE TUBES

Used in radar equipment and high power pulse generators.

Types available: 3D21WA, 6293, 7358, 7403.



## INDICATOR THYATRONS

Used in relay service wherever a small, light-weight, self-indicating tube is needed.

Types available: 7323, 7400, 7401, 7813.



## TRANSMITTING TUBES

Used primarily in mobile transmitters through the UHF range.

Types available: 2E22, 2E26, 6146, 6159, 6883, 6907, 7212.



## TELEPHONE TUBES

Used in hand sets, central office, and carrier equipment.

Types available: 313C, 338A, 407A, 426A, 5842/417A, 5847/404A, 6028, 408A.



## VHF TRIODES

Used in military VHF radio and test equipment.

Types available: 5676



## RECTIFIERS

Used throughout industrial electronic equipment and broadcasting operations—AM, FM and TV.

Types available: 1Z2, 3B24WA, 3B25, 3B28, 4B32, 5R4GY, 5R4WGA, 5R4WGB, 6H6WGT, 6X4W, 2524WGT, 26Z5W, 83, 583, 5517, 5726/6AL5W, 5726/6AL5W/6097, 5829WA, 3B29, 576A.



## TWIN TRIODES

Used widely in equipment handling frequencies from the audio level through the frequency band.

Types available: 5670, 5670WA, 6SU7GY, 12A T7WA, 12A Y7, 65C7GY, 5687, 5687WA, 2C51, 618B/65U7WGT, 5B14, 5B14WA, 5751, 5751WA, 6SN7WGT, 6021.



## POWER TRIODES

Used in series regulated power supplies and wherever high permeance, high current tubes are needed.

Types available: 5998, 6A57C, 6080, 6080WA, 4080WF, 6082, 6082WA, 6082WB, 6336A, 6394A, 6520, 6528, 7105, 7236, 7241, 7242, 7802, 7802WA, 7802WB.



## VOLTAGE REFERENCE TUBES

Used in radio equipment and other electronic gear with regulated power supplies, especially in high-accuracy units.

Types available: 5651, 5651WA, 5783, 5783WA, OG3.



## THYATRONS

Used in power supplies, radio transmitters, motor controllers and spot welders.

Types available: 2A4G, 2D21, 2050, 2050W, 3C23, 3238, 393A, 394A, 395A, 6B5, 5594, 5643, 5643, 5696, 5727, 6D4, 6012, 6901, 7410.



## CLIPPER TUBES

Used in radar to protect modulator components and to regulate output pulse. Both gas and vacuum tube versions available.

Types available: 576A, 583, 6339, 7454, 7455



## POWER PENTODES

Used in public address systems, hi-fi amplifiers, radio transmitters and receivers.

Types available: 2E22, 2E64WGB, 3A4, 5A6, 5881, 6AR6, 6L6WGB, 6098/6AR6WA, 6550.



## VOLTAGE REGULATORS

Used in radio and other electronic equipment with regulated power supplies.

Types available: OA2, OB2WA, OB2, OC3W, OC3W, 5787, 5787WA, 6074, 6542, 7099.



## HYDROGEN THYATRONS

Used in radar modulators and missile tracking beacons. Miniatures in airborne units.

Types available: 1257, 1257A, 1258, 5948, 5948A, 5949, 5949A, 6587A, 7190, 7191, 7192, 7240.



## PENTODES

Used in military and other communications equipment.

Types available: 1A4D, 5636, 5636A, 5639, 5654/6AK5W, 5654/6AK5W/6096, 5672, 5678, 5725/6A56W, 5725/6A56W/6187, 5749/5875, 6A15, 6AK5WA, 6A56, 6AU6WA, 6BA6W, 6096.

## ENTERTAINMENT



Tung-Sol tubes . . . cathode ray, series string, hybrid auto radio, TV, radio, stereo and hi-fi . . . provide an ideal combination of the most sought-after characteristics. Tung-Sol is also packing the popular types of its quality audio tubes in factory-matched pairs. Dynamically-balanced 6550's, 5881's, 6Y6GTA's, 6BQ5's bring you the finest in full-fidelity reproduction.



# TUNG-SOL

MILITARY INDUSTRIAL



# New Receiving Tubes & Special Purpose Tubes

—released during the Period 1950 to May 1961

## MAGNETRONS

Tube	Sponsor	Type	Operating Band	Remarks
7208	Western Elec.		15,800-17,200 MC	
7208A	Western Elec.		15,500-17,500 MC	Forced Air-Cooled
7292	Rogers			Water Cooled
7535	Western Elec.	Pulsed Osc.	8,500-9,600	Air-Cooled
7819	Sylvania		Ka. Band	Ruggedized Version of Type 5789
7798	Westinghouse	CW	4,200-4,400 MC	C Band

## MULTIPLIER PHOTOTUBES

Tube	Sponsor	Const.	Application	Remarks
8838	ITT	10-Stage	S-1 Spectral Resp.	
7698	Tekyo Shibaura Elec. Co. Ltd.	Flat Face, 2 in. End Window	Scintillating Gamma Ray Spectrometer, Flying Spot Scanning	10-Stage Box Type
7764	RCA	Short, Head-On 6 Stage	Computer, Punch-Taper, Low-Light, Small Space	Spectral Response: 3,000-6,500 Angstroms
7767	RCA	Small, Head-On 10 Stage	Geological & Biological Tracer	Spectral Response: 3,000-6,500 Angstroms
7817	CBS		Scintillation Counting Spec Troscopy, Photometry, Scanner	Sensitive to the Blue Region of the Spectrum
7817	CBS	10-Stage, 3 in. Dia.	Flying Spot Scanner Photometric Instruments	Sensitive to Blue Region
7818	CBS	10-Stage, 5 in. Dia.	Flying Spot Scanner Photometric Instruments	Sensitive to Blue Region
7850	RCA	12-Stage Head-On	Scintillation Counters	S-11 Response
7860	Du Mont	10-Stage		S-11 Response
7908	Westinghouse	10-Stage ½ in. Dia.	Extreme Environments	S-11 Response
7909	Westinghouse	10-Stage ¼ in. Dia.		S-11 Response

## THYRATRONS

Tube	Sponsor	Remarks
7390A	GE	Identical to 7390 - Except for addition of Temp. Indic. at top of tube
7454	Chatham	Pass HF Currents as an Inverse Clipper in Live-Type Radar Modulation
7455	Chatham	Same as 7454
7559	Tung-Sol/Chatham	Pass High Currents in Crowbar Protective Circuits
7568	Tung Sol	Same as 7559
7605	Tung-Sol/Chatham	Same as 7559
7890	GE	Radar Modulation
7981	Mullard Ltd.	Motor Control

# NEW VACUUM TUBES

TUBE	SPONSOR	TYPE	CONSTRUCTION	APPLICATION	Ep (v)	GRID 2 (v)	GRID 1 (v)
1V3A 1N2A 2CW4 2FQ5A 2FS5	CBS Sylvania RCA Sylvania GE	Half-Wave Half-Wave Diode Triode Triode Beam Pentode		CRT Anode Supplies HV Rectifier  VHF RF Amp VHF RF Amp	200		
2GK5 3AW3 3DT6A 3FQ5A 3GK5	Sylvania Raytheon RCA Sylvania Sylvania	Triode Diode Pentode Triode Triode	7 Pin Min	VHF RF Amp HV Rectifier  VHF RF Amp VHF RF Amp	200  200 200		
4AV8 4DT6A 5AT4 5DT4 5ES8	RCA RCA Tung-Sol CBS Rogers	Diode-Triode Pentode Power Rect. FW Power Rect. Double Triode	7 Pin Min  9 Pin Min	DC Power Supplies Same as 5U4GB VHF Cascade Amp			
5EW6 5FG7 5V3A 6AS7GYB 6AX3	RCA GE Tung-Sol GE GE	Pentode Triode-Pentode FW Rectifier Twin-Triode Diode	9 Pin Min  Single Heater Cath.	Osc. & Mixer TV Rect. Series-Regulator Damping Diode-TV			
6B10 6C9 6C10 6CW4 6D10	GE Sylvania GE RCA GE	2 Diodes, 2 Triodes Duo-Tetrodes Triple Tetrode Triode Triple Triodes	10 Pin Bulb  Separate Pin	Horiz. Phase Det. VHF RF Amps R-C Voltage Amp. R-F Amp, TV VHF Osc./Mixer	330		
6DM4 6EL7 6EQ7  6ET7 6FA7	RCA Siemens RCA  Sylvania RCA	H-W. Rect. H-F Pentode Diode-Pentode  Duo Diode-Pentode Diode-Tetrode	Glass-Octal 9 Pin Min 9 Pin Min  9 Pin Min	Damper, D & W TV  Bsect. Receivers  Video Amp. Freq. Divider	250		
6FD6 6FD7 6FG7	Raytheon Philco GE	Pentode Duo-Triode Triode-Pentode	7 Pin Min 9 Pin Min 9 Pin Min	Receivers-Converters Osc. & Amp. Osc. & Mixer	30 330		
6FJ7  6FN5 6FG5A 6FQ7	GE  Compagnie Sylvania RCA	Double Triode  Power Pentode Triode Twin Triode	  Octal 9 Pin Min	Osc. & Amp.  Deflection Amp. Vert. Osc. - Horiz. Osc.	350 550 250 200 330		
6FR7  6FS5 6FW5	Sylvania  GE GE	Duo-Triode  Pentode Beam-Pwr. Pentode	  7 Pin Min	Osc. & Amp.  RF Amp, VHF TV Deflec. Amp.	330 330 330		
6GC5 6GK5 6GM5 6GN6 6GX6	Sylvania Sylvania Sylvania RCA RCA	Beam-Pwr. Pentode Triode Pwr. Pentode Beam Power Pentode	9 Pin Min  Glass-Octal 7 Pin Min	Audio Pwr. Amp. VHF RF Amp. Power Output Horiz. Amp. FM Det-TV	200 550 300		
6GY6 6HF8 6HJ8 6HK8 6HS8	RCA RCA Philco Shibaura GE	Pentode Triode-Pentode Diode-Pentode Twin Triode Twin Pentode	7 Pin Min 9 Pin Min 9 Pin Min Sep. Plates & Grids	TV Gen. Purpose Video Detector Cascode Amp.-TV TV, Comb. Sync.-Agc.	330 330		
6HY8 6IC8  6K11	St. El. Lorenz Sylvania  GE	Twin Pentode Triode-Pentode  3 Sec. Triode	9 Pin Min  Sep. Pin	Output & Osc. VHF Osc. & Mixer	330 125 125 300		

## NEW VACUUM TUBES

1p (ma)	1g <sub>2</sub> (ma)	HEATER	R <sub>p</sub>	G <sub>m</sub>	AMP FACTOR	REMARKS	TUBE
		(Identical to 1N2 except for smaller bulbs) (Identical to 6CW4 except for heater ratings - 2v/.45a) 2.3v/.6a (Identical to 6FS5 except for heater ratings - 2.4v/.8a)	5.3 K	12,000	74	Will replace 1J3	1V3A 1N2A 2CW4 25Q5A 2FS5
		2.3v/.8a 3.15v/.22a (Identical to 8DT6A except for heater - 3.15v/.6a) 2.8v/.45a 2.8v/.45a	5.4 K 6.3 K 5.4 K	15,000 12,000 45a15,000	78 74 78	30 Kv	26K5 3AW3 30T6A 3FQ5A 36K5
2.25a 2.25a 15ma		(Identical to 6AV6 except for heater rating - 4.2v/0.45 = 6% Amp.) (Identical to 8DT6A except for heater characteristics - 4.2v/.45a) 5.0v/5.5a 5.0v/3a 5.8v/0.45a	2.5 K	12,500		1550 PIV	4AV6 4DT6A 5AT4 5DT4 5ES8
13ma		(Identical to 6EWB except for heater ratings - 5.6v/.45a) 4.7v/0.6a 5v/3a (Identical to 8AS7GA except for controlled zero bias 1p) 6.3v/1.12amp.	5.7K/180K	7,500/7,400	43	PIV 1550 V PIV-5 KV	5EW6 5FG7 5V3A 6AS7GY8 6AX3
10 10 1.2 7.6 4.2		6.3/1.8amp. 6.3v/0.4amp. 6.3v/0.45amp. 6.3v/0.13a 6.3v/0.45a	7.2 K 100 K 82.5 K 6.3 K 13.6 K	2,500 8,000 1,000 8,800 4,200	18  100 62 57	5ma Diode Current Parallel Heater	6B10 6C9 6C10 6CW4 6O10
1 8		6.3v/1.2a 6.3v/0.3a 6.3v/0.3a (Identical to 8ET7 except for heater characteristics) 6.3v/0.3a	250 K	5,000 9,200 3,800	64	Diode Pentode Diode	8DM4 8EL7 8EW7 8ET7 8FA7
3.8 13 11		6.3v/.33a 6.3v/.825a 6.3v/0.45a	90 K 500 K 40 K 5.7 K 180 K	3,200 1,450 1,600 7,500 7,400	64 43	Tetrode Dissimilar Sec. Triode Pentode	6FD6 6FD7 6FG7
		6.3v/0.8a 6.3v/1.05a 6.3v/0.18a 6.3v/0.6 = 8%	9 K 2 K 3.5 K	2,500 7,700 17,000 12,000 3,000	22.5 15.4 74	Triode No. 1 Triode No. 2 Frame Grid Triode No. 1	6F17 6F25A 6FQ7
10 75		6.3v/0.925a 6.3v/0.2a 6.3v/1.2a	40 K .75 K 240 K 20 K	2,600 1,600 7,200 10,000 8,800	68 5.4	Triode No. 2 Triode No. 1 Triode No. 2	6FR7 6FS5 6FW5
48 70		6.3v/0.0012a 6.3v/0.18a 6.3v/0.8a 6.3v/1.2a 6.3v/0.45a	28 K 5.4 K 28 K 1.5 K 140 K	8,000 15,000 10,200 3,700	78	Grid Controlled 32 w Output	6GC5 6GK5 6GM5 6GW6 6GX8
11.5 8.5 2.0		6.3v/0.75a 6.3v/0.45a 6.3v/0.3a	140 K 200 K 4.5 K	3,700 9,300 8,000 1,100	70 38	Triode Pentode No. 1	6GY8 6HF8 6HJ8 6HK8 6HS8
2.0 12 8		6.3v/0.55a 6.3v/0.45a 6.3v/0.6a	80 K 6 K 300 K 7.7 K	1,100 8,000 8,500 5,500 2,200	40 17	Pentode No. 2 Triode Sec. #1	6HU8 6IC8 6K11

# NEW VACUUM TUBES

TUBE	SPONSOR	TYPE	CONSTRUCTION	APPLICATION	Ep (v)	GRID 2 (v)	GRID 1 (v)
6W4GT 7EK7 7ES8	GE Siemens-Edison Rogers	Diode Twin Triode Double Triode	9 Pin Min	Diode-TV Cascade RF Amp. VHF Cascade Amp.	330		
8FD7	RCA	Twin Triode	9 Pin Min	Vert. Osc-Horiz. Osc.	330 330		
10BQ5 10EM7 10FD7	Sylvania RCA Philco	Beam Power Pentode Duo-Triode Duo-Triode	9 Pin Min 9 Pin Min	Output Stage-Audio Amps. Osc. & Amp.	EV330		
10FR7	Sylvania	Duo-Triode		Osc. & Amp.	EP330 330		
10HF8 12AU8	RCA Tung-Sol	Triode/Pentode Triode/Pentode	9 Pin Min	TV General Purpose	330 330		
12DM4 12EQ7	RCA RCA	H-W Rect. Diode/Pentode	Glass Octal 9 Pin Min	Damper, B & W TV Bcst Receivers			
12GW6 12FX8A	RCA GE	Beam Power	Glass-Octal	Horizontal Amp.			
12HY8 13FD7	St. El. Lorenz Philco	Twin Pentode Duo Triode	9 Pin Min 9 Pin Min	Output-Osc. Osc. & Amp.	330		
13FR7	Sylvania	Duo Triode		Osc. Amp.	330 330		
15EA7 16GK8 17C9 17D4A 17DM4	GE Siemens-Edison Sylvania Tung-Sol RCA	Duo Triode Triode-Tetrode Duo Tetrode Diode	9 Pin Min 10 Pin Bulb Indir- Heated	Osc. Amp.-TV Amps.-Mixers TV-Damper	250		
17GW6 18FW6A 18FX6A 18FY8A 18GD6A	RCA Sylvania Sylvania Sylvania Sylvania	Beam Power Pentode Pentode Double Diode-Triode Pentode	Glass-Octal	Defl. Amp.			
18GE6A 19HV8	Sylvania GE	Double Diode-Triode Triode-Pentode	9 Pin Min	IF-AF Amp.	330 330		
20E67	RCA	Diode-Pentode	9 Pin Min	AM-FM Amp.			
20E27 25DK4 34GD5 36AM3A 40FR5	RCA GE RCA RCA Sylvania	Twin Triode Diode Beam Power HW Rect. Pentode	9 Pin Min 7 Pin Min 7 Pin Min 7 Pin Min Min. Power Pentode	Audio Amp. HW Rect. Amp.-AC-DC Rec. AC-DC Rec. Audio Power Amp.	150		
50FA5 50FK5 5985A 8000 8166A	Sylvania RCA GE Tung-Sol RCA	Pentode Power Pentode Twin Triode Beam Power Pentode Power Tube	7 Pin Min 9 Pin Min	Audio Power Amp. Amp.-AC-DC Rec. Computers Amp. for RF VHF Service	150 800		
6108 6211A 6284A 6354 6684	Tung-Sol GE RCA Rogers GE	Twin Triode Twin Triode Triode Volt. Stabilizer Triode	Ruggedized 9 Pin Min Coaxial Type 7 Pin Min 7 Pin Min	DC Amp. Use in Computers Amp. - Osc. Volt. Regulator Amp. - Osc.	250		
6676 6692 6648 6808 6950	GE ITT GE Nachlett Labs RCA	Pentode Osc. Tetrode High Vacuum Beam Triode	7 Pin Min 3-Electrode Metal - Ceramic Oil-Immersed Shielded Grid	RF, I-F Amp. Oscillator Amp. - Osc. Diode-Power-Sup. RF Power Amp.			

## NEW VACUUM TUBES

1p (ma)	1g <sub>2</sub> (ma)	HEATER	Rp	g <sub>m</sub>	AMP FACTOR	REMARKS	TUBE
15 15ma			82.5 K	1,800	100	Sec #2 & 3	8246TA 7E7 7E8
		(Unilaterally interchangeable with the 8W4-8T) 7v/0.3a		9,200	28		
		7.2v/0.3a	2.5 K 2.5 K	12,500 12,500		Triode No. 1 Triode No. 2	
		8.4/0.45 ± 8%		3,000 2,800		Triode No. 1	8FQ7
		(Identical to 8BQ5 except for heater ratings 10.8v/0.45a) (Identical to 8EM7 except for heater ratings 9.7v/0.8 ± 8%) 9.7v/0.8a		1,800	84	Triode No. 1	10BQ5 10EM7 10FD7
		9.7v/0.8a	40 K 40 K 0.75 K	1,800 7,200 12,500	68 5.4	Triode No. 2 Sec. No. 1 Sec. No. 2	10FR7 10FR7 10HF8 12AU8
		10.5v/0.45a	(Identical to 8AUB except for heater rating 12.8v/0.300 ± 0.030a)				
1 8 70		12.8v/0.8a 12.8v/0.15a	250 K	3,800		Diode Pentode	120M4 12EQ7
		12.8v/0.8a	1.5 K				12G8 12FX8
		(Identical to 12FX8 except more control of conversion-conductance characteristic)					
		12.0v/0.3a 13v/0.45a	80 K	8,000 7,500	6	Triode No. 1 Triode No. 2	12M8 13FD7
		13v/0.45a	0.8 K 40 K 0.75 K	1,800 7,200	88 5.4	Triode No. 1 Triode No. 2	13FR7
		(Identical to 8ES7 except for heater rating 14.8v/0.45a)					
		18v/0.3a		3,400	18		15EA7 188K8 17C9
		18.8v/0.15a	100 K	8,000			1784A 17DM4
		18.8v/0.45a	(Identical to 80M4 except for heater rating 18.8v/0.45a)				
70		18.8v/0.45a	1.5 K				178W8 18FW8A 18FX8A 18FY8A 18808A
		(Identical to FW8 except for heater warm-up characteristic) (Identical to FX8 except for heater warm-up characteristic) (Identical to 18FY8 except for heater warm-up characteristic) (Identical to 18G8B except for heater warm-up characteristic)					
		(Identical to 18G8B except for heater warm-up characteristic) 18.8v/0.15a	100 K 5.4 K	8,500 1,300	70	Pentode Triode Diode Pentode	18G8B 19M8
1 8		20v/0.10a	250 K	3,800			20EQ7
1.2 35		10v/0.2a 25v/0.15a 34v/0.1a 38v/0.10a 40v/0.1a	82.5 K 13 K 20 K	1,800 5,700 8,000	100	DC 0C-100 MA PIV-300 V  DC 0C-82 MA PIV 385 V	20E27 250K4 346S5 38AM3A 40FR5
32 8.5		50v/0.1a 50v/0.1a 12.8v/0.225A 28.5v/0.28A 15v/181A	13 K 14 K 8.7 K	5,800 12,800 7,000 8,000	47 8	Forced Air Cooled	50FA5 50FK5 5885A 8000 8188A
2.3 8.8		5.3v/0.3a 12.8v/0.15a	44 K 8.5 K	1,800 4,700	70 31	Unilaterally interchangeable with 8284 Inert Gas-Filled Cold Cathode	8188 8211A 8284A 8354 8884
10		6.3v/0.15a		5,500	80		8878 8892 8848 8908 8950
13		8.3v/0.3a		8,000		Sharp Cut-Off Pentode Water & Forced Air-Cooled Forced Air-Cooling PIV-150 PKV DC DC 10 A	8878 8892 8848 8908 8950

# NEW VACUUM TUBES

TUBE	SPONSOR	TYPE	CONSTRUCTION	APPLICATION	Ep (v)	GRID 2 (v)	GRID 1 (v)
7002	Machlett Labs	Triode	Shielded Grid	Tubes			
7003	Machlett Labs	Triode	Shielded Grid	Switch Tube			
7007	Machlett Labs	Tetrode	High Power VHF TV				
7012	ITT	Power Triode		HV Pulse Oper.			
7030	ITT			Shunting & Charging			
7120	Machlett Labs	Low-mu Triode		Amp-Modulator	10KV		
7121	Machlett Labs	Low-mu Triode		AM-Modulator	10KV		
7185	ITT	RF AMP	3-Electrode	Modulator RFM			
7206	ITT	Triode		Amp. - Osc.			
7207	ITT	Modulator	3-Electrode	Modulator			
7209	Machlett Labs	High-mu Triode	Planar Electrode	Osc. - Amp.			
7210	Machlett Labs	High-mu Triode	Planar Electrode	Osc. - Amp.			
7211	Machlett Labs	High-mu Triode	Planar Electrode	Osc. - Amp.			
7233	GE	Low-mu Triode	9 Pin Min	Regulator in Per. Sup.			
7234	Nat'l. Union	Pentode-Triode	9 Pin Min	Regulator in KW Range			
7235	Nat'l. Union	Pentode-Triode	9 Pin Min	Regulator - Amp.			
7248	Machlett Labs	Tetrode		Tubes - Circuits			
7249	Machlett Labs	Tetrode		(Same as 7248)			
7255	Westinghouse	Power Amp. & Osc.	3-Element	Lower V Power Sup.	9,200		
7308	Amperex	Twin Triodes	9 Pin Min				
7328	ITT	Triode	3 Electrode	Modulator Class AB			
7333	Machlett Labs	Triode	Shielded-Grid	Switch Tube			
7391	GE	Triode	Metal & Ceramic	Grounded Grid-Class C			
7403	Bendix	Power Tetrode	HV Pulse Modulator				
7494	Standard Telephone	Duo-Triode	9 Pin Min	AF & Control	330		
7495	Standard Telephone	Duo-Tetrode	9 Pin Min	VHF Amp./Driver	300		
7500	Standard Telephone	Duo-Tetrode	9 Pin Min	AF Power	350		
7502	Standard Telephone	Duo Heptode	7 Pin Min	Freq. Changer	330		
7534	Amperex	Pentode		Amp.			
7576	Raytheon	Sub. Triode		Amp., VHF-UHF			
7587	RCA	Tetrode		RF-IF Amp.-Mixer	250		
7588	GE	High-mu Triode	Ceramic - Metal	RF Amp. to 500 mc			
7595	CBS	Trigger & Timer		Varia. & hp Currents Req.	350		
7596	CBS	Trigger & Timer		Varia. & hp Currents Req.	400 to 1500		
7597	CBS	Trigger & Timer		Varia. & hp Currents Req.	400 to 1500		
7598	CBS	Trigger & Timer		Varia. & hp Currents Req.	500 to 2500		
7599	CBS	Trigger & Timer		Varia. & hp Currents Req.	300 to 1500		
7600	CBS	Trigger & Timer		Varia. & hp Currents Req.	300 to 1500		
7602	CBS	Trigger & Timer		Varia. & hp Currents Req.	300 to 1500		
7604	Westinghouse	Power Triode	3-Electrode Radiator	Osc. - Amp. Mod.			
7609	Amperex	Tetrode		RF Power - Amp. - Osc.			
7649	RCA	Power Tube		Power Tube & RF - Osc.			
7656	ITT	Power Diode					
7658	Westinghouse	High Voltage		Vacuum Rect.			
7683	Victoreen Instr	Beam Type Pentode	9 Pin Min	Volt. Power Supply			
7685	Westinghouse	Low-mu Triode		Class AB or B-Lin. Amp.			
7688	CBS Elect.	Triple Triode	12-Pin	Meas. Test Equip.			
7689	CBS	Triple Triode		(Same as 7688)			
7690	CBS	Triple Triode		(Same as 7688)			
7691	Westinghouse	Triode	3-Electrode	Pulse Application			
7693	Amperex	RF Pentode	7 Pin Min	Ind. & Mobile			
7694	Amperex	RF Pentode	7 Pin Min	Ind. & Mobile			
7715	Machlett Labs	Triode	Shielded Grid	Switch Tube			
7716	GE	Triode-Pentode	9 Pin Min	Mobile Communications			
7719	Tung-Sol	Triode	Heated Perveance	Computers			
7720	GE	Triode	Ceramic - Metal	UHF Osc.			
7721	CBS	Pentode	9 Pin Min	Wideband Amp.			

## NEW VACUUM TUBES

I <sub>p</sub> (ma)	I <sub>g2</sub> (ma)	HEATER	R <sub>p</sub>	G <sub>m</sub>	AMP FACTOR	REMARKS	TUBE
		8.0v/80a 5v/180a 15v/36a 13v/36a			10	Anode Forced Flow Oil Forced Air-Cooled Forced Air-Cooled Forced Air-Cooled DC OC - 6a PIV 25 - KV	7002 7003 7007 7012 7030
						Water-Cooled Forced Air-Cooled Forced Air-Cooled Circ. Water Forced Air-Cooling Air-Cooled	7120 7121 7185 7208 7207
120		8.3v/1.25a 8.3v/0.15a	230 K	17,500	4.0	Forced Air-Cooled Forced Air-Cooled Forced Air-Cooled Anode 8,000 } Pentode Inode 5ma	7209 7201 7211 7233 7234
5.		8.3v/0.3a	1,000 K	3,800 850		Anode 10KV Max. Pentode Triode Oil Immersed Oper. (Same as 7248)	7234 7235 7248 7249
37		8.3v/83a 8.3v/0.335a		12,500 11,500	28 33	Water & Air-Cooled Triode No. 1 Triode No. 2 Forced Air-Cooled Anode Radiation-Cooled Phy. App. & Dim. Ident. to 6289	7255 7308 7328 7333 7391
37 1.75 57 7.5 4.1		8.3v/17a 12.8v/0.15a 8v/0.75a 8.3/0.45a 8.3v/0.3a		7,000 8,000 5,200 9,000	115 20 25		7403 7494 7495 7500 7502
100 15.5 11.5 25		8.3v/1.7a 8.3v/0.45a 8.3v/0.15a 8.3v/0.4a	10 K 3.1 K	25,000 10,700 12,200 40,000	8.5 48 125	Muivistor Type	7534 7576 7587 7588 7595
							7598 7597 7598 7599 7600
		5v/8a  11v/28a			20	Max. Rtg. Apply to 80 Mcs. Forced Air-Cooled Forced Air-Cooled	7602 7604 7609 7649 7658
20  10.5 1.2		4.0v/8.8a 8.3v/0.15a  8.3v/0.45a 8.3v/0.45a	30 K  7.7 K 82.5 K	5,000  2,200 1,800	  17 100	Forced Air-Cooled	7658 7683 7685 7688 7689
10.0  7.4 7.4		8.3v/0.45a  8.3v/0.15a 8.3v/0.15a 8.0v/80a	10.8 K  0.0013 K 0.0013 K	5,500  4,800 4,800	80  4.8 48	Forced Air-Cooled  Forced Air-Cooled	7690 7691 7693 7694 7715
1.5 24 4 22		13.8v/0.35a  8.3v/0.45a 8.3v/0.24a 8.3v/0.32a	35 K 70 K 7.1 K 0.00012 K	2,800 10,000 3,500 35,000	102  25 85	Triode Pentode	7716 7718 7719 7720 7721

# NEW VACUUM TUBES

TUBE	SPONSOR	TYPE	CONSTRUCTION	APPLICATION	Ep (v)	GRID 2 (v)	GRID 1 (v)
7722	CBS	Pentode	9 Pin Min	Wideband Amp.			
7723	Nat. Electronics	Rectifier		Ind. Power Rect.			
7724	GE	Diode-Duo Triode	9 Pin Min	Volt. Amp.			
7727	Rogers	Pentode		Logarithmic			
7728	CBS	Twin Triode	9 Pin Min	Meas. & Test Equip.			
7729	CBS	Twin Triode	9 Pin Min	Meas. & Test Equip.			
7730	CBS	Twin Triode	9 Pin Min	Meas. & Test Equip.			
7731	CBS	Triode/Pentode	9 Pin Min	Meas. & Test Equip.			
7732	CBS	Pentode	7 Pin Min	Meas. & Test Equip.			
7733	CBS	Pentode	9 Pin Min	Meas. & Test Equip.			
7734	Westinghouse	Triode/Pentode	9 Pin Min	Power Supplies			
7745	Compagnie Indust	Duo Tetrode	Septar 7-Pin Base	RF Power Amp.	800		
7750	Westinghouse	Triode		Hard Tube Mod.			
7751	CBS	Pentode	9 Pin Min	Wideband Amp.			
7753	Amperex	Power Triode	External Plate	Osc. in Ind. Equip.			
7759	Sylvania	Double Triode	Cathode Connections	Osc. or Amps.			
7760	Sylvania	Double Triode	Same as 7759	(Same as 7759)			
7761	Sylvania	Sub Pentode		Adverse Conditions			
7762	Sylvania	Beam Power Pentode		(Same as 7761)			
7779	ITT	Diode		Rectifier			
7784	GE	UHF Triode	Metal & Ceramic Heater	Amp. to 300 MC			
7785	Westinghouse	Power Triode		AM Systems			
7801	RCA	Beam Power	Very Small	Amp. & Osc.			
7802	Tung-Sol	Twin Triode		Power Supplies			
7803	Sylvania	Duo-Triode		Class C Amp.			
7804	Amperex	Power Triode	External Plate	Osc. in Ind. Equip.			
7805	Amperex	Power Triode	Plate & Waterjacket	Osc. in Ind. Equip.			
7806	Amperex	Triode		Osc. in Freq. Up to 30 MC			
7807	Amperex			Osc. in Freq. Up to 30 MC			
7820	ITT	Triode		Modulator			
7835	RCA	Power Triode	Ceramic-Metal	Amp. - Accel.			
7841	GE	Cathode Type Diode	Ceramic & Metal	Detector & Rect.			
7842	RCA	UHF Beam Power		Amp. - Osc.			
7843	RCA			Amp. - Osc.			
7844	RCA	Beam Power		Amp. - Osc.			
7851	Tung-Sol	Tetrode	7 Pin Min		12		
7859	Victoreon	Volt. Regulator	2 Electrode	Volt. Regulator			
7861	GE	Twin Triode	9 Pin Min	Amp. & Mixer			
7867	Tung-Sol	Beam Power Pentode		Audio Output Stages	700		
7870	RCA	Beam Power					
7887	Sylvania	Duo Triode	Sub-Miniature	Osc. Amp. & Circuits	185		
7888	Sylvania	H Gm Triode	Sub-Miniature	UHF Osc.	185		
7889	Sylvania	Duo Triode	Sub-Miniature	Low Level Audio	185		
7892	Tung-Sol	Twin Triode		Pulse, Amp. & Osc.	175		
7895	RCA	Nuvistor Triode		Indust. Equip.	330		
7971	Assoc. Elect. Ind.	Beam Tetrode		Power Supply	800		
7972	Assoc. Elect. Ind.	Beam Tetrode		DC Control	800		
7973	Assoc. Elect. Ind.	Beam Tetrode		R-F Power Amp. to 100 MC	150		
7974	Assoc. Elect. Ind.	Triode			8,000		
7980	Mullard Ltd.	Voltage Ref.	Cold Cath. Disch.				
7985	GE	Tetrode	Metal-Ceramic	Amp./Osc.			



**NEW VACUUM TUBES**

Ip (ma)	I <sub>g2</sub> (ma)	HEATER	Rp	G <sub>m</sub>	AMP FACTOR	REMARKS	TUBE
22	0.7	6.3v/0.32ma	0.0012 K	35,000	85	PIV 920 V Diode Triode Triode Connected	7722
		2.5v/7-11a					7723
		14.0v/0.15a		1,000	72		7724
10.0		12.0v/0.15a	10.0 K	5,500	60	Replacement for 12AT7	7728
		12.0v/0.15a	62.5 K		100	Replace 12AX7	7728
10.5		12.0v/0.15a	7.7 K	2,200	17	Replace 12AU7	7730
18		8.3v/0.45a	5 K	8,500	40	Replace 6AU8 (Triode)	7731
10ma			400 K	5,200		Pentode	
8.5		8.3v/0.3a	800 K	8,000	31.5	Replace 6C88	7732
24		12.0v/0.3a	80 K	12,000		Replace 12BY7	7733
35		8.3v/0.9a	1.08 K	5.4		Triode	7734
5.5			340 K			Pentode	7745
22		6.3v/0.32a	0.00012 K	35,000	85	Forced Air-Cooled	7750
						Forced Air-Cooled	7751
22		28.5v/0.09a		5,400	35		7753
22		28.5v/0.09a		5,000	20		7758
21		28.5v/0.11	50 K	9,000		Same as 8209 C Bend SW CW Magnetron	7761
30		28.5v/0.11a	15 K	4,200			7762
		13. v/38a					7776
		8.3v/0.6a					7764
						7785	
15		12.0v/0.5a		20,000	8	Conduction Cooled	7801
		8.3v/0.365a		12,500	33	Med.-mu High Current	7802
		8.3v/130a				Forced Air-Cooled	7803
		8.3v/130a				Water Cooled	7804
						7805	
		7.0v/110a				Forced Air-Cooled	7806
						Water Cooled	7807
						Air-Cooled	7820
		8.3v/0.215a				Water Cooled	7835
							7841
18		(Identical to 7844 except for heater ratings 28.5v/0.52a)				Conduction Cooled	7842
						Conduction Cooled	7843
		2.5v/0.2a		40	5	Conduction Cooled	7844
						Screen Grid Electrometer Tube	7858
		(Identical to type 5870 except for heater rating)					7861
		8.3v/2.5a	12 K	10,000			7867
		(Identical to 7801 except for heater rating 8.3 ± 10%v/1.0a)					7870
		28.5v/0.09a		5,000	20	General Purpose	7867
		28.5v/0.045a		8,300	27		7888
8.8		28.5v/0.09a		2,800	70	General Purpose	7888
		8.3v/0.8a					7892
		8.3v/0.135a		10,800	74		7895
		8.3v/1.8a		13.5			7871
		28.0v/1.3a					7872
28		2.5v/0.48a			24	Water Cooled	7873
		8.0v/26.0a				Water & Forced Air Cooling	7874
							7880
							7885



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# Specific Material Applications

THESE tables present the results of a study performed to estimate component and materials characteristics under heavy irradiation. This work is an extrapolation of existing data and many more extensive and specific tests have to be performed before information on the characteristics is complete.

The following parameters and assumptions were used to extrapolate existing data.

1. Time of exposure  $\approx$  9,000 hours  $32 \times 10^6$  seconds

2. Location of radiation is center of first Van Allen Belt (high proton density). Tentative radiation intensities<sup>13</sup> are:

Electrons of energy greater than 20 kev	$2 \times 10^9/\text{cm}^2/\text{sec}$
Electrons of energy greater than 600 kev	$1 \times 10^7/\text{cm}^2/\text{sec}$
Protons of energy greater than 40 mev (avg. 60 mev) (Ref. 12)	$2 \times 10^4/\text{cm}^2/\text{sec}$
Energy of 20 kev electrons = $20 \times 10^3 \times 1.6 \times 10^{-12} \times 2 \times 10^9 \times 32 \times 10^6 =$	$2.04 \times 10^9 \text{ ergs}/\text{cm}^2$
Energy of 600 kev electrons = $6 \times 10^5 \times 1.6 \times 10^{-12} \times 2 \times 10^7 \times 32 \times 10^6 =$	$6.1 \times 10^8 \text{ ergs}/\text{cm}^2$
Energy of 60 mev protons = $6 \times 10^7 \times 1.6 \times 10^{-12} \times 2 \times 10^4 \times 32 \times 10^6 =$	$6.4 \times 10^7 \text{ ergs}/\text{cm}^2$

3. Solar burst radiation is ignored, even though it has been observed to produce high energy protons sufficient to penetrate 5.3 cm of lead and up to 35 cm of human tissue (or its equivalent in organic materials such as plastics)<sup>13</sup>. It is believed that the worst effect of solar burst radiation levels may be a temporary blackout of electrical function in the equipment. The duration of the blackout is a function of the duration of the burst. Shielding against this intensity is believed impractical.

4. The extra hazard due to the relative motion of a vehicle and the more or less stationary radiation cloud is ignored.

5. The effect of ordinary cosmic rays is ignored.

6. Although it is known that the electron impact on the skin of the vehicle produces gamma radiation, the flux ( $10^{-2} \text{ ergs}/\text{cm}^2$ ) of this gamma radiation is so low that no significant material or electrical effects are anticipated. Therefore, secondary gamma effects (bremstrahlung) are neglected in the discussion.

7. The heating effect of the energy input on components will be ignored although this can be readily calculated from the figures in item 2 and the material constants.

Table 1. Capacitors

Element	Materials	Estimated Damage
Case	Silver-plated copper aluminum	Negligible
Electrolyte	Lithium chloride or equivalent	Increase in conduction beneficial
Valve metal	Tantalum	Negligible
Dielectric coating	Tantalum oxide	Negligible
Leads	Nickel	Negligible
Seals for leads	Teflon	Serious mechanical breakdown and loss of insulation
Seals for leads	Buna N	Some loss of insulation
Paper separator (if used)	Alpha cellulose	Negligible

Table 2. Resistors

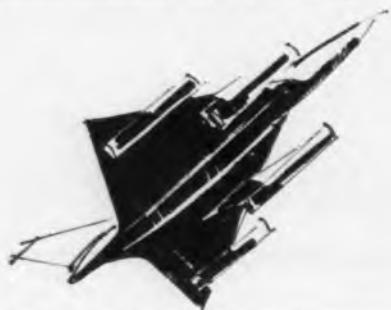
Element	Materials	Estimated Damage
Case	Mineral-filled phenolic	Negligible
Filler	Carbon in a phenolic binder	Unpredictable — drop in resistance
Leads	Tinned copper	Negligible

(More Tables on page 103)

These tables supplement the article "How Radiation Affects Material" by Dr. Robert B. Shane which appeared in the April 1961 issue of *Electronic Industries*.

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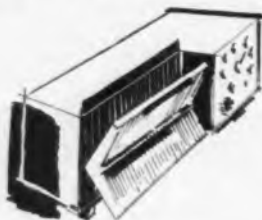
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**Armco Division**

Element	Materials	Estimated Damage
Case	Kovar glass	Negligible (darkening of glass)
Leads	Kovar	Negligible
Lead Seal	Kovar glass	Darkening—but negligible
Element	Silicon-doped	*

The possibility of shielding this component should be investigated. The behavior of both silicon and germanium elements are essentially similar.

\* Collapse of Collector characteristics for common emitter connection is accompanied by relatively large changes in collector-base leakage currents.

Element	Materials	Estimated Damage
Case	Steel-plated	Negligible
Absorbent (if present)	Silica gel, calcium carbonate, etc.	Negligible
Leads	Kovar	Negligible
Lead Seal	Kovar Glass	Negligible
Element	Silicon or Germanium	*

\* See Table 3.

Material	Use	Estimated Effect of Radiation
Silicone Oil	Lubricate bearings	Some outgassing and increase in viscosity
Petroleum Oil	Lubricate bearings	Some outgassing and increase in viscosity
Diesters	Lubricate bearings	Some outgassing and increase in viscosity
Molybdenum Disulfide	Lubricate bearings	Negligible
Silver plating	Bearings	Negligible
Mylar	Insulation winding in slots of motor stator	Some loss in insulation—otherwise negligible
Polyurethane insulation	Magnet wire of motor stator	Some loss in insulation—otherwise negligible
Ceramic	Magnet wire of motor stator	Negligible
Hookup-Wire, Polyvinyl chloride, Nylon overcoat	System wiring	Not advisable to use
Hookup-Wire, Silicone Rubber	System wiring	Negligible
Shielded wire, Polyvinyl chloride, Nylon overcoat	System wiring	Not advisable to use
Bus Wire, Polyvinyl chloride, Nylon overcoat	System wiring	Not advisable to use
Sleeving, Polyvinyl chloride	System wiring	Not advisable to use
Lacing Cord Round Nylon	System wiring	Negligible
Glyptal alkyd varnish	To secure hardware	Negligible; epoxy is better
Neoprene insert material	Connectors	Negligible except for some loss of insulation
Silicone insert material	Connectors	Negligible except for some loss of insulation
Diallyl phthalate insert material	Connectors	Negligible except for some loss of insulation
Mica insulating	Tube sockets	Negligible
Steatite	Tube sockets	Negligible
Potting Compound, polyurethane, Nopco C6C8SS	Welded wire matrix	Negligible
Teflon	Insulator	Not advisable to use



Photo courtesy DU PONT MAGAZINE

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- (b) are reactive at the high temperatures customarily 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	COMPOSITION	PARTICLE SHAPE	PREDOMINANT PARTICLE SIZE (Microns)	SURFACE AREA m <sup>2</sup> /g	APPARENT DENSITY		% PURITY		% MOISTURE (Loss at 105° C)	LOSS ON IGNITION	TYPICAL CHEMICAL ANALYSES								
					S.V.†† GMS./CM <sup>3</sup>	TAPPED GMS./CM <sup>3</sup>	Min	Max.			Min	Max.	% WATER SOLUBLE SALTS	% SiO <sub>2</sub>	% TiO <sub>2</sub>	% SO <sub>2</sub>	% Al <sub>2</sub> O <sub>3</sub>	% Cu	% Mn
					***		Min	Max.			Min	Max.	Min	Max.	Min	Max.	Min	Max.	Min
Yellow Light Lemon 100	ferric oxide hydrate	acicular	0.4-0.8	22.4	.14	.35	98.8	.30	11.5	.04	.05	.002	.20	.001	.03	.015			
EG-1*	magnesium ferrite	acicular	0.4-1.2	4.7	.18	.40	99.3	.10	.05	.35	.05	.002	.10	.001	.02	.015			
EG-2**	zinc ferrite	acicular	0.4-1.2	3.5	.27	.59	99.5	.10	.05	.05	.10	.002	.02	.001	.02	.010			
EG-3	gamma ferric oxide	cubical	0.3-1.2	8.7	.39	.71	98.8	.05	.80	.05	.03	.02	.05	.002	.002	.10			
Red 110-2	alpha ferric oxide	cubical	0.3-1.2	5.4	.33	.67	99.1	.05	.25	.05	.03	.02	.10	.002	.002	.08			
EG-60	alpha ferric oxide	cubical	2.0-4.0	2.8	.45	1.00	99.3	.05	.20	.05	.03	.02	.10	.002	.002	.08			
EG-80	alpha ferric oxide	cubical	3.8-5.9	1.3	.85	1.74	99.3	.05	.10	.05	.03	.02	.03	.002	.002	.08			
Red 297	alpha ferric oxide	spheroidal	0.3-0.8	8.4	.30	.59	99.3	.05	.30	.08	.05	.001	.05	.01	.001	.01			
Red 347	alpha ferric oxide	spheroidal	0.3-0.9	7.4	.32	.61	99.4	.05	.20	.05	.05	.001	.05	.01	.001	.01			
Red 387	alpha ferric oxide	spheroidal	0.3-1.1	6.5	.33	.69	99.4	.05	.20	.05	.05	.001	.05	.01	.001	.02			
Red 477	alpha ferric oxide	spheroidal	0.4-2.0	5.9	.36	.74	99.5	.05	.15	.04	.05	.001	.05	.01	.001	.02			
Red 567	alpha ferric oxide	spheroidal	0.4-2.6	4.9	.37	.74	99.5	.05	.15	.04	.05	.001	.05	.01	.001	.03			
Red 617	alpha ferric oxide	spheroidal	0.4-3.7	3.9	.39	.74	99.5	.05	.15	.04	.05	.001	.05	.01	.001	.03			
Red 516-M	alpha ferric oxide	acicular	0.3-1.0	26.4	.14	.32	97.0	.10	1.0	.10	.05	.002	.15	.001	.03	.015			
Black†	synthetic magnetite	cubical	0.2-0.8	6.7	.34	.71	98.3	.30	2.2	.20	.15	.004	.30	.002	.05	.025			

\*MgO 18.7-19.2%—U.S. Patent 2,502,130

\*\*ZnO 32.6-32.8%—Pat. Appl. For

\*\*\*As determined by nitrogen adsorption

†FeO 21%-22%

††Scott Volumeter

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# COMPUTERS 1961



**SPECIAL JANUARY ISSUE**

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*terminals*



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**NEW CERAMETERM\* TERMINALS—THE ANSWER TO TERMINAL PROBLEMS IN ELECTRONIC EQUIPMENT** This new Bendix development provides super-reliability for transistor platforms, feed-thrus, terminals, and multiple headers of all sizes, types, and shapes. Today, it is solving three troublesome problems. 1. Soldering heat that causes ordinary glass to crack. 2. Insulation cracking through shock or impact. 3. Leakage due to glass insulation failure when bending or adjusting pins. Has vacuum-tight seal. Withstands shearing stress of 11,000 psi without failure. Ideal for encapsulated devices. Write for free sample.

\*Trademark for Bendix' practically indestructible, alumina-insulated ceramic-metal terminal assembly.

**ELECTRON TUBE PRODUCTS**

**Red Bank Division**

EATONTOWN, NEW JERSEY





# Government Contract Awards

The following list classifies and gives the value of electronic equipment selected from contracts awarded by government agencies from January to December 1960. These contract awards appeared in "Synopsis of U. S. Government Proposed Procurement Sales and Contract Awards," issued daily by the U. S. Department of Commerce. It does not list classified contracts or awards for less than \$25,000.

Accelerometers	320,185	Data transfer system, radar	2,963,046	Loudspeakers	201,442
Altimeters, radio	80,000	Decoders-coders	494,819	Mapping set, video	852,500
Amplifiers	8,209,740	Decommutator, telemetry	36,815	Measuring sets	1,308,134
Analizers	1,122,124	Degreaser, ultrasonic	307,704	Memory systems	191,773
Anodes, cathode protection	63,401	Delay lines	53,984	Meters and motor movements	4,789,240
Antennas and antenna equipment	20,511,276	Detectors	496,506	Microphones	711,299
Armature assemblies	35,274	Direction finders	1,340,980	Microscope, electron	63,073
Assemblies, demultiplexer	269,039	Discriminators	188,968	Modulators and modulator systems	154,759
Assemblies, gyro	26,613	Dosimeters, radiac	29,472	Modules, r-f	58,240
Attenuators	139,139	Drying chambers, vacuum	46,608	Modules, servo	27,588
Batteries	15,262,453	Dummy loads	26,004	Monitors and monitor systems	613,209
Beacon, radar	214,932	Duplexers	27,840	Motors, servo	866,813
Beacon, radio	105,575	Dynamometers	115,974	Multi-couplers, antenna	1,186,760
Blower assemblies	316,000	Echo sounders	297,650	Multiplexing system, voice	824,039
Boxes, junction	74,988	Electronic equipment, general	289,731	Multipliers, frequency	25,503
Buffers, synchronizer	69,480	Environmental chambers	99,875	Multipliers, r-f	49,888
Cable	4,845,633	Equipment, data reduction	64,000	Navigation systems, radar	532,119
Cable assemblies	2,027,869	Feed horns, radar	73,169	Networks, impedance	27,056
Calibrators	1,479,863	Filters	31,560	Networks, pulse forming	58,983
Capacitors	245,513	Filters, antenna	1,219,204	Oscillators	4,430,529
Cavity assemblies	102,999	Filters, band-pass	132,307	Oscillographs	642,582
Cavity, tuned	27,026	Filters, dc power	54,215	Oscilloscope	5,336,359
Cells, fuel	266,243	Filters, r-f	233,181	Paper, recording	51,647
Cells, standard	43,486	Flash units, electronic	35,094	Pedestals, antenna	36,507
Chambers, anechoic	97,822	Fuses	159,014	Plotters, systems	61,700
Chambers, vacuum	362,252	Fuse holders	31,532	Potentiometers and assemblies	331,755
Changers, frequency	229,230	Galvanometers	90,000	Power supplies	2,024,142
Channel selectors	41,870	Generators, function	60,000	Pre-amplifiers	241,019
Chargers, battery	164,189	Generators, pulse	188,148	Printers, page	1,158,117
Choppers	25,110	Generators, special purpose	611,680	Probes	102,038
Circuit breakers	127,766	Generators, thermal noise	35,263	Processors, flight test data	229,000
Clocks, digital	121,750	Generators, thermoelectric	87,720	Programmer, electronic	27,650
Coders, transponder	1,736,788	Generators, timing code	99,300	Programming sets	374,133
Coils	292,098	Generators, trigger	364,845	Radar	104,017,347
Communication equipment	26,583,392	Generators, VOR	50,177	Radiac sets	2,029,039
Compass sets	303,709	Governors, electronic	54,120	Radiation sets, solar	35,040
Computer equipment	1,695,910	Ground stations, communications	200,000	Radiometers	93,915
Computers and computer systems	13,963,671	Ground stations, FM/FM telemetry	84,867	Radiomes	1,663,122
Connectors and adapters	701,251	Ground stations, satellite	200,000	Radiosonde sets	770,393
Consoles	251,127	Ground stations, telemetry	39,613	Radio sets	16,039,760
Contacts, crystal	73,295	Gyroscopes	7,895,655	Radio stations	70,558
Controls	8,687,336	Gyros, rate	172,059	Ranging equipment	79,850
Converters	1,813,036	Height sets, cloud	457,150	Reactors	82,548
Correlators, video radar	135,906	Headsets-handsets	2,367,670	Readers, film	40,197
Countermeasures sets	318,725	Homing sets, radar	960,000	Readouts	100,000
Counters	89,220	Hydrophones	50,720	Receivers	20,464,261
Couplers, antenna	1,398,304	Indicators	2,502,931	Receiver-amplifiers	66,945
Couplers, sonar	104,127	Infra-red equipment	418,613	Receiving array, fixed buoy	275,000
Cruisers, video-tape	125,000	Instrumentation, digital	33,114	Reconnaissance sets	1,900,000
Crystal units	209,530	Insulators	130,193	Recording equipment	253,121
Data handling equipment	80,330	Intercom systems	2,007,700	Recorders	3,101,885
Data processing	446,443	Inverters	1,010,531	Recorder/reproducer, magnetic tape	4,496,232
Data sets, coordinate	2,016,250	Inverter synchronizers	27,900	Rectifiers	316,615
		Ion sources	86,850		

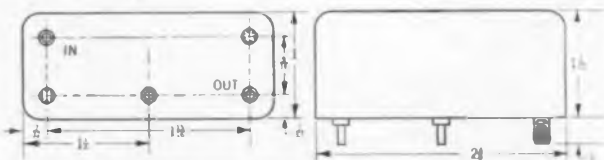
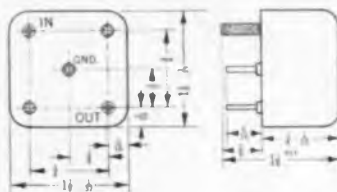


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in practical large percentage  
bandwidth crystal filters*

**With Midland type NB Miniature 1.8% wide band pass 10.7 MC crystal filters**

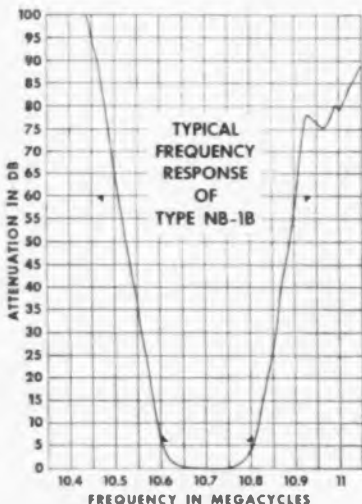
The Types NB-1 and NB-1B are four-crystal networks contained in a hermetically sealed package with a volume less than 1 cu. in. and 2.5 cu. in. respectively. The center frequency of both types is 10.7 MC  $\pm$  3KC with a 6db bandwidth of 200KC + 10KC, - 0 KC and an ultimate minimum rejection of 100db. Singly used they exhibit a maximum 60db 6db bandwidth ratio of 2.25:1. Because they are small in size, two of the same type can be used in cascade with an active network between filters to produce an 80db 6db bandwidth ratio of better than 1.7:1, with an ultimate rejection of over 120db. Small quantities for engineering evaluation are available *immediately* from stock. Midland invites consultation at any time for potential crystal filter users.



**CRYSTAL FILTER SPECIFICATIONS**

	TYPE NB-1	TYPE NB-1B
Center Frequency . . . . .	10.7MC $\pm$ 3KC	10.7MC $\pm$ 3KC
Bandwidth @ 6db . . . . .	200KC + 10KC, - 0 KC	200KC + 10KC, - 0 KC
Bandwidth @ 90db . . . . .	450KC Max.	450KC Max.
Bandwidth Ratio . . . . .	2.25:1 Max.	2.25:1 Max.
Ultimate Rejection . . . . .	90db Min.	100db Min.
Insertion Loss . . . . .	12db Max.	*8db Max.
Required Source / Load Resistance . . .	50 ohms $\pm$ 5%	50 ohms $\pm$ 5%
Inband Ripple . . . . .	1db Max.	*1.5db Max.
Inband Ripple at Temperature Extremes . . . . .	1.5db Max.	*2.5db Max.
Operating Temperature . . . . .	-55° C to +80° C	-55° C to +80° C
Shock . . . . .	100 g	100 g
Vibration . . . . .	15 g to 2KC	15 g to 2KC

\*The Type NB-1B can also be provided with an insertion loss of 12db max.; inband ripple of .5db max.; and inband ripple at temperature extremes of 1db max. When ordering, specify required insertion loss and ripple.



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Regulators, circuit	12,480
Regulators, voltage	102,625
Relays	1,187,175
Relay, armature	1,077,489
Relay assemblies	323,754
Repeaters, telephone	148,518
Resistors	2,459,187
Resistor assemblies	2,240,237
Resolvers	646,257
Semiconductors	532,618
Semiconductor devices	481,858
Servos and synchros	2,134,821
Sets, detecting	385,474
Signal generators	2,809,838
Simulators, radar	713,000
Simulator, digital	38,028
Solenoids	157,116
Sonar equipment	350,020
Sources, r-f, modulated	54,570
Spectrographs	98,080
Spectrometers	272,886
Standards	1,820,318
Stations, call stations	113,555
Stop mechanism, torn tape	124,777
Stroboscopes	61,620
Suppressors, radar signal	149,416
Switchboard equipment	1,148,498
Switches	3,064,076
Systems, automatic flight control	1,399,093
Systems, communication	1,088,352
Systems, data handling	78,000

System, digital data logging	27,840
Systems, equalization	53,755
Systems, flight control	332,999
Systems, inertial navigation	145,000
Systems, jamming	197,447
Systems, microwave	566,148
Systems, radar data distribution	705,000
Systems, recording, strain gage	31,236
Systems, surveillance drones	8,486,025
Systems, telephone carrier	40,354
Systems, tropospheric scatter	185,902
Systems, wave analysis	63,100
Synthesizers	192,940
Tabulation & plotting systems, digital	98,545
Tape assembly	68,952
Tape, electronic	280,896
Tape handler, digital	50,410
Tape, magnetic	831,136
Tape, recording, plastic	75,000
Tape, transport	51,724
Telemetry equipment	3,144,614
Telephone equipment	1,622,185
Teletypewriters	63,647
Teletypewriters	6,315,929
Terminal blocks & boards	43,143
Terminal equipment	342,356

Terminal sets, data	3,173,820
Terminal, telephone	3,820,949
Testers	2,000,947
Test equipment	5,977,658
Test sets	4,677,615
Towers	257,887
Tracking equipment	386,283
Transceivers	9,490,942
Transducers	744,799
Transformers, miscellaneous	1,493,659
Transistors	488,234
Translators	66,988
Transmitters	31,228,642
Transmitters, rate gyro	44,208
Transmitters, synchro	456,970
Transponder sets	4,739,911
Tubes, CRT	175,168
Tubes, electron	27,131,765
Tubes, klystron	10,470,181
Tubes, magnetron	4,374,422
Tuning units	461,201
Turntables, gyro test	103,845
TV sets & systems	219,052
Vibrators	119,485
Waveguide equipment	726,408
Wire	472,219
X-Ray equipment	174,267

**CONTRACT AWARDS—FIRST QUARTER OF 1961**

Amplifiers	1,272,226
Antennas & antenna systems	4,939,722
Attenuator	149,689
Batteries	3,877,211
Beacons	386,503
Brushes	52,042
Buffers, large screen display	44,156
Cable	670,375
Cable assemblies	367,932
Calibrator, instrument	25,551
Calibration set	1,262,700
Capacitors	738,251
Cells, fuel	57,097
Chopper, electronic	67,250
Circuit breakers	28,051
Cleaning system, ultra-sonic	33,772
Coil assembly	26,568
Coil, deflection	34,450
Communication equipment	626,090
Compensators	3,210,874
Computer, airborne navigation	150,000
Computer, digital military	210,491
Connectors	65,808
Controls, speaker-amplifier	104,991
Control set	524,858
Control system, pulse coded	29,387
Converters	2,255,648
Coordinate data set	565,200
Cores, magnetic memory	49,888
Correlators, video	64,000
Delay lines	161,789
Dewars, cryogenic	27,294
Digital tape handlers	38,250
Discriminators	223,470
Discriminator system	58,345
Data processors	55,000
Echo box	83,655
Echo sounder, special purpose	102,850
Filters	46,610
FM/FM system	40,520
Fuse, radar	151,578
Gages, inspection	37,425
Generators, noise	147,930
Generators, thermal noise	42,843
Generators, pulse	73,805
Gyroscopes	1,374,308
Headset	287,917
Hydrophones	46,875
Indicators	1,184,420

Intercom units	123,834
Inverters	90,597
Lie detectors, recording	52,099
Meters	1,403,496
Microphones	1,059,697
Microphone assemblies	31,675
Microwave terminal equipment	87,953
Module, digital	61,917
Monitors	490,516
Motors, servo	91,341
Oscillators	931,862
Oscillator assemblies	58,703
Oscillograph	83,973
Oscilloscope	69,280
Phase shifter	26,936
Power supplies	1,542,829
Radar	25,544,351
Radar beacons	46,900
Radar towers	837,731
Radiac sets	45,969
Radio direction finder	1,359,925
Radio set	9,507,295
Radome	152,634
Radiosonde set	1,606,904
Radio transmitting set	3,040,476
Range finder, computer	2,667,720
Receivers	279,973
Recording equipment	429,359
Recorder, analyzer	115,283
Recording oscillographs	30,875
Record playback system	49,896
Recorder/reproducer, magnetic tape	25,977
Recorder system, airborne	149,347
Recording system, PCM telemetry	278,148
References, a-c	43,226
Relays	179,218
Relay, armature	191,863
Relay assembly	35,063
RF patching system	89,631
Resistor assembly	43,400
Resistors	764,402
Resolvers	260,791
Resonator, selector cavity	34,981
Semiconductors	122,540
Servos	102,447
Signal generators	154,656
Solenoids	28,155

Sounders, echo	296,700
Spectrum analyzer	57,492
Standards, capacitance	31,965
Static frequency changers	147,892
Switches	713,779
Switching units, antenna	78,501
Synchros	57,317
System analyzer, RF	130,000
Systems, antenna	262,823
Systems, digital	169,650
Systems, measuring	95,456
Systems, microwave relay	41,195
Systems, processing	180,000
Systems, multiples receiver	29,100
Systems, radio	10,296,626
Systems, telemetering	90,967
Tape, magnetic	329,981
Tape, recorder	125,199
Telegraph system	48,500
Telemetry station, ground	198,584
Telemetry equipment	196,677
Telephones, field	2,231,319
Telephone set	379,500
TV equipment	116,569
Terminal telegraph	2,506,717
Terminal, telephone	6,087,194
Test & Calibration system	129,889
Test equipment	677,001
Test sets	1,833,256
Timers	200,797
Trainers, radar	197,797
Trainers, weapons system	1,770,893
Tracking system, infra-red	42,787
Transducers	1,880,167
Transceivers	476,660
Transformer assembly	104,700
Transformers	147,914
Transmitters	3,171,429
Transmitters, teletype	736,544
Transponders	47,000
Transistors	56,000
Translator, magnetic tape	46,460
Transmission system, photo	1,250,000
Tubes, electron	7,813,204
Tubes, magnetron	1,288,985
Ultrasonic cleaners	46,402
Video mapping groups	79,137
Viewing set, infra-red	58,800
Wing measuring set	521,355

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Pinpoint accuracy...the highest stability...plus proved reliability in service—all are yours with Motorola Precision Frequency Standards. Here is equipment tailored to the precision calibration and measurement demands of today's advanced electronic circuitry...equipment you can depend on to do the job right, whenever and wherever needed!



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RECEIVER FREQUENCY STANDARD**  
Model S1055A \$5,850.00

- Precise no-drift standard
- Completely transistorized
- Receives NBA (18 kc) or WWVL (20 kc) VLF signals
- Automatic servo tracking
- 10 kc, 100 kc, 1 mc and recorder outputs
- $\pm 2 \times 10^{-9}$  constant accuracy
- $\pm 5 \times 10^{-10}$  short term stability
- $\pm 1 \times 10^{-9}$  per day local osc. only



**1.0 to 5.0 mc HIGH  
STABILITY OSCILLATOR**  
Model SLN6039A \$650.00 for  
3.0 or 5.0 mc...other frequency  
prices on request

- $\pm 1 \times 10^{-9}$  per day stability
- $\pm 5 \times 10^{-10}$  per hour stability
- Warm-up, at  $-30^{\circ}\text{C}$ , 10 min, to  $1 \times 10^{-8}$
- 26 VDC  $\pm 4$ , input voltage
- At  $+25^{\circ}\text{C}$ , 4.5 watts power consumption
- $-55^{\circ}\text{C}$  to  $+80^{\circ}\text{C}$  oper. temp. range
- Meets MIL specifications



**PORTABLE FREQUENCY STANDARDS**  
Model S1054A \$1,400.00  
Model S1054B \$1,600.00

- $\pm 5 \times 10^{-10}$  per day (S1054B)
- $\pm 1 \times 10^{-9}$  per day (S1054A)
- 1 mc and 100 kc outputs
- Optional ni-cad standby batteries
- Completely transistorized
- Rack mounting same price
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Made for the most critical laboratory circuit measurements, yet light in weight and battery-operated for field use, these highly sensitive instruments are Motorola-designed and built for dependable, trouble-free service. Ideal for use in precision measurements of the most sensitive, transistorized electronic circuitry—anytime...anywhere.



**TRANSISTORIZED AC VOLTMETER**  
Model S1051B (Battery Only) \$185.00  
Model S1053A (Battery/117 VAC)  
\$225.00

- Accuracy  $\pm 3\%$ , 20 cps to 1 mc  $\pm 1$  db, 5 cps to 2.5 mc
- 100 uv to 300 volts in 12 ranges
- Input impedance 10 meg. by 15 uuf on volt ranges, 1 meg. by 30 uuf on millivolt ranges
- Battery life over 400 hours



**ELECTRONIC DC MULTIMETER**  
Model S1052A \$195.00

- 2 mv to 1000 volts in 9 ranges
- 20 uamps to 300 milliamps in 12 ranges
- 0.2 ohms to 5 megohms in 5 ranges
- Accuracy  $\pm 3\%$  voltage,  $\pm 5\%$  others
- 11 megohms input resistance
- Battery life over 400 hours

All portable instruments include removable front cover which can be stored on rear of unit.

Specifications subject to change without notice



## **MOTOROLA** PRECISION MEASURING INSTRUMENTS

Motorola Communications & Electronics, Inc.

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Contact your nearest Motorola Instrument Representative for complete details:

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# How to cure traveling wave tube headaches

If you have TWT headaches—finding a microwave amplifier *now*—which produces high gain and wide bandwidth *with* high average and peak powers—Hughes may have just the prescription for you. Hughes TWT's provide all these desirable features with built-in long life, ruggedness and dependability. They fully exploit the advantages of permanent magnet periodic focusing in both glass and metal-ceramic structures, and many are available in either gridded or ungridded versions.



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MICROWAVE TUBE DIVISION

typical twt's available now:



**311H 2.0-4.0 KMC** Gridded 1 KW minimum peak power output, 1% duty, 36db small signal gain @ 50 mw input. Weight 13 lbs. Length 17-7/16".



**312H 2.0-4.0 KMC** Gridded 1 KW minimum peak power output, 1/2% duty, 36db small signal gain @ 50 mw input. Weight: 11 lbs. Length: 15-3/8".



**304H 2.0-4.0 KMC** Ungridded. 1 KW minimum peak power output, 1% duty, 37db small signal gain @ 1 mw input. Weight: 12-1/2 lbs. Length: 17-31/32".



**307H 0.5-0.5 KMC** 50 KW minimum peak power output (500 watt average), metal-ceramic construction, 54db saturation gain, 1% maximum duty cycle, beam voltage = 38 kv. Wt. 21 lbs. Length: 24".

Hughes also has a complete line of  $K_u$ -band backward-wave oscillators for commercial and military applications. Write or telephone today for full information or a catalogue concerning the broad line of Hughes TWT's available in L, S, C & X bands.  
Hughes Microwave Tube Division, P. O. Box 90427, Los Angeles 45, California.

# FROM MOLTEN SOLDER TO COLD WATER

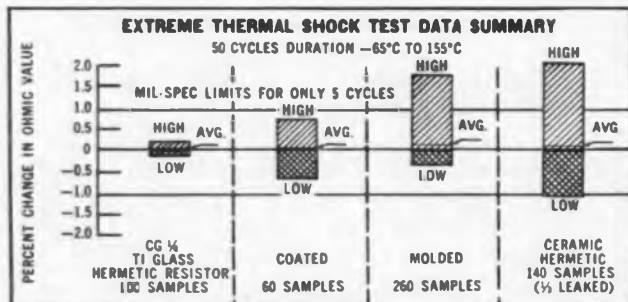


## Positive Proof: TI HARD GLASS ENCAPSULATED RESISTORS Give You Unexcelled Resistance to Thermal Shock

Make this dramatic test yourself and discover why Texas Instruments *hard glass* encapsulated carbon film resistors outperform those of any other construction. First torture the resistor by immersing it in molten solder at 350°C — then quickly dip it in water. Now, test the device for electrical stability and mechanical intactness and you'll find as we have that these precision hermetic resistors are completely unaffected by violent thermal shock. Such performance is possible ONLY because TI type CG 1/4 and CG 1/2 resistors are protected by a *hard glass* encapsulant and entirely *solderless* construction. These same features virtually eliminate possible damage to the resistors during installation in your assemblies.

The extreme thermal shock test is only one of many tests that have proven over the past two years that TI type CG 1/4 and CG 1/2 resistors are virtually indestructible. Over eleven million unit hours of test data have been compiled on moisture resistance, thermal shock, extended overload, and load life to *prove* that TI hard glass encapsulated resistors give you reliable performance under *all* environments and operating conditions. When you specify TI CG 1/4 and CG 1/2 hermetic resistors, you can be assured of getting the most rugged, reliable, precision resistors available... at prices you would pay for *ordinary* resistors!

Take advantage of the *proven* reliability of TI hard glass resistors... order them *today* through your nearby TI Sales Office or authorized TI Distributor.



SPECIFICATIONS				
CG 1/4				
METAL BALL				
TI type number	wattage rating	MIL designation	standard resistance ranges	maximum recommended voltage
—	watts	—	—	volts
CG 1/4	1/4	RN60B	24.9Ω to 1 megΩ	350
CG 1/2	1/2	None	10Ω to 100k	250

Call or write today for complete specifications on TI's CG 1/4 and CG 1/2 resistors, or any of TI's complete line of semiconductors and components: silicon and germanium transistors, diodes and rectifiers, precision resistors, resistor<sup>®</sup> silicon resistors, tan-TI-cop<sup>®</sup> tantalum capacitors.



18160

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# Nylon Connectors

The industry's most complete line of nylon jacks, binding posts, and solderless plugs!

- Shock-proof nylon construction—won't chip or crack with the hardest usage.
- Provides high voltage insulation—voltage breakdowns up to 12,500 volts DC
- Highly resistant to extremes of heat, cold, and moisture.
- Plugs designed for simplified, solderless connection of up to 16 gauge wire.
- Economical—simple, functional engineering design gives you top quality at low cost.
- Available in many distinctive colors for coded applications.

## Nylon Printed Circuit Plug and Jacks—wide variety of colors!

**Sub-miniature Tip Plug**—.081 dia. for use with miniature jacks. Nickel-plated, machined brass body, solder type lead connection.

**Horizontal Jack**—Unique design accepts .081 dia. tip plug in either end, or from top or bottom! Silver-plated phosphor bronze formed contact. Two terminals.

**Vertical Jack**—Accommodates .081 dia. tip plug—requires minimum mounting area. Silver-plated, machined beryllium copper contact.



## Free Catalog

Johnson also manufactures a complete line of standard connectors in addition to the nylon items listed above. For complete specifications and current prices on all Johnson electronic components, write for our newest components catalog.



Tube Sockets



Variable Capacitors



Insulators



Knobs  
Dials



Pilot  
Lights



Inductors

105-301 to -313  
(Patent Pending)



**TIP PLUG**—Nylon sleeve. Metal parts nickel-plated brass. For solderless connection up to 16 gauge wire. Fits standard tip jacks. Current rating: 10 amps.

105-601 to -613  
(U. S. Pat. No. 2,704,357)



**DELUXE TIP JACK**—Molded nylon body with recessed silver-plated machined beryllium copper contact. Hot tin dipped solder terminal. Current rating: 10 amps. Voltage breakdown: 11,000 volts DC. Capacity to 1/8" panel: 2.0 mmf. 1/4"-32 nut furnished.

105-601 to -613



**STANDARD TIP JACK**—Molded nylon body with recessed, silver-plated formed phosphor bronze contact. Current rating: 10 amps. Voltage breakdown: 9,000 volts DC. Capacity to 1/8" panel: 2.0 mmf. 1/4"-32 nut furnished.

105-701 to -713



**JACK AND SLEEVE**—Includes Deluxe Tip Jack (105-601 to 105-613), less mounting nut, with inside threaded molded nylon sleeve. Ideal for patch cords, or insulated rear connection of panel mounted tip jack.

105-681-16 to -693-16



**RAPID-MOUNT TIP JACKS**—Low cost—fast mounting! Snap "speed clip" into hole in .061 to .069 thick panels and insert jack. Silver-plated phosphor bronze contact. Voltage breakdown: 7,000 volts DC. Capacity to 1/8" panel: 3.8 mmf. Current rating: 10 amps.

105-251 to -263



**STANDARD METAL-CLAD TIP JACK**—Nylon body, nickel-plated machined brass jacket. Formed, silver-plated phosphor bronze contact. Current rating: 10 amps. Voltage breakdown: 7,000 volts DC. Capacity to 1/8" panel: 3.8 mmf. 1/4"-32 nut furnished.

105-201-200 to -213-200



**MILITARY METAL-CLAD TIP JACK**—Complies with MS-16108 or MIL-STD-242A. Heavy nickel-plated brass jacket. Silver-plated, machined beryllium copper contact. Current rating: 10 amps. Voltage breakdown: 8,000 volts DC. Capacity to 1/8" panel: 3.8 mmf. 1/4"-32 nut and lock washer furnished.

105-101-200 to -113-200 Like above, lower price. Formed contact. Voltage breakdown: 5,000 volts DC.

100-301 to -313  
(Patent Pending)



**BANANA PLUG**—Molded nylon sleeve. Body and pin constructed of one-piece, nickel-plated brass with high grade nickel silver spring. For solderless connection of up to 16 gauge wire. Current rating: 10 amps.

100-201 to -213  
(Patent Pending)



**DUAL BANANA PLUG**—High quality nickel silver springs—bodies nickel-plated. Machined brass studs extend full length of pins. Solderless connection up to 16 gauge wire. Polarity indication and strain relief hole. Voltage breakdown: 10,000 volts DC. Capacity plug-to-plug: 1.3 mmf. Current rating: 15 amps.

100-901 to -913



**BANANA JACK**—Molded nylon body with recessed cadmium-plated insert. Accommodates .175" dia. plug. Voltage breakdown: 12,500 volts DC. Capacity to 1/8" panel: 2.4 mmf. 5/16"-32 nut furnished.

111-101 to -113  
(U. S. Pat. No. 2,806,999)



**BINDING POST**—Nylon body, silver-plated brass shank. Self-captivated thumb nut. Insulation resistance greater than 200 meg. after MIL-T-5422B humidity test. Voltage breakdown: 8,000 volts DC. Capacity to 1/8" panel: 3.3 mmf. Current rating: 15 amps.

E. F. JOHNSON COMPANY

WABEKA, MINNESOTA

# You get Continuing Assistance

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Last year, Tektronix Field Engineers traveled nearly 1,000,000 miles to call upon over 25,000 precision-measurement-minded people—whom they talked with personally. Most of these people owned Tektronix equipment. Most of these calls concerned continuing assistance—**1 in seeking additional training in oscilloscope theory; 2 in learning simplified techniques for present applications; 3 in planning new applications for present equipment; 4 in installing factory modifications in older instruments; 5 in ordering additional equipment for their laboratory.**

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# MILITARY PROCUREMENT OFFICES

## ELECTRONIC INDUSTRIES

# 1961 MILITARY ELECTRONIC PROCUREMENT DIRECTORY

*This is an up-to-date listing of key AIR FORCE, NAVY and ARMY procurement and production personnel, indicating the organizational placement of the men concerned with electronic procurement.*

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**CONSUMER SUPPLY** R Dorer X51012  
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**SUPPLY SERV** C Mullaney X52684

**SURVEILLANCE DEPT**  
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**DEP** C K Shultes X61121  
**ASST DIR** Dr H J Merrill X61732  
**TECH STAFF** V L Friedrich X61218  
**ADM STAFF** CWO R A Salvador X61730  
**ENGINEERING FLIGHT SUPPORT GROUP**  
**CHF** Lt Col Powell X61665  
**AREA COORDINATOR** Maj W J Kaczon X61643

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**DEP** E K Kaprelian X52884  
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**ARPA-NASA-DASA-COORD** V E Reilly X51272  
**STAFF** H E Inslerman X52371  
**J L Moncrief** X52710  
**A Schwartz** X52135  
**N A Terhune** X51958

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**ADVANCED DEVELOP** J C Ackerman X61435  
**RADAR EQUIP** N Abbott X61313  
**RADAR INSTR & CONTROL** T Maloney X61592

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**DEP** J LeBedda X61220  
**TECH STAFF** S Sheffer X61127  
**ADMIN STAFF** S Steelman X61642  
**ATMOS PHYS** Dr H Aufm Kampe X61319  
**METEOR INSTR** S Sheffer (Actg) X61669

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**DEP DIR** F Haake X52717  
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**DEP DIR** C L Blair X52918  
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**AIR TRAF REG & COMM** T Sueta X61764  
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**DRONE AIRCRAFT** S Greenspan X61668  
**NAV & FLIGHT AIDS** S Bania X61301

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**TECH STAFF** J Newman X61781  
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**JAMMING & DECEPTION** L Miller X61798

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**ADMIN STAFF** E Harrison X61644  
**ADVANCED TECH** A Zarin X61147  
**SYS ENGRG** B Bookbinder (Actg) X61328

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**DEP DIR** D Linden X52084  
**TECH STAFF** A J Legath X51246  
**ADMIN STAFF** H Schwarz X51058  
**PRIMARY BATTERY** C H Clark X52458  
**SPL PURPOSE BAT** Dr A Fischback X51082  
**ENERGY CONVERSION** Dr E Kift X52662

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**ATOMIC RESONANCE** F H Reder X52831  
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**TECH STAFF** M Abramson X52383  
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**ELEC PARTS & ASSEMB**  
**T S Gore (Actg)** X52284  
**MICROWAVE & ELECTRO MECH**  
**J W Grual (Actg)** X51615  
**MATERIALS** Dr E Both X51808

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**DEP DIR** D Ricker X61333  
**TECH STAFF** J F Hanley X61455  
**ADMIN STAFF** V Fletcher X61659  
**GEN TUBES** M H Zinn X61695  
**TECHNIQUES** L L Kaplan X61674  
**MICROWAVE TUBES** H J Hersh X61106



model	type mount	capacitance range mmf measured per JFD = 5177		D.C. working volts	dielectric strength measured at max. rated cap.	insulation resistance 500 VDC	Q factor measured per JFD = 5178	temp. coeff. of capacitance P.P.M. °C 25° to 125°C	material (dielectric-piston)	length (front of panel)	
<b>SEALCAP MINIATURE PANEL MOUNT, PRINTED CIRCUIT, GLASS AND QUARTZ</b>											
SC131°, 141 & 151	Prt. Ct.	0.8	4.5	750	1500 VDC	2x10 <sup>4</sup> Meg.	500	±50	Glass - Invar	1 3/8"†	
SC133°, 143 & 153	Prt. Ct.	0.8	8.5	1250	2500 VDC	10x10 <sup>4</sup> Meg.	500	±50	Glass - Invar	2 3/8"†	
SC134°	Prt. Ct.	0.7	12.0	1250	2500 VDC	10x10 <sup>4</sup> Meg.	500	±75	Glass - Invar	3/4"	
SC144 & 154	Prt. Ct.	0.8	12.0	1250	2500 VDC	10x10 <sup>4</sup> Meg.	500	±75	Glass - Invar	1.053	
SC136°, 146 & 156	Prt. Ct.	0.8	18.0	1250	2500 VDC	10x10 <sup>4</sup> Meg.	500	±100	Glass - Invar	1 3/8"†	
SC139°	Prt. Ct.	1.0	30.0	1250	2500 VDC	10x10 <sup>4</sup> Meg.	500	±100	Glass - Invar	1 3/8"†	
SC149 & 159	Prt. Ct.	0.8	30.0	1250	2500 VDC	10x10 <sup>4</sup> Meg.	500	±100	Glass - Invar	1.928	
QS171°, 181 & 191	Prt. Ct.	0.6	1.8	1000	1500 VDC	2x10 <sup>4</sup> Meg.	1500	Approx. Zero	Quartz - Invar	1 3/8"†	
QS173°, 183 & 193	Prt. Ct.	0.6	5.5	1250	2500 VDC	10x10 <sup>4</sup> Meg.	1500	Approx. Zero	Quartz - Invar	2 3/8"†	
QS176°, 186 & 196	Prt. Ct.	0.6	9.5	1250	2500 VDC	10x10 <sup>4</sup> Meg.	1500	Approx. Zero	Quartz - Invar	1 3/8"†	
QS179°, 189 & 199	Prt. Ct.	0.8	16.0	1250	2500 VDC	10x10 <sup>4</sup> Meg.	1500	Approx. Zero	Quartz - Invar	1 3/8"†	
<b>STANDARD SPLIT-STATOR PANEL MOUNT, GLASS AND QUARTZ</b>											
VC16G	Panel	(A) 0.5 (B) 0.8	5.0 2.5	500	1000 VDC	10 <sup>4</sup> Meg.	700	±50	Glass - Invar	1 3/8"	
VC17G	Panel	(A) 0.6 (B) 1.1	8.5 4.5	500	1000 VDC	10 <sup>4</sup> Meg.	700	±50	Glass - Invar	1 3/8"	
VC18G	Panel	(A) 0.7 (B) 1.8	14.0 7.5	500	1000 VDC	10 <sup>4</sup> Meg.	700	±50	Glass - Invar	1 3/8"	
VC80	Panel	(A) 0.3 (B) 0.4	2.0 1.0	1000	1500 VDC	10 <sup>4</sup> Meg.	1000	Approx. Zero	Quartz - Invar	1 3/8"	
VC81	Panel	(A) 0.4 (B) 0.6	3.2 1.6	1000	1500 VDC	10 <sup>4</sup> Meg.	1000	Approx. Zero	Quartz - Invar	1/2"	
VC82	Panel	(A) 0.5 (B) 0.85	5.5 2.8	1000	1500 VDC	10 <sup>4</sup> Meg.	1000	Approx. Zero	Quartz - Invar	1 3/8"	
VC83	Panel	(A) 4.8 (B) 3.0	11.0 6.0	1000	1500 VDC	10 <sup>4</sup> Meg.	1000	Approx. Zero	Quartz - Invar	1 3/8"	
<b>MINIATURE SPLIT-STATOR SERIES</b>											
SP86G°, 206G & 216G	Prt. Ct.	(A) 0.8 (B) 0.8	4.2 2.0	750	1500 VDC	10 <sup>4</sup> Meg.	500	±50	Glass - Invar	1 3/8"†	
SP87G°, 207G & 217G	Prt. Ct.	(A) 0.8 (B) 1.5	9.0 4.5	750	1500 VDC	10 <sup>4</sup> Meg.	500	±100	Glass - Invar	1"†	
SP88G°, 208G & 218G	Prt. Ct.	(A) 1.0 (B) 2.0	14.0 7.0	750	1500 VDC	10 <sup>4</sup> Meg.	500	±100	Glass - Invar	1 3/8"†	
<b>MINIATURE SPLIT-STATOR SEALCAP SERIES</b>											
SPS226G°, 236G & 246G	Prt. Ct.	(A) 0.8 (B) 0.8	4.2 2.0	750	1500 VDC	10 <sup>4</sup> Meg.	500	±50	Glass - Invar	1 3/8"†	
SPS227G°, 237G & 247G	Prt. Ct.	(A) 0.8 (B) 1.5	9.0 4.5	750	1500 VDC	10 <sup>4</sup> Meg.	500	±100	Glass - Invar	1 3/8"†	
SPS228G°, 238G & 248G	Prt. Ct.	(A) 1.0 (B) 2.0	14.0 7.0	750	1500 VDC	10 <sup>4</sup> Meg.	500	±100	Glass - Invar	1 3/8"†	
<b>DIFFERENTIAL SERIES, STANDARD PANEL MOUNT°, MINIATURE TYPES FOR PANEL MOUNT°, AND PRINTED CIRCUIT TYPES</b>											
DC401°, 411°, 421 & 431	Prt. Ct.	(1) 0.7 (2) 2.0	3.0 3.0	500	1000 VDC	10 <sup>4</sup> Meg.	500	±100	Glass - Invar	3/4"†	
DC403°, 413°, 423 & 433	Prt. Ct.	(1) 0.8 (2) 2.5	8.0 8.5	500	1000 VDC	10 <sup>4</sup> Meg.	500	±100	Glass - Invar	2 3/8"†	
DC404°, 414°, 424 & 434	Prt. Ct.	(1) 0.8 (2) 3.0	12.0 12.0	500	1000 VDC	10 <sup>4</sup> Meg.	500	±100	Glass - Invar	3/4"†	
DC406°, 416°, 426 & 436	Prt. Ct.	(1) 0.9 (2) 3.0	16.0 16.0	500	1000 VDC	10 <sup>4</sup> Meg.	500	±100	Glass - Invar	1 3/8"†	
DC409°, 419°, 429 & 439	Prt. Ct.	(1) 1.0 (2) 4.0	28.0 28.0	500	1000 VDC	10 <sup>4</sup> Meg.	500	±100	Glass - Invar	1 3/8"†	
<b>MINIATURE DIFFERENTIAL SEALCAP SERIES</b>											
DS441°, 451 & 461	Prt. Ct.	(1) 0.7 (2) 2.0	3.0 3.0	500	1000 VDC	10 <sup>4</sup> Meg.	500	±100	Glass - Invar	3/4"†	
DS443°, 453 & 463	Prt. Ct.	(1) 0.8 (2) 2.5	8.0 8.5	500	1000 VDC	10 <sup>4</sup> Meg.	500	±100	Glass - Invar	2 3/8"†	
DS444°, 454 & 464	Prt. Ct.	(1) 0.8 (2) 3.0	12.0 12.0	500	1000 VDC	10 <sup>4</sup> Meg.	500	±100	Glass - Invar	3/4"†	
DS445°, 455 & 465	Prt. Ct.	(1) 0.9 (2) 3.0	16.0 16.0	500	1000 VDC	10 <sup>4</sup> Meg.	500	±100	Glass - Invar	1 3/8"†	
DS449°, 459 & 469	Prt. Ct.	(1) 1.0 (2) 4.0	28.0 28.0	500	1000 VDC	10 <sup>4</sup> Meg.	500	±100	Glass - Invar	1 3/8"†	
<b>MAX-C SEALCAP SERIES</b>											
MC601°, 611 & 621	Prt. Ct.	1.0	14.0	1000	2000 VDC	10 <sup>4</sup> Meg.	500	±50	Glass - Invar	2 3/8"†	
MC603°, 613 & 623	Prt. Ct.	1.0	28.0	1000	2000 VDC	10 <sup>4</sup> Meg.	500	±50	Glass - Invar	1 3/8"†	
MC604°, 614 & 624	Prt. Ct.	1.0	42.0	1000	2000 VDC	10 <sup>4</sup> Meg.	500	±50	Glass - Invar	2 3/8"†	
MC606°, 616 & 626	Prt. Ct.	1.0	60.0	1000	2000 VDC	10 <sup>4</sup> Meg.	500	±50	Glass - Invar	1 3/8"†	
MC609°, 619 & 629	Prt. Ct.	1.0	90.0	1000	2000 VDC	10 <sup>4</sup> Meg.	500	±50	Glass - Invar	1 3/8"†	
<b>LC TUNERS°</b>											
LC303°, 313, 323 & 333°°		400 MIN	725 MAX	.0248 MIN	.0277 MAX	.54 MIN	6.56 MAX	170-200	-55 to +125	Glass - Invar	4 3/8"
LC304°, 314, 324 & 334°°		275 MIN	550 MAX	.0367 MIN	.0396 MAX	.85 MIN	11.66 MAX	150-175	-55 to +125	Glass - Invar	1 3/8"
LC306°, 316, 326 & 336°°		200 MIN	500 MAX	.0507 MIN	.0544 MAX	.86 MIN	20.19 MAX	135-170	-55 to +125	Glass - Invar	1 3/8"
LC309°, 319, 329 & 339°°		125 MIN	375 MAX	.048 MIN	.0798 MAX	.88 MIN	24.49 MAX	145-155	-55 to +125	Glass - Invar	1 3/8"

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°°Standard panel mount

\* miniature panel mount

†Length Applicable for Panel Mount Types Only.

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model	type mount	capacitance range mmf measured per JFD #5177		D.C. working volts	dielectric strength measured at max. rated cap.	Insulation resistance 500 V D.C.	Q factor measured per JFD #5178	Temp. coeff. of capacitance P.P.M./°C 25° to 125°C	material (dielectric-piston)	length (front of panel)	
<b>STANDARD PANEL MOUNT, GLASS AND QUARTZ</b>											
VC18	Panel	0.7	9.0	1500	2500 VDC	10 <sup>4</sup> Meg. Min.	500	-60 to +10	Glass - Invar	3/8	
VC48	Panel	0.8	18.0	1000	1500 VDC	10 <sup>4</sup> Meg. Min.	500	+350 to +450	Glass - Brass	1	
VC58	Panel	0.8	18.0	1000	1500 VDC	10 <sup>4</sup> Meg. Min.	500	-20 to +40	Glass - Invar	1	
VC118	Panel	0.6	14.0	1000	1500 VDC	10 <sup>4</sup> Meg. Min.	500	-30 to +40	Glass - Invar	1	
VC118RA	Panel	0.6	14.0	1000	1500 VDC	10 <sup>4</sup> Meg. Min.	500	-40 to +50	Glass - Invar	1	
VC118RB	Panel	0.6	14.0	1000	1500 VDC	10 <sup>4</sup> Meg. Min.	500	+45 to +600	Glass - Brass	1	
VC118RC	Panel	0.8	18.0	1000	1500 VDC	10 <sup>4</sup> Meg. Min.	500	+20 to +100	Glass - Invar	1	
VC308	Panel	0.8	30.0	1000	1500 VDC	10 <sup>4</sup> Meg. Min.	500	-10 to +50	Glass - Invar	1 1/2	
VC2	Panel	0.7	4.5	1000	1500 VDC	10 <sup>4</sup> Meg. Min.	2000	Approx. Zero	Quartz - Invar	3/8	
VC5	Panel	0.6	6.0	1000	1500 VDC	10 <sup>4</sup> Meg. Min.	2000	Approx. Zero	Quartz - Invar	3/8	
VC11	Panel	0.8	10.0	1000	1500 VDC	10 <sup>4</sup> Meg. Min.	2000	Approx. Zero	Quartz - Invar	1	
VC11A	Panel	1.0	10.0	1000	2000 VDC	10 <sup>4</sup> Meg. Min.	2000	Approx. Zero	Quartz - Invar	1 1/2	
VC12	Panel	9.0	21.0	1000	1500 VDC	10 <sup>4</sup> Meg. Min.	2000	Approx. Zero	Quartz - Invar	1 1/2	
VC99	Panel	0.8	10.0	3000	5000 VDC	10 <sup>4</sup> Meg. Min.	2000	Approx. Zero	Quartz - Invar	1 1/2	
<b>SPLIT BUSHING SERIES PANEL MOUNT, PRINTED CIRCUIT, GLASS AND QUARTZ</b>											
VC38	Panel	0.7	9.0	1500	2500 VDC	10 <sup>4</sup> Meg. Min.	650	+850 to +500	Glass - Brass	3/8	
VC38J	Panel	0.7	9.0	1500	2500 VDC	10 <sup>4</sup> Meg. Min.	650	+0 to -150	Glass - Invar	3/8	
VC88A	Panel	0.7	17.0	1000	1500 VDC	10 <sup>4</sup> Meg. Min.	750	+400 to +600	Glass - Brass	1 1/2	
VC88C	Panel	0.8	17.0	1000	1500 VDC	10 <sup>4</sup> Meg. Min.	650	-100 to +100	Glass - Invar	1 1/2	
VC88I	Panel	0.8	17.0	1000	1500 VDC	10 <sup>4</sup> Meg. Min.	600	-100 to +100	Glass - Invar	1 1/2	
VC78	Panel	2.0	30.0	1000	1500 VDC	10 <sup>4</sup> Meg. Min.	600	-100 to +100	Glass - Invar	1 1/2	
VC138A	Panel	0.8	13.0	3000	5000 VDC	10 <sup>4</sup> Meg. Min.	900	+225 to +375	Glass - Ph. Bronze	1 1/2	
VC50C	Panel	5.0	50.0	1250	2500 VDC	10 <sup>4</sup> Meg. Min.	450	+250 to +450	Ceram Ph. Bronze	1	
VC8018W	Prt. Ct.	0.8	4.5	1000	1500 VDC	10 <sup>4</sup> Meg.	500	-55 to +125	Glass - Invar	3/8	
VC8038W	Prt. Ct.	0.8	8.5	1000	1500 VDC	10 <sup>4</sup> Meg.	500	-55 to +125	Glass - Invar	3/8	
VC8048W	Prt. Ct.	0.8	12.0	1000	1500 VDC	10 <sup>4</sup> Meg.	500	-55 to +125	Glass - Invar	3/8	
VC8068W	Prt. Ct.	0.8	18.0	1000	1500 VDC	10 <sup>4</sup> Meg.	500	-55 to +125	Glass - Invar	1 1/2	
VC8088W	Prt. Ct.	0.8	30.0	1000	1500 VDC	10 <sup>4</sup> Meg.	500	-55 to +125	Glass - Invar	1 1/2	
VC8118W	Prt. Ct.	0.6	1.8	1000	1500 VDC	10 <sup>4</sup> Meg.	2000	-55 to +150	Quartz - Invar	3/8	
VC8138W	Prt. Ct.	0.6	5.0	1000	1500 VDC	10 <sup>4</sup> Meg.	2000	-55 to +150	Quartz - Invar	3/8	
VC8168W	Prt. Ct.	0.6	9.5	1000	1500 VDC	10 <sup>4</sup> Meg.	2000	-55 to +150	Quartz - Invar	1 1/2	
VC8188W	Prt. Ct.	0.6	16.0	1000	1500 VDC	10 <sup>4</sup> Meg.	2000	-55 to +150	Quartz - Invar	1 1/2	
<b>MINIATURE PANEL MOUNT, PRINTED CIRCUIT, GLASS AND QUARTZ</b>											
VC208*	VC88, VC88W	Prt. Ct.	0.8	8.5	1000	1500 VDC	10 <sup>4</sup> Meg. Min.	500	±50	Glass - Invar	3/8
VC218*	VC108, VC108W	Prt. Ct.	0.8	4.5	1000	1500 VDC	10 <sup>4</sup> Meg. Min.	500	±50	Glass - Invar	3/8
VC228*		Panel	0.7	12.0	1000	1500 VDC	10 <sup>4</sup> Meg. Min.	500	±75	Glass - Invar	3/8
VC238*	VC328, VC328W	Prt. Ct.	0.8	18.0	1000	1500 VDC	10 <sup>4</sup> Meg. Min.	500	±100	Glass - Invar	1
VC248*		Panel	1.0	30.0	1000	1500 VDC	10 <sup>4</sup> Meg. Min.	500	±100	Glass - Invar	1 1/2
VC318, VC318W		Prt. Ct.	0.8	12.0	1000	1500 VDC	10 <sup>4</sup> Meg. Min.	500	±75	Glass - Invar	1 1/2
VC428 & VC428W		Prt. Ct.	1.0	21.0	1000	1500 VDC	10 <sup>4</sup> Meg. Min.	500	±100	Glass - Invar	1 1/2
VC438, VC438W		Prt. Ct.	0.8	30.0	1000	1500 VDC	10 <sup>4</sup> Meg. Min.	500	±100	Glass - Invar	1 1/2
MQ101*, 111 & 121		Prt. Ct.	0.6	1.8	1000	1500 VDC	10 <sup>4</sup> Meg. Min.	1500	Approx. Zero	Quartz - Invar	3/8
MQ103*, 113 & 123		Prt. Ct.	0.6	5.5	1000	1500 VDC	10 <sup>4</sup> Meg. Min.	1500	Approx. Zero	Quartz - Invar	3/8
MQ108*, 118 & 128		Prt. Ct.	0.6	9.5	1000	1500 VDC	10 <sup>4</sup> Meg. Min.	1500	Approx. Zero	Quartz - Invar	1
MQ109*, 119 & 129		Prt. Ct.	0.8	16.0	1000	1500 VDC	10 <sup>4</sup> Meg. Min.	1500	Approx. Zero	Quartz - Invar	1 1/2

\* Panel Mount

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2N496	Medium speed switch (Silicon)	MIL-S-19500/85 (Sig C)
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2N501A	Very high speed switch	MIL-T-19500/62 (Sig C)
2N502A	VHF amplifier	MIL-S-19500/112 (Sig C)
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Ft Huachuca Ariz  
GLadstone 8-3311

**MISSION:** Responsibility for placing and administering special equipment contracts and contracts for services and studies as required for performance of the mission assigned to the U. S. Army Electronic Proving Ground.

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**PROC SPECIALIST** F Saunders X5938

**CONTRACTS DIV** Lt Col A Barnsbee X2817

**LARGE PURCHASES BR** W Schlobohm X5518

**LARGE PURCHASES BR (FIXED PRICE)**

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**USASSA**

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Lexington Ky  
LEXington 2-2220

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**Dap Chief** S Wilson X2105

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**USASSA**

Main Navy Building,  
Washington 25, D. C.  
OXford 4-7802

**MISSION:** As a special mission procurement activity, this office serves agencies located in Washington, D. C. It DOES NOT place production contracts nor contracts involving items of military specifications. It primarily buys standard commercial communications equipments and materials, as well as procurements for the technical services, installations of fixed-plant communications equipment and equipment leases.

**COMM OFF** Capt C F Capps X67802

**Civ Chief** T Palm X67802

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**AIR FORCE SYSTEMS  
COMMAND HEADQUARTERS**

Andrews A F Base Wash 25 D C  
Phone REDwood 5-8900

Responsible for military space development mission, complete acquisition program for Air Force Systems, from development, test and production through installation and checkout

**COMMANDER** Lt Gen B A Schriever Extension 6209

**VICE COMM** Maj Gen J Ferguson

**DIR OF PROCUREMENT** Col J D Producers

**DEP CHIEF OF STAFF RES & ENG**

Maj Gen M F Cooper

**BALLISTIC MISSILE & SPACE SYSTEMS**

Col N C Appold 2220

**CONTRACT DIV** Maj R M Burnham

Exec for Small Business J C Eiden

**SPACE SYSTEMS DIV**

Mail: A F Unit Post Office, Los Angeles 45, Calif  
Location: 5800 Arbor Vitae St, Los Angeles Calif  
Phone Spring 6-1444

Responsible for handling A F Space programs and development projects in support of other military branches & governmental agencies

**COMMANDER** Maj Gen O J Riland

**VICE COM** Brig Gen R E Greer

**PROCUREMENT** Col C E Moore

**BALLISTIC SYSTEMS DIV**

Mail: A F Unit Post Office, Los Angeles 45, Calif  
Location: 5800 Arbor Vitae St, Los Angeles  
Phone ORchard 0-1444

Responsible for Atlas Titan & Minuteman programs including design, construction & supervision of all site activities in the field

**COMMANDER** Maj Gen T P Gerrity

**DEPUTY COMM** Brig Gen D Cowland

**DIR OF PROCUREMENT** Col J L Rouse

**AERONAUTICAL SYSTEMS DIV**

Wright-Patterson A F Base Dayton Ohio  
Phone CLEARwater 3-7111

Responsible for developing aeronautical systems such as Skybolt, Dyno-Soar, C-141 jet transport

**COMMANDER** Maj Gen W A Davis

**VICE COMM** Brig Gen D M Jones

**PROCUREMENT** Lt Col T G Watkins Jr

**ARNOLD ENG DEVELOPMENT  
CENTER**

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Phone GLendale 5-2611

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**VICE COMM** Col H L Donich

**PROCUREMENT** J F Fuqua

**A F MISSILE DEVELOPMENT  
CENTER**

Holloman A F Base New Mexico  
Phone (At Alamogordo) GRANite 3-6511

**COMMANDER** Maj Gen W M Canterbury

**DEP COMM** Col R S Garman

**DIR OF PROCUREMENT** Lt Col J B Turner

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CENTER**

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**COMMANDER** Maj Gen R H Terrill

**VICE COMM** Col H M West Jr (Acting)

**PROCUREMENT** Lt Col R H Brittle

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**COMMANDER** Maj Gen C M McCorkle

**VICE COMM** Col C J O'Bryan Jr

**PROCUREMENT** R D Walker

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Phone CLifford 8-2111

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**DEP COMM** Col P C Ashworth

**PROCUREMENT DIV** Lt Col J M Venable

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CENTER**

Griffiss A F Base Rome N Y  
Phone ROME 3200

**COMMANDER** Maj Gen D P Graul

**DEPUTY** Col D M Harvey

**San Antonio R & D Procurement  
Office**

Lackland A F Base Texas  
Phone WALnut 3-3411

**CHIEF** W V Pfister

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SCIENTIFIC RESEARCH**

(Reports to the AF Office of Aerospace Research)  
Temp D Bldg Washington 25 D C

Phone LIBerty 5-6700 or dial OXFord and the extension

Responsible for negotiating and administering contracts for basic research

**EXEC DIRECTOR** Dr K Millsaps Extension 64345

**DIR OF PROCUREMENT**

Lt Col A L Thayer 61513

**CHIEF OF INDUSTRIAL CONTRACTS DIV**

J V Walsh 61513

**CONTRACTOR RELATIONS & SMALL BUSINESS**

S Milnovsky 24056

**AIR LOGISTICS COMMAND**

Wright-Patterson A F Base Dayton Ohio  
Phone CLEARwater 3-7111

**COMMANDER** Gen S E Anderson

**VICE COMMANDER** Lt Gen W F McKee

**CHIEF OF STAFF** Brig Gen J H Bowman

**DIR OF PROCUREMENT & PRODUCTION**

Brig Gen R G Ruegg

**ELECTRONIC SYSTEMS DIV**

L G Hanscom Field Bedford Mass  
Phone CRestview 4-6100

Responsible for acquisition of the Ballistic Missile Early Warning System and NORAD's Air Defense Control System; development of radar, radar and other electronic devices

**COMMANDER** Maj Gen K P Berquist

**PROCUREMENT DIV** W J Irwin

**DEP PROCUREMENT** J Rooney

**ELECTRONIC RES DIRECTOR**

Dr L M Hallingsworth

**A F MISSILE TEST CENTER**

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R-131



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**OGDEN AIR MATERIEL AREA**  
Hill AFB Utah  
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Griffiss AFB N Y  
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**SAN ANTONIO AIR AREA**  
Kelly AFB Tex  
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**ACTG DEP FOR PROD**  
Col S Hele 7-2156  
**ASST TO DIR** R D Lyons 7-3247  
**EXEC** Lt Col W R Joyner 7-1157  
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**OFF OF PROC COMMITTEE**  
R W Burns 7-4108  
**POLICY CONTROL OFF** L R Poe 5-4190  
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**DEP** Col J A Mullins 5-0222  
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**EXEC** Lt Col R G Walker 5-7133  
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Col W W Magness 5-3204  
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Walker 6-1110 Est 2121

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Griffiss A F B N Y  
Rome FF 6-3200

**SACRAMENTO AMA**  
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**OKLAHOMA CITY AMA**  
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Hemlock 8-6011

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Gentile A F Sta  
Dayton Ohio  
Clearwater 2-6551

### WRIGHT-PATTERSON A F B

Brig Gen E Helton  
Wright-Patterson A F B Ohio  
CL 3-7111 Est 6-1316

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A P O 323  
San Francisco Calif

### EASTERN CONTRACT MANAGEMENT REGION

Col H J Mattie  
Olmsted A F B Penna  
Whitney 4-5521

### CENTRAL CONTRACT MANAGEMENT REGION

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CL 3-7111 Est 5-2208

### WESTERN CONTRACT MANAGEMENT REGION

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Turner 9-4411

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**DEP** Col M B Selm Jr 5-7126  
**EXEC** Lt Col L B Maclean 6-9233  
**PLANS & INTEGRATION OFFICE**  
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**REQUIREMENTS SYS DIV** D A Collins 5-3210  
**BASE MATERIALS SYS DIV**  
Col J H Wallace 6-0308  
**REPORTS & FORMS MANAGEMENT DIV**  
C C Brooks (Actg) 6-8310  
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Col J G Stiles 6-9187  
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Col E C Parkerson 6-9100

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Atlanta 3 Ga

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Boston Army Terminal  
Boston 10 Mass

#### CHICAGO

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Chicago 38 Ill

#### DALLAS

500 S Ervay  
Dallas 1 Tex

#### CLEVELAND

113 St Clair Ave NE  
Cleveland 14 Ohio

#### DAYTON

Wright-Patterson AFB  
Ohio

#### DETROIT

6233 Concord Ave  
Detroit 11 Mich

#### INDIANAPOLIS

112 N Pennsylvania St  
Indianapolis 2 Ind

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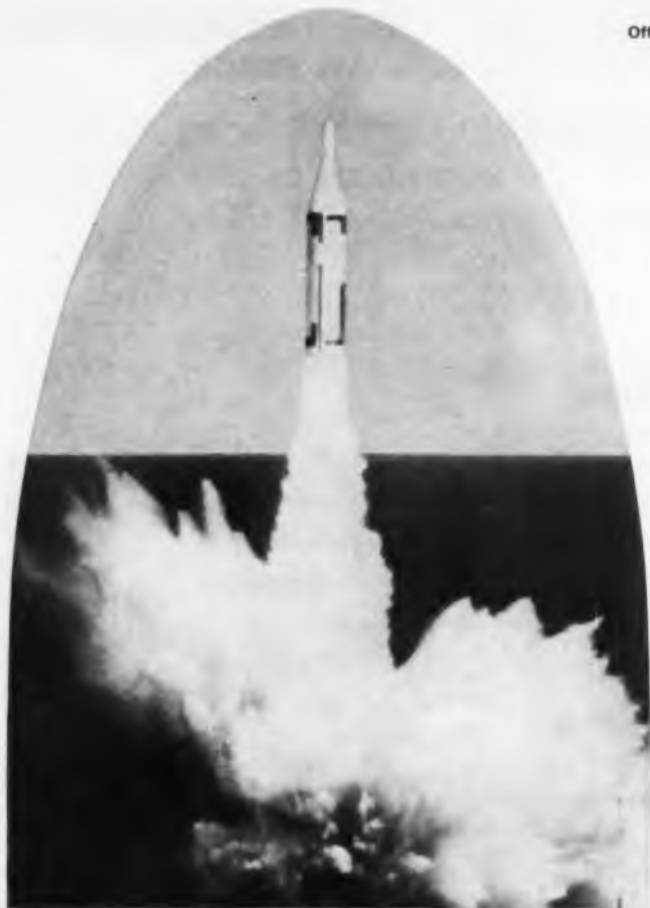
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Philadelphia 2 Pa

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Richmond 25 Va

**ROCHESTER**  
P O Box 1669  
Rochester 3 N Y

**SAN DIEGO**  
3054 Rosecrans Pl  
San Diego 10 Calif

**SAN FRANCISCO**  
Oakland Army Terminal  
W Grand and Maritime  
Oakland 14 Calif

**ST LOUIS**  
1114 Market St  
St Louis 1 Mo

The Pentagon Wash 25 D C  
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Responsible for research, development, test, and procurement and the manufacturing of arms . . . guided missiles, ballistic and rockets systems.

**CHIEF OF ORDNANCE** Extension  
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**INDUSTRIAL DIV** Brig Gen G C Carlson 55371  
**SMALL BUSINESS OFFICE** H M Evans 72774

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**DEP COM** Col R O Lehtonen  
**INDUSTRIAL DIV** Col H Wishart

### ARMY BALLISTIC MISSILE AGENCY

Redstone Arsenal Ala  
Phone Jefferson 6-4411  
**COMMANDER** Brig Gen R M Hurst  
**DEP COM** Col H N Brownson  
**DIR OF PROCUREMENT OPERATION**  
**BRANCH** J A Muller  
**INDUSTRIAL DIV** Col O M Hirsch

### Whitesands Missile Range—New Mexico

Phone: Whitesands Missile Range  
**COMMANDER** Brig Gen J Shinkle  
**DEP COM** Col E R Gillespie  
**PURCHASING & CONTRACT OFFICER**  
Lt Col C D Collins  
**SMALL BUSINESS** V N Cordell

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Wash 25 D C  
Phone Emerson 2-8000  
**COMMANDER** Lt Col R W McEvoy  
**PROCUREMENT** F T Rainier  
**SMALL BUSINESS** J R Amato

### U S ARMY MISSILE COMMAND

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Phone Jefferson 6-4411  
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**DEP COMMANDER** Maj Gen J A Barclay  
**INDUSTRIAL OPERATIONS** Col J S Jeffers  
**PROCUREMENT** L R McGary  
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**FIELD SERVICE GROUP**  
Col J T Shepard 4216  
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Maj W A Anderson 23120  
**DEPUTY D W Hood** 22118  
**SMALL BUSINESS SPECIALIST**  
W Travis Jr 7220

Military Procurement  
Guide  
Continues  
On Page 127

## DEPARTMENT OF THE NAVY

### BUREAU OF SHIPS

Wash 25 D C  
Phone Liberty 5-6700 or OXFORD, then dial the extension desired.

Responsible for shipboard apparatus, radio, radar, sonar, electric end-items; also shares responsibility for equipment for BuWeap

**CHIEF OF BUREAU** RAdm R K James Extension 62058  
**DEP & ASST CHIEF** RAdm P L Moore 63391  
**DIR OF CONTRACTS** Capt G C Wells 62112  
**Asst Dir of Contracts** D E Weatherly Jr 64568  
**Electronics A Heck** 61437  
**Electronics Purchase Branch** E H Koch 61803  
**ASST CHIEF FOR TECH LOGISTICS**  
RAdm F B Schultz 61714  
**Electronics, Materials Branch**  
Cdr J P Jones 62837  
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**Radar Branch** Capt R R Bradley Jr 65577  
**Communications Branch** Capt M L Wood 64056  
**Sonar Branch** Capt J Wallace 61230  
**Electronic Warfare & Parts Branch**  
Cdr E L Hurd 66752  
**Asst for Shore Electronics Director**  
Capt C L D Allen 63595

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Bldg Temp 3, 17th & Constitution Ave. NW  
Wash 25 DC  
Phone Liberty 5-6700 or for direct dialing use OXFORD, then dial the extension.

Responsible for basic and applied research bearing on naval problems.

**CHIEF OF NAVAL RESEARCH** Extension  
RAdm L D Coates 64911  
**DEP & ASST CHIEF** Capt H E Ruble 62525  
**DEP & CHIEF SCIENTIST** Dr T J Killian 64356  
**CONTRACT DIV** Cdr H D Moore 65321  
**ASST CHIEF FOR RESEARCH**  
Capt W K Keen 64049  
**PHYSICAL SCIENCES DIV** Dr S Silverman 66940  
**Electronics** Dr A Shostak 64301

### BUREAU OF NAVAL WEAPONS

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Offices at Main Navy Bldg., Munitions Bldg., and "W" Bldg.  
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ELECTRONIC INDUSTRIES • June 1961

**CHIEF OF BUREAU** RAdm P D Stroop Extension 64462  
**DEP CHIEF** RAdm W A Schoech 62430  
**ASST CHIEF FOR RES DEV TEST**  
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**Aircraft Officer** Capt L S Chambers 64462  
**DIRECTOR AVIONICS DIV**  
Capt T M Adams 64326  
**Missile Officer** Capt C T Doss 61613  
**ASST CHIEF PRODUCTION & QUALITY CONTROL** Capt P H Harrington 66225  
**DIRECTOR GROUND ELECTRONICS DIV**  
Cdr R P Chase 64275  
**ASST CHIEF FOR CONTRACTS**  
RAdm E F Metzger 62436  
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Phone Johnson 3-6600

**COMMANDER** Capt A E Krapf  
**DIRECTOR OF RESEARCH** Dr R M Page  
**SUPPLY DIV** Capt P H Neel  
Technical Purchases R R Block

### PUBLICATIONS HELPFUL IN SELLING TO THE MILITARY & U S GOVERNMENT

1. "Research & Development in The US Air Force" (April 1958) Obtainable free from Air Res. & Dev. Command, Andrews AF Base, Wash. 25, D. C.

2. "How To Sell . . . To The Dept. Of Defense" (March 1958). From the Supt. of Documents, U S Govt. Printing Office, Wash. 25, D. C. 40 cents.

3. "General Procurement Information On Guided Missiles, Rockets and Target Drones" (March 1959). From Supt. of Documents, U. S. Govt. Printing Office, Wash. 25, D. C. Price 15 cents.

4. "Procurement Handbook" General Services Administration, Federal Supply Service (1959) Very general but helpful to those selling to GSA. From Supt. of Documents, U. S. Govt. Printing Office, Wash. 25, D. C. \$1.50.

5. "Armed Services Procurement Regulations."

6. "The Army Procurement Procedure."

7. "The Air Force Procurement Procedure."

8. "Navy Procurement Directives." From the Supt. of Documents, Govt. Printing Office, Wash. 25, D. C. \$7 per year subscription.

## SIX PUSHBUTTON SWITCHES

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CONTROL SWITCH DIVISION

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**ADMINISTRATOR** N E Holaby

**DEPUTY ADM** J T Pyle

**MATERIAL PROGRAM DIV** (Contracts)  
C M Estep

#### ADVANCED RESEARCH PROJECTS AGENCY

(Reports direct to Dir. Defense Res. & Eng.)  
The Pentagon (room 3E160)  
Washington 25 D C

Phone Liberty 5-6700 (or dial OX and the extension)

Responsible for research in ballistic missile defense detection and identification of underground and high altitude nuclear tests, propellant chemistry, materials, energy conversion, toxicology and technical aspects of arms control.

**DIRECTOR** Dr J P Ruina

**DEPUTY DIR (Science)** G W Rathjens

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For a quick, broad view of major purchasing activities of the Department of Defense, together with the type of material or services purchased, see the list below:

#### DEPT. OF THE ARMY

GROUP	OFFICER AND MAILING ADDRESS	ITEM	GROUP	OFFICER AND MAILING ADDRESS	ITEM
Signal Corps	Chief Signal Officer, Room 2D-260, The Pentagon, Wash. 25, D. C.	Res. & Dev.	Ordnance Corps	Chief of Ordnance, Room 1B-466 The Pentagon, Wash. 25, D. C.	Res. & Dev.
	Commanding Officer, Signal Corps Supply Agency, 225 S. 18th St., Phila. 3, Pa.	Fixed & Mobile Communication Equipment		Commanding General, Redstone Arsenal, Huntsville, Ala.	Rockets & Guided Missiles

#### DEPT. OF THE NAVY

<b>BUWEAP</b>	Chief, Bureau of Weapons, Dept of the Navy, Wash. 25, D. C.	Res. & Dev. Electronic Eq. Guided Missiles	<b>ONR</b>	Chief of Naval Research, Dept. of the Navy, Wash 25, D. C.	Res. & Dev.
<b>BUSHIPS</b>	Chief, Bureau of Ships, Dept. of the Navy, Wash. 25, D. C.	Res. & Dev. Electronic Eq. Radio, Radar, Communication Eq.	<b>Quartermaster General</b> , Headquarters, U. S. Marine Corps, Dept. of the Navy, Wash. 25, D. C.	Electronic Eq. & Spare Parts	
			<b>Commanding Officer</b> , Aviation Supply Office, 700 Robins Ave., Phila. 11, Pa.	Aeronautical Electronic Eq.	
			<b>Commanding Officer</b> , Electronic Supply Office, Great Lakes, Ill.	Electronic Main- tenance & Repair Parts	

#### DEPT. OF THE AIR FORCE

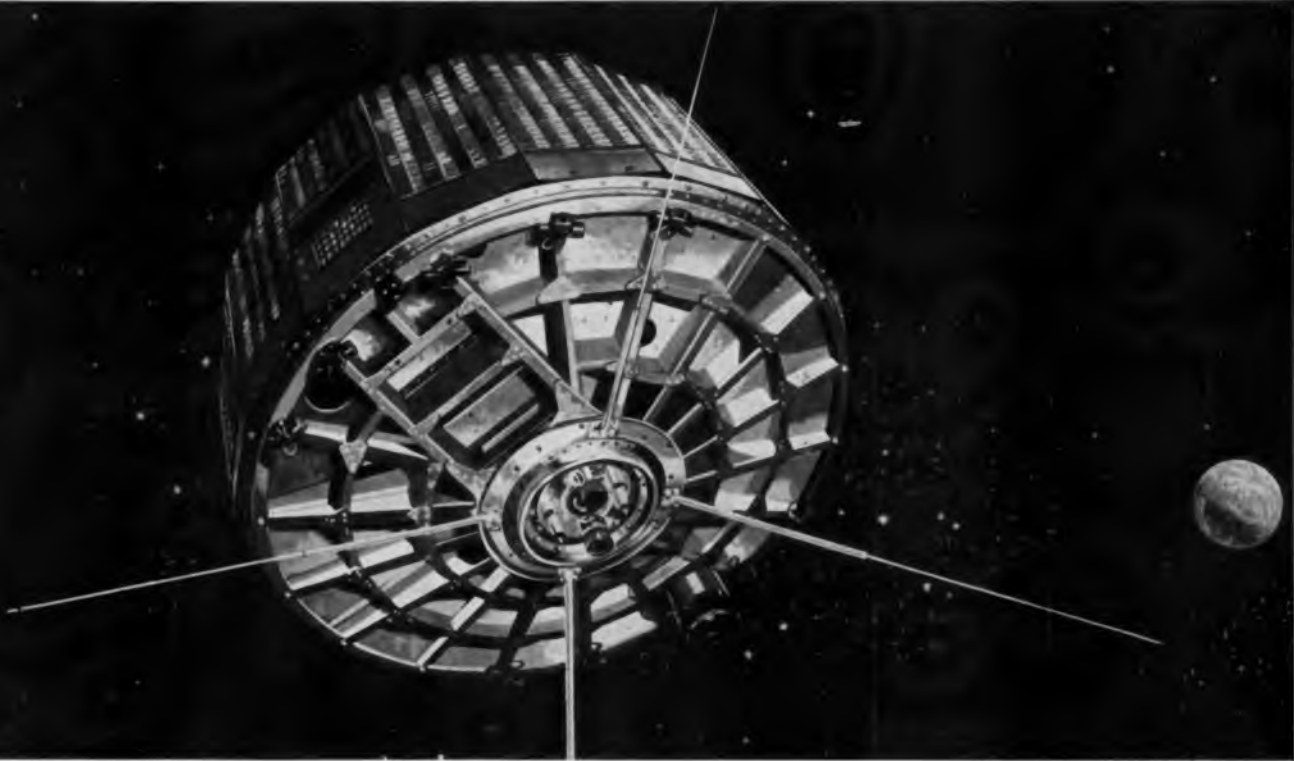
Commander, Headquarters, Air Logistics Command, Wright- Patterson Air Force Base, Ohio Attn.: Director of Procurement & Production	Guided Missiles	Commander, Dayton Air Force Depot, Gentile Air Force Station, Wilmington Pike, Dayton, O. Attn.: Director of Procurement & Production	Switches, Relays, Capacitors, Vacuum tubes, radio crystals, lab. & shop test equipment
Headquarters, Air Systems Command, Andrews Air Force Base, Wash. 25, D. C. Attn.: Director of Procurement	Basic Res. & Dev.	Commander, Rome Air Force Depot, Griffiss Air Force Base, Rome, N. Y. Attn.: Director of Procurement & Production	Ground radio, ground naviga- tion equipment, Ground com- munications, R. & D. for ground electronic eq.

# Key Guided Missile Contractors

(With names of their top GM men and their Personnel Directors)

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Avco Corp. 201 Lowell St., Wilmington, Mass.	F. C. Durant, III Div. of Public & Govt. Relations	J. E. Bergin
Beech Aircraft Corp. Wichita, Kan.	J. N. Lew, V. P. Eng.	J. E. Isaacs
Bell Aero Systems Co. Buffalo 5, N. Y.	W. M. Smith, V. P. & Mgr. Rockets Div.	N. C. Euler
Bendix Corp. South Bend 20, Ind.	D. M. Heller, Asst. Group Exec.	R. J. Bloff
Boeing Co. Seattle 14, Wash.	L. A. Woods V. P. & Gen. Mgr., Aerospace Div.	J. C. Sanders
Chance Vought Corp. Dallas, Texas	R. C. Blaylock, V. P.	R. C. Farmer
Convair San Diego, Calif.	M. Rosenbaum, Ch. Eng. Astronautics Div.	B. L. Dobler
Douglas Aircraft Co. Santa Monica, Calif.	E. P. Wheaton, V. P. Eng.-Tech.	F. Edmonds
General Electric Co. Wash., D. C.	G. P. Metcalf, Regional V. P.	J. Swanson
Goodyear Aircraft Corp. Akron, Ohio	E. A. Brittenham, Chief Eng.	C. Jones
Grumman Aircraft Eng. Corp. Bethpage, L. I., N. Y.	R. M. Carbee, Asst. Chief Missile Eng.	J. G. Gavin, Jr.
Hughes Aircraft Co. Culver City, Calif.	N. I. Hall, V. P. Eng.	R. A. Martin
Lockheed Aircraft Corp. Sunnyvale, Calif.	W. H. Hawkins, V. P. & Asst. Gen. Mgr. Missiles & Space Div.	H. V. LaJeunesse
Marquardt Corp. Van Nuys, Calif.	S. E. Weaver, V. P. Marketing	J. F. Stengel
The Martin Co. Baltimore 3, Md.	A. C. Hall, V. P. Eng.	D. V. Dorman
McDonnell Aircraft Corp. St. Louis, Mo.	B. C. Bromberg, V. P. Missile Eng. Div.	W. R. Orthwein, Jr.
Minneapolis Honeywell Reg. Co. Minneapolis, Wis.	S. F. Keating, V. P.	R. J. Condon
North American Aviation, Inc. Los Angeles, Calif.	J. G. Beerer, V. P. Eng.	G. S. Honey
Northrop Corp. Hawthorne, Calif.	G. F. Douglas, V. P. Eng. of Norair Div.	J. Richardson
RCA Camden, N. J.	W. G. Bain, V. P. & Gen. Mgr. Communications and Aerospace	N. J. Cappella
Republic Aviation Corp. Farmingdale, L. I., N. Y.	A. R. Crawford, V. P.	C. Ketson
Ryan Aeronautical Co. San Diego, Calif.	F. W. Fink, V. P. Eng.	W. Wagner
Sperry Gyroscope Co. Great Neck, L. I., N. Y.	S. Agabian, V. P.	R. Hamlett
Temco Electronics & Missiles Co. Dallas 22, Texas	R. E. Galer, V. P. & Div. Mgr. Missiles Aircraft Div.	Personnel Manager
Thiokol Chemical Corp. Bristol, Pa.	H. R. Ferguson, Exec. V. P.	
Thompson Ramo Woolridge, Inc. Canoga Park, Calif.	R. P. Johnson, V. P. Electronics Group	F. P. Melograno
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*RCA developments in miniaturization, reliability, computing and overall electronic activities are contributing to many of the nation's leading space and missile projects. For information describing new RCA scientific developments, write Dept. 434, Defense Electronic Products, Radio Corporation of America, Camden, N. J.*



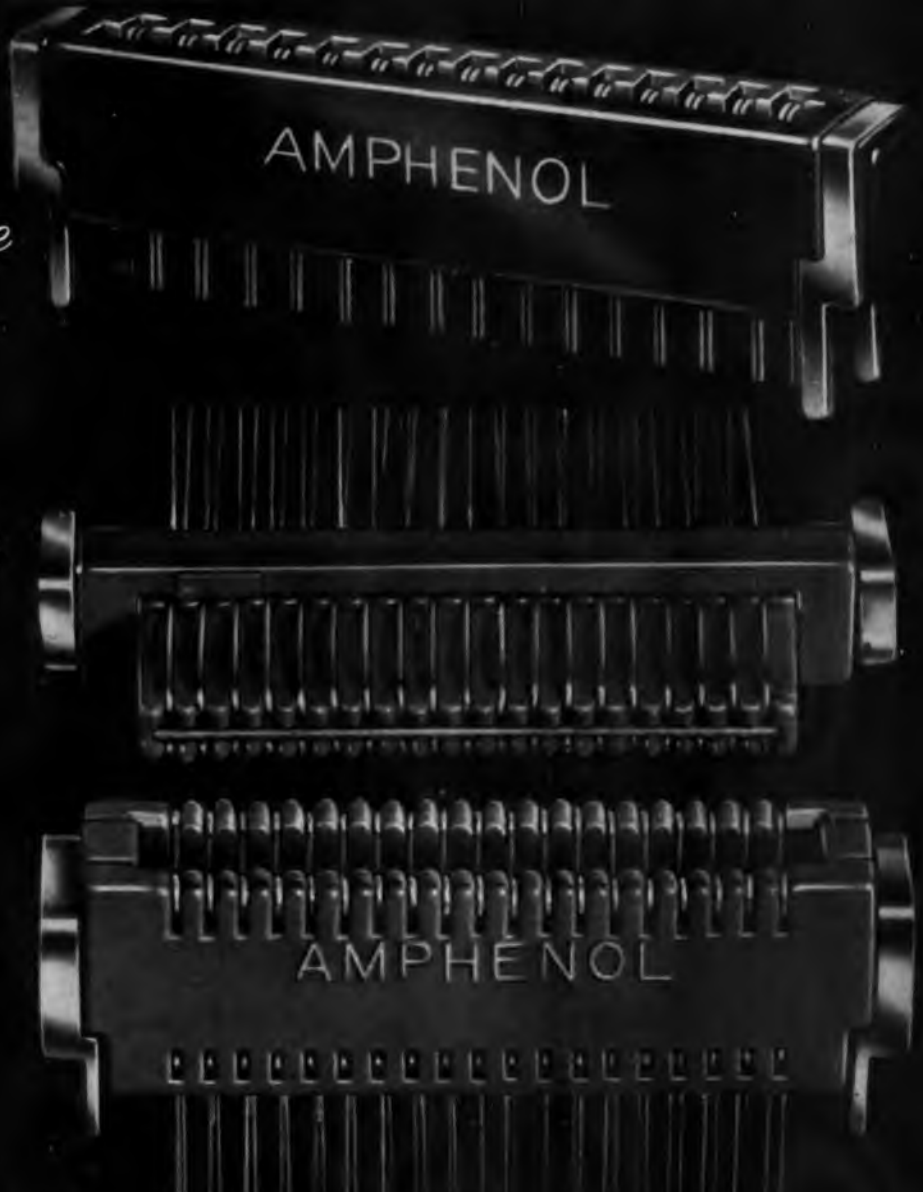
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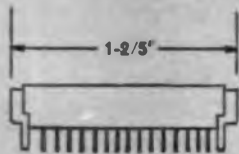
*Micro Min*

*Micro Mod*

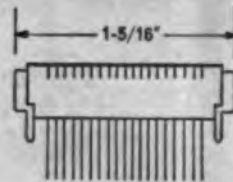


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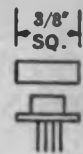
**DIMENSIONS (ACTUAL SIZE)**



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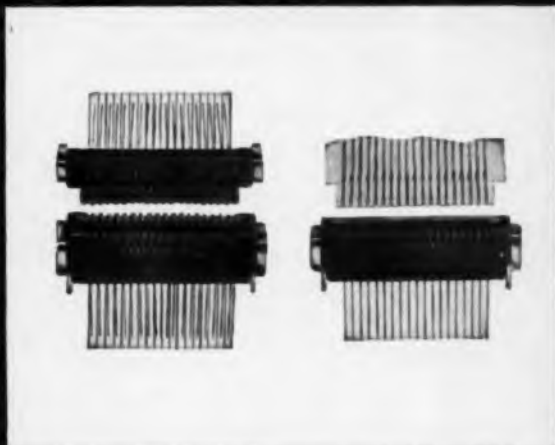
Circle 141 on Inquiry Card





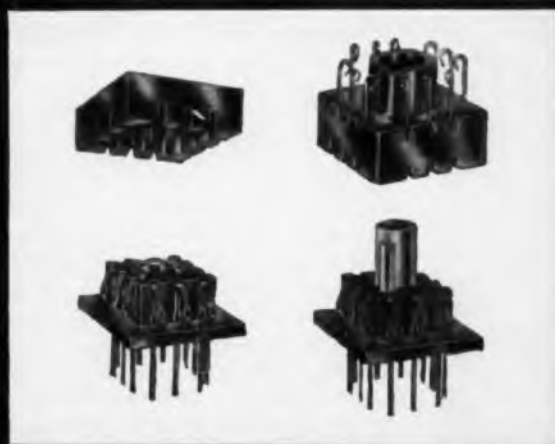
## *Micro Edge*

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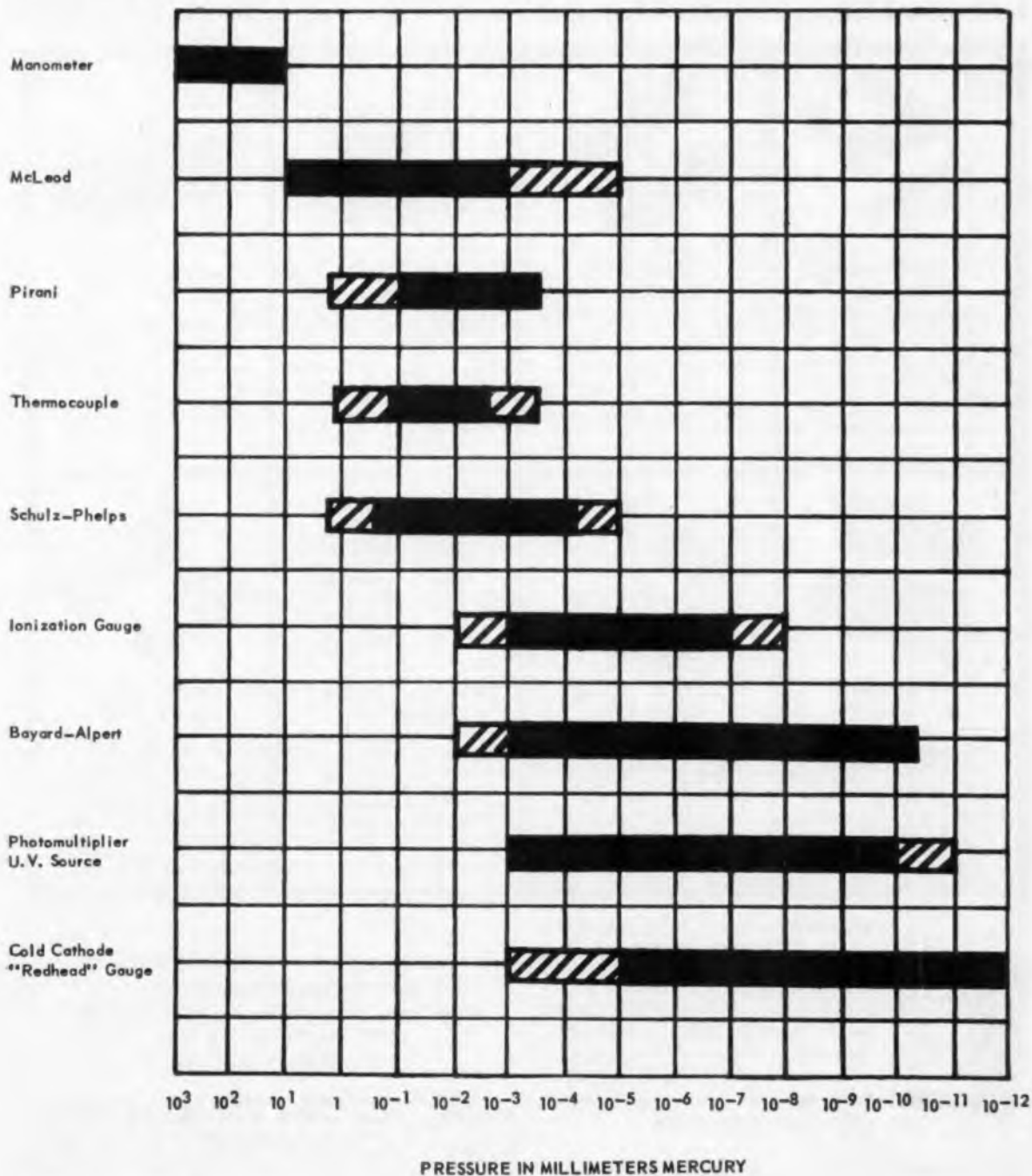
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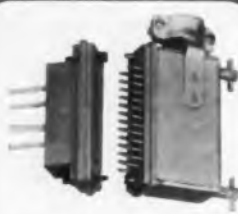
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# Measurement Standards

*It is ironical that our measurement standards should be so lacking in a standard nomenclature.*

*Many systems have been tendered; here's the one that we think has the most merit.*

By **RICHARD G. STRANIX**

Associate Editor  
Electronic Industries

**R**EMEMBER those association tests from psychology class? What's the first thing you think of when you hear the word "standards"? I'll bet that for most engineers, regardless of specialty, the "meter bar" comes to mind—either the one in Paris or the one at NBS.

Since this standard is so well set in our mind—a reflection of our early schooling, no doubt—let's

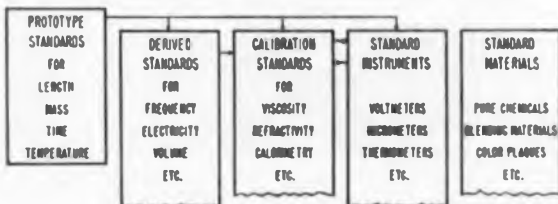


Fig. 1: Classification of standards in categories.

use it as a reference in our explanation of the "classification and nomenclature" of standards.

Before we get into a hassle, let me state that there is no real standard for Nomenclature of Standards. But a member of NBS, A. G. McNish, has presented a system<sup>1</sup> which we feel is quite good.

In this system, the words "primary" and "secondary" are not used—because who knows what they mean? Do they mean that one is not as accurate as the other? One national, the other local?

## Prototype Standards

Physical measurement standards can be assigned to five groups. The first group includes those which embody the independent units of measurement of our system from which the others are derived. By international agreement, there are four standards in this group—length, mass, time and temperature. This is the category for our meter bar. Another metal object in the group is the standard kilogram. For temperature, pure natural water at its triple point. Time; the motion of the earth about the sun.

Members of this group are absolute—they depend on no other standards. Because the standards in this category are the originals from which other standards are fashioned, we call this the "prototype" category.

## Derived Standards

The second group includes those which are derived from the prototype standards, either directly or indirectly through other members of the category. Frequency standards belong here because frequency has the dimension  $T^{-1}$ .

But not all derived units are in this category. There is no standard for force. Nor is there one for the ampere or the coulomb, although there is one for the ohm and the volt. Standards for resistance and electromotive force permit ready measurement of current in terms of them; just as standards of length and time permit ready measurement of speed.

The chain of standards development is not simple and straightforward. Standards are established which are convenient for carrying out the process

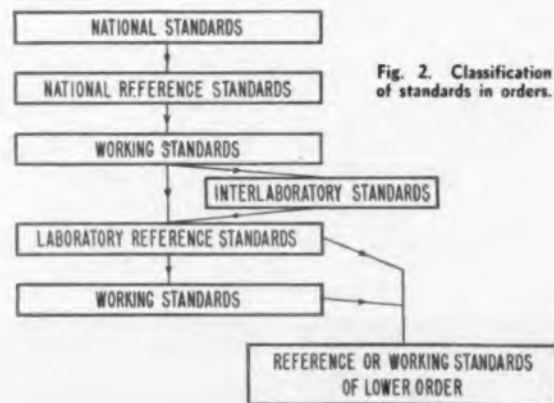


Fig. 2. Classification of standards in orders.

# hp Audio, telemetry and low frequency oscillators

Pictured here are six of the most widely used oscillators in electronics. All employ the highly stable, dependable, accurate resistance-capacity circuit. They require no zero setting. Output is constant, distortion is low and frequency range is wide. Scales are logarithmic for easy reading; all are compact, rugged and broadly useful basic instruments. Brief specifications are given below; call your rep for demonstration or write direct for complete data on any instrument.

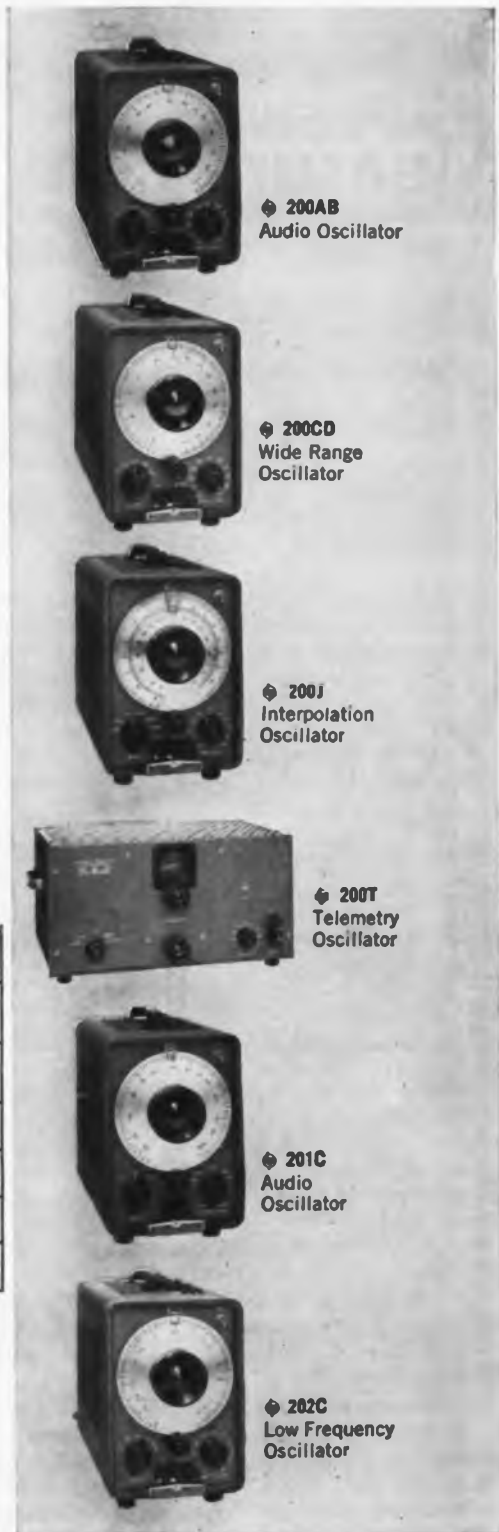
Model	Frequency Range	Calibration Accuracy	Output to 600 ohms	Recommended Load	Maximum Distortion	Max. Hum & Noise †	Input Power	Price
200AB	20 cps to 40 KC (4 bands)	±2%	1 watt (24.5 v)	600 ohms	1% 20 cps to 20 KC 2% 20 KC to 40 KC	0.05%	70 watts	\$145.00
200CD	5 cps to 600 KC (5 bands)	±2%	160 mw 10 volts	600 ohms*	0.5% below 500 KC 1% 500 KC and above	0.1%	75 watts	\$195.00
200J	6 cps to 6 KC (6 bands)	±1% †	160 mw 10 volts	600 ohms*	0.5%	0.1%	110 watts	\$350.00
200T	250 cps to 100 KC (5 bands)	±1% †	160 mw 10 volts	600 ohms*	0.5%	0.03%	160 watts	\$500.00
201C	20 cps to 20 KC (3 bands)	±1% †	3 watts (42.5 v)	600 ohms**	0.5% ‡	0.03%	75 watts	\$250.00
202C	1 cps to 100 KC (5 bands)	±2%	160 mw 10 volts	600 ohms**	0.5% §	0.1%	75 watts	\$300.00

\*Internal impedance is 600 ohms. Frequency and distortion unaffected by load resistance. Balanced output with amplitude control at 100. Use line matching transformer for other control settings. \*\*Internal impedance approximately 600 ohms with output attenuator at 10 db or more. Approximately 75 ohms below 5000 cps with attenuator at zero. †Internal, non-operating controls permit precise calibration of each band. ‡0.5%, 50 cps to 20 KC at 1 watt output. 1.0% over full range at 3 watts output. §0.5%, 10 cps to 100 KC. 1.0%, 5 to 10 cps. 2.0% at 2 cps. 3.0% at 1 cps. ¶Measured with respect to full rated output.

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6038



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pioneered the world-famous resistance-capacity oscillator circuit

of calibration and which possess high consistency among those which are closely related.

Do not be misled into thinking that standards determination is an easy matter. Determining the value of any electric standard in terms of the standards of the prototype category is a difficult procedure.

### Standards Instruments

The fourth group, instruments, differs from the others because its members measure a range of values of the quantities involved. The measurements are usually continuously variable over the range. These instruments are distinctive because they give an indication of the magnitude of the quantity they measure, while standards of the other groups must be compared with similar standards to ascertain differences between them.

An essential requirement for an instrument to be in this group is that it embodies some mechanism, or quality, which serves as a standard for the measurement of a quantity. If an instrument serves merely to facilitate the comparison of two like quantities, such as a comparator, it is not a standard instrument.

### Calibration Standards

Substances or materials possessing some measurable quality which has been determined in terms of the standards of the preceding categories form the next group. Here's the important quality of this group: The quality is an inherent property of the substance and is not due to its geometric dimensions, although in some cases it may depend on the quantity of material which comprises the standard, as is the case for radio active material standards.

These standards are ordinarily used for the calibration of instruments.

ESTIMATES OF ACCURACY AND PRECISION IN MEASURING PHYSICAL QUANTITIES

Physical quantity	Device	Magnitude	Uncertainty in parts per Million	
			Accuracy	Precision
Length	Meter bar	1 meter	—	0.03
	Gage block	0.1 meter	0.1	0.01
	Geodetic tape	50 meters	0.3	0.10
Mass	Cylinder	1 kilogram	—	0.005
	Cylinder	1 gram	1	.01
	Cylinder	20 kilogram	0.5	0.1
Temperature	Triple-point cell	273.16°K	—	0.3
	Gas thermometer	90.18°K	100	20
	Optical pyrometer	3000°K	1300	300
Resistance	Resistor	1 ohm	5	0.1
	Resistor	1000 ohms	7	1
	Resistor	0.001 ohm	7	1
Voltage	Standard cell	1 volt	7	0.1
	Volt box-standard cell	1000 volts	25	10
Power DC	Standard cell-resistor	1 watt	11	1.5
	Wattmeter	10-1000 watts	100	50
	Microcalorimeter	0.01 watt	1000	100

## MEASUREMENT STANDARDS

### Standard Materials

This group is entirely independent of the other categories. It includes materials or substances of specified composition or purity, and materials or substances from batches as nearly identical as possible within each batch, with respect to certain properties.

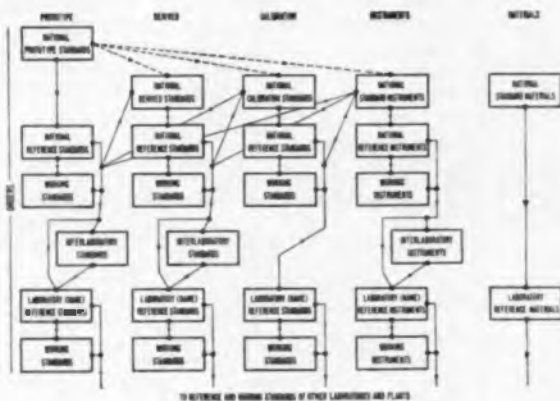


Fig. 3: Classification and relationship of standards.

The important consideration which differentiates the substances in this category from those in the third (calibration) is the information supplied about them. If the information is expressible only in terms of standards of the first category, the substance is a calibration standard. If they are otherwise expressed, the substance is a standard material. A particular substance may be either a calibration standard or a standard material according to the information which is supplied about it.

### A Sixth Category

It appears that logical completeness requires a sixth category to include graduated circles, attenuators, and similar standards which do not depend on the prototype category. Members of this category might be called ratio or geometric standards.

### Classification Within Categories

Thus far little attention has been given to the accuracy of the various standards in classifying them. Standards for different quantities, even though they are members of the same category, may be subject to uncertainties of greatly different magnitudes. Even different standards of the same quantity may vary greatly.

We can readily see that there is a degradation of accuracy in passing from the prototype category to the other groups, for the defining standards of the prototype category are exact by definition. Establishment of standards in the other categories in-



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800	±0.05% DC	5MV	Infinite	Standard Cell (Zener available at extra cost)	\$ 385.00
801	±0.05% DC	50uV	Infinite		485.00
801H	±0.05% DC	5uV	Infinite		555.00
803	±0.05% DC	50uV	Infinite		875.00
8011A (militarized)	±0.2% AC (30cps-5KC)	50uV	1 Meg. 25uufd Infinite	Zener	1745.00

2

### POWER SUPPLIES

(\*all percentages are plus or minus)

MODEL NO.	TYPE	RANGE		CALIBRATION <sup>a</sup> ACCURACY	STABILITY <sup>a</sup>	REGULATION <sup>a</sup>		PRICE
		VOLTAGE	CURRENT			LINE	LOAD	
301C	Precision constant voltage calibrator (chopper stabilized against std. cell ref.)	1.02-1012V	0-400MA	0.1%	0.005%/hr. 0.01%/day	0.005%	0.005%	\$ 985.00
301E		1.02-512V	0-300MA	0.1%		0.005%	0.005%	695.00
334A		0-3111V	0-400MA	0.05%		0.005%	0.005%	2650.00
351A	Precision constant current calibrator (chopper stabilized against std. cell ref.)	0-100V	1uA-100MA	0.05%	0.005%/hr. 0.01%/day	0.01%	0.01%	845.00
406	general purpose	0-530V	0-100MA	3% (full scale meter reading)	0.01%/hr. 0.05%/day	0.01%	0.01%	285.00
407	general purpose	0-555V	0-300MA	0.5%	0.01%/hr. 0.05%/day	0.01%	0.01%	335.00
417A	general purpose	0-500V	0-500MA	3% (full scale meter reading)	0.005%/hr. 0.03%/day	0.001%	0.001%	795.00
402M	HIGH VOLTAGE	500-1600V	0-1MA	0.5%	0.005%/hr. 0.05%/day	0.03%	0.03%	320.00
405	HIGH VOLTAGE	600-3100V	0-15MA	0.25%	0.005%/hr. 0.05%/day	0.01%	0.005%	595.00
408A	HIGH VOLTAGE	500-6010V	0-20MA	0.25%	0.005%/hr. 0.05%/day	0.01%	0.01%	695.00
409A	HIGH VOLTAGE	170-1530V	0-3MA	2%	0.02%/day	0.01%	0.4% for 1MA load change	335.00
410A	HIGH VOLTAGE	1000-10,010V	0-10MA (20MA below 6000V)	0.25%	0.005%/hr. 0.05%/day	0.01%	0.01%	1095.00
412A	HIGH VOLTAGE	500-2010V	0-15MA	0.25%	0.005%/hr. 0.05%/day	0.01%	0.01%	455.00

3

### UNIVERSAL IMPEDANCE BRIDGE

MODEL NO.	RESISTANCE	CAPACITANCE	INDUCTANCE	ACCURACY	FREQUENCY	PRICE
710A	0.1m ohm-12 Meg.	0.1uuf-1200ufd	0.1uh-1200h	R=±0.1%, C=±0.2%, L=±0.3%	100CPS-10KC	\$525.00

4

### VAW METER

MODEL NO.	VOLTAGE (full scale)	CURRENT (full scale)	POWER	POWER FACTOR RANGE	FREQUENCY RESPONSE	ACCURACY	INPUT IMPEDANCE	PRICE
102	1.5-600V	1.5ma-30A	225 uW to 18 KW	1.0 0.1 0.1	20CPS-100KC 20CPS-20KC 20KC-40KC	3% 3% 5%	1 Meg. 25uufd	\$555.00

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## MEASUREMENT STANDARDS

volves measurement of standards in the prototype category, often through intermediaries, under difficult experimental conditions. On the other hand, if a standard is established in one of the other categories, it may be compared with similar standards with greater precision than its accuracy in terms of the prototype standards.

Another important concept is that two quantities of similar magnitude may be compared with each other to greater precision than two quantities of different magnitudes, e. g. meters with meters as opposed to centermeter with meters.

The accuracy of a particular standard depends on a combination of a number of times it has been compared with a standard in a higher echelon, the recentness of such comparisons, the care with which it was done, and the stability of the particular standard itself.

### *Orders in the Prototype Category*

Although the standards for time and temperature are available to all laboratories, the highly national character of the standards for length and mass suggest the name "National" for this order of standards.

We are all familiar with the expressions "wear and tear." Therefore we can readily appreciate the fact that frequent use may impair the accuracy of any standard. Direct comparisons with the National standards are seldom performed. Also, because it is desirable to have other standards which are comparable to the National standards in case of accident, we have standards of slightly lower order which we call "National Reference Standards."

Lengthy experience at NBS has shown that three platinum-iridium meter bars are just as good as the National standards, so that there would be no noticeable change in our unit of length if the National standards were destroyed.

Naturally, a reference standard nominally embodies the same unit as the corresponding National standard. That is, a standard decimeter or a standard yard would not be a National Reference standard.

Such standards belong in a third order, called "Working Standards." These are ordinarily used in calibration work.

Though nothing is specified in these three orders of standards about their relative or absolute accuracy, some degradation of accuracy is implied as one proceeds from National Standards to Working Standards. The important requirement is that the standard be accurate enough to assure the errors involved in using it do not exceed the allowable limits specified for the calibration to be performed.

Here is a little information on how NBS operates. It is not the Bureau's practice to state in detail how a calibration has been performed, nor to state with what particular standard or standards a tested article has been compared. But when a certificate is supplied, the correction to the article is given in terms of its National Standard, and the limits of

## CATEGORIES

### **Prototype Standard**

The "prototype standard" is the category of standards which, with certain defining relationships, fixes the sizes of all units in a measuring system.

### **Derived Standard**

The "derived" standard is the category of standards consisting of objects embodying approximations of units, or integral multiples or sub-multiples thereof, which are derived from standards of the prototype category.

### **Calibration Standard**

A "calibrations standard" is a substance or material having some property, not determined by its geometric dimensions, which has been accurately measured completely or partly in terms of the standards of the two preceding categories, used mainly for the calibration of measuring devices.

### **Standard Instrument**

A "standard instrument" is an instrument for measuring some quality in terms of standards of the preceding categories.

### **Standard Material**

A "standard material" is a material or substance of specified composition or purity, or possessing some other property not specified in terms of our regular standards of measurement.

## ORDER

### **National Standards**

The order of standards which fixes the value on a national basis for all standards of that kind.

### **National Reference Standards**

The order of standards which are approximately duplicates of the national standards.

### **Working Standards**

The order of standards which are ordinarily used in calibration and which are themselves calibrated in terms of the corresponding reference standards.

### **Laboratory Working Standards**

That order of standards which is used for the ordinary calibration work of a standardizing laboratory and which in turn is calibrated by comparison with the reference standards of that laboratory.

### **Inter-laboratory Standards**

Those which are used for comparing reference standards of one laboratory with those of another when the standards are of such nature that reference standards should not be shipped.

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As an amplifier, the  $\Phi$  413A provides an output proportional to meter deflection, offering gain from 0.001 to 1,000 in 13 steps. Extreme linearity, high stability and low noise make it ideal as an indicating and control device. Typical application is for amplifying the output of a thermocouple in control systems, the zero set establishing an arbitrary reference.

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30 megohms on 30 mv range  
100 megohms on 100 mv range  
200 megohms on 300 mv range and above

**AC Rejection:** A voltage at power line or twice power line frequency 40 db greater than full scale affects reading less than 1%. Peak voltage must not exceed 1,500 v.

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**Voltage Gain:** 0.001 to 1,000 in 13 steps

**Gain Accuracy:**  $\pm 1\frac{1}{2}\%$

**Gain Linearity:**  $\pm 0.2\%$

**Noise:** Less than 0.1% (rms) of end scale on any range

**Output:** 1 volt for end scale deflection, same polarity as input. End scale corresponds to 1.0 on upper scale. Max. load current, 1 ma.

**AC Rejection:** Approx. 3 db at 1 cps, 80 db at 50, 60 cps

**Input Isolation:** Greater than 100 megohms shunted by 0.1  $\mu$ f to instrument case (power line ground)

**Common Signal Rejection:** May be operated up to 500 v dc, or 130 v ac above ground

**Dimensions:** 11 $\frac{1}{2}$ " high, 7 $\frac{1}{2}$ " wide, 10" deep (cabinet); 5 $\frac{1}{4}$ " high, 19" wide, 7 $\frac{1}{2}$ " deep behind panel (rack mount)

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## MEASUREMENT STANDARDS

the state uncertainty include the accrued errors in referring back to the National Standard.

### Orders in Other Categories

"National," "National Reference," and "Working" standards are applicable for all of the other categories except "Standard Materials." For this group the only order required seems to be "National Standard Materials."

The United States National Standard for frequency is maintained by NBS as its Boulder Laboratories. (The use of the adjective equivalent "United States" in this case is highly appropriate to avoid confusion with a certain proprietary name.)

### Other Laboratories

This system can be applied with slight modification for the many laboratories which are tied in with the National Standards. These laboratories include the rather extensive system of the Dept. of Defense, including those operated directly by that department and those maintained by its contractors, as well as the standardizing laboratories of various manufacturing companies which deal directly with NBS.

Incidentally, some of these commercial laboratories, particularly those maintained by manufacturers of precise instruments, do just as excellent a job in calibrating as does NBS, and they maintain some standards which are of as good quality as the National Standards.

But only one laboratory can have an order of standards called "National Standards." This is reserved for the laboratory which is responsible for establishing the standards of measurement on a national basis. For us, this is NBS.

The highest ranking order of standards at each laboratory would be the "Laboratory Reference Standards" which would set the values of the standards for that laboratory and which in turn would have their values determined by the standards of another (higher ranking) laboratory, or sometimes, by means of the Reference for Working Standards of another category.

The important requirement is that the accuracy of the standard be sufficient for its purpose.

One important difference between the orders "National Reference Standards" and "Laboratory Reference Standards" is that while the former nominally embodies the same magnitude of the unit, the latter may not.

### Certification

Each laboratory should decide on the method of test for a given type of device and the standards to be used that the required accuracy be achieved. In issuing a certificate for the test, the laboratory might state something like this: "This resistor has



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- 1000 ohms to 100 megohms resistance
- Self contained 1 MC osc-det.
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## TUNED AC NULL DETECTOR



MODEL 51A  
PRICE \$1900

- Useful as a detector for low frequency impedance bridges. Balance can be observed on either built in CRT or external meter
- 20 cycles to 200 KC tuning range
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- 1 megohm shunted by 100  $\mu$ mf input
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- Phase sensitive

## RF DISTORTION METER & VOLTMETER



MODEL 85B & C  
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- 0.1-6 MC:85C
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- Accuracy:  $\pm 2$  db
- RF Voltmeter: Same as 91C

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MODEL  
101B  
PRICE \$275

- Highest sensitivity to I & C coupling
- 300 to 1000 MC
- Accuracy: 2%

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- 10KC — 1000MC Frequency Range
- 300  $\mu$ v — 3v Range
- Linear DC Output
- High Impedance Probe Supplied

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## STILL IN PRODUCTION

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- 1 Mv — 3v Range

MODEL 91C PRICE \$395



## SENSITIVE DC NULL DETECTOR

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MODEL 56A  
PRICE \$395

- 1  $\mu$ v to 100 v sensitivity
- Input: 10 megohms constant
- Floating input
- Amplifier Gain: 100 db

## SENSITIVE DC METER

ULTRA SENSITIVITY IN VOLTAGE & CURRENT MEASUREMENTS

- 1  $\mu$ v to 1000 v in 17 ranges
- 0.1  $\mu$ ma to 1 a in 25 ranges
- Input: 10 megohms constant
- Floating Input
- Amplifier Gain: 100 db

MODEL 95A  
PRICE \$495



## DC VOLTMETER

- 10  $\mu$ v to 1000 v in 14 ranges
- Input: varies 10-100 megohms
- Amplifier Gain: 70 db
- Amplifier Output:  $\pm 0.5$  ma into 1500 ohms
- Zero center meter eliminates polarity switch

MODEL 97A  
PRICE \$325



## DIFFERENTIAL DC VOLTMETER

- 10  $\mu$ v to 1000 v in 14 ranges
- Input: varies 10-50 megohms
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**Boonton ELECTRONICS Corp.**

Morris Plains, N. J.  
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been compared with standard resistors of this laboratory and found to have a value at 20°C of 1.00024 ohms in terms of the National Standard of Resistance. At the time of the test this value was probably correct to within two units of the last figure given."

Such test results should be given in terms of the National Standard to avoid any uncertainty in the values involved.

All laboratories, of course, might not be qualified to certify to the same accuracy. One laboratory might certify 1-ohm resistors to within 0.002% while another might certify only to 0.01%.

There is a practice at present which does not help the standardizing situation. Scientists often express the magnitude of a quantity they are measuring in terms of another which has not been accurately measured but which they call a standard. For example, wavelengths of special lines are frequently

## MEASUREMENT STANDARDS

measured in terms of one line of the spectrum taken as a "standard," or radioactivities of materials that are measured in terms of another taken as a "standard." Clearly, those "standards" do not conform to our definitions. It would be better to refer to such quantities as "fiducial" quantities.

### References

1. McNish, A. G., "Classification and Nomenclature for Standards of Measurement," *IRE Trans. on Instrumentation*, Dec. 1955.
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3. "Nomenclature for Standards of Radio Activity," *International Journal of Applied Radiation and Isotopes*, 1960, Vol. 8, pp. 145-146.
4. McNish, A. G., and Cameron, J. M., "Propagation of Error in a Chain of Standards," *IRE Trans. on Instrumentation*, Sept. 1960.

Legend		Standards Manufacturers	
Time	1	Daystrom, Inc.	8
Frequency	2	Weston Instruments Div.	
Resistance	3	614 Frelinghuysen Ave.	
Capacitance	4	Newark 12, New Jersey	
Voltage	5	Electro Scientific Ind., 3, 8	
Current	6	Inc.	
Temperature	7	7524 S. W. Macadam Ave.	
Instruments	8	Portland 19, Oregon	
Inductance	9	Epsco Inc.	5, 8
Conductance	10	275 Massachusetts Ave.	
		Cambridge 39, Mass.	
Acton Laboratories, Inc.	8	Fork Standards Inc.	2
Technology Instrument Corp.		1915 N. Harlem Ave.	
533 Main St.		Chicago 35, Ill.	
Acton, Mass.		General Radio 2, 3, 4, 8, 9	
American Time Products	2	Co.	
Div. of Bulova Watch Co., Inc.		West Concord, Mass.	
61-20 Woodside Ave.		The Geotechnical	1, 2
Woodside 77, New York		Corp.	
P. A. Bailey Electronic Laboratory	2	3401 Shiloh Road	
6-14 Alsop Ave.		P. O. Box 28277	
Middletown, Conn.		Dallas 28, Texas	
Boonton Electronics Corp.	4, 8	Gertsch Products, Inc.	2, 8
738 Speedwell Ave.		3211 S. La Cienega Blvd.	
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Borg Equipment Div.	1, 2	Gibbs Mfg. & Res. Corp.	2, 8
Amphenol-Borg Electronics Corp.		Janesville, Wis.	
120 South Main St.		Gray Instrument Co.	3, 8
Janesville, Wisconsin		448 Mill Road	
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85 Curlew Drive		Gyrex Corp.	2
Don Mills, Ontario		3003 Penna. Ave.	
Davenport Manufacturing Div.	8	Santa Monica, California	
Duncan Electric Co., Inc.		Hermes Electronics Co.	2
2530 N. Elston Ave.		75 Cambridge Parkway	
Chicago 47, Ill.		Cambridge 42, Mass.	
		Hewlett-Packard Co.	1, 2, 8
		1501 Page Mill Road	
		Palo Alto, Calif.	
		Holt Instrument Laboratories	5, 6, 8
		Div. of Holt Hardwood Co.	
		Oconto, Wisconsin	
		ITT Industrial Products Div.	2, 8
		International Telephone & Telegraph Corp.	
		15191 Bledsoe Street	
		San Fernando, Calif.	
		The James Knights Co.	2
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		4901 Stenton Ave.	
		Philadelphia 44, Penna.	
		Manson Laboratories, Inc.	2, 8
		P. O. Box 1214	
		Stamford, Conn.	
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		Chicago 51, Ill.	
		Muirhead Instruments, Inc.	2, 3, 4, 5, 8
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		New York 17, New York	
		National Company, Inc.	1, 2, 8
		61 Sherman Street	
		Malden 48 Mass.	
		Ernst Norrman Laboratories	1, 2, 8
		Williams Bay, Wisconsin	
		North Hills Electronics, Inc.	6, 8
		Alexander Place	
		Glen Cove, New York	
		Owen Laboratories, Inc.	5
		55 Beacon Place	
		Pasadena, Calif.	
		Royco Instruments, Inc.	8
		440 Olive Street	
		Palo Alto, Calif.	
		Sensitive Research Instrument Corp.	3, 5, 7, 8
		310 Main St.	
		New Rochelle, New York	
		Simmonds Aerocessories, Inc.	4
		Tarrytown, New York	
		Smith-Florence Inc.	5, 8
		4228 Twenty-Third Ave.	
		West Seattle 99, Washington	
		Space Technology Laboratories, Inc.	2
		8929 S. Sepulveda Blvd.	
		Los Angeles, Calif.	
		Tech Laboratories, Inc.	3
		Bergen & Edsall Blvds.	
		Palisades Park, N. J.	
		Trans-Sonics, Inc.	7
		P. O. Box 328	
		Lexington 73, Mass.	
		Varian Associates Instrument Division	2
		611 Hansen Way	
		Palo Alto, California	
		Varo Inc.	2
		2201 Walnut St.	
		Garland, Texas	
		Venner Electronics Limited	1, 2, 8
		Subsidiary of Venner Limited	
		Kingston By-Pass, New Malden, Surrey, England	
		Viking Industries, Inc.	5
		21343 Roscoe Blvd.	
		Canoga Park, California	

We hasten to point out that the companies listed in this summary may manufacture other than the standards indicated. However, these are the particular items which they singled out in an industry-wide survey.

By J. L. KISER

President  
Vari-L Company, Inc.  
207 Greenwich Ave.  
Stamford, Connecticut

# The Electrically Variable Inductor

*Many engineers are not aware of the existence of the electrically variable inductor. Others know of its existence but are not too familiar with its technical characteristics, or its many applications.*

THE variable inductor came into being in the late 1940s, and because it was a new component, it attracted considerable attention. As a result of the publicity at that time, most engineers were familiar with the existence of this device, and many had experimented with samples. However, many engineers who began their working careers in the 1950s have either little or no awareness of this product. It is for their benefit that this article was written.

## Definition

An electrically variable inductor is one in which the inductance can be controlled by a current or a voltage. It is usually made in the form of a saturable reactor with two windings. One is called the signal (tuned) winding—corresponding to the A.C. (load) winding of a power-handling saturable reactor. The other is the control winding and corresponds to the D.C. winding of the saturable reactor. Normally, variable inductors do not handle much power but are used mainly for the control of resonant frequency in low-level tuned circuits. There is no accepted schematic representation for the device, but the configuration illustrated in Fig. 1 can be used.

## History

In designing electronic circuits,

the three quantities are constantly used. It is often necessary to provide a component which permits variation in its value. The latter two have had variable versions available from the beginning of, and even before, the advent of the electronic art. Variable inductance was frequently employed in the form of

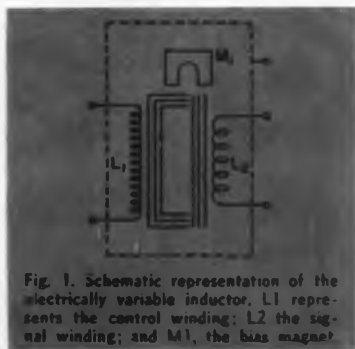


Fig. 1. Schematic representation of the electrically variable inductor. L1 represents the control winding; L2 the signal winding; and M1, the bias magnet.

the variometer, loose coupler, or slide-wire helix. In later years, these devices were not used because of bulkiness, cost, or mechanical complexity. As a result, most engineers came to accept the fact that circuit control was best provided by variation in resistance or capacitance, and inductance was seldom considered as a variable element. This situation changed somewhat with the development of powdered iron core materials. It became common to use slug-tuned transformers and so-called permeability tuners

which were, in reality, a ganged type of slug-tuned coils. These plus nearly all of the other variable circuit components were mechanical devices. With the increasing use of broad-band circuits and pulse techniques, there developed a considerable need for devices which would cover a range of variation repetitiously and at a high rate of speed. A means frequently employed was a motor driven variable capacitor of the conventional type. Butterfly units and vibrating diaphragm capacitors or inductors were also used, but these required maintenance and tended to be mechanically unstable.

From the time when ferro-magnetic material was first used as the core of a high frequency inductor, it was realized that the principle of saturation could be employed to vary the inductance. However, such material was usually made in the form of finely pulverized magnetic powder pressed together with a binder, and the effective permeability was in the order of ten or less. Considering that the basic magnetic material in solid form had a permeability of several hundred or even thousands, it is evident that the pulverizing and repacking process introduced a high order of effective air gap, making material very difficult to saturate. Hence, the range of control obtainable with

reasonable power was small. With the invention of soft ferrite materials during World War II, there was available for the first time a high frequency ferro-magnetic material which did not exhibit these extremely high reluctance characteristics, and which also had high permeabilities. Many engineers had the experience of winding coils on such materials and observing gross shifts in inductance when a permanent magnet was brought near the core. It didn't take long for some of them to begin making their own swept inductance devices. These usually consisted of a small inductor placed in the air gap of a large electro magnet. Work was soon under way to gang such devices for multi-tuned stages. This proved to be quite difficult because of the limitation of available ferrite materials.

Early development work in ferrites was done in European countries. It wasn't until the need for an inexpensive core material for television fly-back transformers made it economically attractive that U. S. manufacturers began producing cores. Most of the firms that entered the field were basically ceramic producers, and their attempts to produce ferrite cores with facilities designed for titanates, steatites and other ceramic bodies resulted in non-uniform products. Furthermore, availability of oxides of suitable purity and uniformity was limited, complicating the problem. Often engineers who devel-

Fig. 2. A typical unit has a rising Q for the first part of its range and then slightly falling Q for the last part.

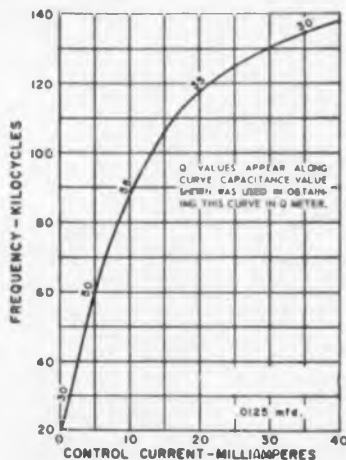
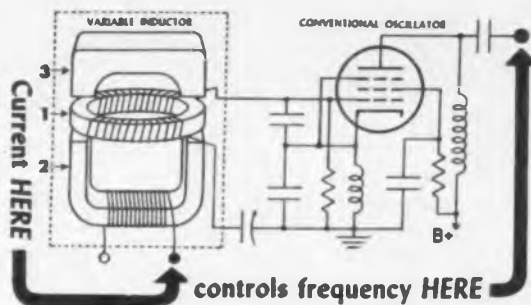


Fig. 3. Number 1 represents the toroidal signal winding, number 2 the control winding and yoke, and number 3 the bias magnet.



oped a saturable reactor using some of the early ferrite bodies found that a reorder for a material could not be filled because the manufacturer was unable to duplicate it. All of this pointed to the need for a specialist in the field of high frequency saturable reactors or "variable inductors."

Government contracts were let for various devices to explore the possibilities of the variable inductor. Among them were panoramic receivers using multi-tuned, tracked stages consisting of variable inductors. A great deal in terms of production techniques for best uniformity and methods for the selection and grading of core materials was learned from these projects.

#### Construction Techniques

Certain configurations for saturable core reactors have been used in power handling versions for over sixty years. Two of these can be applied directly to high frequency types. These are the E-E and toroidal cores. It is a basic necessity of the saturable reactor that the AC winding be split into two symmetrical halves which are connected series opposing, so that transformer coupling from primary to secondary (control to signal) is minimized. Therefore, a toroidal saturable reactor must have two identical cores, each one of which is wound with one-half of the signal (tuned) winding. These are placed together with suitable insulation and shielding, and the control winding is then wrapped around both. This produces an effective high frequency saturable reactor or variable inductor, and is widely used for non-critical applications. Disadvantages of this construction are:

- (a) Need for close matching of the two core sections.

- (b) High capacitance from control to signal winding or to ground if an electrostatic shield is used.
- (c) High retentivity.
- (d) High cost associated with toroidal devices.
- (e) Poor trackability.

From a cost, and to a considerable extent, a quality standpoint, the first approach taken to the construction of a simple saturable reactor as mentioned is far superior to the toroidal one. Placement of the core in an air-gap automatically reduces retentivity, and the control over placement and disposition of the magnetic field provides control over the flux-versus-frequency characteristics. Hence, it is easier to track such devices. The big disadvantage lies in the inefficiency caused by the air-gap and the reduction in inherent range of control, as compared with the same material used for a toroidal type.

It was decided after a thorough survey of the art, that many applications could be served adequately using less range than was formerly thought to be desirable, and at lower cost. Shortly after production started, it was discovered that the addition of a permanent magnet to the assembly could overcome the loss in range. This made a valuable tool for adjusting inductance and the shape of the control curve. A great many designs still use this feature and have been in service for up to eight years in calibrated devices. This is mentioned to dispel any misgivings about a long time stability of properly aged magnets. Numerous by-product advantages also present themselves as can be imagined when it is realized that the assembled reactor consists of

(Continued on page 146)

several parts, each one of which can be modified as necessary to produce a desired shading in parameters.

Packaging of the variable inductor is more difficult than for conventional components such as transformers, capacitors, and relays, for the following reasons:

- (a) The electrical performance of the inductor depends upon the guaranteed proximity of two or more parts to each of the other parts.
- (b) Ferrites are pressure-sensitive and to a certain extent hygroscopic.
- (c) Inductance represented by leads and terminals is effectively in series with the controlled inductance and reduces the available range. This is particularly troublesome in high frequency types.
- (d) Conventional glass metal seals containing magnetic materials seriously inhibit Q at high frequencies.

#### Characteristics

**Range of control**—For the average structure the power required for full range is approximately one watt, and the absolute ratio of maximum frequency is from 1.2 to 1 in the highest frequency unit to 15 to 1 in the lowest frequency unit.

**Frequency**—The upper frequency limit is established by the loss characteristics of presently available ferrite cores plus the non-applicability of lumped inductance in U.H.F. circuits.

**Q**—The core is usually chosen to have nominal losses for the lowest applicable frequency, and, since saturation tends to reduce these losses, Q rises somewhat as frequency increases. A typical unit has rising Q for about the first two-thirds of its range and then slightly falling Q for the last third. (Fig. 2)

**Linearity**—The typical variable inductor has a curve of frequency change with current which starts out as a shallow "S." For circuits requiring good linearity, it is best to have a total range available which is at least twice the range over which linear response is required. Thus a region in the "S" portion can be selected which falls

within one or two percent of a straight line. Some control can be exerted over linearity by tailoring of the shape of the core and its arrangement in the assembly.

**Hysteresis**—The term is often applied to the effect which causes a slight difference in the shapes of the two curves—one with ascending and the other with descending current.

The effect is caused by the retentivity of the core, which stays partially magnetized after the application of control flux and causes a frequency difference between the two curves of from 2 to 15 percent at their point of widest divergence. For many circuits this characteristic has no effect. For critical circuits, special low hysteresis types and special oscillator circuits are available.

**Temperature stability**—Inherently, ferrite-cored inductors, including the electrically variable version, have rather high frequency drift with temperature, and the coefficient varies with the amount of control current applied. There are numerous ways in which the drift can be reduced, including the use of a temperature stabilized enclosure for special cases.

#### Applications

Since all electrical circuits contain some inductance, it follows that the applications of control by means of electrically variable inductors would be numerous and varied. We often don't know the nature of the end-uses of the units, but we have records of their performance in practically all environments including oceanography, geophysical exploration, missile testing guidance and tracking, and satellite instrumentation. Some of the more commonly encountered applications are:

TYPE OF SERVICE	EXAMPLE
Automatic Frequency Control	Signal-seeking receiver
Sweeping Oscillator	Television alignment generator
Sweeping Filter	Speech synthesis
Remote Tuning	Antenna control from receiver
Ganged tuning	Receiver front end
Switching	Teletypewriter control
Telemetry	FM Sub-carrier oscillator

3rd in a series of new brochures from Hughes



## SILICON ALLOY DIODES — RELIABILITY BY DESIGN

If someone beat you to this copy of the magazine, the new Hughes color brochure is probably missing. To get your copy of the brochure, just circle No. 20 on this magazine's reader service card or write to Hughes Semiconductor Division, Marketing Department, Newport Beach, Calif.

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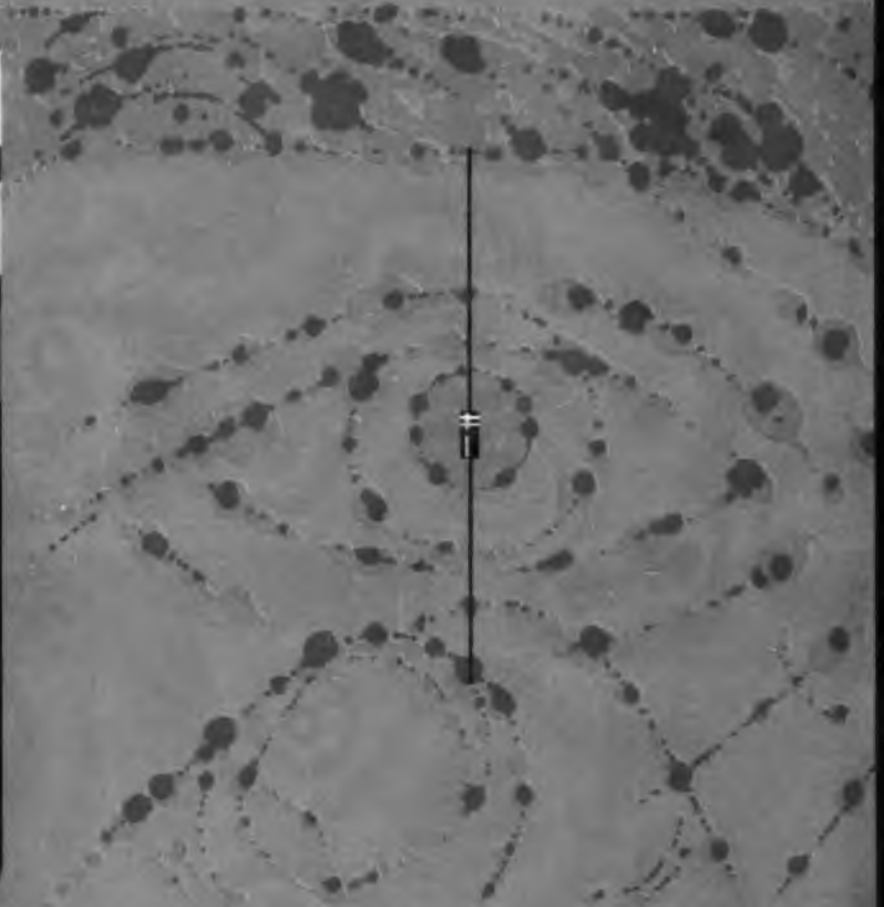
CREATING A NEW WORLD WITH ELECTRONICS

**HUGHES**

SEMICONDUCTOR DIVISION



**SILICON ALLOY DIODES—  
RELIABILITY BY DESIGN**



*Characteristics, applications  
and key types of today's  
most widely used diode family.  
Number three of a series*

## Silicon Alloy Diodes—Reliability by Design

The silicon alloy process is by far the least complex and one of the most thoroughly studied processes in the semiconductor industry. It is a well known fact that Hughes is one of the oldest, if not the oldest name in the manufacture of semiconductor glass diodes. These years of experience have brought about a family of silicon alloy products using one of the most reliable p-n silicon junction manufacturing techniques known today. (1) The simplicity of the process lends itself to excellent control of the product line, continuous reproduction of product distribution and electrical characteristics, and the least probability of

(1) S. H. Barnes, (Hughes Aircraft Company), "Silicon Junction Diodes Sealed in Glass," AIEE, January, 1964.

E. M. Baldwin and J. A. Mateo, (Hughes Aircraft Company), "Silicon Junction Diodes," E.C.C., May, 1962.

process shifts and device degradation.

What does this mean to the design engineer using these products in the design and fabrication of electrical equipment? It will give him the assurance that there is a product that has been in existence for years, guaranteeing continuous reproducibility, availability and interchangeability—a product which has had reliability designed into it through years of conscientious effort to improve quality and to meet the ever increasing market demands.

Of late, many new manufacturers using a variety of manufacturing techniques have come into existence. It should be remembered, however, that it isn't the process complexity or nomenclature which determines the quality or reliability of a diode, but the ability to control and produce a reliable device containing the optimum required electrical characteristics. Examine the following 1N types registered by Hughes; all were developed and param-

eters arrived at with the silicon alloy process in mind.

## Quality and Reliability Controls

All Hughes silicon diode models are subjected to a one hundred percent testing procedure as follows: temperature and humidity cycling, 200°C heat soak, visual and mechanical inspection, and back instability testing.

In existence now at the Hughes Semiconductor Division are hundreds of specifications from customers requiring almost every conceivable stabilization, acceptance, and qualification testing criteria, striving in some cases for reliability goals with the mean time to failure rate as low as .0002% per 1000 hours operation.

Daily surveillance programs in accordance with MIL-E-1D or MIL-S-19500B are performed on Hughes silicon diode product lines.



### SILICON ALLOY FAMILY COMPARISON

## Hughes' Silicon Alloy Diode Families and Types

The variations of the silicon alloy process can be separated into six basic product model categories.

- ① GENERAL PURPOSE DIODES (100mA @ +1V illustrated)
- ② RECTIFIERS (200mA @ +1V illustrated)
- ③ HIGH CONDUCTANCE COMPUTER DIODES (200mA @ +1V illustrated)
- ④ LOW CONDUCTANCE COMPUTER DIODES (4mA @ +1.5V illustrated)
- ⑤ ULTRA FAST COMPUTER DIODES (5mA @ +1V illustrated)
- ⑥ CAPACITOR DIODES (typical forward conductance illustrated)
- ⑦ ZENER DIODES (typical forward conductance illustrated)

Mean forward and reverse characteristics are shown in graph form denoting the various areas of performance each silicon alloy family typifies.

NOTE: Detailed specifications on all Hughes silicon diode types are available upon request—see back cover for address of Hughes representative nearest you.

Fig. 1—Forward Current vs. Forward Voltage

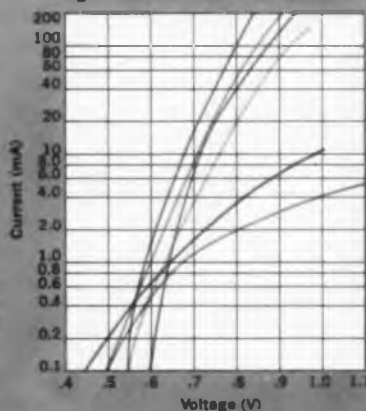


Fig. 2—Reverse Voltage vs. Reverse Current

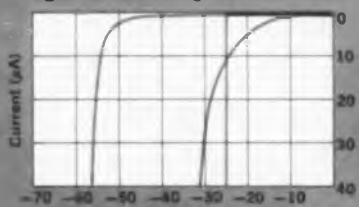
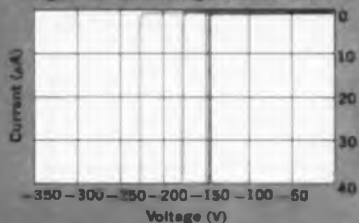


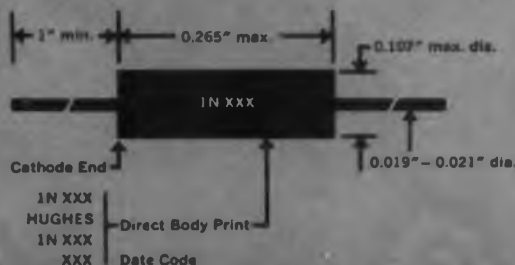
Fig. 3—Reverse Voltage vs. Reverse Current



### PHYSICAL DIMENSIONS—

Note: Unless specified otherwise, 1N and MD types are direct body printed, however upon request:

- 1) Color bands can be used for 1N and MD types
- 2) If special body markings or codings are required, allow additional .008" for outside body diameter.



## GENERAL DESCRIPTION

**General Purpose Diodes:** The general purpose silicon alloy diode is the oldest line of Hughes® silicon diodes, primarily noted for its high forward conductance, medium breakdown voltage, extremely low leakage currents at high and low temperatures and "zener type" stable hard back characteristics. Where applications require a rugged and reliable glass package diode type capable of meeting MIL standards and requiring low leakage, high temperature capabilities, this silicon diode device is highly recommended.

**Rectifiers (Glass Package):** Through the proper selection of materials and processes and the use of pressurization techniques, a new line of high voltage and high conductance silicon alloy rectifier types are available in the compact glass package. Where ruggedness, stability and dependability are important at both high and low temperatures and at high voltage operational conditions, this family type is outstanding.

**Low and High Conductance Computer Diodes:** The silicon alloy computer diode combines the features of the general purpose diodes with that of "fast recovery" high level switching to form one of the most versatile diodes on the market. Its ruggedness and dependability can best be demonstrated by its ability to meet MIL-S-19500B or MIL-E-1D as Single Service type approval.<sup>1</sup>

The latest advancements in special processing techniques make available silicon alloy computer diodes which feature, along with the previously mentioned capabilities, a low stored charge and millimicrosecond reverse recovery times in low level switching circuits.<sup>1</sup>

<sup>1</sup> 1N658 Signal Corp. MIL-E-1/1160

1N662 Signal Corp. MIL-E-1/1139

1N663 Signal Corp. MIL-E-1/1140

1N643 Signal Corp. MIL-E-1/1171

<sup>2</sup> Lumatron, Tektronix Sampling Scope or EGG Traveling Wave Scope.

**Ultra Fast Computer Diodes:** One available in the market is a "special modified pulse loaded" silicon ultra fast computer diode. Never has there been a device with such ultra fast forward and reverse recovery characteristics. No practical means are available for observing the transient turn on response normally characteristic of a semiconductor device. The reverse recovery time for this diode using a sampling or travelling wave scope<sup>3</sup> is in tenths of milli-microseconds. The shunt capacitance at zero bias can only be equalled by that of a germanium point contact. Because of these inherent characteristics this device has a rectification efficiency well above 50%, the highest for any silicon diodes.

<sup>4</sup> Sampling scope switching 10 mA to -6V recovering to 3 mA  $\leq$  .5 nsA.

**Capacitor Diodes:** The silicon capacitor is an evaporated aluminum alloy junction diode making use of the fact that variations in bias voltages vary the junction capacitance. By controlling and properly selecting materials and processes a complete range of capacitance and maximum operating voltages are obtained.

**Zener Diodes:** This is the ideal diode for circuit components which require very low leakage and minimum dynamic impedance in the avalanche region. The Hughes® zener diode is a reliable and dependable alloy junction device perfectly suited for rigid electrical applications in circuits where quality, space and weight are premium items.

## ELECTRICAL CHARACTERISTICS

Forward currents are available of over 200 mA at one volt while back voltages at 100  $\mu$ A are available up to 300 V. The room temperature leakage currents at 80% of the breakdown voltage can be as low as a few millimicroamperes; and at 150°C as low as a few microamperes. The recommended storage temperature range is -80°C to +200°C.

Forward currents range from 10 to over 200 mA at one volt while the Working Inverse Voltages (WIV) can be as high as 1000 V. Static leakage currents at 25°C and 80% of the WIV are generally less than 1.0  $\mu$ A and under 60 cps operating conditions at maximum I<sub>o</sub> and WIV are generally below 10  $\mu$ A. The maximum storage temperature range is -65°C to +200°C.

Forward currents are available over 200 mA at one volt while back voltages at 100  $\mu$ A run above 200 V. Room temperature leakages are as low as .025  $\mu$ A at 80% of E<sub>s</sub> and at -20 V are as low as .010  $\mu$ A. High level reverse recovery in a JAN 256 circuit switching 30 mA to -35 V recovering to 400K are available in less than 0.3  $\mu$ sec. Storage range -65°C to +200°C, operational up to 150°C.

Forward conductance at one volt range from 2 to 5 mA while back voltages at 100  $\mu$ A are available up to 30 V. Leakages at -6V at 25°C are less than 1  $\mu$ A. Storage temperature is -60°C to +125°C while operating temperatures can go as high as +100°C.

Capacitance range available is 6 to 240  $\mu$ mf with maximum bias voltages variations up to 150 V. Q's are available up to 400 @ 5 mc while tracking variations of a particular type is less than 1% over the useful voltage range from one unit to another. The temperature coefficient of capacitance at -4 V is 0.3%/°C.

Low noise in the avalanche region @ 1 mA cc or greater. Low dynamic impedance throughout the voltage range of 2 to 30 volts for premium units. Power ratings up to 400 mW at 25°C. Moderate capacitance over the voltage range of 2 to 30 volts. Adaptability as a tuning condenser over the bias range of +0.35 volt in the forward region to within 90% of the avalanche region. Very low leakage (hard back) until the avalanche point is reached. Minimum temperature coefficient change with variation in power levels. Very close tolerance package size distribution. Storage temperature range of -80°C to +200°C. Operating temperature range of -65°C to +175°C.

## APPLICATIONS

Clippers, clampers, low frequency detectors ( $\leq$  100K), logarithmic elements, stabilizers, series circuit compensators, and circuit protection.

Bridge rectifiers, stacked rectifiers, clippers, clampers, high voltage transient arc suppressors.

Cura drivers, logic gates, modulators, detectors.

RF modulators, demodulators, detectors, high frequency radar, UHF communications, high frequency response test equipment, computer circuitry, reference diodes.

Electronic remote tuning, AFC, RF oscillators, frequency multiplication

Voltage regulators, noise suppressors, clippers, shapers, limiters.

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1N643† 1N840  
1N643A 1N841  
1N662† 1N842  
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† Non-registered  
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HD5001  
HD5002  
HD5003  
HD5004

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1N951‡ 1N954‡  
1N952‡ 1N955‡  
1N956‡

‡ Pending  
Registration

1N702† thru 1N725  
with "A" versions available.  
1N761† thru 1N769  
1N465† thru 1N473  
with "A" versions available.  
1N131† thru 1N1319  
1N1929† thru 1N1937  
† Non-registered  
Hughes Types

## Purchasing Do's and Don'ts



**DON'T** specify a device that does not exist for your circuits—although this will motivate research and development groups to design better products for the future...the immediate result is long delay in quantity delivery. Be sure you can wait if your requirement is exotic.



**DON'T** specify inferior products for economical purposes resulting in unreliable circuit performance. This practice creates a vicious reject and replacement cycle between manufacturer and user.



**DON'T** buy from manufacturers whose facilities are not adequate for testing to rigid military specifications and whose production quantity delivery is questionable.



**DON'T** attempt to buy reliability by specifying breakdown voltages far in excess of those required. There may be some exceptions, however, this is a very expensive practice. **DO** buy reliability—not reliability by safety factor!



**DO** make sure that the diodes you buy meet the manufacturer's advertised and registered specifications.



**DO** make sure your 1N diode type is "registered" with EIA, not "reserved." When using types with a "reserved" status, the manufacturer may alter his specifications at will.



**DO** make sure the leakage currents are measured at a reverse voltage as high as your present requirement demands.



**DO** remember that reliability has to be designed in the diode; it cannot be tested in. No amount of testing will undo poor design. However, it is important that the manufacturer have a sound quality assurance program to insure that the reliability is actually there.



**DO** make sure that a diode that is to be used as a switch meets your speed requirements by actual test in your circuit; this is the only true test. Manufacturers often show values for switch speeds that are optimized.



**DO** be sure to get the leakage currents you actually need. Specify the measurements which match most closely your actual circuit requirements.



**DON'T** guess what the parameters will be if your circuit is for intended high temperature operation, but **DO** get the proper data from the manufacturer.

## Silicon Alloy Diode Trends at Hughes

Constantly striving to keep ahead of the semiconductor industry and abreast of the latest processing techniques, Hughes R&D and Engineering are presently involved in the following programs.

- MICROSEAL® component packaging
- Special surface treatments with emphasis on stability and reliability
- Double diffused computer diodes with reference to high currents, voltages and power dissipation capabilities
- Micro-microsecond recovery times
- Micro-microamp leakage currents
- Epitaxial growth techniques

\*Trademark—Hughes Aircraft Company

The foregoing information has been gathered from the Hughes Semiconductor Division's reports and records on the silicon alloy diodes compiled with the cooperation of Hughes' staff of skilled engineers. \* Pioneer in the semiconductor field, Hughes has continued as a top developer and producer of the most advanced semiconductor devices. The Newport Beach plant, with its third of a million square

feet of floor space, houses all of the facilities necessary for every phase of design, development and production of diodes, transistors, rectifiers, special devices and semiconductor materials. \* For further information call or write your nearest Hughes Semiconductor Sales Office. Or write: Hughes Semiconductor Division, Marketing Dept., 500 Superior Ave., Newport Beach, California.



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# 1961 SEMICONDUCTOR REPLACEMENT GUIDE

**Product List • Diode Similarity • Transistor Interchangeability**

Compiled for industry by the editorial staff of ELECTRONIC INDUSTRIES this 1961 Semiconductor Replacement Guide is a composite chart based on information received from more than 50 domestic and foreign semiconductor manufacturers.

The chart is divided into three sections: the first is an alphabetical listing of semiconductor manufacturers and the diodes and transistors they are currently making available.

The second section is a diode similarity guide listing all diode types that manufacturers indicated were either "direct replacements" or "nearest types."

The third section is an up-to-date version of the Transistor Interchangeability Guide that first appeared in ELECTRONIC INDUSTRIES in 1959 and again in 1960. This, too, is based on manufacturer-supplied data.

Semiconductor types which manufacturers suggest are either direct

replacements or similar types are grouped in the first column of the guide. The first type in each group is the semiconductor with which others in the same group are compared. Direct replacements are identified with an asterisk. Names of manufacturers supplying the data are abbreviated in another column opposite their respective semiconductor type; except that, in the case of the EIA types, the first manufacturer listed in each group is the EIA registrant for the type listed opposite his name. Space does not permit listing in the guide all the manufacturers for each type. However, a complete manufacturer and product list is included at the end of the tabulation.

Manufacturers furnishing replacement information point out that the data supplied is based on published electrical specifications. Physical dimensions may vary considerably and manufacturing techniques are not identical. Therefore, it should not be assumed that all cross-reference semiconductors are exact equivalents.

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1N345	AJ15	AZ19
1N348	AJ20	AV104
1N428	AJ25	AV119
1N471	AJ30	AV304
1N475	AJ35	AV319
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1N1375	AJ50	AZ20

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1N60	1N198	OAS
1N63	1N456	OA7
1N67A	thru 459	OAS
1N68A	1N461	OA31
1N87	thru 464	OA200
thru 89	1N476	OA282
1N90	thru 479	OA211
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1N99	1N490	OA214
1N118	1N441	OA288
1N117	1N542	thru 287
1N119	1N616	SC2
1N120		
2N279	OC22	OC79
thru 281	thru 24	OC80
2N284, A	OC30	OC139
2N314	OC44	thru 161
2N1515	OC51	OC200
2N1516	OC53	OC201
2N1517, A	OC59	OC270
2N1686	OC74	PAOT 20
thru 1689	OC75	thru 31

**AMPEREX ELECTRONIC CORP. — (Continued)**

PAOT 40	PAOT 51	PAOT 60
PAOT 50		

**ASSOCIATED ELECTRICAL INDUSTRIES, LTD.**  
155 Chancery Cross Road  
London, W.C. 2

XD201	XD202	
2N301, A	XA112	XB121
2N384	XA151	XC101
2N643	XA152	XC121
thru 645	XA101	XC131
2N1380	thru 703	XC171
2N1301	XB107	XC703
XA101	thru 104	XC713
XA102	XB112	XC723
XA111	XB113	XS101

**BENDIX AVIATION CORP.**  
Westwood Avenue  
Long Branch, N. J.

1N536	1N434	1N2491
thru 540	thru 1438	thru 2497
1N547	1N1581	thru 285
1N1124	thru 1587	B443
thru 1128	1N1612	thru 449
1N1199	thru 1616	
thru 1206		
1N1341		
thru 1348		
2N155	2N331	2N1071, A, B
2N176	2N399	2N1120
2N234A	thru 401	2N1136, A, B
2N255A, B	2N418	thru 1130, A, B
2N236A, B	thru 420, A	2N1651
2N242	2N637, A, B	thru 1653
2N258	thru 639, A, B	B177
thru 257	1N677, A, B, C	thru 179
2N268, A	2N678, A, B, C	B1817
2N285A	2N100A, A, B	B1085
2N297, A	2N1011	B1154
2N301, A	2N1029, A, B, C	
2N307, A	thru 1032, A, B, C	

**BOGUE ELECTRIC MFG. CO.**  
Palmer 1, N.Y.

1N253	1N332	1N359A
1N316A	thru 349	thru 365A
thru 329A		

**BOGUE ELECTRIC MFG. CO. — (Continued)**

1N440, B	1N1551	4535P
thru 445, B	thru 1560	4535C
1N530	thru 540	45320, C
1N550	1N1763	45330C
thru 555	1N1764	45330P
1N560	1N2080	45340C
thru 563	thru 2086	45340P
1N599, A	1S40A	45350C
thru 614, A	1N160A	45350P
1N1034	2535C	45360P
thru 1038	2535P	45380P
1N1040	25310C	453180
thru 1044	25320C	4535C
1N1095	25330, C	10535C
1N1096	25340, C	10535P
1N1300	25350, C, P	10535C
thru 1305	25360, C, P	105320P
1N1115	25380P	105330P
1N1124	253100P	105340P
thru 1126	45390A	4535C
1N1486	4535CA	4535CA
thru 1492		
2N97	2N160, A	2N347
thru 99	thru 163, A	thru 349
2N163	2N332	2N1035
	thru 337	2N1696

**BOMAC LABS, INC.**  
2160 Road  
Beverly, Mass.

1N118	1N23C	1N416B
1N21C	1N231	1N416C
1N21D	1N23E	1N416D
1N21E	1N23F	1N416E
1N21WE	1N149	BL168
1N23B	1N415B	BL173

**BRADLEY SEMICONDUCTOR CORP.**  
275 Walton Street  
New Haven 11, Conn.

1N2147, A	BY121	BY301
thru 2153, A	thru 1202	thru 3002
1N2524	BY201	BY211
thru 2608	thru 2002	thru 2102
BY401	BY211	BY221
thru 4002	thru 2102	thru 2202
BY111	BY221	BY401
thru 1102	thru 2202	thru 4002



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IN THE INDUSTRY!**

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**WORLD'S ONLY FULLY-AUTOMATED  
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A revolutionary equipment development patented by Philco. Provides unequalled control over all production phases. Results in an inherent reliability possible only through automated production. To you concerned with reliability this means a constant output of reliable transistors.

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**MOST ADVANCED  
QUALITY ASSURANCE PROGRAM!**

A widely acclaimed 5 million dollar transistor reliability assurance program. Surveys quality and reliability from initial design to final release of the finished product. A key factor in this project is the most advanced test equipment found anywhere . . . eliminates all test variables induced by operator techniques or errors. To you concerned with reliability this means the constant checking and eliminating of the factors that result in unreliable transistors.

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**MORE THAN 500 MILLION  
LOGGED HOURS OF LIFE TESTS!**

Currently, more than two million test hours are being run weekly . . . new equipment being

installed will run the logged hours of life tests to 2½ billion by 1963! Provides a history of transistor operation under maximum stress conditions. This is important in determining the effectiveness of present production techniques and in developing new ones. To you concerned with reliability this means that you not only receive the optimum in reliability now, but are assured of it in the future.

★ **RESPONSIBILITY**

**EVERY 4TH EMPLOYEE'S SOLE CONCERN  
IS RELIABILITY!**

Right! 25% of our working force is employed full time at improving our product. But it doesn't stop there. All personnel including operators, engineers, supervisors and managers attend comprehensive training programs designed to educate them with the need for reliability and the steps necessary to achieve it. To you concerned with reliability this means that we are highly concerned with it too!

★ **"BLAST TESTER"**


**THE EXTRA INSURANCE OF 100% TESTING  
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Tests and sorts at the incredible speed of 3600 transistors per hour. To you concerned with reliability this is *extra insurance* that you receive unmatched quality and reliability.

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**LANSDALE DIVISION • LANSDALE, PENNSYLVANIA**



# TRANSISTORS & DIODES

## BRADLEY SEMICONDUCTOR CORP.—(Continued)

Transistors		
BV411	SP3L5R3	SP7K6R4
BV412	SP3L6R3	SP7K6R6
BV421	SP3L6R4	SP7K6R7
thru 4202	SP3L7R5	SP7K6R5
BV501	SP3L8R4	SP7L2R1
thru 5002	SP3L8R6	SP7L2R2
BV511	SP3L9R7	SP7L2R2
thru 5102	SP3L10R5	SP7L5R3
BV521	SP3M2R1	SP7L6R3
thru 5202	SP3M2R2	SP7L6R4
BV701	SP3M2R2	SP7L7R5
thru 7002	SP3M2R3	SP7L8R4
BV711	SP3M2R3	SP7L8R6
thru 7102	SP3M2R4	SP7L8R7
BV721	SP3M7R5	SP7L8R5
thru 7202	SP3M8R4	SP7M2R1
BV801	SP3M8R6	SP7M2R2
thru 8002	SP3M8R7	SP7M2R3
BV811	SP3M10R5	SP7M2R3
thru 8102	SP3P2R1	SP7M2R3
BV821	SP3P2R2	SP7M2R4
thru 8202	SP3P2R2	SP7M7R5
CX1	SP3P3R3	SP7M8R4
CX2	SP3P3R3	SP7M8R6
CX4	SP3P3R4	SP7M8R7
CX5	SP3P3R5	SP7M10R5
CX7	SP3P3R4	SP7P2R1
CX8	SP3P3R6	SP7P2R2
CX14	SP3P3R7	SP7P3R1
SE1	SP7K2R1	SP7P3R3
SE3	SP7K3R2	SP7P3R4
SE6	SP7K4R2	SP7P7R5
thru 9	SP7K5R3	SP7P8R4
SE11	SP7K5R3	SP7P8R6
SE14	SP7K6R4	SP7P8R7
SP3L2R1	SP7K6R4	SP7P10R5
SP3L3R2	SP7K7R5	
SP3L4R2		

## CBS ELECTRONICS

Semiconductor Operations  
Danvers, Mass.

Diodes		
1N34, A	1N95	1N283
1N35	thru 100	1N287
1N36, A, B	1N107	thru 200
1N48	thru 100	1N290
1N51	1N116	1N294
1N52	thru 110	1N295
1N54, A	1N120*, A*	1N299
thru 58, A	1N127*, A*	1N447
1N80	1N128*	1N457
1N63	1N131	thru 500
thru 65	1N132	1N541
1N67, A	1N198*	1N634
thru 68, A	1N273	1N636
1N75	1N276*	1N699
1N75	1N278	1N770
1N82, A	1N279	1N933
1N90	1N281	

\*To Military Specifications

Transistors		
2N101	2N326	2N1012
2N102	2N344	2N1078
2N120	thru 346	2N1080
2N143	2N356, A	2N1091
2N144	2N357	2N1099
2N156	2N358	2N1100
2N157, A	2N371, A	2N1122, A
2N158*	2N385, A	2N1251
2N159A	2N388, A	thru 1298
2N173	2N393	2N1320
2N174	2N399	thru 1334
2N212	2N438, A	2N1358
2N225A, B	2N439, A	2N1411
thru 236A, B	2N440, A	2N1472
2N240	2N441	2N1427
2N242	thru 443	2N1433
2N251*	2N444	thru 1435
2N277	thru 447	2N1437
2N278	2N501, A	2N1438
2N285A	2N556	2N1453
2N301, A	2N558	thru 1458
2N305	2N634	2N1461
2N312	thru 636	thru 1466
	2N1600	2N1504

\*To Military Specifications

## CLEVITE TRANSISTOR

200 South Street  
Waltham 54, Mass.

Diodes		
1N34A	1N89	1N120
1N38, A	1N90	1N126
1N52	1N95	thru 120*
1N54, A	1N96, A	1N139
1N55, A, B	1N97	thru 145
1N56, A	1N98, A	
1N58A	1N99	1N192
1N63	1N100, A	1N198*
1N65	1N107	1N270*
1N66	1N108	1N273
1N67A	1N111	1N276*
1N68A	thru 110, A	1N277*
1N75	1N119	thru 279

\*To Military Specifications

## CLEVITE TRANSISTOR—(Continued)

Diodes		
1N281*	1N222	1N999
1N283	1N225	CS02542
1N287	thru 629	CS02561
thru 292	1N231	CS02562
1N294	thru 632	CTP301
1N297	1N232	CTP304
1N298	thru 635	CTP308
1N300	1N243	CTP320
thru 310	1N245	CTP315
1N312	thru 649	CTP316
1N313	1N250	CTP319
1N314	thru 653	CTP320
thru 459	1N276	CTP462
1N456A	thru 679	CTP532
1N457	thru 680	CTP537
1N461, A	SP7M2R1	CTP563
thru 464, A	SP7M2R2	CTP581
1N462, A, B	SP7M2R2	CTP582
thru 468, A, B	SP7M2R3	CTP583
1N493	SP7M2R3	CTP584
1N497	SP7M2R4	CTP585
thru 502	SP7M2R4	CTP586
1N541	SP7M2R4	CTP587
1N571	SP7M2R6	CTP588
1N619	SP7M2R7	

\*To Military Specifications

Transistors		
2N257	COT1319	CTP1726
2N260	thru 1322	thru 1733
2N267, A	COT1349	CTP1725
2N301, A	CCT1761	CTP1736
2N1011	CTP1320	CTP2800
2N1120	CTP1500	CTP2325
2N1136, A, B	CTP1583	CTP2804
2N1137, A, B	CTP1584	CTP2806
2N1138, A, B	CTP1589	CTP2844
2N1146, A, B, C	CTP1584	CTP2845
2N1147, A, B, C	CTP1545	CTP2853
COT1319	CTP1553	
thru 1313		

## COLUMBUS ELECTRONICS CORP.

1000 Saw Mill River Road  
Yonkers, New York

Diodes		
1N248, A	1N1217	1N2263
thru 250, A	thru 1236	CS-1341
1N253	1N1341	thru 1348
thru 256	thru 1348	2N277
1N253*	1N1443	2N278
thru 256*	1N1444	2N297A*
1N332	1N1498	2N302
thru 340	thru 1497	2N303
1N4400	1N1730	2N304
thru 4650	thru 1733	thru 443
1N530	1N2000	2N456A
thru 530	thru 2006	thru 650A
1N530*	1N2154	2N543
1N539	thru 2160	thru 1172
1N540	1N2217	CEC100, A, B
1N540*	1N2409	CEC101, A, B
1N547	1N2222, A	CEC120, A, B
1N547*	thru 2265, A	CEC127A
1N549	1N2266	CEC1794
thru 563	thru 2280	CEC2050
1N559, A	1N2285, A	CEC2383
thru 614, A	thru 2285, A	CEC2880
1N1095	1N2257	CEC4050
1N1096	thru 2261	CEC4050
1N1100	1N2262, A, B	CEC4050
thru 1105	thru 2371, A, B	CEC4050
1N1130	1N2302	CEC4050

\*To Military Specifications

## COMPAGNIE GENERALE

12, Rue de la Republique  
Paris (Seine) France

Diodes		
1N191	SFD110	SFR105/1
1N192	SFD111	SFR105/2
PN61	SFD115	SFR106/1
PN62	SFD117	SFR106/2
SFD104	SFD127	SFR151
SFD105	SFM101	thru 155
thru 108		

Transistors		
2N396	SFT212	SFT306
2N404	thru 214	thru 308
2N1225	SFT221	SFT315
SFT106	thru 223	thru 317
thru 108	SFT225	SFT319
SFT121	thru 228	thru 323
thru 120	SFT333	SFT351
SFT130	SFT250	thru 354
thru 131	thru 242	SFT357
SFT141	SFT250	SFT358
thru 146	SFT250	SFT384
SFT151	thru 261	SFT325
thru 153	SFT265	thru 327
	thru 267	

## COMPUTER DIODE CORP.

250 Garfield Avenue  
Lodi, N.J.

Diodes		
1N456, A	1N643, A	1N779
thru 458, A	1N645	1N780
1N461, A	thru 649	thru 800
thru 464, A	1N650	1N837, A
1N482, A, B	thru 651	1N838
thru 485, A, B	1N652, A	thru 845
1N486, A	thru 653, A	1N851
thru 488, A	1N656	thru 855
1N625	thru 661	1N854
thru 629	1N776	

## CONTINENTAL DEVICE CORP.

12515 Chatham Avenue  
Northridge, Calif.

Diodes		
1N456	1N770	CO1111
thru 459	1N770	thru 1116
1N461	1N780	CO1141
thru 464	1N791	thru 1143
1N482, A, B	thru 793	CO2116
thru 485, A, B	1N795	thru 2119
1N487, A	1N801	CO3116
1N625	1N802	thru 3119
thru 629	1N804	CO3121
1N643, A	1N806	thru 3129
1N650	thru 808	CO3131
thru 643	1N818	thru 3139
1N662, A	1N837, A	CO3141
thru 663, A	1N838	thru 3149
1N700	1N840	CO3151
thru 707	1N841	CO3152
1N700, A	1N841	CO4111
thru 721, A	1N842	thru 4118
1N746, A	1N844	CO6112
thru 759, A	1N845, A	
1N761	1N864	
thru 763		

## DELCO RADIO DIV.

General Motors Corp.  
Warren, Ind.

Diodes		
1N1183A	1N1191A	
thru 1184A	thru 1194A	

Transistors		
2N173	2N665*	2N1550
2N174, A	2N680	2N1412
2N175	2N1011*	2N1518
2N176	2N1021	thru 1523
2N177A*	2N1022	2N1534
2N182	2N1099	thru 1536
CEC55	2N1100	2N1600
CEC108	2N1150	thru 1612
CEC130	2N1160	2N1970
CEC140	2N1168	2N1971
CEC160	2N1172	

\*To Military Specifications

## ELECTRON RESEARCH, INC.

530 E. 12th Street  
Erie, Pa.

Diodes		
1N34A	1N273	1N658
1N38, A	1N276	thru 662, A
1N39, A, B	thru 279	1N663
1N46	1N277	1N676
1N51	1N281, J	thru 679
1N52, A	1N283	1N681
1N54, A	1N287	thru 687
1N55, A, B	thru 292	1N689
1N56, A	1N294	1N695
1N58, A	1N295	1N698
1N60	1N297	1N699
1N63	1N298, A	1N770
thru 66	1N306	thru 772
1N67A	thru 310	1N774, A
1N68A	1N312	1N775
1N69, A	1N313	thru 777
1N70, A	1N410	1N797
1N75	1N447	thru 804
1N81, A	thru 456, A	1N805
1N80	1N457, A, J	1N807
thru 80	thru 459, A, J	1N818
1N85	1N461, A	1N837
thru 100, A	thru 464, A	thru 839
1N86A	1N482, A, B	1N844
1N88A	thru 485, A, B	1N845
1N100	1N487, A	1N850
1N111	1N488, A	1N851
thru 120	1N490	1N852
1N120A	1N491	thru 820
1N125, J	thru 502	1N849
1N127, A	1N541	1N1580
1N150, AJ	1N542	1N2008
1N133	1N546	thru 2071
1N139	1N547	1N2070
thru 145	1N548	1N2074
1N191	1N549	1N2076
1N192	thru 629	1N2077
1N198, A	1N552	1N2078
1N198A	1N553	thru 2913
1N198J	thru 626	1N2918
1N202	1N643, A, SC	thru 2924
1N251, J	1N645, AF	
1N270, J	thru 649, AF	

# DELCO'S 2N174 PROVED IN MINUTEMAN

**... and Polaris and Talos and Atlas and Jupiter and Thor and Titan and Bomarc and Zeus and Pershing and hundreds of other military and industrial applications.**

For Delco Radio's highly versatile family of 2N174 power transistors meet or exceed the most rigid electrical and extreme environmental requirements.

Over the past five years since Delco first designed its 2N174, no transistor has undergone a more intensive testing program both in the laboratory and in use, in applications from mockups for commercial use to missiles for the military. And today, as always, no Delco 2N174 leaves our laboratories without passing at least a dozen electrical tests and as many environmental tests before and after aging.

This 200 per cent testing, combined with five years of refinements in the manufacturing process, enables us to mass produce these highly reliable PNP germanium transistors with consistent uniformity. And we can supply them to you quickly in any quantity at a low price.

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UPton 0-8807

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PORTsmouth 7-3500

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87 Harper Avenue  
TRinity 3-8500



**DELCO**  
DEPENDABILITY  
**RADIO**  
RELIABILITY

Division of General Motors • Kokomo, Indiana



**ELECTRON RESEARCH, INC.—(Continued)**

Diodes		
ED2	ED1836	ED1892
thru 7	thru 1840	ED1893
ED1167	ED1842	ED1896
ED1880	thru 1845	ED1898
ED1881	ED1847	ED2007
ED1885	thru 1849	ED2372
ED1887	ED1851	ED2180
ED1889	ED1852	thru 2113
ED1910	ED1866	ED2801
ED1913	ED1880	thru 2804
thru 1816	ED1873	ED2815
ED1818	ED1875	thru 2857
ED1823	thru 1879	ED2880
ED1825	ED1885	ED2914
ED1832	thru 1887	thru 2917
ED1834		

**ENGLISH ELECTRIC VALVE CO.**  
 Chislehurst  
 Essex, England

Diodes		
V4710	V4715	V48712
V4713		

**FAIRCHILD SEMICONDUCTOR CORP.**  
 4300 Redwood Highway  
 San Rafael, Calif.

Diodes		
1N251*	1N674	1N804
1N252	1N678	FD180
1N456, A	1N778	FD101
thru 458, A	1N779	FD112
1N461, A	1N789	thru 117
thru 464, A	thru 884	FD120
1N482, A, B	1N806	FD289
thru 486, A, B	thru 809	FD216
1N419	1N811	thru 222
1N622	thru 815	FD277
1N625	1N816	thru 237
thru 629	1N837, A	FD241
1N633*	1N838	FD243
1N643, A	thru 845	thru 260
1N650	1N850	FD262
1N659, A	thru 853	thru 257
1N660	1N853, A	FD271
1N661, A	thru 908, A	FD380
1N662*	1N914, A	FD311
1N662A	1N916, A	thru 352
1N663*	1N925	FD357
1N683, A	thru 928	thru 361

\* To Military Specifications

Transistors		
2N697	2N1620	2N1711
2N699	2N1613	2N1893
2N708		

**FAHSTEEL METALLURGICAL CORP.**  
 Radio-1-Capacitor Division  
 North Chicago, Ill.

Diodes		
4B	9A	15A
6B	10A	16A
7B		

PINNEY  
 34 West Interstate Street  
 Redford, Ohio

Diodes		
1N21, A, B, E	1N72	1N268
1N22, A, B	1N72, A	1N270
1N34, A	1N90	1N273
1N35	thru 93	1N276
1N38, A	1N95	thru 279
1N44	1N96, A	1N281
thru 46	1N115	1N283
1N48	1N116, A	1N283
1N51	1N117, A	thru 289
1N52	1N118, A	1N305
1N54, A	1N126	1N306
1N54, A	1N127, A	1N417
1N58, A	1N128	thru 419
1N60	1N139	1N431
1N64	1N140	1N432, A
thru 67, A	1N147, A	1N454
1N68, A	1N191	1N616
1N71		

**GANAGAN, INC.**  
 Esmond, R.I.

Diodes		
1N38A	1N100	1N289
1N39, A	1N103	1N292
1N54, A	1N196	1N452
1N55, B	1N278	thru 456
1N59	1N279	C-124
1N63	1N277	G-128
1N67A	thru 279	G-400
1N96	1N280	G-500

**GENERAL ELECTRIC CO.**  
 Semiconductor Products Dept.  
 Syracuse, N.Y.

Diodes		
1N91	1N151	1N158
thru 99*	thru 253	

\* To Military Specifications

**GENERAL ELECTRIC CO.—(Continued)**

Diodes		
1N248, A	1N560	1N1682
thru 250, A	1N563	thru 1687
1N249B*	1N599, A	1N2135*
1N250B*	thru 614, A	1N2154
1N253*	1N645	thru 2189
thru 256*	thru 649	1N2847
1N315*	1N677	thru 2852
1N325	1N1095	1N2939, A
thru 349	1N1096	thru 2941, A
1N368	1N1100	1N2969
1N440, B	thru 1103	1N3149, A
thru 445, B	1N1115	1N3156
1N536	thru 1120	1N3218, A
thru 540	1N1199, A	1N3219, A
1N538*	thru 1206A	4JA706
1N540*	1N131A	4JA70C
1N547*	thru 1348A	4JA70D
1N550	1N1487	4JA70E
thru 555	thru 1492	4JA70M

\* To Military Specifications

Transistors		
2N43, A*	2N527	2N1842
2N44, A*	2N534	thru 1850
2N78, A*	thru 516A	2N1989
2N123*	2N656A	thru 1916
2N167, A*	2N675A	2N1929
2N185A	2N681*	thru 1935
2N332*, A	thru 688*	C40V
thru 355*, A, B	2N689	C40P
2N335, A	2N1057	C40A
2N337*	2N1175, A	C40C
2N338*	2N1198	C40B
2N377	2N1217	C40M
2N385	2N1277	C40C
thru 389	thru 1279	C55U
2N394, A	2N1288	C55C
2N396, A*	2N1304	C55G
2N397	2N1386	C55B
2N404*, A	2N1389	C55M
2N413	2N1413	C55C
2N414	2N1415	ZJ283U
2N450	2N1510	ZJ283F
2N489*	2N1514	ZJ283A
thru 494*	2N1671, A, B	ZJ283G
2N497, A	2N1694	ZJ283H
2N498, A	2N1778, A	ZJ283I
2N524	thru 1777, A	ZJ283C
thru 526*		

\* To Military Specifications

**GENERAL INSTRUMENT**  
 Semiconductor Division  
 Newark 4, N.J.

Diodes		
1N67A	1N708	1N1282
1N128*	1N713	1N1351
1N198*	1N718	thru 1362
1N248A	1N725	1N1518
1N248C	1N730	thru 1528
1N259C	1N736	1N1582
1N259D	1N756	1N1584
1N259C	1N745	thru 1598
1N253*	1N746	1N1688
1N270*	1N748	1N2154
1N278*	1N750	thru 2189
1N281	1N752	1N2796
1N448B	1N754	1N2798
thru 445B	1N756	1N2880
1N457*	1N758	AG1012
thru 459*	1N759	AG3012
1N482B	1N761	AG6012
thru 486B	1N771B	DR999
1N509*	MP100	MP100
1N547*	MP225	MP225
1N643	thru 911	MP380
1N645	1N914	MP480
thru 649	1N916	MP580
1N658*	thru 649	MP600
1N663*	thru 932	P A069
1N704	1N1195, A	P A070
	thru 1198A	P A071

\* To Military Specifications

Transistors		
2N317A	2N583	2N1081
2N331*	2N594	2N1122, A
2N354A	2N523A	2N1252
2N383	2N580	2N1253
2N396	2N588	2N1310
2N398	2N592	2N1392
2N404	thru 596	2N484
2N417*	2N604	2N1408
2N428	2N643	2N1420
2N440	2N686	2N1605
2N447A	2N687	2N1678
2N447P	2N699	2N1672
2N469A	2N706	2N1678
2N469	2N1000	GT101
2N581, A	2N1012	GT109
2N582, A	2N1085	

\* To Military Specifications

**GENERAL TRANSISTOR CORP.**  
 91-27 138th Place  
 Jamaica 35, N.Y.

Diodes		
1N66A	1N192	1N313
1N67, A	1N198	1N480
1N68, A	1N270	1N490
1N69	1N276	1N497
thru 80	1N277	thru 582
thru 100	1N279	1N631
1N96A	1N281	thru 634
thru 100A	1N287	1N636
1N102	thru 292	1N777
1N107	1N294, A	thru 777
1N180	1N296, A	1N771A
1N116, A	1N301, A	thru 774A
thru 118, A	1N304	1N771B
1N126	1N308	TD1
thru 128	thru 310	thru TD4
1N191		

Transistors		
2N611	2N629	2N1624
2N612	thru 533	2N1630
2N615, A	thru 117, A	2N1672
2N627A	2N646	2N1678
thru 329A	2N648	GT28
2N631	2N670	GT34, N, 3
2N656, A	2N672	GT35
2N656, B	thru 582	GT46
2N677	2N645	GT75
2N687	2N682	GT81
2N688	thru 684	GT82
2N696	2N643	GT189
2N698	2N1000	GT122
2N714, A	2N114, A	GT167
2N715	2N125	GT222
2N717	2N126	GT364
2N725	2N1065	GT386
2N742B	2N1890	GT388
2N748	2N1091	GT752
thru 440, A	2N1312	GT988
2N744, A	thru 1314	thru 905
2N746	2N1408	GT947
2N749A	2N1450	thru 949
2N759A	2N1685	GT188A
thru 523, A		GT164A

**HOFFMAN ELECTRONICS**  
 Semiconductor Division  
 El Monte, Calif.

Diodes		
1N137A	1N1785	55C
1N138A	1N1786, A	58C
1N200	thru 1787, A	120C
1N222	1N1787	120C
1N225	thru 1802	120C
thru 233	1N1885	thru C11
1N429*	thru 1836	120CG10
1N430*	1N2088	thru CG14
1N430A, B	thru 2012	220C
1N431	1N2043	thru C18
1N432	thru 2049	EA7E1
thru 444	1N2498	thru TES
1N445	thru 2508	NR1
thru 475	1N2808A	thru 6
1N482, A, B	thru 2846A	NCR30P, R
1N487, A	1N2920	NCR35P, R
thru 488, A	thru 2934	NCR100P, R
1N625	1N2978A	NCR200P, R
thru 629	1N2979	NCR300P
1N643	1N2982A	NCR400P
1N650	1N2982A	NR2.3
thru 662*	1N2984A	NR2.8
1N702	thru 2986A	NR4.4
thru 759	1N2988A	NR5.4
1N821	thru 2992A	NR6.5
thru 824	1N2995A	NR9
1N912, A	1N2997A	NR19
thru 913, A	thru 3005A	NR1
1N985, A, B	1N3087A	thru 88
thru 929, A, B	thru 3008A	NR5, A
1N957, A	thru 982A	NR10, A
1N1313	1N311A	NR2, A
1N1314	1N312A	NR3, A
thru 1327	1N314A	NR7, A
1N1315	thru 3851A	NR10, A
thru 1375	2A	RS6
1N1538, A	51C	RT6
1N1681	52C	

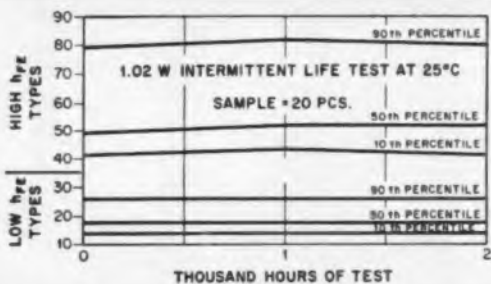
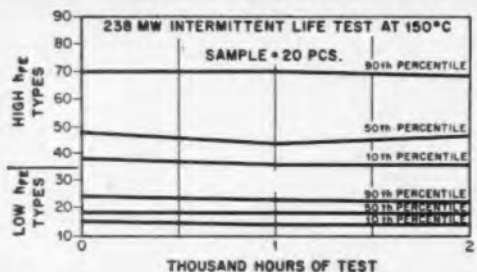
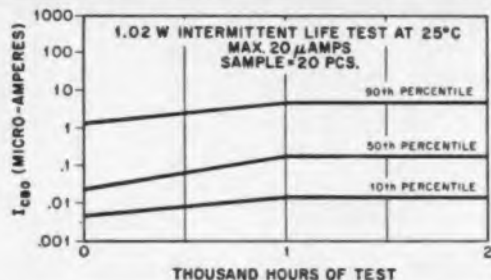
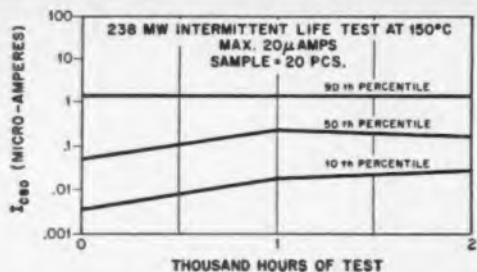
\* To Military Specifications

Transistors		
2N686	2N687	

**HUGHES**  
 Semiconductor Division  
 Newport Beach, Calif.

Diodes		
1N33A	1N65A	1N10
1N38A	1N66	thru 98
1N54A	1N67A	1N95
1N55A	thru 70A	thru 100
1N55B	1N81A	1N96A

# The industry's most thoroughly characterized and medium power silicon Mesa transistors...2N497A,



## Absolute Maximum Ratings (25°C)

	2N497A	2N498A	2N656A	2N657A		
<b>Voltages</b>						
Collector to Base	V <sub>CB0</sub>	60	100	60	100	volts
Collector to Emitter	V <sub>CE0</sub>	60	100	60	100	volts
Emitter to Base	V <sub>EB0</sub>	8	8	8	8	volts
<b>Temperatures</b>						
Storage	T <sub>STG</sub>	-65 to 200°C				
Operating Junction	T <sub>J</sub>	-65 to 200°C				
<b>Total Dissipation</b>						
Free Air @ 25°C	- 1 watt*					
Case Temperature @ 25°C	- 5 watts**					
*Derate 5.72 mw/°C increase in ambient temperature above 25°C						
**Derate 28.8 mw/°C increase in case temperature above 25°C						

## Electrical Characteristics (25°C) unless otherwise specified

### D-C Characteristics

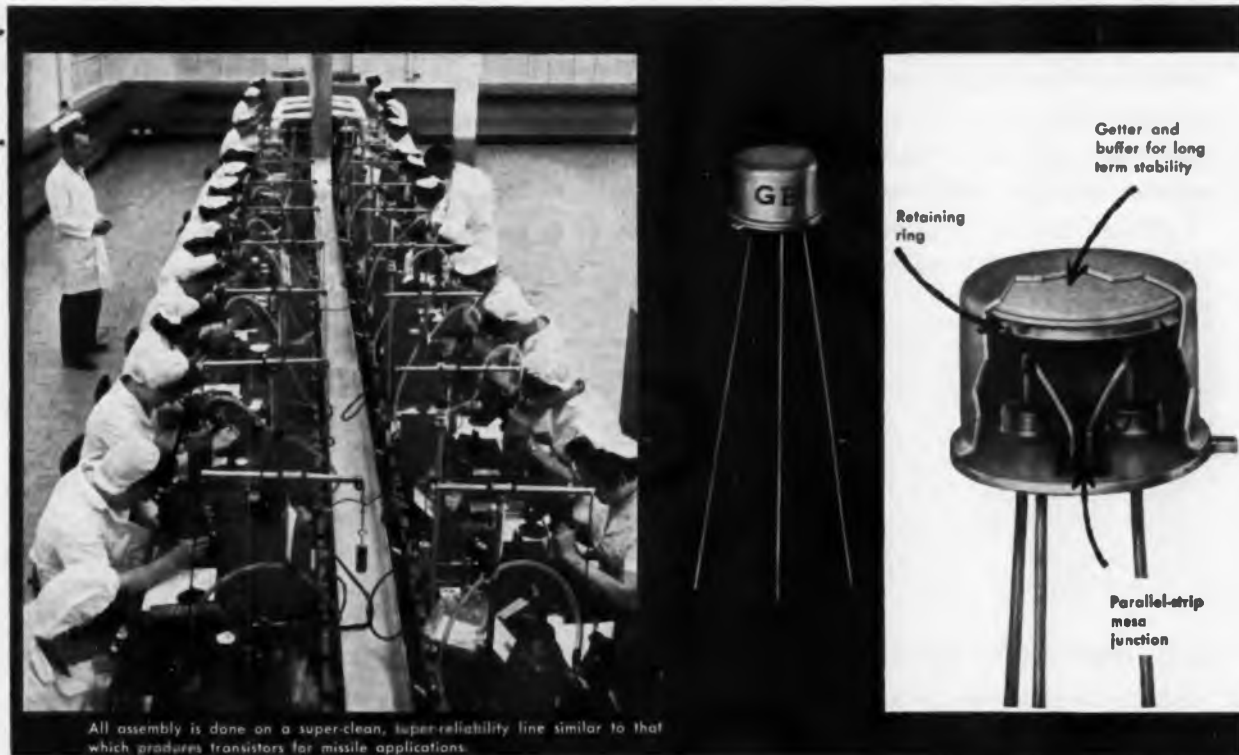
	2N497A		2N498A		2N656A		2N657A		
	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	
Collector to Base Voltage (I <sub>C</sub> = 100 μa, I <sub>E</sub> = 0)	V <sub>CB0</sub>	60	100	60	100	60	100	volts	
Collector to Emitter Voltage (I <sub>C</sub> = 250 μa)	V <sub>CE0</sub>	60	100	60	100	60	100	volts	
Collector to Emitter Voltage (I <sub>C</sub> = 16 ma)	V <sub>CE0</sub>	60		60		60		volts	
Collector to Emitter Voltage (I <sub>C</sub> = 10 ma)	V <sub>CE0</sub>		100				100	volts	
Emitter to Base Voltage (I <sub>E</sub> = 250 μa, I <sub>C</sub> = 0)	V <sub>EB0</sub>	8	8	8	8	8	8	volts	
Forward Current Transfer Ratio* (I <sub>C</sub> = 200 ma, V <sub>CE</sub> = 10V)	h <sub>FE</sub>	12	36	12	36	30	90	30	90
Base Input Resistance* (I <sub>E</sub> = 8 ma, V <sub>CE</sub> = 10V)	h <sub>IE</sub>		200		200		200		ohms
Saturation Resistance* (I <sub>E</sub> = 40 ma, I <sub>C</sub> = 200 ma)	r <sub>CE (sat)</sub>		10		10		10		ohms
<b>Cutoff Characteristics</b>									
Collector Current (I <sub>E</sub> = 0, V <sub>CE</sub> = 30V)	I <sub>C0</sub>		10		10		10		μa
Collector Current (High Temperature) (I <sub>E</sub> = 0, V <sub>CE</sub> = 30V, T <sub>A</sub> = 150°C)	I <sub>C0</sub>		250		250		250		μa

\*Pulse Test: 300 μsec. 2% Duty Cycle

Specifications also available for 2N497, 498, 2N656, 657 mesa transistors

tested

98A, 2N656A, 57A...come from General Electric



All assembly is done on a super-clean, super-reliability line similar to that which produces transistors for missile applications.

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Now you can get a full line of germanium alloyed-junction and diffused-base transistors as well as NPN double-diffused silicon mesa types from one reliable source ■ Highest quality and long semiconductor life are assured through detailed research, careful product development and advanced production techniques. Complete specifications, engineering life test data and design curves are available on all General Instrument transistors, including the representative types listed here ■ Call the General Instrument sales office or franchised distributor nearest you or write today for Catalog SR-2099 to General Instrument Semiconductor Division, 65 Gouverneur Street, Newark 4, New Jersey.

### TRANSISTORS

SILICON		GERMANIUM									
NPN MESA Types	Computer Types		PNP Drift Types		PNP MBDT**		High Voltage Types		Bilateral Types		Audio Types
	(PNP)	(NPN)					(PNP)	(NPN)	(PNP)	(NPN)	
2N696*	2N317A	2N358A	2N604	2N1670	2N499*	2N398	2N1310 (GT1200)	2N592	2N594	2N43A*	
2N697*	2N396	2N388*	2N643	2N1678	2N501	2N140B (GT34HV)	2N1672	2N593	2N595	2N44A*	
2N698	2N396A*	2N1000	2N1065		2N501A*				2N596	2N331*	
2N699	2N404*	2N1012			2N502					2N464*	
2N706	2N416*	2N1091	PNP MAT***		2N502A					through 2N467*	
2N1252	2N417*	2N440	2N393*		2N503	2N1392	2N1393			GT81	
2N1253	2N425*	2N447A	2N1122		2N504	2N469A	2N1394			GT109	
2N1420	through 2N428*	2N1605 (GT1658)	2N1122A		2N588						
	2N523A		2N1411*								
	2N580										

\* MILITARY TYPES. COMPLETE MILITARY LIST ON REQUEST

\*\* MICRO ALLOY TRANSISTOR. TRADEMARK PHILCO CORP.

\*\*\* MICRO ALLOY DIFFUSED-TRANSISTOR. TRADEMARK PHILCO CORP.

## One Dependable Source For All Your Semiconductor Needs

In addition to a complete line of silicon power rectifiers and silicon and germanium diodes, General Instrument also makes encapsulated circuit modules to fit any electrical or physical requirements ("Circuit-Caps"), precision wire-wound resistors and microminiature computer logic circuits ("Nanocircuits") ■ Nanocircuitry brings several important advantages to computer logic design, not the least of which is size reduction. A typical nanocircuit packs six diodes (or diode-transistor combinations) into a standard TO-5 case. Equally important: only active components (surface-passivated for stability) are fused to the common substrate. The diodes are not exposed to the heat generated by resistors and capacitors. Not only is component reliability increased but, since the semiconductors are pre-selected from a 100%-tested standard product line, the designer can evaluate circuit reliability rather than that of individual components. Also, new or existing circuits, breadboarded with conventional components, can be transferred directly into nanocircuits. Let us show you how. Write for Bulletin NC-10.

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## GENERAL INSTRUMENT CORPORATION

# TRANSISTORS & DIODES

**MUGHES—(Continued)**

1M100A	IN480	IN1115
IN100A	IN482, A, B	thru 1120
IN116	thru 485, A, B	IN1131, A
thru 120	IN486, A	thru 1319, A
IN125, A*	thru 488, A	IN1405
IN127, A*	IN500	thru 1413
IN128*	IN536	IN1407
IN133	thru 540	thru 1492
IN139	IN547	IN1692
thru 143	IN560	thru 1695
IN191	thru 563	IN1730
IN192	IN585	thru 1734
IN198*, A, B	thru 605	IN1763
IN253	IN625	IN1764
thru 256	thru 629	IN1929
IN270	IN636	thru 1937
IN273	IN643*, A	IN2382
IN276*	IN645	thru 2385
IN277*	thru 649	ND2963
IN278	IN658	ND2964
IN279	IN659	ND2967
IN281*	IN662*, A	ND2968
IN283	IN663*	ND5000
IN287	IN702, A	thru 3004
thru 292	thru 725, A	ND6635
IN440	IN761	ND6641
thru 445	thru 770	ND6651
IN456	IN835	ND6652
IN457*	thru 839	HR 10671
IN458*	IN844	HR 10673
IN459*	thru 853	HR 10675
IN461	HR857	HR 10677
thru 464	thru 864	HR 10679
IN465, A	IN894	HR 10681
IN471	thru 896	
thru 475	IN950	
	thru 956	

\*To Military Specifications

**Transistors**

2N327A	2N1197	2N1254
thru 329A	2N1220	thru 1259
2N1034	thru 1234	HA9500
thru 1037	2N1238	thru 9502
2N1196	thru 1244	

**INDUSTRO TRANSISTOR CORP.**  
15-10 36th Avenue  
Long Island 6, N.Y.

**Transistors**

2N123	2N564	2N1420
2N315, A	2N566	2N1446
thru 317, A	2N568	thru 1449
2N331	2N570	2N1451
2N359	2N572	2N1452
thru 363	2N575	2N1471
2N381	thru 582	TR34
thru 381	2N631	thru 1733
2N394	thru 633	TR45
2N397	TR656	thru 45
2N398A	thru 699	TR11
2N413	2N702	thru 324
thru 415	2N706	TR508
2N414B	2N1017	TR650
2N416	2N1252	TR653
2N417	2N1253	TR722
thru 420	2N1280	TR760
2N444	2N1313	thru 763
thru 467	TRC44	TRC45
2N482	thru 1310	TRC70
thru 486	2N1343	thru 72
2N519, A	thru 1357	
thru 523, A		

**INTERNATIONAL DIODE CORP.**  
90 Forrest Street  
Jersey City 4, N.J.

**Diodes**

1D1050T	Q10500	Q50500
1D2050T	Q10750	Q50750
1D3050T	Q10950	Q50950
1D10050T	Q20250	Q60250
Q300 T	Q20500	Q60500
Q400	Q20750	Q60750
Q450	Q20950	Q60950
Q5100	Q20500	Q60750
Q5250	Q20750	Q60950
Q6100T	Q30950	Q100500
Q6250	Q40950	Q100750
Q10100T	Q40750	Q100950
Q10250	Q40950	

**INTERNATIONAL RECTIFIER CORP.**  
El Segundo, Calif.

**Diodes**

IN248, A	IN349	IN456, A
thru 250, A	IN359	thru 459, A
IN251*	IN411B	IN461, A
thru 256*	IN4120*	thru 464, A
IN316	IN4140	IN482, A, B
thru 320	IN420*	IN487, A
IN332	IN430*	thru 488, A
thru 337	IN438, A, B	IN532
IN339	IN440, B	IN536
thru 346	thru 445, B	IN537
IN348		

\*To Military Specifications

**INTERNATIONAL RECTIFIER CORP.—(Continued)**

**Diodes**

IN538*	325, 175	45T850
IN539	326, 275	45T860
IN540*	3E, 6, 8, 20	70T85
IN547*	329, 175	70T810
IN550	3210T20	70T815
thru 555	3211T5	70T820
IN570	3213T5	70T825
IN596	3215T20	70T830
thru 598	3216T5	70T835
IN599, A	3220T5	70T840
thru 614, A	3222T20	70T845
IN1095	3224T5	70T850
IN1096	3220T5	70T860
IN1100	5E4	70UB5
thru 1105	thru 0	70UB10
IN1115	SSM1020E4	70UB15
thru 1120	thru 0	70UB20
IN1130	SSM85L	70UB25
IN1131	SSM10L	70UB30
IN1133	SSM820L	70UB35
thru 1142	SSM830L	70UB40
IN1143, A	SSM840L	70UB45
IN1144	SSM850L	70UB50
thru 1149	6, 8, 5C, 20	70UB55
IN1183	6F5	70UB60
thru 1205	6F10	DD185
IN1330	6F15	DD186
thru 1336	6F15	DD1C9
IN1341	6F30	DD1C2
thru 1347	6F40	DD1C15
IN1376	6F50	ED185
thru 1382	8SM85H	ED186
IN1406	8SM10H	ED1C12
thru 1413	8SM20H	ED1C14
IN1487	8SM30H	FD1C12
thru 1492	8SM40H	FD1C15
IN1507, A	8SM85H	MEZ5, 6T10
thru 1520, A	10E25, 6T10	MEZ6, 6T10
IN1530, A	10E26, 6T10	MEZ7, 6T10
IN1540, A	10E28, 7T10	MEZ10T10
thru 1609, A	10E210T10	MEZ12T10
IN1625, A	10E22T10	MEZ15T10
IN1626, A	10E23T10	MEZ18T10
IN1627	10E24T10	MEZ22T10
thru 1642	10E22T10	MEZ27T10
IN1660	10E27T10	MZ4, 3T5
thru 1666	10E27T10	MZ4, 7T20
IN1670	10MB50H	MZ5, 1T5
thru 1676	10MB60H	MZ6, 7T5
IN1680	10Z4, 3T5	MZ6, 6T20
thru 1687	10Z4, 7T20	MZ9, 1T5
IN1692	10Z5, 1T5	MZ10T20
thru 1695	10Z6, 2T5	MZ11T5
IN1698	10Z6, 6T20	MZ11T5
thru 1712	10Z9, 1T5	MZ15T20
IN1730	10Z10T20	MZ15T5
thru 1733	10Z11T5	MZ20T5
IN1745	10Z12T5	MZ22T20
thru 1762	10Z15T20	MZ24T5
IN2054	10Z16T5	MZ30T5
thru 2064	10Z20T5	PCC17-A
IN2116	10Z22T20	Q650
IN2128, A	10Z24T5	S0510E4
thru 2138, A	10Z28T5	thru 11
IN2139	10Z31T5	S0520E4
IN2214	12F10	thru 11
IN2215	12F15	SO1020E4
IN2216	12F20	thru 11
IN2217	12F30	SO91, A
thru 2201	12F40	thru 2497
IN2630	12F50	SD-500
thru 2636	12MB5H	S1R508
IN2638	12MB10H	SPR608
thru 2764	12MB20H	SPR808
IN3085	12MB30H	SPR808
thru 3093	12MB40H	SPR1008
IN325, 6T10	12MB50H	SPR510
IEZ6, 6T10	12MB10L	SPR610
IEZ8, 2T10	12MB20L	SPR810
IEZ10T10	12MB30L	SPR910
IEZ12T10	12MB40L	ST7A
IEZ15T10	12MB50L	ST8
45L15	45L15	thru 10
45L25	45L25	X1RC2
45L30	45L30	X1RC3
45L45	45L45	X1RC5
45L85	45L85	X1RC7
45L130	45L130	X1RC10
45L1815	45L1815	X1RC15
45L820	45L820	X1RC20
45L825	45L825	44M2
45L830	45L830	thru 6
45L845	45L845	45A2
45L845	45L845	thru 6
45L850	45L850	45M2
45L855	45L855	thru 6
45L860	45L860	IN218*
45L865	45L865	thru 53, A
45L870	45L870	IN25*
45L875	45L875	IN54, A
45L880	45L880	thru 58, A
45L885	45L885	IN82*
45L890	45L890	thru 82, A
45L895	45L895	IN83*
45L900	45L900	IN832
45L905	45L905	IN833
45L910	45L910	IN834, A
45L915	45L915	IN835
45L920	45L920	IN836
45L925	45L925	IN837
45L930	45L930	IN838, A
45L935	45L935	thru 90
45L940	45L940	IN839, A, B
45L945	45L945	thru 97, A
45L950	45L950	IN840
45L955	45L955	thru 100, A
45L960	45L960	IN841
45L965	45L965	thru 100, A
45L970	45L970	
45L975	45L975	
45L980	45L980	
45L985	45L985	
45L990	45L990	
45L995	45L995	
45L1000	45L1000	

\*To Military Specifications

**INTERNATIONAL RECTIFIER CORP.—(Continued)**

**Diodes**

X16RC3	X529, 1	Z24, 7
X16RC5	X530	Z25, 6
X16RC7	thru 12	Z26, 8
X16RC10	X531	Z28, 8
X16RC15	X532	Z29, 8
X16RC20	X536	Z30, 8
X525, 6	X538	Z31, 8
X528, 8	X539	Z32, 8
X528, 8	X540	Z33, 8
X527, 5	X541	Z34, 8
X528, 2	X542	Z35, 8

**ITT COMPONENTS DIV.**

P.O. Box 412  
Clifton, N.J.

**Diodes**

IN248, A	ZB9, 1	ZC7, 5
thru 250, A	ZB10	ZC8, 2
IN253	thru 13	ZC9, 1
thru 256	ZB15	ZC10
IN332	thru 10	ZC11
thru 340	ZB18	ZC15
IN411B	ZB20	ZC16
thru 413B	ZB22	ZC18
IN440, B	ZB24	ZC20
thru 445, B	ZB27	ZC22
IN450	ZB30	ZC24
thru 563	ZB33	ZC27
IN599, A	ZB36	ZC30
thru 614, A	ZB39	ZC33
IN1095	ZB43	ZC36
IN1096	ZB47	ZC39
IN1100	ZB51	ZC43
thru 1105	ZB54	ZC47
IN1115	ZB62	ZC51
thru 1120	ZB68	ZC56
IN1120	ZB75	ZC62
thru 1126	ZB82	ZC6, 8
IN1199, A	ZB89	ZC7, 5
thru 1206, A	ZB90	ZC8, 2
IN1217	ZC1, 9	ZC9, 1
thru 1226	ZC4, 7	ZC10
IN1341, A	ZC5, 6	ZC11
thru 1348, A	ZC6, 8	ZC15
IN1407	ZC6, 8	ZC16
thru 1497	ZC7, 5	ZC18
IN1507, A	ZC8, 2	ZC20
thru 1520, A	ZC9, 1	ZC24
IN1537	ZC10	ZC28
thru 1544	ZC11	ZC30
IN1581	ZC15	ZC33
thru 1587	ZC16	ZC36
IN1588, A	ZC18	ZC39
thru 1609, A	ZC20	ZC43
IN1612	ZC22	ZC47
thru 1616	ZC24	ZC51
IN1692	ZC27	ZC56
thru 1695	ZC29	ZC62
IN1731	ZC33	ZC68
thru 1734	ZC36	ZC75
IN1765	ZC39	ZC82
thru 1795	ZC43	ZC89

# Now CBS MAT<sup>\*</sup> for Compact Computer Circuits

Wide Selection... Low Price...  
High-Frequency Performance

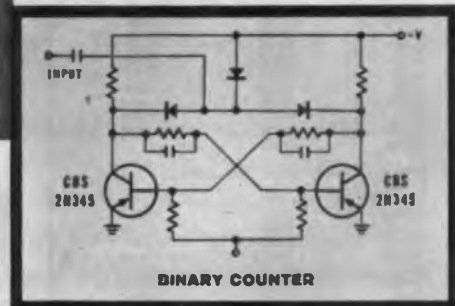
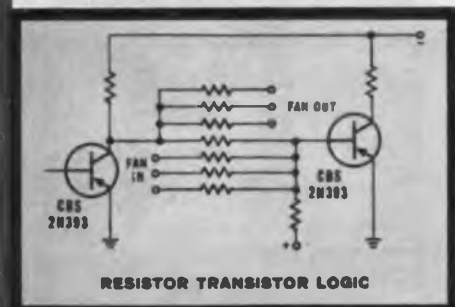
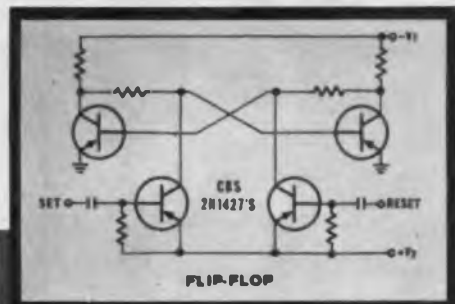
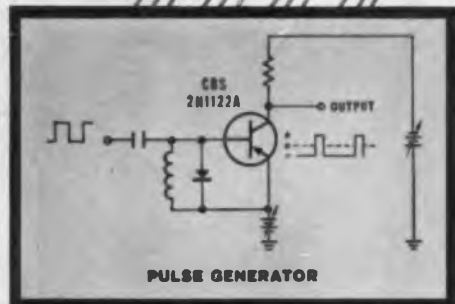
CBS Semiconductors provide a wide selection of Micro Alloy Transistors to give your compact computer circuits the economy and performance you've been seeking.

These transistors work well in a choice of circuits such as Pulse Generator, Flip-Flop, Resistor Transistor Logic and Binary Counter, to mention only a few.

Circuit design engineers can standardize their selection of high-frequency switching circuits by specifying CBS MATs.

Learn how the 13 types listed below can provide you with the advantages of high-frequency performance at low prices. Call or write today for complete technical data and delivery information from your local sales office or Manufacturer's Warehousing Distributor.

\*MAT, trade-mark of Philco Corp.



## ELECTRICAL CHARACTERISTICS

Suggested Application	Type	V <sub>ce</sub> V <sub>dc</sub>	I <sub>c</sub> mA <sub>dc</sub>	f <sub>r</sub> mc	P <sub>r</sub> mW	Min. h <sub>fe</sub> @ 1 kc
Pulse Generator	2N1122A	14	50	40	25†	35
	2N1122	12	50	40	25†	35
Flip-Flop	2N128	10	5	28	25	19
	2N240	6	15	25	30	16
	2N1427	6	50	50	25†	40
Resistor Transistor Logic	2N346	5	5	40	20	10
	2N393	6	50	25	25†	40
	2N1411	5	50	25	25†	—
	2N1750	14	5	20	15	—
Binary Counter	2N345	5	5	20	20	25-110
	2N344	5	5	20	20	11-33
	2N231	5	3	20	9	19-66
	2N232	5	3	15	9	9-39

†@45°C

Note: Suggested applications above indicate desirable uses for each type listed, based on transistor characteristics, economy and circuit requirements. CBS Micro Alloy transistors provide excellent performance in a variety of other computer circuit applications, in addition to these examples.



## semiconductors

More Reliable Products through Advanced Engineering

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Circle 90 on Inquiry Card

# TRANSISTORS & DIODES

## KENTRON ELECTRON PRODS., INC. — (Continued)

Diodes	
IN105*	IN294
IN109	IN295
IN111	IN297
thru 116, A	thru 299
IN117, A	IN332
IN118, A	thru 339
IN126, A	IN458, C, D, E
thru 128, A	IN468, C, D, E
IN132	IN469, B
IN133	thru 445, B
IN149	IN539
IN150	thru 540
IN160	IN547
IN198	IN550
IN253	thru 555
thru 256	IN560
IN265	thru 563
thru 268	IN599, A

**MICRO-STATE ELECTRONICS CORP.**  
152 Floral Avenue  
Morris Hill, N.J.

Diodes	
MS222	MS242
thru 224	

## MINNEAPOLIS-HONEYWELL

Semiconductor Products  
2747 Fourth Avenue, S.  
Minneapolis 8, Minn.

Transistors	
2N538, A	2N1202
thru 540, A	2N1203
2N574, A	2N1261
2N575, A	thru 1263
2N1557, A	2N1581

**MOTOROLA**  
Semiconductor Products Division  
5005 E. McDowell Road  
Phoenix, Ariz.

Diodes	
IN253	MA432
thru 256	MA452
IN258	MA472
thru 540	MA502
IN547	MA522
IN146	MA542
thru 759	MA522
IN957	MA682
thru 962	MA752
IN1095	MA822
IN1096	MA812
IN1115	MA1082
thru 1120	MA1052
IN1169	MA1102
IN1353*	MA1202
IN1358*	MA1302
IN1361*	MA1402
IN1487	MA1502
thru 1492	MA1752
IN1563, A	MA2092
thru 1566, A	MA82
IN1682	MA752
thru 1687	MA822
IN1807*	MA912
IN2610	MA102
thru 2617	thru 202
IN2620	MA222
thru 2624	MA242
IN2804	MA272
thru 2846	MA302
IN2970	MA332
thru 3015	MA362
IN3016	MA392
thru 3051	MA432
IN3288	MA452
thru 3212	MA472
MA2482	MA502
MA27A2	MA522
MA30A2	MA542
MA33A2	MA562
MA36A2	MA582
MA39A2	MA622
MA42A2	MA642
MA45A2	MA662
MA48A2	MA682
MA51A2	MA702
MA54A2	MA722
MA57A2	MA742
MA60A2	MA762
MA63A2	MA782
MA66A2	MA802
MA69A2	MA822
MA72A2	MA842
MA75A2	MA862
MA78A2	MA882
MA81A2	MA902
MA84A2	MA922
MA87A2	MA942
MA90A2	MA962
MA93A2	MA982
MA96A2	MA1002
MA99A2	MA1022
MA102A2	MA1042
MA105A2	MA1062
MA108A2	MA1082
MA111A2	MA1102
MA114A2	MA1122
MA117A2	MA1142
MA120A2	MA1162
MA123A2	MA1182
MA126A2	MA1202
MA129A2	MA1222
MA132A2	MA1242
MA135A2	MA1262
MA138A2	MA1282
MA141A2	MA1302
MA144A2	MA1322
MA147A2	MA1342
MA150A2	MA1362
MA153A2	MA1382
MA156A2	MA1402
MA159A2	MA1422
MA162A2	MA1442
MA165A2	MA1462
MA168A2	MA1482
MA171A2	MA1502
MA174A2	MA1522
MA177A2	MA1542
MA180A2	MA1562
MA183A2	MA1582
MA186A2	MA1602
MA189A2	MA1622
MA192A2	MA1642
MA195A2	MA1662
MA198A2	MA1682
MA201A2	MA1702
MA204A2	MA1722
MA207A2	MA1742
MA210A2	MA1762
MA213A2	MA1782
MA216A2	MA1802
MA219A2	MA1822
MA222A2	MA1842
MA225A2	MA1862
MA228A2	MA1882
MA231A2	MA1902
MA234A2	MA1922
MA237A2	MA1942
MA240A2	MA1962
MA243A2	MA1982
MA246A2	MA2002
MA249A2	MA2022
MA252A2	MA2042
MA255A2	MA2062
MA258A2	MA2082
MA261A2	MA2102
MA264A2	MA2122
MA267A2	MA2142
MA270A2	MA2162
MA273A2	MA2182
MA276A2	MA2202
MA279A2	MA2222
MA282A2	MA2242
MA285A2	MA2262
MA288A2	MA2282
MA291A2	MA2302
MA294A2	MA2322
MA297A2	MA2342
MA300A2	MA2362
MA303A2	MA2382
MA306A2	MA2402
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MA336A2	MA2602
MA339A2	MA2622
MA342A2	MA2642
MA345A2	MA2662
MA348A2	MA2682
MA351A2	MA2702
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MA357A2	MA2742
MA360A2	MA2762
MA363A2	MA2782
MA366A2	MA2802
MA369A2	MA2822
MA372A2	MA2842
MA375A2	MA2862
MA378A2	MA2882
MA381A2	MA2902
MA384A2	MA2922
MA387A2	MA2942
MA390A2	MA2962
MA393A2	MA2982
MA396A2	MA3002
MA399A2	MA3022
MA402A2	MA3042
MA405A2	MA3062
MA408A2	MA3082
MA411A2	MA3102
MA414A2	MA3122
MA417A2	MA3142
MA420A2	MA3162
MA423A2	MA3182
MA426A2	MA3202
MA429A2	MA3222
MA432A2	MA3242
MA435A2	MA3262
MA438A2	MA3282
MA441A2	MA3302
MA444A2	MA3322
MA447A2	MA3342
MA450A2	MA3362
MA453A2	MA3382
MA456A2	MA3402
MA459A2	MA3422
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MA465A2	MA3462
MA468A2	MA3482
MA471A2	MA3502
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MA480A2	MA3562
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MA741A2	MA5302
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MA747A2	MA5342
MA750A2	MA5362
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MA816A2	MA5802
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MA969A2	MA6822
MA972A2	MA6842
MA975A2	MA6862
MA978A2	MA6882
MA981A2	MA6902
MA984A2	MA6922
MA987A2	MA6942
MA990A2	MA6962
MA993A2	MA6982
MA996A2	MA7002
MA999A2	MA7022

\* To Military Specifications

Transistors	
2N173	2N174, A
	2N176
	thru 1149

\* Microwave Associates listing appears on page 170

## MOTOROLA — (Continued)

Transistors	
2N178	2N420
2N277	2N421
2N278	2N422
2N279, A	2N423
2N350	2N424
2N351, A	2N425
2N375, A	2N426
2N441	2N427
IN1139	2N428
IN1141	2N429
IN1143	2N430
IN1144	2N431
IN1146	2N432
thru 1149	2N433
IN1730	2N434
thru 1734	2N435
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	2N438
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	2N466
	2N467
	2N468
	2N469
	2N470
	2N471
	2N472
	2N473

## NATIONAL SEMICONDUCTOR CORP.

P. O. Box 443  
Danbury, Conn.

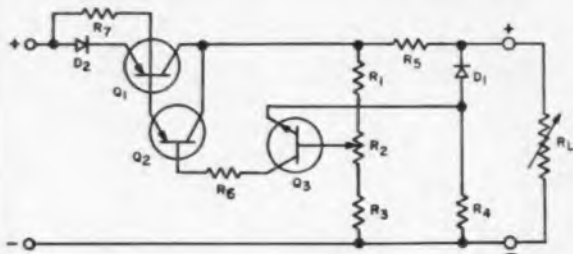
Transistors	
2N243	2N703
2N244	2N704
2N245	2N705
2N246	2N706, A, B
2N247	2N707



# 3 WAYS TO BETTER

Honeywell's circuit-idea file helps

## POWER TRANSISTOR SERIES VOLTAGE REGULATOR



BASIC CIRCUIT

## IF YOUR REGULATED POWER SUPPLY BURNS OUT WHEN SHORT-CIRCUITED... TRY THIS!

Honeywell's improved high current voltage regulation circuitry offers a solution to this common problem. Check these basic circuit features:

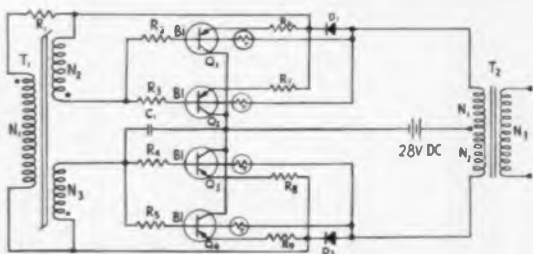
- Short-circuit protection up to 60°C.
- Regulation at 21 volts output from 0 to 3 amperes load current.
- Output impedance of less than 0.07 ohm.
- Open circuit regulation at high temperatures with no power-wasting bleeder.
- Circuit simplicity.
- Versatility. The basic circuit can be easily adapted to operate at higher load currents over wide output voltage ranges or over wider temperature ranges.

## COMPONENTS

- Q<sub>1</sub>—Honeywell 3N49
- Q<sub>2</sub>—Honeywell 2N1263
- Q<sub>3</sub>—2N169A
- D<sub>1</sub>—Voltage Reference Diode (1N763 or equivalent)
- D<sub>2</sub>—3 ampere Silicon Diode (1N1581 or equivalent)

- R<sub>1</sub>—180 ohm
- R<sub>2</sub>—100 ohm
- R<sub>3</sub>—390 ohm
- R<sub>4</sub>—4700 ohm
- R<sub>5</sub>—0.02 ohm
- R<sub>6</sub>—3300 ohm
- R<sub>7</sub>—20-50 ohm
- R<sub>L</sub>—Load

## DC-AC INVERTERS



COMMON-EMITTER, GROUNDED-COLLECTOR 500 WATT INVERTER

## IF YOU'RE LOOKING FOR HIGH-POWER SQUARE WAVE FROM DC... TRY THIS!

Here is what Honeywell Power Tetrode Transistors can give you in an inverter circuit:

- 500 Watts output (higher outputs can be achieved by further paralleling).
- Stable operation at mounting base temperature as high as 71°C—by using Honeywell Power Tetrodes.
- 75% or better overall efficiency—the result of square-wave operation with switching times less than 600 nsec.
- Short circuit protection—can be short-circuited with no inverter damage.
- Uses the Honeywell-developed two-transformer square-wave oscillator circuit.

## COMPONENTS

- R<sub>1</sub>—20 ohm
- R<sub>2</sub>, R<sub>3</sub>—3.3 ohm
- R<sub>4</sub>, R<sub>5</sub>—0.05 ohm
- R<sub>6</sub>—20 ohm @ 25°C
- R<sub>7</sub>, R<sub>8</sub>—3.3 ohm @ 80°C
- Q<sub>1</sub>, Q<sub>2</sub>—Honeywell 3N46 or 3N50
- Q<sub>3</sub>—0.5 μfa.
- D<sub>1</sub>, D<sub>2</sub>—35 amp. rectifiers
- N<sub>1</sub>, N<sub>2</sub>—1N1183 or equivalent

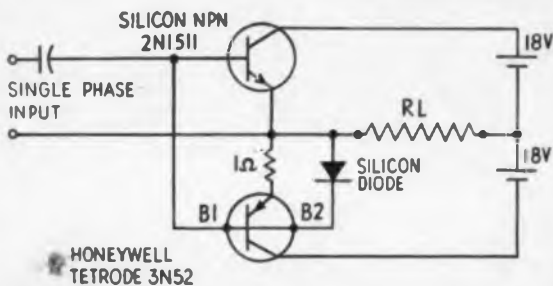
- T<sub>1</sub>—¼" stack of IDU Orthonic
- N<sub>1</sub>—250T #26, N<sub>2</sub>, N<sub>3</sub>—29T #18
- T<sub>2</sub>—Square core Hypersil "C" #H-14
- N<sub>4</sub>, N<sub>5</sub>—15T #12, N<sub>6</sub>—as required



# CIRCUIT PERFORMANCE

*you to invert... amplify... regulate... switch*

## PUSH-PULL IN COMPLEMENTARY SYMMETRY



HONEYWELL  
TETRODE 3N52

## IF CLOSER GAIN-MATCHING IS WHAT YOU'RE AFTER ... TRY THIS!

Honeywell Power Transistors with silicon diodes gain control simplify many complementary problems.



Because of its controlled gain feature, the Honeywell Power Transistor is capable of closely matching the current gain, the transconductance, and the leakage of either silicon or germanium NPN transistors when used in the push-pull complementary symmetry circuit shown above.

	THE PROBLEM		THE ANSWER
POWER TRANSISTORS	PNP	NPN	TWO-SIZE THE TETRODE
CURRENT GAIN	HIGH	AVERAGE	AVERAGE*
TRANSCONDUCTANCE	HIGH	AVERAGE	AVERAGE*
LEAKAGE	AVERAGE	LOW	LOW

## HONEYWELL POWER TRANSISTORS

- Are germanium PNP transistors, millialloyed junctions
- May be operated with junction temperatures as high as 100°C
- Are hermetically sealed for reliability and long life
- Have specified current gain limits
- Have solder terminals for wiring ease and high current-carrying capability
- Are sized and spaced to simplify installation, reduce interface thermal resistance, and conserve chassis space
- Have dynamically-biased junctions to insure maximum reliability

# Honeywell



*First in Control*  
SINCE 1887

*Sales and service offices  
in all principal cities of the world.*

LET US HELP YOU to invert, amplify, regulate or switch. No obligation, of course.

- ( ) Have field engineer call.
- ( ) Send Specification Summary of Honeywell Power Transistors (Catalog 79-9139)

NAME \_\_\_\_\_  
ADDRESS \_\_\_\_\_  
COMPANY \_\_\_\_\_  
CITY \_\_\_\_\_ ZONE \_\_\_\_\_ STATE \_\_\_\_\_

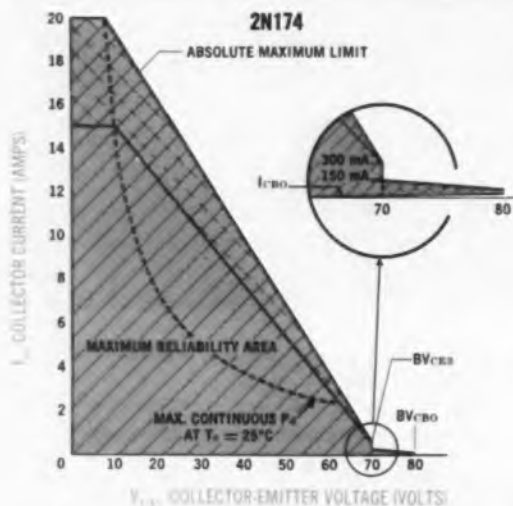
Send coupon to  
Honeywell, Dept. EI-61, Minneapolis 8, Minn.

MOTOROLA IS

POWER  
SOURCE

BETTER SPECS FROM MOTOROLA...

HELP YOU  
IMPROVE  
CIRCUIT  
RELIABILITY



### for example, Motorola defines . . . SAFE OPERATING AREAS

A power transistor's maximum collector voltage and current are related by allowable d.c. power, transient conditions and destructive voltage breakdown. The safe operating area curves included on Motorola power transistor specification sheets help take the guess work out of applications by showing the "maximum reliable" area of operation where you know destructive breakdown will not occur. They also define the region to be entered on a random surge basis only. The small detail drawing illustrates an additional area that can be safely used with "L" shaped load lines.

Safe operating area curves are only one example of the detailed specifications you receive on Motorola power transistors. Motorola specs are more complete . . . containing the valuable data necessary for you to design to utmost circuit reliability.

Motorola is your most complete power transistor source. Whatever your power transistor requirements, you'll find a standard Motorola unit capable of contributing to your circuit efficiency. Over 100 types, TO-3 and TO-36 packages, 3, 5, 10, 15 and 25 amps. Up to 120 volts. For fast delivery contact your Motorola Semiconductor distributor.



For your copy of the Motorola brochure, entitled "How to Get More Value out of a Data Sheet," outlining the many design advantages of Motorola power transistor data sheets, contact your Motorola district office, Motorola distributor or write: Motorola Semiconductor Products Inc., Technical Information Department, 5005 East McDowell Road, Phoenix 10, Arizona.

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# TRANSISTORS & DIODES

## PACIFIC SEMICONDUCTORS, INC. — (Continued)

Diodes	
1N645*	1N173P
thru 649*	1N173A*
1N658	1N2382
thru 661	thru 2385
1N662, A	1N2765
thru 669*	thru 2770
1N663, A	1N3352
1N702	thru 3061
thru 707	PC11240
1N784, A	PC11322
thru 759A	PC11447
1N789	PC11510
thru 804	PC11622
thru 807	PC11747
1N925	PC12247
thru 928	PC13210
1N1139	PC13322
thru 1142	PC13447
1N1143, A	PC13747
1N1164	PD101
thru 1169	thru 109
1N1730	PD301
1N1731*	PS435
1N1732	PS005

\* To Military Specifications

Transistors		
2N410, A	2N1400, A	2N1900
2N496	2N1420	thru 1904
thru 699	2N1505	PMT111
2N706, A, B	2N1506	thru 114
2N717	2N1709	PMT119
thru 720	2N1710	PMT119
2N753	2N1837, A	PT600
2N1336	2N1838	PT601
2N1338	thru 1840	PT705
2N1340	2N1899	PT850, A
2N1342		PT900

## PHILCO CORP. Lansdale Division Lansdale, Pa.

Diodes	
1N26, A, B, C	1N292
1N70, A, B, C, D	1N292
1N263*	

\* To Military Specifications

Transistors		
2N120	2N670	2-1494
2N207, A, B	thru 675	thru 1496
2N223	2N750	2N1499A
thru 227	thru 779	2N1500
2N232	2N846	2N1663
2N240	2N850	2N1676
2N344	thru 865	2N1677
thru 346	2N1122, A	2N1726
2N386	2N1123	thru 1728
2N387	thru 1125	2N177-
2N389, 2N493	2N1128	thru 1740, A
2N495	thru 1130	2N1749
2N496, 2N496	2N1154, A	2N1750
2N499	2N1190, A	2N1752
2N501, A	2N1204	2N1754
2N502, A	2N1267	2N1785
2N503	thru 272	thru 1790
2N504	2N1411	2N1864
2N534	2N1416	thru 1868
2N535, A, B	2N1427	
2N536	thru 1478	
2N580	2N1472	
2N597	2N1478	
thru 601		

## PRINCETON ELECTRONICS CORP. 170 Alexander Street Princeton, N.J.

Diodes		
1N456, A	1N643, A	1N681
thru 459, A	1N645	thru 689
1N461, A	thru 649	1N709
thru 464, A	1N650	thru 804
1N482, A, B	thru 663	1N914
thru 486, A, B	1N676	1N915
1N487, A	thru 679	1N925
1N625		thru 928
thru 629		

## RADIO CORP. OF AMERICA Semi-conductor Division Somerville, N.J.

Diodes		
1N447, B	1N1095	1N2658
thru 445B	1N1763	thru 2664
1N536	1N1764	1N3193
thru 540	1N2059	thru 3195
1N547	1N2326	

Transistors		
2N104	2N176	2N269
2N109	2N215	2N270
2N139	2N217	2N274
2N140	thru 220	2N301, A
2N175	2N247	2N351

## RADIO CORP. OF AMERICA — (Continued)

Transistors		
2N170	2N1023	2N1301
thru 374	2N1066	2N1384
2N176	2N1090	2N1395
2N384	2N1091	thru 1397
2N178	2N1169	2N1425
2N404	2N1170	2N1426
thru 412	2N1177	2N1478
2N578	thru 1180	thru 1493
thru 586	2N1183, A, B	2N1511
2N640	2N1213	thru 1514
thru 647	2N1224	2N1525
2N649	thru 1216	thru 1527
2N706, A	2N1226	2N1631
2N1010	thru 1226	thru 1639
	2N1300	

## RAYTHEON CO. Semi-conductor Division Needham Heights, Mass.

Diodes		
1N384	1N290A	1N599, A
1N385	1N380, A, B	thru 614, A
1N60, A	thru 303, A, B	1N665*
1N61A	1N305	thru 649*
1N66A	thru 307	1N676
thru 68A	1N332	thru 689
1N69	thru 337	1N695
1N90	1N339	1N1095
1N91	1N340	1N1100
1N97	1N341	thru 1105
1N99	thru 349	1N1115
1N100	thru 434, A, B	thru 1120
1N108	1N440, B	1N1124, A
1N116	thru 445, B	thru 1128, A
1N111	1N456*	1N1191A
1N126, A*	1N457*	thru 1194A
1N127, A*	1N458*	1N1195
1N128, A*	1N459*	thru 1198
1N191	1N460, A, B	1N1407
1N192	thru 464	thru 1492
1N198*, A, B	1N464	1N1692
1N248, A	thru 464	thru 1697
thru 250, A	1N466A	1N1763
1N253*	thru 458A	1N1764
thru 256*	1N461A	1N2512
1N270*	thru 464A	thru 2523
1N273	1N482, A	1N2847
1N276*	thru 480, A	thru 2852
1N277*	1N536	1N2858
1N283*	thru 530*	thru 2864
1N292	1N539	CK840
1N294A	1N540*	thru 851
1N295, A	1N547*	CR663, A, B
1N297, A	1N550	
thru 555		

\* To Military Specifications

Transistors		
2N327A	2N700	2N1468
thru 329A	2N710	2N1470
2N332	2N711	2N1528
thru 338	2N745	2N1605
2N359	thru 751	2N1623
thru 363	2N789	2N1654
2N388	thru 793	thru 1657
2N389	2N799	2N1660
2N395	2N801	thru 1662
thru 397	2N803	2N1894
2N404, A	2N805	thru 1898
2N413	2N807	2N1954
2N414	2N809	thru 1957
2N416	2N813	CK14
2N417	2N815	CK16
2N422	2N817	CK17
2N424	2N819	CK22, B
thru 428	2N821	CK25
2N438A	2N823	thru 20
thru 440A	2N825	CK64, B
2N464	2N1017	thru 67, B
thru 467	2N1018	CK419
2N481	2N1034	thru 421
thru 486	thru 1037	CK474
2N501	2N1090	thru 477
2N582	2N1091	CK846
2N631	2N1275	thru 851
thru 633	2N1386	
2N650	thru 1390	
thru 657		

\* To Military Specifications

## RHEEM SEMICONDUCTOR CORP. 327 Moffett Boulevard Mountain View, Calif.

Diodes		
1N221	1N408, A	1N681
1N252	thru 408, A	thru 687
1N456, A	1N625	1N688
1N457*	thru 629	thru 693
1N458*	1N643, A	1N778
1N459*	1N645	1N779
1N458A	thru 649	1N789
1N459*	1N650	thru 804
1N459A	1N655	1N806
1N461, A	thru 663, A	thru 809
1N482, A, B	1N676	thru 815
thru 485, A, B	thru 679	1N818

\* To Military Specification

## RHEEM SEMICONDUCTOR CORP. — (Continued)

Diodes		
1N837, A	1N879	1N925
1N838	thru 886	thru 928
thru 845	1N891	1N934
1N846	thru 893	1N968
thru 853	1N900	RD1356
1N857*	thru 908	thru 1359
thru 864	1N914	RD2121
1N868	1N916	thru 2124
thru 875	1N920	RD2266
	thru 923	

\* To Military Specifications

## SARKIS TARTZIAN, INC. Semi-conductor Division Bloomington, Ind.

Diodes		
1N700	1N1003	2N338, P
thru 730	thru 1008	2N339, P
1N1034	1N2373	2N339, P
thru 1045	thru 2385	3J3
1N1052	1N2389	3D38, P
1N1069	1N2482	3D39, P
thru 1080	thru 2490	3D39, P
1N1100	2F4	3D39, P
thru 1113	5J3	3D39, P
1N1133	5R38, P	3D39, P
thru 1143	5S38, P	40J3
1N145A	5T38, P	40R38, P
thru 1150	5V38, P	40S38, P
1N1157	5X38, P	40S38, P
thru 1160	5Y38, P	40S38, P
1N1171	10H	40V38, P
thru 1182	10J3	40V38, P
1N1237	10R38, P	40W38, P
thru 1238	10S38, P	40X38, P
1N1262	10T38, P	40X38, P
1N1263, A	10V38, P	40X38, P
thru 1270, A	10X38, P	40Y38, P
1N1251	10Y38, P	50H
thru 1375	20J3	60H
1N1617	20R38, P	M-150
thru 1624	20S38, P	S-5130
1N1730	20T38, P	S-5340
thru 1734	20V38, P	S-5347

## SEMICON, INC. Bedford, Mass.

Diodes		
1N253	1N1537	520
thru 256	thru 1544	530
1N332	1N1556	thru 41
thru 349	thru 1560	540A
1N440, B	1N1644	543
thru 445, B	thru 1653	thru 63
1N482TH	1N1692	571
thru 486TH	thru 1695	thru 79
1N530	1N1763	581
thru 547	1N1764	thru 86
1N550	1N2026	591, A, B
thru 555	thru 2031	592, A
1N560	1N2080	593, A
thru 563	thru 2085	595
1N596	1N2217	5100
thru 598	1N2219	thru 100
1N599, A	1N2221	5200
thru 614, A	1N2223, A	thru 208
1N645TH	1N2225, A	5210
thru 649TH	1N2227, A	5217
1N1095	1N2277	thru 224
1N1100	1N2289	5229
thru 1105	1N2289, A	thru 243
1N1115	1N2291, A	5250
thru 1120	thru 2293, A	thru 260
1N1124	1N2512	5M10A
1N1169, A	thru 2556	5M15A
1N1217, A	1N2950	5M20A
thru 1224, A	thru 2864	5M25A
1N1225	S10, A	5M30A
1N1226	S12	5M35A
thru 1226	thru 16	5M40A
1N1227, A	S16A, B	X519
1N1235	S17, A	X522
1N1236	thru 18, A	X516, A
1N1443	S19, A	X517, A
1N1444	S20	X518
1N1486	thru 22	X522
thru 1492	S22A	X523, A
1N1521, A	S23, A	X540
thru 1528, A	S24	
	thru 28	

## SEMI-ELEMENTS, INC. Saxonburg Boulevard Saxonburg, Pa.

Diodes		
1N34, A, B	1N38, A, B	1N39, A, B

# TRANSISTORS & DIODES

## SEMI-ELEMENTS, INC. — (Continued)

Diodes	
1N40	1N294, A
1N43	1N295
thru 40	1N297, A
1N51	1N298, A
1N52, A	1N302
1N54, A	1N304
1N55, A, B	1N305
1N56, A	1N307
1N57	1N309
1N58, A	1N310
1N60, A	1N312
1N61	1N313
1N63, A	1N316
1N64	thru 319, A
thru 66	1N320, A
1N66, A	1N322, A
thru 70, A	1N323, A
1N71	1N324
1N72	thru 327, A
1N75	1N329, A
1N81, A	1N335
1N86	1N359
thru 90	thru 363
1N87A	1N362A
1N95	thru 365A
1N95, A	1N434
thru 100, A	1N440, B
1N108	thru 445, B
1N111	1N447
thru 116	1N450
1N116A	1N452
thru 118A	thru 455
1N126, A	1N463
thru 128, A	1N476
1N137A	thru 479
1N139	1N497
thru 145	thru 500
1N198, A	1N531
1N209	1N536
thru 214	thru 542
1N258	1N550
1N270	1N552
1N273	thru 556
1N276	1N616
1N279	thru 618
1N281	1N634
1N285	1N636
1N287	1N676
thru 292	thru 679

## SILICON TRANSFORMER CORP.

Diodes	
1N456	1N625
1N457*	thru 629
thru 459*	1N643*
1N461	1N645
thru 464	thru 649
1N482, A, B	1N659*
thru 485, A, B	1N662*
1N486, A	1N663*
thru 487, A	

\* To Military Specifications

## SLATER ELECTRIC CO.

Diodes	
1N448, B	1N1100
thru 445, B	thru 1105
1N536	1N1407
thru 540	thru 1492
1N647	1N1692
1N650	thru 1697
1N561	1N2610
1N599, A	thru 2617
thru 606, A	1N3193
1N1895	thru 3196
1N1096	SLA5

## SOLID STATE PRODS.

Diodes	
3A30A, S	3A101
3A31	3A150S
3A60A, S	3A200A, S
3A61	3A201
3A100A, S	3B30S
3B80S	3B80S
3B100S	3B150S
3B150S	3B200S

## SOLITRON DEVICES

Diodes	
CER69	CER700
thru 78	CER710
CER800	CER730
	U-2

## SONY CORP.

Diodes	
1T22	1T101
1T23	thru 103

Transistors	
2SA121	2T6*
thru 124	2T71
2S827	thru 73, R
thru 31	2T75, R
2SC41	thru 78, R
thru 44	2T82
2SC191	thru 85, A
thru 197	2T86
2T11	2T101
thru 17	2T102
2T21	2T101
thru 26	2T203
2T51	2T204, A
thru 54	2T205, A
2T61	2T311
thru 63	thru 315
2T64, R	2T321
thru 66, R	thru 324
2T67	

## SPERRY

Diodes	
1N456	1N662
thru 459	1N663
1N461	1N690
thru 464	thru 693
1N482, A	1N780
thru 488, A	thru 796
1N482B	1N837, A
thru 485B	1N840
1N625	1N844
thru 629	1N920
1N643	thru 923
thru 649	S100
1N658	SD005
thru 660	SD010
	SD015

Transistors	
2N1034	2N1469
thru 1037	2N1474, A
2N1118, A	2N1475
thru 699	thru 1477
2N1219	2N1917
thru 1223	thru 1922
2N1275	

## SPRAGUE ELECTRIC CO.

Diodes	
1N418	1N110
1N420	1N111
1N422	1N112
1N424	1N113
1N426	1N114
1N428	1N115
1N430	1N116
1N432	1N117
1N434	1N118
1N436	1N119
1N438	1N120
1N440	1N121
1N442	1N122
1N444	1N123
1N446	1N124
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1N450	1N126
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1N458	1N130
1N460	1N131
1N462	1N132
1N464	1N133
1N466	1N134
1N468	1N135
1N470	1N136
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2N404-USAF	2N388-USN	2N123/5	2N422	2N527	2N1374	2N385	2N636A
2N425-USA	2N465-USA	2N381	2N426	2N582	2N1375	2N385A	2N679
2N426-USA	2N1302-USN	2N382	2N426	2N591/5	2N1376	2N388	2N1102/5
2N427-USA	2N1304-USN	2N383	2N427	2N650	*2N1684	2N388A	2N1114
2N428-USA	2N1306-USN	2N395	2N428	2N651	*2N1782	2N438	2N1299
2N428-JAN	2N1308-USN	2N396	2N464	2N652	*2N1783	2N438A	2N1302
2N526-JAN		2N396-1	2N465	2N1008	*2N1784	2N439	2N1304
2N1303-USN		2N396A	2N466	2N1008A	NPN	2N439A	2N1306
2N1305-USN		2N397	2N467	2N1009	2N312	2N440	2N1308
2N1307-USN		2N398	2N482	2N1192	2N356	2N440A	2N1473
2N1309-USN		2N404	2N483	2N1265/5	2N356A	2N558	2N1605
		2N404A	2N484	2N1303	2N357	2N557	2N1605A
		2N413	2N519	2N1305	2N357A	2N558	*2N1685
		2N413A	2N520	2N1307	2N358	2N578	*2N1779
		2N414	2N524	2N1309	2N358A	2N578A	*2N1780
		2N414A	2N525	2N1372	2N377	2N585	*2N1781

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# TUNG-SOL®

## GERMANIUM TRANSISTORS

Tung-Sol germanium transistors have been designed to meet the reliability and performance standards of critical commercial and military applications. Performance capabilities are evaluated under the severest environmental conditions and electrical limits.



### HIGH POWER

TYPE	MAXIMUM RATINGS					MAX. I <sub>CB0</sub> mA	CONDITION	h <sub>FE</sub>	TYPICAL VALUES	
	P <sub>c</sub> W	V <sub>CB</sub> V	V <sub>CE</sub> V	I <sub>C</sub> A	T <sub>J</sub> °C				CONDITION	f <sub>osc</sub> KC
2N173	75	60	50	15	100	8	VCB=-60V	52	I <sub>C</sub> =5A, V <sub>CE</sub> =-2V	10
2N174	75	80	70	15	100	8	VCB=-80V	37	I <sub>C</sub> =5A, V <sub>CE</sub> =-2V	10
2N174A	75	80	70	15	100	8	VCB=-80V	37	I <sub>C</sub> =5A, V <sub>CE</sub> =-2V	10
2N277	75	40	40	15	100	8	VCB=-40V	52	I <sub>C</sub> =5A, V <sub>CE</sub> =-2V	10
2N278	75	50	45	15	100	8	VCB=-50V	52	I <sub>C</sub> =5A, V <sub>CE</sub> =-2V	10
2N441	75	40	40	15	100	8	VCB=-40V	30	I <sub>C</sub> =5A, V <sub>CE</sub> =-2V	10
2N442	75	50	45	15	100	8	VCB=-50V	30	I <sub>C</sub> =5A, V <sub>CE</sub> =-2V	10
2N443	75	60	50	15	100	8	VCB=-60V	30	I <sub>C</sub> =5A, V <sub>CE</sub> =-2V	10
2N1099	75	80	70	15	100	8	VCB=-80V	52	I <sub>C</sub> =5A, V <sub>CE</sub> =-2V	10
2N1100	75	100	80	15	100	8	VCB=-100V	37	I <sub>C</sub> =5A, V <sub>CE</sub> =-2V	10
2N1358	75	80	70	15	100	8	VCB=-80V	37	I <sub>C</sub> =5A, V <sub>CE</sub> =-2V	10
2N1412	75	100	80	15	100	8	VCB=-100V	37	I <sub>C</sub> =5A, V <sub>CE</sub> =-2V	10

### POWER

TYPE	MAXIMUM RATINGS					MAX. I <sub>CB0</sub> mA	CONDITION	h <sub>FE</sub>	TYPICAL VALUES	
	P <sub>c</sub> W	V <sub>CB</sub> V	V <sub>CE</sub> V	I <sub>C</sub> A	T <sub>J</sub> °C				CONDITION	f <sub>osc</sub> KC
2N242	50	—	45	5	100	1	VCB=-25V	30 Min.	I <sub>C</sub> =500 mA, V <sub>CE</sub> =-12V	5 Min.
2N307	50	35	35	5	100	5	VCB=-25V	20 Min.	I <sub>C</sub> =200 mA, V <sub>CE</sub> =-1V	3 Min.
2N307A	50	35	35	5	100	2	VCB=-25V	30 Min.	I <sub>C</sub> =200 mA, V <sub>CE</sub> =-1V	3.5 Min.
2N378	50	40	20	5	100	.5	VCB=-25V	35	I <sub>C</sub> =2A, V <sub>CE</sub> =-2V	5 Min.
2N379	50	80	40	5	100	.5	VCB=-25V	50	I <sub>C</sub> =2A, V <sub>CE</sub> =-2V	5 Min.
2N380	50	60	30	5	100	.5	VCB=-25V	55	I <sub>C</sub> =2A, V <sub>CE</sub> =-2V	8 Min.
2N459	50	105	60	5	100	.5	VCB=-25V	50	I <sub>C</sub> =2A, V <sub>CE</sub> =-2V	5 Min.

### MEDIUM POWER

TYPE	MAXIMUM RATINGS					MAX. I <sub>CB0</sub> μA	CONDITION	h <sub>FE</sub>	TYPICAL VALUES	
	P <sub>c</sub> mW	V <sub>CB</sub> V	V <sub>CE</sub> V	I <sub>C</sub> mA	T <sub>J</sub> °C				CONDITION	f <sub>osc</sub> MC
AUDIO & LOW SPEED COMPUTER										
2N381	200	50	25	400	100	10	VCB=-25V	50	I <sub>C</sub> =20 mA V <sub>CE</sub> =-1.0V	3
2N382	200	50	25	400	100	10	VCB=-25V	80	I <sub>C</sub> =20 mA V <sub>CE</sub> =-1.0V	4
2N383	200	50	25	400	100	10	VCB=-25V	100	I <sub>C</sub> =20 mA V <sub>CE</sub> =-1.0V	5
2N460	200	45	—	400	100	15	VCB=-45V	25	I <sub>E</sub> =1 mA V <sub>CB</sub> =-6.0V	1.2
2N461	200	45	—	400	100	15	VCB=-45V	50	I <sub>E</sub> =1 mA V <sub>CB</sub> =-6.0V	4
2N526	200	45	—	500	100	10	VCB=-30V	73	I <sub>C</sub> =20 mA V <sub>CE</sub> =-1V	3
2N1705	200	18	—	400	100	10	VCB=-10V	110 (h <sub>FE</sub> )	I <sub>C</sub> =1 mA V <sub>CE</sub> =-6V f=1 KC	4
2N1706	200	25	—	400	100	10	VCB=-25V	90	I <sub>C</sub> =20 mA V <sub>CE</sub> =-1V	3
2N1707	200	30	—	400	100	15	VCB=-25V	90	I <sub>C</sub> =20 mA V <sub>CE</sub> =-1V	3
R. F. & COMPUTER										
2N396	150	30	—	200	100	6	VCB=-20V	30 Min.	I <sub>C</sub> =10 mA V <sub>CE</sub> =-1V	5 Min.
2N396A	200	30	20	200	100	6	VCB=-20V	30 Min.	I <sub>C</sub> =10 mA V <sub>CE</sub> =-1V	5 Min.
2N413	180	30	18	400	100	5	VCB=-12V	30 (h <sub>FE</sub> )	I <sub>C</sub> =1 mA V <sub>CE</sub> =-6V f=1 KC	2.5
2N414	180	30	15	400	100	5	VCB=-12V	60 (h <sub>FE</sub> )	I <sub>C</sub> =1 mA V <sub>CE</sub> =-6V f=1 KC	7
2N416	180	30	12	400	100	5	VCB=-12V	80 (h <sub>FE</sub> )	I <sub>C</sub> =1 mA V <sub>CE</sub> =-6V	10
2N417	180	30	10	400	100	5	VCB=-12V	140 (h <sub>FE</sub> )	I <sub>C</sub> =1 mA V <sub>CE</sub> =-6V f=1 KC	20
2N425	180	30	20	400	100	25	VCB=-30V	30	I <sub>B</sub> =1 mA V <sub>CE</sub> =-0.25V	4
2N426	180	30	18	400	100	25	VCB=-30V	40	I <sub>B</sub> =1 mA V <sub>CE</sub> =-0.25V	6
2N427	180	30	15	400	100	25	VCB=-30V	55	I <sub>B</sub> =1 mA V <sub>CE</sub> =-0.25V	11
2N428 (1)	180	30	12	400	100	25	VCB=-30V	80	I <sub>B</sub> =1 mA V <sub>CE</sub> =-0.25V	17
2N1313	180	30	15	400	100	25	VCB=-30V	40 Min.	I <sub>B</sub> =1 mA V <sub>CE</sub> =-0.25V	8 Min.
2N1681	180	30	15	200	100	3	VCB=-2V	75	I <sub>C</sub> =10 mA V <sub>CE</sub> =-0.25V	5 Min.

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GFT21D	GFT3215	GFT340840
GFT21G	GFT3230	GFT340860
GFT22R	GFT3260	GFT340880
GFT22S	GFT34	GFT401230
GFT22D	GFT3415	GFT401260
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1N692*	1N693	1N694
1N693*	1N694	1N695
1N694*	1N695	1N696
1N695*	1N696	1N697
1N696*	1N697	1N698
1N697*	1N698	1N699
1N698*	1N699	1N700
1N699*	1N700	1N701
1N700*	1N701	1N702
1N701*	1N702	1N703
1N702*	1N703	1N704
1N703*	1N704	1N705
1N704*	1N705	1N706
1N705*	1N706	1N707
1N706*	1N707	1N708
1N707*	1N708	1N709
1N708*	1N709	1N710
1N709*	1N710	1N711
1N710*	1N711	1N712
1N711*	1N712	1N713
1N712*	1N713	1N714
1N713*	1N714	1N715
1N714*	1N715	1N716
1N715*	1N716	1N717
1N716*	1N717	1N718
1N717*	1N718	1N719
1N718*	1N719	1N720
1N719*	1N720	1N721
1N720*	1N721	1N722
1N721*	1N722	1N723
1N722*	1N723	1N724
1N723*	1N724	1N725
1N724*	1N725	1N726
1N725*	1N726	1N727
1N726*	1N727	1N728
1N727*	1N728	1N729
1N728*	1N729	1N730
1N729*	1N730	1N731
1N730*	1N731	1N732
1N731*	1N732	1N733
1N732*	1N733	1N734
1N733*	1N734	1N735
1N734*	1N735	1N736
1N735*	1N736	1N737
1N736*	1N737	1N738
1N737*	1N738	1N739
1N738*	1N739	1N740
1N739*	1N740	1N741
1N740*	1N741	1N742
1N741*	1N742	1N743
1N742*	1N743	1N744
1N743*	1N744	1N745
1N744*	1N745	1N746
1N745*	1N746	1N747
1N746*	1N747	1N748
1N747*	1N748	1N749
1N748*	1N749	1N750
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1N751*	1N752	1N753
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1N753*	1N754	1N755
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1N776*	1N777	1N778
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1N779*	1N780	1N781
1N780*	1N781	1N782
1N781*	1N782	1N783
1N782*	1N783	1N784
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1N786*	1N787	1N788
1N787*	1N788	1N789
1N788*	1N789	1N790
1N789*	1N790	1N791
1N790*	1N791	1N792
1N791*	1N792	1N793
1N792*	1N793	1N794
1N793*	1N794	1N795
1N794*	1N795	1N796
1N795*	1N796	1N797
1N796*	1N797	1N798
1N797*	1N798	1N799
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1N818*	1N819	1N820
1N819*	1N820	1N821
1N820*	1N821	1N822
1N821*	1N822	1N823
1N822*	1N823	1N824
1N823*	1N824	1N825
1N824*	1N825	1N826
1N825*	1N826	1N827
1N826*	1N827	1N828
1N827*	1N828	1N829
1N828*	1N829	1N830
1N829*	1N830	1N831
1N830*	1N831	1N832
1N831*	1N832	1N833
1N832*	1N833	1N834
1N833*	1N834	1N835
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1N835*	1N836	1N837
1N836*	1N837	1N838
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1N838*	1N839	1N840
1N839*	1N840	1N841
1N840*	1N841	1N842
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1N842*	1N843	1N844
1N843*	1N844	1N845
1N844*	1N845	1N846
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1N847*	1N848	1N849
1N848*	1N849	1N850
1N849*	1N850	1N851
1N850*	1N851	1N852
1N851*	1N852	1N853
1N852*	1N853	1N854
1N853*	1N854	1N855
1N854*	1N855	1N856
1N855*	1N856	1N857
1N856*</		

# TRANSISTORS & DIODES

## U.S. SEMICONDUCTOR PRODS.—(Continued)

<b>Diodes</b>		
SP148BC	SP438B	SP588BA
SP148B	SP48.58BA	SP122.58BA
SP30.588B	SP67.58BA	SP15088B
SP358BA	SP88B	SP30088A
SP3788D	SP758BA	

## WESTERN ELECTRIC CO.

195 Broadway  
New York City, N.Y.

<b>Diodes</b>		
IN664	IN1414	IN2227
thru 675	thru 1433	IN2128
IN696	IN1483	IN2790
IN697	IN1485	IN2791
IN701	IN1743	IN2801
IN818	IN1744	GAS3694L, 14
IN847	IN2146	GAS3695L, 14
<b>Transistors</b>		
2N110	2N560*	2N1195
2N463	2N1051*	2N1444*
2N528	2N1060*	2N1645*
2N537	2N1072*	2N1675*
2N559*	2N1094*	2N1814*

\* To Military Specifications

## MICROWAVE ASSOCIATES, Burlington, Mass.

IN21B	IN1611A	MA449B
thru 21F	IN2127	thru F
IN21WE	IN2509	MF450A
IN23B	IN2771	thru H
thru 23F	IN3123	MA451A
IN23WE	IN3124	thru F
IN26A	MA408A	MA460A
IN32	MA412	thru H
IN53A, B	MA417	MA4202X
IN78A, B	MA418A, B	MA4203X
IN149	MA421A, B	MA4230
IN150	MA423A	MA4253
IN160	MA424	thru 4261
IN350	thru 426	MA4280
IN415B	MA420	thru 4292
thru E	MA435	MA4296
IN416B	MA439	thru 4298
thru E	MA441	MA4380X
IN630	MA444A, B	thru 4380X
IN903	MA444C, D	MAH
thru 908	MA448C, D	
IN1610		

## WESTERN SEMICONDUCTORS, INC.

605G Alton Street  
Santa Ana, Calif.

<b>Diodes</b>	
IN251	IN653
IN252	thru 651
IN456	IN657*
IN456A	IN663*
IN457*	IN702
IN457A	thru 738
IN458*	IN746
IN458A	thru 759
IN459*	IN763
IN459A	thru 769
IN461A	IN837, A
thru 464, A	IN839
IN465	thru 845
thru 470	IN850
IN482, A, B	thru 856
thru 486, A, B	IN861
IN487, A	thru 867
IN488, A	IN873, A
IN489	thru 878
thru 629	IN883
IN643*	thru 889
IN643 thru 649	IN894

\* To Military Specifications

## WESTERN TRANSISTOR CORP.

13021 S. Badlong Avenue  
Gardena, Calif.

2N127A thru 128A	Transistors
	2N128 thru 129

## WESTINGHOUSE ELECTRIC CORP.

Semiconductor Dept.  
Youngwood, Pa.

<b>Diodes</b>	
IN536	IN1271
thru 540	thru 1277
IN647	IN1281
IN650	thru 1287
IN661	IN1291
IN1095	thru 1297
IN1096	IN1330
IN1103	thru 1336
thru 1206	IN1341
IN1217, A	thru 1348
thru 1234, A	IN1376
IN1235	thru 1382
IN1236	IN1443
<b>Transistors</b>	
2N1015	WX110XA
2N1015A	WX110XB
2N1015B	WX110XC
2N1015C	WX109A
2N1016	WX109B
2N1016A	WX109C
2N1016B	WX109D
2N1016C	WX109E
2N1016D	WX109F
WX1150A	WX109H
	WX110XC

## AD Audio Devices

AEI Associated Electrical Inds.	GI General Instrument
ARA Advanced Research	GT General Transistor
AMP Amperex	HOF Hoffman Semiconductor
BEN Bendix	HU Hughes
BOG Boage	IND Indutro
BOM Bomac	IR International Rectifier
BRA Bradley	ITT ITT Components Div.
CBS CBS-Hytron	KEM Kamtron
CD Continental Device Corp.	MAL Mallory
CE Columbus Electronics	MA Microwave Associates
CLE Cleveite	MH Minneapolis-Honeywell
CSF Compagnie	OT Motorola
DEL Delco	MU Mullard
ERI Electron Research	NAE North American
FAN Fansteel	OHM Ohmite
FCH Fairchild	PHL Philco
GAH Gahagan	PSI Pacific Semiconductors
GE General Electric	RAY Raytheon
	RDR Radio Dev. & Research

## General Instrument

RCA Radio Corp. of America
RHE Rheem
SEM Semicon
SIL Silicon Transistor Corp
SON Sony
SPR Sprague
SRC Sperry
ST Sorkes Torzian
STC Standard Tel. & Cables
SYL Sylvania
TEC Transistor
TEK Tekade
TI Texas Instruments
TS Tung-Sol
TSC Trans-Sil
USS US Semiconductor
W Westinghouse
WE Western Electric
WSI Western Semiconductors

## RCA Radio Corp. of America

WX1150B
WX1150C
WX1150D
WX1150E
WX1150F
WX1150G
WX1150H
WX1150I
WX1150J
WX1150K
WX1150L
WX1150M
WX1150N
WX1150O
WX1150P
WX1150Q
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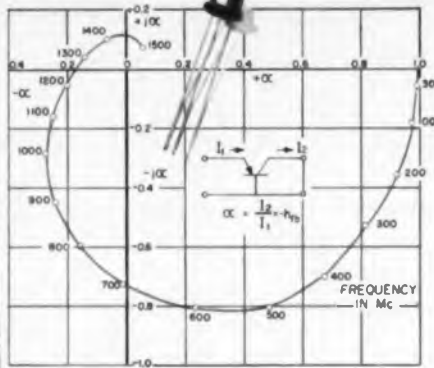
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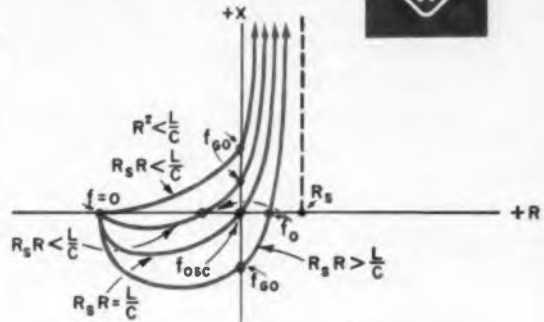
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$\alpha$ - $hf_b$  versus frequency for a diffused-base transistor, as measured with Type 1607-A Bridge.



Tunnel-diode impedance characteristics plotted to determine approximate values for the self-resonant and resistive cut-off frequencies.



**Type 1607-A Transfer Function and Immittance Bridge ... \$1775**

## Measures every Characteristic of Semiconductor Devices from **25 to 1500 Mc**

**TRANSISTORS** —  $h_{fi}$ ,  $h_{fe}$ ,  $h_{rb}$ ,  $h_{ib}$ ,  $h_{ob}$ ,  $h_{oe}$  — all short-circuit admittance and open-circuit impedance parameters.

**TUNNEL DIODES** — equivalent circuit parameters: series L, series R, shunt C, negative R ... resistive cut-off frequency, self-resonant frequency.

- ★ **DIRECT-READING** for all measurements.
- ★ **BASIC ACCURACY** is 5%.
- ★ **BIASING TERMINALS** for application of dc bias to component under test; special model accepts as much as 2.5 amps.
- ★ **LOW R-F SIGNAL APPLIED** — may be held below 5 mv for transistor measurements.
- ★ **COMPLETELY PASSIVE INSTRUMENT** — stability of calibration is dependent only upon permanent physical dimensions.

- ★ **MEASURES VACUUM-TUBE TRANSADMITTANCES** as well, under high frequency, dynamic conditions ... 7-pin miniature, grounded-cathode Tube Mount available (Type 1607-P201, \$75.)

★ **TRANSISTOR TEST MOUNTS AVAILABLE:**

- **Type 1607-P101** (0.200-in.-pin-circle, common base, \$60.)
- **Type 1607-P102** (0.200-in.-pin-circle, common emitter, \$60.)
- **Type 1607-P111** (0.100-in.-pin-circle, common base, \$65.)
- **Type 1607-P401** (0.200-in.-pin-circle, tetrode, \$65.)

*This Instrument Takes In Stride Advances In Solid-State Devices — it can measure all theoretical two-, three-, and four-terminal characteristics*

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Toronto  
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## TRANSISTOR/DIODE MULTIPLES FROM FAIRCHILD

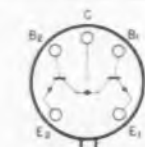
Multiple PLANAR transistor and/or diode dice are packaged in a single TO-5-or TO-18-sized header with common or isolated electrical connections for a variety of circuit functions. PLANAR Multiples offer these advantages: ideal thermal matching, significant space reductions (up to 80%), fewer external soldered connections, reduced component- and circuit-assembly costs, superior device reliability.

### PLANAR makes it possible

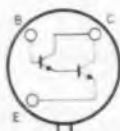
Fairchild's PLANAR process provides the uniformity, parameter stability and high yield to make "multiples" economically and operationally practical.

### The Products

PLANAR Multiples can be produced in many device configurations. Some of the production units now available include:



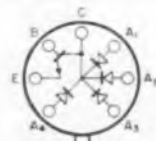
**CHOPPER (FSP-1)**  
 $h_{FE}$  35 at 100 microamps



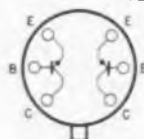
**DARLINGTON AMPLIFIER (FSP-4)**  
 $h_{FE}$  2000 minimum @ 150 mA



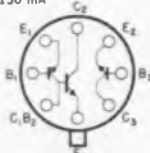
**PHOTO-TRANSISTOR (FSP-5)**  
 Extremely low drift



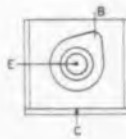
**LOW-LEVEL LOGIC (FSP-14)**  
 High speed logic at low power levels



**COMPLEMENTARY AMPLIFIER (FSP-15)**  
 2N1613 and 2N1132



**AMPLIFIER MODULE (FSP-17)**  
 High voltage low drift amplifier



**TAB MOUNT TYPE II (FSP-42)**  
 Gold clad moly tab varnish coated

Special Products Handbook available on request.

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**FSP-60 Triple Darlington**  
 High Gain Low Noise Amplifier  
 TO-5 size header  
 3 - 2N1613 Planar Transistors  
 $h_{FE}$  typical = 100,000

## DIODE SIMILARITY CHART

EIA NO. & SIMILAR TYPE	DESCR & APP.	MFR**	CASE FIG. †	EIA NO. & SIMILAR TYPE	DESCR & APP.	MFR**	CASE FIG. †	EIA NO. & SIMILAR TYPE	DESCR & APP.	MFR**	CASE FIG. †
<u>1N34A</u>	G-GP	SYL	4	<u>1N54G</u>	G			<u>1N81A</u>	G-GP	SYL	4
<u>1T22</u>		SON	A	<u>1N54A</u>		CLE		<u>1N128</u>		CLE	
<u>SFD112</u>		CSF	1	<u>1N54A</u>		SYL		<u>1N86</u>	G-GP	AMP	4
<u>1N35</u>	G-GP	SYL	21	<u>1N57A</u>	GP	SYL	6	<u>1N58A</u>		CLE	
<u>SFD115</u>		CSF		<u>SFD108</u>		CSF	1	<u>1N58A</u>		SYL	
<u>1N36</u>	G-GP	KEM		<u>1N58A</u>	G-GP	SYL	4	<u>1N87</u>	G-GP	AMP	29
<u>SFD112</u>		CSF	1	<u>SFD108</u>		CSF	1	<u>1N34A</u>		CLE	
<u>1N38</u>	G-GP	SYL	6	<u>4/10</u>		TEK		<u>SFD104</u>		CSF	1
<u>SFD108</u>		CSF	1	<u>1N60A, G</u>	G-GP	SYL	6	<u>1N60</u>		SYL	
<u>LD134</u>		CBS		<u>1N34A</u>		CLE		<u>1N88</u>	G-GP	AMP	29
<u>1N38A, B</u>	G-GP	SYL	4	<u>SFD110</u>		CSF	1	<u>1N38A</u>		CLE	
<u>SFD108</u>		CSF		<u>1N61</u>	G-GP	SYL	6	<u>SFD108</u>		CSF	1
<u>1N43</u>	G-GP	WE	15	<u>1N55A</u>		CLE		<u>1N89</u>	G-GP	HU	1
<u>1N34A</u>		CLE		<u>1N62</u>	G-GP	SYL	6	<u>SFD108</u>		CSF	1
<u>SFD112</u>		CSF	1	<u>1N55A</u>		CLE		<u>1N87A</u>		SYL	
<u>1N89</u>		GE	4	<u>1N63</u>	G-GP	SYL	4	<u>1N90</u>	G-GP	HU	1
<u>1N44</u>	G-GP	WE	15	<u>SFD108</u>		CSF	1	<u>SFD112</u>		CSF	1
<u>1N58A</u>		CLE		<u>1N198</u>				<u>1N95</u>	G-GP	HU	1
<u>1N58A</u>		SYL		<u>1N64</u>	G-SP	GE	4	<u>1N98</u>		SYL	
<u>GD6</u>		STC		<u>1N34A</u>		CLE		<u>1N100</u>	G-GP	HU	1
<u>1N45</u>	G-GP	WE	15	<u>1T23</u>		SON	A	<u>T3G</u>		TEC	
<u>1N38B</u>		SYL		<u>SFD108</u>		CSF	1	<u>1N105</u>	G-SP	SYL	7
<u>SFD108</u>		CSF	1	<u>1N198</u>				<u>1N34A</u>		CLE	
<u>GD10</u>		STC		<u>1N64A</u>	G-SP	KEM		<u>1N109</u>	G-SP	SYL	6
<u>1N46</u>	G-GP	WE	15	<u>1N34A</u>		CLE		<u>1N34A</u>	G-SP	CLE	
<u>1N34A</u>		CLE		<u>1N65</u>	G-GP	GE	4	<u>1N109</u>	G-SP	SYL	6
<u>1N34A</u>		SYL		<u>SFD108</u>		CSF	1	<u>1N34A</u>	G-SP	CLE	
<u>1N139</u>		TEC		<u>1N38A</u>		SYL		<u>1N110</u>	G-SP	GI	11
<u>SFD112</u>		CSF	1	<u>1N86</u>	G-GP	RAY	2	<u>1N82A</u>		SYL	
<u>1N47</u>	G-GP	WE	15	<u>SFD112</u>		CSF	1	<u>1N111</u>	G-SP	CBS	4
<u>1N55A</u>		CLE		<u>1N68</u>	G-GP	RAY	2	<u>1N298</u>		SYL	
<u>1N55A</u>		SYL		<u>SFD108</u>		CSF	1	<u>1N116</u>	G-GP	HU	1
<u>1N48</u>	G-GP	GE	4	<u>1N38A</u>		SYL		<u>SFD108</u>		CSF	1
<u>1N38A</u>		CLE		<u>1N68A</u>	G-GP	HU	1	<u>1N54A</u>		SYL	
<u>1N38A</u>		SYL		<u>SFD108</u>		CSF	1	<u>1N124</u>	G-SP	PHL	5
<u>1N48A</u>	G-GP			<u>1N126A</u>	G-GP	GE	4	<u>1N72</u>		SYL	
<u>1N38A</u>		CLE		<u>1N34A</u>		CLE		<u>1N126A</u>	G-GP	HU	1
<u>1N38A</u>		SYL		<u>1N89A</u>	G-GP	SYL		<u>SFD108</u>		CSF	1
<u>1N48G</u>	G			<u>1N38A</u>		CLE		<u>1N34A</u>	G-GP	SYL	
<u>1N38A</u>		CLE		<u>1N70</u>	G-GP	GE	4	<u>1N127A</u>	G-GP	HU	1
<u>1N48</u>		SYL		<u>1N38A</u>		CLE		<u>SFD108</u>		CSF	1
<u>1N48GA</u>	G			<u>1N70A</u>	G-GP	SYL	4	<u>1N198</u>	G-GP	HU	1
<u>1N38A</u>		CLE		<u>1N127</u>		CLE		<u>SFD110</u>		CSF	1
<u>1N38A</u>		SYL		<u>1N73</u>	G-GP			<u>1N132</u>	G-GP	SYL	8
<u>1N49</u>	G-Z	GE	4	<u>1N40</u>		SYL		<u>1N34A</u>		CLE	
<u>1N34A</u>		CLE		<u>1N74</u>	G-GP			<u>1N135</u>	G-GP	OHM	
<u>1N34A</u>		SYL		<u>1N40</u>		SYL		<u>1N126</u>		CLE	
<u>1N50</u>	G-GP	GE	4	<u>1N75</u>	G-GP	GE	4	<u>1N69A</u>		SYL	
<u>1N54A</u>		CLE		<u>1N87A</u>		CLE		<u>1N139</u>	G-GP	TEC	4
<u>1N54A</u>		SYL		<u>SFD108</u>		CSF	1	<u>1N450</u>		SYL	
<u>1N51</u>	G-GP	GE	4	<u>1N63</u>		SYL		<u>1N147</u>	G-SP	PHL	2
<u>1N34A</u>		CLE		<u>1N75A</u>	G-GP	GE	4	<u>SFD117</u>		CSF	1
<u>SFD112</u>		CSF	1	<u>1N87A</u>		CLE		<u>1N34A</u>		SYL	
<u>1N34A</u>		SYL		<u>1N63</u>		SYL		<u>1N248</u>	S-R	TEC	57
<u>1N52</u>	G-GP	GE	4	<u>1N81</u>	G-GP	GE	4	<u>MOS*</u>		T&C	57
<u>SFD108</u>		SCF	1	<u>1N54A</u>		CLE					
<u>1N38A</u>		SYL									
<u>1N52A</u>	G-GP	SYL	4								
<u>1N38A</u>		CLE									

\* Direct replacement.  
 \*\* See complete list of manufacturers and their semiconductor products at the end of these tables.  
 † Numerical figures correspond to Jedec outline figure numbers.

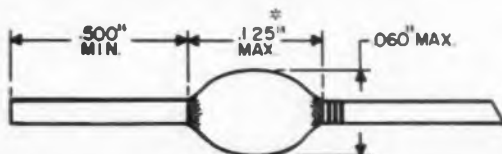
G-GP Germanium, general purpose  
 G-R Germanium, rectifier  
 G-SW Germanium, switch, computer element  
 G-Z Germanium, reference element  
 S-GP Silicon, general purpose

S-R Silicon, rectifier  
 S-SP Silicon, special purpose  
 S-SW Silicon, switch, computer element  
 S-Z Silicon, reference element  
 Se-R Selenium, rectifier

*microglass*

**A MAJOR BREAKTHROUGH — ALL-GLASS MICROMINIATURE COMPUTER DIODES FOR NANOSECOND SWITCHING. HIGHEST RELIABILITY • LOWEST LEAKAGE • HERMETIC SEAL**

*microglass* silicon mesa computer diodes provide optimum miniaturization and highest reliability. Direct fusion of hard-glass to junction, and use of bonded contacts produces mechanically rugged diodes with exceptionally stable electrical characteristics. Excellent reverse current characteristics are combined with switching speeds of typically 2 nanoseconds. Higher allowable junction temperature of 200°C — true hermetic seal (kovar to hard-glass) — and solid mass-of-glass construction, recommend these diodes for all military-severe applications.



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TYPE	FORWARD CURRENT ( $I_F$ ) @ 1.0 VDC	BREAKDOWN VOLTAGE ( $V_{BR}$ ) @ 1.0 mA	CAPACITANCE ( $C_T$ ) pF	REVERSE CURRENT ( $I_R$ )		REVERSE RECOVERY ( $t_{RR}$ ) ns	POWER DISSIPATION ( $P_D$ ) mW
				25°C	175°C		
MA-422	10.0	50.0	1.5 (2) — 3.0	20.0 (2) — 40.0	20.0 (2) — 40.0	4.0	25
MA-424	10.0	50.0	1.5 (2) — 3.0	20.0 (2) — 40.0	20.0 (2) — 40.0	4.0	25
MA-426	10.0	50.0	1.5 (2) — 3.0	20.0 (2) — 40.0	20.0 (2) — 40.0	4.0	25
MA-428	10.0	50.0	1.5 (2) — 3.0	20.0 (2) — 40.0	20.0 (2) — 40.0	4.0	25
MA-430	20.0	100.0	3.0 (2) — 6.0	40.0 (2) — 80.0	40.0 (2) — 80.0	4.0	25
MA-432	20.0	100.0	3.0 (2) — 6.0	40.0 (2) — 80.0	40.0 (2) — 80.0	4.0	25



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## DIODE SIMILARITY CHART

EIA NO. & SIMILAR TYPE	DESCR & APP.	MFR**	CASE FIG.†	EIA NO. & SIMILAR TYPE	DESCR & APP.	MFR**	CASE FIG.†	EIA NO. & SIMILAR TYPE	DESCR & APP.	MFR**	CASE FIG.†
1N248A	S-R	TEC	57	1N307	S-GP	RAY	30	1N335	S-R	TEC	31
M05°		TSC	57	1N143		CLE		1N442B		RCA	
1N1191		TS		1N143		SYL		MA30°		TSC	31
1N248B	S-R	TEC	50	1N309	G-SW	RAY	3	1N338	S-R	TEC	31
6B°		FAN		1N450		SYL		MA20°		TSC	31
1N1191		TS		1N310	G-GP	RAY	3	1N254		TS	
1N249	S-R	TEC	57	1N141		SYL		1N337	S-R	TEC	31
6B°		FAN		1N312	G-SW	RAY	3	1N441B		RCA	
M010°		TSC	57	1N140		SYL		MA20°		TEC	31
1N249A	S-R			1N314	G-Z	GE	19	1N254		TS	
6B°		FAN		1N42		SYL		1N338	S-R	TEC	
1N1192		TS		1N316	S-R	RDR	17	MA10°		TSC	31
M010°		TSC	57	1N2858		RCA	D01	1N253		TS	
1N249B	S-R	TEC	D05	1N316A				1N339	S-R	TEC	31
1N1192		TS		1N440B	R	RCA		MA10°		TSC	
1N250	S-R	TEC	57	1N317	S-R	RDR	17	1N340	S-R	TEC	31
6B°		FAN		1N2859		RCA	D01	1N540		RCA	
1N250A	S-R			1N317A				MA10°		TSC	31
6B°		FAN		1N440B		RCA		1N253		TS	
M020°		TSC	57	1N318	S-R	RDR	17	1N341	S-R	TEC	31
1N1194		TS		1N2860		RCA	D01	MA40°		TSC	31
1N250B	S-R			1N318A				1N255		TS	
6B°		FAN		1N441B		RCA		1N342	S-R	TEC	31
1N253		TEC	31	1N319	S-R	RDR	17	1N540		RCA	
MA10°		TSC	31	1N2862		RCA	D01	MA40°		TSC	31
1N1194		TS		1N319A				1N255		TS	
1N254	S-R	TEC	31	1N540		RCA		1N343	S-R	TEC	31
MA20°		TSC		1N320	S-R	RDR	17	MA30°		TSC	31
1N255	S-R	TEC	31	1N2863		RCA	D01	1N255		TS	
MA40°		TSC	31	1N320A				1N344	S-R	TEC	31
1N256	S-R	TEC	31	1N1095		RCA		1N539		RCA	
MA60°		TSC		1N323	S-R	RDR	17	MA30°		TSC	31
1N265	G-GP	IR	4	1N2858		RCA	D01	1N255		TS	
1N198		CLE		1N323A				MA20°		TSC	31
1N198		SYL		1N440B		RCA		1N254		TS	
1N266	G-GP	IR	4	1N324	S-R	RDR	17	1N346	S-R	TEC	31
1N198		CLE		1N2859		RCA	D01	1N538		RCA	
1N198		SYL		1N324A				MA20°		TSC	31
1N267	G-GP	IR	4	1N440B		RCA		1N254		TS	
1N34A		CLE		1N325	S-R	RDR	17	1N347	S-R	TEC	31
1N34A		SYL		1N2860		RCA	D01	MA10°		TSC	31
1N268	G-GP	IR	4	1N325A				1N253		TS	
1N34A		CLE		1N441B		RCA		1N348	S-R	TEC	31
1N34A		SYL		1N326	S-R	RDR	17	MA10°		TSC	31
1N285	G-SP	GE	4	1N2862		RCA	D01	1N253		TS	
1N02A		SYL		1N326A				1N349	S-R	TEC	31
1N287	G-GP	CBS	1	1N540		RCA		1N537		RCA	
1N118		CLE		1N327	S-R	RDR	17	MA10°		TSC	31
1N118		SYL		1N2863		RCA	D01	1N253		TS	
1N288	G-GP	CBS	1	1N327A				1N355	G-GP	GE	4
1N450		SYL		1N1095		RCA		1N38A		CLE	
1N289	G-GP	CBS	1	1N330	S-GP	WE	13	1N38A		SYL	
1N118		SYL		1N253		TS		1N361	S-R	RDR	17
1N294	G-GP	RAY	3	1N332	S-R	TEC		1N538		RCA	
SDF110		CSF	1	MA40°		TSC	31	1N361A			
1N295	G-SP	RAY		1N255		TS		1N441B		RCA	
1N24A		CLE		1N333	S-R	TEC	31	1N411B	S-R		
SFD108		CSF	1	1N443B				45K5°		IR	
1N296	G-GP	RAY	4	MA40°		TSC	31	1N412B	S-R		
1N295		SYL		1N255		TS		45K10		IR	
1N297	G-GP	RAY	3	1N334	S-R	TEC	31	1N413B	S-R		
SFD108		CSF	1	MA30°		TSC		45K20		IR	
1N299	G-SP	RAY						1N430	S-Z	HE	28
1N02A		SYL						1N2167		USS	
1N305	S-SP	RAY	30					1N430A	S-Z	HE	28
1N281		SYL						1N2170		USS	
								1N430B	S-Z	HE	28
								1N2168		USS	

**Doesn't anyone  
make a reliable  
silicon rectifier  
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Rest easy friend... someone can — and has! Slater Electric applied the engineering know-how that has kept them a leader in the electrical industry and solved the problem of reliability with their new "Trim-Line" diffused junction silicon rectifiers.

This unique series directly replaces top hat types with features to spare — they require no heat sinks up to 1.5 amperes — they're miniature in size, conservatively rated and... no bones about it, they're reliable!

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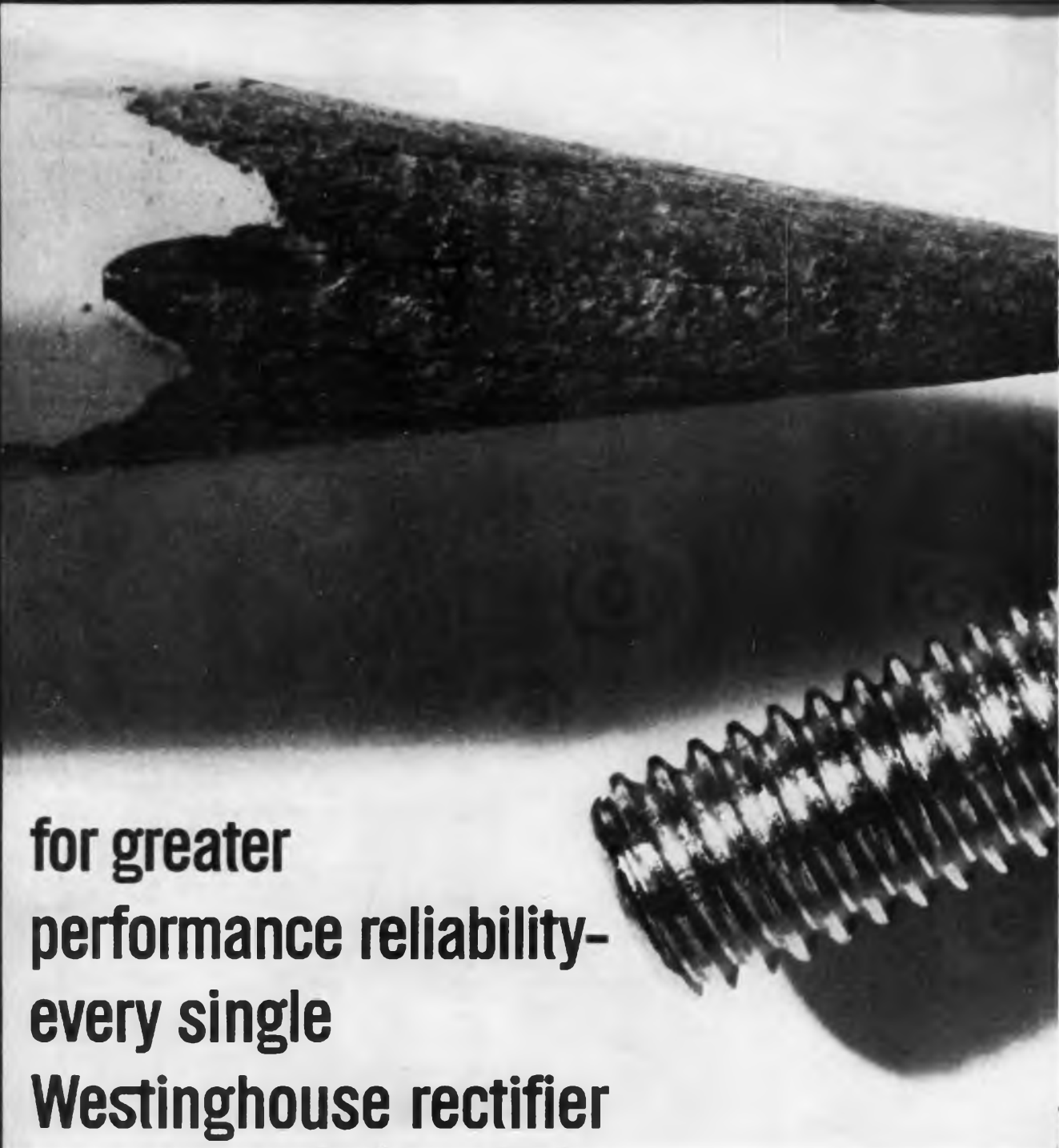
The image shows a dark rectangular area containing the Slater Electric logo on the left and a photograph of a silicon rectifier component on the right. The component is a small, cylindrical device with a central stud and electrical leads.

**TO 1.5 AMPERES**

This series of "Trim-Line" diffused junction silicon rectifiers replace many stud types in high current applications. Their unique design permits direct wiring into the circuit without employing a heat sink.

## DIODE SIMILARITY CHART

EIA NO. & SIMILAR TYPE	DESCR & APP.	MFR**	CASE FIG.	EIA NO. & SIMILAR TYPE	DESCR & APP.	MFR**	CASE FIG.	EIA NO. & SIMILAR TYPE	DESCR & APP.	MFR**	CASE FIG.
1N431	S-GP	HE	13	1N540	S-R	GE	12	1N604	S-R	IR	12
1N212		USS		1T2014		SON	B	1N540		RCA	TS
1N440B	S-R	GE	12	1N1911		USS		1N540		TS	USS
1N1908		USS		1N541	G-GP	AMP	29	1N1911		USS	
1N441	S-R	GI	17	SFD110		CSF	1	1N605	S-R	IR	
1N538		TS		1N542	G-GP	AMP	29	1N1095		RCA	USS
1N441B	S-R	GE	12	SFD115		CSF		1N1912		USS	
1N538		TS		1N60		SYL		1N606	S-R	IR	
1N1909		USS		1N547	S-R	GI	17	1N547		RCA	TS
1N442B	S-R	GE	12	1N1913		USS		1N540		TS	USS
1N1910		USS		1N550	S-R	GI	31	1N1913		USS	
1N443	S-R	GI	17	1N440B		RCA		1N607	S-R		
1N540		TS		1N253		TS		MA5*		TSC	31
1N443B	S-R	GE	12	MA10*		TSC		1N607A	S-R		
1N540		TS		1N551	S-R	GI	31	MA5*		TSC	31
1N1911		USS		1N441B		RCA		1N608	S-R		
1N444B	S-R	GE	12	1N254		TS		1N253		TS	31
1N1912		USS		MA20*		TSC		MA10*		TSC	31
1N445	S-R	GI	17	1N552	S-R	GI	31	1N608A	S-R		
1N547		TS		1N442B		RCA		1N253		TS	31
1N445B	S-R	GE	12	1N255		TS		MA10*		TSC	31
1N547		TS		MA30*		TSC		1N609	S-R		
1N476	G-GP	AMP	29	1N553	S-R	GI	31	MA15*		TSC	31
SFD108		CSF	1	1N443B		RCA		1N609A	S-R		
1N477	G-GP	AMP	4	MA40*		TSC		MA15*		TSC	31
SFD108		CSF	1	1N554	S-R	GI	31	1N610	S-R		
1N478	G-GP	AMP	29	1N444B		RCA		1N254		TS	31
SFD108		CSF	1	MA50*		TSC		MA20*		TSC	31
1N479	G-GP	AMP	4	1N555	S-R	GI	31	1N610A	S-R		
SFD108		CSF	1	1N445B		RCA		1N254		TS	31
1N480	G-SW	AMP	29	MA60*		TSC		MA20*		TSC	31
1N119		CLE		1N560	S-R	GI		1N611	S-R		
1N119		SYL		1N1915		USS		MA30*		TSC	31
1N490	G-SW	AMP	29	1N570	S-R	TI		1N611A	S-R		
1N120		SYL		ST1A		IR		MA30*		TSC	31
1N530	S-R	GI	17	1N588	S-R			1N612	S-R		
1N2167		USS		1N1912/TR		USS		1N255		TS	31
1N537		RCA		1N589	S-R			MA40*		TSC	31
1N530A	S-R			1N1914/TR1		USS		1N612A	S-R		
1N2167		USS		1N599	S-R			1N255		TS	31
1N531	S-R	GI	17	1N536	S-R	IR	12	MA40*		TSC	31
1N538		TS		1N599A	S-R	IR	12	1N613	S-R		
1N538		RCA		1N440B		RCA		MA50*		TSC	31
1N532	S-R	GI	17	1N600	S-R	IR	12	1N613A	S-R		
1N539		RCA		1N537		RCA		MA50*		TSC	31
1N533	S-R	GI	17	1N1908		USS		1N614	S-R		
1N540		TS		1N600A	S-R	IR	12	1N256		TS	31
1N540		RCA		1N440B		RCA		MA60*		TSC	31
1N534	S-R	GI	17	1N1908		USS		1N614A	S-R		
1N1095		RCA		1N601	S-R	IR	12	1N256		TS	31
1N535	S-R	GI	17	1N538		RCA		MA60*		TSC	31
1N547		RCA		1N1909		USS		1N636	G-GP	CBS	1
1N547		TS		1N601A	S-R	IR	12	SFD110		CSF	1
1T20105		SON	B	1N441B		RCA		1N616	G-GP	AMP	29
1N536	S-R	GE	12	1N1909		USS		SFD106		CSF	1
1N1907		USS		1N602	S-R	IR	12	1N617	G-GP	AMP	29
1N537	S-R	GE	12	1N538		RCA		SFD108		CSF	1
1N1908		USS		1N1909		USS		1N618	G-GP	AMP	29
1T2011		SON	B	1N602A	S-R	IR	12	SFD108		CSF	1
1N538	S-R	GE	12	1N441B		RCA		1N676	S-R	TEC	1
1N1909		USS		1N1909		USS		1N440B		RCA	
1T2012		SON	B	1N538		TS		1N677	S-R	TEC	1
1N539	S-R	GE	12	1N603	S-R	IR	12	1N441B		RCA	
1T2013		SON	B	1N539		RCA		1N678	S-R	TEC	1
1N1910		USS		1N1910		USS		1N441B		RCA	
				1N603A	S-R	IR					
				1N442B		RCA					
				1N1910		USS					



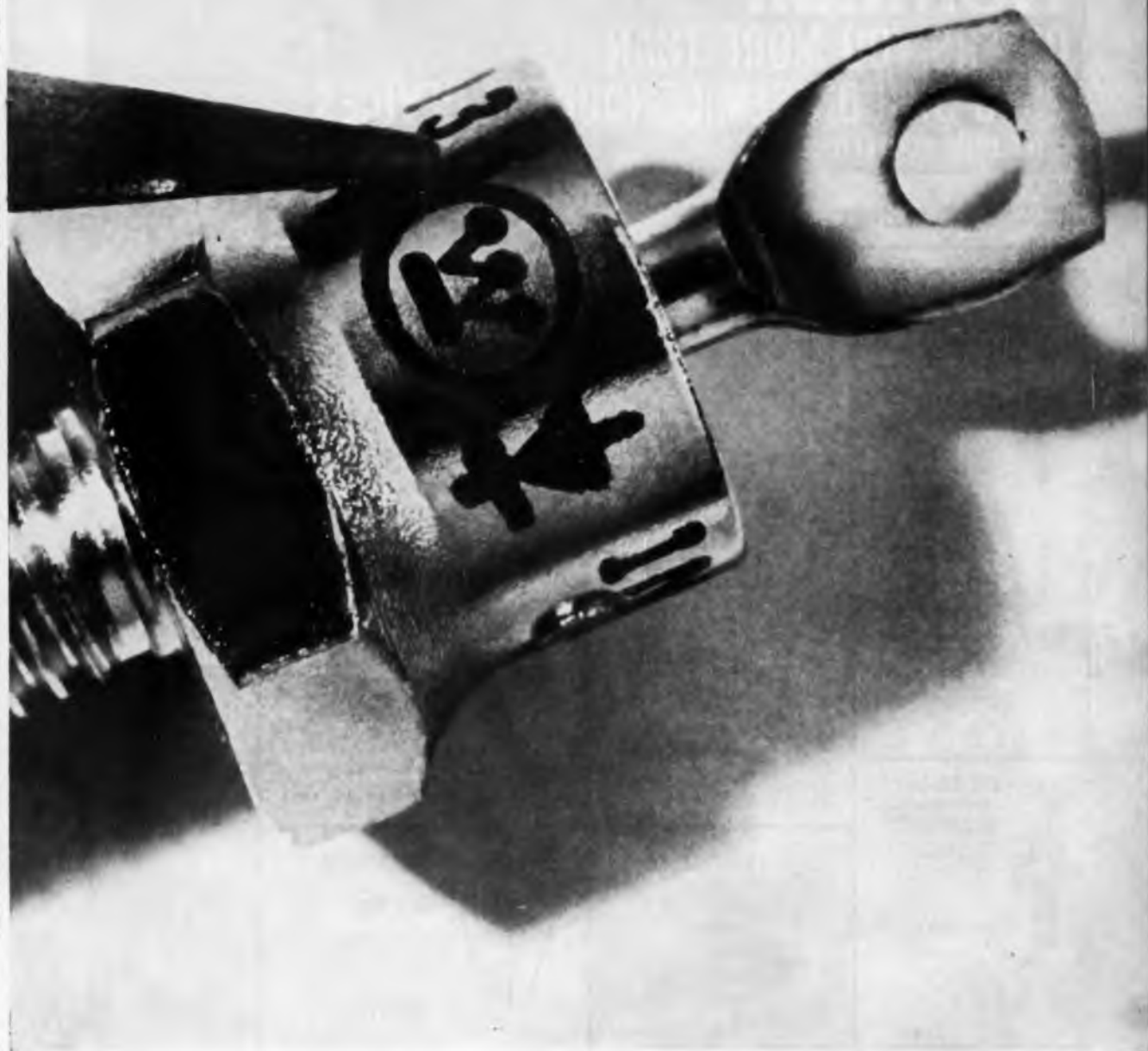
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Type 304, enlarged 12 times, provides forward currents up to 12 amps with peak inverse volts from 50 to 600. Each cell is fully tested before leaving the plant.



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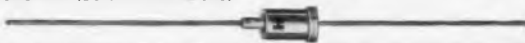
# Hoffman

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### M1A CASE

124 TYPES ■ 1-watt zener regulators—1N1767-1N1799, 1N3016A-1N3048A (Data sheet No. 141)



### G1 CASE

8 TYPES ■ general-purpose diodes—Types 1N456-1N459, 1N461-1N464 (Data sheet No. 130)

19 TYPES ■ high-conductance diodes—Types 1N482-1N488A (Data sheet No. 135)

11 TYPES ■ fast-recovery diodes—Types 1N625-1N629, 1N643, 1N659-1N662 (Data sheets Nos. 132 & 134)

19 TYPES ■ zener reference diodes—Types 1N821-1N824, 1N935-1N939B (Data sheets Nos. 124 & 146)

176 TYPES ■ zener regulators—Types 1N702-1N742, 1N746-1N759, 1N957A-1N989A (Data sheets Nos. 139 & 140)



### S1E CASE

436 TYPES ■ 10-watt zener regulators—1N1351-1N1375, 1N1603-1N1609, 1N1805-1N1812, 1N1816-1N1836, 1N2008-1N2012, 1N2043-1N2049, 1N2498-1N2500, 1N2970A-1N3011A (Data sheet No. 127)



### P1 CASE

2 TYPES ■ temperature-compensated zener reference devices—1N1530, 1N1530A (Data sheet No. 114)



### M1 CASE

26 TYPES ■ general-purpose diodes—1N137A & 1N138A, 1N200-1222, 1N431, 102, 103

6 TYPES ■ economical general-purpose diodes—HB1-HB6 (Data sheet No. 133)

2 TYPES ■ zener general-purpose diodes—RS-6 & RT-6 (Data sheet No. 121)

11 TYPES ■ zener low-voltage diodes—1N465-1N470, 1N471-1N475 (Data sheets Nos. 108 & 109)

24 TYPES ■ zener medium-voltage diodes—1N1313, 1N1327, 1N225-1N233 (Data sheets Nos. 110 & 111)

17 TYPES ■ zener reference diodes—1N429 & USAF-1N429, "strings" (Data sheet No. 115)

### TO-3 CASE

144 TYPES ■ 50-watt zener regulators—1N2808A-1N2843A (Data sheet No. 120)



### M3 CASE

4 TYPES ■ temperature-compensated zener reference devices—1N430, USN-1N430, 1N430A, 1N430B (Data sheet No. 114)

### HIGH-EFFICIENCY SOLAR CELLS



#### 120C TYPE

4 TYPES ■ silicon solar cells—120C-8 to 120-11 (Data sheet No. 126)



#### 120CG TYPE

4 TYPES ■ silicon "Solagrid" cells—120CG-10 to 120CG-14 (Data sheet No. 136)



#### 220C TYPE

3 TYPES ■ silicon solar cells—220C-8 to 220C-10 (Data sheet No. 126)

### SOLAR CELLS AND MODULES



#### H5 TYPE

2 TYPES ■ solar modules—H5B & H5C (Data sheet No. 138)  
7 TYPES ■ 2A, 120C, 110C, 52C, 51C, 55C & 58C (Data sheet No. 129)

### PHOTO-VOLTAIC DEVICES



#### EA7 TYPE

4 TYPES ■ photo-voltaic capsules—EA7E1, EA7E2, EA7E3, EA7E5 (Data sheet No. 119)



#### HPC TYPE

8 TYPES ■ photo-voltaic assemblies—HPC-4-01, HPC-5-01, HPC-6-01, HPC-7-01, HPC-8-01, HPC-9-01, HPC-10-01, HPC-10-02 (Data sheet No. 128)

### TO-18 CASE



2 TYPES ■ silicon mesa transistors—2N717 & 2N718 (Data sheet No. 147)

14 TYPES ■ silicon tunnel diodes—1N2928-1N2934 (Data sheet No. 137)

12 TYPES ■ silicon Uni-Tunnel diodes—HU5-HU100A (Data sheet No. 131)

### TO-5 CASE



3 TYPES ■ silicon mesa transistors—2N695-2N697, 2N1644 (Data sheets Nos. 143 & 144)

12 TYPES ■ 1-AMP silicon-controlled rectifiers—HCR-30P—HCR-400P, HCR-30N—HCR-200N (Data sheet No. 142)

WRITE FOR 1961 CATALOG COVERING FULL LINE OF HOFFMAN SILICON SEMICONDUCTOR DEVICES. INDIVIDUAL DATA SHEETS ARE AVAILABLE AS LISTED.

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## DIODE SIMILARITY CHART

EIA NO. & SIMILAR TYPE	DESCR & APP.	MFR**	CASE FIG.➤	EIA NO. & SIMILAR TYPE	DESCR & APP.	MFR**	CASE FIG.➤	EIA NO. & SIMILAR TYPE	DESCR & APP.	MFR**	CASE FIG.➤
1N679	S-R	TEC	1	1N916	S-SW	TI	1	1N1125	S-R	TI	31
1N441B		RCA		PD310		PSI		MA30°		TSC	31
1N681	S-R	TEC	1	1N1028	S-R	ST	34	1N1126	S-R	TI	31
1N442B		RCA		1N2858		RCA	D01	1N255 MA40°		TS TSC	31
1N682	S-R	TEC	1	1N1029	S-R	ST	34	1N1126A	S-R	TI	31
1N442B		RCA		1N2859		RCA	D01	1N255		TS	
1N683	S-R	TEC	1	1N1030	S-R	ST	34	1N1127	S-R	TI	31
1N443B		RCA		1N2860		RCA	D01	MA50°		TSC	31
1N684	S-R	TEC	1	1N1031	S-R	ST	34	1N1128	S-R	TI	31
1N443B		RCA		1N2860		RCA	D01	1N256 MA60°		TS TSC	31
1N685	S-R	TEC	1	1N1032	S-R	ST	34	1N1128A	S-R	TI	31
1N444B		RCA		1N2861		RCA	D01	1N255		TS	
1N686	S-R	TEC	1	1N1033	S-R	ST	34	1N1130	S-R	TI	31
1N444B		RCA		1N2863		RCA	D01	1N2866		USS	
1N687	S-R	TEC	1	1N1081	S-R	ST	45	1N1131	S-R	TI	31
1N445B		RCA		1N2859		RCA	D01	1N2866R		USS	
1N689	S-R	TEC	1	1N1082	S-R	ST	45	1N1157	S-R	ST	64
1N445B		RCA		1N2860		RCA	D01	1N1191		TS	
1N698	G-SW			1N1083	S-R	ST	45	1N1158	S-R	ST	64
SFD127		CSF	1	1N2861		RCA	D01	1N1192		TS	
1N756	S-Z	TI	1	1N1084	S-R	ST	45	1N1159	S-R	ST	64
1N1875		USS		1N2862		RCA	D01	1N1194		TS	
1N757	S-Z	TI	1	1N1095	S-R	GE	12	1N1160	S-R	ST	64
LP29.1		USS		1N547 1N1912 1T2015		TS USS SON	B	1N1195		TS	
1N758	S-Z	TI	1	1N1096	S-R	GE	12	1N1161	S-R	ST	65
1N1876		USS		1N445B 1N547 1N1913 1T2016		RCA TS USS SON	B	CS120Z		TS	
1N759	S-Z	TI	1	1N1100	S-R	GI	17	1N1162	S-R	ST	65
1N1877		USS		1N537		RCA		CS120A		TS	
1N761	S-Z			1N1101	S-R	GI	17	1N1163	S-R	ST	65
1N1928		USS		1N538 1N538		RCA TS		CS120B		TS	
1N762	S-Z			1N1102	S-R	GI	17	1N1164	S-R	ST	65
1N1929		USS		1N539		RCA		CS120C		TS	
1N846	S-R			1N1103	S-R	GI	17	1N1169	S-R	W	12
1N2858		RCA	D01	1N540 1N540		RCA TS		1N1763 1N540		RCA TS	12
1N847	S-R			1N1104	S-R	GI	17	1N2107		USS	
1N2859		RCA	D01	1N1095	S-R	RCA		1N1171	S-R	ST	64
1N848	S-R			1N1105	S-R	GI	17	1N1191		TS	
1N2860		RCA	D01	1N547 1N547		RCA TS		1N1172	S-R	ST	64
1N849	S-R			1N1115	S-R	GE	31	1N1192		TS	
1N2861		RCA	D01	1N253 MA10°		TS TSC	31	1N1173	S-R	ST	64
1N850	S-R			1N1116	S-R	GE	31	1N1194		TS	
1N2862		RCA	D01	1N254 MA20°		TS TSC	31	1N1174	S-R	ST	64
1N851	S-R			1N1117	S-R	GE	31	1N1195		TS	
1N2863		RCA	D01	MA30°		TSC		1N1175	S-R	ST	65
1N852	S-R			1N1118	S-R	GE	31	CS120Z		TS	
1N2864		RCA	D01	1N255 MA40°		TS TSC	31	1N1176	S-R	ST	65
1N903	S-SW	MA	1	1N1119	S-R	GE	31	CS120A		TS	
PD309		PSI		MA50°		TSC		1N1177	S-R	ST	65
1N904	S-SW	MA	1	1N1120	S-R	GE	31	CS120B		TS	
PD308		PSI		1N256 MA60°		TS TSC	31	1N1178	S-R	ST	65
1N905	S-SW	MA	1	1N1124	S-R	TI	31	CS120C		TS	
PD307		PSI		1N254 MA20°		TS TSC	31	1N1183	S-R	W	
1N906	S-SW	MA	1					4B° MP5°		FAN TSC	57
PD302		PSI						1N1184	S-R	W	
1N907	S-SW	MA	1					4B° MP10°		FAN TSC	57
PD303		PSI									
1N908	B-SW	MA	1								
PD304		PSI									
1N914	S-SW	TI	1								
PD305		PSI									

## DIODE SIMILARITY CHART

EIA NO. & SIMILAR TYPE	DESCR & APP.	MFR**	CASE FIG. -	EIA NO. & SIMILAR TYPE	DESCR & APP.	MFR**	CASE FIG. -	EIA NO. & SIMILAR TYPE	DESCR & APP.	MFR**	CASE FIG. -
<u>1N1185</u>	S-R	W		<u>1N1206</u>	S-R	W	31	<u>1N1233</u>	S-R	W	35
4B°		FAN		7B°		FAN		MA50		TSC	31
MP15°		TSC	57	TM69		TEC	31	1N2114		USS	
<u>1N1186</u>	S-R	W		MT80°		TSC		<u>1N1233A</u>	S-R	W	
4B°		FAN		AG6012		GI		1N2114		USS	
MP20°		TSC	57	<u>1N1217A</u>	S-R	W	12	1N1234	S-R	W	35
<u>1N1187</u>	S-R	W		1N536		RCA		1N256		TS	31
4B°		FAN		1N2103		USS		MA60		TSC	31
MP30°		TSC	57	<u>1N1218A</u>	S-R	W	12	1N1923		USS	
<u>1N1188</u>	S-R	W		1N537		RCA		<u>1N1234A</u>	S-R	W	
4B°		FAN		1N2104		USS		1N1923		USS	
MP40°		TSC	57	<u>1N1219A</u>	S-R	W	12	1N256		TS	
<u>1N1189</u>	S-R	W		1N538		RCA		<u>1N1235</u>	S-R	W	35
4B°		FAN		1N2105		USS		MA70		TSC	31
MP50°		TSC	57	<u>1N1220A</u>	S-R	W	12	1N1924		USS	
<u>1N1190</u>	S-R	W		1N538		RCA		<u>1N1236</u>	S-R	W	35
4B°		FAN		1N538		TS		MA80		TSC	31
MP60°		TSC	57	1N2105		USS		1N1925		USS	
<u>1N1191</u>	S-R	W		<u>1N1221A</u>	S-R	W	12	<u>1N1251</u>	S-R		
6B°		FAN		1N539		RCA		1N2858		RCA	DO1
<u>1N1192</u>	S-R	W		1N2106		USS		1N2103		USS	
6B°		FAN		<u>1N1222A</u>	S-R	W	12	<u>1N1252</u>	S-R		
<u>1N1193</u>	S-R	W		1N540		RCA		1N2859		RCA	DO1
6B°		FAN		1N540		TS		1N2104		USS	
<u>1N1194</u>	S-R	W		1N2107		USS		<u>1N1253</u>	S-R		
6B°		FAN		<u>1N1223A</u>	S-R	W	12	1N2860		RCA	DO1
<u>1N1195</u>	S-R	W		1N1095		RCA		1N2105		USS	
6B°		FAN		1N2108		USS		<u>1N1254</u>	S-R		
<u>1N1196</u>	S-R	W		<u>1N1224A</u>	S-R	W	12	1N2861		RCA	DO1
6B°		FAN		1N547		RCA		1N2106		USS	
<u>1N1197</u>	S-R	W		1N547		TS		<u>1N1255</u>	S-R		
6B°		FAN		1N1013		USS		1N2862		RCA	DO1
<u>1N1198</u>	S-R	W		<u>1N1225</u>	S-R	W	12	1N2107		USS	
6B°		FAN		1N1014		USS		<u>1N1256</u>	S-R		
<u>1N1199</u>	S-R	W	31	<u>1N1226</u>	S-R	W	12	1N2863		RCA	DO1
7B°		FAN		1N1015		USS		1N2108		USS	
TM8		TEC		<u>1N1227</u>	S-R	W	35	<u>1N1257</u>	S-R		
MT5°		TSC	31	MA5		TSC	31	1N2864		RCA	DO1
AG0512		GI		1N2109		USS		LPR600		USS	
X12F5		IR		<u>1N1227A</u>	S-R	W		<u>1N1258</u>	S-R		
<u>1N1200</u>	S-R	W	31	1N2109		USS		LPR700		USS	
7B°		FAN		<u>1N1228</u>	S-R	W	35	<u>1N1259</u>	S-R		
TM19		TEC		1N253		TS		LPR800		USS	
X12F10		IR		MA10		TSC	31	<u>1N1260</u>	S-R		
MT10°		TSC	31	1N2110		USS		LPR900		USS	
AG1012		GI		<u>1N1228A</u>	S-R	W		<u>1N1261</u>	S-R		
<u>1N1201</u>	S-R	W	31	1N2110		TS		LPR1000		USS	
7B°		FAN		<u>1N1229</u>	S-R	W	35	<u>1N1301</u>	S-R	GE	57
X12F15		IR		MA15		TSC	31	CS120Z		TS	57
AG1512		GI		1N2111		USS		M05°		TSC	
MT15°		TSC	31	<u>1N1229A</u>	S-R	W		<u>1N1302</u>	S-R	GE	57
<u>1N1202</u>	S-R	W	31	1N2111		USS		CS120A		TS	57
7B°		FAN		<u>1N1230</u>	S-R	W	35	M010°		TSC	
TM29		TEC		1N254		TS		<u>1N1304</u>	S-R	GE	57
X12F20		IR		MA20		TSC	31	CS120B		TS	57
MT20°		TSC	31	1N2111		USS		M020°		TSC	
AG2012		GI		<u>1N1230A</u>	S-R	W		<u>1N1306</u>	S-R	GE	57
<u>1N1203</u>	S-R	W	31	1N2111		USS		CS120C		TS	57
7B°		FAN		1N254		TS		M030°		TSC	57
TM39		TEC		<u>1N1231</u>	S-R	W	35	<u>1N1313</u>	S-Z	HOF	13
MT30°		TSC	31	MA30		TSC	31	P86313		PSI	
X12F30		IR		1N2112		USS		<u>1N1314</u>	S-Z	HOF	13
AG3012		GI		<u>1N1231A</u>	S-R	W		P86314		PSI	
<u>1N1204</u>	S-R	W	31	1N2112		USS		<u>1N1315</u>	S-Z	HOF	13
7B°		FAN		<u>1N1232</u>	S-R	W	35	P86315		PSI	
TM49		TEC		1N255		TS		<u>1N1316</u>	S-Z	HOF	13
MT40°		TSC	31	MA40		TSC	31	P86316		PSI	
X12F40		IR		1N2113		USS					
AG4012		GI		<u>1N1232A</u>	S-R	W					
<u>1N1205</u>	S-R	W	31	1N2113		USS					
7B°		FAN		<u>1N1232A</u>	S-R	W					
TM59		TEC		1N255		TS					
MT50°		TSC	31	MA40		TSC	31				
X12F50		IR		1N2113		USS					
AG5012		GI		<u>1N1232A</u>	S-R	W					
				1N255		TS					



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**CLEVITE TRANSISTOR**

WALTHAM, MASSACHUSETTS

# How to select power transistors

by RICHARD F. MOREY, JR.

Manager, Applications Engineering, Clevite Transistor  
Division of Clevite Corporation

*A basic understanding of the interrelationship of transistor design parameters facilitates selection of the most advantageous unit for a given application.*

Transistor characteristics depend upon each other. Consequently, a design change in the manufacture of a transistor directly affects a number of its electrical characteristics.

As a guide to users of power transistors, several of the important design elements and the electrical characteristics they influence have been summarized in chart form (fig. 1).

The curves (figs. 2-5), show typical characteristics for two power transistors of quite different design. Clevite's 2N1762, for example, is a 3 ampere unit having the following design parameters: Small junction area; high resistivity germanium; moderate germanium lifetime; average wafer thickness and no emitter doping.

In contrast, Clevite's 2N1146C is a 15 ampere power transistor which has several quite different parameters based upon a higher current and power requirement; large junction area several times the size of the 3 ampere unit; identical base width and resistivity but longer germanium lifetime and thicker wafer plus aluminum doping to increase emitter efficiency.

Working with the chart in figure 1 and the table, figure 6, we see that the comparative design elements of

Effect of Transistor Design on Characteristics

DESIGN PARAMETER	Addition of Emitter Doping	Increase in Wafer Thickness	Reduction in GE material lifetime	Increase in GE material resistivity	Reduction in Base Width	Increase in Junction Area
THERMAL RESISTANCE $R_{\theta}$	—	—	—	—	—	decrease
COLLECTOR LEAKAGE CURRENT $I_{CBO}$	—	decrease	increase	increase	—	increase
COLLECTOR BASE VOLTAGE $V_{CB}$	—	—	—	increase	—	decrease slightly
COLLECTOR EMITTER VOLTAGE $V_{CE}$	decrease	—	increase	increase	decrease	decrease slightly
D.C. CURRENT GAIN $I_{sc}$	increase	—	decrease	—	increase	—
LINEARITY OF $h_{sc}$	better	—	—	—	—	better
SATURATION VOLTAGE $V_{CE(sat)}$	decrease	decrease	increase	increase	decrease	decrease
BETA CUTOFF FREQUENCY $f_{\beta}$	decrease	—	increase	—	increase	decrease
PUNCH THROUGH VOLTAGE $V_{PT}$	—	—	—	decrease	decrease	—
SECONDARY BREAKDOWN CURRENT $I_{sm}$	increase	increase	—	decrease	—	increase

Figure 1.

- the two transistors result in the 15 ampere unit exhibiting:
- lower thermal resistance and higher leakage currents because of its large junction area.
  - slightly lower collector to base voltage.
  - higher gain because of the emitter doping and higher lifetime.
  - very linear current gain out to high currents because of its large area and special emitter doping.
  - lower collector to emitter breakdown voltages because of its higher gain and lower collector to base voltage.
  - much lower saturation voltage and base input voltage because of its high gain and thicker wafer and larger area.
  - low common emitter frequency response because of its high gain and large area.

Comparison of Characteristics — Two different designs

Characteristic	2N1762	2N1146C	Units
	Typical Value 3 Amp. Device	Typical Value 15 Amp. Device	
Thermal Resistance	1.4	0.5	°C/watt
$I_{CBO}$ at 100V at 85°C	3	15	mA
$I_{CBO}$ at 100V at 25°C	1	4	mA
$V_{CB}$	130	120	Volts
$V_{CE(sat)}$	70	50	Volts
Current Gain at $I_C = 1$ Amp.	60	220	
Current Gain at $I_C = 5$ Amps.	15	140	
Current Gain at $I_C = 15$ Amps.	—	75	
Saturation Voltage at 3 Amps.	0.3	0.2	Volts
Saturation Voltage at 15 Amps.	—	0.4	Volts
Saturation Resistance	100	26	Milliohms
Frequency Cutoff at 1 Amp.	18	4	kc.

Figure 6

In order for circuit designers and users of power transistors to obtain the best combination of electrical characteristics, the requirements for the application must be well known and be matched to the transistors available on the market. Therefore, an elementary knowledge of the existing relationships between transistor characteristics is a useful design tool. A tabular summary of characteristics for Clevite's complete line of power transistors is available. Ask for Bulletin 61-A.

CURRENT GAIN VS COLLECTOR CURRENT

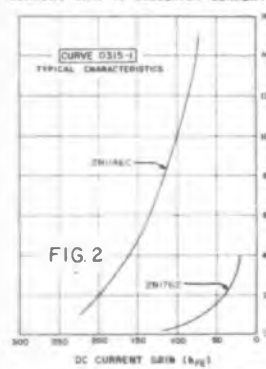


FIG. 2

LARGE SIGNAL COMMON EMITTER FREQUENCY CUTOFF

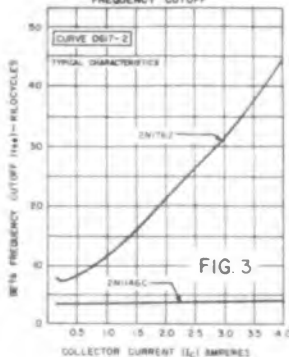


FIG. 3

LEAKAGE CURRENT VS TEMPERATURE

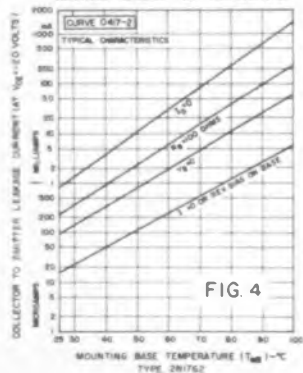


FIG. 4

LEAKAGE CURRENT VS TEMPERATURE

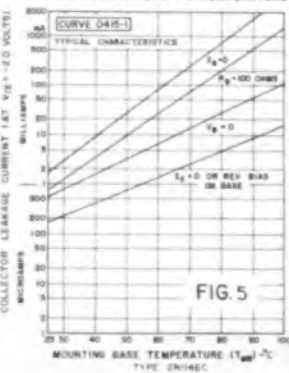


FIG. 5

**CT CLEVITE TRANSISTOR**  
Waltham, Massachusetts

## DIODE SIMILARITY CHART

EIA NO. & SIMILAR TYPE	DESCR & APP.	MFR**	CASE FIG.	EIA NO. & SIMILAR TYPE	DESCR & APP.	MFR**	CASE FIG.	EIA NO. & SIMILAR TYPE	DESCR & APP.	MFR**	CASE FIG.
1N1317	S-Z	HOF	13	1N1459	S-R	AD	64	1N1555	S-R	AD	31
PS6317		PSI		1N1186		TS		MA50°		TSC	31
1N1318	S-Z	HOF	13	1N1460	S-R	AD	64	1N1556	S-R	AD	12
PS6318		PSI		1N1187		TS		1N537		RCA	
1N1341	S-R	W	31	1N1466	S-R	AD	67	1N1557	S-R	AD	12
9A°		FAN		1N1397		TS		1N538		RCA	
TM8		TEC		1N1467	S-R	AD	67	1N538		TS	
MS5°		TSC	31	1N1399		TS		1N1558	S-R	AD	12
X6F5		IR		1N1468	S-R	AD	67	1N539		RCA	
1N1342	S-R	W	31	1N1400		TS		1N1559	S-R	AD	12
9A°		FAN		1N1469	S-R	AD	67	1N540		RCA	
TM18		TEC	31	1N1401		TS		1N540		TS	
MS10°		TSC		1N1401	S-R	AD	67	1N1560	S-R	AD	12
X6F10		IR		1N1401		TS		1N1095		RCA	
1N1343	S-R	W	31	1N1486	S-R	W	12	1N1563A	S-R	MOT	
9A°		FAN		1N1764		RCA	12	1N1908		USS	
X6F15		IR	31	1N1487	S-R	GE	12	1N1564A	S-R	MOT	
MS15°		TSC		1N2059		RCA	D01	1N1909		USS	
1N1344	S-R	W	31	1N1488	S-R	GE	12	1N1565A	S-R	MOT	
9A°		FAN		1N2860		RCA	D01	1N1910		USS	
TM26		TEC	31	1N538		TS		1N1566A	S-R	MOT	
MS20°		TSC		1N1489	S-R	GE	12	1N1911		USS	
X6F20		IR		1N2861		RCA	D01	1N1575	S-R	GI	
1N1345	S-R	W	31	1N1490	S-R	GE	12	MA10°		TSC	31
9A°		FAN		1N2862		RCA	D01	1N1576	S-R	GI	
TM38		TEC	31	1N540		TS		MA20°		TSC	31
MS30°		TSC		1N1491	S-R	GE	12	1N1577	S-R	GI	
X6F30		IR		1N2863		RCA	D01	MA30°		TSC	31
1N1346	S-R	W	31	1N1492	S-R	GE	12	1N1578	S-R	GI	
9A°		FAN		1N2864		RCA	D01	MA40°		TSC	31
TM46		TEC	31	1N547		TS		1N1581	S-R	TS	31
MS40°		TSC		1N1530	S-Z	HOF	88	MR5°		TSC	31
X6F40		IR		1N2167		USS		1N1582	S-R	TS	31
1N1347	S-R	W	31	1N1530A	S-Z	HOF	88	MR10°		TSC	31
9A°		FAN		1N2167		USS		1N1583	S-R	TS	31
TM58		TEC	31	1N1537	S-R	W	31	MR20°		TSC	31
MS50°		TSC		MA5°		TSC	31	1N1584	S-R	TS	31
X6F50		IR		1N1538	S-R	W	31	MR30°		TSC	31
1N1348	S-R	W	31	1N253	S-R	W	31	1N1585	S-R	TS	31
9A°		FAN		MA10°		TSC	31	MR40°		TSC	31
TM68		TEC	31	1N1539	S-R	W	31	1N1586	S-R	TS	31
MS80°		TSC		MA15°		TSC	31	MR50°		TSC	31
1N1434	S-R	BEN	57	1N1540	S-R	W	31	1N1587	S-R	TS	31
CS120Z		TS		1N254		TS		MR60°		TSC	31
MP5°		TSC	57	MA20°		TSC	31	1N1612	S-R	BEN	31
1N1435	S-R	BEN	57	1N1541	S-R	W	31	9A°		FAN	
CS120A		TS		MA30°		TSC	31	MS5°		TSC	31
MP10°		TSC	57	1N1542	S-R	W	31	1N1613	S-R	BEN	31
1N1436	S-R	BEN	57	1N255	S-R	TS		9A°		FAN	
CS120B		TS		MA40°		TSC	31	MS10°		TSC	31
MP20°		TSC	57	1N1543	S-R	W	31	1N1614	S-R	BEN	31
1N1437	S-R	BEN	57	MA50°		TSC	31	9A°		FAN	
CS120D		TS		1N1544	S-R	W	31	MS20°		TSC	31
MP40°		TSC	57	1N256	S-R	AD	31	1N1615	S-R	BEN	31
1N1438	S-R	BEN	57	MA10°		TSC	31	9A°		FAN	
CS120F		TS		1N1552	S-R	AD	31	MS40°		TSC	31
MP60°		TSC	57	1N254		TS		1N1616	S-R	BEN	31
1N1439	S-R	ST		MA20°		TSC	31	9A°		FAN	
1N537		RCA		1N1553	S-R	AD	31	MS60°		TSC	31
1N1440	S-R	ST		MA30°		TSC	31	1N1644	S-R	FAN	17
1N538		RCA		1N1554	S-R	AD	31	1N538		RCA	
1N1441	S-R	ST		1N253		TS		1N1645	S-R	FAN	17
1N539		RCA		MA40°		TSC	31	1N537		RCA	
1N1442	S-R	ST		1N1555	S-R	AD	31				
1N540		RCA		MA50°		TSC	31				
1N1443	S-R	W	12	1N1556	S-R	AD	31				
1N2108		USS		1N256		TS					
1N1444	S-R	W	35	MA10°		TSC	31				
1N2114/PR		USS		1N1557	S-R	AD	31				
1N1458	S-R	AD	64	1N258		TS					
1N1184				MA40°		TSC	31				

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1.2 AMP HERMETICALLY SEALED TYPES—100 to 600 PRV rated  
6 AND 12 AMP, HERMETICALLY SEALED TYPES—50 to 500 PRV rated  
25 TO 45 AMP, HERMETICALLY SEALED TYPES—50 to 500 PRV rated  
45 TO 150 AMP, HERMETICALLY SEALED TYPES—50 to 500 PRV rated  
70 TO 250 AMP, HERMETICALLY SEALED TYPES—50 to 500 PRV rated  
25 TO 35 AMP, "OIL-SEALED" ECONOMY TYPES—50 to 500 PRV rated

## SILICON GENERAL PURPOSE RECTIFIER CELLS

SUBMINIATURE GLASS DIODES—High Conductance and General Purpose Types  
SUBMINIATURE "TRI-SEALED" ECONOMY 4M SERIES—400 ma rated, 225 to 500 PRV  
MINIATURE "TRI-SEALED" ECONOMY 5A SERIES—500 ma rated, 200 to 500 PRV  
DIFFUSED JUNCTION "PLUG-IN" 5M SERIES—500 ma rated, 200 to 500 PRV  
"TRI-SEALED" ECONOMY 2E4, 5E4, 5E5, 5E6 SERIES—200 to 500 ma rated, 400 to 500 PRV  
HERMETICALLY SEALED MINIATURE AXIAL LEAD SERIES—300 to 500 ma, 50 to 500 PRV  
JAN-APPROVED MILITARY SERIES—1N263, 1N264, 1N255, 1N430, 1N440, 1N447  
HERMETICALLY SEALED AXIAL LEAD SERIES—300 to 500 ma, 50 to 500 PRV  
HERMETICALLY SEALED STUD MOUNTED SERIES—500 ma rated, 50 to 500 PRV

## SILICON VOLTAGE REGULATOR DIODES AND REFERENCE ELEMENTS

SUBMINIATURE GLASS ZENER DIODES—250 milliwatt rated  
HERMETICALLY SEALED AXIAL LEAD STYLE M SERIES—750 milliwatt rated  
HERMETICALLY SEALED AXIAL LEAD STYLE B SERIES—1 watt rated  
HERMETICALLY SEALED STUD MOUNTED STYLE T SERIES—3.5 watt rated  
HERMETICALLY SEALED STUD MOUNTED STYLE T SERIES—10 watt rated  
1N430 VOLTAGE REFERENCE ELEMENTS—0.4 volts (average) voltage reference  
1N1530 MINIATURE VOLTAGE REFERENCE ELEMENTS—0.4 volts (average) voltage reference  
HIGH STABILITY VOLTAGE REFERENCE PACKS—0.4 and 16.8 volts dc output

## MINIATURE SELENIUM RECTIFIER CELLS AND CONTACT PROTECTORS

MINIATURE SELENIUM RECTIFIER CELLS—250  $\mu$ s to 25 ma; 45 to 354 PRV  
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describing comprehensive IR line  
of diodes and rectifying cells.

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## DIODE SIMILARITY CHART

EIA NO. & SIMILAR TYPE	DESCR & APP.	MFR**	CASE FIG.†	EIA NO. & SIMILAR TYPE	DESCR & APP.	MFR**	CASE FIG.†	EIA NO. & SIMILAR TYPE	DESCR & APP.	MFR**	CASE FIG.†
1N1646	S-R	FAN	17	1N1692	S-R	GE		1N1772	S-Z	HOF	C
1N538		RCA		1N2059		RCA		LPZ11		USS	
1N1647	S-R	FAN	17	1N1693	S-R	GE	12	1N1773	S-Z	HOF	C
1N538		RCA		1N2860		RCA	D01	1N1887		USS	
1N1648	S-R	FAN	17	1N538		TS		1N1774	S-Z	HOF	C
1N539		RCA		1N1694	S-R	GE	12	LPZ13		USS	
1N1649	S-R	FAN	17	1N2861		RCA	D01	1N1775	S-Z	HOF	C
1N539		RCA		1N1695	S-R	GE	12	1N1878		USS	
1N1650	S-R	FAN	17	1N2862		RCA	D01	1N1776	S-Z	HOF	C
1N540		RCA		1N540		TS		LPZ16		USS	
1N1651	S-R	FAN	17	1N1696	S-R	GE	91	1N1777	S-Z	HOF	C
1N540		RCA		1N2863		RCA	D01	1N1879		USS	
1N1652	S-R	FAN	17	1N1697	S-R	GE	91	1N1778	S-Z	HOF	C
1N1095		RCA		1N2864		RCA	D01	LPZ20		USS	
1N1653	S-R	FAN	17	1N1701	S-R			1N1779	S-Z	HOF	C
1N547		RCA		1N2858		RCA	D01	1N1880		USS	
1N1660	S-R	W	75	1N1702	S-R			1N1780	S-Z	HOF	C
15A*		FAN		1N2859		RCA	D01	LPZ24		USS	
1N1661	S-R	W	75	1N1703	S-R			1N1781	S-Z	HOF	C
15A*		FAN		1N2860		RCA	D01	1N1881		USS	
1N1662	S-R	W	75	1N1704	S-R			1N1782	S-Z	HOF	C
15A*		FAN		1N2861		RCA	D01	LPZ30		USS	
1N1663	S-R	W	75	1N1705	S-R			1N1783	S-Z	HOF	C
15A*		FAN		1N2862		RCA	D01	1N1882		USS	
1N1664	S-R	W	75	1N1706	S-R			1N1784	S-Z	HOF	C
15A*		FAN		1N2863		RCA	D01	LPZ36		USS	
1N1665	S-R	W	75	1N1707	S-R			1N1785	S-Z	HOF	C
15A*		FAN		1N536		RCA		1N1883		USS	
1N1666	S-R	W	75	1N1708	S-R			1N1786	S-Z	HOF	C
15A*		FAN		1N537		RCA		LPZ43		USS	
1N1670	S-R	W	75	1N1709	S-R			1N1787	S-Z	HOF	C
16A*		FAN		1N538		RCA		1N1884		USS	
1N1671	S-R	W	75	1N1710	S-R			1N1788	S-Z	HOF	C
16A*		FAN		1N539		RCA		LPZ51		USS	
1N1672	S-R	W	75	1N1711	S-R			1N1789	S-Z	HOF	C
16A*		FAN		1N540		RCA		1N1885		USS	
1N1673	S-R	W	75	1N1712	S-R			1N1790	S-Z	HOF	C
16A*		FAN		1N1095		RCA		LPZ62		USS	
1N1674	S-R	W	75	1N1735	S-Z			1N1791	S-Z	HOF	C
16A*		FAN		1N2164		USS		1N1886		USS	
1N1675	S-R	W	75	1N1736A	S-Z			1N1792	S-Z	HOF	C
16A*		FAN		1N2164		USS		LPZ75		USS	
1N1676	S-R	W	75	1N1737A	S-Z			1N1793	S-Z	HOF	C
16A*		FAN		1N2164/Pr				1N1887		USS	
1N1680	S-R	IR		1N1738A	S-Z			1N1794	S-Z	HOF	C
10A*		FAN		1N2164/tri		USS		LPZ91		USS	
1N1681	S-R	IR		1N1739A	S-Z			1N1795	S-Z	HOF	C
10A*		FAN		1N2164/quad		USS		1N1888		USS	
1N1682	S-R	IR		1N1740A	S-Z			1N1796	S-Z	HOF	C
10A*		FAN		1N2164/quad		USS		1N1885/pr		USS	
1N1683	S-R	IR		1N1741A	S-Z			1N1797	S-Z	HOF	C
10A*		FAN		1N2164/quad		USS		1N1885/pr		USS	
1N1684	S-R	IR		1N1742A	S-Z			1N1798	S-Z	HOF	C
10A*		FAN		1N2164/quin				1N1886/pr		USS	
1N1685	S-R	IR		1N1763	S-R	RCA		1N1799	S-Z	HOF	C
10A*		FAN		1N540		TS		1N1887/pr		USS	
1N1686	S-R	IR		1N1769	S-Z	HOF	C	1N1800	S-Z	HOF	C
10A*		FAN		1N1875		USS		1N1887/pr		USS	
1N1687	S-R	IR		1N1770	S-Z	HOF	C	1N1801	S-Z	HOF	C
10A*		FAN		LPZ9.1		USS		1N1887/pr		USS	
				1N1771	S-Z	HOF	C	1N1897/pr		USS	
				1N1876		USS					

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## DIODE SIMILARITY CHART

EIA NO. & SIMILAR TYPE	DESCR & APP.	MFR**	CASE FIG.-	EIA NO. & SIMILAR TYPE	DESCR & APP.	MFR**	CASE FIG.-	EIA NO. & SIMILAR TYPE	DESCR & APP.	MFR**	CASE FIG.-
1N1802	S-Z	HOF	C	1N2014	S-R			1N2075	S-R	TS	29
1N1807/pr		USS		1N537		RCA		1N3193		RCA	
1N1875	S-Z	USS		1N2015	S-R			1N2076	S-R	TS	29
1N1522		ITT	D	1N538		RCA		1N2861		RCA	D01
1N1876	S-Z	USS		1N2016	S-R			1N2077	S-R	TS	29
1N1523		ITT	D	1N538		RCA		1N3194		RCA	
1N1877	S-Z	USS		1N2017	S-R			1N2078	S-R	TS	29
1N1524		ITT	D	1N539		RCA		1N3194		RCA	
1N1878	S-Z	USS		1N2018	S-R			1N2079	S-R	TS	29
1N1525		ITT	D	1N539		RCA		1N3195		RCA	
1N1879	S-Z	USS		1N2019	S-R			1N2080	S-R	CE	12
1N1526		ITT	D	1N540		RCA		1N2858		RCA	D01
1N1880	S-Z	USS		1N2020	S-R			1N2081	S-R	CE	12
1N1527		ITT	D	1N540		RCA		1N2859		RCA	D01
1N1881	S-Z	USS		1N2027	S-R			1N2082	S-R	CE	12
1N1528		ITT	D	1N254		TS		1N2860		RCA	D01
1N1882	S-Z	USS		1N2028	S-R			1N538		TS	
ZT33		ITT	D	1N255		TS		1N2083	S-R	CE	12
1N1883	S-Z	USS		1N2029	S-R			1N2861		RCA	D01
ZT39		ITT	D	1N255		TS		1N2084	S-R	CE	12
1N1884	S-Z	USS		1N2030	S-R			1N2862		RCA	D01
ZT47		ITT	D	1N256		TS		1N540		TS	
1N1885	S-Z	USS		1N2031	S-R			1N2085	S-R	CE	12
ZT56		ITT	D	1N256		TS		1N2863		RCA	D01
1N1886	S-Z	USS		1N2032	S-Z			1N2086	S-R	CE	12
ZT66		ITT	D	ZB4. 7		ITT	F	1N2864		RCA	D01
1N1887	S-Z	USS		1N2033	S-Z			1N547		TS	
ZT82		ITT	D	ZB5. 6		ITT	F	1N2088	S-R	ST	
1N1888	S-Z	USS		1N2034	S-Z			1N2863		RCA	D01
ZT100		ITT	D	1N1875		USS		1N2089	S-R	ST	
1N1891	S-Z	USS		ZB6. 8		ITT	F	1N2864		RCA	D01
1N1603		ITT	E	1N2035	S-Z			1N2090	S-R	MAL	
1N1892	S-Z	USS		LPZ8. 7		USS		1N2858		RCA	D01
1N1604		ITT	E	ZB6. 2		ITT	F	1N2091	S-R	MAL	
1N1893	S-Z	USS		1N2036	S-Z			1N3193		RCA	
1N1605		ITT	E	1N1887		USS		1N2092	S-R	MAL	
1N1894	S-Z	USS		ZB10		ITT	F	1N3193		RCA	
1N1606		ITT	E	1N2037	S-Z			1N2093	S-R	MAL	
1N1895	S-Z	USS		1N1877		USS		1N3194		RCA	
1N1607		ITT	E	ZB12		ITT	F	1N2094	S-R	MAL	
1N1896	S-Z	USS		1N2038	S-Z			1N3194		RCA	
1N1608		ITT	E	1N1878		USS		1N2095	S-R	MAL	
1N1897	S-Z	USS		ZB16		ITT	F	1N3195		RCA	
1N1609		ITT	E	1N2039	S-Z			1N2096	S-R	MAL	
1N1898	S-Z	USS		LPZ19		USS		1N3195		RCA	
ZK33		ITT	E	ZB20		ITT	F	1N2103	S-R	USS	93
1N1899	S-Z	USS		1N2040	S-Z			1N2858		RCA	D01
ZK39		ITT	E	LPZ23. 5		USS		1N2104	S-R	USS	93
1N1900	S-Z	USS		ZB24		ITT	F	1N2859		RCA	D01
ZK47		ITT	E	1N2069	S-R	TI	10	1N2105	S-R	USS	93
1N1901	S-Z	USS		1N3193		RCA		1N2860		RCA	D01
ZK56		ITT	E	1N2111		USS		1N2106	S-R	USS	93
1N1902	S-Z	USS		1N2070	S-R	TI	10	1N2861		RCA	D01
ZK68		ITT	E	1N3194		RCA		1N2107	S-R	USS	93
1N1903	S-Z	USS		1N2113		USS		1N2862		RCA	D01
ZK82		ITT	E	1N2071	S-R	TI	10	1N2108	S-R	USS	93
1N1904	S-Z	USS		1N3195		RCA		1N2863		RCA	D01
ZK100		ITT	E	1N1923		USS		1N2109	S-R	USS	
1N2013	S-R			1N2072	S-R	TS	29	MA5*		TSC	31
1N536		RCA		1N2858		RCA	D01	1N2110	S-R	USS	
				1N2073	S-R	TS	29	MA10*	T	TSC	31
				1N2859		RCA	D01				
				1N2074	S-R	TS	29				
				1N2860		RCA	D01				

# GENERAL INSTRUMENT SEMICONDUCTOR DIVISION

## One Dependable Source For All Your Diode Needs

All General Instrument silicon diodes and germanium glass diodes are designed for long life and highest reliability in critical military and industrial applications. They exceed the most rigid requirements of mechanical, electrical, moisture-resistance and thermal-stability specifications ■ For details on the full line, write for Catalog SR-1045B.

### GERMANIUM DIODES

General Purpose Types				Types Designed to Meet JAN Specs		High Conductance Types	High Temperature Types	Computer Types
1N67A	1N95	1N99A	1N118A	1N126A	1N270	1N270	1N277	1N191
1N68A	1N96	1N100A		1N127A	1N276	1N281		1N192
1N89	1N97A	1N116A		1N128	1N277			
1N90	1N98A	1N117A		1N198				

### SILICON DIODES

All Purpose Types	General Purpose Types	Types Designed to Meet JAN Specs	Fast Recovery Types		Ultra-Fast Recovery Types	High Conductance Types		
1N658*	1N456	1N457	1N625	1N658*	1N903	1N482	1N484	1N486
1N891	1N461	1N458	through	1N659	1N914	1N482A	1N484A	1N486A
1N892	1N462	1N459	1N629	1N660	1N914A	1N482B	1N484B	
1N893	1N463		1N643*	1N661	1N916	1N483	1N485	
DR999	1N464		1N645*	1N662*	1N916A	1N483A	1N485A	
			1N649*	1N663*		1N483B	1N485B	

\*MILITARY TYPES. COMPLETE MILITARY LIST ON REQUEST

### SILICON ZENER DIODES

250 Milliwatts		400 Milliwatts		1 Watt			3.5 Watts		10 Watts	
1N704	1N730	1N746	1N754	1N1518	1N1522	1N1526	1N1588	1N1594	1N1808	1N1358
1N708	1N735	1N748	1N756	1N1519	1N1523	1N1527	1N1589	1N1595	1N1351	1N1359
1N713	1N738	1N750	1N758	1N1520	1N1524	1N1528	1N1590	1N1596	1N1352	1N1360
1N718	1N745	1N752	1N759	1N1521	1N1525		1N1591	1N1597	1N1353	1N1361
1N725	1N761						1N1592	1N1598	1N1355	1N1362
							1N1593		1N1357	

## One Dependable Source For All Your Rectifier Needs

General Instrument silicon power rectifiers are designed to exceed the most stringent requirements for reliability and performance in military and industrial applications ■ The wide range of General Instrument rectifier types, some of which are listed here, includes: top hats, 1/8"-hex medium-power studs, high-power diodes, plastic-encapsulated units, 1/8"-hex high-power studs, 1/4"-hex high-power studs, insulated studs, all JAN top hats, rectifier stacks, high-voltage cartridges, and custom packages for special circuits needs ■ Call the General Instrument sales office or franchised distributor nearest you for complete specifications, test data and design curves. Or write today for Catalog SR-1001C to General Instrument Semiconductor Division, 65 Gouverneur Street, Newark 4, New Jersey.

### SILICON RECTIFIERS

General Purpose Types				Types Designed to Meet JAN Specs	Magnetic Amplifier Types	Power Supply Types			High Power Silicon Diode/Rectifiers Designed to Meet USAF Specs	
1N248	1N601A	1N676	1N1101	1N253	1N332	1N442	1N341	1N1115	1N1581	1N645
1N248A	1N602A	1N677	through	1N254	1N333	1N443	through	through	through	1N646
1N249	1N604A	1N678	1N1105	1N255	1N334	1N444	1N349	1N1120	1N1587	1N647
1N249A	1N605A	1N679	1N1487	1N256	1N335	1N445	1N530	1N1124	1N1612	1N648
1N250	1N606A	1N681	through	1N538	1N336	1N440B	through	through	through	1N649
1N250A	1N607A	1N687	1N1492	1N540	1N337	1N441*	1N535	1N1128	1N1616	
1N536	1N608A	1N689	1N1692	1N547	1N338	1N442B	1N560	1N1199	1N1254	MP Hi Temp. Series
1N537	1N609A	1N689	through		1N339	1N443B	1N561	through	through	MP100
1N539	1N610A	1N846	1N1697		1N340	1N444B	1N562	1N1206	1N2160	MP225
1N550	1N611A	through	1N2080		1N440	1N445B	1N563	1N1341	1N2793	MP300
through	1N612A	1N889	1N2086				1N599	through	through	MP400
1N555	1N613A	1N1095	1N2512	1N1731*	1N441		through	1N1348	1N2800	MP500
1N599A	1N614A	1N1096	through	1N1733*			1N614			MP600
1N600A		1N1100	1N2517	1N1734*						

# GENERAL INSTRUMENT CORPORATION

## DIODE SIMILARITY CHART

EIA NO. & SIMILAR TYPE	DESCR & APP.	MFR**	CASE FIG.	EIA NO. & SIMILAR TYPE	DESCR & APP.	MFR**	CASE FIG.	EIA NO. & SIMILAR TYPE	DESCR & APP.	MFR**	CASE FIG.
1N2111	S-R	USS		1N2250A	S-R			1N2313	S-R	FAN	
MA20*		TSC	31	MR20*		TSC	31	1N1186		TS	
1N2112	S-R	USS		1N2252A	S-R			1N2315	S-R	FAN	
MA30*		TSC	31	MR30*		TSC	31	1N1187		TS	
1N2113	S-R	USS		1N2254A	S-R			1N2316	S-R	FAN	
MA40*		TSC	31	MR40*		TSC	31	1N1188		TS	
1N2114	S-R	USS		1N2256A	S-R			1N2317	S-R	FAN	
MA50*		TSC	31	MR50*		TSC	31	1N1188		TS	
1N2128	S-R			1N2258A	S-R			1N2318	S-R	FAN	
CS120Z		TS		MR60*		TSC	31	1N1183		TS	
1N2129	S-R			1N2260A	S-R			1N2319	S-R	FAN	
CS120A		TS		MR80*		TSC	31	1N1184		TS	
1N2130	S-R			1N2272	S-R			1N2320	S-R	FAN	
1N1183		TS		MO5*		TSC	57	1N1185		TS	
1N2131	S-R			1N2273	S-R			1N2321	S-R	FAN	
CS120B		TS		MO10*		TSC	57	1N1186		TS	
1N2133	S-R			1N2274	S-R			1N2323	S-R	FAN	
CS120C		TS		MO20*		TSC	57	1N1187		TS	
1N2135	S-R			1N2275	S-R			1N2324	S-R	FAN	
CS120D		TS		MO30*		TSC	57	1N1188		TS	
1N2137	S-R			1N2276	S-R			1N2436	S-R	ITT	G
CS120E		TS		MO40*		TSC	57	300A		W	
1N2154	S-R	GE		1N2277	S-R			1N2437	S-R	ITT	G
CS120Z		TS		MO50*		TSC	57	300B		W	
MO5*		TSC	57	1N2278	S-R			1N2438	S-R	ITT	G
1N2155	S-R	GE		MO60*		TSC	57	300C		W	
CS120A		TS		1N2279	S-R			1N2439	S-R	ITT	G
MO10*		TSC	57	MO80*		TSC	57	300D		W	
1N2156	S-R	GE		1N2282	S-R			1N2440	S-R	ITT	G
CS120B		TS		MO30*		TSC	57	300E		W	
MO20*		TSC	57	1N2283	S-R			1N2441	S-R	ITT	G
1N2157	S-R	GE		MO40*		TSC	57	300F		W	
CS120C		TS		1N2284	S-R			1N2442	S-R	ITT	G
MO30*		TSC	57	MO50*		TSC	57	300G		W	
1N2158	S-R	GE		1N2285	S-R			1N2443	S-R	ITT	G
CS120D		TS		MO60*		TSC	57	300H		W	
MO40*		TSC	57	1N2286	S-R			1N2444	S-R	ITT	G
1N2159	S-R	GE		MO80*		TSC	57	300K		W	
CS120E		TS		1N2294	S-R	FAN		1N2446	S-R	ITT	H
MO50*		TSC	57	CS120Z		TS		303A		W	
1N2160	S-R	GE		1N2295	S-R	FAN		AM0520		GI	
CS120F		TS		CS120A		TS		1N2447	S-R	ITT	H
MO60*		TSC	57	1N2297	S-R	FAN		303B		W	
1N2212				CS120B		TS		AM1020		GI	
1N1185		TS		1N2299	S-R	FAN		1N2448	S-R	ITT	H
1N2228A	S-R			CS120C		TS		TR152		TEC	
MA5*		TSC	31	1N2301	S-R	FAN		303C		W	
1N2230A	S-R			CS120D		TS		AM1520		GI	
MA20*		TSC	31	1N2302	S-R	FAN		1N2449	S-R	ITT	H
1N2232A	S-R	CE		CS120Z		TS		303D		W	
MA30*		TSC	31	1N2303	S-R	FAN		AM2020		GI	
1N2234A	S-R			CS120A		TS		1N2450	S-R	ITT	H
MA40*		TSC	31	1N2306	S-R	FAN		TR252		TEC	
1N2236A	S-R			CS120D		TS		303E		W	
MA50*		TSC	31	1N2310	S-R	FAN		AM2520		GI	
1N2238A	S-R			1N1183		TS		1N2451	S-R	ITT	H
MA60*		TSC	31	1N2311	S-R	FAN		TR302		TEC	
1N2240A	S-R			1N1184		TS		303F		W	
MA80*		TSC	31	1N2312	S-R	FAN		AM3020		GI	
1N2246A	S-R							1N2452	S-R	ITT	H
MR5*		TSC	31					TR352		TEC	
1N2248A	S-R							303G		W	
MR10*		TSC	31					AM3520		GI	

# Transitron

# SILICON CONTROLLED RECTIFIERS

augmenting the industry's broadest line

With the addition of the 50-Amp Silicon Controlled Rectifier, Transitron now offers the industry the broadest line of Controlled Rectifiers available on the market today.

Research and development efforts during the past year have already produced an impressive array of types which include the following series:

TSW31S SERIES (TO-18 package)...operating current range to 200mA  
 TCR251 SERIES (TO-5 package)...operating current range to 1 amp  
 2N1595 SERIES (TO-5 package)...operating current range to 1 amp  
 2N1600 SERIES (7/16" hex package)...operating current range to 3 amps  
 TCR505 SERIES (7/16" hex package)...operating current range to 5 amps  
 TCR510 SERIES (11/16" hex package) operating current range to 10 amps  
 TCR520 SERIES (11/16" hex package) operating current range to 20 amps

## NOW AVAILABLE — NEW 50-AMP CONTROLLED RECTIFIER

The latest addition to the Transitron line — the 50 Amp Silicon Controlled Rectifier — is a three-terminal, four-layer device designed to control very large load currents with small gate current signals. A mechanically rugged and electrically stable device, the new Controlled Rectifier is provided in the 1 1/4" hex base stud-mounted package and is hermetically sealed. Wherever high power handling ability is required, the 50-Amp Silicon Controlled Rectifier will find wide application ranging from frequency changing to welding control.

TCR550 SERIES (1 1/4" hex package)  
operating current range to 50 amps

Type	Min. Peak Reverse Volt. and Min. Forward Breakover Volt. (volts)	Max. Average Forward Current at 90°C case (amps)	Package Configuration
TCR4050	400	50	1 1/4" hex
TCR3050	300	50	1 1/4" hex
TCR2050	200	50	1 1/4" hex
TCR1050	100	50	1 1/4" hex
TCR550	50	50	1 1/4" hex

Requires 50mA to turn on 50 Amp



For information on any or all of Transitron's line of Controlled Rectifiers, call or write today for Bulletin TE-1356.

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Pioneering in new application techniques, Transitron application engineers have assembled information which demonstrates how "gate biasing" will improve the circuit reliability of the SCR. This informative booklet, entitled "The Biasing of Silicon Controlled Rectifiers and Switches," deals individually with each of Transitron's Controlled Rectifiers and Switches. It is an indispensable aid to the design engineer seeking longer life and greater stability in higher temperature applications . . . It's yours for the asking.

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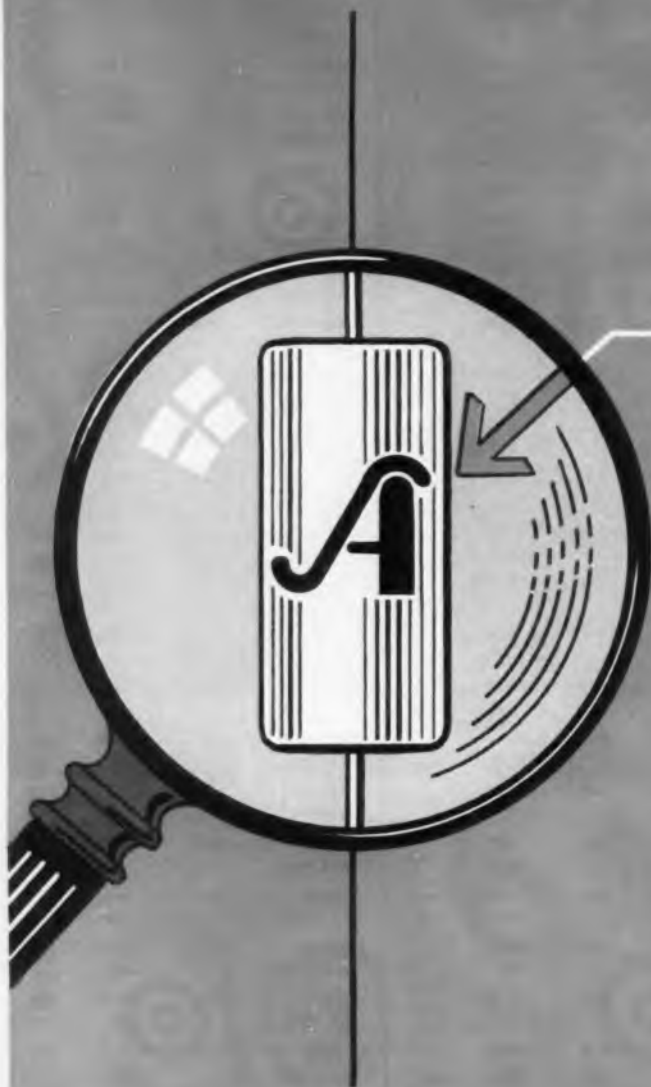


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## DIODE SIMILARITY CHART

EIA NO. & SIMILAR TYPE	DESCR & APP.	MFR**	CASE FIG.†	EIA NO. & SIMILAR TYPE	DESCR & APP.	MFR**	CASE FIG.†	EIA NO. & SIMILAR TYPE	DESCR & APP.	MFR**	CASE FIG.†
1N2453	S-R	ITT	H	1N2612	S-R	MOT		1N2982B	S-Z	MOT	D04
TR402		TEC		1N539		RCA		MZ18BFA		USS	
AM4020		W		1N2614	S-R	MOT		1N2984B	S-Z	MOT	D04
		GI		1N540		RCA		MZ20BDA		USS	
1N2454	S-R	ITT	H	1N2615	S-R	MOT		1N2985B	S-Z	MOT	D04
TR502		TEC		1N1095		RCA		MZ22BFA		USS	
303K		W		1N2620	S-Z	MOT		1N2986B	S-Z	MOT	D04
1N2455	S-R	ITT	H	1N2163		USS		MZ24BDA		USS	
TR602		TEC		1N2620A	S-Z	MOT		1N2988B	S-Z	MOT	D04
303M		W		1N2164		USS		MZ27BFA		USS	
1N2458	S-R	ITT	H	1N2620B	S-Z	MOT		1N2989B	S-Z	MOT	D04
TR53		TEC		1N2185		USS		MZ30BDA		USS	
302A		W		1N2621	S-Z	MOT		1N2990B	S-Z	MOT	D04
X25HB5		IR		1N2163		USS		MZ33BDA		USS	
1N2459	S-R	ITT	H	1N2621A	S-Z	MOT		1N2991B	S-Z	MOT	D04
TR103		TEC		1N2164		USS		MZ36BDA		USS	
302B		W		1N2621B	S-Z	MOT		1N2992B	S-Z	MOT	D04
X25HB10		IR		1N2165		USS		MZ39BDA		USS	
1N2460	S-R	ITT	H	1N2622	S-Z	MOT		1N2993B	S-Z	MOT	D04
TR153		TEC		1N2166		USS		MZ43BDA		USS	
302C		W		1N2622A	S-Z	MOT		1N2995B	S-Z	MOT	D04
X25HB15		IR		1N2167		USS		MZ47BDA		USS	
1N2461	S-R	ITT	H	1N2622B	S-Z	MOT		1N2997B	S-Z	MOT	D04
TR203		TEC		1N2168		USS		MZ51BDA		USS	
302D		W		1N2623	S-Z	MOT		1N2999B	S-Z	MOT	D04
X25HB20		IR		1N2166		USS		MZ56BDA		USS	
1N2462	S-R	ITT	H	1N2623A	S-Z	MOT		1N3000B	S-Z	MOT	D04
TR253		TEC		1N2167		USS		MZ62BDA		USS	
302E		W		1N2623B	S-Z	MOT		1N3001B	S-Z	MOT	D04
X25HB25		IR		1N2168		USS		MZ68BDA		USS	
1N2463	S-R	ITT	H	1N2624	S-Z	MOT		1N3002B	S-Z	MOT	D04
TR303		TEC		1N2169		USS		MZ75BDA		USS	
302F		W		1N2624A	S-Z	MOT		1N3003B	S-Z	MOT	D04
X25HB30		IR		1N2170		USS		MZ82BDA		USS	
1N2464	S-R	ITT	H	1N2624B	S-Z	MOT		1N3004B	S-Z	MOT	D04
TR353		TEC		1N2171		USS		MZ91BDA		USS	
302G		W		1N2860	S-R	RCA		1N3005B	S-Z	MOT	D04
X25HB35		IR		1N538		TS		MZ100BDA		USS	
1N2465	S-R	ITT	H	1N2862	S-R	RCA		1N3007A	S-Z	MOT	D04
TR403		TEC		1N540		TS		MZ110BD		USS	
302H		W		1N2864	S-R	RCA		1N3008A	S-Z	MOT	D04
X25HB40		IR		1N547		TS		MZ120BD		USS	
1N2466	S-R	ITT	H	1N2971B	S-Z	MOT	D04	1N3009A	S-Z	MOT	D04
TR503		TEC		MZ7.5BCA		USS		MZ130BD		USS	
302K		W		1N2972B	S-Z	MOT	D04	1N3011A	S-Z	MOT	D04
X25HB50		IR		MZ8.2BCA		USS		MZ150BD		USS	
1N2467	S-R	ITT	H	1N2973B	S-Z	MOT	D04	1N3012A	S-Z	MOT	D04
TR603		TEC		MZ9.1BCA		USS		MZ160BC		USS	
302M		W		1N2974B	S-Z	MOT	D04	1N3014A	S-Z	MOT	D04
1N2482	S-R	ITT	H	MZ10BFA		USS		MZ180BC		USS	
1N3103		RCA		1N2975B	S-Z	MOT	D04	1N3015A	S-Z	MOT	D04
1N2483	S-R	ITT	H	MZ11BDA		USS		MZ200BC		USS	
1N3104		RCA		1N2976B	S-Z	MOT	D04	1N3017B	S-Z	MOT	J
1N2484	S-R	ITT	H	MZ12BFA		USS		LPZ7.5A		USS	
1N3105		RCA		1N2977B	S-Z	MOT	D04	1N3018B	S-Z	MOT	J
1N2485	S-R	ITT	H	MZ13BDA		USS		1N1875A		USS	
1N2860		RCA	D01	1N2979B	S-Z	MOT	D04	1N3019B	S-Z	MOT	J
1N538		TS		MZ15BFA		USS		LPZ9.1A		USS	
1N2486	S-R	ITT	H	1N2980B	S-Z	MOT	D04	1N3020B	S-Z	MOT	J
1N2861		RCA	D01	MZ16BDA		USS		1N1876A		USS	
1N2487	S-R	ITT	H								
1N2862		RCA	D01								
1N540		TS									
1N2488	S-R	ITT	H								
1N2863		RCA	D01								
1N2489	S-R	ITT	H								
1N2864		RCA	D01								
1N547		TS									
1N2610	S-R	MOT									
1N537		RCA									
1N2611	S-R	MOT									
1N538		RCA									



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## DIODE SIMILARITY CHART

EIA NO. & SIMILAR TYPE	DESCR & APP.	MFR**	CASE FIG.†	EIA NO. & SIMILAR TYPE	DESCR & APP.	MFR**	CASE FIG.†	EIA NO. & SIMILAR TYPE	DESCR & APP.	MFR**	CASE FIG.†
1N3021B	S-Z	MOT	J	1N3032B	S-Z	MOT	J	1N3042B	S-Z	MOT	J
LPZ11A		USS		1N1882A		USS		1N1887A		USS	
1N3022E	S-Z	MOT	J	1N3033B	S-Z	MOT	J	1N3043B	S-Z	MOT	J
1N1877A		USS		LPZ36A		USS		LPZ91A		USS	
1N3023B	S-Z	MOT	J	1N3034B	S-Z	MOT	J	1N3044B	S-Z	MOT	J
LPZ13A		USS		1N1883A		USS		1N1888A		USS	
1N3024E	S-Z	MOT	J	1N3035B	S-Z	MOT	J	1N3045A	S-Z	MOT	J
1N1878A		USS		LPZ43A		USS		LPZ110		USS	
1N3025B	S-Z	MOT	J	1N3036B	S-Z	MOT	J	1N3046A	S-Z	MOT	J
LPZ16A		USS		1N1884A		USS		1N3098		USS	
1N3026B	S-Z	MOT	J	1N3037B	S-Z	MOT	J	1N3047A	S-Z	MOT	J
1N1879A		USS		LPZ51A		USS		LPZ130		USS	
1N3027B	S-Z	MOT	J	1N3038B	S-Z	MOT	J	1N3048A	S-Z	MOT	J
LPZ20A		USS		1N1885A		USS		1N3069		USS	
1N3028B	S-Z	MOT	J	1N3039B	S-Z	MOT	J	1N3049A	S-Z	MOT	J
1N1880A		USS		LPZ62A		USS		LPZ160		USS	
1N3029B	S-Z	MOT	J	1N3040B	S-Z	MOT	J	1N3050A	S-Z	MOT	J
LPZ24A		USS		1N1886A		USS		1N3100		USS	
1N3030B	S-Z	MOT	J	1N3041B	S-Z	MOT	J	1N3051A	S-Z	MOT	J
1N1881A		USS		LPZ75A		USS		LPZ200		USS	
1N3031B	S-Z	MOT	J					1N3064	S-SW		
1N2387A		USS						CD6111		CD	

\* Direct replacement.

\*\* See complete list of manufacturers and their semiconductor products at the end of these tables.

† Numerical figures correspond to Jecdec outline figure numbers.

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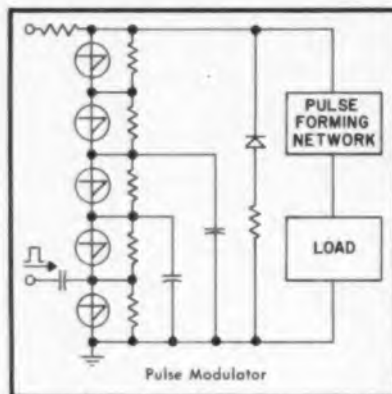
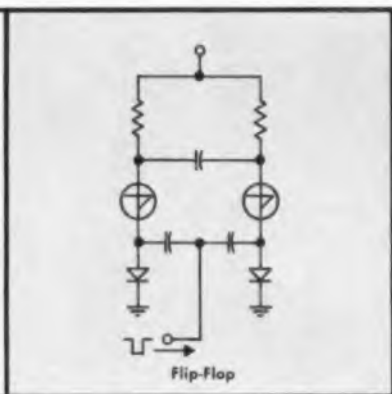
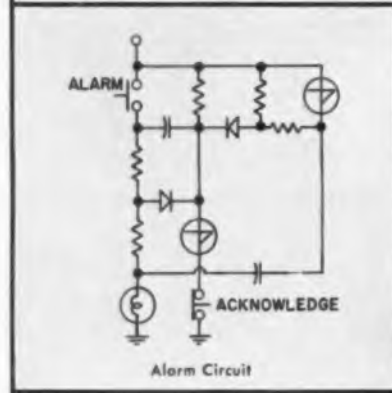

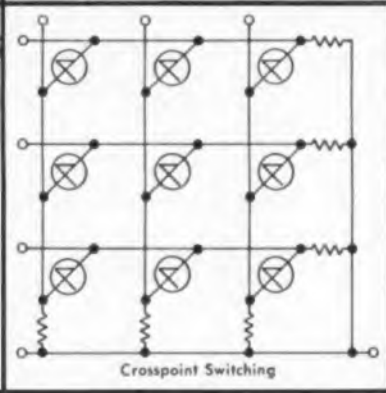
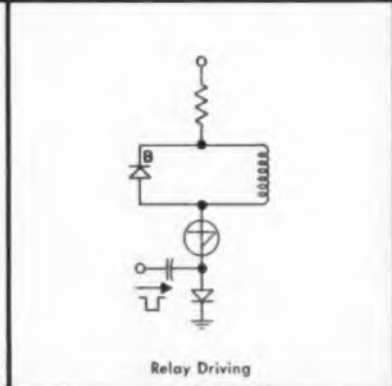
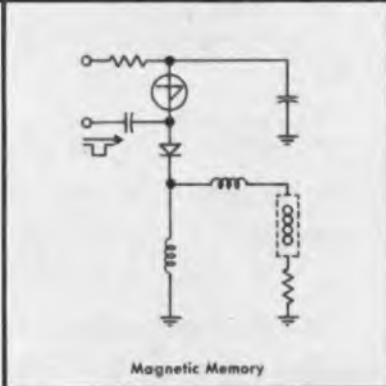
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# SIMPLIFY YOUR SWITCHING CIRCUITS

## with the new Shockley 4-layer diode (Type E)\*

If simplicity and speed can improve your switching circuits, talk to our engineers about the capabilities of the Shockley 4-layer diode. A few of these circuit applications are shown here.

 <p>Pulse Modulator</p>	 <p>Flip-Flop</p>	<p>The Shockley 4-layer diode is a fast, pnpn, two lead, silicon switch. It has two stable states —OFF (high impedance) state and ON (low impedance) state. Turn-On time, depending on the circuit, is typically less than 0.1 <math>\mu</math>s.</p>
 <p>Alarm Circuit</p>	 <p>* 4-times enlargement of the new Type E, subminiature diode.</p>	 <p>Crosspoint Switching</p>
<p>Type E Specs:</p> <ul style="list-style-type: none"> <li>• Carries 150 ma steady dc</li> <li>• Carries 10 amps peak pulse</li> <li>• Lower COMMERCIAL prices</li> <li>• Improved temperature stability</li> <li>• Improved shock and vibration resistance</li> </ul>	 <p>Relay Driving</p>	 <p>Magnetic Memory</p>

For other applications and for specific information, our engineering sales representatives are listed in EDC and EEM.

## Shockley TRANSISTOR

UNIT OF CLEVITE TRANSISTOR  
STANFORD INDUSTRIAL PARK, PALO ALTO, CALIF.



EIA NO. & SIMILAR TYPE	DESCR & APP.	MFR**	CASE FIG.	EIA NO. & SIMILAR TYPE	DESCR & APP.	MFR**	CASE FIG.	EIA NO. & SIMILAR TYPE	DESCR & APP.	MFR**	CASE FIG.
<u>2N34</u>	GP-AF	SYL		<u>2N59</u>	GP-AF	W		<u>2N109</u>	GP-AF	RCA	
2N465		IND	T030	2N1193		MOT	T09	2N1192		MOT	T09
2N1191		MOT		2N1370		TI		2N1370		TI	
2N407		RCA		2N270		RCA		2N632		IND	
				2N466		IND					
<u>2N36</u>	GP-GP	CBS		<u>2N60</u>	GP-AF	W		<u>2N111</u>	GP-IF	RAY	
2N465		IND		2N1193		MOT	T09	2N413		IND	
2N1191		MOT		2N1370		TI		2N218		IND	
2N217		RCA		2N270		RCA		<u>2N111A</u>	GP-IF	RAY	
				TR320		IND		2N413A		IND	
<u>2N37</u>	GP-GP	CBS		<u>2N61</u>	GP-AF	W		2N218		RCA	
2N465		IND		2N1192		MOT	T09	<u>2N112</u>	GP-IF	RAY	
2N1191		MOT		2N1274		TI		2N414		IND	
2N408		RCA		2N270		RCA		2N218		RCA	
				2N464		IND		<u>2N112A</u>	GP-IF	RAY	
<u>2N38</u>	GP-AF	CBS		<u>2N62</u>	GP-GP	PHL		2N483		IND	
2N464		IND		2N109		RCA		2N218		RCA	
2N1191		MOT		2N1191		MOT		<u>2N113</u>	GP-IF	RAY	
2N408		RCA	52	<u>2N63</u>	GP-AF	RAY		2N416		IND	
				2N1191		MOT		2N139*		RCA	
<u>2N39</u>	GP-GP			2N238		TI		<u>2N114</u>	GP-RF	RAY	
2N217		RCA		2N217		RCA		2N140*		RCA	
<u>2N40</u>	GP-GP			2N464		IND		<u>2N115</u>	GP-AF	AMP	
2N464		IND		<u>2N64</u>	GP-AF	RAY		2N270		RCA	
2N217		RCA		2N1191		MOT		<u>2N116</u>	GP-AF	CBS	
<u>2N42</u>	GP-GP			2N238		TI		2N175		RCA	
2N217		RCA		2N217		RCA		<u>2N123</u>	GN-S	GE	
<u>2N43</u>	GP-AF	GE		<u>2N65</u>	GP-AF	RAY		2N1305		TI	
2N650		MOT	T032	2N1193		MOT		2N404		RCA	
2N1373		TI		2N1273		TI		<u>2N125</u>	GN-S	TI	
2N109		RCA		2N217		RCA		2N585		RCA	
8FT242		CSF	T01	2N465		IND		<u>2N126</u>	GN-S	TI	
TR43		IND		<u>2N76</u>	GP-AF	GE		2N585		RCA	
<u>2N43A</u>	GP-AF	GE		2N1192		MOT		<u>2N128</u>	GP-RF	PHL	
2N650		MOT	T032	2N104		RCA		2N247		RCA	
2N1373		TI		<u>2N77</u>	GP-AF	RCA		<u>2N129</u>	GP-RF	PHL	
2N220		RCA		2N465		IND		2N373		RCA	
8FT242		CSF	T01	2N1191		MOT		<u>2N130</u>	GP-AF	RAY	
<u>2N44</u>	GP-AF	GE		2N105*		RCA		2N464		IND	
TR44		IND		<u>2N79</u>	GP-AF	RCA		2N1191		MOT	T024
2N650		MOT	T032	2N1191		MOT		2N220		RCA	
2N109		RCA		<u>2N81</u>	GP-AF	GE		<u>2N130A</u>	GP-AF	RAY	
<u>2N44A</u>	GP-AF	GE		2N1191		MOT		2N650		MOT	T024
2N650		MOT	T032	2N1191		MOT		2N1373		TI	
2N1373		TI		<u>2N82</u>	GP-AF	CBS		2N220		RCA	
2N109		RCA		2N1191		MOT		<u>2N131</u>	GP-AF	RAY	
<u>2N45</u>	GP-AF	GE		<u>2N85</u>	GP-AF	RCA		2N465		IND	
TR45		IND		2N109		RCA		2N1191		MOT	T024
2N1191		MOT	T032	<u>2N94</u>	GN-S			<u>2N131A</u>	GP-AF	GT	
2N109		RCA		2N585		RCA		2N650		MOT	T024
<u>2N47</u>	GP-AF	PHL		<u>2N104</u>	GP-AF	RCA		2N220		RCA	
2N1191		MOT		2N1191		MOT	T026	2N464		IND	
<u>2N49</u>	GP-AF	PHL		2N1274		TI		<u>2N131A</u>	GP-AF	RAY	
2N1191		MOT		TRC44		IND		2N465		IND	
<u>2N54</u>	GP-AF	W		<u>2N105</u>	GP-AF	RCA		<u>2N132</u>	GP-AF	RAY	
2N1191		MOT		2N1274		TI		2N362		IND	T024
2N109		RCA		2N465		IND		2N1192		MOT	T024
<u>2N55</u>	GP-AF	W		<u>2N106</u>	GP-AF	RAY		2N220		RCA	
2N1191		MOT		2N1191		MOT					
2N109		RCA		2N104		RCA					
<u>2N56</u>	GP-AF	W		<u>2N107</u>	GP-AF	GE					
2N1191		MOT		TR722		IND					
2N109		RCA		2N1191		MOT	T032				
				2N218		RCA					

\* Direct replacement.

\*\* See complete list of manufacturers and their semiconductor products at the end of these tables.

† Numerical figures correspond to Jedec outline figure numbers.

### Transistor Interchangeability Chart

GN-AF Germanium, NPN, AF amplifier  
 GN-GP Germanium, NPN, general purpose  
 GP-P Germanium, PNP, power switch  
 GN-RF Germanium, NPN, RF amplifier  
 GN-S Germanium, NPN, switch  
 GP-AF Germanium, PNP, AF amplifier

GP-CD Germanium, PNP, core driver  
 GP-GP Germanium, PNP, general purpose  
 GP-IF Germanium, PNP, IF amplifier  
 GP-RF Germanium, PNP, RF amplifier  
 GP-S Germanium, PNP, switch  
 SN-AF Silicon, NPN, AF amplifier

SN-GP Silicon, NPN, general purpose  
 SN-P Silicon, NPN, power switch  
 SN-RF Silicon, NPN, RF amplifier  
 SN-S Silicon, NPN, switch  
 GP-AF Germanium, PNP, AF amplifier  
 SP-S Silicon, PNP, switch

Extra quality at no extra cost with Bendix Semiconductors

# Bendix Bulletin

## POWER-SWITCHING TRANSISTORS THAT CARRY PROVED RATINGS

*Established parameter limits give engineers new reliable design base*



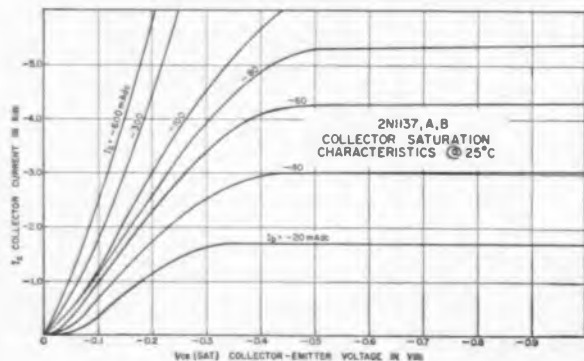
100% specification testing assures transistor rating.

To help engineers achieve maximum circuit design reliability, Bendix series 2N1136 and 2N1137 power-switching transistors now come with absolutely defined and tested maximum performance ratings.

Electrical specifications are substantiated by actual dynamic tests which include both open base and shorted base breakdown voltage tests at high current.

This valuable testing is conducted at our new Holmdel, New Jersey, facility, devoted exclusively to semiconductor production. Here, also, our improved transistor processing reduces leakage currents, increases current gain linearity, increases transistor power rating by reducing thermal resistance, and controls high temperature (85°C.) ICBO to a maximum of 10 mAde.

These 2N1136 and 2N1137 germanium PNP power transistors switch up to 400 watts as drivers for relays, relay replacements, solenoids, magnetic clutches, and have many other high current applications in DC-DC converter and DC-AC inverter circuits. Write for complete information on these series, and others in our complete line of Semiconductors.



Low saturation means high efficiency

Type No.	ABSOLUTE MAXIMUM RATINGS			CURRENT GAIN	
	Vcbo Vdc	Vces Vdc	Vceo Vdc	hFE	@ Ic
2N1136	60	40	30	50-100	3 Adc
2N1136A	90	70	55	50-100	3
2N1136B	100	80	65	50-100	3
2N1137	60	40	30	75-150	3 Adc
2N1137A	90	70	55	75-150	3
2N1137B	100	80	65	75-150	3



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# TRANSISTOR INTERCHANGEABILITY CHART

EIA NO. & SIMILAR TYPE	DESCR & APP.	MFR**	CASE FIG.	EIA NO. & SIMILAR TYPE	DESCR & APP.	MFR**	CASE FIG.	EIA NO. & SIMILAR TYPE	DESCR & APP.	MFR**	CASE FIG.
<u>2N132A</u>	GP-AF	RAY		<u>2N167</u>	GN-S	GE		<u>2N189</u>	GP-AF	GE	
2N651		MOT	T024	2T78R		SON		2N408		RCA	
2N1370		TI		2N1090		RCA		2N1191		MOT	T032
2N220		RCA				IND		2N465		IND	
2N468		IND		<u>2N188A</u>	GN-IF	GE		<u>2N190</u>	GP-AF	GE	
<u>2N133</u>	GP-AF	RAY		2T73R		SON		2N1191		MOT	T032
2N175		RCA		<u>2N189</u>	GN-IF	GE		2N238		TI	
2N1191		MOT	T024	2T75R		SON		2N408		RCA	
<u>2N133A</u>	GP-AF	RAY		<u>2N189A</u>	GN-IF	GE		2N465		IND	
2N650		MOT	T024	2T51		SON		<u>2N191</u>	GP-AF	GE	
2N1274*		TI		<u>2N173</u>	GP-AF	DEL		2N1192		MOT	T032
2N175		RCA		CTP1504		CLE	T03	2N238		TI	
<u>2N135</u>	GP-RF	GE		2N512A		TI		2N270		RCA	
SFT306		CSF		SFT286		CSF	T06	2N465		IND	
2N482		IND	T01	2N301		RCA		<u>2N192</u>	GP-AF	GE	
2N139		RCA		<u>2N174</u>	GP-AF	DEL		2N1193		MOT	T032
<u>2N136</u>	GP-RF	GE		CTP1503		DEL		2N1370		TI	
SFT307		CSF	T01	2N512B		CLE	T03	2N270		RCA	
2N482		IND		SFT287		TI		2N362		IND	
2N139*		RCA		<u>2N174A</u>	GN-AF	DEL		<u>2N195</u>	GP-AF	TEC	
<u>2N137</u>	GP-RF	GE		CTP1503		DEL		2N217		RCA	
SFT308		CSF	T01	2N512B		CLE	T03	<u>2N196</u>	GP-AF	TEC	
2N140*		RCA		SFT287		TI		2N217		RCA	
2N484		IND		<u>2N175</u>	GP-AF	CSF	T06	<u>2N197</u>	GP-AF	TEC	
<u>2N138</u>	GP-AF	RAY		2N633		RCA		2N217		RCA	
2N1193		MOT		2N1370		IND		<u>2N198</u>	GP-AF	TEC	
2N406		RCA		<u>2N176</u>	GP-AF	TI		2N217		RCA	
<u>2N138A</u>	GP-AF	RAY		2N257		MOT	T03	<u>2N199</u>	GP-AF	TEC	
2N406		RCA		2N456A		CLE	T03	2N109		RCA	
<u>2N138B</u>	GP-AF	RAY		<u>2N178</u>	GP-AF	TI		<u>2N206</u>	GP-AF	TEC	
2N270		RCA		CDT1309		MOT	T03	2N206		RCA	
<u>2N139</u>	GP-IF	RCA		2N456A		CLE	T03	2N1191		MOT	
2N1110		TI		<u>2N180</u>	GP-GP	TI		2N1373		TI	
2N482		IND		2N466		CBS		2N362		IND	
<u>2N140</u>	GP-RF	RCA		2N1192		IND		<u>2N207</u>	GP-AF	PHL	
2N1108		TI		2N217		MOT		2N106		RCA	
2N485		IND		<u>2N181</u>	GP-GP	RCA		2N1376		TI	
<u>2N155</u>	GP-AF	CBS	T03	2N382		CBS		2N362		IND	
CDT1349		CLE	T03	2N1192		IND		<u>2N207A</u>	GP-AF	PHL	
2N176		MOT		2N270		MOT		2N105		RCA	
2N301*		RCA		<u>2N185</u>	GP-AF	RCA		2N1376		TI	
<u>2N156</u>	GP-AF	CBS		2N361		GE		<u>2N207B</u>	GP-AF	PHL	
CDT1349		CLE	T03	2N1191		IND		2N105		RCA	
2N176		MOT		2N270		MOT	T030	2N1375		TI	
2N301		RCA		<u>2N186</u>	GP-AF	RCA		<u>2N215</u>	GP-AF	RCA	
<u>2N157</u>	GP-AF	CBS	T03	SFT321		TI		2N1191		MOT	T01
CTP1730		CLE		2N1191		CSF	T01	2N1371		TI	
2N1531		MOT		2N464		MOT	T032	2N362		IND	
<u>2N157A</u>	GP-AF	CBS	T03	2N217		IND		<u>2N217</u>	GP-AF	RCA	
CTP1730		CLE		<u>2N186A</u>	GP-AF	RCA		2N1192		MOT	T01
2N1532		MOT		SFT321		GE		2N1370		TI	
<u>2N158</u>	GP-AF	CBS		2N464		CSF	T01	2N632		IND	
CTP1729		CLE		2N270		MOT		<u>2N218</u>	GP-IF	RCA	
2N1530		MOT		<u>2N187</u>	GP-AF	IND		2N462		IND	
<u>2N158A</u>	GP-AF	CBS		2N1191		GE		2N1110		TI	
CTP1729		CLE		2N1370		MOT	T032	<u>2N219</u>	GP-RF	RCA	
2N1531		MOT		2N109		TI		2N465		IND	
<u>2N160</u>	SN-RF	GP		SFT321		RCA	T01	2N1108		TI	
2N1149		TI		2N632		IND		<u>2N220</u>	GP-AF	RCA	
<u>2N160A</u>	SN-RF	GP		<u>2N187A</u>	GP-AF	IND		2N632		IND	
2N1149		TI		2N1191		GE		2N1370		TI	
<u>2N161</u>	SN-RF	GP		2N1363		MOT	T032	<u>2N223</u>	GP-AF	PHL	
2N1150		TI		2N270		TI		2N1193		MOT	T028
<u>2N161A</u>	SN-RF	GP		SFT321		RCA	T01	2N1378		TI	
2N1150		TI		2N632		CSF		2N270		RCA	
<u>2N163</u>	SN-RF	GP		<u>2N188</u>	GP-AF	IND		2N360		IND	
2N1152		TI		2N1191		GE		<u>2N224</u>	GP-AF	PHL	
<u>2N163A</u>	SN-RF	GP		2N1370		MOT	T032	2N1192		MOT	T028
2N1152		TI		2N109		TI		2N1376		TI	
<u>2N163A</u>	SN-RF	GP		SFT322		RCA	T01	2N270		RCA	
2N1152		TI		2N465		IND		2N466		IND	
<u>2N163A</u>	SN-RF	GP		<u>2N188A</u>	GP-AF	GE		<u>2N228</u>	GP-AF	PHL	
2N1152		TI		2N1191		MOT	T032	2N1192		MOT	T028
<u>2N163A</u>	SN-RF	GP		2N1363		TI		2N1372		TI	
2N1152		TI		2N270		RCA	T01	2N270		RCA	
<u>2N163A</u>	SN-RF	GP		SFT 322		CSF		2N466		IND	
2N1152		TI		2N465		IND		<u>2N228</u>	GP-AF	PHL	
<u>2N163A</u>	SN-RF	GP						2N1192		MOT	T028
2N1152		TI						2N1372		TI	
<u>2N163A</u>	SN-RF	GP						2N270		RCA	
2N1152		TI						2N466		IND	

# Now...5 designers' lines from Sarkes Tarzian



## 1 SILICON POWER RECTIFIERS

1/2 SIZE



Over 100 types for low, medium, and heavy current applications, with ratings from 150 ma to 1000 amperes; 50 to 2800 piv.



## 2

MODULAR SILICON RECTIFIERS  
ACTUAL SIZE

For printed circuits or terminal strips—2, 3, and 4 section modules of 500 ma diodes, 100 to 600 piv.

## 3 SILICON VOLTAGE REGULATORS

ACTUAL SIZE



Over 90 units in three power classifications—1/4, 1, and 10 watts; 5.6 to 100 volts breakdown.

## 4

HIGH VOLTAGE SILICON CARTRIDGE RECTIFIERS  
1/2 SIZE



Ferrule mounted and axial lead series, each in 18 different types; 600 to 16,000 piv.



## 5

SILICON TUBE REPLACEMENT RECTIFIERS  
1/2 SIZE

Nine standard tube replacement units directly interchangeable with more than 95% of all vacuum tube rectifiers; two full-wave replacement units for Citizen's Band radios. Special types on request.

In selecting and specifying these silicon rectifiers and voltage regulators, you can depend on Tarzian experience and ingenuity in manufacturing to deliver high performance devices at realistic prices in the quantities you require, whether for testing or full production.

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# TRANSISTOR INTERCHANGEABILITY CHART

ELA NO. & SIMILAR TYPE	DESCR & APP.	MFR**	CASE FIG. +	ELA NO. & SIMILAR TYPE	DESCR & APP.	MFR**	CASE FIG. +	ELA NO. & SIMILAR TYPE	DESCR & APP.	MFR**	CASE FIG. +
2N231	GP-RF	PHL		2N252	GP-RF	TI		2N285	GP-AF	BEN	T03
2N218		RCA		2N485		IND		2N176		MOT	
2N1373				2N374		RCA		2N456A		TI	
2N232	GP-IF	PHL		2N255	GP-AF	CBS	T03	2N301		RCA	T03
2N218		RCA		2N554		MOT		2N301		CLE	
2N234	GP-AF	BEN	T03	2N456A		RCA		2N285A	GP-AF	BEN	T03
CDT1349		CLE	T03	2N301*		CLE	T03	2N301W		CLE	T03
2N554		MOT		CTP1108				2N669		MOT	
2N301*		RCA		2N255A	GP-AF	CBS	T03	2N301		RCA	
2N234A*	GP-AF	BEN	T03	CTP1108		CLE	T03	2N290	GP-AF	DEL	
2N555		MOT		2N256	GP-AF	CBS	T03	CTP1503		CLE	
2N301*		RCA		2N555		MOT		2N511B		TI	
CDT1349		CLE	T03	2N250		TI		2N291	GP-AF	TI	
2N235	GP-AF	BEN	T05	2N301*		RCA		2N363		IND	T030
2N350		MOT		CDT1349		CLE	T03	2N191		MOT	
2N301*		RCA		2N256A	GP-AF	CBS	T03	2N296	GP-AF	STL	T03
2N257		CLE	T03	CDT1349		CLE	T03	CDT1321		CLE	T03
2N235A	GP-AF	BEN	T03	2N257	GP-AF	CLE	T03	2N1531		MOT	
2N176		MOT		2N176		MOT		2N301A		RCA	
2N250		TI		2N456A		RCA		2N297	GP-AF	CLE	T03
2N301*		RCA		2N301*		RCA		2N457A		TI	
2N257G		CLE	T03	2N265	GP-AF	GE		2N297A	GP-AF	CLE	T03
2N235B	GP-AF	BEN	T03	2N1193		MOT	T032	2N457A		TI	
2N257B		CLE	T03	2N1370		TI		2N457		RCA	
2N301A				2N408		RCA		2N301	GP-AF	RCA	T03
2N236	GP-AF	BEN	T03	2N465		IND		2N176		MOT	
2N301		CLE	T03	2N268	GP-S	CLE	T03	2N456A		TI	
2N350A		MOT		2N301A		RCA		XC141		AEI	
2N236A	GP-AF	BEN	T03	2N1530		MOT		2T3011		SON	
2N301G		CLE	T03	2N268A	GP-AF	CLE	T03	2N301A	GP-AF	RCA	T03
2N351A		MOT		2N1538		MOT		2N1531		MOT	
2N301		RCA		2N269	GP-S	RCA		2N457A		TI	
2N236B	GP-AF	BEN	T03	2N1303		TI		XC142		AEI	
2N301B		CLE	T03	2N270	GP-AF	RCA		2T3021		SON	
2N376A		MOT		2N1192		TI	T07	2N302	GP-S	RAY	
2N301A		RCA		2N1374		MOT		2N269		RCA	
2N237	GP-AF	NA		2N631		IND		2N303	GP-S	RAY	
2N220		RCA		2N271	GP-S	RAY		2N269	GP-S	RCA	
2N238	GP-AF	TI		2N404		RCA		2N307	GP-AF	STL	T03
2N217		RCA		2N486		IND		2N350A		MOT	
2N1192		MOT	T030	2N271A	GP-S	RAY		2N1038		TI	
2N465		IND		2N484		IND		CDT1349A		CLE	T03
2N240	GP-S	PHL		2N404		RCA		2N307A	GP-AF	STL	T03
2N583		RCA		2N272	GP-AF	RAY		2N350A		MOT	
2N241	GP-AF	GE		2N109		RCA		2N456A		TI	
2N1192		MOT	T032	2N273	GP-AF	RAY		2N301*		RCA	T03
2N1370		TI		2N109		RCA		CDT1349A		CLE	
2N217		RCA		2N381		IND		2N308	GP-IF	TI	
8FT323		CSF	T01	2N274	GP-RF	RCA		2N417		IND	
2N383		IND		2N1107		TI		2N373		RCA	
2N241A	GP-AF	GE		2N277	GP-AF	DEL		2N309	GP-IF	TI	
2N1192		MOT	T032	CTP1508		CLE		2N417		IND	
2N1382		TI		2N512		TI		2N373		RCA	
2N270		RCA		8FT265		CSF	T06	2N310	GP-IF	TI	
8FT323		CSF	T01	2N278	GP-AF	DEL		2N465		IND	
2N466		IND		CTP1504		CLE		2N373		RCA	
2N242	GP-AF	STL	T03	2N512A		TI		2N311	GP-S	GT	T08
2N176		MOT		2N279	GP-AF	AMP		2N1191		MOT	
2N457A		TI		2N217		RCA		2N404		RCA	
2N301A*		RCA		2N650		MOT		2N312	GP-S	MOT	
2N257		CLE	T03	TR320		IND	T026	2N585		RCA	
2N248	GP-RF	TI		2N280	GP-AF	AMI'		2N315	GP-S	GT	
2N274		RCA		2N215		RCA		2N578		RCA	
2N249	GP-AF	TI		2N650		MOT	T026	2N1305		TI	
2N270		RCA		2N1352		IND		2N316	GP-S	GT	
2N250	GP-AF	TI	T03	2N281	GP-AF	AMP		2N579		RCA	
CDT1309		CLE	T03	2N217		RCA		2N1307		TI	
2N176		MOT		2N651		MOT	T026	2N317	GP-S	GT	
2N301*		RCA		2N283	GP-AF	AMP		2N582		RCA	
2N251	GP-AF	TI	T03	2N215		RCA		2N1309		TI	
2N268		CLE	T03	2N650		MOT	T026				
2N1530		MOT									
2N301A*		RCA									

# 3 new additions to the



## TYPE 2N768

- Micro-energy switch—designed for low current, low voltage, high speed applications
- 10 mc pulse rates, collector currents as low as 1 ma, collector supply voltages as low as 1 volt
- No reduction in switching speed, as with ordinary low current, low voltage devices. Permits higher density packaging
- Typical DC beta of 40 @  $V_{ce} = -0.20$  v,  $I_c = -2$  ma

## TYPE 2N769

- World's fastest switch—will operate reliably at speeds in excess of 100 mc
- Gain bandwidth product (f<sub>r</sub>) typically 900 mc
- Low capacitance, low saturation voltage, high beta—ideal for low-level, high-frequency logic circuits
- Extremely low hole storage factor ( $K'_s$ ) typically 18 nsec

## TYPE 2N779A

- Manufactured with tighter parameter control than any other transistor in the industry
- Designed to meet rigid specifications of 16 electrical characteristics—ideal for NOR logic and other super-critical applications
- Low saturation voltage—typically 0.09 volts
- Higher in performance, lower in price than mesa transistors with lesser specifications

# SPRAGUE MADT\* transistor line!

High-speed switching transistors in TO-18 cases are now being mass-produced by Sprague. These hermetically-sealed germanium Micro-Alloy Diffused-base Transistors are made by a controlled-etch process to insure extreme uniformity. Maximum frequency capabilities have been improved by graded-base construction. Automated manufacturing techniques have brought about increased production efficiency, permitting favorable reductions in prices. This is why Sprague MADT Transistors can offer you greater performance per dollar than other high-speed devices in low-current switching circuits.

### Other Sprague Micro-Alloy Diffused-Base Transistors

TYPE	APPLICATION
2N499	Amplifier, to 100 mc
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 mc

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

\*Trademark of Philco Corporation

### SPRAGUE COMPONENTS

TRANSISTORS  
CAPACITORS  
RESISTORS  
MAGNETIC COMPONENTS

INTERFERENCE FILTERS  
PULSE TRANSFORMERS  
PIEZOELECTRIC CERAMICS  
PULSE-FORMING NETWORKS

HIGH TEMPERATURE MAGNET WIRE  
CERAMIC-BASE PRINTED NETWORKS  
PACKAGED COMPONENT ASSEMBLIES  
FUNCTIONAL DIGITAL CIRCUITS



"Sprague" and "®" are registered trademarks of the Sprague Electric Co.



# TRANSISTOR INTERCHANGEABILITY CHART

EIA NO. & SIMILAR TYPE	DESCR & APP.	MFR**	CASE FIG.	EIA NO. & SIMILAR TYPE	DESCR & APP.	MFR**	CASE FIG.	EIA NO. & SIMILAR TYPE	DESCR & APP.	MFR**	CASE FIG.
<u>2N319</u>	GP-AF	GE		<u>2N350</u>	GP-AF	MOT	T03	<u>2N376A</u>	GP-AF	BEN	T03
2N1191		MOT	T03	2N350A		MOT		2N301B		CLE	T03
2N1383		TI		2N251		TI		2N301		RCA	
2N270		RCA		2N301		RCA					
2T321		SON		2N301		CLE	T03	<u>2N377</u>	GN-S	SYL	
SFT321		CSF	T01					2N1090		RCA	
				<u>2N350A</u>	GP-AF	MOT	T03	2N1304		TI	T03
				2N301		CLE	T03	SFT280		CSF	
<u>2N320</u>	GP-AF	GE		2N251		TI		<u>2N378</u>	GP-P	TS	T03
2N1192		MOT	T03					CDT1319		CLE	T03
2N1383		TI		<u>2N351</u>	GP-AF	MOT	T03	2N176		MOT	
2N270		RCA		2N251		CLE	T03	<u>2N379</u>	GP-P	TS	T03
2T322		SON				TI		CDT1321		CLE	T03
SFT322		CSF	T01	<u>2N351A</u>	GP-AF	MOT	T03	2N1531		MOT	
TR320		IND		2N301G		CLE	T03	<u>2N380</u>	GP-P	TS	T03
				2N251		TI		CDT1320		CLE	T03
<u>2N321</u>	GP-AF	GE						2N1530		MOT	
2N1193		MOT	T05	<u>2N352</u>	GP-AF	PHL		<u>2N381</u>	GP-AF	TS	
2N1382		TI		2N301B		CLE	T03	2N270		RCA	T09
2N270		RCA		2N351A		MOT		2N1192		MOT	
2T323		SON		2N301*		RCA		<u>2N382</u>	GP-AF	TS	
SFT323		CSF	T01					2N270		RCA	T09
TR321		IND		<u>2N353</u>	GP-AF	PHL		2N1192		MOT	
				2N353		PHL		<u>2N383</u>	GP-AF	TS	
<u>2N322</u>	GP-AF	GE		2N301B		CLE	T03	2N270		RCA	T09
2N1191		MOT	T05	2N376		MOT		2N1192		MOT	
2N1273		TI		2N301*		RCA		<u>2N384</u>	GP-RF	RCA	
2N406		RCA						2T201		SON	
2T311		SON		<u>2N356</u>	GN-S	GT		2N1107		TI	
TR322		IND		2N585*		RCA		XA131		AEI	
				<u>2N357</u>	GN-S	GT		<u>2N385</u>	GP-S	SYL	
<u>2N323</u>	GP-AF	GE		2N1090		RCA		2N1090		RCA	
2N1192		MOT	T05	<u>2N358</u>	GN-S	GT		2N1302			
2N1370		TI		2N1091*		RCA		<u>2N386</u>	GP-AF	PHL	
2N270		RCA						CDT1320		CLE	T03
2T313		SON		<u>2N359</u>	GP-AF	RAY		2N1531		MOT	
TR323		IND		2N652		MOT	T09	2N301A		RCA	
				2N1382		TI		<u>2N387</u>	GP-AF	PHL	
<u>2N324</u>	GP-AF	GE		<u>2N360</u>	GP-AF	RAY		CDT1321		CLE	T03
2N1193		MOT	T05	2N652		MOT	T09	2N1531		MOT	
2N1370		TI		2N1382		TI		2N301A		RCA	
2N407		RCA		<u>2N361</u>	GP-AF	RAY		<u>2N387</u>	GP-AF	PHL	
2T314		SON		2N651		MOT	T09	CDT1321		CLE	T03
TR324		IND		2N1382		TI		2N1531		MOT	
				<u>2N362</u>	GP-AF	RAY		<u>2N388</u>	GN-S	SYL	
<u>2N325</u>	GP-AF	SYL	T03	2N1192		MOT	T09	SFT261		CSF	T05
CDT1319		CLE	T03	2N1382		TI		2N1306		TI	
2N176		MOT		<u>2N363</u>	GP-AF	RAY		2N1090		RCA	
2N301		RCA		2N1191		MOT	T09	<u>2N392</u>	GP-P	DEL	T03
<u>2N326</u>	GP-AF	SYL		2N1373		TI		2N1550		MOT	
2N301		RCA		<u>2N367</u>	GN-GP	TI		2N457A		TI	
2T501		SON		2N406		RCA		CDT1311		CLE	T03
				2N1191		MOT	T030	<u>2N394</u>	GP-S	GE	
<u>2N331</u>	GP-AF	RCA		TR34		IND		2N404		RCA	
2N1039		TI		<u>2N368</u>	GP-GP	TI		2N1303		TI	
<u>2N332A</u>	SN-S	GE		2N215		RCA		<u>2N395</u>	GP-S	GE	
2N1564		TI		2N1191		MOT	T030	2N581		RCA	T05
<u>2N333A</u>	SN-S	GE		TR722		IND		SFT226		CSF	
2N1564		TI		<u>2N369</u>	GP-GP	TI		<u>2N396</u>	GP-S	GE	
<u>2N334A</u>	SN-S	GE		2N215		RCA		2N404		RCA	T05
2N1565		TI		2N1191		MOT	T030	SFT227		CSF	
<u>2N335A</u>	SN-S	GE		TR722		IND		<u>2N397</u>	GP-S	GE	
2N1565		TI		<u>2N370</u>	GP-RF	RCA		2N582		RCA	T05
<u>2N336A</u>	SN-S	GE		2N1107		TI		SFT228		CSF	
2N1566		TI		<u>2N371</u>	GP-RF	RCA		<u>2N398</u>	GP-S	RCA	T09
<u>2N337A</u>	SN-S	GE		2N1109		TI		SFT245		CSF	
2N1564		TI		<u>2N372</u>	GP-RF	RCA		<u>2N399</u>	GP-AF	BEN	T03
<u>2N338A</u>	SN-S	GE		2N1108		TI		2N456		RCA	T03
2N1564		TI		<u>2N373</u>	GP-RF	RCA		2N257B		CLE	T03
<u>2N344</u>	GP-S	PHL		2N1110		TI		2N351A		MOT	
2N274		RCA		<u>2N374</u>	GP-RF	RCA		2N456A		TI	
<u>2N345</u>	GP-RF	PHL		2N1108		TI		<u>2N400</u>	GP-AF	BEN	T03
2N274		RCA		<u>2N375</u>	GP-P	MOT	T03	2N456		RCA	T03
<u>2N346</u>	GP-RF	PHL		CDT1321		CLE	T03	2N257W		CLE	T03
2N384		RCA		2N458A		TI		2N350A		MOT	
<u>2N347</u>	SN-AF	BOG		2N581		RCA		2N456A		TI	
951		TI		<u>2N376</u>	GP-AF	MOT	T03	<u>2N401</u>	GP-AF	BEN	T03
<u>2N348</u>	SN-AF	BOG		2N301B		CLE	T03	2N456		RCA	T03
952		TI		2N251		TI		2N257		CLE	T03
<u>2N349</u>	SN-AF	BOG						2N176		MOT	T03
953		TI						2N456A		TI	



## Widest Choice of Glass Sealing Alloys for Semi-Conductors



You use different glasses for different semi-conductor applications. So to get the most perfect match of glass-sealing alloy, choose from the broad line offered by Superior. Quantities as small as 50 ft. in any size and analysis may be ordered and in precision-cut short lengths. All alloys are cold drawn to close tolerances in seamless or WELDRAWN<sup>1</sup> form. Sizes from .012 to 1/2-in. OD. In addition to the standard alloys listed in the following, many special alloys are available to order. For complete details, write for Data Memo No. 15, Superior Tube Co., 2502 Germantown Ave., Norristown, Pennsylvania.

**Kovar.**<sup>2</sup> Excellent for hard glasses. Oxide fuses into glass. Provides vacuum-tight joint. Coef. thermal expansion 50.3/53.7 (30-450°C). See note.

**Sylvania #4.**<sup>3</sup> Well matched for certain soft glasses. Used for internal seals. Coef. thermal expansion 85 (25-300°C). See note.

**#52 Alloy.** Popular for sensitive magnetic use and for thermostatic work. Coef. thermal expansion 95 (20-400°C). See note.

**#42 Alloy.** A nickel-iron alloy practical for sealing to soft glass. Coef. thermal expansion 53 (20-400°C). See note.

<sup>1</sup>A Superior trademark registered United States and Canada.

<sup>2</sup>Kovar Alloy Tubing is stocked and sold through the Stupakoff Division of The Carborundum Company, Latrobe, Pa. The name "Kovar" is a registered trademark of the Westinghouse Electric Corporation (No. 337,962).

<sup>3</sup>T.M. Reg. U.S. Pat. Off., Sylvania Electric Products, Inc. Note: Expressed in in./in./°F (x 10<sup>-1</sup>).

**AISI Type MT-1010.** A low carbon steel with good bending and flaring qualities.

**OFHC Copper.** May be used with either hard or soft glasses. Coef. thermal expansion 165 (25-300°C). See note.

**AISI Type 446.** Stainless steel suitable for soft glasses. Highest heat resistance of chromium irons.

**AISI Type 430.** Less chromium than 446. Easier to work. Appropriate for soft glass seals.

**AISI Type 430 Ti.** Same properties as Type 430. Stabilized with titanium to improve weldability. Suitable for soft glasses.

**Superior Tube**  
The big name in small tubing  
NORRISTOWN, PA.

Johnson & Hoffman Mfg. Corp., Mineola, N. Y.—an affiliated company making precision metal stampings and deep-drawn parts.

## TRANSISTOR INTERCHANGEABILITY CHART

EIA NO. & SIMILAR TYPE	DESCR & APP.	MFR**	CASE FIG.†	EIA NO. & SIMILAR TYPE	DESCR & APP.	MFR**	CASE FIG.†	EIA NO. & SIMILAR TYPE	DESCR & APP.	MFR**	CASE FIG.†
<u>2N402</u>	GP-AF	W		<u>2N422</u>	GP-AF	RAY		<u>2N458A</u>	GP-P		T03
2N406		RCA		2N1191		MOT	T09	2N1537		MOT	
2N1191		MOT	T05	2N1373		TI		CDT1312		CLE	T03
TR722		IND		2N215		RCA		<u>2N459</u>	GP-P	TS	T03
<u>2N403</u>	GP-AF	W		<u>2N424</u>	SN-P	TI		2N1532		MOT	
2N215		RCA		<u>2N425</u>	GP-S	RAY		CDT1322		CLE	T03
2N1191		MOT	T05	2N404		RCA		<u>2N460</u>	GP-AF	TS	
2N465		IND		2N1303		TI		2N650		MOT	T05
<u>2N404</u>	GP-S	RCA		<u>2N426</u>	GP-S	RAY		2N1373		TI	
2N1404		TI		2N578		RCA		2N331		RCA	
<u>2N404A</u>	GP-S	RCA		2N1303		TI		2N1451		IND	
2N1404		TI		<u>2N427</u>	GP-S	RAY		<u>2N461</u>	GP-AF	TS	
<u>2N405</u>	GP-AF	RCA		2N579		RCA		2N331		RCA	
2N1191		MOT	T026	2N1305		TI		2N1373		TI	
2N1372		TI		<u>2N428</u>	GP-S	RAY		2N1452		IND	
2N362		IND		2N580		RCA		<u>2N463</u>	GP-AF	WE	
<u>2N406</u>	GP-AF	RCA		2N1307		TI		2N639		CLE	T03
2N1191		MOT	T01	<u>2N438</u>	GN-S	CBS		2N1551		MOT	
2N1273		TI		2N1302		TI		<u>2N464</u>	GP-AF	RAY	
2N362		IND		<u>2N438A</u>	GN-S	CBS		2N270		RCA	
<u>2N407</u>	GP-AF	RCA		2N1302		TI		2N1373		TI	
2N1192		MOT	T026	<u>2N439</u>	GN-S	CBS		<u>2N465</u>	GP-AF	RAY	
2N1370		TI		2N1304		TI		2N270		RCA	
2N633		IND		2N585		RCA		2N1373		TI	
<u>2N408</u>	GP-AF	RCA		2N1302		TI		<u>2N466</u>	GP-AF	RAY	
2N1192		MOT	T01	<u>2N439A</u>	GN-S	CBS		2N270		RCA	
2N1370		TI		2N1090		RCA		2N1375		TI	
2N633		IND		2N1304		TI		<u>2N467</u>	GP-AF	RAY	
<u>2N409</u>	GP-IF	RCA		<u>2N440</u>	GN-S	CBS		2N1379		TI	
2N482		IND		2N1306		TI		<u>2N470</u>	SN-RF	TEC	
2N1110		TI		<u>2N440A</u>	GN-S	CBS		2N332		TI	
<u>2N410</u>	GP-IF	RCA		2N1090		RCA		<u>2N471</u>	SN-RF	TEC	
2N482		IND		2N1306		TI		2N1140		TI	
2N1110		TI		<u>2N441</u>	GP-AF	DEL		<u>2N471A</u>	SN-		
<u>2N411</u>	GP-RF	RCA		CTP1508		CLE	T03	2N1149		TI	
2N485		IND		2N512		TI		<u>2N473</u>	SN-RF		
2N1108		TI		8FT265		CSF	T06	2N333		TI	
<u>2N412</u>	GP-RF	RCA		<u>2N442</u>	GP-AF	DEL		<u>2N474</u>	SN-RF	TEC	
2N485		IND		CTP1504		CLE	T03	2N1150		TI	
2N1108		TI		2N512A		TI		<u>2N474A</u>	SN-		
<u>2N413</u>	GP-IF	RAY		<u>2N443</u>	GP-AF	DEL		2N1150		TI	
2N218		RCA		CTP1504		CLE	T03	<u>2N475</u>	SN-RF	TEC	
2N1109		TI		2N512A		TI		2N333		TI	
<u>2N414</u>	GP-IF	RAY		<u>2N444</u>	GN-S	GT		<u>2N476</u>	SN-RF	TEC	
2N218		RCA		2N585		RCA		2N702		TI	
2N1304		TI		<u>2N445</u>	GN-S	GT		2N477		SN-RF	TEC
<u>2N415</u>	GP-RF	RAY		2N585		RCA		2N477		TI	
2N521		IND		2N1302		TI		2N702		TI	
2N374		RCA		<u>2N446</u>	GN-S	GT		<u>2N478</u>	SN-RF	TEC	
<u>2N416</u>	GP-IF	RAY		2N1090		RCA		2N335		TI	
2N274		RCA		2N1304		TI		<u>2N479</u>	SN-RF	TEC	
2N1107		TI		<u>2N447</u>	GP-S	GT		2N119		TI	
<u>2N417</u>	GP-IF	RAY		2N1091		RCA		<u>2N479A</u>	SN-		
2N274		RCA		2N1306		TI		2N119		TI	
2N1107		TI		<u>2N450</u>	GN-RF	GE		<u>2N480</u>	SN-RF	TEC	
<u>2N418</u>	GP-AF	BEN	T03	2N1347		IND		2N335		TI	
2N1537		MOT		2N1305		TI		<u>2N481</u>	SN-RF	RAY	
2N1021		TI		<u>2N456</u>	GP-P	TI	T03	2N371		RCA	
2N301		RCA		CDT1310		CLE	T03	2N1109		TI	
CDT1312		CLE	T03	<u>2N456A</u>	GP-P	TI	T03	<u>2N482</u>	GP-IF	RAY	
<u>2N419</u>	GP-P	BEN	T03	2N1535		MOT		2N373		RCA	
CDT1319		CLE	T03	CDT1310		CLE	T03	2N1110		TI	
2N456A		TI		<u>2N457</u>	GP-P	RCA	T03	<u>2N483</u>	GP-IF	RAY	
<u>2N420</u>	GP-P	BEN	T03	CDT1311		CLE	T03	2N373		RCA	
2N1535		MOT		<u>2N457A</u>	GP-P	GE	T03	2N1110		TI	
2N457A		TI		2N1536		MOT		<u>2N484</u>	GP-IF	RAY	
CDT1310		CLE	T03	CDT1311		CLE	T03	2N373		RCA	
<u>2N420A</u>	GP-P	BEN	T03	<u>2N458</u>	GP-S	TI	T03	2N1110		TI	
2N1537		MOT		CDT1312		CLE	T03	<u>2N484A</u>	GP-IF	RAY	
2N458A		TI						2N373		RCA	
CDT1312		CLE	T03					2N1110		TI	

# DIFFERENT SIZE - SAME PERFORMANCE



MY SIN, COURTESY OF LANVIN

## NEW TO-18 TYPES NOW AVAILABLE

2N935  
2N936  
2N937  
2N938  
2N939  
2N940  
2N941\*  
2N942\*  
2N943\*  
2N944\*  
2N945\*  
2N946\*

## TO-5 EQUIVALENT

2N327A  
2N328A  
2N329A  
2N1025  
2N1026  
2N1469  
2N1917\*  
2N1918\*  
2N1919\*  
2N1920\*  
2N1921\*  
2N1922\*

**More than just another transistor - available now, a full line of PNP Alloy Junction Silicon Transistors in a smaller case (TO-18) with the same high performance as TO-5.**

The engineering problem of getting the exact performance from a substantially smaller unit has for years faced engineers using silicon transistors. Now Sperry offers you PNP Alloy Junction Silicon Transistors in a higher density package than the popular TO-5. These new TO-18s have the same electrical characteristics, are smaller in size, lighter in weight than TO-5 . . . and at no increase in price.

**THESE PNP ALLOY SILICON TRANSISTORS, IN EITHER CASE, ARE PARTICULARLY WELL-SUITED FOR**

- Medium frequency digital switching circuits
- Operational analogue elements
- Audio and communication circuits
- Airborne and missile instrumentation
- Nuclear instrumentation

\*Chopper Transistors — for single use or matched pairs that have the best combination of chopper characteristics available — high breakdown ratings 50 to 80 volts. Two point control of current/voltage offset parameters. Matched pairs to standard tolerance of 100  $\mu$ v.

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SPERRY RAND CORPORATION  
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SEMICONDUCTOR OPPORTUNITIES  
AVAILABLE TO QUALIFIED ENGINEERS

\*Trade Mark, Sperry Rand Corporation

# TRANSISTOR INTERCHANGEABILITY CHART

EIA NO. & SIMILAR TYPE	DESCR & APP.	MFR**	CASE FIG.	EIA NO. & SIMILAR TYPE	DESCR & APP.	MFR**	CASE FIG.	EIA NO. & SIMILAR TYPE	DESCR & APP.	MFR**	CASE FIG.
<u>2N485</u>	GP-IF	RAY		<u>2N521</u>	GP-S	GT		<u>2N542</u>	SN-RF	TEC	
2N374		RCA		2N579		RCA		2N1153		TI	
2N1108		TI		2N1307		TI		<u>2N543</u>	SN-RF	TEC	
<u>2N486</u>	GP-IF	RAY		<u>2N522</u>	GP-S	GT		2N336		TI	
2N374		RCA		2N580		RCA		<u>2N544</u>	GP-RF	RCA	
2N1108		TI		2N1307		TI		2N1107		TI	
<u>2N495</u>	SP-S	PHL		<u>2N523</u>	GP-S	GT		<u>2N545</u>	SN-S	TEC	
2N726		TI		2N643		RCA		2N1714		TI	
<u>2N496</u>	SP-S	PHL		2N1309		TI		<u>2N546</u>	SN-S	TEC	
2N726		TI		<u>2N524</u>	GP-AF	GE		2N1714		TI	
<u>2N497</u>	SN-P	TI		2N650		MOT	T05	<u>2N547</u>	SN-S	TEC	
<u>2N499</u>	GP-RF	PHL		2N1373		TI		2N1714		TI	
2N371		RCA		2N586		RCA		<u>2N549</u>	SN-S	TEC	
2N1407		TI		2N1446		IND		2N1714		TI	
<u>2N500</u>	GP-RF	PHL		<u>2N525</u>	GP-AF	GE		<u>2N548</u>	SN-S	TEC	
2N1407		TI		2N650		MOT	T05	2N1714		TI	
<u>2N502</u>	GP-RF	PHL		2N1373		TI		<u>2N549</u>	SN-S	TEC	
2N1407		TI		2N586		RCA		2N1714		TI	
<u>2N502A</u>	GP-RF	PHL		SFT242		CSF	T05	<u>2N550</u>	SN-S	TEC	
2N1407		TI		2N1447		IND		2N1714		TI	
<u>2N503</u>	GN-RF	PHL		<u>2N526</u>	GP-AF	GE		<u>2N551</u>	SN-S	TEC	
2N1407		TI		2N651		MOT	T05	2N1714		TI	
<u>2N504</u>	GP-IF	PHL		2N1375		TI		<u>2N552</u>	SN-S	TEC	
2N373		RCA		2N586		RCA		2N656		TI	
<u>2N508</u>	GP-RF	GE		2T383		SON	T05	<u>2N553</u>	SN-S	DEL	T03
2N1193		MOT	T05	SFT242		CSF	T05	2N656		TI	
2N1274		TI		2N1448		IND		<u>2N554</u>	SN-S	TEC	
2T315		SON		<u>2N527</u>	GP-AF	GE		2N656		TI	
<u>2N511</u>	GP-S	TI	T03	2N652		MOT	T05	<u>2N555</u>	SN-S	DEL	T03
CTP1508		CLE	T03	2N1377		TI		CST1761		CLE	
<u>2N511A</u>	GP-P	TI	T03	2N586		RCA		2N458A		TI	
CTP1504		CLE	T03	SFT242		CSF	T05	<u>2N554</u>	GP-AF	MOT	T03
<u>2N511B</u>	GP-P	TI	T03	2N1449		IND		CDT1349		CLE	T03
CTP1503		CLE	T03	<u>2N534</u>	GP-S	PHL		2N251		TI	
<u>2N512</u>	GP-P	TI	T03	2N652		MOT	T021	2N301*		RCA	
CTP1508		CLE	T03	<u>2N536</u>	GP-S	PHL		<u>2N555</u>	GP-AF	MOT	T03
<u>2N512A</u>	GP-P	TI	T03	2N1193		MOT	T021	CDT1349		CLE	T03
CTP1504		CLE	T03	2N578		RCA		<u>2N556</u>	GN-S	SYL	
<u>2N512B</u>	GP-P	TI	T03	<u>2N535</u>	GP-AF	PHL		2N1308		TI	
CTP1503		CLE	T03	2N1192		MOT	T021	<u>2N557</u>	GN-S	SYL	
<u>2N513</u>	GP-P	TI	T03	2N1376		TI		2N1304		TI	
CTP1552		CLE	T03	<u>2N535A</u>	GP-GP	PHL		<u>2N558</u>	GN-S	SYL	
<u>2N513A</u>	GP-P	TI	T03	2N1376		TI		2N1308		TI	
CTP1544		CLE	T03	<u>2N535B</u>	GP-GP	PHL		<u>2N559</u>	GP-S	WE	
<u>2N513B</u>	GP-P	TI	T03	2N1378		TI		2N645		RCA	
CTP1545		CLE	T03	<u>2N536</u>	GP-S	PHL		<u>2N560</u>	SN-S	WE	
<u>2N514</u>	GP-AF	TI	T03	2N578		RCA		2N708A		TI	
CTP1552		CLE	T03	<u>2N537</u>	GP-RF	WE		<u>2N561</u>	GP-P	RCA	T03
<u>2N514A</u>	GP-P	TI	T03	2N1141		TI		CDT1321		CLE	T03
CTP1544		CLE	T03	<u>2N538</u>	GP-GP	MH		2N1551		MOT	
<u>2N514B</u>	GP-P	TI	T03	2N1531		MOT		<u>2N563</u>	GP-GP	GT	
CTP1545		CLE	T03	2N1044		TI		2N564		IND	T032
<u>2N518</u>	GP-S	GE		CDT1321		CLE	T03	2N650		MOT	
2N404		RCA		<u>2N538A</u>	GP-GP	MH		<u>2N564</u>	GP-GP	GT	T09
2N416		IND		2N1531		MOT		2N650		TI	
<u>2N519</u>	GP-S	GT		2N1044		TI		<u>2N565</u>	GP-S	WE	
2N1191		MOT	T09	CDT1321		CLE	T03	2N651		SN-S	
2N1303		TI		<u>2N539</u>	GP-GP	MH		<u>2N566</u>	GP-P	RCA	T03
2N578		RCA		CDT1321		CLE	T03	2N651		TI	
<u>2N519A</u>	GP-S	IND		2N1535		MOT		<u>2N567</u>	GP-GP	GT	T09
2N1191		MOT	T09	<u>2N539A</u>	GP-GP	MH		2N568		IND	T032
<u>2N520</u>	GP-S	GT		CDT1321		CLE	T03	2N652		MOT	
2N1191		MOT	T09	2N1536		MOT		<u>2N568</u>	GP-GP	GT	T09
2N1305		TI		<u>2N540</u>	GP-GP	MH		2N568		IND	T032
2N578		RCA		2N1551		MOT		2N652		MOT	T09
				2N1044		TI		<u>2N569</u>	GP-GP	GT	
				CDT1312		CLE	T03	2N570		IND	T032
				<u>2N540A</u>	GP-GP	MH		2N652		MOT	
				2N1551		MOT		<u>2N570</u>	GP-GP	GT	T09
				2N1044		TI		2N652		TI	
				CDT1312		CLE	T03				
				<u>2N541</u>	SN-RF	TEC					
				2N336		TI					

# TRANSISTOR INTERCHANGEABILITY CHART

EIA NO. & SIMILAR TYPE	DESCR & APP.	MFR**	CASE FIG.†	EIA NO. & SIMILAR TYPE	DESCR & APP.	MFR**	CASE FIG.†	EIA NO. & SIMILAR TYPE	DESCR & APP.	MFR**	CASE FIG.†
2N571	GP-GP	GT		2N606	GP-GP	GT		2N635	GP-S	GE	
2N572		IND		2N384		RCA		2N1091		RCA	
2N652		MOT	T032					2N1306		TI	
2N572	GP-GP	GT		2N607	GP-GP	GT		2N636	GP-S	GE	
2N652		MOT	T09	2N384		RCA		2N1091		RCA	
2N574	GP-GP	MH		2N608	GP-GP	GT		2N1308		TI	
2N1500		MOT		2N384		RCA		2N637	GP-P	BEN	T03
2N457A		TI		2N609	GP-AF	W		2N1535		MOT	
CTP1551		CLE	T03	2N380		IND		2N458A		TI	
2N574A	GP-GP	MH		2N1193		MOT	T05	CDT1310		CLE	T03
2N1500		MOT		2N217		RCA		2N637A	GP-P	BEN	T03
2N458A		TI		2N610	GP-AF	W		2N1537		MOT	
CTP1551		CLE	T03	2N465		IND		2N457A		TI	
2N575	GP-GP	MH		2N1193		MOT	T05	CDT1321		CLE	T03
2N1554		MOT		2N217		RCA		2N637B	GP-P	BEN	T03
2N457A		TI		2N611	GP-AF	W		2N1538		MOT	
CTP1544		CLE	T03	2N464		IND		2N458A		TI	
2N575A	GP-GP	MH		2N1192		MOT	T05	CDT1322		CLE	T03
2N1555		MOT		2N217		RCA		2N638	GP-P	BEN	T03
2N458A		TI		2N612	GP-AF	W		2N1530		MOT	
CTP1545		CLE	T03	2N217		RCA		2N456A		TI	
2N576	GP-S	SYL		2N612		IND		CDT1319		CLE	T03
2N585		RCA		2N217		MOT	T05	2N638A	GP-P	BEN	T03
2T82		SON		2N1191		IND		2N1532		MOT	
2N576A	GP-S	SYL		TR722				2N457A		TI	
2N585		RCA		2N613	GP-AF	W		CDT1321		CLE	T03
2N581	GP-S	RCA		2N270		RCA		2N638B	GP-P	BEN	T03
2N1305		TI		2N1191		MOT	T05	2N1533		MOT	
2N582	GP-S	RCA		2N614	GP-IF	W		2N458A		TI	
2N1309		TI		2N373		RCA		CDT1322		CLE	T03
2N583	GP-S	RCA		2N615	GP-IF	W		2N639	GP-P	BEN	T03
2N1305		TI		2N373		RCA		2N1530		MOT	
2N584	GP-S	RCA		2N617	GP-RF	W		2N456A		TI	
2N1309		TI		2N374		RCA		CDT1310		CLE	T03
2N585	GP-S	RCA		2N618	GP-AF	MOT	T03	2N639A	GP-P	BEN	T03
2N1302		TI		CDT1312		CLE	T03	2N1532		MOT	
2T682		SON		2N458A		TI		2N457A		TI	
2N586	GP-S	RCA		2N619	SN-S	RAY		CDT1312		CLE	T03
2N651		MOT	T07	2N1564		TI		2N639B	GP-P	BEN	T03
2N1377		TI		2N620	SN-S	RAY		2N1533		MOT	
2N589	GP-AF	PHL		2N1565		TI		2N458A		TI	
2N1532		MOT		2N621	SN-S	RAY		CDT1313		CLE	T03
2N591	GP-AF	RCA		2N1566		TI		2N643	GP-S	RCA	
2N1192		MOT	T01	2N622	SP-AF	RAY		XA141		AEI	
2N1370		TI		2N339		TI		2N1309		TI	
2N594	GN-S	GT		2N623	GN-S	TI		2N644	GP-	RCA	
2N1304		TI		2N645		RCA		XA142		AEI	
2N595	GN-S	GT		2N627	GP-AF	MOT	T03	2N645	GP-	RCA	T033
2N1169		RCA		CTP1508		CLE	T03	XA143		AEI	
2N1306		TI		2N511		TI		2N647	GP-AF	RCA	
2N596	GN-S	GT		2N628	GP-AF	MOT	T03	2T681		SON	
2N1170		RCA		CTP1504		CLE	T03	2N650	GP-AF	MOT	
2N1300		TI		2N511A		TI		2N1373		IND	
2N597	GP-S	PHL		2N629	GP-AF	MOT	T03	2N651	GP-AF	MOT	
2N578		RCA		CTP1503		CLE	T03	2N1375		TI	
2N598	GP-S	PHL		2N511B		TI		2N652	GP-AF	MOT	
2N579		RCA		2N630	GP-AF	MOT	T03	2N1377		TI	
2N599	GP-S	PHL		CTP1500		CLE	T03	2N653	GP-AF	MOT	
2N580		RCA		2N511B		TI		2N1372		IND	
2N602	GP-S	GT		2N631	GP-AF	RAY		2N654	GP-AF	MOT	
2N643		RCA		2N408		RCA		2N1374		TI	
2N1309		TI		2N1193		MOT	T09	2N655	GP-AF	MOT	
2N603	GP-S	GT		2N632	GP-AF	RAY		2N1376		TI	
2N644		RCA		2N1193		MOT	T09	2N656	SN-P	TI	
2N604	GP-S	GT		2N1370		TI		2N659	GP-S	RAY	
2N645		RCA		2N127		RCA		2N578		RCA	
2N605	GP-GP	GT		2N633	GP-AF	RAY		2N660	GP-S	RAY	
2N384		RCA		2N1192		MOT	T09	2N643		RCA	
				2N1274		TI					
				2N270		RCA					
				2N634	GP-S	GE					
				2N1304		TI					

## TRANSISTOR INTERCHANGEABILITY CHART

EIA NO. & SIMILAR TYPE	DESCR & APP.	MFR**	CASE FIG.†	EIA NO. & SIMILAR TYPE	DESCR & APP.	MFR**	CASE FIG.†	EIA NO. & SIMILAR TYPE	DESCR & APP.	MFR**	CASE FIG.†
2N661	GP-S	RAY		2N1008B	GP-AF	BEN		2N1032B	GP-P	BEN	T03
2N643		RCA		2N651		MOT	T09	2N1559		MOT	
2N662	GP-S	RAY		2N1039		TI		2N512B		TI	
2N570		RCA		2N1011	GP-AF	BEN	T03	2N1147B		CLE	
2N665	GP-P	DEL	T03	2N458A		TI		2N1032C	GP-P	BEN	T03
CTP1729		CLE		2N1014	GP-AF	RCA	T03	2N1560		MOT	
2N458A		TI		CTP1500		CLE	T03	2N512B		TI	
2N669	GP-AF	MOT	T03	2N1016A	SN-P	W		2N1147C		CLE	T03
CDT1349		CLE	T03	2N1487		RCA		2N1034	SP-AF	RAY	
2N458A		TI		2N1016B	SN-P	W		2N1132		TI	
2N677	GP-AF	BEN	T03	2N1488		RCA		2N1035	SP-AF	RAY	
2N1553		MOT		2N1017	GP-S	RAY		2N1132		TI	
2N512A		TI		2N582		RCA		2N1036	SP-AF	RAY	
CTP1508		CLE	T03	2N1021	GP-P	TI	T03	2N1132		TI	
2N677A	GP-AF	BEN	T03	CDT1313		CLE	T03	2N1037	EP-AF	RAY	
2N1554		MOT		2N1538		MOT		2N1132		TI	
2N511A		TI		2N1022	GP-P	TI		2N1038	GP-S	TI	
CTP1504		CLE	T03	2N1538		MOT		CTP1728		CLE	
2N677B	GP-AF	BEN	T03	2N1029	GP-P	BEN	T03	2N1183		RCA	
2N1555		MOT		2N1553		MOT		2N1039	GP-S	TI	
2N512B		TI		2N1553		MOT		CTP1735		CLE	
CTP1503		CLE	T03	2N512A		TI		2N1183A*		RCA	
2N677C	GP-AF	BEN	T03	CTP1506		CLE	T03	2N1040	GP-S	TI	
2N1556		MOT		2N1029A	GP-P	BEN	T03	CTP1729		CLE	
2N512B		TI		2N1554		MOT		2N1183B		RCA	
CTP1500		CLE	T03	2N512B		TI		2N1041	GP-S	TI	
2N678	GP-AF	BEN	T03	CTP1504		CLE	T03	CTP1730		CLE	
2N1557		MOT		2N1029B	GP-P	BEN	T03	2N1184B*		RCA	
2N512A		TI		2N1555		MOT		2N1042	GP-P	TI	
2N1144		CLE	T03	2N512B		TI		CTP1731		CLE	
2N678A	GP-AF	BEN	T03	CTP1503		CLE	T03	2N1043	GP-P	TI	
2N1558		MOT		2N1029C	GP-P	BEN	T03	CTP1738		CLE	
2N512A		TI		2N1556		MOT		2N1044	GP-P	TI	
2N1146A		CLE	T03	2N512B		TI		CTP1732		CLE	
2N678B	GP-AF	BEN	T03	CTP1500		CLE	T03	2N1045	GP-P	TI	
2N1559		MOT		2N1030	GP-P	BEN	T03	CTP1733		CLE	
2N512B		TI		2N1557		MOT		2N1046	GP-CD	TI	
2N1146B		CLE	T03	2N512A		TI		CTD1321		CLE	T03
2N678C	GP-AF	BEN	T03	2N1146		CLE	T03	2N1054	SN-		
2N1560		MOT		2N1030A	GP-P	BEN	T03	2N498		TI	
2N512B		TI		2N1558		MOT		2N1056	GP-S	GE	
2N1146C		CLE	T03	2N512B		TI		SFT243		CSF	
2N679	GN-S	SYL		CTP1500		CLE	T03	2N650		MOT	T032
2N1302		TI		2N1030B	GP-P	BEN	T03	2N1057	GP-S	GE	
2N680	GP-AF	TI		2N1559		MOT		SFT242		CSF	T03
2N1191		MOT	T030	2N512B		TI		2N650		MOT	T032
2N700	GP-RF	MOT		2N1146B		CLE	T03	2N1058	GP-RF	SYL	
2N1405		TI		2N1030C	GP-P	BEN	T03	2N412		RCA	
2N705	GP-S	TI	T018	2N1560		MOT		2N1059	GP-AF	SYL	
2N1300		RCA		2N512B		TI		2N270		RCA	
2N706	SN-S	FCH		2N1146C		CLE	T03	2N1060	SN-S	WE	
2N706A		TI		2N1031	GP-P	BEN	T03	2N1565		TI	
2N707	SN-S	FCH		2N1553		MOT		2N1067	SN-P	RCA	
2N1491		RCA		2N512A		TI		2N497		TI	
2N707A		TI		CTP3508		CLE	T03	2N1069	SN-P	RCA	
2N717	SN-			2N1031A	GP-P	BEN	T03	2N1722		TI	
2N730		TI		2N1554		MOT		2N1070	SN-P	RCA	
2N718	SN-			2N512A		TI		2N1722		TI	
2N731		TI		CTP3504		CLE	T03	2N1072	SN-CD	WE	
2N741	GP-	MOT		2N1031B	GP-P	BEN	T03	2N1508		TI	
2N711		TI		2N1555		MOT		2N1074	SN-AF	RAY	
2N834	SN-			2N512B		TI		2N359		TI	
2N743		TI		CTP3503		CLE	T03	2N1075	SN-AF	RAY	
2N1008	GP-AF	BEN		2N1031C	GP-P	BEN	T03	2N359		TI	
2N1192		MOT	T09	2N1556		MOT					
2N1038		TI		2N512B		TI					
2N1008A	GP-AF	BEN		CTP3500		CLE	T03				
2N651		MOT	T09	2N1032	GP-P	BEN	T03				
2N1038		TI		2N1557		MOT					
				2N512A		TI					
				2N1147		CLE	T03				
				2N1032A	GP-P	BEN	T03				
				2N1558		MOT					
				2N512A		TI					
				2N1147A		CLE	T03				

# TRANSISTOR INTERCHANGEABILITY CHART

EIA NO. & SIMILAR TYPE	DESCR & APP.	MFR**	CASE FIG -	EIA NO. & SIMILAR TYPE	DESCR & APP.	MFR**	CASE FIG -	EIA NO. & SIMILAR TYPE	DESCR & APP.	MFR**	CASE FIG -
2N1076	SN-AF	RAY		2N1136B	GP-P	BEN	T03	2N1162A	GP-		
2N339		TI		2N1543		MOT		2N514A		TI	
2N1077	SN-AF	RAY		2N1022		TI		2N1163	GP-S	MOT	T03
2N339		TI		2N1137	GP-P	BEN	T03	CTP3544		CLE	T03
2N1078	GP-P	CBS		2N1544		MOT		2N514A		TI	
CTP1735		CLE		2N457A		TI		2N1163A	GP-S		
2N1092	SN-P	RCA		2N1137A	GP-P	BEN	T03	2N514A			
2N497		TI		2N1546		MOT		2N1164	GP-S	MOT	T03
2N1095	SN-RF	BOG		2N1021		TI		CTP1545		CLE	T03
952		TI		2N1137B	GP-P	BEN	T03	2N514B		TI	
2N1096	SN-RF	BOG		2N1547		MOT		2N1164A	GP-		
951		TI		2N1022		TI		2N514B		TI	
2N1097	GP-AF	GE		2N1138	GP-P	BEN	T03	2N1165	GP-S	MOT	T03
2N109		RCA		2N1545		MOT		CTP3545		CLE	T03
2N1191		MOT	T09	2N457A		TI		2N514B		TI	
2N363		IND		2N1138A	GP-P	BEN	T03	2N1165A	GP-		
2N1098	GP-AF	GE		2N1547		MOT		2N514B		TI	
2N109		RCA		2N1021		TI		2N1166	GP-S	MOT	T03
2N1191		MOT	T09	2N1138B	GP-P	BEN	T03	CTP1553		CLE	T03
2N465		IND		2N1548		MOT		2N1167	GP-S	MOT	T03
2N1099	GP-GP	DEL		2N1022		TI		CTP3553		CLE	T03
CTP1503		CLE		2N1139	SN-RF	TEC		2N1168	GP-P	DEL	T03
2N512B		TI		2N715		TI		2N1535		MOT	
2N1100	GP-GP	DEL		2N1140	SN-S	TEC		2N457A		TI	
2N1099		RCA		2N1716		TI		CDT1311		CLE	T03
CTP1500		CLE		2N1144	GP-AF	GE		2N1172	GP-GP	DEL	
2N1101	GN-AF	SYL		2N363		IND		CTP1728		CLE	
2N647		RCA		2N1191		MOT	T032	2N1039		TI	
2N1102	GN-AF	SYL		2N109		RCA		2N301A		RCA	
2N647		RCA		2N1145	GP-AF	GE		2N1176	GP-AF	BEN	
2N1114	GN-CD	SYL		2N109		RCA		2N1191	GP-AF	MOT	T09
2N1306		TI		2N1191		MOT	T032	2N1038		TI	
2N1116	SN-P	TEC		2N465		IND		2N1176A	GP-AF	BEN	
2N1716		TI		2N1146	GP-P	CLE	T03	2N650		MOT	T09
2N1117	SN-P	TEC		2N1557		MOT		2N1038		TI	
2N1716		TI		2N1146A	GP-P	CLE	T03	2N1176B	GP-AF	BEN	
2N1118	SP-RF	PHL		2N1558		MOT		2N650		MOT	T09
2N726		TI		2N1146B	GP-P	CLE	T03	2N1039		TI	
2N1119	SP-S	PHL		2N1559		MOT		2N1177	GP-RF	RCA	
2N726		TI		2N1146C	GP-P	CLE	T03	2N1398		TI	
2N1120	GP-AF	BEN	T03	2N1560		MOT		2N1178	GP-RF	RCA	
2N512B		TI		2N1147	GP-P	CLE	T03	2N1400		TI	
2N1124	GP-S	PHL		2N1557		MOT		2N1179	GP-RF	RCA	
2N651		MOT	T07	2N1147A	GP-P	CLE	T03	2N1399		TI	
2N1377		TI		2N1558		MOT		2N1180	GP-RF	RCA	
2N1125	GP-S	PHL		2N1147B	GP-P	CLE	T03	2N1401		TI	
2N651		MOT	T07	2N1559		MOT		2N1183	GP-P	RCA	T03
2N1377		TI		2N1147C	GP-P	CLE	T03	CTP1728		CLE	
2N1128	GP-S	PHL		2N1560		MOT		2N1183A	GP-P	RCA	T03
2N1192		MOT	T07	2N1157	GP-GP	MH		CTP1735		CLE	
2N1376		TI		2N1163		MOT		2N1183B	GP-P	RCA	T03
2N360		IND		2N514A		CLE	T03	CTP1729		CLE	
2N1129	GP-S	PHL		CTP1544		CLE		2N1184	GP-P	RCA	T03
2N1193		MOT	T07	2N1157A	GP-GP	MH		CTP1728		CLE	
2N1379		TI		2N1165		MOT		2N1184A	GP-P	RCA	T03
2N1130	GP-S	PHL		2N514B		TI		CTP1735		CLE	
2N1193		MOT	T07	CTP1545		CLE		2N1184B	GP-P	RCA	T03
2N1375		TI		2N1159	GP-S	DEL	T03	CTP1729		CLE	
2N359		IND		2N1536		MOT		2N1191	GP-P	MOT	
2N1131	SP-S			2N458A		TI		2N1373		TI	
2N1136	GP-P	BEN	T03	2N1014		RCA		2N1192	GP-AF	MOT	
2N1539		MOI		CDT1312		CLE		2N1375		TI	
2N457A		TI		2N1160	GP-S	DEL	T03	2N1193	GP-AF	MOT	
2N1136A	GP-P	BEN	T03	2N1537		MOT		2N270		RCA	
2N1542		MOT		2N458A		TI					
2N1021		TI		2N1014		RCA					
				CDT1312		CLE					
				2N1162	GP-S		T03				
				CTP1544		CLE					
				2N514A		TI					



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# TRANSISTOR INTERCHANGEABILITY CHART

EIA NO. & SIMILAR TYPE	DESCR & APP.	MFR**	CASE FIG.†	EIA NO. & SIMILAR TYPE	DESCR & APP.	MFR**	CASE FIG.†	EIA NO. & SIMILAR TYPE	DESCR & APP.	MFR**	CASE FIG.†
2N1196	SP-	HU		2N1257	SP-S	HU		2N1301	GP-S	RCA	T05
2N726		TI		2N1131		TI		XA162		AEI	
2N1197	SP-	HU		2N1258	SP-S	HU		2N1303	GP-		T05
2N726		TI		2N1131		TI		2N363		IND	
2N1199	SN-S	PHL		2N1259	SP-S	HU		2N1305	GP-		T05
2N706A		TI		2N1131		TI		2N466		IND	
2N1202	GP-P	MH		2N1261	GP-GP	MH		2N1307	GP-		T05
2N618		MOT		2N1531		MOT		2N426		IND	
2N1044		TI		2N1043		TI		2N1309	GP-		T05
2N561		RCA		CDT1320		CLE	T03	2N428		IND	
CDT1321		CLE	T03	2N1262	GP-GP	MH		2N1320	GP-AF	CBS	
2N1203	GP-P	MH		2N1531		MOT		CTP1728		CLE	
2N1362		MOT		2N1043		TI		2N1321	GP-AF	CBS	
2N1045		TI		CDT1320		CLE	T03	2N1322	GP-AF	CBS	
2N1204	SN-RF	PHL		2N1263	GP-GP	MH		CTP1735		CLE	
2N753		TI		2N618		MOT		2N1323	GN-AF	CBS	
2N1205	SN-IF	TEC		2N1043		TI		2N1324	GP-AF	CBS	
2N703		TI		CDT1311		CLE	T03	CTP1729		CLE	
2N1206	SN-P	TEC		2N1264	GP-GP	SYL		2N1328	GP-AF	CBS	
2N1714		TI		2N370		RCA		CTP1728		CLE	
2N1207	SN-P	TEC		2N1191		MOT		2N1328	GP-AF	CBS	
2N1716		TI		2N1265	GP-RF	SYL		CTP1730		CLE	
2N1208	SN-P	TEC		2N408		RCA		2N1328	GP-AF	CBS	
2N424		TI		2N1192		MOT		CTP1728		CLE	
2N1209	SN-P	TEC		2N1267	SN-RF	PHL		2N1331	GP-AF	CBS	
2N389		TI		2N706A		TI		CTP1729		CLE	
2N1210	SN-	TEC		2N1268	SN-RF	PHL		2N1333	GP-AF	CBS	
2N1722		TI		2N706A		TI		CTP1730		CLE	
2N1211	SN-	TEC		2N1269	SN-RF	PHL		2N1353	GP-S	IND	
2N1722		TI		2N753		TI		2N404		RCA	
2N1219	SP-S	GT		2N1270	SN-RF	PHL		2N1354	GP-S	IND	
2N1131		TI		2N706A		TI		2N581		RCA	
2N1220	SP-S	GT		2N1271	SN-RF	PHL		2N1355	GP-S	IND	
2N1131		TI		2N706A		TI		2N404		RCA	
2N1221	SP-AF	GT		2N1272	SN-RF	PHL		2N1357	GP-GP	DEL	
2N1131		TI		2N753		TI		2N582		RCA	
2N1228	SP-AF	HU		2N1273	GP-AF	TI		2N1358	GP-GP	DEL	
2N1131		TI		TRC71		IND		CTP1503		CLE	T03
2N1238	SP-S	HU		2N1191		MOT		2N512B		TI	
2N497		TI		2N1274	GP-AF	TI		2N1359	GP-	MOT	T03
2N1239	SP-S	HU		2N363		IND		CTP1735		CLE	
2N658		TI		2N1191		MOT		2N251		TI	
2N1240	SP-S	HU		2N1276	SN-GP	GE		2N1360	GP-	MOT	T03
2N497		TI		2N332		TI		CTP1736		CLE	
2N1241	SP-S	HU		2N1277	SN-GP	GE		2N251		TI	
2N656		TI		2N1564		TI		2N1362	GP	MOT	T03
2N1242	SP-S	HU		2N1278	SN-GP	GE		CTP1730		CLE	
2N497		TI		2N1565		TI		2N1021		TI	
2N1243	SP-S	HU		2N1279	SN-GP	GE		2N1363	GP-	MOT	T03
2N656		TI		2N1566		TI		CTP1733		CLE	
2N1244	SP-S	HU		2N1291	GP-AF	CBS	T03	2N1021		TI	
2N498		TI		CTP1728		CLE		2N1364	GP-	MOT	
2N1245	GP-P	CBS	T03	2N1529		MOT		2N1022		TI	
CDT1319		CLE	T03	2N301		RCA		2N1365	GP-	MOT	
2N1246	GP-P	CBS	T03	2N1293	GP-P	CBS	T03	2N1022		TI	
CDT1310		CLE	T03	CTP1735		CLE		2N1366	GN-		
2N1254	SP-S	HU		2N1531		MOT		2N1306		TI	
2N726		TI		2N301A		RCA		2N1367	GP-		
2N1255	SP-S	HU		2N1295	GP-P	CBS	T03	2N1307		TI	
2N1131		TI		CTP1729		CLE		2N1370	GP-AF	TI	
2N1256	SP-S	HU		2N1532		MOT		2N1370		TI	
2N1131		TI		2N561		RCA		2N1370		TI	
				2N1297	GP-P	CBS	T03	2N1370		TI	
				CTP1730		CLE		2N361		IND	
				2N1014		MOT		2N1192		MOT	
				2N1300	GP-S	RCA	T05	2N1371	GP-AF	TI	
				XA161		AEI		2N1192		MOT	

## TRANSISTOR INTERCHANGEABILITY CHART

EIA NO. & SIMILAR TYPE	DESCR & APP.	MFR**	CASE FIG.	EIA NO. & SIMILAR TYPE	DESCR & APP.	MFR**	CASE FIG.	EIA NO. & SIMILAR TYPE	DESCR & APP.	MFR**	CASE FIG.
2N1372	GP-GP	TI		2N1449	GP-S	IND		2N1530	GP-		T03
2N1192		MOT		2N596		RCA		CTP1320		CLE	T03
2N1373	GP-GP	TI		2N1450	GP-S	GT		2N457A	TI		
2N1191		MOT		2N1384		RCA		2N1530A	GP-	TI	
2N1374	GP-GP	TI		2N1470	SN-AP			2N457A			
TR721		IND		2N389		TI		2N1531	GP-		T03
2N1192		MOT		2N1479	SN-P	RCA		CDT1321		CLE	T03
2N1375	GP-GP	TI		2N1714		TI		2N458A	TI		
2N1192		MOT		2N1480	SN-P	RCA		2N1531A	GP-	TI	
2N1376	GP-GP	TI		2N1714		TI		2N458A			
2N360		IND		2N1481	SN-P	RCA		2N1532	GP-		T03
2N1192		MOT		2N1718		TI		CDT1322		CLE	T03
2N1377	GP-GP	TI		2N1482	SN-P	RCA		2N1021	TI		
2N651		MOT		2N1483	SN-P	RCA		2N1532A	GP-		
2N1378	GP-GP	TI		2N1718		TI		2N1021		TI	
2N1193		MOT		2N1483	SN-P	RCA		2N1533	GP-	TI	
2N1379	GP-GP	TI		2N1047		TI		2N1022		TI	
2N1193		MOT		2N1484	SN-P	RCA		2N1534	GP-		T03
2N1380	GP-GP	TI		2N1048		TI		CDT1319		CLE	T03
2N1192		MOT		2N1485	SN-P	RCA		2N456A	TI		
2N1381	GP-GP	TI		2N1049		TI		2N1534A	GP-	TI	
2N1192		MOT		2N1486	SN-P	RCA		2N456A			
2N1382	GP-AP	TI		2N1050		TI		2N1535	GP-		T03
2N466		IND		2N1487	SN-P	RCA		CDT1320		CLE	T03
2N1192		MOT		2N1722		TI		2N457A	GP-	TI	
2N1383	GP-AP			2N1488	SN-P	RCA		2N457A		TI	
2N465		IND		2N1722		TI		2N1536	GP-	TI	T03
2N1191		MOT		2N1489	SN-P	RCA		CDT1321		CLE	T03
2N1386	SN-	RAY		2N1722		TI		2N458A	TI		
2N753		TI		2N1490	SN-P	RCA		2N1537	GP-		T03
2N1387	SN-	RAY		2N1722		TI		CDT1322		CLE	T03
2N753		TI		2N1511	SN-P	RCA		2N1021	TI		
2N1409	SN-S	PSI		2N1724		TI		2N1537A	GP-	TI	
2N753		TI		2N1512	SN-P	RCA		2N1021		TI	
2N1410	SN-S	PSI		2N1724		TI		2N1538	GP-	TI	
2N753		TI		2N1513	SN-P	RCA		2N1022		TI	
2N1412	GP-			2N1724		TI		2N1539	GP-		T03
CTP1500		CLE	T03	2N1514	SN-P	RCA		CDT1310		CLE	T03
2N1420	SN-S	IND		2N1724		TI		2N458A	TI		
2N1507		TI		2N1518	GP-S	DEL		2N1539A	GP-	TI	
2N1425	GP-IF	RCA		2N1162		MOT		2N458A			
2N1110		TI		2N514B		TI		2N1540	GP-		T03
2N1426	GP-RF	RCA		CTP1544		CLE	T03	2N457A	GP-	TI	
2N1108		TI		2N1519	GP-S	DEL		CDT1311		CLE	T03
2N1431	GN-AP	SYL		2N1164		MOT		2N457A	TI		
2N270		RCA		2N514A		TI		2N1540A	GP-	TI	
2N1432	GP-RF	SYL		CTP1545		CLE	T03	2N457A			
2N274		RCA		2N1521	GP-S	DEL		2N1540A	GP-	TI	
2N1433	GP-P	CBS		2N514B		TI		2N457A		TI	
2N1183B		RCA		2N1524	GP-IF	RCA		2N457A			
2N1434	GP-P	CBS		2N1110		TI		2N1541	GP-		T03
2N1184B		RCA		2N1525	GP-IF	RCA		CDT1312		CLE	T03
2N1435	GP-P	CBS		2N1110		TI		2N458A	TI		
2N1184B		RCA		2N1526	GP-RF	RCA		2N458A		TI	
2N1436	GP-S	PHL		2N1108		TI		2N1541A	GP-	TI	
2N643		RCA		2N1527	GP-RF	RCA		2N458A			
2N1446	GP-S	IND		2N1107		TI		2N1542	GP-		T03
2N596		RCA		2N1529	GP-			CDT1313		CLE	T03
2N1447	GP-S	IND		CDT1319		CLE	T03	2N1021	TI		
2N586		RCA		2N456A		TI		2N1543	GP-	TI	
2N1448	GP-S	IND		2N1529A	GP-			2N1022		TI	
2N586		RCA		2N456A		TI		2N1544	GP-		T03
								CDT1310		CLE	T03
								2N456A	TI		

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Pulse transformers no longer need to remain the only over-size component in your high density transistor circuit packages.

Now you can get pulse widths from less than 1 to over 16 microseconds — plus the other parameters listed below — with transistor-size PICO TRAN® transformers.

Typical specs for 4:1 Turns Ratio PICO TRAN in a 12 V blocking oscillator circuit; and 1:1 Turns Ratio pulse coupling PICO TRAN:

4:1 Ratio	PW (μ Sec)	OCL (Pn)	1:1 Ratio	OCL (Pn)
B 350	1	65μH	B 355	65μH
B 351	2	150μH	B 356	150μH
B 352	4	450μH	B 357	450μH
B 353	8	1.25mH	B 358	1.25mH
B 354	16	5.0 mH	B 359	5.0 mH

Dimensions all units: 11/32" dia. x 1/4" high

PICO TRAN P10B pulse transformer kits containing one each of types B350 thru B359 are available from stock at \$59.95.

This breakthrough in transformer miniaturization came from PIC's 13 years of experience in the manufacture of magnetic components. The PICO TRAN is a thoroughly tested production unit. Its reliability has been proven.

For complete PICO TRAN specifications and applications assistance, contact your nearest PIC Rep, or write to PIC on your company letter-head.

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## ANOTHER Bradley PRODUCT

### tailored to your specifications



Illustration is twice actual size

12 ampere stud silicon rectifiers (USAF)  
INT 199-INT 206

Bradley silicon rectifiers are designed for wide ranges of application. This new 12 ampere stud silicon rectifier, qualified to MIL-E-1/1108, is available with ratings from 50 to 600 volts. These 12 amp. diodes are also available in high voltage assemblies with compensating networks of resistors and capacitors (for example, 50,000 volts at 3 amps.), as well as in standard and special configurations. This development brings the industry still another product in the ever increasing Bradley line of silicon, selenium and copper oxide rectifiers and diodes. Data sheets available on request.

### OTHER BRADLEY PRODUCTS



## Bradley SEMICONDUCTOR CORP.

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# TRANSISTOR INTERCHANGEABILITY CHART

EIA NO. & SIMILAR TYPE	DESCR & APP.	MFR**	CASE FIG+	EIA NO. & SIMILAR TYPE	DESCR & APP.	MFR**	CASE FIG+	EIA NO. & SIMILAR TYPE	DESCR & APP.	MFR**	CASE FIG+
2N1544A	GP-			2N1553	GP-		T03	2N1562	GP-		
2N456A		TI		CTP1508 2N511		CLE TI	T03	2N1141		TI	
2N1545	GP-		T03	2N1553A	GP-			2N1805	GN-S	SYL	
CDT1311 2N457A		CLE TI	T03	2N511		TI		2N1080 2N1304		RCA TI	
2N1545A	GP-			2N1554	GP-		T03	2N1609	GP-P	DEL	
2N457A		TI		CTP1504 2N511A		CLE TI	T03	CTP1729 2N1040		CLE TI	
2N1546	GP-		T03	2N1554A	GP-			2N1610	GP-P	DEL	
CDT1312 2N458A		CLE TI	T03	2N511A		TI		CTP1729 2N1040		CLE TI	
2N1546A	GP-			2N1555	GP-		T03	2N1611	GP-P	DEL	
2N458A		TI		CTP1503 2N511B		CLE TI	T03	CTP1735 2N1039		CLE TI	
2N1547	GP-		T03	2N1555A	GP-			2N1612	GP-P	DEL	
CDT1313 2N1021		CLE TI	T03	2N511B		TI		CTP1735 2N1039		CLE TI	
2N1547A	GP-			2N1556	GP-		T03	2N1613	SN-	FCH	
2N1021		TI		CTP1500		CLE	T03	2N607		TI	
2N1548	GP-			2N1557	GP-		T03	2N1616	SN-	TEC	
2N1022		TI		2N1146 2N511		CLE TI	T03	2N1724		TI	
2N1549	GP-		T03	2N1557A	GP-			2N1617	SN-	TEC	
CTP1508 2N511		CLE TI	T03	2N511		TI		2N1724		TI	
2N1549A	GP-			2N1558	GP-		T03	2N1618	SN-	TEC	
2N511		TI		2N1146A 2N511A		CLE TI	T03	2N1724		TI	
2N1550	GP-		T03	2N1558A	GP-			2N1620	SN-	TEC	
CTP1504 2N511A		CLE TI	T03	2N511A		TI		2N1722		TI	
2N1550A	GP-			2N1559	GP-		T03	2N1657	SN-	RAY	
2N511A		TI		2N1146B 2N511B		CLE TI	T03	2N1722		TI	
2N1551	GP-		T03	2N1559A	GP-			2N1660	SN-	RAY	
CTP1503 2N511B		CLE TI	T03	2N511B		TI		2N1722		TI	
2N1551A	GP-			2N1560	GP-		T03	2N1711	SN-	TI	
2N511B		TI		2N1146C 2N511B		CLE TI	T03	TI490		TI	
2N1552	GP-		T03	2N1561	GP-			2N1750		TI	
CTP1500 2N511B		CLE TI	T03	2N1141		TI		2N1304		TI	

\* Direct replacement.  
 \*\* See complete list of manufacturers and their semiconductor products at the end of these tables.  
 + Numerical figures correspond to Jedec outline figure numbers.

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Welding  
Final Sealing

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Header Forming  
Crystal Mounting  
Welding  
Exhausting  
Sealing

#### ELECTRON TUBES

Stem Forming  
Bulb Making  
Tubulating  
Lead Welding  
Lead Beading  
Grid Winding  
Heat Treating  
Degassing  
Exhausting  
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Bombarding  
Testing  
Flaring



KAHLE continuous  
firing vacuum furnace. Output  
equivalent to 10 conventional furnaces

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Crystal Diode Final  
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Transistor Header  
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Electron Tube Button  
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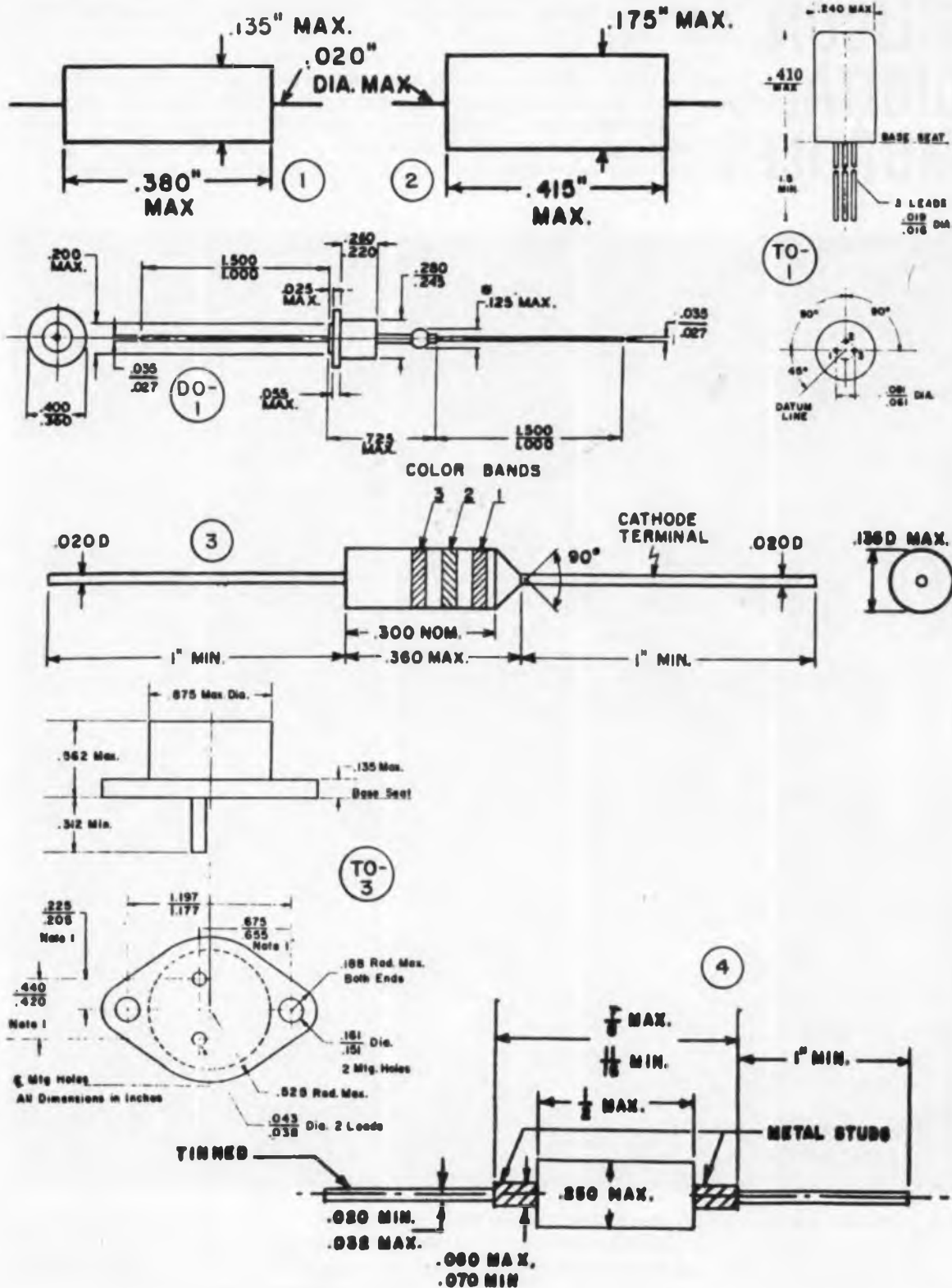
For example, the latest KAHLE continuous firing vacuum furnace provides uninterrupted operation and an output equal to 10 conventional furnaces.

KAHLE experience in raising production quality and reducing costs is available to help solve your fabrication problems. For recommendations on specific applications, just call or write outlining your requirements.

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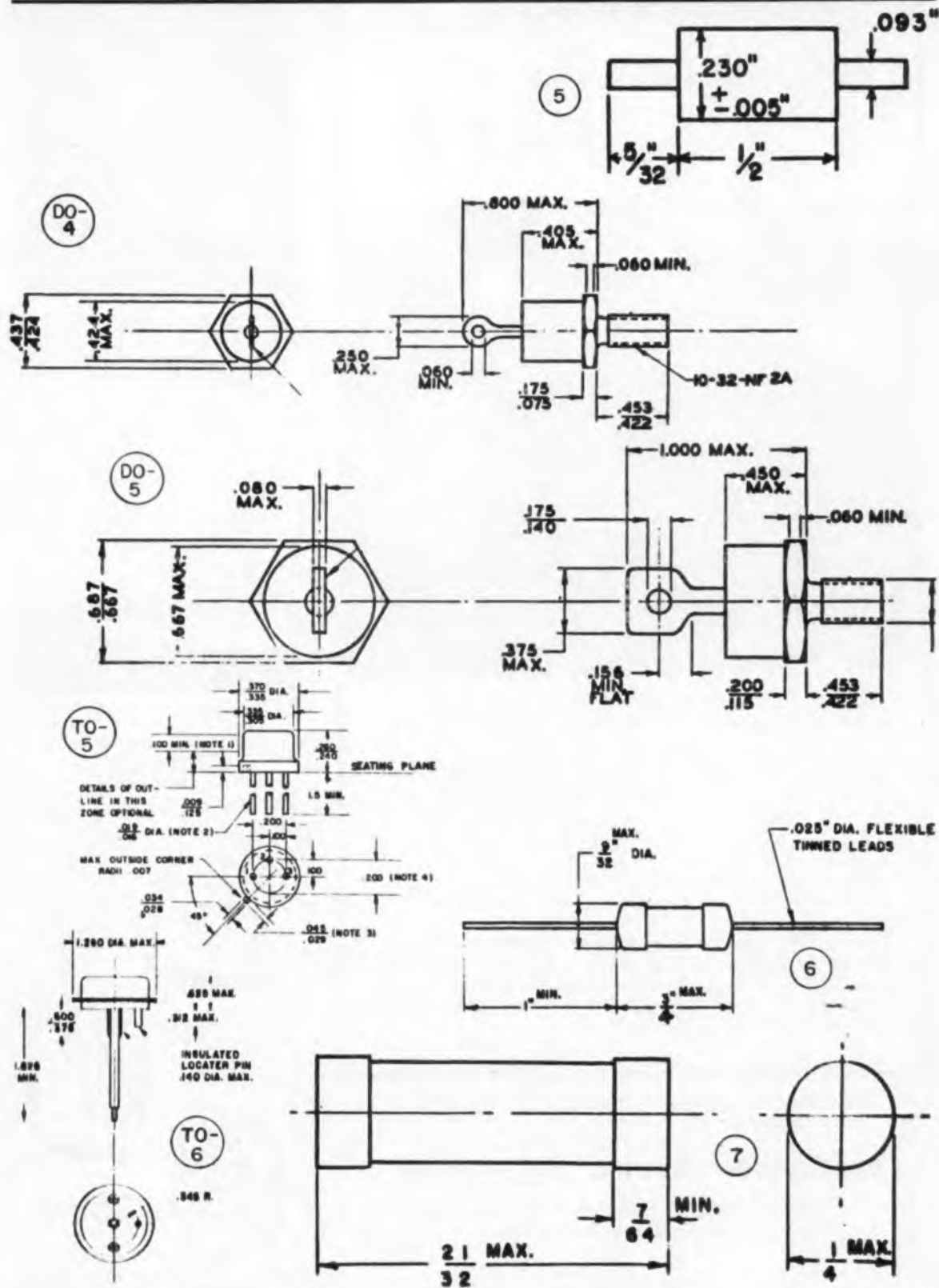
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In evacuation, leak-checking, backfilling and sealing of small electrical components, you'll be able to multiply production and profits with this flexible new CVC 10-Port Manifold Vacuum Pumping System.

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For full details on the new PSM-110 10-Port Manifold write for Bulletin 4-1.

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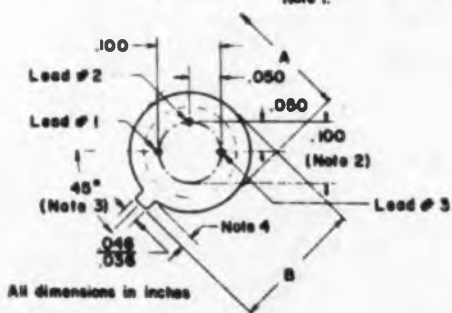
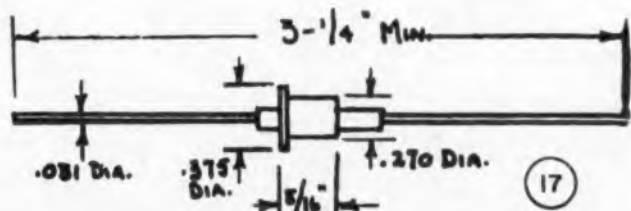
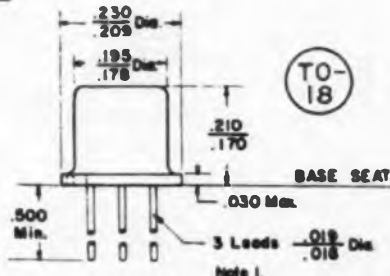
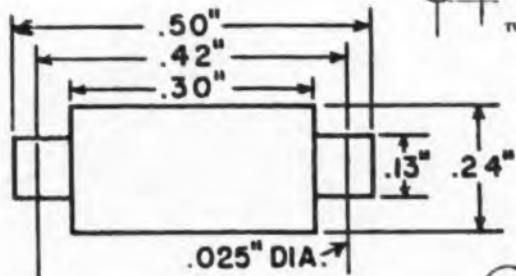
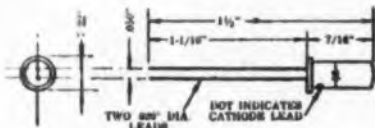
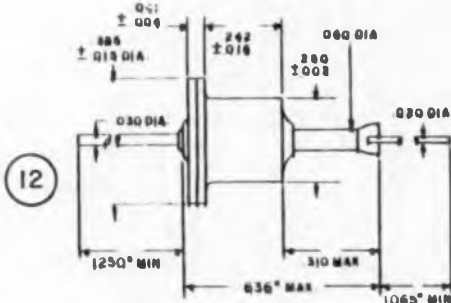
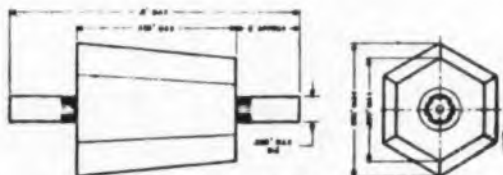
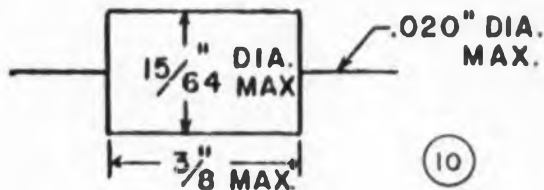
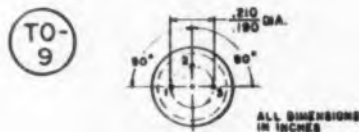
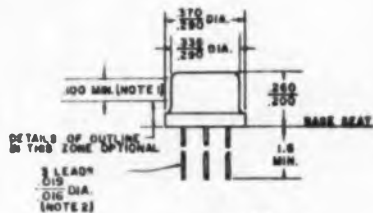
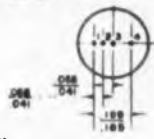
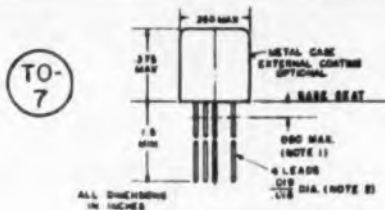
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Salt Spray Chambers All Lucite Construction.

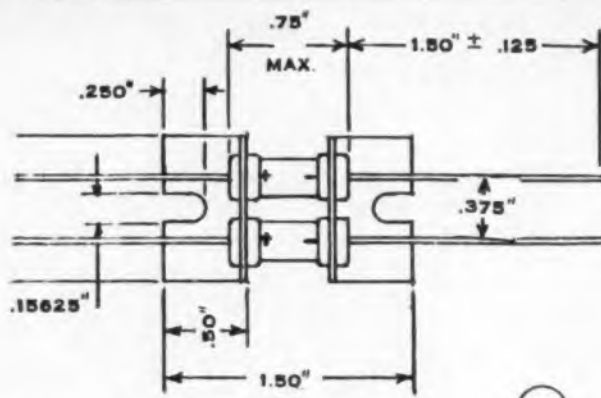
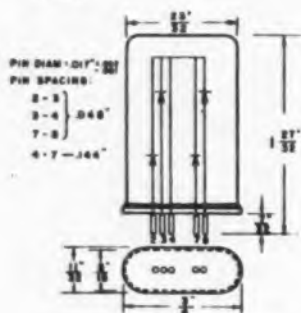


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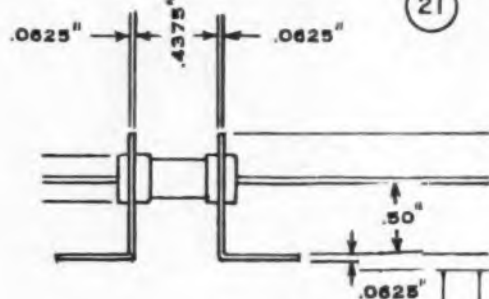


# TRANSISTORS & DIODES

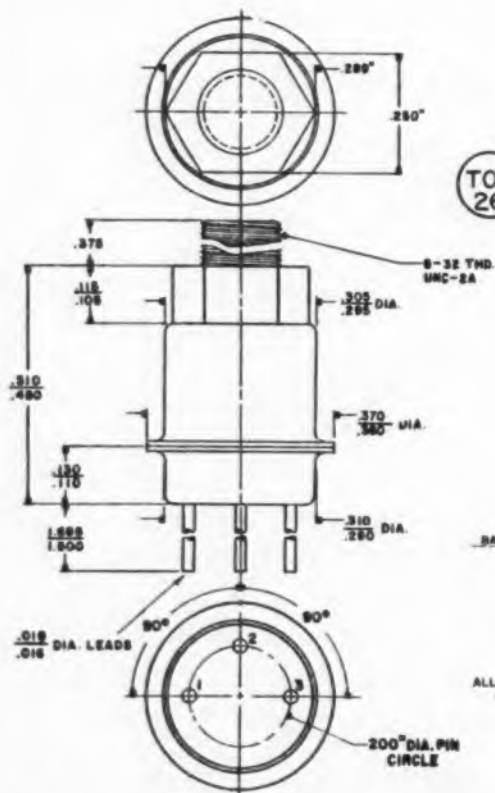
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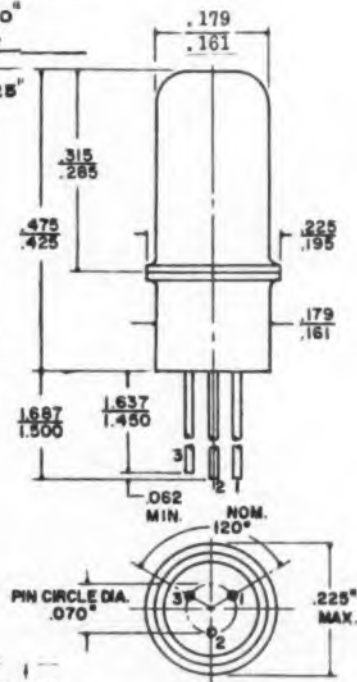
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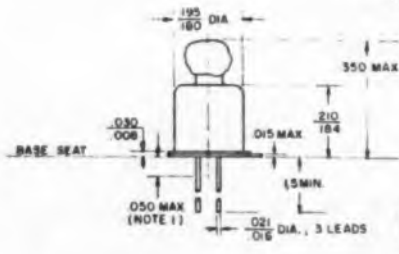
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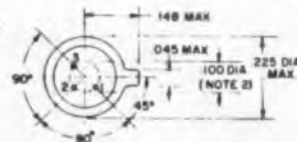
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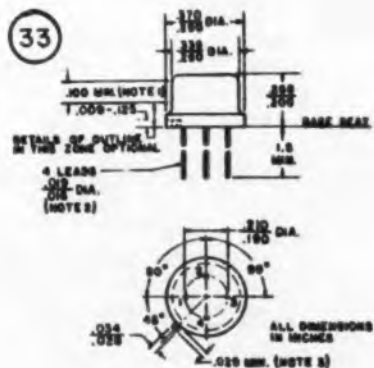
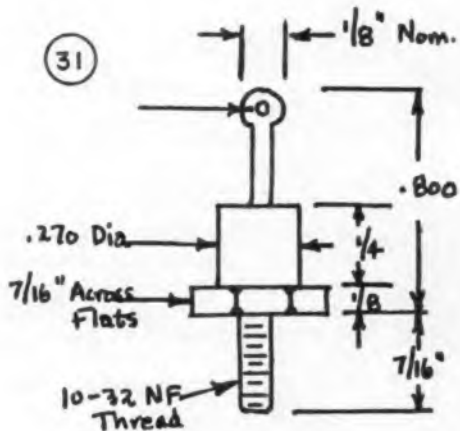
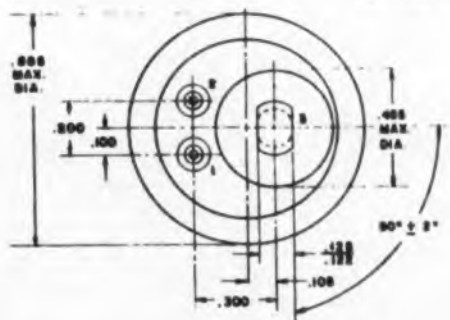
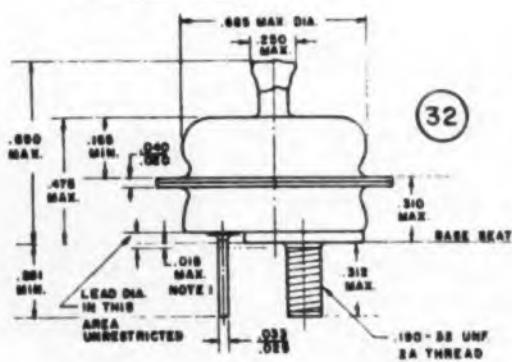
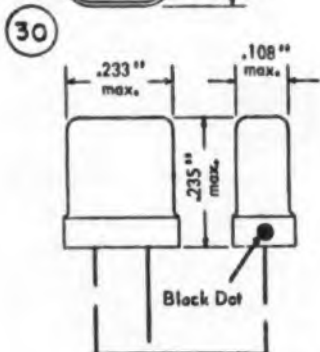
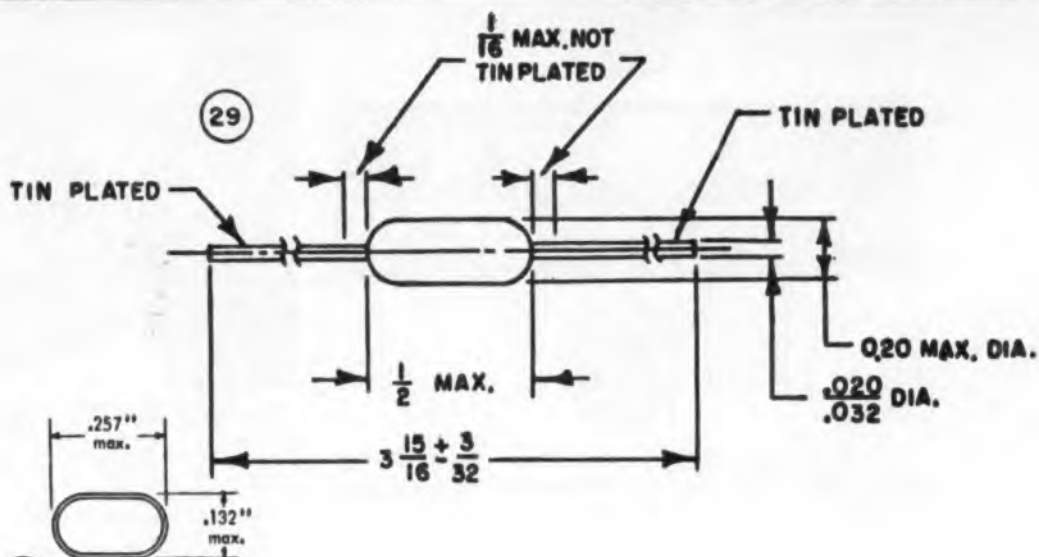


TO-28



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Ideal for voltage and phase comparison.  
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CRB-1B	30-1,000 cps	2.5 f or 200 V max.
CRB-2B	50-3,000 cps	.35 f or 200 V max.



**AUTOMATIC COMPLEX RATIO BRIDGE**—Model CRB-3. A self-nulling AC bridge with digital readout of both in-phase and quadrature voltage ratios. Excellent for production testing.

Accuracy of bridge is  $.002\%$  max. Five-place resolution, with automatic quadrant indication. Unit is self-contained, requiring no external calibration sources, and is equipped for external printer readout.

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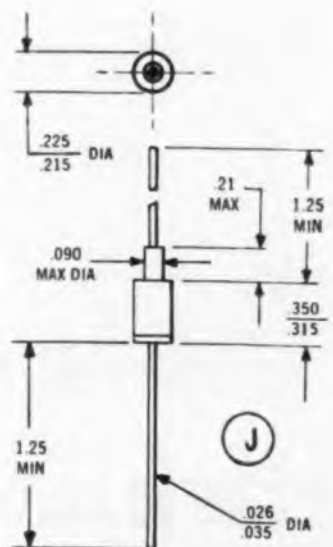
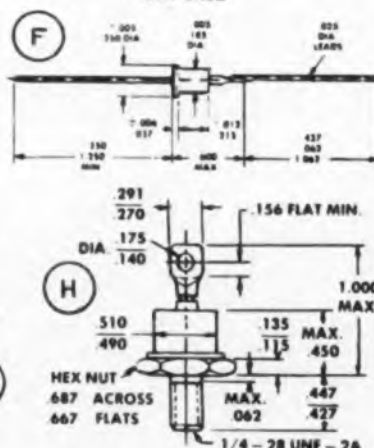
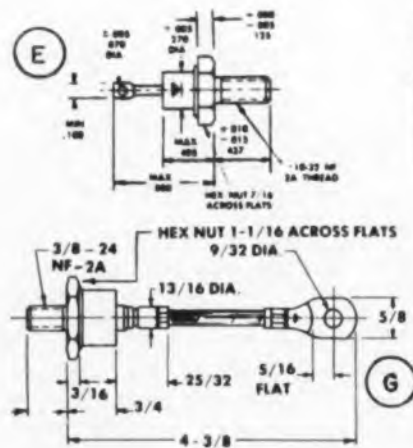
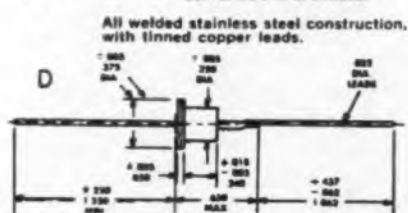
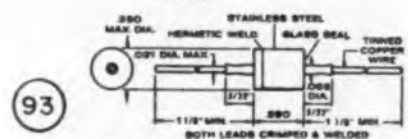
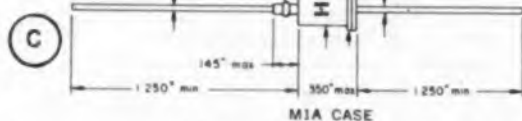
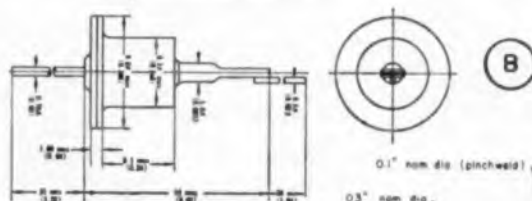
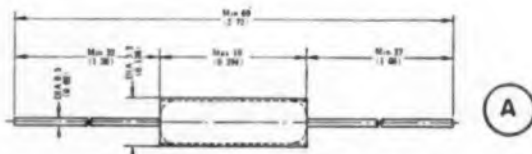
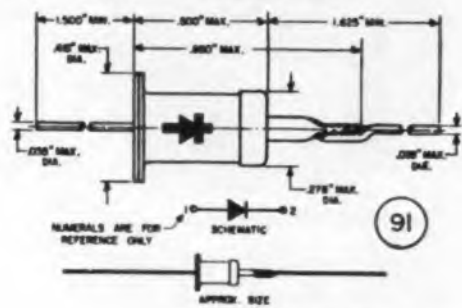
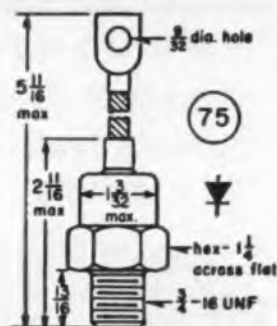
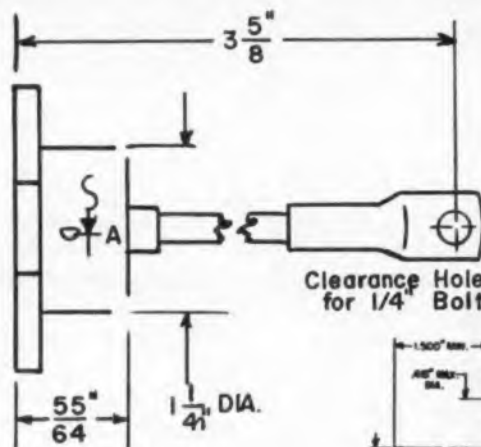
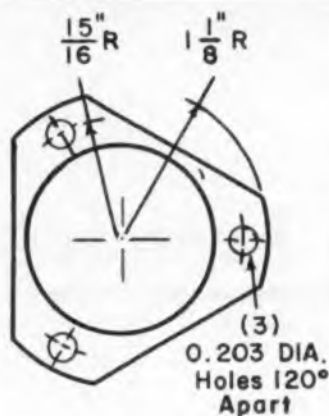
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# rotax

## PRECISION

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Available from Stock

**Unique Axial Air Gap Design** (Pat. Pend.) Provides vane-cooled hysteresis synchronous motors in smallest sizes obtainable for 360 through 3600 rpm. Compact Design. Pancake-type 2" vertical by 4" or 5" diameter depending on speed combination.

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Designed to provide constant speed with low induced flutter for capstans, memory drums, pulse generators, etc.

Rotax Shielding retains stray flux.

**Design simplicity for quality assurance.** Rotax hysteresis synchronous motors have only 5 major precision parts.

Precision thick-wall sintered oilite or ball bearings used as required by torque factor to provide long service life. Ambient range -32 to 135°C.

**Shaft runout** for tape drives can be furnished with integrally ground capstans held within .0001" T.I.R. and with less than 50 micro-inch finish.

**Special Designs.** Rotax engineering department will adapt the unique advantages of this design to meet special motor requirements. Submit operating specifications.

**Typical Applications.** Tape Transports — Turntable Drives — Missile and Aircraft Instrumentation — Viscometers — Flow Meters — Dynamometers.

Write for Bulletin R-61. Factory representatives desired in key areas.

# rotax inc.

2209 Federal Avenue • Los Angeles 64, Calif.  
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228

## Rise Time for

THE formula for transistors rise time,  $t_r$ , as presented\* several years ago is

$$t_r = \frac{\tau_c}{1 - \alpha_N} \ln \frac{1}{1 - 0.9 \frac{\beta_c}{\beta_N}} \quad (1)$$

where,

$$\tau_c = \frac{1}{2\pi f_c}$$

$f_c$  = cutoff frequency in common base configuration

$\alpha_N$  = low frequency forward current gain in common base configuration

$\beta_N$  = low frequency forward current gain in common emitter configuration

$\beta_c$  = current amplification of the circuit after the transistor is turned on ( $I_c/I_b$ )

In Eq. (1) the collector capacitance influence is neglected and the rise time is measured from 0% to 90% of the collector current value. But, for medium power and power transistors the collector capacitance generally has to be considered. This new calculation gives the result:

$$t_r = \frac{\tau_c + \tau_c}{1 - \alpha_N} \ln \frac{1 - 0.1 \frac{\beta_c}{\beta_N}}{1 - 0.9 \frac{\beta_c}{\beta_N}} \quad (2)$$

where,  $\tau_c = (R_L + R_{cs})(C + C_c)$

$R_L$  = load resistor

$R_{cs}$  = saturation resistance

$C + C_c$  = total collector capacitance

In addition to the correction for capacitance, corrections for measuring rise time from 10% to 90% of the collector current value instead of 0% to 90% are made.

The graphical analysis of Eq. (2)

\* Ebers & Moll, Proc. IRE, Vol. 42, Dec. 1954.

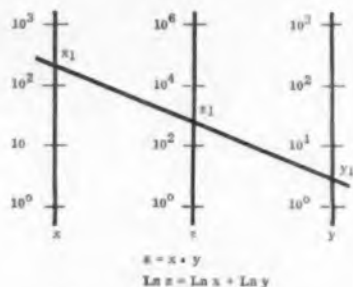


Fig. 1: To multiply two variables, their logarithms are added on this nomograph.

is solved by a combination of 4 nomographs. Three of them show a multiplication of two variables; one a multiplication of a variable with the constant  $\frac{1}{2\pi}$ .

The basic idea of a nomograph multiplying two variables is to convert the multiplication to an addition of the logarithms of these variables, Fig. 1.

If the scale of the  $x$  and  $y$  function is  $\ln x$  and  $\ln y$ , the scale for the  $z$  function has to be  $\frac{\ln z}{2}$ , assuming equal spacing.

In a first step, the time-constant  $\tau_c$  has to be computed from the variable

$$(R_L + R_{cs}) \text{ and } (C + C_c)$$

In a second step,  $\tau_c$  is determined from the given cutoff frequency  $f_c$ .

$\tau_c$  and  $\tau_c$  have to be added manually.

In a third step, the result of this addition is multiplied by  $(\beta_N + 1)$ , which is identical to a division by  $(1 - \alpha_N)$ .

It is sufficient to enter  $\beta_N$  instead of  $(\beta_N + 1)$  into the nomograph since the scale is automatically computed for  $(\beta_N + 1)$ .

By KURT P. KUFFER

Electronic Engineer  
Transistron Electronic Corp.  
168-182 Albion St.  
Wakefield, Mass.

# Medium Power Transistors

The outcome of this multiplication is now multiplied in a last step with

$$\frac{1 - 0.1 \frac{\beta_c}{\beta_N}}{1 - 0.9 \frac{\beta_c}{\beta_N}}$$

Using Fig. 2, the following example illustrates the use of this nomograph:

$$R_{cs} = 6 \Omega \quad C + C_c = 80 \text{ pf} \quad f_a = 30 \text{ mc}$$

$$R_L = 40 \Omega \quad \beta_N = 25 \quad \beta_c = 12.5$$

1. Fix the point 46  $\Omega$  on the  $(R_{cs} + R_L)$  Scale (Pt. A).
2. Fix the point 80 pf on the  $(C + C_c)$  Scale (Pt. B).
3. Draw a straight line from A to B. Pt. D gives the value of  $\tau_c = (0.0035 \mu \text{ sec})$ .
4. Look up  $\tau_a = (0.0055 \mu \text{ sec})$  corresponding to the given  $f_a$  (30 mc) (Pt. C).

5. Add  $\tau_a$  and  $\tau_c$  and fix the result  $(0.009 \mu \text{ sec})$  on the  $(\tau_a + \tau_c)$  Scale (Pt. E).
6. Fix the point 25 on the  $\beta_N$  Scale (Pt. F).
7. Draw a straight line from E to F (Pt. J).
8. Fix the point 0.5 on the  $\beta_c/\beta_N$  Scale (Pt. G).
9. Draw a straight line from J to G (Pt. H).
10. Point H indicates the correct rise time of  $0.12 \mu \text{ sec}$ .

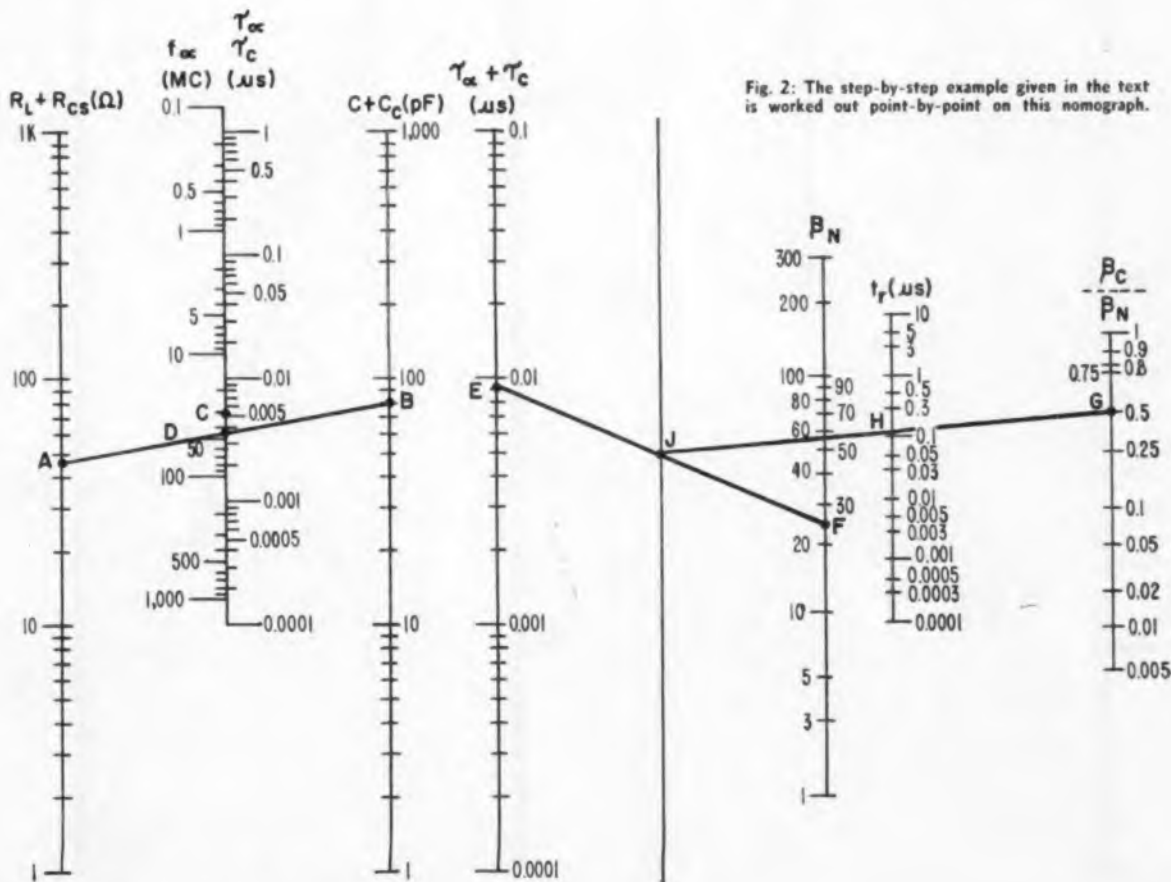
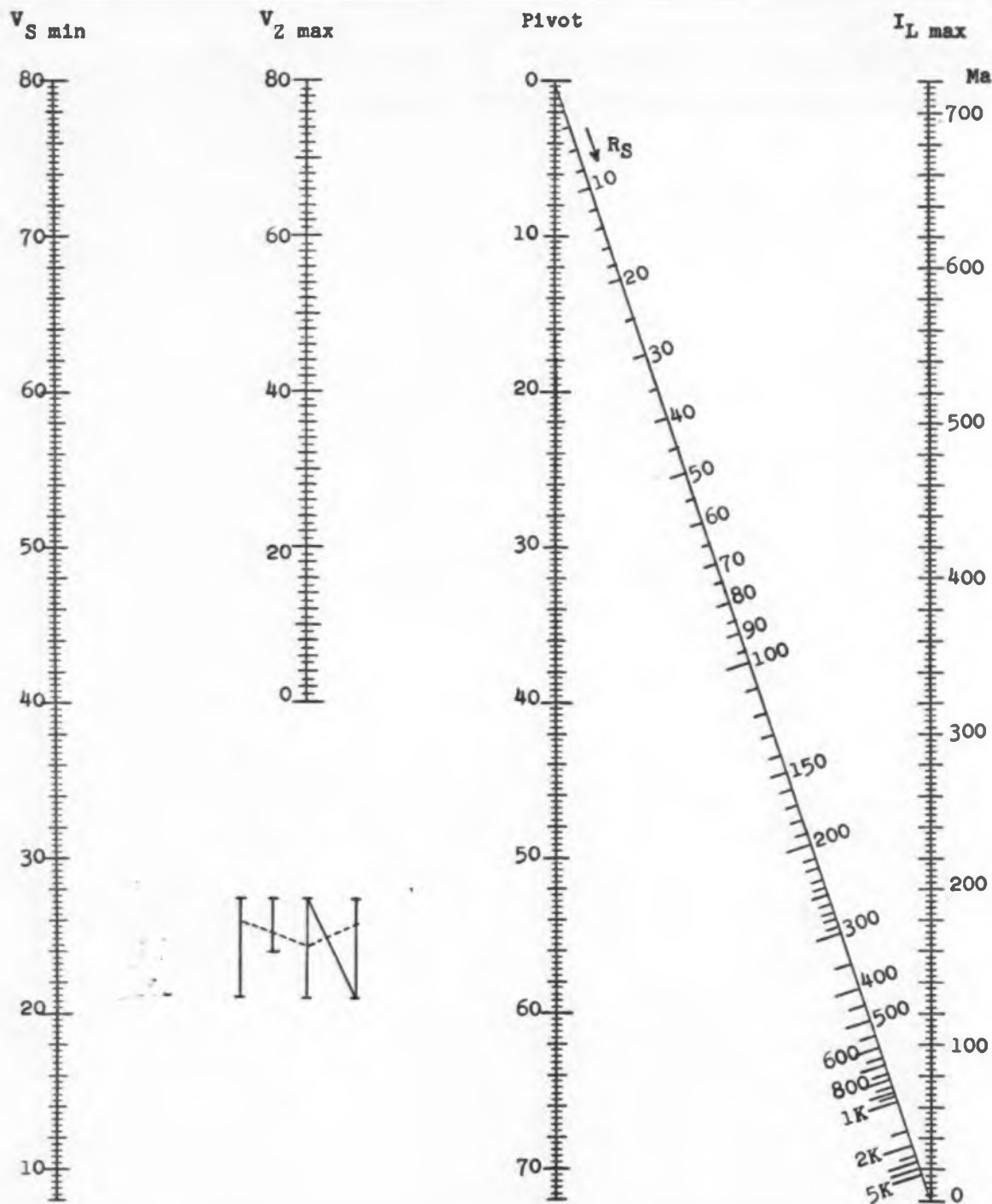


Fig. 2: The step-by-step example given in the text is worked out point-by-point on this nomograph.

# Shunt D.C. Regulator

*Proper selection of a Zener diode for use in a shunt D.C. regulator circuit takes time. Included is a time saving step-by-step procedure, complete with equations and nomographs, to aid the engineer in his selection.*

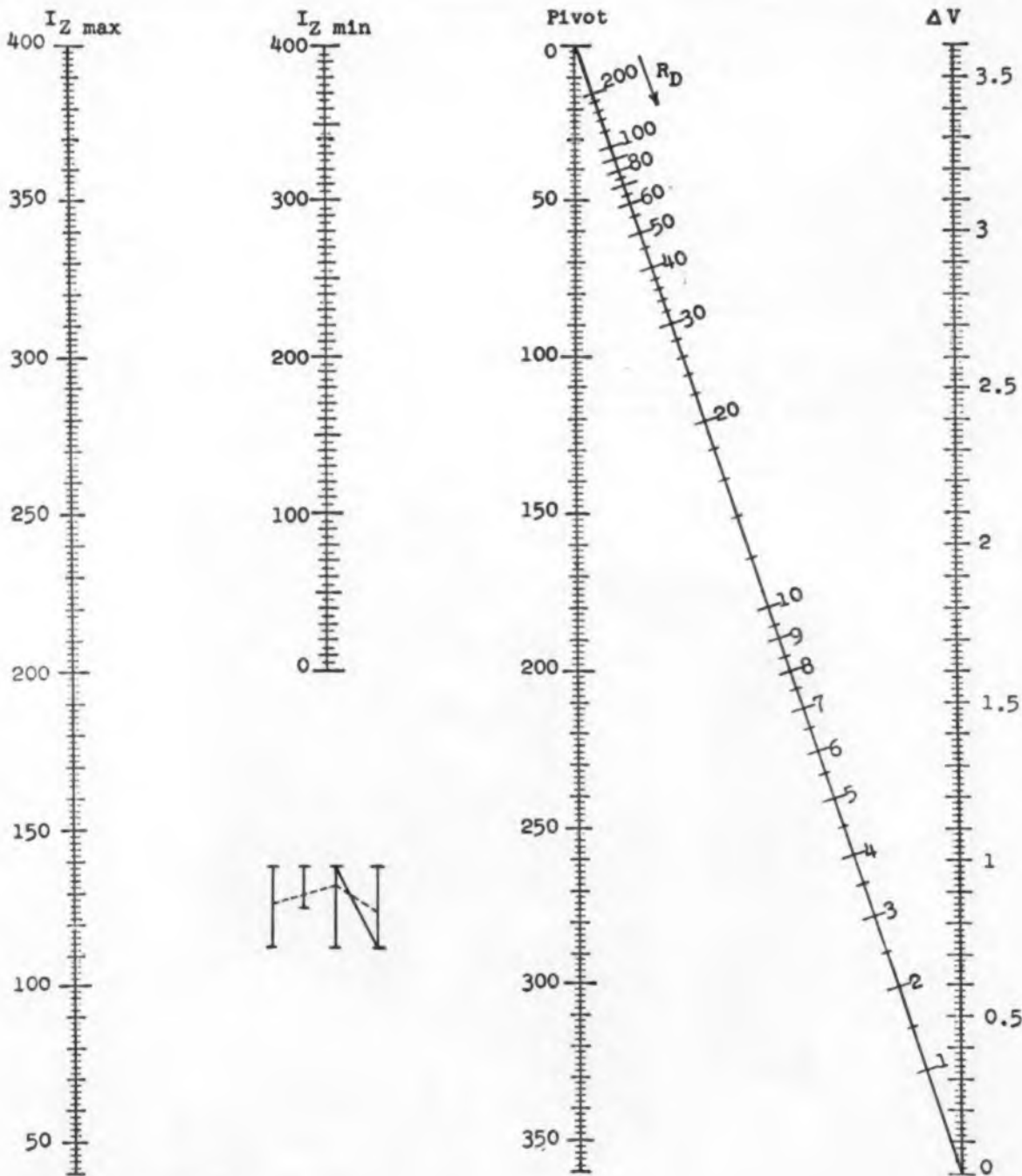
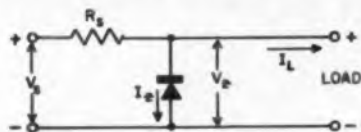


# Nomographs

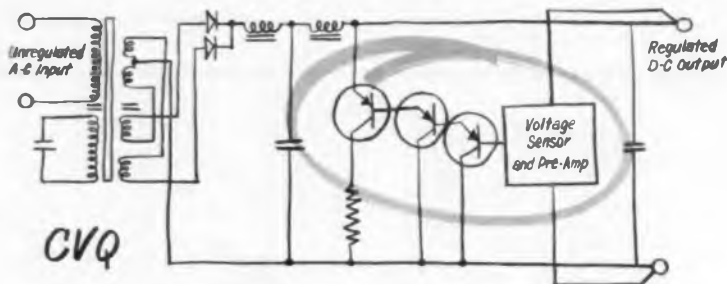
THESE Nomographs will aid in the proper selection of a silicon diode voltage regulator ("Zener" diode) for use in the following basic shunt D.C. regulator circuit.

**THOMAS W. KIRCHMAIER**

Applications Engineer  
 Transiron Electronic Corporation  
 168-182 Albion Street  
 Wakefield, Mass.



# SOLA writes this new **R<sub>X</sub>** for reliable d-c power



This schematic tells "CVQ's" secret at a glance . . . how SOLA's remarkably reliable new power supply achieves d c output ideal for computers and other voltage-sensitive equipment. "CVQ" integrates the advantages of shunt-circuit regulation with the *inherent* high stability of the SOLA static-magnetic transformer. And the result is transistorized voltage regulation *with split-cycle response!*

"CVQ" answers the demands of dynamic loading. Voltage variations are ironed out down to the last transient — even to the last ripple of the a-c source. And the SOLA static-magnetic transformer *automatically* prevents damage in event of a short circuit.

SOLA "CVQ" d-c power supplies are available *right now*, in a wide range of ratings; also in custom units

built to your specific requirements. Advantages include:

- More watts per dollar.
- Continuous automatic protection without fuses, both for output short circuits, and for open circuits in the voltage-sensing circuitry.
- Output regulated within  $\pm 0.04\%$  for line voltage variations  $\pm 15\%$ ; 0.2% static-load regulation, 0 to full load. Excellent response time.
- Standard models available in the 120-watt range for 5, 6, 10 and 12 volts d-c (100-130/181-235/200-260 volt input).
- Compact mechanical layout — only 12¼ x 5¼ x 19".

Get full facts by writing for new SOLA Catalog DCX-361A. Or telephone HEMPstead 9-2800, Elk Grove Village, Illinois.



## SOLA

A DIVISION OF  
BASIC PRODUCTS CORPORATION



SOLA ELECTRIC Co.  
Busse Road at Lunt,  
Elk Grove Village, Ill.  
HEmpstead 9-2800

IN CANADA, Sola-Basic  
Products Ltd., 377 Evans  
Ave., Toronto 18, Ontario

The equations from which the nomographs are drawn are indicated in brackets. A step-by-step procedure follows.

(1) List the following data.

From manufacturer's data sheet:

- (a)  $V_z$ , nominal voltage of desired Zener regulator.
- (b)  $V_{z \text{ min}}$  and  $V_{z \text{ max}}$ , as indicated by tolerance.
- (c) TC (temperature coefficient) of the Zener. Observe coefficient sign.
- (d)  $R_D$ , maximum dynamic resistance of the Zener.

From power supply and load data:

- (a)  $V_s \text{ min}$  and  $V_s \text{ max}$ , the limits within which supply voltage may change.

(b)  $I_{L \text{ min}}$  and  $I_{L \text{ max}}$ , the limits within which load current may change.

(2) From Nomograph I, find  $R_s$

$$\left[ \frac{V_{z \text{ min}} - V_{z \text{ max}}}{1.1 I_{L \text{ max}}} = R_s \right]$$

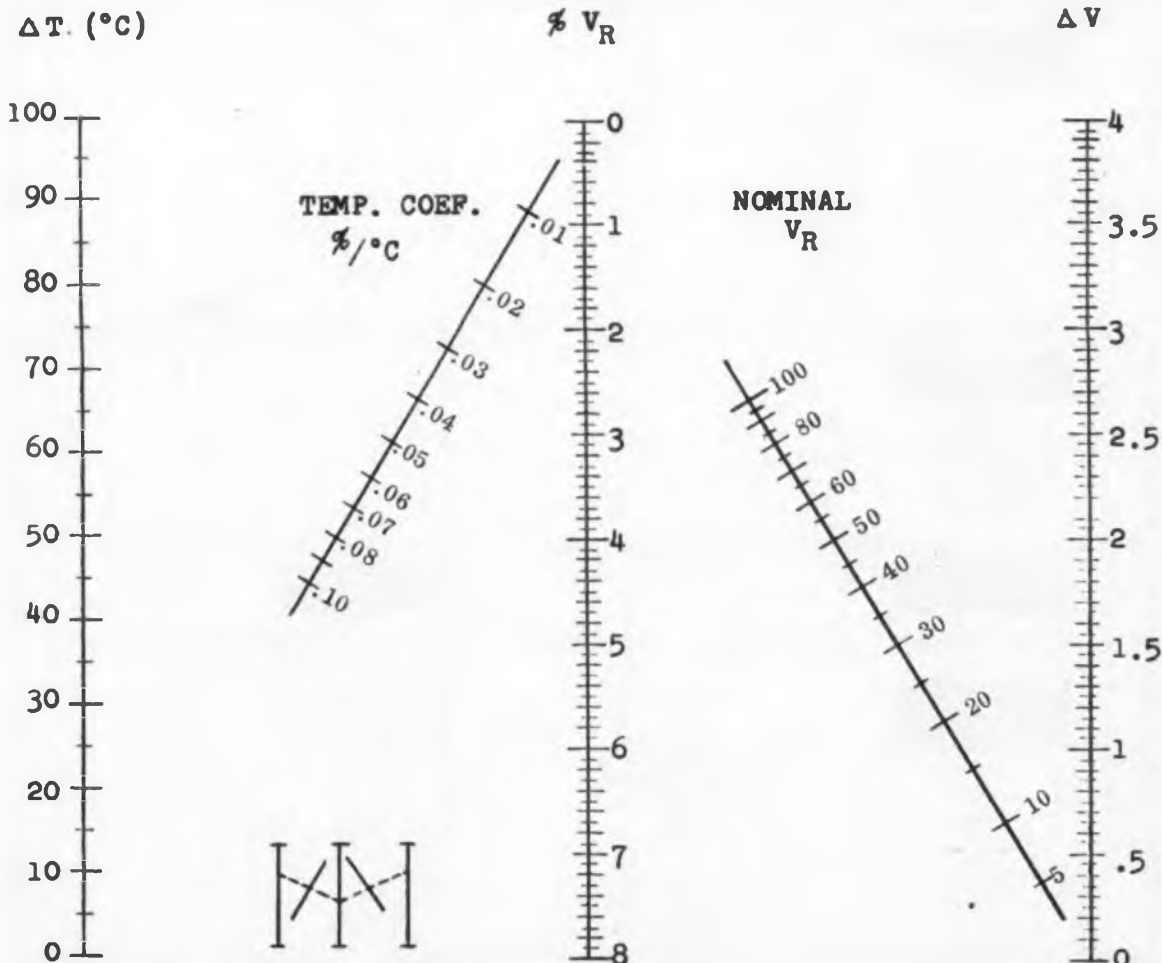
(3) From Nomograph II, find:

$$I_{z \text{ min}} = \left[ \frac{V_{z \text{ max}} - V_{z \text{ min}}}{R_{z \text{ min}}} \right] - I_{L \text{ min}}$$

and:

$$I_{z \text{ max}} = \left[ \frac{V_{z \text{ min}} - V_{z \text{ max}}}{R_{z \text{ max}}} \right] - I_{L \text{ max}}$$

At this point, if  $I_z$  is found to swing above or below





# D-C POWER



**CHRISTIE CHRISTIE ELECTRIC CORP.**  
3414D WEST 67TH ST., LOS ANGELES 43, CALIF.

SINCE 1949  
D-C POWER SUPPLIES • BATTERY CHARGERS  
PLEASANT 9-101 • TWO LAYERS

SERIES	TYPE REGULATOR AND GENERAL CHARACTERISTIC	MODEL NUMBER	D-C VOLTS	D-C AMPS. (CONT.)	REGU-LATION ± %	RECOVERY TIME CONSTANT millise.c.	MODEL NUMBER	D-C VOLTS	D-C AMPS. (CONT.)	REGU-LATION ± %	RECOVERY TIME CONSTANT millise.c.				
K and KK	MAGNETIC AMPLIFIER REGULATED (Stavolt)	MH8-50K	5½-8	50	1	100	*MH64-100K	44-64	100	0.25	50				
		MH8-100K	5½-8	100	1	100		MH135-40K	110-135	40	0.25	50			
		MH8-200K	5½-8	200	1	100			MH135-60K	110-135	60	0.25	50		
		MH8-300K	5½-8	300	1	100				*A36-400K	26-36	400	0.25	50	
		MH16-50K	11-16	50	1	100					*2A36-500K	26-36	500	0.25	50
		MH16-100K	11-16	100	1	100						*2A36-600K	26-36	600	0.25
	MH16-200K	11-16	200	1	100	*2A36-800K	26-36						800	0.25	50
	MH16-300K	11-16	300	1	100		*2A36-1000K	26-36					1000	0.25	50
	30 - 1500 amp DC output 3-phase input 1% rms ripple *Close dynamic regulation	MH32-50K	22-32	50	0.25			50	4A31-1500K				28-29	1500	0.25
		*MH32-100K	22-32	100	0.25			50		A36-400KK			15-36	400	0.5
		*MH32-200K	22-32	200	0.25			50			A135-100K		110-135	100	0.5
		*MH32-300K	22-32	300	0.25			50				2A135-200K	110-135	200	0.5
*MH36-50KK		15-36	50	0.25	50										
*MH36-100KK		15-36	100	0.25	50										
*MH36-200KK	15-36	200	0.25	50											
SCR	SILICON CONTROLLED RECTIFIER REGULATED Wide range - 1-phase input	BC236-30	2-36	30	0.5	50/150									
A-R-T and PD	SHUNT BALLAST SEMI REGULATED (Rectodyne) Tap switch adjustment Regulation is for load variation only (at constant line) 1% rms ripple 3-phase input	MH28-100A	28	100	7.5	1	MH6-200PD	1-7	200		5				
		*MH28-100R	28	100	2	1		MH6-300PD	2-14	100		5			
		*MH28-100DT	28	100	7.5	1			MH6-400PD	1-7	300		5		
		14	200	2	1	MH6-600PD				2-14	150		5		
		MH28-100AV	0-30	100	7.5					1	H6-800PD	1-7	400		5
		MH28-200A	28	200	7.5					1		H6-1000PD	2-14	200	
	*MH28-200R	28	200	2	1		H6-1200PD			1-7			600		5
	*MH28-300R	28	300	2	1			H6-1000PD		2-14			1000		5
	*H28-400R	28	400	2	1				H6-1200PD	2-14			500		5
	*H28-600R	28	600	2	1	H6-1200PD				1-7			1200		5
	*A28-1000T	28	1000	3.75	1										
			MH120-20A	120	20					3	1				
		MH120-40A	120	40	3		1								
		MH120-60A	120	60	3		1								
		MH120-80A	120	80	3		1								
		MH120-125A	120	125	3	1									
		MH120-200A	120	200	3	1									
M	SHUNT BALLAST SEMI-REGULATED (Rectodyne) Tap switch adjustment Regulation is for load variation only (at constant line) 1-phase input	M16-100	8.5-16	100	10	Unf.	*M32-15RF	28	15	3	2				
			17-32	15	6		*M32-50RF	28	50	3	3				
		M32-15D	8.5-16	30	10	Unf.	M120-15D	60-120	15	3	Unf.				
			17-32	50	6			36-60	30						
		M32-50D	8.5-16	100	10	Unf.	M120-15F	60-120	15	4	3				
		M32-50	17-32	50	6	Unf.									
KG	TRANSISTOR MAGAMP REGULATED				• Extra Close Regulation • Special Characteristics		ALL TRANSISTOR REGULATED Series GG			• Wide Range • "Transient-Free"					
BC and MHB	AUTOMATIC BATTERY CHARGERS Stepless Attendant-free Magnetic amplifier voltage and current regulated	MODEL NUMBERS					NUMBER OF CELLS IN SERIES								
							Lead Acid	Nickel Cad.	Silver Zinc	Silver Cad.	Nickel Iron	Charger Amps.			
		BC6-15, BC6-60, MH6-125B				2-3	3-5	2-3	2-4	3-4	15,60,125				
		BC12-15, BC12-60, MH12-125B				4-6	6-10	4-7	5-8	6-8	15,60,125				
		BC18-12, BC18-25, MH18-125B				8-9	11-15	8-10	9-12	10-12	12,25,125				
		BC24-6, BC24-12, BC24-25				11-12	16-20	11-14	13-17	14-17	6,12,25				
		BC24-50, BC24-125B				11-12	16-20	11-14	13-17	14-17	50,125				
		BC32-12, BC32-25, MH32-125B				14-16	21-26	15-18	18-22	18-22	12,25,125				
		BC35-12, BC36-25, MH36-125B				18-19	27-30	19-21	23-25		12,25,125				
		MH42-125B				21-22	31-35	22-25	26-31	28-30	125				
		BC48-6, BC48-12, BC48-25				21-25	31-40	22-28	26-34		6,12,25				
		MH48-25B, MH48-60B, MH48-125B				24-25	36-40	26-28	32-34		25,60,125				
		BC120-3, BC120-6, BC120-12				52-64	80-100				3,6,12				
		MH120-25BS, MH120-25B, MH120-50B				52-64	80-100				25,25,50				



recommended values, or exceeds power supply capabilities, repeat this step with closer tolerance  $R_s$  or adjust  $R_s$  accordingly.

(4) Obtain power requirements of unit mentally:

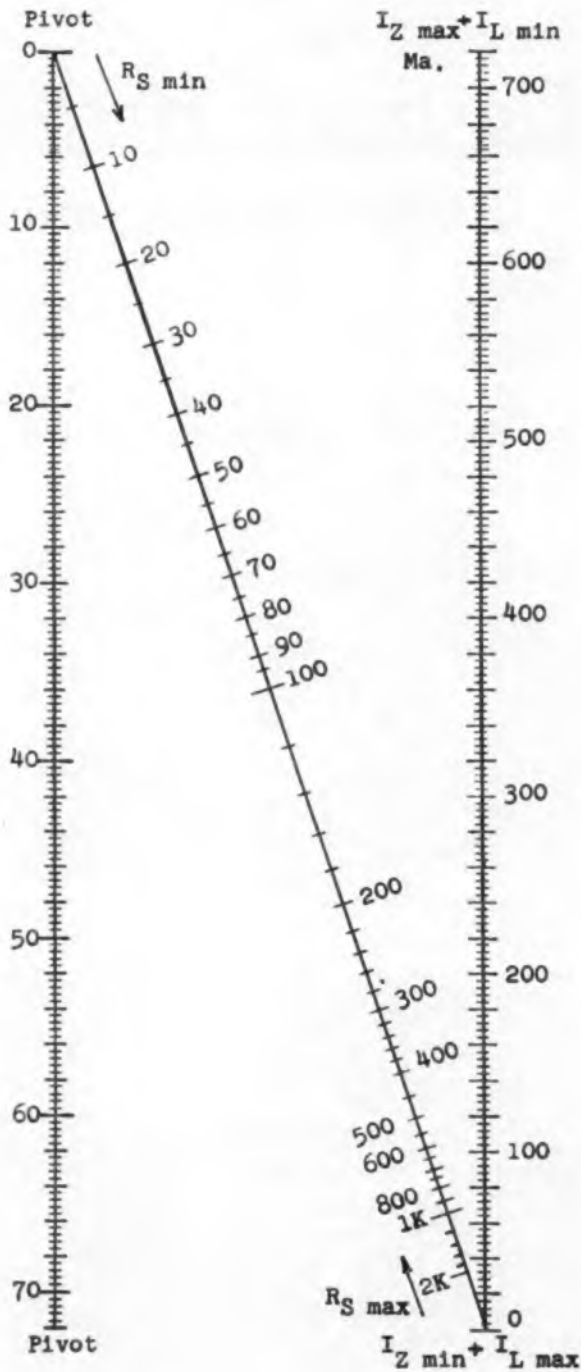
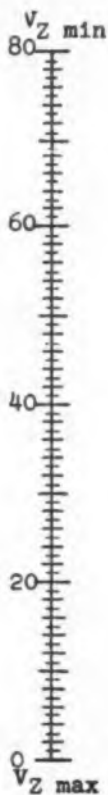
$$P_z = I_z \text{ max.} \cdot V_z \text{ max.}$$

(5) With Nomographs III and IV, the maximum

change in load voltage due to changes in temperature, source voltage, and load current is approximated:

$$\Delta V_{TC} = \left[ \frac{TC \cdot \Delta T (^{\circ}C) \cdot V_z \text{ max.}}{100} \right]$$

$$\Delta V_{RD} = \left[ R_D (I_z \text{ max.} - I_z \text{ min.}) \right]$$



*This is the sixth in a series which describes hardware for the electronic industry. Part VI presents in tabular form, laminated miniature, noval, octal, loctal or lock-in, cathode ray and glass tube sockets. Each item is clearly described and illustrated along with uses, types of material and known suppliers.*

# Electronic Hardware

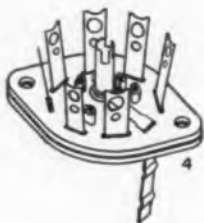
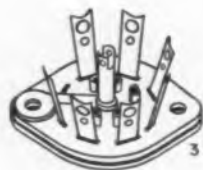
## Sub-Panel Mounting Miniature Tube Laminated Sockets

**By V. S. GITTENS**

*Component Applications Section  
Engineering Dept.  
Philco Corp.  
Tioga & "C" Sts.  
Philadelphia 4, Pa.*



1, 2. The wafers are of NEMA grade XP laminated phenolic—Contacts are cadmium plated or solder coated spring temper brass. Center shield, when used, cadmium or solder coated brass. Other grades of phenolic for the wafers are available as well as wax impregnation. Supplied with (2) or without center shield (1) with mounting hole centers 0.875, 1.00 or 1.312 apart. From Industrial Electronic Hardware Corp., Cinch Mfg. Co. and Alcon Metal Products, Inc.

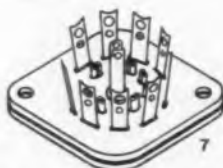
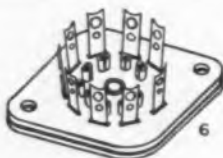


3. Miniature electronic tube sockets similar in all respects to 2, except that the center shield has a grounding strap of cadmium plated or solder coated brass which automatically grounds the center shield when the socket is mounted to the sub-base. Available from Industrial Electronic Hardware Corp., Cinch Mfg. Co. and Alcon Metal Products, Inc.

4. This miniature electronic tube socket is similar in all respects to 2, except that it has a tube shield which grounds the tube shield to the center shield of the socket. Available from Industrial Electronic Hardware Corp., Cinch Mfg. Co. and Alcon Metal Products, Inc.



5. An eight contact miniature electronic tube socket similar in all respects to 1, 2, 3, 4 except that it has an extra contact that may be used as an extra wiring point. This contact is plain brass, lacquer dipped for easy identification. Available from Industrial Electronic Hardware Mfg. Corp., Cinch Mfg. Co. and Alcon Metal Products, Inc.



6, 7. Nine contact electronic tube laminated socket. Wafers are of XP laminated phenolic. Other grades of phenolic for the wafers are available as well as wax impregnation. Contacts are made of cadmium plated or solder coated spring brass. Supplied with (7) or without (6) center shield. Available from Industrial Electronic Hardware Mfg. Corp., Cinch Mfg. Co. and Alcon Metal Products, Inc.


a tube  
in this...  
fails 12  
times more  
often than  
in these!



PATENTED—PAT. PENDING

Tubes, properly shielded with IERC Heat-dissipating Electron Tube Shields, instead of with harmful, obsolete JAN types, can extend tube life up to 12 times in new or retrofitted equipments.

For reliability and extended MTBF in your equipment, write for IERC's report, "Heat-dissipating Electron Tube Shields and Their Relation to Tube Life and Equipment Reliability." From it, you'll find the most effective, practical way to reduce bulb temperatures, neutralize critical environmental conditions, minimize down-time and tube failure-replacement costs!

**IERC**  **DIVISION**

International Electronic Research Corporation  
135 West Magnolia Boulevard, Burbank, California

Foreign Manufacturers: Europelec, Paris, France. Garrard Mfg. & Eng. Co., Ltd., Swindon, England

Circle 129 on Inquiry Card

## ELECTRONIC ASSEMBLY WORK GLOVES

Designed for use in the electronic control, instrument and other industries where precision work is required with small parts.

### PROTECTS AGAINST:

- PERSPIRATION
- FINGERPRINTS
- ABRASION
- CONTAMINATION
- LINT

SPECIAL fabric impregnation prevents chloride etch due to perspiration. Cotton Knit or 100% lint-free nylon. Reversible to fit right or left hand for longer wear. Washable for re-use.

Write today  
for bulletin  
and prices



**STANDARD GLOVE CO.**  
OF NEW JERSEY  
101 Frelinghuysen Ave.  
Newark 8, New Jersey

manufacturers of "AMBASSADOR" gloves

Circle 130 on Inquiry Card

## FIELD PROVEN!

MODEL  
**3240**



WITH



**ROBOTEC**  
overload and  
short protection  
and



**HEATRAN**  
electronic  
dissipation  
control

**SEMICONDUCTORIZED  
POWER SUPPLY**

**1-32 VOLTS  
0-4.0 AMP**

**\$349<sup>50</sup>**

FOB FACTORY  
Other Models  
Available. Write  
for Catalog

High efficiency,  
stabilized solid state  
DC power supply with  
.05% regulation,  
1 millivolt ripple,  
.01 ohm source im-  
pedance, 50 microvolt  
response time, 55-440  
cycle input.

**IMMEDIATE DELIVERY**

**Power Designs inc.**

1700 SHAMES DRIVE, WESTBURY, NEW YORK  
EDgewood 3-6200 (LD Area Code 518)

Circle 131 on Inquiry Card

# Special Pliers for the Highly Specialized Electronics Field

When the early transmission lines were strung in this country a century ago, it was Klein Pliers in the hands of linemen that helped do the job.

Klein has kept pace with the development of the electrical field, meeting each new challenge with tools specially designed to do the wiring job better . . . more economically.

Shown here are a few of the many highly specialized Klein Pliers carried in stock to meet the needs of electrical and electronics manufacturers.

You will find your assemblies go together more smoothly and wiring is done more rapidly when the right Klein Plier is used.

SEE YOUR DISTRIBUTOR



Mathias **KLEIN** & Sons  
Established 1857 Chicago, Ill., U.S.A.

INCORPORATED

7200 McCORMICK ROAD, CHICAGO 45, ILL.



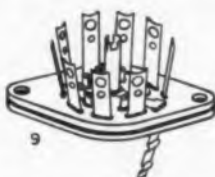
Mathias Klein & Sons, Inc. 7200 McCormick Road, Chicago 45, Ill.  
Please send me the Klein Plier Catalog and information.

Name \_\_\_\_\_  
Title \_\_\_\_\_  
Company \_\_\_\_\_  
Address \_\_\_\_\_  
City \_\_\_\_\_ State \_\_\_\_\_



8. Nine contact laminated electronic tube sockets, similar in all respects to 6 and 7, except that the center shield has a grounding strap of cadmium plated or soldered coated brass, which

automatically grounds the center shield when the socket is mounted to the sub-base. Available from Industrial Electronic Hardware Corp., Cinch Mfg. Co. and Alcon Metal Products, Inc.



9. Nine pin electronic tube laminated socket similar in all respects to 7, except that it has a tube shield contact which grounds the tube shield to the center shield of the socket. Available from Industrial Electronic Hardware Mfg. Corp., Cinch Mfg. Co. and Alcon Metal Products, Inc.

10. Octal electronic tube laminated socket has wafers of XP phenolic with contacts of hot-solder coated or cadmium plated brass. Contact tabs are available with 1 or 2 holes from Industrial Electronic Hardware Corp., Alcon Metal Products, Inc. and Cinch Mfg. Co.



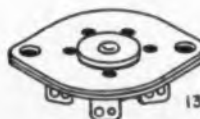
11. Metal saddle type, laminated octal electronic tube socket made of NEMA grade XP laminated phenolic material 1/16 in. thick top plate and 3/64 in. thick bottom plate. Wiping action spring

temper brass alloy contacts, hot solder coated, are used. Saddles are provided with 4 ground lugs. Available from Cinch Mfg. Co.



12. Lock-In laminated electronic tube sockets of the sub-panel mounting type with spring temper brass alloy contacts. Top plates are 1/32 in. XP laminated phenolic and bottom plates are either 1/16 or 5/64 in. thick of the same material. The locking device holds the tube

securely in place and is provided with a hot solder coated terminal for connecting to the chassis. Sockets are supplied with mounting hole centers of 1/16 and 1/2 in. Available from Cinch Mfg. Co.

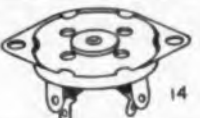


13. Laminated glass electronic tube sockets of the sub-panel mounting type available in three mounting hole centers, 1 1/2, 1 1/16, and 1 27/32 in. for 4, 5, 6 or 7 prong electronic tube sockets. The top panels are 1/32 in. thick of NEMA grade XP phenolic material and the bottom panels are of the same material 3/64 in. thick and contains a layer of canvas on the bottom for strength. There is a finder ring on the top used for locating tube. Cutting edge contacts of spring brass alloy hot solder coated. Sockets have contacts

for tube pin sizes as listed, see drawings for locations.

4 prong type	2 contacts for 1/8 inch pins.
2	" " 5/32 " "
5 prong type	all 5 contacts for 1/8 inch pins.
6	" " 4 contacts for 1/8 inch pins.
2	" " 5/32 " "
7	" " 5 " " 1/8 " "
2	" " 5/32 " "

Available from Cinch Mfg. Co.

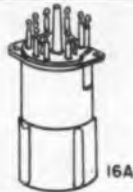


14. Steel saddle type laminated glass tube sockets for sub-panel mounting eliminate the possibility of breakage during installation. For mounting with 1/8 in. diam. rivets. Steel mounting saddles of 0.025 steel with or without integral grounding lugs are hot solder coated; lugs are adjacent to contact soldering tails. Bodies are

of NEMA grade XP laminated phenolic material. Contacts are special long spring member side opening for maximum holding tension. Developed for mobile applications. Sockets are available with 4, 5, 6 and 7 contacts as shown from Cinch Mfg. Co.



15. 15A. Printed circuit 7 and 9 pin laminated electronic tube sockets are supplied with or without center shield grounding clips. The wafers are of NEMA grade XP laminated phenolic. The contacts are of hot solder coated spring temper brass. Bullet nose terminals provide for easy location and insertion and general construction permits mechanical insertion of sockets. Available from Industrial Electronic Hardware Mfg. Corp.



16. 16A. Printed circuit 7 and 9 pin laminated electronic tube sockets similar to the ones described above, except the collapsible tube shields are mounted on the base of the socket. Available from Industrial Electronic Hardware Mfg. Corp.

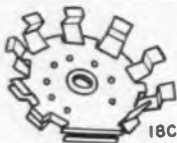


17. Printed circuit laminated octal electronic tube sockets have upper wafer of 3/64 in. and lower 1/16 in. thick NEMA grade XP laminated phenolic material. The contacts are of spring temper brass, hot solder coated. The mounting posts

snap into 0.093 in. holes in the P.W. panel. Wafers of materials other than XP phenolic are obtainable. Available from Industrial Electronic Hardware Mfg. Corp.



18, 18A. Seven and nine pin miniature electronic tube sockets of the single wafer type for P.W. use. These sockets are somewhat similar to the laminated type (two wafers) except only one wafer of NEMA grade XP is used, eliminating any possibility for humidity traps that might be formed when two wafers are used. The contacts are of spring temper brass, hot solder coated. The mounting posts vary in shape depending on the supplier but they are interchangeable. Sockets are supplied with or without center shields which are of hot solder coated brass. Available from United International Dynamics Corp., Methuen Mfg. Co., Industrial Electronic Hardware Mfg. Corp., Alcon Metal Products, Inc.

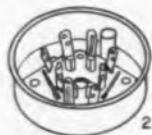


18B, 18C. Seven and nine pin miniature P.W. laminated electronic tube sockets of the offset type, have the added advantage of being about 1/8 in. below the top surface of the panel to which it is mounted, wafers are of 3/64 in. XP phenolic and the contacts are of spring tempered solder-coated brass. Available from Alcon Metal Products, Inc.



19. Duodecal cathode ray tube socket consists of a laminated 12 pin socket containing two NEMA grade XP wafers and 12 hot solder coated spring brass contacts to which wire leads are attached. The wiring tabs of the contacts are protected by a thermoplastic housing which is securely eye-letted to the assembly. Available from Industrial Electronic Hardware Mfg. Corp.

20. Magnal laminated socket contains 11 contacts and is somewhat similar to construction as the duodecal except that the keyed center hole is smaller and the socket has 11 contacts instead of 12. Socket may be riveted to a sub-base or may be assembled into a cable using the thermoplastic cover to protect the wiring tabs. Available from Industrial Electronic Hardware Mfg. Corp.



21. Octal laminated electronic tube socket and corona shield for higher voltage applications consist of a laminated octal socket as described above assembled to a tin plated steel corona shield. Available from Industrial Electronic Hardware Mfg. Corp.

The **WELL-NUT**  
seals leaks and dampens vibration

The WELL-NUT<sup>®</sup> is a flanged Neoprene bushing with a brass nut embedded in one end. Turning a conventional screw in the nut draws the Neoprene tightly against the back of the material, sealing the hole tightly against air, gas or liquid leaks.

Also has pronounced vibration-dampening effect. Equally satisfactory results in hole or cavity. Easy to assemble, space and fastens simultaneously. Will not crack or mar highly finished surfaces.

SOME STANDARD SIZES

Catalog Number	6S	10S	6-1032	10SL	1/4S	D-1420	Z3816
Standard Thread	6-32	10-32	10-32	10-32	1/4-20	1/4-20	3/8-16
Length	7/16"	33/64"	3/4"	1"	37/64"	41/64"	45/64"

\*Patented

Send for literature and samples.

ROCKWELL PRODUCTS CORPORATION

Dept. A, 146 Central Ave., Newark 3, N. J.

MArket 3-7650

Circle 133 on Inquiry Card

**FASTER... EASIER SWITCHING**

New Convenient Tabs on... **THUMBWHEEL SWITCH Modules**

4-MODULE ASSEMBLY

Equally accurate for gloved or barehand operation. Especially useful when manual settings are changed often. Large, clear numbers. High legibility because only selected number is visible. Can be furnished in 8, 10, 12 or 16 positions with single or multi-wafer construction in lug or time-saving removable type printed circuit wafers. Digital, binary, multiples of each, or multiples of both available with or without internal lighting. Ask for technical details today.

**CHICAGO DYNAMIC INDUSTRIES, INC.**  
PRECISION PRODUCTS DIVISION  
1725 Diversely Blvd., Chicago 14, Illinois

Circle 148 on Inquiry Card

# 1961 NEDA Battery Index

VOLTAGE	BRIGHT STAR	BURGESS	EVER-EADY	GAMBLE	NEDA NUMBER	MALLORY	MARATHON	MASTER-CRAFT (Coast to Coast)	MILITARY	MONTC. WARD	PHILCO	NEDA NUMBER	RCA	RAY-O-VAC	SEARS	WIZARD (Western Auto)	ZENITE
9, 90	66-03	G6B60	752		400	M-400*	5400			37*	P6086F*	400	V5M47	A400	6401		2885
7 1/2, 9, 90	66-50	F6A60	753	17-323	401	M-401	5401			33	P841A*	401	V5019	401	6407	7D7401	2879
7 1/2, 9, 90		G6M60	754		402		5402			35*	P350*	402	V5018*	402	6404*	3B6470*	
6, 7 1/2, 75	66-52	T5Z50	755		403	M-405	5403				P371	403	V5050	403	6408*	3B6464	
7 1/2, 9, 90	66-53	T6Z60	756		405		5405	3F91		82*	P371	405	V5057W	405	6409	7D7405	
3, 30	66-54	F1A60P	757		406		5406			73*	P41A1F1*	406	V5058	406	6410*	3B6462	2809
1 1/2, 63		4GA42	W-366		407		5407			34*	P87*	407	V5053*	407			
7 1/2, 63		G5A42	W-367		408		5408			36*		408	V5038*	408			
1 1/2, 90		5DA60*	W-368		409		5410		BA-45			409	V5043*	409			
1 1/2, 90		4TA60	W-369		410		5411					410	V5054*	410			
6, 75		F4X50	W-365		411		5412					411		411			
1 1/2, 80		2TXX40	W-370		412		5413			32*	P69*	412	V5022	413	6312*	7D7413	Z802
1 1/2, 90	61-05	17GD60	759	17-325	413	M-413	5413 or 5424	3F96		57	P60D11L	413		413			
1 1/2, 90		4SD60	758*		414		5414			59*	P6086L*	414	V5021*	414	8303*		
7 1/2, 9, 90		S6D60	776		415		5415			54	P326	415	V5119	415			2890
1 1/2, 9, 90		G6B0038R	752W		416		5400 & 3023					416		23 & A400			2885X
1 1/2, 90		6FA60*		AB667*	417					31*		417	V5037*	417			
6, 90		F4B60*			418							418	V5048*	418			
1 1/2(A), 87 1/2(B), 7 1/2(C)					419							419	V5041*	419			
6, 7 1/2, 87 1/2		F5M45*			420							420	V5020*	420	6400*		
6, 90		2F4A60*			421							421	V5044*	421			
6, 75		G4B50*			422		5422					422	V5046*	422	6403*		2675
1 1/2, 61 1/2		4GA41*			423							423	V5052*	423			
1 1/2, 90		4T260	729		425		5425				P364	425	V5084	425			
1 1/2, 90		18CD80*			426		5426					426	V5045*	426	6305*		228
6, 67 1/2					427							427		AB6145N	6408*		
9, 90		T6Z60P	727		428		5428					428	V5059	428			2862
1 1/2(A), 87 1/2(B), 7 1/2(C)					429							429	V5051*	429			
9, 90		3GR60*			430							430		AB682			
7 1/2, 75		T5Z50P	766		431		5431					431	V5660	431			2775

"A" and "B" BATTERY PACKS

\*Discontinued number shown for reference purposes only.

SINCE the first organized, serious efforts to produce a cross-referenced battery chart in 1949, manufacturers have changed their attitude from one of passive acceptance to active participation.

All the major manufacturers thought such a compilation was a good idea, but they also had a few misgivings. The major problems were: a numbering system acceptable to all; fears of price-fixing accusations; and, finally, an actual chart, comprehensive and complete.

After NEDA established its own numbering system, and the original tabulation made on a 3 ft. by 5 ft. sheet, the first Index was published in 1952.

With publication, interest heightened. And with that, cooperation. Progress naturally followed. No one likes to see their wares listed in error, so mistakes were reported promptly. Now manufacturers are eager to take part in this endeavor.

This Index is copyrighted by the National Electronic Distributors Association. For further historical data, see: Wedemeyer, G. E., "How and Why the NEDA Battery Index was Developed," NEDA Journal, Feb. 1961.

	"A" BATTERIES							
	VOLTAGE	BRIGHT STAR	BURGESS	EVER-EADY	GAMBLE	NEDA NUMBER	MALLORY	MARA-TTHON
	6	866°	2F4	718		1		3001
	6		Z4	724		2		3002
	4½	360	F3	736		3	M-3°	3003
	1½	462	4F	742	17-263°	4		3004
	1½	660	6F	743		5		3005
	6	646	F4PI	744		6	M-6	3006
	4½°	361	G3	746	17-266	7		3007
	7½		B5	713		8		3008
	7½	591	C5	717	17-275	9	M-9	3009
	7½		75	W-380		10		3010
	1½		2F	W-353		11		3011
	1½		4FL			12		3012
	1½	10M	Z30	A100	17-439	13	M-13R	123
	1½	11M	130	835	17-429	14	M-14R or Mn-1400	113
	1½	59-1	930	1015		15	M-15R or Mn-1500	173
	6	868	2F4L	747°	45-268°	16		3016
	1½	860	8F	741		17		3017
	1½		ZD	720		18		3018
	4½	305	D3	726		19		3019
	1½	61R	21R	964	17-272	20	M-20	3020
	1½		8FL°	745°		21		3021
	7½		C5°			22		
	1½		8R	960P		23		3023
	1½	58	7	912		24	M-24F	160
	6		F4L°			25		
	7½		D5	707		26	M-28°	3028
	6		2F4S			27		897
	67½	45N	XX45	467	17-304	200	M-200	4200
	45		XX30	455		201	M-201	4201
	45	30-33	M30	482		202	M-202	4202
	67½		K45	457		203		4203
	90		N60	490		204		4204
	22½, 45	30-59	Z30	738		205		4205
	45		A30	W-359	17-302°	206		4206
	45	30-03	B30	484		207		4207
	15		U10	411		208	M-208	4208
	30		U20	413		210	M-210	4210
	67½		P45M			211M		4211
	67½	675	P45	477	17-310	211P	M-211P	4211
	75		XX50	437	17-311°	212		4212
	45		U30	415		213	M-213	4213
	90		P60	479	17-314	214	M-214	4214
	22½	12P	D15	412		215	M-215	4215
	90		N60X	495		216	M-216°	4216
	67½		UX45	416	17-305	217	M-217	4217
	15	15P	Y10	504		220	M-504	4220
	22½	22P	Y15	505		221	M-505	4221
	30		Y20S	507		222	M-507	4222
	30		Y20	506		223	M-506	4223
	15		K10	417		224		4224
	22½		K15	420		225		4225
	30		K20	430		226		4226
	103½		XX89	W-361		227		4227
	67½		UB45			228		



MASTER-CRAFT (Coast to Coast)	MILITARY	MONTC. WARD	PHILCO	NEDA NUMBER	RCA	RAY-O-VAC	SEARS	WIZARD (Western Auto)	ZENITH
	BA-203/U			1	V8010	A1			
				2	V8068	A2			
		26	P38°	3	V8067	A3	6441°	7D7003	Z736
	BA-65	21°	P94°	4	V8004	A4	6430°	3B6110°	Z84
			P96°	5	V8007°	A5	6431°	3B6115°	Z68
			P4F4R	6	V8009	A6	6451°	3B6145°	
	BA-228/U		P100°	7	V8002°	A7	6440		Z83A
				8	V8129	8			
SF63		29	P31	9	V8065	9	6444	7D7009	Z750
				10		A10			
				11	V8141	11			
SF51B		23	P920	12	V8005°	12			
				13	V8336	13	6445	7D8013 or 7D8013	Z4NL
SF48			P903	14	V8335	14	6446	7D8014 or 7D7014	Z7
SF86		47	P15R	15	V8334	15	6447	7D7015 or 7D8015	Z8
				16	V8011°	16	6452°		Z698L
		20°		17		17			
				18	V8069	18			
				19	V8072	19			Z450
SF60		27	P77	20	V8236	20	6442	7D8020	Z5
				21	V8008°	21			
				22	V8003°	22			
	BA-231/U			23	V8070	23			Z1
SF47			K°	24	V8074	400	4656	7D7024	Z912
				25		25	6450°		
SF64			P26°	26	V8315	26			Z707
				27		27			
SF73	BA-51	43	P67	200	V8016	200	6480	7D7200	Z67
SF70	BA-56	79°	P105°	201	V8055	201		7D7201	Z455
	BA-59	42°	P45	202	V8013	202	6461	3B6241	Z763
				203	V8062	203			Z457
		46°	P132°	204	V8090	204	6465°	3B6260	Z460
	BA-63		F104°	205	V8015	205			
		41°	P210°	206	V8014	206	6480°	3B6228	
	BA-223/U	49°	P305°	207	V8012	207	6462°		Z530
				208	V8083	208			Z11M
				210	V8085	A210			Z13M
		87°		211M	V8215°	211M	6482		
SF75		40	P149	211P	V8216	211P		7D7211	Z477
SF79		47°	P144	212	V8217	212			Z437
SF72		120	P150	213	V8066	213	6485		Z415
		55	P176	214	V8219	214	6470		Z90
SF89	BA-261/U	66°	P612	215	V8084	215			Z12M
			P190°	216	V8316				Z495
SF77			P217	217	V8318	217			Z5M
				220		220			Z6M
				221		221			
				222					
				223					
				224					
				225					
				226					
	BA-38			227		69N			
				228					

\*Discontinued number shown for reference purposes only.

# BATTERIES

VOLTAGE	BRIGHT STAR	BURGESS	EVER-EADY	GAMBLE	NEDA NUMBER	MALLORY	MARATHON	MASTER-CRAFT (Coast to Coast)	MILITARY	MONTG. WARD	PHILCO	NEDA NUMBER	RCA	RAY-O-VAC	SEARS	WIZARD (Western Auto)	ZENITH
1½	262*	2TBP	W-354		700		6700		BA-15A			700	VS101	700			
3	260	F2BP	W-352		701		6701		BA-205			701	VS100	701			
10½ to 22½			W-352		702		6702		BA-8			702	VS137*	702			
3		2T2H	W-356		703		6703					703	VS136	703			
50-17	422		750		704		6704		BA-208			704	VS134	704			
4½	51-17	421	731		705		6705		BA-28			705	VS142	705			
4½	03-17	532	705		706		6706		BA-9			706	VS133	706			
3 to 22½		5156SC	776		708		6708		BA-230			708	VS131	708			
22½, 45			7625		709		6709		BA-36			709	VS112	709			
22½, 45			763		710		6710		BA-2			710	VS102	710			
1½ to 4½		230NK	W-350		711		6711		BA-53			711	VS114	711			
1½ to 7½	51-03	23705T	761T		712		6712		BA-27			712	VS130	712	5005*		
1½ to 7½	03-17S	5960	773		713		6713					713	VS029	713			
4½			781		714		6714					714	VS028	714			
22½, 45		21308SC	W-364F		715		6715					715	VS157W	715			
22½, 45		10308SC	W-363F		716		6716					716	VS127W	716			
22½, 45	30-95	2308P1	W-365P	43-295*	717		6717			70*	P30D*	717	VS026*	717	6363*		
22½, 45	71-17	2370P1	771	43-305*	716		6718			85*		718	VS030*	718	6390*		
3, 4½	20-80*	20F	740		719		6719			64*		719	VS024*	719	6330*		
1½		20F2			720		6720			65*		720	VS025*	720	6342*		
3 to 22½	15-03	5156P1	768*		721		6721		BA-211/U			721	VS031*	721	6391*		
300		U200	493		722		6722		BA-291/U			722	VS093	722			
22½, 45		2308SC	W-365F		723		6723					723	VS126	723			
22½, 45		10308SCPr			724		6724					724	VS127W	724			
6		F4X			725		6725					725		725			
22½, 45	30-60	10308P1	W-363P	43-295*	726		6726					726	VS027*	726	6361*		710725A
22½, 45		21308P1	W-364P		727		6727					727		727	6360*		

INDUSTRIAL and SPECIAL PURPOSE

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		Hg - 1R E1			1100	RM-1				62-103		1100	VS143				
		Hg - 12R E12			1101	RM-12						1101	VS144				
		Hg - 401 E401			1102	RM-401				62-122	P9	1102	VS401	15M	6448	7D9015	Z9
		Hg 9 E9 or E91			1103	ZM-9						1103	VS313				
		Hg - 630 E630			1104	RM-630						1104	VS147				
		Hg - 640 E640			1105	RM-640						1105	VS150				
		Hg - 400R E400			1106	RM-400						1106	VS145				
		H233 E233			1300	TR-233						1300	VS400				
					1301	TR-233						1301	VS311*	1301			
					1302							1302	VS308*	1302			
		2731			1303	TR-133						1303	VS321				
		H133			1304	TR-163				62-105	P1306	1304	VS149				
		H163			1305	TR-163						1305	VS163		6415		
		E163			1306	Mfr-1306						1306	VS146				
		4D4	274		1400		1400					1400					
					1401							1401	VS310*	1401			
					1402							1402	VS307*	1402			
		2713			1403							1403	VS325				
		H164			1404	TR-164				62-104		1404	VS164				
		E164			1404	TR-164						1404	VS164				
		H165			1500	TR-165						1500	VS165				
		E165			1501	TR-175						1501	VS165				
					1600	M-1600	1600A	SF82		96	P91	1600	VS300A	1600 or 1600M	6418 or 6421	7D7600	Z226
	0198	P6M	226		1601							1601	VS301	1601			
		D6PI	2506		1602	M-1602	1601	SF84				1602	VS305	1602			
		ZM6	246		1603	M-1603	1602					1603	VS308	1603		7D7602	
		D6	276		1604	M-1604 or TR-146	1603	SF85				1604	VS333 or VS332	1604 or 1604M	6419 or 6417 or 6418	7D7604 or 7D9604	Z276 or Z216 or Z146
	0920	H146	E146		1605	TR-146	1604					1605	VS332	1605			
		M6	266		1605	M-1605	1605	SF90				1605	VS309A	1605			
		YL 6 H177	E177		1606	TR-177						1606		1606			
		D6S	2761		1608		1608					1608					
			2762		1609		1609					1609					
		223	243		1610		1610					1610	VS324	1611M			
			206		1611	M-1611						1611	VS327				
		C6X	2356		1612		1952					1612	VS326				
			2709		1613							1613	VS326				
					1614	303145						1614					
					1610							1610					
		XX9	239	17-277	1900	M-1900	1900	SF86		95		1900	VS304	1900			
			2314		2400		2400					2400					

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Input Voltage: . . . . . 24-30 VDC  
Output Voltage: . . . . . 115 VRMS  
Output Frequency: . . . . . 400 cps  
(other frequencies available)  
Output Power: . . . . . 50 volt-amps  
Frequency Regulation: 0.3% for 6 V line variations  
Harmonic Distortion (Total): 2% at specified load (4% max.)  
Size and Weight: . . . 2 1/2" x 4" x 2 1/2" high; 26 oz.

### DC TO DC Model 591HC



Input Voltage . . . . . 24-30 VDC  
Output Voltage Range . . . from 6 VDC to 3500 VDC  
Output Power . . . 60 watts (max.) regulated  
Regulation . . . ±1.0% for 6 V line variations; ±1.5% for 50% load variations  
Ripple . . . . . 0.3% RMS  
Size and Weight . . . 3" OD x 3 3/8" high; 22 oz.

### DC TO SQUARE WAVE Model 591ACB



Input Voltage . . . . . 24-30 VDC  
Output Voltage Range . . . 1.0 to 3500 VRMS, square wave, 400 cps (other frequencies available)  
Output Power . . . . . 50 V. A.  
Regulation . . . Frequency and Voltage: ±1.0% for 6 V line variations; ±1.0% for 50% load variations  
Size and Weight . . . 3" OD x 3" high; 19 oz.

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A compilation of those textbooks, published in 1960 and 1961 which should be of interest to electronic engineers. For convenience, books are divided into categories of broad interest.

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#### Electronic Equipment Reliability

By G. W. A. Dummer & N. Griffin. 274 pages. Price \$7.50

#### Electronic Maintainability, Vol. 3

Edited by F. L. Ankenbrandt. 312 pages. Price \$10.00 (RP)

#### Electronic Processes in Solids

By P. R. Aigrain and prepared by R. J. Coelho & G. Ascarelli. 67 pages. Price \$4.00 (Jointly JW & TP)

#### High Frequency Magnetic Materials

By W. J. Polydoroff. 220 pages. Price \$9.00 (JW)

#### Magnetic Materials, 3rd Edition

By F. Brailsford. 188 pages. Price \$3.00 (JW)

#### Miniaturization

Edited by H. D. Gilbert. Price and size to be announced (RP)

#### Modern Electronic Components

By G. W. A. Dummer. 320 pages. Price \$15.00 (PL)

#### Progress in Dielectrics, Vol. I

General Editor J. B. Birks. 312 pages. Price \$11.00 (JW)

#### Progress in Dielectrics, Vol. II

General Editor J. B. Birks. 225 pages. Price \$9.50 (JW)

### COMPUTERS

#### Electronic Computers: Revised Edition

By T. E. Ivall. 320 pages. Price \$12.00 (PL)

#### Automation, Cybernetics and Society

By F. H. George. 272 pages. Price \$12.00 (PL)

#### Automatic Translation

By D. Yu Panov. Price \$3.50 (PP)

#### Applied Automation

Edited by J. R. Custer. 236 pages. Price \$6.00 (CC)

#### Annual Review in Automatic Programming, Vol. I

Edited by R. H. Goodman. Price \$10.00 (PP)

#### Basics of Analog Computers

By Truitt & Rogers. 400 pages. Price \$12.50 (JR)

#### Computer Handbook

By Huskey & Korn. 1200 pages. Price \$25.00 (MH)

#### Digital Applications of Magnetic Devices

By A. J. Meyerhoff. 604 pages. Price \$14.00 (JW)

#### Design Fundamentals of Analog Computer Components

By R. M. Howe. 268 pages. Price \$7.50 (DV)

#### Digital Computer Principles

By W. C. Irwin. 328 pages. Price \$8.00 (DV)

#### Mathematical Methods for Digital Computers

Edited by A. Ralston & H. S. Wilf. 293 pages. Price \$9.00 (JW)

#### Computer Logic

By I. Flores. 456 pages. Price \$12.00 (PH)

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#### Industrial Electronics and Controls, 2nd Edition

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#### Magnetic Control of Industrial Motors, Part I, 3rd Edition

By G. W. Heumann. 368 pages. Price \$9.00 (JW)

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By G. W. Heumann. Price and pages indefinite. In press (JW)

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By C. H. Wilts. 271 pages. Price \$8.75 (AW)

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#### Direct Conversion of Heat to Electricity

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AT	American Technical Society
CC	Chilton Co.
CE	Communication Engineering Book Co.
DP	Dover Publications, Inc.
DV	D. Van Nostrand Co., Inc.
GL	Gernsback Library, Inc.
JR	John F. Rider Publisher, Inc.
JW	John Wiley & Sons, Inc.
MH	McGraw Hill Book Co.
PH	Prentice-Hall, Inc.
PL	Philosophical Library
PP	Pergamon Press, Inc.
RP	Reinhold Publishing Corp.
TP	The Technical Press (MIT)

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# 1961 ELECTRONIC INDUSTRIES DIRECTORY

## **Contents—Changes—What's New—in this 19th Edition**

### **Contents:**

- **Product Finding Index** .....page 250  
A fast reference guide that enables you to find the product you want in the Product Directory—quickly.
  
- **Products & Manufacturers** .....page 256  
Over 2000 specific product identifications listed under 82 major product sections. Alphabetical listings of manufacturers in each section tells who makes what.
  
- **Manufacturers Alphabetical Index** .....page 349  
Alphabetical listing of names and addresses of more than 8000 electronic manufacturers.

### **Changes and What's New:**

- More than 2500 new names and addresses of Electronic Manufacturers added.
- This year for the first time all of the listings have been developed and printed-out through a Univac Computer. These lists represent only a portion of the data stored for Electronic Industries' (MAP) Marketing Assistance Programs. It is planned to produce future editions of the Electronic Industries Directory in the same way. As a consequence our "Questioning and Verification Cycles" will be somewhat altered. Previously our questionnaires started into the mails in January of each year. Under the new MAP programs questioning for 1962 data will begin in July of 1961. Watch for yours!

### **Reproduction and Usage:**

These listings are designed primarily as an aid to electronic design engineers in locating sources of supply. They are not intended for any commercial mailing purposes. Unauthorized usage and reproduction of these lists or any portions thereof is expressly prohibited. © Chilton Company, Chestnut and 56th Streets, Philadelphia 39, Pa. June 1961



# Product Finding Index

## Here's How To Use This Index:

### ● Find the product in the alphabetical list below.

Products are listed by their basic description (i.e. a wheatstone bridge will be found listed as "bridge, wheatstone"). Cross-referencing is also provided where a product may be known by a number of different names—for instance, volume control; resistor, variable; and potentiometer will be found listed separately in alphabetical order but all indicating Section 79 as the major grouping where their manufacturers will be located.

### ● The FIRST NUMBER indicates the Section Number (Major Grouping).

And for quick indexing the top of each right hand page carries a line indicating which "Section" is listed on that and the preceding page.

### ● The SECOND NUMBER INDICATES the specific product that the manufacturer makes.

At the head of each section are listed individually the various products found in that grouping; over 2,000 products are included altogether.

### ● The BOLD FACE lines are major group headings.

And the page number following tells where the major group begins.

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# 1961 ELECTRONIC INDUSTRIES DIRECTORY

## Product Listings

This is a verified listing of equipment, test and measuring instruments, and components manufactured by the electronic industries. Also listed are supplementary items such as cabinets, chemicals, hardware, raw materials and services related to the electronic field. Names and addresses of manufacturers are given for over 2000

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MECHANICAL PRODUCTS INC	9
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TEMCO ELECTRONICS DIV TEMCO AIRCRAFT CORP	1-2-3-12-13-14
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NJE CORP	18-
NORDEN DIVISION UNITED AIRCRAFT CORP	19-20
NORNA HOFFMANN BEARINGS CORP WALKER DIV	9
NORTHROP CORP NORTHONICS DIV	18
NORWOOD CONTROLS UNIT DETROIT CONTROLS	16
NUCLEAR-ELECTRONICS CORP	9
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OPAD ELECTRIC CO	9
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ORBITRAN CO INC	9-34
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P H ELECTRONICS INC	34
PACE ENGINEERING CORP	14
PACIFIC MERCURY T V MFG CORP-SEPULVEDA	5-
	16-33-34
PACIFIC SCIENTIFIC CO-LOS ANGELES	5
PACKARD BELL ELECTRONICS CORP	18-19-20-31-
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PANSEAL INC	14-17-18-20
PANSONS CO RALPH H ELECTRONICS DIV	9
PATTERSON WOODS RESEARCH DIV LEESONA CORP	5
PEARCE SIMPSON INC	33-34
PEEBLES & CO LTD BRUCE	21
PEER INC	19-21-34
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PENWOOD NUMECHRON CO	18
PERKIN ENGG CORP	9
PERMA-POWER CO	21
PERMFLUX PRODUCTS CO	9-14
PESCO PRODUCTS DIV BORG-WARNER CORP BEDFORD	9
PHILCO CORP GOVT & INDUSTRIAL GROUP	16-18-
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PHILCO CORP-TIOGA & C STS	18-20-31-33-34
PHILLIPS ELECTRONICS MFG CO	9
PHOTOCOR RESEARCH PRODUCTS	14
PHOTOGRAPHIC ANALYSIS INC	10-20
PLASTIC CAPACITORS INC	9
POLARAD ELECTRONICS CORP	20-31-33
POLYPHASE INSTRUMENT CO	14
POTTER AERONAUTICAL CORP	14
POTTER INSTRUMENT CO	20
POWER SUPPLIES INC	9
PRODUCTION RESEARCH CORP	5-33-34-38
PROJECTS UNLIMITED INC	33-34
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R S ELECTRONIC CORP	31-33
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RADIO CITY PRODUCTS CO	19-20-33-34
RADIO CORP OF AMERICA DEFENSE ELECTRONIC	31-38
PRODUCTS	9
RADIO FREQUENCY LABS INC	9
RADIONICS INC	9
RADIOPLANE DIV NORTHROP AIRCRAFT INC	20-
	21
RAHM INSTRUMENTS	19-19
RAND-WOODBRIDGE CORP-DENVER	9-31
RATIGAN ELECTRONICS INC	9
RAULAND-BORG CORP	9-33-34
RAYTHEON CO COMMERCIAL EQUIP DIV	31
RAYTHEON CO MAYNARD LAB	17-31
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RESDEL ENGG CORP	31-33
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ROSEHOUT ENGG CO	14
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SANTA BARBARA DIV CURTISS WRIGHT	20
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SEISCOR MFG DIV SEISMOGRAPH SERVICE CORP	19-33-34
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SERVO CORP OF AMERICA-HICKSVILLE	18-33
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SERVONIC INSTRUMENTS INC	14
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SIERRA ELECTRONIC CORP-MENLO PARK	34
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SPECTROL ELECTRONICS CORP	9-19-20
SPERRY FARRAGUT CO DIV SPERRY RAND CORP	18-20
SPERRY GYROSCOPE CO DIV SPERRY RAND CORP	18-19-20-31
GREAT NECK	18-31
SPERRY GYROSCOPE CO MARINE DIV	18-31
SPERRY GYROSCOPE CO-AIR ARM DIV	18-20-31-
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SPRINGER AIRCRAFT RADIO CORP	33
SPRINGFIELD ENTERPRISES	33-34
STANCIU-HOFFMAN CORP	12
STANLEY AVIATION CORP	5
STATHAM INSTRUMENTS INC-LOS ANGELES	14
STATISTICAL INSTR CO	9-14-18-21-33
STEWART & STEVENSON SERVICES INC	9
STEWART WARNER ELECTRONICS DIV CHICAGO	17-
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STRONG ELECTRIC CORP	31
SUFFOLK PRODUCTS CORP	9
SUN ELECTRIC CORP	9
SUPERIOR ELECTRIC CO	9
SYLVANIA ELECTRIC PRODUCTS INC ELECTRONIC	17
SYSTEMS PLANT	17-18-31-33
SYLVANIA ELECTRIC PRODUCTS CO ELECTRIC	18-31-33-34
SYSTEMS DIV	17-18-31-33
SYLVANIA ELECTRONIC SYSTEMS	17-18-31-33-
SYLVANIA ELECTRONIC SYSTEMS	34-38
SYLVANIA ELECTRONIC SYSTEMS-NEEDHAM	18
SYSTRON CORP	14
TABER INSTRUMENT CORP	18
TAFEL ELECTRONICS INC	21-33
TALLY CORP	9-20
TAPCO GROUP THOMPSON RAND WOODBRIDGE INC	9-20
TECHNICAL APPARATUS BUILDERS	9
TECHNICAL OIL TOOL CORP	16-20-31
TEL-INSTRUMENT ELECTRONICS CORP	33-34
TELE-DYNAMICS/DIV AMERICAN BOSCH ARMA	20-
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TELEMARINE COMMUNICATIONS CO	33-34
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TEMCO ELECTRONICS DIV TEMCO AIRCRAFT CORP	18
TEXAS INSTRUMENTS INCORPORATEU-DALLAS	10-
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TOPP INDUSTRIES INC	18-18-18-19-20-33-
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TOPPER MFG CO INC	14
TOPPING ELECTRONICS LTD F V	33
TORICO ELECTRONICS INC	9
TRANS-SONICS INC	14
TRANSLINE ELECTRONIC COMMUNICATION CO	35-
	34
TRANSONIC INC	9
TRANSVAL ENGG	9
TRG INC	16-17-18-19-20-31
TUNG SOL ELECTRIC INC-NEWARK	9
U S RADIUM CORP-BLOOMSBURG	5
U S RADIUM CORP-HORRISTOWN	5
U S SCIENCE CORP	18
ULTRADYNE INC	14
UNITED CONTROL CORP	14
UNITED ELECTRODYNAMICS	9-34
UNITED MFG CO DIV W L MAXSON CORP	9
UNIVERSAL TRANSLATOR PRODUCTS CORP	9
UNIVOX CORP-LOS ANGELES	18-18-19-20-21-31
UTRAD CORP DIV LITTON IND	9
VALVEP CRYSTAL CORP	14
VARO MFG CO-GARLAND	9-19-20-21-33
VECTRON INC	18-17-18-31
VIBRATION RESEARCH LABS INC	9
VICKERS INC ELECTRIC PRODUCTS DIV	9-20
VICTOR HF & MICROWAVE CO	14
VINSON ENGG & SALES CORP	14
VIRGINIA ELECTRONICS CO	21-33-34
VORON & CO GEORGE	33-34
WAALINE INC	20
WALDRIF ELECTRONICS DIV F C HUYSK & SONS	9-12-16-18-19-20-21
WANG LABS INC	18
WAUGH ENGG CO	14
WEBCOR INC-ELECTRONICS DIV	5-31-33-38
WELLS INDUSTRIES CORP	21-34
WEST COAST RESEARCH CORP	14
WESTERN DESIGN DIV U S INDUSTRIES INC	9
WESTGATE LAB INC	12-18-20
WESTINGHOUSE ELECTRIC CORP-PITTSBURGH	9-
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WESTINGHOUSE ELECTRIC CO DIV AIR ARM DIV	14-18-20-31
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WHITTAKER GYRO DIV TELECOMPUTING CORP	19-
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WIACON ENGG CO	14
WICKES ENGG & CONSTRUCTION CO	19-21
WINGCHARGER CORP	9
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WOODLAND ELECTRONICS CO INC	33-34

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BATTERIES, MERCURY	4
BATTERIES, NICKEL ALKALINE	5
BATTERIES, NICKEL CADMIUM	6
BATTERIES, NUCLEAR	7
BATTERIES, RECHARGEABLE	21
BATTERIES, SILVER	8
BATTERIES, SILVER CADMIUM	22
BATTERIES, SILVER ZINC	9
BATTERIES, SOLAR	19
BATTERIES, STANDARD CELL	10
BATTERIES, STORAGE	11
BATTERIES, STORAGE NONSPILL	12
FUEL CELLS	18

ACCURATE ELECTRONICS CO	12
ALCO BATTERY LAMP	1
ALCO ELECTRONIC PRODUCTS INC	21
ARGONNE ELECTRONICS MFG CORP	1
ASSOCIATED ELECTRICAL INDUSTRIES LTD RADIO & ELECTRONIC COMPONENTS DIV	1-10-12-21
BODIE ELECTRIC MFG CO	11
BOBERS BATTERY & SPARK PLUG CO	11
BRIGHT STAR INDUSTRIES	1
BRITISH ELECTRONIC SALES-FLUSHING	1-4-6-
BURGESS BATTERY CO	12
BURGESS BATTERY CO DIV SERVEL CANADA LTD	1-4-6-

C & D BATTERIES DIV ELECTRIC AUTOLITE CO	11-21
CENTRAL SCIENTIFIC CO OF CANADA LTD	1
COOK BATTERIES	9-9-11-12
EAGLE-PICHER CO AMERICAN LLOG-CINCINNATI	5-6-9-9-21-22

EAGLE-PICHER CO-COUPLES PLANT	6-8-9-22
ELECTRIC AUTOLITE CO-PORT HURON	11-12
ELECTRIC AUTOLITE CO-TOLEDO	11-12
ELECTRIC STORAGE BATTERY CO MISSILE BATTERY DIV	9
ELECTRONIC BATTERIES INC	12
ERCONA CORP	9

EXIDE INDUSTRIAL DIV ELECTRIC STORAGE BATTERY CO	1-6-8-9-10-11-12
FEDTRO INC FEDERAL ELECTRONICS SALES DIV	1
FEDERAL ELECTRONICS BLD	1
FELLSINHAL & SONS INC G	18
FLORIAN & BABS INC	6
GENERAL ELECTRIC CO-RAND	18
GENERAL ELECTRIC LAB INC SILVER SPRING LAB	26-33-34
GULTON INDUSTRIES INC-METUEN	5-6-11-12
INT L RECTIFIER CORP-EL SEGUNDO	1-5-6-10-11-21
LECLANCHE S A	1-5-6-10-11-21

LYTEL CORP-CHICAGO	9
MACKAY RADIO & TELEGRAPH CO MARINE DIV	6
MALLORY I CO INC P R	1-4
MALLORY & CO INC P R	1-4-9
MALLORY BATTERY CO DIV P R MALLORY & CO	1-
MALLORY BATTERY CO DIV P R MALLORY & CO	1-
MALLORY BATTERY CO DIV P R MALLORY & CO	1-
MALLORY BATTERY CO OF CANADA LTD	1-8-8-9-10-21

MERATHON BATTERY CO	1
MICROWAVE & DEVELOPMENT LABS	6-7-8-21
MURHEAD B CO LTD	10
MURHEAD INSTRUMENTS INC-NEW YORK	10
NICAD DIV INC GOLD NATL BATTERIES INC	5-
OLIN MATHIESON CHEMICAL CORP ELECTRICAL	6-11-12

PATTERSON CORP	11
PATTERSON MOOS RESEARCH DIV L&ESONA CORP	1-7-8-18
RADIATION RESEARCH CORP-NEW YORK	7
RADIATION RESEARCH CORP-WEST PALM BEACH	7
RADIO CORP OF AMERICA-ELECTRO TUBE DIV	4

RAY-O-VAC CO-MADISON	1-4-10
R O S CIMENA SUPPLY CORP	6
SOMOTOME CORP	6
TELECOMPUTING CORP-LOS ANGELES	6-9-11
TRACELAB INC-WALTHAM	7
U S RUBBER CO	1
UNION CARBIDE CONSUMER PRODUCTS CO	1-8-6-

WESTERN COIL & ELECTRICAL CO	11
WILLARD STORAGE BATTERY DIV-CLEVELAND	11-
YARDNEY ELECTRIC CORP	8-9-11-12-21-22

## 11 - CABINETS, RACKS, PANELS & ACCESSORIES

ACCESSORIES, MOUNTING	1
BOARDS, PLUG-IN	3
CABINETS, METAL	8
CABINETS, PLASTIC	9
CABINETS, WOOD	10
CASES, PORTABLE	11
CHASSIS	14
CONSOLES	15
PANELS, FIBRE	25
PANELS, GLASS	33
PANELS, METAL	26
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SLIDES, CHASSIS	29
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A A METAL PRODUCTS INC	8-14-26-28
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ABBOTT SCREW & MFG CO	53
ACCESSORY CONTROLS & EQUIPMENT CORP	1-8
ACCURATE BOX CORP	10-11-15
ACCURATE ELECTRONICS CORP	3-25-27
ACF PLASTIC CO	27
ACF ELECTRONICS DIV	8
AKERMAN ENGRAVERS	25-26-27
ALCO TELEPHON DIV NEA SERVICE-CLEVELAND	8

ADDISON INDUSTRIES LTD	10-11
ADAPT INDUSTRIES INC	25-26-27-33
AEROLITE ELECTRONICS CORP	3-27
AIR TRANSPORT MFG CO	1-8-11-14-15-28
AIRCRAFT ARMAMENTS INC	8-28
AKRO-MILLS INC	8-9-11
ALDEN PRODUCTS CO	3-8-11-14-15-28
ALLEN ELECTRIC & EQUIPMENT CO	1-8-14
ALLIED ALLEGRI MACHINE CO INC	25-26-27
ALLIED ENGRAVING & STAMPING CO	25-26-27
ALLIED FABRICATING CORP	1-8-14-26
ALMITEC INC	1-8-11-14-15-26-28
ALCO ENG CO	1-8-14-15-28-29-30
AMERICAN ALUMINUM CO	8-11-29
AMERICAN ELECTRONICS INC TALLER & COOPER DIV	8

AMERICAN INSULATOR CORP	9-27
AMERICAN LAUBSCHER CORP	26
AMERICAN MACHINE & FOUNDRY GOVT PROC GROUP	8-26-28
AMERICAN MACHINE & FOUNDRY CO-NEW YORK	8
AMERICAN MACHINE & FOUNDRY CO GEN ENGR LABS	8
ANCHOR SPECIALTY MFG CO	3-8-9-10-14-25-26-

ANDOVER INDUSTRIES INC	9-27
ANTLAB INC	15
APAMUSSER CORP OF M E	25-26-27
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ARCAN EASTERN LTD	8-28
ARGOS PRODUCTS CO	10-11
ARTISAN METAL WORKS CO	8-11-14-15-26
ATKINS & MERRALL INC	9-15-27
AUDIO ACCESSORIES	26
AUTO TEST INC-CHICAGO	8-11-14-26
AVCO CORP WASHVILLE DIV	1-8
B-B MFGS INC PHILLIPS RADIO DIV	8-26
BAILEY METER CO-CLEVELAND	26
BARRY CONTROLS INC-BATERTOWN	28
BECKMAN INST INC SCIENTIFIC & PROC INST	26-28

BECKS INC	3
BELMAR WHEEL & MACHINE CO INC	1-8-14-26-
BELMET PRODUCTS INC	28
BENNETT MFG CO INC	1-3-8-11-14-15-26-
BERNARD FRANKLIN CO INC	28-29-30
BETHLEHEM ENGINEERING CORP	8-14-26
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BITCHER CORP INDUSTRIAL DIV	8-14-26
BUONAN INDUSTRIES INC	28
BOLTA PRODUCTS DIV GEN TIRE & RUBBER	27
BUNNY MFG CORP	27
BOOKER & WALLESTAD INC	9-27
BOYLE METALCRAFT CORP	8-11-14-15-26-28-29
BROOKS & PERKINS INC	8-11-14-15-26-28
BROOKS RADIO & TV CORP	1-10-14-27
BUCKS COUNTY ENTERPRISES	8-26-28
BUD RADIO INC	1-8-11-14-15-26-28-

CAL-OMN LABS INC	3-9
CALBEST ELECTRONICS CO	10
CALIFORNIA CHASSIS CO	1-8-14-26-28
CAMBRIDGE PATTERN WORKS	10
CAMPRO CO	8-9
CARMODY CORP	8-10-11-14-15-26-28
CENTRONIX INC-MIAMI	8-14-15-28
CHASSIS-TRAK INC	29-30
CHISHOLM INDUSTRIES LTD	1-8-9-10-14-15-28
CLARK CONTROLLER CO-LOS ANGELES	15
CLARE CO M JGY	8-26
CLEVELAND METAL SPECIALTIES CO	25-26-27
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COILS ELECTRONICS CO	8-11-14-25-26
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COLLINS RADIO CO-DALLAS	8-15-28
COLUMBIA METAL BOX CO	8-11-14-15-26
COMCO PLASTICS INC	8-14-15-26-28
CONRAD & WISER	27
CONSOLIDATED MOLDED PRODUCTS CORP	27
CONTINENTAL ELEC EQUIP CO	3-8-15-26
CONTROLLED ATMOSPHERE ENCLOSURES MFG CO	8-

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CORRY JAMESTOWN CORP	8-14-15-26
CORTLAND INDUSTRIES	25-27
CRAFT MFG CO	8-14-26-29
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DAHLSTROM METALLIC DOOR CO	3-8-11-16-15-
DAVIES HOLDING CO HARRY	26-28
DEVCO ENGG INC	9
DIETHEIM-FREIMUTH CORP	8-15-26-27
DOEMLER-JARVIS DIV NATIONAL LEAD CO	8-10-11
DOLIN METAL PRODUCTS INC	11-14-26-29
DONNELLY MFG CO	8-26
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DOWNING CRYSTAL CO	14-23
DURALITH CORP	27
DYNAMIC ELECTRONICS INC	1-8-9-10-11-14-15-
DYNABOND CORP	29
EAGLE SIGNAL CO DIV GAMEWELL CO	9-10
ELECTRO-CHEMICAL ENGRAVING CO INC	26
ELECTRO-PRODUCTS INC	26
ELECTRONICS DIV ERIE RESISTOR CORP	9-27
ELGIN METALFORMERS CORP	8
ELM LABS-HASTINGS-ON-HUONSON	1-10
ELZEE METAL PRODUCTS CO	1-3-8-11-14-15-26-

EMFLUID CO	27
EMERSON PLASTICS CORP	25-27
EMERSON-SACK-BARNER CORP	1-3-8-14-15-26-
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EQUIPTO DIV AURORA EQUIPMENT CO	8
ERCA TOOL DIE & STAMPING CO	14
ERIE RESISTOR CORP-ERIE	9-27
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EUGENE ENGINEERING CO INC	26-27-28-29-30-33

EXCELLER ELECTRONICS INC	14-28
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FALSTROM CO	8-11-14-15-26-28
FARBELL METAL FABRICATING	1-8-11-14-15-26-
FARBELL METAL FABRICATING	28
FEDERAL SHOCKMOUNT CORP DIV KORFUND CO	28
FELNER & SONS	8-14-15-26-28
FELLSINHAL & SONS INC G	27
FISCHER & PORTER CO	27
FISHER & CROMB	3-27
FISHER BERKELEY CORP	8
FORMICA METAL PRODUCTS CO	8-14-15-26-28
FOURJAY INDUSTRIES	15
G R ELECTRONICS CORP	14-15
G E ELECTRONICS CO CHEMICAL & TOOL DIV	29
GATES RADIO CO	1-8-10-11-14-15-26-
GENERAL BRONZE ELECTRONICS CORP	8
GENERAL DYNAMICS/ELECTRONICS-SAN DIEGO	3-
GENERAL DYNAMICS/ELECTRONICS-JARLSON RD	8-
GENERAL ELECTRIC CO AUDIO PRODUCTS SECT	15
GENERAL ELECTRIC CO DIST ASSEMBLIES DEPT	15
GENERAL ELECTRIC CO TECHNICAL PRODUCTS DEPT	25
GENERAL METAL PRODUCTS CO	1-8-9-11-14-15-
GENERAL METAL PRODUCTS CO	28
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GOLDING MFG CO	1-8-11-14-26-28
GRAND SLIDING MECHANISMS INC	28
GRANLEY FURNITURE CO	10
GRANT PULLEY & HARDWARE CORP INDUSTRIAL DIV	29-33
GRAY PANTOGRAPH ENGRAVING CO-HOBOKEN	18-
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HALL-SCOTT INC	8-15-26
HAMMER ELECTRONICS CO INC	14-26
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HELDOP MFG CORP	8-14-26-28-29
HENRY & MILLER INDUSTRIES INC	8-14-15-26-

HERMES PLASTICS INC	26-27
HOFFMAN ENGR CORP	8-15
HONEYWELL CONTROLS LTD	15-26
HOUSTON FEARLESS CORP	8-9-11-14-25-26-27-
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IC MFG	1-8-14-26-29
INDUSTRIAL ENGRAVERS INC	27
INDUSTRIAL WASHING MACH CORP	26
INDUSTRIAL WIRE A CABLE CO INC	26
INSTRUMENT CASE DIV TA MFG CORP	11
INSULATING FABRICATORS INC	27
JACKSONVILLE METALS PLASTICS CO	1-3-8-9-
JACKSONVILLE METALS PLASTICS CO	11-14-15-25-26-27-28
JAN HARDWARE MFG CO	8-27
JANSA WOODWORKING CORP	10-11
JODEE PLASTICS INC	9-27
JAHN & CO	1-8-26-28
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IND-OAKLAND	8-14-15-26-28
KANE MFG CORP	8-14-15-26-28
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KEES MFG CO F D	10
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KENT LIGHTING CORP	8-26
KENT TV INC	10-15
KLAPCO PRODUCTS	9-27
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KIRBY INSTRUMENT CO	14
KINN ELECTRONICS CORP	1-8-10-25-26-27
KLPER VUE MFG CO INC	8-9
KOCH & SONS H	9
KOLLMAN CASE LAMP	11
KUSS INDUSTRIES INC	1-3-8-11-14-15-26-
KUSS INDUSTRIES INC	28-29-30-33
LANCASTER GLASS CORP	9
LAND AIR INC CHEYENNE DIV	8-10-15-26-27-
LAND-AIR INC-CHICAGO	28
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LEACH CORP INET DIV	10
LEACH CORP INET DIV	10
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LEACH CORP INET DIV	10
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LEACH CORP INET DIV	10
LEACH CORP INET DIV	10
LEACH CORP INET DIV	10
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DIV-MINNEAPOLIS	29
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MURKINHEAD & CO LTD	16-21
MURKINHEAD INSTRUMENTS INC-NEW YORK	16-21
MURKINHEAD INSTRUMENTS LTD	1-16-21
MULLENBACH DIV ELECTRIC MACHINERY MFG CO	3-11-12
MUTER CO	19-18-21-39
NEW YORK COIL CO	19-18-21-39
OHIO BRASS CO	7-17-30
OHNITE MFG CO	7-17-30
ONONBAMA ELECTRONICS DIV SPEER CARBON CO	3
PATTERSON MOOS RESEARCH DIV LEXONA CORP	12-31
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PYRAMID ELECTRIC CO-DARLINGTON	6-8-11-12-13-15-17-18-21-22-27-30-37-38-39
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RADIATION RESEARCH CORP-NEW YORK	12-22-24
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RADIO INDUSTRIES INC-DES PLAINES	3-8-12-17-36
RADIO INDUSTRIES INC-CHICAGO	3-8-12-24
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SAN FERNANDO ELECTRIC MFG CO	8-11-12-13-15-17-18-21-22-24-27-31
SANFORD ELECTRIC CO-SPRINGFIELD	4-6-7-8-11-12-13-16-17-18-20-21-22-24-25-27-28-30-31-36-37-38-39-43-45
SARATOGA INDUSTRIES	12-18-20-21-22
SCHMOR	30
SHIMMONS AERONAUTICS INC-VERGINNES	29
SHOTTIE ELECTRONICS INC	3-12-17-36
SOLAR MFG CORP	18-17-18-20-21-22-24-25-28-29-30-31-36-37-38-43-46-47
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STACKPOLE CARBON CO-ST MARYS	4
SYMPHONY ELECTRONICS CORP	3-16-36-39
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TANSITOR ELECTRONICS INC	17-30
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UNIVERSAL CONDENSER CO	11-12-15-17-18-20-21-22-31-37-39
VITRAMON INC	3-8-11-17-25-45
WESCO ELECTRIC & MFG CO	8-11-12-13-15-17-18-20-21-22-24-27-31
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CAPACITORS, GLASS TRIMMER	3
CAPACITORS, HIGH TEMPERATURE	5
CAPACITORS, MICA TRIMMER	6
CAPACITORS, MINIATURE	7
CAPACITORS, OIL FILLED	10
CAPACITORS, PISTON	11
CAPACITORS, PLASTIC	12
CAPACITORS, SEMI-CONDUCTOR	18
CAPACITORS, VACUUM	17
CAPACITORS, VARIABLE MOTOR-DRIVEN	20
CAPACITORS, VARIABLE OIL	21
CAPACITORS, VARIABLE PISTON	23
CAPACITORS, VARIABLE QUARTZ	24
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ARGONNE ELECTRONICS MFG CORP	7-12
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BALCO RESEARCH LABS CAPACITOR DIV	5-12
BARKER & WILLIAMSON INC	1
BRIGHT RADIO LABS INC	1
BRITISH ELECTRONIC SALES CO INC PAINTON DIV	4-5-11
BRITISH RADIO ELECTRONICS LTD	7
CAMBRIDGE THERMTRONIC LTD	2-4-11
CENTRALBA DIV GLOBE-UNION INC-WISC	2-7-18
COLUMBUS ELECTRONICS CORP	3
COMPONENT RESEARCH CO INC	1-2-4-5-7-11-12-20-21-23-24
CORNING ELECTRONIC COMPONENTS	4-5-7-11-23-24
CURNING GLASS WORKS	1-4-5-7-11
EL RAY MOTOR CO INC	2-5-7
ELECTRICAL SPECIALTY CO-SAN FRANCISCO	10
ELECTRO-CERAMICS INC	2-7
ELECTRO-MOTIVE MFG CO INC	2-5
ELECTRONICS DIV ERIE RESISTOR CORP	2-7
ENGLISH ELECTRIC VALVE CO LTD	17
ERIE RESISTOR CORP-ERIE	2
ERIE RESISTOR OF CANADA LTD	2-12-23
FASTER DIV ILL TOOL WORKS	2
FLUOROCARBON PRODUCTS INC DIV U S GASKET	2-12
FRANKLIN FIBRE-LAMITEX CORP	12
FRYLING ELECTRIC PRODUCTS INC	2-12
GENERAL INSTRUMENT CORP-NEWARK	1-10
GENERAL INSTRUMENT CORP F W SICKLES DIV	1
GENERAL INSTRUMENT CORP SEMICONDUCTOR DIV	1
GENERAL RADIO CO-WEST CONCORD	1
GOMBOS INC CO JOHN	1
HAMMARLUND MFG CO	1-2-5-7-23
HOFFMAN ELECTRONICS CORP-EVANSTON	18
HUGHES SEMICONDUCTOR DIV	26
INT L RECTIFIER CORP-EL SEGUNDO	29
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JENNINGS RADIO MFG CORP	17
JFD ELECTRONIC CORP	2-3-4-5-7-11-23
JOHANSON MFG CO	1-2-4-5-7-11-23
JOHNSON CO E F	1-7
LAPP INSULATOR CO RADIO SPECIALTIES DIV	3
LEEDS & NORTHROP CO	1
MAIDA DEVELOPMENT CO	7-11
MARSHLAND ENGG LTD	7-11
MARSHMAN ELECTRONICS CORP	12-23
MCCOY ELECTRONICS CO	7
MILLEN MFG CO JAMES	1-6-7
MORROW RADIO MFG CO	1
MURKINHEAD & CO LTD	1
MURKINHEAD INSTRUMENTS INC-NEW YORK	1
MUTER CO	2
NATL RADIO CO INC	2
PACIFIC SEMICONDUCTOR-HARTHORNE	18
PRECISION CAPACITORS INC	12
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RADIO CONDENSER CO LTD	1-7-12
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RALLAND-BORG CORP	1
SEARLES TARTZIAN INC	1
SERIFON INC	1
SICKLES F W DIV SIC	1
SOLAR MFG CORP	2
SOUTHERN ELECTRONICS CORP	12
SPRAGUE ELECTRIC CO-NORTH ADAMS	2
SPRAGUE OF WISCONSIN	2
TAPET MFG CO	27
TAPPEL ELECTRONICS INC	2
TELEGRAPH CONDENSER CO	2
TRANSITRON ELECTRONIC CORP	18
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## 21 - CONTROL EQUIPMENT, COMMUNICATIONS

ADAPTERS, PANORAMIC	19
CONTROLS, AUDIO RECORDING	1
CONTROLS, AUTOMATIC TUNING	2
CONTROLS, FREQUENCY	4
CONTROLS, LIMITATION	5
CONTROLS, MOTOR & GENERATOR	7
CONTROLS, PHOTOELECTRIC	7
CONTROLS, PHOTOGRAPHIC	8
CONTROLS, POWER LEVEL	9
CONTROLS, REMOTE RADIO	10
CONTROLS, REMOTE TV	11
CONTROLS, TYPING	17
CONTROLS, TOWER LIGHTING	12
CONTROLS, VENTILATION	13
TUNERS, AUTOMATIC	14

A & F PRODUCTS INC-RIVER FOREST	10
AEROFLEX CORP DIV AEROFLEX LABORATORIES	8-9
AERONCA MFG CORP	8-9
AERONETIC ASSOCIATES INC-CONCORD	8-9
AIRSEARCH MFG CO LOS ANGELES DIV GARRETT	8-9
ALLEN-BRADLEY CO	8-9
ALLIS CHALMERS MFG CO	8
ALTEC LANSING CORP-ANAHEIM	1
AMERICAN ELECTRONICS CO-MINED-A	1
AMERICAN MACHINE & FOUNDRY GOVT PROD GROUP	8-9
AMERICAN RECTIFIER CORP	6
ANTRAX CORP	10
ARMA DIV AMERICAN BOSCH CORP	6-7-8
ARROB-HART & HEGEMAN ELECTRIC CO	4-19
ATYLIERS DE MONTAGES ELECTRIQUES	6-12
AUTOMATIC SWITCH CO	7
AUTOTRON INC	10
AVIONICS DIV-BELL AIRCRAFT CORP	10
BACH AURICON INC	1-8
BARBER-COLMAN CO AIRCRAFT CONTROLS DIV	13
BARTON ELECTRONICS INC	7
BENDIX CORP BENDIX PACIFIC DIV	10
BENDIX CORP BEO BANK DIV	4-9
BERNCO ENGINEERING CORP	9
BLISS ELECTRONIC CORP	1
BLOEMER-TONGUE LABORATORIES	6
BOESCH MFG CO-DAMBURY	6
BORGIE ELECTRIC MFG CO	4-6
BRIGGS ASSOCIATES-MORRISTOWN	10
BRISTOL CO-WATERBURY	9-13
BRITISH ELECTRONIC SALES CO INC PAINTON DIV	1
CALBEST ELECTRONICS CO	10-11
CANADIAN APPLIED RESEARCH LTD	8
CAPITOL TRANSCRIPTIONS INC	1
CENTRONIX INC-MIAMI	1-9-9-10-11
CG ELECTRONICS CORP	10
CINEMA ENGG DIV AEROVOX CORP	1
CLARK CONTROLLER CO-CLEVELAND	6
CLARK CONTROLLER CO-LOS ANGELES	8-7-13
COLLINS RADIO CO-CECER RAPIDS	4-18
COLLINS RADIO CO-DALLAS	1-2-4-10-14-19

COMPUTER MEASUREMENTS CO-SYLVA	1
CONSOLIDATED AVIONICS CORP	10
CONSOLIDATED PRODUCTIONS INC	4
CONTINENTAL ELEC EQUIP CO	6
CONTINENTAL ELECTRONICS CORP-BROOKLYN	10
CONTROLS CO OF AMERICA-SCHILLER PARK	13
COOK ELECTRIC CO	2-10
COOK ELECTRIC CO DATA STORAGE DIV	7
CROWN ENGINEERING	11
DAGE TV DIV THOMPSON PRODUCTS	7
OALES CO FRAMLIN	6
DATASCAN INC	7
DAVEN CO	1
DAVENPORT MFG CO	7
DAYSTROM INC BESTON INSTRUMENTS DIV	5
DEITZ CO S J	7-17
DETECT-O-RAY CO	7
DICTAPHONE CORP-BRIDGEPORT	1
DIETZ CO HENRY & INC	13
DUNLAP ELECTRONICS	1-10
DYNAPAR CORP	4-7
E-Y-A PRODUCTS CO OF AMERICA	6-13
EICOR DIV THE SCRANTON CORP	4-6
ELECTRIC REGULATOR CORP	7
ELECTRICAL SERVICE CO	7
ELECTRO PHYSICS CO	7-8
ELECTRON-RADAR PRODUCTS	5-7-9-12
ELECTRONIC APPLICATIONS INC	1
ELECTRONIC COMMUNICATIONS INC	2-14
ELECTRONICS CORP OF AMERICA-CAMBRIDGE	5-7
ELECTRONIC CORP OF AMERICA-TORONTO	7
ELECTRONICS DESIGN CO	10
ELM LABS-HASTINGS-ON-HUDSON	10-11
ENGINEERED MAGNETICS	6-9
ERCO RADIO LABS INC	10
FAIRCHILD CAMERA & INST CORP-SYOSSET	8
FARMER ELECTRIC PRODUCTS CO	7
FELKER INC J B	8
FEDTRO INC FEDERAL ELECTRONICS SALES DIV	10-11
FEDERAL ELECTRONICS BLD	4-10-11
FISCHER ELECTRONICS INC	4-10-11
FISHER CO INC OSCAR	7-8
FISHER PIERCE CO	7
FLIGHT RESEARCH INC	7-8
FATES RADIO CO	1-10
GENERAL CONTROLS CO-GLLENDALE	6
GENERAL DYNAMICS/ELECTRONICS-CARLSON RD	14
GENERAL ELECTRIC CO DIST ASSEMBLIES DEPT	6-9
GENERAL ELECTRIC CO INDUSTRY CONTROL DEPT	6
GENERAL ELECTRIC CO SPECIALTY CONTROL DEPT	6-7
GENERAL ELECTRIC CO-COMM PROD DEPT	10
GENERAL ELECTRIC LAB INC SILVER SPRING LAB	5
GENERAL RADIO CO-BEST CONCORD	19
GERST & CO PAUL E	5
GIBBS MFG & RESEARCH CORP	8
GLOBE INDUSTRIES INC-JAYTLN	6
GORDON ENTERPRISES	1-8
GPL DIV GENERAL PRECISION INC	11
GRAY PANTOGRAPH ENGRAVING CO-ROBOKEN	5
GREEN RECTIFIER CO	5-6
GUARDIAN ELECTRIC MFG CO	11
GULYON INDUSTRIES INC-METUQUE	7
GURLEY W & L	7
GYRO ELECTRONICS CO	10
HANMARLUND MFG CO	5-9-10-12-13
HANSON-SORRILL-BRIAN	17
HATHAWAY INSTRUMENTS INC	4
HAYDON CO & W	4
HOLLAND ELECTRONICS	5
HONEYWELL CONTROLS LTD	6
HOOPER ELECTRIC CO-LOS ANGELES	13
HOUSTON FEARLESS CORP	11
HUGHEY & PHILLIPS	7-12
MYCON MFG CO	3-7-8
IUEAL ELECTRICAL & MFG CO	6
INDUSTRIAL CONTROL CO	6
INDUSTRIAL ELECTRONICS INC	11
INTERCONTINENTAL ELECTRONICS CORP	11
ITRK CORP-BALTIMAR	8
ITT IND PRODUCTS DIV-SAN FERNANDO	11
JERROLD ELECTRONICS CORP	11
JOHNSON SERVICE CO	13
KRIDE & CO WALTER	12
KIN TEL RESEARCH DIV	11
KIRKEL-SAN DIEGO	11
K R E INC	1
LANE ELECTRONICS MFG CORP	10
LAVOIE LABS INC	4
LEACH CORP COMMUNICATIONS DIV	10
LEACH CORP INET DIV	6
LETRA LABS INC	7-8
LELAND AIRBORNE PRODUCTS	1
LINDLY & CO	4
LING SYSTEMS INC	4
LORAL ELECTRONICS CORP	14
LUMENITE ELECTRONIC CO	5-7-10
MADISON CORP	10-11
MAGNASYNE MFG CO	1-17
MAGNECORD DIV MIDWESTERN INSTRUMENTS INC	1
MALLORY A CO INC P R	1-9-10-11
MALLORY CONTROLS CO	1-9-10-11
MANSON LABORATORIES INC	4
MARCONI WIRELESS TELEGRAPH CO LTD	2-4-10-11-14
MARSTAN ELECTRONICS CORP	7-17
MCCOY ELECTRONICS CO	4
MEASUREMENT ENGG LTD	5-8
MEGADINE ELECTRONICS INC	7
MEREDITH & CO LTD C C	8-9-6-7-12
MICROMETRICAL MFG CO	6-7
MIDWESTERN INSTRUMENTS	1

# PRODUCTS & MFRS

MIRATEL INC	1-10-11
MOERNER DESIGN DIV H C SCHLOER INC	1-9
MODERN MFG CO	13
MOORE ASSOCIATES INC	10
PULLARD EQUIPMENT LTD	6
MULTI-PRODUCTS CO	10
NEVADA AIR PRODUCTS CO	14
NORRMAN LABORATORIES ERNST	10
NORTH ELECTRIC CO	5-11
NORTHMAN RADIO MFG CO LTD	4
OHMART CORP	4
OHAN & SONS D B	4
OPTRON CORP	7
PANORAMIC RADIO PRODUCTS	19
PAR PRODUCTS CORP	8
PEER INC	10
PERMA-POWER CO	11
PHILCO CORP GOVT & INDUSTRIAL GROUP	10
PHILCO CORP-TIOGA & C STS	11
PHILIPS ELECTRONIC INSTRUMENTS	10
PHOENIX PRECISION INSTRUMENT CO	7-8
PHOTO-CRYSTALS	5-7-12
PHOTOBELL CO	7-12-17
PHOTOGRAPHIC ANALYSIS INC	2
PHOTOMAT INC	11
POLYTRONICS CO-TORONTO	5-7-9
POWER SUPPLIES INC	6
PYE CANADA LTD	11
PYE CORP OF AMERICA	10
PYE TELECOMMUNICATIONS LTD	10
RACAL ENGG LTD	19
RADIOTELEPHONE OF AMERICA COMMERCIAL ELECTRONIC PRODUCTS	6-11
RANSOM RESEARCH	7
REGENT CONTROLS INC	4
RELIANCE AUTOMATIC LIGHTING CO	12
RICH ELECTRONICS INC	7
RIPLEY CO	5-7
RUBAL PHOTO-SCIENCE LABORATORIES	10
RUBAL PHOTO-CUSTOM ENGG	10
SECODE CORP	6-9-10-12-13
SERVO-TEK PRODUCTS CO	6-9
SERVO MECHANISMS CANADA LTD	10
SERVO MECHANISMS INC LOS ANGELES DIV	21
SHAND & JURS LO	6
SIFRRA ELECTRONICS CORP-MT VENNON	7
SKITATION ELECTRONICS & TV CORP	4-5-7-8-11
SOUTHWESTERN INDUSTRIAL ELECTRONICS CO	13
SPECTRA ELECTRONICS CORP	5-7
STATISTICAL INSTR CO	10
STEWART & STEVENSON SERVICES INC	4
STYBART CORP F W	10-11
STUDIO ELECTRONICS CORP	1
SUPERIOR ELECTRIC CO	5
SYSTEM CORP	4
TABET MFG CO	7
TALLY CORP	6
TAPCO GROUP THOMPSON RAMO WOODRIDGE INC	4-6-8
TECH-MASTER CORP	11
TECHNICAL MATERIAL CORPORATION	2-4-19
TELETRON INDUSTRIES CORP	1-2-9-10
TELETRON CO	10
TENSOR ELECTRIC DEVELOPMENT CO	1-2
TOPP INDUSTRIES INC	8-10
TOPPING ELECTRONICS LTD F V	4
TRI-TRONICS CO	7
TROTT ELECTRONICS INC	7
UCINITE CO DIV UNITED CARR FASTENER CORP	17
UNITED ELECTRIC CONTROLS CO	6
US CONTROLS INC	5-6-7
VACUUM MFG CO	6
VECTROL ENGG INC	4-5-6-7-17
VIRGINIA ELECTRONICS CO	10
VACLINE INC	4
WALD ELECTRONICS	1-4
WANG LABS INC	4
WELCO INC-ELECTRONICS DIV	1
WELLMAN BRONZE & ALUMINUM CO	7
WELLS INDUSTRIES CORP	3-7-10-12-13-17
WELLS-GARDNER & CO	6
WESTINGHOUSE ELECTRIC CORP-PITTSBURGH	17
WHITE DENTAL MFG CO SS INDUSTRIAL DIV	10-
WICKES ENGG & CONSTRUCTION CO	11
WINDER AIRCRAFT CORP FLA	4-6-9
WOLLENSAK OPTICAL CO	8
WORMER ELECTRONIC DEVICES	5-7-12

## 22 - CONTROL EQUIPMENT, INDUSTRIAL

CONTROLS, ALARM SYSTEM	1
CONTROLS, COMPUTER	1
CONTROLS, DYNAMOMETER	10
CONTROLS, ELECTRONIC	11
CONTROLS, FILM THICKNESS	13
CONTROLS, GUIDED MISSILE	20
CONTROLS, HUMIDITY	22
CONTROLS, MECHANICAL OVERLOAD	28
CONTROLS, MOISTURE	29
CONTROLS, MOTOR & GENERATOR	30

A & F PRODUCTS INC-RIVER FOREST	1
ABBEON INCORPORATED	22
ABRAMS INSTRUMENT CORP	20
AC ELECTRONICS DIV GMC	4-20
ACF ELECTRONICS DIV	4-20
ACME MODEL ENGG CO	13-29
ADDER INC	11
ADVANCE INDUSTRIES INC	20
ADVANCED ELECTRONICS INC	1-11

For Company Addresses, See the Alphabetical Listing of Electronic Mfrs, beginning on Page 349



## PRODUCTS & MFRS

ADVANCED TECHNOLOGY LABS PLANNING & MARKETING 1  
 AECO INC 52-73-75  
 AEROLAB DEVELOPMENT CO SEMICONDUCTOR SYSTEMS 11  
 AERONCA MFG CORP 1  
 AIR TRANSPORT MFG CO 20  
 AIRBORNE INSTNS LAB DIV CUTLER HAMMER INC 11  
 DEER PARK 11  
 AIRSEARCH MFG CO ARIZONA DIV GARRETT 11-30  
 AIRMATIC VALVE INC 29  
 AIRPAX ELECTRONICS INC SEMINOLE DIV 1-11  
 ALDEN ELECTRONIC & IMPULSE RECORDING EQUIP CO 63  
 ALFRED ELECTRONICS 56  
 ALLEN-BRADLEY CO 30  
 ALLIS CHALMERS MFG CO 30-36-37-41-58-68  
 ALLIS CO LOUIS 30  
 AMERICAN DISTRICT TELEGRAPH CO 1  
 AMERICAN ELECTRONICS INC TALLER & COOPER DIV 1  
 AMERICAN INSTRUMENT CO 13-22-29  
 AMERICAN MACHINE & FOUNDRY GOVT PROD GROUP 13  
 AMERICAN MEASUREMENT & CONTROL INC 11  
 AMERICAN MOISTENING CO 22  
 AMERICAN RECTIFIER CORP 11-20-30  
 AMERICAN RESEARCH & MFG CORP 11-20  
 AMERICAN RESEARCH PRODUCTS 1  
 AMERICAN SEARLWRIGHT CORP 11  
 ANGLE PUMP 52-70-71-73-75  
 ANALOGUE CONTROLS INC 4-11-20  
 ANTRIX CORP 1  
 APPLIED TECHNOLOGY CORP-NEW YORK 11-30  
 ARNONE ELECTRONIC MFG CORP 59  
 ARMA DIV AMERICAN BOSCH CORP 11-49-50  
 ASCOP DIV ELECTRO MECHANICAL RESEARCH INC 1  
 ASSEMBLY PRODUCTS INC-CHESTERLAND 1-11-28-29-30  
 ATeliers de Montages Electriques 20  
 ATLANTIC INSTRUMENT CORP 11  
 ATLAS OVERHEAD DOOR CO 22  
 ATMOSPHERE CONTROL CO INC 1-11  
 AUTICOM ELECTRONICS INC 1-11  
 AUTOCALL CO 1-42  
 AUERBACH ELECTRONICS CORP 4-11-20  
 AUSTIN ELECTRONICS DIV AUSTIN CO 4-11-20  
 AUTM ELECTRIC CO 1  
 AUTHORIZED REPAIRS SERVICE CO 1  
 AUTOMATIC CONTROL CO 11  
 AUTOMATIC SWITCH CO 1-11-13-20-30  
 AUTOMATIC TIMING & CONTROLS INC 11-22  
 AUTOMATION DEVICES INC 11  
 AUTOMATION DYNAMICS CORP 11  
 AUTOMATION INC 11  
 AUTOMATION INDUSTRIES INC 11  
 AUTOMAT MFG INC 11  
 A F INDUSTRIES 11  
 B&B COCK RADIO ENGG 11  
 B&D-ATOMIC INC 4-11  
 BALDWIN-LIMA-HAMILTON CORP-BALTHAM 11  
 BARBER-COLMAN CO 11  
 BARLOE ELECTRONICS 11  
 BARRITT ELECTRONICS CORP-NORTHBROOK 11  
 BARTON ELECTRONICS INC 11  
 BAYSIDE TIMERS 46-52-61-63-70-71-72-75  
 BECK CO MARLU 11  
 BELKMAN INST INC BERKELEY DIV 11  
 BELKMAN INST INC SCIENTIFIC & PROD INST 4-11-22-29  
 BELLOCK INSTRUMENT CORP-COLLEGE POINT 22  
 BENDIX CORP BENDIX PACIFIC DIV 1-4-20  
 BENDIX CORP MONTROSE DIV 1  
 BENDIX CORP RED BANK DIV 73  
 BENDIX CORP-CINCINNATI DIV 4-10-11-14  
 BENDIX CORP-ECLIPSE PIONEER DIV 20-22-38-41-42-53-64  
 BERGEN LABS INC 11  
 BERNO ENGINEERING CORP 11-20-30  
 BLIE M ELECTRIC CO 50  
 BOGUE ELECTRIC MFG CO 30  
 BOKMAN INSTRUMENT CORP 11-20-28  
 BRANSON CORP 20  
 BRITGES ASSOCIATES-NORRISTOWN 1-4-11-20  
 BRISTOL CO-WATERBURY 1-4-11-22-29  
 BROOKS ROTAMETER CO 1  
 BRUND-NEW YORK INDUSTRIES CORP 1  
 B/W CONTROLLER CORP 1-11  
 BUNNELL & CO J H 1  
 BURLING INSTRUMENT CO 50  
 CADILLAC GAGE CO 20  
 CALTRON PRODUCTS CO 69  
 CANADAIR LTD 29  
 CANADIAN APPLIED RESEARCH LTD 20  
 CANADIAN CURTISS-BRIGHT LTD-ORVILLE 13-29  
 CANADIAN CURTISS-BRIGHT LTD-MONTREAL 13-29  
 CANADIAN RESEARCH INSTITUTE 11-22-29  
 CASH VALVE MFG CORP A B 1-20  
 C&C CONTROL SERVICES INC 4-11-22  
 C&D ENGG DIV CONTROL DATA CORP 41-64  
 CENTRAL DYNAMICS LTD 1-11-20-30  
 CENTRIX INC-MIAMI 11-20  
 CHANCE VOUGHT ELECTRONICS DIV 20  
 CHATHAM CONTROLS CORP 1  
 CHRONO-LOG CORP 1-63  
 CLARK CONTROLLER CO-CLEVELAND 1-10-11-30  
 CLARK CONTROLLER CO-LOS ANGELES 11-20-28  
 COLLINS RADIO CO-DALLAS 11-20

COLORADO RESEARCH CORP 4-11  
 COMPTON CORP 50  
 COMPUTER CONTROL CO INC WESTERN DIV 4  
 COMPUTER CONTROL CO INC-FRAMINGHAM 4  
 COMPUTER MEASUREMENTS CO-SYLMAR 30  
 COMPUTER SYSTEMS INC 4  
 CONSOLIDATED AVIONICS CORP 4-13  
 CONSOLIDATED CONTROLS CORP-BETHEL 1-20-30-41-46-50-56  
 CONSOLIDATED PRODUCTS INC 11-20  
 CONTINENTAL ELEC EQUIP CO 30  
 CONTROL A DIV OF MAGNETICS INC 30  
 CONTROL CIRCUITS INC 1  
 CONTROL CORP 1  
 CONTROL DATA CORP 4-20  
 CONTROLLED ATMOSPHERE ENCLOSURES MFG CO 22-29  
 CONTROLS CO OF AMERICA-SCHILLER PARK 20  
 CONVAIR SAN DIEGO ELECTRONICS 20  
 COOK ELECTRIC CO 11-20-22  
 COPPER CO D C 22  
 CORONA ENGG SERVICE 10  
 COSA CORP 10  
 CRANER CONTROLS CORP 52-71-72-73-75  
 CRESCENT ENGG & RESEARCH CO 11-20  
 CROWN ENGINEERING 1  
 CURTISS-BRIGHT CORP ELECTRONICS DIV 11-76  
 CUTLER-HAMMER INC 11-28-30  
 D&O INSTRUMENT CO 20  
 DALES CO FRAMALIN 11-28-30  
 DATA TECHNOLOGY INC 11  
 DATASCAN INC 1-22-29  
 OAVENPORT MFG CO 11  
 DAYSTROM INC WESTON INSTRUMENTS DIV 13-22-29  
 DAYTRONIC CORP 11-28  
 DBM RESEARCH CORP 11  
 DE FLOREZ CO 11  
 DE-TECH-TRONIC CORP 11  
 DEFENDER INSTRUMENT & REGULATOR CO 11  
 DELTZ CO S J 11  
 DELCO RADIO DIV GMC 4  
 DELTRON INC 11  
 DENRAD MFG CO INC 1-11  
 DESIGNERS FOR INDUSTRY 4-11-20  
 DETECT-O-RAY CO 1  
 DEVO ENGG INC 1  
 DEVTRONICS INC 1-30  
 DI-AN CONTROLS INC 1-11  
 DIAL PRODUCTS CO 28  
 DICE CO J B 13  
 DIEHL MFG CO 51  
 DIGITAL EQUIP CORP 10-28  
 DILLON & CO INC W C 10-28  
 DIMCO-GRAY CO 4-11  
 DJPCO DIV DJORJEVIC ENGG CO 1-11-28  
 DUNLAP ELECTRONICS 29  
 DUNN ENGG ASSOCIATES INC 11  
 DYREC INC 10-11  
 DYNAMATIC DIV EATON MFG CO 58-67-68  
 DYNAMIC CONTROLS CO 10-11-30  
 DYNAPAR CORP 49-70-73  
 DYNATRONIC INC 4-11-30  
 E-T-A PRODUCTS CO OF AMERICA 11-20-52-54-70-71-72-75  
 EAGLE SIGNAL CO DIV GAMBELL CO 38-43-50-69  
 EASTERN INDUSTRIES INC-NARDEN 20-36-38-53  
 ECLIPSE FUEL ENGG CO 63  
 EDCLIFF INSTRUMENTS 1  
 EDERTON GERMESHAUSEN & GRIER INC 11  
 EDISON INDUSTRIES THOMAS A INSTRUMENT DIV 1  
 MCGRAB-EDISON CO 11  
 EICOR DIV THE SCRANTON CORP 22-29  
 EL-TRONICS INC-HAYFIELD 1-4-11-11-53  
 ELECTRIC BOAT DIV GENERAL DYNAMICS 36-41-53  
 ELECTRIC EYE EQUIPMENT CO 11-13-29  
 ELECTRIC MACHINERY MFG CO 11-13-20-30  
 ELECTRIC REGULATOR CORP 11  
 ELECTRIC SERVICE CO 11  
 ELECTRIC INSTRUMENT INC 11  
 ELECTRO LOGIC CORP 1  
 ELECTRO VISION LAB 1-11  
 ELECTRO-DEVICES INC 11  
 ELECTRO-MECHANICAL DIV GENERAL RIVETERS INC 20  
 ELECTRODATA DIV BURROUGHS CORP 4  
 ELECTRON-RADAR PRODUCTS 1-11-22-29  
 ELECTRONIC ASSOCIATES INC 4-11  
 ELECTRONIC COMMUNICATIONS INC 11  
 ELECTRONIC CONTROL CORP 1-11  
 ELECTRONIC CONTROL SYSTEMS 4-11  
 ELECTRONIC COUNTERS INC 4-11  
 ELECTRONIC PROCESSES CORP OF CALIF 11  
 ELECTRONIC SPECIALTY CO-LOS ANGELES 11  
 ELECTRONIC SYSTEMS DEVELOPMENT CORP 4-11-20  
 ELECTRONIC-TIMERS CO 73-75  
 ELECTRONIC-TIMERS CO 73-75  
 ELECTRONICS CORP OF AMERICA-CAMBRIDGE 1-11-28-75  
 ELECTRONICS CORP OF AMERICA-TORONTO 1-11  
 ELLISON DRAFT GAGE CO 1  
 ENGINEERED ELECTRONICS CO 4-11  
 EPRAID INC 11  
 ERA ENGG INC 1-20  
 ESCO GROUP DIV ELECTRONIC SPECIALTY CO 1-4-11-22  
 FAIRCHILD CAMERA & INST CORP-SYOSSET 10-11-20-30  
 FAIRCHILD CAMERA & INST CORP-SYOSSET 11  
 FARMER ELECTRIC PRODUCTS CO 11-52-71-73-74  
 FARNSWORTH ELECTRONICS CO DIV I T & T 11-20-41  
 FASCO INDUSTRIES INC 30  
 FECKER INC J B 4-20-36-41-66  
 FEEDBACK CONTROLS INC 11-52-63-71-73-75  
 FERRARA INC 11-52-63-71-73-75

## COMM. CONTROL EQUIP

FISCHER & PORTER CO 1-11  
 FISCHER ELECTRONICS INC 1-11  
 FLIGHT RESEARCH INC 4  
 FORD INSTRUMENT CO DIV SPERRY RAND CORP 20  
 FORBRO CO 1-11-13-22-29  
 FRANKLIN DALES CO 11-28-30  
 FUEL WATCHMAN INC 1-11  
 FURNAS ELECTRIC CO 30  
 GENERAL COMMUNICATION CO 45  
 GENERAL CONTROLS CO CANADA LT. 20-22  
 GENERAL CONTROLS CO IRON MOUNTAIN DIV 1-11  
 GENERAL CONTROLS CO GLENDALE 1-11-22-29  
 30-36-39-50-52-56-57-63-70-71-72-73-74-75-76-83  
 GENERAL DEVICES INC 4-11-20  
 GENERAL DYNAMICS-ELECTRONICS-CARLSON RD 4-11  
 GENERAL DYNAMICS-ELECTRONICS-SAN DIEGO 4  
 GENERAL ELECTRIC CO COMPUTER DIV 4  
 GENERAL ELECTRIC CO DIST ASSEMBLIES DEPT 33  
 GENERAL ELECTRIC CO INDUSTRY CONTROL DEPT 10-30  
 GENERAL ELECTRIC CO SPECIALTY CONTROL DEPT 11-20  
 GENERAL ELECTRIC CO-APPARATUS SLS DIV 1-11  
 GENERAL KINETICS INC 11  
 GENERAL RADIO CO-WEST CONCORD 30  
 GENERAL ELECTRO MECHANICAL CO 10-20  
 GERST & CO PAUL E 11  
 GIANNINI & CO G R-PASADENA 11-20-36-38-41-42-50-64  
 GIBBS MFG & RESEARCH CORP 11  
 GREEN RECTIFIER CO 30  
 GUARDIAN ELECTRIC MFG CO 1-4-11-20-30  
 GUIDE LAMP DIV 11  
 GUIDE ELECTRONICS INC 11  
 GULTON INDUSTRIES INC-METUEN 1-20  
 GURLEY B & L E 36  
 H-R INSTRUMENT CO 11  
 HANAN CHEMICALS & CONTROL INC PITTSBURGH 4-11  
 MALEDY ELECTRONICS CO 11  
 HALLAMORE ELECTRONICS CO 11-20  
 HALLCRAFTERS CO-CHICAGO 11-20  
 HAMILTON STANDARD ELECTRONICS DEPT 11-20  
 HANMARLUND MFG CO 1-11-20  
 HART MFG CO 11  
 HASTINGS-RAYDIST INC 1-11-20-30  
 HAYDON CO A B 4-11-20-30  
 H&L-RUFF CO 11  
 HERMES-SONIC CORP 1  
 HESBON CO INC 1-11  
 HICKOK ELECTRICAL INSTRUMENT CO 11  
 HOLLAND ELECTRONICS 11  
 HOWELL CONTROLS LTD 1-4-11-22-29  
 HOOVER ELECTRIC CO-LOS ANGELES 20  
 HOOVER ELECTRONICS CO 11  
 HUBBARD SCIENTIFIC LABS 52-71-73-75-75  
 HUGHES PRODUCTS GROUP HUGHES AIRCRAFT CO 4-11  
 HYCON MFG CO 11-20  
 HYSON MFG CO 20  
 IDPAL ELECTRIC & MFG CO 30  
 ILLINOIS TESTING LABS INC 50  
 INDIRON CO 1-11  
 INDUSTRIAL CONTROL CO 11-30  
 INDUSTRIAL ELECTRONICS INC 4-11  
 INDUSTRIAL ELECTRONIC ENGINEERS INC 4-11  
 INDUSTRIAL INSTRUMENTS INC 22  
 INDUSTRIAL NUCLEONICS CORP 4-11-13-45  
 INFRARED INDUSTRIES INC 74  
 INSCO CO DIV BARRY CONTROLS 46  
 JACKSONVILLE METALS PLASTICS CO 1  
 J&W ELECTRONICS CORP 11  
 JORDAN CO 11  
 K&H & CO 11-20-22-29  
 KATO ENGG CO 30  
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GENISCO INC	21
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GLOBE INDUSTRIES INC-DAYTON	1
GRAY MFG CO	1
BUILD ELECTRONICS INC	4
GULFON INDUSTRIES INC-METUCHEN	21
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HOFFMAN ELECTRONICS CORP-LOS ANGELES	1-14
HONEYWELL CONTROLS LTD	21-35
HOOVER ELECTRIC CO-COLUMBUS	1
HOOVER ELECTRONICS CO	35
HOTBATT INC	12
HOUDAILLE INDUSTRIES INC	1
HRB SINGER INC	14
MUMPHREY INC	12
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MYRON MFG CO	14-35
MYRON-AIRE CO DIV CRANE CO	1-35
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INDUSTRIAL ELECTRONICS INC	21
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INDUSTRIAL NUCLEONICS CORP	21
INFARED INDUSTRIES INC	14
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INSTRUMENTATION ASSOCIATES	21
INTERNATIONAL RESEARCH & DEVELOPMENT CORP	18
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ITT IND PRODUCTS DIV-SAN FERNANDO	14
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KANN & CO	26
KEARFOTT DIV GEN PRECISION-PASADENA	1
KEARFOTT DIV GENERAL PRECISION INC	1
KELVIN & HUGHES LTD	21
KEMITE LABS INC	14
KEMP PRODUCTS	21
KIDDE ULTRASONIC & DETECTION ALARMS INC	1
KIN TEL RESEARCH DIV	21
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KISTLER INSTRUMENT CORP	21
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LEAR INC ELECTRO-MECHANICAL DIV	1-5
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MECH-TRONIC EQUIPMENT CO	17
MEGADON ELECTRONICS INC	21
MICROBAVE & DEVELOPMENT LABS	21
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MINCO PRODUCTS INC	12-21
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MURHEAD & CO LTD	1
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NEVADA AIR PRODUCTS CO	14
NEW ROCHELLE THERMATOOL CORP	4
NORWOOD CONTROLS UNIT DETROIT CONTROLS	1
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SENECA FALLS MACHINE CO	1
SERVIC CORP OF AMERICA-NICKSVILLE	14
SERVIC-TEK PRODUCTS CO	1
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SERVONIC INSTRUMENTS INC	21
SHERMAN INDUSTRIAL ELECTRONICS	4
SIFERRA ELECTRIC CO-MEMLO PARK	35
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SMALL MOTORS INC	21
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SOLARTRON ELECTRONIC GROUP LTJ	21
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SPECTRA ELECTRONICS CORP	14
SPRAGUE ELECTRIC CO-NORTH ADAMS	21
STANDARD TOOL & MFG CO-LYNDHURST	26
STATHAM INSTRUMENTS INC-LOS ANGELES	21-35
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STREETER AMET	21-35
TABER INSTRUMENT CORP	1-27
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VULCAN ELECTRIC CO	12
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WELLCRAFT PRODUCTS CO INC	12
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CLEVELITE HARRIS PROD INC-MILAN	31
COAST PRO-SEAL & MFG CO	31
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HAVEG INDUSTRIES INC	8-26
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MYKROY INC	26
NATIONAL ELECTRIC COIL DIV MCGRAW-EDISON	35
NATIONAL GASKET & WASHER MFG CO	26
NATIONAL VULCANIZED FIBRE CO-WILMINGTON	26
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REPUBLIC RUBBER DIV LEE RUBBER & TIRE	31
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RUBATEX DIV GREAT AMERICAN INDUSTRIES	31
RUBBERCRAFT CORP OF CALIFORNIA	31
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SCHEMECTADY VARNISH CO INC	11-26
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SEAMLESS RUBBER CO	35
SHAMBAN CO B S-CULVER CITY	35
SHURCLOSE SEAL CO	31
SOUTHERN PLASTICS CO	26
SPARTA MFG CO	35
SPAUDLING FIBRE CO INC-LOS ANGELES	26
SPALLS FIBRE CO-TORRANANDA	26
ST REGIS PAPER CO-TRENTON	26
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TAYLOR FIBRE CO-NORRISTOWN	26
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ARLIN MFG CO	5-10-11-15-16-17-19
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CONSTANTIN & CO L L	8
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CONTINENTAL-DIAMOND FIBRE CORP	11-15-16-17
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JACKSONVILLE METALS SPECIALTY CO	15
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LA POINTE INDUSTRIES INC	1-14-15-16
LAMINATED SHEET PRODUCTS CORP	11-15-16-17
LAMTER INDUSTRIES INC	11-15-16-19
LANCASTER GLASS CORP	14-15
LANCE ANTENNA MFG CORP	1
LAPP INSULATOR CO RADIO SPECIALTIES DIV	4-8-10-16-20
LEEDS & NORTHRUP CO	22
LESTERSHIRE SPOOL DIV NATIONAL VULCANIZED FIBRE CO	11
LINE MATERIAL INDUSTRIES	10
LONG STAR PLASTICS CO INC	15
LONG INC THOMAS J	15-16-17
LOUTHAN PLANT REFRACTORIES DIV FERRO CORP	8
MAGNETIC SHIELD DIV PERFECTION MICA CO	13-14-15-17
MANSOL CERAMICS CO	4
MARTEL & SONS L FRANK	19
MAYFAIR MOLDED PRODUCTS CORP	1-14-15
MCHUGH & SON RAYMOND F	22
METOX	15-20
MICA CORP	11-17
MICA INSULATOR CO	11-13
MICA INSULATOR DIV MMH CO	13
MICACRAFT PRODUCTS INC	13
MIDWEST HOLDING & MFG CO	14-15
MILLEN MFG CO JAMES	1-4-6-8-14-15-20
MINERALS & INSULATION CO	4-9-13-14-15-16-17-19
MINNESOTA MINING & MFG CO IRVINGTON DIV	19
MINNESOTA MINING & MFG CO-ST PAUL	4-13-14-15-16-17-22
MINNESOTA RUBBER & GASKET CO	14-19
MINOR RUBBER CO	14-19
MITRONICS INC	4-8-20
MODERN WIRE CO	14-15
MOLDED INSULATION CO	14-15
MOLDING CORP OF AMERICA	8-10-14-15-19-20
MOORE CO HOWARD J	9-11-13-14-15-16-17-19-20
MOREY CORP	13
MURGANITE INC	4
MOSLEY ELECTRONIC INC	1-8-15
MULLER ELECTRIC CO	21
MYCALEX CORP OF AMERICA-CLIFTON	4-9-13-14-15-16-17
MYKROY INC	1-4-6-8-9-10-11-13-14-15-16-17-19-20
NATIONAL CERAMIC CO	8-20
NATIONAL ELECTRIC COIL DIV MCJRAW-EDISON	13
NATIONAL TEL TRONICS CORP	11-15
NATIONAL VULCANIZED FIBRE CO-WILMINGTON	1-6-11-15-16-17-19-20
NATIONAL VULCANIZED FIBRE CO-NEWARK	11-15-16-17-19
NATL BERYLLIA CORP-BERGEN	4-22
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NATL RADIO CO INC	1-8-14-19-20
NATL VULCANIZED FIBRE CO-KENNETT SQUARE	11-15-16-17
NATL VULCANIZED FIBRE CO-MARYLAND & BEECH ST	11-15-16-17
NATVAR CORP	15
NEVADA AIR PRODUCTS CO	1-8
NEW ENGLAND LAMINATES CO	17
NEWMAN CORP M H	19
NICHOLS PRODUCTS CO	6-11-15
NORRICH PLASTICS CORP	1-4-8-11-14-15-16-17-19-20-24
NORTHERN PLASTICS CORP	11-15-17
NORTON CO	4-22
OHIO BRASS CO	10
OLYMPIC PLASTICS CO	15
PANEL ENGINEERING CORP	14-15
PARKER METAL GOODS CO	1-15-20
PEARCE SIMPSON INC	1-14-15
PEE-WEE MOLDING CO	14
PENN FIBRE & SPECIALTY CO	1-11-15-16-17-18-19
PENNA FLUOROCARBON CO INC	15
PERFECTION MICA CO	9-13
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PERRALLI INC	11-15-16-17
PLASTECK INC	15
PLASTIC ACCESSORIES INC	15
PLASTIC FACTORS INC	14
POLYMER CORP-READING	14-15-16-17-19-20
POLYNICA & INSULATION CO INC	13
PORCELAIN PRODUCTS CO	1-4-20
PORTER CO INC H K DELTA STAR ELECTRIC DIV	4
PRECISION METAL PRODUCTS CO	11-14-15-16-17-20
PRECISION PAPER TUBE CO	17-20
PREMAX PRODUCTS DIV CHISHOLM-RYDER CO	1-8-20
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RAYCLAD TUBES INC	19
RED SEAL ELECTRIC CO	1-11-14-15
REFRACTORIES DIV CARBORUNDUM CO	4-8-20-22
R.G. INSULATED WIRE CO	8
RELIANCE MICA CO INC	15
RESISTOFLEX CORP SOUTHWESTERN DIV	1-8-16-19-20
RESISTOFLEX CORP-ROSELAND	15-16-17
ROGAN BROS	14
ROGERS CORP	1
ROMAR PLASTICS INC	15
ROSS METALS CO MILTON	14-15-23
ROSTONE CORP	14-15
RUBBERCRAFT CORP OF CALIFORNIA	14-16-17-18
RUSSELL REINFORCED PLASTICS CORP	15
SAPETEE GLASS CO	9-11
SAXTON PRODUCTS INC	20
SCHJELDHAL CO G T	11-15-17
SEALECTRO CORP	8-20
SHAMBAN 1 CO W S-CULVER CITY	8-16-15-16-17-19-20
SHAMBAN 1 CO W S-FT WAYNE	8-15-20
SHAW INSULATOR CO	14-15
SHEFFCO MFG CORP	11
SILTCONE INSULATION INC	1-11-14-15-16-17-19-20
SINCLAIR MFG CO	22
SMITH INC HERMAN H	4-6-8-14-15-20
SMITH MFG CO INC E C	22
SOLAR MFG CORP	4-8-20
SPARTA MFG CO	15
SPALDING FIBRE CO INC-LOS ANGELES	15-16-17
SPALDING FIBRE CO-N ROCHESTER	15
SPALDING FIBRE CO-TONAWANDA	8-11-15-16-17
SPRUCO PINE MICA CO	11-13-15
STANLEY CHEMICAL CO THE	15
STAR PORCELAIN CO	4-8-14-16-19-20-22
STEVENS PRODUCTS INC	11-14-15
STEWART MFG CO D M	1-6-8-16-19-20
SUPERIOR STEATITE & CERAMIC CORP	6-14-15-16-17-18-19-20-22
SUPREHANT MFG CO	1-11-15-17
SMELLOW PLASTICS CO	1-11-15-17
SYLVANIA ELECTRIC PRODUCTS INC PARTS DIV	13-15
SYNCO PRODUCTS CO	4
SYNTHANE CORP	11-15-17-20
TAURUS CORP	8-15-20
TAYLOR FIBRE CO-LA VERNE	11-16-17
TAYLOR FIBRE CO-NORRISTOWN	11-16-17
TELEGRAPH CONSTRUCTION & MAINTENANCE CO	15-16-19
TELEPHONICS CORP	1
TEVCO INSULATED WIRE	20
THERMAL REFRACTORIES CORP	22
THERMO ELECTRIC CO-SADDLE BROOK	4
THERMO MATERIALS INC	4
THOR CERAMICS INC	1-4-3-6-8-15-16-17-18-19-20-22
TUPPER MFG CO INC	15
TRI-DEX ELECTRONICS	11
TRI-POINT PLASTICS INC	1-8-11-15-16-19-20
TROXER INC	8
U S PLASTIC MOLDING CORP	14-15-19-20-22
U S STONEWARE CO	4-8
UNITED MINERAL & CHEMICAL CORP	1-4-10-13-19-20
UNIVERSAL CLAY PRODUCTS CO	1-4
VARFLEX CORP	19
WALTHAM SCREW CO	6-15-20
WARREN COMPONENTS DIV EL-TRONICS INC	8-16-17-19-20
WATERBURY COS INC	13
WEBSTER MFG-SAN FRANCISCO	1
WELSH CO INC W H	14-15
WEST INSTRUMENT CORP	22
WESTERN COIL & ELECTRICAL CO	1-14-20
WESTERN GOLD & PLATINUM CO	4-14
WESTINGHOUSE ELECTRIC CORP-MILWAUKEE DIV	11
WESTINGHOUSE ELECTRIC CORP-PITTSBURGH DIV	14-15-16-17-19-20
WESTLAKE PLASTICS CO	15
WHITSO INC	8-14-15-20
WILMINGTON FIBRE SPECIALTY CO	11-15-16-17-19
WIND TURBINE CO	1-4-8-15-20
WINDER AIRCRAFT CORP FLA	1
WIRE CO OF AMERICA SUB WARREN WIRE CO	4-8
WILMINGTON	17
WISCONSIN PORCELAIN CO	1-4-8-16-19-20-22
ZENITH PLASTICS CO	1-11-14-15-17

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B & K INSTRUMENTS INC	1-4-5-7-17
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BARKER & WILLIAMS INC	10
BARNES DEVELOPMENT CO	1-3-4-6-7-9-10
BARNETT INSTRUMENT CO	1-7
BENDIX CORP-CINCINNATI DIV	6
BIRGEN LABS INC	16
BIDDLE CO JAMES S	6-7-16
BLISS ELECTRONIC CORP	1-2-7
BUNTON ELECTRONICS CORP	4-8-11
BUNTON RADIO CORP	1-2-3-4-5-6-7-9-12
BRISTOL CO-WATERBURY	16
BROWNING LABS INC	10
BRUNO-NEW YORK INDUSTRIES CORP	8-13
BRUNSWICK INSTRUMENTS	7-9
BYTHER CORP	1-2-3-4-5-6-7-8-9-12-13-15
CAL-OMM LABS INC	12-13-15
CALIF TECHNICAL INDUSTRIES DIV-TEXTRON	10-
CAMBRIDGE INSTRUMENT CO-NEW YORK	1-2-3-5-7-16
CANADIAN MARCONI CO	1-10-12-13-15-16
CANADIAN RESEARCH INSTITUTE	1-2-3-4-6-7-9-10-11-12-13-15-16
CARDINAL INSTRUMENTATION CORP	12
CENTRAL SCIENTIFIC CO OF CANADA LTD	4-10
CENTRAL SCIENTIFIC CO OF CALIF	2-16
CHESAPEAKE INSTRUMENT CORP	1-2-3-4-5-6-7-9-12
CHICAGO INDUSTRIAL INSTRUMENT CO	5-7-12-13
CLEGG LABS/DIV CLEGG INC	4-7-16
CLOUD-HRENGL CO	1-4-5-7
CLAST COIL CO	3
COMMUNICATION MEASUREMENTS LABS	7
CONSOLIDATED AIRBORNE SYSTEMS INC	1-4
CONSOLIDATED AVIONICS CORP	13
CONSOLIDATED RESISTANCE CO OF AMERICA	16
CORNELL-DUBILIER ELECTRIC CORP PLAINFIELD	1-7
CURTISS-WRIGHT CORP ELECTRONICS DIV	1-4-5-7
CURTISS-WRIGHT CORP PRINCETON DIV	5-7-16
DATASCAN INC	1-12
DATACAN DIV AUTOMATION INDUSTRIES INC	7-9
DAVEN CO	4-5-6-7-16-17
DAVENPORT MFG CO	2-3-6-7-12
DAYSTROM INC PACIFIC DIV	9-12-16
DYNAMIC DEVELOPMENT CO	1-3-4-5-7-17
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ELECTRO IMPULSE LAB INC	1-3-4-5-6-7-9-12
ELECTRO INSTRUMENT INC	1-2-3-4-5-6-7-9-11-16
ELECTRO SCIENTIFIC INU INC	1-4-5-7-10-15-16
ELECTRONIC APPLICATIONS INC	16
ELECTRONIC INSTRUMENT CO INC	1-7
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ELLIOTT BROTHERS LTD	10-13
ELM LABS-HASTINGS-OW-HUDSON	1-15
ENGINEERING DEVELOPMENTS INC-NEWPORT	7
F W INC	1-3-5-7-16
EPPLEY LAB INC	12-16
ERDCO ENGG CORP	1
F X R INC-WOODSIDE	10-13-18
FOXBORO CO	12
FREED TRANSFORMER CO	1-3-5-7
FURZEMILL LABS LTD	8
GENERAL COMMUNICATION CO	8-13
GENERAL ELECTRIC CO-APPARATUS SLS DIV	3-7
GENERAL RADIO CO-WEST CONCORD	1-2-3-4-5-6-7-8-14-16-17-19
GENERAL RESISTANCE INC	16
GETSCH PRODUCTS INC	3-4-9-17
GRAY INSTRUMENT CO	7-11-12-16
GULTON INDUSTRIES INC-METUICHE	1
HAGAN CHEMICALS & CONTROL INC PITTSBURGH	7-9-12-16
HARRIS TRANSDUCER CORP	1-4
HEATH CO	1-3-4-5-7-10-16
HELLIGE INC	2
HEWLETT-PACKARD CO	4-13-14-18
HILLAND ELECTRONICS	13
HONEYWELL CONTROLS LTD	1-2-3-7-9-12
HOWELL INSTRUMENT CO	7-9-16
INDIKON CO	1
INDUSTRIAL CONTROL CO	1
INDUSTRIAL DEVELOPMENT LABS INC	1-7-13
INDUSTRIAL INSTRUMENTS INC	1-2-3-4-6-7-16
INDUSTRIAL TEST EQUIPMENT CO	1-3-4-5-7-11
INDUSTRIAL TRANSFORMER CORP-GULDSBORO	3
ITT IND PRODUCTS DIV-LODI	1-3-4-5-6-7-8-9
J-V-M MICROWAVE CO	8-10-13
JOHNSON AIRCRAFT ENGG CO	3-7-16
JONES ELECTRONICS CO INC M C	8-10
JULIE RESEARCH LABS	7-11-16
KAHN & CO	1-7-12-13-16
KEARFOTT DIV GEN PRECISION-PASADENA	1-5-9-11
KEARFOTT DIV GENERAL PRECISION INC	1-3-4-6-7-11-12-16
KEYSTONE CARBON CO	13
KINETICS CORP	7
LEFOS & NORTHRUP CO	1-2-3-4-5-6-7-9-12-16
LEHIGH VALLEY ELECTRONICS ENGG & MFG CO	4-
MACLEOD & HANDPOL	12-13
MAGNAVOX CORP	1
MAGNETIC CONTROLS CO	7-9-12
MARCONI INSTRUMENTS LTD	1-2-4-5-6-7-8-14
MEASUREMENT ENGG LTD	12

MEASUREMENTS DIV MC GRAW-EDISON	18
MEASUREMENTS RESEARCH DIV PRINCETON	1-4-5-7-13
MELTRONIX INC	6
MILLER MFG CO JAMES	4-8-10
MILLTEST CORP	3-7
MILLIVAC INSTR DIV CONU ELECTRONICS INC	7
MINCO PRODUCTS INC	12
MINN-HONEYWELL REGULATOR CO-RUBICON DIV	7-
MINN-HONEYWELL REGULATOR CO AERONAUTICAL	11-12-16
MINN-HONEYWELL REGULATOR CO BROWN	12-13
INST DIV	3-7-16
MIRATEL INC	8-17
MODEL ENGG & MFG CO INC-HUNTINGTON	1-3-4-5-8
MUIRHEAD & CO LTD	1-3-4-5-7-16-17
MUIRHEAD INSTRUMENTS LTD	1-4-5-7-11-15-16
MUIRHEAD INSTRUMENTS INC-NEW YORK	1-3-4-5-7-11-16-17
NARDA MICROWAVE CORP	4
NON-LINEAR SYSTEMS INC	3-7-9-16
NORTHEAST ELECTRONICS CORP	4-10
NORTHERN RADIO MFG CO LTD	4
PACO ELECTRONICS CO INC	1-7
PACO PRECISION	1-7
PARKS LAB HENRY FRANCIS	12
PHILLIPS ELECTRONICS MFG CO	8
PHOENIX PRECISION INSTRUMENT CO	9
PHYSICS RESEARCH LABS INC	7-16
PIASECKI AIRCRAFT CORP-MAYFIELD	1-3-4-5-13-15-17-18
POLYTRONICS CO-TORONTO	3-6-7-12-15-16
PRECISE MEASUREMENTS CORP	6
PRECISION APPARATUS CO	1-15
PYE CANADA LTD	1-2-3-4-5-6-7-9-12-14-15-16
PYROMETER INSTRUMENT CO	12
RADAR MEASUREMENTS CORP	10-13-18
RADIO CITY PRODUCTS CO	1-3-4-6-7-15-16
RANK CINTEL LTD	1-3-4-5-6-7
RESEARCH INSTRUMENT CO	1-3-4-6-7-16
RINCO INC	1-4-5-6-7-16
RIXON ELECTRONICS INC	1-4-5-8-10
ROYCO INSTRUMENTS INC-MT VIEW	12-13
ROYCO INSTRUMENTS-PALO ALTO	13
RUGE ASSOC INC ARTHUR C	12
SARATOGA INDUSTRIES	5
SHALLCROSS MFG CO	3-6-7-16
SIMMONDS AEROCOSSORIES INC-VERGINNES	1-4-
SIMMONDS AEROCOSSORIES INC-GLENDALE	6-9-13-16
SOUTHWESTERN INDUSTRIAL ELECTRONICS CO	1-9
SPECIAL INSTRUMENTS LABORATORY INC	2-4-5-6-7
SPERRY MICROWAVE ELECTRONICS CO-FLA	10-13-
SPRAGUE ELECTRIC CO-NORTH ADAAS	18
STICHT CO HERMAN H	1
STRATOCORP	6-16
SULLIVAN LTD H W	7-16
SUN ELECTRIC CORP	1-2-4-5-7-16
TAFPET ELECTRONICS INC	3-8
TECH LABS	1-3-4-5-6-7-16
TECHNICAL OIL TOOL CORP	8
TECHNIQUE ASSOCIATES	12
ELECTRO INDUSTRIES CORP	1-3-4-5-
TELERAD MFG CORP	10
TELEX INC	7
THETA INSTRUMENT CORP-SADDLE BROOK	11
TRANSFORMERS INC	1-3-4-5-7-11-12-15-16-17
TRUMP DR WALTER H	6
U S DYNAMICS INC	5
UNITED MINERAL & CHEMICAL CORP	1-2-4-5-6
VIRGINIA ELECTRONICS CO	8-17
VIS-U-ALL PRODUCTS CO	19
VORON & CO GEORGE	1-4-5-6-7-15-16
WATERS MFG INC-WAYLAND	8-9
WAYNE KERR CORP	1-2-3-4-5-6-7-8-9-
WEST COAST RESEARCH CORP	14-17
WEST INSTRUMENT CORP	12
WESTRONICS INC	12
WEYMOUTH INSTRUMENT CO	2-3-9-13
WINDER AIRCRAFT CORP FLA	16
WINSLOW CO	1-2-3-4-5-7-1-3-4-7-16

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AD-VU ELECTRONICS LAB INC	2-4
AERONCA MFG CORP	2
AEROTRONIC ASSOCIATES INC-CONTOCOOK	13
AEROTRONIC ASSOCIATES INC-CONCORD	2-3-4-
AIRPAX ELECTRONICS INC SEMINOLE DIV	11
ALEXANDRIA DIV-AMF	4-11
AMERICAN ELECTRONICS INC-6TH ST	2-9-12

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AMERICAN MISSILE PRODUCTS CO INC	13
AMERICAN TRADAIR CORP	10
ARMA DIV AMERICAN BOSCH CORP	2-3-4-9-11-
	13
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ATOMIC ACCESSORIES INC	12-15
AUSTIN ELECTRONICS DIV AUSTIN CO	2-13
AUTOMATIC ELECTRIC CO	1-9
AUTOMATIC TIMING & CONTROLS INC	9-11-13
AUTOMATION DYNAMICS CORP	9
AUTOTRON INC	8
B H INSTRUMENT CO INC-FT WORTH	4-11
BAIRD-ATOMIC INC	1-2-3-4-8-9-11-12-
	15
BARKLEY & DEXTER LABS	1-8
BECKMAN INST INC BERKELEY DIV	2-3-4-8-9-
	13
BECKMAN INSTRUMENTS INC SYSTEMS DIVISION	2-3-4-9-13
BENDIX CORP-CINCINNATI DIV	2-9-12
BENSON-LEHNER G B LTD	1
BIDDLE CO JAMES S	4
BOESCH MFG CO-DANBURY	2
BRIGGS ASSOCIATES-NORRISTOWN	2
BRISTOL CO-WATERBURY	3-11-16
BURROUGHS CORP ELECTRONIC TUBE DIV	2-3-4-
	9
BURROUGHS CORP-DETROIT	2-3-4-9-13
C & W COMPONENTS INC	9
CANADIAN APPLIED RESEARCH LTD	2-13
CANADIAN MARCONI CO	2-4
CANADIAN RESEARCH INSTITUTE	2-8-12
CENTRAL DYNAMICS LTD	1-2-4-9-11-13
CENTRONIX INC-MIAMI	2
CHRONO-LOG CORP	13
CLARK CONTROLLER CO-CLEVELAND	6
COMPTON CORP	2
COMPUTER CONTROL CO INC WESTERN DIV	2-9-
	14
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COMPUTING DEVICES OF CANADA LTD	2-3-4-9-13
CONSOLIDATED AVIONICS CORP	2-3-4-9-13
DATASCAN INC	8
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DURANT MFG CO	1-2-8-9-11
DURANT MFG CO	1-2-8-9-11-14
DYME INC	2-3-4-9-13
DYNAPAR CORP	2-3-4-8-9-11-13-14
DYNATRONIC INC	2
E P C	2-4-9
EAGLE SIGNAL CO DIV GAMEWELL CO	1-9-11-13
EASTERN SPECIALTY CO	8
EGERLINE INSTRUMENT CORP	3-12
EDGERTON GERMESHAUSEN & GRIER INC	12
EL-TRONICS INC-MAYFIELD	12
ELDORADO ELECTRONICS CO	13
ELECTRIC TACHOMETER CORP	1-11
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ELECTRO CONTACTS INC	13
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	8
ELECTRONICS CORP OF AMERICA-CAMBRIDGE	2-4-
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ELECTRONICS CORP OF AMERICA-TORONTO	8
ELECTRONICS ENGG CO OF CALIF	2-4-9-13
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ENGLER ELECTRONICS CO	2-9-13
ENGLER EQUIPMENT CO	8
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EPIC INC	13
EPSCO INC	8
ERIE RESISTOR CORP-ERIE	2-3-4-9-11-13
ERIE-PACIFIC-DIV ERIE RESISTOR CORP	2-3-4-
	8-9-11-13
ERIE-PACIFIC-ELECTRONICS CO DIV I T & T	2-11-13
FEDERAL EQUIPMENT CO	8
FISHER & PORTER CO	2-3
FISHER RESEARCH LAB	12
FISHER RESEARCH LAB LTD	12
FREED TRANSFORMER CO	2-8-9-11-
	12
FURZEMILL LABS LTD	2
G W MANUFACTURING CO	4
GATES RADIO CO	2-4
GENERAL CONTROLS CO CANADA LTD	1-8-9-11-
GENERAL CONTROLS CO-GLENDALE	1-8-9-11
GENERAL DEVICES INC	2-9-11-13
GENERAL DYNAMICS/ELECTRONICS-CARLSON RD	2-
	3
GENERAL ELECTRIC CO X-RAY DEPT	12
GENERAL ELECTRIC CO-APPARATUS SLS DIV	8
GENERAL RAILWAY SIGNAL CO	2
GENERAL-ELECTRO MECHANICAL CORP	1
GORDON ENTERPRISES	1-2-3-11-13
GUARDIAN ELECTRIC MFG CO	1
GURLEY W & L E	8-11
HALLICRAFTERS CO-CHICAGO	2-13
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HARVEY-WELLS ELECTRONICS INC SOUTHBRIDGE	2-12

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**PRODUCTS & MFRS**

**MEAS. EQUIP.—DECADE BOXES & GENERATORS**

MAYDON CO A B	1-13-15
MAYDON DIV GENERAL TIME CORP	13
MAYDON INSTRUMENT CO	9-11-13
MEBELTT-PACKARD CO	2-3-4-8-13
MOBE CORP JOHN B DIV STEWART-BARNER CORP	13
MYCON MFG CO	12
MYSON MFG CO	2
1-L-5 INSTRUMENT DIV MERIAN INSTRUMENT CO	2-3-4-13
ICONIX INC	2-3-4-9-11-13
INDUSTRIAL ELECTRONIC CONTROLS	2-3-4-9-11-13
INDUSTRIAL ELECTRONICS INC	8
INTERSTATE ELECTRONICS CORP	13
INTIREX CORP	1-8-9-11-13-14
ISOMET CORP	12
ISOTOPIES INC	2-12
ISOTOPIES SPECIALTIES CO	12-15
ITY IND PRODUCTS DIV-SAN FERNANDO	4-13
JEM ELECTRONICS CORP	2-8
JONES & BETTLAUER ENGR CORP	2-8
KAISER AIRCRAFT & ELECTRONICS DIV KAISER	2-3-4-13
IND-OAKLAND	1-14
KEARFOY DIV GENERAL PRECISION INC	1-14
KOLLSMAN INSTRUMENT CORP-ELMHURST	2-3-6-9-11
LABORATORY FOR ELECTRONICS INC	2-3-6-9-13
LAND-AIR INC-CHICAGO	3-4-13
LANDIS & GYR	1-8-13
LARSON INSTRUMENT CO	2-3-4
LAS-LAB INC	4
LAVOIE LABS INC	4
LIBRASCOPE DIV GENERAL PRECISION INC	2
LENDALE	2-8
LUMENTIC ELECTRONIC CO	2-8
MAGNETIC RESEARCH CO	2-4
MAGNISON ENGINEERS INC	2
MAGTROL INC	2-8-11
MARSTAN ELECTRONICS CORP	4
MAST DEVELOPMENT CO INC	1-3-9-11
MEASUREMENT ENGG LTD	2-3-4-8-9-11-12-13
MELGO ELECTRONIC CORP	2-3-13
MODERN DESIGN DIV H C SCHLDER INC	2-4
MORAN INSTRUMENT CORP	2-3-9-12-13-15
MULLARD EQUIPMENT LTD	2-4-9
NATIONAL INSTRUMENT LABS INC	8
NAVCOR	2-3-4-9-13-16
NORMAN LABORATORIES ERNST	4-13
NORTHEASTERN ENGG INC	2-4-13
NUCLEAR CORP OF AMERICA	1-12-15
NUCLEAR MEASUREMENTS CORP	2-12-15
NUCLEAR-CHICAGO CORP	2-3-9-12-13-15
NUCLEAR-ELECTRONICS CORP	2-3-4-8-9-12
NUCLEONIC CORP OF AMERICA	12
ORBITRAN CO INC	2-13
PACIFIC MERCURY T V MFG CORP-SEPULVEDA	2
PACKARD INSTRUMENT CO	2-3-9-12-13
PATTERSON MOOS RESEARCH DIV LLESONA CORP	2-9-13
PEEBLES & CO LTD BRUCE	2-13
PENWOOD NUMCHRON CO	13
PHILIPS ELECTRONIC INSTRUMENTS	12-15
PHOENIX PRECISION INSTRUMENT CO	8
PHOTOBELL CO	2-3-4-8-9-11-14
PHOTOCOR RESEARCH PRODUCTS	1-9-11
PIASECKI AIRCRAFT CORP-MAYFIELD	12
PIC AUTOMATION CONTROLS	1-2-3-8-9-11-13-15
POLYTRONICS CO-TORONTO	8
POTTER AERONAUTICAL CORP	1-2-3-8-9-11-13-15
POTTER INSTRUMENT CO	2-3-4-9-11-13
PRECISION RADIATION INSTRUMENTS INC	12
PYE CANADA LTD	1-2-8-11-12-13
QUANTAMTRIC DEVICES INC	8
RACAL ENGG LTD	2-3-4-8-9-11-13-15-16
RADIATION COUNTER LABS INC	12
RADIATION INSTRUMENT DEVELOPMENT LAB INC	12-15
RADIO CORP OF AMERICA-DETROIT	2-8-9
RAN METER INC	1-2-4-9-13
RANK CINTEL LTD	2-3-4-8-11-13-16
RANSON RESEARCH	2-3-4-8-9-13
RAYCO ELECTRONIC MFG INC	2
RESEARCH INDUSTRIAL LAB OF ELECTRONICS	2
REUTER STOKES ELECTRONIC COMPONENTS	15
RIXON ELECTRONICS INC	3
ROBOTRON CORP	4
SCANTLIN ELECTRONICS INC	2-3-4-13
SLM-ELEMENTS INC	12
SENSORY INC	1-2
SERVMECHANISAS CANADA LTD	2
SIGMA INSTRUMENTS INC	3-13
SIMPSON ELECTRIC CO-CHICAGO	1
SKYTRON ELECTRONICS & TV CORP	1-2-3-4-8-9-11-13
SOUTHWESTERN INDUSTRIAL ELECTRONICS CO	11
SPECTRA ELECTRONICS CORP	2-4
STANDARD ELECTRIC TIME CO	2-3-8-9-13
STANDARD INSTRUMENT CORP	12
STANLEY AVIATION CORP	13
STEWART INSTRUMENT CO	13
STICHT CO HERMAN H	1-3-13
STREETER AMET	2-3-4-9-11-13
SYSTEM CORP	11
TECHNICAL OIL TOOL CORP	12
TELECHROME MFG CORP	12
TELECOMPUTING CORP-LOS ANGELES	2
TELETRON INDUSTRIES CORP	1-2-3-4-8
TEXTRON CORP	2-4
TIME-O-MATIC INC	13
TRACERLAB INC-BALTIMORE	2-3-9-12-15
TRANSISTOR SPECIALISTS	2-8-13
TROTT ELECTRONICS INC	2-8-13
TULLAMORE ELECTRONICS CORP SUB VICTOREEN	2-3-12-13
INSTRUMENT CO	1-16

UNIVERSAL MFG CO INC-IRVINGTOWN	2
UNIVERSAL TRANSISTOR PRODUCTS CORP	12
UNIVAVE INC	11
WEDDER ROOT INC-HARTFORD	1-2-8-9-11-13
VENNER ELECTRONICS LTD	2-3-4-8-9-13-16
VICTOR ADDING MACHINE CO	2-9
VICTOREEN INSTRUMENT CO	12-13-15
VOI-SHAN ELECTRONICS	1-2
WACLINE INC	11-13
WALKIRY CO	2-3-4-8-9-11-13
WANG LABS INC	2-9
WESCOR INC-ELECTRONICS DIV	1-4
BELLS INDUSTRIES CORP	1-2-3-8-9-11-13-15
WELTRONIC CO	2
WESTERN RADIATION LAB	12
WICKES EMGG & CONSTRUCTION CO	13
WOOD COUNTER LAB N	12
ZERNICKOW CO O	11

**39 - MEASUREMENT & TEST EQUIPMENT  
DECADE BOXES**

ATTENUATORS, DECADE	4
DECADE BOXES, CAPACITANCE	1
DECADE BOXES, INDUCTANCE	2
DECADE BOXES, RESISTANCE	3

AERO ELECTRONICS CO-CHICAGO	2
AEROVOX CORP-NEW BEDFORD	1-2-3-4
AUDICON ELECTRONICS INC	1-2-3
BARNES DEVELOPMENT CO	1-3
BURNELL & CO INC	1-2
CAL-OHM LABS INC	1-2-3
CAMBRIDGE INSTRUMENT CO-NEW YORK	3
CANADIAN RESEARCH INSTITUTE	1-3
CAPITOL TRANSCRIPTIONS INC	3
CENTRAL SCIENTIFIC CO OF CANADA LTD	3
C/M/PA ENGG DIV AEROVOX CORP	3
CLAROSTAT MFG CO	3
COAST COIL CO	2
CORNELL-DUBILIER ELECTRIC CORP PLAINFIELD	1-3
DAVEN CO	1-2-3-4
DAME INSTRUMENTS LTD	3
DMETER MFG CO	3
ELECTRO SCIENTIFIC INC INC	1-3
ELECTRONIC APPLICATIONS INC	1-4
ELECTRONIC INSTRUMENT CO INC	1-3
ELECTRONIC MEASUREMENTS CORP	1-3
EPIC INC	3
FIDELITY AMPLIFIER CO	3
FRECO TRANSFORMER CO	1-2
FURZELL LABS LTD	1-2
GENERAL RADIO CO-BEST CONCORD	1-2-3-4
GENERAL RESISTANCE INC	3
GERTSCH PRODUCTS INC	3
GRAY INSTRUMENT CO	3
HEATH CO	1-3
HONEYWELL CONTROLS LTD	3
INDUSTRIAL INSTRUMENTS INC	1-3
INT L RESISTANCE CO-PHILA	2
ITY IND PRODUCTS DIV-LOUI	1-3
JULIE RESEARCH LABS	3-4
KURTSTON ELECTRONICS	3
LEEDS & NORTHROP CO	1-2-3
MARINA ELECTRONICS CO	1-3
MINN-HONEYWELL REGULATOR CO-RUBICON DIV	3
MINNEAPOLIS-HONEYWELL REGULATOR CO BROWN	3
INST DIV	3
MUIRHEAD & CO LTD	1-2-3-4
MUIRHEAD INSTRUMENTS LTD	1-2-3-4
MUIRHEAD INSTRUMENTS INC-NEW YORK	1-2-3-4
NEW LONDON INSTRUMENT CO INC	4
CHWITE MFG CO	3
PACO ELECTRONICS CO INC	1-2-3
PACO PRECISION	1-2-3
PHYSICS RESEARCH LABS INC	3-4
POLYTRONICS CO-TORONTO	1-3
PRECISE DEVELOPMENT CORP	3-4
PRECISION APPARATUS CO	1-3
PROJECTS UNLIMITED INC	1-3-4
PYE CANADA LTD	1-2-3
RINCO INC	1-2-3
SARATOGA INDUSTRIES	1-2-3
SCIENTIFIC WOOD CABINET CO	1-2-3
SMALLCROSS MFG CO	3-4
SIMMONDS ACCESSORIES INC-VEAINGNES	1
SIMMONDS AEROCESORIES INC-GLANDALE	1
SIMMONDS AEROCESORIES INC-TAARBYTOWN	1
SULARTRON ELECTRONIC GROUP LTD	4
SPRAGUE ELECTRIC CO-NORTH ADAMS	1
SULLIVAN LTD H B	1-2-3-4
TECH LABS	1-2-3-4
TELETRON INDUSTRIES CORP	1
TELEX INC	3
TELOVIC INDUSTRIES INC	1
TOROCOIL CO	1
ULTRONIX INC	3
UNIVERSAL MFG CO INC-IRVINGTOWN	2
VALANDY ELECTRONICS CORP	1-3
WALD ELECTRONICS	4
WALTHAM ELECTRONICS CORP	3-4
WAYNE HERR CORP	4
WELCH SCIENTIFIC CO W H	1-3
WESTINGHOUSE ELECTRIC CORP-PITTSBURGH	23
WYBOMOUTH INSTRUMENT CO	3
WINSLOW CO	1-3

**40 - MEASUREMENT & TEST EQUIPMENT  
GENERATORS**

GENERATORS, A-F SIGNAL	1
GENERATORS, COLOR TV BAR	2
GENERATORS, COLOR TV DOT	3
GENERATORS, COLOR TV SIGNAL	4
GENERATORS, F-M SIGNAL	5
GENERATORS, HARMONIC	6
GENERATORS, MICROWAVE SIGNAL	7
GENERATORS, NOISE	8
GENERATORS, PHASE MODULATION	27
GENERATORS, PICTURE SIGNAL	9
GENERATORS, PULSE	10
GENERATORS, R-F SIGNAL	11
GENERATORS, SINGLE-SIDEBAND	12
GENERATORS, SQUARE WAVE	13
GENERATORS, SWEEP	14
GENERATORS, SYNC	15
GENERATORS, SYNC STRETCHER	16
GENERATORS, SYNC, STUDIO TV	17
GENERATORS, TIMING MARKER	18
GENERATORS, TACHOMETRIC	19
GENERATORS, TV COMPOSITE SIGNAL	19
GENERATORS, TV SIGNAL	20
GENERATORS, UHF	21
GENERATORS, ULTRASONIC	22
GENERATORS, VHF	23
GENERATORS, VIDEO SIGNAL	24
GENERATORS, WAVEFORM	25
MULTIPLIERS, FREQUENCY	26

A & F PRODUCTS INC-RIVER FOREST	5-13-23
ALCUSTICA ASSOCIATES-PLAINFIELD	22
AD-YL ELECTRONICS LAB INC	8-13
ADMIRAL CORP-CHICAGO	8-13
AIRBORNE INSTR LAB DIV CUTLER HAMMER INC	7-8
USER RANK	7-8
A/RCCO INC-BOSTON	6-7-8-10-11-14-21
AIRCRAFT RADIO CORP	7-11-21-23
AIRTEC INC	8-7
ALCAR INSTRUMENTS INC	22
ALFRED ELECTRONICS	7-14
ALFRED RADIO CORP	1-11-14
ALPHA INSTRUMENT CO	1-5-11
AMPRAC INC	7-21-26
AMERICAN ELECTRONIC LABS INC-OLMHP	10
AMERICAN ELECTRONICS INC-6TH ST	26
AMERICAN ELECTRONICS LAB-PHILA	10-13-18
AMERICAN RESEARCH & MFG CORP	25
ANDEX INSTRUMENTS INC	18
ANTLAS INC	13
ARENBERG ULTRASONIC LABORATORY INC	22
ARKAY INTERNATIONAL INC	11-14
ARMSTRONG WHITWORTH EQUIPMENT	29
ATLIERI DE MONTAGES ELECTRIQUES	11
ATOMIC ACCESSORIES INC	4
AUDICON ELECTRONICS INC	1-5-8-11-13-22
AUTOMATION INDUSTRIES INC	1-5
AVO LTD	1-5
B K MFG CO-BELLE PLAINE AVE	2-3-4-9-11-13
B K MFG CO-SOUTHPORT AVE	2-3-24
B & K INSTRUMENTS INC	1
BARCOCK RADIO ENGG	11-21
BACHMANN LTD	1-5-11
BARKER & WILLIAMSON INC	1-9
BENIX CORP-CINCINNATI DIV	5-11-14
BERGEN LABS INC	21
BERKSHIRE LABS	10-23
BLACKSTONE CORP	22
BOONTON RADIO CORP	5-7-11-16-21-23
BORG-WARNER CONTROLS BORG-WARNER CORP	10-11-13-18-21-23-25
BOSCO ELECTRONICS INC DON	1-8-10-11
BRANSON INSTRUMENTS INC	22
BHUBAKER ELECTRONICS INC	10-13
BRUNO-NEW YORK INDUSTRIES CORP	7-11-21
BUDD LEWY ELECTRONICS INC	1-5-7-8-11-18
BUILDING BLOCKS ELECTRONIC CO	21-24
BULOVA WATCH CO ELECTRONICS DIV	1-5-6-10-13
BURROUGHS CORP ELECTRONIC TUBL DIV	1-13
BURR-BROWN RESEARCH CORP	1-13
BURROUGHS CORP ELECTRONIC TUBL DIV	10
CALIF TECHNICAL INDUSTRIES DIV-TEXTRON	7
CANADIAN AVIA ELECTS	24
CANADIAN MARCONI CO	1-5-7-8-10-11-13-14-17-19-23-26
CANADIAN RESEARCH INSTITUTE	1-10-11-13-22
CANOGA CORP OF CALIF SOUTHERN DIV	7-11
CANOGA DIV UNDERBOLT CORP	14
CARBELL ELECTRICAL ENGG A E	13
CANTRONIX INC-MIAMI	11
CESAGEAKE INSTRUMENT CORP	8-22
CIRLO ULTRASONIC CORP	22
CLFGE LABS/DIV CLEGG INC	7-10-12-21
CLOUGH-BRENLE CO	1-7-11-14-21-23
CULLINS RADIO CO-CEDAR RAPIDS	12
CULLINS RADIO CO-DALLAS	1-7-11-12-18-25
COLORADO RESEARCH CORP	19-20-24-26
COMMUNICATION MEASUREMENTS LABS	22
COMPAGNIE GENERALE DE METROLOGIE	5-10-13
CONN ORGAN CORP-ELKHART	1
CONSOLIDATED AVIONICS CORP	25-26
CONTINENTAL ELECTRONICS CORP-BROOKLYN	1
CONTINENTAL ELECTRONICS CO INC	6-7-18-26
COOK ELECTRIC CO	13
CROSBY LABS INC	12
CUBIC CORP-SAN DIEGO	25
DAVEN CO	1-11

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## MEAS. EQUIP—SIGNAL GENERATORS

DECADE INSTRUMENT CO	11
DEMORNAV-BONARDI CORP	6-8-20
DESIGNERS FOR INDUSTRY	12-21-22-26
DI-AN CONTROLS INC	18
DI-TRAN CORP	26
DIEHL MFG CO	14
DJECO DIV DJORDJEVIC ENGG CO	13
DOMNER SCIENTIFIC CO	1-13
DOMONT LABS INC ALLEN B-CLIFTON	10-20
DUNLAP ELECTRONICS	1-10-13
DYNEC INC	1-7-14
DYNA-EMPIRE INC	8
E H RESEARCH LABORATORIES INC	10
ELCOR INC	13
ELECTRICAL & PHYSICAL INST CORP	10-13
ELECTRO-CERAMICS INC	22
ELECTRO-PULSE INC-CULVER CITY	10-13-18
ELECTROMATION CO	10-18
ELECTRONIC APPLICATIONS INC	1-5-7-8-11-14-21-25-26-28
ELECTRONIC COUNTERS INC	21-25-26-28
ELECTRONIC INSTRUMENT CO INC	1-11-13-14
ELECTRONIC MEASUREMENTS CORP	1-3-20
ELECTRONICS OF CLEARFIELD INC	10-14
ELGECO	8
ELLIOTT BROTHERS LTD	1-7-13-14
ELVIN ELECTRONICS CORP	7
ELY SALES INC	1
EMI COSSOR ELECTRONICS	8-10-13-14
EMPIRE DEVICES PRODUCTS CORP	8-10-11
EMPIRE PRODUCT SALES CORP	8
ENGINEERED ELECTRONICS CO	10-13
ENGINEERING ASSOCIATES	7-8-10-11-13-21-22-23-26
ENTRON INC-BLADENBURG	11
FARNSWORTH ELECTRONICS CO DIV I Y & T	18
FELKER ENGG & MFG CO	1-11
FERRIS INDUSTRIES CORP	11-21
FISCHER ELECTRONICS INC	1
FLIGHT RESEARCH INC	10-18
FLOW CORP	8
FOTO VIDEO LABS	3-9-10-11-15-16-17-19-20-24
FRANKLIN ELECTRONICS INC-BRIDGEPORT	10
FURZELL LABS LTD	1-13
G-M LABORATORIES INC	19
GENERAL COMMUNICATION CO	5-7-10-11-13-14-15-18-24
GENERAL DYNAMICS/ELECTRONICS-CARLSON	7-26
GENERAL ELECTRIC CO TECHNICAL PRODUCTS DEPT	11-12
GENERAL ELECTRIC LAB INC SILVER SPRING LAB	6-8-26
GENERAL RADIO CO-WEST CONCORD	1-6-7-8-10-11-13-14-21-22-26
GEOTECHNICAL CORP	18
GETSICH PRODUCTS INC	26
GORDON ENTERPRISES	13
GRAPHIC RECORDERS INC	1
GREN ENGG CO	7
GRIEN INDUSTRIES INC/ELECTRONIC PROD	10
GULTON INDUSTRIES INC-METUCHEN	22
GURLEY W & L E	10
GUYRA ELECTRONICS CORP	1
GYRE CORP	1-10
HALLICRAFTERS CO-CHICAGO	7-10-11-12-16-21
HAZELTINE ELECTRONICS DIV HAZELTINE CORP LITTLE NECK	2-3-4-7-9-10-11-21-23
HEATH CO	1-2-3-6-11-13-14-19
HELIPOT DIV BECKMAN INSTRS INC TORONTO	40
HERMES ELECTRONICS CO	18
HERMES-SONIC CORP	22
HEWLETT-PACKARD CO	1-6-7-10-11-13-14-21-22-23-25-28-29
HICKOK ELECTRICAL INSTRUMENT CO	1-2-3-4-5-9-11-13-14-18-20-21-23-24-25
HOLT INSTRUMENT LABS	1
HYCON MFG CO	7-8
HYSON MFG CO	1-5-11-13-14-15-18-21-23
ICONIX INC	10-25-74
INDUSTRIAL TEST EQUIPMENT CO INSTRUMENT CORP OF AMERICA	10
INTERELECTRONICS CORP	1-6-8-13-22-25-26
INVAR ELECTRONICS CORP	1
ITEK CORP-WALTHAM	7-13
ITT IND PRODUCTS DIV-SAN FERNANDO	1-10-11-13-14-24-26-27
ITT IND PRODUCTS DIV-LODI	1-5-8-11-21-23
J-V-H MICROVAC CO	7-11-26
JACKSON ELECTRICAL INSTRUMENT CO	1-5-13-14-23
JERROLD ELECTRONICS CORP	14-23
KAHN & CO	22
KAISER AIRCRAFT & ELECTRONICS DIV KAISER IND-OARLAND	15
KATO ENGG CO	1
KAY ELECTRIC CO	1-2-3-4-5-6-7-8-9-10-11-14-19-20-21-22-23-24
KEARFOTT DIV GEN PRECISION-PASADENA	7-29
KEARFOTT DIV GEN PRECISION-VAN NUYS	7-11-13-26
KEARFOTT DIV GENERAL PRECISION INC	7-8
KETAY DEPT NORDEN DIV UNITED AIRCRAFT	7-8
KIN TEL RESEARCH DIV	17-19
KINTEVOX-HALLEN DIV ELECTROMATION CO	10-18
KINTEL-SAN DIEGO	17-19-20
KOLL-SMAM INSTRUMENT CORP-ELMHURST	29
KURTSTON ELECTRONICS	14
LABORATORY FOR ELECTRONICS INC	7
LAMBDA PACIFIC ENGG CORP	6-11
LAMPKIN LABS INC	6-11

LAND-AIR INC-CHICAGO	15
LAVOIE LABS INC	10-11-21-23
LEVINTHAL ELECTRONIC PRODUCTS INC	7-21
LINS SYSTEMS INC	7
LUMATRON ELECTRONICS INC-NEW HYDE PARK	10-13-19-25
MANSON LABORATORIES INC	6-7-10-11-21-23
MANUFACTURERS ENGG & EQUIP CORP	14
MARCONI INSTRUMENTS LTD	5-7-8-11-13-14-21-22-23-24
MARCONIS WIRELESS TELEGRAPH CO LTD	2-4-9-13-19-25
MEASUREMENTS ENGG LTD	12-14-15-17-19-20-25
MEASUREMENTS DIV MC GRAM-EDISON	5-10-11-13-21-23
MEASUREMENTS HCBRAW EDISON INC	1-5-10-11-13-20-21-23-24
MELABS	7
MENLO PARK ENGG	7-26
MICROWAVE ASSOCIATES INC	10
MILGO ELECTRONIC CORP	18
MILLER ASSOCIATES	15
MINN-HONEYWELL REGULATOR CO AERONAUTICAL DIV-MINNEAPOLIS	26
MIRATEL INC	1-5-9-11-17-19-20-24-25
MISSOURI RESEARCH LABORATORIES INC	10
MOBIL ELECTRONICS MFG CO	1
MODEL ENGG & MFG CO INC-HUNTINGTON	7
MODERN DESIGN DIV H C SCHLOER INC	10-13
MONTEK ASSOCIATES INC	10
MURHEAD & CO LTD	1-13-29
MURHEAD INSTRUMENTS INC-NEW YORK	1-13
MULLARD EQUIPMENT LTD	12-22
NARDA MICROVAC CORP	7
NATIONAL COMPANY INC-MALDEN	7-11-12-26
NATL ULTRASONIC CORP	22
NAVCOR	10
NAVIGATION COMPUTER CORP	10-18
NEW LONDON INSTRUMENT CO INC	5-11-13-21-23
NICHOLS & CLARK INC	1
NORMAN LABORATORIES ERNST	6-10-18-26
NORTHEAST SCIENTIFIC CORP	7
NORTHERN RADIO MFG CO LTD	13-26
NUCLEAR-ELECTRONICS CORP	1-10-11-13-10-18
ORBITRAN CO INC	1-14
PACIFIC TRANSDUCER CORP	1-14
PACKARD-BELL ELECTRONICS CORP	10
PACO ELECTRONICS CO INC	11-14
PACO PRECISION	1-2-3-4-5-11-13-14-20
PANORAMIC RADIO PRODUCTS	1-14
PANSEAL INC	2-3-4-12-15-16-19-24
PEEBLES & CO LTD BRUCE	8-22
PEER INC PROFESSIONAL ELECTRONIC ENG RES	7-10-11-12-13-14-15-21-23-26-28
PHILAMON LABS INC	13
PHILBRICK RESEARCHES INC GEORGE A	1-13-14-18-25
PHILCO CORP S & I DIV	5-6-7-8-9-10-11-17-19-20-21-22-23-24-26-27-28
PHILLIPS ELECTRONICS MFG CO	11-12-22
PIASECKI AIRCRAFT CORP-MAYFIELD	21-22-23
PITOMETER LOG CORP-NEW YORK	26
POLARAD ELECTRONICS CORP	7-8-10-11-14-21-23
POTTER AERONAUTICAL CORP	23
POWER SUPPLY INC	10
PRECISE DEVELOPMENT CORP	1-2-5-10-11-13
PRECISION APPARATUS CO	1-2-3-11-13-14
PRECISION HEARING AIDS	8
PROBESCOPE CO INC	14
PROJECTS UNLIMITED INC	26
PYE CANADA LTD	1-11-15-17-22
PYE TELECOMMUNICATIONS LTD	1-11-25
R S ELECTRONIC CORP	8
RADAR ENGINEERS	10-13
RADAR MEASUREMENTS CORP	7
RADIATION COUNTER LABS INC	10
RADIATION INC-MELBOURNE	10
RADIATION INSTRUMENT DEVELOPMENT LAB INC	10
RADIATION INSTRUMENT CO	10
RADIO CITY PRODUCTS CO	1-2-3-4-5-10-11-13-14-21-23
RADIO CORP OF AMERICA-ELECTRON TUBE DIV	1-2-3-11-14
RADIO CORP OF AMERICA DEFENSE ELECTRONIC PRODUCTS	11-15
RADIO CORP OF AMERICA COMMERCIAL ELECTRONIC PRODUCTS	1-2-3-4-5-6-10-11-13-14-15-17-18-20-21-23-24-25-26
RANK CINTEL LTD	1-2-10-13-14-25
RATHEON CO-RIVER ST.	7
RCA BROADCAST & TV DIV	2-3-4-5-7-9-10-11-12-13-14-15-17-20-21-23-24-25-26-27
REEVES INSTRUMENT CORP	8
REHANO INC	7-10-11-24-26
RESEDL ENGG CORP	7-10-11-21-26-28
RESE ENGG INC	10-25
RESEARCH INDUSTRIAL LAB OF ELECTRONICS	10
RIVERBANK LABS ENGG DEPT	1
RIXON ELECTRONICS INC	8-26
ROY CO MILTON	10
RUTHERFORD ELECTRONICS CO	10-18
SANTA BARBARA DIV CURTISS WRIGHT	22
SCHONE ELECTRONICS LAB	10
SCOTT INC H H	8
SEABARD ELECTRIC PRODUCTS CORP	10
SERVICE INSTRUMENTS CORP	6
SERVO-TEK PRODUCTS CO	29

## PRODUCTS & MFRS

SIERRA ELECTRONIC CORP-MENLO PARK	5-7-21-23-27
SIMPSON ELECTRIC CO-CHICAGO	2-3-4-5-10-11-14-19-20-21
SOLARTRON ELECTRONIC GROUP LTD	1-10-11-13-14-25
SOUTHWESTERN INDUSTRIAL ELECTRONICS CO	10-13-14-18-22-25
SPECIALTY ELECTRONICS DEVELOPMENT CORP	1-7-10-11-28
SPENCER-KENNEDY LABS INC	10
SPERRY GYROSCOPE CO MARINE DIV	1-5-9
SPERRY MICROVAC ELECTRONICS CO-FLA	7-8
STATISTICAL INSTR CO	8-25-26
STELMA INC	10
STODDART AIRCRAFT RADIO CO	10
TAFFET ELECTRONICS INC	1-5-6-11-13
TALLY CORP	1-29
TALLY REGISTER CORP	13
TARC ELECTRONICS INC	2-9-10-15-16-17-19-24
TECHNICAL MATERIAL CORPORATION	28
TECHNICAL OIL TOOL CORP	7
TEKTRONIX INC-PORTLAND	10-13-18-25
TEL-INSTRUMENT ELECTRONICS CORP	2-3-4-5-9-11-14-15-17-19-20-21-23-24
TELECOMPUTING CORP-LOS ANGELES	10-18
TELECON INC	1-17
TELECO INDUSTRIES CORP	1-7-10-11-21-24
TELEMARINE COMMUNICATIONS CO	5-11-21-23
TELERAD MFG CORP	5-7-10-11
TELETRONICS LAB INC-WESTBURY	10
TELEVISION UTILITIES CORP DIV NORD	15
TELEVIC ENGINEERING CORP	6-7-10-11-14-21-23-26
TELOGIC INDUSTRIES INC	1-6-10-11-14-21-23
THETA INSTRUMENT CORP-SADDLE BROOK	27
TOPPING ELECTRONICS LTD F V	26
TRAD ELECTRONICS CORP	11
TRANSLINE ELECTRONIC COMMUNICATION CO	26
TRG INC	4
TRIPLETT ELECTRICAL INSTRUMENT CO	2-3-4-5-7-11-18-20-24
TULLAMORE ELECTRONICS CORP SUB VICTOREEN INSTRUMENT CO	10
TV UTILITIES CORP DIV NORD-NEW HYDE PARK	9-15-19-24
ULTRASONIC ENGG CO	22
ULTRASONIC INDUSTRIES INC	22
UNDERWOOD CORP CANADA DIV	7-11
VALANDY ELECTRONICS CORP	1
VAN NORMAN INDUSTRIES INC ELECTRONICS DIV	7-11-14-21-23
VARO MFG CO-SARLAND	1-13-25-26
VECTRON INC	7-13
VICTOREEN INSTRUMENT CO	10
VIRI-SHAM ELECTRONICS	26
VORON & CO GEORGE	1
WALTHAM ELECTRONICS CORP	5-7-8-11-13-14-21-23-25-26
WANG LABS INC	10-25
WAVE PARTICLE DIV RAMAGE & MILLER INC	7-14-23-25
WAVEFORMS INC	1-22
WAVEFORMS CORP	7-8
WAVE/PARTICLE CORP	14
WEINSCHEL ENGG	7-11-13
WESTERN INSTRUMENT CO	1
WEYHOUT INSTRUMENT CO	7
WICKES ENGG & CONSTRUCTION CO	2-3-4
WINDER AIRCRAFT CORP FLA	26
WINSLOW CO	1
WINSTON ELECTRONICS DIV JETRONIC IND	1-2-3

41 - MEASUREMENT & TEST EQUIPMENT - MONITORS

MONITORS, ANTENNAS, PHASE	1
MONITORS, AUDIO	2
MONITORS, FREQUENCY	3
MONITORS, MODULATION	4
MONITORS, PHASE ANGLE	5
MONITORS, POWER	6
MONITORS, VIDEO COLOR	8
MONITORS, VIDEO LINE	9
MONITORS, VOR	11
MONITORS, WAVEFORM	12

A R F PRODUCTS INC-RIVER FOREST	4
ACTON LABORATORIES INC-ACTON	5
ADMIRAL CORP-CHICAGO	12
AIRBORNE INSTRS LAB DIV CUTLER HAMMER INC	6
DEER PARK	6
AIRCRAFT RADIO CORP	41
AIRPAR ELECTRONICS INC SEMINDLE DIV	3
ANADIX INSTRUMENTS INC	3
ANDREW ANTENNA CORP	1-5
ARMA DIV AMERICAN BOSCH CORP	3-5-6
ATELIER DE MONTAGES ELECTRIQUES	3
AUDOCALL CO	6
AUTHORIZED MFRS SERVICE CO	6
BAY-FOY ELECTRONICS INC	6
BECKMAN INST INC BERKELEY DIV	3
BENDIX CORP-CINCINNATI DIV	2-3
BERGEN LABS INC	5
BIRD ELECTRONIC CORP-CLEVELAND	6
BOONTON ELECTRONICS CORP	12
BOSCO ELECTRONICS INC DON	2
BROWNING LABS INC	4
BUDELMAN RADIO CORP	3-4
BULOVA WATCH CO ELECTRONICS DIV	3

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## PRODUCTS & MFRS

CANADIAN MARCONI CO	3-4-6
CENTRAL ELECTRONICS INC	4-12
CGS LABORATORIES INC-WILTON	3
CHADWICK-HELMUTH CO	12
CHEMALLOW ELECTRONICS CORP	6
CHESSAKEE INSTRUMENT CORP	2
COLLINS RADIO CO-CEDAR RAPIDS	11
COLLINS RADIO CO-DALLAS	2-3-4-11
COMPUTER MEASUREMENTS CO-SYLMAR	3
COMRAC INC	8-9
CONTROL ELECTRONICS CO INC	3-5-12
COOPER ELECTRONICS INC	9-6
CROSBY LABS INC	4
DAGE TV DIV THOMPSON PRODUCTS	8-9-12
DAVEN CO	2
DIAMOND POWER SPECIALTY CORP	9
DOUGLAS MICROWAVE CO	6
DUKANE CORP	2
DUNLAP ELECTRONICS	2-3-4
DYNA-EMPIRE INC	2
DYNAPAR CORP	3
DYNATRONIC INC	2
DYTRONICS CO	5
ELECTRIC REGULATOR CORP	3-6
ELECTRO IMPULSE LAB INC	3-6
ELECTRONIC APPLICATIONS INC	3-6
EMPIRE DEVICES PRODUCTS CORP	4-6
EMPIRE PRODUCT SALES CORP	4
ENGINEERING ASSOCIATES	4
FISCHER ELECTRONICS INC	2-3
FOTO VIDEO LABS	9-12
GATES RADIO CO	2-3-4-9-12
GENERAL DYNAMICS/ELECTRONICS-CARLSON RD	11
GENERAL RADIO CO-WEST CONCORD	3-4
GERTSCH PRODUCTS INC	4
GRIMSON CO INC	4
GRUEN INDUSTRIES INC/ELECTRONIC PROD	3
GULFON INDUSTRIES INC-METUCHEN	3
HATHAWAY INSTRUMENTS INC	3
HAZELTINE ELECTRONICS DIV HAZELTINE CORP	8-11
LITTLE NECK	4
HEATH CO	2
HOLT INSTRUMENT LABS	4
HYSON MFG CO	12
INDUSTRIAL TEST EQUIPMENT CO	5
INDUSTRIAL TV INC	8-9
INSUL-8-VICON CORP	9
KAISER AIRCRAFT & ELECTRONICS DIV KAISER	9-12
IND-OAKLAND	8-9
KANE PRODUCTIONS AL	9
KEARFOTT DIV GEN PRECISION-VAN NUYS	3-4
KINGS ELECTRONICS CO INC	6
KINTEL-SAN DIEGO	9
LABORATORY FOR ELECTRONICS INC	2-3
LAMPKIN LABS INC	3-4
LANGEVIN DIV W L MAXSON CORP	2
LUMATRON ELECTRONICS INC-NEW HYDE PARK	12
MARCONIS WIRELESS TELEGRAPH CO LTD	8
MARSTAN ELECTRONICS CORP	4
MAURER INC J A	2-8-9
MINN-HONEYWELL REGULATOR CO-BELTSVILLE	2-
MIRATEL INC	9-12
MODERN DESIGN DIV H C SCHLDER INC	2
MONITOR SYSTEMS INC	3-4-5-8-11-13-17-4
MULTITRONICS INC	1-3-4-5
NATIONAL COIL CO	6
NATIONAL COMPANY INC-MALDEN	3-6
NEW LONDON INSTRUMENT CO INC	3-4
NORTHEAST ELECTRONICS CORP	6
NORTHERN RADIO CO	3
NORTHERN RADIO MFG CO LTD	3
OLYMPIC RADIO & TV DIV SIEGLER CORP	1-6
PANORAMIC RADIO PRODUCTS	3-4-5-6-12
PARSEAL INC	4-5-8-11
PLER INC PROFESSIONAL ELECTRONIC ENG RES	3
PHILCO CORP G & I DIV	3-4
PROJECTS UNLIMITED INC	2-4
PYE CANADA LTD	9
RADAR DESIGN CORP	6
RADIO CORP OF AMERICA COMMERCIAL ELECTRONIC	1-3-4-8-12
RAM METER INC	6
RANK CINTEL LTD	2-3-8-9-11-12
RCA BROADCAST & TV DIV	1-2-3-4-5-6-8-9-12
RICON ELECTRONICS INC	6
SANTA BARBARA DIV CURTISS WRIGHT	3-5
SCOTT INC H H	2
SIERRA ELECTRONIC CORP-MENLO PARK	3-6-12
SKIATRON ELECTRONICS & TV CORP	9-12
SOUTHWESTERN INDUSTRIAL ELECTRONICS CO	4
SPERRY MICROWAVE ELECTRONICS CO-FLA	3-6
SYSTEM CORP	3-5
TARC ELECTRONICS INC	5
TECHNICAL MATERIAL CORPORATION	3
TEKTRONIX INC-PORTLAND	12
TEL-INSTRUMENT ELECTRONICS CORP	8
TELECONTROL CORP	8-9
TELETRON INDUSTRIES CORP	2-11
TELEVISION UTILITIES CORP DIV NORD	9
THE TA INSTRUMENT CORP-SADDLE BROOK	5
TOPP INDUSTRIES INC	1-9-8-11
TORWICO ELECTRONICS INC	3
TOWACO ELECTRONICS	3
TV UTILITIES CORP DIV NORD-NEW HYDE PARK	9
U S SCIENCE CORP	11
VARO MFG CO-BOULDER	2-3-4-5-6
VIRGINIA ELECTRONICS CO	2
VOKAR PRODUCTS INC	2
WALTHAM ELECTRONICS CORP	3-4
WATERMAN PRODUCTS CO	4-5-12
WAUGH ENGG CO	3
WESTERN ELECTRO ACOUSTIC LAB INC	2
WESTERN INSTRUMENT CO	5

WESTINGHOUSE ELECTRIC CORP-PITTSBURGH 3  
WICKES ENGG & CONSTRUCTION CO 3  
WINDER AIRCRAFT CORP FLA 1-2

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OSCILLATORS	1
OSCILLATORS, AUDIO	1
OSCILLATORS, CAVITY	2
OSCILLATORS, CRYSTAL	4
OSCILLATORS, GRID DIP	4
OSCILLATORS, KLYSTRON	15
OSCILLATORS, MICROWAVE	6
OSCILLATORS, PULSE	7
OSCILLATORS, R-F	8
OSCILLATORS, SERRATED	11
OSCILLATORS, ULTRA LOW FREQUENCY	11
OSCILLATORS, ULTRASONIC	12
OSCILLATORS, VIDEO PATTERN	13
OSCILLATORS, VIDEO RANGE	14

A R F PRODUCTS INC-RIVER FOREST	12
ACOUSTICA ASSOCIATES-PLAINVIEW	9
ADVANCE INDUSTRIES INC	2
AIRBORNE INSTRS LAB DIV CUTLER HAMMER INC	6-8
DEER PARK	2-6-8-9
AIRCORP INC-BOSTON	6-9
ALFRED ELECTRONICS	5
ALLIED RADIO CORP	6-9
ALPHA INSTRUMENT CO	1-7
AMERAC INC	2-6-7
AMERICAN ELECTRONICS LAB-PHILA	7
ANDERTON ELECTRONIC LAB	1
APPLIED RADIATION CORP	1
AREMBERG ULTRASONIC LABORATORY INC	7-11
ARKAY INTERNATIONAL INC	8
ARMSTRONG WHITWORTH EQUIPMENT	9
ASSOCIATED ELECTRICAL INDUSTRIES LTD RADIO & ELECTRONIC COMPONENTS DIV	1
ATYLIERS DE MONTAGES ELECTRIQUES	4-6
AUDION ELECTRONICS INC	1-12
AUTOMATION INDUSTRIES INC	12
B & K INSTRUMENTS INC	1-9-12
BACH-SIMPSON LTD	1-5
BARKER & WILLIAMSON INC	1-5-10
BLILEY ELECTRIC CO	4
BOGART MFG CORP	6
BOONTON ELECTRONICS CORP	5-8
BORG EQUIP DIV BREMEN-BORG ELECTRONIC	1-7-8
BUSCO ELECTRONICS INC DON	1-7-8
BRANSON INSTRUMENTS INC	12
BUDD LEWY ELECTRONICS INC	9
BULOVA WATCH CO ELECTRONICS DIV	1-4-11
BURR-BROWN RESEARCH CORP	1-12
CALIF TECHNICAL INDUSTRIES DIV-TEXTRON	6-12

CANADIAN MARCONI CO	1
CANADIAN RESEARCH INSTITUTE	1-5-12
CANOGA CORP OF CALIF SOUTHERN DIV	6
CENTRAL COIL CO	8
CG ELECTRONIX INC-MIAMI	4-8-12
CG LABORATORIES INC-WILTON	2-6-9
CLEGG LABS/DIV CLEGG INC	6-7-9
CLEVITE ORDNANCE DIV CLEVITE CORP	12
CLOUGH-BRENGLE CO	1-8-9
COLLINS RADIO CO-DALLAS	4-6-8
COMMUNITY ENGG CORP	8-9
COMPAGNIE GENERALE DE METROLOGIE	1
CORN ORGAN CORP-ELKHART	1
CONSOLIDATED AVIONICS CORP	1
CONTINENTAL ELECTRONICS CORP-BROOKLYN	1
CONTROL ELECTRONICS CO INC	6-14
CBS WAVEGUIDE CORP	5
DAVEN CO	1-8
DAVE INSTRUMENTS LTD	1-7-9-11
DECADE INSTRUMENT CO	6-8
DESIGNERS FOR INDUSTRY	8-11-12
DIAMOND ANTENNA & MICROWAVE CORP WINCHESTER	6-8

DONNER SCIENTIFIC CO	1-9-11-14
DUKANE CORP	1
DUNLAP ELECTRONICS	1-4
DYNEC INC	1-6
DYNAMIC ELECTRONICS INC	8
DYNATRONIC INC	8
EIDSON ELECTRONIC CO	4
EL-TRONICS INC-MAYFIELD	1
ELECTRO-PULSE INC-CULVER CITY	7
ELECTRONATION CO	7
ELECTRONIC INSTRUMENT CO INC	5
ELECTRONIC MEASUREMENTS CORP	5
ELECTRONIC RESEARCH ASSOCIATES	8
ELECTRONICS INTL CO INC	8
ELIN DIV INTL ELECTRONIC RESEARCH CORP	1
ELLIOTT BROTHERS LTD	1-2-6-9-15
ELM LABS-HASTINGS-ON-HUDSON	1
EMI COSSOR ELECTRONICS	1-7-9-12-15
EMPIRE DEVICES PRODUCTS CORP	19-31
EMPIRE PRODUCT SALES CORP	6
ENGINEERED ELECTRONICS CO	4-7
ENGINEERING ASSOCIATES	6-8
ENTRON INC-BLADENSBURG	2
F X R INC-WOODSIDE	8
FERRIS INDUSTRIES CORP	2
FISCHER ELECTRONICS INC	1
FURZEMILL LABS LTD	2
GATES RADIO CO	1-8
GENERAL COMMUNICATION CO	2-6-8
GENERAL DEVICES INC	1-2-4-5-6-7-8-9-11
GENERAL DYNAMICS/ELECTRONICS-CARLSON RD	6-
	7-8-9-12

## MEAS. EQUIP—OSCILLATORS

GENERAL RADIO CO-WEST CONCORD	1-4-6-7-8-9-
	11-12-15
GENISCO INC	1-9
GIBBS MFG & RESEARCH CORP	2
GOMBO INC CO JOHN	2
GRUEN INDUSTRIES INC/ELECTRONIC PROD	8
GYREX CORP	1
HALLICRAFTERS CO-CHICAGO	2-6-8
HAMMARLUND MFG CO	4-8
HAZELTINE ELECTRONICS DIV HAZELTINE CORP	1
LITTLE NECK	1-2-4-6-7-8-9
HEATH CO	1-4-5-8-9
HERMES ELECTRONICS CO	4
HERMES-SONIC CORP	1-12
HEWLETT-PACKARD CO	1-6-8-9-11-12-15
HICKOK ELECTRICAL INSTRUMENT CO	8-9-13
HILL ELECTRONICS INC	1-4-8-11
HOLT INSTRUMENT LABS	1
HYSON MFG CO	1-7-8-9
INDUSTRIAL TEST EQUIPMENT CO	1-11-12
INSTRUMENT LABS	1
INTERNATIONAL RESEARCH & DEVELOPMENT CORP	11
INTL CRYSTAL MFG CO INC	4-8
INVAR ELECTRONICS CORP	1
ITT IND PRODUCTS DIV-LOUI	4
ITT LABS DIV ITT-MUTLEY	8
JAY-M MICROVAPE CO	2-6-8
JACKSON ELECTRICAL INSTRUMENT CO	1-9
KAISER AIRCRAFT & ELECTRONICS DIV KAISER	9-13-14
IND-OAKLAND	1-4-6-7-8-9-11-12-
KAY ELECTRIC CO	13-14
KINEVOX-HALLER DIV ELECTROMATION CO	7
KNIGHT CO JAMES	1
KROHN-WHITE CORP	1-11-12
LABORATORY FOR ELECTRONICS INC	8
LAMBDA PACIFIC ENGG CORP	8
LAVOIE LABS INC	4
LEAR INC-SANTA MONICA	2-4-6-8-15
LING ELECTRONICS DIV LING ALTEC ELEC INC	9
LING ELECTRONICS INC	9
LING SYSTEMS INC	6
HANSON LABORATORIES INC	4-6-8
MARCH ASSOCIATES	6
MARCONI INSTRUMENTS LTD	4-8-11
MARCONIS WIRELESS TELEGRAPH CO LTD	4-8
MEASUREMENT ENGG LTD	1-4-12
MEASUREMENTS DIV MC GRAM-EDISON	6-8
MEASUREMENTS MCGRAW EDISON INC	5
MECHANICAL PRODUCTS INC	6
MELCOR ELECTRONICS CORP	1
MENLO PARK ENGG	6-9
MILLEN MFG CO JAMES	5-8-9
MIRATEL INC	1-8
MOBIL ELECTRONICS MFG CO	1-4-12
MONITOR PRODUCTS CO	9-11
MURHEAD & CO LTD	1-11-12
MURHEAD INSTRUMENTS LTD	1-11
MURHEAD INSTRUMENTS INC-NEW YORK	1-11-12
MULTITRONICS INC	4-7
NATIONAL COMPANY INC-MALDEN	2-8-7-8
NATL ULTRASONIC CORP	12
NEW LONDON INSTRUMENT CO INC	8
NORRMAN LABORATORIES ERNST	4
NORTHERN RADIO CO	4-8
NORTHERN RADIO MFG CO LTD	4
NUCLEAR-ELECTRONICS CORP	1-8-12
PACO ELECTRONICS CO INC	8
PACO PRECISION	1-5
PEBBLES & CO LTD BRUCE	1
PEER INC PROFESSIONAL ELECTRONIC ENG RES	2-4-6-7-8-15
PHILCO CORP G & I DIV	0-8-11-12-13-14
PHILLIPS ELECTRONICS MFG CO	4-8-12
PIASECKI AIRCRAFT CORP-MAYFIELD	1-2-4-6-8-
	12-15
PITOMETER LOG CORP-NEW YORK	2-4-6
PLECTRON CORP	1
POLARAD ELECTRONICS CORP	2-6-7-8-9-15
PRECISION APPARATUS CO	1-5-8-9
PREMIER INSTRUMENT CORP-PORT CHESTER	6
PROJECTS UNLIMITED INC	1-4-8
PULSE TECHNIQUES INC	1
PYE CANADA LTD	1-8-12
PYE TELECOMMUNICATIONS LTD	8
RADIATION INSTRUMENT CO	7
RADIO CITY PRODUCTS CO	1-4-5-7-9
RADIO CORP OF AMERICA-ELECTRON TUBE DIV	1-
	8
RADIO CORP OF AMERICA COMMERCIAL ELECTRONIC	4-8-9
PRODUCTS	1-4-8
RANK CINTEL LTD	1-4-8
RATIGAN ELECTRONICS INC	1-11-12
REAVES HOFFMAN DIV	1-4-5-7-8-11-12
REMANCO INC	8
RESEL ENGG CORP	2-4-6-7-8
RESEARCH INDUSTRIAL LAB OF ELECTRONICS	7
RICH ELECTRONICS INC	12
RIVERBANK LABS ENGG DEPT	11-12
RIXON ELECTRONICS INC	1-4-7-8
RUTHERFORD ELECTRONICS CO	7
SANTA BARBARA DIV CURTISS WRIGHT	7-12
SCALA RADIO CO	1
SERV CONSULTANTS LTD	11
SHORT BROS & HARLAND LTD	11
SIERRA ELECTRONIC CORP-MENLO PARK	2-6-8
SIMPSON ELECTRIC CO-CHICAGO	4-8-9
SIVERS LAB	6-15
SOLARTRON ELECTRONIC GROUP LTD	1-6-8-9-11-
	14
SOUTHWESTERN INDUSTRIAL ELECTRONICS CO	7-9-11-12
SPECIALTY ELECTRONICS DEVELOPMENT CORP	1-
	2

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**PRODUCTS & MFRS**

**MEAS. EQUIPMENT—SPEC. PURPOSE**

AMERICAN RESEARCH CORP 6  
 AMERICAN TELEVISION & RADIO CO-ST PAUL 22  
 AMERICAN THERMO ELECTRIC CO 43  
 AMERICAN TUBE BENDING CO 17  
 AMPLEX CORP-REUWOOD CITY 20-62  
 ANADIX INSTRUMENTS INC 15-16-20  
 ANCHOR SPECIALTY MFG CO 74-82  
 ANDERSEN LABS INC 17-18  
 ANTHEM ANTENNA CORP 35  
 ANTRONEDIA INC 13-21  
 ANSCO DIV GENL ANILINE & FILM CORP 9  
 ANTENNA & RADOME RESEARCH ASS'N 3-26-55-56-72  
 ANTLAS INC 2-21-26-32  
 ANZAC ELECTRONICS INC 77  
 APPLIED PHYSICS CORP 40  
 APPLIED RESEARCH INC 1-3-33-55-56-57-58  
 APPLIED TECHNOLOGY CORP-NEW YORK 23  
 ARFENBERG ULTRASONIC LABORATORY INC 2-17  
 ARMA DIV AMERICAN BOSCH CORP 13-15-19-20-21-22-34-42  
 ARMSTRONG WHITWORTH EQUIPMENT 20-50-82  
 ARNOUX CORP 16-22-29-47-78-79  
 ARTRONIC INSTRUMENT CO 7-17-30  
 ASSOCIATED ELECTRICAL INDUSTRIES LTD RADIO & ELECTRONIC COMPONENTS DIV 4-34  
 ASSOCIATED RESEARCH INC 23-74-92-93  
 ASSOCIATED TESTING LABS 6  
 ATRO SYSTEMS INC 34-74  
 ATLANTIC RESEARCH CORP 47-48-77  
 ATLAS PRECISION PRODUCTS CO  
 ATMOSPHERE CONTROL CO INC  
 ATRONIC PRODUCTS INC 74  
 AUDAX INC 47  
 AUDICON ELECTRONICS INC 31  
 AUDIO INSTRUMENT CO 2  
 AUDIVOX 47  
 AUSTIN ELECTRONICS DIV AUSTIN CO 13-15-21-30-31-34-74  
 AUTHORIZED MFRS SERVICE CO  
 AUTO TEST INC-CHICAGO 23  
 AUTOMATIC TUNING & CONTROLS INC 34-47-77-91  
 AUTOMATION INDUSTRIES INC 34-74-77-78  
 AVIONICS LTD P O BOX 200 26  
 AVTRON MFG INC 20  
 AXLER ASSOCIATES INC 19-39-70  
 B F INSTRUMENTS INC-PHILA 74  
 B F INSTRUMENT CO INC-FT WORTH 20-29-43  
 B K MFG CO-BELLE PLAINE AVE 83  
 B & V INSTRUMENTS INC 19-32-39-47-48-50-74-75  
 BACH AURICON INC 9  
 BAILEY INC P A INDUSTRIAL ELECTRONICS DEPT 9  
 BAIRD-ATOMIC INC 5-18-19-30-39-40-41-74-76  
 BALDWIN-LINAM-HAMILTON CORP-WALTHAM 47-77-84  
 BALLANTINE LABS INC 22-62-64-83  
 BARBER-COLMAN CO 33  
 BARBER-COLMAN CO SMALL MOTORS DIV 34  
 BARKER & WILLIAMSON INC 13-36-38  
 BARNES DEVELOPMENT CO 20  
 BASSETT INC RELX 39-40-41  
 BAUSCH & LOMB OPTICAL CO 51  
 BAY-ROY ELECTRONICS INC 43  
 BEAM INSTRUMENTS CORP 20-26-47  
 BECKMAN INST INC BERKELEY DIV 40  
 BECKMAN INST INC SCIENTIFIC & PROC INST 10-20-74  
 BECKMAN INSTRUMENTS INC SYSTEMS DIVISION 3-16  
 BENDIX CORP BENTON PACIFIC DIV 31-48-78  
 BENDIX CORP MONTROSE DIV 47-77-78  
 BENDIX CORP RED BANK DIV 16-22  
 BENDIX CORP-CINCINNATI DIV 39  
 BENDIX CORP-DETROIT 22-39-48  
 BENDIX CORP-ECLIPSE PIONEER DIV 74-86-93  
 BENSON-LEWNER & B LTD 34  
 BERGEN LABS INC 13  
 BERICO ENGINEERING CORP 29-43  
 BIDDLE CO JAMES S 20-23-39-40-44-92-93  
 BIRD ELECTRONIC CORP-CLEVELAND 19-51  
 BLISS ELECTRONIC CORP 13-15-74  
 BLONDER-TONGUE LABORATORIES 3  
 BLUE M ELECTRIC CO 6  
 BOESCH MFG CO-DANBURY 67-88  
 BUGART MFG CORP 3-26  
 BUGUE ELECTRIC MFG CO 47  
 BOWMAN ELECTRONICS CORP 64  
 BOWMAN RADIO CORP 8-20-80  
 BORG-WARNER CONTROLS BORG-WARNER CORP 3-31-35-39-47-51-78-79  
 BUSCO ELECTRONICS INC DON 45  
 BOURAS INC 47-77  
 BOURNS LABS INC 47-77  
 BRES & CO RICHARD D 17  
 BRIGGS ASSOCIATES-NORWISTOWN 50-74-75  
 BRISTOL CO-WATERBURY 20-21-22-43-44-47-77-79  
 BROWNING LABS INC 26-51  
 BRUNO-NEW YORK INDUSTRIES CORP 5-26  
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GENERAL ELECTRIC CO-APPARATUS SLS DIV	10
GENERAL RADIO CO-WEST CONCORD	2-4-3-6-7-8
HEATH CO	11
HAMMARLUND MFG CO	4
HEATH CO	1-5-6-8-11
HEWLETT-PACKARD CO	4
HOLT INSTRUMENT LABS	10
HONEYWELL CONTROLS LTD	10
HOTT ELECTRICAL INSTRUMENT BIRMS	2-11
HYSON MFG CO	1-4-6-8-9
INTERNATIONAL INSTRUMENTS INC	1-2
INTL CRYSTAL MFG CO INC	4
ITT IND PRODUCTS DIV-LOUI	4-6
KAY ELECTRIC CO	1-7-10-11
KORFLUND CO INC	1-2
MAGNETIC AMPLIFIERS INC-NEW YORK	1-2
MEASUREMENTS MCGRAW EDISON INC	5
METERS INC	2
MINE SAFETY APPLIANCES CO	1-2-7-11
MURKHEAD & CO LTD	9
MURKHEAD INSTRUMENTS INC-NEW YORK	9
NATIONAL COIL CO	2-4
NICHOLS & CLAR INC	1
NORTH ATLANTIC INDUSTRIES INC	9
NORTHEAST ELECTRONICS CORP	2-11-18
NORTHEASTERN ENGG INC	4
NORTHERN RADIO MFG CO LTD	4
OTARION LISTENER CORP	1
PACE ELECTRICAL INSTRUMENTS CO	1-2-8-11
PHOOSTRON INSTRUMENT & ELECTRONIC CO	2-7
PRECISION APPARATUS CO	2-8-11
PRECISION METER DIV-MINI-HONEYWELL	2
QUALITONE CO	2
RADIO CORP OF AMERICA COMMERCIAL ELECTRONIC PRODUCTS	4-6
RAM METER INC	4
RICH ELECTRONICS INC	5
SARATOGA INDUSTRIES	4
SCOTT INC M H	1-2-7-11
SENSITIVE RESEARCH INSTRUMENT CORP	1-4-9
SIMPSON ELECTRIC CO-CHICAGO	2-8-11
SOLARTRON ELECTRONIC GROUP LTD	2-8
SOMEX INC-SCHOOLHOUSE LANE	1
SOUTHWESTERN INDUSTRIAL ELECTRONICS CO	1-8
STATISTICAL INSTR CO	2-6-8-10
STODDART AIRCRAFT RADIO CO	7
TAFFET ELECTRONICS INC	1-2-4
TELETRON INDUSTRIES CORP	9-10
TELETRONICS LAB INC-WESTBURY	4
TRIPLETT ELECTRICAL INSTRUMENT CO	2-4-6
VARO MFG CO-GARLAND	11
VENNER ELECTRONICS LTD	4
VOLTRON PRODUCTS	4-6-9
VORNER & CO GEORGE	1-2
WAELINE INC	1-2-4-7-8-11
WAUGH ENGG CO	4
WAVEFORMS INC	1
WAYNE KERR CORP	2
WELCH SCIENTIFIC CO B M	2
WESTERN ELECTRO ACOUSTIC LAB INC	1-2-7-11
WESTERN INSTRUMENT CO	9
WESTINGHOUSE ELECTRIC CORP-PITTSBURGH	1-2-4-9-10
WINDER AIRCRAFT CORP FLA	1
WINSLOW CO	4-9
WINSLOW ELECTRONICS DIV JETRONIC IND	1-7

### 49 - METERS, ELECTRICAL MEASUREMENT

METERS, AMMETER	1
METERS, CAPACITANCE	2
METERS, CONDUCTANCE	3
METERS, D'ARSONVAL	4
METERS, ELECTROMETER	5
METERS, FLUX	6
METERS, FREQUENCY	7
METERS, GALVANOMETER	8
METERS, IMPEDANCE	9
METERS, KILOVOLT	10
METERS, KILOWATT	11
METERS, MEGOHM	12
METERS, MICROAMPERE	13
METERS, MICROFARAD	14
METERS, MICROVOLT	15
METERS, MILLIAMPERE	16
METERS, MILLIVOLT	17
METERS, MULTITESTER	18
METERS, MULTIPLIER	19
METERS, NOISE	20
METERS, OHM	21
METERS, OUTPUT	22
METERS, PANEL	23
METERS, PHASE	24
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METERS, VACUUM TUBE VOLT	29
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VOLTMETERS, DIGITAL	33
VOLTMETERS, ELECTROSTATIC	34
VOLTMETERS, SLIDEBACK	35
<b>ACROGAG INC</b>	
ACTON LABORATORIES INC-ACTON	9-19-20-25-29-34
AD-YU ELECTRONICS LAB INC	24
ADAGE INC	33
AERO ELECTRONICS CO-CHICAGO	8
AERO INSTRUMENT CO	7
AIRBORNE INSTRS LAB DIV CUTLER HAMMER INC	7
DEER PARK	20
AIRPAR ELECTRONICS INC SEMINOLE DIV	1-7-13-16-17-30
ALCO ELECTRONIC PRODUCTS INC	4-7-13-16-18-23-30
ALEXANDRIA DIV-AMP	7-13-30
ALLEGHANY INSTRUMENT CO	17-21
ALLEN ELECTRIC & EQUIPMENT CO	1-8-13-15-16-17-21-23-30-31
ALLIED RADIO CORP	18-29
ALPHA INSTRUMENT CO	15-17-18-21-26-29-30
AMFRICAN MACHINE & FOUNDRY GOVT PROD GROUP	7
AMERICAN MACHINE & FOUNDRY CO-NEW YORK	7-30
AMERICAN METRIX CORP	1-12-13-15-16-17-18-21-22-23-25-29-30-33
ANTON ELECTRONIC LABS	1-4-8-10-13-15-16-17-20-22-30
ANTHONIC CORP	29
APPLIED PHYSICS CORP	5
APPLIED RADIATION CORP	5
ARGONNE ELECTRONICS MFG CORP	18-22
ARKAY INTERNATIONAL INC	2-17-18-29
ASSEMBLY PRODUCTS INC-CHESTERLAND	1-8-8-10-11-13-16-17-23-30
ASSOCIATED ELECTRICAL INDUSTRIES LTD RADIO & ELECTRONIC COMPONENTS DIV	1-9-10-11-13-15-16-17-21-25-30-31-32
ASSOCIATED RESEARCH INC	10-12-13-17-18-21
AUDIO INSTRUMENT CO	29
AUTO TEST INC-CHICAGO	1-4-16-17-18-21-30
AUTO TEST INC-NEILLSVILLE	1-7-30
AVTRON MFG INC	18-19-31
B & K INSTRUMENTS INC	12-13-29
BACH-SIMPSON LTD	1-4-7-8-10-15-16-17-18-19-21-22-23-26-29-30
BALLANTINE LABS INC	2-14-20-22-29
BARBER-COLMAN CO	17
BARNETT INSTRUMENT CO	1-2-13-16-17-18-21-23-29-30
BARNSTEAD STILL & DEMINERALIZER CO	3
BARRY ELECTRONICS CORP	1-13
BASSETT INC REX	7-7
BECKMAN INST INC BERKELEY DIV	7-33
BECKMAN INSTRUMENTS INC SYSTEMS DIVISION	33
BEEDE ELECTRICAL INSTRUMENT CO	1-4-8-10-13-16-17-18-19-23
BELL INC F W	33
BELLEVILLE-HEXEM CORP	1-5-12-13-16-17-21-29-30
BENDIX CORP-CINCINNATI DIV	1-5-7-21
BERGEN LABS INC	18-21-24-29-30-31-32
BERKSHIRE LABS	29
BIDDLE CO JAMES S	7-8-12-21
BOESCH MFG CO-DANBURY	6
BOONTON ELECTRONICS CORP	15-16-17-22-29-30
BOONTON RADIO CORP	28
BRISTOL CO-WATERBURY	1-3-4-5-7-8-10-11-12-13-15-17-21-23-25-30-31
BRUNO-NEW YORK INDUSTRIES CORP	21-29-30
BUDELMAN RADIO CORP	7
BURR-BROWN RESEARCH CORP	17-30
BUTCHER CO L H-LOS ANGELES	1-30
CAMBRIDGE INSTRUMENT CO-NEW YORK	6-34
CANADIAN RESEARCH INSTITUTE	1-2-3-4-7-8-9-10-11-12-13-15-16-17-18-19-20-21-22-23-25-29-30-31-34-35
CENTRAL DYNAMICS LTD	1-4-10-11-13-15-16-17-19-23-29-30-31-33
CENTRAL SCIENTIFIC CO OF CALIF	1-8-13-16-17-21-31
CHEMALLY ELECTRONICS CORP	31
CHESSABEAK INSTRUMENT CORP	20
CHICAGO INDUSTRIAL INSTRUMENT CO	1-2-3-4-9-10-12-13-14-15-16-17-18-19-21-22-23-29-30
COLUMBIA ELECTRIC MFG CO	1-30
COMMUNICATION MEASUREMENTS LABS	12-29
COMPAGNIE GENERALE DE METROLOGIE	1-4-10-12-13-15-16-21-23-29-30
COMPUTER MEASUREMENTS CO-SYLMAN	7
CONSOLIDATED AIRBORNE SYSTEMS INC	2
CONSOLIDATED AVIONICS CORP	7
CONSOLIDATED CONTROLS CORP-BETHEL	7
CONSOLIDATED ELECTRODYNAMICS CORP PASADENA	30
CONTROL ELECTRONICS CO INC	24
CORNELL-DUBILIER ELECTRIC CORP PLAINFIELD	29
CROWN ENGINEERING	7-30
CUBIC CORP-SAN DIEGO	15-21-30-31-33
CURTISS-WRIGHT CORP ELECTRONICS DIV	30
CURTISS-WRIGHT CORP PRINCETON DIV	5-16-21
CUSTOM SCIENTIFIC INSTRUMENTS INC	34
DAVEN CO	17-19-20-29-30

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DAVENPORT MFG CO	1-10-12-15-16-20-33
DAYSTRON INC WESTON INSTRUMENTS DIV	1-2-8-6-8-11-12-13-14-15-16-17-18-19-21-22-23-24-25-30-31
DE JVR - AMSCO CORP ELECTRONICS DIV	1-4-10-13-16-17-18-20-22-23-30
DIAMOND ANTENNA & MICROWAVE CORP WINCHESTER	7
DICE CO J W	21
DITTRONE-FREINMUTH CORP	1-10-11-13-14-15-16-17-18-30-33
DONNER SCIENTIFIC CO	7
DYNA-EMPIRE INC	6
DYNAMICS INSTRUMENTATION CO	15-17
DYNATRAN ELECTRONICS CORP	13-25
DYTRONICS CO	24
E H RESEARCH LABORATORIES INC	1-5-12-16-17-29
E O ELECTRONICS INC	29
EASTERN SPECIALTY CO	29
EGY CO H H	7
ELECTRIC DESIGN & MFG CO-BURLINGTON	1-8-10-13-16-17-23-30
ELECTRO INSTRUMENT INC	2-3-7-9-10-12-13-14-15-16-18-21-24-30-33
ELECTRO LOGIC CORP	10-17-30-33
ELECTRO-MECHANICAL INSTRUMENT CO	1-13-16-17-30
ELECTRONIC APPLICATIONS INC	9-15-21
ELECTRONIC ASSOCIATES INC	21
ELECTRONIC COMPUTER CO	30
ELECTRONIC INSTRUMENT CO INC	18-29
ELECTRONIC MEASUREMENTS CORP	16-18-29-30
ELECTRONIC RESEARCH ASSOCIATES	20
ELECTRONICS INTL CO INC	7
ELK ELECTRONICS LABS INC	26-29
EMPIRE DEVICES PRODUCTS CORP	23
ENGELHARD INC CHARLES	1-30
ENGELHARD INDUSTRIES INC	30
ENGINEERING ASSOCIATES	26
EPIC INC	1-2-5-6-7-8-16-17-18-24-25-31-34
EPSCO INC	33
ENCOCO CORP	10
ERIE RESISTOR CORP-ERIE	7
ERIE-PACIFIC-DIV ERIE RESISTOR CORP	7-33
ESTERLINE-ANGUS CO	1-4-7-10-11-13-16-17-25-30
F X R INC-WOODSIDE	7
FEDERAL PACIFIC ELECTRIC COMPANY	1-4-7-8-10-11-12-13-15-16-17-18-20-21-22-23-24-25-30-31
FEILER ENGG & MFG CO	16-21-29-30
FERRANTI ELECTRIC INC-NEW YORK	10-25-32
FISHER RESEARCH LAB	34
FLOW CORP	17
FLUKE MFG CO INC JOHN-SEATTLE	10-11-15-17-29-30-31-35
FOXBORO CO	8
FRANKLIN ELECTRONICS INC-BRIDGEMPT	2-18-21-30-33
FREED TRANSFORMER CO	12-26-29
FURZEHILL LABS LTD	29
G-H LABORATORIES INC	7
GARY WELLS CO	3
GATES RADIO CO	18-19
GENERAL COMMUNICATION CO	7
GENERAL ELECTRIC CO-APPARATUS SLS DIV	1-4-6-7-10-11-13-15-16-17-24-25-30-31
GENERAL RADIO CO-WEST CONCORD	5-7-12-13-17-20-22-29-31
GERTSCH PRODUCTS INC	28
GRAY MFG CO	7
GREIBACH INSTRUMENTS CORP	1-4-8-10-12-13-15-16-17-18-22-23-30
GYRA ELECTRONICS CORP	35
HAGAN CHEMICALS & CONTROL INC PITTSBURGH	17-30
HAMMARLUND MFG CO	7
HEATH CO	14-16-18-21-26-29-30-31
HELIPOT DIV BECKMAN INSTRUMENTS INC	30-31
FULLERTON	1-7-23-30
HELIPOT DIV BECKMAN INSTRS INC TORONTO	1-7-30
HEWLETT-PACKARD CO	1-7-9-12-13-15-16-17-21-29-33
HICKOK ELECTRICAL INSTRUMENT CO	1-2-3-4-5-7-8-9-12-13-14-15-16-17-18-22-23-24-25-26-29-31-34
HONEYWELL CONTROLS LTD	1-3-7-8-10-11-12-15-16-17-29-31
HOYT ELECTRICAL INSTRUMENT WORKS	1-4-13-16-17-23-30
HUGHES PRODUCTS GROUP HUGHES AIRCRAFT CO	29
HYSON MFG CO	18-21-22-24-29-30-33
I-L-S INSTRUMENT DIV MERIAM INSTRUMENT CO	7
IUAL PRECISION METER CO	1-4-13-16-17-23-30
INDUSTRIAL CONTROL CO	13-15-16-17-30
INDUSTRIAL DEVICES INC	30
INDUSTRIAL INSTRUMENTS INC	12-21
INDUSTRIAL TEST EQUIPMENT CO	24-25-26-29
INDUSTRIAL TV INC	18
INSTRUMENT ELECTRONICS CORP	29
INSTRUMENT LABS	18-22-29
INSTRUMENTS INC	2
INSTRUMENTS OF NEW ENGLAND	21
INTERNATIONAL INSTRUMENTS INC	1-4-13-16-17-23-30
INTERNATIONAL RESEARCH & DEVELOPMENT CORP	7
INTL CRYSTAL MFG CO INC	7
ITT IND PRODUCTS DIV-LODI	2-8-7-8-12
JACKSON ELECTRICAL INSTRUMENT CO	20
JENNINGS RADIO MFG CORP	19
JOHNSON AIRCRAFT ENGG CO	8-21
JONES ELECTRONICS CO INC M C	31
JOSLYN-HUDSON INC SUB AMELCO INC SANTA MONICA	21
JOSLYN-HUDSON INC-LOS ANGELES	21
KAHN & CO	2-17
KAY ELECTRIC CO	7-15-26-29
KEITHLEY INSTRUMENTS INC	1-5-10-12-13-15-16-17-18-21-29-30-34
KILOVOLT CORP	10
KIN TEL RESEARCH DIV	1-8-13-15-16-17-33
KINGS ELECTRONICS CO INC	25
KINTEL-SAN DIEGO	1-8-10-13-15-16-17-21-30-33
KLEIN ELECTRONICS CO LEO	5
LAMPKIN LABS INC	7
LANDIS & GYR	32
LARSON INSTRUMENT CO	4
LEEDS & NORTHROP CO	4-8-12-15-17-21
LEITCH ENGG CORP	29
LINK AVIATION INC-BINGHAMTON	29
MACLEOD & HANAPOL	2-12
MAGNAFLUX CORP	6
MAGNETIC AMPLIFIERS INC-NEW YORK	24
MARCONI INSTRUMENTS LTD	26-29
MARSTAN ELECTRONICS CORP	29
MARTINDALE ELECTRIC CO	1-12-18-21-25-31
MCDOWELL ELECTRONICS INC	29
MEASUREMENTS DIV MC GRAM-EDISON	7-29
MEASUREMENTS MCGRAW EDISON INC	29
METERS INC	1-4-8-10-12-13-16-17-21-23
METROLOG CORP SUB AIR LOGISTICS CORP	24
METRONIC INC	29
MILLEN MFG CO JAMES	7
MILLER CO H C	1-8-13-16-17-18-19-30
MILLIVAC INSTR DIV COMU ELECTRONICS INC	1-13-15-16-17-18-20-29
MINE SAFETY APPLIANCES CO	60
MINN-HONEYWELL REGULATOR CO-RUBICON DIV	29
MINNEAPOLIS-HONEYWELL REGULATOR CO BROWN INST DIV	5-7-8-17-33
MORAN INSTRUMENT CORP	33
MOTOROLA COMMUNICATIONS & ELECTRONICS	17-18-21-30
MUIRHEAD & CO LTD	9-24
MUIRHEAD INSTRUMENTS INC-NEW YORK	9-24-29-30
NARDA MICROWAVE CORP	7-29
NATIONAL COIL CO	1-4-7-8-10-11-12-13-15-16-18-19-21-23-25-30-31-32
NATIONAL INSTRUMENT LABS INC	1-8-13-16-17-23-30
NILSEN MFG CO	33
NON-LINEAR SYSTEMS INC	24
NORTH ATLANTIC INDUSTRIES INC	9-17-24-29
NORTHERN RADIO MFG CO LTD	7
NUCLEAR-CHICAGO CORP	13-15-16-17
ORAD ELECTRIC CO	10
OPTIMIZED DEVICES INC	21
PACE ELECTRICAL INSTRUMENTS CO	1-4-8-13-16-17-22-23-30
PACO ELECTRONICS CO INC	18-29
PACO PRECISION	1-2-4-13-16-17-18-21-25-29
PARECO	25-29
PARKER ELECTRONICS CO	1-4-16-17-23-30
PESCHER ELECTRONICS INC	13
PHASTRON INSTRUMENT & ELECTRONIC CO	1-4-7-10-13-16-17-18-21-23-30
PHOTON INSTRUMENT CO	8
PHYSICS RESEARCH LABS INC	1-4-7-8-10-12-13-14-15-16-18-19-21-23-25-30-31
PIASECKI AIRCRAFT CORP-HAYFIELD	19
POLYTRONICS CO-TORONTO	21
POTTER AERONAUTICAL CORP	10-12-34
PRECISE MEASUREMENTS CORP	12-13-16
PRECISION APPARATUS CO	1-4-8-10-12-13-16-17-18-21-29-30
PRECISION METER DIV-MINN-HONEYWELL	1-4-8-10-13-16-17-23-30
PRODUCTION RESEARCH CORP	7
PYE CANADA LTD	1-2-3-5-6-7-8-9-10-13-14-15-16-17-26-30-34
PYE TELECOMMUNICATIONS LTD	18-29
Q V S INC	1-4-8-10-12-13-16-17-21-22-30
QUAN-TECH LABORATORIES INC-BOONTON	13
R S ELECTRONIC CORP	20
RADAR MEASUREMENTS CORP	7-9-31
RADIO CITY PRODUCTS CO	2-9-12-13-21-22-29
RADIO CORP OF AMERICA-ELECTRON TUBE DIV	13-18-29
RADIO CORP OF AMERICA COMMERCIAL ELECTRONIC PRODUCTS	13-18-21-24-29-30-31
RAH METER INC	1-6-7-21-23-30-32
RAWSON ELECTRICAL INSTRUMENT CO	1-4-6-10-13-16-17-18-23-30-34
REED RESEARCH INC	18-29
RHEAR MFG CO-ELECTRONICS DIV-RIVERA	20
ROWAN CONTROLLER CO-RED BANK	1-4-5-7-9-10-11-12-13-15-17-18-19-21-23-29
SANGAMO ELECTRIC CO-SPRINGFIELD	1-23-25-30-31-32
SANTA BARBARA DIV CURTISS WRIGHT	20-33
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CORP	12
SCHOENE ELECTRONICS LAB	13
SCOPE CO INC	29-30
SCOTT INC H M	20-29
SEABOARD ELECTRIC PRODUCTS CORP	7
SECO MFG CO	29
SEKONIC INC	23
SEMCON	1-8-30
SENSITIVE RESEARCH INSTRUMENT CORP	1-3-4-6
6-7-8-10-11-13-15-16-19-23-	
25-30-31-34	8-21
SERVO-TEK PRODUCTS CO	18-21-30
SERVONICS INC	17-30
SHALLCROSS MFG CO	8-21
SHURITE METERS	1-14-21-23-30
SIERRA ELECTRIC CORP-MEMO PARK	7-29-31
SIMPSON ELECTRIC CO-CHICAGO	1-4-8-10-11-
13-16-17-18-19-22-23-29-30-	
31	
SIMPSON ELECTRIC CO-LAC DU FLAMBEAU	1-2-3-
4-7-8-9-10-11-12-13-15-16-	
17-18-21-22-23-29-30	
SIMPSON ELECTRIC CO-MERCER	1-4-7-8-10-13-
14-15-16-17-21-22-23-24-26-	
30-31	
SMITH & FLORENCE INC	15-30
SOLARTRON ELECTRONIC GROUP LTD	17-29-33
SORENSEN & IB INC NEW YORK	10-13
SOUTH-WESTERN INDUSTRIAL ELECTRONICS CO	1-
2-9-12-13-15-16-17-18-19-	
22-29-30	
SPECIAL INSTRUMENTS LABORATORY INC	5
SPECIALTY ELECTRONICS DEVELOPMENT CORP	29
SPERRY PIEDMONT CO DIV SPERRY RAND CORP	24-30
STICHT CO HERMAN H	1-3-7-12-16-21-34
STODART AIRCRAFT RADIO CO	20-29
STRATOCON CORP	8
SULLIVAN LTD H B	4-8-13-16-17
SUN ELECTRIC CORP	1-2-3-4-5-7-8-10-11-
12-13	
SYSTRON CORP	7-33
TAYLOR INSTRUMENTS COMPANIES	1-16-17
TECHNIQUE ASSOCIATES	1-30
TECHTRONIX INC-PORTLAND	2
TELETRON INDUSTRIES CORP	2-26
TELETRONICS LAB INC-BESTBURY	7-16
THERMO ELECTRIC CO-SADDLE BROOK	17
THERMO ELECTRIC MFG CO-DUBUQUE	17
THE TA INSTRUMENT CORP-SADDLE BROOK	
TIPTRONIC INC	1-13-16-17-24
TRIO LABS INC	12-24-29
TRIPLETT ELECTRICAL INSTRUMENT CO	1-4-10-
11-12-13-15-16-17-18-20-21-	
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TRUMP DR WALTER H	
TULLAMORE ELECTRONICS CORP SUB VICTOREEN	
INSTRUMENT CO	5-13
U S GAUGE DIV AMERICAN MACHINE & METALS	1
UNITED MINERAL & CHEMICAL CO	2-12-14-15-
17-29-26	
VALANDY ELECTRONICS CORP	21
VAN NORMAN INDUSTRIES INC ELECTRONICS DIV	4-13-16-17-23
VARIAN ASSOCIATES	6
VARD MFG CO-CHARLAND	7
VICTOREEN INSTRUMENT CO	3
VOLTRON PRODUCTS	1-7-23-24-25-30-31
VORON & CO GEORGE	1-2-12-18-21
WACLINE INC	1-4-5-7-8-10-13-15-
16-17-20-21-22-23-30-34	
WALOON ELECTRONICS INC	1-4-13-15-16-17-21-
23-30	
WANG LABS INC	29
WAVEFORMS INC	29
WAVELINE INC	7
WAYNE KERR CORP	10-26-29
WELCH MFG CO H M	1-4-8-16-17-18-21-
23-29-30-34	
WELCH SCIENTIFIC CO H M	1-4-8-10-13-16-17-
19-21-23-88	
BEST COAST RESEARCH CORP	7
BEST INSTRUMENT CORP	13-16-17
BESTBERG MFG CO	7
WESTERN ELECTRO ACOUSTIC LAB INC	20-29
WESTINGHOUSE ELECTRIC CORP-PITTSBURGH	1-4-
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25-30-31	
WEYMOUTH INSTRUMENT CO	7
WINSLOW CO	7-8-12-21-31

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METERS, AMMETERS, RF	1
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METERS, DECIBEL	4
METERS, DISTORTION	4
METERS, FIELD STRENGTH	5
METERS, FM DEVIATION	6
METERS, FREQUENCY	7
METERS, GRID DIP	8
METERS, MICROWAVE	9
METERS, NOISE	10
METERS, OUTPUT	11
METERS, PHASE	12
METERS, R-F POWER	13
METERS, STANDING WAVE RATIO	14
METERS, VOLT	16
METERS, WAVE	15

AD-YU ELECTRONICS LAB INC	12
AERO INSTRUMENT CO	7
AIRBORNE INSTR LAB DIV CUTLER HAMMER INC	13
DEER PARK	10-13
AIRCON INC-BOSTON	7-9-13-14-15
AIRTEC INC	7-9-14
ALCO ELECTRONIC PRODUCTS INC	5-8
ALLIED RADIO CORP	8
AMERAC INC	7
AMERICAN METRIX CORP	15
ANTENNA & RADOME RESEARCH ASSOC	1
ANTLAB INC	13
ASSEMBLY PRODUCTS INC-CHESTERLAND	1
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The first part of the study examined the relationship between job satisfaction and organizational commitment. The results showed a positive correlation between the two variables. This finding is consistent with previous research that suggests that employees who are satisfied with their jobs are more likely to be committed to their organizations. The study also explored the mediating role of organizational trust in this relationship. The results indicated that organizational trust acts as a mediator, meaning that job satisfaction leads to organizational trust, which in turn leads to organizational commitment.

The second part of the study focused on the impact of organizational trust on job satisfaction. The results showed that employees who trust their organizations are more likely to be satisfied with their jobs. This finding is important because it suggests that organizations can improve job satisfaction by building trust. The study also examined the relationship between organizational trust and organizational commitment. The results showed a positive correlation between the two variables, indicating that trust leads to commitment.

The third part of the study investigated the role of organizational trust in the relationship between job satisfaction and organizational commitment. The results showed that organizational trust mediates the relationship between job satisfaction and organizational commitment. This means that job satisfaction leads to organizational trust, which then leads to organizational commitment. The study also explored the impact of organizational trust on the relationship between job satisfaction and organizational commitment. The results showed that organizational trust moderates the relationship, meaning that the relationship between job satisfaction and organizational commitment is stronger when organizational trust is high.

The study has several limitations. First, it is a cross-sectional study, which means that it only measures variables at a single point in time. This limits the ability to establish causality. Second, the study only examined the relationship between job satisfaction and organizational commitment. There are many other factors that can influence organizational commitment, and these were not included in the study.

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VICKERS INC ELECTRIC PRODUCTS DIV	1-3-11-12-16-17-22-23-24
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ELECTRONIC COMPONENTS DIV TEL-COMPUTING	1
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GARDE MFG CO-CUMBERLAND 9

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GARDNER LAB INC 19

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GATES RADIO CO 4-5-6-7-12-16-19

GAVITT WIRE & CABLE CO 3-4-5-6-7-15-22-25

GENERAL DYNAMICS/ELECTRONICS-CARLSON RD 7

GENERAL DYNAMICS/ELECTRONICS-SAN DIEGO 16

GENERAL ELECTRIC CO RECEIVING TUBE DEPT 7

GENERAL ELECTRIC CO-APPARATUS SLS DIV 15-19

GENERAL ELECTRIC CO-COSHOCTON 11-12

GENERAL ELECTRIC LAMINATED PRODUCTS DEPT 11

GENERAL INSTRUMENT CORP F W SICKLES DIV 2-

GENERAL PLASTICS CORP 10-15

GENERAL RESEARCH & SUPPLY CO 22

GLOBE ELECTRICAL MFG CO 4-5-7-16-22

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GRAY KUNH-ROSLYN HEIGHTS 10

GRAY & KUNH INC DIV INC MAGNETICS CORP 10

GRAY PANTOGRAPH ENGRAVING CO-HOBOKEN 4-7-  
22

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GUDEMAN CO OF CALIF/MONROVIA DIV 22

MALOID XEROX INC 10

HAMILTON STANLARD ELECTRONICS DEPT 1-4-5-  
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HARVEY-BELLS ELECTRONICS INC SOUTHBRIDGE 18

HELIPOT DIV BECKMAN INSTRUMENTS INC  
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INSULATING FABRICATORS INC 4-7-8-11-19

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# Effect of Stimulus Control on the Acquisition of a Complex Skill

John M. McDonnell, Robert M. G. Durbin, and Robert M. G. Durbin

Department of Psychology, University of North Carolina at Charlotte, Charlotte, North Carolina

Abstract: The present study examined the effect of stimulus control on the acquisition of a complex skill.

Subjects were trained to perform a complex skill under two different conditions.

One condition involved the use of a stimulus control procedure, and the other condition

involved the use of a response control procedure. The results of the study

showed that the stimulus control procedure resulted in faster acquisition of the

skill compared to the response control procedure.

Keywords: stimulus control, complex skill, acquisition

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The following table shows the results of the experiment. The data points are plotted on a graph of  $\ln(I/I_0)$  versus  $x$ . The slope of the line is determined to be  $-0.015 \text{ cm}^{-1}$ . This value is compared with the theoretical value of  $-0.012 \text{ cm}^{-1}$  calculated from the known absorption coefficient of the material. The agreement is within experimental error.

The experimental setup consisted of a source of  $\gamma$  rays, a collimator, a sample of thickness  $x$ , and a detector. The intensity  $I$  was measured at various distances  $x$  from the source. The initial intensity  $I_0$  was determined by measuring the intensity at a distance where the absorption is negligible.

The data points are as follows:

Distance $x$ (cm)	Intensity $I$ (counts/min)
0	1000
10	900
20	810
30	730
40	660
50	600
60	550
70	510
80	470
90	440
100	410

The error in the slope is estimated to be  $\pm 0.002 \text{ cm}^{-1}$ . The overall uncertainty in the absorption coefficient is  $\pm 0.003 \text{ cm}^{-1}$ .

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CONSOLIDATED MOLDED PRODUCTS CORP	4
CONSOLIDATED VACUUM CORP	8-10
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Name	Address	Occupation
John Doe	123 Main St	Teacher
Jane Smith	456 Elm St	Nurse
Robert Brown	789 Oak St	Engineer
Mary White	101 Pine St	Homemaker
James Green	202 Cedar St	Farmer
Elizabeth Black	303 Birch St	Retailer
William Gray	404 Spruce St	Carpenter
Margaret Hall	505 Willow St	Librarian
Richard King	606 Ash St	Lawyer
Susan Lee	707 Hickory St	Dancer
Thomas Scott	808 Sycamore St	Physician
Patricia Adams	909 Magnolia St	Artist
Charles Baker	1010 Dogwood St	Scientist
Dorothy Miller	1111 Redwood St	Musician
George Wilson	1212 Cypress St	Historian
Betty Moore	1313 Juniper St	Journalist
Frank Taylor	1414 Fir St	Architect
Lillian Jackson	1515 Palm St	Actress
Harold Evans	1616 Cottonwood St	Astronomer
Gladys King	1717 Laurel St	Singer
Walter Hill	1818 Dogwood St	Geologist
Evelyn Scott	1919 Magnolia St	Dancer
Roy Adams	2020 Dogwood St	Historian
Alice Baker	2121 Redwood St	Journalist
Eugene Miller	2222 Cypress St	Architect
Frances Taylor	2323 Fir St	Actress
Clarence Jackson	2424 Palm St	Astronomer
Mildred King	2525 Laurel St	Singer
Arthur Hill	2626 Dogwood St	Geologist
Bertha Scott	2727 Magnolia St	Dancer
Royce Adams	2828 Dogwood St	Historian
Lillian Baker	2929 Redwood St	Journalist
Eugene Miller	3030 Cypress St	Architect
Frances Taylor	3131 Fir St	Actress
Clarence Jackson	3232 Palm St	Astronomer
Mildred King	3333 Laurel St	Singer
Arthur Hill	3434 Dogwood St	Geologist
Bertha Scott	3535 Magnolia St	Dancer
Royce Adams	3636 Dogwood St	Historian
Lillian Baker	3737 Redwood St	Journalist
Eugene Miller	3838 Cypress St	Architect
Frances Taylor	3939 Fir St	Actress

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The first section of the paper discusses the importance of understanding the individual differences in the workplace. It highlights how these differences can affect performance, job satisfaction, and organizational behavior. The authors argue that a one-size-fits-all approach is not only ineffective but also potentially harmful to the organization's success.

The second section delves into the concept of 'person-job fit' and 'person-organization fit'. It explores how these fits can be measured and how they relate to various outcomes such as turnover, absenteeism, and organizational commitment. The authors provide a comprehensive review of the literature on these topics, identifying key findings and areas for further research.

In the third section, the authors discuss the role of leadership in fostering a positive work environment. They emphasize the importance of leaders who are not only effective in their roles but also who are aware of and responsive to the needs and preferences of their employees. This section includes a discussion on transformational leadership and its impact on employee well-being and performance.

The fourth section focuses on the importance of employee development and training. It discusses how organizations can invest in their employees' growth and development, leading to higher levels of skill, knowledge, and motivation. The authors provide practical suggestions for designing effective training programs that cater to individual learning styles and needs.

The final section of the paper offers concluding thoughts and recommendations for practitioners. It stresses the need for a holistic approach to human resource management, one that considers the individual, the organization, and the broader context in which they operate. The authors encourage organizations to continuously evaluate and improve their practices to stay competitive in a rapidly changing world.

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The first section of the report discusses the current state of the industry and the challenges it faces. It highlights the need for innovation and investment in research and development to remain competitive in a global market. The second section provides a detailed analysis of the market trends and forecasts for the next five years. It identifies key drivers of growth and potential risks to the industry. The third section outlines the strategic recommendations for the company, focusing on operational efficiency, customer engagement, and talent development. The final section concludes with a summary of the findings and a call to action for the board of directors.

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 STANDARD METALS CORP 27-28-35-44-47-48-50-54-61  
 STANDARD WIRE & CABLE CO 1-2-3-4-5-6-7-8-9-10-11-12-13-14-15-16-17-18-19-20-21-22-23-25-27-28-29-30-31-34-37-38-39-40-41-43-45-48-49-50-53-34-50-54-56-57-60-61  
 STAR-A ELECTRIC MFG CO 4  
 STEEL PROTECTION & CHEMICAL CO 44-56  
 STRECH WIRE CO 18  
 STROCK ELECTRIC CORP 4  
 SUPERIOR INSULATED WIRE CO 2-3-6-9-9-11-12-13-14-15-20-29-30-39-49-54  
 SURPREMANT MFG CO 8-5-9-10-11-12-13-14-15-20-23-30-37-38-39-44-45-48-49-50-57-60-67-73  
 SWITCHCRAFT INC 4  
 SYLVANIA ELECTRIC PRODUCTS INC PARTS DIV 28-35-44-45-47-48-53-56  
 SYLVANIA ELECTRIC PRODUCTS INC-SANTA CRUZ 28-46-48-65  
 SYLVANIA ELECTRIC PRODUCTS INC CHEM B METALLURGICAL DIV 35-44-46-56-63  
 SYLVANIA ELECTRIC PRODUCTS INC-EMPHORIUM 28-46-48-65  
 TAFFET ELECTRONICS INC 4  
 TAFAR ELECTRONICS INC-GARDENA 9-10-12  
 TAFE CABLE CORP 41  
 TAYLOR INSTRUMENTS COMPANIES 47-48-53-57  
 TECHNICAL WIRE PRODUCTS INC 26  
 TELCON METALS TELCON BROS 23-41-53-57-61  
 TELE-COIL CO INC 4  
 TELETRON INDUSTRIES CORP 4  
 TELEGRAPH CONSTRUCTION & MAINTENANCE CO 2-3-5-6-7-9-11-12-13-14-15-20-23-27-29-38-45-50-53-54-63-65  
 TELETRONICS LABS INC-GARDENA 4-43-65  
 TELEX INC 4  
 TERNALONICS LTD 4  
 TENSOLITE INSULATED WIRE CO INC 7-3-4-8-7-7-9-10-11-12-13-19-22-29-30-31-34-37-39-41-50-54-60-61  
 TEVCO INSULATED WIRE 2-3-5-6-9-12-14-15-16-20-27-36-38-39-50-54  
 THE LEWIS ENGINEERING CO 4-5-22-29-34-45-54-60-61  
 THERMAL WIRE OF AMERICA 5-9-12-29-30-36-41-54-60  
 THERMAX WIRE CORP 5-9-10-12-13-14-15-30-34-39-45-50-54-60-67  
 THERMO ELECTRIC CO-SADDLE BROOK 61  
 THOMAS ELECTRONICS INC 4  
 TIME ELECTRONIC SALES 2-3-5-11-12-15  
 TIMES WIRE & CABLE CO AFF INTL SILVER CO 2-3-5-9-10-11-12-13-15-19-20-29-34-38-39-50-54-56-60  
 TINNEMAN PRODUCTS INC 15  
 TITANIUM ALLOY MFG DIV NATL LEAD CO 64  
 TITEXLEX INC 4-12-37  
 TOPPER MFG CO INC 9-22-25-30-38-39-41-50-54  
 TOUCH-PLATE MFG CORP 4-12  
 TRANSVAL ENGS 4-37  
 TRI-DEX ELECTRONICS 16-39  
 TRI-EX TOWER CORP-TULARE 51  
 TRICON MFG CO 4-17  
 TRIMM INC 61  
 TRINITY EQUIPMENT CORP 4  
 U S PLASTIC HOLDING CORP U S PLASTIC ROPE INC 34  
 U S STEEL CORP 9-14-26-27-36-41-57-58  
 U S WIRE & CABLE 3  
 U S WIRE & CABLE CORP 2-3-4-5-9-11-12-13-15-29-50-54  
 UNIQUE WIRE BEAVING CO INC 26  
 UNITED MINERAL & CHEMICAL CORP 9-21  
 UNITED WIRE & SUPPLY CORP 21-27  
 UNIVOX CORP-LOS ANGELES 2-3-4-5-6-7-9-10-20-37-67  
 UNIVOX CORP-NEW YORK 2-3-4-10  
 UTILITY BRASS & COPPER CORP 27-89  
 VECTOR MFG CO-HOUSTON 4-9-10-12-60-67  
 VICTOR ELECTRIC WIRE A CABLE CORP 2-3-4-3-9-10-11-12-14-15-18-19-20-27-29-30-37-38-39-53-54  
 VICTOR MANUFACTURING CO 4-5-9-10-12-14-29-50-54

For Company Addresses, See the Alphabetical Listing of Electronic Mfrs. Beginning on Page 349

## PRODUCTS & MFRS

VICTOR RF & MICROWAVE CO 4-20  
 VIRGINIA ELECTRONICS CO 19-37  
 WALDORF ELECTRONICS DIV F C HUYCK & SONS 4  
 WALSCO ELECTRONICS MFG CO 11-12-19  
 WARD PRODUCTS CORP 2-3-4-12  
 WARREN COMPONENTS DIV EL-TRONICS INC 30  
 WARREN WIRE CO 5-9-12-25-27-29-31-  
 38-39-41-48-53-54-56-60  
 WEBCOR INC-ELECTRONICS DIV 4  
 WECKESSER 16  
 WELCRAFT PRODUCTS CO INC 4-18-29-30-37-43-  
 50-54  
 WEST INSTRUMENT CORP 61  
 WESTERN GOLD & PLATINUM CO 51  
 WESTERN INSULATED WIRE CO 5-9-10-11-12-17-  
 20-22-29-34-38-54-60

WESTERN INTL CO 2-3-5-6-7-9-10-11-  
 12-13-14-15-19-20-27-28-30-  
 34-36-37-38-39-50-54-55-56-  
 63  
 WESTLAKE PLASTICS CO 50  
 WESTLINE PRODUCTS DIV WESTERN LITHOGRAPH 43-65  
 WEYMOUTH INSTRUMENT CO 4-5  
 WHEELER ELECTRONIC CORP-SUB SPERRY RAND 4-  
 37  
 WHITAKER CABLE CORP 4-7-9-12-17-29-30-  
 34-37-50-54  
 WHITEHEAD METALS INC 1-16-21-26-27-47-48-  
 57-62  
 WHITNEY BLAKE CO 9-11-12-14-29-54  
 WILBERG BROS SMELTING & REFINING CO 51  
 WILLIAMS GOLD REFINING CO INC 35-51-56

WINDER AIRCRAFT CORP FLA 4-6  
 WINSLOW CO 19-61  
 WIRE CO OF AMERICA INC-SANTA BARBARA 4-9-  
 11-12-39-45-50-54  
 WIRE CO OF AMERICA SUB WARREN WIRE CO 44-45  
 ALHAMBRA 25-27-28-30-36-41-  
 44-45  
 WIRE CO OF AMERICA SUB WARREN WIRE CO GOLETA 5-9-10-12-13-22-25-  
 27-29-31-34-38-39-41-44-50-  
 54-56-60  
 WIRECRAFT PRODUCTS INC 4-5-9-10-12-29-30-  
 34-37-39-60  
 WORKMAN TV INC 4-30-37  
 WORLD WIDE WIRE INC 28-29-31-37-38-39-  
 41-54-60  
 YORK CO INC OTTO H 25  
 ZIPPERTUBING CO 65

For Company Addresses, See the Alphabetical Listing of Electronic Mfrs. beginning on Page 349

## WIRE & CABLE

### ADDENDUM

THE FOLLOWING MANUFACTURERS ARE NOT CLASSIFIED IN THE FOREGOING PRODUCT CLASSIFICATIONS BUT DETAILED INFORMATION ON THEIR PRODUCTS CAN BE FOUND ON THEIR ADVERTISING PAGES IN THIS ISSUE. FOR YOUR CONVENIENCE PLEASE REFER TO THE ALPHABETICAL INDEX ON PAGES 6 AND 7.

AMERICAN STERILIZER, SCIENTIFIC & INSTRUMENT DIV.—DUST-FREE ENVIRONMENT CHAMBER  
 ARTOS ENGINEERING CO.—WIRE STRIPPING MACHINES  
 DORSETT ELECTRONICS INC., ELECTRONIC ORGAN DIVISION—ELECTRONIC ORGAN KIT  
 KLEIN & SONS, MATHIAS—HAND TOOLS  
 RONDO OF AMERICA, INC.—PAPER PACKAGING UNIT  
 WELLER ELECTRIC CORP.—ELECTRIC SOLDERING IRON  
 XCELITE, INC.—NUT DRIVERS

# Alphabetical Listing of Manufacturers

A listing of the names and addresses of manufacturers in the electronic and allied industries. All the information in this

listing and in the product listing section has been supplied by the manufacturer.

A B D ELECTRONICS INC  
 17 PASCAL RD CHEKETTSTOWN N J  
 A A METAL PRODUCTS INC  
 154 ELLIOT ST BRATTLEBORO VT  
 A C TRANSFORMER CORP  
 89 MADISON ST NEWARK 3 N J  
 A D T CO INC  
 155 6TH AVE NEW YORK 13 N Y  
 A B A CORP  
 1914 DUKE ST ALEXANDRIA VA  
 A 6 A DIV ELASTIC STOP NUT CORP  
 1027 NEWARK AVE ELIZABETH 3 N J  
 A I INSTRUMENT CO  
 422 TALBERT ST PLAYA DEL REY CALIF  
 A L A INDUSTRIES INC  
 151 CROTONA AVE HARRISON N Y  
 A P M CORP  
 252 HATHORNE AVE YONKERS N Y  
 A P W CO  
 72 W MAIN ST ROCKAWAY N J  
 A R & T ELECTRONICS INC  
 1101 MCALMONT LITTLE ROCK ARK  
 A R F PRODUCTS INC  
 P O BOX 57 RANTON N H  
 A R F PRODUCTS INC  
 7627 LAKE ST RIVER FOREST ILL  
 A R L CO  
 7310 - 24TH AVE HYATTSVILLE MD  
 A-1 PRECISION PRODUCTS  
 3822 W JEFFERSON BLVD LOS ANGELES 16 CALIF  
 A-W MFG CO INC  
 115 S NORTHWEST HWY BARRINGTON ILL  
 ABALON PRECISION MFG CORP  
 540 CASANOVA ST NEW YORK 50 N Y  
 ABBEON INCORPORATED  
 179-15 JAMAICA AVE JAMAICA 32 N Y  
 ABBEY MACH & ENG CO  
 P O BOX 707-PASSAIC AVE CALDWELL NJ  
 ABBOTT SCREW & MFG CO  
 6525 N CLARK ST CHICAGO 26 ILL  
 ABLE TOOL & ENGRG CO  
 5205 W AGATITE CHICAGO 30 ILL  
 ABRAMS INSTRUMENT CORP  
 600 E SHIMMASEE ST LANSING 1 MICH  
 AC ELEC DIV GRC  
 1925 E KENILWORTH PL MILWAUKEE WIS  
 AC ELECTRONICS DIV GRC  
 1720 S NOBELL AVE OAK CREEK WIS  
 AC SPARK PLUG  
 1925 E KENILWORTH PL MILWAUKEE WIS  
 AC SPARK PLUG DIV-G N E  
 P O BOX 105 PORT CAMAVERAL FLA  
 ACAR-HACKETT MARINE DIV  
 133 TERMINAL AVE CLARK N J  
 ACCESSORY CONTROLS & EQUIPMENT CORP  
 805 BLOOMFIELD AVE P O BOX 381  
 BINDSON CONN  
 ACCURACY INC  
 4 GORDON ST BALTHAM 34 MASS  
 ACCURATE BOB CORP  
 1214-18 N WELLS ST CHICAGO 10 ILL  
 ACCURATE ELECTRONICS CO  
 2005 BLUE ISLAND AVE CHICAGO 9 ILL  
 ACCURATE ELECTRONICS CORP  
 169 S ABBE RD S E ELYRIA OHIO  
 ACCURATE INSTRUMENT CO  
 P O BOX 6373 HOUSTON TEXAS  
 ACCURATE INSULATED WIRE CORP  
 25 FOX ST NEW HAVEN 1 CONN  
 ACCURATE MFG CO  
 80 NEPBORTH PL GARFIELD N J  
 ACCURATE SHEET METAL & MFG WORKS INC  
 2336 MILWAUKEE AVE CHICAGO 47 ILL  
 ACCURATE SPECIALTIES CO INC  
 37 11 57TH ST WOODSIDE 77 N Y  
 ACCURATE SPECIALTIES CO INC  
 338 HUDSON ST HACKENSACK N J  
 ACCURATE SPRING MFG CO  
 3811 W LAKE ST CHICAGO 24 ILL  
 ADCS ELECTRONICS INC  
 2979 N ONTARIO ST BURBANK CALIF  
 ACE COIL & ELECTRONICS CO  
 914 LINCOLN HWY HETUCHEN N J  
 ACE ELECTRIC MFG CO  
 1450 SHAKESPEARE AVE NEW YORK 52 N Y  
 ACE ELECTRONICS ASSOCIATES  
 99 DOVER ST SOMERVILLE 40 MASS  
 ACE ENGG & MACHINE CO INC  
 TOMLINSON RD HUNTINGDON VALLEY PENNA  
 ACE PLASTIC CO  
 91-30 VAN DYCK EXPY JAMAICA 35 N Y  
 ACE SPRING MFG CO  
 146 32ND STREET BROOKLYN 32 NEW YORK

ACF ELECTRONICS DIV  
 RIVERDALE MO  
 ACF ELECTRONICS DIV ACF INDUSTRIES INC  
 11 PARK PL PARAMUS N J  
 ACF ELECTRONICS/DIV ACF INDUSTRIES  
 1321 LESLIE AVE ALEXANDER VA  
 ACF INDUSTRIES INC  
 P O BOX 1666 ALBUQUERQUE N MEX  
 ACHESON COLLOIDS CO  
 PORT HURON MICH  
 ACHESON INO INC  
 1019 BROAD ST NEWARK 2 N J  
 ACKERMAN ENGRAVERS  
 858 BROADWAY NEW YORK 13 N Y  
 ACKERMAN-GOULD CO INC  
 10 NEIL COURT PO BOX 188 OCEANSIDE LI N Y  
 ACME BATTERY CORP  
 200 MENRY ST STAMFORD CONN  
 ACME BRASS FOUNDRY CO OF S A INC  
 716 BYOMING ST SAN ANTONIO 3 TEXAS  
 ACME ELECTRIC CORP  
 12822 YUKON AVE HATHORNE CALIF  
 ACME ELECTRIC CORP  
 WATER ST CUBA N Y  
 ACME ELECTRIC HEATING CORP  
 49 READING ST BOSTON MASS  
 ACME INDUSTRIAL CO  
 200-222 N LAFLIN ST CHICAGO 7 ILL  
 ACME MFG & GASKET CO  
 738 N 41 ST PHILADELPHIA 4 PA  
 ACME MODEL ENGG CO  
 6228 15TH AVE BROOKLYN 19 NY  
 ACME NEOPORT STEEL CO  
 NEOPORT KY  
 ACME PRECISION PROTS INC  
 215 N FINDLAY ST DAYTON 3 OHIO  
 ACME TELETRONIX  
 24375 WESTWOOD RD WESTLAKE OHIO  
 ACME TELETRONIX DIV NEA SERVICE  
 1200 W 3 ST CLEVELAND 13 OHIO  
 ACME WIRE CO  
 1255 DIXWELL AVE NEW HAVEN 14 CONN  
 ACORN ELECTRONICS/DIV JAMES VIBRAPOUR CO  
 107 E 6TH ST GIBSON CITY ILL  
 ACOUSTIC RESEARCH INC  
 28 THORNDIRE ST CAMBRIDGE 41 MASS  
 ACOUSTICA ASSOC  
 10800 AVIATION BLVD LOS ANGELES CALIF  
 ACOUSTICA ASSOCIATES  
 FAIRCHILD COURT PLAINVIEW N Y  
 ACOUSTICA ASSOCIATES INC  
 26 WINDSOR AVE MINEOLA LI N Y  
 ACOUSTRONICS INC  
 150 OLIVE ST HUNTINGTON STA LI N Y  
 ACO DIV ROBERT S HUB FULTON CONTROL CO  
 2040 E MAIN ST COLUMBUS OHIO  
 ACO PRODUCTS CO  
 369 SMURS LANE PHILADELPHIA 28 PA  
 ACO TOOL & DIE WORKS  
 4554 BROADWAY CHICAGO 40 ILL  
 ACROMAG INC  
 22319 TELEGRAPH RD SOUTHFIELD MICH  
 ACROMAG INC  
 22519 TELEGRAPH RD DETROIT 41 MICH  
 ACROMARK CO  
 309 NORRELL ST ELIZABETH N J  
 ACTIONCRAFT PRODUCTS  
 2 YENNICOCK AVE PORT WASHINGTON N Y  
 ACTON LABORATORIES  
 1225 W OAKTON LOS ANGELES CALIF  
 ACTON LABORATORIES INC  
 533 MAIN ST ACTON MASS  
 ACTUATOR PRODS CORP  
 PO BOX 247 40 NASHUA ST BIRJURN PASS  
 AD-YU ELECTRONICS LAB INC  
 249 TERHUNE AVE PASSAIC N J  
 ADAGE INC  
 292 MAIN ST CAMBRIDGE 42 MASS  
 ADALET MFG CO  
 14300 LORAIN AVE CLEVELAND 11 OHIO  
 ADAM METAL SUPPLY INC  
 4-63 48TH AVE LONG ISLAND CITY LI N Y  
 ADAMS B WESTLAKE CO  
 1025 N HIGHWAY ELKHART IND  
 ADAMS ELECTRONICS INC  
 16 CHARLES ST BAMBOR MAINE  
 ADAMS LABS INC  
 47-37 AUSTELL PL LONG ISLAND CITY LI N Y  
 ADAMS RADIO LAB  
 225 PARK ST WEST HAVEN CONN  
 ADAMS RITE MFG CO  
 540 W CHEVY CHASE WA GLENDALE 4 CALIF

ADAMS RUSSELL CO INC  
 200 SIXTH ST CAMBRIDGE 42 MASS  
 ADC INC  
 2833 13 AVE S MINNEAPOLIS MINN  
 ADCON DIV WAYNE-GEORGE CORP  
 580 COMMONWEALTH AVE BOSTON 15 MASS  
 ADDISON INDUSTRIES LTD  
 40 QUEEN ELIZABETH BLVD TORONTO 18 ONT CAN  
 ADOO K  
 300 PARK AVE NEW YORK N Y  
 ADDRESSOGRAPH-MULTIGRAPH CORP  
 1200 BABBITT RD CLEVELAND 17 OHIO  
 ADEL DIV GENL MET CORP  
 BOX 671 BURBANK CALIF  
 ADEL PREC PROD  
 1444 WASHINGTON AVE HUNTINGTON WEST VA  
 ADEPT INDUSTRIES INC  
 1636 W HUNTING PARK AVE PHILA 40 PA  
 ADHESIVE PRODUCTS CORP  
 1660 BOONE AVE NEW YORK 60 N Y  
 ADLER ELECTRONICS CORP  
 858 PALISADE AVE YONKERS 3 N Y  
 ADLER ELECTRONICS INC  
 1 LEFEVRE LANE NEW ROCHELLE N Y  
 ADMIRAL CORP  
 901 CALIFORNIA AVE PALO ALTO CALIF  
 ADMIRAL CORP  
 P O BOX 248 HARVARD ILL  
 ADMIRAL CORP  
 3801 W CORTLAND ST CHICAGO 47 ILL  
 ADVANCE CARBON & ELECTRIC MFG CO  
 2505 MARIPOSA ST SAN FRANCISCO 10 CALIF  
 ADVANCE ELECTRONICS CO  
 8510 NORTH END AVE OAK PARK 37 ILL  
 ADVANCE GEAR & MACHINE CORP  
 5851 HOLMES AVE LOS ANGELES 1 CALIF  
 ADVANCE INDUSTRIES INC  
 640 MEMORIAL DR CAMBRIDGE 39 MASS  
 ADVANCE INSTRUMENT CORP  
 1109 6TH AVE NEPTUNE N J  
 ADVANCE RELAY CO  
 2435 N MAONI ST BURBANK CALIF  
 ADVANCE ROSS ELECTRONICS CORP  
 2538 PETERSOM AVE CHICAGO 45 ILL  
 ADVANCE STAMPING CO  
 1205 DIXIE DETROIT MICH  
 ADVANCE TRANSFORMER CO  
 2950 N WESTERN AVE CHICAGO 18 ILL  
 ADVANCED ACOUSTICS CORP  
 67 EAST CENTRE ST HUTLEY N J  
 ADVANCED ELECTRONICS INC  
 94 SILAS DEANE HWY ROCKY HILL 9 CONN  
 ADVANCED ELECTRONICS MFG CORP  
 2025 PONTIUS AVE LOS ANGELES 25 CALIF  
 ADVANCED INSTRUMENT CORP  
 700 B 4TH ST RICHMOND CALIF  
 ADVANCED INSTRUMENTS  
 45 KENNETH ST NEWTON HIGHLANDS 61 MASS  
 ADVANCED PRODUCTS  
 59 BROADWAY NORTH HAVEN CONN  
 ADVANCED TECHNOLOGY LABS PLANNING & MARKETING  
 8 WHISMAN RD MOUNTAIN VIEW CALIF  
 ADVANCED VACUUM PRODUCTS INC  
 430 FAIRFIELD AVE STAMFORD CONN  
 AERCO INC  
 10 STATE ST MANKATO MINN  
 AER-O-COM  
 3090 S W 37TH AVE MIAMI FLA  
 AERIAL MEASUREMENTS LAB  
 2422 OAKTON ST EVANSTON ILL  
 AERIAL TOWER MFG CO  
 BOX 9142 OKLAHOMA CITY OKLA  
 AERMOTIVE EQUIP CORP  
 1632 CENTRAL ST KANSAS CITY 8 MO  
 AERO DESIGN ENGG CORP  
 P O BOX 118 BETHANY OKLA  
 AERO DESIGN ENGRG CORP  
 P O BOX 398 NORMAN OKLA  
 AERO ELECTRONICS CO  
 P O 9232 PALO ALTO CALIF  
 AERO ELECTRONICS CO  
 1512 N WELLS ST CHICAGO 10 ILL  
 AERO ELECTRONICS CORP  
 1657 W 134 ST GARDENA CALIF  
 AERO GEO ASTRO CORP  
 BOX 1082 ALEXANDRIA VA  
 AERO INSTRUMENT CO  
 11423 VANOREN ST N HOLLYWOOD CALIF  
 AERO RESEARCH INSTRUMENT CO  
 315 N ABERDEEN ST CHICAGO 7 ILL  
 AERO-TEST EQUIPMENT CO INC  
 1601 DRAGON ST DALLAS 7 TEXAS  
 AERO-TRONIX  
 2049 MAIN ST SAN DIEGO 13 CALIF

# ELECTRONIC MANUFACTURERS-A-Z

AEROFLEX CORP DIV AEROFLEX LABORATORIES  
38-06 SKILLMAN AVE LONG ISLAND CITY 1 N Y  
AEROMH LABORATORIES  
BOSTON POST RD WAYLAND MASS  
AEROJET GENERAL CORP  
410 N CITRUS COVINA CALIF  
AEROJET GENERAL CORP  
BOX 77 SAN RAMON CALIF  
AEROJET GENERAL CORP  
ATLANTIC DIVISION FREDERICK MD  
AEROJET GENERAL CORP  
NIMBUS CALIF  
AEROJET GENERAL CORP  
6112 BEECH AVE ORANGEVALE CALIF  
AEROJET-GENERAL  
P O BOX 1987 SACRAMENTO CALIF  
AEROJET-GENERAL CORP  
6352 N IRVINDALE AVE AZUSA CALIF  
AEROJET GENERAL CORP  
11711 BOODRUFF AVE DONEY CALIF  
AEROJET-GENERAL CORP  
16630 KELWOOD ST LA PUENTE CALIF  
AERGLAB DEVELOPMENT CO SEMICONDUCTOR SYSTEMS  
330 W HOLLY ST PASADENA CALIF  
AERGLITE ELECTRONICS CORP  
2207 SUMMIT AVE UNION CITY NJ  
AEROLUX LIGHT CORP  
653 11 AVE NEW YORK 36 N Y  
AERONAUTICAL COMM EQUIP CO  
3090 S W 37 AVE MIAMI 33 FLA  
AERONAUTICAL ELECTRONICS INC  
P O BOX 6527 RALEIGH N C  
AERONCA MFG CORP  
2475 CRENSHAW BLVD TORRANCE CALIF  
AERONCA MFG CORP  
MIDDLETOWN OHIO  
AERONCA MFG CORP AEROSPACE DIV  
HILLTOP & FREDERICK RDS BALTIMORE 28 MD  
AERONUTRONIC SYSTEMS INC  
1234 AIR WAY GLENDALE CALIF  
AERONUTRONIC SYSTEMS INC  
FORD ROAD NEWPORT BEACH CALIF  
AERONUTRONICS SYSTEMS INC  
5656 E Slauson Ave LOS ANGELES 22 CALIF  
AERONUTRONICS SYSTEMS INC  
2701 MALLADAY BLDG E SANTA ANA CALIF  
AEROPHYSICS DEV CORP  
BOX 689 SANTA BARBARA CALIF  
AEROPROJECTS INC  
P O BOX 555 WEST CHESTER PA  
AERODUPE HARMAN DIV  
1121 EXPOSITION BLVD LOS ANGELES CALIF  
AEROSPACE CORP  
ROOM 110 P O BOX 95081 LOS ANGELES CALIF  
AEROSTEEL INC  
801 23RD ST UNION CITY N J  
AERCTEC INDUSTRIES INC  
PEMBERWICK RD GREENWICH CONN  
AEROTEST LABORATORIES  
COMAC RD DEER PARK L I N Y  
AEROTRONIC ASSOCIATES INC  
PO BOX 367 CONTOCOCK N H  
AEROTRONIC ASSOCIATES INC  
BOX 419 CONCORD N H  
AEROTRONIC CONTROLS CO  
3424 W 48TH PL CHICAGO 32 ILL  
AEROVOX CANADA LTD  
1551 BARTON ST E HAMILTON ONTARIO CANADA  
AEROVOX CORP  
740 BELLEVILLE AVE NEW BEDFORD MASS  
AEROVOX CORP  
CINEMA ENGG CO DIV BURBANK CALIF  
AETNA ELECTRONIC CORP  
READINGTON RD NORTH BRANCH N J  
AETNA FELT CO  
204 CENTRE ST NEW YORK 13 NY  
AETNA SUPPLY INC  
15 N HICKORY ST ARLINGTON HTS ILL  
AFFILIATED TELEVISION LABS INC  
112-07 FRANCIS LEIBS BLVD  
QUEENS WILLES 29 NY  
AFFILIATED PHOTOGRAPHIC CO  
21 W 45 ST NEW YORK 36 N Y  
AID ASSOCIATES  
2443 5TH ST PALO ALTO CALIF  
AIDESTON CORP  
P O BOX #987 MORRISTOWN PA  
AIDIN AUTOMATION INC  
1613 E NEW YORK AVE BROOKLYN 12 N Y  
AIMSLIE CORP  
531 POND ST S BRAintree 85 MASS  
AIMSLIE CORP  
QUINCY MASS  
AIR CONTROL ENGR INC  
2522 CLOSER BLVD OKLAHOMA CITY 6 OKLA  
AIR CONTROL CORP  
2310 SUPERIOR AVE CLEVELAND 14 OHIO  
AIR MARINE MOTORS  
369 BAYVIEW AVE AMITYVILLE L I N Y  
AIR REDUCTION SALES CO DIV AIR REDUCTION CO  
150 E 42 ST NEW YORK 17 N Y  
AIR TRANSPORT MFG CO  
1114 S SYCAMORE AVE LOS ANGELES CALIF  
AIR-MARINE MOTORS INC  
2221 BARRY AVE LOS ANGELES CALIF  
AIR-MAZE CORP  
25000 HILES RD CLEVELAND 28 OHIO  
AIR-O-TRONICS ENGINEERING CO  
PO BOX 31 LANCASTER CALIF  
AIR-SHIELDS INC  
HATBORO PENNA  
AIRTERRA  
620 PAULA AVE GLENDALE 1 CALIF  
AIRBORNE ACCESSORIES CORP  
1414 CHESTNUT AVE HILLSIDE 5 N J  
AIRBORNE ELECTRONICS CO  
6813 TROOST AVE N HOLLYWOOD CALIF

AIRBORNE INSTRS LAB DIV CUTLER HAMMER INC  
COMAC ROAD ST PAVEN L I N Y  
AIRBORNE INSTRUMENT LAB  
13145 NEW YORK AVE HUNTINGTON STA N Y  
AIRCOM INC  
48 CUMMINGTON ST BOSTON 13 MASS  
AIRCOM INC  
WINTHROP MASS  
AIRCONDUCTORS  
367 E OLIVE GARDENA CALIF  
AIRCRAFT & ELECTRONIC SPECIALTIES  
22 S GREEN ST GROENSBURG IND  
AIRCRAFT ACCESSORIES CO  
244 GREAT MEADOWS RD STRATFORD CONN  
AIRCRAFT APPARATUS INC  
INDUSTRY LANE COCKEYSVILLE MD  
AIRCRAFT RADIO CORP  
BOONTON N J  
AIRDESIGN CORP  
600 W WASHINGTON ST MORRISTOWN PA  
AIRECO INC  
2323 2 AVE SCHEENACTAY 3 N Y  
AIRESEARCH MFG CO ARIZONA DIV GARRETT CORP  
602 S 34TH ST PHOENIX ARIZ  
AIRESEARCH MFG CO DIV GARRETT CORP  
9851 SEPULVEDA BLVD LOS ANGELES 43 CALIF  
AIRFLYTE ELECTRONICS CO  
535 AVENUE A BAYTONE N J  
AIRMAN ELECTRONICS  
14733 TERRYKNOLL WHITTIER CALIF  
AIRMATIC VALVE INC  
7314 ASSOCIATE AVE CLEVELAND OHIO  
AIRPAX ELECTRONICS CORP CAMBRIDGE DIV  
CAMBRIDGE MD  
AIRPAX ELECTRONICS INC  
JACKTOWN RD CAMBRIDGE MD  
AIRPAX ELECTRONICS INC SEMINOLE DIV  
FORT LAUDERDALE FLA  
AIRPAX PRODUCTS CO  
MIDDLE RIVER BALTIMORE 20 MD  
AIRTEC INC  
139 E 1ST AVE ROSSELLE N J  
AIRTRON CANADA LTD  
349 CARLAW AVE TORONTO 8 ONT CANADA  
AIRTRON INC  
8423 RODEO RD LOS ANGELES 16 CALIF  
AIRTRON INC  
1301 E LINDEN AVE LINDEN N J  
AIRTRON INC DIV LITTON IND  
200 MANOVER AVE MORRIS PLAINS N J  
AIRTRONICS INC  
5522 DORSEY LANE BETHESDA MD  
AIRTRONICS INTL CORP  
6900 WEST RD B4 P O BOX 8576  
FT LAUDERDALE FLA  
AIRTRONIX DEVELOPMENT CORP  
4902 CHURCH AVE BROOKLYN 3 N Y  
AJAX CONDENSER CO  
932 B BRIGHTWOOD AVE CHICAGO 14 ILL  
AKRO-NILS INC  
BOX 989 AKRON 9 OHIO  
AKRON METALLIC GASKET CO  
150 N UNION ST AKRON OHIO  
ALAC INC  
365 B ARDEN ST GLENDALE 3 CALIF  
ALADDIN ELECTRONICS DIV ALADDIN INDUSTRIES  
703 MURFREESBORO RD NASHVILLE 10 TENN  
ALADDIN INDUSTRIES INC  
ALADDIN ELECTRONICS DIV 380 E GREEN ST  
PASADENA CALIF  
ALAN WOOD STEEL CO  
CONSHOHOCKEN PA  
ALCAR INSTRUMENTS INC  
17 INDUSTRIAL AVE LITTLE FERRY R J  
ALCO ELECTRONIC PRODUCTS INC  
3 BOLCOTT AVE LAWRENCE MASS  
ALCORN LAB  
1680 INDIAN VALLEY RD NOVATO CALIF  
ALDEN ELECTRONIC & IMPULSE  
RECORDING EQUIP CO  
P O BOX 125 WESTBORO MASS  
ALEXANDRIA DIV-AMF  
1025 N ROYAL ST ALEXANDRIA VA  
ALFAX PAPER & ENGG CO  
P O BOX 125 WESTBORO MASS  
ALFORD MFG CO  
209 ATLANTIC AVE BOSTON 10 MASS  
ALFRED ELECTRONICS  
897 COMMERCIAL ST PALO ALTO CALIF  
ALIGN-A-MATIC  
62 GASTON ST WEST ORANGE N J  
ALION INSTRUMENTS INC  
430 BUCKLEY ST BRISTOL PA  
ALITE DIV U S STONEWARE CO  
PO BOX 119 ORVILLE OHIO  
ALL AMER AIRCRAFT PROD  
1311 W PACIFIC CST HWY HARBOR CITY CALIF  
ALL AMERICAN TOOL & MFG CO  
8027 LANDALE AVE SKOKIE ILL  
ALL CHANNEL PRODUCTS CORP  
47-39 80TH ST WOODSIDE 77 N Y  
ALL PRODUCT CO/COMMUNICATION PROD DIV  
BOX 110 MINEHAT BELLS TEX  
ALL STAR PRODUCTS INC  
SQUIRE AVE DEFIANCE OHIO  
ALL TRONCS INC  
45 BOND ST WESTBURY L I N Y  
ALDEN PRODUCTS CO  
12359 N MAIN ST BROCKTON 64 MASS  
ALDEN SYSTEMS  
201 WASHINGTON ST WESTBORO MASS  
ALDSHIR MANUFACTURING CO INC  
111 LAKE AVE TUCKAHOE N Y  
ALFETRIC MFG CO  
7842 39TH AVE KENOSHA WISC

ALL-AMERICAN ENGG CO  
BOX 1247 BILMINGTON 99 DEL  
ALL-STATE WELDING ALLOYS CO  
249 FERRIS AVE WHITE PLAINS N Y  
ALLARD INSTRUMENT CORP  
146 E 2 ST MINEOLA L I N Y  
ALLEGANY INSTRUMENT CO  
1091 WILLS MOUNTAIN CUMBERLAND MD  
ALLEGHENY ELECTRONIC CHEMICALS CO  
207 HOOKER FULTON BLDG BRADFORD PA  
ALLEGHENY LUDLUM STEEL CORP  
OLIVER BLDG PITTSBURGH 22 PA  
ALLEGHENY PLASTICS INC  
ROUTE 51 A THORN RUN RD CORAPOLIS PENNA  
ALLEN AIRCRAFT PRODUCTS INC  
P O BOX 271 RAVENNA OHIO  
ALLEN AVIONICS INC  
255 E 2ND ST MINEOLA N Y  
ALLEN CO INC L B  
9329 W BERENICE SCHILLER PARK ILL  
ALLEN ELECTRIC & EQUIPMENT CO  
2101-2117 M PITCHER ST KALAMAZOO MICH  
ALLEN MFG CO  
DRABER 370 HARTFORD I CONN  
ALLEN ORGAN CO  
LOCUST ST MACUNGIE PA  
ALLEN-BRADLEY CO  
136 W GREENFIELD AVE MILWAUKEE 4 WISC  
ALLEN-JONES INC  
2115 TORRANCE BLVD TORRANCE CALIF  
ALLENOR PRODUCTS CORP  
607 M LABREA AVE LOS ANGELES CALIF  
ALLIANCE MFG CO INC  
LAKE PARK BLVD ALLIANCE OHIO  
ALLIED ALLEGRI MACHINE CO INC  
141 RIVER RD NUTLEY 10 N J  
ALLIED CHEMICAL CORP P A C C DIV  
40 RECTOR ST NEW YORK 6 N Y  
ALLIED CONTROL CO  
2 EAST END AVE NEW YORK 21 N Y  
ALLIED CONTROL CO INC  
1326 FLOBER ST GLENDALE 1 CALIF  
ALLIED CONTROL CO INC  
PLANTSVILLE CONN  
ALLIED CONTROL COMPANY INC  
BAUREGAN CONN  
ALLIED DECALS INC  
8400 MOUGH AVE CLEVELAND 3 OHIO  
ALLIED ELECTRONIC EQUIP CO  
868 SAN MATEO AVE SAN BRUNO CALIF  
ALLIED ENGINEERING & PRODUCTION CORP  
2421 BLANDING AVE ALAMEDA CALIF  
ALLIED ENGRAVING & STAMPING CO  
701 SENECA ST BUFFALO 10 N Y  
ALLIED FABRICATING CORP  
1336 N CLYBOURN AVE CHICAGO 10 ILL  
ALLIED INDUSTRIES INC  
P O BOX 119 OGALLALA NEBR  
ALLIED RADIO CORP  
100 N WESTERN AVE CHICAGO 90 ILL  
ALLIED RECORDING PRODUCTS CO  
32-32 GREENPOINT AVE  
LONG ISLAND CITY 1 N Y  
ALLIED RESEARCH INC  
43 LEON ST BOSTON MASS  
ALLIED RESINOUS PROD INC  
CLARK & WHITNEY RD CONNEAUT OHIO  
ALLIED BITAM CO  
PO BOX 8725 12500 BELLAIRE RD  
CLEVELAND 35 OHIO  
ALLIES PRODUCTS CORP  
P O BOX 188 KENDALL BRANCH MIAMI FLA  
ALLIS CHALMERS MFG CO  
934 S 70TH ST MILWAUKEE 1 WISC  
ALLIS CO LOUIS  
427 E STEWART ST MILWAUKEE 1 WISC  
ALLISON LABORATORIES  
14185 SKYLINE DR LA PUENTE CALIF  
ALLISON LABS INC  
11301 E OCEAN AVE LA HABRA CALIF  
ALLMETAL SCREW PRODUCTS CO INC/WEST COAST DIV  
5822 W WASHINGTON BLVD CULVER CITY CALIF  
ALLMETAL SCREW PRODUCTS CO  
821 STEWART AVE GARDEN CITY N Y  
ALLOY BELLOWS INC  
18123 ROSELAND RD CLEVELAND 12 OHIO  
ALLOYS UNLIMITED INC  
21-01 43RD AVE LONG ISLAND CITY N Y  
ALMO ELECTRONICS CORP  
1415 N BRAZOS ST SAN ANTONIO 7 TEXAS  
ALONGE PRODUCTS INC  
163 W 23RD ST NEW YORK 11 N Y  
ALPAR MFG CORP  
220 DEXETER ST PALO ALTO CALIF  
ALPHA CORP  
820 E ARAPAHO RD RICHARDSON TEXAS  
ALPHA CORP AIR MOD CENTER  
ADDISON A/P ADDISON TEXAS  
ALPHA INSTRUMENT CO  
85 HEMPSTEAD ST NEW LONDON CONN  
ALPHA METALS INC  
56 BATES ST JERSEY CITY 4 N J  
ALPHA POLYTECH CORP  
65 HAYWARD AVE STAMFORD CONN  
ALPHA WIRE CORP  
200 VARICK ST NEW YORK 14 N Y  
ALPHACUT WIRE & CABLE CO  
25 VAN DYKE AVE NEW BRUNSWICK N J  
ALPTEC INC  
49 GLEASON AVE STAMFORD CONN  
ALPROCO INC  
540 BEAKLEY AVE MEMPHIS 7 TENN  
ALSOPE ENGG CORP  
MILLDALE CONN  
ALTAIR CO  
18251A CARMOLLA SANTA BARBARA CALIF

## ELECTRONIC MANUFACTURERS-A-Z

ALTEC LANSING CORP  
1515 S MANCHESTER AVE ANAHEIM CAL  
ALTEC LANSING CORP PEERLESS ELECTRICAL PDS  
6920 MCINLEY AVE LOS ANGELES 1 CALIF  
ALTO FOMIC MUSIC SYSTEMS INC  
981 COMMERCIAL ST PALO ALTO CALIF  
ALTO SCIENTIFIC CO  
855 COMMERCIAL ST PALO ALTO CALIF  
ALTRON INC  
WESTERLY STATE A/P WESTERLY R I  
ALUMINUM CO OF AMERICA  
1501 ALCOA BLDG PITTSBURGH 19 PA  
ALUMINUM CO OF AMERICA  
2210 HARVARD AVE CLEVELAND 5 OHIO  
ALVA ALLEN INDUSTRIES  
35 & 13 JCY CLINTON MO  
ALBAC COMPUTER DIV EL-TRONICS INC  
13040 S CERISE HAWTHORNE CALIF  
ALVAC CORP  
5107 E 131ST ST CLEVELAND 25 OHIO  
AMATOM ELECTRONIC HARDWARE CO INC  
88 DRACKE AVE NEW ROCHELLE N Y  
AMTROID CO  
BOX 30 WEYMOUTH 88 MASS  
AMCHEN PRODUCTS INC  
AMBLER PENNA  
AMCO ENG CO  
7333 W AINSLIE ST CHICAGO 31 ILL  
AMECO DIV ANTENNAVISION INC  
2449 W DODD RD PHOENIX ARIZ  
AMELCO INC  
2040 COLO AVE SANTA MONICA CALIF  
AMERIC INC  
2421 N RAMSEY SPRINGFIELD MO  
AMER CAR FOUNDRY MIL & IND ELECT DEPT  
1305 LESLIE AVE ALEXANDRIA VA  
AMER DIAPHY GROUP INC  
11858 MISSISSIPPI AVE LOS ANGELES CALIF  
AMER RADIATOR & STDS SANITARY CORP  
5900 TRUMBULL AVE DETROIT 8 MICH  
AMERAC INC  
DUNHAM RD BEVERLY MASS  
AMERACE CORP GAVITT WIRE & CABLE CO  
BROOKFIELD MASS  
AMERCATY CORP  
4809 FIRESTONE BLVD SOUTH GATE CALIF  
AMERELAY CORP  
130 COUNTY COURT HOUSE RD NEW HYDE PARK  
N Y  
AMERICAN ASILE CORP  
P O BOX 148 BEDFORD OHIO  
AMERICAN AIR FILTER CO  
215 CENTRAL AVE LOUISVILLE 8 KY  
AMERICAN AIR FILTER CO INC DEFENSE PRODUCTS  
DIVISION  
310 3RD ST ROCK ISLAND ILL  
AMERICAN ALUMINUM CO  
230 SHEFFIELD ST MOUNTAINSIDE N J  
AMERICAN AUTOMATION CO  
10223 GARLAND ROAD DALLAS 18 TEXAS  
AMERICAN AVIONICS INC  
2028-2032 STONER AVE LOS ANGELES 25 CALIF  
AMERICAN BOSCH ARMA CORP  
SUITE 701 -7046 HOLLYWOOD HOLLYWOOD 28 CAL  
AMERICAN BOSCH ARMA CORP  
5857 W 95TH ST OAK LAWN ILL  
AMERICAN BOSCH ARMA CORP  
ROOSEVELT FIELD GARDEN CITY L I N Y  
AMERICAN BOSCH ARMA CORP  
320 FULTON AVE HEMPSTEAD L I N Y  
AMERICAN BOSCH ARMA CORP  
OLD COUNTRY RD MINEOLA L I N Y  
AMERICAN BOSCH ARMA CORP  
21 LARK AVE PLAINVIEW L I N Y  
AMERICAN BOSCH ARMA CORP  
3454 MAIN ST SPRINGFIELD 7 MASS  
AMERICAN BRAKE SHOE CO  
13 HATHAWAY ROAD TITONIUM MO  
AMERICAN BRAKE SHOE CO KELLOGG DIV  
97 HURBOLDT ST ROCHESTER 18 N Y  
AMERICAN BRASS CO  
414 MEADOW ST WATERBURY 88 CONN  
AMERICAN BRASS CO  
179 WATER ST TORRINGTON CONN  
AMERICAN CABLE & RADIO CORP  
271 DENOKE AVE NEW CANAAN CONN  
AMERICAN CAR FOUNDRIES NUCLEAR PRODUCTS  
ERCO DIV  
RIVERDALE MO  
AMERICAN CAR FOUNDRY NUCLEAR PRODUCTS-ERCO  
BOX 586 ERCO FLD OFF PERRIN SHERMAN TEXAS  
AMERICAN CAR FOUNDRY NUCLEAR PRODS-ERCO DIV  
P O BOX 651 MERCED CALIF  
AMERICAN CAR FOUNDRY IND AVION DIV  
11 PARK PLACE PARAMUS N J  
AMERICAN CHEMICAL PAINT CO  
AMBLER PA  
AMERICAN CONCERTONE  
DIV AMERICAN ELECTRONICS INC  
9449 W JEFFERSON BLVD CULVER CITY CALIF  
AMERICAN DECALOMANIA CO  
630 11TH AVE NEW YORK 36 N Y  
AMERICAN DISTRICT TELEGRAPH CO  
155 6TH ST NEW YORK 13 NY  
AMERICAN ELECTRIC CABLE CO  
181 APPLETON ST HOLYOKE MASS  
AMERICAN ELECTRICAL HEATER CO  
6110 CASS AVE DETROIT 2 MICH  
AMERICAN ELECTRONIC LABS INC  
COLMAR PENNA  
AMERICAN ELECTRONIC LABS  
RICHARDSON RD LANSDALE PA  
AMERICAN ELECTRONICS CO  
178 HERRICKS RD MINEOLA L I N Y  
AMERICAN ELECTRONICS CO  
2801 - 37TH ASENUE NE MINNEAPOLIS 21 MINN  
AMERICAN ELECTRONICS INC  
480 PIQUETTO ST SANTA BARBARA CALIF

AMERICAN ELECTRONICS INC  
3325 OLINDA ANAHEIM CALIF  
AMERICAN ELECTRONICS INC  
2112 CHICO AVE EL MONTE CALIF  
AMERICAN ELECTRONICS INC  
1725 W SIXTH ST LOS ANGELES 17 CALIF  
AMERICAN ELECTRONICS INC  
1536 E ROSS AVE FULLERTON CALIF  
AMERICAN ELECTRONICS INC  
AMERICAN NUCLEAR DIV  
9459 W JEFFERSON BLVD CULVER CITY CALIF  
AMERICAN ELECTRONICS INC INSTRUMENT  
9503 W JEFFERSON BLVD  
CULVER CITY CALIF  
AMERICAN ELECTRONICS INC  
4811 TELEGRAPH RD LOS ANGELES 22 CALIF  
AMERICAN ELECTRONICS INC  
TALLER & COOPER DIV  
75 FRONT ST BROOKLYN 1 N Y  
AMERICAN ELECTRONICS LCB  
1211 N Y ST PHILADELPHIA 6 PA  
AMERICAN ELITE INC  
48-50 34TH ST LONG ISLAND CITY 1 N Y  
AMERICAN GAS FURNACE CO  
140 SPRING ST ELIZABETH 1 N J  
AMERICAN GELOSO ELECTRONICS INC  
251 FOURTH AVE NEW YORK 10 N Y  
AMERICAN HERGSE CO  
205 WALLABOUT ST BROOKLYN 6 N Y  
AMERICAN HOIST & DERRICK CO  
63 S ROBERTS ST ST PAUL 7 MINN  
AMERICAN INSTRUMENT CO  
8050 GEORGIA AVE SILVER SPRINGS MD  
AMERICAN INSULATOR CORP  
NEW FREEDOM PA  
AMERICAN LAUBSCHER CORP  
250 W 87TH ST NEW YORK 19 NY  
AMERICAN LAVA CORP SUBS MINN MINING & MFG  
CHEROKEE BLVD & MFRS RD CHATTANOOGA 5 TENN  
AMERICAN MACHINE & FDRY CO  
1025 N ROYAL ST ALEXANDRIA VA  
AMERICAN MACHINE & FDRY CO LELAND ELECTRIC  
DIV  
DAYTON 9 OHIO  
AMERICAN MACHINE & FOUNDRY CO  
261 MADISON AVE NEW YORK N Y  
AMERICAN MACHINE & FOUNDRY CO GEN ENG LABS  
11 BRUCE PL GREENWICH CONN  
AMERICAN MACHINE & FOUNDRY  
HENRY ST STAMFORD CONN  
AMERICAN MACHINE & FOUNDRY CO LELAND  
AIRBORNE PRODUCTS DIV  
P O BOX 128 VANDALIA OHIO  
AMERICAN MACHINE & FOUNDRY CO  
RICHMOND VA  
AMERICAN MACHINE & FOUNDRY GOVT PROD GROUP  
1701 K ST WASHINGTON D C  
AMERICAN MACHINE & FOUNDRY POTTER &  
BRUMFIELD DIV  
PRINCETON 18 NJ  
AMERICAN MACHINE & FOUNDRY CO  
2510 LOUISBURG RD RALEIGH N C  
AMERICAN MARIETTA CO  
3400 13TH ST S SEATTLE WASH  
AMERICAN MEASUREMENT & CONTRL INC  
240 CALVARY ST WALTHAM 24 MASS  
AMERICAN MERCANTILE CO INC  
33 W 42ND ST NEW YORK 36 N Y  
AMERICAN METAL CLIMAX INC  
61 BROADWAY NEW YORK 6 N Y  
AMERICAN METRIA CORP  
80 HADDON AVE CAMDEN 3 N J  
AMERICAN MICROPHONE MFG CO  
DIV GENERAL CEMENT MFG CO  
400 S 44TH AVE ROCKFORD ILL  
AMERICAN MISSILE PRODUCTS CO INC  
15233 GREVILLEA AVE LANSDALE CALIF  
AMERICAN MOISTENING CO  
CLEVELAND N CAROLINA  
AMERICAN MOLDING PRODUCTS CO  
2727 W CHICAGO AVE CHICAGO 22 ILL  
AMERICAN MONARCH CORP  
2801 37TH AVE N E MINNEAPOLIS 18 MINN  
AMERICAN MOTORS CORP  
5626 25TH AVE KENOSHA WISC  
AMERICAN NUCLEAR SERVICE CORP  
61 BROADWAY NEW YORK 6 NY  
AMERICAN NUT & BOLT FASTENER CO  
18 WOOD ST PITTSBURGH 42 PA  
AMERICAN OPTICAL  
1 MARLBORO ST KEENE N H  
AMERICAN OPTICAL CO INSTRUMENT DIV  
BOX A BUFFALO 15 N Y  
AMERICAN PERFECT CRYSTAL CORP  
653 11 AVE NEW YORK 36 N Y  
AMERICAN PHOTOCOPI EQUIP CO  
2100 DEMPSTER ST EVANSTON ILL  
AMERICAN POTASH & CHEMICAL CO  
99 PARK AVE NEW YORK 16 N Y  
AMERICAN POWER JET CO  
705 GRAND AVE RIDGEFIELD N J  
AMERICAN PRINTED CIRCUITS CO  
104 FORREST ST HETICHEN N J  
AMERICAN PRINTED CIRCUITS CO  
90 W NEWELL AVE RUTHERFORD N J  
AMERICAN PRODUCTS MFG CO  
8131 CLEANDER ST NEW ORLEANS 18 LA  
AMERICAN RADAR COMPONENTS INC  
415 E MAIN ST DENVER N J  
AMERICAN RECORDING TAPE CORP  
2020 PLACENTIA AVE COSTA MESA CALIF  
AMERICAN RECTIFIER CORP  
95 LAFAYETTE ST NEW YORK 13 N Y  
AMERICAN RESEARCH & MFG CORP  
923 HALPINE AVE ROCKVILLE MO  
AMERICAN RESEARCH CORP  
ROUTE 6 FARMINGTON CONN

AMERICAN RESEARCH PRODUCTS  
BOX 185 SONNENTO FLA  
AMERICAN SCREW CO  
1680 W MAIN ST WILLIMANTIC CONN  
AMERICAN SEALANTS CO  
103 WOODBINE ST HARTFORD 6 CONN  
AMERICAN SEARCHLIGHT CORP  
38 W 53 ST NEW YORK N Y  
AMERICAN SEMICONDUCTOR CORP  
1418 W CORTX CHICAGO 22 ILL  
AMERICAN SEMICONDUCTOR CORP  
CHICAGO ILL  
AMERICAN SILVER CO  
3467 PRINCE ST FLUSHING 54 N Y  
AMERICAN SMELTING & REFINING CO  
120 BROADWAY NEW YORK 5 N Y  
AMERICAN SMELTING & REFINING CO  
2230 INDIANAPOLIS BLVD WHITING IND  
AMERICAN SOLDER & FLUX CO  
19 & WILLARD STS PHILADELPHIA 40 PA  
AMERICAN SOUND PRODUCTS INC  
404 S WELLS ST CHICAGO 7 ILL  
AMERICAN SPEEDLIGHT CORP  
63-01 METROPOLITAN AVE  
MIDDLE VILLAGE 79 N Y  
AMERICAN STANDARD INDUSTRIAL DIV  
DETROIT MICH  
AMERICAN STANDARD MILITARY PROD DIV  
100 MORSE ST NORWOOD MASS  
AMERICAN STERILIZER SCIENTIFIC & INSTRUMENT  
DIV  
29-01 BORDEN AVE L I CITY 1 N Y  
ERIE PENNA  
AMERICAN STOCK GEAR  
HARVEY ILL  
AMERICAN SUPER TEMPERATURE WIRE  
PRINCETON N J  
AMERICAN SUPER-TEMPERATURE WIRES INC  
32 WEST CANAL ST WINDSOR VT  
AMERICAN SYSTEMS INC  
1625 E 126TH ST HAWTHORNE CALIF  
AMERICAN T V & RADIO RADIO SET BRANCH  
2601 E FRANKLIN ST MINNEAPOLIS 6 MINN  
AMERICAN TELEVISION & RADIO CO  
300 E 4TH ST ST PAUL 1 MINN  
AMERICAN THERMO ELECTRIC CO  
1023 N FULLER AVE LOS ANGELES 46 CALIF  
AMERICAN TIME PRODUCTS INC  
580 S AVE NEW YORK 36 N Y  
AMERICAN TOWER CO  
RFD 2 BOX 28 SHELBY OHIO  
AMERICAN TRAOAIR CORP  
3401 30 ST LONG ISLAND CITY N Y  
AMERICAN TRANSFORMER  
DIV STANDARD ELECTRONICS  
AMERICAN TRANSISTOR PROD CO  
1538 CASSIL PL LOS ANGELES 28 CALIF  
AMERICAN TUBE BENDING CO  
5 LAWRENCE ST NEW HAVEN 11 CONN  
AMERICAN WOOD WORKING CO  
MONTELO WISC  
AMERICAN ZINC LEAD & SMELTING  
P O BOX 495 EAST ST LOUIS ILL  
AMERISCO INC  
3 CENTER ST LITTLE FALLS N J  
ANGLO CORP  
8333 RAVENSWOOD AVE CHICAGO 13 ILL  
ANHERST LAB SYLVANIA  
1131 WHEBLE DR WILLIAMSVILLE N Y  
ANI INC  
1500 UNION AVE GRAND RAPIDS 2 MICH  
ANP INC  
EISENHOWER BLVD HARRISBURG PA  
ANP INC CAPITON DIV  
155 PARK AVE ELIZABETHTOWN PA  
AMPEREX ELECTRONIC CORP  
230 DUFFY AVE HICKSVILLE N Y  
AMPEREX ELECTRONIC CORP  
7400 W NORTH AVE ELMWOOD PARK ILL  
ANPERITE CO  
561 BROADWAY NEW YORK 12 N Y  
AMPEX AUDIO/SUB AMPEX CORP  
1020 KIFER RD SUNNYVALE CALIF  
ANPEX CORP  
BOX 53 MCKINNEY TEXAS  
ANPEX CORP  
P O BOX 514 PALO ALTO CALIF  
ANPEX CORP  
212 W ST CHARLES RD VILLA PARK ILL  
ANPEX CORP  
306 VISTA AVE VANDALIA OHIO  
ANPEX CORP  
934 CHARTER ST REDWOOD CITY CALIF  
ANPEX MAGNETIC TAPE PRODUCTS  
SHARROCK CIRCLE OPELIKA ALA  
AMPHENOL BORG ELECTRONICS  
120 S MAIN ST JAMESVILLE WISC  
AMPHENOL CABLE & WIRE DIV  
5 HARLEM AVE-63RD ST CHICAGO ILL  
AMPHENOL CANADA LTD  
349 CARLAW AVE TORONTO ONT CANADA  
AMPHENOL CONNECTOR  
1830 S 54TH AVE CHICAGO 50 ILL  
AMPHENOL ELECTRONICS CORP DANBURY-KNUJSEN  
DIV  
15 THORPE ST DANBURY CONN  
AMPHENOL WESTERN DIV  
9201 INDEPENDENCE AVE CHATSWORTH CALIF

# ELECTRONIC MANUFACTURERS-A-Z

AMPHENOL-BORG ELECTRONICS CO  
25TH AVE CERRAS BROOKVIEW ILL  
AMPLEX DIV CURRYSLER CORP  
P O BOX 2718 DETROIT 31 MICH  
AMPLEX RADIO PROD INC  
2072 PORTLOCK MILFORD RR & MICH  
AMPLIFIER CORP OF AMERICA  
308 BROADWAY NEW YORK 13 N Y  
AMPLITEL INC  
342 W 40 ST NEW YORK 18 N Y  
AMPLIVOX LTD  
BERESFORD AVENUE  
WENDLEY MIDDLESEX ENGLAND  
AMPLIVOX LTD ABBEY MFG EST MT PLSMT  
WENDLEY MIDDLESEX ENGLAND  
ANTHOR TESTING INSTRUMENT CO  
85-53 VAN SINDEREN AVE BROOKLYN 7 N Y  
ANTRON CORP  
17 FELTON ST BALTHAM 94 MASS  
ANACONDA ALUMINUM CO  
PO BOX 1654 LOUISVILLE 1 KY  
ANACONDA PRODUCTS  
20-A WATERBURY CONN  
ANACONDA WIRE & CABLE  
8TH & CLAY AVE MUSKOGEE MICH  
ANACONDA WIRE & CABLE CO  
MARION IND  
ANACONDA WIRE & CABLE CO QUALITY CONT  
HASTINGS-ON-HUDSON N Y  
ANACONDA WIRE & CABLE CO  
25 BROADWAY NEW YORK 4 N Y  
ANADIR INSTRUMENTS INC  
1873A ARRINTA ST, PO BOX 472  
VAN NUYS CALIF  
ANALAB INC  
30 CANFIELD RD CEDAR GROVE N J  
ANALOGUE CONTROLS INC  
200 FRANK RD HICKSVILLE N Y  
ANALYTIC SYSTEMS CO  
DIV/RESEARCH INSTRUMENT CORP  
904 N FAIR OAKS AVE PASADENA CALIF  
ANALYTICAL MEASUREMENTS INC  
585 MAIN ST CHATHAM N J  
ANCHOR METAL CO  
966 WEEKER AVE BROOKLYN 22 N Y  
ANCHOR PLASTICS CO  
34-36 34 ST LONG ISLAND CITY 6 N Y  
ANCHOR SPECIALTY MFG CO  
300 MOLLISTER RD TETERBORO N J  
ANCHOR WIRE CORP  
183-16 JAMAICA AVE JAMAICA 23 N Y  
ANDERSEN LABS INC  
501 WEB PARK AVE W HARTFORD CONN  
ANDERSON & SONS INC  
NORTH ELM ST WESTFIELD MASS  
ANDERSON ASSOCIATES N Y  
233 BROAD ST SUMMIT N J  
ANDERSON CONTROLS  
DES PLAIN ILL  
ANDERSON CONTROLS INC  
8939 PACIFIC AVE FRANKLIN PARK ILLINOIS  
ANDERSON ELECTRIC CORP SPEC PROD DIV  
P O BOX 2151 BIRMINGHAM ALA  
ANDERSON ELECTRONICS  
808 1710 ALTOONA PA  
ANDERSON GREENWOOD & CO  
1400 N RICE BELLAIRE TEXAS  
ANDERSON INC W E  
2921 BROOKLYN AVE KANSAS CITY MO  
ANDERTON ELECTRONIC LAB  
129 E 1800 S ST BOUNTIFUL UTAH  
ANDOVER INDUSTRIES INC  
ANDOVER OHIO  
ANDREA RADIO CORP  
27-01 BRIDGE PLAZA N  
LONG ISLAND CITY 1 N Y  
ANDREW ANTENNA CORP  
606 BEECH ST WHITBY ONTARIO CAN  
ANDREW CALIFORNIA CORP  
931 MARYLAND AVE CLAREMONT CALIF  
ANDREW CORP  
P O BOX 5897 BETHESDA 14 MD  
ANDREW CORP  
36 E 75 ST CHICAGO 19 ILL  
ANDREW CORP  
10401 W 143RD ST ORLAND PARK ILL  
ANDROMEDA INC  
3742 HOWARD AVE KENSINGTON MD  
ANEXLEX CORP  
150 CAUSEWAY ST BOSTON 15 MASS  
ANEMOSTAT CORP OF AMER FRM INST DIV  
15 FLOWER HARTFORD CONN  
ANETSBERGER BROS INC  
175 N ANETS DR NORTHBROOK ILL  
ANGLE COMPUTER CO  
1709 STANDARD AVE GLENDALE 1 CALIF  
ANIMATION INC  
8504 MELROSE AVE HOLLYWOOD 46 CALIF  
ANKC MFG CO  
5025 N 124TH ST MILWAUKEE 18 WIS  
ANNIS CO R B  
1101 N DELAWARE ST INDIANAPOLIS IND  
ANSCO DIV GENL ANILINE & FILM CORP  
VESTAL PARKWAY EAST BIRMGHAMTON N Y  
ANSLEY MO CO ARTHUR  
NEW HOPE PA  
ANSONIA WIRE & CABLE CO  
111 MARTIN ST ASHTON R I  
ANTARA CHEMICALS  
DIV GENERAL ANILINE & FILM CORP  
433 HULSON ST NEW YORK 18 N Y  
ANTENNA & RADOME RESEARCH ASSOC  
1 BOND ST WESTBURY N Y  
ANTENNA DESIGNS INC  
225 S 3RD ST BURLINGTON IOWA  
ANTENNA PRODUCTS  
3753 NORTH CLARK ST CHICAGO 13 ILL

ANTENNA SPECIALISTS CO  
12435 EUCLID AVE CLEVELAND 6 OHIO  
ANTENNA SYSTEMS INC  
HINGHAM 1ND CENTER HINGHAM MASS  
ANTI-CORROSION PRODUCTS INC  
P O BOX 1894 ALBANY N Y  
ANTI-CORROSION METAL PRODUCTS CO  
CASTLETON-ON-HUDSON N Y  
ANTLAB INC  
6330 PROPRIETORS RD BORTHINGTON OHIO  
ANTON ELECTRONIC LABS  
1226 FLUSHING AVE BROOKLYN 37 N Y  
ANTON MACHINE WORKS  
1226 FLUSHING AVE BROOKLYN 37 N Y  
ANTREX CORP  
856 N ROCKWELL CHICAGO 22 ILL  
ANTRONIC CORP  
2712 W MONROSE AVE CHICAGO ILL  
ANZAC ELECTRONICS INC  
CAMBONDALE ILL  
APAMOUSE CORP OF M E  
1312 BOYLSTON ST BOSTON 15 MASS  
APC ELECTRONIC PRODUCTS DIV  
808 110 MINERAL BELLS TEXAS  
APEX COATED FABRICS CO  
12 E 22 ST NEW YORK 10 N Y  
APEX COIL TRANSFORMER CORP  
1919 S FAIRFIELD AVE CHICAGO 8 ILL  
APEX ELECTRONICS INC  
100 8TH ST PASSAIC N J  
APEX MACHINE CO  
14 13 118TH ST COLLEGE POINT 96 N Y  
APEX WIRE & CABLE CORP  
237 ST 31 W YORK 32 M Y  
APPALACHIAN ELECTRONIC INST  
RONCEVERTE W VA  
APPARATUS DEVELOPMENT CO  
115 MAIN ST WETHERSFIELD 9 CONN  
APPLE FREQUENCY MEASURING SERVICE M L  
609 UNION AVE BURLINGTON N C  
APPLICATE B CO C J  
1840 28 ST BOULDER COLO  
APPLETON CO INC HARRY  
136 SAN FERNANDO RD LOS ANGELES 31 CALIF  
APPLIED COHN SYSTEMS  
8535 WAREN DR CULVER CITY CALIF  
APPLIED DYNAMICS SUB BOMBAR INST CORP  
P O BOX 2058 ANN ARBOR MICH  
APPLIED ELECTRONICS CO SUB RAYTHEON CO  
213 E GRAND AVE S SAN FRANCISCO CALIF  
APPLIED ELECTRONICS CORP  
22 CENTER ST METUCHEN N J  
APPLIED MAGNETICS CORP  
SANTA BARBARA A/P BLDG 304 GOLETA CALIF  
APPLIED PHYSICS CORP  
2724 SO PECK RD MONROVIA CALIF  
APPLIED RADIATION CORP  
2408 N MAIN ST WALNUT CREEK CALIF  
APPLIED RESEARCH INC  
76 S BAYLES AVE PORT WASHINGTON N Y  
APPLIED RESEARCH LABS  
5717 PARK PL GLENDALE 6 CALIF  
APPLIED SCIENCE CORP OF PRINCETON  
15591 CADRITE RD VAN NUYS CALIF  
APPLIED TECHNOLOGY CORP  
475 5TH AVE NEW YORK 17 N Y  
APPLIED TECHNOLOGY INC  
930 INDUSTRIAL AVE PALO ALTO CALIF  
APOLLON METAL WORKS  
6450 S OAK ST CHICAGO 38 ILL  
ARCAN EASTERN LTD  
P O BOX 150 STA C HAMILTON ONT CANADA  
ARCH GEAR WORKS INC  
97 HOLMES ST N QUINCY MASS  
ARCH INSTRUMENT CO  
101 HOLMES ST N QUINCY MASS  
ARCO CO  
7301 BESSEMER AVE CLEVELAND 27 OHIO  
ARCO ELECTRONICS INC  
64 WHITE ST NEW YORK 13 N Y  
ARCO TRANSFORMER ELECTRIC CORP  
1602 S HANNA ST FT BAYNE 5 IND  
ARCS INDUSTRIES INC  
BOX 1008 WEST BABYLON L I N Y  
ARCS INDUSTRIES INC  
1239 SUNRISE HWY WEST ISLIP N Y  
ARCE ASSOCIATES  
1729-66TH ST BROOKLYN 4 N Y  
ARDE ENGINEERING DIV ARDE ASSOCIATES  
75 AUSTIN ST NEWARK 2 N J  
ARDENTE ACOUSTIC LABS LTO  
MIMERVA RD LONDON N W 10 ENGLAND  
ARENBERG ULTRASONIC LABORATORY INC  
94 GREEN ST JAMAICA PLAIN 30 MASS  
ARENS CONTROLS INC  
2017 GREENLEAF ST KEANON ILL  
ARGAS CORP  
626 SCHUYLER AVE EVANSTON N J  
ARPHONE ELECTRONICS MFG CORP  
165-11 SOUTH RD JAMAICA 33 N Y  
ARGOS PRODUCTS CO  
301 MAIN ST GENOA ILL  
ARIEL DAVIS MFG CO  
3487 50 STATE ST SALT LAKE CITY UTAH  
ARIES LABS INC  
225 GREENWICH AVE STAMFORD CONN  
ARIZONA ELECTRONICS INC  
BOX 244 BENSON ARIZONA  
ARK ENGG CO  
431 W TADOR RD PHILA 20 PA  
ARK-LES SWITCH CORP  
51 WATER ST WATERTOWN 72 MASS  
ARKAY CO  
605 1 AVE S W ROCHESTER MINN  
ARKAY ENGINEERING INC  
225 SANTA MONICA BLVD SANTA MONICA CALIF

ARKAY INTERNATIONAL INC  
88 06 VAN BYCK EXPWAY RICHMOND HILL 18 NY  
ARLIN MFG CO  
12 PERKINS ST P O BOX 296 LOWELL MASS  
ARLO ELECTRONICS CORP  
22 WARREN DR SYOSSET L I N Y  
ARMA CORP B CV-A  
BOX 1120 SAN DIEGO 12 CALIF  
ARMA DIV AMERICAN BOSCH CORP  
ROOSEVELT FIELD GARDEN CITY NY  
ARMA COMPANY  
287 FENDALE ST FRANKLIN SQUARE L I N Y  
ARMC STEEL CORP  
703 CURTIS ST MIDDLETOWN OHIO  
ARME ELECTRONICS INC  
840 S AVE BROOKLYN 32 N Y  
ARMENTA LABORATORIES  
932 SO GERRHART AVE LOS ANGELES 22 CALIF  
ARMOUR ALLIANCE INDUSTRIES  
16123 ARMOUR ST N E ALLIANCE OHIO  
ARMOUR INDUSTRIAL CHEMICAL CO  
110 N BAKER DR CHICAGO 6 ILL  
ARMOUR STABVOLT DIV  
3160 W EL SEGUNDO BLVD HASTHORNE CALIF  
ARMSTRONG BROS TOOL CO  
5200 W ARMSTRONG AVE CHICAGO ILL  
ARMSTRONG CORK CO  
LANCASTER PENNA  
ARMSTRONG EMBITRTH EQUIPMENT  
HULLCOTE GLOUCESTER ENGLAND  
ARMHOLD CERAMICS INC  
1 E 57TH ST NEW YORK 22 NY  
ARNOLD ENG & CO  
P O BOX 6 WARENGO ILL  
ARNOLD ENGG CO/REPAPH PACIFIC DIV  
641 E 61ST ST LOS ANGELES 1 CALIF  
ARNOLD MAGNETICS CORP  
6050 W JEFFERSON BLVD LOS ANGELES 16 CALIF  
ARNOUX CORP  
1924 W BASHINGTON BLVD LOS ANGELES CALIF  
ARQ INC  
ARNOLD ATR FORCE BASE STATION TENN  
ARROE FASTENER CO INC  
1 JUNIUS ST BROOKLYN 12 N Y  
ARROW RADIO CO  
1829 DAVENPORT RD TORONTO ONTARIO CANADA  
ARROW TOOL CO INC  
36 HILL ST WETHERSFIELD CONN  
ARROW-HART & HEGEMAN ELECTRIC CO  
103 HASTHORNE ST HARTFORD 6 CONN  
ARROWHEAD PRODUCTS  
2300 CURRY ST LONG BEACH 1 CALIF  
ART DECORATING CO  
4201 HUDSON BLVD N BERGEN N J  
ART WIRE & STAMPING CO  
227 HIGH ST NEWARK 2 N J  
ARTISAN ELECTRONICS CORP  
171 RIDGEDALE AVE MORRISTOWN N J  
ARTISAN METAL WORKS CO  
11400 MADISON AVE CLEVELAND 2 OHIO  
ARTOS ENGG CO  
2757 S 28TH ST MILWAUKEE 46 WISC  
ARTRONIC INSTRUMENT CO  
11232 TRIANGLE LA SILVER SPRING MD  
ARTTED CO INC  
367 BORTHINGTON ST SPRINGFIELD 3 MASS  
ARVEY CORP  
300 COMMUNIPAB AVE JERSEY CITY 4 N J  
ARVIN INDUSTRIES INC  
COLUMBUS IND  
ARWOOD PRECISION CASTINGS  
70 WASHINGTON ST BROOKLYN 1 N Y  
ASCH EQUIPMENT CO  
642 KEOWEE ST DAYTON 6 OHIO  
ASCO WIRE & CABLE CO  
2 BURLINGHAM ST BRIDGEPORT 8 CONN  
ASCP DIV ELECTRO MECHANICAL RESEARCH INC  
44 BALLACE RD PRINCETON N J  
ASHEVILLE-SCHOONMAKER NICA CO  
900 JEFFERSON AVE NEWPORT NEWS VA  
ASHLAND ELECTRIC PRODUCTS INC  
3202 QUEENS BLVD LONG ISLAND CITY 1 N Y  
ASKANIA REGULATOR CO  
240 E ONTARIO ST CHICAGO 11 ILL  
ASSEMBLY PRODUCTS INC  
277 FRANKLIN AVE BYCKOFF N J  
ASSEMBLY PRODUCTS INC  
75 WILSON HILLS RD CHESTERLAND OHIO  
ASSOC MISSILE PRODS CORP  
BOX 769 POMONA CALIF  
ASSOC SPRING CORP  
BRISTOL CONN  
ASSOC SPRING CORP SEABOARD COIL SPRING DIV  
15001 S BROADWAY GARDENA CALIF  
ASSOCIATED AMERICAN BINDING MACHINERY INC  
750 ST ANNS AVE NEW YORK 36 N Y  
ASSOCIATED ELECTRICAL INDUSTRIES LTD /  
TELECOMMUNICATIONS DIV  
155 CHARING CROSS RD LONDON W C 2 ENGLAND  
ASSOCIATED ELECTRICAL INDUSTRIES LTD /  
TELECOMMUNICATION TRANSMISSION DEPT  
155 CHARING CROSS RD LONDON W C 2 ENGLAND  
ASSOCIATED ELECTRICAL INDUSTRIES LTD  
CARHOLME RD LINCOLN ENGLAND  
ASSOCIATED ELECTRICAL INDUSTRIES LTD / RADIO  
ELECTRONIC COMPONENTS DIV  
155 CHARING CROSS RD LONDON W C 2 ENGLAND  
ASSOCIATED ENG & MFG CORP  
210 STONEHOUSE RD GLEN RIDGE N J  
ASSOCIATED ENG & MFG CORP  
210 STONEHOUSE RD GLEN RIDGE N J  
ASSOCIATED ENG CORP  
65 KENT ST BROOKLYN 46 MASS  
ASSOCIATED ENG CORP  
65 KENT ST BROOKLYN 46 MASS

# ELECTRONIC MANUFACTURERS-A-Z

ASSOCIATED MFG CO  
4755 N ROCKWELL ST CHICAGO 25 ILL  
ASSOCIATED MFG CO  
4755 N ROCKWELL ST CHICAGO 25 ILL  
ASSOCIATED NUCLEONICS INC  
975 STEWART AVE GARDEN CITY L I N Y  
ASSOCIATED NUCLEONICS INC  
975 STEWART AVE GARDEN CITY L I N Y  
ASSOCIATED PRODUCTION CO  
162 N CLINTON ST CHICAGO 6 ILL  
ASSOCIATED PRODUCTION CO  
162 N CLINTON ST CHICAGO 6 ILL  
ASSOCIATED RESEARCH INC  
3787 W BELMONT AVE CHICAGO 18 ILL  
ASSOCIATED RESEARCH INC  
3787 W BELMONT AVE CHICAGO 18 ILL  
ASSOCIATED SPECIALTIES CO  
1751 MAIN ST OREFIELD PA  
ASSOCIATED SPECIALTIES CO  
1751 MAIN ST OREFIELD PA  
ASSOCIATED TESTING LABS  
109 CLINTON RD CALDWELL N J  
ASSOCIATED TESTING LABS  
109 CLINTON RD CALDWELL N J  
ASTATIC CORP  
250 HARBOR ST CONNEAUT OHIO  
ASTATIC CORP  
250 HARBOR ST CONNEAUT OHIO  
ASTRO SYSTEMS INC  
220 E 23RD ST NEW YORK 10 N Y  
ASTRO SYSTEMS INC  
220 E 23RD ST NEW YORK 10 N Y  
ASTRO-GEARS INC  
67 TESLER WAY SEATTLE WASH  
ASTRO-GEARS INC  
67 TESLER WAY SEATTLE WASH  
ASTRONIC CORP  
GLENDALE CALIF  
ASTRONIC CORP  
GLENDALE CALIF  
ASTRON CORP  
255 GRANT AVE E NEWARK N J  
ASTRON CORP  
255 GRANT AVE E NEWARK N J  
ASTRONOMICS INC  
809 450 RED BANK N J  
ASTRONOMICS INC  
809 450 RED BANK N J  
ATCHELY INC RAYMOND  
2339 COTNER AVE LOS ANGELES 64 CALIF  
ATCHELY INC RAYMOND  
2339 COTNER AVE LOS ANGELES 64 CALIF  
ATELIERS DE MONTAGES ELECTRIQUES  
77 RUE SAINT CHARLES PARIS 15EME FRANCE  
ATELIERS DE MONTAGES ELECTRIQUES  
77 RUE SAINT CHARLES PARIS 15EME FRANCE  
ATKINS & MERRILL INC  
POST RD SOUTH SUDBURY MASS  
ATKINS & MERRILL INC  
POST RD SOUTH SUDBURY MASS  
ATKINSON DYNAMICS  
10 WEST ORANGE AVE SO SAN FRANCISCO CALIF  
ATKINSON DYNAMICS  
10 WEST ORANGE AVE SO SAN FRANCISCO CALIF  
ATKINSON LAB INC  
7070 SANTA MONICA BLVD LOS ANGELES CALIF  
ATKINSON VALVE CO INC  
345 W ABBOTT ST INDIANAPOLIS 25 IND  
ATLANTIC & PACIFIC WIRE & CABLE CO  
137 GRAND ST NEW YORK NY  
ATLANTIC ELECTRONICS CO  
89-91 JEFFERSON ST PASSAIC N J  
ATLANTIC INSTRUMENT CORP  
92 BROADWAY WOHORND MASS  
ATLANTIC MFG CO  
86 NEW HAVEN AVE MILFORD CONN  
ATLANTIC RESEARCH CORP  
901 N COLUMBUS ST ALEXANDRIA VA  
ATLANTIC TRANSFORMER CORP  
30 MYNES AVE GROTON CONN  
ATLANTIC VIDEO CORP  
18 CLINTON ST BROOKLYN 2 N Y  
ATLANTIS ELECTRONICS CORP  
1807 STAFFORD DR GARLAND TEXAS  
ATLAS CHAIN & MFG CO  
P O BOX 708 WEST PITTSSTON PA  
ATLAS COIL CORP  
63 MAIN ST ANSONIA CONN  
ATLAS ELECTR CO  
8673 VENICE BLVD LOS ANGELES 34 CALIF  
ATLAS ELECTRIC PRODUCTS CO  
P O BOX 1591 ERIE PA  
ATLAS ENG CO  
176 BLUE HILL AVE ROXBURY 19 MASS  
ATLAS FILM CORP  
1111 S BLVD OAK PARK ILL  
ATLAS MINERAL PRODUCTS CO  
151 WALNUT ST HERTZTOWN PA  
ATLAS OVERHEAD DOOR CO  
MILL ST AT READING RR QUAKERTOWN PA  
ATLAS POWDER CO  
BILMINGTON 99 DEL  
ATLAS PRECISION PRODUCTS CO  
3801 CASTOR AVE PHILADELPHIA 24 PA  
ATLAS RESISTOR CO  
1128 MADISON ST CHESTER PA  
ATLAS SCREWS & SPECIALTY CO  
450 BROOMFIELD ST NEW YORK 1 N Y  
ATLAS SOUND CORP  
1449 34 ST BROOKLYN 18 N Y  
ATLAS SOUND CORP  
783 HARRISON ST W HEMPSTEAD L I N Y  
ATLEE COMPONENTS INC  
8220 LANCKERSHIM BLVD N HOLLYWOOD CALIF  
ATLEE CORP  
47 PROSPECT ST BOBURN MASS

ATMOSPHERE CONTROL CO INC  
5315 CHESTER AVE PHILA 43 PENNA  
ATOCON CORP  
527 N UNION ST GALION OHIO  
ATOMIX ELECTRONICS  
7648 849 FERNANDO RD SUN VALLEY CALIF  
ATOMIC ACCESSORIES INC  
811 W MERRICK RD VALLEY STREAM N Y  
ATOMIC LABS INC  
3084 CLAREMONT AVE BERKELEY 5 CALIF  
ATONICS INTERNATIONAL  
P O BOX 309 CANOGA PARK CALIF  
ATRONIC PRODUCTS INC  
1 BALA AVE BALA CYNWOOD PA  
ATTLEBORO REFINING CO  
36 UNION ST ATTLEBORO MASS  
AU-TEMP CO CORP  
657 BROADWAY NEW YORK 12 N Y  
AUBURN MFG CO  
PEASE AVE & STACK ST MIDDLETOWN CONN  
AUBURN SPARR PLUG CO  
89 YORK ST AUBURN N Y  
AUGAR INC  
109 01 37TH AVE CORONA N Y  
AUDICON ELECTRONICS INC  
216 LYON ST PATERSON 4 N J  
AUDIO ACCESSORIES  
279 BROADWAY AMITYVILLE N Y  
AUDIO DEVELOPMENT  
8233 13TH AVE S MINNEAPOLIS MINN  
AUDIO DEVICES INC  
840 N FAIRFAX AVE LOS ANGELES 46 CALIF  
AUDIO DEVICES INC  
844 MADISON AVE NEW YORK 22 N Y  
AUDIO DEVICES INC RECTIFIER DIV  
620 E DYER RD SANTA ANA CALIF  
AUDIO ELECTRONICS  
15856 95TH N E SEATTLE 95 WASH  
AUDIO EQUIPMENT CO  
75 HARBOR ROAD PORT WASHINGTON N Y  
AUDIO INSTRUMENT CO  
135 W 14 ST NEW YORK 11 N Y  
AUDIO LABS PROD INC  
74 E PALISADE AVE ENGLEWOOD N J  
AUDIO-MASTER CORP  
17 E 48 ST NEW YORK 17 N Y  
AUDIOSEARCH CORP  
514 BROADWAY NEW YORK 12 N Y  
AUDIOMATION LABS  
7230 CLINTON RD UPPER DARTM 14 PA  
AUDIOSEARS CORP  
SHEPARD HILL RD BOLEBY N Y  
AUDIOTEK MFG CO/DIV G C TEATRON INC  
600 S SYMAN ROCKFORD ILL  
AUDIOTRONICS CORP  
BOX 508 NORTH HOLLYWOOD CALIF  
AUDIVOR  
123 WORCESTER ST BOSTON MASS  
AUDIOWALL CO  
57 RACK AVE SHELBY OHIO  
AUERBACH ELECTRONICS CORP  
1634 ARCH ST PHILA 3 PA  
AUGAT BRDS  
33 PERRY AVE ATTLEBORO MASS  
AUREA CORP  
1117 N FRANKLIN ST CHICAGO 10 ILL  
AUSTENAL CO DIV OF HOWE SOUND CO  
224 E 39TH ST NEW YORK 16 N Y  
AUSTIN ELECTRONICS DIV AUSTIN CO  
76 9TH AVE NEW YORK 11 NY  
AUSTIN INC A B  
P O BOX 100 BARBERTON OHIO  
AUTH ELECTRIC CO  
34-20 89 ST LONG ISLAND CITY 1 N Y  
AUTHORIZED MFGS SERVICE CO  
919 BYCKOFF AVE BROOKLYN 21 N Y  
AUTO TEST INC  
600 S MICHIGAN AVE CHICAGO 3 ILL  
AUTO TEST INC  
411 W 8TH ST MELLVILLE WISC  
AUTO-SWAGE PRODUCTS INC  
SHELTON CONN  
AUTOCRAFT ELEC CO  
5024 ELM ST SKOKIE ILL  
AUTODYNE  
236 PARK AVE WETHPAGE L I N Y  
AUTOMATIC & PRECISION MFG CO  
252 HATHORNE AVE YONKERS N Y  
AUTOMATIC COIL CO INC  
199 SACRET ST BROOKLYN 31 NY  
AUTOMATIC CONTROL CO  
995 UNIVERSITY AVE ST PAUL 6 MINN  
AUTOMATIC ELECTRIC CO  
NORTH-LAKE ILL  
AUTOMATIC FIRE ALARM CO  
151 WEST 15TH ST NEW YORK 11 N Y  
AUTOMATIC METAL PRODUCTS CORP  
323 BERRY ST BROOKLYN 11 N Y  
AUTOMATIC MFG CORP  
65 GOUVERNEUR ST NEWARK 4 N J  
AUTOMATIC RADIO MFG CO  
122 BROOKLINE AVE BOSTON 19 MASS  
AUTOMATIC SWITCH CO  
MANOVER RD FLORHAM PARK N J  
AUTOMATIC TIMING & CONTROLS INC  
KING OF PRUSSIA PENNA  
AUTOMATION COMPONENTS INC  
875 HICKORY ST PECKVILLE PA  
AUTOMATION DEVELOPMENT CO  
11824 JEFFERSON BLVD CULVER CITY CALIF  
AUTOMATION DEVICES INC  
3125 BRANDES ST ERIE PENNA  
AUTOMATION DYNAMICS CORP  
255 COUNTY RD TENAFLY N J  
AUTOMATION INC  
212 WORCESTER ST BELLESLY HILLS 62 MASS

AUTOMATION INDUSTRIES INC  
INDUSTRIAL PK BOULDER COLO  
AUTOMATION INDUSTRIES INC  
3613 AVIATION BLVD MANHATTAN BCH CALIF  
AUTOMATION INDUSTRIES INC  
771 HAMILTON AVE MENLO PARK CALIF  
AUTOMATION INSTS INC  
401 E GREEN ST PASADENA CALIF  
AUTOMATION MANAGEMENT INC  
25 BRIGHAM ST WESTBORO MASS  
AUTOMATION SPECIALTIES CO  
7666 AUSTIN ST FOREST HILLS L I N Y  
AUTOMECH ASSOC INC  
259 BASHINGTON AVE P O BOX 394 NORTH  
HAVEN CONN  
AUTOMETRIC INC  
1501 BROADWAY NEW YORK N Y  
AUTONETICS  
SUITE 503 MORSCHI ELDG  
905 16TH ST NW WASHINGTON 6 D C  
AUTONETICS DIV N A A  
3046 OSTRON AVE LONG BEACH 8 CALIF  
AUTONETICS DIV NORTH AMERICAN AVIATION INC  
9150 E IMPERIAL HWY DOWNEY CALIF  
AUTONETICS DIV OF N A A  
11752 DEBBIE LANE GARDEN GROVE CALIF  
AUTOSCREW CO INC  
218 W 18 ST NEW YORK 11 N Y  
AUTOTRON INC  
3629 N VERNILION ST DANVILLE ILL  
AUTOTRONICS INC  
P O BOX 206 FLORISSANT MO  
AUTRON ENG INC  
1301 WILSHIRE BLVD LOS ANGELES 17 CALIF  
AUTRONICS CORP  
5440 ALHAMBRA AVE LOS ANGELES 32 CALIF  
AVCO CORP  
12 ESSEX ST STONEHAM 8 MASS  
AVCO CORP - EVERETT RESEARCH LAB  
2385 REVERE BEACH PKWY EVERETT MASS  
AVCO CORP CROSLLEY DIV  
1329 ARLINGTON ST CINCINNATI 25 OHIO  
AVCO CORP NASHVILLE DIV  
NASHVILLE 1 TENN  
AVCO MFG - CROSLLEY DIV  
750 COMMONWEALTH AVE BOSTON MASS  
AVCO MFG CO - CROSLLEY DIV  
EVANDALE OHIO  
AVCO MFG CORP CROSLLEY DIV  
109 N W CIENEGA BLVD BEVERLY HILLS CALIF  
AVCO MFG RAD  
287 ANDOVER ST DANVERS MASS  
AVCON CORP  
BOX 3431 BRAND CENTRAL STATION NEW YORK 17 N Y  
AVDEL INC  
210 S VICTORY BLVD BURBANK CALIF  
AVERY ADHESIVE LABEL  
117 LIBERTY ST NEW YORK N Y  
AVIA PROD CO  
7270 BEVERLY BLVD LOS ANGELES 36 CALIF  
AVIATION DEVELOPMENT INC  
210 S VICTORY BLVD BURBANK CALIF  
AVIATION ELECTRONIC SERVICE  
N 12 ST WHEELING ILL  
AVIEL ELECTRONICS INC  
4204 GLENCOE AVE VENICE CALIF  
AVIEN INC  
224 E NORTHERN BLVD WOODSIDE 7 L I N Y  
AVIONICS DIV-BELL AIRCRAFT CORP  
P O BOX 1 BUFFALO 5 N Y  
AVIONICS LTD P O BOX 200  
NIAGARA-ON-THE-LAKE ONTARIO CANADA  
AVITRONICS INC  
P O BOX 2076 DANBURY CONN  
AVNET CORP  
70 STATE ST WESTBURY N Y  
AVNET CORPORATION  
5077 RODEO ROAD LOS ANGELES 16 CALIF  
AVNET ELECTRONIC SUPPLY CO  
36 N MOORE ST NEW YORK 13 N Y  
AVNET ELECTRONICS CORP OF N CALIF  
1362 N LAWRENCE STATION RD SUNNYVALE CAL  
AVO LTD  
80 SHORE RD PORT WASHINGTON NY  
AVON GEAR CO  
2009 RICE ST MELROSE PARK ILL  
AVON TUBE DIV HIGBIE MFG CO  
BARRETT RD ROCHESTER MICH  
AVTRON MFG INC  
10400 HECH AVE CLEVELAND 9 OHIO  
AXEL BROS INC/ELECTRONICS DIV  
134-20 JAMAICA AVE JAMAICA 18 N Y  
AXLER ASSOCIATES INC  
102-42 43 AVE NEW YORK 68 N Y

**B**

B & B MAGNETICS CO  
331 E 4TH ST LA HABRA CALIF  
B & C INSULATION PRODUCTS INC  
LINCOLN HWY ISELIN N J  
B & F ENTERPRISES  
1627 ROCKFORD ACRON 19 OHIO  
B & F INSTRUMENTS INC  
3444 N LAWRENCE ST PHILA 40 PA  
B & H INSTRUMENT CO INC  
3479 W VICKERY BLVD FT WORTH 7 TEXAS  
B & K INSTRUMENTS INC  
3044 W 100TH ST CLEVELAND 11 OHIO  
B & K MFG CO  
1801 W BELLE PLAINE AVE CHICAGO 13 ILL  
B & K MFG CO  
3726 N SOUTHPORT CHICAGO ILL



# ELECTRONIC MANUFACTURERS-A-Z

B & M ELECTRIC CORP  
168 7TH ST BROOKLYN 4 NY

B F GOODRICH INDUSTRIAL PRODUCTS CO  
MARIETTA OHIO

B I F INDUSTRIES  
345 HARRIS AVE PROVIDENCE R I

B J SERVICE INC  
6505 PARAMOUNT BLVD LONG BEACH 5 CALIF

B-M ELECTRONICS  
P BOX 24724 LOS ANGELES 25 CALIF

B-W MFGS INC PHILLIPS RADIO DIV  
721 N WEBSTER ST KOKOMO IND

BABBITT CHEMICAL CO  
38 PROSPECT ST NEW BEDFORD MASS

BABCO PRODUCTS INC  
28 WATER ST DANVERS MASS

BABCOCK & WILCOX CO  
TUBULAR PRODUCTS DIV BEAVER FALLS PA

BABCOCK RADIO ENGG  
1640 MONROVIA AVE COSTA MESA CALIF

BABCOCK RELAYS INC  
1640 MONROVIA AVE COSTA MESA CALIF

BACH AURICON INC  
6900 ROMAINE AVE HOLLYWOOD 38 CALIF

BACH-SIMPSON LTD  
1255 BRYDGES ST LONDON ONT CANADA

BACHE & CO SEMON  
636 GREENWICH ST NEW YORK 14 N Y

BACON INDUSTRIES  
192 PLEASANT ST WATERTOWN 72 MASS

BADGER GRDN WKS CORP LIBERTY POWDER DEF  
BARABOO WISC

BAER CO N S  
1-11 MONTGOMERY ST HILLSIDE 5 N J

BAIA CORP  
9353 LEE RD - R 7 JACKSON MICH

BAILEY INC P & INDUSTRIAL ELECTRONICS DEPT  
14 ALSOP AVE MIDDLETOWN CONN

BAILEY METER CO  
29 BALA AVE BALA-CYNWYD

BAILEY METER CO METROTYPE DIV  
29901 EUCLID AVE WICKLIFFE OHIO

BAILEY METER COMPANY  
1050 IVANHOE RD CLEVELAND 10 OHIO

BAIRD-ATOMIC INC  
37 UNIVERSITY RD CAMBRIDGE 38 MASS

BAKER CHEMICAL CO J T  
PHILLIPSBURG N J

BAKER CO  
104 GRANITE ST BIDDEFORD ME

BAKER INDUSTRIES INC PYROTRONICS DIV  
10 EMPIRE ST NEWARK N J

BALCO MFG CO ALERT PROD DIV  
1531 16TH AVE SACRAMENTO 18 CALIF

BALCO RESEARCH LABS CAPACITOR DIV  
49-53 EDISON PL NEWARK 2 N J

BALCRAM INC MACHINE TOOL DIV  
OISNEY ST CINCINNATI 9 OHIO

BALDWIN LIMA HAMILTON CORP LOEWE HYDRO DIV  
111 - 5TH AVE NEW YORK 3 N Y

BALDWIN LIMA HAMILTON CORP  
ELLERY LA WESTPORT CONN

BALDWIN PIANO CO  
1801 GILBERT AVE CINCINNATI 2 OHIO

BALDWIN PRODUCTS CORP  
432 E VALLEY BLVD SAN GABRIEL CALIF

BALDWIN-LIMA-HAMILTON CORP  
WALTHAM 54 MASS

BALL BROTHERS RES CORP  
BOULDER INDUSTRIAL PARK BOULDER COLO

BALMANTINE LABS INC  
BOONTON N J

BALLANTYNE CO  
1712 JACKSON ST OMAHA 2 NEBR

BALLASTRAAN CORP  
1701 N CALHOUN ST FT WAYNE IND

BALTEAU ELECTRIC CORP  
NEW & HEADROW STS STAMFORD N Y

BALTIMORE TRANS & COIL CO  
5607 WASHINGTON BLVD ELK RIDGE 27 MD

BAMFORD CORP  
1167 TENNESSEE AVE LOS ANGELES CALIF

BANCRAFT INC  
3819 N PUEBLO CHICAGO 34 ILL

BAR-RAY PRODUCTS INC  
269 25TH ST BROOKLYN 32 N Y

BARBER & HOWARD CO  
EAST AVE WESTERLY R I

BARBER LARS ALFRED W  
32-44 FRANCIS LEWIS BLVD FLUSHING 58 N Y

BARBER-COLMAN CO  
1300 ROCK ST ROCKFORD ILL

BARBER-COLMAN CO AIRCRAFT CONTROLS DIV  
ROCKFORD ILL

BARBER-COLMAN CO ELECTRICAL COMP DIV  
ROCKFORD ILL

BARBER-COLMAN CO SMALL MOTORS DIV  
ROCKFORD ILL

BARCO CHEMICAL PRODUCTS CO  
701 S LASALLE ST CHICAGO 5 ILL

BARCEN CORP  
200 PARK AVE DANBURY CONN

BARIUM & CHEMICALS INC  
WILLOUGHBY OHIO

BARKER & WILLIAMSON INC  
CANAL & BEAVER STS BRISTOL PENNA

BARKLEY & DEXTER LABS  
50 FRANKFORT ST FITCHBURG MASS

BARLOWE ELECTRONICS  
392 BANTAGH AVE BETHPAHE N Y

BARNES DEVELOPMENT CO  
213 W BALTIMORE AVE LANSDOWNE PA

BARNES ENGINEERING  
30 COMMERCE RD STAMFORD CONN

BARNETT INSTRUMENT CO  
KRAFT ST CLARKSVILLE TENN

BARNSTEAD STILL & DEMINERALIZER CO  
331 LANESVILLE TERR BOSTON 31 MASS

BARRETT CO LEON J  
P O BOX 376 WORCESTER 1 MASS

BARRETT ELECTRONICS  
31732 MAR VISTA SOUTH LAGUNA CALIF

BARRETT ELECTRONICS CORP  
650 DUNDEE RD NORTHBROOK ILL

BARRETT ELECTRONICS CORP  
1015 LEMON ST MENLO PARK CALIF

BARRETT VARNISH CO  
1532 S 50 COURT CICERO 30 ILL

BARRY CONTROLS  
INSCO DIV GROTON MASS

BARRY CONTROLS INC  
700 PLEASANT ST WATERTOWN 72 MASS

BARRY CONTROLS INC WESTERN DIV  
1400 FLOWER ST GLENDALE CALIF

BARRY ELECTRONICS CORP  
512 BROADWAY NEW YORK N Y

BART MFG CORP  
135 MANCHESTER PL NEWARK N J

BARTH ENG & MFG CO  
88 ELW ST MERIDEN CONN

BARTON ELECTRONICS INC  
1000 FARMINGTON AVE W HARTFORD 7 CONN

BARTON MINES CORP  
GORE MOUNTAIN AVE N CREEK N Y

BARWOOD ELECTRONICS INC  
120 S MARYLAND AVE GLENDALE 5 CALIF

BASCO CO GEORGE  
19 HANSE AVE FREEPORT L I N Y

BASCO INC  
730 N JACKSON MILWAUKEE 1 WISC

BASIC & EXPERIMENTAL PHYSICS  
BOX 669 FALMOUTH MASS

BASIC TOOL IND INC  
P O BOX 472 GARDENA CALIF

BAUER ELECTRIC CO  
BOX 269 RT 143 HIGHLAND ILL

BASO INC  
730 N JACKSON ST MILWAUKEE 1 WISC

BASSETT INC REA  
1314 N E 17 CT FT LAUDERDALE FLA

BASTIAN BROS CO  
ROCHESTER 1 N Y

BAKER ENGINEERING CO  
17848 ROSCOE BLVD NORTHRIDGE CALIF

BAUGHMAN CO E J  
1914 N COGSWELL RD EL MONTE CALIF

BAUSCH & LOMB OPTICAL CO  
91760 BAUSCH ST ROCHESTER 2 N Y

BAY-ROY ELECTRONICS INC  
PO BOX 7503 CLEVELAND 30 OHIO

BAYLY  
AJAX ONTARIO CANADA

BAYSIDE TIME CO  
45-25 162 ST FLUSHING 58 N Y

BEACH-RUBS CO  
622 GRAYBAR BLDG NEW YORK 17 N Y

BEAD CHAIN MFG CO  
110 MOUNTAIN GROVE ST BRIDGEPORT 5 CONN

BEAM INSTRUMENTS CORP  
350 5TH AVE NEW YORK 1 N Y

BEAM TUBE CORP  
422 NORTH AVE WESTON MASS

BEAR MFG CO  
ROCK ISLAND ILL

BEATTIE-COLEMAN INC  
1000 N OLIVE ST ANAHEIM CALIF

BEAUCHAINE & SONS INC  
LAKEPORT N H

BEAVER GEAR WORKS INC  
1025 PARMELEE ST ROCKFORD ILL

BECCO CHEMICAL DIV FOOD MACHINERY CHEM CORP  
STATION B BUFFALO 7 N Y

BECCO CHEMICAL F R C  
34 SAWYER AVE -5TA B BUFFALO 7 NY

BECK CO HAROLD  
3640 N 2 ST PHILA 40 PENNA

BECKER ELECTRONICS MFG CORP  
1091 ROCKAWAY AVE VALLEY STREAM N Y

BECKER PRODUCTIONS V S  
551 S AVE NEW YORK 17 NY

BECKMAN & WHITLEY  
973 E SAN CARLOS AVE SAN CARLOS CALIF

BECKMAN INST INC BERKELEY DIV  
2200 WRIGHT AVE RICHMOND CALIF

BECKMAN INST INC SCIENTIFIC & PROC INST DIV  
2500 FULLERTON RD FULLERTON CALIF

BECKMAN INSTRUMENTS HELIPOINT DIV  
MOUNTAINSIDE N J

BECKMAN INSTRUMENTS INC SYSTEMS DIVISION  
325 N WALLEY AVE ANAHEIM CALIF

BECKMAN INSTS INC SPINCO DIV  
STANFORD INDUSTRIAL PARK PALO ALTO CALIF

BECKS INC  
298 E 5 ST ST PAUL 1 MINN

BECK CHEMICAL CO  
12933 S STONEY ISLAND CHICAGO 33 ILL

BEECH AIRCRAFT CORP  
1424 PEARL ST BOULDER COLO

BEECH AIRCRAFT CORP  
9709 E CENTRAL AVE WICHITA 1 KANS

BEEDE ELECTRICAL INSTRUMENT CO  
PENACOOK N H

BEEKER ENG CO  
401 N BROAD ST PHILA PA

BEETLE PLASTICS CORP CARL N  
198 AIRPORT RD FALL RIVER MASS

BEGEN CO M  
1683 JERROLD ST SAN FRANCISCO 24 CALIF

BEHLMAN ENG CO  
2911 WINONA AVE BURBANK CALIF

BEHR-MANNING CO  
4960 HOWE ST TROY N Y

BEKEY ELECTRIC CO INC  
1327 S MAIN ST LOS ANGELES 15 CALIF

BEKINS ELECTRONIC DIV  
1335 S FEGISERDA ST LOS ANGELES 15 CALIF

BEL FUSE INC  
311 MOUNTAIN RD UNION CITY N J

BELDEN MFG CO  
P O BOX 341 RICHMOND IND

BELDEN MFG CO  
415 S KILPATRICK CHICAGO 44 ILL

BELDING CORTICELLI INDUSTRIES INC  
1407 BROADWAY NEW YORK 18 N Y

BELDING HEMINWAY INC  
1407 BROADWAY NEW YORK 18 N Y

BELFAB CORP  
MUNICIPAL AIRPORT DAYTONA BEACH FLA

BELFAB CORP  
9 HOBSON AVE HAMDEN CONN

BELFUSE INC  
198 VAN VORST JERSEY CITY N J

BELL & GOSSETT CO  
36 OAK LA ANNANDALE VA

BELL & GOSSETT CO/DUALIX DIV  
8200 AUSTIN AVE MORTON GRIEVE ILL

BELL & HOWELL  
7100 MCCORMICK RD CHICAGO 45 ILL

BELL AEROSYSTEM CO  
749 MONROE ROCHESTER N Y

BELL AEROSYSTEM CO  
131 N LUOLOW ST DAYTON 2 OHIO

BELL AEROSYSTEM CO  
P O BOX 482 FORT WORTH TEXAS

BELL AEROSYSTEMS CO  
P O BOX 1 BUFFALO N Y

BELL AUTOMATION CORP  
749 MONROE AVE ROCHESTER 7 N Y

BELL ELECTRONICS SUPPLY CO  
1835 W 9TH ST CHESTER PA

BELL HELICOPTER  
P O BOX 482 FT WORTH TEXAS

BELL HELICOPTER CORP  
P O BOX 482 HURST TEXAS

BELL INC F W  
1356 NORTON AVE COLUMBUS 8 OHIO

BELL INC F W  
1356 NORTON AVE COLUMBUS 12 OHIO

BELL SOUND DIV THOMPSON RAMO WOODBRIDGE INC  
555 MARION RD COLUMBUS 7 OHIO

BELL SOUND SYSTEMS INC  
1394 ZOLLINGER RD COLUMBUS 21 OHIO

BELL TEL LABS  
ROOM 14-211 MURRAY HILL N J

BELL TEL LABS INC WESTERN ELECTRIC CO INC  
P O BOX 609 COCOA FLA

BELL TEL LABS WESTERN ELECTRIC CO INC  
WHIPPANY N J

BELL TELE LABS WESTERN ELECTRIC CO  
BOX 249 LITTLETON COLO

BELL TELEPHONE LAB  
463 WEST NEW YORK N Y

BELL TELEVISION  
5528 53RD ST NEW YORK 19 N Y

BELLAIRE ELECTRONICS INC  
62 WHITE ST RED BANK N J

BELLANDI CO INC M  
7510 W GRAND AVE ELMWOOD PARK 33 ILL

BELLEVILLE-MEXER CORP  
638 UNIVERSITY AVE LOS GATOS CALIF

BELLFORD METAL PRO  
5900 MAURICE AVE CLEVELAND OHIO

BELLING LEE ERCONA  
16 W 46TH ST NEW YORK 36 N Y

BELMAR WHEEL & MACHINE CO INC  
1707 F ST BELMAR N J

BELMET PRODUCTS INC  
503 MORGAN AVE BROOKLYN 22 N Y

BELMONT SMELTING & REFINING WORKS  
330 BELMONT AVE BROOKLYN 7 N Y

BELUCK INSTR CORP  
118-37 METROPOLITAN AVE KEN GARDENS 15 L I N Y

BELUCK INSTRUMENT CORP  
111-01 14 AVE COLLEGE POINT 56 N Y

BELTONE HEARING AID CO  
2900 W 36TH ST CHICAGO 32 ILL

BELZ INDUSTRIES INC  
89 UNION ST MINNEOLA L I N Y

BENIS BRO BAG CO  
408 FINE ST BOX 144 ST LOUIS 2 MO

BENCHMASTER MFG CO  
1835 W ROSECRANS AVE GARDENA CALIF

BENCO TELEVISION ASSOC LTD  
27 TABER RD READEALE ONT CANADA

BENDER INC TAL  
1902 E LINNWOOD AVE MILWAUKEE 11 WISC

BENDIX  
PO BOX 1159 KANSAS MO

BENDIX -COMPUTER DIV  
919 N MICHIGAN CHICAGO ILL

BENDIX CORP  
3325 WILSHIRE BLVD LOS ANGELES 5 CALIF

BENDIX CORP  
RED BANK DIV SEMICONDUCTOR DEPT  
201 WESTWOOD AVE LONG BRANCH N J

BENDIX CORP  
1104 FISHER BLDG DETROIT 2 MICH

BENDIX CORP BENDIX COMPUTER DIV  
5630 ARBOR VITAE LOS ANGELES CALIF

BENDIX CORP BENDIX PACIFIC DIV  
11600 SHERMAN WAY N HOLLYWOOD CALIF

BENDIX CORP BENDIX RADIO DIV  
BALTIMORE 4 MD

BENDIX CORP CINCINNATI DIV  
3130 RASSON RD CINCINNATI 8 OHIO

BENDIX CORP ECLIPSE MACHINE DIV  
ELMIRA N Y

BENDIX CORP ECLIPSE PIONEER DIV  
117 EAST PROVIDENCIA BURBANK CALIF

# ELECTRONIC MANUFACTURERS-A-Z

BENDIX CORP KANSAS CITY DIV  
1412 E 76TH ST KANSAS CITY 10 MO  
BENDIX CORP MONROE DIV  
SOUTH MONROE PENNA  
BENDIX CORP PIONEER-CENTRAL DIV  
2734 HICKORY GROVE RD DAVENPORT IOWA  
BENDIX CORP PROD DIV  
401 BENDIX DRIVE SOUTH BEND 20 IND  
BENDIX CORP RADIO DIV  
P O BOX 86 MARICOPA ARIZ  
BENDIX CORP RADIO DIV SAC  
P O BOX 2038 OMAHA CALIF  
BENDIX CORP REOBANK DIV  
RT 39 EASTONTON N J  
BENDIX CORP / SCINTILLA DIV  
DELAWARE AVE SIDNEY N Y  
BENDIX CORP SYSTEMS DIV  
3300 PLYMOUTH RD ANN ARBOR MICH  
BENDIX CORP YORK DIV  
YORK PA  
BENDIX CORP-COMPUTER DIV  
FIDELITY UNION LIFE BLDG DALLAS & TEXAS  
BENDIX CORP-ECLIPSE PIONEER DIV  
TETERBORO N J  
BENDIX PRODUCTS DIV-MISSILES  
400 BIEGER ST  
MISHAWAKA IND  
BENDIX RESEARCH LAB DIV  
SOUTHFIELD MICH  
BENDIX UTICA DIV  
211 SEWARD AVE UTICA N Y  
BENDIX-FRIEZ INSTRUMENT DIV  
BALTIMORE MD  
BENDIX-PACIFIC DIV  
16417 KESWICK ST VAN NUYS CALIF  
BENDIX-RADIO DIV  
EAST JOPPA ROAD TOWSON 4 MD  
BENDIX-RADIO DIV  
REISTERSTOWN RD 6 PAINTERS RD OBINGS MILLS  
MO  
BENDIX-RADIO DIV  
C/O BOX 1302-BRANCH P O ROME BRIFFISS AFB  
NY  
BENNETT & CO PAUL  
230 E OHIO ST CHICAGO 11 ILL  
BENNETT LABS INC  
4224 HOLDEN ST EMERYVILLE CALIF  
BENNETT MFG CO INC  
RAILROAD ST ALOHA NY  
BENRUS WATCH CO  
30 CHERRY AVE WATERBURY CONN  
BENSON-LENNER CORP  
11930 B OLYMPIC BLVD LOS ANGELES 44 CALIF  
BENSON-LENNER CORP  
1860 FRANKLIN ST SANTA MONICA CALIF  
BENSON-LENNER G B LTD  
WEST QUAY RD SOUTHAMPTON ENGLAND  
BENTLEY HARRIS MFG CO  
CONSHOHOCKEN JO PA  
BERG MFG CORP  
NEW CUMBERLAND PA  
BERGEN LABS INC  
60 SPRUCE ST PATERSON 8 N J  
BERGEN WIRE ROPE CO  
456 GREGG ST LODI N J  
BERKELEY CRYSTAL CO  
1740 UNIVERSITY AVE BERKELEY 3 CALIF  
BERKELEY DYNAMICS  
2831-7TH ST BERKELEY 2 CALIF  
BERKSHIRE LAB  
3 PLEASANT ST HANOVER N H  
BERKSHIRE LABS  
586 BERRY VILLAGE GREENVILLE N H  
BERKSHIRE TRANSFORMER CORP  
ROUTE 381 KENT CONN  
BERMAN LABS  
112-03 ROCKAWAY BLVD OZON PARK 20 N Y  
BERNARD FRANKLIN CO INC  
4155 E MEDLEY ST PHILA PENNA  
BERNCO ENGINEERING CORP  
9230 S TERRY AVE INDIANAPOLIS 41 IND  
BERNOT-BACH INC AURICOM DIV  
6900 ROMAINE ST LOS ANGELES 30 CALIF  
BERYLLIUM CORP  
P O BOX 1462 READING PENNA  
BESELER CO CHARLES  
219 SOUTH 18TH ST EAST ORANGE N J  
BESTCRAFT PRODUCTS CO  
626 BROADWAY NEW YORK 12 N Y  
BESTRAM CORP OILECTRON DIV  
2669 S MYRTLE AVE MONROVIA CALIF  
BETHLEHEM FOUNDRY & MACHINE CO  
225 2ND ST BETHLEHEM PENNA  
BETHLEHEM STEEL CO  
BETHLEHEM PA  
BETTER AUDIO COMPANY  
4638 10TH AVE LOS ANGELES 43 CALIF  
BETTER COIL & TRANSFORMER CORP  
BODDLAND IND  
BETTIS ATOMIC POWER  
PITTSBURGH PA  
BEVA LABORATORY  
22 PARKER AVE TRENTON 9 NJ  
BEVIN BILCOX LINE CO  
95 SKINNER ST HAMPTON CONN  
BIDDLE CO  
109 E MARKET ST BLOOMINGTON ILL  
BIDDLE CO JAMES G  
1316 ARCH ST PHILADELPHIA 7 PA  
BIGLOBE CHEM PRODS CORP  
P O BOX 981 QUINCY 69 MASS  
BIGGS CO CARL H  
1547 FOURTEENTH ST SANTA MONICA CALIF  
BIGLER ELECTRONICS CO  
2174 CALIFORNIA ST SAN FRANCISCO 15 CALIF  
BILL JACK SCIENTIFIC INSTR  
P O BOX 4 SOLANA BEACH CALIF

BIO-RAD LABS  
32ND AND GRIFFIN AVE RICHMOND CALIF  
BIOPHYSICAL ELECTRONICS INC  
NEW HOPE PA  
BIOPHYSICAL INSTRUMENTS INC  
20 HERMAN ST PHILADELPHIA 44 PA  
BIOS LABS INC  
17 W 80 ST NEW YORK 23 N Y  
BIRD & CO RICHARD H  
1 SPRUCE ST BALTHAM 54 MASS  
BIRD & SONS LTD SYDNEY S  
FLEETS LANE POOLE DORSET ENGLAND  
BIRD ELECTRONIC CORP  
30303 AURORA RD CLEVELAND 39 OHIO  
BIRD ELECTRONICS CORP  
30303 AURORA RD SOLON OHIO  
BIRDAIR STRUCTURES INC  
1800 BROADWAY BUFFALO 12 N Y  
BIRMINGHAM BOLDM REPRODUCERS LTO  
MONARCH WIRE & POWER LANE OLD HILL  
STAFFORDSHIRE ENGLAND  
BIRNBACH RADIO CO  
145 HUDSON ST NEW YORK 13 N Y  
BIRTCHEM CORP INDUSTRIAL DIV  
4371 VALLEY BLVD LOS ANGELES 32 CALIF  
BISHOP & CO PLATINUM WORKS J  
MALVERN PENNA  
BISHOP DIE-ENGRAVING  
1605 18TH ST RACINE WISC  
BISHOP MFG  
10 CAMFIELD RD CEDAR GROVE NJ  
BITTERRMAN ELECTRIC CO  
BARLOW ST CANAAN CONN  
BITWAX CORP  
3445 HOWARD ST SKOKIE ILL  
BLACK & DECKER MFG CO  
E PENNA AVE TOWSON 4 MD  
BLACK & WEBSTER INC  
483 WATERSTON ST NEWTON 58 MASS  
BLACK LIGHT EASTERN CORP  
201-04 NORTHERN BLVD BAYSIDE 61 N Y  
BLACK LIGHT PRODUCTS INC  
53 W JACKSON BLVD CHICAGO 4 ILL  
BLACK ROCK MFG CO  
168 OSBORNE ST BRIDGEPORT 3 CONN  
BLACK SIVALLS & BRYSON INC  
P O BOX 1714 BILAHAMA CITY OKLA  
BLACKSTONE CORP  
1111 ALLEN ST JAMESTOWN N Y  
BLACKWELL ELECTRONIC LABS  
2755 ALBION ST DENVER 7 COLO  
BLACK MFG CO  
6541 EUCLID AVE CLEVELAND 3 OHIO  
BLAINE ELECTRONICS INC  
14757 KESWICK ST VAN NUYS CALIF  
BLAND BURNER CO PRECISION THREADED PROD DIV  
83 BODDIBINE ST HARTFORD CONN  
BLAW-KNOX CO/BLAW-KNOX EQUIP DIV  
PITTSBURGH 38 PENNA  
BLICKMAN INC  
201 GREGORY AVE BETHLEHEM N J  
BLILEY ELECTRIC CO  
UNION STATION BLDG ERIE PA  
BLINN CO DELBERT  
P O BOX 757 POMONA CALIF  
BLISS ELECTRONIC CORP  
BOX 366 SEISEN NJ  
BLONDER-TONGUE LABORATORIES  
9 ALLING ST NEWARK 2 N J  
BLOOMINGDALE RUBBER CO  
P O BOX 453 ABERDEEN MD  
BLUE H ELECTRIC CO  
138 & CHATHAM ST BLUE ISLAND ILL  
BOODE-SCREED PRO-JECTOR CO  
11541 BRADLEY AVE SAN FERNANDO CALIF  
BOONE ELECTRIC CO  
2500 W BRADLEY PLACE CHICAGO 18 ILLINOIS  
BOONAR INDUSTRIES INC  
238 HUGENOT ST NEW ROCHELLE NY  
BOEHRM INC H O  
915 BRIDGE AVE NEW YORK 10 M Y  
BOEING AIRPLANE CO  
P O BOX 88 LEXINGTON 73 MASS  
BOEING AIRPLANE CO  
MELBOURNE FLA  
BOEING AIRPLANE CO  
7755 E MARGINAL BAY SEATTLE WASH  
BOEING AIRPLANE CO  
P O BOX 3707 SEAN  
BOEING AIRPLANE CO  
BLOG 981 PATRICK AFB FLA  
BOEING AIRPLANE CO  
3800 S OLIVER BICHITA KANSAS  
BOEING AIRPLANE CO  
539 - 157TH AVE S E BELLEVUE WASH  
BOEING AIRPLANE CO  
8TH & LOGAN RENTON WASH  
BOESCH MFG CO  
45 RIVER ST DANBURY CONN  
BOESCH MFG CO  
376 S MAIN ST WEST HARTFORD CONN  
BOGARD MFG CORP  
315 SEIGEL ST BROOKLYN 6 N Y  
BOGEN-PRESTO CO DIV SIEGLER CORP  
P O BOX 500 PARAMUS N J  
BOGUE ELECTRIC  
150 TRYON AVE ENGLEWOOD N J  
BOGUE ELECTRIC MFG CO  
52 108A AVE PATERSON 3 N J  
BOLLING INDUSTRIES INC  
P O BOX 981 SCRANTON PA  
BOLSEY RESEARCH & DEVELOPMENT  
11 W 57TH ST NEW YORK 19 NY  
BOLTA PRODUCTS DIV GENERAL TIRE & RUBBER CO  
70 GARDEN ST LAWRENCE MASS  
BONAC LABS INC  
SALEM RD BEVERLY MASS

BORYTE CO  
GREEN ST SILVERDALE PA  
BOND ELECTRONICS CORP  
60 SPRINGFIELD AVE SPRINGFIELD N J  
BONE ENGG CORP  
701 W BROADWAY GLENDALE 4 CALIF  
BONNE EQUIPMENT & SALES CO  
2105 BEAUNEY ST EL CERRITO CALIF  
BONNY MFG CORP  
360 AUBURN ST AUBURNDALE MASS  
BOOKER & BALLESTAD INC  
3336 GORHAM AVE MINNEAPOLIS 26 MINN  
BOONTON ELECTRONICS CORP  
738 SPEEDWELL AVE MORRIS PLAINS N J  
BOONTON RADIO CORP  
INTERVALE RD BOONTON N J  
BOOTH CO ARTHUR E  
285 S ALEXANDRIA AVE LOS ANGELES 4 CALIF  
BOOTS AIRCRAFT MFG CORP  
NEWTOWN TURNPIKE NORWALK CONN  
BOOTE MFG CO INC  
1800 PARK ST EVANSVILLE 7 IND  
BORDEN CHEMICAL CO  
N ANDOVER MASS  
BORDEN CHEMICAL CO DIV BORDEN CO  
P O BOX 430 COMPTON CALIF  
BORDEN CHEMICAL CO DIV BORDEN CO  
350 MADISON AVE NEW YORK 17 N Y  
BORG-EQUIP DIV AMPHENOL-BORG ELECTRONIC CORP  
120 S MAIN ST JAMESVILLE WISC  
BORG BARNER CORP  
3310 VANOWEN BURBANK CALIF  
BORG-BARNER CONTROLS BORG-BARNER CORP  
3300 NEWPORT BLVD P O BOX 1678  
SANTA ANA CALIF  
BORG-BARNER CORP B J ELECTRONICS  
P O BOX 1678 SANTA ANA CALIF  
BORG-BARNER CORP INGERSOLL STEEL DIV  
NEW CASTLE IND  
BORG-BARNER CORP RESEARCH  
WOLF & ALGONQUIN RD DES PLAINES ILL  
BORTHIG CO GEORGE  
2600 RICHMOND TERRACE STATEN ISLAND N Y  
BORTHIG CO GEORGE C  
HEBY 20 E RUTHERFORD N J  
BORUSKI JR ERNEST F  
290 RIVERSIDE DR NEW YORK 25 N Y  
BOSCH INC N TEN  
PLEASANTVILLE N Y  
BOSCH ELECTRONICS INC DON  
56 ROUTE 10 HANOVER N J  
BOSTON AUTO GAGE CO  
10 BEST ST PITTSFIELD MASS  
BOSTON GEAR WORKS  
70 HAYWARD ST QUINCY MASS  
BOSTON INSULATED WIRE & CABLE CO  
65 BAY ST BOSTON MASS  
BOULDER LABS  
BOULDER COLO  
BOULETTE CO  
P O BOX 73 MOUNTINGTON STA N Y  
BOULEVARD RECORDING STUDIO  
632 N DEARBORN ST CHICAGO 4 ILL  
BOURNS INC  
110 HAYWARD ST ANES IOWA  
BOURNS LABS INC  
P O BOX 2112 RIVERSIDE CALIF  
BOUDROS INSTRUMENT LAB  
12511-E 67TH R R 3 KANSAS CITY 33 MO  
BOE SOLDER PRODUCTS CO  
251 FREEMAN ST BROOKLYN 22 N Y  
BOWERS BATTERY & SPARK PLUG CO  
P O BOX 1262 READING PA  
BOWL-HOR CO INC  
P O BOX 426 LITTLETON MASS  
BOWMAR INSTRUMENT CORP  
8000 BLUFFTON RD FT WAYNE IND  
BOWSER INC  
1302 E CREIGHTON AVE FORT WAYNE IND  
BOY-HAR ELECTRICAL SERVICE CO  
1271 MISSION ST SAN FRANCISCO 3 CALIF  
BOYLE METALCRAFT CORP  
150 SULLIVAN ST BROOKLYN 31 N Y  
BOZAR SALES CO R Y  
BOX 1166 DARIEN CONN  
BRACH MFG CORP DIV GEN BRONZE CORP  
200 CENTRAL AVE NEWARK 3 N J  
BRACKE SEIB Y RAY CO  
16 PELHAM BAY DR B PELHAM RANGH N Y  
BRADFORD COMPONENTS INC  
65 SOUTH AVE SALAMANCA N Y  
BRADLEY SEMICONDUCTOR CORP  
275 WELTON ST NEW HAVEN CONN  
BRADY CO W H  
727 W GLENDALE AVE MILWAUKEE 9 WISC  
BRATLSFORD & CO  
670 HILTON RD AVE N Y  
BRAIN CORP C S  
320 WASHINGTON ST NY VERNON N Y  
BRAM METALLURGICAL-CHEMICAL CO  
820 65 AVE PHILADELPHIA 26 PA  
BRAND WILLIAM REZ DIV AMERICAN ENKA CORP  
NORTH WINDHAM CONN  
BRAND-HEZ REZ ENK  
31 SUDBURY RD CONCORD MASS  
BRANSON CORP  
41 S JEFFERSON RD WHIPPANY N J  
BRANSON INSTRUMENTS INC  
37 BROWN MOUSE RD STAMFORD CONN  
BRAUN TOOL & INSTRUMENT CO INC H  
160 FIFTH AVE HARTHORNE N J  
BRAUN-MEYER-MEINHANN CO/GLASS ENGG DEPT  
601 ONEIL AVE BELMONT CALIF  
BRAUNT TOOL & INST  
182 5TH AVE NEW YORK 19 N Y  
BRAY STUDIOS INC  
729 7 AVE NEW YORK 19 N Y

# ELECTRONIC MANUFACTURERS-A-Z

BREEZE CORPS  
700 LIBERTY AVE UNION N J  
BREON LABS  
1820 EVERGREEN RD WILLIAMSPORT PA  
BREVEL PRODUCTS CORP  
601 W 26TH ST NEW YORK N Y  
BREW & CO RICHARD B  
90 AIRPORT RD CONCORD N H  
BRIDGEPORT BRASS CO  
30 GRAND ST BRIDGEPORT 2 CONN  
BRIDGEPORT BRASS CO  
5 MOLT RD INDIANAPOLIS IND  
BRIGGS ASSOCIATES  
10 DEKALB ST NORRISTOWN PA  
BRIGGS ASSOCIATES INC  
CLOTHIER SPRING RD - R D 1 MALVERN PA  
BRIGHT RADIO LABS INC  
222 E 3RD ST MINEOLA LI N Y  
BRIGHT STAR INDUSTRIES  
600 GETTY AVE CLIFTON N J  
BRILHART PLASTICS CORP  
P O BOX 31 MINEOLA LI N Y  
BRILHAYER LABORATORIES E W  
86 FULTON ST NEW YORK 38 N Y  
BRINKMANN INST INC  
115 CUTLER HILL RD GREAT NECK N Y  
BRISCOE MFG CO  
1055 GIBBARD AVE COLUMBUS 3 OHIO  
BRISTOL CO  
P O BOX 1790 EI WATERBURY CONN  
BRISTOL CO  
250 57TH ST NEW YORK 19 N Y  
BRISTOL MOTORS DIV VOCALINE CO AMERICA INC  
OLD SAYBROOK CONN  
BRITISH ELECTRONIC SALES CO INC  
PAINTON DIV  
OAKLAND GMS FLUSHING 64 N Y  
BRITISH ELECTRONIC SALES CO INC  
ARCLECTRIC SWITCH DIV  
OAKLAND GMS FLUSHING N Y  
BRITISH ELECTRONIC SALES  
OAKLAND GARDENS FLUSHING 64 N Y  
BRITISH INDUSTRIES CORP BROWN DIV 58  
80 SHORE RD PORT WASHINGTON N Y  
BRITISH RADIO ELECTRONICS LTD  
1833 JEFFERSON PL NW WASHINGTON D C  
BRITTON ELECTRONIC  
19 WARREN PL MT VERNON N Y  
BRITTON ELECTRONICS CORP  
19 WARREN PL MT VERNON N Y  
BROADCAST EQUIPMENT SPECIALTIES CORP  
P O BOX 149 BEACON N Y  
BROADVIEW 48  
1811 TROUSDALE DR BURLINGAM CALIF  
BROADWAY COIL CO  
5638 BROADWAY CHICAGO 40 ILL  
BROCKER LABS  
935 COMMERCIAL ST PALO ALTO CALIF  
BROWN-SHOE CO  
249 E BROAD ST COLUMBUS 15 OHIO  
BRONSON CORP  
P O BOX 327 SEYMOUR WISC  
BROOKLYN PAINT & VARNISH CO INC  
50 JAY ST BROOKLYN 1 N Y  
BROOKS & PERKINS INC  
1950 W FORT ST DETROIT 38 MICH  
BROOKS RADIO & TV CORP  
84 VESEY ST NEW YORK 7 N Y  
BROOKS ROTAMETER CO  
P O BOX 432 LANSDALE PA  
BROWN & SHARPE MFG CO  
235 PROMENADE ST PROVIDENCE 1 R I  
BROWN ENGINEERING CO INC  
P O BOX DRAWER 917 HUNTSVILLE ALA  
BROWN INC DAYTON T  
1305 STRONG RD COPIAGUE N Y  
  
BROWN-BRIDGE HILLS INC  
90X 390 TROY OHIO  
BROWNING LABS INC  
100 UNION AVE LACONIA N H  
BRUBAKER ELECTRONICS INC  
3652 EASTHAM DR CULVER CITY CALIF  
BRUMBERGER CO  
38 - 34TH ST BROOKLYN 32 N Y  
BRUNING CO CHARLES  
1800 CENTRAL RD MT PROSPECT ILL  
BRUNO-NEW YORK INDUSTRIES CORP  
460 W 34 ST NEW YORK 1 N Y  
BRUNSWICK BALKE COLLENDER CO  
MARION VA  
BRUNSWICK ELECTRONIC ENGRS  
47 WILSON AVE HILLTOP N J  
BRUNSWICK INSTRUMENTS  
P O BOX 813 NEW BRUNSWICK N J  
BRUSH BERYLLIUM CO  
4301 PERKINS AVE CLEVELAND OHIO  
BRUSH BERYLLIUM CO PENROD DIV  
501 CRESCENT AVE READING PENNA  
BRUSH INSTRUMENTS  
37TH AND PERKINS CLEVELAND 14 OHIO  
BRUSH NAIL EXPANSION BOLT CO  
GREENWICH CONN  
BRYANT COMPUTER PRODUCTS DIVISION  
BOX 620 SPRINGFIELD VT  
BRYANT COMPUTER PRODUCTS DIV  
860 LADD RD WALL LAKE MICH  
BRYG INC  
BUTLER PA  
BRYG INSTRUMENT CO  
7026 6TH AVE BROOKLYN 9 N Y  
B/W CONTROLLER CORP  
2200 E MAPLE BIRMINGHAM MICH  
BTU ENGG CORP  
179 BEAR HILL RD WALTHAM 58 MASS  
BUCHANAN ELECTRICAL PRODUCTS CORP  
225 ROUTE 22 HILLSIDE 4 J

BUCK ENGS CO  
37 MARCY ST FREEHOLD N J  
BUCKBEE BEARS CO  
9TH FLR TONI BLDG- 4 & ROSABEL ST  
ST PAUL 1 MINN  
BUCKEYE BOBBIN CO  
12200 SPRECHER AVE CLEVELAND 11 OHIO  
BUCKS COUNTY ENTERPRISES  
MUNICIPAL AIRPORT QUAKERTOWN PA  
BUJ RADIO INC  
2118 E 55TH ST CLEVELAND 3 OHIO  
BUDD LEWY ELECTRONICS INC  
43-22 QUEENS ST LONG ISLAND CITY 1 N Y  
BUDD STANLEY CO  
43-01 22 ST LONG ISLAND CITY 1 N Y  
BUDELMAN ELECTRONICS CORP  
375 FAIRFIELD AVE STAMFORD CONN  
BUDELMAN RADIO CORP  
375 FAIRFIELD AVE STAMFORD CONN  
BUHL OPTICAL CO  
1009 BEECH AVE PITTSBURGH 33 PA  
BUILDING BLOCKS ELECTRONIC CO  
2172 E 36TH ST BROOKLYN 34 N Y  
BULLARD  
286 CANFIELD AVE BRIDGEPORT 9 CONN  
BULOVA WATCH CO ELECTRONICS DIV  
40-01 61 ST WOODSIDE 77 N Y  
BUNDY ELECTRONICS CORP  
171 FAYAN PL NEWARK 12 N J  
BUNNELL & CO J H  
81 PROSPECT ST BROOKLYN 1 N Y  
BURDICK CORP  
638 FLUNG ST HILTON WISC  
BUREAU OF ENGRAVING INC  
500 S 4TH ST MINNEAPOLIS MINN  
BURGESS BATTERY CO  
FOOT OF EXCHANGE ST FREEPORT ILL  
BURGESS BATTERY CO DIV SERVEL CANADA LTD  
415 BUTTNEY ST NIAGARA FALLS ONT CANADA  
BURKE & JAMES INC  
321 S BABASH AVE CHICAGO 4 ILL  
BURLYN CO  
3429 GLENDALE BLVD LOS ANGELES 39 CALIF  
BURLING INSTRUMENT CO  
16 RIVER RD CHATHAM N J  
BURLINGAME ASSOC  
310 S FULTON AVE MT VERNON N Y  
BURNBY CORP N H BUGGIE DIV  
BOX 817 TOLEDO 1 OHIO  
BURNBY CORP ONATON DIV  
NORBALA CONN  
BURNBY ENGG CO  
NORBALA 3 CONN  
BURNELL & CO INC  
10 PELHAM PKBY PELHAM MANOR NY  
BURNELL ASSOC  
282 FARM AVE HARTFORD CONN  
BURNETT RADIO LAB W L  
4814 IDAHO ST SAN DIEGO 16 CALIF  
BURNLEY BATTERY & MFG CO  
103 CLAY ST NORTH EAST PA  
BURR-BROWN RESEARCH CORP  
BOX 6448 TUCSON ARIZ  
BURROUGHS CORP  
6071 2ND AVE DETROIT 32 MICH  
BURROUGHS CORP  
41100 PLYMOUTH RD PLYMOUTH MICH  
BURROUGHS CORP  
1209 VINE ST PHILADELPHIA PA  
BURROUGHS CORP CALUMET CITY ILL  
P O BOX 1595 VANDENBERG AFB CALIF  
BURROUGHS CORP  
PATRICK AIR FORCE BASE COCOA FLA  
BURROUGHS CORP ELECTRO DATA DIV  
67-35TH ST BROOKLYN 32 N Y  
BURROUGHS CORP ELECTRO-DATA DIV  
15-163RD ST CALUMET CITY ILL  
BURROUGHS CORP ELECTRODATA DIV  
460 SIERRA MADRE VLA PASADENA CAL  
BURROUGHS CORP ELECTRONIC TUBE DIV  
BOX 1226 PLAINFIELD N J  
BURROUGHS CORP MILITARY FIELD SERVICE DIV  
BURROUGHS DRIVE RADNOR PA  
BURTEX INC  
42 CARLETON ST CAMBRIDGE 42 MASS  
BURTON INSTRUMENT DIVISION BURTON MFG CO  
2520 COLORADO AVE SANTA MONICA CALIF  
BURTON-ROGERS CO  
42 CARLETON ST CAMBRIDGE 42 MASS  
BUSH TRANSFORMER CORP  
707 NORTH ST ENDICOTT NY  
BUSHINGS INC  
4358 COOLIDGE HWY PD BOX 189  
BUSSMANN MFG CO Div MCGRAW EDISON CO  
UNIVERSITY AT JEFFERSON ST LOUIS 7 MO  
BUTCHER CO L H  
2050 MCKINLEY AVE FRESNO 3 CALIF  
BUTCHER CO L H  
3628 OLYMPIC BLVD LOS ANGELES 23 CALIF  
BUTLER ROBERTS ASSOC  
14471 N W 36TH ST MIAMI SPRINGS FLA  
BY-BUK CO  
4314 W PICO BLVD LOS ANGELES 19 CALIF  
BYTEX CORP  
50 HUNT ST NEWTON 58 MASS  
  
C & D BATTERIES DIV ELECTRIC AUTOLITE CO  
CONSHOHOCKEN PA  
C & M SALES CO  
PASADENA CALIF  
C & R COMPONENTS INC  
101-103 MORSE ST NEWTON 58 MASS  
C B C ELECTRONICS CO  
2401 N HOWARD ST PHILADELPHIA 33 PA  
C B S LABORATORIES  
227 HIGH RIDGE RD STAMFORD CONN

C E M CO  
24 SCHOOL ST DANIELSON CONN  
C E S ELECTRONIC PROD  
P O BOX 7504 SAN DIEGO CALIF  
C G S LAB INC  
93 CROSS LA BEVERLY MASS  
C G S LABS INC  
391 LUULOB ST STAMFORD CONN  
C W HFG CO  
BOX 2065 EL MONTE CALIF  
CABLE & WIRE PRODUCTS CO  
CHICAGO RD SWANTON OHIO  
CABLE COMPRADIO  
75 VARICK ST NEW YORK N Y  
CABLE DESIGNS INC  
66 RUSHMORE ST WESTBURY LI N Y  
CABLE ELECTRIC PRODUCTS  
238 EMMETT ST PROVIDENCE 7 R I  
CABLE SPECIALISTS OF CONN  
95 KITTS LANE NEWINGTON 11 CONN  
CABLE T V INC  
217 E NINTH ST HAZLETON PA  
CADDRELL-BURNS MFG CO  
40 E 2 ST MINEOLA N Y  
CADILLAC ASSOC  
CHICAGO ILL  
CADILLAC GAGE CO  
P O BOX 3806 DETROIT 3 MICH  
CAEMCO  
JACKSONVILLE FLA  
CAIG LABS  
86 STANWOOD RD NEW HYDE PARK N Y  
CALCONNECTOR CO  
7360 VARRA AVE N HOLLYWOOD CALIF  
CAL-LEE MFG CO  
6759 WEST BLVD INGLEWOOD 3 CALIF  
CAL-MET ELECTRONICS  
5860 SPRING OAK DR LOS ANGELES 28 CALIF  
CAL-OHR LABS INC  
BROADWAY & ADAMS ST STERLING KANSAS  
CAL-TRONICS CORP  
11307 HINDRY AVE LOS ANGELES 45 CALIF  
CALBEST ELECTRONICS CO  
4801 EXPOSITION BLVD LOS ANGELES 16 CALIF  
CALBRATION STANDARD  
1025 WESTMINSTER AVE ALHAMBRA CALIF  
CALCON MFG CO  
100 OAKLAND AVE WASHINGTON PA  
CALEDONIA ELECTRONICS & TRANSFORMER CORP  
P O BOX 98 CALEDONIA N Y  
CALIDYNE CO INC SUB LING-ALTEC ELECTRONICS  
120 CROSS ST WINCHESTER MASS  
CALIF MAGNETIC CONTROL CORP  
11922 VALERIO ST N HOLLYWOOD CALIF  
CALIF MEASUREMENT CO  
7500 W 92ND ST LOS ANGELES 45 CALIF  
CALIF TECHNICAL INDUSTRIES DIV TETRON INC  
1421 OLD COUNTY RD BELMONT 10 CALIF  
CALIFOME CORP  
1028 N LA BREA AVE LOS ANGELES 38 CALIF  
CALIFORNIA CHASSIS CO  
5445 E CENTURY BLVD LYNNWOOD CALIF  
CALIFORNIA COMPUTER PRODUCTS INC  
8714 CLETA ST DOWNEY CALIF  
CALIFORNIA PLASTIC INC  
221 E 4TH ST LOS ANGELES 13 CALIF  
CALINAG DIV CALIF MAGNETIC CONT CORP  
11922 VALERIO ST N HOLLYWOOD CALIF  
CALTRON PRODUCTS CO  
3518 W PICO BLVD LOS ANGELES 19 CALIF  
CALVIDE TUBE CORP  
18001 S SANTA FE AVE COMPTON CALIF  
CAMBLOCK CORP  
825 BRONX RIVER AVE NEW YORK N Y  
CAMBRIDGE CORN CORP  
238 MAIN ST CAMBRIDGE MASS  
CAMBRIDGE FILTER CORP  
738 ERIE BLVD E SYRACUSE 3 N Y  
CAMBRIDGE INSTR CO INC  
SPRING ST OSSINGING N Y  
CAMBRIDGE INSTRUMENT CO  
GRAND CENTRAL TERMINAL NEW YORK 17 N Y  
CAMBRIDGE PATTERN BOOKS  
55 FIRST ST CAMBRIDGE 41 MASS  
CAMBRIDGE THERMIONIC CORP  
445 CONCORD AVE CAMBRIDGE 38 MASS  
CANCAR SCREW & MFG CO DIV TETRON INC  
600 18 AVE ROCKFORD ILL  
CAMERA EQUIPMENT CO INC  
315 W 43RD ST NEW YORK 36 N Y  
CAMERA HART INC  
1845 BROADWAY NEW YORK 23 N Y  
CAMERAFLEX CORP SUBSIDIARY OF  
55 STEWART AVE GARDEN CITY LI N Y  
CAMLOC FASTENER CORP  
22 SPRING VALLEY RD PARAMUS N J  
CAMPBELL INDUSTRIES INC  
DOVER N H  
CAMPBELL X-RAY CORP  
110 CUMMINGTON ST BOSTON 15 MASS  
CAMPRO CO  
3131 ALLIANCE RD N E CANTON 1 OHIO  
CANADAIR LTD  
PO BOX 6087 MONTREAL P Q CANADA  
CANADIAN APPLIED RESEARCH LTD  
750 LABRENCE AVENUE WEST  
TORONTO ONTARIO CANADA  
CANADIAN ASTATIC LTD  
2273 DANFORTH AVE TORONTO 13 ONT CANADA  
CANADIAN AVIA ELECTS  
6214 COTE DE LIESSE RD ST LRMTOBE CANADA  
CANADIAN CURTISS-BRIGHT LTD  
OAKVILLE ONTARIO CANADA  
CANADIAN CURTISS-BRIGHT LTD  
1980 SHERBROOKE ST W MONTREAL QUE CANADA  
CANADIAN MARCONI CO  
2442 TRENTON AVE MONTREAL 16 CAN

# ELECTRONIC MANUFACTURERS-A-Z

CANADIAN RADIUM & URANIUM CORP  
630 S AVE NEW YORK 20 N Y

CANADIAN RESEARCH INSTITUTE  
48 ST GEORGE ST TORONTO 5 ONT CANADA

CANAL INDUSTRIAL CORP  
4940 ST ELMO AVE BETHESDA 14 MD  
CANNON CO C P  
SPRINGWATER N Y

CANNON ELEC CO  
2801 E AIRLINE PHOENIX ARIZ

CANNON ELECT CO EASTERN DIV  
180 MAIN ST BRANFORD CONN

CANNON ELECTRIC CANADA LTD  
160 BARTLEY DR TORONTO ONT CANADA

CANNON ELECTRIC CO  
465 BANNA COVINA CALIF

CANNON ELECTRIC CO  
1849 S CENTRAL ST GLENDALE 4 CALIF

CANNON ELECTRIC CO  
666 E DYER RD SANTA ANA CALIF

CANNON ELECTRIC CO  
3208 HUMBOLDT ST LOS ANGELES 31 CALIF

CANNON ELECTRIC CO EASTERN DIV  
PINGREE & LEAVITT STS SALEM MASS

CANNON PLUGS CO  
107 EASTERN RD BENSONVILLE ILL

CANNON-MUSKOGON CORP  
BOX 306 MUSKOGON NICH

CANOGA CORP OF CALIF SOUTHERN DIV  
77 EGLIN HWY FT BALTON BEACH FLA

CANOGA DIV UNDERWOOD CORP  
15330 OXNARD ST VAN NUYS CALIF

CANRAD PRECISION INDUSTRIES  
10136 E RUSH ST EL MONTE CALIF

CAPCON INC  
61 STANTON ST NEW YORK 2 N Y

CAPREARY CORP  
87-66 123RD ST RICHMOND HILL N Y

CAPITOL MACHINE CO  
36 BALFORTH AVE DANBURY CONN

CAPITOL TRANSCRIPTIONS INC  
620 ELEVENTH ST NW WASHINGTON D C

CAPNF CO  
WESSON MISS

CAPPS & CO  
20 ADDISON PL VALLEY STREAM L I N Y

CARAD CORP  
2890 BAY RD REDWOOD CITY CALIF

CARBOLINE CO  
32 HAWLEY 140 CT ST LOUIS 19 MO

CARBON ELECTRONIC DEVELOPMENT CORP  
218 E PATTERSON ST LANSFORD PENNA

CARBONMAU INDUSTRIES INC  
100 LEXINGTON AVE S W GRAND RAPIDS 4 MICH

CARBORUNDUM CO  
KEASBY N J

CARBORUNDUM CO REFRACTORIES DIV  
LATROBE PA

CARBORUNDUM CO GLOBAL PLANT  
P O BOX 379 NIAGARA FALLS N Y

CARBORUNDUM METALS CO DIV CARBORUNDUM CO  
P O BOX 32 AKRON N Y

CARDILLO ELECTRONICS CO  
1732 POINT BREEZE AVE PHILA 45 PA

CARDINAL INSTRUMENTATION CORP  
4201 REDWOOD AVE LOS ANGELES 66 CALIF

CARDINAL MFG  
3151 FIBERGLAS RD KANSAS CITY 13 KANS

CARBILL DETROIT CO  
1250 CROOKS RD CLAWSON NICH

CARLETON AVIATION CO INC  
EAST AURORA N Y

CARLING ELECTRIC INC  
503 NEW PARK AVE W HARTFORD 10 CONN

CARLSON & NICHOLSON INC  
697 MAYNARD DRIVE BUFFALO 21 N Y

CARMODY CORP  
2360 WENHLE DR BUFFALO 21 N Y

CARNF CO  
P O DRAWER 354 BROOKHAVEN MISS

CAROL CABLE CO  
190 MIDDLE ST PASTUCKET R I

CAROL CABLE DIV/CRESCENT CO INC  
20 CENTRAL AVE PASTUCKET R I

CAROL ELECT CORP  
21 MACARTHUR DRIVE GLENS FALLS N Y

CAROL ELECTRONICS CORP  
515 W STEPHEN ST MARTINSBURG W VA

CARPENTER MANUFACTURING CO INC  
BOX 217 DEWITT 14 N Y

CARPENTER STEEL CO  
FRONT & BERN STS READING PA

CARPENTER STEEL CO ALLOY TUBE DIV  
SPRINGFIELD RD UNION N J

CARRIER CORP  
CARRIER PARKWAY SYRACUSE 1 N Y

CARRIER CORP -SPECTROL ELECTRONICS DIV  
1704 S OEL MAR AVE SAN GABRIEL CALIF

CARRIER CORP-SPECTROL ELECTR DIVN  
1130 SHAMES DR WESTBURY L I N Y

CARROLL PRESSED METAL INC  
133 DEWEY ST WORCESTER 10 MASS

CARSON MICROWAVE CORP  
2 E MAIN ST LITTLE FALLS N J

CARSTEDT RESEARCH  
2501 E 80TH ST LONG BEACH 5 CALIF

CARTER MFG CORP  
25 WASHINGTON ST HUDSON MASS

CARTER MOTOR CO  
2711 W GEORGE ST CHICAGO 18 ILL

CARTER PARTS CO  
3401 W MADISON ST SKOKIE ILL

CARTRISEAL CORP  
3515 W TOLMY AVE LINCOLNWOOD ILL

CARVER INC FRED S  
1 CHATHAM RD SUMMIT N J

CASCADE RESEARCH CORP  
DIV MONODRUM PRECISION INDUSTRIES  
93 VICTORY LANE LOS GOTOS CALIF

CASCADE RESEARCH DIV  
5285 SAN FERNANDO RD W LOS ANGELES CALIF

CASH VALVE MFG CORP A B  
P O BOX 191 DECATUR ILL

CASSELL ELECTRONICS CORP  
814 QUEENS LANE SAN JOSE 12 CALIF

CATALYST RES CORP  
6101 FALLS ROAD BALTIMORE 9 MD

CATERPILLAR TRACTOR CO  
PEORIA ILL

CATHODEON LTD  
CHURCH ST CAMBRIDGE ENGLAND

CAWKELL ELECTRICAL ENGG A E  
80 SHORE RD PORT WASHINGTON NY

CBS ELECTRONICS  
KENT & BARRETT STS NEWBURYPORT MASS

CBS ELECTRONICS  
32 GREENE ST NEWARK N J

CBS ELECTRONICS DIV COLUMBIA BROADCASTING SY  
LOWELL MASS

CBS ELECTRONICS DIV COLUMBIA BROADCASTING SY  
100 ENOICOTT ST DANVERS MASS

CBS ELECTRONICS SEMICONDUCTOR OPERATIONS  
900 CHELMSFORD ST LOWELL MASS

CBS-ELECTRONICS  
1900 N HANHEIM RD MELROSE PARK ILL

CBS-HYTRON DIV C B S  
DANVERS MASS

CDC CONTROL SERVICES INC  
404 S BARNHURST RD HATBORO PA

CEDAR ENGG DIV CONTROL DATA CORP  
5826 W 36 ST MINNEAPOLIS 16 MINN

CELANESE PLASTICS CO  
744 BROAD ST NEWARK 3 N J

CELANESE PLASTICS CO DIV OF CELANESE CORP  
180 MADISON AVE NEW YORK 16 N Y

CELCO CONSTANTIN E L CO  
P O BOX 555 BAHAM N J

CELCO PACIFIC DIV  
6993 - 9TH ST CUCAMONGA CALIF

CENTAUR STUDIOS  
7657 MELROSE AVE HOLLYWOOD 96 CALIF

CENTRAL COIL CO  
1720 N LUETT ST INDIANAPOLIS 22 IND

CENTRAL COIL CORP  
102-23 GLENWOOD RD BROOKLYN 36 N Y

CENTRAL DYNAMICS LTD  
167 MYRUS BLVD PTE CLAIRE QUE CANADA

CENTRAL ELECTRONIC MFRS  
2 RICHMOND PL DENVERIL N J

CENTRAL ELECTRONICS INC  
1207 W BELMONT AVE CHICAGO 13 ILL

CENTRAL RESEARCH LABS  
REG BING MINN

CENTRAL SCIENTIFIC CO  
1700 IRVING PARK RD CHICAGO 13 ILL

CENTRAL SCIENTIFIC CO OF CALIF  
1040 MARTIN AVE SANTA CLARA CALIF

CENTRAL SCIENTIFIC CO OF CANADA LTD  
146 KENDAL AVE TORONTO 4 ONT CANADA

CENTRAL SCREB CO  
3501 SHIELDS AVE CHICAGO 9 ILL

CENTRAL TRANSFORMER CO  
900 W JACKSON BLVD CHICAGO 7 ILL

CENTRALAB DIV GLOBE UNION INC  
FORT DOGUE IOWA

CENTRALAB DIV GLOBE-UNION INC  
900 E KEEFE AVE MILWAUKEE 1 WISC

CENTRE CIRCUITS INC  
PO BOX 145 STATE COLLEGE PA

CENTRONIX INC  
COCOA FLA

CENTRONIX INC  
4000 NW 28TH ST MIAMI FLA

CENTURY COIL CORP  
1522 N CLYBOURN AVE CHICAGO 10 ILL

CENTURY ELECTRIC CO  
1804 PINE ST ST LOUIS 3 MO

CENTURY ELECTRONICS & INSTRUMENTS INC  
1333 N UTICA P O BOX 6216 PINE STA  
TULSA 10 OKLA

CENTURY GEOPHYSICAL CORP  
515 JENKINS BLDG TULSA 3 OKLA

CENTURY LIGHTING INC  
521 WEST 43 ST NEW YORK 36 N Y

CENTURY PLATING CO  
229 FERRIS AVE WHITE PLAINS N Y

CENTURY PROJECTOR CORP  
729 7 AVE NEW YORK 19 N Y

CENTURY PROJECTOR INC  
32-02 QUEENS BLVD LONG ISLAND CITY 1 N Y

CERAMASEAL INC  
P O BOX 25 NEW LEBANON CENTER N Y

CERAMATRONICS INC  
364 HIGHLAND AVE PASSAIC N J

CERAMIC METAL ASSEMB  
P O BOX 32 LATROBE PA

CERAMIC SPEC CO INC  
BOX 146 E LIVERPOOL OHIO

CERDERUS AG WERK FUR ELEKTRONENTECHNIK  
MANNEDORF 2H SWITZERLAND

CERIUM METALS & ALLOYS DIV  
45 MFRS PL NEWARK 3 N J

CERRO DE PASO SALES CORP  
500 PARK AVE NEW YORK 22 N Y

CERTIFIED RADIO LABS  
5507 13 AVE BROOKLYN 19 N Y

CESSNA AIRCRAFT CO  
5800 E PABNEE RD WICHITA KANSAS

CFI CORP - DEPT E  
COTTAGE PLAC WINEOLA N Y

CG ELECTRONIC CORP  
15000 CENTRAL EAST ALBUQUERQUE NEW MEXICO

CGS LABORATORIES INC  
50 DANBURY ROAD ROUTE 7 WILTON CONN

CHACE CO W M  
1600 BEARD AVE DETROIT 9 MICH

CHADBICK-HELMUTH CO  
472 E DUARTE RD MONROVIA CALIF

CHALCO ENGRNG CORP  
15126 S BROADWAY GARDENA CALIF

CHAMP PAPER FIBRE CO  
HAMILTON ONT

CHAMPION DEPARTMENT TOOL CO  
5 MAIN ST MEADVILLE PENNA

CHAMPION LAMP WORKS  
330 LYNNWAY LYNN MASS

CHAMPLAIN CO INC  
100 HARRISON AVE ROSELAND N J

CHANCE CO W M  
1608 BEARD AVE DETROIT 9 MICH

CHANCE VOUGHT CORP  
2131 HUNTINGTON ARLINGTON TEXAS

CHANCE VOUGHT CORP  
9314 W JEFFERSON GRAND PRAIRIE TEXAS

CHANCE VOUGHT CORP  
908 JACKSON ST DALLAS 22 TEXAS

CHANCE VOUGHT CORP  
PORT HUENEME CALIF

CHANCE VOUGHT ELECTRONICS DIV  
P O BOX 3907 DALLAS TEX

CHAMMEL INDUSTRIES INC  
427 OLIVE ST SANTA BARBARA CALIF

CHAMMEL MASTER CORP  
ELLENWILT ONT

CHAPIN ELECTRONICS INC  
275 MAIN ST WEBSTER MASS

CHART PAK INC  
LEEDS MASS

CHASE & SONS  
26 SPRUCE ST N QUINCY MASS

CHASE BRASS & COPPER CO  
230 GRAND ST WATERBURY 20 CONN

-CHASE MFG CO  
329 W WASHINGTON PASADENA CALIF

CHASE-FOSTER INC  
38 ORNSBEE AVE PROVIDENCE R I

CHASE-SHAWMUT CO  
374 HERRINAC ST NEWBURYPORT MASS

CHASSIS-TRAK INC  
525 W WEBSTER AVE INDIANAPOLIS 19 IND

CHATHAM CONTROLS CORP  
33 RIVER ST CHATHAM N J

CHATHAM ELECTRONICS DIV-TUNG-SOL ELECTRIC INC  
630 W NY PLEASANT AVE LIVINGSTON N J

CHATILLON & SONS JOHN  
85 CLIFF ST NEW YORK 38 N Y

CHENALBY ELECTRONICS CORP  
GILLESPIE AIRPORT SANTEE CALIF

CHEMETRON CORP -GIRDLER PROCESS EQUIP DIV  
334 E BROADWAY LOUISVILLE KY

CHEMICAL COMMERCE  
166 CLIFFORD ST NEWARK 5 N J

CHEMICAL CORP  
43 BALTHAM AVE SPRINGFIELD MASS

CHEMICAL DEVELOPMENT CORP  
ENOICOTT ST DANVERS MASS

CHEMICAL PRODUCTS CORP  
KING PHILIP RD E PROVIDENCE 14 R I

CHEMICALS & PLASTICS DIV  
NITRO W VA

CHEMO PRODUCTS INC  
BOX 169 BARBICK R I

CHEMPLAST INC  
3 CENTRAL AVE & NEWARK N J

CHEMPRINT CORP  
4000 CAMPBELL AVE MENLO PARK CALIF

CHEMTRONIC CORP  
309 11TH AVE NASHVILLE 4 TENN

CHERRY ELECTRICAL PRODUCTS CORP  
1650 DEERFIELD RD HIGHLAND PARK ILL

CHESAPEAKE INSTRUMENT CORP  
SHADYSIDE MD

CHESTER CABLE CORP  
1000 TOP ST CHESTER N Y

CHESTER MOIST DIV-NATL SCREW & MFG CO  
LISBON OHIO

CHICAGO AERIAL IND INC  
10134 PACIFIC AVE FRANKLIN PARK ILL

CHICAGO AERIAL INDUSTRIES INC  
1980 HAYTHORNE MELROSE PARK ILL

CHICAGO CONDENSER CORP  
3258 W ARMITAGE AVE CHICAGO 47 ILL

CHICAGO DYNAMIC INDUSTRIES INC  
1725 DIVERSER BLVD CHICAGO 14 ILL

CHICAGO ELECTRONIC ENGG CO  
3223 W ARMITAGE AVE CHICAGO 47 ILL

CHICAGO GASKET CO  
1271 W NORTH AVE CHICAGO 22 ILL

CHICAGO INDUSTRIAL INSTRUMENT CO  
865 N BANGAMON ST CHICAGO 22 ILL

CHICAGO MAGNETIC CONTROL  
1816 N DAMEN AVE CHICAGO 47 ILL

CHICAGO MINIATURE LAMP WORKS  
1500 N OGDEN AVE CHICAGO 10 ILL

CHICAGO RAWHIDE MFG CO  
1301 ELSTON AVE CHICAGO 22 ILL

CHICAGO RIVET & MACHINE CO  
930 S 23 AVE BELLWOOD ILL

CHICAGO SCREW CO DIV STANDARD SCREW  
2701 WASHINGTON BLVD BELLWOOD ILL

CHICAGO STANDARD TRANSFORMER CORP  
3501 W ADDISON ST CHICAGO 18 ILL

CHICAGO STD TRANSFORMER CORP  
CERAPAC AVE ZANESVILLE OHIO

CHICAGO SURGICAL & ELECTRICAL CO  
3070 W GRAND AVE CHICAGO 22 ILL

CHICAGO TELEPHONE OF CALIF  
105 PASADENA AVE S PASADENA CALIF

# ELECTRONIC MANUFACTURERS-A-Z

CHICAGO TELEPHONE SUPPLY CORP  
1142 W BEARDSLEY AVE ELKHART IND  
CHICOPEE MFG CURP LUMITE DIV  
CORNELIA GA  
CHISHOLM INDUSTRIES LTD  
ELECTRIC AVE PORT MOODY B C CANADA  
CHROMATIC TV LABS INC  
1501 BROADWAY NEW YORK 36 N Y  
CHROMIUM CORP OF AMERICA  
P O BOX 229 WATERBURY 20 CONN  
CHROMDEX CO  
P O BOX 131 LA VERNE CALIF  
CHROMO-LOG CORP  
P O BOX 4587 PHILA 31 PENNA  
CHRYSLER CORP  
VAN DYKE & SIXTEEN MILE WARREN MICH  
CHRYSLER CORP  
ORDAB-DLEY REDSTONE ARSENAL ALA  
CHRYSLER CORP -MISSILE DIV  
445 B EVANSDALE DR BIRMINGHAM MICH  
CHRYSLER CORP DEFENSE ENGRG  
P O BOX 1316 CENTERLINE MICH  
CHRYSLER CORP MISSILE DIV  
BOX 857 HUNTSVILLE ALA  
CHRYSLER CORP MISSILE DIV  
P O BOX 2628 DETROIT MICHIGAN  
CHRYSLER CORP-MISSILE DIV  
P O BOX 2294-SHERIDAN STA LAWTON OKLA  
CHU ASSOCIATES  
P O BOX 387 WHITCOMB AVE LITTLETON MASS  
CHURCHILL LIGHTING CORP  
348 FRANKLIN ST MELROSE 76 MASS  
CIBA PRODUCTS CORP  
P O BOX 415 FAIR LAWN N J  
CICO CORP  
9615 GLENOKRS BLVD SUN VALLEY CALIF  
CICOLL CORP  
13633 SATICOY ST VAN NUYS CALIF  
CINAGRAPHER INC  
7334 W CLARK ST CHICAGO 26 ILL  
CINC SUB ZERO PRODS  
3932 READING RD CINCINNATI 29 OHIO  
CINC TIME RECORDER CO  
1733 CENTRAL AVE CINCINNATI 14 OHIO  
CINCH MFG CO DIV UNITED CARR FASTENER  
2621 LOCUST ST ST LOUIS 3 MO  
CINCH MFG CO-GRAPHIC CIRCUITS DIV  
200 S TURNBULL CANYON RD LA PUENTE CAL  
CINCH MFG CORP  
1026 S HOMAN AVE CHICAGO 24 ILL  
CINCINNATI CLEANING & FINISHING MACHINERY  
SHARONVILLE OHIO  
CINCINNATI MILLING MACHINE CO  
CINCINNATI OHIO  
CINCINNATI HOLDING CO  
2037 FLORENCE AVE CINCINNATI 6 OHIO  
CINCINNATI CIB-ZERO PRODUCTS  
3932 READING RD CINCINNATI 29 OHIO  
CINCINNATI TIME RECORDER CO  
1733 CENTRAL AVE CINCINNATI 14 OHIO  
CINE-VIDEO PRODUCTIONS  
1322 BOSTON POST RD MILFORD CONN  
CINEMA ENGRG DIV AEROVOK CORP  
1100 CHESTNUT ST BURBANK CALIF  
CINEMATIC DEVELOPMENTS  
2125 32 AVE SAN FRANCISCO 16 CALIF  
CIRCO ULTRASONICS CORP  
51 TERMINAL AVE CLARK N J  
CIRCON COMPONENTS CORP  
SANTA BARBARA MUNICIPAL AIRPORT  
VOLETTE CALIF  
CIRCUIT INSTR INC  
P O BOX 1128 ST PETERSBURG 33 FLA  
CIRCUIT INSTRUMENTS DIVISION  
2801 72ND ST N ST PETERSBURG 1 FLA  
CIRCUIT RESEARCH CO  
33 SEA CLIFF AVE GLEN COVE L I N Y  
CIRLO ULTRASONIC CORP  
51 TERMINAL AVE CLARK N J  
CIRTRONICS CO  
1101 EMERSON ST SEATTLE 99 WASH  
CITY CHEMICAL CORP  
132 W 22 ST NEW YORK 11 N Y  
CITY MARKING DEVICES CORP  
12 SPRUCE ST NEW YORK 38 N Y  
CLAIREX CORP  
19 W 26 ST NEW YORK 10 N Y  
CLARAGE FAN CO  
KALAMAZOO MICH  
CLARE CO C P  
101 N 33RD ST PHILADELPHIA 4 PA  
CLARE TRANSISTOR CORP C P  
260 GLEN HEAD RD GLEN HEAD LI N Y  
CLAREMONT TUBE CORP  
36-02 35TH AVE LONG ISLAND CITY 6 N Y  
CLARK CONTROLLER CO  
4755 E 49TH ST LOS ANGELES CALIF  
CLARK CONTROLLER CO  
1146 E 152 ST CLEVELAND 10 OHIO  
CLARK CRYSTAL CO  
3 FARM RD MARLBORO MASS  
CLARK ELECTRONIC LABS  
BOX 163 PALM SPRINGS CALIF  
CLARK MFG CO  
2509 FIRST AVE EAST MEADOW L I N Y  
CLARKE M JOY CO  
27003 KNICKERBOCKER RD BAY VILLAGE OHIO  
CLARKSON LABORATORIES INC  
1450 FERRY ST CAMDEN N J  
CLAROSTAT MFG CO  
WASHINGTON ST DOVER N H  
CLARY CORP  
808 JUNIPERO ST SAN GABRIEL CALIF  
CLAUSS CUTLERY CO  
223 PROSPECT ST FREMONT OHIO  
CLEAR BEAM ANTENNA CORP  
21341 ROSCOE BLVD CANOGA PARK CALIF

CLEARPRINT PAPER CO  
1482 67TH ST EMERYVILLE CALIF  
CLECO AIR TOOLS  
P O BOX 2119 HOUSTON TEXAS  
CLEGG LABS/DIV CHG INC  
RIDGEDALE AVE MORRISTOWN N J  
CLETRON INC  
1974 E 61 ST CLEVELAND 30 OHIO  
CLEVELAND CAP SCREW CO  
4448 LEE ROAD CLEVELAND 28 OHIO  
CLEVELAND CONTAINER CO  
6201 BARBERTON AVE CLEVELAND 2 OHIO  
CLEVELAND DESIGNERS  
4241 FULTON PKBY CLEVELAND OHIO  
CLEVELAND ELECTRONICS INC  
1974 E 61ST ST CLEVELAND 3 OHIO  
CLEVELAND GRAPHITE BRONZE DIV CLEVITE CORP  
17000 ST CLAIR AVE CLEVELAND 10 OHIO  
CLEVELAND INSTRUMENT CO  
6220 E SCHAFF RD CLEVELAND 31 OHIO  
CLEVELAND INSTRUMENT CO  
6220 E SCHAFF RD INDEPENDENCE 31 OHIO  
CLEVELAND METAL SPECIALTIES CO  
1783 E 21 ST CLEVELAND 14 OHIO  
CLEVELAND PNEUMATIC INDUSTRY INC-ADVANCED  
SYSTEMS DEV DIV  
1301 E EL SEGUNDO BLVD EL SEGUNDO CALIF  
CLEVELAND WIRE CLOTH & MFG CO  
3573 E 78TH ST CLEVELAND OHIO  
CLEVITE COMPONENTS  
BEDFORD OHIO  
CLEVITE CORP  
17000 CLAIR AVE CLEVELAND 10 OHIO  
CLEVITE CO-CLEVITE TRANSISTOR PRODUCTS  
3402 W CENTURY BLVD-SUIT 12 INGLEWOOD CAL  
CLEVITE CORP-BRUSH INSTRUMENTS DIV  
3336 E FOOTHILL BLVD PASADENA CALIF  
CLEVITE ELECTRONIC COMPONENTS DIV CLEVITE  
3405 PERKINS AVE CLEVELAND 14 OHIO  
CLEVITE HARRIS PRODS INC  
LOCKWOOD RD MILAN OHIO  
CLEVITE HARRIS PRODUCTS INC  
6545 CARNEGIE AVE CLEVELAND 3 OHIO  
CLEVITE ORNANCE DIV CLEVITE CORP  
540 E 105TH ST CLEVELAND 8 OHIO  
CLEVITE TRANSISTOR PRODUCTS  
241 CRESCENT ST WALTHAM 54 MASS  
CLIFFORD MFG CO  
152 GROVE ST WALTHAM 54 MASS  
CLIFTON PRECISION PRODS CO  
P O BOX 782 COLORADO SPRINGS COLO  
CLIFTON PRECISION PRODUCTS CO INC  
MARPLE AT BROADWAY CLIFTON HEIGHTS PA  
CLIPPAARD INSTRUMENT LAB  
7390 COLERAIN AVE CINCINNATI 39 OHIO  
CLOUGH-BRENGLE CO  
6014 BROADWAY CHICAGO 40 ILL  
CLOVER INDUSTRIES INC  
578-588 YOUNG ST TOWANANDA N Y  
CLY DEL MFG CO INC  
P O BOX 1367 WATERBURY 20 CONN  
COAST COIL CO  
5333 W WASHINGTON BLVD LOS ANGELES CALIF  
COAST PRO-SEAL & MFG CO  
2235 BEVERLY BLVD LOS ANGELES 57 CALIF  
COAX ELECTRONICS CO  
46 NOTRE DAME RD BEDFORD MASS  
COAXIAL CONNECTOR CO INC  
37 N 24th AVE MOUNT VERNON N Y  
COBEHM INC  
PASSAIC AVE CALDWELL N J  
COEN CONTROLS CO  
40 BOARDMAN PL SAN FRANCISCO 3 CALIF  
COFAX ELECTRONIC CORP  
327 MAIN ST LOOI N J  
COHAN EPNER CO  
142 W 14 ST NEW YORK 11 N Y  
COHN CORP SIGNMD  
121 S COLUMBUS AVE MOUNT VERNON N Y  
COMU ELECTRONICS - MASSA DIV  
3 FOTTLER RD HINGHAM MASS  
COIL COMPANY OF AMERICA  
212 WASHINGTON ST NORTHVALE N J  
COIL ENGG & MFG CO  
ROANOKE IND  
COIL BINDERS INC  
NEW YORK AVE WESTBURY LI N Y  
COIL WINDING EQUIPMENT CO  
19 MARWELL AVE OYSTER BAY N Y  
COLCRAFT INC  
CARY ILL  
COILS ELECTRONICS CO  
2939 49 N 2ND ST PHILA 33 PENNA  
COLBER CORP  
26 BUFFINGTON ST IRVINGTON 11 N J  
COLBURN LAB 88  
164 N BAKER DR CHICAGO 6 ILL  
COLE HERSE CO  
20 OLD COLONY AVE S BOSTON 27 MASS  
COLE RADIO BATTERY MFG CO  
86 WESTVILLE AVE CALDWELL N J  
COLEMAN CABLE & WIRE CO  
1900 N RIVER RD RIVER GROVE ILL  
COLEMAN ELECTRONICS INC  
133 EAST 162ND ST GARDENA CALIF  
COLEMAN ENGRG CO INC  
3510 TORRANCE BLVD TORRANCE CALIF  
COLEMAN INSTRUMENT CO INC  
P O BOX 5127 TULSA 16 OKLA  
COLEMAN INSTRUMENTS INC  
42 MADISON ST MAYWOOD ILL  
COLIN CAMPBELL CO INC  
ABBOTT ST DANBURY CONN  
COLLECTRON CORP  
304 E 45TH ST NEW YORK 17 N Y  
COLLINS CORP G L  
2820 E HULLETT ST LONG BEACH 5 CALIF

COLLINS ELECTRONICS MFG CORP  
STEVENSVILLE MO  
COLLINS RADIO CO  
1200 N ALMA RD RICHARDSON TEXAS  
COLLINS RADIO CO  
1845 B MOUNTAIN GLENDALE 1 CALIF  
COLLINS RADIO CO  
2700 W OLIVE AVE BURBANK CALIF  
COLLINS RADIO CO  
855 35 ST N E CEDAR RAPIDS IOWA  
COLLINS RADIO CO  
1930 MILITARY DR DALLAS 7 TEXAS  
COLLINS RADIO CO OF CANADA LTD  
31 BERMUNDOSEY RD TORONTO ONT CAN  
COLLYER INSULATED WIRE CO  
249 ROOSEVELT AVE PARTUCKET R I  
COLMAN ELECTRONIC PRODUCTS INC  
1017 N E 3RD AVE AMARILLO TEX  
COLMAN TOOL & MACHINE CO  
P O BOX 6007-1017 NE 3RD ST AMARILLO TEX  
COLONIAL ALLOYS CO  
RIDGE AVE & CRAWFORD STS  
PHILADELPHIA 29 PA  
COLONIAL INSULATOR CO  
945 GRANT ST AKRON 11 OHIO  
COLORADO RESEARCH CORP  
BROOMFIELD COLO  
COLSON CORP  
440 SOMERVILLE AVE SOMERVILLE 43 MASS  
COLUMBIA ELECTRIC MFG CO  
4519 HAMILTON AVE CLEVELAND 14 OHIO  
COLUMBIA METAL BOX CO  
260 E 143 ST NEW YORK 51 N Y  
COLUMBIA PRODUCTS CO  
6625 SHAKESPEARE RD COLUMBIA S C  
COLUMBIA RECORDS INC  
DIV COLUMBIA BROADCASTING SYSTEMS  
799 7 AVE NEW YORK NY  
COLUMBIA RESEARCH & MFG CO  
RT 6A COLUMBIA CONN  
COLUMBIA RESEARCH LABS  
MACDADE BLVD & BULLENS LA WOODLYN PA  
COLUMBIA TAPE MILLS INC  
BANK ST & GREENVILLE PA  
COLUMBIA TECHNICAL CORP  
61-02 31 AVE WOODSIDE 77 N Y  
COLUMBIA WIRE & SUPPLY CO  
2850 IRVING PARK RD CHICAGO 18 ILL  
COLUMBIAN CARBON CO MAPICO IRON OXIDES UNIT  
381 MADISON AVE NEW YORK 17 N Y  
COLUMBUS ELECTRONICS CORP  
1010 E HILL RIVER RD YONKERS N Y  
COLUMBUS PROCESS CO  
2851 SOUTHEASTERN AVE COLUMBUS IND  
COLUMB MACHINE CO INC  
MOULTON & HUNDE STS GEORGETOWN MASS  
COLVIN LABS INC  
364 GLENWOOD AVE E CHICAGO N J  
COM TRONICS INC  
3409 VENICE BLVD LOS ANGELES 19 CALIF  
COMAR ELECTRIC CO  
3349 ADDISON ST CHICAGO 18 ILL  
COMAR PRODUCTS  
BOX 776 BUTLER N J  
COMBUSTION ENGRG NUCLEAR DIV  
PROSPECT HILL RD WINDSOR CONN  
COMCO PLASTICS INC  
98-34 B JAMAICA AVE RICHMOND HILL 18 N Y  
COMET LTD  
BERNE SWITZERLAND  
COMMERCIAL CONTROLS CORP  
1 LEIGHTON AVE ROCHESTER 2 N Y  
COMMERCIAL FILTERS CORP  
2 MAIN ST MELROSE 76 MASS  
COMMERCIAL OPTICAL CO  
P O BOX 474 HUNTINGTON W VA  
COMMERCIAL RADIO SOUND CORP  
652 E AVE NEW YORK 16 N Y  
COMMERCIAL TELECAST NETWORKS INC  
808 5TH AVE NEW YORK 20 N Y  
COMMERCIAL VIDEO  
7960 BEVERLY BLVD LOS ANGELES 48 CALIF  
COMMUNICATION ACCESSORIES CO  
U S 50 HWY LEES SUMMIT MO  
COMMUNICATION COIL CO  
2830 N HARRAGANSETT CHICAGO 38 ILL  
COMMUNICATION EQUIPMENT & ENGRG CO  
5686 B RACE AVE CHICAGO 44 ILL  
COMMUNICATION MEASUREMENTS LABS  
350 LELAND AVE PLAINFIELD N J  
COMMUNICATION PRODUCTS  
STATE HWY 79 MARLBORO N J  
COMMUNICATIONS CO  
300 GREG AVE CORAL GABLES FLA  
COMMUNITY ENGRG CORP  
BOX 824 STATE COLLEGE PA  
COMPACT CONTROLS CO INC  
1633 N HALSTED ST CHICAGO 14 ILL  
COMPAGNIE GENERALE DE METROLOGIE  
CHEMIN DE LA CROIX-ROUGE PO BOX 30  
ANNEXE HAUTE-SAVOIE FRANCE  
COMPCO CORP  
1800 N SPAULDING ST CHICAGO 47 ILL  
COMPONENT MFG SERVICE INC  
1 COMPONENT PR B BRIDGEWATER MASS  
COMPONENT RESEARCH CO INC  
3019 E ORANGE DR LOS ANGELES 16 CALIF  
COMPONENTS CORP  
106 MAIN ST DENVER N J  
COMPONENTS CORP  
2853 - 57 N HALSTED ST CHICAGO ILL  
COMPONENTS DEPT DIV CURTISS BRIGHT  
ELECTRONICS DIV CARLSTADT N J  
COMPONENTS FOR RESEARCH INC  
979 COMMERCIAL ST PALO ALTO CALIF  
COMPONENTS INC  
SMITH ST BIDDEFORD MAINE

- COMPTONER CORP  
842 LINCOLN AVE N PARK RIDGE ILL  
COMPTONER CORP  
5800 W JARVIS AVE CHICAGO 48 ILL  
COMPTON CORP  
778 PLEASANT ST BELMONT 79 MASS  
COMPTON CORP  
778 PLEASANT ST BELMONT 79 MASS  
COMPUTER CONTROL CO  
92 BROAD ST WELLESLEY 57 MASS  
COMPUTER CONTROL CO INC WESTERN DIV  
2251 BARRY AVE LOS ANGELES CALIF  
COMPUTER CONTROL COMPANY INC  
983 CONCORD ST FRAMINGHAM MASS  
COMPUTER ENGG ASSOC INC  
1610 S MAGNOLIA HIGHWAY CALIF  
COMPUTER ENGINEERING ASSOCIATES INC  
350 N HALSTEAD PASADENA CALIF  
COMPUTER EQUIPMENT CORP  
1031 PONTIUS AVE LOS ANGELES 25 CALIF  
COMPUTER INSTRUMENTS CORP  
92 MADISON AVE HEMPSTEAD N Y  
COMPUTER MEASUREMENTS  
5528 VINELAND AVE NORTH HOLLYWOOD CALIF  
COMPUTER MEASUREMENTS CO  
12970 BRADLEY AVE SYLMAR CALIF  
COMPUTER OPER/AERO  
FORD RD NEWPORT BEACH CALIF  
COMPUTER SYSTEMS INC  
611 BROADWAY NEW YORK 12 N Y  
COMPUTER TECHNIQUES INC  
3330 NORTHERN BLVD LONG ISLAND CITY N Y  
COMPUTING DEVICES OF CANADA LTD  
P O BOX 508 OTTAWA ONTARIO CAN  
COMPUTRONIS INC  
5310 E PACIFIC PLACE DENVER COLO  
CON-ELCO  
1711 S MOUNTAIN AVE MONROVIA CALIF  
CONANT LABS  
BOX 3997 BETHANY STA LINCOLN 5 NEBR  
CONCERTAPES INC  
PO BOX 88 WILMETTE ILL  
CONCORD CONTROL INC  
1282 SOLDIERS FIELD RD BOSTON 35 MASS  
CONCORD MFG CORP  
100 BAKER ST PROVIDENCE 5 R I  
CONDENSER PRODUCTS DIV  
NEW HAVEN CLOCK & WATCH CO 140 HAMILTON ST  
NEW HAVEN 4 CONN  
CONDUCTORLAB INC  
GROTON MASS  
CONFORMING MATRIX CORP  
474 TOLEDO FACTORIES BLDG TOLEDO 2 OHIO  
CONLEY ELECTRONICS CORP  
8225 CHRISTIANA AVE SKOKIE ILL  
CONLEY ELECTRONICS CORP-FIDELIPAC DIV  
1702 WAYNE ST TOLEDO 9 OHIO  
CONN HARD RUBBER CO  
P O BOX 1911 NEW HAVEN 9 CONN  
CONN LTD C G  
555 E JACKSON BLVD ELKHART IND  
CONN MARINE INSTRUMENT CO  
ESSEX CONN  
CONN ORGAN CORP  
555 E JACKSON BLVD ELKHART IND  
CONN ORGAN CORP  
919 NO WILLIAM AVE FREMONT NEBRASKA  
CONN SEAL CORP  
4224 TEMPLE CITY BLVD ROSEMEAD CALIF  
CONN TELEPHONICS CORP  
34 CAMBRIDGE ST MERIDEN CONN  
CONN-CRAFT CO  
301 FAIRLAWN AVE WATERBURY 5 CONN  
CONNECTICUT CIRCUIT LABS  
P O BOX 52 NORWALK CONN  
CONNECTOR CORP  
4027 N KEYSTONE AVE CHICAGO 30 ILL  
CONNECTOR CORPORATION OF AMERICA  
12959 SHERMAN WAY N HOLLYWOOD CALIF  
CONNECTOR SEALS CORP  
300 NORTH LAKE AVE PASADENA CALIF  
CONNOLLY & CO WALLACE E  
PO BOX 295 MENLO PARK CALIF  
CONPOLCO CORP  
2100 ARCH ST PHILA PENNA  
CONRAC INC  
19217 E FOOTHILL BLVD GLENORA CALIF  
CONRAD & MOSER  
2 BORDEN AVE LONG ISLAND CITY 1 N Y  
CONRAY CORP  
141 JEFFERSON ST HOLLAND MICH  
CONRAY CORP  
19 W FOURTH ST DAYTON 2 OHIO  
CONS RADIO PRODUCTS CO  
7334 N CLARK ST CHICAGO 26 ILL  
CONSOLIDATED AIRBORNE SYSTEMS INC  
900 3RD AVE NEW HYDE PARK LI N Y  
CONSOLIDATED AVIONICS CORP  
800 SHAMES DR WESTBURY N Y  
CONSOLIDATED CONTROLS CORP  
750 S 1515 INGLEWOOD CALIF  
CONSOLIDATED CONTROLS CORP  
& DURANT AVE BETHEL CONN  
CONSOLIDATED DIESEL ELECTRIC CORP  
880 CANAL ST STAMFORD CONN  
CONSOLIDATED ELECTRODYNAMICS CORP  
360 SIERRA MADRE VILLA PASADENA CALIF  
CONSOLIDATED ELECTRODYNAMICS  
1400 S SHAMROCK AVE MONROVIA CALIF  
CONSOLIDATED MINING & SMELTING OF CANADA LTD  
TRAIL B C CANADA  
CONSOLIDATED MOLDED PRODUCTS CORP  
809 CHERRY ST SCRANTON 2 PENNA  
CONSOLIDATED PRODUCTIONS INC  
3991 SW 12TH TERRACE FT LAUDERDALE FLA  
CONSOLIDATED RESISTANCE CO OF AMERICA  
44 PROSPECT ST YONKERS 1 N Y
- CONSOLIDATED VACUUM CORP  
1775 HY READ BLVD ROCHESTER 4 N Y  
CONSOLIDATED WIRE & ASSOCIATED COS  
1635 S CLINTON ST CHICAGO 16 ILL  
CONSTAD LABS  
83-02 142 ST JAMAICA N Y  
CONSTANTA CO OF CANADA LTD  
280 REGINA AVE VERONA MONTREAL QUE CANADA  
CONSTANTIN & CO L L  
ROUTE 48 LODI N J  
CONSTANTINE ENGRG LABS  
RT 17 & ISLAND AVE HANNAH N J  
CONSUMER INDUSTRIAL PRODUCTS INC  
P O BOX 186 AKRON 9 OHIO  
CONTACT INC  
P O BOX 344 MAYNARD MASS  
CONTACTS INC  
1100 SILAS DEANE HWY WETHERSFIELD 9 CONN  
CONTINENTAL AVIA & ENGRG CO  
12700 KERACHEVAL DETROIT 15 MICH  
CONTINENTAL CAN CO  
7622 S RACINE AVE CHICAGO ILL  
CONTINENTAL CAN CO INC  
100 E 42ND ST NEW YORK 17 N Y  
CONTINENTAL CAN CO-CONOLITE DIV  
4300 N PT WASHINGTON RD MILWAUKEE WISC  
CONTINENTAL CARBON INC  
5221 GREYS ST PHILADELPHIA 44 PA  
CONTINENTAL CONNECTOR CORP  
34-63 56 ST WOODSIDE 77 N Y  
CONTINENTAL DEVICE CORP  
12515 CHADRON AVE HARTHORNE CALIF  
CONTINENTAL ELEC EQUIP CO  
205 W 4 ST CINCINNATI 1 OHIO  
CONTINENTAL ELEC MFG CO  
4212 BUCKNER BLVD DALLAS TEXAS  
CONTINENTAL ELECTRIC CO  
715 HAMILTON ST GENEVA ILL  
CONTINENTAL ELECTRIC CO  
325 FERRY ST NEWARK 5 N J  
CONTINENTAL ELECTRONICS CORP  
302 DAKLAND ST BROOKLYN 22 N Y  
CONTINENTAL ELECTRONICS CORP  
1900 W ALLEGHENY AVE PHILADELPHIA 32 PA  
CONTINENTAL ELECTRONICS CORP  
2724 LEONIS BLVD LOS ANGELES 58 CALIF  
CONTINENTAL MFG INC  
1612 CALIF ST OMAHA NEB  
CONTINENTAL OIL CO  
PONCA CITY OKLA  
CONTINENTAL PRECISION PRODUCTS  
1026 E 179TH ST NEW YORK 60 N Y  
CONTINENTAL SCREW CO  
459 MT PLEASANT ST NEW BEDFORD MASS  
CONTINENTAL WIRE CORP  
560 MARYLAND AVE YORK PENNA  
CONTINENTAL WIRE SLS CORP  
322 N CHERRY ST EXT P O BOX 366  
WALLINGFORD CONN  
CONTINENTAL-DIAMOND FIBRE CORP  
NEWARK DELA  
CONTINENTAL-EMSCO MFG CO  
P O BOX 1289 GARDEN VILLAS HOUSTON TEXAS  
CONTINENTAL-WIRT ELECTRONICS CORP  
5221 GREENE ST PHILA 44 PA  
CONTROL & DIV OF MAGNETICS INC  
BOX 391 BUTLER PA  
CONTROL CIRCUITS INC  
66 MARLBOROUGH ST PORTLAND CONN  
CONTROL CORP  
718 CENTRAL AVE N E MINNEAPOLIS 14 MINN  
CONTROL DATA CORP  
501 PARK AVE MINNEAPOLIS 15 MINN  
CONTROL ELECTRONICS CO INC  
10 STEPAR PLACE HUNTINGTON STA N Y  
CONTROL INSTRUMENT CO  
67 35TH ST BROOKLYN 32 N Y  
CONTROL PANEL CORP  
4431 W DIVISION ST CHICAGO 6 ILL  
CONTROL PARTS CORP  
530 BURNSIDE AVE INWOOD LI 96 N Y  
CONTROL PRODUCTS INC  
304 SUSSEX ST HARRISON N J  
CONTROL SWITCH DIV CONTROL CO OF AMERICA  
139 ILLINOIS ST EL SEGUNDO CALIF  
CONTROL SWITCH DIV CONTROLS CO OF AMERICA  
4218 W LAKE ST CHICAGO 24 ILL  
CONTROL SWITCH DIV CONTROLS CO OF AMERICA  
DELMAR OR POLCROFT PA  
CONTROLLED ATMOSPHERE ENCLOSURES CORP  
230-11 141 AVE SPRINGFIELD GARDENS LI N Y  
CONTROLLED ATMOSPHERE ENCLOSURES MFG CO  
1061 E 8 ST JACKSONVILLE 6 FLA  
CONTROLS CO OF AMER  
800 BROADWAY TEMPLE ARIZ  
CONTROLS CO OF AMERICA  
CRYSTAL LAKE ILL  
CONTROLS CO OF AMERICA  
9555 SORENG AVE SCHILLER PARK ILL  
CONTROLS FOR RADIATION INC  
130 ALEWIFE BROOK PKRY CAMBRIDGE 40 MASS  
CONVAIR  
DAINGERFIELD TEXAS  
CONVAIR  
BOX 748 FT WORTH TEXAS  
CONVAIR  
P O BOX 1355 TOPEKA KANSAS  
CONVAIR ASTRONAUTICS  
BOX 1128 SAN DIEGO 17 CALIF  
CONVAIR ASTRONAUTICS-ERB  
P O BOX 194 HESPERIA CALIF  
CONVAIR POMONA DIV GEN DYNAMICS CORP  
1675 W 5TH POMONA CALIF  
CONVAIR SAN DIEGO ELECTRONICS  
3165 PACIFIC HWY SAN DIEGO CALIF
- CONVAIR-ASTRONAUTICS  
EDWARDS CALIF  
COOK CO C LEE AERONAUTIC PRODUCTS DIV  
916 S 8TH ST LOUISVILLE 3 KY  
COOK CO FRANK R  
3850 OLIVE ST DENVER 7 COLO  
COOK ELECTRIC CO  
2700 N SOUTHPORT AVE CHICAGO 11 ILL  
COOK ELECTRIC CO  
600 OLD COUNTRY ROAD GARDEN CITY LI N Y  
COOK ELECTRIC CO  
110 W LIBERTY ST ROME N Y  
COOR ELECTRIC CO DATA STORAGE DIV  
8100 N MONTICELLO AVE SKOKIE ILL  
COOK TECHNOLOGICAL CENTER DIV  
6401 OAKTON ST MORTON GROVE ILL  
COOKE ENGINEERING CO  
508 NO PITT ST ALEXANDRIA VA  
COOL FIM CORP  
6442 COLDWATER CANYON AVE NORTH HOLLYWOOD  
CALIF  
COOPER & SON JOSEPH B  
180 VARICK STREET NEW YORK 14 N Y  
COOPER CO D C  
1467 S MICHIGAN AVE CHICAGO 5 ILL  
COOPER ELECTRONICS INC  
28TH PARRISH STREETS PHILA 30 PA  
COPPERWELD STEEL CO WIRE & CABLE DIV  
GLASSPORT PA  
COPPERWELD STEEL CO-FLEXO WIRE DIV  
OSWEGO N Y  
CORBETT SCIENCE LABS F W  
3117 VENICE BLVD LOS ANGELES 19 CALIF  
CORBIN CORP  
76 PRIMROSE LA LEVITTOWN N J  
CORD PRODUCTS CO  
1 W MAIN ST 50 HADLEY FALLS MASS  
CORDOVER & CO CARL  
104 LIBERTY AVE MINEOLA N Y  
CORDS LIMITED DIV ESSEX WIRE CORP  
121 DOGGE AVE DEKALB ILL  
CORNELL-DUBILIER ELEC CORP  
2900 COLUMBIA AVE INDIANAPOLIS 5 IND  
CORNELL-DUBILIER ELEC-MECH DEVEL LABS  
921 PROVIDENCE HWY NORWOOD MASS  
CORNELL-DUBILIER ELEC-PAPER CAPACITOR DIV  
1605 RODNEY FRENCH BLVD NEW BEDFORD MASS  
CORNELL-DUBILIER ELEC-SANFORD DIV  
P O BOX 248 BOSTON N CAR  
CORNELL-DUBILIER ELEC CORP  
15 PEMBROKE COURT ROCKVILLE CENTRE N Y  
CORNELL-DUBILIER ELECTRIC CORP  
4144 GLENCOE AVE VENICE CALIF  
CORNELL-DUBILIER ELECTRIC CORP  
333 HAMILTON BLVD S PLAINFIELD N J  
CORNELL-DUBILIER MICA  
55 CORNWELL ST PROVIDENCE R I  
CORNING ELECTRONIC COMPONENTS  
BRADFORD PA  
CORNING GLASS WORKS  
CORNING N Y  
CORNING WIRE CO  
50 CHURCH ST NEW YORK 7 N Y  
CORNWELL ELECTRONICS CORP  
84 S WATER ST PORT CHESTER N Y  
CORONA ENGG SERVICE  
94-52 CORONA AVE ELMHURST 73 N Y  
CORRUGATED PAPER PRODUCTS  
2233 UTICA AVE BROOKLYN 34 N Y  
CORY JAMESTOWN CORP  
43 W CENTER ST CORY PA  
CORSON ELECTRIC MFG CORP  
540 39TH ST UNION CITY N J  
CORTLAND INDUSTRIES  
4545 CORTLAND AVE CHICAGO ILL  
COSA CORP  
405 LEXINGTON AVE NEW YORK 17 N Y  
COSMIC CONDENSER CO  
853 WHITTIER ST BRONX N Y  
COSMIC RADIO CORP  
853 WHITTIER ST NEW YORK 59 N Y  
COSMOS IND INC  
31-28 QUEENS BLVD LONG ISLAND CITY 1 N Y  
COTO-COIL CO  
45 PAVILION AVE PROVIDENCE 9 R I  
COTTRELL PAPER CO INC  
88 PURCHASE ST FALL RIVER MASS  
COULTER ORDNANCE INC  
3 ARLINGTON ST N QUINCY 71 MASS  
COURTNER PRODUCTS/DIV MODEL ENGG & MFG INC  
N LAKE ST BOYNE CITY MICH  
COUSINO INC  
2107 ASHLAND AVE TOLEDO 2 OHIO  
COVEL MFG CO  
P O BOX 116 BENTON HARBOR MICH  
COX & CO  
115 E 23 ST NEW YORK 10 N Y  
COX INSTRUMENTS DIV GEORGE C HANMERVIS CO  
15300 FULLERTON AVE DETROIT 27 MICH  
CPS LABS  
HIGH RIDGE RD STAMFORD CONN  
CRAFT MFG CO  
2301 DAVIS ST N CHICAGO ILL  
CRAFTINT MFG CO  
1615 COLLAMER AVE CLEVELAND 10 OHIO  
CRAIG SYSTEMS INC  
1016 BERLIN ROAD HADDENFIELD N J  
CRAIG SYSTEMS INC  
360 MERRIMACK ST LAWRENCE MASS  
CRAMER CONTROLS CORP  
CENTERBROOK CONN  
CRANE PACKING CO  
6400 OAKTON ST MORTON GROVE ILL  
CRATEX MFG CO INC  
1600 ROLLINS RD BURLINGAME CALIF

# ELECTRONIC MANUFACTURERS-A-Z

CRESCENT CO  
20 CENTRAL AVE PABTUCKET R I  
CRESCENT ENGG & RESEARCH CO  
5440 N PECK RD EL MONTE CALIF  
CRESCENT INSULATED WIRE & CABLE CO  
321 N OLDEN AVE TRENTON 5 N J  
CRESCENT FABRICATORS CORP  
3931 60TH ST WOODSIDE 77 N Y  
CREST ELECTRIC CORP  
20490 OLD U S 12 CHELSEA MICH  
CREST TRANSFORMER CORP  
1834 N NORTH AVE CHICAGO 22 ILL  
CRITTENDEN TRANSFORMER WORKS  
13011 S SPRING ST LOS ANGELES 61 CALIF  
CROAME INC  
6283 HOWARD ST CHICAGO 48 ILL  
CROSBY LABS INC  
299 ROBBINS LANE SYOSSET N Y  
CROSBY LAUGHLIN DIV  
BOX 570 FT WAYNE IND  
CROSS CO N  
15 BEKMAN ST NEW YORK 38 N Y  
CROSS COUNTY AUDIO EXCHANGE  
583 GRANATIN AVE FLTBD NY VERNON NY  
CROUSE-HINDS CO  
BOX 131 SYRACUSE 1 N Y  
CROVEN LTD  
500 BEECH ST WHITBY ONT CANADA  
CROWN CONTROLS CO INC  
40-44 S WASHINGTON NEW BREMEN OHIO  
CROWN ENGINEERING CORP  
3021 COMMERCIAL N E ALBUQUERQUE N M  
CROWN INDUSTRIAL PRODUCTS CO  
713 AMSTERDAM WOODSTOCK ILL  
CRUCIBLE STEEL CO OF AMERICA  
P O BOX 2518 PITTSBURGH 30 PENNA  
CRUCIBLE STEEL CO OF AMERICA  
1000 S 4TH ST HARRISON N J  
CRYCO INC  
2242 MIDWICK DR ALTADENA CALIF  
CRYSTALONICS INC  
249 FIFTH ST CAMBRIDGE 42 MASS  
CRYSTAL-WESTLAKE CORP  
BY LEMME RD LENNI HILLS PA  
CT INC  
PO BOX 152 BERNE IND  
CTS OF ASHEVILLE INC  
MILLS GAP ROAD SKYLAND NORTH CAROLINA  
CUBIC CORP  
5575 KEARNY VILLA RD SAN DIEGO 11 CALIF  
CUBIC CORP  
45 TERRY ST EAU GALLIE FLA  
CUMMINS ENGINE CO  
1000 5TH ST COLUMBUS IND  
CUMMINS PORTABLE TOOLS  
5055 N LYDELL AVE MILWAUKEE 17 WISC  
CUMMINS-CHICAGO CORP  
4740 RAVENSWOOD CHICAGO 40 ILL  
CUMMINGS SON & CO INC JAMES  
33 LITCHFIELD ST P O BOX 516 ROCHESTER 8 N Y  
CURTIS DEVELOPMENT & MFG CO  
3210 N 33 ST MILWAUKEE 16 WISC  
CURTIS HADLOCK CO  
BOX 1 50 FREEPORT MAINE  
CURTIS UNIVERSITY JOINT CO  
BRIGHTWOOD SPRINGFIELD MASS  
CURTISS BRIGHT CORP  
8 CALDWELL N J  
CURTISS BRIGHT CORP-BRIGHT AERONAUTICAL DIV  
BLDG 22 WOODRIDGE N J  
CURTISS BRIGHT SANTA BARBARA DIV  
MUNICIPAL A/P SANTA BARBARA CALIF  
CURTISS-BRIGHT CO  
BLDG 87 QUEHANNA PENNA  
CURTISS-BRIGHT CORP  
20 VENNA AVE (N H) PATERSON 2 N J  
CURTISS-BRIGHT CORP ELECTRONICS DIV IMI BRCH  
PO BOX 8324 ALBUQUERQUE N M  
CURTISS-BRIGHT CORP ELECTRONICS DIV  
35 MARKET ST EAST PATERSON N J  
CURTISS-BRIGHT CORP PRINCETON DIV  
PO BOX 110 PRINCETON N J  
CURTISS-BRIGHT CORP SANTA BARBARA DIV  
6767 HOLLISTER AVE GOLETA CALIF  
CURTISS-BRIGHT CORP-ELECT DIV  
631 CENTRAL AVE CARLSTADT N J  
CURTISS-BRIGHT CORP-INDUSTRIAL & SCIENTIFIC  
PRODS DIV P O BOX 110 PRINCETON N J  
CUSHMAN PRECISION INDUSTRIES  
NIGHTSTOWN RD PRINCETON JUNCTION N J  
CUSTOM COMPONENTS INC  
P O BOX 248 CALDWELL N J  
CUSTOM ELECTRONIC ASSEMBLY  
15 BRATTLE ST CAMBRIDGE 38 MASS  
CUSTOM ELECTRONICS CORP  
738 SPEEDWELL AVE MORRIS PLAINS N J  
CUSTOM ENGINEERING  
3921 HARRIDGE RD LA CRESCENTA CALIF  
CUSTOM INSTRUMENT CO  
1808 HARRAN ST BERKELEY 3 CALIF  
CUSTOM PRODUCTS CORP  
606 LINDLEY ST BRIDGEPORT 6 CONN  
CUSTOM SCIENTIFIC INSTRUMENTS INC  
541 DEVON ST KEARNEY NJ  
CUSTOM GEAR CO  
848 COLLEGE SOUTH BEND 28 IND  
CUTLER METAL PRODUCTS CO  
1025 LINE ST CAMDEN 3 N J  
CUTLER-HAMMER INC  
436 N 12 ST MILWAUKEE 1 WISC  
CYS WAVEGUIDE CORP  
AMITYVILLE LI N Y  
CYCLE EQUIPMENT CO  
17480 SHELburne BAY LOS GATOS CALIF  
CYCLE TRANSFORMER CORP  
356 GLENWOOD AVE E ORANGE 11 N J

## D

D & R LTD  
402 E SUTTIERREE ST SANTA BARBARA CALIF  
D & R PILOT PLANTS INC  
WATER ST HAZARDVILLE CONN  
D-R PILOT PLANTS INC  
61 CROSS ST WEST NEWTON MASS  
DA-LITE SCREEN CO  
BARSAB IND  
DACE ENGINEERING  
2576 PATRICIA DRIVE SANTA CLARA CALIF  
DACO INSTRUMENT CO  
TILLARY & PRINCE STS BROOKLYN 1 N Y  
DAGE ELECTRIC CO  
67 N 2 ST BEECH GROVE IND  
DAGE TV DIV THOMPSON PRODUCTS  
# 10 ST MICHIGAN CITY IND  
DAHLSTROM METALLIC DOOR CO  
BUFFALO & 2 STS JAMESTOWN N Y  
DAKOTA ENGG INC  
4315-4317 SEPULVEDA BLVD CULVER CITY CALIF  
DALE ELECTRONIC CORP  
2530 N ONTARIO ST BURLINGAME CALIF  
DALE PRODUCTS INC  
2530 ONTARIO BURLINGAME CALIF  
DALE PRODUCTS INC  
P O BOX 136 COLUMBUS NEBR  
DALES CO FRANKLIN  
180 E HILL ST ARRON OHIO  
DALLONS LABS  
5006 SANTA MONICA BLV LOS ANGLS CAL  
DALLONS SEMICONDUCTORS DIV DALLONS LABS INC  
5066 SANTA MONICA BLVD LOS ANGELES 29 CAL  
DALMO VICTOR CO  
420 HARTHORNE SAN BRUNO CALIF  
DALMO VICTOR CO  
1515 INDUSTRIAL BAY BELMONT CALIF  
DALMO VICTOR CO  
BOX 1648 MONTEREY CALIF  
DALMORE CORP  
47 PROSPECT ST WOBURN MASS  
DALMOTOR CO DIV DALMO VICTOR CO  
DIV TEXTRON INC 1375 CLAY ST SANTA CLARA  
CALIF  
DALNOTRON CO  
534 LAUREL ST SAN CARLOS CALIF  
DALWELD CO INC  
13 BERTEL AVE NT VERNON N Y  
DAMASCUS TUBE CO  
GREENVILLE PA  
DANON RECORDING STUDIOS  
117 W 14 ST KANSAS CITY 5 MO  
DAMP-CHASER INC  
1440 RIDGEWOOD BLVD HENDERSONVILLE N CARO  
DAMED MFG CO  
22901 OSTRONIC DR WOODLAND HILLS CALIF  
DAME ELECTRIC CO  
93 MAIN ST WINSTED CONN  
DAME ELECTRONIC LABS  
84 LINDWOODERRY RD MARBLEHEAD MASS  
DANTE ELECTRIC MFG CO  
BANTAM CONN  
DARE INC  
BOX 258 TROY 3 OHIO  
DARGAN ELECTRONICS CO  
159 NEVADA ST HICKSVILLE LI N Y  
DARNELL MFG CO  
MISSION STATE BANK BLDG MISSION KANSAS  
DATA INST DIV TELECO  
12838 SATICOY ST N HOLLYWOOD CALIF  
DATA PROCESSING CORP  
460 CAMBRIDGE AVE PALO ALTO CALIF  
DATA SYSTEMS NORDEN DIV UNITED AIRCRAFT  
13210 CRENSHAW BLVD GARDENA CALIF  
DATA TECHNOLOGY INC  
1122 E SAN RAYE SE ALBUQUERQUE N MEX  
DATA-CONTROL SYSTEMS INC  
39 ROSE ST DANBURY CONN  
DATASCAN INC  
PO BOX 785 CLIFTON N J  
DATASTOR COOK CO  
8100 MONTICELLO AVE SKOKIE ILL  
DATEX CORP  
1307 S HYRTLE AVE MONROVIA CALIF  
DATEX CORP  
3740 DEMPSTER SKOKIE ILL  
JATEX CORP  
845 BROAD AVE RIDGEBLVD N J  
DATRAM DIV AUTOMATION INDUSTRIES INC  
1836 ROSECRANS AVE MANHATTAN BEACH CALIF  
DAVEN CO  
ROUTE 10 LIVINGSTON N J  
DAVENPORT MFG CO  
1713 N ASHLAND AVE CHICAGO 32 ILL  
DAVIDOFF CHARLES  
198 BROADWAY NEW YORK 38 N Y  
DAVIDSON ELECTRONIC DEV CO  
2211 PENINSULA DRIVE ERIE PA  
DAVIES HOLDING CO HARRY  
1428 N BELLS ST CHICAGO 10 ILL  
DAVIS ELECTRIC CO  
230 SPRING AVE CAPE GIRARDEAU MO  
DAVIS ELECTRONICS INC  
PO BOX 1247 BURLINGAME CALIF  
DAVIS EMERGENCY EQUIPMENT CO  
DAVIS INSTRUMENT DIV 45 HALLECK ST NEWARK  
N J  
DAVISON CHEN DIV W R BRACE CO  
101 N CHARLES ST BALTIMORE 3 MD  
DAVISON CHEMICAL CO  
ERBIN TENN.

CAGE INSTRUMENTS LTD  
99 101 UBRIDGE RD LALING LONDON BS ENGLND  
DABELD CO INC  
13 BERTEL AVE MOUNT VERNON N Y  
DAY-RAY PRODUCTS INC  
1133 MISSION ST PASADENA CALIF  
DAYSTRON ELECTRIC CO  
837 MAIN ST POUGHKEEPSIE N Y  
DAYSTRON INC  
430 MOUNTAIN AVE MURRAY HILL N J  
DAYSTRON INC  
INDUSTRIAL GAUGES DIV WEST ENGLEWOOD N J  
DAYSTRON INC MILITARY ELECTRONICS DIV  
ARCHBOLD PENNA  
DAYSTRON INC PACIFIC DIV  
6320 LINCOLN BLVD LOS ANGELES 45 CALIF  
DAYSTRON INC POTENTIOMETER DIV  
ARCHBOLD PENNA  
DAYSTRON INC TRANSICOID DIV  
BORCESTER PA  
DAYSTRON INCORPORATED BESTON INSTRUMENTS DIV  
614 FRELINGHUYSEN AVE NEWARK 12 N J  
DAYSTRON INSTR  
812 ASH ST CLARKS SUMMIT PA  
DAYSTRON SYSTEMS  
4455 MIRAMAR RD LA JOLLA CALIF  
DAYSTRON TRANSICOID CORP  
BORCESTER PENNA  
DAYSTRON-BESTON INDUSTRIES  
DIV DAYSTRON INC  
MANCHESTER RD POUGHKEEPSIE N Y  
DAYTON AVIATION RADIO & EQUIPMENT CO  
P O BOX 312 BUSINESS RT 25 TROY OHIO  
DAYTRONIC CORP  
223-227 S JEFFERSON ST DAYTON 2 OHIO  
DAZOR MFG CORP  
4481-49 DUNCAN AVE ST LOUIS 10 MO  
DBM RESEARCH CORP  
PO BOX 521 COCOA BEACH FLA  
DE FLOREZ CO  
116 E 30 ST NEW YORK 16 N Y  
DE-LUX MFG CO  
1007 NB 36TH ST OKLAHOMA CITY 18 OKLA  
DE-TEC-TRONIC CORP  
2512 N HALSTED ST CHICAGO 14 ILL  
DEAN & BENSON RESEARCH DIV BENSON MFG CO  
KANSAS CITY MO  
DEAN & BENSON RESEARCH INC  
16 RICHMOND ST CLIFTON N J  
DEARBORN ELECTRONIC LABS INC  
1421 N BELLS ST CHICAGO 10 ILL  
DEARBORN GLASS CO  
6600 S HARLEM AVE BEDFORD PARK ILL  
DECADE INSTRUMENT CO  
BOX 193 CALDWELL N J  
DECAUR ELEC IND CORP  
BOX 453 BYANDANCH N Y  
DECCO INC  
BOX 13325 DALLAS 20 TEXAS  
DECIMETER PRODUCTS CO  
STAR ROUTE BOX 67 LITTLETON COLO  
DECKER CORP  
45 HONIGHT RD BALA CYNBYD PENNA  
DECKER CORP  
3522 GEARY BLVD SAN FRANCISCO 18 CALIF  
DECOURSEY ENGG LAB  
11828 W JEFFERSON BLVD CULVER CITY CALIF  
DEE ELECTRIC CO  
1101 N PAULINA ST CHICAGO 22 ILL  
DEERE & CO  
1325 - 3RD AVE MOLINE ILL  
DEFENDER INSTRUMENT & REGULATOR CO  
BODY ILL  
DEFENSE ELECTRONICS INC  
WASHINGTON-ROCKVILLE INDUSTRIAL PARK  
3431-B ROCKVILLE MD  
DEFIANCE ENGG & MICROBAYE CO  
BEVERLY AIRPORT BEVERLY MASS  
DEFIANCE PRINTED CIRCUIT CORP  
81 ALBION ST WAKEFIELD MASS  
DEITZ CO S J  
9 E BESLEY ST S MACKENSACK N J  
DEJUR ANSCO CORP  
2523 E ARMOUR AVE MILWAUKEE 7 WISC  
DEJUR-ANSCO CORP ELECTRONICS DIV  
45-01 NORTHERN BLVD LONG ISLAND CITY 1 N Y  
DELANDRI PRECISION ELEMENTS CO INC  
39 SCHOOL ST YONKERS N Y  
DELCO APPLIANCE DIV GMC  
P O BOX 230 ROCHESTER 1 N Y  
DELCO RADIO DIV GMC  
700 FIRMIN ST KOKOMO IND  
DEL ELECTRONICS CORP  
521 HOMESTEAD AVE NT VERNON N Y  
DELL OPTICS CO LTD  
327 95TH ST WEST NEW YORK N J  
DEL MAR ENGINEERING LABS  
6901 IMPERIAL HWY LOS ANGELES 45 CALIF  
DELMONICO INTL  
4224 ORCHARD ST LONG ISLAND CITY 1 N Y  
DELS TUMBLING SERVICE  
232 N ROSEMARY DEARBORN 6 MICH  
DELSEN CORP  
719 B BROADWAY GLENDALE 4 CALIF  
DELTA & CO  
3336 W MADISON ST CHICAGO 24 ILL  
DELTA COILS INC  
1128 MADISON AVE PATERSON N J  
DELTA DESIGN ENG INC  
7460 GIRARD AVE LA JOLLA CALIF  
DELTA DESIGN INC  
3163 ADAMS AVE SAN DIEGO 6 CALIF  
DELTA ELECTRONICS  
259 GREENE ST BROOKLYN 22 N Y  
DELTA ELECTRONICS INC  
621 HOWELDAVE AVE NEW ORLEAN 24 LA

# ELECTRONIC MANUFACTURERS-A-Z

DELTA RADIO CO  
115 WORTH ST NEW YORK 13 N Y

DELTEX LABS  
DRAWER 2666 JACKSON MISS  
DELTRON ASSOCIATES INC  
2738 BELMONT AVE CHICAGO 18 ILL

DELTRON INC  
2905 N LEITHGOW ST PHILADELPHIA 33 PA

DELUXE COILS INC  
200 CHESTNUT ST WABASH INDIANA

DEMENT LABS  
5918 S E 72ND AVE PORTLAND ORE

DEMORNAY-BONARDI CORP  
780 S ARROYO PKWY PASADENA CALIF

DEMUTH GLASS BROS INC  
P O BOX 629 PARKERSBURG W VA

DENISON ENGG DIV AMERICAN BRAME SHOZ  
1160 DUBLIN RD COLUMBUS 16 OHIO

DENNIS CHEMICAL CO  
2701 RAPIN ST ST LOUIS 3 MO

DENISON MFG CO  
300 HOBARD ST FRAMINGHAM MASS

DEMTRAD MFG CO INC  
310 W WOODARD ST DENISON TEXAS

DENSON ELECTRONICS CORP  
P O BOX 122 ROCKVILLE CONN

DEPENDABLE PRINTED CIRCUIT CORP  
827 BLACK OAK RIDGE WAYNE N J

DEPHOUR STUDIOS INC  
782 COMMONWEALTH AVE BOSTON 15 MASS

DERF RADIO CO  
150 E 42ND ST NEW YORK N Y

DERINGER METALLURGICAL CORP  
8131 MONTICELLO AVE SKOKIE ILL

DERO ELECTRONICS  
10 WOODS AVE ROOSEVELT N Y

DESIGN & DEVELOP LAB  
BOX 496 PEERSKILL N Y

DESIGN TOOL CO DIV FEDERAL MFG & ENGG CORP  
1055 STEWARD AVE GARDEN CITY N Y

DESIGN TOOL CORP  
772 BERGEN ST BROOKLYN 38 N Y

DESIGNERS FOR INDUSTRY  
4241 FULTON PKWY CLEVELAND 9 OHIO

DESMOND STEPHAN MFG CO  
BOX RD 30 URBANA OHIO

DESPATCH OVEN CO  
619 S E 8TH ST MINNEAPOLIS 15 MINN

DESTRON CO  
25914 CHALWETTE ROLLING HILLS EST CALIF

DETECT-ORAY CO  
2022 N HALSTED ST CHICAGO 14 ILL

DETREX CHEM INC INC  
804 501 DETROIT 32 MICH

DETROIT CONTROLS CORP  
360 PROVIDENCE HIGHWAY NORWOOD MASS

DETROIT CONTROLS CORP  
1650 BROADWAY REDWOOD CITY CALIF

DETROIT CONTROLS DIV AMERICAN STANDARD  
5900 TRUMBULL AVE DETROIT 8 MICH

DETROIT CONTROLS DIV OF AMERICAN STANDARD  
GREAT MEADOWS RD & HONEYPORT RD STRATFORD CONN

DETROIT DIESEL ENGINE DIV  
13400 B OUTER DRIVE DETROIT 28 MICH

DETROIT EDISON DEVELOPMENT DIV  
DETROIT MICH

DETROIT POWER SCREWDRIVER CO  
SUB LINK-BELT CO DEPT 59-EI 2801 W FORT ST  
DETROIT 16 MICH

DETRONIC INDUSTRIES  
BOX 175 WARREN MICH

DEUTSCH CO ELECTRONIC COMPONENTS DIV  
MUNICIPAL AIRPORT 64ANNING CALIF

DEUTSCH CONTROLS CORP  
14504 S FIGUEROA ST LOS ANGELES 61 CALIF

DEVCO ENGG INC  
PIER LANE WEST CALDWELL N J

DEVELOPMENT AMASTIC EQUIPMENT  
PALO ALTO CALIF

DEVELOPMENT ENGG CO  
9 CROSS ST NORWALK CONN

DEVELOPMENTAL ELECTRONICS CORP  
4213 S BROADWAY LOS ANGELES 37 CALIF

DEVENCO INC  
150 BROADWAY NEW YORK 38 N Y

DEVICE DEVELOPMENT CORP  
428 BOSTON POST RD BOSTON MASS

DEVILBISS METAL FABRICATORS  
5741 RUSSELL AVE DETROIT 11 MICH

DEVOL RESEARCH CO  
BROOKSIDE OR GREENWICH CONN

DEVTRONICS INC  
1995 SPRUCE ST TRENTON 8 N J

DEVALD RADIO MFG CORP  
35-15 37TH AVE LONG ISLAND 1 N Y

DEWEY CO G C  
202 E 44TH ST NEW YORK N Y

DEWITT DEVELOPMENT CO  
3008 W 127 ST BLUE ISLAND ILL

D1-AN CONTROLS INC  
40 LEON ST BOSTON 15 MASS

D1-TRAIN CORP  
11307 HINDRY AVE LOS ANGELES 45 CALIF

DIAL PRODUCTS CO  
19 COTTAGE ST BAYONNE N J

DIALIGHT CORP  
60 STEWART AVE BROOKLYN 37 N Y

DIAMOND ANTENNA & MICROWAVE CORP  
35 RIVER ST WINCHESTER MASS

DIAMOND ANTENNA & MICROWAVE  
7 NORTH AVE WAKEFIELD MASS

DIAMOND COILS INC  
540 39 ST UNION CITY N J

DIAMOND DRILL CARBON CO  
244 MADISON AVE NEW YORK 16 N Y

DIAMOND ELECTRONICS CORP  
64 WHITE ST NEW YORK 13 N Y

DIAMOND POWER SPECIALTY CORP  
P O BOX 415 LANCASTER OHIO

DIAMOND TOOL & HORSESHOE CO  
4602-4706 GRAND AVE W DULUTH 7 MINN

DIAMOND TOOL ENGG CO  
108 MASSACHUSETTS AVE BOSTON 15 MASS

DIAMONITE PRODUCTS TFG CO  
DIV U S CERAMIC TILE CO

DIAMONITE PRODUCTS MFG CO  
CANTON OHIO

DIAPHLEX DIV  
2700 N SOUTHPORT CHICAGO 14 ILL

DIATRON INC  
3339 N RICE AVE HOUSTON 36 TEXAS

DICE CO J V  
16 HIGHWOOD AVE ENGLEWOOD N J

DICK CO A B  
5700 TOWNY AVE CHICAGO 48 ILL

DICKSON ELECTRONICS  
SCOTTSDALE ARIZ

DICTAPHONE INC  
375 HOBARD AVE BRIDGEPORT 5 CONN

DICTAPHONE CORP  
420 LEXINGTON AVE NEW YORK 17 N Y

DICTAPHONE CORP  
OLD TURNPIKE RD CONCORD N H

DICTOGRAPH PRODUCTS INC  
SARGENT CUL I N Y

DIE-FORM CIRCUITS INC  
6045 W OGDEN AVE CHICAGO 90 ILL

DIEBEL DIE & MFG  
2711 W IRVING PARK RD CHICAGO ILL

DIEBOLD INC  
CANTON 2 OHIO

DIEHL MFG CO  
PINDERME AVE SOMERVILLE N J

DIELECT INC  
CEDAR & GROSS STS FORDS N J

DIELECTRIC MATERIALS CO  
5315-17 N RAVENSWOOD AVE CHICAGO 40 ILL

DIELECTRIC PRODUCTS ENGG CO  
RAYMOND ME

DIETZ CO MENY & INC  
12-16 ASTORIA BLVD LONG ISLAND CITY 2 N Y

DIETZ DESIGN & MFG CO  
GRANDVIEW 13 MO

DIETZEN CO ENGG  
2425 N SHEFFIELD AVE CHICAGO ILL

DIGITAL DEVELOPMENT CORP  
7941 EADS AVE LA JOLLA CALIF

DIGITAL EQUIP CORP  
MAYNARD MASS

DIGITRON CO DIV ENDEVCO CORP  
45 W UNION ST PASADENA CALIF

DIGITRON INC  
1931 PONTIUS AVE LOS ANGELES 25 CALIF

DIGITRONICS CORP  
ALBERTSON AVE ALBERTSON L I N Y

DIGITRONICS CORP  
83-75 - 118TH ST NEW GARDENS L I 15 N Y

DILETRIX CORP  
ALLEN BLVD B GRAND AVE FARMINGDALE LI N Y

DILLON & CO INC C  
14620 KESWICK ST VAN NUYS CALIF

DIMCO-GRAY CO  
207 E 6 ST DAYTON 2 OHIO

DINION COIL CO  
CALEDONIA N Y

DIRIGO COMPASS & INSTRUMENT CO  
BOEING FIELD BOX 37 SEATTLE 8 WASH

DIR-HCO INC  
911 BROADWAY KANSAS CITY MO

DIR-HCO INC ELECTRONICS DIV  
911 BROADWAY KANSAS CITY MO

DITTHORE-FREIMUTH CORP  
2517 E MORRICH ST MILWAUKEE 7 WISC

DIVCO - WAYNE CORP  
9701 READING RD CINCINNATI 15 OHIO

DIVISION LEAD CO  
7742 W 61 PL SUMMIT ILL

DIXON CORP  
BURNSIDE ST BRISTOL R I

DIXON CRUCIBLE CO JOSEPH  
167 WAYNE ST JERSEY CITY 3 N J

DIXON ELECTRONICS CO  
13844 W MCNICHOLS RD DETROIT 35 MICH

DJECO DIV DJORDJEVIC ENGG CO  
1933 N DAMEN CHICAGO 47 ILL

DMETER MFG CO  
22-24 LARKIN PLAZA YONKERS N Y

DOALL CO  
258 W LAUREL AVE DES PLAINES ILL

DOBECKMUN CO  
3301 MONROE ST CLEVELAND OHIO

DOBLE ENGRNG CO  
BOX 346 BELMONT 78 MASS

DOEDEN TOOL CORP  
SHERWOOD OHIO

DOEMLER-JARVIS DIV NATIONAL LEAD CO  
TOLEDO 1 OHIO

DOLGORUKOV MFG CO  
407 FISHER BLDG DETROIT 2 MICH

DOLIN METAL PRODUCTS INC  
315 LEXINGTON AVE BROOKLYN 16 N Y

DOLINKO & WILKENS INC  
1907 SUMMIT AVE UNION CITY N J

DOLLAR CO ROBERT COMMUNICATIONS EQUIP DIV  
50 DRUMM ST SAN FRANCISCO 11 CALIF

DOLLIN CORP  
600 S 21 ST IRVINGTON 11 N J

DON-LAM ELECTRONICS CO  
1101 OLYMPIC BLVD SANTA MONICA CALIF

DONMAR PRODUCTS INC  
P O BOX 8906 DENVER 10 COLO

DONNELLY MFG CO  
880 WINTER ST BALTHAM 54 MASS

DONNER SCIENTIFIC CO  
808 GALINDO ST CONCORD CALIF

DORAN MFG CO  
1033 BADER ST CINCINNATI 25 OHIO

DORR CO JOHN L  
P O BOX 7772 HOUSTON 7 TEX

DORMEYER INDUSTRIES  
3418 MILWAUKEE AVE CHICAGO 41 ILL

DORMEYER INDUSTRIES  
KENTLAND INDIANA

DORNE & MARBOLIN  
29 NEW YORK AVE WESTBURY N Y

DORSETT ELECTRONICS INC ELECTRONIC ORGAN DIV  
49492 TERR BLVD LOS ANGELES 42 CALIF

DORSETT LABS INC  
401 E BOYD ST NORMAN OKLA

DOSSEY MFG CORP  
249 HURON ST BROOKLYN 22 N Y

DOSSEY CO M H  
395 N COLUMBIA ST FRANKFORT IND

DOTY ACOUSTICAL ELECTRONIC LABS  
TOBYHAMMA PENN

DOUBLE E PRODUCTS CO  
208 STANFORD ST EL SEGUNDO CALIF

DOUGLAS AIRCRAFT  
3942 STEVELY LOS ANGELES 8 CALIF

DOUGLAS AIRCRAFT  
2000 N MEMPHIAL TULSA OKLA

DOUGLAS AIRCRAFT CO  
BOX 1596 VANDENBURG AFB CALIF

DOUGLAS AIRCRAFT CO  
BOX 4066 PATRICK AFB FLA

DOUGLAS AIRCRAFT CO  
BOX 10338 CHARLOTTE 1 N CAR

DOUGLAS AIRCRAFT CO  
190TH AND NORMANIE TORRANCE CALIF

DOUGLAS AIRCRAFT CO  
3855 LAKEWOOD BLVD LONG BEACH 1 CALIF

DOUGLAS AIRCRAFT CO  
418 SOUTH ELM DRIVE BEVERLY HILLS CALIF

DOUGLAS AIRCRAFT CO INC  
3000 OCEAN PARK BLVD SANTA MONICA CALIF

DOUGLAS AIRCRAFT INC  
827 LAPHAM ST EL SEGUNDO CALIF

DOUGLAS ENG G CO  
TAYLORTOWN RD MONTVILLE N J

DOUGLAS MICROWAVE CO  
252 E 3 ST MT VERNON N Y

DOUGLAS RADIO LABS  
176 NORFOLK AVE BOSTON 19 MASS

DOUGLAS RANDALL INC  
8 PARCATUCK AVE WESTERLY R I

DOVEN MACH & ENG INC  
2706 W VAN BUREN ST CHICAGO 12 ILL

DOB CHEMICAL CORP  
ABBOTT RD MIDLAND MICH

DOB CORNING CORP  
BOX 592 MIDLAND MICH

DOB ELECTRONIC EQUIPMENT  
1425 W MARWELL FRENONT NEBR

DOB KEY CO  
P O BOX 711 THIEF RIVER FALLS MINN

DOB METAL PRODUCTS  
MIDLAND MICH

DOB-KEY CO INC  
RT 3 HWY 29 THIEF RIVER FALLS MINN

DOBING CRYSTAL CO  
191 SHAFFER AVE WESTMINSTER MD

DOKE CO R L  
18 E CENTRAL AVE MIAMISBURG OHIO

DOKE MFG CO  
1713 W HUBBARD ST CHICAGO 22 ILL

DOKE MFG CO  
PLT 2 1718 N DAMEN AVE CHICAGO ILL

DOKEFIELD & CO B F  
45 PARK PL NEW YORK 7 N Y

DOKEFIELD & CO INC B F F  
SPEC PROD DIV PLANT A BOX 419 BASHINGTON

DRAYTON ENGR CO  
WATERLOO AVE BEAUMY PA

DREIER BROS INC  
7301 WOODLAWN AVE CHICAGO 37 ILL

DREMEL MFG CO  
2020 10TH ST RACINE WISC

DRESSEN BARNES CORP  
250 N VINEWOOD AVE PASADENA CALIF

DRESSER ELECTRIC CO  
2705 WIGHT ST DETROIT 7 MICH

DRESSER IDECO CO  
8909 S VERMONT LOS ANGELES CALIF

DRESSER INDUSTRIES  
REPUBLIC BANK BLDG DALLAS TEXAS

DRESSER-IDECO CO  
875 MICHIGAN AVE COLUMBUS 8 OHIO

DRESSLER ELECTRONICS INC  
121 CHAPEL ST HARTFORD CONN

DRICO INDUSTRIAL CORP  
6045 W OGDEN AVE CHICAGO 90 ILL

DRIVER CO WILBUR  
120 HALSTED ST EAST ORANGE N J

DRIVER CO WILBUR B  
1875 MCCARTER HWY NEWARK 8 N J

DRIVER-HARRIS CO  
HARRISON 33 N J

DRYONATIC CORP  
PO BOX 334 806 N FAIRFAX ST ALEXANDRIA VA

DU MONT LABS INC A B  
513 MADISON AVE NEW YORK 22 N Y

DU PONT DE NEMOURS & CO E I  
BILWINGTON 98 DEL

DU-CO CERAMICS CO  
BOX 587 BUTLER PA

DU-CO CERAMICS CO  
BOX 278 SAXONBURG PA



# ELECTRONIC MANUFACTURERS-A-Z

DUBROW DEVEL CO  
233 PENN ST BURLINGTON N J

DUCOMMUN CO N  
580 FIFTH AVE NEW YORK 36 N Y

DUEKER & CO R C  
407 N MAPLE DR BEVERLY HILLS CALIF

DUFFERS ASSOCIATES INC  
BOX 296 TROY N Y

DUFFY & CO INC M N  
2040 GRAND RIVER DETROIT 26 MICH

DUKANE CORP  
ST CHARLES ILL

DUMONT AIRPLANE & MARINE INSTRUMENT INC  
P O BOX 92 CLEARFIELD PENNA

DUMONT LABS A B  
FORT DAVES (DEER ISLAND) WINTHROP MASS

DURDENT LABS INC ALLEN B INDUST TUBES  
2 MAIN ST PASSAIC N J

DUMONT LABS INC ALLEN B  
11006 B OLYMPIC BLVD LOS ANGELES 64 CALIF

DUMONT LABS INC ALLEN B  
750 BLOOMFIELD AVE CLIFTON N J

DUMONT LABS INC ALLEN B  
35 MARKET ST EAST PATTERSON N J

DUMONT LABS INC ALLEN B  
BOX 168 GREAT NOTCH N J

DUMORE CO  
1300 17TH ST RACINE WISC

DUNCAN ELECTRIC CO  
52 BY-PASS LAFAYETTE IND

DUNHAM-BUSH INC  
HARTFORD CONN

DUNLAP ELECTRONICS  
764 9 ST DES MOINES 14 IOWA

DUNLEAVY ELECTRONICS CORP  
1735 CENTRAL ST STOUGHTON MASS

DUNLEE CORP  
1023 S PUSCHECK RD BELLWOOD ILL

DUNN ENGG ASSOCIATES INC  
225 C WRIEN HWY CAMBRIDGE 41 MASS

DUNTON CO M B  
7 GOFF ST PROVIDENCE R I

DUNWELL MFG CORP  
161 FORT LEE RD TEANECK N J

DUTONE CORP  
LOCUST ST KEYPORT N J

DUPONT DE NEMOURS  
SAVANNAH RIVER PLANT AIKEN S CAR

DUPONT DE NEMOURS & CO E I  
NEWPORT DEL

DUPONT DE NEMOURS & CO E I POLYCHEMICAL DEPT  
NEMOURS BLDG WASHINGTON 98 DEL

DURABLY LUGGAGE MFG  
4517 14TH ST N W SEATTLE 7 WASH

DURAKOOL INC  
1010 N MAIN ST ELKART IND

DURALITH CORP  
1025 RACE ST PHILADELPHIA 7 PA

DURANIC PRODUCTS INC  
426 COMMERCIAL AVE PALISADES PARK N J

DURANT MFG CO  
1929 N BUFFUM ST MILWAUKEE 1 WISC

DUREZ PLASTIC DIV-HOOKER CHEMICAL CORP  
1926 WALCK RD NORTH TONAWANDA N Y

DURO SPECIALTY CO  
811 BOSTON ST LYNN MASS

DURVAL ELECTRONICS INC  
1225 B WASHINGTON BLVD LOS ANGELES 7 CALIF

DYER ENG CO  
AIRPORT RD P O BOX 452 NASHUA  
NEW HAMPSHIRE

DYER MFG CO F W  
P O BOX 373 MICHIGAN CITY IND

DX RADIO PRODUCTS INC  
2300 W ARRIVAGE AVE CHICAGO 47 ILL

DYMEC INC  
395 PAGE HILL RD PALO ALTO CALIF

DYMO CORP  
2546 TENTH ST BERKELEY 10 CALIF

DYNA CO  
617 N 41ST ST PHILA 6 PENNA

DYNA MAGNETIC DEVICES INC  
110 DUFFY AVE HICKSVILLE L I N Y

DYNA-EMPIRE INC  
1075 STEWART AVE GARDEN CITY L I N Y

DYNACOR INC  
1010 WESTMORE AVE ROCKVILLE MD

DYNAMATIC DIV EATON MFG CO  
3307 10 AVE KENOSHA WISC

DYNAMETRICS CORP  
NORTHWEST INDUSTRIAL PK BURLINGTON MASS

DYNAMIC AIR ENGG INC  
7412 MAIE AVE LOS ANGELES 1 CALIF

DYNAMIC CONTROLS CO  
2225 MASSACHUSETTS AVE CAMBRIDGE MASS

DYNAMIC DEVELOPMENT CO  
59 NEW YORK AVE WESTBURY N Y

DYNAMIC ELECTRONICS INC  
87-46 123RD ST RICHMOND HILL N Y

DYNAMIC FILTERS INC  
2100 HOWARD ST DETROIT 16 MICH

DYNAMIC GEAR CO  
20 HERRICK RD ANTIYVILLE L I N Y

DYNAMIC INSTRUMENT CO  
28 CARLETON ST CAMBRIDGE 39 MASS

DYNAMIC INSTRUMENT CORP  
59 NEW YORK AVE WESTBURY N Y

DYNAMIC TECHNIQUES INC  
72 E SEFONO ST MIMOLA LI N Y

DYNAMICS INSTRUMENTATION CO  
1118 MISSION ST S PASADENA CALIF

DYNAMICS INSTRUMENTS  
583 MONTEREY PASS RD MONTEREY PARK CALIF

DYNAMI MAGNETRONICS CORP DIV MAICO CO  
21 N 3 ST MINNEAPOLIS 1 MINN

DYNAPAR CORP  
7312 N RIDGEBAY SKOKIE ILL

DYNATRAN ELECTRONICS CORP  
178 HERRICKS RD NIMOLA L I N Y

DYNATRONIC INC  
717 B AMELIA AVE ORLANDO FLA

DYNAVIA CORP  
3021 WEST CLAY ST RICHMOND 30 VA

DYNAVOK CORP  
40-05 21 ST LONG ISLAND CITY 1 NY

DYNWOOD CORP  
15026 OXNARD ST VAN NUYS CALIF

DYNER INC  
777 DYNER DR PEWAKEE WISC

DYNER INC  
123 EILEEN WAY STOSSET L I N Y

DYTRONICS CO  
PO BOX 3676 COLUMBUS 14 OHIO

DZUS FASTENER CO  
125 UNION ST WEST ISLIP N Y

EASLE ELECTRIC MFG CO  
2310 BRIDGE PLAZA 50 LONG ISLAND CITY 1 NY

EAGLE ELECTRONICS CORP  
P O BOX 775 MERIDEN CONN

EAGLE-PICHER CO AMERICAN BLDG  
AMERICAN BLDG CINCINNATI 1 OHIO

EAGLE-PICHER CO-COUPLES PLANT  
P O BOX 290 JOPLIN MO

EAGLE PICHER CO  
MIAMI LAB MIAMI OKLA

EAGLE SIGNAL CO DIV GAMBELL CO  
202 20 ST MOLINE ILL

EASTERN AIR DEVICES  
391 CENTRAL AVE DOVER N H

EASTERN CHEM CORP  
3RD & GREENWICH STS READING PA

EASTERN CHEMICAL CORP  
34 SPRING ST NEWARK N J

EASTERN ETCHING & MFG CO  
GRAPE ST CHICOPEE MASS

EASTERN HEAT TREATING & BRAZING CORP  
44 SEA CLIFF AVE GLEN COVE N Y

EASTERN IND INC AUTOMATIC SIGNAL  
REGENT ST E NORWALK CONN

EASTERN INDUSTRIES INC  
100 SKIFF ST HARDEN 14 CONN

EASTERN METALS INDUSTRIES INC  
44 SEA CLIFF AVE GLEN COVE N Y

EASTERN PRECISION RESISTOR CORP  
675 BARBEY ST BROOKLYN 7 N Y

EASTERN ROLLING MILLS INC  
1122 E 180TH ST NEW YORK N Y

EASTERN SCIENCE CO  
30 N EMERSON ST WAKEFIELD MASS

EASTERN SMELTING & REFINING CORP  
109 B BROOKLINE ST BOSTON 18 MASS

EASTERN SPECIALTY CO  
3617 N 8 ST PHILA 40 PA

EASTERN TOOL & MFG CO  
1 MONTGOMERY ST BELLEVILLE 9 N J

EASTMAN CHEMICAL PRODUCTS INC  
KINGSFORD TENN

EASTMAN KODAK CO  
343 STATE ST ROCHESTER 4 N Y

EASTMAN KODAK CO  
TENNESSEE EASTMAN CO DIV KINGSFORD TENN

EASTWOOD IND INC  
1101 W ARMITAGE AVE CHICAGO 14 ILL

EATON ELECTRONICS CORP  
5 MAIN ST WASHINGTON 98 MASS

EATON MFG CO DYNAMIC DIV  
3122 14TH AVE KENOSHA WISC

EBAUCHES S A DEP SEMICONDUCTEURS  
FAUBOURG HOPITAL 1 NEUCHÂTEL SWITZERLAND

EBERLINE INSTRUMENT CORP  
813 EARLY ST SANTA FE NEW MEXICO

EBERT ELECTRONICS CORP  
212-26 JAMAICA AVE QUEENS VILLAGE 28 N Y

EBY CO M H  
4700 GERMANTOWN AVE PHILADELPHIA 44 PA

ECCO HIGH FREQUENCY CORP  
7020 MUON BLVD NORTH BERGEN N J

ECKEL CORP  
155 FACETT ST CAMBRIDGE 38 MASS

ECKSTEIN RADIO & TV CO  
4842 GRAND AVE 30 MINNEAPOLIS 9 MINN

ECLIPSE FUEL ENGG CO  
1100 BUCHANAN ROCKFORD ILL

ECH CORP  
8160 ORION AVE VAN NUYS CALIF

ECONS ELECTRONICS  
10530 DENSHORNE AVE GRANADA HILLS CALIF

ED-BEAR PRODUCTS INC  
96 S GRAND AVE BALDWIN N Y

EDCLIFF INSTRUMENTS  
1711 S MOUNTAIN AVE MONROVIA CALIF

EDER ENGR CO  
1568 S 1ST ST MILWAUKEE 4 WISC

EDER INSTRUMENT CO INC  
2293 N CLYBOURN AVE CHICAGO 14 ILL

EDGERTON GERMESHAUSEN & GRIER INC  
BLDG 226 SANTA BARBARA AIRPORT GOLETA CAL

EDGERTON GERMESHAUSEN & GRIER INC  
1622 B A ST PO BOX 1912 LAS VEGAS NEV

EDGERTON GERMESHAUSEN & GRIER  
160 BROOKLINE AVE WOSTON 15 MASS

EDIN - A DIVISION OF EPSCO INC  
207 MAIN ST WORCESTER 8 MASS

EDISON INDUSTRIES THOMAS A INSTRUMENT DIV  
MCGRAB-EDI SON CO 45 LAKESIDE AVE W ORANGE  
N J

EDS ELECTRONICS ENGG CO  
202 GRAND ST BROOKLYN 11 N Y

E O L CO  
P O BOX 2508 5929 E DUNES HWY BARY IND

EDMUND SCIENTIFIC CO  
101 E GLOUCESTER PK BARRINGTON N J

EDD CANADA LTD  
PO BOX 97 CORNBALL ONT CANADA

EDCO CORP  
13-10 111 ST COLLEGE POINT 96 L I N Y

E O P CORP  
3501 S ORANGE BLOSSOM TRAIL ORLANDO FLA

EDUCATIONAL ELECTRONICS CO  
1227 LOYOLA AVE CHICAGO 26 ILL

EDWARDS CO INC  
CONNECTICUT AVE NORWALK CONN

EDWARDS ENGRA CO  
21 YENNICOCK AVE PT WASHINGTON L I N Y

EDWARDS HIGH VACUUM  
1920 BUFFALO AVE NIAGARA FALLS N Y

EPSON INCORPORATED  
PATTERSON PL ROOSEVELT FIELD GARDEN CITY  
L I N Y

EGAN LABORATORY  
107-56 113TH ST RICHMOND HILL 10 N Y

E H RESEARCH LABORATORIES INC  
163 ADELINE ST OAKLAND 20 CALIF

EICOR DIV THE SCRANTON CORP  
4059 W NORTH AVE CHICAGO 39 ILL

EICOR INC  
6238 N NORTH AVE CHICAGO 39 ILL

EIDSON ELECTRONIC CO  
1902 N 3 ST TEMPLE TEXAS

EISLER ENGG CO  
750 S 13 ST NEWARK 3 N J

EISLER TRANSFORMER CO INC  
24 N SALEM ST DOVER NJ

EITEL-MCCULLOUGH INC  
301 INDUSTRIAL HWY SAN CARLOS CALIF

ELASTIC STOP NUT CORP OF AMERICA  
2330 VAURNALL RD UNION N J

ELCO CORP  
N ST BELOW ERIE AVE PHILA 24 PA

ELCO PACIFIC SUB OF ELCO CORP  
2200 CENTINELA AVE W LOS ANGELES 64 CALIF

ELCO TOOL & SCREW CORP  
11 SAMUELSON RD ROCKFORD ILL

ELCOR INC  
1225 W BROAD ST FALLS CHURCH VA

ELDERA CORP  
1805 BELCROFT AVE EL MONTE CALIF

ELDERA CORP  
9848 REMER ST EL MONTE CALIF

ELDICO ELECTRONICS  
29-01 BARDEN AVE LONG ISLAND CITY 1 N Y

ELDORADO ELECTRONICS CO  
2021 10 ST BERKELEY 10 CALIF

ELEC COMMUNICATION CO  
55 MINNESOTA SAN FRANCISCO 7 CALIF

ELECT DEVICE CO  
38-06 61ST ST BOOSEFIELD L I N Y

ELECT ENGG ENTERPRISES  
BOX 126 FT LEE N J

ELECT MECH PRODS CO  
929-31 ATLANTIC AVE ATLANTIC CITY N J

ELECT PROD RSCH DEV CO  
1206 CHERRY ST TOLEDO 4 OHIO

ELECT SPECIALTY CO  
3333 SAN FERNANDO RD LOS ANGELES 30 CALIF

ELECTR CONTROL SYS INC  
2231 S BARRINGTON LOS ANGELES 64 CALIF

ELECTRA MFG CO  
800 NORTH 21ST ST INDEPENDENCE MISS

ELECTRA MFG CO  
4051 BROADWAY KANSAS CITY MO

ELECTRALAB PRINTED ELECTRONICS CORP  
175 S ST NEEDHAM HEIGHTS 94 MASS

ELECTRAN MFG CO  
1901 CLYBOURN AVE CHICAGO 14 ILL

ELECTRATONE INC  
47 IRBY AVE N ATLANTA GA

ELECTREND PRODUCTS CORP  
BOX 110 ST JOSEPH MICH

ELECTRIFIRE ASSEMBLIES  
700 B VIRGINIA MILWAUKEE 4 WISC

ELECTRIC AUTO-LITE CO  
919 E CABLE DIV PORT HURON MICH

ELECTRIC AUTOLITE CO  
CHAMPLAIN ST TOLEDO OHIO

ELECTRIC AUTOLITE CO  
22 ETHEL ST NEWTON N J

ELECTRIC BOAT DIV GENERAL DYNAMICS  
EASTERN POINT DR GROTON CONN

ELECTRIC CORO CO  
432 PLANE ST NEWARK 2 N J

ELECTRIC DES & MFG CO  
2407 AVE G FT MADISON IOWA

ELECTRIC DESIGN & MFG CO  
722 JEFFERSON ST BURLINGTON IOWA

ELECTRIC EYE EQUIPMENT CO  
1948 E FAIRCHILD ST DANVILLE ILL

ELECTRIC HOTPACK CO  
5078A COTTMAN AVE PHILA 35 PA

ELECTRIC INDICATOR CO  
CAMP AVE STAMFORD CONN

ELECTRIC MACHINERY MFG CO  
800 CENTRAL AVE MINNEAPOLIS 13 MINN

ELECTRIC MOTORS & SPECIALTIES  
KING & HAMPSHER ST GARRETT IND

# ELECTRONIC MANUFACTURERS-A-Z

ELECTRIC PRODUCTS CO  
1725 CLARKSTONE RD CLEVELAND 12 OHIO

ELECTRIC REGULATOR CORP  
PEARL ST NORWALK CONN

ELECTRIC SOLDERING IRON CO  
8 ELN ST DEEP RIVER CONN

ELECTRIC SPECIALTY COMP  
211 SOUTH ST STAMFORD CONN

ELECTRIC STEEL FOUNDRY CO  
2181 N W 25 ST PORTLAND ORE

ELECTRIC STGE BATTERY CO  
246 E 131ST ST CLEVELAND 1 OHIO

ELECTRIC STORAGE BATTERY CO EXIDE IND DIV  
RISING SUN & ADAMS AVES PHILA PA

ELECTRIC STORAGE BATTERY CO MISSILE BATTERY  
P O BOX 11301 RALEIGH N C

ELECTRIC TACHOMETER CORP  
68TH & UPLAND STS PHILA PENNA

ELECTRIC TERMINAL CORP  
MO 2 BARBICK INDUS PK PROVIDENCE 3 R I

ELECTRIC TRADING CO  
313 CANAL ST NEW YORK 13 N Y

ELECTRICAL & PHYSICAL INST CORP  
42 10 27TH ST LONG ISLAND CITY N Y

ELECTRICAL DEVICE MFG CO  
300 PARK AVE P O BOX 648 PLAINFIELD N J

ELECTRICAL INDUSTRIES  
691 CENTRAL AVE MURRAY HILL N J

ELECTRICAL MUSICAL IND  
WESTBURY N Y

ELECTRICAL REFRATORIES CO  
E CLARK ST E PALESTINE OHIO

ELECTRICAL SERVICE CO  
1271 MISSION ST SAN FRANCISCO CALIF

ELECTRICAL SPECIAL CO  
138 11 ST SAN FRANCISCO 3 CALIF

ELECTRICAL TESTING LABS INC  
2 EAST END AVE NEW YORK 21 N Y

ELECTRICAL TOBER SERVICE INC  
325 S WASHINGTON ST PEORIA ILL

ELECTRICAL UTILITIES CO  
2427 ST VINCENTS AVE LASALLE ILL

ELECTRICAL WINDINGS INC  
2015 N KOLMAR AVE CHICAGO 30 ILL

ELECTRIGDOOR CO  
1335 N E 4TH AVE FT LAUDERDALE FLA

ELECTRIX  
R R 3 BOX 182 KINGSTON N Y

ELECTRO & MECH DEVICES  
BOX 148 VALHALLA NEW YORK

ELECTRO-AIR CLEANER CO INC  
OLIVIA & SPROUL ST MCKEES ROCKS PA

ELECTRO ALARM SAFETY DEVICES  
745 PLEASANT PRESHO 3 CALIF

ELECTRO ASSEMBLIES INC  
1111 N KEDWICK AVE CHICAGO 25 ILL

ELECTROCAM INC  
9-25 ALLING ST NEWARK N J

ELECTRO-CERAMICS INC  
120 STATE ST NEW HAVEN CONN

ELECTRO-CERAMICS INC  
2845 S 2ND SALT LAKE CITY 15 UTAH

ELECTRO-CHEMICAL ENGRAVING CO INC  
1100 BROAD AVE BRONX 36 N Y

ELECTRO-CIRCUITS INC  
401 EAST GREEN ST PASADENA 1 CALIF

ELECTRO CIRCUITS INC  
645 LAWRENCE ST LOWELL MASS

ELECTRO COATINGS INC  
1862 W FULLERTON AVE CHICAGO 14 ILL

ELECTROCOR INDUSTRIES  
1105 N IRONWOOD AVE SOUTH BEND 15 IND

ELECTRO CONTACTS INC  
1111 N KEDWICK AVE CHICAGO 25 ILL

ELECTRODATA SYSTEMS CORP  
460 SIERRA MADRE VILLA PASADENA CALIF

ELECTRO DEVELOPMENT CORP  
3930 UNIVERSITY WAY SEATTLE 5 WASH

ELECTRO DEVICES INC  
580 MAIN ST WILKINGTON MASS

ELECTRO-DEVELOPMENT CO  
14701 RESWICK ST VAN NUYS CALIF

ELECTRO-DEVICES INC  
4 GODWIN AVE PATERSON 1 N J

ELECTRODYNAMIC INSTRUMENT CO  
3508 TANGLEY RD HOUSTON 5 TEX

ELECTRODYNAMICS INC  
1841 OLD SPANISH TRAIL HOUSTON TEXAS

ELECTRODYNE CO INC  
ENDICOTT ST NORWOOD MASS

ELECTRODYNE CORP  
903-A SOUTH MC CLAY ST SANTA ANA CALIF

ELECTRODYNE INC  
401 PREGO ST SAN LEANDRO CALIF

ELECTRO-ETCH CIRCUITS INC  
7112 SO VICTORIA AVE LOS ANGELES 43 CALIF

ELECTROFAB CO  
3635 SPANN AVE INDIANAPOLIS 3 IND

ELECTROFILM INC  
7116 LAUREL CANYON BLVD N HOLLYWOOD CALIF

ELECTRO-FLEX HEAT INC  
83 BOODDINE ST HARTFORD 6 CONN

ELECTRO IMPULSE LAB INC  
208 RIVER ST RED BANK N J

ELECTRO INSTRUMENT INC  
3540 AERO COURT SAN DIEGO 11 CALIF

ELECTRO INSTRUMENTS CORP  
5931 BELLEVUE AVE LA JOLLA CALIF

ELECTRO INSTRUMENTS INC  
607 MAIN ST BALTHAM 50 MASS

ELECTROL INC  
9000 W PICO BLVD LOS ANGELES CALIF

ELECTROLAB CENTER ELECTRONICS  
INDUSTRIAL PRINTED NEEDHAM MASS

ELECTROLITING CORP  
P O BOX 973 PROVIDENCE 3 R I

ELECTRO LOGIC CORP  
515 BOCCACCIO AVE VENICE CALIF

ELECTROMAGNETICS INC  
12830 MADRON AVE HARTHORNE CALIF

ELECTROMATH CORP  
42-14 GREENPOINT AVE LONG ISLAND CITY 4 N Y

ELECTROMATIC EQUIPMENT CO  
175 RESEN AVE BROOKLYN 12 N Y

ELECTROMATIC MFG CORP  
88 UNIVERSITY PL NEW YORK 3 N Y

ELECTROMATION CO  
1646 18 ST SANTA MONICA CALIF

ELECTRO MEASUREMENTS INC  
7528 S W MACADAM PORTLAND 1 ORE

ELECTRO MECHANICAL DEV CO  
2337 BISSONNET AVE HOUSTON 5 TEX

ELECTRO MECHANICAL RES & DEV  
1220 STOCKTON OR CLEARWATER FLA

ELECTRO MECHANICS CO  
P O BOX 802 AUSTIN 68 TEX

ELECTRO-MECHANICAL DIV GENERAL RIVETERS INC  
783 METEL AVE BUFFALO 2 N Y

ELECTRO-MECHANICAL ENGG CO INC  
1516 S LONG BEACH BLVD COMPTON CALIF

ELECTRO-MECHANICAL INSTRUMENT CO  
B & CHESTNUT ST PERKASIE PA

ELECTRO-MECHANICAL INSTR INC  
4978 EAGLE ROCK BLVD LOS ANGELES 41 CALIF

ELECTRO-MECHANICAL INSTRUM CO  
BOX 3048 SARASOTA FLA

ELECTRO-MECHANICAL SPECIALTIES CO  
407 N MAPLE DR BEVERLY HILLS CALIF

ELECTRO MECH SPECIALTIES CO  
783 S 39TH ST BANNING CALIF

ELECTRO-MECHANICAL SYSTEMS INC  
47-51 33 ST LONG ISLAND CITY 1 N Y

ELECTRO-MEDICAL LAB INC  
S WOODSTOCK 10 VT

ELECTRO-MINIATURES CORP  
604 HUYLER ST SOUTH HACKENSACK N J

ELECTRO-MOTIVE MFG CO INC  
WILLMANTIC CONN

ELECTROMODE  
P O BOX 1052 ROCHESTER 3 N Y

ELECTRON ARC INC  
244 BROAD ST LYNN MASS

ELECTRON ENTERPRISES  
6917 W STANLEY AVE BERBYN ILL

ELECTRONIC AIDS INC  
857 N EUTAW ST BALTIMORE MD

ELECTRONIC APPLICATIONS INC  
194 RICHMOND HILL AVE STAMFORD CONN

ELECTRONIC ASSEMBLY CO INC  
5 PRESCOTT ST ROXBURY 19 MASS

ELECTRONIC ASSOCIATES INC  
LONG BRANCH N J

ELECTRONIC BATTERIES INC  
28-34 35 ST BROOKLYN 32 N Y

ELECTRONIC BRAZING CO  
140 GLENROD AVE MONTCLAIR N J

ELECTRONIC CAP CORP  
1400 5TH AVE SAN DIEGO CALIF

ELECTRONIC CHEMICAL CORP  
813 COMMUNIST AVE JERSEY CITY 4 N J

ELECTRONIC COILS INC  
P O BOX 1665 SPRINGFIELD MASS

ELECTRONIC COMMUNICATION EOPT CO  
1249 W LOYOLA AVE CHICAGO 38 ILL

ELECTRONIC COMMUNICATIONS INC  
1501 72ND ST N ST PETERSBURG 10 FLA

ELECTRONIC COMMUNICATION INC  
1830 YORK ST INDIANAPOLIS IND

ELECTRONIC COMPONENT  
14706 ARMINA ST VAN NUYS CALIF

ELECTRONIC COMPONENT  
118 S MAIN ST WICHITA KANS

ELECTRONIC COMPONENTS  
2655 W 19 ST CHICAGO 8 ILL

ELECTRONIC COMPONENTS CORP  
920 INTERSTATE RD ADDISON ILL

ELECTRONIC COMPONENTS DIV TELECOMPUTING  
14706 ARMINA ST VAN NUYS CALIF

ELECTRONIC COMPONENTS INC  
1947 E 61ST ST CLEVELAND 3 OHIO

ELECTRONIC COMPUTER CO  
618 MAPLE ST CONSUMERS PA

ELECTRONIC COMPUTER CORP  
DIV UNDERDOOR CORP 3510 36 AVE LONG ISLAND CITY N Y

ELECTRONIC CONTRACTORS INC  
2101 SE 6 AVE PORTLAND 14 ORE

ELECTRONIC CONTROL CORP  
1573 E FOREST AVE DETROIT 7 MICH

ELECTRONIC CONTROL SYSTEMS  
2231 BARRINGTON AVE LOS ANGELES 64 CALIF

ELECTRONIC COUNTERS INC  
164 EILEEN WAY SYOSSET LI N Y

ELECTRONIC CRAFTSMEN  
8805 42ND PL HYATTSVILLE MD

ELECTRONIC CRAFTSMEN INC  
6861 BETHESDA RD BETHESDA MD

ELECTRONIC CREATIONS CORP  
1648 WEBSTER AVE NEW YORK 37 N Y

ELECTRONIC DEV LAB  
63-07 23RD AVE LONG ISLAND CITY 5 N Y

ELECTRONIC DEV LABS INC  
3501 S DRUMME BLOSSOM TRAIL ORLANDO FLA

ELECTRONIC DEVELOPMENT LAB  
409 S W 134TH SEATTLE 66 WASH

ELECTRONIC DEVICES  
P O BOX 25 BLUE BELL PA

ELECTRONIC DEVICES INC  
429 12TH ST BROOKLYN 15 N Y

ELECTRONIC ENGG CO  
362 W BOBEAY ST AKRON 7 OHIO

ELECTRONIC ENGR CO  
2921 30 108TH ST OHAMA 14 NEBR

ELECTRONIC ENTERPRISES  
124 N 3RD ST PHILADELPHIA 6 PA

ELECTRONIC ENTERPRISES INC  
65 7 AVE NEWARK N J

ELECTRONIC EQUIPMENT CO  
300 HANOVER AVE COSTA MESA CALIF

ELECTRONIC EQUIPMENT SUPPLY CO  
249 N 48TH ST LINCOLN NEB

ELECTRONIC FABRICATORS INC  
682 BROADWAY NEW YORK N Y

ELECTRONIC INSTRUMENT CO INC  
3500 NORTHERN BLVD LONG ISLAND CITY N Y

ELECTRONIC LAB  
1968 12 LAUREL CANYON BLVD LOS ANGELES 64 CALIF

ELECTRONIC MACHINE PARTS INC  
128-11 18TH AVE COLLEGE POINT 96 N Y

ELECTRONIC MEASUREMENTS CORP  
625 BROADWAY NEW YORK 12 N Y

ELECTRONIC MEASUREMENTS CO INC  
EATONTOWN N J

ELECTRONIC MECHANICS INC  
101 CLIFTON BLVD CLIFTON N J

ELECTRONIC ORGAN ART  
4949 YORK BLVD LOS ANGELES CALIF

ELECTRONIC PLASTICS CORP  
675 BARREY ST BROOKLYN 7 N Y

ELECTRONIC PROCESSES CORP OF CALIF  
436 BRYANT ST SAN FRANCISCO 7 CALIF

ELECTRONIC PRODS CORP  
4642 BELAIR RD BALTIMORE 6 MD

ELECTRONIC PRODS CO  
P O BOX 101 NEW HYDE PARK LI N Y

ELECTRONIC PRODS CO  
605 PRAIRIE ST ST CHARLES ILL

ELECTRONIC PRODUCTION & DEVELOPMENT  
901 N PRAIRIE AVE HARTHORNE CALIF

ELECTRONIC PRODUCTS CO  
111 E 3RD ST MOUNT VERNON N Y

ELECTRONIC PRODUCTS CORP  
4642 BELAIR RD BALTIMORE MD

ELECTRONIC PRODUCTS DIV POST MACHINERY  
190 ELLIOT ST BEVERLY MASS

ELECTRONIC PROTOTYPES  
285 COLUMBUS AVE BOSTON MASS

ELECTRONIC RECTIFIERS INC  
2102 SPANN AVE INDIANAPOLIS 3 IND

ELECTRONIC RESEARCH  
221 ANGELIQUE ST WEEHAWKEN N J

ELECTRONIC RESEARCH ASSOCIATES  
67 FACTORY ST CEDAR GROVE N J

ELECTRONIC RESEARCH CO  
5115 WESTHEIMER HOUSTON TEXAS

ELECTRONIC RESEARCH LABS  
85 SURREY ST BRIGHTON MASS

ELECTRONICS  
107 FRANKLIN ST NEW YORK N Y

ELECTRONICS CORP OF AMERICA  
104 ADVANCE RD TORONTO ONTARIO CANADA

ELECTRONICS CORP OF AMERICA  
1 MEMORIAL DR CAMBRIDGE 42 MASS

ELECTRONICS DESIGN CO  
400 E CORNELL ST P O BOX 401 ENID OKLA

ELECTRONICS DEVELOPMENT CO  
3743 CAMUENGA BLVD N HOLLYWOOD CALIF

ELECTRONICS DIV ELGIN NATL WATCH CO  
2435 N MADISON ST PLUMBURG CALIF

ELECTRONICS DIV ERIE RESISTOR CORP  
644 W 12TH ST ERIE PA

ELECTRONICS DIV METAL TEXTILE CORP  
647 E 1ST AVE ROSELLE N J

ELECTRONIC SECRETARY INDUSTRIES INC  
1101 S PRAIRIE AVE WAUKESHA WISC

ELECTRONICS ENG CO OF CALIF  
1601 E CHESTNUT ST SANTA ANA CALIF

ELECTRONICS GUID INC  
VALLEY STREAM LI N Y

ELECTRONICS INC  
39 YORK RD WILLOW GROVE PA

ELECTRONICS INC OF PA  
232 WYNGOTE RD JENKINTOWN PA

ELECTRONICS INSTR CO  
33-00 NORTHERN BLVD LONG ISLAND CITY 1 N Y

ELECTRONICS INTL CO INC  
20 N LEE ST OKLAHOMA CITY 2 OKLA

ELECTRONICS OF CLEARFIELD INC  
PO BOX 792 CLEARFIELD PA

ELECTRONIC SPECIALTY CO  
5121 SAN FERNANDO RD LOS ANGELES 30 CALIF

ELECTRONIC SPECIALTY CO  
8623 RAVENNA AVE N SEATTLE 15 WASH

ELECTRONIC SYS INC  
1938 E FAIRCHILD ST DANVILLE ILL

ELECTRONICS SYS CORP OF AMERICA  
624 HIGH ST RACINE WISC

ELECTRONIC SYSTEMS  
7412 VARNA AVE N HOLLYWOOD CALIF

ELECTRONIC SYSTEMS  
7309 VARNA AVE N HOLLYWOOD CALIF

ELECTRONIC SYSTEMS DEVELOPMENT CORP  
1404 E MAIN ST VENTURA CALIF

ELECTRONIC SYSTEMS ENGS CO  
903 CRAVENS BLVD OKLAHOMA CITY OKLA

ELECTRONIC TEST INSTRUMENT CORP  
29166 BIXON RD BIXON MICH

ELECTRONIC TRANSFORMER CO  
10 WASHINGTON ST BROOKLYN 1 N Y

ELECTRONIC TUBE COIL CO  
274 N DAY ST DORANGE N J

ELECTRONIC TUBE CORP  
1200 E HERNAID LANE PHILA 18 PA

ELECTRONIC TUBE SALES  
74 GARLANDS ST NEW YORK N Y

ELECTRONIC-TIMERS CO  
88888 N Y

ELECTRONIC-TIMERS CO  
PANA ILL

ELECTRON MACH CORP  
UMATILLA FLA

# ELECTRONIC MANUFACTURERS-A-Z

ELECTRON PRODUCTS DIV MARSHALL INDUSTRIES  
430 N MALSTEAD ST PASADENA 8 CALIF  
ELECTRON RADAR PROD INC  
P O BOX 90 NORTH AURORA ILL  
ELECTRON-RADAR PRODUCTS  
4806 W CHICAGO AVE CHICAGO 51 ILL  
ELECTRONICS INC  
127 SUSSEX AVE NEWARK 3 N J  
ELECTRO OPTICAL INST  
P O BOX 4238 PASADENA CALIF  
ELECTRO OPTICAL SYS  
125 N VINEDO AVE PASADENA CALIF  
ELECTRO PACK INC  
11505 JEFFERSON BLVD CULVER CITY CALIF  
ELECTRO PHYSICS CO  
297 BROADWAY NEW YORK 7 N Y  
ELECTRO-PHYSICS LABS  
2065 HUNTINGTON DR SAN MARINO CALIF  
ELECTRO PRECISION CORP  
P O BOX 669 ARKADDELPHIA ARK  
ELECTRO PRODUCTS DIV WESTERN GEAR CORP  
132 W COLORADO ST PASADENA CALIF  
ELECTRO-PRODUCTS INC  
15050 SCHAEFER HWY DETROIT 27 MICH  
ELECTRO PRODUCTS LABS INC  
4501 N RAVENSWOOD AVE CHICAGO 40 ILL  
ELECTRO-PULSE INC  
11861 TRALEE ST CULVER CITY CALIF  
ELECTRO SALES CO INC  
50 EASTERN AVE BOSTON MASS  
ELECTRO SCIENCE INVESTORS INC  
NEW YORK N Y  
ELECTRO SCIENTIFIC IND INC  
7524 S W MACADAM AVE PORTLAND 19 ORE  
ELECTRO-SEAL CORP  
946 N NORTH AVE DES PLAINES ILL  
ELECTRO-SECURITY CORP  
275 MAIN ST WEBSTER MASS  
ELECTROSNAP CORP  
4218 W LAKE CHICAGO ILL  
ELECTRO SNAP SWITCH W MFG CO  
4218 W LAKE ST CHICAGO ILL  
ELECTRO-SOLIDUS CORP  
13745 SATCOY ST PANORAMA CITY CALIF  
ELECTRO-SONIC LABS  
35-34 36 ST LONG ISLAND CITY 6 N Y  
ELECTROSONIC MFG CO  
1719 HARNIL WAY SAN JOSE 25 CALIF  
ELECTRO SPACE LABS INC  
29 S PASADENA PASADENA CALIF  
ELECTRO SWITCH CORP  
KING AVE BEYMOUTH 88 MASS  
ELECTRO-SWITCH & CONTROLS INC  
5755 CANTILLE AVE CULVER CITY CALIF  
ELECTRO TEC CORP  
P O BOX 667 ORMOND BEACH FLA  
ELECTRO TEC CORP  
10 ROMANELLI AVE B HACKENSACK N J  
ELECTRO-TECH EQUIPT CO  
150-26-76TH RD FLUSHING L I N Y  
ELECTRO-TECHNICAL LABS  
5134 GLENMONT DR P O BOX 13243 HOUSTON 36 TEXAS  
ELECTRO-TECHNICAL PRODUCTS  
DIV SUN CHEMICAL CORP 113 E CENTRE ST  
MUTLEY N J  
ELECTRO VISION LAB  
41-08 45TH ST LONG ISLAND CITY 1 N Y  
ELECTRO-VOICE INC  
CARROLL & CECIL STS BUCHANAN MICH  
ELEKTRO-SERV CO  
880 JOHNSON AVE BROOKLYN 37 N Y  
ELGENCO  
1555 14TH ST SANTA MONICA CALIF  
ELGIN ELECTRONIC CORP  
BOX 13 BLUFFTON IND  
ELGIN INST  
BOX 311 BURBANK CALIF  
ELGIN LABS INC  
WATERFORD PA  
ELGIN METALFORMERS CORP  
630 CONDON ELGIN ILL  
ELGIN MICRONICS DIV ELGIN NATIONAL WATCH CO  
366 BLUFF CITY BLVD ELGIN ILL  
ELGIN NATIONAL WATCH CO  
366 BLUFF CITY BLVD ELGIN ILL  
ELGIN NATL WATCH CO WEST COAST MICRONICS  
21001 WARDHOFF ST CHATSWORTH CALIF  
ELIN DIV INTL ELECTRONIC RESEARCH CORP  
145 B MAGNOLIA BLVD BURBANK CALIF  
ELION INSTRUMENTS INC  
430 BUCKLEY ST BRISTOL PA  
ELK ELECTRONICS LABS INC  
333 W 52 ST NEW YORK 19 N Y  
ELKEN DIV SEMICONDUCTOR DEPT  
DUQUIN ILL  
ELLIOTT BROS LONDON LTD DANMELLIT DIV  
ELSTREE WAY BOREHAMWOOD HERTS ENGLAND  
ELLIOTT BROS LTD  
BOREHAMWOOD HERTS ENGLAND  
ELLIOTT BROTHERS LONDON LTD RADAR DIV  
ELSTREE WAY BOREHAMWOOD HERTFORDSHIRE ENG  
ELLIOTT BROTHERS LTD  
ELSTREE WAY BOREHAMWOOD HERTFORDSHIRE ENG  
ELLIOTT ENGINEERING CO  
33 LITCHFIELD ST ROCHESTER 8 N Y  
ELLIS & BATT'S PRODUCTS INC  
P O BOX 35 CINCINNATI 36 OHIO  
ELLIS ASSOCIATES  
67 LINCOLN AVE PELHAM N Y  
ELLISON DRAFT GAUGE CO  
548 W MONROE ST CHICAGO 6 ILL  
ELM LABS  
10 S BROADWAY DOBBS FERRY N Y  
ELM LABS  
10 WASHINGTON AVE HASTINGS-ON-HUDSON N Y

ELMAG CONTROLS CORP  
17215 VALERIO ST VAN NUYS CALIF  
ELMES ENGG DIV AMERICAN STEEL FOUNDRIES  
1150 TENNESSEE AVE CINCINNATI 20 OHIO  
ELOR CORP OF MICHIGAN  
1840 N STEPHENSON HWY ROYAL OAK 3 MICH  
EL PRODUCTS CORP  
P O B 41 NEW YORK 63 N Y  
EL RAY MOTOR CO INC  
11747 VOST ST N HOLLYWOOD CALIF  
EL-RAD MFG CO  
4300 N CALIFORNIA AVE CHICAGO 18 ILL  
ELSAM PRODUCTS CO  
P O BOX 417 BROCKTON MASS  
ELSIM ELECTRONICS CORP  
EILEEN WAY SYOSSET N Y  
EL-TRONICS INC  
6706 KEYNOTE ST LONG BEACH 8 CALIF  
EL-TRONICS INC  
PENN AVE MAYFIELD PA  
ELY SALES CO  
130 LAFAYETTE ST NEW YORK 13 N Y  
ELZEE METAL PRODUCTS CO  
775 39 ST BROOKLYN 32 N Y  
EMACO  
2900 ANTHONY ST BANTAM L I N Y  
EMC RECORDINGS CORP  
806 E 7 ST ST PAUL 6 MINN  
E M D INC  
16-11 WASHINGTON AVE PLAINFIELD N J  
EMELOID CO  
1239 CENTRAL AVE HILLSIDE 9 N J  
EMERSON & CUNING INC  
869 BASHINGTON ST CANTON 1 MASS  
EMERSON ELECT MFG CO  
57TH & INDUSTRIAL AVE EAST ST LOUIS ILL  
EMERSON ELECTRIC  
8100 FLORISSANT AVE ST LOUIS 21 MO  
EMERSON ELECTRIC MFG CO  
59TH & INDUSTRIAL WASHINGTON PARK ILL  
EMERSON PLASTICS CORP  
SEABURY AVE & BUTLER PL BRONX 61 N Y  
EMERSON RADIO & PHONOGRAPH CORP  
14 B COLES STS JERSEY CITY 2 N J  
EMERSON-SACK-BARNER CORP  
85 WASHINGTON ST SOMERVILLE 43 MASS  
EMI COSSOR  
WESTBURY N Y  
EMI COSSOR ELECTRONICS  
WOODSIDE DARTMOUTH NOVA SCOTIA  
EMERT MFG CO  
1051 E MAIN ST WAYNESBORO PA  
EMPIRE DEVICES PRODUCTS CORP  
37 PROSPECT ST AMSTERDAM NY  
EMPIRE ELECTRONICS CO  
166 RIVER ST PATERSON 1 N J  
EMPIRE ELECTRONICS CO INC  
80 SPRUCE ST PATERSON 1 N J  
EMPIRE PRODUCT SALES CORP  
37 PROSPECT ST AMSTERDAM N Y  
EMPIRE SPRING CO  
210 S ABBE ROAD LYERTIA OHIO  
EMPIRE STATE LABS INC  
2608 HERRICK RD BELLMORE L I N Y  
ENDECO ENGG DEVELOPMENT CO OF LOS ANGELES  
148-50 WILMINGTON BLVD WILMINGTON CALIF  
ENDEVCO CORP  
161 E CALIFORNIA BLVD PASADENA CALIF  
ENERGY KONTROLS INC  
15 S 1ST ST GENEVA ILL  
ENFAB INC  
312 E BROKAW RD SAN JOSE CALIF  
ENFLO CORP  
FELLOWSHIP RD ROUTE 73 MAPLE SHADE N J  
ENGELHARD INC CHARLES  
850 PASTIC AVE NEWARK N J  
ENGELHARD IND INC AMER PLATINUM & SILVER DIV  
231 N J RR AVE NEWARK N J  
ENGELHARD INDUSTRIES INC  
113 ASTOR ST NEWARK N J  
ENGELHARDT ENGG CO  
38 BURRITT AVE S NORWALK CONN  
ENGG & MFG CORP OF TEXAS  
P O BOX 18216 DALLAS 38 TEXAS  
ENGINEERED ELECTRONICS CO  
506 E 1 ST SANTA ANA CALIF  
ENGINEERED MAGNETICS  
13030 CERISE AVE HAWTHORNE CALIF  
ENGINEERING ASSOCIATES  
434 PATTERSON RD DAYTON 19 OHIO  
ENGINEERING DEVELOPMENTS INC  
PO BOX 149 NEWPORT R I  
ENGINEERING DEVELOPMENTS INC  
FOREST AVE MIDDLETOWN R I  
ENGINEERING RESEARCH CO  
950 KENNARD WAY SUNNYVALE CALIF  
ENGINEERS NORTHWEST  
1554 NICOLL AVE MINNEAPOLIS 4 MINN  
ENIGS EQUIPMENT CO  
431 S DEARBORN ST CHICAGO 5 ILL  
ENGLER INSTRUMENT CO  
250 CULVER JERSEY CITY 5 N J  
ENGLISH ELECTRIC CO LTO  
750 THIRD AVE NEW YORK 17 N Y  
ENGLISH ELECTRIC VALVE CO LTO  
CHELMSFORD ESSEX ENGLAND  
ENGRG & DEVEL CO OF LOS ANGELES  
1150 WILMINGTON BLVD WILMINGTON CALIF  
ENSIGN COIL CO  
2520 S PULASKI CHICAGO 23 ILL  
ENTHONE INC  
462 ELN ST NEW HAVEN 8 CONN  
ENTHONEN SOLDERS LTD  
113 N WATER ST ROCHESTER 4 N Y  
ENTROM INC  
9006 ADELPHI RD ADELPHI MD

ENTROM INF  
6627 - 23RD AVE HYATTSVILLE MD  
ENTROM INC  
4902 LAWRENCE ST BLADENSBURG MD  
ENVIRONMENTAL EQUIPMENT CO  
389 LINDEN ST BROOKLYN 27 N Y  
E O ELECTRONICS INC  
14 MORRIS AVE MOUNTAIN LAKES N J  
E P C  
PO BOX 669 ARKADDELPHIA ARK  
EPCO PRODUCTS INC  
2500 ATLANTIC AVE BROOKLYN 7 N Y  
EPI-HAB L I INCORPORATED  
84-36 PARSONS BLVD JAMAICA 32 L I N Y  
EPIC INC  
150 NASSAU ST NEW YORK 38 N Y  
EPR CORP  
675 BARBEY ST BROOKLYN N Y  
EPOXY PRODUCTS DIV JOS BALDWIN & SONS  
133 COIT ST IRVINGTON N J  
EPPLLEY LAB INC  
12 SHEFFIELD AVE NEWPORT R I  
EPRAD INC  
1206 CHERRY ST TOLEDO 4 OHIO  
E P H SPEC PROD CORP  
675 BARBEY ST BROOKLYN N Y  
EPSICO INC  
588 COMMONWEALTH AVE BOSTON 15 MASS  
EPSICO INC  
275 MASSACHUSETTS AVE CAMBRIDGE 39 MASS  
EPSICO WEST  
240 E PALAIS RD ANAHEIM CALIF  
EQUIP CRAFTERS INC  
523 WINNE AVE RIVER EDGE N J  
EQUIP-A-MATIC ENGG CORP  
8045 W OGDEN AVE CHICAGO 50 ILL  
EQUIPMENT AND SERVICE CO  
7118 ENVOY CT DALLAS 7 TEXAS  
EQUIPTO DIV AURORA EQUIPMENT CO  
AURORA ILL  
EQUITABLE ENGINEERING CO  
2724 NORMANDY RD ROYAL OAK MICH  
ERA ELECTRIC  
67 FACTORY PLACE CEDAR GROVE N J  
ERA ENGG INC  
1009 MONTANA AVE SANTA MONICA CALIF  
ERA PACIFIC INC  
1760 STANFORD ST SANTA MONICA CALIF  
ERASER CO  
1628 S CLINTON ST SYRACUSE 8 N Y  
ERCA TOOL DIE & STAMPING CO  
19 ASH ST BROOKLYN 22 N Y  
ERCO RADIO LABS INC  
637 STEWART AVE GARDEN CITY N Y  
ERCONA CORP  
16 W 46TH ST NEW YORK 36 N Y  
ERDCO ENGG CORP  
OFFICIAL & WESTGATE ADDISON ILL  
ERICO PRODUCTS INC  
2070 E 61ST PLACE CLEVELAND 3 OHIO  
ERICSSON CORP  
100 PARK AVE NEW YORK 17 N Y  
ERIE RESISTOR CORP  
644 W 12 ST ERIE 6 PA  
ERIE RESISTOR CORP ERIE TECH CERAMIC DIV  
BOX 677 STATE COLLEGE PA  
ERIE RESISTOR OF CANADA LTD  
7 FRASER AVE TRENTON ONT CANADA  
ERIE-PACIFIC-DIV ERIE RESISTOR CORP  
12932 S WEBER WAY HAWTHORNE CALIF  
ERIKSON SPECIALIZED TOOL CO  
P O BOX 428 PICO CALIF  
ERITRON CORP  
TORRANCE CALIF  
ERWOOD INC  
1770 W BERTEAU AVE CHICAGO 13 ILL  
ESC CORP  
534 BERGEN BLVD PALISADES PARK N J  
ESCO DIV TEXAS INST  
6000 DENTON DR DALLAS TEXAS  
ESCO GROUP DIV ELECTRONIC SPECIALTY CO  
5121 SAN FERNANDO RD LOS ANGELES 39 CALIF  
ESCON INC  
724 BRANCH AVE PROVIDENCE R I  
ESQUIRE RADIO CORP  
62-01 15TH AVE BROOKLYN 19 N Y  
ESSEX ELECTRONICS DIV NYTRONICS INC  
550 SPRINGFIELD AVE BERKELEY HEIGHTS N J  
ESSEX ELECTRONICS OF CANADA LTD  
90 WRASSE ST TRENTON ONT CANADA  
ESSEX MFG CO  
8213 GRAVOIS AVE ST LOUIS 23 MO  
ESSEX WIRE CORP  
R B M DIV LOGANSPOUT IND  
ESSEX WIRE CORP  
6233 CONCORD AVE DETROIT 11 MICH  
ESSEX WIRE CORP  
1601 WALL ST FT WAYNE 6 IND  
ESSEX WIRE CORP GUTHMAN DIV  
3443 W ADDISON CHICAGO 18 ILL  
ESSEX WIRE CORP MAGNETIC BINDINGS  
FREMANSBURG AVE HOBSON BLVD EASTON PA  
ESTERLINE-ANGUS CO  
P O BOX 596 INDIANAPOLIS 6 IND  
E-T-A PRODUCTS CO OF AMERICA  
6284 N CICERO AVE CHICAGO 46 ILL  
ETC INC  
490 E 67 ST CLEVELAND 3 OHIO  
ETCHING CO OF CALIF  
1208 HOBARD ST SAN FRANCISCO 3 CALIF  
ETO-HOKIN & GALVAN  
218 N AVALON BLVD WILMINGTON CALIF  
EULOID ELEC & MFG CO  
50 EDWARDS ST MADISON OHIO  
EUGENE ENGINEERING CO INC  
1217 HYDE PARK AVE HYDE PARK 36 MASS

# ELECTRONIC MANUFACTURERS-A-Z

EUREKA X-RAY TUBE CORP  
3250 N MILPATRIC AVE CHICAGO 41 ILL  
EUTECTIC WELDING ALLOYS CORP  
40-40 172 ST FLUSHING 98 N Y  
EVERY READY LABEL  
BELLEVILLE N J  
EWALD INSTRUMENTS  
ROUTE 70 KENT CONN  
EX-CEL-D  
1200 OAKMAN BLVD DETROIT MICH  
EXACT ELECTRONICS INC  
BOX 123 HILLSBORO ORE  
EXACT ENGG & MFG INC  
P O BOX 688 OCEANSIDE CALIF  
EXACT ENGR & MFG CO  
281 PACIFIC AVE SOLANA BEACH CALIF  
EXACT MACHINE WORKS  
7465 S CHICAGO AVE CHICAGO 19 ILL  
EXACT WEIGHT SCALE CO  
530 E TOWN ST COLUMBUS 15 OHIO  
EXAKTA CAMERA CO  
705 BRONX RIVER RD BRONXVILLE 8 N Y  
EXCELLEX ELECTRONICS CORP  
39-53 60TH ST WOODSIDE 77 N Y  
EXCELLEX ELECTRONICS INC  
39-51 60TH ST WOODSIDE N Y  
EXECUTONE INC  
415 LEXINGTON AVE NEW YORK 17 N Y  
ERIDE INDUSTRIAL DIV  
ELECTRIC STORAGE BATTERY CO 42 S 15 ST  
PHILA PA  
EXTRUDERS INC  
3232 E EL SEGUNDO BL HAWTHORNE CAL  
EYELET TOOL CO  
236A BROADWAY CAMBRIDGE MASS  
E-2 WAY TOBERS INC  
9901 E BROADWAY TAMPA 5 FLA  
E-2-HOOK TEST PRODUCTS  
1536 WOODBURN AVE COVINGTON KY  
E-2-WAY TEMPLATES  
P O BOX 535 RESEDA CALIF

## F

FABER CASTELL CO A N  
41 DICKERSON ST NEWARK N J  
FABRA PRINT INC  
801 S E 8TH ST MINNEAPOLIS 14 MINN  
FACTSIMILE PRODUCTS CO  
336 LACEWOOD DR NEW MILFORD N J  
FACTORY ENTERPRISES INC  
3431 BUTLER ST PITTSBURGH 1 PA  
FACTORY SERVICE CO  
4615 N 21ST ST MILWAUKEE 9 WISC  
FAE INSTRUMENT CORP  
42-61 HUNTER ST LONG ISLAND CITY 1 NY  
FAESY & BESTHOFF INC  
28 E 26TH ST NEW YORK 10 N Y  
FAFNIR BEARING CO  
37 BOOTH ST NEW BRITAIN CONN  
FAIR-RITE PRODUCTS CORP  
COMMERCIAL RD WALKHILL N Y  
FAIRBANKS CO  
905 LAFAYETTE ST NEW YORK 3 N Y  
FAIRBANKS HORSE & CO  
600 S MICHIGAN AVE CHICAGO 5 ILL  
FAIRBANKS HORSE & CO  
ST JOHNSBURY VERMONT  
FAIRBANKS WIRE CO  
2287 HOLLERS AVE NEW YORK 69 N Y  
FAIRCHILD AIRCRAFT CORP  
P O BOX 101 SHAWNEE DR SHAWNEE OKLA  
FAIRCHILD ASTRONICS DIV  
STRAIGHT PATH BYANDANCH L I N Y  
FAIRCHILD CAMERA & INSTR CO  
FAIRCHILD DR PLAINVIEW L I N Y  
FAIRCHILD CAMERA AND INSTRUMENT CORP  
ROBBINS LA SYOSSET N Y  
FAIRCHILD CONTROLS CORP  
6111 E WASHINGTON BLVD LOS ANGELES CALIF  
FAIRCHILD CONTROLS CORP  
56-16 206 ST FLUSHING L I 64 N Y  
FAIRCHILD CONTROLS CORP COMPONENTS DIV  
225 PARK AVE HICKSVILLE L I N Y  
FAIRCHILD DATA DEVICES CORP  
580 MIDLAND AVE YONKERS N Y  
FAIRCHILD ENB & AIRPLANE STRATOS DIV  
BAY SHORE L I N Y  
FAIRCHILD ENGINE & AIRPLANE  
FAIRCHILD APPLIED SCIENCE DIV 1336 N HENRY  
ST ALEXANDRIA VA  
FAIRCHILD GRAPHIC EQUIP CO  
FAIRCHILD DR PLAINVIEW L I N Y  
FAIRCHILD GUIDED MISSILES  
STRAIGHT PATH BYANDANCH L I N Y  
FAIRCHILD MISSILES  
HAGERSTOWN MD  
FAIRCHILD RECORDING EQUIPMENT CO  
10-40 45 AVE LONG ISLAND CITY 1 N Y  
FAIRCHILD SEMICONDUCTOR CORP  
545 WHISMAN RD MOUNTAIN VIEW CALIF  
FAIRCHILD SEMICONDUCTORS  
840 CHARLESTON RD PALO ALTO CALIF  
FAIRCHILD SEMICONDUCTORS  
SAN RAFAEL CALIF  
FAIRFIELD ENGRS CORP  
114 MANHATTAN ST STAMFORD CONN  
FAIRMOUNT CHEMICAL CO INC  
136 LEBERT ST NEW YORK 6 N Y  
FALCON WATCH & TOOL  
208 CONCORD TPK CAMBRIDGE MASS  
FALSTROM CO  
12 FALSTROM COURT PASSAIC N J  
FANON ELECTRONIC INDUSTRIES INC  
98 BERRIHAN ST BROOKLYN 8 N Y

FANSTEEL METALLURGICAL CORP  
2200 SHERIDAN RD N CHICAGO ILL  
FARE ELECTRONICS  
7 CLOVER GRASS DR ALEXANDRIA VA  
FARINON ELECTRIC CO  
416 D ST REDWOOD CITY CALIF  
FARLEY & LOETSCHER MFG CO PLASTICS DIV  
7 & WHITE STS DUBUQUE IOWA  
FARMER ELECTRIC PRODUCTS CO  
2300 WASHINGTON ST NEWTON LOWER FALLS 62  
MASS  
FARNAM MFG CO INC  
P O BOX 5276 ASHEVILLE NC CAR  
FARNSWORTH ELECTRONICS  
861 KNITTER'S AVE FORT WAYNE IND  
FARNSWORTH ELECTRONICS  
819 34th ANTONIO RD PALO ALTO CALIF  
FARNSWORTH ELECTRONICS CO DIV I T & T  
3702 E PONTIAC ST FT WAYNE IND  
FARRALL INSTRUMENT CO  
BOX 698 GRAND ISLAND NEB  
FARRANO OPTICAL CO INC  
4601 BERNA BLVD NEW YORK 70 N Y  
FARRELL CO  
1243 N 26TH ST PHILA PA  
FARBELL METAL FABRICATING  
83 W FAIRFIELD AVE ST PAUL 7 MINN  
FASCO INDUSTRIES INC  
235 N UNION ST ROCHESTER 2 N Y  
FAST & CO JOHN E  
3580 N ELSTON AVE CHICAGO 18 ILL  
FASTER DIV ILL TOYOTA  
195 ALGONQUIN RD DES PLAINES ILL  
FEAY CO MEAL  
133 LA PATERA AVE GOLETA CALIF  
FECKER INC J B  
6592 HAMILTON AVE PITTSBURGH 6 PA  
FEDERAL ANTI CAPACITY SWITCH CORP  
P O BOX 25 LANCASTER N Y  
FEDERAL ELECTRIC CORP  
621-671 INDUSTRIAL AVE PARAMUS NJ  
FEDERAL ELECTRONICS PRDTS INC  
1380 POMPTON AVE CEDAR GROVE N J  
FEDERAL EQUIPMENT CO  
38 BRADY ST SAN FRANCISCO 3 CALIF  
FEDERAL INSTRUMENT CORP  
92-60 QUEENS BLVD REGO PARK 74 N Y  
FEDERAL MACHINE CO  
635 GARFIELD AVE JERSEY CITY 5 N J  
FEDERAL MFG & ENGG CORP  
1055 STEWART AVE GARDEN CITY LI N Y  
FEDERAL MOGUL BOBER BEARINGS INC  
11031 SHOENAKER AVE DETROIT 13 MICH  
FEDERAL PACIFIC ELECTRIC COMPANY  
FTY AVENUE L INC HEBARR 1 N J  
FEDERAL PACIFIC ELECTRIC CO  
333 BROKAV RD SANTA CLARA CALIF  
FEDERAL PRODUCTS CORP  
1144 EDDY ST PROVIDENCE R I  
FEDERAL SCREW PRODUCTS INC  
3917 W MEDIE AVE CHICAGO 18 ILL  
FEDERAL SHOCKMOUNT CORP  
DIVISION OF THE KORFUNG CO 1060 WASHINGTON  
AVE NEW YORK 56 N Y  
FEDERAL SHOCKMOUNT CORP  
DIVISION OF THE KORFUNG CO  
FEDERAL TEL LABS  
CHURCH RD GREAT RIVER LI N Y  
FEDERAL TELECOMM LAB  
19191 BLEDSOE ST SAN FERNANDO CALIF  
FEDERAL TELECOMM LABS  
492 RIVER RD NUTLEY 10 N J  
FEDERAL TELECOMM LABS  
525 MAIN ST BELLEVILLE N J  
FEDERAL TELEPHONE & RADIO  
100 KINGSLAND RD CLIFTON N J  
FEDERAL TELEVISION CORP  
19-10-23 RD TERRACE LONG ISLAND CITY 5 N Y  
FEDERAL TOOL & MFG CO  
3600 ALABAMA AVE MINNEAPOLIS 16 MINN  
FEDERAL TOOL ENGG CO  
1384 POMPTON AVE CEDAR GROVE N J  
FEDERATED METAL DIV  
AMERICAN SMELTING & REFINING CO 8010 E  
26TH ST LOS ANGELES 23 CALIF  
FEDERATED METALS DIV  
AMERICAN SMELTING & REFINING CO 150 ST  
CHARLES ST NEWARK 5 N J  
FEDTRO INC FEDERAL ELECTRONICS SALES DIV  
FEDERAL ELECTRONICS BLDG ROCKVILLE CENTRE  
N Y  
FEEDBACK CONTROLS INC  
8 ERIE DRIVE NATICK MASS  
FELER ENGG & MFG CO  
8028 N MONTICELLO AVE SKOKIE ILL  
FEINER & SONS P  
522 B 45 ST NEW YORK 36 N Y  
FELKER MFG CO  
TORRANCE CALIF  
FELLOWS ENGINEERING CO  
1168 MEADOWBROOK RD ALTADENA CALIF  
FELLOWS GEAR SHAPER CO  
78 RIVER ST SPRINGFIELD VT  
FELSINTHAL & SONS INC B  
3500 N KEDZIE AVE CHICAGO 10 ILL  
FELT PRODUCTS MFG CO  
7450 N MCCORMICK BLVD SKOKIE ILL  
FELTERS CO  
210 SOUTH ST BOSTON 11 MASS  
FELTERS CO  
350 5TH AVE NEW YORK 1 N Y  
FELTHOUSEN AUDIO SERVICE  
17409 CHATSWORTH ST GRANADA HILLS CALIF  
FEMCO INC  
P O BOX 32 TABIN PA  
FEN-TONE CORP  
106 5TH AVE NEW YORK 11 N Y

FENSKE FREDERICK & MILLER  
12820 PANAMA ST LOS ANGELES 66 CALIF  
FENVAL ELECTRONIC INC  
51 HELLEN ST FRAMINGHAM MASS  
FERRANTI ELECTRIC INC  
95 MADISON AVE HEMPSTEAD LI N Y  
FERRANTI ELECTRIC INC  
TRANSFORMER DIV 30 MAIN ST BROOKLYN 1 N Y  
FERRANTI ELECTRIC INC  
30 ROCKEFELLER PLAZA NEW YORK 20 N Y  
FERRARA INC  
8106 B 9 MILE RD OAK PARK 37 MICH  
FERRIS INSTRUMENT CORP  
110 CORNELIA ST BOONTON 1 N J  
FERRO DYNAMICS CORP  
GREGG ST & AYE 17 LODI N J  
FERRO POWDERED METALS ELECTRONIC MATERIALS  
DIV BOX 312 SALEM IND  
FERRO-MAGNETIC CO  
989 COMMERCIAL ST PALO ALTO CALIF  
FERROPRINT CORP  
7070 SANTA MONICA BLVD HOLLYWOOD 38 CALIF  
FERROTEC INC  
217 CALIF ST NEWTON MASS  
FERROTRAM ELECTRONICS CO INC  
693 BROADWAY NEW YORK 12 N Y  
FERROXCOBE CORP OF AMERICA  
35 E BRIDGE ST SAUGERTIES N Y  
FF & M INC  
12820 PANAMA ST LOS ANGELES 66 CALIF  
FIBRE GLASS EVERCOAT CO  
BLUE ASH & KUGLER MILL ROADS CINCINNATI 38  
OHIO  
FIDELITY TONE INC  
6415 N RAVENSWOOD AVE CHICAGO 26 ILL  
FIDELITY AMPLIFIER CO  
1633 N HALSTED ST CHICAGO 14 ILL  
FIDELITY CHEMICAL PRODUCTS CORP  
470 FRELINGHUYSEN AVE NEWARK 12 N J  
FIDELITY ELECTRIC CO  
332 N ARCH ST LANCASTER PA  
FIELD ELECTRICAL INSTRUMENT  
8 N MANHEIM BLVD NEW PLAZA N Y  
FIELD EMISSION  
NEW YORK N Y  
FIELD EMISSION CORP  
210 N FORD MCINNHVILLE ORE  
FILDERS ELECTRIC MOTORS  
1014 CLEVELAND AVE GRAFTON OHIO  
FILM ARTS PRODUCTIONS  
1700 S 19TH ST MILWAUKEE 4 WISC  
FILM ASSOCIATES  
4600 S DIXIE HWY DAYTON 39 OHIO  
FILM CAPACITORS INC  
3400 PARK AVE NEW YORK 56 N Y  
FILM RESISTORS INC  
242 RIDGEDALE AVE MORRISTOWN N J  
FILMORPH CORP  
48 B 25 ST NEW YORK 10 N Y  
FILTRONS INC  
30 SAGARORE HILL DR PORT WASHINGTON N Y  
FILTRON CO  
131-15 FOWLER AVE FLUSHING 55 N Y  
FILTRON CO INC WESTERN DIV  
10023 W JEFFERSON BLVD CULVER CITY CALIF  
FILTRON COMPANY INC  
169 E HELENA ST DAYTON 4 OHIO  
FINE ORGANICS INC  
205 MAIN ST LODI N J  
FINK ELECTRONICS INC  
7629 S COLFAX AVE CHICAGO 49 ILL  
FINN & CO T R  
275 GOFFLE RD HAWTHORNE N J  
FINN & CO T R  
200 CENTRAL AVE HAWTHORNE N J  
FINNELL SYSTEM INC  
ELKHART IND  
FINNEY CO  
38 E INTERSTATE ST BEDFORD OHIO  
FIRESTONE TIRE & RUBBER CO  
BOX 1431 MONTEREY CALIF  
FIRST ELECTRONICS CORP  
117 BLUE HILL AVE BOSTON 19 MASS  
FIRTH STERLING INC  
3113 FORBES AVE PITTSBURGH 30 PA  
FISCHER & CO R A  
917 COMMERCIAL ST GLENDALE 3 CALIF  
FISCHER & PORTER CO  
WARMINSTER PA  
FISCHER ELECTRONICS INC  
2238 BAILEY AVE BUFFALO 11 N Y  
FISH-SCHURMAN CORP  
70 PORTMAN RD NEW ROCHELLE N Y  
FISHER & CRONE  
109 N CAMAC ST PHILA 7 PA  
FISHER BERKELEY CORP  
4224 HOLDEN ST EMERYVILLE 8 CALIF  
FISHER CO INC OSCAR  
P O BOX 426 NEWBURGH N Y  
FISHER ENGG INC  
P O BOX 327 HUNTINGTON IND  
FISHER GOVERNOR CO  
BOX 307 MARSHALLTOWN IOWA  
FISHER PIERCE CO  
170 PEARL ST S BRAINTREE 85 MASS  
FISHER RADIO CORP  
21-21 84 DR LONG ISLAND CITY 1 N Y  
FISHER RESEARCH LAB  
1961 UNIVERSITY AVE PALO ALTO CALIF  
FISHER RESEARCH LAB LTD  
1272 B BENDER ST VANCOUVER 1 B C CANADA  
FISHER SCIENTIFIC CO  
1 REAGENT LANE FAIR LAWN NJ  
FISHER SCIENTIFIC CO  
711 FORBES ST PITTSBURGH 22 PA  
FISHER SPECIAL MFG CO  
446 MORGAN ST CINCINNATI 6 OHIO

# ELECTRONIC MANUFACTURERS-A-Z

FIVE STAR CO  
 8 MAIN ST PLANTSVILLE CONN  
 FLAMEMASTER CHEMICAL INC  
 3813 HOKKE CULVER CITY CALIF  
 FLARE RESEARCH INC  
 801 10502 PITTSBURGH 35 PA  
 FLEETWOOD LABS INC  
 300 VICTORY BLVD NEW ROCHELLE N Y  
 FLETT LABORATORY  
 3711 MARSHALL RD DREXEL HILL PA  
 FLEXAUST CO  
 100 PARK AVE NEW YORK 7 N Y  
 FLEXIBLE CO  
 SPRING DR BEL AIR MD  
 FLEXO INTERNATIONAL CORP  
 3720 N MILWAUKEE AVE CHICAGO 41 ILL  
 FLEXONICS CORP  
 1315 S 3 AVE MAYWOOD ILL  
 FLEXPRIINT PRODUCTS  
 MASHUA N H  
 FLIGHT REFUELING INC  
 30X 1701 FRIENDSHIP A/P BALTIMORE 3 MD  
 FLIGHT RESEARCH INC  
 P O BOX 1-F RICHMOND 1 VA  
 FLITE INDUSTRIES INC  
 3312 BURTON BURBANK CALIF  
 FLOCK PROCESS CO  
 375 MAIN AVE NORWALK CONN  
 FLOQUIL PRODUCTS INC  
 COMLESKILL N Y  
 FLORIDA MERIT INC  
 2040 SHERMAN ST HOLLYWOOD FLA  
 FLOPMAN & BABB INC  
 68 W 45 ST NEW YORK 36 N Y  
 FLOB CORP  
 85 MYSTIC ST ARLINGTON MASS  
 FLUKE MFG CO INC JOHN  
 P O BOX 7161 SEATTLE 33 WASH  
 FLUKE MFG CO JOHN  
 16030 35ND AVE W LYNNWOOD WASH  
 FLUKE MFG CO JOHN  
 7100 220TH S W MOUNTLAKE TERRACE WASH  
 FLUOROCARBON PRODUCTS INC DIV U S GASKET CO  
 602 N 10 ST CAMDEN 1 N J  
 FLUORULON LABS INC  
 BOX 305 CALDWELL N J  
 FLUSH WALL RADIO CO  
 1012 CLEVELAND ST CLEARWATER FLA  
 FAN SCIENTIFIC CORP  
 1202 ARNOLD AVE AIR BASE NEW CASTLE DEL  
 F & M SCIENTIFIC CORP  
 1001 KENDALL RD WILMINGTON 5 DEL  
 FONDA GAGE CO INC  
 STAMFORD CONN  
 FOOD MACHINERY & CHEMICAL  
 1105 COLEMAN AVE SAN JOSE 6 CALIF  
 FOOD MACHINERY CHEMICAL CORP  
 161 E 42ND ST NEW YORK N Y  
 FOOTE BROS GEAR & MACHINE CORP  
 4545 S WESTERN BLVD CHICAGO 9 ILL  
 FOOTE BROS GEAR & MACHINE CORP  
 555 ROGERS ST DONNERS GROVE ILL  
 FOOTE MINERAL CO  
 18 W CHELSEA AVE PHILA 44 PA  
 FORBES & WAGNER INC  
 345 CENTRAL AVE SILVER CREEK N Y  
 FORD INSTRUMENT CO DIV SPERRY RAND CORP  
 31-10 THOMSON AVE LONG ISLAND CITY 1 N Y  
 FORD MOTOR CO ENGRNG  
 804 2053 DEARBORN RICH  
 FORD RADIO & MICA CORP  
 536 63 ST BROOKLYN 20 N Y  
 FORDHAM MFG CO  
 2220 PEARLSALL AVE NEW YORK 69 N Y  
 FORDOM ELECTRIC CO INC  
 BETHEL CONN  
 FOREST ELECTRIC CO  
 7216 CIRCLE AVE FOREST PARK ILL  
 FORM-IT PRODUCTS INC  
 16-19 W WALNUT ST CHICAGO 12 ILL  
 FORMALITE CORP  
 902 SECOND ST MARSHALL ILL  
 FORNICA CORP  
 4614 SPRING GROVE AVE CINCINNATI 11 OHIO  
 FORMICA METAL PRODUCTS CO  
 CORPORATION WAY MEDFORD 55 MASS  
 FORMSPRAG INC  
 2501 HODDER RD BARREN RICH  
 FORMO SCIENTIFIC CO  
 833 LINCOLN ST EVANSTON ILL  
 FORSBERG MFG CO  
 125 SEAVIEW AVE BRIDGEPORT 1 CONN  
 FORT WAYNE METALS INC  
 3211 MACARTHUR DR FT WAYNE 6 IND  
 FORTE ENG CO  
 100 DAVIS AVE NORWOOD MASS  
 FORTER-TEICHMAN CO  
 1212 CLARK BLDG PITTSBURGH 22 PA  
 FORTUNE ELECTRONICS  
 2505 SOUTH BLVD HOUSTON 6 TEXAS  
 FOSTER ELECTRONICS INC  
 3635 N KEDZIE CHICAGO 18 ILL  
 FOSTER MFG CO JOHN J  
 BOX 2067 SANTA ANA CALIF  
 FOSTER TRANSFORMER CO  
 3820 COLERAIN AVE CINCINNATI 23 OHIO  
 FOSTORIA CORP  
 1200 N MAIN ST FOSTORIA OHIO  
 FOSTORIA CORP DEPT D2  
 BUCK & COUNTY LINE RDS HUNTINGDON VAL PA  
 FOTD VIDEO LABS  
 34 COWEN RD CEDAR GROVE 8 J  
 FOUNDRY EQUIP CO DIELECTRIC DIV  
 1831 COLUMBUS RD CLEVELAND 13 OHIO  
 FOUR BELL DRIVE AMP CO  
 GROUND SUPPORT EQUIP DIV CLINTONVILLE BISC  
 FOURDES INC  
 704 W FAIRBANKS AVE WINTER PARK FLA

FOURJAY INDUSTRIES  
 2340 W WORTHINGME DAYTON 39 OHIO  
 FOX ELECTRONIC CO INC  
 701 S 9TH ST RICHMOND IND  
 FOX PRODUCTS CO  
 4720 N 18 ST PHILA 41 PA  
 FORBORD CO  
 NEPONSET AVE FOXBORO MASS  
 FRANCE MFG CO  
 10325 BEEBA RD CLEVELAND 2 OHIO  
 FRANK BEAR WORKS INC  
 4401 N RAVENSWOOD AVE CHICAGO 40 ILL  
 FRANKEL CONNECTOR CO  
 27 VESTRY ST NEW YORK 13 N Y  
 FRANKLIN DALES CO  
 180-184 E HILL ST ARRON 8 OHIO  
 FRANKLIN ELECTRONICS  
 5901 NOBLE AVE VAN NUYS CALIF  
 FRANKLIN ELECTRONICS INC  
 E 4TH ST BRIDGEPORT PA  
 FRANKLIN FIBRE-LAMITEX CORP  
 18TH & MARKET STS DR PRR STIOING WILMINGTON  
 DELAWARE  
 FRANKLIN MFG CO  
 65 N E 22ND AVE MINNEAPOLIS MINN  
 FREQBANK CO  
 711 W BROADWAY GLENDALE 4 CALIF  
 FREDERICK RECORDING CO  
 510 SIXTH ST MIDLAND MICH  
 FREDERICK TOOL & ENGS CORP  
 414 PINE AVE FREDERICK MD  
 FREDERICKS CO GEO E  
 BETHAYRES PA  
 FREED TRANSFORMER CO  
 1718-36 WEIRFIELD ST BROOKLYN 27 N Y  
 FRELAND PRODUCTS CO  
 706 DRYADES ST NEW ORLEANS 12 LA  
 FREEPORT ENG CO  
 390 5TH AVE NEW YORK N Y  
 FREEBAY WASHER & STAMPING CO  
 4911 GRANT AVE CLEVELAND 5 OHIO  
 FRENCHTOWN PORCELAIN CO  
 FRENCHTOWN N J  
 FREQUENCY CONVERTER CORP  
 BOX 156 SAN CARLOS CALIF  
 FREQUENCY STANDARDS  
 BOX 504 ASBURY PK N J  
 FREQUENCY STANDARDS INC  
 BOX 190 RED BANK N J  
 FRIDEN CO  
 3811 E MONUMENT ST BALTIMORE MD  
 FRIEDEN INC  
 31 PRINC ST ROCHESTER 7 N Y  
 FRIEDRICH & DIMMOCK INC  
 BOX 230 MILVILLE N J  
 FRIESCH LABS L C  
 3703 MATCHER ST DALLAS 10 TEX  
 F & R MACHINE WORKS  
 26-12 BOROUGH PL WOODSIDE L I 77 N Y  
 FROST & CO INC L H  
 904-36TH ST S E GRAND RAPIDS 8 MICH  
 FRUEHAUF TRAILER CO MILITARY EQUIP DIV  
 10940 HARPER AVE DETROIT 32 MICH  
 FRYLING ELECTRIC PRODUCTS INC  
 HOLLY SPRINGS MISS  
 FRYLING MFG CO  
 531 W 11TH ST ERIE 6 PA  
 FUEL BATCHMAN INC  
 77-29 138 ST FLUSHING 67 N Y  
 FUGLE-MILLER LABS INC  
 301 CENTRAL AVE CLARK N J  
 FULLER CO M B  
 255 EAGLE ST ST PAUL 2 MINN  
 FURANE PLASTICS INC  
 8516 BRAZIL ST LOS ANGELES 39 CALIF  
 FURNAS ELECTRIC CO  
 1000 MCKEE ST BATAVIA ILL  
 FURZEHILL LABS LTD  
 57 CLARENDON RD WATFORD ENGLAND  
 FUSITE CORP  
 6000 FERNVIEW AVE CINCINNATI 13 OHIO  
 F X R INC  
 28-12 BOROUGH PLACE WOODSIDE 77 N Y  
 F X R INC  
 BOX 92 SOUTH LINCOLN MASS

## G

GABLES ENGRG INC  
 PO BOX 751 CORAL GABLES FLA  
 GABRIEL ELECTRONICS DIV GABRIEL CO  
 135 CRESCENT RD NEEDHAM HEIGHTS 94 MASS  
 GAERTNER SCIENTIFIC CO  
 1250 BRIGHTWOOD AVE CHICAGO ILL  
 GAGANAN INC  
 BATERMAN AVE ESOMOND 17 R I  
 GAI-TRONICS CORP  
 925 LANCASTER AVE READING PENNA  
 GALLARD - SCHLESINGER  
 1001 FRANKLIN AVE GARDEN CITY N Y  
 GAMBELL CO  
 1238 CHESTNUT ST NEWTON UPPER FALLS 64  
 MASS  
 GAP INSTRUMENT CORP  
 116 E HERRICK RD FREEPORT N Y  
 GAR PRECISION PARTS  
 190 HENRY ST STAMFORD CONN  
 GARDE MFG CO  
 588 EDDY ST PROVIDENCE 3 R I  
 GARDE MFG CO  
 53 JOHN ST CUMBERLAND R I  
 GARDINER ELECTRONIC CO  
 2545 E INDIAN SCHOOL RD PHOENIX ARIZ  
 GARDNER LAB INC  
 P O BOX 9728 BETHESDA 14 MD  
 GARDNER-DENVER CO  
 FRONT ST QUINCY ILL

GARDNER-DENVER CO KELLER TOOL DIV  
 GRAND HAVEN RICH  
 GARFIELD BIRE OIV THE OVERLAKES CORP  
 19 RECTOR ST NEW YORK 6 N Y  
 GARLOCK ELECTRONIC  
 602 N 10TH ST CAMDEN N J  
 GARLOCK PACKING CO  
 402 MAIN ST PALMYRA N Y  
 GARRARD SALES CORP  
 80 SHORE RD PORT WASHINGTON N Y  
 GARWOOD DEVELOPMENT LAB  
 P O BOX 412 LAS CRUCES N M  
 GART BELLS CO  
 361 ROCKAWAY AVE VALLEY STREAM N Y  
 GASKET MFG CO INC  
 319 W 17TH ST LOS ANGELES CALIF  
 GATES & CO GEO W  
 HEMPSTEAD TPKE & LUCILLE AVE FRANKLIN  
 SQUARE L I N Y  
 GATES ELECTRONIC CO  
 1705 TAYLOR AVE NEW YORK N Y  
 GATES RADIO CO  
 123 HAMPSHIRE ST QUINCY ILL  
 GAVITT WIRE & CABLE CO  
 455 N QUINCE ST ESCONOIDO CALIF  
 GAVITT WIRE & CABLE CO  
 CENTRAL ST BROOKFIELD MASS  
 GAYLOR PRODUCTS CO  
 11100 CUMPTON ST MO HOLLYWOOD CALIF  
 GB COMPONENTS INC  
 14621 ARMINTA ST VAN NUYS CALIF  
 G B ELECTRONICS CORP  
 MOON CREEK BLVD VALLEY STREAM N Y  
 G C ELECT CO  
 325 EXPOSITION PL LOS ANGELES CALIF  
 G C ELECTRONICS COMPANY CHEMICAL & TOOL DIV  
 400 SO BYRAN ST ROCKFORD ILL  
 G-C ELECTRONICS CO KNOB & RESISTOR DIV  
 400 S BYRAN ST ROCKFORD ILL  
 GEAR SPECIALTIES INC  
 2635 S HEDILL AVE CHICAGO 47 ILL  
 GEE-LAR MFG CO  
 418 S BYRAN ST ROCKFORD ILL  
 GEISLER LABS  
 P O BOX 252 BIRD PARK CALIF  
 GEN EAR PHONE CO INC  
 80 E JERICHO TPK HINEOLA N Y  
 GENERAL DIV BRITISH INDUSTRIES CORP  
 88 SHORE RD PORT WASHINGTON N Y  
 GEN AMERICAN TRANSPORTATION CORP  
 135 E LASALLE ST CHICAGO 90 ILL  
 GEN ANILINE & FILM CORP  
 29 CHARLES ST BINGHAMTON N Y  
 GENERAL APPLIED SCIENCE LAB  
 58 HEMPSTEAD Gdns DR HEMPSTEAD N Y  
 GENERAL APPATURE & MFG CO  
 LOCK HAVEN PA  
 GENERAL AUTO INC  
 PALO ALTO CALIF  
 GENERAL AUTOMATIC CORP  
 12 CARLTON AVE WAYNE N J  
 GENERAL AUTOMATIC CORP  
 111 39RD ST UNION CITY N J  
 GENERAL BRONZE CORP  
 711 STEWART AVE GARDEN CITY L I N Y  
 GENERAL BRONZE ELECTRONICS CORP  
 MOON CREEK BLVD VALLEY STREAM N Y  
 GENERAL CABLE CORP  
 730 3RD AVE NEW YORK 17 N Y  
 GENERAL CABLE CORP  
 1321 NO E ST SAN BERNARDINO CALIF  
 GENERAL CABLE CORP  
 236 W FIRST ST BAYONNE N J  
 GENERAL CEMENT MFG CO  
 400 SO BYRAN ST ROCKFORD ILL  
 GENERAL CERAMICS DIV INDIANA GENERAL CORP  
 CROWS HILL RD KEASBEY N J  
 GENERAL CHEMICAL DIV  
 40 RECTOR ST NEW YORK 6 N Y  
 GENERAL COIL PRODUCTS CORP  
 147-12 LIBERTY AVE JAMAICA 35 N Y  
 GEN COMMUNICATIONS  
 2930 WEST MORSE CHICAGO ILL  
 GENERAL COMMUNICATION CO  
 677 BEACON ST BOSTON 15 MASS  
 GENERAL COMMUNICATIONS INC  
 P O BOX 169 FORT ATKINSON WISC  
 GENERAL CONTROL CO  
 1200 SOLDIERS FIELD RD BOSTON 34 MASS  
 GENERAL CONTROLS CO  
 801 ALLEN AVE GLENDALE 1 CALIF  
 GENERAL CONTROLS CO  
 1 W ALAMEDA AVE BURBANK CALIF  
 GENERAL CONTROLS CO CANADA LTO  
 171 SURREY ST QUELPH ONT CANADA  
 GENERAL CONTROLS CO IRON MOUNTAIN DIV  
 IRON MOUNTAIN MICH  
 GENERAL CRYSTAL CO INC  
 P O BOX 9 BURLINGTON WISC  
 GENERAL DEVELOPMENT CORP  
 BOX 275 - NACKALL ST ELKTON MD  
 GENERAL DEVICES INC  
 P O BOX 253 PRINCETON N J  
 GENERAL DYNAMICS  
 3165 PACIFIC HWY SAN DIEGO CALIF  
 GENERAL DYNAMICS CORP  
 135 S LA SALLE ST CHICAGO ILL  
 GENERAL DYNAMICS ELECTRONICS  
 ELECTRONIC CONTROL SYSTEMS 2231 BARRINGTON  
 AVE LOS ANGELES 64 CALIF  
 GENERAL DYNAMICS ELECTRONICS  
 100 CARLSON RD ROCHESTER 3 N Y  
 GENERAL DYNAMICS ELECTRONICS  
 150 CHESTNUT AVE MANHATTAN BEACH CALIF  
 GENERAL DYNAMICS/ELECTRONICS  
 1400 N GOODMAN ST ROCHESTER N Y  
 GENERAL DYNAMICS/ELECTRONICS  
 1895 MANCOCK ST BOX 2440 SAN DIEGO CALIF

## ELECTRONIC MANUFACTURERS-A-Z

- GENERAL ELECT CO CATHODE RAY TUBE  
ELECTRONICS PARK LIVERPOOL N Y  
GENERAL ELECTRIC CAPACITOR DEPT  
IRMO 5 C  
GENERAL ELECTRIC CO  
2525 ELEVENTH ST HIGHFORD ILL  
GENERAL ELECTRIC CO  
1099 IVANHOE RD CLEVELAND 10 OHIO  
GENERAL ELECTRIC CO  
LOW VOLTAGE SWITCHGEAR DIV 520 PUSEY AVE  
COLI INGDALE PA  
GENERAL ELECTRIC CO  
SPECIALIST FLECT SYSTEMS 118 WEST 1ST ST  
DAYTON 2 OHIO  
GENERAL ELECTRIC CO  
40 FEDERAL ST LYNN MASS  
GENERAL ELECTRIC CO  
ELECTRONIC COMPONENTS DIV 1184 W OLYMPIC  
BLVD LOS ANGELES 63 CALIF  
GENERAL ELECTRIC CO  
DOVER WIRE PLANT 200 W BROADWAY DOVER OHIO  
GENERAL ELECTRIC CO  
23871 DEVCE AVE EUCLID 23 OHIO  
GENERAL ELECTRIC CO  
P O BOX 11508 ST PETERSBURG FLA  
GENERAL ELECTRIC CO  
P O BOX 7 EDWARDS CALIF  
GENERAL ELECTRIC CO  
3300 COLBY AVE LOS ANGELES 66 CALIF  
GENERAL ELECTRIC CO  
21800 TUNGSTEN RD CLEVELAND 17 OHIO  
GENERAL ELECTRIC CO  
SILICONE PRODUCTS DEPT A WATERFORD N Y  
GENERAL ELECTRIC CO  
CAROLINA WELDS PLANT GOLOSBORO NC  
GENERAL ELECTRIC CO  
100 WOODLAWN AVE PITTSFIELD MASS  
GENERAL ELECTRIC CO  
SHELBYVILLE IND  
GENERAL ELECTRIC CO  
PO BOX 808 WILMINGTON N C  
GENERAL ELECTRIC CO  
MEDIUM VOLTAGE SWITCHGEAR DIV 5134 PEACHTREE  
RD CHAMBLEE GA  
GENERAL ELECTRIC CO  
CIRCUIT PROTECTIVE DEVICES DIV 135 CENTER  
ST BRISTOL CONN  
GENERAL ELECTRIC CO  
BOX 4247 PATRICK AFB FLA  
GENERAL ELECTRIC CO  
P O BOX 846 PLEASANTON CALIF  
GENERAL ELECTRIC CO  
565 BROADWAY REDWOOD CITY CALIF  
GENERAL ELECTRIC CO  
PLANT #2 THAMES ST NEWPORT R I  
GENERAL ELECTRIC CO  
SYRACUSE N Y  
GENERAL ELECTRIC CO  
FRENCH RD UTICA N Y  
GENERAL ELECTRIC CO  
10 HANSON ST P O BOX 278 COXSACKIE N Y  
GENERAL ELECTRIC CO  
BOX 237 ROOSEVELT PARK ANNEX DETROIT 32  
MICH  
GENERAL ELECTRIC CO  
APPARATUS SALES DIV SCHENECTADY N Y 1  
RIVER ROAD SCHENECTADY 5 N Y  
GENERAL ELECTRIC CO  
SPECIAL DESIGN PROJECT DEPT M050 2900  
CAMPBELL AVE SCHENECTADY N Y  
GENERAL ELECTRIC CO  
P O BOX 294 SAN JOSE 3 CALIF  
GENERAL ELECTRIC CO  
DEFENSE SVS DEPT P O BOX 1537 VANDENBERG  
AFB CALIF  
GENERAL ELECTRIC CO  
P O BOX 237 LITTLETON COLO  
GENERAL ELECTRIC CO  
6901 ELWOOD AVE PHILA 42 PA  
GENERAL ELECTRIC CO  
COSHOCTON OHIO  
GENERAL ELECTRIC CO  
271 NORTH AVE NEW ROCHELLE N Y  
GENERAL ELECTRIC CO  
COMMUNICATION PRODUCTS DEPT LYNCHBURG VA  
GENERAL ELECTRIC CO  
95 HATHAWAY ST PROVIDENCE 7 R I  
GENERAL ELECTRIC CO  
3190 CHESTNUT ST PHILA 4 PENNA  
GENERAL ELECTRIC CO  
OUTDOOR LIGHT DEPT HENDERSONVILLE N C  
GENERAL ELECTRIC CO  
1034 66TH AVE OAKLAND 21 CALIF  
GENERAL ELECTRIC CO  
1285 BOSTON AVE BRIDGEPORT 2 CONN  
GENERAL ELECTRIC CO  
TECHNICAL PRODUCTS DEPT ELECTRONIC PARK  
SYRACUSE N Y  
GENERAL ELECTRIC CO AIRCRAFT NUCLEAR PROP  
DIV P O BOX 132 CINCINNATI OHIO  
GENERAL ELECTRIC CO ANNISTON TUBE PLANT  
PO BOX 1400 ANNISTON ALA  
GENERAL ELECTRIC CO AUDIO PRODUCTS SECTION  
2200 N 22 ST DECATUR ILL  
GENERAL ELECTRIC CO CAPACITOR DIV  
BROADWAY FORT EDWARD N Y  
GENERAL ELECTRIC CO CAPACITOR DIV  
P O BOX 198 IRMO 5 C  
GENERAL ELECTRIC CO CAPACITOR DEPT  
JOHN ST HUDSON FALLS N Y  
GENERAL ELECTRIC CO CATHODE RAY TUBE DIV  
548 CALHOUN ST AUGUSTA GA  
GENERAL ELECTRIC CO CATHODE RAY TUBE DIV  
P O BOX 1151 JOLIET ILL  
GENERAL ELECTRIC CO CATHODE RAY TUBE DEPT  
ELECTRONICS PARK SYRACUSE N Y  
GENERAL ELECTRIC CO CIRCUIT PROTECTIVE  
41 WOODFORD AVE PLAINVILLE CONN
- GEN ELECT CO  
CARROLL AVE PLANT BATES BLOS LYNCHBURG VA  
GEN ELECT CO RADIATION TESTING  
P O BOX 125 OAK RIDGE TENN  
GENERAL ELECTRIC CO COMM PROD DIV  
ELECTRONICS PARK SYRACUSE N Y  
GENERAL ELECTRIC CO COMM PROD DIV  
128 E CENTER ST CANASTOTA N Y  
GENERAL ELECTRIC CO COMPUTER DIV  
13430 N BLACK CANYON HWY PHOENIX ARIZ  
GENERAL ELECTRIC CO CONDUIT PROD DIV  
700 CONSTITUTION BLVD NEW KENSINGTON PA  
GENERAL ELECTRIC CO DIST ASSEMBLIES DEPT  
41 WOODFORD AVE PLAINVILLE CONN  
GENERAL ELECTRIC CO ELEC COMPONENTS DIV  
3 RIVER RD SCHENECTADY 5 N Y  
GENERAL ELECTRIC CO FOUNDRY DEPT  
1000 LAWRENCE PKY ERIE PA  
GENERAL ELECTRIC CO INDUSTRY CONTROL DEPT  
1501 ROANOKE BLVD SALEM VA  
GENERAL ELECTRIC CO INST DEV OPER  
1713 D BLDG 100 D AREA RICHLAND WASH  
GENERAL ELECTRIC CO INSULATOR DEPT  
5 CHARLES B CROWELL ST BALTIMORE 30 MD  
GENERAL ELECTRIC CO INSULATING MATERIALS  
23 RIVER RD SCHENECTADY N Y  
GENERAL ELECTRIC CO INSULATING MATERIALS  
1 PLASTIC COSHOCTON OHIO  
GENERAL ELECTRIC CO JET ENGINE DEPT  
BLDG 501 CINCINNATI 15 OHIO  
GENERAL ELECTRIC CO LTD OF ENGLAND  
80 SHORE RD PORT WASHINGTON N Y  
GENERAL ELECTRIC CO LTD OF ENGLAND  
11 UNIVERSITY RD CAMBRIDGE 38 MASS  
GENERAL ELECTRIC CO MAGNETIC MATERIALS SEC  
EDMORE MICHIGAN  
GENERAL ELECTRIC CO MEDIUM TRANSFORMER DIV  
REDWOOD CIRCLE ROWE GA  
GENERAL ELECTRIC CO METALLURGICAL PRODUCTS  
DEPT 1177 E EIGHT MILE RD DETROIT 32 MICH  
GENERAL ELECTRIC CO MICROWAVE  
3200 MAPLE AVE DALLAS TEXAS  
GENERAL ELECTRIC CO MINIATURE LAMP DEPT  
NELA PARK CLEVELAND 12 OHIO  
GENERAL ELECTRIC CO MISSILE PRODUCTION SEC  
LAKESIDE AVE BURLINGTON VT  
GENERAL ELECTRIC CO MISSILE & ORDNANCE DEPT  
100 PLASTICS AVE PITTSFIELD MASS  
GENERAL ELECTRIC CO ORDNANCE DEPT  
100 PLASTICS AVE PITTSFIELD MASS  
GENERAL ELECTRIC CO POWER TUBE DEPT  
PALO ALTO CALIF  
GENERAL ELECTRIC CO POWER TUBE DEPT  
SCRANTON PENNA  
GENERAL ELECTRIC CO POWER TRANSFORMER DIV  
100 WOODLAWN AVE PITTSFIELD MASS  
GENERAL ELECTRIC CO POWER TUBE DEPT  
BLDG 267 SCHENECTADY 5 N Y  
GENERAL ELECTRIC CO RECEIVING TUBE DEPT  
316 E 8TH ST GRENDSBORO KY  
GENERAL ELECTRIC CO RECEIVING TUBE DEPT  
11840 WEST OLYMPIC BLVD LOS ANGELES 63  
CALIF  
GENERAL ELECTRIC CO RECEIVING TUBE DEPT  
137H & PAYNE STS TELL CITY IND  
GENERAL ELECTRIC CO RECTIFIER COMPONENTS  
DEPT ELECTRONICS PARK SYRACUSE N Y  
GENERAL ELECTRIC CO SEMI CONDUCTOR PRODUCTS  
DIV AUBURN N Y  
GENERAL ELECTRIC CO SEMICONDUCTOR PROD DIV  
ELECTRONICS PARK SYRACUSE N Y  
GENERAL ELECTRIC CO SEMICONDUCTOR DIV  
1495 FILLMORE BLVD 60 N Y  
GENERAL ELECTRIC CO SEMICONDUCTOR PROD  
CLYDE N Y  
GENERAL ELECTRIC CO SEMICONDUCTOR DEPT  
SYRACUSE NY  
GENERAL ELECTRIC CO SEMICONDUCTOR PROD  
P O BOX 4217 LYNCHBURG VA  
GENERAL ELECTRIC CO SPECIALTY TRANSFORMER  
DIV 1701 COLLEGE ST FORT WAYNE IND  
GENERAL ELECTRIC CO SPECIALTY TRANSFORMER  
1701 COLLEGE ST FORT WAYNE IND  
GENERAL ELECTRIC CO SPECIALTY CONTROL DEPT  
P O BOX 812 WAYNESBORO VA  
GENERAL ELECTRIC CO SPECIALTY MOTOR DEPT  
1635 BROADWAY FORT WAYNE 2 IND  
GENERAL ELECTRIC CO TELEVISION RECEIVER DEPT  
ELECTRONICS PARK SYRACUSE N Y  
GENERAL ELECTRIC CO WIRING DEVICE DIV  
COMMERCIAL WARE PLANT 3 NEWPORT R I  
GENERAL ELECTRIC CO W-REAY DEPT  
4855 ELECTRIC AVE MILWAUKEE 1 WISC  
GENERAL ELECTRIC CO/WHMD  
SYRACUSE N Y  
GENERAL ELECTRIC CO/WLMD  
333 W 1ST ST DAYTON OHIO  
GENERAL ELECTRIC CO/WLMD  
600 MAIN ST JOHNSON CITY N Y  
GENERAL ELECTRIC LAMINATED PRODUCTS DEPT  
COSHOCTON OHIO  
GENERAL ELECTRIC TECH PROD OPER  
ELECTRONIC PARK SYRACUSE N Y  
GENERAL ELECTRODYNAMICS CORP  
4430 FOREST LANE P O BOX 517 GARLAND TEXAS  
GENERAL ELECTRIC LAB INC SILVER SPRING MD  
8521 2ND AVE SILVER SPRING MD  
GENERAL ELECTRONICS CONTROL  
8001 BLOOMINGTON FREEWAY MINNEAPOLIS MINN  
GENERAL ELECTRONICS LABS  
8521 2ND AVE SILVER SPRING MD  
GENERAL FINDINGS & SUPPLY CO INDUSTRIAL DIV  
LEACH & GARNER BLDG ATTLEBORO MASS  
GENERAL FINDINGS & SUPPLY CO  
608 5TH AVE NEW YORK N Y  
GENERAL FORMULATIONS INC  
320 S UNION SPARTA MICH
- GENERAL GEOPHYSICAL CO  
2802 POST OAK RD HOUSTON 3 TEXAS  
GENERAL HERMETIC SEALING CORP  
99 E HARTHORNE AVE VALLEY STREAM L I N Y  
GENERAL INDUSTRIES CO  
OLIVE & TAYLOR STS ELYRIA OHIO  
GENERAL INSTRUMENT CORP F W SICKLES DIV  
165 FRONT ST CHICOPEE MASS  
GENERAL INSTRUMENT CORP  
65 GOVERNOR ST NEWARK N J  
GENERAL INSTRUMENT CORP SEMICONDUCTOR DIV  
65 GOVERNOR ST NEWARK N J  
GENERAL INSTRUMENT CORP-F W SICKLES DIVN  
1301 HERKIMER ST JOLIET ILL  
GENERAL INSTRUMENT SEMICONDUCTOR  
8YTHE AVE BROOKLYN N Y  
GENERAL INSULATED WIRE WORKS  
69 GORDON AVE PROVIDENCE 5 R I  
GENERAL KINETICS INC  
555 23 ST 3 ARLINGTON 2 VA  
GENERAL LAB ASSOC INC  
17 E RAILROAD ST NORWICH N Y  
GENERAL LAB ASSOC INC  
LEE AVE NORWOOD N J  
GENERAL MACHINE & INSTRUMENT CO  
CLINTON RD CALDWELL N J  
GENERAL MAGNETIC CORP  
10001 ERIEN AVE DETROIT 34 MICH  
GENERAL MAGNETICS INC  
135 BLOOMFIELD AVE BLOOMFIELD N J  
GENERAL METAL PRODUCTS CO  
1010 CENTRE ST EASTON PA  
GENERAL MILLS INC  
182-27 117 ST  
GENERAL MILLS INC  
FAR HILLS BOX 633 DAYTON 19 OHIO  
GENERAL MILLS INC  
1620 CENTRAL AVE MINNEAPOLIS 13 MINN  
GENERAL MILLS INC CHEMICAL DIV  
5 KENNINGTON RD RANKAKEE ILL  
GENERAL MILLS INC-CHEMICAL DIV  
2003 E HENNEPIN MINNEAPOLIS MINN  
GENERAL MILLS INC-NUCLEAR EQUIP DEPT  
419 N 5TH ST MINNEAPOLIS 1 MINN  
GENERAL MOTORS AC SPARK PLUG DIV  
7929 S HOBELL AVE S MILWAUKEE WISC  
GENERAL MOTORS CORP  
2400 COLUMBUS AVE ANDERSON IND  
GENERAL MOTORS CORP-A C SPARK PLUG DIV  
210-12 AIRPORT RD WEST LAFAYETTE IND  
GENERAL MOTORS CORP-A C SPARK PLUG DIV  
1300 N DORT HWY FLINT 2 MICH  
GENERAL MOTORS CORP-A C ELECTRONICS  
950 N WOODWARD BLVD SEGUIN CALIF  
GENERAL MOTORS CORP-A C SPARK PLUG DIVN  
BOX 106 PORT CANAVERAL FLA  
GENERAL MOTORS CORP-A C SPARK PLUG DIV  
2020 SHARON RD WINTER PARK FLA  
GENERAL MOTORS CORP-A C SPARK PLUG DIVN  
4055 SOUTH 7TH ST ARLINE TEXAS  
GENERAL MOTORS CORP-A C SPARK PLUG DIV  
5TH & VIRGINIA MILWAUKEE WISC  
GENERAL MOTORS CORP-A C SPARK PLUG DIV  
9225 E KENILWORTH PL MILWAUKEE 2 WISC  
GENERAL MOTORS CORP-AC SPARK PLUG DIV  
P O BOX 51 EDWARDS CALIF  
GENERAL MOTORS CORP-AC SPARK PLUG DIV  
124 E HARDING AVE COCOA BEACH FLA  
GENERAL MOTORS CORP-AERO PRODUCTS DIV  
MUNICIPAL AIRPORT DAYTON 1 OHIO  
GENERAL MOTORS CORP-ALLISON DIV  
P O BOX 894 INDIANAPOLIS 6 IND  
GENERAL MOTORS CORP-ALLISON DIV  
MAYWOOD IND  
GENERAL MOTORS CORP-DELCO RADIO DIV  
1160 RAYMOND BLVD NEWARK 2 N J  
GENERAL MOTORS CORP-DELCO RADIO DIVN  
5750 WEST 51 ST CHICAGO 38 ILL  
GENERAL NUCLEAR CO  
4957 HOLLYWOOD BLVD HOLLYWOOD 27 CALIF  
GENERAL NUCLEAR CORP  
550 5TH AVE NEW YORK 32 N Y  
GENERAL PHOTO PROD CO  
63 LAFAYETTE AVE CHATHAM N J  
GENERAL PHOTO PRODUCTS CO  
15 SUMMIT AVE CHATHAM N J  
GENERAL PLASTICS CORP  
165 3 AVE PATERSON 4 N J  
GENERAL PRECISION LAB  
ANNADALE ST ARMOCK N Y  
GENERAL PRECISION LAB  
367 LEXINGTON AVE MOUNT KISCO N Y  
GENERAL PRECISION LAB  
63 BEDFORD RD PLEASANTVILLE N Y  
GENERAL PRECISION LAB INC  
180 N VINDO AVE PASADENA 8 CALIF  
GENERAL PRECISIONS INC  
670 ARGUES AVE VAN NUYS CALIF  
GENERAL PRODUCTS CORP  
SALEM ST UNION SPRINGS N Y  
GENERAL RADIO CO  
WEST CONCORD MASS  
GENERAL RADIO CO  
BROAD AVE AT LINDEN RIDGEFIELD N J  
GENERAL RADIO CO  
1182 LOS ALTOS AVE LOS ALTOS CALIF  
GENERAL RADIO CO-LOW-FREQ DEVICES  
275 MASSACHUSETTS AVE CAMBRIDGE 38 MASS  
GENERAL RAILWAY SIGNAL CO  
P O BOX 600 ROCHESTER N Y  
GENERAL RESEARCH & SUPPLY CO  
372 DIVISION ST GRAND RAPIDS 3 MICH  
GENERAL RESEARCH CO  
120 LA GRANGE ST MORENCI MICH  
GENERAL RESISTANCE INC  
430 SOUTHERN BLVD NEW YORK 55 N Y  
GENERAL RF FITTINGS INC  
702 BEAFON ST BOSTON 15 MASS

# ELECTRONIC MANUFACTURERS-A-Z

GENERAL SCIENTIFIC EQUIPMENT CO  
7516 LINCOLN PIKE PHILA 30 PA  
GENERAL SONICS INC  
1 ST FRANCIS ST NEWARK N J  
GENERAL STRONIS INC  
827 E 92ND ST BROOKLYN 36 N Y  
GENERAL TEL LABS INC  
BOX 17 NORTHLAKE ILL  
GENERAL TELEPHONE & ELECTRONICS LAB  
208-20 WILLETTS POINT BLVD BAYSIDE N Y  
GENERAL TELEPHONE CO OF CALIF  
P O BOX 800 SANTA MONICA CALIF  
GENERAL TESTING LABS  
227 W CHESTNUT AVE MONROVIA CALIF  
GENERAL TESTING LABS  
60 WASHINGTON AVE CARLSTADT N J  
GENERAL TIME CORP  
355 LEXINGTON AVE NEW YORK N Y  
GENERAL TIRE & RUBBER CO  
1708 ENGLEWOOD AVE AKRON 9 OHIO  
GENERAL TRANSFORMER CO  
18240 HARWOOD AVE HOMERWOOD ILL  
GENERAL TRANSFORMER CO  
BOX 231 FOWLER INDIANA  
GENERAL TRANSISTOR CORP  
91-27 138TH PLACE JAMAICA 35 N Y  
GENERAL TRANSISTOR CORP  
96 HILL ST BOONSOCKET R I  
GENERAL TRANSISTOR WESTERN CORP  
6110 VENICE BLVD LOS ANGELES CALIF  
GENERAL ULTRASONICS CO  
67 MULBERRY ST HARTFORD 3 CONN  
GENERAL VACUUM CORP  
400 BORDER ST BOSTON 28 MASS  
GENERAL-AMERICAN VALVE CO  
P O BOX 444 CORONA DEL MAR CALIF  
GENERAL-ELECTRO MECHANICAL CORP  
785 MERTEL AVE BUFFALO 7 N Y  
GENESYS CORP  
10131 NATIONAL BLVD LOS ANGELES 34 CALIF  
GENISCO INC  
2233 FEDERAL AVE LOS ANGELES 84 CALIF  
GENISTRON INC  
6320 W ARIZONA CIRCLE LOS ANGELES 49 CALIF  
GENTAPE CORP  
165 THIRD AVE PATERSON N J  
GEO-SCIENCE INC  
P O BOX 4 ALAMOGORDO N MEX  
GEOPHYSICAL RESEARCH CORP  
136 MOHAWK BLVD TULSA 6 OKLA  
GEOPHYSICAL SPECIALTIES CO  
4206 LONGFELLOW AVE MINNEAPOLIS 7 MINN  
GEOPHYSICS CORP OF AMERICA  
700 COMMONWEALTH AVE BOSTON MASS  
GEORATOR CORP  
315 TUDOR ROAD MANASSAS VA  
GEORGE CO P O  
5200 N 2ND ST ST LOUIS 7 MO  
GEOTECHNICAL CORP  
3401 SHILON ROAD GARLAND TEXAS  
GETTRONIC LABS INC  
1314 CEDAR HILLS AVE DALLAS 5 TEXAS  
GERBER SCIENTIFIC INSTRUMENT  
89 SPRUCE ST HARTFORD CONN  
GERLYN ENGG CO  
2151 N DAMEN AVE CHICAGO 47 ILL  
GERRARD & CO A J  
1950 HARTHORN AVE NERLOSE PARK ILL  
GERST & CO PAUL E  
4866 N CLARK ST CHICAGO 40 ILL  
GERTSCH PRODUCTS INC  
3211 LA CIENGA BLVD LOS ANGELES 16 CALIF  
GETCOA INC  
15593 BROOKPARK RD CLEVELAND 35 OHIO  
GETTERS ELECTRONICS INC  
1920 BUFFALO AVE NIAGARA FALLS N Y  
GIANNINI & CO G M  
918 E GREEN ST PASADENA CALIF  
GIANNINI & CO G M-CONTROLS DIV  
SHERWOOD LANE CALDBELL N J  
  
GIANNINI & CO INC B M-AIRBORNE SYS DIV  
1902 W CHESTNUT SANTA ANA CALIF  
GIANNINI PASMADYNE CORP  
3639 S MAIN ST SANTA ANA CALIF  
GIBBS MFG & RESEARCH CORP  
450 N MAIN ST JAMESVILLE WISC  
GIBSON & ASSOC  
108 GREENWOOD LA BALTHAM 54 MASS  
GIBSON ELECTRIC CO  
OLD BR PENN HWY DELMONT PA  
GILBERT & BAKER MFG CO  
WEST SPRINGFIELD MASS  
GILBERT PLASTICS INC  
BORIGHT AVE KENILWORTH N J  
GILCO ELECTRONICS  
2912 N BUENA VISTA ST BURBANK CALIF  
GILFILLAN BROS  
1410 RIVIERA DRIVE PASADENA CALIF  
GILFILLAN BROS INC  
1815 VENICE BLVD LOS ANGELES 6 CALIF  
GILFILLAN BROS INC-RADAR SPEC  
FONTANA A/P FONTANA CALIF  
GILFORD INSTRUMENT LABS INC  
OBERLIN OHIO  
GILL ELECTRIC MFG CORP  
BOX 431 REDLANDS CALIF  
GILLIES CO INC DUNCAN M  
66 CENTRAL ST WEST BOYLSTON MASS  
GILLILAND INSTR CO INC  
P O BOX 7049 FRUITVALE STA OAKLAND 1 CAL  
GILMAN INC RUSSELL T  
622 BEECH ST GRAFTON WISC  
GILMORE INDUSTRIES INC  
13015 WOODLAND AVE CLEVELAND 20 OHIO  
GIRARD-HOPKINS  
1600 46 AVE OAKLAND 1 CALIF

GIRDOR CO - THERMEX DIV  
P O BOX 43 LOUISVILLE KY  
GIRDLER PROCESS EQUIP DIV  
334 E BROADWAY LOUISVILLE 1 KY  
GISHOLT MACHINE CO  
1245 E BASHINGTON MADISON 10 WISC  
GLASER STEERS CORP  
155 ORATON ST NEWARK 4 N J  
GLASPLY CORP  
70 LYONS PL MOUNT VERNON N Y  
GLASS PRODUCTS CO  
30 S SALSITUDES ST P O BOX 926 SANTA  
BARBARA CALIF  
GLASS-SOLDER ENGG  
4232 TEMPLE CITY BLVD ROSEMEADE CALIF  
GLASS-TYPE INDUSTRIES INC  
725 BRANCH AVE PROVIDENCE 4 R I  
GLASSCRAFT CO  
1628 E 7TH ST LOS ANGELES 21 CALIF  
GLASSEAL PRODUCTS CO INC  
725 COMMERCE RD LINDEN N J  
GLASTIC CORP  
4321 GLENRIDGE RD CLEVELAND 21 OHIO  
GLEASON AVERY INC  
AUBURN N Y  
G-L ELECTRONICS CO  
2921 ADMIRAL WILSON BLVD CAMDEN 5 N J  
GLENAIR INC  
1211 AIRWAY GLENDALE 1 CALIF  
GLO-BRITE PRODUCTS INC  
6415 N CALIF AVE CHICAGO 45 ILL  
GLOBE ELECTRICAL MFG CO  
1729 W 134 ST GARDENA CALIF  
GLOBE ELECTRONICS  
2716 COOLIDGE AVE LOS ANGELES 64 CALIF  
GLOBE ELECTRONICS  
3415 W BROADWAY COUNCIL BLUFFS IOWA  
GLOBE ELECTRONICS INC  
22-30 S 34TH ST COUNCIL BLUFFS IOWA  
GLOBE INDOUST INC  
525 MAIN ST BELLEVILLE N J  
GLOBE INDUSTRIES INC  
1784 STANLEY AVE DAYTON 8 OHIO  
GLOBE INDUSTRIES INC-INTEGRATED DYNAMICS DIV  
2432 SAN MATEO BLVD E ALBUQUERQUE N M  
GLOBE TOOL & ENGG CO  
5028 KITTRIDGE RD DAYTON 24 OHIO  
GLOBUS INC  
600 MADISON AVE NEW YORK 21 N Y  
GLYCO CHEMICALS DIV C L MUIKING B CO INC  
417 5TH AVE NEW YORK 16 N Y  
G-M LABORATORIES INC  
4300 N KNOX AVE CHICAGO 41 ILL  
G M MANUFACTURING CO  
134 W 28TH ST NEW YORK 1 N Y  
GOFFREY MFG CO  
1633 N HALSTED ST CHICAGO 14 ILL  
GOE ENGG CO  
P O BOX 22004 LOS ANGELES 22 CALIF  
GOLDAN CO  
1544 W GLENDALE BLVD GLENDALE 1 CALIF  
GOLDEN CO  
1054 38 ST BROOKLYN 19 N Y  
GOLDING MFG CO  
52 ELM ST NEWARK N J  
GOLDSMITH BROS DIV NATIONAL LEAD CO  
900 W 18TH ST CHICAGO 8 ILL  
GOMBOS INC CO JOHN  
WEBER ROAD CLIFTON N J  
GOOD ELECTRONICS CORP  
P O BOX 2406 B PALM BEACH FLA  
GOOD-ALL ELECTRIC MFG CO  
112 W FIRST ST OGALLALA NEBR  
GOODALL ELEC MFG CO  
26 RITTENHOUSE PL ARDMORE PA  
GOODHART R E CO  
P O BOX 1220-E BEVERLY HILLS CALIF  
GOODLINE CORP  
309 DATE ALHAMBRA CALIF  
GOODMAN MFG CO  
HALSTED ST & 48TH PL CHICAGO 9 ILL  
GOODRICH AVIATION PRODUCTS  
DIV B F GOODRICH CO 500 S MAIN ST AKRON 18  
OHIO  
GOODRICH INDUSTRIAL PRODUCTS CO B F  
500 S MAIN ST AKRON 18 OHIO  
GOODRICH SPONGE PRODUCTS B F DIV B F  
GOODRICH CO CANAL ST S MELTON CONN  
GOODRICH-HIGH VOLTAGE ASTRONAUTICS INC  
BURLINGTON MASS  
GOODWIN LABS B F  
831 SUMMIT AVE HACKENSACK N J  
GOODYEAR AIRCRAFT CO  
BOX 77 - RT 1 TOLLESON ARIZ  
GOODYEAR AIRCRAFT CORP  
3033 PRIOR DR CUYAHOGA FALLS OHIO  
GOODYEAR AIRCRAFT CORP  
D/453 - LITCHFIELD PARK ARIZ  
GOODYEAR AIRCRAFT CORP  
BLDS 96 - WINGFOOT LAKE SUFFIELD OHIO  
GOODYEAR AIRCRAFT CORP  
BOX 4-1913-DEPT 873 ORLANDO FLA  
GOODYEAR AIRCRAFT CORP  
1210 MASSILLON RD AKRON 15 OHIO  
GOODYEAR AIRCRAFT CORP  
228 E ERIE ST KENT OHIO  
GOODYEAR ATOMIC CORP  
P O BOX 628 PORTSMOUTH OHIO  
GORBAN SUPPLY CO  
1139 S WABASH AVE CHICAGO 5 ILL  
GORDON CO CLAUDE S  
3000 S WALLACE ST CHICAGO 16 ILL  
GORDON CORP  
230 GLENWOOD AVE BLOOMFIELD N J  
GORDON ENTERPRISES  
5362 N CALUENGA BLVD N HOLLYWOOD CALIF  
GORDOS CORP  
2500 GLENWOOD AVE BLOOMFIELD N J

GORNE & ASSOCIATES INC W L  
487 PAPER HILL RD NEWARK DEL  
GORMAN ELECTRONICS DIV GORMAN MFG CO  
333 ADELAIDE AVE PROVIDENCE 7 R I  
GORMAN MANUFACTURING CO-ELECTR DIV-EMERG RES  
LAB BARWICK INDUSTRIAL PARK BARWICK R I  
GORMAN MACHINE CORP  
480 S MAIN ST RANDOLPH MASS  
GORN ELECTRIC CO BORN ELECTRONIC DIV  
845 MAIN ST WATFORD CONN  
GORRELL & GORRELL  
336 OLD HOOK RD WESTWOOD N J  
GORRELL & GORRELL  
HAWORTH N J  
GOSLIN ELECTRIC & MFG CO  
2922 W OLIVE AVE BURBANK CALIF  
GOTHAM AUDIO DEVELOPMENT CORP  
2 W 46 ST NEW YORK 36 N Y  
GOTT RADIO MFG CO  
6128 11TH AVE LOS ANGELES 43 CALIF  
GOULD NATIONAL BATTERIES  
172 PLEASANT ST EASTHAMPTON MASS  
GOULD NATIONAL BATTERIES  
931 N VANDALIA ST ST PAUL MINN  
GOULING MFG CO  
52 ELM ST NEWARK 5 N J  
GOB-NAC INSTRUMENT CO  
100 KINGS RD MADISON 1 I  
G P E CONTROLS INC  
240 E ONTARIO ST CHICAGO 11 ILL  
GPL DIV GENERAL PRECISION INC  
63 BEDFORD RD PLEASANTVILLE N Y  
GPS INSTRUMENT CO  
100 NEEDHAM ST NEWTON 64 MASS  
GRACE ELECTRONIC CHEMICALS INC  
101 N CHARLES ST BALTIMORE 1 MD  
GRACO COLLOIDS CORP  
310 HILBES PL SHARON PA  
GRAMER RESEARCH INC  
606 22ND AVE N E MINNEAPOLIS 18 MINN  
GRAINGER W W INC  
110 S OAKLEY BLVD CHICAGO ILL  
GRAMER HALLDORSON TRANSFORMER CORP  
700 W 7TH ST MT CARMEL ILLINOIS  
GRAMER-HALLDORSON TRANSFORMER CORP  
2734 N PULASKI RD CHICAGO 30 ILL  
GRANCO PRODUCTS INC  
83-30 KEA GARDENS RD KEW GARDENS N Y  
GRANCO PRODUCTS INC  
36-07 20TH AVE LONG ISLAND CITY 5 N Y  
GRAND COIL BINDERS  
154 W 2 ST BOSTON MASS  
GRAND SLIDING MECHANISMS INC  
2401 N OHIO ST CHICAGO 12 ILL  
GRAND TRANSFORMERS INC  
BEECHTREE & PAMON STS GRAND HAVEN MICH  
GRAND TRANSFORMERS INC  
PAB PAB AVE BENTON HARBOR MICH  
GRANELY FURNITURE CO  
MARTINSVILLE VA  
GRANGER ASSOCIATES  
964 COMMERCIAL ST PALO ALTO CALIF  
GRANITE STATE MACHINE CO INC  
124 JOLIETTE ST MANCHESTER N H  
GRANT GEAR WORKS  
154 W 2 ST BOSTON MASS  
GRANT PULLEY & HARDWARE CORP INDUSTRIAL DIV  
HIGH ST B NYACK N Y  
GRAPHIC RECORDERS INC  
14 EDGEWOOD AVE TRUMBULL CONN  
GRAPHIC SYSTEMS  
YANCVILLE N C  
GRAPHIK CIRCUITS DIV CIN CH MFG CO  
200 S TURN BULL CANYON RD CITY OF  
INDUSTRY CALIF  
GRAPHITE METALLIZING CORP  
1002 NEPPERMAN AVE YONKERS N Y  
GRASON-STADLER CO INC  
WEST CONCORD MASS  
GRASS INSTRUMENT CO  
101 OLD COLONY AVE QUINCY 70 MASS  
GRAY & KUMH  
20 RAILROAD AVE ROSLYN HEIGHTS N Y  
GRAY & KUMH INC DIV INC MAGNETICS CORP  
80 SWALM ST WESTBURY L I N Y  
GRAY INSTRUMENT CO  
448 MILL RD ANDALUSIA PA  
GRAY MFG CO  
16 ARBOR ST HARTFORD 1 CONN  
GRAY PANTOGRAPH ENGRAVING  
200 WASHINGTON ST HOBBOKEN N J  
GRAY PANTOGRAPH ENGRAVING CO  
P O BOX 72 STATE 39 POTEAU OKLA  
GRAY RADIO CO  
501 FOREST HILL BLVD B PALM BEACH FLA  
GRAYHILL INC  
561 HILLGROVE AVE LA GRANGE ILL  
GREAT EAST METAL PRODUCTS  
22 WOODBORTH AVE YONKERS N Y  
GREAT EASTERN MFG CO  
163-165 RENSEN AVE BROOKLYN 12 N Y  
GREAT LAKES ELECTRIC MFG CO  
17 S DESPLAINES ST CHICAGO 6 ILL  
GREAT NORTHERN PAPER CO  
P O BOX 51 SHERIDAN MAINE  
GREEN INSTRUMENT CO  
385 PUTNAM AVE CAMBRIDGE 39 MASS  
GREEN INSTRUMENTS INC N J  
2500 SHAWNS DR WESTBURY N Y  
GREEN RECTIFIER CO  
1-10 30 ST FAIRLAWN N J  
GREENE CO L CHARLTON  
314 WASHINGTON ST NEWTON 58 MASS  
GREENE CO L CHARLTON  
HILLSTREAM CHELMSFORD MASS  
GREENE CORP G G  
WARREN PA

# ELECTRONIC MANUFACTURERS-A-Z

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GREENE TWEED & CO  
NORTH WALES PA  
GREENLEAF MFG  
7814 MAPLEWOOD INDUSTRIAL CT ST LOUIS 17 MO  
GREENLEE TOOL CO  
2136 12 ST ROCKFORD ILL  
GREENRAY INDUSTRIES  
# ROUTE MECHANICSBURG PA  
GREER HYDRAULICS INC  
4474 E OLYMPIC BLVD LOS ANGELES 23 CALIF  
GREG  
BOX 11 EAST SIDE STA BINGHAMTON N Y  
GREIBACH INSTRUMENTS CORP  
315 NORTH AVE NEW ROCHELLE N Y  
GREIN ENG CO  
923 LOWMEYER RD KING OF PRUSSIA PA  
GREHAR MFG CO  
7 NORTH AVE WAKEFIELD MASS  
GREMCO  
3535 N SYLVANIA BOX 7115 FT WORTH TEXAS  
G R H MALLETT CO  
157 S MORRIS BLVD VALPARAISO IND  
GRIEBS REPRODUCER CORP  
5 2ND ST NEW ROCHELLE N Y  
GRIEVE-HENDRY CO  
1350 N ELSTON AVE CHICAGO 22 ILL  
GRIGSBY COMPANY INC  
407 N SALEM AVE ARLINGTON HEIGHTS ILL  
GRINSON COLOR INC  
381 FOURTH AVE NEW YORK 16 N Y  
GRINWELL CORP  
280 WEST EXCHANGE ST PROVIDENCE 1 R I  
GRINWELL-HARRIS ELECTRONICS  
4130 TEMPLE CITY BLVD ROSEMEAD CALIF  
GRIP NUT CO  
SOUTH WHITLEY IND  
GRISWOLD MACHINE WORKS  
412 MAIN ST PORT JEFFERSON N Y  
GROOV-PIN CORP  
1125 HENDRICKS CAUSEWAY RIDGEFIELD N J  
GRUVE ELECT SUPPLY CO  
4103 W BELMONT AVE CHICAGO 41 ILL  
GROVE ENTERPRISES  
1375-83 EASTON RD ROSLYN PENNA  
GROEN APPLIED SCIENCE LABS  
59 HEMPSTEAD GDN DR HEMPSTEAD N Y  
GROEN INDUSTRIES INC/ELECTRONIC PRODUCTS DIV  
9701 READING RD CINCINNATI 19 OHIO  
GROEN LAB INC  
59 HEMPSTEAD GARDEN DR HEMPSTEAD N Y  
GRUMMAN AIRCRAFT ENGRG CORP-AVIONIC S DEPT  
763 CALVERTON L I N Y  
GRUMMAN AIRCRAFT ENGRG CORP  
PLANT 3 BETHPAGE L I N Y  
GUARDIAN ELECTRIC MFG CO  
1821 W WALNUT ST CHICAGO 12 ILL  
GUEBROD BROS SILK CO  
225 W 34 ST NEW YORK 1 N Y  
GUDENAM CO  
340 HURON ST CHICAGO 10 ILL  
GUDENAM CO DP CALIF  
190 COMMERCIAL ST SUNNYVALE CALIF  
GUDENAM CO OF CALIF/MONROVIA DIV  
7875 AVENUE 304 VISALIA CALIFORNIA  
GUENTHER BILLY W G  
39 HUMBOLDT ST NUERNBERG GERMANY  
GUIDANCE CONTROLS  
110 DUFFY AVE HICKSVILLE N Y  
GUIDANCE ENGINEERS INC  
114 S CATALINA AVE REDONDO BEACH CALIF  
GUIDE LAMP DIV  
2915 PENDLETON AVE ANDERSON IND  
GUILD ELECTRONICS INC  
368 BROADWAY NEW YORK 13 N Y  
GUILD RADIO & TV CO  
460 N EUCALYPTUS AVE INGLEWOOD CALIF  
GULF RESEARCH & DEV CO  
P O BOX 2038 PITTSBURGH 30 PA  
GULOT TRANSFORMER INC  
RTE 17 & BROAD ST CARLSTADT N J  
GULTON IND INC NUCLEAR INSTR DIV  
15000 E CENTRAL AVE ALBUQUERQUE NM  
GULTON INDUST INC-ENGINEERED MAGNETICS DIV  
15041 CERISE AVE HAWTHORNE CALIF  
GULTON INDUSTRIES INC  
21560 EASTERN PKWY SCHEMECTADY 9 N Y  
GULTON INDUSTRIES INC  
212 DURHAM AVE METUCHEN N J  
GULTON INDUSTRIES INC  
1000 RC CLUNG AVE MUMTSVILLE ALA  
GULTON INDUSTRIES-ORTHODOX DIV  
804 ST PRINCETON JUNCTION N J  
GULTON INDUSTRIES-ORTHODOX DIV  
4045 QUAKER BRIDGE RD TRENTON N J  
GUNNAR LABS  
3333 26TH ST BOX 346 RT 1 BRADENTON FLA  
GURLEY W & L E  
516 FULTON ST TROY N Y  
G-V CONTROLS INC  
OKNER PARKWAY LIVINGSTON N J  
G W ASSOCIATES  
BOX 363 EL SEGUNDO CALIF  
GWILLIAM CO  
342 FURMAN ST BROOKLYN 1 N Y  
GYRA ELECTRONICS CORP  
WASHINGTON & ELM STS P O BOX 184 LA GRANGE ILL  
GYREX CORP  
3003 PENNA AVE SANTA MONICA CALIF  
GYRO ELECTRONICS CO  
325 CANAL ST NEW YORK 13 N Y  
GYRODYNE CO OF AMERICA INC  
FLOWERFIELD ST JAMES L I N Y

HACKENSACK CABLE CORP  
110 ORCHARD ST HACKENSACK N J  
HACKER & CO  
82 BEAVER ST NEW YORK 5 N Y  
HADDAM MFG CO  
HADDAM CONN  
HAGAN CHEMICALS & CONTROLS INC  
804 1346 PITTSBURGH 30 PA  
HAGAN CHEMICALS & CONTROLS ELECTRONICS  
PRODUCTION DEPT BOX 402 ORRVILLE OHIO  
HAGAN CHEMICALS & CONTROLS KYBERNETICS DIV  
271 MADISON AVE N Y 16 N Y  
HAL MEN CO  
36 14 11 ST LONG ISLAND CITY N Y  
HALAX CORP  
17470 SHELBOURNE BAY LOS GATOS CALIF  
HALEDY ELECTRONICS CO  
57 WILLIAM ST NEW YORK 5 N Y  
HALEX INC  
310 S IMPERIAL HWY EL SEGUNDO CALIF  
HALL ENG  
263 16TH N E BELLEVUE WASH  
HALL-BARKAN INSTR INC  
181 MARLBOROUGH RD TUCKAHOE N Y  
HALL-SCOTT INC  
2950 N ONTARIO ST DUBUQUE CALIF  
HALLANORE ELECTRONICS CO  
714 N BROOKHURST ST ANAHEIM CALIF  
HALLET MANUF CO  
36040 SHELBOURNE DR MT CLEMENS MICH  
HALLETT MFG CO  
5910 BOBCRAFT ST LOS ANGELES CALIF  
HALLIBURTON INC  
4724 S BOYLE AVE LOS ANGELES CALIF  
HALLICRAFTERS CO  
314 BILSHIRE DR WILMETTE ILL  
HALLICRAFTERS CO  
WITRE BLDG 100 LEXINGTON 73 MASS  
HALLICRAFTERS CO  
4401 B 5TH AVE CHICAGO 26 ILL  
HALLIKAINEN INSTRUMENTS  
1341 7 ST BERKELEY 10 CALIF  
HALL INSTRUMENT CO  
100 GLEN HEAD RD GLEN HEAD N Y  
HALOGEN INSULATOR & SEAL CORP  
9940 PACIFIC AVE FRANKLIN PARK ILL  
HALOID XEROX INC  
HALOID ST ROCHESTER 3 N Y  
HAMILTON ELECTRONIC LAB  
360 FREEMAN ST ORANGE N J  
HAMILTON ELECTRONICS CORP  
2726 W PRATT AVE CHICAGO 45 ILL  
HAMILTON-HALL MFG CO  
227 80 BAY ST MILWAUKEE 2 WIS  
HAMILTON KENT MFG CO  
427 BRANT ST KENT OHIO  
HAMILTON STANDARD ELECTRONICS DEPT  
MAIN ST BROAD BROOK CONN  
HAMILTON WATCH CO ALLIED PRODUCTS DIV  
COLUMBIA AVE LANCASTER PA  
HAMILTON WATCH CO HATHAWAY INSTR DIV  
P O BOX 28 SCARSDALE N Y  
HAMLIN INC  
LAKE & GROVE STS LAKE MILLS WIS  
HAMMARLUND MFG CO  
460 W 34TH ST NEW YORK 1 N Y  
HAMMEL DAHL CO  
BARBIC INDUST PARK PROVIDENCE R I  
HAMMORF ORSMA CO  
4200 W DIVERSEY AVE CHICAGO 10 ILL  
HAMNER ELECTRONICS CO INC  
P O BOX 521 PRINCETON N J  
HAMPSHIRE ENGINEERING CO  
2300 WASHINGTON ST NEWTON LOWER FALLS 62 MASS  
HAND FILM CORP  
6926 MELROSE AVE HOLLYWOOD 38 CALIF  
HANDLEY INC  
2030 COLORADO AVE SANTA MONICA CALIF  
HANDLEY INC  
12960 PANAMA ST LOS ANGELES 66 CALIF  
HANDY & HARRAN  
82 FULTON ST NEW YORK 38 N Y  
HANDY & HARRAN  
LOS ANGELES CALIF  
HANDY & HARRON  
330 N GIBSON RD EL MONTE CALIF  
HANNIFIN CO DIV PARKER-HANNIFIN CORP  
625-D S BOLF RD DES PLAINES ILL  
HANNON LAB DIV/ENGINEERED INDUSTRIES INC  
100 CHESTNUT ST NEWARK 5 N J  
HANSBERGER REFRIG CO  
745 MESQUITE AVE YUMA ARIZ  
HANSEN CO WA  
163 SILVERBROOK AVE NILES MICH  
HANSEN MFG CO  
R I PRINCETON IND  
HANSON VAN WINKLE MUMING CO  
CHURCH ST NATABAN N J  
HANSON-GORRILL-BRATON  
85 HAZEL ST GLEN COVE N Y  
HARCO LABS  
77 OLIVE ST NEW HAVEN CONN  
HARDER CD DONALD C  
2580 K ST SAN DIEGO 2 CALIF  
HARDMAN CO N Y  
583 CORTLANDT ST BELLEVILLE 9 N J  
HARDWICK MINDLE INC  
40 HERMON ST NEWARK 5 N J  
HARRIS ELECTRONICS INC  
4848 E BASHINGTON BL PHOENIX ARIZ  
HARRAN-KARDON INC  
520 MAIN ST WESTBURY L I N Y

HARRON LICHTENSTEIN & CO  
26 BROADWAY NEW YORK 6 N Y  
HAROWE PRECISION INC  
MOUNT RD LENNI HILLS PENNA  
HARPER CO N H  
8200 LENHIG AVE MORTON GROVE ILL  
HARPER ELECTRIC FURNACE CORP  
56 RIVER ST BUFFALO 2 N Y  
HARPER ENGINEERING CO  
9527 48TH AVE N E SEATTLE 15 WASH  
HARPER-LEADER INC  
1046 S MAIN ST WATERBURY 20 CONN  
HARREL INC  
1786 FIRST AVE NEW YORK 28 N Y  
HARRINGTON-FEDERAL SCREEN-PRINTING INC  
608 N 8TH ST COLUMBUS 8 OHIO  
HARRIS MFG CO  
8031 LITESINGER RD BRENTWOOD 17 MD  
HARRIS TRANSDUCER CORP  
BOX 247 WOODBURY CONN  
HARRIS-INTERTYPE CORP  
4510 E 71ST ST CLEVELAND 8 OHIO  
HARRISON LABS  
45 INDUSTRIAL RD BERKELEY HEIGHTS N J  
HARRISON LABS INC B H  
80 BINGHAMSTER ST WESTON HIGHLANDS 61 MASS  
HARRISON PAINT & VARNISH CO  
1329 HARRISON AVE S CANTON 1 OHIO  
HARRISTAM LABORATORIES  
674 E 2ND ST BROOKLYN 26 N Y  
HARROW LABS  
42-10 220TH ST BAYSIDE LI 61 N Y  
HARSHAW CHEMICAL CO  
1945 E 97 ST CLEVELAND 6 OHIO  
HART MFG CO  
128 BARTHOLOMEW AVE HARTFORD 1 CONN  
HARTFORD CITY PAPER DIV  
SOUTH SPRING AVE HARTFORD CITY IND  
HARTLEY PRODUCTS CO  
521 E 182 ST NEW YORK 31 N Y  
HARTMAN ELECTRICAL MFG CO  
175 N DIAMOND ST WANSFIELD OHIO  
HARTMAN ENG'G CO  
182 OAKLAND ST SPRINGFIELD 8 MASS  
HARTMAN SCIENTIFIC CO  
6311 WAYWOOD CIRCLE FORT WAYNE IND  
HARTWELL CO  
9035 VENICE BLVD LOS ANGELES CALIF  
HARVEY WELLS ELECT  
W ROXBURY MASS  
HARVEY WELLS ELECTRONICS INC R & D DIV  
E NATICK INDUSTRIAL PARK NATICK MASS  
HARVEY-WELLS ELECTRONICS INC  
NORTH ST SOUTHBRIDGE MASS  
HARVOLD CO INC  
1285 CHICAGO AVE EVANSTON ILL  
HARWOOD ELECTRONICS CO  
466 W SUPERIOR ST CHICAGO 10 ILL  
HARBORTH MFG CO  
409 EL COMINO REAL MEMLO PARK CALIF  
HARRIS BRGS INSTRUMENT CO  
6236 RITCHIE RD S E WASHINGTON 10 D C  
HASSALL INC JOHN  
CANTAGUE RD WESTBURY LI N Y  
HASTINGS-RAYDIST INC  
NEBCOM AVE HAMPTON VA  
HATHAWAY CO N Y  
1330 LEYDEN DENVER 20 COLO  
HATHAWAY INSTRUMENTS INC  
5800 E JEWELL AVE DENVER 22 COLO  
HAUMAN INSTRUMENTS CO INC  
70 COOLIDGE HILL RD WATERTOWN MASS  
HAVER INDUSTRIES INC  
900 GREENBANK RD WILMINGTON 8 DELA  
HAWKINS COMMERCIAL ELECTRONICS CO  
920 KING ST WILMINGTON 1 DELA  
HAWLEY PRODUCTS CO  
333 N 6TH ST ST CHARLES ILL  
HAYDEN STONE B CO  
NEW HAVEN N Y  
HAYDON CO A B  
232 N ELM ST WATERBURY 20 CONN  
HAYDON CORP  
3815 9TH AVE NEW YORK 34 N Y  
HAYDON DIV GENERAL TIME CORP  
245 E ELM ST TORRINGTON CONN  
HAYDON INSTRUMENT CO  
165 W LIBERTY ST WATERBURY CONN  
HAYDON SWITCH INC  
536 S LEONARD ST WATERBURY CONN  
HAYES INC C I  
875 BELLINGTON AVE CRANSTON 10 R I  
HAYNES LABS INC C B  
61 CHANDLER ST SPRINGFIELD 8 MASS  
HAYNES STELLITE CO DIV UNION CARBIDE CORP  
1020 W PARK AVE KOKOMO IND  
HAYS CORP  
742 E 8TH ST MICHIGAN CITY IND  
HAYS MFG CO  
803 W 12TH ST ERIE PA  
HAYWARD SCIENTIFIC GLASS CORP  
217 MAGNOLIA AVE BHTTIER I CALIF  
HAZELTINE CORP  
138 HAVEN AVE PORT WASHINGTON L I N Y  
HAZELTINE CORP  
P O BOX 41067 INDIANAPOLIS IND  
HAZELTINE CORP ELECTRONICS DIV  
31-33 STEWART ST FLORAL PARK L I N Y  
HAZELTINE CORP-ELECTRONICS  
CUBA HILL RD GREENLAWN L I N Y  
HAZELTINE CORP-ELECTRONICS  
1 CHESTNUT ST GARDEN CITY L I N Y  
HAZELTINE CORP-RES DIV  
5445 DIVERSEY AVE CHICAGO 39 ILL  
HAZELTINE ELECT CORP  
P O BOX 779 RIVERHEAD L I N Y



# ELECTRONIC MANUFACTURERS-A-Z

HAZELTINE ELECTRONICS DIV/HAZELTINE CORP  
59-25 LITTLE NECK PKBY LITTLE NECK 02 N Y  
H-B INSTRUMENT CO  
AMERICAN A BRISTOL STS PHILA PA  
HEALT-RUFF CO  
2255 UNIVERSITY AVE ST PAUL 14 MINN  
HEATH CO  
BENTON HARBOR MICH  
HEATRON CO  
333 EBRITS ST YORK PA  
HEDDEN CO  
280B-10 LAYTON AVE FORT WORTH 17 TEXAS  
HEINEMANN ELECTRIC CO  
PENNSYLVANIA AVE & PLUM ST TRENTON 2 N J  
HEINRICH CO  
326 W FLORIDA ST MILWAUKEE WIS  
HEINRICH CO CARL  
711 CONCORD AVE CAMBRIDGE 30 MASS  
HEINZ MUELLER ENGG CO  
4725 106A ST CHICAGO 51 ILL  
HEINZE ELEC CO/DIV CONSOLIDATED ELEC LAMP  
665 LAURENCE ST LOWELL MASS  
HELBEL LABORATORIES  
6236 CALLE CAMELIA SCOTTSDALE ARIZ  
HELDOR MFG CORP  
238 LEWIS ST PATERSON N J  
HELL-COIL CORP  
SMELTER ROCK LANE DANBURY CONN  
HELLPOT DIV BECKMAN INSTRUMENTS INC  
2500 FULLERTON RD FULLERTON CALIF  
HELLPOT DIV OF BECKMAN INSTRS INC  
3 514 PORTERS RD TORONTO 18 ONT CANADA  
HELKO PRODUCTS CO  
243 W 55 ST NEW YORK 19 N Y  
HELLIGE INC  
877 STEWART AVE GARDEN CITY 4 N Y  
HELVIG CO  
2550 N 30TH ST MILWAUKEE 10 WISC  
HEMINGWAY & BARLETT MFG  
ECHO LAKE CO WATERFORD CONN  
HEMWAY & BARLETT MFG CO  
500 S AVE NEW YORK 36 N Y  
HEMRITE PRODUCTS CORP  
2514 S 3 ST IRONTON OHIO  
HENAY & MILLER INDUSTRIES INC  
675 GARFIELD AVE JERSEY CITY 5 N J  
HENSCHEL CORP  
14 CEDAR ST ANDOVER MASS  
HEPNER MFG CO  
504 608 ROUND LAKE ILL  
HERCON ELECTRONICS CORP  
481 WASHINGTON ST NEWARK 2 N J  
HERCULES CHEMICAL CO INC  
416 EROAD RD NEW YORK 13 N Y  
HERCULES POWDER CO  
RADFORD ARSENAL RADFORD VA  
HERMASEAL CO  
1010 N MAIN ST ELKHART IND  
HERMES ELECTRONICS CO  
75 CAMBRIDGE PKBY CAMBRIDGE 42 MASS  
HERMES PLASTICS INC  
13-19 UNIVERSITY PL NEW YORK 3 N Y  
HERMES-SONIC CORP  
13-19 UNIVERSITY PL NEW YORK N Y  
HERMETIC PACIFIC CORP  
4232 TEMPLE CITY BLVD ROSEMEAD CALIF  
HERMETIC SEAL CORP  
75 RIVER RD N ARLINGTON N J  
HERMETIC SEAL CORP  
37 W 4TH ST NEWARK N J  
HERMETIC SEAL TRANSFORMER CO  
555 N 5 ST GARLAND TEXAS  
HERMETITE CORP  
702 BEACON ST BOSTON 15 MASS  
HEROLD RADIO & ELECTRONICS CORP  
MT VERNON N Y  
HERZOG MINIATURE LAMP WORKS  
50-17 8 ST LONG ISLAND CITY 1 N Y  
HESSE-EASTERN CORP  
210 BROADWAY EVERETT 40 MASS  
HEVI-DUTY ELECTRIC CO DIV BASIC PROD CORP  
3002 W BURLINGHAM ST P O BOX 563 MILWAUKEE  
WIS  
HEWLETT-PACKARD CO  
275 PAGE MILL RD PALO ALTO CALIF  
HEWSON CO INC  
443 BROAD ST NEWARK 2 N J  
HEXACON ELECTRIC CO  
181 W CLAY AVE ROSELLE PARK N J  
HEXCEL PRODUCTS INC  
2332 4TH ST BERKELEY 10 CALIF  
HEXCEL PRODUCTS INC EASTERN DIV  
HAVRE DE GRACE MD  
HEYER PRODS CO  
GOV'T CONTRACTS DIV BELLEVILLE 9 N J  
HEYMAN MFG CO  
147 N MICHIGAN AVE KENILWORTH N J  
H & H MACHINE CO INC  
NOBLE & JACKSON STS NORRISTOWN PA  
HI GRADE ALLOY CORP  
1236 S TALMAN CHICAGO 8 ILL  
HI TEST CHEMICAL CORP  
722 64TH ST BROOKLYN 20 N Y  
HI-G INC  
BRADLEY FIELD WINDSOR LOCKS CONN  
HI-LO MFG CORP  
1122 W NEWPORT AVE CHICAGO 13 ILL  
HI-SHEAR RIVET TOOL CO  
2400 B 247TH ST TORRANCE CALIF  
HI-SPEC ELECTRONICS CORP  
7328 ETHEL AVE N HOLLYWOOD CALIF  
HI-SPEED EQUIPMENT CO  
73 POND ST WALTHAM 34 MASS  
HICKOK ELECTRICAL INSTRUMENT CO  
10514 DU PONT AVE CLEVELAND 8 OHIO  
HEATY ENGG CO  
2228 N HOLLYWOOD WAY BURBANK CALIF

HIGH SPEED HAMMER CO  
313 NORTON ST ROCHESTER 21 N Y  
HIGH VACUUM EQUIPMENT CORP  
E CHURCHILL RD HINGHAM MASS  
HIGH VOLTAGE ENGG CORP  
BURLINGTON MASS  
HIGHFIELD MFG CO  
P O BOX 549 BRIDGEPORT 1 CONN  
HIGHLAND DESIGN INC  
90 MAGNOLIA AVE WESTBURY N Y  
HIGHLE MFG CO AVON TUBE DIVN  
291 GRANGER RD OXFORD MICH  
HIGHSIDE CHEMICALS INC  
11 COLFAX AVE CLIFTON N J  
HILDEBRAND JOHN CO  
45 BRIGHTON ST BELMONT 70 MASS  
HILGER & WATTS LTD  
80 SHORE RD PORT WASHINGTON NY  
HILL B CO E VERNON  
P O BOX 189 LAKE GENEVA WISC  
HILL CO C W  
35 W GRAND RIVER AVE DETROIT 26 MICH  
HILL ELECTRONICS INC  
300 N CHESTNUT ST MECHANICSBURG PA  
HILLBURN ELECTRONIC PRODUCTS CO  
55 NASSAU AVE BROOKLYN 22 N Y  
HINDS & DAUG  
P O BOX 841 SANDUSKY OHIO  
HINDLE TRANSFORMER CO  
WOODS CHURCH RD 3 FLEMINGTON N J  
MINNERS-GALANER RADIO CORP  
66-02 AUSTIN ST FOREST HILLS 74 L I N Y  
HIQ DIV  
AEROVOR CORP OLEAN N Y  
HIRSCHMANN CO INC  
30 PARK AVE MANHASSET N Y  
HISONIC INC  
9700 W 75TH ST MERRIAN KANS  
HITCHINER MFG CO INC  
P O BOX 330 MILFORD N Y  
HITEMP WIRES INC  
1200 SHAMES DRIVE WESTBURY N Y  
HITSCHI LTD  
TOKYO JAPAN  
HOBART BROS CO  
HOBART SQUARE E TROY 1 OHIO  
HOBBS CORP JOHN W DIV STEWART-BARNER CORP  
SPRINGFIELD ILL  
HOBBS MFG CO  
26 SALISBURY ST WORCESTER 5 MASS  
HOBBY & BROWN ELEC CORP  
237 SUNRISE HWY ROCKVILLE CENTRE L I N Y  
HOBSON BROS  
4940 W LAWRENCE AVE CHICAGO 30 ILL  
HOE & CO R  
910 EAST 138TH ST BRONX 54 N Y  
HOFFMAN CO P R  
321 CHERRY ST LARLISE PA  
HOFFMAN ELECTRONICS CORP  
3761 S HILL ST LOS ANGELES 7 CALIF  
HOFFMAN ELECTRONICS CORP  
P O BOX 4067 SANTA BARBARA CALIF  
HOFFMAN ELECTRONICS CORP  
930 PITMAN AVE EVANSTON ILL  
HOFFMAN ELECTRONICS CORP SEMICONDUCTOR DIV  
1001 N ARDEN DR EL MONTE CALIF  
HOFFMAN ENG CORP  
9TH & TYLER ANOKA MINN  
HOFFMAN ELECTRONICS CORP  
WALTER READE BLDG 710 HATTISON AVE ASBURY  
PARK N J  
HOFFMAN RADIO CORP  
6200 S AVALON BLVD LOS ANGELES 3 CALIF  
HOGAN FARMVILLE CORP  
155 PERRY ST NEW YORK 14 N Y  
HOKI INC  
1 TENAKILL PARK CRESSKILL N J  
HOLEX INC  
P O BOX 148 HOLLISTER CALIF  
HOLIDAY TRANSFORMER CO  
2954 N SHEPHERD AVE CHICAGO 14 ILL  
HOLLAND ELECTRONICS  
772 E 93 ST BROOKLYN N Y  
HOLLINGSWORTH CO  
P O BOX 430 PHOENIXVILLE PA  
HOLLOID CO MACHINE DEV DIV  
P O BOX 1580 ROCHESTER 3 N Y  
HOLT INSTRUMENT LABS  
DIV HOLT HARKWOOD CO INC OCONTO WISC  
HOLT MFG CO  
2510 FIRST AVE EAST MEADOW L I N Y  
HOLTZER CABOT DIV NATL PNEUMATIC CO  
125 AMORY ST BOSTON 19 MASS  
HOLUB INDUSTRIES INC  
413 DE KALB AVE SYCAMORE ILL  
HOLYOKE WIRE & CABLE CORP  
720 MAIN ST HOLYOKE MASS  
HOMELITE OIV TEXTRON INC  
67 RIVERDALE AVE PORT CHESTER N Y  
HOMMEL CO  
209 W AVE PITTSBURGH 22 PA  
HONEYWELL CONTROLS LTD  
VANDERHOOF AVE TORONTO 17 ONTARIO CANADA  
HONEYWELL MICRO SWITCH  
VANDERHOOF AVE TORONTO CANADA  
HOOKER CHEMICAL CORPORATION  
28 IROQUOIS ST NIAGARA FALLS N Y  
HOOPER CHEMICAL CORP  
P O BOX 313 RUTHERFORD N J  
HOOPER BALL & BEARINGS CO  
5400 S STATE RD ANN ARBOR MICH  
HOOPER ELECTRIC CO  
2100 S STOWER AVE LOS ANGELES CALIF  
HOOPER ELECTRIC CO  
HANGER 2 PORT COLUMBUS A/P COLUMBUS OHIO  
HOOPER ELECTRONICS CO  
110 B TITONIUM RD TITONIUM MD

HOPKINS ENG CO  
12900 FOOTHILL BLVD SAN FERNANDO CALIF  
HORIZONS INC  
2905 E 79 ST CLEVELAND OHIO  
HORLICK CO INC BR 1  
246 SUMMER ST BOSTON 10 MASS  
HOSE MC CANN TELEPHONE CO  
761 THIRD AVE BROOKLYN 32 N Y  
HOSKINE ALLOYS OF CANADA LTD  
45 RACINE RD REXDALE P O TORONTO ONT  
CANADA  
HOSKINE ALLOYS OF CANADA LTD  
45 RACINE RD REXDALE P O  
HOSKINS MFG CO  
4445 LABTON AVE DETROIT 8 MICH  
HOTPACH  
J. 5083 COTTMAN AVE PHILA PA  
HOTWATT INC  
DANVERS MASS  
HOUDAILLE INDUSTRIES INC  
BUFFALO 11 N Y  
HOUGHTON LABS INC ELEC INSULATION DIV  
322 HOUGHTON AVE OLEAN N Y  
HOULINAN CO T J  
2510 W LAWRENCE CHICAGO 25 ILL  
HOUSTON FEARLESS CORP  
11801 S OLYMPIA BLVD LOS ANGELES 64 CALIF  
HOUSTON INSTRUMENT CORP  
804 22234 HOUSTON 27 TEXAS  
HOBARD CRYSTAL HOLDERS INC  
2600 GRAND AVE KANSAS CITY 8 MO  
HOBARD FOUNDRY CO  
1700 N KOSTNER AVE CHICAGO 39 ILL  
HOBARD INDUSTRIES  
300 BROADWAY - RM 403 CAMDEN 3 N J  
HOBARD INDUSTRIES INC  
1760 STATE ST RACINE WISC  
HOBARD INDUSTRIES INC LLOYD SCRUGGS DIV  
DRAWER 232 FESTUS MO  
HOBARD MOLDING INC  
215 S 5 ST CAMERON MO  
HOBARD MOLDINGS INC  
2600 GRAND AVE KANSAS CITY 8 MO  
HOBELL ELECTRIC MOTORS CO  
409 N ROOSEVELT HOBELL MICH  
HOBELL INSTRUMENT CO  
3101 TRINITY ST FT WORTH 7 TEXAS  
HOYT ELECTRICAL INSTRUMENT WORKS  
42 CARLETON ST CAMBRIDGE 42 MASS  
HOB SINGER INC  
SCIENCE PARK STATE COLLEGE PA  
HRUSKA RADIO  
704 MORRIS AVE LUTHERVILLE MD  
HUB-POT INC  
6880 TROOST AVE NORTH HOLLYWOOD CALIF  
HUBBARD SCIENTIFIC LABS  
1093 INDUSTRIAL ST INDUSTRIAL PARK  
POMONA CALIF  
HUBBELL INC HARVEY  
STATE ST & BOSTWICK AVE BRIDGEPORT CONN  
HUCH MFG CO  
2480 BELLEVUE AVE DETROIT 7 MICH  
HUSON LAMP CO  
528 ELM ST KEARNY N J  
HUSON TOOL & DIE CO  
18 VALVERN ST NEWARK 5 N J  
HUSON WIRE CO  
4000 WEST NORTH AVE CHICAGO 39 ILL  
HUSON WIRE CO CASES DIV  
CASSOPOLIS MICH  
HUSON WIRE CO WINSTED DIV  
901 MAIN ST WINSTED CONN  
HUFCO INDUSTRIES  
2815 W OLIVE AVE BURBANK CALIF  
HUGHES LABS INC  
999 EAST ARGUES SUNNYVALE CALIF  
HUGHES - RADAR MAINT  
FLORENCE & TEALE STS LOS ANGELES CALIF  
HUGHES AC CO SEMICONDUCTOR DIV  
500 SUPERIOR AVE NEWPORT BEACH CALIF  
HUGHES AIRCRAFT CO  
450TH FIS CASTLE AFB CALIF  
HUGHES AIRCRAFT CO  
BOX 390 HOLLOWMAN AFB N Y  
HUGHES AIRCRAFT CO  
2060 IMPERIAL HWY EL SEGUNDO CALIF  
HUGHES AIRCRAFT CO  
1310 MCKINLEY AVE ALAMOGORDO N M  
HUGHES AIRCRAFT CO  
BOX 216 VIENNA OHIO  
HUGHES AIRCRAFT CO  
P O BOX 11337 TUCSON ARIZ  
HUGHES AIRCRAFT CO ELECTRONIC MFG DIV  
BOX 90427 LOS ANGELES 45 CALIF  
HUGHES AIRCRAFT CO-EL SEGUNDO  
INTL A/P STA P O BOX 90426 LOS ANGELES 45  
CALIF  
HUGHES AIRCRAFT CO-GROUND SYSTEMS DIV  
P O BOX 2097 FULLERTON CALIF  
HUGHES IND SYS DIV  
FLORENCE & TEALE STS LOS ANGELES CALIF  
HUGHES MICROBAVE TUBE  
1105 ANZA AVE LOS ANGELES CALIF  
HUGHES PRODUCTS GROUP HUGHES AIRCRAFT CO  
BOX 90427 LOS ANGELES 45 CALIF  
HUGHES PRODUCTS HUGHES AIRCRAFT  
1943 PLACENTIA COSTA MESA CALIF  
HUGHES SEMICONDUCTOR DIV  
500 SUPERIOR AVE NEWPORT BEACH CALIF  
HUGHES VACUUM TUBE  
2020 SHORT ST OCEANSIDE CALIF  
HUGHES & PHILLIPS  
3200 N SAN FERNANDO BLVD BURBANK CALIF  
HUGHSON CHEMICAL CO DIV FORD MFG CO  
GREEN GARDEN AT 12TH ERIE PA  
MULL & CO R O  
1300 PARSONS COURT ROCKY RIVER OHIO  
MULL CORP  
DAVISVILLE RD AT PA TRPK HATBORO PA

HUMBLE OIL & REFINING CO  
BOX 2180 HOUSTON 1 TEXAS  
HUMPHREY FABRICATING CORP  
252 ASYLUM ST HARTFORD 3 CONN  
HUMPHREY INC  
7805 CANON ST SAN DIEGO CALIF  
HUNT CO PHILIP A ELECTRONIC PRODUCTS  
PALISADES PARK N J  
HUNT CORP  
453 LINCOLN ST CARLISLE PA  
HUNTER MFG CO  
30525 AURORA RD SOLON OHIO  
HUNTER MFG CO INC  
108 N Linn ST JOBA CITY IOBA  
HUNTER SPRING CO  
1 SPRING AVE LANSDALE PA  
HUNTER TOOLS  
9031 ALBERTS AVE SANTA FE SPRINGS CALIF  
HUPP CORP PERFECTION INDUSTRIES DIV  
1135 IVANHOE RD CLEVELAND 10 OHIO  
HUPPERT CO E M  
6830 COTTAGE GROVE AVE CHICAGO 37 ILL  
HURON INDUSTRIALS  
PO BOX 588 PORT HURON MICH  
HURST TOOL & MFG CO  
RD 46 PRINCETON IND  
HUSE-LIBERTY RICA CO  
PEABODY INDUSTRIAL CENTER PEABODY MASS  
HUYER & SONS F C  
200 E 42ND ST NEW YORK 17 N Y  
HUYER SYSTEMS CO ELECTRONICS DIV  
38 WOLF HILL RD HUNTINGTON STA L I N Y  
HYATT CO WALTER J  
PO BOX 943 BEVERLY HILLS CALIF  
HY-GAIN ANTENNA PRODUCTS CO  
1135 N 22 ST LINCOLN NEBR  
MYCON MFG CO  
1030 S BAYVIEW PKWY PASADENA CALIF  
MYCOR DIV INTL RESISTANCE CO  
12970 BRADLEY AVE SYLMAR CALIF  
MYEL INC  
223 CRESCENT ST WALTHAM 54 MASS  
HYDRAULIC PRESS MFG CO DIV KOENIGER CO  
MARION RD MT GILEAD OHIO  
MYRE HOLDING CO  
100 SHARROCK AVE PLATTSBURGH N Y  
HYDRO-AIRE CO DIV CRANE CO  
3000 WINONA AVE BURBANK CALIF  
MYPERION INC  
76 COOLIDGE HILL RD WATERTOWN MASS  
MY/GAIN TV PDTS  
249 S 46TH ST LINCOLN NEBR  
MYSCANDIA LTD  
P O BOX 93 POSTAL STA R TORONTO ONT CANADA  
MYSOL CORP  
OLEAN N Y  
MYSON MFG CO  
P O BOX 8 PASADENA CALIF  
MYSTER COMPANY  
2902 N E CLACKAPAS ST PORTLAND 8 ORE

I B M  
7230 WISCONSIN AVE BETHESDA 14 MD  
I B M  
SPRING ST OSSINING NY  
I B M  
901 BROAD ST UTICA NY  
I B M  
231 SYMONS RICHLAND BASH  
I B M  
900 DELAWARE AVE WILMINGTON DEL  
I B M  
SOUTH RD POUGHKEEPSIE NY  
I B M AIRBORNE COMPUTER LAB  
509 N MAIN ST VESTAL NY  
I B M CORP  
COMMUNICATION DEPT 602 ENDCOTT NY  
I B M CORP  
DEPARTMENT 504 OWEGO NY  
I B M CORP  
P O BOX 194 ABERDEEN MISS  
I B M CORP  
P O BOX 803 ROSWELL N M  
I B M CORP  
6600 EXCELSTON BLVD MINNEAPOLIS 26 MINN  
I B M CORP  
DEPT 508 ROCHESTER MINN  
I B M CORP  
NEIGHBORHOOD RD KINGSTON NY  
I B M CORP  
217 S JULIAN ST SAN JOSE CALIF  
I B M CORP  
777 GRANT ST DENVER 8 COLO  
I B M CORP  
LINCOLN LAB LEWINGTON MASS  
I B M CORP  
421-7TH AVE PITTSBURGH 19 PA  
I B M CORP  
2409 TEALFORD DALLAS TEX  
I B M CORP  
340 MARKET ST SAN FRANCISCO 11 CALIF  
I B M CORP  
BOX 218 YORKTOWN HEIGHTS NY  
I B M CORP  
1212 S W 6TH AVE PORTLAND 4 ORE  
I B M CORP  
503 S MAIN SAN ANTONIO 4 TEX  
I B M CORP FEDERAL SYSTEMS DIV  
326 E MONTGOMERY ST ROCKVILLE MD  
I B M FEDERAL SYSTEMS DIV  
230 S 15TH ST PHILA 2 PA  
I B M-C P DIV PROD DEVELOPMENT  
112 E POST RD WHITE PLAINS NY

I D E A INC REGENCY DIV  
7900 PENOLETON PIKE INDIANAPOLIS 26 IND  
I-L-S INSTRUMENT DIV MERIAM INSTRUMENT CO  
4525 W 160 ST CLEVELAND 35 OHIO  
I-Y-E CIRCUIT BREAKER CO  
601 E ERIE AVE PHILA 34 PENNA  
ICHIJUKA OPTICAL INC  
288 CHIBUE TOKYO JAPAN  
ICOMEL INC  
943 INDUSTRIAL PALO ALTO CALIF  
IDEAL AEROSITH INC OIV ROYAL INDUSTRIES  
3913 EVANS AVE CHEYENNE WYO  
IDEAL CORP  
435 LIBERTY AVE BROOKLYN 7 NY  
IDEAL ELECTRIC & MFG CO  
300 E 1 ST MANFIELD OHIO  
IDEAL INDUSTRIES INC  
5127 PARK AVE SYCAMORE ILL  
IDEAL PRECISION METER CO  
126 GREENPOINT AVE BROOKLYN 22 N Y  
IDEAS INC  
219 ININSON AVE LARAMIE WYO  
IDENTIFICATION SERVICE CORP  
1410 S 86 ST NEW YORK 36 N Y  
IE MFG  
325 N MOYNE AVE CHICAGO 12 ILL  
IERC DIV INTL ELECTRONIC RESEARCH CORP  
143 B MAGNOLIA BLVD BURBANK CALIF  
ILEX OPTICAL COMPANY  
690 PORTLAND AVE ROCHESTER 21 N Y  
ILB ELECTRIC INDUSTRIES CO  
2890 N PULASKI RD CHICAGO 41 ILL  
ILL TOOL FASTEX DIV  
195 ALGONQUIN RD DES PLAIN ILL  
ILLINOIS CONDENSER CO  
1616 N THROOP ST CHICAGO 22 ILL  
ILLINOIS TESTING LABS INC  
620 W LASALLE ST CHICAGO 10 ILL  
ILLINOIS TOOL WORKS  
ELGIN ILL  
ILLUMITRONIC ENGG CO  
600 E TAYLOR AVE SUNNYVALE CALIF  
ILSCO CORP  
4730 MADISON RD CINCINNATI 27 OHIO  
INBEC INSTRUMENTS INC  
2300 WASHINGTON WESTON 62 MASS  
INC MAGNETICS CORP  
370 MAIN ST WESTBURY LI N Y  
IMPACT-O-GRAPH CORP  
1900 EUCLID AVE CLEVELAND 15 OHIO  
IMPERIAL ELECTRONIC CO  
1505 E HENRY ST LINDEN NJ  
IMPROVED SAFETY CO  
773 EDDY ST PROVIDENCE 5 R I  
INTRA CORP  
11 UNIVERSITY RD CAMBRIDGE MASS  
INCA MFG DIV PHELPS DODGE COPPER PRODS  
LINCOLN HWY E FT WAYNE 1 IND  
IND ELECT HARDWARE  
109 PRINCE ST NEW YORK NY  
IND HARDWARE MFG CO INC  
109 PRINCE ST NEW YORK NY  
INDIAK MFG CORP  
1915 TECHMY RD NORTHEROOK ILL  
INDIANA GENERAL PRODUCTS  
403 ELM ST VALPARISO IND  
INDIANA PRODUCTS  
428 HERTLAND AVE DAYTON 3 OHIO  
INDIANA STEEL & WIRE CO  
2200 E JACKSON ST MUNCIE IND  
INDIRON CO  
76 COOLIDGE HILL RD WATERTOWN 72 MASS  
INDIUM CORP OF AMERICA  
1674 LINCOLN AVE UTICA 4 N Y  
INDL WIRE PRODUCTS INC  
1104 CARMELIE AVE CLEVELAND 19 OHIO  
INDL-MARINE ELECTRONICS  
8077 WATSON RD ST LOUIS 19 MO  
INDUCTION HEATING CORP  
181 BYTHE AVE BROOKLYN 11 N Y  
INDUCTION MOTORS CORP  
570 MAIN ST WESTBURY LI N Y  
INDUCTION MOTORS OF CALIF  
6058 BALKER AVE MAYWOOD CALIF  
INDUCTOR ENGG INC  
117 SCHLEY AVE LEWES DELA  
INDUSTRIAL B COMMUNICATION ELECTRONICS INC  
2222 E 30TH ST ERIE PA  
INDUSTRIAL ACCESSORIES INC  
LINE RD MATABAN N J  
INDUSTRIAL ACCESSORIES INC  
233 PINEWOOD AVE ELBERON N J  
INDUSTRIAL COMPONENTS INC  
P O BOX 506 BEAVERTON ORE  
INDUSTRIAL CONSUMER CORP  
3243 N CALIF ST MEIA AVE CHICAGO 18 ILL  
INDUSTRIAL CONTROL CO  
605 ALBIN AVE LINDENHURST L I N Y  
INDUSTRIAL CONTROLS INC  
5501 ELSTON AVE CHICAGO 30 ILL  
INDUSTRIAL DEVELOPMENT ENGG ASSOC  
7900 PENOLETON PK INDIANAPOLIS IND  
INDUSTRIAL DEVELOPMENT LABS INC  
982 RIVER RD EDGEWATER N J  
INDUSTRIAL DEVICES INC  
EDGEWATER N J  
INDUSTRIAL DYNAMICS CORP  
9081 BASH BLVD CULVER CITY CALIF  
INDUSTRIAL ELECTRICAL WORKS  
1509 CHICAGO ST OHAMA 2 NEBR  
INDUSTRIAL ELECTRONIC CONTROLS  
2271 E 14 ST BROOKLYN 28 N Y  
INDUSTRIAL ELECTRONIC ENGINEERS INC  
3528 VINELAND AVE N HOLLYWOOD CALIF  
INDUSTRIAL ELECTRONIC RUBBER  
P O BOX 4626 CLEVELAND 24 OHIO

INDUSTRIAL ELECTRONICS INC  
6040 WHEELER ST DETROIT 10 MICH  
INDUSTRIAL ENGG CORP  
525 E WOODBINE LOUISVILLE 6 KY  
INDUSTRIAL ENGG & EQUIP CO  
24 MANLEY IND CT ST LOUIS 17 MO  
INDUSTRIAL ENGRAVERS INC  
2212 McDONALD AVE BROOKLYN 23 N Y  
INDUSTRIAL INSTRUMENT AUTO CORP  
89 COMMERCE RD CLEAR GROVE NJ  
INDUSTRIAL INSTRUMENTS INC  
89 COMMERCE RD CEDAR GROVE N J  
INDUSTRIAL MEASUREMENTS CORP  
250 N THOMAS POMONA CALIF  
INDUSTRIAL RICA CORP  
223 S VAN BRUNT ST ENGLEWOOD NJ  
INDUSTRIAL NUCLEONICS CORP  
490 ACERMAN RD COLUMBUS 21 OHIO  
INDUSTRIAL RADIO CORP  
454 N PARKSIDE AVE CHICAGO 44 ILL  
INDUSTRIAL RES PRODUCTS  
9800 BELMONT AVE FRANKLIN PARK ILL  
INDUSTRIAL RETAINING RING CO  
57 CORDIER ST INWINTON 11 N J  
INDUSTRIAL TECTONICS  
P O BOX 606 ANN ARBOR MICH  
INDUSTRIAL TEST EQUIPMENT CO  
55 E 11TH ST NEW YORK 3 N Y  
INDUSTRIAL TIMER CORP  
1407 MCCARTER HWY NEWARK 6 N J  
INDUSTRIAL TRAMP ANTHONY MASS  
235 AIRFIELD AVE UPPER DARBY PENNA  
INDUSTRIAL TRANSFORMER CO  
6 BROADLAWN DRIVE LIVINGSTON N J  
INDUSTRIAL TRANSFORMER CORP  
GOULDSBORO PA  
INDUSTRIAL TUBES INC  
321 STEVENS ST GENEVA ILL  
INDUSTRIAL TV INC  
340 LEWINGTON AVE CLIFTON N J  
INDUSTRIAL WASHING MACH CORP  
32 MAIN ST MATABAN N J  
INDUSTRIAL WINDING MACHINERY CORP  
123 WALL ST P O BOX 62 NEW YORK 5 N Y  
INDUSTRIAL WIRE & CABLE CO INC  
2 SMITH WAREFIELD MASS  
INDUSTRO TRANSISTOR CORP  
35-10 34TH ST LONG ISLAND CITY 6 N Y  
INERTIA SWITCH  
311 W 43RD ST NEW YORK 36 N Y  
INFRARED INDUSTRIES INC  
62 4TH AVE WALTHAM 54 MASS  
INFRARED STANDARDS LAB DIV INFRARED IND INC  
10355 MAGNOLIA AVE RIVERSIDE CALIF  
INERSOL PRODS INC  
630 COMMON ELGIN ILL  
INBERSOLL RAND CO  
ATHENS PA  
INBERSOLL-RAND CO  
PHILLIPSBURG N J  
INBERSOLL-RAND CO  
11 BROADWAY NEW YORK 6 N Y  
INJECTORALL CO  
12 BAY 50 ST BROOKLYN 14 N Y  
INLAND ELECTRONICS CORP  
500 RATHBONE AVE AURORA ILL  
INLAND MOTOR CO OF VA  
SUB RILLHOBAN CORP NORTHAMPTON MASS  
INLAND MOTOR CORP  
NORTHAMPTON MASS  
INLAND STEEL CO  
3210 WATLING ST E CHICAGO IND  
INSCO CO DIV BARRY CONTROLS  
MOLLS ST GROTON MASS  
INSL E CO INC  
WATER ST AT BROADWAY OSSINING N Y  
INSO PRODUCTS LTD  
404 FIFTH AVE NEW YORK 18 N Y  
INSTANT CIRCUITS  
32-44 FRANCIS LEWIS BLDG FLUSHING LI NY  
INSTRON ENGG CORP  
2500 WASHINGTON ST CANTON MASS  
INSTRU-LEC CORP  
520 HOMESTEAD AVE MOUNT VERNON N Y  
INSTRUMENT CASE DIV TA MFG CORP  
4607 ALGER ST LOS ANGELES 39 CALIF  
INSTRUMENT CORP OF AMERICA  
516 GLENWOOD AVE BALTIMORE 12 MD  
INSTRUMENT CORP OF FLA  
P O BOX 1226 BLDG 14 MELBOURNE FLA  
INSTRUMENT DEV & MFG CO  
801 584 PASADENA CALIF  
INSTRUMENT DEVELOPMENT LABS INC  
67 MECHANIC ST ATTLEBORO MASS  
INSTRUMENT ELECTRONICS CORP  
PO BOX 830 PORT WASHINGTON N Y  
INSTRUMENT LABS  
315 B WALTON PL CHICAGO 10 ILL  
INSTRUMENT NETWORKS INC SUB JULIE RESEARCH  
LABS INC 350 W 168TH ST NEW YORK 32 N Y  
INSTRUMENT RESISTORS CO  
1036 COMMERCE AVE UNION N J  
INSTRUMENT SPECIALTY CO INC  
248 BERGEN BLVD LITTLE FALLS N J  
INSTRUMENTATION ASSOCIATES  
17 B AC ST NEW YORK 23 N Y  
INSTRUMENTS CORP  
8 N CENTRAL AVE BALTIMORE 2 MD  
INSTRUMENTS DIV O L MAXSON CORP  
875 10TH AVE NEW YORK 18 N Y  
INSTRUMENTS FOR INDUSTRY INC  
101 NEW SOUTH RD HICKSVILLE LI N Y  
INSTRUMENTS INC  
3102 SAN SPRINGS RD P O BOX 556 TULSA OKLA  
INSTRUMENTS OF NEW ENGLAND  
BOX 326 WALTHAM 54 MASS

# ELECTRONIC MANUFACTURERS-A-Z

INSUL-B-VICON CORP  
1369 INDUSTRIAL RD SAN CARLOS CALIF

INSULATED CIRCUITS INC  
BOX R MELROSE 18 CONN

INSULATING FABRICATORS INC  
150 UNION AVE E RUTHERFORD N J  
INSULATING FABRICATORS OF N E INC  
69 GROVE ST WATERTOWN 72 MASS

INSULATION MFG CORP  
712 S FEDERAL ST CHICAGO ILL

INSULATION MFGS CORP  
365 B WASHINGTON BLVD CHICAGO 6 ILL

INSULATION STANDARDS CO  
P O BOX 467 MILLBURN NJ

INTEGRANO CORP  
662 MAIN ST WESTBURY NY

INTEGRATED MICA CORP  
202 FRANKLIN PL WOODHURST L I N Y

INTEGRATED MICA CORP  
202 FRANKLIN PLACE WOODHURST N Y

INTELLIGENT MACHINES RESEARCH CORP  
7019 EDSALL RD RESEARCH PARK ALEXANDRIA VA

INTER-MOUNTAIN INSTR CO  
P O BOX 8324 STA C ALBUQUERQUE NEW MEXICO

INTERCONTINENTAL DYN CORP  
170 COOLIDGE AVE EMERSON N J

INTERCONTINENTAL ELECTRONICS CORP  
1551 FRANKLIN AVE MINEOLA N Y

INTERELECTRONICS CORP  
2432 64D CONCOURSE NEW YORK 38 N Y

INTERFERENCE MEASUREMENT LAB INC  
907 E 51 ST BROOKLYN 3 N Y

INTERLAKE STAMPING CORP  
12415 EULIO AVE CLEVELAND 8 OHIO

INTERLECTRIC CORP  
1401 LEXINGTON AVE WARREN Pa

INTERNAT'L BUS MACH CORP  
BOX 430 GALVESTON TEXAS

INTERNATIONAL BUSINESS MACH  
7526 E ALMERIA RD SCOTTSDALE ARIZ

INTL BUSINESS MACHINES CORP  
590 MADISON AVE NEW YORK 22 N Y

INTL CRYSTAL MFG CO INC  
18 N LEE OKLAHOMA CITY OKLA

INTERNATIONAL ELECTRIC CORP  
PARAMUS NJ

INTERNATIONAL ELECTRIC INDUSTRIES INC  
468 GRAND AVE BROOKLYN 38 N Y

INTERNATIONAL ELECTRONIC INDUSTRIES  
P O BOX 1368 NASHVILLE 3 TENN

INTERNATIONAL ELECTRONICS CORP  
81 SPRING ST NEW YORK 12 N Y

INTL ELECTRONICS CORP DIV ITT  
RT 17 & GARDEN STATE PKWY PARAMUS N J

INTL ELECTRONICS MFG CO  
2ND ST EXT GREENWOOD ACRES ANNAPOLIS MD

INTL ELECTRONIC RESEARCH CORP  
P O BOX 271 BURBANK CALIF

INTERNATIONAL ENGG INC  
1149 BOLANDER AVE DAYTON 1 OHIO

INTL EQUIP CO  
1284 SOLDIERS FIELD RD BOSTON 35 MASS

INTERNAL GENERAL ELEC CO  
150 EAST 42ND ST NEW YORK 17 NY

INTERNATIONAL HARVESTER CO  
DEPT 74-0 & R LAB MELROSE PARK ILL

INTERNATIONAL INSTRUMENTS INC  
BOX 2958 NEW HAVEN 15 CONN

INTERNATIONAL NICKEL CO  
67 WALL ST NEW YORK 5 N Y

INTERNATIONAL POWDER METALLURGY CO  
439 W MAIN ST RIDGWAY PA

INTL PUMP & MACHINE WORKS  
81 DORSIA AVE LIVINGSTON N J

INTERNATIONAL RADIANT CORP  
574 EAST 158TH ST NEW YORK 35 N Y

INTERNATIONAL RADIO & ELECTRONICS CORP  
R 4 BOX 123 ELKHART IND

INTERNATIONAL RECTIFIER CORP  
1521 E GRAND AVE EL SEGUNDO CALIF

INTL RECTIFIER CORP  
1799 COOLIDGE HWY BERRLEY MICH

INTERNATIONAL REGISTER CO  
2620 B WASHINGTON BLVD CHICAGO 11 ILL

INTERNATIONAL RESEARCH & DEVELOPMENT CORP  
P O BOX 55 BORTHINGTON OHIO

INTERNATIONAL RESEARCH ASSOC  
2221 WARBICK AVE SANTA MONICA CAL

INTL RESISTANCE CO  
112 MONTGOMERY ST SYRACUSE 2 NY

INTL RESISTANCE CO  
SKYLAND NC

INTL RESISTANCE CO  
800NE N C

INTERNATIONAL RESISTANCE CO  
401 N BROAD ST PHILADELPHIA 8 PA

INTERNATIONAL RESISTANCE CO  
BURLINGTON N

INTERNAT'L TELEMETR CORPP  
PC20 STONER AVE LOS ANGELES 25 CALIF

INTERNATIONAL TELEPHONE & TELEGRAPH CORP  
INTERNATIONAL PRODUCTS DIV 250 GARABA LOI AVE  
LODI N J

INTERNATIONAL BAR REFINING CO  
99 E HARTHORNE AVE VALLEY STREAM N Y

INTERSTATE ELECTRONICS CORP  
707 E VERMONT AVE ANAHEIM CALIF

INTIMEX CORP  
RICHARDSON BLVD BONIFANT & FENTON STS  
SILVER SPRING MD

INVAC CORP  
14 HURON DR EAST NATICK INDUSTRIAL PARK  
NATICK MASS

INVAR ELECTRONICS CORP  
323 B WASHINGTON BLVD PASADENA CALIF

INVE SPLINE INC  
HAZEL PARK MICH

INVESTMENT CASTING CO  
60 BROWN AVE SPRINGFIELD N J

IRCO CORP  
16 HUDSON ST NEW YORK 13 N Y

IRON FIREARM MFG CO ELECTRONICS DIV  
2038 S E 9 AVE PORTLAND 2 ORE

IRVING ELECTRONICS CO  
P O BOX 9222 SAN ANTONIO TEXAS

IRWIN LABS INC  
1238 S GERHART AVE LOS ANGELES 22 CALIF

ISKROM ELECTRONICS CO  
ROOSEVELT NJ

ISLIP TRANS B METAL CO  
BEECH ST ISLIP LI NY

ISOCHER RESINS CO  
221 OAK ST PROVIDENCE 9 R I

ISOCYANATE PRODUCTS INC  
900 WILMINGTON RD NEW CASTLE DELA

ISOLANTITE MFG CORP  
337 BARRAN AVE STIRLING N J

ISOMET CORP  
430 COMMERCIAL AVE PALISADES PARK N J

ISOTOPE ACCESSORIES CO INC  
5312 WESTMINSTER AVE PHILA 31 PA

ISOTOPIES INC  
123 BOODLAND AVE WESTWOOD N J

ISOTOPIES SPECIALTIES CO  
BOX 688 BURBANK CALIF

ITEK CORP  
1605 TRAPELO RD BALTHAM MASS

ITEK CORP  
700 COMMONWEALTH AVE BOSTON MASS

ITEK CORP  
128 SPRING ST LEXINGTON MASS

ITEMCO  
P O BOX 191 PORT WASHINGTON N Y

ITEMLAB INC  
18 BEECHWOOD AVE PORT WASHINGTON NY

ITI ELECTRONICS INC  
369 LEXINGTON AVE CLIFTON NJ

ITT  
67 BROAD ST NEW YORK NY

ITT  
PLANTATION RD ROANOKE VA

ITT  
GARDEN STATE PLAZA RT 40 17 PARAMUS N J

ITT AVIONICS DIV  
343 CORTLAND ST BELLEVILLE NJ

ITT COMPONENTS DIV  
4600 S TRIPP AVE CHICAGO 32 ILL

ITT COMPONENTS DIV  
P O BOX 412 CLIFTON N J

ITT COMPONENTS DIV  
PO BOX 5367 ROANOKE VA

ITT FEDERAL DIV  
3700 E PONTIAC ST FT WAYNE IND

ITT FEDERAL DIV ITT CORP  
100 KINGSLAND RD CLIFTON N J

ITT INDUSTRIAL PRODUCTS DIV  
15191 BLEDSOE ST SAN FERNANDO CAL

ITT INDUSTRIAL PRODUCTS DIV  
BOX 4008 ANNEX SAN FERNANDO CALIF

ITT KELLLOGG COMM DIV  
500 N PULASKI RD CHICAGO ILL

ITT KELLLOGG-COMM DIV  
P O BOX 2729 RALEIGH N CAR

ITT LAB  
W ALUMIN ST NORWALK CONN

ITT LABS A DIV OF ITT  
937 COMMERCIAL ST PALO ALTO CALIF

ITT LABS DIV ITT  
500 WASHINGTON AVE NUTLEY N J

ITT PALO ALTO DIV  
2626 MANOVER ST PALO ALTO CALIF

IVANCOE ELECTRONIC LABS  
14230 S LA SALLE ST CHICAGO 27 ILL

JACK & HEINTZ INC  
SOLOM RD BEDFORD OHIO

JACK & HEINTZ INC  
17600 BROADWAY CLEVELAND 1 OHIO

JACKES-EVANS MFG CO  
4827 GERALDINE ST LOUIS MO

JACKSON BROS LONDON LTD  
KINGSWAY WADDON SURREY ENGLAND

JACKSON ELECTRICAL INSTRUMENT CO  
124 MCDONOUGH ST DAYTON 2 OHIO

JACKSON ELECTRONICS & MFG CO  
695 JOHNSTON ST AKRON OHIO

JACKSONVILLE METALS PLASTICS CO  
575 DARA ST JACKSONVILLE FLA

JACO PRODUCTS  
2150 ST CLAIR AVE CLEVELAND 18 OHIO

JACOBSON NUT MFG CORP  
Box 177 KENILWORTH N J

JAIDINGER MFG CO  
1921 W HUBBARD ST CHICAGO 22 ILL

JAMAC PRODUCTS CO  
8845 N E SANDY BLVD PORTLAND 20 ORE

JAMES ELECTRONICS INC  
4050 N ROCKWELL ST CHICAGO ILL

JAMES INTERNATIONAL CORP  
420 LEXINGTON AVE NEW YORK 17 N Y

JAMES PLATING WORKS INC  
1609 N ELSTON AVE CHICAGO 22 ILL

JAMPRO ELECTRONICS INC  
1236 - 40TH AVE SACRAMENTO CALIF

JAN ENGINEERING  
2128 PICO BLVD SANTA MONICA CALIF

JAN HARDWARE MFG CO  
36-01 QUEENS BLVD LONG ISLAND CITY 1 N Y

JANCO CORP  
3111 WINONA AVE BURBANK CALIF

JANITROL AIRCRAFT DIV  
4200 SURFACE RD COLUMBUS 4 OHIO

JANSA WOODWORKING CORP  
330 WESERLE ST BROOKLYN 8 N Y

JANSEN ELECTRIC CO  
86 SHERMAN AVE TEANECK N J

JAPAN MICROMETER CO  
851 4-CHOME TOKYO JAPAN

JARRELL-ASH CO  
26 FARWELL ST NEWTONVILLE 60 MASS

JARVIS ELECTRONICS CORP  
1140 CHERRY ST WINNETKA ILL

JAVEX ELECTRONICS  
P O BOX 646 REOLANDS CALIF

J-B-T INSTRUMENT INC  
133 HAMILTON ST NEW HAVEN 8 CONN

JEFFERS ELECTRONICS DIV SPEER CARBON CO  
HOOVER AVE DUBOIS PA

JEFFERSON CITY CABINET CO  
JEFFERSON CITY TENN

JEFFERSON ELECTRIC CO  
25TH & MADISON BELLWOOD ILL

JEFFERSON ELECTRONIC PRODUCTS CORP  
322 STATE ST SANTA BARBARA CALIF

JEFFERSON INC RAY  
40 E WERRICK RD FREEPORT N Y

JEFFERSON WIRE & CABLE CORP  
PLEASANT VALLEY RD SUTTON MASS

JEFFREY MFG CO  
803 N 4 ST COLUMBUS 16 OHIO

JEFFRIES TRANSFORMER CO  
610 TURNER ST LOS ANGELES 12 CALIF

JELLIFF MFG CORP C O  
PEQUOT RD SOUTHPORT CONN

JEM ELECTRONICS CORP  
743 CIRCLE AVE FOREST PARK ILL

JEM LABORATORIES INC  
1108 W 5TH ST ASHTABULA OHIO

JENNINGS MACHINE CORP  
3452 LUDLOW ST PHILA PENNA

JENNINGS RADIO MFG CORP  
970 McLAUGHLIN AVE SAN JOSE 8 CALIF

JENSEN INDUSTRIES INC  
7333 HARRISON ST FOREST PARK ILL

JENSEN MFG CO  
6601 S LARAMIE AVE CHICAGO 38 ILL

JERGUSON GAGE & VALVE CO  
ADAMS ST BURLINGTON MASS

JERROLD ELECTRONICS CORP  
15TH & LEHIGH AVE PHILA PENNA

JERSEY PRODUCTION RSCH CO  
1133 N LEWIS TULSA OKLA

JERSEY SPECIALTY CO INC  
P O BOX 235 BAYNE N C

JERVIS CORP  
2900 WILSON AVE S W GRANDVILLE MICH

JESSALL PLASTICS INC  
DIV ELECTRIC STORAGE BATTERY CO B99

FARMINGTON AVE KENSINGTON CONN

JET PROPULSION LAB  
4800 OAK GROVE DR PASADENA CALIF

JETRONIC INDUSTRIES INC  
4312 MAIN ST PHILA 28 PA

JETTRON PRODUCTS  
56 ROUTE 10 HANOVER N J

JED ELECTRONIC CORP  
6101 16 AVE BROOKLYN 8 N Y

JO-BELL PRODUCTS INC  
5456 W 111 ST OAK LAWN ILL

JO-LINE TOOLS INC  
8442 OTIS ST SOUTH GATE CALIF

JOBBINS ELECTRONIC ENTERPRISE  
622 HARTHORNE AVE LOS ALTOS CALIF

JOBBINS ELECTRONICS  
771 HAMILTON AVE MEMO PARK CALIF

JOBBINS ELECTRONICS  
302 E OLIVE AVE SUNNYVALE CALIF

JOERI INDUSTRIES  
2225 GREENWOOD AVE WILMETTE ILL

JOELIN MFG CO  
LUBBERY AVE BALLINGFORD CONN

JOEPE PLASTICS INC  
36 CRESCENT ST BROOKLYN 8 N Y

JOHANSON MFG CO  
P O BOX 329 BOONTON N J

JOHNS-NAVVILLE  
22 E 40TH ST NEW YORK 16 N Y

JOHNS-NAVVILLE DUTCH BRAND DIV  
7800 WOODLAWN AVE CHICAGO 19 ILL

JOHNSON & CO INC K W  
1825 WEBSTER ST DAYTON 4 OHIO

JOHNSON & HOFFMAN MFG CORP  
31 E 2 ST MINEOLA N Y

JOHNSON AIRCRAFT INC  
GEOGRAPHICAL SERVICES DIV P O BOX 10  
HORRISTOWN N J

JOHNSON ASSOCIATES WALTER A  
318 NORTON AVE ENDICOTT N Y

JOHNSON CO E F  
206 2ND AVE S W BASECA MINN

JOHNSON CO BELTON V  
SUMMIT NJ

JOHNSON CORP  
805 WOOD ST THREE RIVERS MICH

JOHNSON ELECTRONICS INC  
P O BOX 1675 HWY 17-92 CASSELBERRY FLA

JOHNSON ELECTRONICS RED  
311 PARK BLVD PALO ALTO CALIF

JOHNSON LABS  
603 RIVERSIDE AVE WESTPORT CONN

JOHNSON MFG CO INC  
MOUNT VERNON IOBA

JOHNSON SERVICE CO  
507 E MICHIGAN ST MILWAUKEE 2 WISC

# ELECTRONIC MANUFACTURERS-A-Z

JOHNSON-WILLIAMS INC  
2625 PARK BLVD PALO ALTO 15 CALIF  
JOHNSTON B PUNK TITANIUM CORP  
# KENBOW AVE WOOSTER OHIO  
JOHNSTON POIL MFG CO  
4106 S BROADWAY ST LOUIS 11 MO  
JONES & LAUGHLIN STEEL CORP  
3 GATEWAY CENTER PITTSBURGH 30 PA  
JONES & BETTLAUER ENGR CORP  
11780 W PICD BLVD LOS ANGELES 64 CALIF  
JONES DIV HOWARD B CINCINNATI OHIO  
1024 S HOWARD AVE CHICAGO 24 ILL  
JONES ELECTRONICS CO INC N C  
185 N MAIN ST BRISTOL CONN  
JONES ELECTRONICS MIRAM  
2313 W OLIVE AVE BURBANK CALIF  
JONES LAMSON MACHINE CO  
500 BRADLEY BLVD SPRINGFIELD MASS  
JONES OPTICAL WORKS A O  
2400 MASSACHUSETTS AVE CAMBRIDGE 40 MASS  
JONESVILLE PAPER TUBE CORP  
474 BECK RD JONESVILLE NICH  
JONTZ MFG CO INC  
1101 E MCKINLEY AVE HISHABAKA IND  
JORDAN CO  
3235 W HAMPTON AVE MILWAUKEE 9 WIS  
JORDAN ELECTRONICS DIV VICTOREEN  
3029 W MISSION RD ALHAMBRA CALIF  
JORDAN-WHITE  
420 LEXINGTON AVE NEW YORK NY  
JOSLYN-HUSON INC  
11982 WILSHIRE BLVD LOS ANGELES 25 CALIF  
JOSLYN-HUSON INC/SUB ANELCO INC  
1090 COLORADO AVE SANTA MONICA CALIF  
JOY MFG CO  
333 OLIVER BLDG PITTSBURGH 22 PA  
JOY MFG CO  
338 S BROADWAY NEW PHILA OHIO  
JOY MFG CO ELECTRICAL PRODUCTS DIV  
1201 WACKLIN AVE ST LOUIS 10 MO  
JUALL BEAR CO INC  
1108 BOFFLE RD HAWTHORNE N J  
JUDD WIRE MFG CORP  
22 AVE A TURNERS FALLS MASS  
JUSON RESEARCH & MFG CO  
CONSHOHOCKEN PENNA  
JULIE RESEARCH LABS  
956 W 156 ST NEW YORK 32 N Y  
J-V-M MICROVAPE CO  
9300 W 47TH ST BROOKFIELD ILL  
J W COIL CO  
5917 S MAIN ST LOS ANGELES 3 CALIF

**K**

KAAR ENGG CORP  
2995 MIDDLEFIELD RD PALO ALTO CALIF  
KAHL SCIENTIFIC INSTRUMENT CORP  
P O BOX 1166 EL CAJON CALIF  
KAHLE ENGG CO  
1307 7 ST N BERGEN N J  
KAHLENBERG BRGS CO  
780 RIVERS WISC  
KAHN & CO  
885 BELLS ROAD WETHERSFIELD HARTFORD CONN  
KAHN RESEARCH LABS  
22 PINE ST FREEPORT N Y  
KAISER AIRCRAFT & ELECTRONICS DIV KAISER IND  
P O BOX 1878 OAKLAND 4 CALIF  
KAISER AIRCRAFT & ELECTRONICS  
DIV KAISER IND CORP TOLEDO ELECTRONICS PLT  
P O BOX 437 TOLEDO 1 OHIO  
KAISER AIRCRAFT & ELECTRONICS CORP  
880 DOLLITTLE DR SAN LEANDRO CALIF  
KAISER AIRCRAFT & ELECTRONICS  
80X 900B PHOENIX ARIZONA  
KAISER ALUM & CHEM  
8TH FLOOR KAISER CENTER OAKLAND CALIF  
KAISER ALUMINUM & CHEMICAL  
919 N MICHIGAN AVE CHICAGO 11 ILL  
KAISER A/C & ELECTR BEST COAST ELECTR LAB  
850 SAN ANTONIO RD PALO ALTO CALIF  
KAISER ELECTRONICS INC  
13 MONROE ST UNION N J  
KALART CO INC  
MULTENEUS ST PLAINVILLE CONN  
KAMAN AIRCRAFT CORP  
OLD WINDSOR RD BLOOMFIELD CONN  
KANDY TAPES & RECORDS CORP  
203 N WABASH CHICAGO 1 ILL  
KANE MFG CORP  
P O BOX 641 N FRALEY ST KANE PA  
KANE PRODUCTIONS AL  
1411 WALNUT ST PHILADELPHIA 2 PA  
KANEHATSU N Y INC  
150 BROADWAY NEW YORK NY  
KAND LABS  
1000 S THOMPSON LA NASHVILLE 11 TENN  
KANTHAL CORP  
AMELIA PLACE STAMFORD CONN  
KAPITOL MAGNETIC CORP  
2241 N KNOX AVE CHICAGO 39 ILL  
KARLSON INC KARMAN  
520 MAIN ST WESTBURY L I N Y  
KARLSON ASSOCIATES INC  
433 HEMPSTEAD AVE WEST HEMPSTEAD N Y  
KARMAN AIRCRAFT CORP  
BLOOMFIELD CONN  
KARTRON  
P O BOX 672 HUNTINGTON BEACH CALIF  
KATY ENGG CO  
1415 J AVE HANKATO MINN  
KATOLIGHT CORP  
15T AVE AT CHESTNUT HANKATO MINN  
KAUKE & CO INC  
1632 EUCLID ST SANTA MONICA CALIF  
KAUPP C B 3045  
MEARER WAY HARLEWOOD NJ

KARECH J CHEMICAL CO  
220 E 42ND ST NEW YORK N Y  
KAY ELECTRIC CO  
MAPLE AVE PINE BROOK N J  
KAY-TOWNES ANTENNA CO  
BOX 593 ROME GA  
KAYRAC CO  
BOX 2001 TERMINAL AR LOS ANGELES CAL  
KAYRAC MFG CO INC  
BOX 2001 TERMINAL ANNEX LOS ANGELES CALIF  
KEARFOTT CO INC  
561 MCBRIDE AVE W PATERSON NJ  
KEARFOTT CO INC  
93 HOWARD ST IRVINGTON 11 N J  
KEARFOTT CO INC  
293 N VINEWOOD AVE PASADENA CALIF  
KEARFOTT CO INC  
1378 MAIN AVE CLIFTON N J  
KEARFOTT CO INC  
359 LITTLETON AVE NEWARK 3 N J  
KEARFOTT CO INC ASHEVILLE DIV  
RT 70 BLACK MOUNTAIN NC  
KEARFOTT CO INC COMPONENTS DIVN  
460 TOTOWA AVE PATERSON 2 N J  
KEARFOTT DIV GENERAL PRECISION INC  
1150 MCBRIDE AVE LITTLE FALLS N J  
KEARFOTT DIV GENERAL PRECISION INC  
14844 OGDARD ST VAN NUYS CALIF  
KEASBEY & HATTISON CO  
BUTLER AVE AMBLER PA  
KECKLEY CO O C  
3400 CLEVELAND ST SKOKIE ILL  
KEES MFG CO F O  
700 PARK DECATRICE NEBR  
KEIL ENGG PRODUCTS CO  
6833 MANCHESTER AVE ST LOUIS 10 MO  
KEITHLEY INSTRUMENTS INC  
12415 EUCLID AVE CLEVELAND 6 OHIO  
KELLER JR MFG P  
50 E 42ND ST NEW YORK 17 N Y  
KELLOGG SWITCHBOARD 8 SUPPLY  
6850 S CHICAGO AVE CHICAGO 38 ILL  
KELLOGG SWITCHBOARD SUPPLY  
4000 W 51 ST CHICAGO 38 ILL  
KELSEY HAYES CO CALIFORNIA DIV  
2845 LEONIS BLVD LOS ANGELES 38 CALIF  
KELSEY-HAYES CO  
3606 MILITARY AVE DETROIT 32 MICH  
KELSH INSTRUMENT CO INC  
1031 E BALTIMORE ST BALTIMORE 2 MD  
KELVIN & HUGHES LTD  
80 SHORE RD PORT WASHINGTON NY  
KELVIN ELECTRIC CO  
5907 NOBLE AVE VAN NUYS CALIF  
KEMET CO DIV UNION CARBIDE CORP  
P O BOX 6087 CLEVELAND 1 OHIO  
KEMET DIV  
30 E 42ND ST NEW YORK N Y  
KEMRITE LABS INC  
1819 W GRAND AVE CHICAGO 22 ILL  
KENODE MFG CO  
161 E 18 ST NEW YORK 11 N Y  
KENP AERO PRODUCTS CO INC  
MARSHALL HILL RD WEST MILFORD N J  
KENTRON ELECTRON PRODUCTS INC  
14 PRINCE PL NEWBURYPOR MASS  
KEN-TRON CORPORATION  
399 LYNNWAY LYNN MASS  
KENDALL CO POLYKEN SALES DIV  
300 W HICKORY BLVD CHICAGO 20 ILL  
KENN EQUIPMENT CO  
16-18 S MARSHALL PHILA PA  
KENNAMETAL INC  
LLOYD AVE LATROBE PA  
KENNEDY & CO D S  
432 S MAIN ST COMASSET MASS  
KENNEDY INDUSTRIES  
1581 E CHARLES ST BANNING CALIF  
KENT CORP F C  
133 MANCHESTER PLACE NEWARK 9 N J  
KENT LIGHTING CORP  
500 JOHNSON AVE BROOKLYN 37 N Y  
KENT TV INC  
505 DRIGGS AVE BROOKLYN 11 NY  
KENTRON  
1140 BATHURU ST HONOLULU 14 HAWAII  
KENWOOD ENGG CO  
265 COLFAX AVE KENILWORTH N J  
KENYON TRANSFORMER CO  
1057 SUMMIT AVE JERSEY CITY 7 N J  
KEPCO INC  
131 38 SANFORD AVE FLUSHING 55 N Y  
KERN INSTRUMENTS INC  
120 GRAND ST WHITE PLAINS N Y  
KERRCO PRODUCTS  
PO BOX 4178 LINCOLN 7 NEBR  
KESLER CHEMICAL CO INC  
STATE RD & COTTMAN AVE PHILA 35 PA  
KESTER SOLDER CO  
4201 WRIGHTWOOD AVE CHICAGO 39 ILL  
KETAY DEPT NORDEEN DIV UNITED AIRCRAFT CORP  
JERICHO TPK COMACK LI N Y  
KEUFFEL & ESSER CO  
ADAMS & THIRD STS HOBOKEN N J  
KEY RESISTOR CORP  
321 W REDONDO BEACH BLVD GARDENA CALIF  
KEYSTONE BOLT & NUT CORP  
125 CHURCH ST NEW YORK 7 NY  
KEYSTONE CARBON CO  
1935 STATE ST ST HARTS PA  
KEYSTONE ELECTRONICS CO  
114 MANHATTAN ST STAMFORD CONN  
KEYSTONE ELECTRONICS CO  
65 7 AVE NEWARK 4 N J  
KEYSTONE ELECTRONICS CORP  
49 BLEECKER ST NEW YORK 12 N Y  
KEYSTONE PRODUCTS CO  
904-6 23RD ST UNION CITY N J

K-F DEVELOPMENT CO  
2606 SPRING ST REDWOOD CITY CALIF  
K F INDUSTRIES  
230 B DAUPHIN ST PHILADELPHIA 33 PA  
K F PRODUCTS INC  
3100 E 43RD AVE DENVER 16 COLO  
KFR CORP  
6009 B WASHINGTON BLVD CULVER CITY CALIF  
K-G ELECTRONICS CORP  
425 BELLINGTON AVE CHICAGO 14 ILL  
KIBBY INSTRUMENT CO  
P O BOX 50 PERKINS CALIF  
KICKHAEPER MFG CO  
901 S 2ND ST MILWAUKEE 4 WISC  
KIDCO INC  
PO BOX 178 RT 70 MEDFORD N J  
KIDDE & CO WALTER  
1154 MAIN ST BELLEVILLE 9 N J  
KIDDE ULTRASONIC & DETECTION ALARMS INC  
1154 BRIGHTON RD CLIFTON N J  
KIELEY & MUELLER INC  
1156 BRIGHTON RD ALLWOOD STA CLIFTON N J  
KILE ENGG CO  
2011 3RD ST LAVERNE CALIF  
KILGEN AIRCRAFT DIV KILGEN ORGAN CO  
4632 W FLORISSANT AVE ST LOUIS 15 MO  
KILGEN ORGAN CO KILGEN AIRCRAFT DIV  
P O BOX 94 CLAYTON 5 MO  
KILOVOLT CORP  
2 WAGON HOUSE SQUARE YONKERS N Y  
KIMBLE GLASS CO  
P O BOX 1035 TOLEDO 1 OHIO  
KIMBLE GLASS  
OBENS ILL  
KIN TEL COHU ELECTRONICS DIV  
27419 SANTA CLARITA RD SAUGUS CALIF  
KIN TEL RESEARCH DIV  
18743 LULL ST VAN NUYS CALIF  
KINE-AB  
3250 KENILWORTH AVE BERYN ILL  
KINETIC INSTRUMENT CO  
491 S BEVERLY PL LAKE FOREST ILL  
KINETICS CORP  
410 S CEDROS AVE SOLANA BEACH CALIF  
KINGEY-HALLEN DIV ELECTROMOTION CO  
1644 18 ST SANTA MONICA CALIF  
KING ELECTRIC EQUIPMENT CO  
9123 INMAN AVE CLEVELAND 5 OHIO  
KING ELECTRONICS  
915 MERIDIAN AVE PASADENA CALIF  
KING LABORATORY INC  
2845 SO 2ND ST SEASALT LAKE CITY 15 UTAH  
KING LABS INC  
127 SOLAR ST SYRACUSE 3 N Y  
KING RADIO CORP  
9700 W 75TH ST MERRIAN KAN  
KIMB'S ELECTRONICS CO INC  
40 MARLEDALE RD TUCKAHOE N Y  
KINGSLEY MACHINE CO  
850 CAMERON BLVD HOLLYWOOD 38 CALIF  
KINGSTON ELECTRONICS DIV KINGSTON IND INC  
NORTH ST MEDFIELD MASS  
KINN ELECTRONICS CORP  
4104 PINKNEY RD BALTIMORE 15 MD  
KINNEY CO JOSEPH  
35CAMORE ST CARNEGIE PA  
KINNEY VACUUM DIV NEW YORK AIR BRAKE CO  
3529 WASHINGTON ST BOSTON 30 MASS  
KINSMAN MFG CO INC  
LACONIA N H  
KINTEL  
3725 KEARNY VILLA RD SAN DIEGO 12 CALIF  
KINTRONIC  
FRANKLIN SQUARE ILL  
KIP ELECTRONIC CORP  
29 HOLLY PL P O BOX 562 STAMFORD CONN  
KIRCHBERGER & CO N  
83-91 W FOREST AVE ENGLEWOOD N J  
KIRKLAND CO H R  
8 KING ST MORRISTOWN 4 N J  
KIRKWOOD COMPUTATOR CORP  
4859 W 130TH ST CLEVELAND OHIO  
KIRSCH MUSIC CORP  
36-27 PRINCE ST FLUSHING 54 N Y  
KIRYU EIKOSHA CO LTD  
TOKYO JAPAN  
KISTLER INSTRUMENT CORP  
15 WEBSTER ST N YONAHANDA N Y  
KIT-TRONICS  
2315 HENDOLA DR N E ALBUQUERQUE NEW MEX  
KLANN ORGAN SUPPLY CO  
PARK STATION BAYNESBORO VA  
KLEER VUE MFG CO INC  
P O BOX 10326 PITTSBURGH 34 PA  
KLEIN & SOHN MATHIAS  
7200 MCCORMICK RD CHICAGO 45 ILL  
KLEIN ELECTRONICS CO LEO  
1 2404 S LABREA AVE LOS ANGELES 16 CALIF  
KLEINSCHMIDT DIV SMITH-CORONA MARCHANT INC  
COUNTY LINE RD DEERFIELD ILL  
KLEIG BROS  
UNIVERSAL ELECTRIC STAGE LIGHTING CO INC  
321 E 50TH ST NEW YORK 19 N Y  
KLINCHER LOCKNUT CORP  
2153 HILLSIDE AVE INDIANAPOLIS 18 IND  
KLINE IRON & STEEL CO  
P O BOX 1013-1225-35 MUGER ST COLUMBIA 8 MO  
KLING METAL SPINNING & STAMPING CO  
245 CENTRAL ST NEW YORK 13 N Y  
KLING ELECTRO PHYSICS INC  
936-38 INDUSTRIAL AVE PALO ALTO CALIF  
KNIGHT CORP EBEN  
EAST NATICK MASS  
KNIGHT ELECTRONICS  
210 S DES PLAINES ST CHICAGO 6 ILL  
KNIGHTS CO JAMES  
CHURCH & BELLS STS SANDWICH ILL

# ELECTRONIC MANUFACTURERS-A-Z

KNOPP INC  
1307 66TH ST OAKLAND 8 CALIF  
KNOWLES ELECTRONICS INC  
10545 ANDERSON PLACE FRANKLIN PARK ILL  
KNOWLTON BROTHERS  
WATERTOWN N Y  
KOLBE KOSYO CORP  
800AYAMA-DARI 1-CHROME LOBE JAPAN  
KOBZY TOOL CO  
1535 N DAYTON ST CHICAGO ILL  
KOCH & SONS M  
HWY 101 CORTE MADERA CALIF  
KOCOUR CO  
4800 S ST LOUIS AVE CHICAGO 32 ILL  
KOH-I-NOOR PENCIL CO  
BLOOMSBURG N J  
KOWLER CO  
KOWLER WISC  
KOILED BORDS DIV WHITNEY BLAKE CO  
1565 DIXWELL AVE NEW HAVEN 14 CONN  
KOLLMAN CASE CORP  
P O BOX 180 FT WAYNE 1 IND  
KOLLMORGEN OPTICAL CORP  
347 KING ST NORTHAMPTON MASS  
KOLLSHAN INSTRUMENT CORP  
80-08 49TH AVE ELMHURST 73 N Y  
KOLLSHAN INSTRUMENT CORP  
UNDER HILL BLVD & JERICHO STOSSET L I N Y  
KOLTON ELECTRIC MFG CO  
123 N J RAILROAD AVE NEWARK 5 M J  
KONIGSLOD STAMPING & TOOL CO E  
ELWOOD IND  
KONTES GLASS CO  
VINELAND N J  
KOOLTRONIC FAN CO  
CARTER RD AT ROSEDALE PRINCETON N J  
KOPP GLASS INC  
5855VALE PITTSBURGH 18 PENNA  
KOPPERS CO INC  
KOPPERS CO PITTSBURGH 19 PENNA  
KOPPERS CO INC METAL  
200 SCOTT ST BALTIMORE MD  
KORFUND CO INC  
48-15 32ND PL LONG ISLAND CITY 1 N Y  
KOST PRODUCTS CO  
2335 N CICERO AVE CHICAGO 39 ILL  
KRAUTER A CO  
285 18 AVE NEWARK 3 N J  
KRAMER TRENTON CO  
OLDEN & BREWING AVE TRENTON 5 N J  
KRANTZ HARRY  
89 CHAMBERS ST NEW YORK 7 N Y  
KRAUTER ELECTRIC MACHINE CO  
360 GROVE ST NEWARK 3 M J  
KRAUTER-WEBER TOOL CO  
69 12TH AVE NEWARK 2 NJ  
KRECKMAN CO HERB  
CRESCO PA  
KRENGEL MFG CO  
227 FULTON ST NEW YORK 7 NY  
KRISZ ELECTRONICS INC  
191-195 ORATON ST NEWARK 4 N J  
KROHN-NITE CORP  
580 MASSACHUSETTS AVE CAMBRIDGE 39 MASS  
KROKER ENGG & DEVEL CO  
9947 FRANKLIN AVE FRANKLIN PARK ILL  
KRUGER INSTRUMENTS HAROLD  
313 N VALLEY BLVD SAN GABRIEL CALIF  
KRYLON INC  
FORD & WASHINGTON STS NORRISTOWN PA  
KRYSIMEL CORPORATION  
FOX ISLAND RD PORT CHESTER N Y  
KTV TOMER & COMMUNICATION EQUIP CO  
P O BOX 294-620 S HAMILTON ST SULLIVAN ILL  
KUNH ELECTRONICS INC  
1801 HILLS AVE NORWOOD 12 OHIO  
KUMKE H  
HOLSTEIN GERMANY  
KUMICK & SOFFA MFG CO  
1234 CALLOHBILL ST PHILA 23 PA  
KULITE TUNGSTEN CO  
1040 HOYT AVE RIDGEFIELD N J  
KULKA ELEC CORP  
633 S FULTON ST MT VERNON NY  
KUPFMAN MFG CORP  
189 PROSPECT AVE BINGHAMTON N Y  
KURMAN ELECTRIC CO SUB CRESCENT PETROLEUM CO  
191 NEBEL ST BROOKLYN 23 N Y  
KURSTON ELECTRONICS  
702 BAY ST STATEN ISLAND 4 N Y  
KURZ-KASCH INC  
1421 S BROADWAY DAYTON 1 OHIO  
KUSS INDUSTRIES INC  
TACONY B LEWIS STS PHILADELPHIA 24 PA  
KUTME LABS  
730 S 13 ST NEWARK 3 N J  
K-V TRANSFORMER CORP  
20 E FRANKLIN ST DANBURY CONN  
K-B ENGINEERING WORKS  
950 R1632B PIN OAK COURT BUTLER WISC  
KBIKHEAT MFG CO  
3732 SAN FERNANDO RD GLENDALE 4 CALIF  
KYBERNETS CORP  
P O BOX 1346 PITTSBURGH 30 PA

LAN CORP  
E ONONDAGA SKANEATELES N Y  
LAB FOR SCIENCE  
3431 COLLEGE AVE P O BOX 2925 OAKLAND  
CALIF  
LAB-TRONICS INC  
3656 N LINCOLN AVE CHICAGO 13 ILL

LABELLE INDUSTRIES INC  
510 S BORTHINGTON ST OCONOMOC WISC  
LABELON TAPE CO  
450 ATLANTIC AVE ROCHESTER 9 N Y  
LABKO SCIENTIFIC INC  
111 B ELM STILLWATER OKLA  
LABLINE INC  
3070 W GRAND AVE CHICAGO 22 ILL  
LABORATOIRE INDUSTRIEL DE PHYSIQUE APPLIQUEE  
67 RUE RUA TE-ANNE COLOMBIER 67 BAGNOLET  
SEINE PARIS FRANCE  
LABORATORY EQUIPMENT CORP  
LAKEVIEW & HILLTOP RD ST JOSEPH MICH  
LABORATORY FOR ELECTRONICS INC  
1079 COMMONWEALTH AVE BOSTON 15 MASS  
LACESA ENGG CORP  
5614 W GRAND AVE CHICAGO 39 ILL  
LAFAYETTE RADIO  
BOSTON MASS  
LAFAYETTE RADIO  
NEWARK N J  
LAKE MFG CO  
2333 CHESTNUT ST OAKLAND 7 CALIF  
LAMACO INC  
9230 W GRAND AVE FRANKLIN PARK ILL  
LAMARCHE MFG CO  
3955 25TH AVE SCHILLER PARK ILL  
LAMB ELECTRIC CO  
LAKE ST RENT OHIO  
LAMB ELECTRONIC INSTRUMENT  
5636 LANDALE HOUSTON 23 TEXAS  
LAMBDA ELECTRONICS CORP  
11-11 131 ST COLLEGE POINT 34 N Y  
LAMBDA PACIFIC ENGG CORP  
P O BOX 70 VAN NUYS CALIF  
LAMINAIR INC  
1850 S BROADWAY GARDENA CALIF  
LAMINATED FOILS INC  
62-05 30TH AVE WOODSIDE L I 77 N Y  
LAMINATED SHEET PRODUCTS CORP  
449 NEPONSET ST NORWOOD MASS  
LAMINATED SHIM CO  
UNION STREET GLENBROOK CONN  
LAMINATIONS CO  
P O BOX 13 STAMFORD CONN  
LA MORSE CO  
2433 BIRKDALE ST LOS ANGELES 31 CALIF  
LAMOTTE CHEMICAL PRODUCTS CO  
CHESTEROWN MD  
LAMPKIN LABS INC  
TECHNICAL DIVISION BRADENTON FLA  
LANSON B SESSIONS CO  
5025 W 73 ST CHICAGO ILL  
LANSON B SESSIONS CO  
3000 TIEDENAN RD CLEVELAND 9 OHIO  
LANSON CORP  
LANSON ST SYRACUSE 1 N Y  
LANTEX INDUSTRIES INC  
51 STATE ST WESTBURY N Y  
LANCASTER GLASS CORP  
LANCASTER OHIO  
LANCE ANTENNA MFG CORP  
1730-16C2 1ST ST SAN FERNANDO CALIF  
LAND AIR INC  
2304 DOGWOOD LA MOUNTSVILLE ALA  
LAND AIR INC CHEYENNE DIV  
P O BOX 2327 CHEYENNE WYO  
LAND-AIR INC  
7444 B BILSON AVE CHICAGO 31 ILL  
LAND-AIR INC INSTRUMENT & ELECTRONIC DIV  
2133 ADAMS AVE SAN LEANDRO CALIF  
LANDAUER JR & CO S  
3920 216TH ST HATTESON ILL  
LANDIS & GYR  
45 B 45 ST NEW YORK 36 N Y  
LANDSVERK ELECTROMETER CO  
641 SONORA AVE GLENDALE 4 CALIF  
LANE ELECTRONICS MFG CORP  
7254 ATOLL AVE N HOLLYWOOD CALIF  
LANE-WELLS CO  
241 MADELINE DR MONROVIA CALIF  
LANGE MACHINE WORKS INC  
160 N MAY ST CHICAGO 7 ILL  
LANGEVIN DIV W L HANSON CORP  
475 TENTH AVE NEW YORK 18 N Y  
LANSDALE TUBE CO  
SPRING CITY PENNA  
LANSDALE TUBE CO  
6957 B NORTH AVE OAK PARK ILL  
LANSING SOUND CO JAMES B  
2439 FLETCHER DR LOS ANGELES 39 CAL  
LA POINTE INDUSTRIES INC  
155 B MAIN ST ROCKVILLE CONN  
LAPP INSULATOR CO RADIO SPECIALTIES DIV  
318 GILBERT ST LE ROY NY  
LAROZ INSTRUMENTS INC  
1709B E MONTGOMERY AVE ROCKVILLE MD  
LAROSE & ASSOC INC B T  
BOX F LANS STA TROY N Y  
LARSON ELECTRONIC GLASS  
P O BOX 371 2426 EL CAMINO REAL REDWOOD  
CITY CALIF  
LARSON INSTRUMENT CO  
24 ORCHARD ST TARRYTOWN N Y  
LAS-LAB INC  
1113 N ROLLING RD BALTIMORE MD  
LAS-LAB INC  
ROUTE 32 SYKESVILLE MD  
LATHROP'S  
5106 JACKWOOD HOUSTON 35 TEXAS  
LAVELLE AIRCRAFT CORP  
STERLING ST NEWTON PA  
LA VEZZI MACHINE WORKS  
4635 W LAKE ST CHICAGO 48 ILL  
LAVOIE LABS INC  
MATARAN-FREEMOLD RD MORGANVILLE N J  
LAWN ELECTRONICS CO INC  
E FREEMOLD RD FREEMOLD N J

LAWRENCE ADHESIVE & CHEMICAL CO  
LABRENCE MASS  
LAWRENCE MFG CORP  
250 MILL ST BELLEVILLE N J  
LAWTER CHEMICALS INC  
3550 TOLBY AVE CHICAGO 45 ILL  
L & B WELDING EQUIP  
2424 6TH ST BERKELEY CALIF  
L'ACH & BARNER CO INDUSTRIAL DIV  
LEACH & BARNER BLDG ATTLEBORO MASS  
LEACH CORP COMMUNICATIONS DIV  
18435 SUSANNA RD COMPTON CALIF  
LEACH CORP INET DIV  
18435 SUSANNA RD COMPTON CALIF  
LEACH CORP LEACH RELAY DIV  
5915 AVALON BLVD LOS ANGELES 3 CALIF  
LEACH CORP SPECIAL PRODUCTS DIV  
518 E COMPTON BLVD COMPTON CALIF  
LEAK DIV BRITISH INDUSTRIES CORP  
80 SHORE RD PORT WASHINGTON N Y  
LEAR INC  
6100 CAMP BOBIE BLDG P O BOX 12006 WORTH  
16 TEXAS  
LEAR INC  
1518 BROWLEY AVE LA PUENTE CALIF  
LEAR INC  
317 B BUNDY DR SANTA RONICA CALIF  
LEAR INC  
11916 B PICCO BLVD LOS ANGELES 64 CALIF  
LEAR INC ELECTRO-MECHANICAL DIV  
110 IONIA AVE W GRAND RAPIDS MICH  
LEAR INCORPORATED INSTRUMENT DIVISION  
110 IONIA AVENUE N W GRAND RAPIDS MICH  
LEAR ROMEC DIV LEAR INC  
ELYRIA OHIO  
LEBANON STEEL FOUNDRY  
LEBANON PENNA  
LEBEC CHEMICAL CORP  
10066 S GARFIELD AVE PARAMOUNT CALIF  
LEBLANCHE S A  
48 AVENUE DE GANDERSON YVERDON SWITZERLAND  
LECTRONH INC  
5540 NORTHWEST HWY CHICAGO 30 ILL  
LECTRON CORP OF AMERICA  
13460 W REICHERT PL BUTLER WISC  
LEDER CORP  
123 WEBSTER ST DAYTON OHIO  
LEE ELECTRIC INC  
546 S 2ND ST W NEW YORK N J  
L E E INC  
629 N Y AVE N W WASHINGTON I D C  
LEE SPRING CO  
30 MAIN ST BROOKLYN 1 N Y  
LEECE NEVILLE CO  
5109 HAMILTON AVE CLEVELAND 14 OHIO  
LEECE-NEVILLE CO  
GAINSVILLE GA  
LEECE ROY B  
2149 PERKINS BAY SACRAMENTO 18 CALIF  
LEECRAFT MFG CO INC  
60 GREEN ST NEW YORK 12 N Y  
LEEDAL INC  
2929 S HALSTED CHICAGO ILL  
LEEDS & NORTHRUP CO  
4970 STENTON AVE PHILADELPHIA 24 PA  
LEEMATH INC  
OAK DRIVE SYOSSET L I N Y  
LEESONA CORP  
P O BOX 1605 PROVIDENCE 1 R I  
LEETRONICS INC  
30 MAIN ST BROOKLYN 1 N Y  
LEFPO PRODUCTS INC  
15521 LARABUR ST VAN NUYS CALIF  
LEHIGH VALLEY ELECTRONICS ENGG & MFG CO  
215 S 3 ST ALLENTOWN PA  
LEICH ELECTRIC CO  
333 E FIRST ST GENOA ILL  
LEICHTNER MANUFACTURING CO  
1510 N NEIL ST CHAMPAIGN ILL  
LEIGHTON LABS N W  
YORK RD B SUNSET LAKE HATBORO PA  
LEIMAN BROS  
146 CHRISTIE ST NEWARK 3 N J  
LEITCH ENGG CORP  
326 LINCOLN ST RANCRESTER N H  
LEKTRA LABS INC  
154 11 AVE NEW YORK 11 N Y  
LEL INC  
380 OAK ST COPIAGUE N Y  
LELAND AIRBORNE PRODUCTS  
700 E NATIONAL RD VANDALIA OHIO  
LEMER ENGG CO  
1313 WESTERN AVENUE PLYMOUTH IND  
LEMERY INDUSTRIES INC  
8136 W BEAVERTON HIGHWAY PORTLAND 25 ORE  
LEMO INC  
590 WEST ADAMS ST JACKSON RD  
LENAK MFG CO  
FRANKLIN KY  
LENKURT ELECTRIC CO  
1105 COUNTY RD SAN CARLOS CALIF  
LENKURT ELECTRIC CO  
536 VAN BUREN LOS ALTOS CALIF  
LENNARD CO INC P M  
1061 E B ST JACKSONVILLE 6 FLA  
LENOX INSTR CO  
2010 CHANCELLOR ST PHILADELPHIA 3 PA  
LENZ ELECTRIC MFG CO  
1751 N WESTERN AVE CHICAGO 47 ILL  
LEONARD ELEC MFG CO  
3907 PERKINS AVE CLEVELAND 14 OHIO  
LEONARD ELECTRIC PROD CO INC  
67-34TH ST BROOKLYN NY  
LEONARD MFG CO  
39 FRANKLIN PL REVERE 51 MASS

# ELECTRONIC MANUFACTURERS-A-Z

LEPACE MFG CO  
71 HARRIETT RD N BABYLON L I N Y

LEPEL HIGH FREQUENCY LABS  
58-18 37 AVE WOODSIDE 77 NY

LENERA PLASTIC INC  
322 SOUTH AVE GARBOOD N Y

LESA COSTRUZIONI ELETTROMECCANICHE SPA  
VIA BERGAMO 21 MILANO ITALY

LESA OF AMERICA  
11 B 22ND ST NEW YORK 36 N Y

LESIF CO  
LYNDHURST NJ  
LESSELLS & ASSOCIATES INC  
916 COMMONWEALTH AVE BOSTON 13 MASS

LESTERSHIRE SPOOL DIV  
NATIONAL VULCANIZED FIBRE CO 140 BALDWIN  
ST JOHNSON CITY N Y

LETTING RADIO MFG CO  
62 BERKLEY ST VALLEY STREAM N Y

LEUPOLD & STEVENS INSTRUMENTS INC  
6485 N E GLISAN ST PORTLAND 13 ORE

LEVEY LABS MAROLD A  
8127 OLEANDER ST NEW ORLEANS 18 LA

LEVIN & SON LOUIS  
3610 S BROADWAY LOS ANGELES 7 CALIF

LEVINTHAL ELECTRONIC PRODUCTS INC  
5180 MANOVER ST PALO ALTO CALIF

LEVITON MFG CO  
236 GREENPOINT AVE BROOKLYN 22 N Y

LEVOLOR LORENTZEN INC M K LORENTZEN DIV  
391 B BROADWAY NEW YORK 12 N Y

LEWIS & KAUFMAN LTD  
1732 EL RANCHO AVE LOS GATOS CALIF

LEWIS CO E  
11 BRAGA ST E HARTFORD 8 CONN

LEWIS ELECTRONICS INC  
103 B INDIAN SCHOOL RD PHOENIX ARIZ

LEWIS INSTRUMENTS  
P O BOX 397 LOCKPORT N Y

LEVYMAN CORP MAGNETICS DIV  
5178 GOODSHIRE RD CINCINNATI 38 OHIO

LEWIS-OWENS FORD GLASS CO  
808 MADISON AVE TOLEDO 3 OHIO

LIBBY WELDING CO INC  
2700 TRUMAN RD KANSAS CITY 27 MO

LIBERTY MFG CORP  
2787 BELMONT AVE YOUNGSTOWN 5 OHIO

LIBERTY MIRROR DIV  
LIBBY OWENS FORD GLASS CO BRACKENRIDGE  
KY

LIBRASCOPE DIV GENERAL PRECISION INC  
100 E TULUNGA AVE BURBANK CALIF

LIBRASCOPE DIV GENERAL PRECISION INC  
858 WESTERN AVE GLENDALE 1 CALIF

LIBRASCOPE INC  
670 ARQUES AVE SUNNYVALE CALIF

LICON DIV ILLINOIS TOOL WORKS  
6606 W DAKIN ST CHICAGO 34 ILL

LIEBEL-FLARSHEIM CO  
111 E AMITY RD CINCINNATI 15 OHIO

LIECO INC  
130 EILEEN WAY SYOSSET L I N Y

LIFE INSTRUMENT CO  
200 BROOK ST FRANKLIN MASS

LIGHT ELECTRIC CORP  
214 LACKAWANNA AVE NEWARK 3 N J

LIN ELECTRIC CO  
271 67TH ST NEWARK 3 N Y

LINAIR AIRCRAFT INST CO  
LINDEN A/P LINDEN N J

LINCOLN ELECTRIC CO  
22801 ST CLAIR AVE CLEVELAND 17 OHIO

LIND INSTRUMENTS INC  
357 MASSAUI ST PRINCETON N J

LINDBERG ENGG CO  
2450 W HUBBARD ST CHICAGO 12 ILL

LINDE CO DIV UNION CARBIDE CORPORATION  
270 PARK AVENUE NEW YORK 17 N Y

LINDGREN & ASSOC ERIK A  
4915 N RAVENWOOD CHICAGO 40 ILL

LINDLY & CO  
248 MERRICKS RD WINDOLA N Y

LINDSAY STRUCTURE DIV INTL STEEL CO  
1321 EDGAR EVANSVILLE 7 INDI

LIME ELECTRIC CO  
231 RIVER STREET ORANGE N J

LIME MATERIAL INDUSTRIES  
700 B MICHIGAN BELLAIR WISC

LIMEAR INC  
STATE RD & LEVICK ST PHILADELPHIA 35 PA

LIMELL ENGG CORP CHAS S  
3974 W AVONDALE AVE CHICAGO 41 ILL

LINEMASTER SWITCH CORP  
WOODSTOCK CONN

LING ELECTRONICS DIV LING ALTEC ELEC INC  
1515 S MANCHESTER AVE ANAHEIM CALIF

LING ELECTRONICS INC  
9937 JEFFERSON BLVD CULVER CITY CALIF

LING SYSTEMS INC  
11949 VOSE ST N HOLLYWOOD CALIF

LINK AVIATION  
530 UNIVERSITY AVE PALO ALTO CALIF

LINK AVIATION INC  
1525 N DET 39 (M45) QUONSET POINT B I

LINK AVIATION INC  
7046 HOLLYWOOD BLVD HOLLYWOOD 28 CALIF

LINK AVIATION INC  
BINGHAMTON N Y

LINK AVIATION INC  
P O BOX 3055 OVERLOOK BR DAYTON 31 OHIO

LINK-BELY CO  
DEPT E1 PRUDENTIAL PLAZA CHICAGO 1 ILL

LINLAR INC  
4101 SAN FERNANDO RD GLENDALE 8 CALIF

LINOFILM CORP  
WELLSBORO PA

LIONEL CORP  
28 SAGER PL IRVINGTON N J

LIPPS CO EDWIN A  
1511 COLORADO AVE SANTA MONICA CALIF

LIQUIDOMETER CORP  
81-03 36 ST LONG ISLAND CITY 1 N Y

LISER CO J B  
CLIFTON SPRINGS N Y

LITHIUM CORP OF AMERICA  
2500 RAND TOWER MINNEAPOLIS 2 MINN

LITTELFUSE INC  
1865 MINER ST DES PLAINES ILL

LITTLE FALLS ALLOYS  
188 CALDWELL AVE PATERSON N J

LITTLEFOOT BROS INC  
451 E PEARL ST CINCINNATI 2 OHIO

LEBIS ENGINEERING CO  
339 CHURCH ST NAUBATUCK CONN

LITTON ENGG LABS  
P O BOX 948 GRASS VALLEY CALIF

LITTON IND  
8798 COLBATH VAN NUYS CALIF

LITTON IND COMPONENTS DIV  
5873 RODEO RD LOS ANGELES 16 CALIF

LITTON INDUSTRIES  
1476 66TH ST EMERYVILLE CALIF

LITTON INDUSTRIES  
6700 ETON AVE CANOGA PARK CALIF

LITTON INDUSTRIES  
10954 GARDEN GROVE AVE NORTHRIIDGE CALIF

LITTON INDUSTRIES  
16356 LONOEIUS ST SEPULVEDA CALIF

LITTON INDUSTRIES ELECTRON TUBE DIVISION  
960 INDUSTRIAL RD SAN CARLOS CALIF

LITTON INDUSTRIES ELECTRONIC EQUIP DIV  
336 N FOOTHILL RD BEVERLY HILLS CALIF

LITTON INDUSTRIES INC  
10914 B WASHINGTON BLVD CULVER CITY CALIF

LITTON INDUSTRIES INC  
2205 STONER AVE LOS ANGELES 64 CALIF

LITTON INDUSTRIES RESEARCH DIV  
4900 CALIFORNIA COLLEGE PARK MD

LITTON INDUSTRIES POTENTIOMETER DIV  
215 S FULTON AVE MT VERNON N Y

LITTON INDUSTRIES U S ENGG DIV  
13536 SATIICO ST VAN NUYS CALIF

LIVINGSTON AUDIO PROD CORP  
BOX 208 CALDWELL N J

LIVINGSTON AUDIO PRODUCTS CORP  
BOX 202 CALDWELL N J

LIVINGSTON ELECTRONIC CORP  
P O BOX 3 LIVINGSTON N J

LOCKHEED  
2079 BELLE AVE SAN CARLOS CALIF

LOCKHEED  
2555 N HOLLYWOOD WAY BURBANK CALIF

LOCKHEED  
3251 MANOVER PALO ALTO CALIF

LOCKHEED ACFT CORP  
SANTA CRUZ RURAL STA SANTA CRUZ CALIF

LOCKHEED AIRCRAFT  
MARIETTA GA

LOCKHEED AIRCRAFT CO  
ROUTE 1 DABSONVILLE GA

LOCKHEED AIRCRAFT CO -M45  
1123 N MATHILDA AVE SUNNYDALE CALIF

LOCKHEED AIRCRAFT CORP  
P O BOX 428 SANTA MARIA CALIF

LOCKHEED AIRCRAFT CORP  
BLD 401 54-1 PALMDALE CALIF

LOCKHEED AIRCRAFT CORP  
2555 N HOLLYWOOD WAY BURBANK CALIF

LOCKHEED AIRCRAFT CORP NEWPORT DIV  
P O BOX 22174 LOS ANGELES 22 CALIF

LOCKHEED AIRCRAFT ELECTRONICS & AVIONICS DIV  
6201 E RANDOLPH ST LOS ANGELES 22 CALIF

LOCKHEED AIRCRAFT MISSILES & SPACE DIV  
7701 WOOLLEY AVE VAN NUYS CALIF

LOCKHEED AIRCRAFT MISSILES  
PAGE MILL RD PALO ALTO CALIF

LOCKHEED AIRCRAFT MISSILES & SPACES DIV  
20510 WAPA ST CANOGA PARK CALIF

LOCKHEED AIRCRAFT SERVICES  
3884 N LYNDOK DR CLAREMONT CALIF

LOCKHEED AIRCRAFT SPECIAL DEVICES DIV  
ONTARIO INT A/P ONTARIO CALIF

LOCKHEED AIRCRAFT-M45 DIV  
P O BOX 504 SUNNYVALE CALIF

LOCKHEED ELECTRONICS CO STAVID DIV  
U S ROUTE 22 PLAINFIELD N J

LOCKHEED MISSILE & SPACE DEPT J-93  
P O BOX 504 962 E EL CAMINO REAL SUNNYVALE  
CALIF

LOCKBY-HYDROP RESS DIV  
BALDWIN-LINA-HAMILTON CORP 111 5TH AVE NEW  
YORK 10 NY

LOCKE SOLAR ENGRS J M  
2171 B WASHINGTON BLVD LOS ANGELES 18  
CALIF

LOCKHEED CO C B  
633 BERGEN ST BROOKLYN 38 N Y

LOBETHRONICS INC  
500 E POWHIE AVE ALEXANDRIA VA

LOMASNEY CO DA  
BROADWAY NEW YORK N Y

LONDON CHEMICAL CO INC  
1335 N 31ST AVE MELROSE PARK ILL

LONG ENGRG CO  
961 BURKE ST WINSTON-SALEM N CAR

LONG INC THOMAS J  
215 STONEHENGE LA CARLE PL L I N Y

LONG-LOK CORP  
2681 COLORADO AVE SANTA MONICA CALIF

LONGVIEW AIRCRAFT CO  
2576 W CARSON ST TORRANCE CALIF

LORAIN COUNTY RADIO CORP  
203 9TH ST LORAIN OHIO

LORAL ELECTRONICS CORP  
825 BROWN RIVER AVE NEW YORK 72 N Y

LOREBN CORP  
21 CLEVELAND ST VALLEY STREAM L I N Y

LORD MFG CO  
1635 B 12TH ST ERIE 6 PA

LOUCKS & NORLING  
418 W 54TH ST NEW YORK 10 N Y

LOUTHAN PLANT REFRACATORIES DIV FERRO CORP  
BOX 781 E LIVERPOOL OHIO

LOWELL MFG CO  
3030 LAUREL STATION RD ST LOUIS 17 MO

L & R MFG CO  
577 ELM ST ARLINGTON N J

L & R MFG CO  
577 ELM ST KEARNY N J

LUBRON RUBBER CO  
51 KELVIN ST EVERETT 49 MASS

LUCAS-WILKHAUPT ENG  
5057 SOUTHLAKE DR CAUDARY B18  
LUCKENBACH & CO PAUL  
312 B 231ST ST NEW YORK 63 N Y

LUFKIN RULE CO  
1730 NESS ST SAGINAW MICH

LUMRS & CO C M  
297 HUDSON ST HACKENSACK N J

LUNA ELECTRIC EQUIPMENT CO  
P O BOX 132 TOLEDO 1 OHIO

LUNAR CHEMICAL PRODUCTS  
25 CLIFTON AVE WEST HARTFORD 7 CONN

LUMATRON ELECTRONICS INC  
68 URBAN AVE WESTBURY L I N Y

LUMATRON ELECTRONICS INC  
116 COUNTY COURTHOUSE RD NEW HYDE PARK N Y

LUMEN INC  
BOX 909 JOLIET ILLINOIS

LUMENITE ELECTRONIC CO  
407 S DEARBORN ST CHICAGO 5 ILL

LUMINOUS PROCESSES INC  
161 E 42 ST NEW YORK 17 N Y

LUMINOUS RESINS INC  
166 B WASHINGTON ST CHICAGO 2 ILL

LUNAR ENGINEERING CORP  
1501 CALLE VALLE SAN CLEMENTE CALIF

LUNDELL & CO  
7356 S BOULDAIN AVE CHICAGO 19 ILL

LUNDEY ASSOCIATES INC  
694 MAIN ST WALTHAM 54 MASS

LURN LAMINATES INC  
MUNTINGTON STA L I N Y

LUTHER ELECTRONIC MFG CO  
5728 B WASHINGTON BLVD LOS ANGELES 16  
CALIF

LUTHER MFG CO  
7312 WARRA AVE N HOLLYWOOD CALIF

LUX CLOCK MFG CO  
JOHNSON ST WATERBURY CONN

LUXO LAMP CANADA LTD  
370 STE CROIX BLVD MONTREAL 9 P O CANADA

LUXO LAMP CORP  
DOCK STREET PORT CHESTER N Y

LUXOR LIGHTING PROD INC  
EMPIRE STATE BLDG ROOM 7001 N Y N Y

LUZERNE RUBBER CO  
BOX 2191 TRENTON 7 N J

LYON ENGS  
85 ZABRISKIE ST HACKENSACK N J

LYMAN ELECTRONIC CORP  
P O BOX 1649 SPRINGFIELD 1 MASS

LYNCH CARRIER SYSTEMS INC  
695 BRYANT ST SAN FRANCISCO 7 CALIF

LYNCOACH & TRUCK CO INC  
ONEONTA N Y

LYNCO AIRCRAFT INC  
140 CLIFFORD ST NEWARK 3 N J

LYNMAN ENGINEERS INC  
1432 N CARLISLE ST PHILADELPHIA 21 PA

LYON AIRCRAFT SERVICE  
2701 N ONTARIO ST BURBANK CALIF

LYON METAL PRODUCTS INC  
YORK PA

LYON METAL PRODUCTS INC  
P O BOX 471 AURORA ILL

LYONS LTD CLAUDE  
80 SHORE RD PORT WASHINGTON NY

LYTLE CORP  
1404 SAN MATEO BLVD S E ALBUQUERQUE N MEX

LYTLE CORPORATION  
188 B RANDOLPH ST CHICAGO 1 ILL

## M

MACARR INC  
4360 BULLARD AVE NEW YORK 66 N Y

MACARR INC  
2983 BOSTON RD NEW YORK 67 N Y

MAC DERMID CO  
WATERBURY CONN

MACDONALD AND COMPANY  
1324 ETHEL ST GLENDALE 7 CALIF

MACHINE O MATIC  
2045 N HAY N E AVE CHICAGO 4 ILL

MACHINERY ELECTRIFICATION INC  
35 HUDSON ST NORTHBORO MASS

MACHELTY LABS INC  
1063 HOPE ST SPRINGDALE CONN

MACK ELECTRIC DEVICES INC  
48 GLENSIDE AVE BYNCOTE PENNA

MACKAY INC A D  
188 BROADWAY NEW YORK 38 N Y

MACKAY RADIO - TELEGRAPH CO  
1 HUDSON ST NEW YORK N Y

MACKAY RADIO & TELEGRAPH CO MARINE DIV  
333 TERMINAL AVE CLARK N J

# ELECTRONIC MANUFACTURERS-A-Z

**MACKAY RESEARCH LABS**  
 P O BOX 738 BIRMINGHAM ARIZ  
**MACKENZIE ELECTRONICS INC**  
 145 W HAZEL ST INGLEWOOD 3 CALIF  
**MACLEOD & MANOPOL**  
 10 ROLAND ST CHARLESTOWN 29 MASS  
**MACLEOD INSTRUMENT**  
 8250 N W 11TH AVE FT LAUDERDALE FLA  
**MACON ELECTRONICS**  
 BOX 56 WARRENSBURG ILL  
**MACPANEL CO**  
 124 COLLEGE ST HIGH POINT N C  
**MADIGAN CORP**  
 200 STONEHEDGE LANE CARLE PLACE N Y  
**MADISON FIELDING CORP**  
 5 LORIMER ST BROOKLYN 6 N Y  
**MAGE ELECTRONICS CO**  
 4706 W BALTON ST CHICAGO 51 ILL  
**MAGIC VUE TV CORP**  
 323 E 13TH ST NEW YORK N Y  
**MAGNA HEAD ELECTRONICS**  
 7129 VARNNA ST N HOLLYWOOD CALIF  
**MAGNADYNE CORP**  
 PORT CHESTER N Y  
**MAGNAFLUX CORP**  
 7328 W LACRANCE AVE CHICAGO 31 ILL  
**MAGNASYNCF MFG CO**  
 5546 SATSUMA AVE N HOLLYWOOD CALIF  
**MAGNATRAM INC**  
 P O BOX 211 KEARNY N J  
**MAGNAVOX**  
 JEFFERSON CITY TENN  
**MAGNAVOX**  
 GREENVILLE TENN  
**MAGNAVOX CO**  
 1505 E MAIN CHAMPAIGN ILL  
**MAGNAVOX CO**  
 1505 EAST MAIN URBANA ILL  
**MAGNAVOX CO**  
 1808 MILLER AVE BELMONT CALIF  
**MAGNAVOX CO**  
 1500 NORTH 8TH ST PADUCAH KY  
**MAGNAVOX CO RESEARCH LABS**  
 2255 S CARMELINA AVE LOS ANGELES CALIF  
**MAGNAVOX CORP**  
 2131 QUETER RD FT WAYNE 4 IND  
**MAGNE HEAD DIV GENERAL TRANSISTOR CORP**  
 2640 S LACRANCE BLVD LOS ANGELES 34 CALIF  
**MAGNECESSORIES**  
 BOX 0960 WASHINGTON 20 D C  
**MAGNECORD DIV MIDWESTERN INSTRUMENTS INC**  
 P O BOX 7186 TULSA OKLA  
**MAGNECRAFT ELECTRIC CO**  
 3352 W GRAND AVE CHICAGO 51 ILL  
**MAGNESIUM PRODUCTS OF MILWAUKEE INC**  
 740 N PLANKTON AVE MILWAUKEE 3 WISC  
**MAGNET BAYE T B PRODUCTS**  
 OLD FLANDERS RD WESTBORO MASS  
**MAGNETEC CORP**  
 7232 ETON AVE CANOGA PARK CALIF  
**MAGNETIC AMPLIFIERS INC**  
 156 WASHINGTON ST EL SEGUNDO CALIF  
**MAGNETIC AMPLIFIERS INC**  
 632 TINTON AVE NEW YORK 55 N Y  
**MAGNETIC ANALYSIS CORP**  
 42-44 TWELFTH ST LONG ISLAND CITY 1 N Y  
**MAGNETIC CIRCUIT ELEMENTS INC**  
 3722 PARK PL MONTROSE CALIF  
**MAGNETIC CONTROLS CO**  
 6405 CAMBRIDGE ST MINNEAPOLIS 16 MINN  
**MAGNETIC CORE CORP**  
 JOHN & LAWRENCE STS P O BOX 368 NEBBURGH N Y  
**MAGNETIC CORE CORP**  
 JOHN & LAWRENCE STS P O BOX 368  
**MAGNETIC DEVICES**  
 712 EAST ST FREDERICK MD  
**MAGNETIC INSTRUMENT CO INC**  
 546 COMMERCE ST THORNWOOD N Y  
**MAGNETIC METALS CO**  
 HAYES AVE B 21 ST CAMDEN 1 N J  
**MAGNETIC POWDERS INC**  
 P O BOX 247 JOHNSONBURG PA  
**MAGNETIC RECORDERS CO**  
 7120 MELROSE AVE LOS ANGELES 46 CALIF  
**MAGNETIC RECORDING INC**  
 126 FIFTH AVE N Y 11 N Y  
**MAGNETIC RECORDING INDUSTRIES**  
 11 E 16 ST NEW YORK 3 N Y  
**MAGNETIC RESEARCH CORP**  
 3160 W EL SEGUNDO BLVD HAWTHORNE CALIF  
**MAGNETIC RESEARCH CORP STABLEVOLT**  
 200 CENTER ST EL SEGUNDO CALIF  
**MAGNETIC SHIELD DIV PERFECTION MICA CO**  
 1322 N ELSTON AVE CHICAGO 22 ILL  
**MAGNETIC SYSTEMS INC**  
 225 W DUARTE RD MONROVIA CALIF  
**MAGNETIC WINDINGS DIV ESSEX WIRE CORP**  
 EASTON MA  
**MAGNETIC INC**  
 B RICHTER CT E NORTHPORT 1 N Y  
**MAGNETICS INC**  
 BOX 391 BUTLER PA  
**MAGNETICS INC**  
 1743 MARYLAND AVE REDWOOD CITY CALIF  
**MAGNETICS RESEARCH CO**  
 295 GROVE ST WHITE PLAINS N Y  
**MAGNOLIA ELECTRONICS**  
 UTICA ILLINOIS  
**MAGNOLIA PETROLEUM CO**  
 P O BOX 900 DALLAS TEXAS  
**MAGNUSON ENGINEERS INC**  
 509 EMORY ST SAN JOSE 10 CALIF  
**MAGTROL INC**  
 240 SENECA ST BUFFALO 4 N Y  
**MAGUIRE INDUST INC**  
 77H & BELLMONT MT CARMEL ILL

**MAHONEY TELETRONIC LABS INC**  
 209 16 AVE NEWARK 3 N J  
**MAICO ELECTRONICS INC**  
 21 N 3RD ST MINNEAPOLIS 1 MINN  
**MAIDA DEVELOPMENT CO**  
 214 ACADEMY ST HAMPTON VA  
**MAIGNE CO O J**  
 323 PEARL ST NEW YORK 38 N Y  
**MAJESTIC INTL SALES CORP**  
 743 N LA SALLE CHICAGO 10 ILL  
**MAJOR ELECTRONICS CORP**  
 762 BYTHE AVE BROOKLYN 11 N Y  
**MAKEPEACE CODE**  
 PINE & DUNHAM STS ATTLEBORO MASS  
**MAKEPEACE DIV D E ENGLAND INDUSTRIES INC**  
 PINE & DENHAM STS ATTLEBORO MASS  
**MALAYAN TIN BUREAU**  
 2000 K ST N WASHINGTON 2 D C  
**MALCO MFG CO**  
 8025 W LAKE ST CHICAGO 24 ILL  
**MALCO TOOL & MFG CO**  
 4024 W LAKE ST CHICAGO 26 ILL  
**MALKIN-ILLIOM CO**  
 400 COIT ST IRVINGTON 11 N J  
**MALLINCKRODT CHEMICAL WORKS**  
 2 & MALLINCKRODT STS ST LOUIS 7 MO  
**MALLORY & CO INC P R**  
 52 S GRAY ST INDIANAPOLIS 6 IND  
**MALLORY & CO INC P R VIBRATOR DIV**  
 DUQUOIN ILL  
**MALLORY & P R**  
 3229 E WASHINGTON ST INDIANAPOLIS 6 IND  
**MALLORY BATTERY CO DIV P R MALLORY & CO INC**  
 13000 ATHENS AVE CLEVELAND 7 OHIO  
**MALLORY BATTERY CO DIV P R MALLORY & CO INC**  
 80 N ELM ST N TARRYTOWN N Y  
**MALLORY BATTERY CO OF CANADA LTD**  
 228 ST HELENS AVE TORONTO 4 ONTARIO  
**MALLORY CAPACITOR CO DIV P R MALLORY & CO INC**  
 CRAWFORDSVILLE IND  
**MALLORY CAPACITOR CO DIV P R MALLORY & CO INC**  
 42 S GRAY ST INDIANAPOLIS IND  
**MALLORY CAPACITOR CO DIV P R MALLORY & CO INC**  
 HUNTSVILLE ALA  
**MALLORY CONTROLS CO**  
 FRANKFORD IND  
**MALLORY ELECTRONICS DIV P R MALLORY & CO INC**  
 42 S GRAY ST INDIANAPOLIS 6 IND  
**MALLORY METALLURGICAL CO**  
 42 S GRAY ST INDIANAPOLIS 6 IND  
**MALMO CORP**  
 532-542 4TH ST RACINE WISC  
**MANCO MFG CO**  
 380 UNION ST MANCHESTER N H  
**MANDEX MFG CO INC**  
 2614 W 48TH ST CHICAGO 32 ILL  
**MANDREL INDUSTRIES INC**  
 BOX 428 BURBANK CALIF  
**MANDRELL INDUSTRIES INC**  
 P O BOX 1324 HOUSTON TEXAS  
**MANGER ELECTRIC CO**  
 MILLER ST STAMFORD CONN  
**MANNING MAXWELL & MOORE INC**  
 STRATFORD CONN  
**MANNING PAPER CO JOHN A**  
 P O DRAWER 328 TROY N Y  
**MANOSTAT CORP**  
 20-26 N MOORE ST NEW YORK 13 NY  
**MANSOL CERAMICS CO**  
 140 LITTLE ST BELLEVILLE N J  
**MANSON LABORATORIES INC**  
 375 FAIRFIELD AVE STAMFORD CONN  
**MANUFACTURERS ENGG & EQUIP CORP**  
 YORK RD & SUNSET LANE HATBORO PA  
**MANUFACTURERS LAB**  
 10610 KESWICK ST SUN VALLEY CALIF  
**MARANTZ CO**  
 25-14 BOBBY LONG ISLAND CITY N Y  
**MARATHON BATTERY CO**  
 840 HENRIETTA ST SAUSALITO WISC  
**MARBLE CARD ELECTRIC CO**  
 GLADSTONE 1 MICH  
**MARLETTE CORP**  
 37-31 30 ST LONG ISLAND CITY 1 N Y  
**MARBON CHEMICAL DIV BORG-WARNER CORP**  
 7165 CHICAGO AVE GARY IND  
**MARBON CHEMICAL DIV BORG-WARNER CORP**  
 P O BOX 68 WASHINGTON 5 VA  
**MARCH ASSOCIATES**  
 145 CORTLAND ST LINDENHURST N Y  
**MARCHMANT CALCULATORS INC**  
 6701 SAN PABLO AVE OAKLAND 8 CALIF  
**MARCO INDUSTRIES CO**  
 P O BOX 110 ANAHEIM CALIF  
**MARCONI**  
 LONDON ENGLAND  
**MARCONI INSTRUMENTS LTD**  
 111 CEDAR LANE ENGLEWOOD N J  
**MARCONI TELEGRAPH**  
 CHELMSFORD ENGLAND  
**MARCONIS WIRELESS TELEGRAPH CO LTD**  
 750 3RD AVE NEW YORK 17 N Y  
**MARDUTH PRODUCTS**  
 R D # MEDINA OHIO  
**MARINE ELEC CO**  
 600 - 4TH AVE BROOKLYN 15 N Y  
**MARINE INSTRUMENT CO**  
 7901 SW 16 ST MIAMI 33 FLA  
**MARINE VIB ELECTRONICS INC**  
 88-06 VAN DYCK EXPRESSWAY JAMAICA 18 N Y  
**MARUD TECHNICAL PRODUCTS CO**  
 1150 E HENRY ST LINDEN N J  
**MARKEL & SONS L FRANK**  
 SCHOOL LANE MORRISTOWN PA  
**MARKEL ELECTRIC PRODUCTS INC**  
 145 E SENECA ST BUFFALO 3 N Y

**MARKEN MACHIN CO**  
 150 CONGRESS ST KEENE N H  
**MARKITE CORP**  
 155 WAVERLY PL NEW YORK N Y  
**MARK-LINE**  
 7227 WHITSEY AVE N HOLLYWOOD CALIF  
**MARK PRODUCTS CO**  
 5439 FARGO AVE SKOKIE ILL  
**MARK PRODUCTS CO**  
 6412 W LINCOLN AVE MORTON GROVE ILL  
**MARLIN-ROCKWELL CORP**  
 402 CHANDLER ST JAMESTOWN N Y  
**MARMA ELECTRONICS CO**  
 1633 N HALSTED ST CHICAGO 16 ILL  
**MAROTTA VALVE CORP**  
 BOONTON AVE BOONTON N J  
**MARQUARDT CO**  
 16555 SATICOY ST VAN NUYS CALIF  
**MARQUARDT CORP POMONA DIV**  
 2709 N GAREY AVE POMONA CALIF  
**MARQUETTE DIV CURTISS-WRIGHT CORP**  
 6185 GALEWOOD DR CLEVELAND 10 OHIO  
**MARSH INSTRUMENT CO DIV COLORADO OIL & GAS**  
 CO 3501 N HOWARD ST SKOKIE ILL  
**MARSHALL ASSOCIATES INC JOHN**  
 BOX 2463 BRIDGEPORT 8 CONN  
**MARSHALL INSTRUMENTS**  
 753 QUAKERBORN AVE WINNETKA CALIF  
**MARSHALL INSTRUMENTS INC**  
 10203 BESSEMER ST VAN NUYS CALIF  
**MARSHALLTOWN MFG CO**  
 810 E NEVADA ST MARSHALLTOWN IOWA  
**MARSLAND ENGG LTD**  
 154 VICTORIA ST S KITCHENER ONT CANADA  
**MARSTAN ELECTRONICS CORP**  
 6125 AVE OF THE AMERICAS NEW YORK 11 N Y  
**MARTIN**  
 BOX 126 CORONADO CALIF  
**MARTIN CO**  
 P O BOX 248 LA SALLE STATION NIAGARA FALLS N Y  
**MARTIN & CO H S**  
 191 GREENLEAF ST EVANSTON ILL  
**MARTIN CO**  
 MISSILE MASTER BLDG 409 FT LABTON SEATTLE  
 99 WASH  
**MARTIN CO**  
 P O BOX 551 FREDERICKSBURG VA  
**MARTIN CO**  
 BALTIMORE 3 MD  
**MARTIN CO**  
 P O BOX 179 MAIL 1-42 DENVER 1 COLO  
**MARTIN CO**  
 P O BOX 2315 BUFFALO 23 N Y  
**MARTIN CO**  
 20009 SUMMERFIELD RD WINTER PARK FLA  
**MARTIN CO**  
 6495 ST JOHNING LITTLETON COLO  
**MARTIN CO**  
 DRAWER M - ROOM 105 COCOA FLA  
**MARTIN CO**  
 ORLANDO FLA  
**MARTIN CO**  
 MIDDLE RIVER 2 MD  
**MARTIN CO**  
 P O BOX 290 MT CLEMENS MICH  
**MARTIN CO**  
 7204 CHADWELL RD HUNTSVILLE ALA  
**MARTIN COMPANY**  
 MIDDLE RIVER BALTIMORE MD  
**MARTIN HEARING AID CO**  
 6031 N CICERO AVE CHICAGO 46 ILL  
**MARTIN ORLANDO**  
 P O BOX 2831 ORLANDO FLA  
**MARTIN-DENVER**  
 239 PRINCE AVE LITTLETON COLO  
**MARTINDALE ELECTRIC CO**  
 BOX 617 EDGEWATER BRANCH CLEVELAND 7 OHIO  
**MARYLAND LAVA COMPANY**  
 BOX 129 BELAIR MD  
**MASDEN CO INC**  
 1116 PATERSON PLANK RD NORTH BERGEN N J  
**MASON ELECTRIC CORP**  
 3839 VERDUGO RD LOS ANGELES 65 CALIF  
**MASCON INSTRUMENT CO**  
 29 ELM AVE MT VERNON N Y  
**MASON-MELAN DIVN**  
 BORTHINGTON CORP NORWOOD MASS  
**MASONITE CORP**  
 111 B WASHINGTON ST CHICAGO 2 ILL  
**MASS-CONN ASSOCIATES**  
 P O BOX 698 CANAAN CONN  
**MASS-GEAR B TOOL CO**  
 2 WASHUA ST BOBURN MASS  
**MASSA DIV OF CONU ELECTRONICS INC**  
 5 FOTTLER RD HINGHAM MASS  
**MASSACHUSETTS GEAR & TOOL CO**  
 2 WASHUA ST BOBURN MASS  
**MASSACHUSETTS GEAR DIVISION-GEARTRONICS CORP**  
 920 MAIN ST B CONCORD MASS  
**MASSEY-FERGUSON INC**  
 P O BOX 322 RPA DETROIT 32 MICH  
**MAST DEVELOPMENT CO INC**  
 2212 E 12TH ST DAVENPORT IOWA  
**MASTER ELECTRIC DIV RELIANCE ELEC & ENGG CO**  
 120 DAVIS AVE DAYTON 1 OHIO  
**MASTER ETCHING CORP**  
 50 HONECK ST ENGLEWOOD N J  
**MASTER MOBILE MOUNTS INC**  
 1306 BOND ST LOS ANGELES 15 CALIF  
**MASTER SPECIALTIES CO**  
 950 E 100TH ST LOS ANGELES 59 CALIF  
**MASTERITE INDUSTRIES INC**  
 835 W GLIVE ST INGLEWOOD CALIF  
**MASTERSCREEN PRINTING EQUIP CO**  
 16-18 E MARSHALL PHILA PA  
**MASTRA CO**  
 2104 SUPERIOR AVE CLEVELAND 18 OHIO

# ELECTRONIC MANUFACTURERS-A-Z

MATCHLESS ELECTRIC CO  
1700 WASHINGTON BLVD CHICAGO 12 ILL  
MATERIALS FOR ELECTRONICS  
152-25-130 AVE JAMAICA L I 34 N Y  
MATHEWSON LAB  
716 FIRST AVE N W LARGO FLA  
MATHIS CO G E  
6100 S DARTMOUTH PARK AVE CHICAGO 38 ILL  
MATRONICS INC  
558 MAIN ST WESTBURY L I N Y  
MATTHEW LABS  
3344 FORT INDEPENDENCE ST NEW YORK 63 N Y  
MATTHEWS B CO JAS  
3823 FORBES ST PITTSBURGH 13 PA  
MATSTON ELECT CORP  
11645-87 MCDONALD DR EL MONTE CALIF  
MAURER INC J A  
37-01 31 ST LONG ISLAND CITY 1 N Y  
MAURY & ASSOCIATES  
10373 MILLS AVE POMONA CALIF  
MAXSON CORP B L  
480 WEST 34TH ST NEW YORK 1 N Y  
MAXWELL ELECTRONICS CO  
229 GARVON ST GARLAND TEXAS  
MAYBERRY ELECTRONICS CO  
111 S OAK ST INGLEWOOD 1 CALIF  
MAYFAIR MOLDED PRODUCTS CORP  
3700 N ROSE ST SCHILLER PARK ILL  
M-B COMMUNICATION CO  
4626 WALNUT ST PHILA 39 PA  
MB ELECTRONIC DIV TEXTRON ELECTRONICS INC  
PO BOX 1818 NEW HAVEN CONN  
MB MFG CO DIV TEXTRON INC  
P O BOX 1025 NEW HAVEN 11 CONN  
MCALISTER INC J G  
1117 N MCCADDEN PL HOLLYWOOD 38 CALIF  
MCCLURE TALKING PICTURES O J  
1115 W WASHINGTON BLVD CHICAGO 7 ILL  
MCCLURICK SELF INC  
HOLLISTER AIRPORT HOLLISTER CALIF  
MCCOY ELECTRONICS CO  
CHESTNUT B WATTS STS MT HOLLY SPRINGS PA  
MCCULLOUGH MOTORS CORP  
6001 B 98TH ST LOS ANGELES 45 CALIF  
MCCULLOUGH TOOL CO  
5820 80 ALAMEDA ST LOS ANGELES 98 CALIF  
MCDONNELL B MILLER INC  
3500 N SPAULDING AVE CHICAGO 18 ILL  
MCDONNELL AIRCRAFT  
P O BOX 516 ST LOUIS MO  
MCDONNELL AIRCRAFT CORP  
P O BOX 111 DOW ILL  
MCDONNELL ELECTRONICS INC  
105 FORREST ST METUCHEN N J  
MCFINSHAW ENTERPRISE  
5020 BRADLEY BLVD CHEVY CHASE 15 MD  
MCGILL MFG CO ELECTRICAL DIV  
1002 N CAMPBELL ST VALPARAISO IND  
MCGOHAN INC DON  
3700 W ROOSEVELT RD CHICAGO 24 ILL  
MCGRAW EDISON INC  
P O BOX 1766 PITTSBURGH 30 PA  
MCGRAW EDISON CO POWER TOOL DIV  
110 MAIN ST BURLINGTON VT  
MCGRAW EDISON-INSTR DEV  
P O BOX 943 ORANGE NJ  
MCGRAW-EDISON CO LINE MATERIAL DIV  
P O BOX 176 SOUTH MILWAUKEE WIS  
MCGRAW-EDISON CO THOMAS A EDISON INC  
51 LAKESIDE AVE WEST ORANGE N J  
MCGREGOR ELECTRONIC INDUSTRIES INC  
132 FIRST ST MCGREGOR IOWA  
MCHUGH B SON RAYMOND F  
P O BOX 6025 PHILA 14 PA  
MCMINTOSH LEE INC  
2 CHARGERS ST BINGHAMTON N Y  
MCKENNA LABORATORIES  
2503 MAIN ST SANTA MONICA CALIF  
MC KIERNAN-TERRY CORP  
100 RICHARDS AVE DOVER N J  
MCKINSTRY METAL BRK  
285 MCKINSTRY AVE CHICOPEE MASS  
MCLAUGHLIN CORP J L A  
P O BOX 529 LA JOLLA CALIF  
MCLEAN ENGG LABS  
P O BOX 228 70 WASHINGTON RD PRINCETON N J  
MCMILLAN COMPANIES  
BROOKVILLE AVE IPSWICH MASS  
MCMERSON CORP  
1361 S BROADWAY DENVER 10 COLO  
MCOUAY-NORRIS MFG CO  
2320 MARCONI AVE ST LOUIS 10 MO  
MCS CORP  
1001 S MOUNTAIN AVE MONROVIA CALIF  
MEASUREMENT ENGG LTD  
232 JOHN ST AARHUR ONTARIO CAN  
MEASUREMENT RESEARCH CENTER  
P O BOX 69 IOWA CITY IOWA  
MEASUREMENTS DIV MC GRAB-EDISON  
BEN 180 BOONTON N J  
MEASUREMENTS MCGRAW EDISON INC  
INTERSTATE ROAD BOONTON N J  
MEASUREMENTS RESEARCH CO DIV PRUDENTIAL IND  
3801 CASTOR AVE PHILA 24 PA  
M E C INC  
796 BERRY RD P O BOX 577 NASHVILLE TENN  
MECH-TRONIC EQUIPMENT CO  
P O BOX 510 SILVER SPRING MD  
MECHANICAL ENGRAVING CO INC  
10 VAN CORTLANDT AVE NEW YORK 68 NY  
MECHANICAL INDUSTRIES PRODS CO  
217 ASH ST AKRON 6 OHIO  
MECHANICAL PRODUCTS INC  
1824 RIVER ST JACKSON MICH  
MECHATROL DIV SERVOMECHANISMS INC  
1200 PROSPECT AVE WESTBURY N Y

MECTRON CO  
166 RIDGE AVE NORTH PLAINFIELD NJ  
MEDAL MFG CO  
P O BOX 292 SHARON PA  
MEDCRAFT ELECTRONIC CORP  
426 GREAT EAST NECK RD BABYLON N Y  
MEDISTOR INST CO  
1443 NORTHLAKE WAY SEATTLE 3 WASH  
MEDITRONICS ASSOC  
1443 NORTHLAKE WAY SEATTLE 3 WASH  
MEDTRONIC INC  
818 - 19TH AVE N E MINNEAPOLIS 18 MINN  
MEGADYNE ELECTRONICS INC  
PO BOX 869 PORT CHESTER N Y  
MELINK STEEL SAFE CO TELE ELECTRONICS DIV  
1672 OAKWOOD AVE TOLEDO 6 OHIO  
MEL-RAIN CORP  
2100 E FLETCHER AVE INDIANAPOLIS 3 IND  
MELABS  
3500 HILLVIEW AVE PALO ALTO CALIF  
MELCO PRODUCTS INC  
301 S AVE S MINNEAPOLIS 15 MINN  
MELCOR ELECTRONICS CORP  
46 TOLEDO ST S FARMINGDALE LI N Y  
MELTROW CORP  
950 N HIGHLAND AVE LOS ANGELES 38 CALIF  
MELLER CO ADOLF  
P O BOX 702 PROVIDENCE RI  
MELODY MASTER MFG CO  
2149 W ROSCOE ST CHICAGO 18 ILL  
MELPAR INC  
11 SALEM ST WATERTON 72 MASS  
MELPAR INC  
1301 S FERN ST ARLINGTON VA  
MELPAR INC  
1411 S FERN ST ARLINGTON VA  
MELPAR INC  
3000 ARLINGTON BLVD FALLS CHURCH VA  
MELRAY ELECTRONICS MFG CO  
531 BRISTOL ST BROOKLYN N Y  
MELROSE ENGINEERING CO  
BYANOTTE RD WILLOW GROVE PA  
MELSTROM MFG CO  
103 N FELTUS ST SOUTH AMBOY N J  
MEMCOR  
400 FREDERICK ST HUNTINGTON IND  
MEMASCO MFG CO  
805 S SAN FERNANDO BLVD BURBANK CALIF  
MEMLO PARK ENGG  
711 HAMILTON AVE MEMLO PARK CALIF  
MEMLO RESEARCH LABORATORY  
538 PHELAN AVE SAN JOSE CALIF  
MEMO  
35-37 ABBETT AVE MORRISTOWN N J  
MEM-Q TROL CO  
804 147 DANA POINT CALIF  
MEMAD LABS - CORNELL PLANT  
1720 LUETT INDIANAPOLIS 24 IND  
MEMCAST MFG CORP  
2820 E ST LA VERNE CALIF  
MEMCK & CO INC CHEMICAL DIV  
RAYWAY N J  
MERCOLD CORP  
4201 BELMONT AVE CHICAGO 41 ILL  
MERCURY AIR PARTS CD INC  
P O BOX 135 9310 B JEFFERSON BLVD CULVER  
CITY CALIF  
MERCURY CONTACTS INC  
1950 NEVA DRIVE DAYTON 14 OHIO  
MERCURY ELECTRONIC CO  
BOX 450 B REG BANK N J  
MERCURY ENGG CORP  
339 E COTTAGE PL YORK PA  
MERCURY TRANSFORMER CORP  
12950 PANAMA ST LOS ANGELES 66 CALIF  
MEREDITH & CO LTD C C  
80 THOMAS ST STREETSVILLE ONT CANADA  
MERGENTHAUER LINDTYPE CO  
29 RYERSON ST BROOKLYN 5 N Y  
MERIAM INSTR CO INL-S INSTRUMENT DIV  
4525 N 100TH ST CLEVELAND 35 OHIO  
MERIAM INSTRUMENT CO  
10920 MADISON AVE CLEVELAND 2 OHIO  
MERIDIAN METALCRAFT INC  
8739 S HILLGROVE DR WHITTIER CALIF  
MERIT COIL & TRANSFORMER CORP  
2027 SHERMAN ST HOLLYWOOD CALIF  
MERIT PLATING CO INC  
218 E 181 ST NEW YORK 51 N Y  
MERIX CHEMICAL CO  
2234 E 75TH ST CHICAGO 49 ILL  
MERKLE KORFF GEAR CO  
213 N MORGAN ST CHICAGO 7 ILL  
MERKLE-KORFF BLAR CO  
BOX 333 RUMSON N J  
M E R L  
5929 S 5TH ST MILWAUKEE 7 WIS  
MERRILL ENGINEERING LAB  
1025 B THIRD AVE DENVER 23 COLO  
MERRIMAC RESEARCH & DEV INC  
584 WASHINGTON AVE BELLEVILLE N J  
MERRINAC RESEARCH & DEVELOPMENT INC  
517 LYONS AVE IRVINGTON N J  
MERZ ENGINEERING INC  
200 S HARDING ST INDIANAPOLIS 7 IND  
MESA PLASTICS CO  
12270 NEBRASKA AVE LOS ANGELES 25 CALIF  
METAL & THERMIT CORP  
RAYWAY N J  
METAL B THERMIT CORP  
CARTERET NJ  
METAL CRAFT MFG CORP M K  
3775 10TH AVE NEW YORK 34 N Y  
METAL FABRICATORS CORP  
63 POND ST WALTHAM 54 MASS  
METAL FORGING CORP  
373 VAN SINDEREN AVE BROOKLYN 7 N Y

METAL HYDRIDES INCORP  
CONGRESS ST BEVERLY MASS  
METAL PRODUCTS INC  
FAIRFAX INDUSTRIES DIST KANSAS CITY 19 KAN  
METAL SPECIALTY PRODUCTS CORP  
27-01 BROOKLYN QUEENS EXPRESSWAY W  
WOODSIDE 77 N Y  
METAL SPECIALTY PRODUCTS CORP  
27-01 BROOKLYN QUEENS EXPRESSWAY W  
METAL-CRAFT INC  
BURGESS PL BAYNE N J  
METAL-FAB CO  
12321 BRANDFORD ST PACIFICA CALIF  
METALIZING INDUSTRIES INC  
340 HUDSON ST HACKENSACK N J  
METALIZING INDUSTRIES INC  
338 HOUSTON ST HACKENSACK N J  
METALLIC PLASTICS CORP  
27-10 BR DR LONG ISLAND CITY 1 N Y  
METALLIZED PRODUCTS CO INC  
29 KNIGHT ST NORWALK CONN  
METALLO GASKET CO  
16 BETHANY ST NEW BRUNSWICK N J  
METALPLAST CORP  
DAVISVILLE RD AT PA TPKE HATBORO PA  
METAVAC INC  
45-68 162 ST FLUSHING 98 N Y  
METCO ELECTRONICS INC  
311 MARKET NEBARK N J  
METCO INC  
BOX 272 76 LAFAYETTE ST SALEM MASS  
METERS INC  
5553 N KEYSTONE AVE INDIANAPOLIS 20 IND  
METHODE MFG CORP  
7447 W 91ST AVE CHICAGO 31 ILL  
MET-L-WOOD CORP  
6755 B 65TH ST CHICAGO 38 ILL  
METOX  
68 RUE VILLIERS DE L ISLE ADAM PARIS 20EM  
E FRANCE  
METOX  
68 RUE VILLIERS DE L ISLE ADAM  
METPRO INC R I  
250 TORONTO AVE PROVIDENCE R I  
METROLOG CORP SUB AIR LOGISTICS CORP  
169 N HALSTAD PASADENA CALIF  
METROM INSTRUMENT CO  
432 LINCOLN ST DENVER 3 COLO  
METRONIX INC  
75 WILSON MILLS RD CHESTERLAND OHIO  
METROPOLITAN ELECTRIC MFG CO  
2250 STEINWAY ST LONG ISLAND CITY 5 N Y  
METROPOLITAN SUPPLY CO  
1133 BROADWAY NEW YORK 10 N Y  
METZ CO HARRY  
1611 S VERMONT AVE LOS ANGELES CALIF  
METZ REFINING CO  
369 MULBERRY ST NEWARK 2 N J  
METZNER ENGG CORP  
2250 N LA BREA AVE HOLLYWOOD 38 CALIF  
MEYERCORD CO  
5323 B LAKE ST CHICAGO 44 ILL  
M F ELECTRONICS CO  
122 E 29 ST NEW YORK 10 N Y  
M-H STANDARD CORP  
910 COMMUNIPAR AVE JERSEY CITY 4 N J  
MICA COATED PRODUCTS CO  
SALEM INDUSTRIAL CENTER SALEM MASS  
MICA CORP  
4031 ELENDA ST CULVER CITY CALIF  
MICA FABRICATING CO  
53 CENTRAL AVE ROCHELLE PARK N J  
MICA IMP ASSO INC  
420 LEXINGTON AVE N Y N Y  
MICA INSULATOR CO  
797 BROADWAY SCHEMENADY 1 N Y  
MICA INSULATOR DIV MINNESOTA MINING & IRON CO  
P O BOX 1076 SCHEMENADY 1 N Y  
MICACRAFT PRODUCTS INC  
701 MCCARTER HWY NEBARK 5 N J  
MICAMOLD ELECTRONICS MFG CORP  
65 GOVERNOR ST NEBARK 4 N J  
MICHAEL RES CO INC  
4211 BURBANK BLVD BURBANK CALIF  
MICHIGAN ELECTRONICS  
824 N ROCKWELL AVE CHICAGO ILL  
MICHIGAN MAGNETICS INC  
2080 HUNTINGTON HICH  
MICHIGAN ORDNANCE MISSILE  
P O BOX 2028 DETROIT 31 MICH  
MICHIGAN PANELYTE MOLDED PLASTIC  
DEXTER RICH  
MICHIGAN TOOL CO  
7171 E MCHICOLS RD DETROIT MICH  
MICO INSTRUMENT CO  
80 TROWBRIDGE ST CAMBRIDGE 38 MASS  
MICRO BALANCING CO  
191 HERRICKS BLVD GARDEN CITY N Y  
MICRO DYNAMICS  
P O BOX 134 GRASS VALLEY CALIF  
MICRO ELECTRO MAGNETIC INSTRUMENTS  
1511 COLORADO AVE SANTA MONICA CALIF  
MICRO ELECTRONICS CO  
2951 B PERSHING RD CHICAGO 32 ILL  
MICRO GEE PRODUCTS INC  
6319 B SLAUSON CULVER CITY CALIF  
MICRO LECTRIC DIV MICRO MACHINE WORKS INC  
19 DEBEVOISE AVE ROOSEVELT N Y  
MICRO-DYNE INC  
P O BOX A-925 OAKLAND PARK FLA  
MICRO-PATH INC  
4949 B 104TH ST INGLEWOOD 2 CALIF  
MICRO SWITCH DIV MINN-HONEYWELL REGULATOR CO  
11 B SPRING ST FREEPORT ILL  
MICRO SYSTEMS INC  
191 MD VINEDO AVE PASADENA CALIF  
MICRO-CIRCUITS CO  
NEW BUFFALO MICH  
MICRO-PATH INC  
10321 ANZA AVE LOS ANGELES 85 CALIF



# ELECTRONIC MANUFACTURERS-A-Z

MICRODOT INC  
220 PASADENA AVE S PASADENA CALIF

MICRODYNE  
500 W BASHINGTON ST CHICAGO 6 ILL

MICROFARADS INC  
P O BOX 1175 WESSON MISS

MICROFILM CAT FILE  
3946 S BROADWAY ENGLEWOOD COLO

MICROFLECT CO  
2300 S 29 ST SALEM ORE

MICROLAB  
570 W MY PLEASANT AVE LIVINGSTON N J

MICROMATIC MACHINE CORP  
45 MORGAN AVE BROOKLYN 37 N Y

MICROMECH MFG CO  
1020 COMMERCE AVE UNION N J

MICROMEGA CO  
413 DEL REY AVE VENICE CALIF

MICROMETRICAL DEVEL CO  
P O BOX 694 SALINE MICH

MICROMETRICAL DEVELOPMENT CO  
2821 S STATE ST ANN ARBOR MICH

MICROMETRICAL MFG CO  
385 S MAIN ST ANN ARBOR MICH

MICROMOLO PRODUCTS CORP  
1 SCHOOL ST YONKERS N Y

MICRON GEAR MFG CO  
73 RUSHMORE ST WESTBURY L I N Y

MICROPHASE CORP  
BOX 1166 GREENWICH CONN

MICROSECOND ELECTRONICS INC  
3211 1/2 E WASHINGTON PHOENIX ARIZ

MICROSONICS INC  
HINGHAM INDUSTRIAL CENTER RT 3A HINGHAM MASS

MICROSSOUND INC  
4627 LEAHY ST CULVER CITY CALIF

MICROTECH INC  
MILDALE RD CHESHIRE CONN

MICROTRAN CO  
145 E HINEOLA AVE VALLEY STREAM N Y

MICROWAVE & DEVELOPMENT LABS  
92 BROAD ST BABSON PARK BELLESLY 57 MASS

MICROWAVE ASSOCIATES INC  
BURLINGTON MASS

MICROWAVE CHEN LAB  
282 7TH AVE N Y N Y

MICROWAVE COMPONENTS  
DOWLESTOWN PENNA

MICROWAVE DYNAMICS CO  
7 FAIRCHILL CT PLAINVIEW L I N Y

MICROWAVE ELECTRONIC TUBE CO INC  
76 LAFAYETTE ST SALEM MASS

MICROWAVE ELECTRONICS CORP  
4061 TRANSPORT ST PALO ALTO CALIF

MICROWAVE ENG LABS  
943 INDUSTRIAL AVE PALO ALTO CALIF

MICROWAVE SERVICES INC  
TIMES TOWER BLOC TIMES SQUARE NEW YORK N Y

MID-AMERICA NUT & BOLT CORP  
1012 PACIFIC AVE FRANKLIN PARK ILL

MID-EASTERN ELECTRONICS INC  
32 COMMERCE ST SPRINGFIELD N J

MIDDLESEX PAPER TUBE CO  
345 CHELMSFORD ST LOBELL MASS

MIDGET LOUVER CO  
6-8 WALL ST NORWALK CONN

MIDLAND INDUSTRIAL FINISHES CO  
E WATER ST BAKESGAM ILL

MIDLAND MFG CO  
3155 FIBERGLAS RD KANSAS CITY 19 KANSAS

MIDODOT INC  
220 PASADENA AVE S PASADENA CALIF

MID WEST COIL & TRANSFORMER CO  
1642 W HALSTEAD ST CHICAGO 14 ILL

MIDWEST ELECTRIC PRODUCTS INC  
1515 N FRONT ST MANKATO MINN

MIDWEST FOAM PROD CO  
1901 MARGUETT AVE N CHICAGO ILL

MIDWEST METAL PRODUCTS INC  
450 E DONOVAN ROAD KANSAS CITY 15 KANSAS

MIDWEST MOLDING & MFG CO  
GURNEE ILL

MIDWEST NATURLITE CO  
6651 N CLARK ST CHICAGO 26 ILL

MIDWEST RESEARCH INSTITUTE  
425 VOLKER BLVD KANSAS CITY 10 MO

MIDWEST SPRING MFG CO  
ETNA ST MENTONE IHO

MIDWESTERN INSTRUMENTS  
P O BOX 7186 TULSA OKLA

MIL CASE CORP  
35-18 37 ST LONG ISLAND CITY N Y

MILES REPRODUCER CO  
812 BROADWAY NEW YORK 3 N Y

MILEX INSTRUMENT PRODUCTS CORP  
455 COMMERCIAL AVE PASSAIC N J

MILFORD DEF-NORDEN DIV-UNITED AIRCRAFT  
MILFORD CONN

MILFORD RIVET & MACHINE CO  
MILFORD CONN

MILFORD RIVET & MACHINE CO  
ELYRIA OHIO

MILGO ELECTRONIC CORP  
7620 N W 36TH AVE MIAMI 47 FLA

MILGRAV N Y  
136 LIBERTY ST NEW YORK N Y

MILGRO  
NEW YORK N Y

MILLEN MFG CO JAMES  
150 EXCHANGE ST WALDEN 48 MASS

MILLER ASSOCIATES  
P O BOX 389 LAKEVILLE CONN

MILLER CO J  
5917 E MAIN ST LOS ANGELES 3 CALIF

MILLER CO K M  
14979 LA CUMBRE DR PACIFIC PALISADES CALIF

MILLER CO L C  
5005 E. SLAUSON AVE LOS ANGELES 22 CALIF

MILLER CO M C  
208 E SADDLE RIVER RD UPPER SADDLE RIVER N J

MILLER CO B A  
OQUOSSOC MAINE

MILLER CORP HARRY  
4TH & BRISTOL STS PHILA 40 PA

MILLER DIAL & MANEPLATE CO  
4800 N TEMPLE CITY BLVD EL MONTE CALIF

MILLER ELEC CO  
120 MAIN ST PANTUCKET R I

MILLER ELECTRO-RESEARCH LABS  
5529 S 5 ST MILWAUKEE 7 WISC

MILLER FLUID POWER DIV  
BENSONVILLE ILL

MILLER INDUSTRIES R A  
MARION ST GRAND HAVEN MICH

MILLER LABS AUGUST E  
9226 HUDSON BLVD N BERGEN N J

MILLER MFG CO M A  
4 & CHURCH STS LIBERTYVILLE ILL

MILLER RESEARCH LABS  
2215 RUSSELL ST BALTIMORE 30 MD

MILLER TECH-1-LAB  
407 W ARBOR VITAE ENGLEWOOD CALIF

MILLER-MARRIS INSTRUMENT CO  
1134 S FIRST ST MILWAUKEE 4 WISC

MILLER-TROJAN CO INC  
TROY OHIO

MILLERS FALLS CO  
57 BELLS ST GREENFIELD MASS

MILLI-SWITCH CORP  
PO BOX 67 HILL CREEK RD GLADSTONE PA

MILLIPORE FILTER CORP  
36 PLEASANT ST WATERTOWN 72 MASS

MILLIPORE FILTER CORP  
P O BOX 427 BEDFORD MASS

MILLITEST CORP  
88 MADISON AVE HEMPSTEAD N Y

MILLIVAC INSTR DIV COMJ ELECTRONICS INC  
2315 2ND AVE SCHEMECTADY 3 N Y

MILRO CONTROLS CO INC  
280 MIDLAND AVE SADDLE BROOK N J

MILTRONICS CO  
3733 N 7TH MILWAUKEE 8 WISC

MILWAUKEE RESISTOR CO  
700 W VIRGINIA ST MILWAUKEE 4 WISC

MILWAUKEE STAMPING CO  
800 S 72 ST MILWAUKEE 10 WISC

MILWAUKEE TRANSFORMER  
5231 N HOPKINS MILWAUKEE 9 WISC

MIMATRON CORP  
BELLE MEAD 9 N J

MIMCO PRODUCTS INC  
740 WASHINGTON AVE MINNEAPOLIS 1 MINN

MIMCOM DIV MINN MINING & MFG CO  
2049 S BARRINGTON AVE LOS ANGELES 25 CALIF

MINE SAFETY APP  
7501 PENN AVE WILKINSBURG PA

MINE SAFETY APPLIANCES CO  
201 N BRADDOCK AVE PITTSBURGH & PA

MINERALS & INSULATION CO  
ROCHELLE PARK N J

MINIATURE ELECTRONIC COMPONENTS  
P O BOX 577 NASHVILLE TENN

MINIATURE PRECISION BEARINGS  
PRECISION PARK KEENE N H

MINICORD CORP OF AMERICA  
1915 ATLANTIC AVE ATLANTIC CITY N J

MINIMAR CO  
5905 N CLARK ST CHICAGO 26 ILL

MINITEC  
5423 DELAWARE AVE LOS ANGELES 4 CALIF

MINITRAN CORP  
9 OLIVER ST NEBARK 2 N J

MINITRON INC  
1105 2 ST ENCINITAS CALIF

MINN-HONEYWELL BOSTON DIV  
40 LIFE ST BOSTON 35 MASS

MINN-HONEYWELL ELECTRONIC DATA PROC DIV  
60 WALNUT ST BELLESLY HILLS MASS

MINN-HONEYWELL REF CO AERONAUTICAL DIV  
INERTIAL GUIDANCE CENTER 13350 U S HIGHWAY 19 ST PETERSBURG FLA

MINN-HONEYWELL REG CO  
8330 N AUSTIN AVE NORTON GROVE ILL

MINN-HONEYWELL REG CO  
6620 TELEGRAPH RD LOS ANGELES 22 CALIF

MINN-HONEYWELL REG CO  
1724 S MOUNTAIN AVE DUARTE CALIF

MINN-HONEYWELL REG CO  
200 COMMERCE DRIVE FT WASHINGTON PA

MINN-HONEYWELL REG CO BOSTON DIV  
24 BROOK ST NEWTON MASS

MINN-HONEYWELL REG CO MICRO SWITCH  
CHICAGO 8 SPRING STS FREEPORT ILL

MINN-HONEYWELL REGULATOR CO COMMERCIAL & RESIDENTIAL DIVS 2753 4 AVE S MINNEAPOLIS 8 MINN

MINN-HONEYWELL REGULATOR CO  
PENN & BAY STS FALL RIVER MASS

MINN-HONEYWELL REGULATOR CO  
10721 HANNA ST BELTSVILLE MD

MINN-HONEYWELL REGULATOR CO AERONAUTICAL DIV  
2600 RIDGWAY AVE MINNEAPOLIS 13 MINN

MINN-HONEYWELL REGULATOR CO  
1015 S SIXTH ST MINNEAPOLIS 4 MINN

MINN-HONEYWELL REGULATOR CO-AERO DIV  
1915 ARACOST AVE LOS ANGELES 25 CALIF

MINN-HONEYWELL REGULATOR CO/MIL PROD CO  
AERONAUTICAL & ORDNANCE DIV 2753 4TH AVE S MINNEAPOLIS MINN

MINN-HONEYWELL REGULATOR CO  
RIDGE AVE AT 35 STS PHILADELPHIA 32 PA

MINN-HONEYWELL REGULATOR CO  
ORDNANCE DIV 600 2 ST N HOPKINS MINN

MINNEAPOLIS HONEYWELL HEILAND DIV  
5200 E EVANS AVE DENVER 22 COLO

MINNEAPOLIS-HONEYWELL DAVIES LAB  
10721 HANNA ST BELTSVILLE MD

MINNEAPOLIS-HONEYWELL REG CO  
BABASH IND

MINNEAPOLIS-HONEYWELL REG  
1600 W 13TH AVE DENVER 4 COLO

MINNEAPOLIS-HONEYWELL REG CO  
BOX 161 UNION N J

MINNEAPOLIS-HONEYWELL REG  
2900 SUPERIOR AVE CLEVELAND 18 OHIO

MINNEAPOLIS-HONEYWELL REG CO DARAMATIC DIV  
NEWTON HIGHLANDS 61 MASS

MINNEAPOLIS-HONEYWELL REGULATOR CO  
13350 US HWY NO 19 ST PETERSBURG FLA

MINNEAPOLIS-HONEYWELL REG CO MILITARY PROB  
1017 WILSHIRE BLVD LOS ANGELES 17 CALIF

MINNEAPOLIS-HONEYWELL REGULATOR CO  
WAYNE & WINDSOR AVES PHILADELPHIA 88 PA

MINNEAPOLIS-HONEYWELL REGULATOR COMPANY  
QUEEN & SOUTH BAILEY POTTSBOM PA

MINN MINING & MFG CO  
ELECTRICAL PRODUCTS DIV 900 BUSH ST ST PAUL 6 MINN

MINN MINING & MFG CO  
400 MCKNIGHT RD ST PAUL 6 MINN

MINN MINING & MFG CO IRVINGTON DIV  
FREMOLD N J

MINN MINING & MFG CO  
JERSEY CITY CHEMICAL DIV 75 DODYER ST JERSEY CITY N J

MINNESOTA MINING & MFG CO IRVINGTON DIV  
900 BUSH AVE ST PAUL 6 MINN

MINNESOTA MINING & MFG CO  
900 BUSH AVE ST PAUL 6 MINN

MINNESOTA RADIO & TV INC  
2000 FERNWOOD ST PAUL MINN

MINNESOTA RUBBER & GASKET CO  
3630 WOODALE AVE MINNEAPOLIS 16 MINN

MINNOR RUBBER CO  
ACKERMAN ST BLOOMFIELD N J

MINSMALL ORGAN INC  
28 BIRGE ST BRATTLEBORO VT

MINSTER MACHINE CO  
1500 S 5TH ST MINSTER OHIO

MIRACLE ADHESIVES CO  
250 PETIT AVE BELLMORE L I N Y

MIRATEL INC  
1080 DIONNE ST ST PAUL 13 MINN

MISKELLA INFRA-RED CO  
E 73 & GRAND AVE CLEVELAND 4 OHIO

MISSILE ELECTRONICS ENGAG  
BOX 312 WINNETKA CALIF

MISSILE ENG PRODUCTS INC  
9TH & GUAVE EAU GALLIE FLA

MISSILE SYSTEM CO  
11949 VOSE ST N HOLLWOOD CALIF

MISSILEONICS INC  
P O BOX 716 MELBOURNE FLA

MISSOURI RESEARCH LABORATORIES INC  
2109 LOCUST ST ST LOUIS 3 MO

MITCHELL CAMERA CORP  
684 B HARVARD ST GLENDALE 1 CALIF

MITCHELL INDUSTRIES INC  
MUNICIPAL A P P O BOX 17 MINERAL BELLS TEXAS

MITCHELL RAND MFG CORP  
51 MURRAY ST NEW YORK 7 N Y

MITRE CO  
LEXINGTON MASS

MITRONICS INC  
1290 CENTRAL AVE HILLSIDE N J

MITSUMI ELECT CO  
TOKYO JAPAN

MOBAY CHEMICAL CO  
1815 WASHINGTON RD PITTSBURG PA

MOBIL ELECTRONICS MFG CO  
1111 STATE RD 57 E ANDERSON IND

MODEL ENGG & MFG INC  
50 FRDERICK ST HUNTINGTON IND

MODEL ENGG & MFG INC  
NORTH LAKE ST BOYNE CITY MICH

MODEL RECTIFIER CORP  
1675 UTICA AVENUE BROOKLYN 34 N Y

MODELECTRIC PRODUCTS CORP  
ASBURY PARK N J

MODERN ADHESIVES & ELECTRONICS INC  
131 ALLEN BLVD FARRINGDALE N Y

MODERN DESIGN DIV H C SCHLOER INC  
VESTAL PARKWAY EAST VESTAL N Y

MODERN INDUSTRIES INC  
5755 CAMELLE AVE CULVER CITY CALIF

MODERN LABORATORY EQUIP CO  
1811 I AVE NEW YORK 20 N Y

MOEHR WIRE CO  
39 30 REVISED AVE LONG ISLAND CITY 1 N Y

MODERN AIR CO  
400 PREDA ST SAN LEANDRO CALIF

MODINE MFG CO  
1500 DE KOVEN AVE RACINE WISC

MODULATION PROD CO  
58 WALKER ST N Y 13 N Y

MOELLER INSTRUMENT CO  
132-02 89 AVE RICHMOND HILL 18 N Y

MOHAWK BUSINESS MACHINES CORP  
944 HALSEY ST BROOKLYN 33 N Y

MOHAWK MFG CO  
P O BOX 1110 MIDDLETOWN CONN

MOHAWK WIRE A CABLE CO  
320 RIVER ST FITCHBURG MASS

MOHAWK WIRE A CABLE CORP  
45 SUMMER ST LEONISTER MASS

MOISTURE REGISTER CO  
P O BOX 910 ALHAMBRA CALIF

# ELECTRONIC MANUFACTURERS-A-Z

MOLDED CIRCUITS INC  
39 W CHICAGO AVE ROSELLE ILL  
MOLDED FIBER GLASS CO  
4401 BENEFIT AVE ASHTABULA OHIO  
MOLDED INSULATION CO  
335 E PRICE ST PHILADELPHIA 64 PA  
MOLDING CO OF AMERICA  
40 CHURCH ST PARTUCKET N J  
MOLDING CORP OF AMERICA  
58 BEYBOSSET ST PROVIDENCE 3 RI  
MOLE-RICHARDSON CO  
937 N SYCAMORE AVE HOLLYWOOD 38 CALIF  
MOLECU-WIRE CORP  
SCOTTSVILLE N J  
MOLETRONICS CO  
373 EUCLID AVE OAKLAND CALIF  
MOLEX PRODUCTS CO  
9515 SOUTHWEST AVE BROOKFIELD ILL  
MOLLY CORP  
230 N 9 ST READING PA  
MOLON MOTOR & COIL CORP  
3737 INDUSTRIAL AVE ROLLING MEADOWS ILL  
MOLONEY ELECTRIC CO  
5390 BIRCHER BLVD ST LOUIS 20 MO  
MONA INDUSTRIES INC  
P O BOX 1786 PATERSON 17 N J  
MONADMOCK HILLS  
977 FIRST AVE SAN LEANDRO CALIF  
MONASHAW CO J  
500 ALCOTT ST DENVER 8 COLO  
MONARCH ELECTRONICS CO  
2801 37TH N E MINNEAPOLIS 21 MINN  
MONARCH INDUSTRIES  
8835 NEV AVE OAKLAND 8 CALIF  
MONITOR CONTROLS  
60 GROVE ST ROCKLAND MASS  
MONITOR PRODUCTS CO  
815 FREMONT AVE S PASADENA CALIF  
MONITOR SYSTEMS INC  
FORT WASHINGTON PA  
MONROE PRECISION INDUSTRIES CASCADE RES  
DIV 3245 S FERNANDO RD LOS ANGELES 39  
CALIF  
MONROE CALCULATING MACHINE COMPANY  
555 MITCHELL ST ORANGE N J  
MONROE INDUSTRIES INC  
934 36TH ST S E GRAND RAPIDS 8 MICH  
MONROVIA AVIATION CORP  
801 ROYAL OAKS DR MONROVIA CALIF  
MONSANTO CHEMICAL CO  
800 N LINDENBACH BLVD ST LOUIS 66 MO  
MONTEK ASSOCIATES INC  
4475 S STATE ST SALT LAKE CITY 7 UTAH  
MONTGOMERY MFG CO  
206 S MAIN GREENVILLE IND  
MOODY MACHINE PRODUCTS CO  
40 DUDLEY ST PROVIDENCE 9 R I  
MOOG VALVE CO  
PROVER AIRPORT E AURORA N Y  
MOORADIAN HIGH FREQUENCY LABS  
13 E FORT LEE RD BOBOTA N J  
MOORE ASSOCIATES INC  
1600 SPRING ST REDWOOD CITY CALIF  
MOORE CO HOWARD J  
266 WILLIAMS ST NEW YORK N Y  
MORAN COMPANY  
MORAN COMPANY  
PO BOX 189 721 EL SEGUNDO BLVD EL SEGUNDO  
CA  
MORAN INSTRUMENT CORP  
170 E ORANGE GROVE BLVD PASADENA CALIF  
MORAN PRODUCTS CO  
7199 BENTONITE AVE CLEVELAND 8 OHIO  
MORAN PRODUCTS CO  
2025 E 89TH ST CLEVELAND 27 OHIO  
MORSE CORP  
2014 N MAJOR AVE CHICAGO 39 ILL  
MORGAN ELECTRONICS  
BOX 1204 BOSTON 9 MASS  
MORGANITE INC  
33-02 88 AVE LONG ISLAND CITY 1 N Y  
MORNINGSTAR PAISLEY INC  
4150 N UNION BLVD ST LOUIS 13 MO  
MORNINGSTAR-PAISLEY INC  
1770 CANALPORT AVE CHICAGO ILL  
MORNINGSTAR-PAISLEY INC  
630 W 51 ST NEW YORK 19 N Y  
MORNINGSTAR-PAISLEY INC  
1111 CHESTNUT ST REDWOOD CITY CALIF  
MORRIAN HIGH FREQ LABS  
13 E FORT LEE RD BOBOTA N J  
MORRIS BEAN & CO  
YELLOW SPRINGS OHIO  
MORRIS CO J I  
390 ELM ST SOUTHBRIDGE MASS  
MORROW RADIO MFG CO  
2794 MARKET ST SALEM OREGON  
MORSE CO FRANK B  
334 CONGRESS ST BOSTON 10 MASS  
MORSE INSTRUMENT CO  
20 CLINTON ST HUDSON OHIO  
MORTON ELECTRIC CORP  
10TH ST & MORTON AVE CHESTER PA  
MORSELEY CO F L  
404 N FAIR OAKS AVE PO BOX 791  
MOSINEE PAPER MILLS CO  
MOSINEE WISC  
MOSLER RESEARCH PRODUCTS INC  
9 SOUTH ST DANBURY CONN  
MOSLEY ELECTRONICS INC  
8422 ST CHARLES ROCK RD ST LOUIS 14 MO  
MOSLEY ELECTRONICS INC  
4610 N LINDENBACH BRIDGETON MO  
MOSSMAN INC DONALD B  
P O BOX 245 BREWSTER N Y  
MOTOGRAPH INC  
4441 W LAKE ST CHICAGO 24 ILL  
MOTORBYE INC  
2661 S MYRTLE AVE MONROVIA CALIF

MOTORESEARCH CO  
1800 JUNCTION AVE RACINE WISC  
MOTOROLA C & E  
916 N KILBOURN CHICAGO ILL  
MOTOROLA C & E INC  
7138 ENVY DALLAS 35 TEXAS  
MOTOROLA C & E INC  
1414 ROLLINS RD BURLINGAME CALIF  
MOTOROLA COMMUNICATIONS & ELECTRONICS INC  
4501 W AUGUSTA BLVD CHICAGO 91 ILL  
MOTOROLA INC  
9401 W GRAND AVE FRANKLIN PARK ILL  
MOTOROLA INC  
P O BOX 677 FT HUACHUCA ARIZ  
MOTOROLA INC  
8201 E MCDOWELL RD SCOTTSDALE ARIZ  
MOTOROLA INC  
1400 W 30TH ST QUINCY ILL  
MOTOROLA INC  
ARCADE N Y  
MOTOROLA INC  
8330 IMPERIAL AVE RIVERSIDE CALIF  
MOTOROLA INC  
1400 N CICERO AVE CHICAGO 91 ILL  
MOTOROLA INC  
4501 W AUGUSTA CHICAGO 91 ILL  
MOTOROLA INC  
9401 GRAND AVE FRANKLIN PARK ILL  
MOTOROLA INC SEMICONDUCTOR PRODUCTS DIV  
5005 E MC DOWELL RD PHOENIX ARIZ  
MOTOROLA INC W M  
PHOENIX ARIZ  
MOTSON CO J FRANK  
1717 BETHLEHEM PIKE FLOURTOWN PA  
MOUTIC SPECIALTIES CO  
1005-7 W WASHINGTON ST BLOOMINGTON ILL  
MOUNTAIN ASSOCIATES  
CHARLES ROAD MOUNT KISCO N Y  
MOVIOLA MFG CO  
1491 N GORDON ST HOLLYWOOD 28 CALIF  
MORNESS PRODUCTS INC  
1914 INDIANA ST RACINE WISC  
MOYEN CO C P  
8137 N MONTICELLO AVE SKOKIE ILL  
MP ENGINEERING CO  
FAIRFIELD 3 CONN  
MPLS-MONEYWELL REG CO  
2400 SE BELMONT PORTLAND 13 OREGON  
MPLS-MONEYWELL REG CO  
5440 GULF FREEWAY HOUSTON TEXAS  
MPLS-MONEYWELL REG CO SEMICONDUCTOR  
2835 NICOLLETT AVE MINNEAPOLIS 8 MINN  
MTC CO  
1912 MONTEREY AVE BERKELEY CALIF  
MUCKLE MFG CO  
U S HWY 14 ONATONIA MINN  
MUCON CORP  
9 ST FRANCIS ST NEWARK 5 N J  
MUELLER BRASS CO  
1923 LAPEL AVE PORT HURON 38 MICH  
MUELLER ELECTRIC CO  
1583 E 31 ST CLEVELAND 18 OHIO  
MUELLER HEINZ ENG CO  
CICERO & PORTLAND CHICAGO ILL  
MUIRHEAD & CO LTD  
BECKENHAM KENT ENGLAND  
MUIRHEAD INSTRUMENTS  
BECKENHAM KENT ENGLAND  
MUIRHEAD INSTRUMENTS INC  
441 LEXINGTON AVE NEW YORK 17 N Y  
MUIRHEAD INSTRUMENTS LTD  
STRATFORD ONTARIO CANADA  
MULLARD ELECT TUBES  
CENTURY HOUSE SHAPTESBURY AVE LONDON ENG  
MULLARD EQUIPMENT LTD  
TORRINGTON PL LONDON WC 1 ENGLAND  
MULLARD OVERSEAS LTD  
MULLARD HOUSE TORRINGTON PL LONDON W C 1  
ENGLAND  
MULLENBACH DIV ELECTRIC MACHINERY MFG CO  
2100 E 27 ST LOS ANGELES 58 CALIF  
MULLOWNEY F J  
BOX 152 WEST TRENTON N J  
MULTI-AMP ELECTRONIC CORP  
463 LEHIGH AVE UNION N J  
MULTICORE SALES CORP  
80 SHORE RD PORT WASHINGTON N Y  
MULTICORE SOLDERS LTD  
MARYLANDS AVE HEMEL HEMPSTEAD  
HERTFORDSHIRE ENGLAND  
MULTI-PRODUCTS CO  
21470 COOLIDGE HWY OAK PARK 37 MICH  
MULTI-TRON LAB INC  
9861 DERBY LAKE WESTCHESTER ILL  
MULTI-TRON SERVICE CO  
535 VENTURA AVE SAN MATEO CALIF  
MULTITRONICS INC  
BOX 1539 4130 BASHINGTON BLVD SARASOTA FLA  
MUNDT B SONS CHARLES  
53 FAIRMOUNT AVE JERSEY CITY 4 N J  
MUNSTON MFG B SERVICE INC  
BEECH ST 1511 N Y  
MUNTZ INDUSTRIES INC  
1000 GRAY AVE EVANSTON ILL  
MURPHY & MILLER  
614 W TAYLOR ST CHICAGO 9 ILL  
MURRAY ELECTRONIC INC  
8182 ALAMO ST ANAHEIM CALIF  
MURRAY MFG CORP  
1250 ATLANTIC AVE BROOKLYN 16 N Y  
MUSICOLOR INC  
111 HOFFETT RD LAKE BLUFF ILL  
MUTER CO  
1255 S MICHIGAN AVE CHICAGO 5 ILL  
MUTRONICS  
939 GALLOWAY ST PACIFIC PALISADES CALIF  
MUTUAL ELECTRONIC INDUSTRIES CORP  
85 BEECHWOOD AVE NEW ROCHELLE N Y

MUTUAL ELECTRONICS INDUSTRIES INC  
50 ALEPPA ST PROVIDENCE 4 I  
MY-T-GRIP MFG CO INC  
176 BROADWAY NEW YORK 38 N Y  
MYCALEX  
30 ROCKEFELLER PLAZA NEW YORK N Y  
MYCALEX CORP OF AMERICA  
125 CLIFTON BLVD CLIFTON N J  
MYERS BROS INC & A  
RADIOEAR BLDG VALLEY BROOK RD  
CANNONSBURG PA  
MYKROY INC  
645 WHEELING RD WHEELING ILL  
MYSTIC TRANSFORMERS INC  
114 WEST ST BILMINGTON MASS  
MYSTIK ADHESIVE PROD  
2439 N KILDARE AVE CHICAGO ILL  
MYTRON MFG CO  
4923 BRAZIL ST LOS ANGELES 39 CALIF

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NAGEL-CHASE MFG CO  
2811 N ASHLAND AVE CHICAGO 13 ILL  
NAREPLATES INC  
421 E 101 ST BROOKLYN 36 N Y  
NANILOA CORP  
BOX 2791 - STA B TOLEDO 6 OHIO  
NANPERRIS CO G L  
15300 FULLERTON DETROIT 27 MICH  
NANCO  
INDUSTRIAL PARK FT WASHINGTON PA  
NARDA MICROAVE CORP  
118-160 HERRICKS RD NINEOLA N Y  
NARDA ULTRASONIC CORP 625 RAIN ST WESTBURY  
N Y  
NARMCO MATERIALS DIV NARMCO INDUSTRIES INC  
600 VICTORIA ST COSTA MESA CALIF  
NARMCO MFG CO  
BOX 247 LA MESA CALIF  
NARROW FABRIC CO  
P O BOX 742 READING PA  
NASHUA CORP  
80 FRANKLIN ST NASHUA N H  
NATIONAL AERONAUTICAL CORP  
COMMERCE DR FT WASHINGTON PENNA  
NATIONAL AIRCRAFT CORP  
3110 EDITH BLVD N E ALBUQUERQUE N MEX  
NATIONAL AIRCRAFT CORP  
222 PEARL ST NORRISTON PA  
NATL BERYLLIA CORP  
157 AVE HASKELL N J  
NATL BERYLLIA CORP  
4501 DELL AVE N BERGEN N J  
NATIONAL CARBON CO DIV UNION CARBIDE CORP  
270 PARK AVENUE NEW YORK 17 N Y  
NATIONAL CARBON CO PRODUCT & PROC CONTROL  
ASHEBORO N C  
NATIONAL CASH REGISTER  
1401 E EL SEGUNDO BLVD HAWTHORNE CALIF  
NATIONAL CASH REGISTER CO  
MAIN & 4 STS DAYTON 9 OHIO  
NATIONAL CERAMIC CO  
300 SOUTHWARD ST TRENTON 2 N J  
NATIONAL CINE EQUIPMENT INC  
209 W 48 ST NEW YORK 36 N Y  
NATIONAL COIL CO  
P O BOX 1237 SHERIDAN BVD  
NATIONAL COMPANY INC  
61 SHERMAN ST HALDEN 68 MASS  
NATIONAL COMPANY INC  
34 ESSEX ST MELROSE MASS  
NATIONAL DATA PROCESSING CO  
BOX 122 DALLAS 21 TEXAS  
NATIONAL ELEC COIL CO  
794 CHAMBERS RD COLUMBUS 16 OHIO  
NATIONAL ELECTRIC COIL DIV MCBAB-EDISON CO  
800 KING AVE COLUMBUS 16 OHIO  
NATL ELEC PRODS CORP  
338 14TH ST AMBRIDGE PENNA  
NATIONAL ELECTRONICS INC  
628 NORTH ST GENEVA ILL  
NATL ELEC DIV M B PORTER CO INC  
PORTER BUILDING PITTSBURGH 22 PA  
NATIONAL ELECTRONICS LABS INC  
1713 KALARANA RD N WASHINGTON 9 D C  
NATIONAL ENGG PRODUCTS INC  
435 WASHINGTON BLDG WASHINGTON 5 D C  
NATIONAL FABRICATED PRODUCTS  
DIV HOFFMAN ELECTRONICS CORP  
2630 W BELDEN AVE CHICAGO 67 ILL  
NATIONAL GASKET & WASHER MFG CO  
124 E 25 ST NEW YORK 10 N Y  
NATL GEOPHYSICAL CO INC  
2345 MOCKINGBIRD LANE DALLAS TEXAS  
NATIONAL INSTRUMENT LABS INC  
828 EVARTS ST N WASHINGTON D C  
NATL LEAD CO  
BOX 58 SOUTH AMBOY N J  
NATL LOCK CO  
1902 7TH ST ROCKFORD ILL  
NATIONAL LOCK WASHER CO  
40 HERMON ST NEWARK 5 N J  
NATIONAL METALLIZING CORP  
DU PONT CIRCLE BLVD WASHINGTON 6 D C  
NATIONAL MOLDITE CO  
250 SOUTH AVE NEWARK N J  
NATL PNEUMATIC CO INC HOLTZER-CABOT DIV  
125 ANORY ST BOSTON 19 MASS  
NATL PRESTO INDUSTRIES  
EAU CLAIRE WIS

# ELECTRONIC MANUFACTURERS-A-Z

MATL RADIAC INC  
475 WASHINGTON ST NEWARK 2 N J  
MATL RADIO CO INC  
37 WASHINGTON ST MELROSE 76 MASS  
NATIONAL SCIENTIFIC LABS INC  
2010 MASSACHUSETTS AVE N WASHINGTON 6  
B E  
MATL SCREW & MFG CO  
3423 SO GARFIELD AVE LOS ANGELES 22 CALIF  
NATIONAL SCREW & MANUFACTURING CO  
2440 E 75 ST CLEVELAND 4 OHIO  
MAT'L SEMICONDUCTOR CORP  
PO BOX 443 SUGAR HOLLOW RD DANBURY CONN  
MAT'L SEMICONDUCTORS LTD  
230 AUTHIER SR MONTREAL 9 QUE CANADA  
MATL SPECTROGRAPHIC LABS INC  
6300 EUCLID AVE CLEVELAND 7 OHIO  
NATIONAL-STANDARD CO  
NILES MICHIGAN  
NATIONAL-STANDARD CO  
DIXON ILL  
NATIONAL-STANDARD CO  
CLIFTON N J  
NATIONAL TELEVISION TUBE INC  
P O BOX 133 ROCHELLE PARK N J  
MATL TELEVISION TUBE INC  
ROUTE 46 SADDLE BROOK N J  
NATIONAL TEL TRONICS CORP  
52 ST CASIMIR AVE YONKERS N Y  
NAT'L TOWERS  
1579 MORRISTON ORLANDO FLA  
MATL ULTRASONIC CORP  
111 MONTGOMERY AVE IRVINGTON 11 N J  
NATIONAL UNION ELECTRIC CORP ELECTRONICS DIV  
1201 E BELL ST BLOOMINGTON ILL  
NATIONAL VACUUM PLATERS INC  
2633 E HAGERT ST PHILA 25 PA  
NATIONAL VIDEO CORP  
4300 W 47TH ST CHICAGO 32 ILL  
NATIONAL VULCANIZED FIBRE CO  
P O BOX 311 WILMINGTON 99 DELA  
NATIONAL VULCANIZED FIBRE CO  
NEWARK DEL  
NATIONAL VULCANIZED FIBRE CO  
YORKLYN DEL  
NATIONAL VULCANIZED FIBRE CO  
2415 GARDNER RD BROADVIEW ILL  
NATIONAL VULCANIZED FIBRE CO  
50 CHURCH ST NEW YORK 7 N Y  
MATL VULCANIZED FIBRE CO  
MULBERRY A LAFAYETTE KENNETT 50 PA  
MATL VULCANIZED FIBRE CO  
MARYLAND & BEECH ST WILMINGTON DEL  
NATIONAL WATER LIFT CO  
2220 PALMER ST CALAMAZOO MICH  
NATURAL LIGHTING CORP  
630 W FLOWER BURBANK CAL  
NATVAR CORP  
211 RANDOLPH AVE WOODBRIDGE N J  
NAUGLER ENGG INC  
19 MADISON AVE BEVERLY MASS  
NAM PRODUCTS INC  
900 N SEPULVEDA ST EL SEGUNDO CAL  
NAVCOR  
1621 SNYDER AVE PHILA 45 PA  
NAVIGATION COMPUTER CORP  
1621 SNYDER AVE PHILA 45 PENNA  
NAVIGATION DEVICES INC  
BOX 1107 BINGHAMTON N Y  
NAVYOR LABORATORIES INC E W  
28 MANORHAVEN BLVD PORT WASHINGTON N Y  
NAZ-DAR CO  
465 MILWAUKEE AVE CHICAGO 10 ILL  
NEALS ROETHER HICKOK  
503 FIRST BATT BR BLDG ORLANDO FLA  
NEBEL LAB R E  
1634 EAST 12TH ST BROOKLYN 29 N Y  
NEFF INSTRUMENT CORP  
1088 E HAMILTON RD DUARTE CALIF  
NEFF INSTRUMENT CORP  
2211 E FOOTHILL BLVD PASADENA CALIF  
NEILL CO R W  
4320 MONTRUSE AVE CHICAGO 41 ILL  
NELSON VACUUM PUMP CO GEO F  
2133 W ST BERKELEY 10 CALIF  
NEMS CLARKE CO  
7713 OAKDALE AVE CANOGA PARK CALIF  
NEMS-CLARKE CO DIV VITRO CORP OF AMERICA  
919 JESUP-BLAIR OR SILVER SPRING MD  
NEOSIL PRODUCTS CO  
10 E 39TH ST NEW YORK 16 N Y  
NESCO INST INC  
638 W 17TH ST COSTA MESA 9 CALIF  
NESHAMINY ELECTRONIC CORP  
EASTON RD NESHAMINY PA  
NESOA ALLOY PRODUCTS CO  
282 HALSEY ST NEWARK N J  
NETWORK INDUSTRIES INC  
P O BOX 397 BAYONNE N J  
NETWORKS ELECTRONIC CORP  
14806 ORNARD ST VAN NUYS CALIF  
NEUCOR INC  
1730 ALTAWOOD DR PALMDENA CALIF  
NEUMADE PRODUCTS CORP  
250 W 57 ST NEW YORK 19 N Y  
NEUMADE PRODUCTS CORP  
654 MICHIGAN AVE BUFFALO 3 N Y  
NEUTRONIC ASSOCIATES INC  
32 TENNESSEE AVE HEMPSTEAD N Y  
NEUTRONICS RESEARCH CO  
343 LEXINGTON ST BALTHAM 54 MASS  
NEVADA AIR PRODUCTS CO  
P O BOX 1090 W VALLEY RD RENO NEV  
NEB BRUNSWICK SCIENTIFIC CO  
PO BOX 606 NEW BRUNSWICK N J

NEW DEPARTURE DIV GNC  
269 W MAIN ST BRISTOL CONN  
NEW ENGLAND CABLE CO  
22 BRIDGE ST CONCORD NH  
NEW ENGLAND ELECTRICAL WORKS INC  
365 MAIN ST LISBON N H  
NEW ENGLAND ETCHING & PLATING CO  
HOLYOKE MASS  
NEW ENGLAND INST CO  
1334 MAIN ST WALTHAM MASS  
NEW ENGLAND LAMINATES CO  
481 CANAL ST STAMFORD CONN  
NEW ENGLAND NUCLEAR CORP  
575 ALBANY ST BOSTON 18 MASS  
NEW ENGLAND OVEN & FURNACE CO  
385 BOSTON POST RD ORANGE CONN  
NEW ENGLAND TAPE CO  
30 TOWER ST HUDSON MASS  
NEW ENGLAND TRANSFORMER CO  
47 MCGRATH HWY SOMERVILLE 43 MASS  
NEW HERMES ENGRAVING MACHINE CORP  
1346 N HIGHLAND AVE LOS ANGELES 28 CALIF  
NEW HERMES ENGRAVING MACHINE CORP  
154 W 10TH ST NEW YORK 11 N Y  
NEW JERSEY WOOD FINISHING CO  
800BORRIDGE N J  
NEW JERSEY ZINC CO  
160 FRONT ST NEW YORK 38 N Y  
NEW LONDON INSTRUMENT CO INC  
82 UNION ST LONDON CONN  
NEW ROCHELLE THERMATOOL CORP  
320 MAIN ST NEW ROCHELLE N Y  
NEW YORK AIR BRAKE CO  
230 PARK AVE NEW YORK 17 N Y  
NEW YORK COIL CO  
40 2 AVE PHOENIXVILLE PA  
NEW YORK MFG & GENERAL SUPPLY CO  
10-38 JACKSON AVE LONG ISLAND CITY 1 N Y  
NEW YORK SOLDER CO  
684 E 133 ST NEW YORK 94 N Y  
NEW YORK TRANSFORMER CO  
3 AVE ALPHA N J  
NEW YORK TUBIST DRILL CO INC  
276 LAFAYETTE ST NEW YORK 12 N Y  
NEW-TRONICS CORP  
3455 VEGA AVE CLEVELAND 13 OHIO  
NEWAGE INDUSTRIES INC  
222 YORK RD JENKINTOWN PENNA  
NEWARK CONTROLS CO  
15 WARD ST BLOOMFIELD N J  
NEWARK ELECT CO  
223 W MADISON ST CHICAGO ILL  
NEWARK WIRE CLOTH CO  
351 VERONA AVE NEWARK 4 N J  
NEWBURY INDUSTRIES INC  
NEWBURY OHIO  
NEWCASTLE FABRICS CORP  
75 N 11TH ST BROOKLYN 11 N Y  
NEWCOMB AUDIO PRODUCTS CO  
6824 LEXINGTON AVE HOLLYWOOD 38 CALIF  
NEWCOMB SPRING CORP  
17 E HARTHURST AVE VALLEY STREAM N Y  
NEWCOMB SPRING OF ATLANTIC INC  
1200 SPRING ST NW ATLANTA GA  
NEWCOMB SPRING OF CONN  
510 QUEEN ST SOUTHWINGTON CONN  
NEWMAN CORP N H  
79 CLIFTON AVE MARBLEHEAD MASS  
NEWTON CO N H  
NEWTON CO ST MANCHESTER CONN  
NEY CO J M  
P O BOX 990 HARTFORD 1 CONN  
NEY CO J M  
MAPLEWOOD AVE BLOOMFIELD CONN  
N H BALL BEARINGS INC  
PETERBOROUGH 1 NH  
NIAGARA ELECTRON LABS  
P O BOX 128 MAIN ST ANDOVER N Y  
NIAGARA MACHINE & TOOL WKS  
683 NORTHLAND AVE BUFFALO 11 N Y  
NICAD DIV INC GOULD-NATIONAL BATTERIES INC  
EASTHAMPTON MASS  
NICHOLS & CLARK INC  
321 NEWBURYPORT TURNPIKE HATHORNE MASS  
NICHOLS PRODUCTS CO  
325 W MAIN ST MOORESTOWN N J  
NICHOLS WIRE & ALUMINUM CO  
1725 ROCKINGHAM RD DAVENPORT IOWA  
NIELSEN CO A C  
807 HOWARD ST EVANSTON ILL  
NIELSEN HARDWARE CORP  
770 BETHERSFIELD AVE HARTFORD 14 CONN  
NIEMAND BROS INC  
45-10 94TH ST ELMHURST 13 N Y  
NILSEN MFG CO  
21 N CHURCH ST ADDISON ILL  
NILSSON ELECTRICAL LABORATORY INC  
103 LAFAYETTE ST NEW YORK 13 N Y  
NIPPERT ELECTRIC PRODUCTS CO  
1759 W MOUND ST COLUMBUS 23 OHIO  
NIPPON ELECTRIC CO LTD  
SHIBA HITA TOKYO JAPAN  
NJL CORP  
20 BORTGHT AVE KENILWORTH N J  
NOBLE & WESTBROOK MFG CO  
EAST HARTFORD 8 CONN  
NOEL MFG CO  
3 W 18 ST NEW YORK 11 N Y  
NOEL SHYSER ENGG CORP  
5250 W 10TH ST INDIANAPOLIS 24 IND  
NOLCO CO BALTR  
24 GIRCH RD NATICK MASS  
NOLLER ASSOC  
PO BOX 118 BERKELEY 1 CALIF  
NON-LINEAR SYSTEMS INC  
DEL MAR AIRPORT DEL MAR CALIF

NONOTUCK MFG CO  
HOLYOKE MASS  
NOOTER CORP  
1400 S 2ND ST ST LOUIS 4 MO  
NOPCO CHEMICAL CANADA LTD  
PO BOX 68 LONDON ONT CANADA  
NOPCO CHEMICAL CO  
60 PARK PLACE NEWARK N J  
NORBUITE  
191 NEWEL ST BROOKLYN 22 N Y  
NORCO PRODUCTS MFG CO  
392 BLEECKER ST NEW YORK 16 N Y  
NORDEN DIV UNITED AIRCRAFT CORP  
13210 CRENSHAW BLVD GARDENA CALIF  
NORDEN DIVISION UNITED AIRCRAFT CORP  
COMMERCE RD STAMFORD CONN  
NORDEN KETAY CORP  
JERICHO TPK COMMACK N Y  
NORDEN KETAY CORP  
BOSTON POST RD MILFORD CONN  
NORDEN LAB DIV UNITED AIRCRAFT  
121 WESTMORELAND AVE WHITE PLAINS N Y  
NORDEN-KETAY CORP NORDEN LABS  
121 WESTMORELAND AVE WHITE PLAINS N Y  
NORMAN HOFFMANN BEARINGS CORP WALKER DIV  
HAMILTON AVE STAMFORD CONN  
NORMAN TOOLS  
7120 CANBY RESEDA CALIF  
NORRICH PLASTICS CORP  
107 W 18TH ST NEW YORK N Y  
NORRMAN LABORATORIES ERNST  
WILLIAMS BAY WISC  
NORSIDA MFG CO  
333 PROSPECT ST YONKERS 1 N Y  
NORTH AMER AVIATION  
9489 MUROC ST BELLFLOWER CALIF  
NORTH AMERICAN AIRCRAFT  
PO BOX 511 NEOSHO MO  
NORTH AMERICAN AVIA INC  
BOX 786 BELLEVUE NEBR  
NORTH AMERICAN AVIA-AUTOMETICS  
4616 CLOUD AVE LA CRESCENTA CALIF  
NORTH AMERICAN AVIA-AUTOMETICS  
2360 FERN WAY LA HABRA CALIF  
N AMERICAN AVIATION INC MISSILE DIV  
12214 LAKEWOOD BLVD DOWNEY CALIF  
NORTH AMERICAN AVIA-AUTOMET  
6112 E SPRING ST LONG BEACH 18 CALIF  
NORTH AMERICAN AVIAT INC  
536 ELDER ST ANAHEIM CALIF  
NORTH AMERICAN AVIATION INC  
43 SO BREATLAND AVE COLUMBUS 4 OHIO  
NORTH AMERICAN AVIATION CORP ROCKETDYNE  
BOX 548 MC GREGOR TEXAS  
NORTH AMERICAN AVIATION AUTOMETICS DIV  
TROJAN & INDUSTRY AVE PICO RIVERA CALIF  
NORTH AMERICAN AVIATION  
2401 WHITNEY DRIVE ALHAMBRA CALIF  
NORTH AMERICAN AVIATION AUTOMETICS DIV  
4780 N OBISPO AVE LAKEWOOD CALIF  
NORTH AMERICAN AVIATION  
2019 WEST 42ND ST LOS ANGELES 62 CALIF  
NORTH AMERICAN AVIATION INC  
11770 MINES BLVD WHITTIER CALIF  
NORTH AMERICAN AVIATION-ROCKETDYNE DIV  
6633 CANOGA AVE CANOGA PARK CALIF  
NORTH AMERICAN ELECTRIC LAMP CO  
1520 N 13 ST ST LOUIS 8 MO  
NORTH AMERICAN ELECTRONICS INC  
71 LINDSON ST LYNN MASS  
NORTH AMERICAN ELECTRONICS  
157 BROAD ST RED BANK N J  
NORTH AMERICAN PHILLIPS CO  
LISBON RD LEWISTON ME  
NORTH AMERICAN PHILLIPS CO  
100 E 42ND ST NEW YORK N Y  
NORTH ATLANTIC INDUSTRIES INC  
603 MAIN ST WESTBURY N Y  
NORTH ELECTRIC CO  
553 S MARKET ST GALION OHIO  
NORTH HILLS ELECTRIC CO INC  
402 SAGAMORE AVE HINDELTA LI N Y  
NORTH HILLS ELECTRIC CO INC  
ALEXANDER PL GLEN COVE L I N Y  
NORTH SHORE NAMEPLATE DIV ANODYNE INC  
214-27 NORTHERN BLVD BAYSIDE 61 N Y  
NORTHEAST ELECTRIC CO  
5224 NO KEDZIE AVE CHICAGO 25 ILL  
NORTHEAST ELECTRONICS CORP  
AIRPORT RD CONCORD N H  
NORTHEAST SCIENTIFIC CORP  
30 WETHERBEE ST ACTON MASS  
NORTHEAST TELECOMM INC  
BOX 145 PLANTSVILLE CONN  
NORTHEASTERN ENGG INC  
25 S BEDFORD ST MANCHESTER N H  
NORTHERN ENGG LABS  
372 WILMOT AVE BURLINGTON WISC  
NORTHERN INDUSTRIAL CHEMICAL CO  
7 ELKINS ST S BOSTON 27 MASS  
NORTHERN METAL PRODUCTS CORP  
9595 W GRAND AVE FRANKLIN PARK ILL  
NORTHERN PLASTICS CORP  
2ND MARKET ST LACROSSE WISC  
NORTHERN RADIO CO  
143 W 22 ST NEW YORK 11 N Y  
NORTHERN RADIO MFG CO LTD  
1950 BANK ST OTTAWA ONT CANADA  
NORTHERN SIGNAL CO  
SAUKVILLE WISC  
NORTHFIELD PRECISION INSTRUMENT CORP  
ISLAND PARK LI N Y  
NORTHMOOR RECORDING  
BOX 691 ST LOUIS 88 MO  
NORTHROP AIRCRAFT INC  
16710 ELGAR AVE TORRANCE CALIF

# ELECTRONIC MANUFACTURERS-A-Z

**NORTHROP AVIATION INC**  
26311 BIRCHFIELD AVE ROLLING HILLS CALIF  
**NORTHROP CORP**  
FIRST SECURITY BLDG OGDEN UTAH  
NORTHROP CORP  
438 TALBERT PLAYA DEL REY CALIF  
**NORTHROP CORP**  
7348 CHIRINEAS AVE RESEDA CALIF  
**NORTHROP CORP-NORAIR DIV**  
2031 E MARIPOSA EL SEGUNDO CALIF  
**NORTHROP CORP-NORTHTRONICS DIV**  
222 N PRAIRIE AVE HAWTHORNE CALIF  
**NORTHROP CORP-NORTHTRONICS DIV**  
500 E ORANGETHORPE AVE ANAHEIM CALIF  
**NORTHROP CORP-NOVAIR DIV**  
130 E OSCEOLA LA COCOA BEACH FLA  
**NORTHROP CORP-NORAIR DIV**  
PO BOX 500 LANCASTER CALIF  
**NORTHWEST PLASTICS INC**  
65 PLATO AVE ST PAUL 7 MINN  
**NORTON ASSOC INC**  
PO BOX 96 GARDEN CITY LI N Y  
**NORTON ASSOCIATES INC**  
240 OLD COUNTRY RD HICKSVILLE N Y  
**NORTON CO**  
1 NEW BOND ST WORCESTER 6 MASS  
**NORTHTRONIC DIV NORTHROP**  
NORWOOD MASS  
**NORTHTRONICS CO INC**  
1015 S 6TH ST MINNEAPOLIS 4 MINN  
**NORTHTRONICS DIV NORTHROP**  
1001 E BROADWAY HAWTHORNE CALIF  
**NORBALK CUTTER SHARPENING CO**  
356 ELY AVE S NORBALK CONN  
**NORWOOD CONTROLS UNIT DETROIT CONTROLS DIV**  
5900 TRUMBULL AVE DETROIT MICH  
**NOTHELFER BINDING LABS INC**  
P O BOX 835 TRENTON 3 N J  
**NOTNAC MFG CO INC**  
1410 2ND ST S W CANTON 2 OHIO  
**NOVA-TECH INC**  
943 10TH ST MANHATTAN BEACH CALIF  
**NRC EQUIPMENT CORP**  
180 CHARLEMONT ST NEWTON 61 MASS  
N R K MFG & ENGR CO  
4601 W ADDISON ST CHICAGO 41 ILL  
**NTH PRODUCTS INC**  
1655 CUYANACA AVE EL CAJON CALIF  
**NUCLEAR CORP OF AMERICA**  
2 RICHWOOD PL DENVER 11 N J  
**NUCLEAR DEVELOPMENT CORP OF AMERICA**  
3 NEW ST WHITE PLAINS N Y  
**NUCLEAR DEVELOPMENT LAB**  
P O BOX 7034 KANSAS CITY 13 MO  
**NUCLEAR ELECTRO LAB DIV**  
PO BOX 90919 LOS ANGELES CALIF  
**NUCLEAN ENTERPRISES G B LTD**  
BANKHEAD REDWAY SIGHTILL, EDINBURGH 11  
SCOTLAND  
**NUCLEAR MEASUREMENTS CORP**  
2460 N ARLINGTON AVE INDIANAPOLIS 18 IND  
**NUCLEAR SYSTEMS DIV BUDD CO**  
2459 MUMFORD PARK AVE PHILA PA  
**NUCLEAR-CHICAGO CORP**  
333 E HOWARD AVE DES PLAINES ILL  
**NUCLEAR-ELECTRONICS CORP**  
2925 N BROAD ST PHILADELPHIA 32 PA  
**NUCLEONIC CO**  
25 WILLET ST NEW YORK 2 N Y  
**NUCLEONIC CORP OF AMERICA**  
196 DEGRAV ST BROOKLYN 31 N Y  
**NUCLEONIC PRODUCTS CO**  
1601 GRANDE VISTA AVE LOS ANGELES 23 CALIF  
**NUCOR RESEARCH INC**  
2421 WALCOTT FERRDALE 20 MICH  
**NUBENT ELECTRONICS CO INC**  
802 E 8TH ST NEW ALBANY IND  
**NUKEM PRODS CORP**  
111 COLGATE AVE BUFFALO 20 NY  
**MURNBERG THERMOMETER CO**  
124 LYNINGTON ST BROOKLYN 2 N Y  
**MU STEEL CO**  
1714 S ASHLAND AVE CHICAGO 8 ILL  
**MUTRON MFG CO INC**  
57 MONROE AVE STATEN ISLAND 1 N Y  
**MUTT-SMEL CO SP3 WESTERN**  
2701 S HARBOR BLVD SANTA ANA CALIF  
**MY-GLASS INC**  
2501 E 86 ST, LONG BEACH, CALIF  
**MYE INC WA P**  
10 HOWLAND RD FAIRHAVEN MASS  
**MYLOGRIP PRODUCTS**  
570 PLEASANT ST WATERTOWN MASS  
**MYLOK CORP**  
6044 CENTRAL PARK AVE SKOKIE ILL  
**MYLOK CORP**  
611 INDUSTRIAL AVE PARAMUS N J  
**MYLOK CORP**  
133 PEHR ST EL SEGUNDO CALIF  
**N Y T ELECTRONICS INC**  
2979 NW ONTARIO BURBANK CALIF  
**NYTRONICS INC**  
550 SPRINGFIELD AVE BERKELEY HEIGHTS N J

**OAK ELECT CO**  
150 OAK ST BUFFALO 3 N Y  
**OKAITE PRODS INC**  
MATH & FORD AVES MILLTOWN NJ  
**OKAITE PRODUCTS INC**  
79 RECTOR ST NEW YORK 6 N Y  
**OAK MANUFACTURING CO**  
18 WASHINGTON AVE HADDONFIELD N J

**OAK MFG CO**  
1260 N CLYBOURN AVE CHICAGO 10 ILL  
**OAK MFG CO**  
ELKHORN WIS  
**OAKTRON INDUSTRIES INC**  
HIBWAY 69 SOUTH MONROE WISC  
**O'BRIEN ELECTRIC CO**  
4729 VARNA AVE VAN NUYS CALIF  
**OERLIKON TOOL & ARMS CORP**  
P O BOX 3049 ASHEVILLE 10 CAR  
**OFFNER ELECTRONICS INC**  
3900 RIVER RD SCHILLER PARK ILL  
**OGDEN COIL & TRANSFORMER CO**  
3323 W CERNAK RD CHICAGO 23 ILL  
**OHIO BRASS CO**  
380 N MAIN ST MANSFIELD OHIO  
**OHIO CARBON CO**  
12508 BEEBA RD CLEVELAND 11 OHIO  
**OHIO CHEMICAL & SURGICAL EQUIPMENT CO**  
1130 GRAND ST HOBOKEN N J  
**OHIO CHEMICAL & SURGICAL EQUIPMENT CO**  
1177 MARQUETTE ST CLEVELAND 16 OHIO  
**OHIO CHEMICAL PACIFIC CO**  
1231 SECOND ST BERKELEY CALIF  
**OHIO CRANKSHAFT CO TOCCO DIV**  
1519 HARBARD AVE CLEVELAND 3 OHIO  
**OHIO SEAMLESS TUBE DIV COPPERWELD STEEL CO**  
SHELBY OHIO  
**OHIO SEMICONDUCTORS INC**  
1035 W THIRD AVE COLUMBUS 8 OHIO  
**OHMART CORP**  
2236 BOGEN ST CINCINNATI 14 OHIO  
**OHMETS MFG CO**  
3601 HOWARD ST SKOKIE ILL  
**OHMWEVE CO INC**  
43 DARCY ST WEST HARTFORD CONN  
**OILBEAR CO INC**  
185 BEAR HILL RD WALTHAM 94 MASS  
**OK ELECTRONICS CORP**  
7 HUNT PL WATLEY 10 M J  
**OKI ELECTRONIC IND CO LTD**  
TOKYO JAPAN  
**OKLANOMA ELEC CORP**  
101 E GRAY NORMAN OKLA  
**OKONITE CO**  
PASSAIC N J  
**OLIN MATHESSON CHEMICAL CORP ELECTRICAL DIV**  
275 WINCHESTER AVE NEW HAVEN CONN  
**OLTRONIX CO**  
235 UNDERWOOD DR ATLANTA 3 GA  
**OLYMPIC INSTRUMENTS INC**  
VASHON WASH  
**OLYMPIC PLASTICS CO**  
3471 S LACIEMEGA BLVD LOS ANGELES 16 CALIF  
**OLYMPIC PRODUCTS CO INC**  
3 AVE ALPHA N J  
**OLYMPIC RADIO & TV DIV SIEGLER CORP**  
34-01 38 AVE LONG ISLAND CITY 1 N Y  
**OMCO**  
BOX 1110 KINGMAN ARIZ  
**OMEGA ELECTRONICS CO**  
1015 DIAMOND AVE EVANSVILLE 7 IND  
**OMEGA LABS INC**  
HAVERHILL ST ROWLEY MASS  
**OMEGA MFG INC**  
219 E 44TH ST NEW YORK 17 N Y  
**OMNITRONICS INC**  
511 N BROAD ST PHILA 23 PENNA  
**ON MARK COUPLINGS INC**  
4440 YORK BLVD LOS ANGELES 41 CALIF  
**ONAN & SONS W**  
2515 UNIVERSITY AVE S E MINNEAPOLIS 14  
MINN  
**ONEIL-IRWIN MFG CO**  
300 8TH AVE LAKE CITY MINN  
**ONONDAGA ELECTRONICS DIV SPEER CARBON CO**  
1810 W FAYETTE ST SYRACUSE 1 N Y  
**OPAD ELECTRIC CO**  
43 WALKER ST NEW YORK 13 N Y  
**OPTICAL COATING LAB INC**  
977 SEBASTOPOL RD SANTA ROSA CALIF  
**OPTICAL GAGING PRODUCTS INC**  
26 FORBES ST ROCHESTER 11 N Y  
**OPTICS MFG CO**  
BILLARD B AMBER STS PHILA 34 PA  
**OPTIMIZED DEVICES INC**  
884 FRANKLIN AVE THORNWOOD N Y  
**OPTIONIC RESEARCH INC**  
1374 MASS AVE CAMBRIDGE 38 MASS  
**OPTRON CORP**  
335 S SALINAS ST SANTA BARBARA CALIF  
**OPTE-JORDON**  
4013 BIEBE RD CINCINNATI 13 OHIO  
**ORANGE ROLLER BEARING CO INC**  
557 MAIN ST CARMEL N J  
**ORBIT INDUSTRIES**  
BOX 066 RESEDA CALIF  
**ORBITRAN CO INC**  
11487 WOODSIDE AVE LAKESIDE CALIF  
**ORION ELECTRONICS MFG CO**  
2105 S E 4 AVE PORTLAND 14 ORE  
**ORELL INC**  
P O BOX 527 SOUTH GATE CALIF  
**ORIGIN ERECT CO LTD**  
TOKODARINICHO TOSHINAKA TOKYO JAPAN  
**ORONITE CHEMICAL CO**  
200 BUSH ST SAN FRANCISCO CALIF  
**ORR INDUSTRIES CO**  
P O BOX 190 OPELIKA ALA  
**ORTHO FILTER CORP**  
7 PATERSON ST PATERSON 1 N J  
**ORTHRONIC INC**  
P O DRAWER 8217 ORLANDO FLA  
**ORVX CO**  
13804 VENTURA BLVD SHERMAN OAKS CALIF  
**OSBORNE ELECTRONIC CORP**  
712 S E HAWTHORNE BLVD PORTLAND 16 ORE

**OSBORNE ELECTRS CORP**  
13105 S CRENSHAW BLVD HAWTHORNE CALIF  
**OSBORNE TRANSFORMER CORP**  
3834 MITCHELL AVE DETROIT 7 MICH  
**O & S RESEARCH INC**  
1811 BANNARD ST RIVERTON N J  
**OSTER MFG CO JOHN AVIONIC DIV**  
1 MAIN ST RACINE WISC  
**OSTER MFG CO JOHN CUMMINS PORTABLE TOOL DIV**  
5055 N LYDELL AVE MILWAUKEE 17 WISC  
**OTARION LISTENER CORP**  
SCARBOROUGH PK OSSINGTON N Y  
**OTIS ELEVATOR CO**  
260 - 11TH AVE NEW YORK 1 N Y  
**OTIS ELEVATOR CO**  
44 BELLS AVE YONKERS N Y  
**OTIS ELEVATOR CO DEFENSE & INDUSTRIAL DIV**  
38 RYERSON ST BROOKLYN 5 N Y  
**OTIS RADIO & ELEC CORP**  
P O Box 152 HAWARDEN IOWA  
**OVENAIRE INC**  
P O BOX 845 CHARLOTTEVILLE VA  
**OVERHEAD DOOR CORP**  
PO BOX 188 HARTFORD CITY IND  
**OVERLOAD CONTROL CO**  
1519 MARION AVE N LONG BEACH ISLAND PARK N Y  
**OVITRON CORP**  
LONG ISLAND CITY N Y  
**OBATONNA TOOL CO**  
OBATONNA MINN  
**OVEN LABS INC**  
55 BEACON PL PASADENA CALIF  
**OWENS-ILLINOIS**  
1700 N WESTWOOD AVE TOLEDO OHIO  
**OXFORD COMPONENTS DIV OXFORD ELECTRIC CORP**  
556 W MONROE ST CHICAGO 6 ILL  
**OXFORD ELECTRIC CORP**  
3911 S MICHIGAN AVE CHICAGO 15 ILL  
**OXFORD EQUIPMENT & SERVICE CO**  
6355 S HALSTED ST CHICAGO 20 ILL  
**OZALID DIV GENERAL AMLINE & FILM**  
ANSCO RD JOHNSON CITY N Y

## P

**PACE ELECTRICAL INSTRUMENTS CO**  
70-31 84 ST GLENDALE 27 L I N Y  
**PACE ENGINEERING COMPANY**  
13035 SATICDY ST N HOLLYWOOD CALIF  
**PACE INC**  
384 BAYNE ST MANSFIELD OHIO  
**PACIFIC AUTOMATION PRODUCTS**  
1000 AIR WAY GLENDALE 1 CALIF  
**PACIFIC ELECTRIC N CO**  
1009 66TH AVE OAKLAND CALIF  
**PACIFIC ELECTRO KINETICS**  
329 S VERNONT GLENORA CALIF  
**PACIFIC ELECTRONMARINE CORP**  
PO BOX 375 LA CANADA CALIF  
**PACIFIC ELECTRONIC CONTROLS CORP**  
1001 S MOUNTAIN AVE MONROVIA CALIF  
**PACIFIC ELECTRONICS**  
1528 INGLE ST SAN DIEGO 1 CALIF  
**PACIFIC INDIAN ELECTRONICS**  
20 BRADY ST SAN FRANCISCO CALIF  
**PACIFIC MAGNETIC CORP ELECTRONIC CENTER**  
ROMALAND CALIF  
**PACIFIC MERCURY T V MFG CORP**  
8345 HAYVENHURST AVE SEPULVEDA CAL  
**PACIFIC MERCURY TV MFG CORP**  
137H B MAIDEN LANE JOPLIN MO  
**PACIFIC OPTICAL CORP DIV CHICAGO AERIAL IND**  
120 GLASGOW AVE INGLEWOOD 1 CALIF  
**PACIFIC SCIENTIFIC CO**  
P O BOX 22019 LOS ANGELES 22 CALIF  
**PACIFIC SCIENTIFIC CO**  
6280 CHALEY DR BELL GARDENS CALIF  
**PACIFIC SCIENTIFIC CO AERONAUTICAL DIV**  
10242 PLACENTIA AVE ANAHEIM CALIF  
**PACIFIC SEMICONDUCTOR**  
12955 CHADRON AVE HAWTHORNE CALIF  
**PACIFIC SEMICONDUCTORS**  
8271 MELROSE AVE LOS ANGELES 46 CALIF  
**PACIFIC SEMICONDUCTORS INC**  
14520 AVIATION BLVD LANHALE CALIF  
**PACIFIC SEMICONDUCTORS INC**  
10451 N JEFFERSON BLVD CULVER CITY CALIF  
**PACIFIC TECHNICAL CO**  
2047 SATELLE BLVD LOS ANGELES 28 CALIF  
**PACIFIC TRANSDUCER CORP**  
11836 PICO BLVD LOS ANGELES CAL  
**PACIFIC TRANSFORMERS CORP**  
BOX 5387 PASADENA CALIF  
**PACIFIC UNIVERSAL PRODUCTS CORP**  
168 VISTA AVE PASADENA 8 CALIF  
**PACIFIC-ELECTRO-NUCLEAR CO**  
11818 TEALE ST CULVER CITY CALIF  
**PACKAGED PROGRAMS INC**  
636 PENN AVE PITTSBURGH 22 PA  
**PACKARD BELL CO TECHNICAL PRODUCTS DIV**  
1925 S BUNDY LOS ANGELES 25 CALIF  
**PACKARD BELL COMPUTER CORP**  
1905 ARMECOST W LOS ANGELES 25 CALIF  
**PACKARD BELL ELECTRONICS**  
970 JACON BAY PACIFIC PALISADES CALIF  
**PACKARD BELL ELECTRONICS CORP**  
12333 W OLYMPIC BLVD LOS ANGELES 64 CALIF  
**PACKARD BELL ELECTRONICS**  
1933 S BUNDY LOS ANGELES 64 CALIF  
**PACKARD BELL ELECTRONICS**  
PO BOX 2035-SOUTH AMNEX VAN NUYS CALIF  
**PACKARD INC J L**  
200 HUDSON ST NEW YORK 13 N Y  
**PACKARD INSTRUMENT CO**  
P O BOX 438 LA GRAMME ILL

# ELECTRONIC MANUFACTURERS-A-Z

PACO ELECTRONICS CO INC  
70-31 84TH ST GLENDALE 27 LI N Y  
PACO PRECISION  
70-31 84TH ST GLENDALE 27 LI N Y  
PADWAY AIRCRAFT PRODS INC  
1709 STANDARD AVE GLENDALE 1, CALIF  
PAGE COMMUNICATIONS ENGINEERS INC  
COMMUNICATIONS BLDG 710 14TH ST NW  
WASHINGTON 5 D C  
PAGE ELECTRONICS  
136 LIBERTY ST NEW YORK N Y  
PAGE FOGWELL CORP  
3041 N COOLIDGE AVE LOS ANGELES CALIF  
PAISLEY PRODUCTS INC DIV MORNINGSTAR NICOL  
INC 2457 E 30 ST LOS ANGELES CALIF  
PARKTRON DIV ILL TOOL  
1321 LESLIE AVE ALEXANDRIA VA  
PALMER ELECTRIC MFG CO  
11011 PALMER AVE SOUTH GATE CALIF  
PALMER ELECTRIC MFG CO  
PO BOX 70 BRIDAL VEIL OREG  
PALMER INC N Y  
4108 NW FRUIT VALLEY RD VANCOUVER WASH  
PALMUT CO  
25 GLEN RD MOUNTAINSIDE N J  
PALO ALTO ENGG CO  
230 PAGE HILL RD PALO ALTO CALIF  
PALOMAR EQUIPMENT CO  
4254 NIAGARA AVE SAN DIEGO 7 CALIF  
PAMECO  
MILL LANE WATERFORD CONN  
PAPA ELECTRONICS CORP  
221 ROCK HILL RD BALA-CYMBYD PA  
PAN-ELECTRONICS CORP  
P O BOX 458 LAFAYETTE CALIF  
PANATRON DEVELOPMENTS DIV DELTA BROADCASTING  
SYS 941 SHELDORNE AVE DAYTON 3 OHIO  
PANDUIT CORP  
14461 WAVERLY AVE MIDLOTHIAN ILL  
PANUM ENGINEERING CORP  
222 W MURKIN ST CHICAGO 10 ILL  
PANELLIT INC OIV INFORMATION SYSTEMS INC  
7401 N HAMLIN AVE SKOKIE ILL  
PANELYTE DIV ST REGIS PAPER CO  
RICHMOND IND  
PANHANDLE ELECTRIC CO  
PO BOX 248 ARLINGTON TEXAS  
PANHANDLE ELECTRICAL CONST  
609 JOHNSON AMARILLO TEXAS  
PANORAMIC RADIO PRODUCTS  
520 S FULTON AVE MT VERNON N Y  
PANSEAL INC  
10 MAIN ST LITTLE FERRY N J  
PANTEX CO  
P O BOX 212 EL SEGUNDO CALIF  
PANTHER ELECTRONICS INC  
6000 SUNSET BLVD HOLLYWOOD 28 CALIF  
PAR PRODUCTS CORP  
602 COLORADO AVE SANTA MONICA CALIF  
PAR-METAL PRODUCTS CORP  
32-62 49 ST LONG ISLAND CITY 3 N Y  
PARABAR INC  
13000 YUKON AVE HAWTHORNE CALIF  
PARAGON ELECTRIC CO  
1600 12 ST TWO RIVERS WISC  
PARAGON REVOLUTE DIV CHARLES BRUNING CO INC  
77 SOUTH AVE ROCHESTER 8 N Y  
PARALOY CO  
6045 W CLAREMONT CHICAGO 45 ILL  
PARAMETERS INC CO  
195 HERRICKS RD NEW HYDE PARK N Y  
PARAMOUNT PAPER TUBE CORP  
614 S LAFAYETTE ST FORT WAYNE 2 IND  
PARAPLEGICS MFG CO  
10068 FRANKLIN AVE FRANKLIN PARK ILL  
PARK ARMATURE CO  
1218 COLUMBUS PL ROXBURY MASS  
PARK MANUFACTURING CO  
34-10 LINDEN PL FLUSHING 54 N Y  
PARK PRODUCTS CO INC  
4901 PERKINS AVE CLEVELAND 3 OHIO  
PARKER AIRCRAFT CO  
5827 W CENTURY BLVD LOS ANGELES 45 CALIF  
PARKER ELECTRONICS CO  
375 FAIRFIELD AVE STAMFORD CONN  
PARKER METAL GOODS CO  
85 PRESCOTT ST WORCESTER 5 MASS  
PARKER SEAL CO DIV PARKER-HAMMIFIN CORP  
10567 JEFFERSON BLVD CULVER CITY CALIF  
PARKER-KALON DIV GENERAL AMERICAN  
TRANSPORTATION CO 1 PECKAY DR CLIFTON N J  
PARKS ELECTRONICS CORP  
12311 BOTHELL WAY SEATTLE 95 WASH  
PARKS LAB HENRY FRANCIS  
P O BOX 1665 LAKE CITY STA SEATTLE 55 WASH  
PARMENTER B BULLUCH MFG CO LTD  
GANANOGUE ONTARIO CANADA  
PARR MFG CORP  
84 AUSTIN ST NEWARK 2 N J  
PARSONS CO RHP M ELECTRONICS DIV  
151 S DE LACEY AVE PASADENA CALIF  
PARSONS CORP  
804 112 TRAVERSE CITY MICH  
PARTLOB CORP  
211 CAMPION RD NEW HARTFORD N Y  
PARTRICK B WILKINS CO  
51 W 7 ST PHILA 4 PA  
PARTRIDGE TRANSFORMERS LTD  
ROEBUCK RD TOLBORTH SURREY ENGLAND  
PARTRIDGE TRANSFORMERS LTD  
259 BROADWAY NEW YORK 7 N Y  
PASS & SEYMOUR INC  
8050 AVENUE SOLVAY 9 N Y  
PATHFINDER ELECTRICS CO  
8836 LEXINGTON AVE LOS ANGELES 38 CALIF  
PATTERSON CORP  
437-453 PARK AVE NW NEW PHILA OHIO

PATTERSON MOOS RESEARCH DIV LEESONA CORP  
90-28 VAN BYCK EXPRESSWAY JAMAICA 18 N Y  
PATWIN DIV PATENT BUTTON  
WATERBURY 20 CONN  
PAUL B BECKMAN  
1801 W COURTLAND ST PHILADELPHIA 40 PA  
PAUL F M B STEIN BROS INC  
235 S AVE NEW YORK 16 N Y  
PAX ELECTRONICS CO  
68-28 MYRTLE AVE GLENDALE 27 N Y  
PAYO ENG'G LABS  
1828 STATE QUINCY ILL  
P B R MFG CO  
H & LUZERNE STS PHILADELPHIA 24 PA  
PCA ELECTRONICS INC  
16799 SCHOENBORN ST SEPULVEDA CALIF  
PEARCE SIMPSON INC  
2295 NW 14TH ST MIAMI 35 FLA  
PEARSON ELECTRONICS INC  
707 URBAN LA PALO ALTO CALIF  
PECK & HARVEY MFG CORP  
5650 N WESTERN AVE CHICAGO 45 ILL  
PECK STOW & WILCOX CO  
217-274 CENTER ST SOUTHINGTON CONN  
PEDERSEN ELECTRONICS  
P O BOX 458 LAFAYETTE CALIF  
PEE CEE TAPE & LABEL CO  
521 N LA BREA AVE LOS ANGELES 36 CALIF  
PEE-BEE MOLDING CO  
1720 ATLANTIC AVE BROOKLYN 13 N Y  
PEEBLES & CO LTD BRUCE  
EAST PILTON EDINBURGH 5 SCOTLAND  
PEECO CORP  
2760 WHITTIER BLVD LOS ANGELES 23 CALIF  
PEER INC  
1200 MILTON ST BENTON HARBOR MICH  
PEER INC PROFESSIONAL ELECTRONIC ENG RES INC  
2924 SHELBY ST DALLAS 19 TEXAS  
PEERLESS ELECTRIC CO  
1401 B MARKET ST WARREN OHIO  
PEERLESS ELECTRIC PRODUCTS DIV ALTEC LANSING  
CORP 6920 MCKINLEY AVE LOS ANGELES CAL  
PEERLESS ELECTRICAL PRODUCTS OIV  
ALTEC LANSING CORP 1915 S MANCHESTER AVE  
ANAMETH CAL  
PEERLESS ELECTRONICS INC  
5338 ALHAMBRA AVE LOS ANGELES 32 CALIF  
PEERLESS ENGG PRODUCTS CO  
30-81 21ST LONG ISLAND CITY 2 N Y  
PEERLESS INSTRUMENT CO  
90-15 CORONA AVE ELMHURST LI N Y  
PEERLESS PRODUCTS INDUSTRIES  
812 N PULASKI RD CHICAGO 51 ILL  
PEGASUS LABS INC  
3690 W 11 MILE RD BERKLEY MICH  
PEIRCE DICTATION SYSTEMS  
5900 N NORTHWEST HWY CHICAGO 31 ILL  
PELC DESIGNS  
5560 LA PASADA ST LONG BEACH 15 CALIF  
PELLEY CO  
37 MURLEY ST CAMBRIDGE MASS  
PEMBREX THEATRE SUPPLY CORP  
1969 S VERMONT AVE LOS ANGELES 7 CALIF  
PENBERTHY INSTRUMENT CO  
4301 & AVE S SEATTLE WASH  
PENCO DIV ALAN BOOD STEEL CO  
OAKS PENNA  
PENDAR INC  
14744 ARMINA ST VAN NUYS CALIF  
PENETONE CO  
TENAPLY N J  
PENN CONTROLS INC  
GOSHEN IND  
PENN EAST ENGG CORP  
BOX 240 KUTZTOWN PENNA  
PENN ENGG & MFG CORP  
COYLESTOWN  
PENN FIBRE SPECIALTY CO  
2020 E BESTMORELAND ST PHILADELPHIA 34 PA  
PENN KEYSTONE CORP  
100 HAWKINS ST DERBY CONN  
PENN TRANSFORMER CORP  
E BISHOP ST EXT BELLEFONTE PA  
PENN-TRAN CORP  
P O BOX 140 BELLEFONTE PA  
PENN-UNION ELECTRIC CORP  
315 STATE ST ERIE PA  
PENNA FLUOROCARBON CO INC  
1115 N 38 ST PHILA 4 PENNA  
PENNA OPTICAL CO  
234 S 8TH ST READING PA  
PENNA TV PRODUCTS CO  
1835 RUAN PHILADELPHIA 24 PA  
PENNSYLVANIA TRANSFORMER CO  
90X 330 CANONSBURG PA  
PENNAWOOD MUMCHRON CO  
PENWOOD BLDG 7249 FRANKSTOWN AVE PITTSBURG  
8 PA  
PENTA LABORATORIES INC  
312 N NOPAL ST SANTA BARBARA CALIF  
PENTRON SALES CO INC  
777 S TRIPP AVE CHICAGO 28 ILL  
PENWARDEN CO J G  
7311 VAN NUYS BLVD VAN NUYS CALIF  
PERPICO CO MEX M  
12242 WOODROW WILSON AVE DETROIT 6 MICH  
PERENY EQUIPMENT CO  
BOX 8123 STA A ZONE 1 COLUMBUS 12 OHIO  
PERFECTION GEAR CO  
HARVEY ILL  
PERFECTION MICA CO  
4322 N EASTON AVE CHICAGO 22 ILL  
PERFORMANCE MEASUREMENTS CO  
15120 THIRD AVE DETROIT 5 MICH

PERKIN ENGG CORP  
345 KANSAS ST EL SEGUNDO CALIF  
PERKIN-ELMER CORP  
MAIN AVE NORWALK CONN  
PERKIN-ELMER CORP  
P O BOX 477 MELBOURNE BEACH FLA  
PERKIN-ELMER CORP  
5670 E WASHINGTON BL LOS ANGELES 22 CALIF  
PERKIN-ELMER CORP VERMISTAT DIV  
HERALD ST NORWALK CONN  
PERKINS MACHINE & GEAR CO  
CIRCUIT AVE WEST SPRINGFIELD MASS  
PERMA-POWER CO  
3102 N ELSTON AVE CHICAGO 18 ILL  
PERMACEL  
U S HIGHWAY 1 NEW BRUNSWICK NJ  
PERMAG CORP  
88-08 VAN BYCK EXPRESSWAY JAMAICA 18 N Y  
PERMAGLASS INC  
GENOA OHIO  
PERMAL INC  
P O BOX 718 MT PLEASANT PA  
PERMOFLUX CORP  
106 CHURCH ST E TROY WISC  
PERMOFLUX OIV  
2300 W ARMITAGE AVE CHICAGO 41 ILL  
PERMOFLUX PRODUCTS CO  
4101 SAN FERNANDO RD GLENDALE 4 CALIF  
PERMONITE MFG CO  
910 JACKSON BLVD CHICAGO 7 ILL  
PERMUTIT CO DIV PFAUDLER PERMUTIT INC  
3-50 W 48 ST NEW YORK 36 N Y  
PERRY-BRIGGS CO  
4803 SUPERIOR AVE CLEVELAND 3 OHIO  
PESCHEL ELECTRONICS INC  
TOWNERS RT 216 PATTERSON N J  
PESCO PRODUCTS DIV BORG BARBER CORP  
24700 N MILES RD BEDFORD OHIO  
PESCO PRODUCTS DIV WESTERN BRANCH  
3310 VANOWEN ST BURBANK CALIF  
PETER PARTITION CORP  
124 BOERUM PL BROOKLYN 1 N Y  
PETTIBONE MULLIKEN CORP  
4700 W DIVISION ST CHICAGO 51 ILL  
PETTINOS GRAPHITE CORP  
1 E 42ND ST NEW YORK 17 N Y  
PETTINOS INC CHARLES  
1 E 42ND ST NEW YORK 17 NY  
PETTY LABS INC  
5280 S 2061 SAN ANTONIO TEXAS  
PFANSTIEL CHEMICAL CORP  
104 LAKE VIEW AVE WAUKEGAN ILL  
PFLEGER PRODUCTS  
3901 W 54TH ST LOS ANGELES 43 CALIF  
PHALO PLASTICS CORP  
530 BOSTON TWP SHREWSBURY MASS  
PMAOSTRON INSTRUMENT & ELECTRONIC CO  
151 PASADENA AVE 5 PASADENA CALIF  
P B H ELECTRONICS  
424 COLUMBIA LAFAYETTE IND  
PHELON CO INC R E  
70 MAPLE ST EAST LONGMEADOW MASS  
PHELPS DODGE COOPER PRODUCTS  
YONKERS 1 N Y  
PHELPS DODGE COPPER PRODUCTS CORP  
LINCOLN HWY E FT WAYNE 3 IND  
PHELPS DODGE COPPER PRODUCTS CORP  
300 PARK AVE NEW YORK 22 N Y  
PHEOLL MFG CO  
5700 W ROOSEVELT RD CHICAGO 50 ILL  
PHILA COMPUTER DIV  
WILLOW GROVE PA  
PHILA SCIENTIFIC GLASS CO  
BOX 406 PALETTOWN RD QUAKERTOWN PA  
PHILADELPHIA INSULATED WIRE CO  
200 N 3 ST PHILADELPHIA 43 PA  
PHILADELPHIA QUARTZ CO  
1146F PUBLIC LEDGER BLDG PHILADELPHIA 6 PA  
PHILADELPHIA RESINS CO INC  
33 W MORTIER ST PHILA 19 PENNA  
PHILAMON LABS INC  
90 HOPPER ST WESTBURY N Y  
PHILBRICK RESEARCHES INC GEORGE A  
285 COLUMBUS AVE BOSTON 16 MASS  
PHILCO CORP  
424 MONTGOMERY AVE HAVERFORD PA  
PHILCO CORP  
34 CONGRESS AVE SPRINGFIELD PA  
PHILCO CORP  
18TH & COURTLAND STS PHILA 40 PA  
PHILCO CORP  
19TH & LEHIGH AVE PHILADELPHIA 32 PA  
PHILCO CORP  
W MONROE ST SANDUSKY OHIO  
PHILCO CORP  
3875 FABIAN WAY PALO ALTO CALIF  
PHILCO CORP  
866 CHESTNUT ST REDWOOD CITY CALIF  
PHILCO CORP  
FRONT & VENANGO STS PHILA 34 PA  
PHILCO CORP  
3736 THIRD AVE SAN DIEGO 3 CALIF  
PHILCO CORP  
1028 JACQUELINE SAN JOSE CALIF  
PHILCO CORP  
918 B AVE CORONADO CALIF  
PHILCO CORP  
TIOGA & C STS PHILADELPHIA 24 PA  
PHILCO CORP  
P O BOX 506 FORT WALTON BEACH FLA  
PHILCO CORP G & I DIV  
4700 BISSAHICKON AVE PHILA 44 PENNA  
PHILCO CORP GOVT & INDUSTRIAL GROUP  
4700 BISSAHICKON AVE PHILADELPHIA 44 PA  
PHILCO CORP LANSDALE DIV  
CHURCH RD LANSDALE PA

# ELECTRONIC MANUFACTURERS-A-Z

PHILCO CORP TECH REP DIV  
22ND ST A LEMIGH AVE PHILADELPHIA 32 PA  
PHILCO CORP LAMP DIV  
990 YORK RD HANTSVILLE PA  
PHILHARMONIC RADIO & TV  
235 JERSEY AVE NEW BRUNSWICK N J  
PHILIPS ELECTRONIC INSTRUMENTS  
750 S FULTON AVE MT VERNON N Y  
PHILIPS ELECTRONICS INC  
1825 GRANT AVE PHILADELPHIA 15 PA  
PHILIPS LABORATORIES  
IRVINGTON-ON-HUDSON N Y  
PHILLIPS CO  
5032 TALMADGE RD TOLEDO OHIO  
PHILLIPS CONTROL CORP  
JOLIET ILL  
PHILLIPS ELECTRONIC TOOLS  
TORONTO ONT CANADA  
PHILLIPS ELECTRONICS MFG CO  
119 ALLEN BLVD FARRINGDALE LI N Y  
PHILLIPS MFG CO  
3475 W TONY AVE CHICAGO 45 ILL  
PHILLIPS PETROLEUM CO  
P O BOX 2067 IDAHO FALLS IDAHO  
PHILLIPS PAPER CO  
192 HILL ST ROCHESTER 14 N Y  
PHILMORE MFG CO INC  
130-01 JAMAICA AVENUE RICHMOND HILL 10 N Y  
PHILOANON LABS  
90 HOPPER ST WESTBURY L I N Y  
PHILSON MFG CO INC  
47 BERGEN ST BROOKLYN 1 N Y  
PHOENIX PRECISION INSTRUMENT CO  
3405 N 5 ST PHILADELPHIA 90 PA  
PHOTO CHEMICAL PROD OF CALIF  
1715 BERKELEY ST SANTA MONICA CALIF  
PHOTO SOUND  
1020 N HILLS ORLANDO FLA  
PHOTO-CRYSTALS  
15 S 1ST ST GENEVA ILL  
PHOTO-RESEARCH CORP  
437 N CAROLINA BLVD HOLLYWOOD 38 CALIF  
PHOTO-SONICS INC  
820 S HARTPOSA ST BURBANK CALIF  
PHOTOBELL CO  
43 VESEY ST NEW YORK 7 N Y  
PHOTOCHROM RESEARCH INC  
2 N HOBARD ST NEW YORK 13 N Y  
PHOTOCIRCUITS CORP  
31 SEA CLIFF AVE GLEN COVE N Y  
PHOTOCON RESEARCH PRODUCTS  
421 N ALIADENA DR PASADENA CALIF  
PHOTOGRAPHIC ANALYSIS INC  
13273 VENTURA BLVD N HOLLYWOOD CALIF  
PHOTONATION INC  
96 S WASHINGTON AVE BERGENFIELD N J  
PHOTON INC  
58 CHARLES ST CAMBRIDGE 41 MASS  
PHOTON INC  
125 BERWICK PLACE NORWOOD MASS  
PHOTOTRONICS  
FLUSHING N Y  
PHOTOVOLT CORP  
93 MADISON AVE NEW YORK 16 N Y  
PHOTRON INSTRUMENT CO  
6516 DETROIT AVE CLEVELAND 2 OHIO  
P & H SALES CORP  
5650 N WESTERN AVE CHICAGO 45 ILL  
PHYSICS RESEARCH LABS INC  
P O BOX 555 HEMPSTEAD N Y  
PIASECKI AIRCRAFT CORP  
HAYFIELD PA  
PIASECKI AIRCRAFT CORP  
ISLAND RD-INT'L A/P PHILA 42 PA  
PIC  
235 OREGON ST EL SEGUNDO CALIF  
PIC AUTOMATION CONTROLS  
8080 MCCORMICK BLVD SKOKIE ILL  
PIC DESIGN CORP SUB OF BENRUS WATCH CO INC  
477 ATLANTIC AVE E ROCKAWAY L I N Y  
PICKARD & BURNS INC  
240 HIGHLAND AVE NEEDHAM 90 MASS  
PICKER X-RAY CORP  
25 S BROADWAY WHITE PLAINS N Y  
PICKERING & CO INC  
SUNNYSIDE BLVD PLAINVIEW N Y  
PICKRETT INDUSTRIES INC  
1111 SO FREMONT ALHAMBRA CALIF  
PIZO CRYSTAL CO  
265 E POMFRET ST CARLISLE PA  
PIEZO PRODUCTS CO  
WHITNEY ST SHERBORN MASS  
PIEZO-ELECT RES INC  
PROSPECT W MADISON AVE DUMONT N J  
PIKE & CO INC E W  
575 PENNSYLVANIA AVE ELIZABETH N J  
PILGRIM SCREW CORP  
PO BOX 1223 PROVIDENCE 1 R I  
PILOT CHEMICALS INC  
58 PLEASANT ST WATERTOWN 72 MASS  
PILOT RADIO CORP  
97-06 36 ST LONG ISLAND CITY 1 N Y  
PIONEER BROADCAST CO  
6434 TELEGRAPH RD LOS ANGELES 22 CALIF  
PIONEER ELECT INSTR CO  
5353 STROMH AVE-BOX 500 N HOLLYWOOD CALIF  
PIONEER ELECTRONIC CORP  
2239 S CARLETTA LOS ANGELES 64 CALIF  
PIONEER GEN-E-MOTOR CORP  
5841 W DICKENS AVE CHICAGO 39 ILL  
PIONEER INDUSTRIES INC  
2700 HAWKEYE DR SIOUX CITY IOWA  
PIONEER MAGNETICS INC  
5836 WILSHIRE BLVD LOS ANGELES 36 CALIF  
PIONEER PATENTS & PRODUCTS CO  
3720 N NEW ENGLAND AVE CHICAGO 30 ILL

PIPESTONE SALES CO  
BOX 311 PIPESTONE MINN  
PIPETRON CO  
8121 MATILJA AVE PANORAMA CITY CALIF  
PIQUA MACHINE & MFG CO  
441 S COLLEGE ST PIQUA OHIO  
PITNEY-BOWES INC  
STAMFORD CONN  
PITOMETER LOG CORP  
237 LAFAYETTE ST NEW YORK 12 N Y  
PITOMETER-LOG CORP  
132-27 BA ST-OZONE PK OZONE PARK L I N Y  
PITTSBURGH COIL CO  
37 MCMICHAEL RD CARNEGIE PENNA  
PITTSBURGH LECTRODRYER DIV MCGRAW-EDISON CO  
FOOT 32 ST PITTSBURGH PA  
PITTSBURGH PLATE GLASS COMPANY  
ONE GATEWAY CENTER PITTSBURGH 22 PA  
PIX MFG CO  
76 HUDSON ST NEWARK NJ  
PLANET MFG CORP  
225 BELLEVILLE AVE BLOOMFIELD N J  
PLANET PLATING CO INC  
1333 FLUSHING AVE BROOKLYN 37 N Y  
PLANETRONICS INC  
CENTRE & GLENDALE STS EASTON PENNA  
PLASTECK INC  
P O BOX 551 POTEAU OKLA  
PLASTI-KOTE INC  
9801 HARVARD RD CLEVELAND 5 OHIO  
PLASTIC ACCESSORIES INC  
10-08 48TH AVE LONG ISLAND CITY 1 N Y  
PLASTIC ASSOCIATES  
185 MOUNTAIN RD LAGUNA BEACH CALIF  
PLASTIC CAPACITORS INC  
2620 N CLYBOURN AVE CHICAGO 14 ILL  
PLASTIC FACTORS INC  
926 BROADWAY REDWOOD CITY CALIF  
PLASTIC MOLD & ENGG CO  
WAMPANAGO TRAIL E PROVIDENCE 14 R I  
PLASTIC SVCE ASSUC  
233 COMDOR ST EAST BOSTON 28 MASS  
PLASTIC WIRE & CABLE CORP  
BOX 486 JEFFET CITY CONN  
PLASTICS & COAL CHEMICALS DIV ALLIED  
CHEMICAL CORP 40 RECTR ST NEW YORK 6 N Y  
PLASTICS & ELECTRONICS CORP  
P O BOX 38 STA J BUFFALO 8 N Y  
PLASTICS & RESINS DIV SHELLE CHEMICAL CO  
110 W 51ST ST NEW YORK 20 N Y  
PLASTOFILM INC  
616 N UNION AVE WHEATON ILL  
PLASTOID EDORP  
45 GINGERBREAD RD HAMBURG N J  
PLASTOID CORP  
42-61 24TH ST LONG ISLAND CITY 1 NY  
PLEASANTVILLE INSTR CORP  
270 MARBLE AVE PLEASANTVILLE N Y  
PLECTRON CORP  
OVERTON NEBR  
PLUS-IN INSTRUMENTS INC  
1416 LEBANON RD NASHVILLE 10 TENN  
PLYMOUTH ELECT CORP  
340 MAIN ST WORCESTER MASS  
PM DIVISION CRANE CO  
1960 BRIDGE ST JOHNSTOWN PA  
PNEU-HYDRO VALVE CORP  
52 MORSE HILL RD CEDAR KNOLLS N J  
PNEUMAFIL CORP  
2516 WILKINSON BLVD CHARLOTTE 8 N C  
PNEUMODYNAMICS CORP  
4936 FAIRMONT AVE BETHESDA 14 MD  
PODGOR CO INC JOE E  
16-18 S WASHMALL PHILA PA  
POINSETTIA INC  
112 CEDAR AVE PITMAN N J  
POLARAD ELECTRONICS CORP  
43-20 34 ST LONG ISLAND CITY 1 N Y  
POLLAK CORP JOSEPH  
81 FREEPORT ST BOSTON 22 MASS  
POLY-KOTE INC  
82 CHESTNUT ST NORTH ATTLEBORO MASS  
POLY-SCIENTIFIC CORP  
COLLEGE AVE BLACKSBURG VA  
POLYCHEMICAL DIV GEN DEVICES  
525 S WEBSTER INDIANAPOLIS IND  
POLYMER CORP  
2120 FAIRMONT AVE READING PA  
POLYMER CORP  
3028 S OAK ST SANTA ANA CALIF  
POLYMER INDUSTRIES INC  
SPRINGDALE CONN  
POLYTRONIC & INSULATION CO INC  
WILLIMANTIC CONN  
POLYPHASE INSTRUMENT CO  
E 4 ST BRIDGEPORT PA  
POLYTECHNIC ENGINEERING CO  
9105 BROOKVILLE RD SILVER SPRING MD  
POLYTEK  
1111 COMMONWEALTH AVE BOSTON 15 MASS  
POLYTRON ENGG INC  
32 W BRIDGE ST BALTIMORE 1 MD  
POLYTRONIC RESEARCH INC  
7326 WESTMORE RD ROCKVILLE MD  
POLYTRONICS CO  
382 BATHURST ST TORONTO 4 ONT CANADA  
POLYTRONICS INC  
7326 WESTMORE RD ROCKVILLE MD  
POMCA ELECTRONICS CO INC  
1126 W 9 AVE POMONA CALIF  
POOLE INSTRUMENTS INC  
150 EXPRESS ST DALLAS 21 TEXAS  
POPPER & SONS  
300 4 AVE NEW YORK 10 N Y  
PORAY INC  
3369 W GRAND AVE CHICAGO 31 ILL

PORCELAIN PRODUCTS CO  
224 N PATTERSON ST CAREY OHIO  
PORT O VOX CORP  
521 W 43RD ST NEW YORK 36 N Y  
PORTABLE ELECTRIC TOOLS INC  
320 W 83 ST CHICAGO 20 ILL  
PORTER CO INC N K DELTA STAR ELECTRIC DIV  
2437 FULTON ST CHICAGO 12 ILL  
PORTER CO INC N K PEARLESS ELECTRIC DIV  
1500 W MARKET ST WARREN OHIO  
PORTER CO INC N K RIVERSIDE-ALLOY METAL DIV  
RIVERSIDE N J  
PORTER INC N K  
74 FOLEY ST SOMERVILLE 43 MASS  
PORTER-CABLE MACHINE CO  
700 MARCELLUS ST SYRACUSE 4 N Y  
PCSTIVE LOCK WASHER CO  
181 VANDERPOOL ST NEWARK 5 N J  
POST CO F  
801 803 CHICAGO 9C ILL  
POTTER & BRUMFIELD  
1200 E BROADWAY PRINCETON IND  
POTTER & BRUMFIELD  
BOX 45 MARION NY  
POTTER & BRUMFIELD INC  
FRANKLIN KY  
POTTER AERONAUTICAL CORP  
ROUTE 22 UNION N J  
POTTER CO  
1950 SHERIDAN RD N CHICAGO ILL  
POTTER INSTRUMENT CO  
SUNNYSIDE BLVD PLAINVIEW N Y  
POTTER PACIFIC  
22540 VENTURA WOODLAND HILLS CALIF  
POTTHOF BR C  
115 S BRANDYBINE WEST CHESTER PA  
POWELL CO HAROLD H  
2102 MARKET ST PHILA J PA  
POWER DESIGNS INC  
89-25 130 ST RICHMOND HILL 18 N Y  
POWER EQUIPMENT CO  
317 HARDING WAY E GALION OHIO  
POWER GENERATORS INC  
458 E GREENHAW RD MADDOXFIELD N J  
POWER SOURCES INC  
SOUTH AVE BURLINGTON MASS  
POWER SUPPLIES INC  
1005 OLIVE ST HIGHLAND ILL  
POWERS CO J J  
818 N 22ND AVE P O BOX 254 MELROSE PARK  
ILL  
POWER REGULATOR CO  
3400 OAKTON ST SKOKIE ILL  
POBERTON ULTRASONICS CORP  
PATTERSON PLACE ROOSEVELT FIELD GARDEN  
CITY N Y  
POBIS ENGRG CO HENRY A  
1615 WESTWOOD BLVD LOS ANGELES 24 CALIF  
PRAIRIE RADIO CORP  
608 STATT AVE LINCOLN 1 ILL  
PRATT & WHITNEY AIRCRAFT  
NORTH HAVEN CONN  
PRATT & WHITNEY-GAGE RAND DIV  
CHARTER OAK BLVD WEST HARTFORD CONN  
PRATT ALBERT  
114 W LAKE VIEW AVE MILWAUKEE 17 WISC  
PRO ELECTRONICS  
6713 N OLIPHANT AVE CHICAGO 31 ILL  
PRO ELECTRONICS INC  
202 TILLARY ST BROOKLYN 8 N Y  
PRECIMET LABS INC  
88 FULTON ST NEW YORK N Y  
PRECISE DEVELOPMENT CORP  
2 NEIL CT OCEANSIDE N Y  
PRECISE MEASUREMENTS CORP  
RD 1 HILLBROOK RD FLEMINGTON N J  
PRECISION APPARATUS CO  
70-31 84 ST GLENDALE 27 L I N Y  
PRECISION CAPACITORS INC  
150 W CYPRESS ST BURBANK CALIF  
PRECISION CARBIDE CO  
292 BELMONT AVE PATERSON 2 N J  
PRECISION CASTPARTS CORP  
4000 S E HARNEY DR PORTLAND 6 ORE  
PRECISION CIRCUITS  
85 WEYMAN AVE NEW ROCHELLE N Y  
PRECISION CIRCUITS INC  
705 S FULTON AVE MT VERNON N Y  
PRECISION CONNECTORS  
NEW YORK N Y  
PRECISION CRYSTAL LAB  
2223 BARWICK AVE SANTA MONICA CALIF  
PRECISION ELECTRICAL INSTR CO  
120 LAFAYETTE ST NEW YORK 13 N Y  
PRECISION ELECTRONICS  
MARSHFIELD MASS  
PRECISION ELECTRONICS INC  
9101 KING ST FRANKLIN PK ILL  
PRECISION ELECTROPLATING CO  
519 S OAKLEY BLVD CHICAGO 12 ILL  
PRECISION HEARING AIDS  
5157 W GRAND AVE CHICAGO 39 ILL  
PRECISION INC  
4748 FRANCE AVE MO MINNEAPOLIS 22 MINN  
PRECISION INSTRUMENT CO  
1011 COMMERCIAL ST SAN CARLOS CALIF  
PRECISION LINE INC  
63 MAIN ST HAYWARD MASS  
PRECISION MECHANISMS CORP  
577 NEWBRIDGE AVE EAST MEADOW L I N Y  
PRECISION METAL PRODUCTS CO  
41 ELM ST STONEHAM MASS  
PRECISION METER DIV-MINN-HONEYWELL  
GRENIER FIELD MANCHESTER N H  
PRECISION PAPER TUBE CO  
2035 W CHARLESTON ST CHICAGO 47 ILL

# ELECTRONIC MANUFACTURERS-A-Z

PRECISION PHOTOMECHANICAL CO  
170 # VAN BRUNT ST ENGLEWOOD N J  
PRECISION PIEZO SERV  
427 MAYFLOWER ST BATON ROUGE 2 LA  
PRECISION PRODS CO OF CINCINNATI  
BOX 130 NORWOOD 12 OHIO  
PRECISION PROTOTYPE POTENTIOMETER  
873 MAIN ST WALTHAM MASS  
PRECISION RADIATION INSTRUMENTS INC  
5810 S NORMANDIE AVE LOS ANGELES CALIF  
PRECISION RESISTOR CO  
109 U S HWY 22 HILLSIDE N J  
PRECISION SCIENTIFIC CO  
3737 B CORTLAND ST CHICAGO 47 2LL  
PRECISION THERMOMETER B INSTRUMENT CO  
1434 BRANDYWINE ST PHILADELPHIA 30 PA  
PRECISION TUBE CO  
CHURCH RD & BISSANICKON AVE NORTH WALES PA  
PRECO INC  
6300 E SLAUSON LOS ANGELES 22 CALIF  
PREIS ENGRAVING MACHINE CO M P  
651 U S HWY 22 HILLSIDE N J  
PRELCO ELECTRONICS  
1660 SO CONLON AVE WEST CONVINA CALIF  
PREPAX PRODUCTS DIV CHISHOLM-RYDER CO  
COLLEGE B HIGHLAND AVES NIAGARA FALLS N Y  
PREMIER INSTRUMENT CORP  
33 NEW BROAD ST PORT CHESTER N Y  
PREMIER INSTRUMENT CORP  
33 BROAD ST PORT CHESTER N Y  
PREMIER METAL PRODUCTS CO  
337 MANJDA ST NEW YORK 59 M Y  
PREMIER RESEARCH LABS INC  
59 7 AVE NEW YORK 11 N Y  
PREMICO INC  
5470 VALLEY BLVD LOS ANGELES 32 CALIF  
PRES PROBE CO  
9135 NORTH MASON MORTON GROVE ILL  
PRESCOTT TV CO  
7706 MELROSE AVE LOS ANGELES 46 CALIF  
PRESERVATION PACKAGING INC  
1407 CHESTNUT AVE HILLSIDE N J  
PRESIN CO  
2014 BROADWAY SANTA MONICA CALIF  
PRESS WIRELESS INC  
P O BOX 892 BELMONT CALIF  
PRESS WIRELESS LABS INC  
25 PROSPECT PL W NEWTON 65 MASS  
PRESTO RECORDING CORP  
BOX 500 PARAMUS N J  
PRESTOLE CORP  
1345 MIAMI ST TOLEDO 5 OHIO  
PRESTON ELECTRONICS CO  
1345 BRIDGE ST NB GRAND RAPIDS 4 MICH  
PRESTOSEAL MFG CORP  
37-21 33 ST LONG ISLAND CITY 1 N Y  
PRICE ELECTRIC CORP  
E CHURCH & 2 ST FREDERICK MD  
PRINCETON ELECTRIC CORP  
PRINCETON N J  
PRINCETON ELECTRONICS CORP  
P O BOX 127 178 ALEXANDER ST PRINCETON N J  
PRINTED ELECTRONIC RESEARCH INC  
4212 LANCASTER M HOLLYWOOD CAL  
PRINTED ELECTRONICS CORP  
7 NORTH AVE NATICK MASS  
PRINTED MOTORS  
SEA CLIFF AVE GLEN COVE N J  
PRINTLOAD CORP DEPT E  
10-08 44TH AVE LONG ISLAND CITY 1 N Y  
PRINTLOAD INC  
1840 HIBSDUS DR NORTH MIAMI FLA  
P R L ELECTRIC  
232 WEST COTT DR RAMBAY N J  
PROBESCOPE CO INC  
B SAGAMORE HILL DR PORT WASHINGTON N Y  
PROCESS & INSTRUMENTS  
15 STONE AVE BROOKLYN 33 N Y  
PRODELIN INC  
305 BERGEN AVE KEARNY N J  
PRODUCERS SALES CORP  
830 SOUTH MARIPOSA ST BURBANK CALIF  
PRODUCT ENGG LABS CO INC  
555 CENTRAL AVE ORANGE N J  
PRODUCTION PROCESS SCREEN CO  
16-18 S MARSHALL PHILA PA  
PRODUCTION RESEARCH CORP  
THORNWOOD N Y  
PRODUCTION SERVICES CORP  
81 MARKET SQ NEWINGTON 11 CONN  
PRODUCTS DEV CO INC  
307 BERGEN AVE KEARNEY N J  
PRODUCTS ENGINEERING SER  
1245 N FAIR AVE PASADENA 3 CALIF  
PRODUCTS RESEARCH ASSOC  
2 HOBART ST NEW YORK 13 N Y  
PROGRESS ELECTRONICS CO  
107 FRANKLIN ST NEW YORK 13 N Y  
PROJECTS UNLIMITED INC  
1926 E SIEBENTHALER AVE PO BOX 26  
RIVERSIDE STA DAYTON 14 OHIO  
PROTECTIVE CLOSURE  
2207 ELMWOOD AVE BUFFALO N Y  
PROTECTIVE COATINGS INC  
BOX 3985 DETROIT 27 MICH  
PROTECTOBIRE CO  
WASHINGTON ST HANOVER MASS  
PROTECTOBIRE CO  
P O BOX 543 YORK MAINE  
PRO-TEX REEL BAND CO  
200 FILM BLDG CLEVELAND 14 OHIO  
PROTO TOOL CO LOS ANGELES DIV  
BOX 3519 TERMINAL AMHERS LOS ANGELES CALIF  
PROTOTYPE TRANS CORP  
1 HENRY ST BLOOMFIELD N J  
PRUYN-MOORE INC  
2586 E 67TH ST LONG BEACH 5 CALIF

PRY WELDING & MFG INC  
MOENNA PA  
PRYOR MARKING PRODUCTS  
434 S BABASH AVE CHICAGO 5 ILL  
PSP ENGINEERING CO DIV INC MAGNETICS ROUGE  
605B WALKER AVE MAYWOOD CALIF  
PUBLIC INFORMATION PROGRAMS INC  
10000 RIVERSIDE OR BLDG SUITE 6 TOLUCA  
LAKE N HOLLYWOOD CALIF  
PULSE ENGINEERING INC  
560 ROBERT AVE SANTA CLARA CALIF  
PULSE ENGINEERING INC  
637 ALVARADO STANFORD CALIF  
PULSE TECHNIQUES INC  
1411 PALISADE AVE W ENGLEWOOD N J  
PUR DESIGN PUR SUPPLY  
WESTBURY N Y  
PYE CANADA LTD  
92 NORTHLINE RD TORONTO 16 ONTARIO CANADA  
PYE CORP OF AMERICA  
1149 RARITAN AVE HIGHLAND PARK N J  
PYE TELECOMMUNICATIONS LTD  
NEWMARKET RD CAMBRIDGE ENGLAND  
PYLE-NATIONAL CO  
1334 N KOSTNER AVE CHICAGO 51 ILL  
PYRAMID ELECTRIC CO  
DARLINGTON S C  
PYRAMID ELECTRIC CO  
1445 HUDSON BLVD N BERGEN N J  
PYRAMID ELECTRIC CO  
101 N YATES ST GASTONIA NC CAR  
PYRAMID INSTR CORP  
630 MERRICK RD LYNBROOK L I N Y  
PYRAMID SCREEN CORP  
181 HARVARD ST BROOKLINE 46 BOSTON MASS  
PYROFILM RESISTOR CO  
U S HIGHWAY 46 PARSIPPANY N J  
PYROMETER INSTRUMENT CO  
92 PORTLAND AVE BERGENFIELD N J

## Q

Q GLASS CO  
470 BROAD ST BLOOMFIELD N J  
Q L C CORP  
RD LONG VALLEY N J  
Q L C CORP  
409 MAIN ST GREENPORT N Y  
Q-LINE MFG CORP  
1562 61 ST BROOKLYN 19 N Y  
Q D S CORP  
BRGAUX BLVD AT 216 ST NEW YORK 67 N Y  
QUALITONE CO  
4318 UPTON AVE S MINNEAPOLIS 10 MINN  
QUALITY BEAM CO  
96 EAST 40 ST HIALEAH FLA  
QUALITY COMPONENTS INC  
ST MARYS PA  
QUALITY CONTROL CORP  
10 DEPOT PLAZA WHITE PLAINS N Y  
QUALITY ELECTRIC  
3700 SOUTH BROADWAY LOS ANGELES 7 CALIF  
QUALITY ELECTRONICS INC  
319 CHURCH ST NEW YORK 13 N Y  
QUALITY NAMEPLATE INC  
FISHER HILL RD E GLASTONBURY CONN  
QUAN NICHOLS CO  
234 E MARQUETTE RD CHICAGO 37 ILL  
QUAN TECH LABS  
236 MT KEMBLE AVE MORRISTOWN N J  
QUAN-TECH LABORATORIES INC  
60 PARSIPPANY BLVD P O BOX 187 BOONTON N J  
QUANTAMETRIC DEVICES INC  
BOX 1107 BINGHAMTON N Y  
QUARIE CONTROLLERS  
381 N MAIN ST SHARON MASS  
QUARTZITE PROCESSING INC  
197 CHELSEA ST EVERETT 49 MASS  
QUESTERS CORP  
1026 E ARLEE PL ANAHEIM CALIF  
QUIETROL CO  
395 ST JOHN ST SPARTANBURG S C  
QUINCY COMPRESSOR CO  
QUINCY ILL  
OUTRONIC TRANSFORMER CORP  
525 BROADWAY NEW YORK 12 N Y  
Q V S INC  
20 N 15 ST E ORANGE N J  
RACAL ENGG LTD  
WESTERN RD BRACKNELL BERKS ENGLAND  
RACON ELECTRIC CO  
1261 BROADWAY NEW YORK 1 N Y  
RACON ELECTRIC CO  
67 HANFORD ST MIDDLETOWN N J  
RAD-O-LITE INC  
1202 MYRTLE ST P O BOX 306 ERIE PA  
RADA PRODUCTS CO  
2911 CARROLL AVE CHICAGO 12 ILL  
RADAR DESIGN CORP  
P O BOX 38 PICKARD DR SYRACUSE NY  
RADAR DEVICES INC  
P O BOX 1162 MADISON 1 WISC  
RADAR ENGINEERS  
4719 BROOKLYN SEATTLE 5 WASH  
RADAR MEASUREMENTS CORP  
190 DUFFY AVE HICKSVILLE LI N Y  
RADAR RELAY INC  
2322 MICHIGAN AVE SANTA MONICA CALIF  
RADIAL CUTTER MFG CORP  
831 BOND ST ELIZABETH 4 N J  
RADIANT LAMP CORP  
300 JELLIFF AVE NEWARK 8 N J  
RADIAPHONE CO  
600 E EVERGREEN AVE MONROVIA CALIF  
RADIART CORP ANTENNA DIV  
3455 VEGA AVE CLEVELAND 13 OHIO

RADIATION COUNTER LABS INC  
5121 B GROVE ST SKOKIE ILL  
RADIATION ELECTRONICS CO  
5600 JARVIS AVE CHICAGO 48 ILL  
RADIATION ENGG LABS  
RATIN ST MAYNARD MASS  
RADIATION INC  
EAU GALLIE FLA  
RADIATION INSTR  
P O BOX 2040-PC BRANCH ORLAADO FLA  
RADIATION INC  
MELBOURNE FLA  
RADIATION INC SPACE COMMUNICATIONS DIV  
1625 STIERLIN RD MOUNTAIN VIEW CALIF  
RADIATION INSTRUMENT CO  
P O BOX 733 SILVER SPRING MD  
RADIATION INSTRUMENT DEVELOPMENT LAB INC  
5737 S HALSTED ST CHICAGO 21 ILL  
RADIATION RESEARCH CORP  
1114 1ST AVE NEW YORK 21 N Y  
RADIATION RESEARCH CORP  
312 FLORIDA AVE W PALM BEACH FLA  
RADIATRONICS INC  
14801 CALIFAX ST VAN NUYS CALIF  
RADIATRONICS INC  
5956 KESTER AVE VAN NUYS CALIF  
RADIO ACTIVITIES INC  
119 DAWSON AVE BOONTON N J  
RADIO CITY PRODUCTS CO  
CENTRE B GLENDALE STS EASTON PA  
RADIO CONDENSER CO  
RADIO CONO AUTO TUNER HOPESTON ILL  
RADIO CONDENSER CO  
DAVIS & COPEWOOD STS CAMDEN 3 N J  
RADIO CONDENSER CO LTD  
6 BERNMONSEY RD TORONTO 16 CANADA  
RADIO CONDENSER CO WESTERN DIV  
WALNUT ST WATSEKA ILL  
RADIO CORES INC  
9540 S TULLEY AVE OAK LAWN ILL  
RADIO CORP OF AMERICA  
SEMICONDUCTOR A MATERIAL DIV SOMERVILLE NJ  
RADIO CORP OF AMERICA  
12605 ARNOLD DETROIT 39 MICH  
RADIO CORP OF AMERICA  
R C A TV DIV BLOOMINGTON IND  
RADIO CORP OF AMERICA  
RADIO CORP OF AMERICA COMMERCIAL ELECTRONIC  
PRODUCTS FRONT B COOPER STS CAMDEN N J  
RADIO CORP OF AMERICA COMMUNICATIONS  
PRODUCTS DEPT BLDG 1-5 CAMDEN N J  
RADIO CORP OF AMERICA  
BOX 1163 JACKSONVILLE ARK  
RADIO CORP OF AMERICA  
BOX 1507 WILMINGTON DEL  
RADIO CORP OF AMERICA  
P O BOX 588 BURLINGTON MASS  
RADIO CORP OF AMERICA  
7901 FREEWAY 183 DALLAS 35 TEXAS  
RADIO CORP OF AMERICA DEFENSE ELECTRONIC PRO  
FRONT A COOPER STS BLDG 15 2 CAMDEN 2 N J  
RADIO CORP OF AMERICA-ELECTRON TUBE DIV  
415 S 3TH ST HARRISON N J  
RCA BROADCAST B TV DIV  
SOMERVILLE N J  
RCA BROADCASTING CO  
FRONT B COOPER STS CAMDEN NJ  
RCA CORP  
68 TERRY ST SCAOAST SHORES EAU GALLIE FLA  
RCA DEFENSE ELEC DEPT  
20445 BELLS DR WOODLAND HILLS CALIF  
RCA ELECTRON TUBE DIV  
1625 K ST N WASHINGTON DC  
RCA HIGH POWER ELECTRONICS B NUCLEONICS  
11819 W OLYMPIC BLVD LOS ANGELES CALIF  
RCA INDUSTRIAL TUBE PRODUCTS  
LANCASTER PA  
RCA MISSILE & SURFACE RADAR  
MOORESTOWN N J  
RCA VICTOR  
MIAMI RD & KINGS HWY HADDONFIELD N J  
RCA WEST COAST MISSILE B SURFACE  
8500 BALBOA BLVD VAN NUYS CALIF  
R C A  
P O BOX 246 LEXINGTON 73 MASS  
R C A  
FOSTORIA RD FINDLAY OHIO  
R C A  
BLDG 101-2 MOORESTOWN N J  
R C A  
3301 S ADAMS MARION IND  
R C A  
1908 BANHARD AVE RIVERTON N J  
R C A -SEMICONDUCTOR DIV  
SUITE 1154 - NUSE MART CHICAGO 54 ILL  
R C A CORP  
501 N LA SALLE ST INDIANAPOLIS 1 IND  
R C A ELECTRON TUBE DIVISION  
MARTHA AVE LANCASTER PENNA  
R C A LABS  
140 MORICHES RD RIVERHEAD L I N Y  
R C A NEEDHAM MATERIALS LAB  
64 A STREET NEEDHAM HGTS 94 MASS  
R C A TUBE DIV  
1000 S 2ND ST - BLDG 55 HARRISON N J  
R C A WESTERN DIV MICROVAE  
1560 N VINE ST HOLLYWOOD 28 CALIF  
RADIO ENGG CO  
8 STATE ST NEW YORK 4 N Y  
RADIO ENGG LABS INC  
29-01 BORDEN AVE LONG ISLAND CITY 1 N Y  
RADIO ENGG PRODUCTS  
1080 UNIVERSITY ST MONTREAL 3 QUE CANADA

# ELECTRONIC MANUFACTURERS-A-Z

**RADIO ESSENTIALS INC**  
152 MQUESTEN PKWY MT VERNON N Y

**RADIO FREQUENCY CO**  
44 PARK ST MEDFELL MASS

**RADIO FREQUENCY LABS INC**  
BOONTON N J

**RADIO INDUSTRIES INC**  
466 GARLAND PL DES PLAINES ILL

**RADIO INDUSTRIES INC**  
5225 N RAVENSWOOD AVE CHICAGO 25 ILL

**RADIO INSTR LABS**  
1205 SUMMER PLACE FAIR LAWN N J

**RADIO KITS INC**  
48-06 VAN WYCK EXPY RICHMOND HILL 18 N Y

**RADIO MANUFACTURING CO**  
85 EUCALYPTUS LANE SANTA BARBARA CALIF

**RADIO MATERIALS CO**  
P O BOX 59 ATTICA IND

**RADIO MATERIALS CO DIV P R MALLORY & CO INC**  
3325 N CALIFORNIA AVE CHICAGO 18 ILL

**RADIO MERCHANDISE SALES INC**  
2016 BROOKDALE AVE BRONX 62 N Y

**RADIO MFG ENGG INC**  
501 WALNUT ST WASHINGTON ILL

**RADIO MUSIC CORP**  
84 S WATER ST PORT CHESTER N Y

**RADIO RECEPTOR CO INC**  
700 SHAMES DRIVE WESTBURY L I N Y

**RADIO RECEPTOR CO INC SELENIUM DIV**  
2400 BYTHE AVE BROOKLYN 11 N Y

**RADIO RESEARCH INSTRUMENT CO**  
550 5TH AVE NEW YORK N Y

**RADIO SHACK CORP**  
730 COMMONWEALTH AVE BOSTON 17 MASS

**RADIO SPECIALTY MFG CO**  
2023 S E & AVE PORTLAND 14 ORE

**RADIO SWITCH CORP**  
MARLBOROUGH MASS

**RADIO TV PRODUCTS CORP**  
308 N LAKE ST GRASS LAKE MICH

**RADIO-MATIC OF AMERICA INC**  
1550 SPRINGFIELD AVE MAPLEWOOD N J

**RADIOMETER**  
72 ENDRUPVEJ COPENHAGEN DENMARK

**RADION CORP**  
345 TERRA COTTA AVE CRYSTAL LAKE ILL

**RADIONICS INC**  
P O BOX 186 COCKEYSVILLE MD

**RADIONICS INC**  
P O BOX 86 COCKEYSVILLE MD

**RADIOPHONE CO INC**  
P O BOX 39 HENRIEVILLE CALIF

**RADIOPHONE CORP**  
509 MADISON AVE NEW YORK 22 N Y

**RADIOPLANE**  
18710 CELTIC ST NORTHRIDGE CALIF

**RADIOPLANE CO**  
4886 DANNY BOYAR AVE CANOGA PARK CALIF

**RADIOPLANE DIV WORTHROP AIRCRAFT INC**  
8000 WOODLEY AVE VAN NUYS CALIF

**RADIUM CHEMICAL CO**  
161 E 42ND ST NEW YORK 17 N Y

**RADIX WIRE CO**  
26240 LAKELAND BLVD CLEVELAND 32 OHIO

**RADSON ENGINEERING CORP**  
MADISON ILL

**RAE MOTOR CORP**  
2099 KEWAUNEE ST RACINE WISC

**RAECO**  
318 50 PASADENA AVE PASADENA CALIF

**RAHM INSTRUMENTS**  
45 RUSHMORE ST WESTBURY N Y

**RAILROAD ELECTRONIC LABS OF OMAHA INC**  
6614 BLOND ST OMAHA 4 NEB

**RAILS CO INC**  
187 MAPLEWOOD AVE MAPLEWOOD N J

**RAILWAY COMMUNICATIONS INC**  
9351 E 58 ST RAYTOWN 33 MO

**RAINIER CORP**  
86 MAGNOLIA AVE WESTBURY L I N Y

**RAM CHEMICALS INC**  
210 E OLIVE ST GARDENA CALIF

**RAM ELECTRONICS INC**  
800 INDUSTRIAL AVE PARAMUS N J

**RAM METER INC**  
1100 HILTON RD FERNDALE 20 MICH

**RAMAGE & MILLER ENTERPRISES**  
3221 FLORIDA AVE RICHMOND CALIF

**RAMCO PRODUCTS**  
4918 DORCHESTER DR P O BOX 1581 ERIE PA

**RAMCO PRODUCTS**  
P O BOX 36 HARTINGTON STATION N Y

**RAMO WOODBRIDGE**  
BOX 45047 AP STATION LOS ANGELES 45 CALIF

**RAMO WOODBRIDGE INC**  
5730 ARBOR VITAE LOS ANGELES CALIF

**RAMO-WOODBRIDGE CORP**  
P O BOX 8405 DENVER 10 COLO

**RAMO-WOODBRIDGE LABS**  
8433 FALLBROOK AVE CANOGA PARK CALIF

**RANSEY CORP SUB THOMPSON RAMO WOODBRIDGE INC**  
PO BOX 513 ST LOUIS 66 MO

**RANCO CORP**  
1700 MAIN ST SANTA MONICA CALIF

**RANCO DEVELOP CORP ELECTRONICS DIVN**  
13600 DENISE AVE CLEVELAND 10 OHIO

**RANDALL INC DOUGLAS**  
6 PARCATUCK AVE WESTERLY R I

**RANCO INC**  
SALEM ST UNION SPRINGS N Y

**RANDOLPH PRODUCTS CO**  
CARLSTADT N J

**RANGERTONE INC**  
73 WINTHROP ST NEWARK 4 N J

**RANK CINTEL LTD**  
WORSLEY BR RD LWR SYDENHAM ENGLAND

**RANSHOFF CO**  
N 8TH ST & FORD BLVD HAMILTON OHIO

**RANSON RESEARCH**  
BOX 269 374 W 8 ST SAN PEDRO CALIF

**RANTEC CORP**  
23999 VENTURA BLVD CALBASAS CALIF

**RAPID DESIGN INC**  
BOX 429 BURBANK CALIF

**RAPID ELECTRIC CO**  
2881 MIDDLETOWN RD BRONX 61 N Y

**RAPID ELECTROPLATING PROCESS INC**  
1014 S WABASH AVE CHICAGO 9 ILL

**RAPID SPECIALTIES CO**  
327 W HURON ST CHICAGO 10 ILL

**RASCHER & BETZOLD INC**  
730 N FRANKLIN ST CHICAGO 10 ILL

**RATEL INC**  
1 EL CAMINO RATEL GOLETA CALIF

**RATTIGAN ELECTRONICS INC**  
425 W CYPRESS ST GLENDALE 4 CALIF

**RA TONE ELECTRONIC SALES CO**  
1648 W CAMPBELL AVE PHOENIX ARIZ

**RAYTHEON CO MISSILE SYS DIV**  
NORTH ANDOVER MASS

**RAYTHEON CO POWER TUBE DEPT**  
25 ADAMS ST ARLINGTON MASS

**RAYTHEON CO RECEIVING TUBE DIV**  
465 CENTRE ST QUINCY 69 MASS

**RAYTHEON CO-MISSILE SYST**  
4350 CUMBERLAND AVE CHICAGO 31 ILL

**RAYTHEON CO/INDUSTRIAL COMPONENTS DIV**  
55 CHAPEL ST NEWTON 98 MASS

**RAYTHEON CO/SEMICONDUCTOR DIV**  
215 1ST AVE NEEDHAM HEIGHTS MASS

**RAYTHEON EQUIP DIV**  
55 CHAPEL ST NEWTON MASS

**RAYTHEON INDUSTRIAL APPARATUS DIV**  
100 RIVER ST WALTHAM MASS

**RAYTHEON INDUSTRIAL TUBE**  
55 CHAPEL ST NEWTON 98 MASS

**RAYTHEON MFG CO**  
1415 BOSTON & PROVIDENCE TPK NORWOOD MASS

**RAYTHEON MFG CO GOVERNMENT EQUIP DIV**  
WALTHAM MASS

**RAYTHEON MFG CO MAYNARD LAB**  
THOMPSON ST MAYNARD MASS

**RAYTHEON MFG CO MICROWAVE DEVICE DEPT**  
100 RIVER ST WALTHAM MASS

**RAYTHEON MFG CO MISSILE SYSTEMS DIV**  
SEYON ST WALTHAM MASS

**RAYTHEON MFG CORP SANTA BARBARA LAB**  
P O BOX 436 SANTA BARBARA CALIF

**RAYTHEON MISSILE SYSTEM DIV**  
HARTWELL RD BEDFORD MASS

**RAYTHEON POWER SUPPLY**  
5 NORWALK CONN

**RAYTHEON RECEIVING TUBE DIV**  
55 CHAPEL ST NEWTON 98 MASS

**RAYTHEON CORP**  
OAKSIDE AT NORTHSIDE REDWOOD CITY CALIF

**RAYMOND-SEELIG ELECTRONICS**  
10913 PICO LOS ANGELES 84 CALIF

**RAYPAR INC**  
7800 W ADDISON ST CHICAGO 34 ILL

**RAYTHEON CANADA LTD**  
WATERLOO ONT CANADA

**RAYTHEON CO**  
225 N VAN NESS AVE HAWTHORNE CALIF

**RAYTHEON CO**  
BOX 949 OXNARD CALIF

**RAYTHEON CO**  
WOBURN ST LOWELL MASS

**RAYTHEON CO**  
100 ROESLER RD GLEN BURNIE MD

**RAYTHEON CO**  
1422 N MANCOCK ST S-5 COLORADO SPRINGS COLO

**RAYTHEON CO**  
6380 HALLISTER AVE GOLETA CALIF

**RAYTHEON CO**  
REDSTONE ARSENAL ALA

**RAYTHEON CO**  
YORK & HAVERHILL STS ANDOVER MASS

**RAYTHEON CO**  
9501 W GRAND AVE FRANKLIN PARK ILL

**RAYTHEON CO MICROWAVE & POWER TUBE**  
OPERATIONS FOUNDRY AVE WALTHAM MASS

**RAYTHEON CO**  
100 RIVER ST WALTHAM 34 MASS

**RAYTHEON CO**  
SPRING ST NORTH DIGHTON MASS

**RAYTHEON CO**  
VANCE TANK RD BRISTOL TENN

**RAYTHEON CO**  
22 BROOK RD WESTON MASS

**RAYTHEON CO**  
75 W BEACON ST BRIGHTON MASS

**RAYTHEON CO**  
SPENCER LAB BURLINGTON MASS

**RAYTHEON CO**  
42 GLEASON ST FRAMINGHAM MASS

**RAYTHEON CO**  
15 LLOYD ST WINCHESTER MASS

**RAYTHEON CO**  
WAYLAND LAB WAYLAND MASS

**RAYTHEON CO**  
1089 WASHINGTON ST WEST NEWTON MASS

**RAYTHEON CO COMM APPARATUS SYSTEMS**  
WATERTOWN MASS

**RAYTHEON CO COMMERCIAL EQUIP DIV**  
100 RIVER ST WALTHAM 34 MASS

**RAYTHEON CO DISTRIBUTOR PRODS**  
WESTWOOD MASS

**RAYTHEON CO GOVT EQUIPMENT**  
62413 WORCESTER RD FRAMINGTON MASS

**RAYTHEON CO INDUSTRIAL APPARATUS DIV**  
MANCHESTER N H

**RAYTHEON CO MAYNARD LAB**  
THOMPSON ST MAYNARD MASS

**RAYTHEON CO MICROWAVE & POWER TUBE DIV**  
130 SECOND AVE WALTHAM 56 MASS

**RATRAY & CO GEORGE DIV HARWICK HINDLE INC**  
116-OR MYRTLE AVE RICHMOND HILLS N Y

**RAU FASTENER CO**  
102 WESTFIELD ST PROVIDENCE R I

**RAULAND CORP**  
4245 N KNOX AVE CHICAGO 41 ILL

**RAULAND-BORG CORP**  
3535 W ADDISON ST CHICAGO 18 ILL

**RAVEN ELECTRONICS MFG CO**  
2130 W CARROLL AVE CHICAGO 12 ILL

**RAVEN SCREEN CORP**  
124 E 124 ST NEW YORK 38 N Y

**RAWAY BEARING CO INC**  
141 CHRYSSTIE ST NEW YORK 2 N Y

**RAWCO INSTRUMENTS INC**  
3527 W ROSEDALE FT WORTH TEXAS

**RAWDON SMITH ASSOC INC**  
1735 20 ST N W WASHINGTON 9 D C

**RAWL ENGINEERING & MFG CO ELECTRONICS DIV**  
167 VALLEY ST PROVIDENCE 9 R I

**RAWSON ELECTRICAL INSTRUMENT CO**  
116 POTTER ST CAMBRIDGE 42 MASS

**RAY PROOF CORP**  
863 CANAL ST STAMFORD CONN

**RAY-O-VAC CO CLINTON PLANT**  
CLINTON MASS

**RAY-O-VAC CO**  
212 E WASHINGTON AVE MADISON WISC

**RAY-TRONICS SALES CO INC**  
9835 DERBY LAKE WESTCHESTER ILL

**RAYBESTOS-MANHATTAN INC**  
61 WILLET ST PASSAIC N J

**RAYBESTOS-MANHATTAN INC PLASTIC PRODUCTS DIV**  
MANHEIM PA

**RAYBESTOS-MANHATTAN INC**  
P O BOX 1021 BRIDGEPORT 2 CONN

**RAYCHEM CORP**  
OAKSIDE AT NORTHSIDE REDWOOD CITY CALIF

**RAYCLAD TUBES INC**  
OAKSIDE AT NORTHSIDE REDWOOD CITY CALIF

**RAYCLAD TUBES INC**  
OAKSIDE AT NORTHSIDE REDWOOD CITY CALIF

**RAYCO ELECTRONIC MFG INC**  
7229 ATOLL AVE N HOLLYWOOD CALIF

**RAYMOND ENGINEERING LABORATORY INC**  
SMITH ST MIDDLETOWN CONN

**R B W DIV ESSEX WIRE CORP**  
131 GOUFREY ST LOGANSPOUT IND

**RCL MFG CO**  
NEW JERSEY AVE RIVERSIDE N J

**R D F RECORDINGS**  
BOX 24544 LOS ANGELES CALIF

**R & D LABS**  
14315 BESSEMER ST VAN NUYS CALIF

**REA CO J B ELECTRONICS DIV**  
2202 BROADWAY SANTA MONICA CALIF

**REA MAGNET WIRE CO**  
3610 E PONTIAC ST FT WAYNE IND

**REACTION MOTORS DIV THIOKOL CHEM CORP**  
25 MILES WEST BRIGHAM CITY UTAH

**REACTION MOTORS INC**  
90 FORD RD DENVER N J

**REACTION MOTORS INC**  
ROCKAWAY N J

**READY POWER CO**  
11231 FREDU AVE DETROIT 14 MICH

**RECORA CO**  
6100 S ARCHER RD SUMMIT ILL

**RECORA CO INC**  
POWIS RD - BOX 68 ST CHARLES ILL

**RECORDAK CORP**  
WANAMAKER PLACE NEW YORK 3 N Y

**RECORDED PUBLICATIONS LABS**  
1559 PIERCE AVE CARDEN N J

**RECORDED TAPE OF THE MONTH CLUB**  
449 W 51ST ST NEW YORK 19 N Y

**RECORDISC CORP**  
33-01 FAR ROCKAWAY BLVD EDGEWATER 91 N Y

**RECTON CORP**  
5235 BARNETT AVE LONG ISLAND CITY 4 N Y

**RECTICO INC**  
905 FRELINGHUYSEN AVE NEWARK 12 N J

**RECTIFIER CORP**  
1521 E GRAND AVE EL SEGUNDO CALIF

**RECTIFIER CORP**  
FAJARDO PUERTO RICO

**RED DEVIL MFG CO**  
1812 N OGDEN AVE CHICAGO 10 ILL

**RED POINT CORP**  
105 W SPAZIER AVE BURBANK CALIF

**RED POINT CORP**  
1907 RIVERSIDE DR GLENDALE 1 CALIF

**RED SEAL ELECTRIC CO**  
10307 DETROIT AVE CLEVELAND 2 OHIO

**REDCOR DEVELOPMENT CORP**  
14750 ARMINTA ST VAN NUYS CALIF

**REDFORD CORP**  
P O BOX 1067 SCHENECTADY 1 N Y

**REDFORD CORP INSTRUMENT DIV**  
262 SARAGOTA RD SCOTIA N Y

**REDMAN ELECTRONICS CORP**  
92 PROSPECT ST THOMPSONVILLE CONN

**REDMOND CO**  
MONROE ST DROSSO MICH

**REED & REESE RETRON CORP**  
717 N LAKE AVE PASADENA CALIF

**REED CURTIS NUCLEAR IND INC**  
9459 W JEFFERSON BLVD CULVER CITY CALIF

**REED INSTRUMENT BEARING CO DIV SKF IND INC**  
4241 REDWOOD AVE LOS ANGELES 46 CALIF



# ELECTRONIC MANUFACTURERS-A-Z

**REED INSTRUMENT CO INC**  
 1048 POTOMAC ST N W WASHINGTON 7 D C  
**REEDER & CO CHARLES N**  
 171 173 VICTOR AVE DETROIT MICH  
**REED RESEARCH INC**  
 1048 POTOMAC ST N W WASHINGTON 7 DC  
**REEVE ELECTRONICS INC**  
 609 W LAKE ST CHICAGO 6 ILL  
**REEVES EQUIPMENT CORP**  
 8940 AVE PELHAM N Y  
**REEVES HOFFMAN DIV**  
 CHERRY & NORTH STS CARLISLE PA  
**REEVES INSTRUMENT CORP**  
 ROOSEVELT FIELD GARDEN CITY N Y  
**REEVES PULLEY CO DIV RELIANCE ELEC & ENG CO**  
 1225 7TH ST COLUMBUS IND  
**REEVES SOUNDRAFT CORP**  
 15 GREAT PASTURE RD DANBURY CONN  
**REEVES SOUNDRAFT CORP**  
 671 HOPE ST SPRINGDALE CONN  
**REEVES SOUNDRAFT CORP**  
 204 WALNUT ST ALLENTOWN PA  
**REEVESOUND CO INC**  
 35-54 36TH ST LONG ISLAND CITY 6 N Y  
**REF MFG CORP**  
 393 JERICHO TURNPIKE NINEOLA N Y  
**REFLECTONE CORP**  
 1057 RD STAMFORD CONN  
**REFRACTORICS DIV CARBORUNDUM CO**  
 LATROBE PA  
**REGAN INDUSTRIES**  
 1720 MARCO POLO BURLINGAME CALIF  
**REGENT CONTROLS INC**  
 HARVARD AVE STAMFORD CONN  
**REGO INSULATED WIRE CO**  
 830 HENRY ST HOOKEN N J  
**REGULATORS INC**  
 454 MAIN ST BYCHOFF N J  
**REICHMOLD CHEMICALS INC**  
 525 N BROADWAY WHITE PLAINS N Y  
**REID ENTERPRISES**  
 2610 E 67 ST LONG BEACH 5 CALIF  
**REIGNER READING LIBRARY**  
 3401 BROOK RD RICHMOND 27 VA  
**REILLY TAR & CHEMICAL CORP**  
 1635 MERCHANT BANK BLDG INDIANAPOLIS 4 IND  
**REINER ELECTRONICS CO**  
 CENTRE & GLENDALE STS EASTON PA  
**REITER CO F**  
 3340 BOWNE HILL DR HOLLYWOOD 28 CALIF  
**REK O RUY COMPANY INC**  
 18 19 108TH ST CORONA 68 L I N Y  
**RELAY SALES INC**  
 P O BOX 186 W CHICAGO ILL  
**RELIABLE SPRING & WIRE FORMS CO**  
 3167 FULTON ST CLEVELAND 9 OHIO  
**RELIANCE AUTOMATIC LIGHTING CO**  
 1927 MEAD ST RACINE 3 WISC  
**RELIANCE DIV EABIN**  
 MASSILON OHIO  
**RELIANCE ELEC & ENG CANADA LTD**  
 127 JUDGE RD TORONTO 18 ONT CANADA  
**RELIANCE ELEC & ENG CO-ASHTABULA DIV**  
 4200 BENEFIT RD ASHTABULA OHIO  
**RELIANCE ELECTRIC & ENGG CO**  
 24701 EUCLID AVE CLEVELAND 17 OHIO  
**RELINANCE MICA CO INC**  
 341 39TH ST BROOKLYN 32 N Y  
**RELINANCE PAINT CO CORROSITIVE DIV**  
 64 S 6TH ST BROOKLYN 11 N Y  
**RELTRON CORP**  
 26 HOSMAN ST W NEWTON MASS  
**REN SALES DIV ROBERT E NORRIS CO**  
 WEST HARTFORD 7 CONN  
**RENANCO INC**  
 1805 COLORADO SANTA MONICA CALIF  
**RENBAR CO INC**  
 57 MAINE ST DOBBS FERRY N Y  
**RENINGTON RAND SPERRY**  
 ST PAUL MINN  
**RENINGTON RAND UNIVAC DIV-SPERRY RAND CORP**  
 315 4TH AVE NEW YORK 10 N Y  
**RENLER CO**  
 2101 BRYANT ST SAN FRANCISCO CALIF  
**RENSBRANT INC**  
 6 PARMELEE ST BOSTON 18 MASS  
**RENFREB ELECTRIC CO LIMITED**  
 349 CARLAW AVE TORONTO 9 ONT CANADA  
**REON RESISTOR CORP**  
 155 SABBILL RIVER RD YONKERS N Y  
**REPAIR PACIFIC DIV ARNOLD ENGG CO**  
 541 E 61 ST LOS ANGELES 1 CALIF  
**REPUBLIC AVIATION CORP**  
 FARRINGDALE L I N Y  
**REPUBLIC AVIATION CORP**  
 21 LEWIS CIRCLE BABYLON L I N Y  
**REPUBLIC AVIATION CORP GUIDED MISSILES DIV**  
 223 JERICHO TPK NINEOLA NEW YORK  
**REPUBLIC AVIATION CORP-MSO**  
 447 BROADWAY NICKSVILLE L I N Y  
**REPUBLIC FLOW METERS CO**  
 2240 DIVERSEY PKWY CHICAGO 47 ILL  
**REPUBLIC FOIL & METAL MILLS INC**  
 55 TRIANGLE ST DANBURY CONN  
**REPUBLIC FOIL INC**  
 PO BOX 408 DANBURY CONN  
**REPUBLIC LENS CO**  
 31 E 169TH ST NEW YORK 92 N Y  
**REPUBLIC RUBBER DIV LEE RUBBER & TIRE CORP**  
 1410 ALBERT ST YOUNGSTOWN 1 OHIO  
**REPUBLIC STEEL CORP**  
 REPUBLIC BLDG CLEVELAND 1 OHIO  
**RESCON ELECTRONICS CORP**  
 1911 BEAR HILL RD WALTHAM 94 MASS  
**RESDEL ENGG CORP**  
 330 S FAIR OAKS AVE PASADENA CALIF

**RESE ENGG INC**  
 731 ARCH ST PHILADELPHIA 6 PA  
**RESEARCH CHEMICALS**  
 170 W PROVIDENCIA BURBANK CALIF  
**RESEARCH DEVELOPMENT MFG INC**  
 429 E COLLEGE ST PHILADELPHIA 44 PA  
**RESEARCH ELECTRONICS MFG CO**  
 1200 CALUMET ST HOUSTON 6 TEXAS  
**RESEARCH ENGINEERING INC**  
 328 PARK AVE PLAINFIELD N J  
**RESEARCH INC**  
 115 BUCHANAN AVE HOPKINS MINN  
**RESEARCH INDUSTRIAL LAB OF ELECTRONICS**  
 ROSLYN PA  
**RESEARCH INST CO INC**  
 290 BROADWAY HUNTINGTON STA N Y  
**RESEARCH INSTRUMENT**  
 980 N FAIR OAKS AVE PASADENA CALIF  
**RESEARCH INSTRUMENT CO**  
 BOX 9188 MONTAVILL STA PORTLAND ORE  
**RESEARCH MFG CORP**  
 P O BOX 6036 SAN DIEGO 6 CALIF  
**RESEARCH SPECIALTIES CO**  
 200 S GARRARD BLVD RICHMOND CALIF  
**RESISTANCE PRODUCTS CO**  
 914 S 13 ST HARRISBURG PA  
**RESISTOFLEX CORP**  
 WOODLAND RD ROSELAND N J  
**RESISTOFLEX CORP SOUTHWESTERN DIV**  
 135 GLASS ST DALLAS 7 TEX  
**RESISTORS INC**  
 5226 W 26 ST CHICAGO 13 ILL  
**RESITRON LABS INC**  
 2908 NEBRASKA AVE SANTA MONICA CALIF  
**REUTER STOKES ELECTRONIC COMPONENTS**  
 2149 HAMILTON AVE CLEVELAND OHIO  
**REVCO INC**  
 DEERFIELD MICH  
**REVCO INC**  
 1900 LYNDALE AVE SO MINNEAPOLIS 5 MINN  
**REVERE CAMERA CO**  
 320 E 21ST ST CHICAGO ILL  
**REVERE COPPER & BRASS INC**  
 230 PARK AVE NEW YORK 17 N Y  
**REVERE CORP OF AMERICA**  
 N COLONY RD WALLINGFORD CONN  
**REVOLATOR CO**  
 86TH ST US RT 189 N BERGEN N J  
**REX CORP**  
 MAYBARD RD W ACTON MASS  
**REX RHEOSTAT CO**  
 149 BABYLON TURNPIKE ROOSEVELT N Y  
**REYNOLDS ELECTRIC CO**  
 3000 RIVER RD RIVER GROVE ILL  
**REYNOLDS INDUSTRIES INC**  
 2105 COLORADO AVE SANTA MONICA CALIF  
**REYNOLDS METALS CO**  
 P O BOX 2346-ZF RICHMOND 18 VA  
**REYNOLDS WIRE DIV NATIONAL-STANDARD CO**  
 809 E 2ND ST DIXON ILL  
**R-F ELECTRONICS INC**  
 KING AVE BEYHOUTH 88 MASS  
**RF PRODUCTS DIV AMPHENOL-BORG**  
 DANBURY CONN  
**RHEEM CALIFONE CORP**  
 1020 N LA BREA HOLLYWOOD 38 CALIF  
**RHEEM ELECTRONICS**  
 11711 WOODRUFF AVE DOWNEY CALIF  
**RHEEM MFG CO**  
 4361 FIRESTONE BLVD SOUTH GATE CALIF  
**RHEEM MFG CO**  
 11711 WOODRUFF AVE DOWNEY CALIF  
**RHEEM MFG CO DEFENSE & TECH PROD DIV**  
 9236 E HALL RD DOWNEY CALIF  
**RHEEM MFG CO-ELECTRONICS DIV**  
 7777 INDUSTRY AVE RIVERA CALIF  
**RHEEM SEMICONDUCTOR CORP**  
 327 MORFITT RD MOUNTAIN VIEW CALIF  
**RHEIN SOUND SYSTEMS INC**  
 133 HAMILTON ST NEW HAVEN 5 CONN  
**RHU ENGG CO**  
 2242 SEPULVEDA BLVD LOS ANGELES CALIF  
**RHODE & SCHWARZ**  
 111 LEXINGTON AVE PASSAIC N J  
**RHODES & SONS CO N Y**  
 BOX 627 TAUNTON MASS  
**RHODES INC N Y**  
 30 BARTHOLOMEW AVE HARTFORD CONN  
**RIBER DESJARDINS**  
 13-17 RUE PERIER MONTRONGE SEIVE FRANCE  
**RICE CO A W**  
 SPRING & BURBANK STS PITTSFIELD MASS  
**RICH ELECTRONICS INC**  
 212 NW 8TH AVE MIAMI 36 FLA  
**RICHARDS ELECTROCRRAFT INC**  
 4432 N KEDMI AVE CHICAGO 18 ILL  
**RICHARDS-WILCOX MFG CO**  
 AURORA ILL  
**RICHARDSON CO**  
 27 AVE & LAKE ST MELROSE PARK ILL  
**RICHARDSON LABS KENNETH**  
 254 VINCENT AVE LYMBROOK N Y  
**RICHARDSON-ALLEN CORP**  
 116-15 15 AVE COLLEGE POINT 56 N Y  
**RICHEY ELECTRONICS**  
 1066 BURBANK BLVD N HOLLYWOOD CALIF  
**RICHFIELD COINED PRODUCTS CO**  
 722 BROAD ST CLIFTON N J  
**RICHMONT INC**  
 922 S MYRTLE AVE MONROVIA CALIF  
**RICHTER LABS**  
 1960 HARBORN AVE MIAMI BEACH FLA  
**RIDGEWAY DIV GRAVELY FURN CO**  
 RIDGEWAY VA  
**RIESTER & THESMACHER CO**  
 1526 W 25 ST CLEVELAND 13 OHIO

**R I INSULATED WIRE CO**  
 50 BURKHAM AVE CRANSTON R I  
**RIGGS ELECTRONICS CO**  
 1775 JOAN AVE TOWSON 4 MD  
**RIGGS NUCLEONICS CORP**  
 177 W MAGNOLIA BLVD BURBANK CALIF  
**RIGIDIZED METALS CORP**  
 658 OHIO ST BUFFALO N Y  
**RIMAK INC**  
 10929 VANOBEN ST N HOLLYWOOD CALIF  
**RINCO INC**  
 7962 S E POWELL BLVD PORTLAND 6 ORE  
**RIPLEY CO**  
 1 FACTORY ST MIDDLETOWN CONN  
**RISCO**  
 265 MINNA ST SAN FRANCISCO 3 CALIF  
**RITTER CO INC**  
 RITTER PARK ROCHESTER 3 N Y  
**RIVER EDGE SALES CORP**  
 80 SHORE RD PORT WASHINGTON N Y  
**RIVERBANK LABS ENGG DEPT**  
 P D BOX 65 GENEA ILL  
**RIVETT LATHE & GRINDER INC**  
 P O BOX 7 BOSTON 35 MASS  
**RIVIERA ELECT CO**  
 6060 SW 114TH ST SOUTH MIAMI 56 FLA  
**RIXON ELECTRONICS INC**  
 2414 REEDIE DR SILVER SPRING MD  
**R-J AUDIO PRODUCTS**  
 80 SHORE RD PORT WASHINGTON N Y  
**R K MFG CO**  
 P O BOX 38 CARTERSVILLE ILL  
**R L C ELECTRONICS INC**  
 930 THE PARKWAY MAMARONECK N Y  
**ROANWELL CORP**  
 180 VARICK ST NEW YORK 14 N Y  
**ROBERSON MARINE RADIO**  
 48 SINTSINK DR E PT WASHINGTON L I N Y  
**ROBBINS & BENDER ASSOC INC**  
 726 E 11TH ST NEW YORK 8 N Y  
**ROBBINS & MYERS INC**  
 1345 LAGONDA AVE SPRINGFIELD OHIO  
**ROBCO MFG CO INC**  
 225 WEST MAIN ST PATCHOGUE N Y  
**ROBERTS ELECTRONICS INC**  
 1028 N LABREA AVE HOLLYWOOD 38 CALIF  
**ROBERTS MFG CO**  
 CLEBURNE TEX  
**ROBERTS TOLEDO RUBBER CO**  
 4143 MONROE ST TOLEDO 6 OHIO  
**ROBERTSHAW FULTON CONTROL**  
 155 HILL ST MILFORD CONN  
**ROBERTSHAW-FULTON CO ACRO DIV**  
 COLUMBUS 16 OHIO  
**ROBERTSHAW-FULTON CONTROLS CO**  
 SANTA ANA FRY EUCLID AVE ANAHEIM CALIF  
**ROBERTSHAW-FULTON CONTROLS CO-FULTON SYLPHON**  
 DIV P O BOX 400 KNOXVILLE 8 TENN  
**ROBERTSON ELEC CO**  
 124 S ELMWOOD AVE BUFFALO N Y  
**ROBINETTE CO W C**  
 802 FAIR OAKS AVE SOUTH PASADENA CALIF  
**ROBINS INDUSTRIES CORP**  
 36-27 PRINCE ST FLUSHING 54 N Y  
**ROBINSON AVIATION**  
 BOX 676 SANTA MONICA CALIF  
**ROBINSON MACHINE CO INC**  
 286 PRAKNESS AVE PATERSON 2 N J  
**ROBINSON MACHINE WORKS INC**  
 812 E EIGHTH ST NEW ALBANY IND  
**ROBINSON RECORDING LABS**  
 35 S 9 ST PHILADELPHIA 7 PA  
**ROBINSON TECHNICAL PRODUCTS INC**  
 TETERBORO N J  
**ROBOT INDUSTRIES INC**  
 7041 ORCHARD AVE DEARBORN MICH  
**ROBOTRON CORP**  
 21300 W 8 MILE RD DETROIT 19 MICH  
**ROBUCK LABS**  
 1431 S LA BREA AVE LOS ANGELES 19 CALIF  
**ROCKBAR CORP**  
 650 HALSTEAD AVE MAMARONECK N Y  
**ROCKBESTOS PRODS CORP**  
 P O DRAWER 1102 NEW HAVEN 4 CONN  
**ROCKBESTOS WIRE & CABLE CO**  
 NICOLL & BARBER STS NEW HAVEN 4 CONN  
**ROCKWELL ENGINEERING**  
 2133 & 45 ST INDIANAPOLIS 5 IND  
**ROCKWELL MFG CO AUTOMATIC VOTING MACH**  
 JONES & GIFFORD AVE JAMESTOWN N Y  
**ROCKWELL PRODS CORP**  
 146 CENTRAL AVE NEWARK 3 N J  
**RODALE ELECTRONICS INC**  
 562 GRAND BLVD WESTBURY L I N Y  
**RODALE MFG CO**  
 6 & MINOR STS EMMAUS PA  
**RODGERS ORGAN CO**  
 2040 N W 272ND AVE HILLSBORO ORE  
**RODNEY METALS INC**  
 1357 RODNEY FRENCH BLVD NEW BEDFORD MASS  
**ROEBLINGS SONS JOHN A DIV**  
 640 S BROAD ST TRENTON 2 N J  
**ROESCH COMMUNICATIONS DOUGLAS**  
 1832 S FLOWER LOS ANGELES 7 CALIF  
**ROFLAN CO**  
 TOPSFIELD MASS  
**ROGAN BROS**  
 8031 N MONTICELLO SKOKIE ILL  
**ROGERS & AKE CO**  
 150 N UNION ST AKRON OHIO  
**ROGERS CORP**  
 BINDHAM COUNTY ROGERS CONN  
**ROGERS ELECTRONIC CORP**  
 49 BLEECKER ST NEW YORK 12 N Y

# ELECTRONIC MANUFACTURERS-A-Z

ROGERS RESEARCH & MFG  
P O BOX 19012 MEMORIAL PK BRNCH HOUSTON 28  
TEX

ROHDEEN MFG CO INC  
4739 B MONROSE AVE CHICAGO 41 ILL

ROMIK-PERRIN CO  
P O BOX 227 CULVER CITY CALIF

ROMM MFG CO  
116 LIMESTONE BELLEVUE-PEORIA ILL  
FOOT OF M ST CHULA VISTA CALIF

ROLA CO  
2330 SUPERIOR AVE CLEVELAND 14 OHIO

ROLLAN ELECTRIC CO  
RHLAB PHOTO-SCIENCE LABORATORIES  
WALNUT TREE HILL SANDY HOOK CONN

ROLAND RADIO CO  
1230 ANDERSON AVE MT VERNON N Y

ROLL FARMED PRODUCTS CO  
PO BOX 418 YOUNGSTOWN 1 OHIO

ROLLAN ELECTRIC CO  
8233 S PRINCETON AVE CHICAGO 20 ILL

ROMAC PRODUCTS CO  
48-01 25 AVE LONG ISLAND CITY 3 N Y

ROMAN RESEARCH  
1101B MOORPARK ST NDRTH HOLLYWOOD CALIF

ROMAR PLASTICS INC  
1311 E MAIN ST ST CHARLES ILL

ROME CABLE CORP  
1739 21374 ST TORRANCE CALIF

ROME CABLE DIV ALCOA  
RIDGE ST ROME N Y

ROME TURNEY RADIATOR CO  
BCE 32 ROME N Y

ROMAN & KUNZL INC  
502 S KALAMAZOO AVE MARSHALL MICH

ROMO OF AMERICA INC  
100 SANFORD ST MADISON CONN

ROMETTE ACOUSTICAL CORP  
190 EARLE AVE LYNNBROOK N Y

ROOVERS LOTSCH CORP  
P O BOX 97 OLD FORGE PENNA

ROSAN INC  
2901 W COAST HWY NEWPORT BEACH CALIF

ROSCO LABS INC  
29 MOORE ST BROOKLYN 8 N Y

ROSEMOUNT ENGG CO  
4900 WEST 78TH ST MINNEAPOLIS 24 MINN

ROSS METALS CO MILTON  
237 JACKSONVILLE ROAD HATBORO PA

ROSS HFG CO  
BURLINGTON IOWA

ROSTAN CORP  
5660 59 ST MASPETH 78 N Y

ROSTONE CORP  
STATE RD 52 S LAFAYETTE IND

ROTATING COMPONENTS INC  
267 GREEN ST BROOKLYN 22 N Y

ROTEK INSTRUMENT CORP  
733 CONCORD AVE CAMBRIDGE MASS

ROTEK PUNCH CO  
2350 ALVARADO SAN LEANORO CALIF

ROTH J INSTRUMENTS DIV BUDD CO  
P O BOX 245 PHOENIXVILLE PA

ROTOLITE SALES CORP  
STERLING N J

ROTOR CLIP CO  
114 ALLEN BLVD FARMINGDALE N Y

ROTOTEST LABS INC  
2803 LOS FLORES BLVD LYNNWOOD CALIF

ROTRON MFG CO  
SCHOONMAKER LANE WOODSTOCK N Y

ROWAN CONTROL CORP  
2315 HOMEWOOD AVE BALTIMORE MD

ROWAN CONTROLLER CO  
3D BRIDGE AVE RED BANK N J

ROWE ENGRAVERS INC  
262 E 16TH ST PATERSON 4 N J

ROBE INDUSTRIES  
1702 WAYNE ST TOLEDO 9 OHIO

ROXMAN ENGINEERING ED  
4924 MAMMOTH AVE SHERMAN OAKS CALIF

ROY CO MILTON  
1300 E MERNAID LANE PHILA 18 PA

ROYAL COMMUNICATION SYSTEMS  
4501 PROSPECT AVE CLEVELAND 3 OHIO

ROYAL ELECTRIC CORP  
95 GRAND AVE PABTUCKET R I

ROYAL INDUSTRIES INC  
2961 E COLORADO PASADENA 8 CALIF

ROYAL MC BEE CORP  
740 N MAIN ST WEST HARTFORD 10 CONN

ROYAL MC BEE CORP  
WESTCHESTER AVE PORT CHESTER N Y

ROYAL PRECISION CORP  
WESTCHESTER AVE PORT CHESTER NY

ROYCO INSTRUMENTS  
874 FABIAN WAY PALO ALTO CALIF

ROYCO INSTRUMENTS INC  
365 SAN ANTONIO RD MOUNTAIN VIEW CALIF

ROYLYN INC  
1704 STANARD AVE GLENDALE 1 CALIF

R S ELECTRO-TECH CORP  
P O BOX 368 STA A PALO ALTO CALIF

RUBATEX DIV GREAT AMERICAN INDUSTRIES  
BEEFORD VA

RUBBER & ASBESTOS CORP  
225 BELLEVILLE AVE BLOOMFIELD N J

RUBENBRAFT CORP OF CALIFORNIA  
1800 W 220TH ST TORRANCE CALIF

RUBY CHEMICAL CO  
68-70 MCCOBELL ST COLUMBUS 16 OHIO

RUCKELS POTTERIES INC  
WHITE HALL ILL

RUCKER CO  
4700 SAN PABLO AVE EMERYVILLE CALIF

RUE PRODUCTS  
4323 CORINTH AVE CULVER CITY CALIF

RUGE ASSOC INC ARTHUR E  
HUDSON N H  
RUMPLE INC  
19076 OKNARD ST VAN NUYS CALIF

RUNZEL CORD & WIRE COMPANY  
4723 B MONROSE AVE CHICAGO 41 ILL

RUSH ELECT DEVEL CO  
P O BOX 3277 BELLAIRE 101 TEXAS

RUSKA INSTRUMENT CORP  
P O BOX 3396 BELLAIRE 101 TEXAS

RUSSELL & STOLL CO INC  
125 BARCLAY ST NEW YORK 7 N Y

RUSSELL BARDISALL & BARD BOLT & NUT CO  
P O BOX 110 PORT CHESTER N Y

RUSSELL GASKET CO  
7424 BESSEMER AVE CLEVELAND 27 OHIO

RUSSELL REINFORCED PLASTICS CORP  
521 W HOFFMAN AVE LINDENHURST LI N Y

RUST INDUSTRIAL CO  
130 SILVER ST WANCHESTER N H

RUTHERFORD ELECTRONICS CO  
8948 LINDBLADE ST CULVER CITY CALIF

R W ELECTRONICS  
2430 S MICHIGAN AVE CHICAGO ILL

RYAN AERONAUTICAL CO  
2750 LOMITA BLVD TORRANCE CALIF

RYAN AERONAUTICAL CO ELECTRONICS DIV  
2701 HARBOR DR SAN DIEGO 12 CALIF

RYAN AERONAUTICAL CO ENGG DIV  
LINDBERGH FIELD SAN DIEGO 12 CALIF

RYAN CO S C  
1316 YALE PLACE MINNEAPOLIS 3 MINN

RYE SOUND CORP  
145 ELM ST MAHARONECK N Y

RYLSON & SON JOSEPH T  
16 B ROCKWELL STS CHICAGO 8 ILL

RYPINSKI CO C A  
2005 N FAIR OAKS AVE PASADENA CALIF

RYTRON CO INC  
7303 LANKESSHIN BLVD N HOLLYWOOD CALIF

## S

S & A ELECTRONICS  
1025 NEVADA ST TOLEDO 5 OHIO

SABA & CO  
6962 W NORTH AVE CHICAGO 39 ILL

SAEBERTOWN COMPONENTS INC  
SAEBERTOWN PA

SAFE FLIGHT INST CORP  
B WATER ST WHITE PLAINS N Y

SAFE LIGHTING INC  
527 LEXINGTON AVE NEW YORK 17 N Y

SAFETEE GLASS CO  
4717 STENTON AVE PHILA 48 PENNA

SAFETY ELECTR EQUIP  
1187 DIXIE BL AVE NEW HAVEN 18 CONN

SAFETY INDUSTRIES INC  
P O BOX 904 NEW HAVEN 8 CONN

SAFEMAY HEAT ELEMENTS INC  
680 MIDDLEFIELD ST MIDDELTOWN CONN

SAG HARBOR INDUSTRIES  
BOX N SAG HARBOR N Y

SAGE CRAFT INC  
NORWICH N Y

SAGE ELECTRONICS CORP  
P O BOX 126 ROCHESTER 10 N Y

SAGE LABS  
E NATICK INDUSTRIAL PARK NATICK MASS

SAGE LABS INC  
159 LINDEN ST BELLESEY 81 MASS

SAGINAW STEERING GEAR DIV GMC  
3900 MOLLAND SAGINAW MICH

SAINTE EQUIPMENT LAB HARRY T  
RT 2 BOX 407 E MAIN AVE MORGAN HILL CALIF

SAMPLES MACHINE CO A M  
208 TAZEWELL PIKE KNOXVILLE 18 TENN

SANPSON CHEMICAL B PIGMENT CORP  
2830 B LAKE ST CHICAGO 12 ILL

SAN DIEGO SCIENTIFIC CORP  
3434 MIDWAY DR SAN DIEGO 10 CALIF

SAN FERNANDO ELECTRIC MFG CO  
1509 I ST SAN FERNANDO CALIF

SANBORN CO  
175 WYMAN ST BALTIM 54 MASS

SANDEL & ASSOC GED B  
BOSTON MASS

SANDERS ASSOCIATES  
93 CANAL ST NASHUA N H

SANDIA CORP  
SANDIA BASE ALBUQUERQUE N M

SANFORD MILLER CO  
11 LYNCH ST BROOKLYN 11 N Y

SANGAMO ELECTRIC  
MARION ILL

SANGAMO ELECTRIC CO  
PICKENS DIV PICKENS S C

SANGAMO ELECTRIC CO  
1207 N 11TH ST SPRINGFIELD ILL

SANNEBORN SONS L BLDG PRODS DIV  
408 4 AVE NEW YORK 1 N Y

SANTA ANITA ENGG CO OF CALIF  
2451 E COLORADO ST PASADENA CALIF

SANTA BARBARA DIV CURTISS BRIGHT  
P O BOX 689 SANTA BARBARA CALIF

SARASOTA ENGR CO INC  
P O BOX 1329 SARASOTA FLA

SARATOGA INDUSTRIES  
CONGRESS & BALLSTON AVES SARATOGA SPRINGS  
N Y

SARATOGA PLASTICS INC  
N WALPOLE NH

SARATOGA SEMICONDUCTOR DIV  
SARATOGA SPRINGS N Y

SARGO CO INC ELEC DEPT  
635 MADISON AVE NEW YORK 22 N Y

SARGEANT & WILBUR MEAT TREATING CORP  
170 YORK AVE PABTUCKET R I

SARGENT ELECTRIC CORP  
630 HERRICK RD LYNNBROOK N Y

SARGENT-RAYMENT CO  
4926 E 12 ST OAKLAND 1 CALIF

SARKES TARZIAN INC  
EAST HILLSIDE DR BLOOMINGTON IND

SARTRON INC  
118 NO MAIN ST NEWBERG ORE

SATELLITE-KENNEDY INC OF CALIF  
P O BOX 1711 MONTEREY CALIF

SATULLO CO  
4512 N WOODWARD ROYAL OAK MICH

SAUERISEN CEMENTS CO  
1045 N CANAL ST PITTSBURGH 15 PA

SAVOY ELECTRONICS  
FT LAUDERDALE FLA

SAVIER RESEARCH PRODUCTS  
3540G LAKELAND BLVD EASTLAKE OHIO

SAXONBURG CERAMICS INC  
BOX 157 SANDHURST PENNA

SARXON PRODUCTS INC  
4320 PARK AVE NEW YORK 57 N Y

SCALCO CONTROL S INC  
P O BOX 41 COOPER ST DELANCO N J

SCALA RADIO CO  
2814 19 ST SAN FRANCISCO 10 CALIF

SCAN INSTRUMENT CORP  
1811 IRVING PARK RD CHICAGO 13 ILL

SCANTLIN ELECTRONICS INC  
2115 COLBY AVE LOS ANGELES 64 CALIF

SCATTER-COMMUNICATIONS INC  
4923 ST ELMO AVE BETHESDA 14 MD

SCHAEVITZ ENGG  
U S RTE 130 & SCHAEVITZ BLVD CAMDEN N J

SCHAFFER CUSTOM ENGG  
235 S 3 ST BURBANK CALIF

SCHAFFER AIR INDUSTRIES  
290 N HENRY ST BROOKLYN 22 N Y

SCHAUER MFG CORP  
4501 ALPINE AVE CINCINNATI OHIO

SCHENECTADY VARNISH CANADA LTD  
409 CONSTOCK RD SCARBOROUGH ONT CANADA

SCHENECTADY VARNISH CO INC  
CONGRESS ST & 9 AVE SCHENECTADY 3 NY

SCHERMA MFG CO F A  
424 BROOME ST NEW YORK 13 N Y

SCHERR CO HEARGE  
200 LAFAYETTE ST NEW YORK 12 N Y

SCHINDLERS  
2429 BEVERLY AVE SANTA MONICA CALIF

SCHIRMER NATIONAL ALARM CO  
20 WESTSIDE AVE BERGENFIELD N J

SCHJEDDAHL CO G T  
BOX 170 NORTHFIELD MINN

SCHLUMBERGER RIDGEFIELD INSTRUMENTS  
RIDGEFIELD CONN

SCHLUMBERGER WELL SURVEY CORP  
BOX 550 RIDGEFIELD CONN

SCHLUMBERGER WELL SURVEYING  
5000 FREEWAY HOUSTON 25 TEXAS

SCHNELLEN ELECTRONICS DIV RARITAN INDUSTRIES  
CORP 20 1ST ST KEYPORT N J

SCHMIT ENGINEERING  
4062 FABIAN WAY PALO ALTO CALIF

SCHUBER OREGAN CORP  
2248B BROADWAY N Y 24 N Y

SCHOENE ELECTRONICS LAB  
1410 S GRAND AVE EVANSVILLE 13 IND

SCHONSTEDT ENGRG CO  
1227 PERSHING DR SILVER SPRING MD

SCHROCK ELECTRICAL SALES CORP  
1100 MADISON AVE NEW YORK 28 N Y

SCHULMERIC ELECTRONICS INC  
KILLBUCK HILL SELLERSVILLE PA

SCHUTTER MICROBAVE CORP  
80 E MONTAUX HWY LINDENHURST LI N Y

SCHUYLER MFG CORP  
84 PORETE AVE N ARLINGTON N J

SCHWEBER ELECTRONICS  
60 HERRICKS RD MINOLA N Y

SCHWEITZER INC PETER J  
LEE MASS

SCIARY BROS  
4915 W 67 ST CHICAGO 38 ILL

SCIENCE-ELECTRONICS INC  
195 MASSACHUSETTS AVE CAMBRIDGE MASS

SCIENTIFIC COIL CO  
9619 BROADWAY CHICAGO 80 ILL

SCIENTIFIC COMPONENTS INC  
30 S SALSTPUEDES ST SANTA BARBARA CALIF

SCIENTIFIC ELECTRONIC LABS INC  
866 BERGEN ST NEWARK N J

SCIENTIFIC ENGG LAB  
1510 SIXTH STREET BERKELEY 10 CALIF

SCIENTIFIC GLASS APPARATUS CO  
100 LANEBROO TERRACE BLOOMFIELD N J

SCIENTIFIC RADIO PRODS INC  
2303 W 8TH ST LOVELAND COLORADO

SCIENTIFIC RADIO SERVICE  
4301 SHERIDAN ST UNIVERSITY PARK  
MYRTSVILLE MD

SCIENTIFIC 8000 CABINET CO  
32-34 NEWARK ST NEWARK 3 N J

SCIENTIFIC-ATLANTIC INC  
2162 PIEDMONT RD NE ATLANTA 9 GA

SCINTILLONICS INC  
P O BOX 701 FORT COLLINS COLO

SCOPE INC  
FAIRFAX VA

# ELECTRONIC MANUFACTURERS-A-Z

SCOPES CO INC  
P O BOX 96 NORSEY N Y

SCOTT, INC M M  
111 ROBER WILL RD RAYBARD MASS

SCOTT INSTRUMENT LAB  
17 EAST 48TH ST NEW YORK 17 N Y

SCOTT RECORDING LAB  
MUNICIPAL AIRPORT TUSCALOOSA ALA

SCOVILL MFG CO  
99 HILL ST WATERBURY 20 CONN

SCRIBBLES LOYD CO  
P O DRAWER 232 PESTUS MO

SCULLY ANTHONY CORP  
4707 WILLOW SPRINGS RD LA GRANGE ILL

SEABOARD ELECTRIC PRODUCTS CORP  
417 CANAL ST NEW YORK 13 N Y

SEABOARD PACIFIC DIV ASSOC SPRING  
15001 S BROADWAY PO BX 231 GARDENA CALIF

SEACASTER PRODUCTS CO  
P O BOX 1288 WILLIAMSTOWN MASS

SEAGER STANDARD CARBON CO  
291 CHURCH ST NEW YORK 13 N Y

SEAL PEEL INC  
775 STEPHENSON HWY ROYAL OAK MICH

SEALTECH SWITCH & RELAY CORP  
6025 N KOSTER AVE CHICAGO 30 ILLINOIS

SEALTECH CORP  
610 FAYETTE AVE HAMARONCK N Y

SEALOL INC  
BARWICK INDUSTRIAL PARK PROVIDENCE 5 RI

SEALOMATIC ELECT  
429 KENT AVE BROOKLYN 11 N Y

SEALTRON CORP  
READING RD AT AMITY CINCINNATI 13 OHIO

SEARLESS RUBBER CO  
253 MALLOCK AVE NEW HAVEN 3 CONN

SEAVIE ELECT CO  
806 MAIN ST AVON N J

SECO MFG CO  
5015 PEAN AVE S MINNEAPOLIS 19 MINN

SECOE CORP  
555 MINNESOTA ST SAN FRANCISCO 7 CALIF

SECON METALS CORP  
7 INTERVALE ST WHITE PLAINS N Y

SECURITY CONTROLS INC  
503 FRANKLIN ST BUFFALO 2 N Y

SECURITY DEVICES LAB  
ROCHESTER N Y

SEZBURG CORP  
1500 N DAYTON ST CHICAGO 22 ILL

SEELEY ELECTRONICS  
1000 S LABREA AVE LOS ANGELES 19 CALIF

SEELY INSTRUMENT CO INC  
377 4TH ST P O BOX 387 NIAGARA FALLS N Y

SEGAL EDWARD  
132 LAFAYETTE ST NEW YORK 13 N Y

SEIDONICS CO  
5013 TYRONE RD PORT WAYNE IND

SEISCOR MFG DIV SEISMOGRAPH SERVICE CORP  
P O BOX 1590 TULSA OKLA

SEIKONIC INC  
130 B 82ND ST NEW YORK 36 N Y

SEL REX CORP  
75 RIVER RD NUTLEY N J

SELAS CORP OF AMERICA  
DRESHER PENNA

SELAS CORP OF AMERICA  
DRESHER PENNA

SELECTONS LTD  
520 5TH AVE NEW YORK 36 N Y

SELF LIFTING PIANO TRUCK CO  
423 N MAIN ST FINDLAY OHIO

SEMCO ENGRG & MFG CO  
8409 S MOOVER ST LOS ANGELES CALIF

SEMICON  
262 E 16 ST PATERSON 4 N J

SEMICOR  
3536 W OSBORN RD PHOENIX ARIZ

SEMI-ELEMENTS INC  
SAXONBURG BLVD SAXONBURG PENNA

SEMICON ASSOCIATES INC  
P O BOX 832 LEXINGTON KY

SEMICOM INC  
SWEETWATER RD P O BOX 328 BEDFORD MASS

SEMICON OF CALIF INC  
70 MARIPOSA AVE WATSONVILLE CALIF

SEMICONDUCTOR SPECIALTY INC  
5706 N NORTH AVE CHICAGO ILL

SEMINALS INC  
133-25 91ST AVE RICHMOND HILL 18 N Y

SENNOR PRODUCTS CO  
4317 N RAVENSBORO AVE CHICAGO 13 ILL

SENECA FALLS MACHINE CO  
314 FALL ST SENECA FALLS N Y

SENER ELECTRONICS CO  
923 WEST END AVE NEW YORK 25 N Y

SENSITIVE RESEARCH INSTRUMENT CORP  
310 MAIN ST NEW ROCHELLE N Y

SENSORY INC  
10 NEW ST MORRISTOWN N J

SENTINEL ALARM CORP  
10TH & VINE STS PHILA 7 PA

SEQUOIA WIRE  
2201 B&H RD REDWOOD CITY CALIF

SEQUOIA WIRE & CABLE CO  
BOX 1007 REDWOOD CITY CALIF

SEQUOIA WIRE & CABLE CO  
1630 EUCLID AVE SANTA MONICA CALIF

SERDEX INC  
12 BORDOIN ST BOSTON MASS

SERVICE INSTRUMENTS CORP  
426 S WESTGATE DR ADDISON ILL

SERVICE PARTS SYSTEMS  
13380 E 9 MILE RD E DETROIT MICH

SERVO CONSULTANTS LTD  
80 SHORE RD PORT WASHINGTON N Y

SERVO CONTROL DIV OILGEAR CO  
160 BEAR HILL RD WALTHAM 94 MASS

SERVO CORP OF AMERICA  
111 NEW SOUTH RD HICKSVILLE N Y

SERVO CORP OF AMERICA  
2020 JERICHO TPKE NEW HYDE PK L I N Y

SERVO DEVELOPMENT CORP  
947 MAIN ST WESTBURY L I N Y

SERVO DYNAMICS CORP  
MAIN ST SOWERSBORTH N H

SERVO SYSTEMS CO  
14 CARMER AVE BELLEVILLE N J

SERVO-TEK OF CALIF  
14736 ARRINTA ST VAN NUYS CALIF

SERVO-TEK PRODUCTS CO  
1084 GOFFLE RD HARTHORNE N J

SERVO-MECHANISM INC  
234 ORTEGA RIDGE RD SANTA BARBARA CALIF

SERVO-MECHANISMS  
1200 PROSPECT AVE WESTBURY N Y

SERVO-MECHANISMS CANADA LTD  
123 REDALE BLVD REDALE TORONTO ONT CAN

SERVO-MECHANISMS INC  
BLDG 114 SANTA BARBARA GOLETA CALIF

SERVO-MECHANISMS INC  
200 AVIATION BLVD EL SEGUNDO CALIF

SERVO-MECHANISMS INC LOS ANGELES DIV  
12500 AVIATION BLVD HARTHORNE CALIF

SERVONIC INSTRUMENTS INC  
640 TERMINAL BAY COSTA MESA CALIF

SERVONICS INC  
822 N MERRY ST ALEXANDRIA VA

SERVWELL PRODUCTS CO  
6541 EUCLID AVE CLEVELAND 3 OHIO

S E S ASSOCIATES INC  
154-70 -71ST AVE FLUSHING L I 67 N Y

SESCO INC  
47 NICHOLS AVE FRIDAY HARBOR WASH

SESSIONS CLOCK CO  
61 E MAIN ST FORESTVILLE CONN

SET SCREW & MFG CO  
BARTELL ILL

SETCHELL-CARLSON INC  
165 BRIGTON ST PAUL 12 MINN

SETH THOMAS CLOCKS  
SOUTH MAIN ST THORASTON CONN

SETHCO MFG CO  
2284 BABYLON TPKE MERRICK N Y

SEYMOUR MFG CO  
200 FRANKLIN ST SEYMOUR CONN

SFD LABS INC  
800 PARKWAY AVE UNION N J

SHAKEPROOF DIV ILLINOIS TOOL WORKS  
57 CHARLES RD ELGIN ILL

SMALLCROSS MFG CO  
PRESTON ST SELMA NC

SHALLITE INC  
128 W FIRST AVE ROSELLE N J

SHARMAN & CO  
MEYER RD PT WAYNE 8 IND

SHARMAN & CO W S  
11617 W JEFFERSON BLVD CULVER CITY CALIF

SHARD & JURS CO  
2600 8TH ST BERKELEY 10 CALIF

SHANNON LUMINOUS MATERIALS CO  
7356 SANTA MONICA BLVD HOLLYWOOD 46 CALIF

SHAPIRO & EOBARD  
1130 MISSION ST PASADENA CALIF

SHAW INSULATOR CO  
201 1ST ST STROUDSBURG PENNA

SHAWBUT ENGRG CO  
195 PREPOST ST BOSTON 22 MASS

SHEFFCO MFG CORP  
FAIRVIEW N J

SHEFFIELD CORP SUB BENOIX CORP  
BOX 893 DAYTON 1 OHIO

SHELL CHEMICAL CORP  
50 W 50TH ST - RM 4410B NEW YORK N Y

SHELL COMMUNICATION INC  
P O BOX 2099 2219 SHELL BLDG HOUSTON 17 TEXAS

SHELL DEVELOPMENT CO  
3737 BELLAIRE BLVD HOUSTON 25 TEXAS

SHELL ELECTRONIC MFG CORP  
112 STATE ST WESTBURY N Y

SHELTERED WORKSHOPS  
2521 5TH ST SANTA MONICA CALIF

SHEPARD INC  
103 PARK AVE NUTLEY N J

SHEPARD INSTRUMENT DIV SAVABE INDUSTRIES INC  
3131 N 29TH AVE PHOENIX ARIZ

SHEPARD LABS INC  
BROAD ST AT PARK AVE SUMMIT N J

SHEPPARD CO B H  
101 PHILADELPHIA ST HANOVER PA

SHERIDAN-GRAY INC  
24701 CRENSHAW BLVD TORRANCE CALIF

SHERMAN INDUSTRIAL ELECTRONICS  
108 N GILL ST STATE COLLEGE PA

SHERMAN MFG CO B H  
22 BARNEY ST BATTLE CREEK MICH

SHEROLD CRYSTALS INC  
1910-12 MCGEE TROFFICWAY KANSAS CITY 8 MO

SHERWOOD ELECTRONIC LABS INC  
4300 N CALIFORNIA AVE CHICAGO 18 ILL

SHIELDALLOY CORP  
NEWFIELD N J

SHIELDING INC  
N READ AVE RIVERTON N J

SHIPLEY CO INC  
WALNUT ST WELLESLEY 81 MASS

SHOCKLEY TRANSISTOR CORP  
1117 CALIFORNIA AVE PALO ALTO CALIF

SHORT BROS & HARLAND LTD  
CASTLENEIGH BELFAST NORTHERN IRELAND

SHRADER CO F  
11623 S BROADWAY LOS ANGELES 61 CALIF

SHRADER SOUND INC  
2003 M ST N W WASHINGTON 7 D C

SHUR-LOK CORP  
879 S EAST ST PO BOX 963 ANAHEIM CALIF

SHURCLOSE SEAL CO  
17411 E BARRON AVE DETROIT 24 MICH

SHURE BROS  
222 HARTREY AVE EVANSTON ILL

SHURMIT PRODUCTS INC  
845 S MARKET ST BAUKEGAN ILL

SHURITE METERS  
130 WALLACE ST NEW HAVEN 8 CONN

SHURON OPTICAL CO INC  
LYCEUM ST GENEVA N Y

SIBLEY CO  
BRIDGE ST HADDAM CONN

SICKLES F B DIV GIC  
165 FRONT ST CHICOPEE MASS

SIEGLER CORP  
610 30 HARVARD BLVD LOS ANGELES 5 CALIF

SIER BATH BEAT & PUMP CO INC  
9252 HUDSON BLVD NORTH BERGEN N J

SIERRA ELECTRONIC CORP  
3885 BOHANNON DR HEALD PARK CALIF

SIERRA ELECTRONIC CORP  
250 E 3RD ST MOUNT VERNON N Y

SIERRA RESEARCH CORP  
P O BOX 22 BUFFALO 25 N Y

SIFCO METACHEMICALS INC  
935 E 67 ST CLEVELAND OHIO

SIGHTMASTER CORP  
50 ALEPPO ST PROVIDENCE R I

SIGHTMASTER CORP  
111 CEDAR ST NEW ROCHELLE N Y

SIGNA ELECTRONICS  
15735 ARBAUM BLVD SEATTLE 66 WASH

SIGNA INSTRUMENTS INC  
170 PEARL ST S BRAintree MASS

SIGNAL BROS MFG CO  
273 BRANCHPORT AVE LONG BRANCH N J

SIGNAL EQUIP CO INC  
2706 THIRD AVE SEATTLE 1 WASH

SIGNAL TRANSFORMER CO  
1651 McDONALD AVE BROOKLYN N Y

SIGNALITE INC  
37 NEPTUNE HWY NEPTUNE N J

SIKORSKY AIRCRAFT  
STRATFORD CONN

SILICON CRYSTALS INC  
PT OF MADISON ST WILMINGTON 99 DELA

SILICON TRANSISTOR CORP  
150 GLEN COVE RD CARLE PLACE LI N Y

SILICONE INSULATION INC  
SEABURY AVE & BUTLER PL BRONX 61 N Y

SILICONE SEALS INC  
3694 MILWAUKEE AVE CHICAGO 41 ILL

SILTRONIC CO  
231 SAW HILL RUN BLVD PITTSBURGH 10 PA

SILVER HAT EQUIP CO  
MARINE ELECTR DIV STEHEKIN WASH

SIMMONDS AEROCOSSARIES INC  
VERGINES VT

SIMMONDS AEROCOSSARIES INC  
1515 S GARDEMA AVE BLENDALE CALIF

SIMMONDS AEROCOSSARIES INC  
105 WHITE PLAINS RD TARRYTOWN N Y

SIMMONS FASTENER CORP  
N BROADWAY ALBANY 1 N Y

SIMMONS SAW & STEEL CO  
470 MAIN ST FITCHBURG MASS

SIMPLATROL PRODUCTS CORP  
24 SALISBURY ST WORCESTER MASS

SIMPLEX EQUIPMENT CORP  
55 LA FRANCE AVE BLOOMFIELD N J

SIMPLEX VALVE & METER CO  
7 E ORANGE ST LANCASTER PA

SIMPSON ELECTRIC CO  
BOX 249 LAC DU FLAMBEAU WISC

SIMPSON ELECTRIC CO  
5200 W KINZIE ST CHICAGO 94 ILL

SIMPSON ELECTRIC CO  
MERCER WISC

SIMPSON INST SLS INC PANEL METERS TEST EQUIP  
130 CUTLER HILL RD GREAT NECK L I N Y

SIMPSON MFG CO MARK  
32-28 49 ST LONG ISLAND CITY 3 N Y

SIMPSON OPTICAL MFG CO  
3200 W CARROLL AVE CHICAGO 24 ILL

SINCLAIR MFG CO  
S WORCESTER ST CHARTLEY MASS

SINCLAIR RADIO LABS  
BUFFALO N Y

SINGER-BRIDGEPORT MILITARY DIV  
915 PENBROKE ST BRIDGEPORT 8 CONN

SIPPICAN CORP  
P O BOX 437 MATTAPoisETT MASS

SITTLER CORP  
18 N ADA ST CHICAGO 7 ILL

SIVERS LAB  
KRISTALLVAGEN 10 HAGERSTEN SWEDEN

SIZE CONTROL CO DIV AMERICAN B&B & MACHINE  
CO 2500 W WASHINGTON BLVD CHICAGO 12 ILL

SKF INDUSTRIES INC  
FRONT ST & ERIE AVE PHILADELPHIA 32 PA

S K F INDUSTRIES INC  
TULIP & KENNEDY STS PHILA PA

SKOTTE ELECTRONICS INC  
20A BRIDGE ST PECKVILLE PA

SKY DATA ELECTRONICS  
OAKLAND A/P OAKLAND 14 CALIF

SKIATRON ELECTRONICS & TV CORP  
180 VARICK ST NEW YORK 14 N Y

SKIDMORE-WILHELM MFG CO  
442 GREEN RD CLEVELAND 21 OHIO

SKIL CORP  
5033 ELSTON AVE CHICAGO 30 ILL

# ELECTRONIC MANUFACTURERS-A-Z

SKY-BORNE ELECTRONICS  
13013 LOS METOS RD SANTA FE SPRINGS CALIF  
SKYDINE INC  
RIVER RD PORT JERVIS N Y  
SKYLINE ELECTRONICS  
1828 S BANNOCK ST DENVER COLOR  
SKYSLEEPER INC  
P O BOX 92 WICHENRY ILL  
SJOBERG C & SON  
415 STATION ST CRAWSTON 10 R I  
SLATER ELECTRIC CO  
45 SEA CLIFF AVE GLEN COVE N Y  
SLAUGHTER CO  
YOUNG AND COLLEGE STS PLOUA 9 OHIO  
SLEPIAN A CO AIRMAIL  
2 BURROUGHS ST BRIDGEPORT CONN  
SLIP RING CO OF AMERICA  
3612 W JEFFERSON BLVD LOS ANGELES 16 CALIF  
SLOAN CO  
4029 BURBANK BLVD BURBANK CALIF  
SMALL MOTORS INC  
2076 ELSTON AVE CHICAGO 14 ILL  
SMALLWOOD & SON MACHINE  
P O BOX 9365 DALLAS TEXAS  
SMALLWOOD LTD S G  
391-399 KING ST E RITCHENER ONTARIO CANADA  
SMITH & FLORENCE INC  
4228 23RD AVE W SEATTLE 98 WASH  
SMITH CORP & B  
531 N W 57TH ST CIPPI CITY OHIO  
SMITH INC MERRIMAN M  
2326 NOSTRAND AVE BROOKLYN 10 N Y  
SMITH-CORDINA MARCHANT  
472 PARK AVF HIGHLAND PARK ILL  
SMITH-CORDINA MARCHANT INC MARCHANT  
CALCULATORS DIV 6701 SAN PABLO AVE OAKLAND  
W CALIF  
E C SMITH MFG CO INC  
FOREST & HECTOR STS CONSHOHOCKEN PA  
SMITH-MEYER ENGG CO  
157 CHAMBERS ST NEW YORK 7 N Y  
SMOOTH-ON MFG CO  
872 COMMUNIPAD AVE JERSEY CITY 4 N J  
SNAP TILE INC  
201 TITUSVILLE RD UNION CITY PENNA  
SNAP-ON TOOLS EBRP  
KENOSHA WISC  
SNC MFG CO  
P O BOX 277 OSHKOSH WISC  
SNYDER MFG CO  
22 & ONTARIO STS PHILADELPHIA 40 PA  
SOEHLBERG MFG CO  
628 S PALM AVE ALHAMBRA CALIF  
SOLA ELECTRIC CO  
4633 W 16 ST CHICAGO 90 ILL  
SOLAR AIRCRAFT CO  
2200 PACIFIC HWY SAN DIEGO 12 CALIF  
SOLAR MFG CORP  
4553 SEVILLE AVE LOS ANGELES 98 CALIF  
SOLARTRON ELECTRONIC GROUP LTD  
DIPFINS RD THAMES DITTON SURREY ENGLAND  
SOLARTRON INC  
1742 ZEYN ST ANAHEIM CALIF  
SOLID STATE ELECTRONICS CO  
8158 ORION AVE VAN NUYS CALIF  
SOLID STATE ELECTRONICS CO  
15321 RAYEN ST VAN NUYS CALIF  
SOLID STATE PRODUCTS INC  
1 PINGREE ST SALEM MASS  
SOLIUM DEVELOPMENT INC  
67 S LEXINGTON AVE WHITE PLAINS N Y  
SOLRAC INC  
11760 VOSE ST NORTH HOLLYWOOD CALIF  
SOLTRONICS INC  
14712 RAYMER ST VAN NUYS CALIF  
SOLMERS BASS CO  
94 BALDWIN AVE WATERBURY CONN  
SONAR RADIO CORP  
3050 E 21 ST BROOKLYN 24 N Y  
SOMEX INC  
185 W SCHOOLHOUSE LANE PHILA 40 PA  
SOMEX INC  
73 SOUTH STATE RD UPPER MERY PA  
SONI-LABS INC  
349 SALEM ST NEW MILFORD N J  
SONI-LABS INC  
P J BOX 69 BURNHOUT N J  
SONIL INDUSTRIES  
19 WILBUR ST LYMBROOK N Y  
SONIC RECORDING PRODUCTS  
58 HILL RD FRELPORT N Y  
SONIC RECORDING STUDIOS  
1370 HILBERRY HT CLEMENS MICH  
SONOTONE CORP  
P O BOX 208-SAN HILL RIVER RD ELMSTON N Y  
SONY CORP  
514 BROADWAY NEW YORK N Y  
SORENSEN & CO  
RICHARDS AVE NORWALK CONN  
SORENSEN & CO INC  
333 E 103 ST NEW YORK 20 N Y  
SORENSEN INDUSTRIAL ELECTRONIC CO  
ROUTE 10 DOVER N J  
SOROBAN ENGG INC  
P J BOX 1719 MELBOURNE FLA  
SORVALL INC IVAN  
P O BOX 236 NORWALK CONN  
S O S CINDA SUPPLY CORP  
402 B 52 ST NEW YORK 19 N Y  
SOUND APPARATUS CO  
STIRLING N J  
SOUND PRODUCTS  
181 BEACON ST SAN FRANCISCO CALIF  
SOUND RECORDING SPECIALISTS  
132 MATTHEW ST FARMINGDALE L I N Y  
SOUND SCREEN SUPPLIERS INC  
752 BROADWAY NEW YORK 3 N Y

SOUND-BY-SCRIBER  
P O BOX 2247 LONG BEACH 1 CALIF  
SOUNDOLIER INC  
PO BOX 3848 ST LOUIS 22 MO  
SOUNDScriber CORP  
6 MIDDLETOWN AVE NEW HAVEN CONN  
SOUTH BEND LAYNE BORAS  
425 E HANSON ST SOUTH BEND 22 IND  
SOUTH HAVEN COIL & IRRINGHAM ALA  
264 BROADWAY SOUTH HAVEN 31 MICH  
SOUTH RIVER METAL PRODUCTS CO  
377 TURNPIKE SOUTH RIVER N J  
SOUTHCO DIV SOUTH CHESTER CORP  
LESTER PA  
SOUTHERN CALIFORNIA AIRCRAFT  
INTL A/P ONTARIO CALIF  
SOUTHERN ELECTRONICS CORP  
150 W CYPRESS AVE BURBANK CALIF  
SOUTHERN INSTRUMENTS COMPUTER DIV  
FRIMLEY RD CAMBERLEY SURREY ENGLAND  
SOUTHERN PLASTICS CO  
408 PENOLETON ST COLUMBIA S C  
SOUTHERN RESEARCH INSTITUTE  
2000 9TH AVE S BIRMINGHAM ALA  
SOUTHERN SCREW CO  
P O BOX 1360 E I D STATESVILLE N C  
SOUTHWEST PRODUCTS INC  
ALAMO DOWNS AT SAN ANTONIO TEXAS  
SOUTHWESTERN INDUSTRIAL ELECTRONICS CO  
10201 WEST HEISTER RD P O BOX 22187 HOUSTON  
TX TEXAS  
SPACE ELECTRONICS CORP  
930 AIRWAY GLENDALE CALIF  
SPACE ELECTRONICS LAB  
BOX 447 LYMBROOK L I N Y  
SPACE RECOVERY SYSTEMS INC  
140 OREGON EL SEQUOIA CALIF  
SPACE TECHNOLOGY LAB  
RN 2253-BLDG B P O BOX 95001 LOS ANGELES  
95 CALIF  
SPARKLING METER CO INC  
225 N TEMPLE CITY BLVD EL MONTE CALIF  
SPARTA MFG CO  
DOVER OHIO  
SPARTON CORP  
JACKSON MICH  
SPARTON ELECTRONICS DIV  
2400 E DANSON ST JACKSON MICH  
SPAULDING FIBRE CO  
310 WHEELER ST TONABANDA N Y  
SPAULDING FIBRE CO  
N ROCHESTER N H  
SPAULDING FIBRE CO INC  
1325 SAN JULIAN ST LOS ANGELES 15 CALIF  
SPAULDING PLASTICS  
310 WHEELER AVE TONABANDA N Y  
SPAULDING PRODUCTS CO  
550 B BARNER ST FRANKFORD IND  
SPEC ELECTRONICS INC  
P O BOX 468 ASBURY PARK N J  
SPECIAL CHEMICALS CORP  
100 S WATER ST OSSINGING N Y  
SPECIAL INSTRUMENTS LABORATORY INC  
312 W VINE AVE MOXVILLE 2 TENN  
SPECIALTIPS INC  
SKUNKS MISERY RD SYOSSET LI N Y  
SPECIALTIES INC  
CHARLOTTESVILLE VA  
SPECIALTY AUTOMATIC MACHINE CORP  
80 CAMBRIDGE ST BURLINGTON MASS  
SPECIALTY ELECTRONICS DEVELOPMENT CORP  
115 ELLEN BAY SYOSSET N Y  
SPECIALTY ENGRG & ELECTRONIC  
79 CLIFTON PL BROOKLYN 38 N Y  
SPECIFIC ELECTRONICS  
1995 N FAIR OAKS AVE PASADENA CALIF  
SPECIFIC PRODUCTS CO  
21091 COSTA MOUNTAIN HILLS CALIF  
SPECTRA ELECTRONICS CORP  
250 E THIRD ST MOUNT VERNON N Y  
SPECTRA-STRIP WIRE & CABLE CORP  
10052 LARSON AVE GARDEN GROVE CALIF  
SPECTRACOAT INC  
308 HARBOR BLVD BELMONT 4 CALIF  
SPECTRALAB INST CO  
608 FIG AVE MONROVIA CALIF  
SPECTROL ELECTRONICS CORP  
1708 S DEL MAR AVE SAN GABRIEL CALIF  
SPECTROL ELECTRONICS CORP  
1250 SHAMES DR WESTBURY LI N Y  
SPECTRUM INSTRUMENTS INC  
BOX 61 STEINWAY STATION LONG ISLAND CITY  
N Y  
SPEEDWAY MFG CO THOR POWER TOOL CO  
1421 BARNSDALE RD LA GRANGE PARK ILL  
SPEER CARBON CO  
JEFFERS ELECTRONICS DIV DU BOIS PA  
SPEER CARBON CO  
ST MARYS PA  
SPEER RESISTOR DIV SPEER CARBON CO  
BRADFORD PA  
SPEIDEL CORP INDUSTRIAL DIV  
89 SHIP ST PROVIDENCE R I  
SPELLMAN HIGH VOLTAGE CO  
3029 DEWATER AVE BRONX 67 N Y  
SPENCER-KENNEDY LABS INC  
1320 SOLDIERS FIELD RD BOSTON 39 MASS  
SPERRY ELECTRONIC TUBE DIV SPERRY RAND CORP  
GAINESVILLE FLA  
SPERRY FARRAGUT CO DIV SPERRY RAND CORP  
FARRAGUT RD BRISTOL TENN  
SPERRY GYROSCOPE CO  
36 LEBKAMP AVE HUNTINGTON N Y  
SPERRY GYROSCOPE CO  
P O BOX 1447-NARCH AFB RIVERSIDE CALIF  
SPERRY GYROSCOPE CO  
A1R ARM DIV GREAT NECK N Y

SPERRY GYROSCOPE CO  
ELECTRONIC TUBE DIV GREAT NECK NY  
SPERRY GYROSCOPE CO  
272 LINDBERG ST WEST MEMPHIST L I M Y  
SPERRY GYROSCOPE CO DIV SPERRY RAND CORP  
GREAT NECK N Y  
SPERRY GYROSCOPE CO MARINE DIV  
ROOSEVELT FIELD MINNEOLA N Y  
SPERRY GYROSCOPE CO SUNNYVALE DEV CENTER  
294 COMMERCIAL ST SUNNYVALE CALIF  
SPERRY MICROWAVE  
NEW YORK N Y  
SPERRY MICROWAVE ELECTRONICS CO  
PO BOX 1828 CLEARWATER FLA  
SPERRY PHOENIX  
PHOENIX ARIZ  
SPERRY PIEDMONT CO DIV SPERRY RAND CORP  
CHARLOTTESVILLE VA  
SPERRY PRODUCTS CO DIV MORE SOUND CO  
SHELTER ROCK RD DANBURY CONN  
SPERRY RAND CORP FORD INSTRUMENT CO  
157 HATHORNE AVE YONKERS 2 N Y  
SPERRY RAND CORP FORD INSTRUMENT DIV  
86-02 208TH ST QUEENS VILLAGE N Y  
SPERRY RAND CORP MICROWAVE ELECTRONICS DIV  
PO BOX 1828 OLDSTAR FLA  
SPERRY RAND CORP REYNOLDS RAND UNIVAC  
2730 W 7TH ST ST PAUL 16 MINN  
SPERRY RAND CORP REYNOLDS RAND UNIVAC  
315 4TH AVE NEW YORK 10 N Y  
SPERRY RAND CORP REYNOLDS RAND UNIVAC  
2300 W ALLEGHENY AVE PHILA 29 PA  
SPERRY RAND CORP REYNOLDS RAND UNIVAC  
6218 37TH AVE REDUENNA WIS  
SPERRY RAND CORP REYNOLDS RAND UNIVAC  
311 TURNER ST UTICA N Y  
SPERRY RAND CORP SPERRY GYROSCOPE CO  
BOX 218 RONKONOMA L I N Y  
SPERRY RAND CORP SPERRY GYROSCOPE CO  
701 E HAMBIR DRIVE SAN DIEGO CALIF  
SPERRY RAND CORP SPERRY GYROSCOPE DIV  
715 FOLSOM ST SAN FRANCISCO 7 CALIF  
SPERRY RAND CORP SPERRY PHOENIX CO  
2111 NORTH 10TH AVE PHOENIX ARIZ  
SPERRY RAND CORP SPERRY GYROSCOPE CO  
DEPT 9231 CP17 CABLE PLACE L I N Y  
SPERRY RAND CORP SPERRY GYROSCOPE CORP  
MARCUS AVE-MAIL STA 8-6 LAKE SUCCESS N Y  
SPERRY RAND CORP SPERRY GYROSCOPE CO  
55 DENTON AVE NEW HYDE PARK N Y  
SPERRY RAND CORP SPERRY MARINE DIV  
7 AERIAL BAY SYOSSET L I N Y  
SPERRY RAND CORP-MARINE DIV SPERRY GYROSCOPE  
CO ROOSEVELT FIELD GARDEN CITY L I N Y  
SPERRY RAND CORP INSTRUMENT CO  
P O BOX 857 HUNTSVILLE ALA  
SPERRY SEMICONDUCTOR DIV SPERRY RAND CORP  
WILSON AVE S NORWALK CONN  
SPERRY UTAH ENGR LAB  
322 N 21ST WEST SALT LAKE CITY UTAH  
SPERTI PARADAY INC  
1322 E CHURCH ST ADRIAN MICHIGAN  
SPHERE CO INC  
25 AMITY ST LITTLE FALLS N J  
SPINCRRAFT INC  
4122 W STATE ST MILWAUKEE 8 WISC  
SPINFORM INC  
65 MECHANIC ST ATTLEBORO MASS  
SPIRILING PRODUCTS CO  
HENRIETTA ST & DUFFY AVE HICKSVILLE L I  
N Y  
SPIVAY INC JAMES S  
4908 HAMDEN LANE WASHINGTON 14 D C  
SPLIT BALLBEARING DIV/HPB INC  
LEBANON N H  
SPOX CO  
HAMBURG AVE HIGH POINT N C  
SPRAGUE ELECT CO  
224 LEO ST DAYTON 4 OHIO  
SPRAGUE ELEC CO INC  
24 NO MAIN ST CHAGRIN FALLS OHIO  
SPRAGUE ELECTRIC CO  
CONCORD N H  
SPRAGUE ELECTRIC CO  
NASHUA DIVN NASHUA N H  
SPRAGUE ELECTRIC CO  
LANSHING N C  
SPRAGUE ELECTRIC CO  
BARRÉ VT  
SPRAGUE ELECTRIC CO  
12870 PANAMA ST LOS ANGELES 66 CALIF  
SPRAGUE ELECTRIC CO  
BOX 1509 VISALIA CALIF  
SPRAGUE ELECTRIC CO  
NORTH ADAMS MASS  
SPRAGUE ELECTRIC CO  
313 WASHINGTON ST NEWTON 98 MASS  
SPRAGUE ELECTRIC ED  
B JEFFERSON N C  
SPRAGUE ENGR CORP  
P O BOX 121 GARDENA CALIF  
SPRAGUE OF WISCONSIN INC  
6 & BEECH STS GRAFTON WISC  
SPRAYLAV CORP  
1 PARK AVE NEW YORK 16 N Y  
SPRINGFIELD AIRCRAFT RADIO CORP  
ROUTE 11 BOX 330 INDIANAPOLIS IND  
SPRINGFIELD ENTERPRISES  
190-48 99TH AVE HOLLIS 23 N Y  
SPRINGFIELD WIRE & TINSEL CO  
70 LEE ST SPRINGFIELD 4 MASS  
SPRUCE PINE WICA CO  
P O BOX 456 SPRUCE PINE N CAROLINA  
SQUARE D CO  
6041 N RICHARDS ST MILWAUKEE 12 WISC  
SQUARE D CO  
4500 LEE RD CLEVELAND 20 OHIO

# ELECTRONIC MANUFACTURERS-A-Z

S-2 ELECTRONIC MFG CO  
3200-1ST AVE SEATTLE 8 WASH  
S B S MACHINERY CO  
160 53RD ST BROOKLYN 32 N Y  
ST CHARLES SCIENTIFIC CO  
707 NOSEDALE ST ST CHARLES ILL  
ST ELOI CORP  
P O BOX 507 NORTOWN BR CINCINNATI 44 OHIO  
ST JOHN X-RAY LAB  
CALIFON N J  
ST MARYS CARBON CO  
STATE ST ST MARYS PA  
ST REGIS PAPER CO  
261 RADISON AVE NEW YORK 55 NY  
ST REGIS PAPER CO  
ENTERPRISE AVE TRENTON N J  
STA-WARM ELECTRIC CO  
553 N CHESTNUT ST RAVENNA OHIO  
STACKBIN CORP  
1079 MAIN ST PAWTUCKET RI  
STACKPOLE CARBON CO  
ST MARYS PA  
STACKPOLE CARBON CO  
3403 BROADWAY CHICAGO 13 ILL  
STACKPOLE CARBON CO  
KANE PENN  
STAELER INC J S  
25 DICAROLIS COURT HACKENSACK N J  
STAMLIN BROS INC  
500 MAPLE ST BELDING MICH  
STAINLESS INC  
5 ST NORTH WALES PA  
STALWART CORP CO  
160 NORTHFIELD RD BEDFORD OHIO  
STANFORD METAL SPECIALTY CO  
427 W BROADWAY NEW YORK 12 N Y  
STAMFORD STAMPINGS CO  
LITCHFIELD CONN  
STAMPINGS DIV LAR SHIM CO  
GLENNDALE CONN  
STANAT MFG CO  
523 SHAMES DR WESTBURY N Y  
STANCIL-HOFFMAN CORP  
921 N HIGHLAND AVE HOLLYWOOD 38 CALIF  
STANDARD COIL PROD  
980 RATHBONE AURORA ILL  
STANDARD COIL PRODS CO  
16 CHARLES ST BANGOR 2 MICH  
STANDARD COIL PRODUCTS CO  
2085 N MAUTHORNE AVE MELROSE PARK ILL  
STANDARD CONTROLS  
1130 POPLAR PL SEATTLE WASH  
STANDARD CRYSTAL CO  
1714 LOCUST ST KANSAS CITY MO  
STANDARD ELEC CORP  
1026 17TH ST NW WASHINGTON 6 D C  
STANDARD ELECTRIC MFG CO  
HADDON AVE W BERLIN N J  
STANDARD ELECTRIC TIME CO  
89 LOGAN ST SPRINGFIELD 2 MASS  
STANDARD ELECTRICAL PRODUCTS CO  
2240 E 3RD ST DAYTON OHIO  
STANDARD ELECTROMAGNETICS  
P O BOX 679 FREDERICK MD  
STANDARD ELECTROMAGNETICS DIV  
4 FREDERICK ST WALKERSVILLE MD  
STANDARD ELECTRONICS  
FARMINGDALE N J  
STANDARD ELECTRONICS  
1611 W 63RD ST CHICAGO ILL  
STANDARD ELECTRONICS INC  
5205 LANKERSHAN BLVD N HOLLYWOOD CALIF  
STANDARD ELECTRONICS RESEARCH CORP  
7 E 7TH AVE NEW YORK 21 N Y  
STANDARD GAGE CO  
FOUSE-MEYER M Y  
STANDARD INSTRUMENT CORP  
657 BROADWAY NEW YORK 12 N Y  
STANDARD INSTRUMENTS  
P O BOX 11556 DALLAS 18 TEXAS  
STANDARD LOCKNUT & LOCKWASHER INC  
2250 VALLEY AVE INDIANAPOLIS 18 IND  
STANDARD METALS CORP  
262 BROAD ST N ATTLEBORO MASS  
STANDARD OIL CO  
1737 MIDLAND BLVD CLEVELAND OHIO  
STANDARD PRESSED STEEL CO  
BOX 899 JENKINTOWN PA  
STANDARD RECORD MFG CO  
70 N SAN GABRIEL BLVD PASADENA 8 CALIF  
STANDARD RECTIFIER CORP  
620 E DYER SANTA ANA CALIF  
STANDARD REGISTER CO  
626 ALBANY ST DAYTON 1 OHIO  
STANDARD SCORE CO  
2601 WASHINGTON BLVD BELLWOOD ILL  
STANDARD T V TUBE CORP  
700 DRYADES ST NEW ORLEANS 12 LA  
STANDARD TELEVISION & TUBE CORP  
3233 CONTI ST NEW ORLEANS 19 LA  
STANDARD TOOL & MFG CO  
237 LAUREL AVE KEARNY N J  
STANDARD TOOL & MFG CO  
738 SCHUYLER AVE LYNDHURST NJ  
STANDARD WINDING CO  
44 JOHNS ST NEWBURGH N Y  
STANDARD WIRE & CABLE CO  
3440 OVERLAND AVE LOS ANGELES 34 CALIF  
STANFORD RESEARCH INSTITUTE  
MENLO PARK CALIF  
STANLEY AVIATION CORP  
2501 DALLAS ST DENVER COLO  
STANLEY CHEMICAL CO  
BERLIN ST E BERLIN CONN  
STANLEY INDUSTRIAL SALES STANLEY WORKS  
LAKE ST NEW BRITAIN CONN

STANLEY TRANSFORMER CO  
31-23 VERNON BLVD LONG ISLAND CITY N Y  
STANPAT CO  
150-82 12TH RD WHITESTONE N Y  
STANWYCK WINDING CO  
137-151 WALSH AVE NEWBURGH N Y  
STAPLES CO  
775 5 AVE BROOKLYN 32 NY  
STAR ENGRAVING CO LTD  
223 E 4TH ST LOS ANGELES 13 CALIF  
STAR EXPANSION PRODUCTS  
719 A SECOND AVE NEW YORK N Y  
STAR PORCELAIN CO  
21 HURMEAD AVE TRENTON 6 N J  
STAR PRODUCTS CO  
777 S TRIPP CHICAGO 24 ILL  
STAR STAINLESS SCREW  
655 UNION BLVD PATERSON N J  
STAR-A ELECTRIC MFG CO  
269 MESEROLE ST BROOKLYN 6 N Y  
STARLINE CORP  
1006 FIELD DRIVE N E ALBUQUERQUE N M  
STARRETT CO L S  
165 CRESCENT ST ATHOL MASS  
STATE LABS CO  
689 BROADWAY NEW YORK 12 NY  
STATES CO  
19 NEW PARK AVE HARTFORD 6 CONN  
STATHAM DEV'OP CORP  
1845 PONTIUS AVE W LOS ANGELES CALIF  
STATHAM INSTRUMENTS INC OF PUERTO RICO  
294 CARPENTER RD HATE REY P R  
STATHAM INSTRUMENTS INC  
12401 W OLYMPIC BLVD LOS ANGELES 64 CALIF  
STATISTICAL INSTR CO  
330 HAVEN AVE NEW YORK 33 N Y  
STATMETICS CORP  
5121 BEDKS AVE SAN DIEGO CALIF  
STATOR ELECTRIC CORP  
22-18 - 40TH AVE LONG ISLAND CITY NEW YORK  
STAYER CO  
41-51 N SAXON AVE BAY SHORE L I N Y  
STAVID ENG INC  
8841 WINSTON ST ANAHEIM CALIF  
STAVID ENGINEERING DIV  
U S 22 PLAINFIELD N J  
STAVID ENGRG CO  
FIELD RT 1 - BOX 116 MAPLES FLA  
STAVID ENGRG DIV  
400 LINCOLN AVE RUTHERFORD N J  
STAVID ENGRG DIV  
BOX 6293 SAN DIEGO CALIF  
STAVID ENGRG DIV  
P O BOX 257 MECANICSBURG PA  
STEARNS MAGNETIC PRODUCTS  
635 S 28 ST MILWAUKEE 46 WISC  
STEEL & ALLOY TANK CO  
1 BESSEMER ST NEWARK 5 N J  
STEEL CO MERNAN O  
LAFAYETTE BLDG PHILADELPHIA 6 PA  
STEEL PROTECTION & CHEMICAL CO  
BRIDGE ST HICKSVILLE IND  
STEELMAN PHONO & RADIO CO  
12-30 ANDERSON AVE RT VERNON N Y  
STEIN LABS FRED  
121 N 4TH ST ATCHISON KANSAS  
STEINEN MFG CO BR  
43 BRUEN ST NEWARK 5 N J  
STEINER-IVES CO  
SPRINGFIELD RD UNION N J  
STELMA INC  
200 HENRY ST STAMFORD CONN  
STEPHENS TRU-SONIC INC  
8938 BARNER DR CULVER CITY CALIF  
STEPPER MOTORS CORP  
1732 B CLISON AVE CHICAGO 37 ILL  
STERLING ALDERFER CO  
3850 GRANGER RD AKRON OHIO  
STERLING BOLT CO  
363 W ERIE ST CHICAGO 10 ILL  
STERLING CO S  
15310 W MC NICHOLS RD DETROIT 35 MICH  
STERLING ELECTRIC MOTORS INC  
5401 TELEGRAPH RD LOS ANGELES 22 CALIF  
STERLING PRECISION CORP  
5 SIMTSHK DR E PORT WASHINGTON N Y  
STERLING TRANSFORMER CORP  
297 N 7 ST BROOKLYN 11 N Y  
STERN M D  
1221 VENICE BLVD LOS ANGELES 6 CALIF  
STEVALL DESIGNS  
21-50 W 33 ROAD LONG ISLAND CITY 6 N Y  
STEVENS ARNOLD INC  
5 FOREST CIRCLE WINCHESTER MASS  
STEVENS MFG CO  
P O BOX 1007 AMHER MANSFIELD OHIO  
STEVENS MFG CO INC  
6022 N ROGERS AVE CHICAGO 30 ILL  
STEVENS PAPER MILLS INC  
P O BOX 347 WINDSOR CONN  
STEVENS PRODUCTS INC  
86 MAIN ST E ORANGE N J  
STEVENS-ARNOLD INC  
7 ELKINS ST SOUTH BOSTON 27 MASS  
STEVENSON M D  
110 RACE ST PHILA PENNA  
STEWART MFG CO D M  
CHATTANOOGA TENN  
STEWART & STEVENSON SERVICES INC  
4516 HARRISBURG BLVD HOUSTON 1 TEXAS  
STEWART CORP F W  
4311 RAVENSWOOD AVE CHICAGO 13 ILL  
STEWART ENGRG CO  
467 BEAN CREEK RD SANTA CRUZ CALIF  
STEWART ENGRG CO  
P O BOX 727 SOQUEL CALIF

STEWART EQUIPMENT CO  
SOQUEL CALIF  
STEWART INSTRUMENT CO  
18805 MEYERS DETROIT 27 MICH  
STEWART INSTRUMENT CO  
6507 GRAND RIVER AVE DETROIT 8 MICH  
STEWART STAMPING CO  
630 CENTRAL PARK AVE YONKERS N Y  
STEWART TRANS-LUX  
1111 W SEPULVEDA BLVD TORRANCE CALIF  
STEWART WARNER ELECTRONICS  
11973 SAN VICENTE BLVD LOS ANGELES 49 CALIF  
STEWART WARNER ELECTRONICS DIV  
1300 N KOSTNER AVE CHICAGO 51 ILL  
STEWART WARNER ELECTRONICS  
1514 DROVER ST INDIANAPOLIS 7 IND  
STICHT CO MERNAN H  
27 PARK PL NEW YORK 7 NEW YORK  
STIEN CHEMICALS INCORPORATED  
20 VESSEY ST NEW YORK 7 N Y  
STILLMAN RUBBER CO  
811 MARILYN AVE CULVER CITY CALIF  
STILSON TOOL INC  
30231 BROESBECK HWY ROSEVILLE MICH  
STIMPSON CO EDWIN W  
70 FRANKLIN AVE BROOKLYN 5 N Y  
STITH ENGR CO  
P O BOX 1329 ALAMOGORDO N M  
STOCKMAN ELECT RSCH CO  
583 LEXINGTON AVE WALTHAM 34 MASS  
STODDARD AIRCRAFT RADIO CO  
6848 SANTA MONICA BLVD HOLLYWOOD 38 CALIF  
STOELTING CO C H  
424 N MORAN AVE CHICAGO 24 ILL  
STORES CORP F J  
5500 TABOR RD PHILADELPHIA 20 PA  
STORES MOLDED PRODUCTS  
214 TAYLOR ST TRENTON 4 N J  
STONE & SMITH INC  
5965 ALCOA ST LOS ANGELES 58 CALIF  
STONE CITY PRODUCTS CO  
1206 Y ST BEDFORD IND  
STONE LAWS  
1312 TREMONT ST BOSTON 18 MASS  
STONE PAPER TUBE CO DIV STONE STRAW CORP  
900 FRANKLIN ST N E WASHINGTON 17 D C  
STONHAM COMPANY INC  
401 N BROAD ST PHILADELPHIA 8 PA  
STONITE COIL CORP  
RT 130 YARDVILLE N J  
STON MFG CO  
443 STATE ST BINGHAMTON N Y  
STRAND ENGR  
1354 NORTH MAIN ST AMY ANBOR MICH  
STRAND LABS INC  
217 CALIFORNIA ST NEBTON 56 MASS  
STRANDERS ENGR LABS INC  
225 SUMMIT AVE GREENSBORO N CAROLINA  
STRAT-O-SEAL MFG CO  
3030 W FULLERTON AVE CHICAGO 47 ILL  
STRATFORD CORP  
745 5TH AVE NEW YORK 22 N Y  
STRATFORD CORP  
84 W 28TH AVE NEW YORK 22 N Y  
STRATOCON CORP  
BOX 10 MORRISTOWN N J  
STREETER AMET  
GRAYS LAKE ILL  
STREMPPEL INSTRUMENT CORP  
LAKE GEORGE N Y  
STRETCH WIRE CO  
P O BOX 893 NEW ROCHELLE N Y  
STRIPPIT INC  
AFRON N Y  
STROBLITE CO  
75 W 85 ST NEW YORK 36 N Y  
STROMBERG TIME CORP  
135 S MAIN ST THORASTON CONN  
STRONG ELECTRIC CORP  
87 CITY PARK AVE TOLEDO 1 OHIO  
STRUCTURAL FIBERS  
CHARDON OHIO  
STRUTHERS-DUNN INC  
LANES RD PITMAN N J  
STUDEBAKER HYDRAULIC PRODUCTS CO  
1735 N 35 AVE MELROSE PARK ILL  
STUDIO ELECTRONICS CORP  
440 S VICTORY BLVD BURBANK CALIF  
STUDIO TV PRODUCT SALES  
356 W 40TH ST NEW YORK 18 N Y  
STURRUP INC  
50 SILVER ST MIDDLETOWN CONN  
STURTEVANT CO P A  
ADDISON ILL  
STYCH ENGINEERING EDWARD J  
3032 S 54TH PLACE CHICAGO ILL  
SU-MARK BOATS INC INDUSTRIAL DIV  
STONE ST WALPOLE MASS  
SUCKLE ELECTRONICS CO  
22 S BOSTON AVE CAMDEN 5 N J  
SUFFOLK PRODUCTS CORP  
WOODBINE & SCUDDER AVE NORTHPORT N Y  
SULLIVAN LTD M W  
80 SHORE RD PORT WASHINGTON NY  
SUMMERS & MILLS INC  
911 W COMMERCE DALLAS 8 TEX  
SUMMERS GYROSCOPE CO  
2500 BROADWAY SANTA MONICA CALIF  
SUMMIT COIL CO  
4 CLAREMONT RD BERNARDSVILLE N J  
SUMMIT ELECTRONIC PROD  
16706 ARNITA ST VAN NUYS CALIF  
SUMMIT INDUSTRIES INC  
2104 W ROSECRANS AVE GARDENA CALIF  
SUMNITT ELECTRS INC  
7 INDUSTRIAL PL SUMMIT N J

# ELECTRONIC MANUFACTURERS-A-Z

SUN CHEMICAL CORP  
750 3RD AVE NEW YORK N Y  
SUN DIAL CORP  
P O BOX 326 PAUSAIC AVE CALDBELL N J  
SUN ELECTRIC CORP  
HARLEN & AVONDALE AVE CHICAGO 31 ILL  
SUN RADIO  
650 6TH AVE NEW YORK 11 N Y  
SUNBANK ELECTRONICS INC  
2516 N ONTARIO ST BURBANK CALIF  
SUNCOAST INSTRUMENTS DIV MILTON ROY CO  
6301 49TH ST ST PETERSBURG FLA  
SUNSTRAND MACH & TOOL CO AVIATION DIV  
2421 - 11TH ST ROCKFORD ILL  
SUNSTRAND-TURBO  
10445 GLENOAKS BLVD PACOIMA CALIF  
SUPER ELECTRONIC CORP  
53 BORTH ST NEW YORK 13 N Y  
SUPERB SPRING BATTERIES INC  
34 E SIDNEY AVE NY VERNON NY  
SUPEREX ELECTRONICS CORP  
4-6-RADFORD PL TOMMERS NY  
SUPERIOR CABLE CORP  
HICKORY N C  
SUPERIOR CARBON PRODS INC  
9115 GEORGE AVE CLEVELAND 5 OHIO  
SUPERIOR ELECTRIC CO  
83 LAUREL ST BRISTOL CONN  
SUPERIOR ELECTRONICS CORP  
208 PIAGET AVE CLIFTON N J  
SUPERIOR ENG & MFG CO  
P O BOX 723 MACON GA  
SUPERIOR FLUX A MFG CO  
1536 ST CLAIR AVE CLEVELAND OHIO  
SUPERIOR GRAPHITE CO  
37 S CLARK ST CHICAGO 3 ILL  
SUPERIOR INSTRUMENTS CORP  
WASHBURN LANE STONY POINT N Y  
SUPERIOR MFG B INSTR CORP  
154-01 BARCLAY AVE FLUSHING 35 L I N Y  
SUPERIOR RESISTOR & ELECTRONICS CORP  
333 W SUPERIOR PL BOX 274 FRANKFORT IND  
SUPERIOR STEATITE & CERAMIC CORP  
83 91 B FOREST ST ENGLEWOOD N J  
SUPERIOR SWITCH CO  
1001 B BRADDO ST RICHMOND VA  
SUPERIOR TUBE CO  
BOX 191 NORRISTOWN PA  
SUPERIOR TUBE CO  
WAPAKONETA OHIO  
SUPERSCOPE INC  
8520 YUJUNGA AVE SUN VALLEY CALIF  
SUPREME TRANSFORMER CORP TRANSFORMER DIV  
430A W ARMITAGE CHICAGO 15 ILL  
SURFACE COMBUSTION CORP  
2375 DORN ST TOLEDO 1 OHIO  
SURPRENANT MFG CO  
172 STERLING ST CLINTON MASS  
SURVEYOR SERVICE CO INC  
2311 PERKINS PL SILVER SPRING MD  
SUTTON ELECTRONIC CO INC  
483 FAIRMAN RD P O BOX 289 LEXINGTON KY  
SWARTWOUT CO  
18511 EUCLID AVE CLEVELAND 12 OHIO  
SWEDGAL  
258 BROADWAY NEW YORK 7 N Y  
SWEDLOW PLASTICS CO  
304 N WFRIDIAN RD YOUNGSTOWN OHIO  
SWENSON CO V H  
556 ELM ST HEARNY N J  
SWIFT TEXTILE METALLIZING AND LAMINATING  
CORP 10 LOVE LANE HARTFORD 1 CONN  
58155 JEWEL CO  
LAFAYETTE BLDG PHILADELPHIA 6 PA  
SWITCHCRAFT INC  
5555 N ELSTON AVENUE CHICAGO ILL  
SWITCHES INC  
516 HIGH ST LOGANSPORT INC  
B W RESEARCH INSTITUTE  
SAN ANTONIO TEXAS  
SYLVANIA ELEC CO ELECTRONIC DEFENSE  
3372 SOUTH COURT PALO ALTO CALIF  
SYLVANIA ELEC DEFENSE LAB  
BOX 472 WELDON PARK CALIF  
SYLVANIA ELEC PROD INC  
1401 ORANGE THORPE AVE FULLERTON CALIF  
SYLVANIA ELEC PROD INC  
6506 E GAYHART ST LOS ANGELES 54 CALIF  
SYLVANIA ELEC PROD INC  
75 SYLVAN ST DANVERS MASS  
SYLVANIA ELEC PRODUCTS  
208-20 WILLETTS PT BLVD BAYSIDE L I N Y  
SYLVANIA ELEC PRODS  
OTTAWA OHIO  
SYLVANIA ELEC PRODS  
189 W ST NEEDHAM MASS  
SYLVANIA ELEC PRODS  
1811 ADRIAN AVE BURLINGAME CALIF  
SYLVANIA ELEC PRODS INC  
BROOKVILLE PA  
SYLVANIA ELEC PRODS INC  
TITUSVILLE PA  
SYLVANIA ELEC PRODS INC  
1120 ROOSEVELT AVE YORK PA  
SYLVANIA ELEC PRODS INC PHOTOFLASH DIV  
MONTAURVILLE PA  
SYLVANIA ELEC PRODS INC  
BENEDICT & KENNEDY STS SHAWNEE OKLA  
SYLVANIA ELEC PRODS INC  
3101 PLEASANT VALLEY BLVD ALTOONA PA  
SYLVANIA FLEC PRODS INC  
MELSONVILLE OHIO  
SYLVANIA ELEC PRODS INC  
WINCHESTER KY  
SYLVANIA ELEC PRODS INC  
MILL HALL PA

SYLVANIA ELEC PRODS MICROAVE TUBE PLT  
P O BOX 997 MOUNTAIN VIEW CALIF  
SYLVANIA ELEC PROD INC  
2001 N CORNELL MELROSE PARK ILL  
SYLVANIA ELEC PRODS CO  
P O BOX 4465 EL PASO TEX  
SYLVANIA ELEC PRODS INC  
2825 MT PLEASANT ST BURLINGTON IOWA  
SYLVANIA ELEC PRODS INC  
BOX 360 MUNCY PA  
SYLVANIA ELECTRIC PRODUCTS CO ELECTRIC  
SYSTEMS DIV 100 FIRST AVE WALTHAM 54 MASS  
SYLVANIA ELECTRIC PRODUCTS INC  
E 3814 ST WILLIAMSPOET PENNA  
SYLVANIA ELECTRIC PRODUCTS INC  
500 EVELYN AVE MOUNTAIN VIEW CALIF  
SYLVANIA ELECTRIC PRODUCTS INC  
700 ELLICOTT ST BATAVIA N Y  
SYLVANIA ELECTRIC PRODUCTS INC  
CHEN & METALLURGICAL DIV TORONTO PA  
SYLVANIA ELECTRIC PRODUCTS INC PARTS DIV  
12 2ND AVE WARREN PA  
SYLVANIA ELECTRIC PRODUCTS INC  
SENECA FALLS N Y  
SYLVANIA ELECTRIC PRODUCTS INC  
EMPORIUM PENNA  
SYLVANIA ELECTRIC PRODUCTS CO  
WOBURN MASS  
SYLVANIA ELECTRIC PRODUCTS  
ESTES ST IPSWICH MASS  
SYLVANIA ELECTRIC PRODUCTS  
60 BOSTON ST SALEM MASS  
SYLVANIA ELECTRIC PRODUCTS INC  
1740 BROADWAY NEW YORK 19 NY  
SYLVANIA ELECTRIC PRODUCTS INC SPECIAL TUBE  
OPERATIONS 108 SYLVAN RD WOBURN MASS  
SYLVANIA ELECTRIC PRODUCTS INC ELECTRONIC  
SYSTEMS PLANT 175 GREAT ARROW AVE BUFFALO  
7 N Y  
SYLVANIA ELECTRIC PRODUCTS INC  
PO BOX 981 353 ENCHIAL ST SANTA CRUZ CALIF  
SYLVANIA ELECTRONIC SYSTEMS  
PO BOX 981 SANTA CRUZ CALIF  
SYLVANIA ELECTRONIC SYSTEMS  
189 B ST NEEDHAM 94 MASS  
SYLVANIA ELECTRONIC SYSTEMS  
63 SECOND AVE WALTHAM 54 MASS  
SYLVANIA ELECTRONIC SYSTEMS  
63 SECOND AVE WALTHAM 54 MASS  
SYLVANIA PARTS DIV  
WARREN PA  
SYMPHONIC RADIO & ELECTRONIC CORP  
235 JERSEY AVE NEW BRUNSWICK NJ  
SYMPHONY ELECTRONICS CORP  
925 S WESTERN AVE LOS ANGELES 6 CALIF  
SYNCO PRODUCTS CO  
30 EASTERN AVE BOX 51 MALDEN 48 MASS  
SYNCO CORP  
643 LAPER RD OXFORD MICH  
SYNTHAME CORP  
MONTGOMERY AVE OAKS PA  
SYNTRONQUE INC  
PO BOX 75 BEARSVILLE STA BOONSTOCK N Y  
SYNTRON CO  
283 LEXINGTON AVE HOMER CITY PA  
SYNTRONIC INSTRUMENTS INC  
100 INDUSTRIAL RD ADDISON ILL  
SYSTEMS DEVELOPMENT CORP  
7319 OGELSBY AVE LOS ANGELES 45 CALIF  
SYSTEMS DEVELOPMENT CORP  
2500 COLORADO AVE SANTA MONICA CALIF  
SYSTEMS DEVELOPMENT INC  
307 WATER ST BINGHAMTON N Y  
SYSTEMS LAB CORP  
14852 VENTURA BLVD SHERMAN OAKS CALIF  
SYSTEMS RESEARCH LABS INC  
300 WOODS DRIVE DAYTON 32 OHIO  
SYSTEM CORP  
950 GALING ST CONCORD CALIF  
SZERELY ASSOC INC O E  
P O BOX 269 COMMERCE GA

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TAAG DESIGNS INC  
55 WILLOUGHBY ST BROOKLYN 1 N Y  
TAAG DESIGNS INC  
351 HEMPSTEAD TPK W HEMPSTEAD L I N Y  
TAB  
111 LIBERTY ST NEW YORK 6 N Y  
TABER INSTRUMENT CORP  
107 GOLFURY ST NORTH TONAWANDA N Y  
TABEL MFG CO  
1336 BALLENTINE BLVD NORFOLK 12 VA  
TABLE & TICKET CO  
1021 W ADAMS ST CHICAGO 7 ILL  
TAFETT ELECTONICS INC  
27-05 BROOKLYN-QUEENS EXPRESSWAY W  
WOODSIDE 77 N Y  
TAKK CORP  
P O BOX 346 NEARAK OHIO  
TALK-A-PHONE CO  
1512 S PULASKI RD CHICAGO 23 ILL  
TALKING DEVICES CO  
4847 IRVING PARK RD CHICAGO 41 ILL  
TALKMASTER INC  
534 LAUREL ST SAN CARLOS CALIF  
TALLY CORP  
MEBURY PARK CALIF  
TALLY REGISTER CORP  
1310 MERCER SEATTLE 9 WASH  
TA MFG CORP  
4607 ALGER ST LOS ANGELES 39 CALIF  
TAMAR ELECTRONICS INC  
2045 W ROSECRANS AVE GARDENA CALIF

TAMAR ELECTRONICS INC  
2339 COTNER AVE LOS ANGELES 64 CALIF  
TANDBERG OF AMERICA INC  
8 THIRD AVE PELHAM N Y  
TANG INDUSTRIES  
49 JONES RD BALTHAM MASS  
TANSITOR ELEC CORP  
211 W 19TH ST NEW YORK N Y  
TANSTOR ELECTRONICS INC  
WEST RD THENNING VT  
TAPCO GROUP THOMPSON RAMO WOOLDRIDGE INC  
23555 EUCLID AVE CLEVELAND 17 OHIO  
TAPE CABLE CORP  
790 LINDEN AVE ROCHESTER 10 N Y  
TAPECODE  
142 N HARTHORNE AVE LANSHORNE PENNA  
TAPESWITCH CORP OF AMERICA  
229-24 LINDEN BLVD CAMBRIA HEIGHTS 11 N Y  
TAPETONE INC  
10 ARDLOCK PLACE WEBSTER MASS  
TARC ELECTRONICS INC  
48 URBAN AVE BESTBURY L I N Y  
TARGET ROCK CORP  
104 MADISON AVE HEMPSTEAD L I N Y  
TASK CORP  
1009 E VERMONT AVE ANAHEIM CALIF  
TASKER INSTR CORP  
3349 CAMUENGA BLVD HOLLYWOOD 28 CALIF  
TATNALL MEASURING SYS CO  
P O BOX 245 PHOENIXVILLE PA  
TATUM CO A K  
127 N LE DOUX RD BEVERLY HILLS CALIF  
TAURUS CORP  
8 CORVELL ST LAMBERTVILLE N J  
TAVIS EMGAG  
P O BOX 565-1711 30 MOUNTAIN AVE MONROVIA  
CALIF  
TAYLOR ELECTRIC CO  
4040 N PORT WASHINGTON RD MILWAUKEE WISC  
TAYLORZEL CORP  
185 MURRAY ST ROCHESTER 6 N Y  
TAYLOR-EMMETT CONTROLS INC  
48 TURKEYFOOT LAKE RD P O BOX 728 AKRON  
9 OHIO  
TAYLOR FIRME CO  
1400 PALOMARES AVE LAVERNE CALIF  
TAYLOR FIBRE CO  
BOX 471 NORRISTOWN PA  
TAYLOR INSTRUMENTS COMPANIES  
95 AMES ST ROCHESTER 1 N Y  
TAYLOR WINFIELD CORP  
1052 RAMONING AVE N W WARREN OHIO  
TEALE MACHINE CO INC  
1425 UNIVERSITY AVE ROCHESTER 7 N Y  
TEC KIT CO  
BOX 8827 KANSAS CITY 15 MO  
TECA CORP  
80 MAIN ST WHITE PLAINS N Y  
TECH LABS  
BERGEN & EOSALL BLVD PALISADES PARK N J  
TECH PANEL CO INC  
KIRKWOOD N Y  
TECH-MASTER CORP  
75 FRONT ST BROOKLYN 1 N Y  
TECH-OMN RESISTOR CORP  
36-11 33 ST LONG ISLAND CITY 6 N Y  
TECHALLOY CO  
RT 113 RAMMS PENNA  
TECHLINE DIV WHEELABRATOR CORP  
1471 AVE VICKSBURG MICH  
TECHNIC INC  
88 SPECTACLE ST CRANSTON R I  
TECHNIC INC  
7001 N CLARK ST CHICAGO 26 ILL  
TECHNICAL APPARATUS BUILDERS  
109 LIBERTY ST NEW YORK 6 N Y  
TECHNICAL APPLIANCE CORP  
1 YACE ST SHERBURNE N Y  
TECHNICAL ASSOCIATES  
140 W PROVIDENCIA AVE BURBANK CALIF  
TECHNICAL DEVELOPMENT CO  
305 S CHESTER PK GLENOLDEN PA  
TECHNICAL DEVICES CO  
11242 PLAYA COURT CULVER CITY CALIF  
TECHNICAL ELECTRONICS CO  
4060 INCE BLVD CULVER CITY CALIF  
TECHNICAL MATERIAL CORPORATION  
700 FENIMORE RD HAMARONCK N Y  
TECHNICAL MEASUREMENT CORP  
411 WASHINGTON AVE NORTH HAVEN CONN  
TECHNICAL OIL TOOL CORP  
1057 N LA BREA LOS ANGELES 38 CALIF  
TECHNICAL OPERATIONS INC  
SOUTH AVE BURLINGTON MASS  
TECHNICAL PLY-WOODS SALES  
6756 CRANDON AVE CHICAGO 49 ILL  
TECHNICAL PRODUCTS CO INSTRUMENT DIV  
6870 LEXINGTON AVE LOS ANGELES 38 CALIF  
TECHNICAL PUBLISHING HOUSE  
4 TYLER RD LEXINGTON 73 MASS  
TECHNICAL RES PRODS  
7863 MELROSE AVE LOS ANGELES 46 CALIF  
TECHNICAL SERVICE CORP  
917-19 S THIRD LOUISVILLE 3 KY  
TECHNICAL SLS CORP  
189 VAN RESELLEER ST BUFFALO 10 N Y  
TECHNICAL SYSTEMS INC  
501 S VARNER ST BURBANK CALIF  
TECHNICAL TAPE CORP  
240 NORTH AVE NEW ROCHELLE N Y  
TECHNICAL WIRE PRODUCTS INC  
46 BROWN AVE SPRINGFIELD N J  
TECHNICRAFT CO  
1156 COMMONWEALTH AVE BOSTON 34 MASS  
TECHNICRAFT PROD CO  
130 KNOLL TERRACE W CALDWELL N J

# ELECTRONIC MANUFACTURERS-A-Z

TECHNICRAFT-LABORATORIES INC  
THOMASTON-WATERBURY RD THOMASTON CONN  
TECHNIKROTE CORP  
63 SEABRING ST BROOKLYN 31 N Y  
TECHNIPOWER INC  
18 MARSHALL ST 5 NORWALK CONN  
TECHNIQUE ASSOCIATES  
1413 N CORNELL AVE INDIANAPOLIS 2 IND  
TECHNIQUES INC  
40 JAY STREET ENGLEWOOD N J  
TECHNITROL ENG CO  
1052 E ALLEGHENY AVE PHILADELPHIA 34 PA  
TECHNOGRAPH PRINTED ELECTRONICS INC  
920 NORTHWEST BLVD WINSTON-SALEM N C  
TECHNOLOGY INSTRUMENT CORP  
533 MAIN ST ACTON MASS  
TECHNOLOGY INSTRUMENT CORP  
850 LABRENCE DR NEWBURY PARK CALIF  
TECHNOLOGY INSTRUMENT CORP OF CALIF  
850 LAURENCE CY NEWBURY PARK CALIF  
TECHRON CORP  
20 SIMMONS ST BOSTON 20 MASS  
TECHRON PRODUCTS  
421 GILES LA FLORIDA ILL  
TECHTRON ELECTRONICS LTD  
129 PARK AVE PARK CREST N J  
TECHTRON ELECTRONICS LTD  
22 BILLARD AVE MT VERNON N Y  
TECHTRON CORP  
276 HIGH ST HOLYOKE MASS  
TED MFG CORP  
1010 JOHNSON DR SHAWNEE KANSAS  
TEDFORD CRYSTAL LABS  
4126 COLERAIN AVE CINCINNATI 23 OHIO  
TEIMER CO INC ROLAND  
134 TREMONT ST EVERETT 49 MASS  
TEKTRON INST  
26225 NO CORNELL RD HILLSBORO ORE  
TEKTRONIX INC  
412 CHESTNUT UNION N J  
TEKTRONIX INC  
840 HILLIS AVE ALBERTSON L I N Y  
TEKTRONIX INC  
BEAVERTON ORE  
TEKTRONIX INC  
9019 COLUMBIA PIKE ANMANDALE VA  
TEKTRONIX INC  
724 YORK RD TOWSON B MD  
TEKTRONIX INC  
P O BOX 831 PORTLAND 7 ORE  
TELAUTOGRAPH CORP  
8700 BELLANCA AVE LOS ANGELES 45 CALIF  
TELCO ELECTRONICS MFG CO  
400 S BYMAN ST ROCKFORD ILL  
TELCOM METALS TELCOM BORDERS  
MANOR ROYAL CRAWLEY SUSSEX ENGLAND  
TELE-BEAM INDUSTRIES  
4145 WEAVER BLV NAPA CALIF  
TELE BROADCASTERS OF CALIF INC  
758 E COLORADO ST PASADENA CALIF  
TELE-COIL CO INC  
2733 SAUNDERS ST CAMDEN N J  
TELE COMPUTING CORP BITTANNER CYRO DIV  
16217 LINDENBERG AVE VAN NUYS CALIF  
TELE-DYNAMICS  
5000 PARKSIDE AVE PHILA 31 PA  
TELE-DYNAMICS INC  
15014 VENTURA BLVD SHERMAN OAKS CALIF  
TELE-DYNAMICS INC  
305 WASHINGTON ST SE ALBUQUERQUE N M  
TELE-TONE CO OF AMERICA  
1608 WEBSTER AVE NEW YORK 57 N Y  
TELE-VUE TOBERS INC  
701 49 ST ST PETERSBURG FLA  
TELE-WHORE MFG CORP  
28 BANICK DR AMITYVILLE LI N Y  
TELECOM INC  
4210 MAIN ST KANSAS CITY 11 MO  
TELECOMPUTING CORP  
12838 SATICOT N HOLLYWOOD CALIF  
TELECOMPUTING CORP  
915 N CITRUS AVE LOS ANGELES CALIF  
TELECOMPUTING CORP COOK CO DIV  
3850 OLIVE DENVER 7 COLO  
TELECONTROL CORPORATION  
20 DILLER AVE NEWTON N J  
TELECONTROL CORP  
11712 INGLEWOOD AVE HARTHORNE CALIF  
TELECTRO INDUSTRIES CORP  
35-18 37 ST LONG ISLAND CITY 1 N Y  
TELECTRON CO  
3991 S W 12TH TERR FT LAUDERDALE FLA  
TELEGRAPH CONDENSER CO  
N ACTON LONDON B 3 ENGLAND  
TELEGRAPH CONSTRUCTION & MAINTENANCE CO LTD  
MERCURY HOUSE THEOBALDS RD LONDON B C 1  
ENGLAND  
TELEMARINE COMMUNICATIONS CO  
140 W BROADWAY NEW YORK 13 N Y  
TELEMAT CORP  
21 LAFAYETTE ST WORCESTER 3 MASS  
TELEMATED MOTION PICTURES  
70 E 48 ST NEW YORK 17 N Y  
TELEMATICS INC  
1413 EAST END AVE CHICAGO HEIGHTS ILL  
TELEMETER MAGNETICS INC  
9037 JEFFERSON BLVD CULVER CITY CALIF  
TELEMETER MAGNETICS INC  
P O BOX 320 CULVER CITY CALIF  
TELEMETER MAGNETICS INC  
2245 PONTIUS AVE LOS ANGELES 64 CALIF  
TELEMETERING ASSOCIATES  
6410 INDIANO ST HOUSTON TEXAS  
TELEMETERING CORP OF AMERICA  
8345 HAYVENHURST SEPULVEDA CALIF  
TELEMETRICS INC  
4297 S BUDLONG AVE GARDENA CALIF

TELEPHONICS CORP  
PARK AVE HUNTINGTON L I N Y  
TELEPHONICS CORP PLANT 2  
1301 50 43RD ST PROBOARD INTL A P  
FT LAUDERDALE FLA  
TELEPIX CORP  
1515 N WESTERN HOLLYWOOD 27 CALIF  
TELEPRINTER CORP  
26 PARK PL PARARUS N J  
TELERAD MFG CORP  
1840 BROADWAY NEW YORK 18 N Y  
TELERADIO ENG'G CORP  
SHANNON B BARRLT STS WILKES-BARRE PA  
TELEREGISTER  
485 FAIRFIELD AVE STAMFORD CONN  
TELETEST INSTRUMENT CORP  
136-10 31 RD FLUSHING 34 N Y  
TELETRONIC LABS INC  
1035 W ROSECRANS AVE GARDENA CALIF  
TELETRONICS LAB INC  
54 KINKEL ST WESTBURY N Y  
TELETYPE CORP  
5555 W TOUCHY AVE SKOKIE ILL  
TELEVIEW CO  
111 LAKE AVE TUCKAHOE N Y  
TELEVIDEO COMP AMER  
2214 WELLINGTON RD LOS ANGELES CALIF  
TELEVISION ASSOC INC  
E BARKER AVE LAKELAND MICHIGAN CITY IND  
TELEVISION SPECIALTY CO INC  
350 W 31ST ST NEW YORK 1 N Y  
TELEVISION SPECIALTY CO DIV F M E  
1055 STEWART AVE GARDEN CITY LI N Y  
TELEVISION UTILITIES CORP DIV NORD  
300 DENTON AVE NEW HYDE PARK L I N Y  
TELEVISIO CORP  
1415 GOLF RD DES PLAINES ILL  
TELEVISOR CO  
515 MADISON AVE NEW YORK 22 N Y  
TELEWAVE LABS INC  
43 20 34TH ST LONG ISLAND CITY N Y  
TELEX INC  
1633 EUSTIS AVE ST PAUL MINN  
TELEX INC  
2508 LEE RD MINNEAPOLIS 22 MINN  
TELEFLY INC  
5701 ATLANTIC AT OXFORD VENTNOR N J  
TEL-INSTRUMENT ELECTRONICS CORP  
728 GARDEN ST CARLSTADT N J  
TELKOR INC  
804 106 ELYRIA OHIO  
TEL-LABS INC  
1050 2 ST MANCHESTER N H  
TELLER CO  
BOX 408 BUTLER PA  
TELL-TRONICS PHOUS INC  
125 KEEL AVE - BU 409 MEMPHIS 1 TENN  
TELOMIC ENGINEERING CORP  
773 BROADWAY LAGUNA BEACH CALIF  
TELOMIC INDUSTRIES INC  
60 N FIRST AVE BEECH GROVE IND  
TEL-RAD ELECTRONICS CORP  
127-20 ROCKAWAY BLVD 3 OZONE PARK 20 LI N Y  
TEL-RAD INC  
592 NEW PARK AVE HARTFORD 10 CONN  
TELEX LABS  
ASBURY PARK N J  
TELETRONICS INC  
277 MAIN ST NASHUA N H  
TELEVISION LABS INC  
333 MILL ST BAUCONDA ILL  
TEMCO AIRCRAFT CORP  
P O BOX 0191 GARLAND TEXAS  
TEMCO AIRCRAFT CORP  
B HARTCO POINT MUGU CALIF  
TEMCO AIRCRAFT CORP  
P O BOX 0191 DALLAS 22 TEXAS  
TEMCO ELECTRONICS DIV TEMCO AIRCRAFT CORP  
P O BOX 0191 DALLAS 22 TEXAS  
TEMCO OVERHAUL & AEROSYSTEMS  
P O BOX 1056 GREENVILLE TEXAS  
TEMPEL STEEL CO  
1939 BRYAN HARR AVE CHICAGO 26 ILL  
TEMPERATURE ENGG CORP  
1600 UNION LANGING ROAD RIVERTON N J  
TEMPIL CORP  
132 B 22ND ST NEW YORK 11 N Y  
TEMPLET INDUSTRIES INC  
701 ATKINS AVE BROOKLYN 10 N Y  
TEMPO INSTRUMENT INC  
COMMERCIAL STREET PO BOX 338 HICKSVILLE NY  
TEMPTRONICS LTD INC  
1011 POSEY AVE CLEVELAND 14 OHIO  
TENCO ELECTRONIC  
811 BOYLSTON ST BOSTON 16 MASS  
TENNA MFG CO  
7580 GARFIELD BLVD CLEVELAND 25 OHIO  
TENNALAB  
417 E 10 ST QUINCY ILL  
TENNEY ENGG INC  
1090 SPRINGFIELD RD UNION N J  
TENSITRON INC  
PIN MILL HARVARD MASS  
TENSO-LAB INC  
5 BUCKHOUT ST IRVINGTON-ON-HUDSON N Y  
TENSOLITE INSULATED WIRE CO INC  
B MAIN ST YARRITOWN N Y  
TENSOLITE PACIFIC DIV  
1516 N GARDNER ST LOS ANGELES 46 CALIF  
TENSOR ELECTRIC DEVELOPMENT CO  
1073 EASTERN PKBY BROOKLYN 33 N Y  
TENCOP INC  
936 E ARGUES SUNNYVALE CALIF  
TEPCOR  
912 HILLCREST ARLINGTON TEXAS  
TEPRO ELECTRIC CORP  
5 ST PAUL ST ROCHESTER 4 N Y

TERADO CO  
1058 RAYMOND AVE ST PAUL 14 MINN  
TERMINAL ELECTRONICS  
236 W 17TH ST NEW YORK N Y  
TERRELL CORP  
19 LANE ST BALTHAM 54 MASS  
TERRY CO GEORGE B  
356 S ELMWOOD AVE BUFFALO 1 N Y  
TERRY-PHONE INC  
4809 CARLISLE PIKE CAMP PA  
TFSLA ELECTRIC CO  
2605 ARMITAGE AVE CHICAGO 47 ILL  
TETRAD CO  
62 ST MARY ST YONKERS N Y  
TEVCO INSULATED WIRE  
108 E PROSPECT AVE BURBANK CALIF  
TEXAS CAPACITOR CO DIV R-C-R CORP  
4310 LANGLEY RD HOUSTON 16 TEXAS  
TEXAS CRYSTALS  
1000 CRYSTAL DR FORT MYERS FLA  
TEXAS ELECTRONIC PRODUCTS CO  
5114 W JEFFERSON DALLAS 11 TEXAS  
TEXAS INSTRUMENT INCORPORATED INSTR DIV  
3608 BUFFALO SPOBY HOUSTON 8 TEXAS  
TFKAS INSTRUMENTS INCORPORATED METALS &  
CONTROLS 300 N MAIN ST VERSAILLES KY  
TEXAS INSTRUMENTS INCORPORATED METALS &  
CONTROLS DIV FOREST ST ATTLEBORO MASS  
TEXAS INSTRUMENTS INCORPORATED  
6000 LEMMON AVE DALLAS 9 TEXAS  
TEXTRAN CORP  
P O BOX 9207 AUSTIN 17 TEXAS  
TETRON INC 340 VICTOR CO DIV  
1515 INDUSTRIAL BL BELMONT CALIF  
THAYER SCALE CORP 518 SANDSTRAND CORP  
PERBROKE MASS  
THER ELECTRIC & MACHINE CO  
17 S JEFFERSON ST CHICAGO 6 ILL  
THER MERCOID CORP  
4201 BELMONT AVE CHICAGO 41 ILL  
THERM-O-DISC INC  
MAIN ST RD MANSFIELD OHIO  
THERMADON ELECTRICAL MFG CO  
715 S RAYMOND AVE ALAMOGORA CALIF  
THERMADON ELECTRONICS DIV MORRIS THERMADON  
CORP 2000 S CAMPFIELD LOS ANGELES 22 CALIF  
THERMAL AMERICAN FUSED QUARTZ CO  
18-20 SALEM ST DOVER N J  
THERMAL CONTROLS INC  
41 RIVER ST W ARLINGTON N J  
THERMAL REFRACTORIES CORP  
4501 DELL AVE N BERGEN N J  
THERMAL WIRE OF AMERICA  
KEELERS BAY SOUTH HERO VT  
THERMAX WIRE CORP  
309 E 45TH ST NEW YORK 17 N Y  
THERMOAL  
1631 COLORADO AVE SANTA MONICA CALIF  
THERRECH ENGG CORP  
1773 LINCOLN AVE ANAHEIM CALIF  
THERMO ELECTRIC CO  
109 B ST SADDLE BROOK N J  
THERMO ELECTRIC MFG CO  
6112 HUFF ST DUBUQUE 16IA  
THERMO ELECTRON ENGG  
171 HARVEY ST LANBRIDGE MASS  
THERMO ELECTRONICS  
808 207 ANGLA IND  
THERMO MATERIALS INC  
4040 CAMPBELL AVE MENLIS PARK CALIF  
THERMO-GERAR INC  
940 FACTORY RD ADDISON ILL  
THERMOCAL INC  
1631 COLORADO AVE SANTA MONICA CALIF  
THERMOSFN INC  
375 FAIRFIELD AVE STAMFORD CONN  
THETA INSTRUMENT CORP  
320 VICTOR STREET SADDLE BROOK N J  
THETA INSTRUMENT CORP  
E PATERSON N J  
THIOKOL CHEMICAL CORP  
BRICHAM CITY UTAH  
THIOKOL CHEMICAL CORP HUNTER BRISTOL DIV  
P O BOX 27 BRISTOL PA  
THOMAS & BETTS CO INC  
36 BUTLER ST ELIZABETH 1 N J  
THOMAS & SHIMMER INC  
1120 E 23 ST INDIANAPOLIS 7 IND  
THOMAS & SONS BILLIAM  
SLOCUM AVE RIDGEFIELD N J  
THOMAS BETTS LTD  
MONTREAL QUF CANADA  
THOMAS ELECTRIC BELD  
181 PLEASANT ST LYNN MASS  
THOMAS ELECTRONICS INC  
118 9TH ST PASSAIC N J  
THOMAS ENGG CO  
4475 LANDER RD CHAGRIN FALLS OHIO  
THOMAS ENGINEERING INC D B  
367 W 7TH ST SAN PEDRO CALIF  
THOMAS INDUSTRIES WHITE DIV  
FORT ATKINSON IOWA  
THOMAS INSTRUMENT CO  
BOX 41 OSBEGR RD PHOENIX 1 N Y  
THOMAS MULD B WIE CO  
249 W HENRY ST BOOSTER OHIO  
THOMAS ORGAN CO  
8345 HAYVENHURST AVE SEPULVEDA CALIF  
THOMPSON BREWER & CO  
228 N LASALLE ST CHICAGO 10 ILL  
THOMPSON CLOCK CO M C  
BRISTOL CONN  
THOMPSON PRODUCTS INC RAYSEN CORP SUB  
3693 FOREST PARK BLVD ST LOUIS 8 M O  
THOMPSON PRODUCTS INC  
2196 CLARKWOOD RD CLEVELAND 3 OHIO

# ELECTRONIC MANUFACTURERS-A-Z

THOMPSON PRODUCTS INC DAJE TV DIV  
857 10TH ST MICHIGAN CITY IND  
THOMPSON RAMO BOOLDRIDGE  
2355 EUCLID AVE CLEVELAND OHIO  
THOMPSON RAMO BOOLDRIDGE  
801 45534 AIRPORT STA LOS ANGELES 45 CALIF  
THOMPSON RAMO BOOLDRIDGE  
8433 TALLBROOK AVE CANOGA PARK CALIF  
THOMPSON RAMO-BOOLDRIDGE  
4583 BEIDLER RD WILLOWHART OHIO  
THOMPSON-RAMO BOOLDRIDGE INC BELL SOUND DIV  
555 HARTON RD COLUMBUS 7 OHIO  
THOMPSON-RAMO-BOOLDRIDGE CORP DATA SYSTEMS  
LAB P O BOX 5073 TERMINAL ANNE DENVER 17  
COLO  
THOMPSON-RAMO-BOOLDRIDGE PROD CO  
202 A CANON DR BEVERLY HILLS CALIF  
THOMPSON-RAMO-BOOLDRIDGE INC  
1845 B 30TH ST CLEVELAND 14 OHIO  
THOMPSON CO  
209 W 3RD ST CAMERON MO  
THOMPSON INDUSTRIES INC  
1029 PLANOQUE RD RAMHASSSET N Y  
THOR CERAMICS INC  
229 BELLEVILLE AVE BLOOMFIELD N J  
THOR TRANSFORMER & ELECTRS  
750 SAN ANTONIO RD PALO ALTO CALIF  
THOR TRANSFORMER & ELECTRONICS INC  
750 SAN ANTONIO RD PALO ALTO CALIF  
THORNTON WESSMAN MFG  
77H A MILLMONT RT CARMEL ILL  
THORENS CO  
THORENS AVE NEW HYDE PARK N Y  
THREE POINT ONE FOUR CORP  
24 WOODBURN AVE YONKERS N Y  
THRING ALBERT INSTRUMENT CO  
531 PALMIST AVE PHILA 44 PA  
THIBETTS INDUSTRIES INC  
COLCORD AVE CAMDEN ME  
TICKLE ENRG WORKS ARTHUR  
21 DELAVAN ST BROOKLYN 31 N Y  
TIDERATER VIRGINIA DEV  
700 BUSH ST NEWPORT VA  
TIMBER TOP INC  
79 CONN AVE FALEPORT N Y  
TIME ELECTRONIC SALES  
373 BRADWAY NEW YORK 13 N Y  
TIME-O-MATIC INC  
P O BOX 859 1108 BANKS ST DANVILLE ILL  
TIMES FACSIMILE CORP  
540 W 58TH ST NEW YORK 19 N Y  
TIMES RIME & CABLE CO AFF INTL SILVER CO  
358 MALL AVE BALLINGFORD CONN  
TINGSTOL CO  
1401 B GRAND AVE CHICAGO ILL  
TIMMERMAN PRODUCTS INC  
DEPT 16 P O BOX 6488 CLEVELAND 1 OHIO  
TINSLEY LABS INC  
2526 BRUCE ST BERKELEY & CALIF  
TIPO MFG CO  
14760 CALVERT VAR NUYS CALIF  
TIPTONTRONIC INC  
P O BOX 306 SHARON FALLS OHIO  
TITAN METAL MFG CO DIV CERRO DE PASCO CORP  
BELLEFONTE PA  
TITANIUM ALLOY MFG DIV MATL LEAD CO  
111 BROADWAY NEW YORK 6 N Y  
TITCHENER CO INC  
67 CLINTON ST BINGHAMTON N Y  
TITELER INC  
HENDZE ST SPRINGFIELD MASS  
TKM ELECTRIC CORP  
820 LINDEN AVE ROCHESTER 10 N Y  
TODD PRODUCTS CO  
258 SHANAHAN AVE MT VERNON N Y  
TOELCO INC  
1206 CHERRY ST TOLEDO 4 OHIO  
TOKYO SHIBAWA ELEC  
TOKYO JAPAN  
TOLEDO COMMUTATOR CO  
1101 S CHESTNUT ST OBASSO MICH  
TOLEDO SCALE DIV TOLEDO SCALE CORP  
1227 TELEGRAPH RD TOLEDO 12 OHIO  
TOMAN & CO  
8700 W 47 ST LYONS ILL  
TOPATRON INC  
942 E OJAI AVE OJAI CALIF  
TOPFLIGHT CORP  
160 E 6TH AVE TOPEKA PA  
TOPP INDUSTRIES INC  
8007 BILSHIRE BLVD BEVERLY HILLS CALIF  
TOPP MFG CO  
10200 AVIATION LOS ANGELES 45 CALIF  
TOPPER MFG CO INC  
84-56 PARSONS BLVD JAMAICA 32 N Y  
TOPPING ELECTRONICS LTD P V  
84 LAIRD AVE TORONTO 17 ONTARIO CANADA  
TORIT RAMO ACTURING CO  
1135 HANKIN ST ST PAUL 16 MINN  
TORX TIME CONTROLS INC  
1 GROVE ST MT VERNON N Y  
TORGREN CO C O  
236 PEARL ST SOMERVILLE 45 MASS  
TORGOCCI CO  
1211 S CHESTNUT AVE ARLINGTON HTS ILL  
TOROTEL INC  
5512 E 110 ST KANSAS CITY 34 MO  
TORO ENGINEERED PRODUCTS INC  
32 W MONROE BEDFORD OHIO  
TORRES ENGG CO INC  
3 CAROLINE ST S HACKENSACK N J  
TORRINGTON CO  
59 FIELD ST TORRINGTON CONN  
TORRINGTON MFG CO SPECIALTY BLOWER DIV  
100 FRANKLIN DR TORRINGTON CONN  
TORSION BALANCE CO  
35 MONROEGAN ST CLIFTON N J

TORBICO ELECTRONICS INC  
1000 MORRIS AVE UNION N J  
TOUCH-PLATE MFG CORP  
P O BOX 1970 LONG BEACH 1 CALIF  
TOBACO ELECTRONICS  
PINE BROOK RD TOBAGO N J  
TOBER CONSTRUCTION CO  
2700 MARKEY DR SIOUX CITY 2 IOWA  
TOWNSEND CO  
808 238 NEW BRIGHTON PK  
TOWNSEND CO CHERRY RIVET DIV  
1224 E DELHI RD SANTA ANA CALIF  
TOWNSEND MFG CO H P  
BROOK ST W HARTFORD 10 CONN  
TOWSON LABORATORIES  
200 E JOPPA RD TOWSON 4 MD  
TOWSON LABS INC  
200 E JOPPA RD BALTIMORE MD  
TRACERLAB INC  
2030 BRIGHT AVE RICHMOND CALIF  
TRACERLAB INC  
1601 TRAPELO RD WALTHAM 54 MASS  
TRAD ELECTRONICS CORP  
1001 FIRST AVE ASBURY PARK N J  
TRAID CORP  
P O BOX 448 17136 VENTURA BLVD ENCINO CALIF  
TRAINER CORP OF AMERICA  
1255 NIAGARA STREET BUFFALO 13 N Y  
TRAK MICROWAVE CORP  
5006 N COOLIDGE AVE TAMPA FLA  
TRANCOA CHEMICAL CORP  
312-326 454 ST READING MASS  
TRANCO CO  
CAMERON & 2 ST LA CROSSE 815C  
TRANS ELECTRONICS INC  
7349 CANOGA AVE CANOGA PARK CALIF  
TRANS LUX CORP  
162 13TH ST BROOKLYN N Y  
TRANS LUX CORP  
625 MADISON AVE NEW YORK 22 N Y  
TRANS TECH INC  
P O BOX 103 ROCKVILLE MD  
TRANS-SIL CORP  
55 WOMECK ST ENGLEWOOD 4 J  
TRANS-SONICS INC  
P O BOX 128 LEWINGTON 73 MASS  
TRANS-TEL CORP  
910 W ORANGE DR LOS ANGELES 30 CALIF  
TRANS-VUE CORP  
329 MC CARTY RD BEVERLY HILLS CALIF  
TRANSCO PRODUCTS INC  
12210 NEBRASKA AVE LOS ANGELES 25 CALIF  
TRANSDATA  
1844 BRIDGEN RD PASADENA CALIF  
TRANSDUCERS INC  
2957 HONOLULU LA CRESCENTA CALIF  
TRANSDYNE CORP  
43 ALBERTSON AVE ALBERTSON N Y  
TRANSELECTRIC MFG CO  
P O BOX 335 OXFORD PA  
TRANSFORMER & ELECTRONIC SPECIALTIES  
2824 28 TERRACE ST PHILA 38 PA  
TRANSFORMER DESIGN INC OF MILWAUKEE  
7377 N 76TH ST MILWAUKEE 18 WISC  
TRANSFORMER ELECTRONICS CO  
BOULDER INDUSTRIAL PK BOULDER COLO  
TRANSFORMER ENGG  
285 N HALSTEAD PASADENA CALIF  
TRANSFORMER METAL PROOS CORP  
35 YORK ST BROOKLYN 1 N Y  
TRANSFORMER TECHNICIANS INC  
2608BN CICERO AVE CHICAGO 39 ILL  
TRANSFORMERS INC  
208 STAGS RD WESTAL N Y  
TRANSFORMERS MFG INC  
5435 N NORTHWEST HWY CHICAGO 30 ILL  
TRANSISTOR APPLICATIONS INC  
103 BROAD ST BOSTON 10 MASS  
TRANSISTOR APPLICATIONS INC  
HARRISON MAINE  
TRANSISTOR CIRCUIT ENGG CO  
804 E FILLMORE COLORADO SPRINGS COLO  
TRANSISTOR DEVICES INC  
626 SCHUYLER AVE KEARNY N J  
TRANSISTOR ELECTRONICS CO  
3357 REPUBLIC AVE MINNEAPOLIS 26 MINN  
TRANSISTOR SPECIALTIES  
TERMINAL DR PLAINFIELD N Y  
TRANSISTOR ELECTRONICS INC  
BEST RD BENNINGTON VT  
TRANSITRON ELECTRONIC CORP  
WAKEFIELD MASS  
TRANSITRON ELECTRONIC CORP  
14625 DETROIT LAKEWOOD 7 OHIO  
TRANSITRON ELECTRONIC CORP  
2300 JAMES ST SYRACUSE 6 N Y  
TRANSITRON ELECTRONIC SALES  
227 S 6TH ST CAMDEN 3 N J  
TRANSITRON ELECTRONIC SALES  
6362 HOLLYWOOD BLVD HOLLYWOOD 28 CALIF  
TRANSITRON ELECTRONICS CORP  
2310 HARTLAND AVE BALTIMORE 18 MD  
TRANSITRON INC  
188 GRANITE ST PANCHSTER N H  
TRANSITUBES  
114 LIBERTY ST NEW YORK N Y  
TRANSLAB  
6591 CLARA LEE DR SAN DIEGO 70 CALIF  
TRANSLINE ASSOCIATES  
86 PARK ST W CALDWELL N J  
TRANSLINE ELECTRONIC COMMUNICATION CO  
503 MCCARTER HWY NEBARK 2 N J  
TRANSMIT INC  
319 S SPRING ST RR 205 LA 13 CALIF  
TRANSONIC INC  
808 16 ST BAKERSFIELD CALIF

TRANSPORT PRODUCTS CORP  
3008 MAGAZINE ST LOUISVILLE 11 KY  
TRANSRADIO LTD  
138 A CROMWELL RD LONDON SW 7 ENG  
TRANSVAL ENGG  
10401 W JEFFERSON CULVER CITY CALIF  
TRANSTRON INC  
480 NORTH AVE NEW ROCHELLE N Y  
TRAVIS FABRICS  
1071 6TH AVE NEW YORK N Y  
TRENTON TRANSFORMER CORP  
P O BOX 568 822 E STATE ST TRENTON N J  
TREPAC CORP OF AMERICA  
30 W HAMILTON AVE ENGLEWOOD N J  
TRESKO INC  
3824 TERRACE ST PHILADELPHIA 28 PA  
TRG INC  
2 AERIAL BAY STYOSSETT LI N Y  
TRI EX TOWER CORP  
421 S BALMUT ST OTTAWA KAN  
TRI-DEX ELECTRONICS  
P O BOX 1207 LINDSAY CALIF  
TRI-EX TOWER CORP  
127 E INFO ST TULARE CALIF  
TRI-KRIS CO  
BALUNY & MATFIELD STS LANSDALE PA  
TRI-POINT PLASTICS INC  
175 I U WILLETS RD ALBERTSON L I N Y  
TRI-R INSTRUMENTS  
144-13 JAMAICA AVE JAMAICA 35 N Y  
TRI-TRONICS  
2607 ST CHARLES RD BELLWOOD ILL  
TRI-TRONICS LAB INC  
804 258 EULESS TEX  
TRIAD TRANSFORMER CORP DIV LITTON INDUSTRIES  
4059 REDWOOD AVE VENICE CALIF  
TRIAD TRANSFORMER LITTON  
LINDSAY CALIF  
TRICO FUSE MFG CO  
2948 N 5 ST MILWAUKEE 12 WISC  
TRICON MFG CO  
8008 BALLACE ST CHICAGO 20 ILL  
TRICRAFT PRODUCTS CORP  
1124 W NEWPORT AVE CHICAGO 22 ILL  
TRIDEA ELECTRONICS INC  
1020 MISSION ST 5 PASADENA CALIF  
TRILSCH INC JOHN D  
P O BOX 14201 HOUSTON 21 TEXAS  
TRIMM INC  
400 B LAKE ST LIBERTYVILLE ILL  
TRIPOINT INSTRUMENT CO  
3119 W LAKE ST CHICAGO 12 ILL  
TRIPOINT PLASTIC CO  
71 DUDLEY ST ARLINGTON 74 MASS  
TRINOL PRODUCTS LTD  
1807-11 S CLARK ST CHICAGO 16 ILL  
TRINITY EQUIPMENT CORP  
CORTLAND N Y  
TRIO LABS INC  
PLAINFIELD L I N Y  
TRIO MFG CO  
GRIGGSVILLE ILL  
TRION INC  
1000 ISLAND AVE NCREES ROCKS PA  
TRIONIC INDUSTRIES  
P O BOX 639 STEELTON PA  
TRIPLET & BARTON  
831 W LAKE ST P O BOX 3128 BURBANK CALIF  
TRIPLET ELEC'L INST CORP  
BOX 687 OCEANSIDE CALIF  
TRIPLET ELECTRICAL INSTRUMENT CO  
HARMON RD BLUFFTON OHIO  
TRITON MFG CO  
4000 TOWNE ST E HADDAM CONN  
TRITON  
844 N RICHARDS MILWAUKEE 12 WISC  
TRIBEC TRANSFORMER CO  
3261 MILWAUKEE CHICAGO 18 ILL  
TROJAN ELECTRONICS  
3706 N HALSTEAD ST CHICAGO 13 ILL  
TRONER INC  
6 STREET HILLVILLE N J  
TRONIC COIL WINDING CO INC  
58 BESLEY ST WATERBURY CONN  
TROT ELECTRONICS INC  
412 SMITH ST ROCHESTER 6 N Y  
TRU-CONNECTOR CORP  
416 UNION ST LYNN MASS  
TRU-OMN PRODUCTS DIV MODEL ENGG & MFG CO  
2800 N MILWAUKEE AVE CHICAGO 18 ILL  
TRU-VUE TV CO  
99 FEATHERBED LANE BROWN 92 N Y  
TRUMP DR BALTER N  
516 S VERMONT COLUMBUS KAN  
TRUTONE ELECTRONICS INC  
6812 SANTA MONICA BLVD LOS ANGELES 38  
CALIF  
TRYGON ELECTRONIC INC  
111 PLEASANT AVE ROOSEVELT L I N Y  
T T ELECTRONICS INC  
P O BOX 180 CULVER CITY CALIF  
TUB-LOK MFG CO  
4049 TRANSPORT PALO ALTO CALIF  
TUBULAR RIVET & STUD CO  
WESTON AVE WOLLASTON 70 MASS  
TULLAMORE ELECTRONICS CORP SUBSIDIARY  
VICTOREEN INSTRUMENT CO 6055 S ASHLAND AVE  
CHICAGO 36 ILL  
TUNG SOL ELECTRIC INC  
8575 WASHINGTON BLVD CULVER CITY CALIF  
TUNG SOL ELECTRIC INC  
1975 N HARTHORNE AVE MELROSE PARK ILL  
TUNG SOL ELECTRIC INC  
ONE SUMMER AVE NEBARK 4 N J  
TUNG SOL ELECTRIC INC ELECTRIC TUBE DIV  
200 BLOOMFIELD AVE BLOOMFIELD N J



# ELECTRONIC MANUFACTURERS-A-Z

TUNG-SOL ELECTRIC INC  
BOYERTOWN PA  
TUNG-SOL ELECTRIC INC  
WEATHERLY PA  
TUR-80 POWER  
424 S SAN GABRIEL BLVD SAN GABRIEL CALIF  
TURBO JET PRODUCTS INC  
424 S SAN GABRIEL BLVD SAN GABRIEL CALIF  
TURBO MACHINE CO  
LANDSDALE PA  
TURBO PRODUCTS INC  
12177 MONTAGUE ST PACOIMA CALIF  
TURKE INDL ENTERPRISES  
423 S LINCOLN ST HINSDALE ILL  
TURNER CO  
909 17 ST N E CEDAR RAPIDS IOWA  
TURNER CORP  
821 PARK AVE SYCAMORE ILL  
TUTTLE ELECTRIC PRODUCTS INC  
KIRKLAND ILL  
TUTTLE & KIFT INC  
1823 N MONITOR AVE CHICAGO 39 ILL  
TV DEVELOPMENT CORP  
187-61 HOLLIS AVE JAMAICA 23 N Y  
TV UTILITIES CORP  
112-33 COLONIAL AVE CORONA L I N Y  
TV UTILITIES CORP  
1128 OAK ST ELMIRA N Y  
TV UTILITIES CORP DIV NORD  
300 DENTON AVE NEW HYDE PARK N Y  
TWIN LOCK INC  
1024 W HILLCREST BLVD INGLEWOOD CALIF  
TYCO SEMICONDUCTOR CORP  
882-HILL RD WALTHAM MASS  
TYPHOON AIR CONDITIONING DIV HUPP CORP  
505 CARROLL ST BROOKLYN 15 N Y

**U**

U B S CHEMICAL CORP  
491 MAIN ST CAMBRIDGE 42 MASS  
UCINITE CO DIV UNITED CARR FASTENER CORP  
459 WATERTOWN ST NEWTONVILLE 60 MASS  
ULTRA CINE MACHINE CO  
15742 WYOMING AVE DETROIT 38 MICH  
ULANET CO GEORGE  
413 MARKET ST NEWARK 5 N J  
ULMER CO H W  
P O BOX 486 2941 SAN LUIS REY RD  
OCEANSIDE CALIF  
ULTEC CORP  
920 COMMERCIAL ST PALO ALTO CALIF  
ULTRA ELECTROFORMING & MFG CO  
110 CEDAR AVE PITMAN 15 N J  
ULTRA-VIOLET PRODUCTS INC  
5114 WALNUT GROVE AVE SAN GABRIEL CALIF  
ULTRADYNE INC  
P O BOX 3308 ALBUQUERQUE NEW MEX  
ULTRASONIC CORP  
640 MEMORIAL RD CAMBRIDGE 39 MASS  
ULTRASONIC ENGG CO  
618 LAKE ST MAYWOOD ILL  
ULTRASONIC INDUSTRIES INC  
141 ALBERTSON AVE ALBERTSON LI N Y  
ULTRASONIC MACHINING CO  
1015 ASBURY AVE ASBURY PARK N J  
ULTRAUDIO DIV OBERLINE INC  
P O BOX 921 BEVERLY HILLS CALIF  
ULTRAVISION MFG CO  
185 GOFFLE RD HAWTHORNE N J  
ULTRONIX INC  
111 E 20TH AVE SAN MATEO CALIF  
ULTRAWKS SOCKET SCREW CO LTD  
BURNBURY RD COVENTRY ENGLAND  
UNDERGROUND PHOTOGRAPHIC  
2 TURBER DR RANDOLPH MASS  
UNDERWOOD CORP  
57 ARBOR ST HARTFORD 8 CONN  
UNDERWOOD CORP  
ALBERTSON AVE ALBERTSON N Y  
UNDERWOOD CORP  
1008 BELMONT AVE SECANE PA  
UNDERWOOD CORP CANOGA DIV  
150 EGLIN HWY FT WALTON BEACH FLA  
UNDERWOOD-CANOVA DIV  
15330 ORNARD ST VAN NUYS CALIF  
UNGAR ELECTRIC TOOLS ELECTRONIC DIV ELDON  
INDUSTRIES INC 1475 E EL SEGUNDO BLVD  
HAWTHORNE CALIF  
UNIBAR ELECTRIC TOOLS INC  
4101 REDWOOD AVE LOS ANGELES 66 CALIF  
UNI-FORM ELECTRONICS  
NEW YORK N Y  
UNIFORM INC  
NEW YORK N Y  
UNIFORM TUBES INC  
LEVEL RD COLLEGEVILLE 2 PA  
UNILECTRIC INC  
405 S 6TH ST MILWAUKEE W WISC  
UNIMATIC MFG CORP  
SHERWOOD LANE CALDWELL N J  
UNIMAX SWITCH DIV W L MAXSON CORP  
IVES ROAD WALLINGFORD CONN  
UNION CARBIDE CHEMICAL CO DIV OLEFINS CO  
SPECIAL INSTRUMENTATION SOUTH CHARLESTON  
3 W V A  
UNION CARBIDE CONSUMER PRODUCTS CO  
270 PARK AVE NEW YORK 17 N Y  
UNION CARBIDE CORP SILICONES DIV LONG REACH  
SILICONES PLANT P O BOX 18 OSISTERVILLE  
W VA  
UNION CARBIDE CORP SILICONES DIV  
30 E 42 ST NEW YORK 17 N Y  
UNION CARBIDE METALS CO FINE METALS & CHEM  
808 290 NIAGARA FALLS N Y

UNION CARBIDE METALS CO  
270 PARK AVENUE NEW YORK 17 N Y  
UNION CARBIDE PLASTIC CO  
LIBRARY BLDG 200 BOUND BROOK N J  
UNION ELECTRIC & MFG CO  
1057 SUMMIT AVE JERSEY CITY 7 N J  
UNION ELECTRONICS & MACHINE CORP  
71 BROADWAY WAKEFIELD MASS  
UNION ROTARY CORP  
1104 N MISSION ST HT PLEASANT MICH  
UNION SWITCH & SIGNAL DIV  
1789 1807 BRADDOCK AVE SWISSVALE P D  
PITTSBURGH 18 PENNA  
UNION THERMOELECTRIC CORP  
2001 GREENLEAF ST EVANSTON ILL  
UNION THERMOELECTRIC CORP  
5600 JARVIS AVE CHICAGO 48 ILL  
UNION THERMOELECTRIC CORP  
7212 CIRCLE AVE FOREST PARK ILL  
UNIQUE WIRE WEAVING CO INC  
276 RANNEY AVENUE HILLSIDE N J  
UNISTRUT PRODUCT CO  
933 W WASHINGTON BLVD CHICAGO ILL  
UNIT PROCESS ASSEMBLIES INC  
61 E 4 ST NEW YORK 3 N Y  
UNITED AIRCRAFT  
400 MAIN HARTFORD CONN  
UNITED AIRCRAFT  
HAMILTON STANDARD BROAD BROOK CONN  
UNITED AIRCRAFT CORP  
HAMILTON STANDARD WINDSOR LOCKS CONN  
UNITED AIRCRAFT CORP  
NORDEN DIV HAMILTON AVE WHITE PLAINS N Y  
UNITED AIRCRAFT CORP  
STRATFORD CONN  
UNITED AIRCRAFT CORP NORDEN DIV  
WILEY ST MILFORD CONN  
UNITED AIRCRAFT CORP NORDEN DIV  
COMMERCE RD STAMFORD CONN  
UNITED AIRCRAFT CORP SIKORSKY AIRCRAFT DIV  
SOUTH AVE BRIDGEPORT CONN  
UNITED AIRCRAFT NORDEN DIV  
311 W MONROE ST NEW YORK 2 OHIO  
UNITED AIRCRAFT PRATT & WHITNEY AIRCRAFT DIV  
CANEL OPERATIONS MIDDLETOWN CONN  
UNITED AIRCRAFT PRATT & WHITNEY AIRCRAFT  
400 MAIN ST EAST HARTFORD CONN  
UNITED AIRCRAFT PRODUCTS INC  
1118 BOLANDER AVE DAYTON 8 OHIO  
UNITED AIRCRAFT PRODUCTS INC  
50 E 42ND ST NEW YORK 17 N Y  
UNITED AIRCRAFT-NORDEN DIV  
JERICHO TPKE & LARKFIELD RD COMACK LI N Y  
UNITED AIRCRAFT-NORDEN DIV  
CHESTER ST ANSONIA CONN  
UNITED AUDIO PRODUCTS INC  
202 E 15 ST NEW YORK 5 N Y  
UNITED CARBON PRODUCTS CO  
1310 N MADISON ST BAY CITY MICH  
UNITED CARR FASTENER CO  
31 AMES ST CAMBRIDGE 42 MASS  
UNITED CARR FASTENER UCINITE DIV  
459 WATERTOWN ST NEWTONVILLE MASS  
UNITED CONTROL CORP  
4540 UNION BAY PL SEATTLE 5 WASH  
UNITED CONTROL INC  
11-4 WESTVIEW AVE WHITE PLAINS N Y  
UNITED ELECTRIC CONTROLS CO  
85 SCHOOL ST WATERTOWN 72 MASS  
UNITED ELECTRODYNAMICS  
200 ALLENDALE AVE PASADENA CALIF  
UNITED ELECTRONIC MFG CORP  
542 39 ST UNION CITY N J  
UNITED ELECTRONICS CO  
42 SPRING ST NEWARK 4 N J  
UNITED ELECTRONICS LABS INC  
3947 PARK DR LOUISVILLE 16 KY  
UNITED ENGINEERS INC  
824 E 4TH ST OKLA 20 OKLA  
UNITED FABRICATORS & ELECTRONICS INC  
MYRTLE & WATER STS STILLWATER MINN  
UNITED GEOPHYSICAL CORP  
BOX M PASADENA 15 CALIF  
UNITED IN'L DYNAMICS  
373 LONG BEACH RD OCEANSIDE N Y  
UNITED INSTRUMENT CORP  
1650 19TH ST SANTA MONICA CALIF  
UNITED INTL DYNAMICS CORP  
373 LONG BEACH RD OCEANSIDE LI N Y  
UNITED MFG CO  
3401 N CALIFORNIA AVE CHICAGO 18 ILL  
UNITED MFG CO DIV W L MAXSON CORP  
41 HAIG ST BOSTON 7 MASS  
UNITED MINERAL & CHEMICAL CORP  
16 HUDSON ST NEW YORK 13 N Y  
UNITED PRODUCTS CO  
165 FRANKLIN AVE NUTLEY 10 N J  
UNITED RESEARCH LAB  
681 FIFTH AVE NEW YORK 22 N Y  
UNITED SCIENTIFIC LABS  
35-15 37TH AVE LONG ISLAND CITY I N Y  
UNITED SCREW & BOLT CORP  
2513 W CULLERTON ST CHICAGO 8 ILL  
UNITED SHOE MACHINERY CO  
RIVER ROAD SHELTON CONN  
UNITED SHOE MACHINERY CORP  
140 FEDERA ST BOSTON 7 MASS  
UNITED SPEAKER SYSTEMS INC  
32 NEWARK ST NEWARK 3 N Y  
UNITED STATES TIME CORP  
76 N BROADWAY IRVINGTON N Y  
UNITED TESTING LABS  
575 MONTEREY PASS RD MONTEREY PARK CALIF  
UNITED TRANSFORMER CORP  
150 VARICK ST NEW YORK 13 N Y  
UNITED TRANSFORMER CORP PACIFIC DIV  
4008 W JEFFERSON BLVD LOS ANGELES 16 CALIF

UNITED WIRE & SUPPLY CORP  
1497 ELWOOD AVE PROVIDENCE 7 R I  
UNITEK CORP  
265 N HALSTEAD AVE PASADENA 8 CALIF  
UNIVERSAL CIRCUIT CONTROLS  
3610 DARTON ST SKOKIE ILL  
UNIVERSAL CLAY PRODUCTS CO  
1528 E 1 ST SANDUSKY OHIO  
UNIVERSAL CONDENSER CO  
3635 N KIMBALL AVE CHICAGO 18 ILL  
UNIVERSAL DRAFTING MACHINE CORP  
7960 LORAIN AVE CLEVELAND 2 OHIO  
UNIVERSAL ELECTRIC CO  
300 E MAIN ST OSSOSO MICH  
UNIVERSAL ELECTRONICS CO  
1720 22 ST SANTA MONICA CALIF  
UNIVERSAL INDUSTRIAL EQUIPMENT CORP  
1625 PATERSON PLANK RD SECAUCUS N J  
UNIVERSAL WATCH CORP AVIONICS DEPT  
4807 COOK AVE ST LOUIS 13 MO  
UNIVERSAL WFG CO  
HILLSIDE N J  
UNIVERSAL WFG CO INC  
1168 GROVE ST IRVINGTON 11 N J  
UNIVERSAL MICROPHONE CO  
80X 55 INGLEWOOD CALIF  
UNIVERSAL MICROWAVE CORP  
1172-E1 GROVE ST IRVINGTON N J  
UNIVERSAL MOTOR CO  
1552 HARRISON ST OSMOSH WISC  
UNIVERSAL PRODUCTS ENGG CO  
4100 TAYLOR AVE RACINE WISC  
UNIVERSAL REBUILDERS INC  
11 BLEEKER ST ALBANY N Y  
UNIVERSAL RELAY CORP  
42 WHITE ST NEW YORK 13 N Y  
UNIVERSAL SCIENTIFIC CO INC  
1102 SHELBY ST VINCENNES IND  
UNIVERSAL SHELLAC & SUPPLY CO  
540 IRVING AVE BROOKLYN 27 N Y  
UNIVERSAL SYS ENGRNG  
90457 INTL A/P LOS ANGELES 45 CALIF  
UNIVERSAL TOROID COIL WINDINGS  
171 COIT ST IRVINGTON N J  
UNIVERSAL TRANSISTOR PRODUCTS CORP  
36 SYLVESTER ST WESTBURY L I N Y  
UNIVERSAL X-RAY PRODS  
1140 N WESTERN AVE CHICAGO 22 ILL  
UNIVERSITY LOUDSPEAKERS INC  
80 S KENSICO AVE WHITE PLAINS N Y  
UNIVOX CORP  
4301 W JEFFERSON BLVD LOS ANGELES CALIF  
UNIVOX CORP  
102 WARREN ST NEW YORK 7 N Y  
UNIWAVE INC  
109 MARTINE ST FARMINGDALE N Y  
U S & C TRANSPORT INC  
457 W FORT ST DETROIT MICH  
U S CHEMICAL MILLING CORP  
1700 ROSECRANS AVE MANHATTAN BEACH CALIF  
U S COMPONENTS  
454 E 148TH ST NEW YORK 55 N Y  
U S CONTROLS INC  
410 4TH AVE BROOKLYN 15 N Y  
U S DYNAMICS CORP  
1250 COLUMBUS AVE BOSTON 20 MASS  
U S DYNAMICS INC  
10 DEDHAM ST MERTON HIGHLANDS 81 MASS  
U S ELECTRICAL MOTORS INC  
200 E SCLAUSON AVE LOS ANGELES 34 CALIF  
U S ENGINEERING CO DIV LITTON INDUSTRIES  
13536 SATICOY ST VAN NUYS CALIF  
U S GAUGE DIV AMERICAN MACHINE & METALS  
SELLERSVILLE PA  
U S GEAR CORP  
81 BAY STATE RD WAKEFIELD MASS  
U S GRAPHITE CO DIV WICKES CORP  
1621 HOLLAND AVE SAGINAW MICH  
U S INSTRUMENT CORP  
P O BOX 1191 CHARLOTTEVILLE VA  
U S I RUBODYNE CO DIV U S INDUSTRIES INC  
8411 SECOND AVE SILVER SPRING MD  
U S INDUSTRIES INC  
POMPADOR BEACH FLA  
U S PLASTIC MOLDING CORP  
150 CARLTON ST WALLINGFORD CONN  
U S PLASTIC ROPE INC  
2581 SPRING ST REDWOOD CITY CALIF  
U S PLYWOOD CORP  
55 W 44 ST NEW YORK 36 N Y  
U S RADIATOR CORP PLASTIC METALS DIV  
221 CENTRAL AVE JOHNSTOWN PA  
U S RADIUM CORP  
WHIPPANY N J  
U S RADIUM CORP  
5420 VINELAND AVE N HOLLYWOOD CALIF  
U S RADIUM CORP  
MORRISTOWN N J  
U S RADIUM CORP  
BLOOMSBURG PENNA  
U S RECORDING CO  
1347 S CAPITOL ST WASHINGTON 5 D C  
U S RELAY ELECTRONICS  
717 N CONEY AZUSA CALIF  
U S RUBBER CO  
1230 AVE OF THE AMERICAS NEW YORK 20 N Y  
U S SCIENCE CORP  
5221 W 102 ST LOS ANGELES 45 CALIF  
U S SEMICONDUCTOR PRODUCTS  
3540 W OSBORN RD P O BOX 11098 PHOENIX  
ARIZ  
U S STEEL CORP  
525 WILLIAM PENN PL PITTSBURGH 30 PA  
U S STONEWARE CO  
EAST AVE TALLMADE OHIO

## ELECTRONIC MANUFACTURERS-A-Z

U S TAXIMETER CORP  
516 W 54 ST NEW YORK 19 N Y  
U S TESTING CO  
1415 PARK AVE HOBOKEN N J  
U S TIME CORP  
375 PARK AVE NEW YORK 22 N Y  
U S TIME CORP  
WATERBURY CONN  
U S TIME CORP GYRO DIV  
375 PARK AVE NEW YORK 22 N Y  
U S TRANSISTOR CORP  
349 ELIEN WAY SYOSSET N Y  
U S WIRE & CABLE CORP  
PROGRESS & HOWRDE ST UNION N J  
UTAH RADIO CORP  
1124 E FRANKLIN ST HUNTINGTON IND  
UTECHNICS  
9958 STATE ST HURRAY UTAH  
UTICA DROP FORGE & TOOL DIV KELSEY-HAYES CO  
2415 WHITESBORO ST UTICA 4 N Y  
UTILITIES SERVICE CO  
1 PINE ST ALLENTOWN PA  
UTILITY BRASS & COPPER CORP  
255 CONOVER ST BROOKLYN 31 N Y  
UTILITY METAL PRODUCTS CO INC  
117 ELLIOTT ST BEVERLY MASS  
UTRAID CORP DIV LITTON IND  
305 N BRIANT ST HUNTINGTON IND

## V

VACAP CORP  
1905 SUMMIT AVE UNION CITY N J  
VACO PRODUCTS CO  
317 E ONTARIO ST CHICAGO 11 ILL  
VACUDENT MFG CO  
975 E 5 ST S SALT LAKE CITY 2 UTAH  
VACUUM ELECTRONIC CORP  
KENILWORTH N J  
VACUUM EQUIPMENT CO N AIR BRAKE CO  
1325 ADMIRAL WILSON BLVD CAMDEN N J  
VACUUM SPECIALTIES CO  
34 LINDEN ST SOMERVILLE MASS  
VACUUM TUBE PRODUCTS DIV HUGHES AIRCRAFT CO  
2020 SHORT ST OCEANSIDE CALIF  
VALANDY ELECTRONICS CORP  
61-35 166 ST FLUSHING 68 N Y  
VALCO MFG CO  
4700 W WALTON ST CHICAGO 51 ILL  
VALCOR ENG CORP  
365 CARNEGIE AVE KENILWORTH N J  
VALLORBS JEWEL CO  
P O BOX 958 LANCASTER PA  
VALOR ELECTRONICS CO  
13214 CRENSHAW BLVD GARDENIA CALIF  
VALPEY CRYSTAL CORP  
2040 HIGHLAND ST HOLLISTON MASS  
VALVERDE LABS  
252 LAFAYETTE ST NEW YORK 12 N Y  
VAN NORMAN INDUSTRIES INC ELECTRONICS DIV  
180 GRANITE ST MANCHESTER N H  
VAN NOSTRAND CO  
120 ALEXANDER ST PRINCETON N J  
VANGUARD ELECTRONICS CO  
3384 MOTOR AVE LOS ANGELES 34 CALIF  
VANITY FAIR ELECTRONICS  
50 S 4 ST BROOKLYN 11 N Y  
VANKEUREN CO  
175 WALTHAM ST WATERLOO 72 MASS  
VANTON PUMP EQUIPMENT CORP  
201 SWEETLAND AVE HILLSIDE 5 N J  
VAPOR HEATING CORP  
6420 W HOWARD ST CHICAGO 31 ILL  
VAPOR HEATING CORP  
NILES ILL  
VAPOR RECOVERY SYSTEMS CO  
2820 NORTH ALAMEDA ST COMPTON CALIF  
VAR-LAC-OID CHEMICAL CO  
116 BROAD ST NEW YORK 4 N Y  
VARO INC  
2981 E COLORADO PASADENA 8 CALIF  
VARE INDUSTRIES  
128 W FIRST AVE ROSELLE N J  
VARE MFG CO INC  
2201 WALNUT GARLAND TEXAS  
VARIFLEX CORP  
511 W COURT ST POME N Y  
VARI TECH CO  
546 W LEONARD GRAND RAPIDS 4 MICH  
VARI-L CO  
435 FAIRHAM AVE STAMFORD CONN  
VARIAN ASSOCIATES  
611 HANSEN BAY PALO ALTO CALIF  
VARITYPER CORP  
720 FRELINGHUYSEN AVE NEWARK 12 N J  
VARO MFG CO  
2201 WALNUT ST GARLAND TEXAS  
VARO MFG CO  
14801 CHEVY CHASE DALLAS 25 TEXAS  
VECTOR ASSOC  
139-34 - 34TH RD FLUSHING 54 N Y  
VECTOR ELECTRONIC CO  
1100 FLOWER ST GLENDALE 1 CALIF  
VECTOR MFG CO  
KEYSTONE RD SOUTH HAMPTON PA  
VELTON MFG CO  
P O BOX 18212 HOUSTON 23 TEX  
VECTOR TECHNICAL SERVICES  
86-83 102ND ST RICHMOND HILL 18 L I N Y  
VECTROL ENGB INC  
P O BOX 1089 STAMFORD CONN  
VECTRON INC  
1811 TRAPELO RD WALTHAM 54 MASS  
VEECO VACUUM CORP  
96 DENTON AVE NEW HYDE PARK N Y

VEEDER ROOT INC  
HARTFORD 2 CONN  
VEEDER ROOT INC  
83 ELK ST DANVERS MASS  
VEGA ELECTRONICS CORP  
10784 N HWY 9 CUPERTINO CALIF  
VELCRO SALES CORP INDUSTRIAL SALES  
681 FIFTH AVE NEW YORK 22 N Y  
VELDEN ELECTRIC CO  
2110 W ROSCOE ST CHICAGO 18 ILL  
VENDO CO  
7400 E 12TH ST KANSAS CITY 26 MO  
VENNER ELECTRONICS LTD  
KINGSTON BY-PASS NEW MALDEN SURREY ENGLAND  
VERD-A-RAY CORP  
615 FRONT ST TOLEDO 5 OHIO  
VERMALINE PRODUCTS CO  
P O BOX 223 HAWTHORNE NJ  
VERNER ELECTRONIC PRODS CO  
87 GARRABANT AVE BLOOMFIELD N J  
VERNISTAT DIV PERKIN ELMER CORP  
EMERALD ST NORWALK CONN  
VERNITRON CORP  
1742 S CRENSHAW BLVD TORRANCE CALIF  
VERNITRON CORP  
129 OLD COUNTRY RD CARLE PLACE L I N Y  
VERSAILLES PRODUCTS DIV METALS & CONTROLS  
CORP 300 N MAIN VERSAILLES KY  
VERTOL AIRCRAFT CORP  
MORTON PA  
VESTO CO  
20 & CLAY STS N KANSAS CITY 18 MO  
VIBRA SEAL CORP  
2832 E GRAND BLVD DETROIT 11 MICH  
VIBRATION RESEARCH LABS INC  
58 HARBLEDALE RD TUCKAHOE NY  
VICKERS INC  
3201 LOMITA BLVD TORRANCE CALIF  
VICKERS INC ELECTRIC PRODUCTS DIV  
1887 LOCUST ST ST LOUIS 3 MO  
VICKERS INC MACHINERY HYDRAULICS DIV  
1400 GAKMAN BLVD DETROIT 32 MICH  
VICOM INC  
1353 MESITA RD COLORADO SPRINGS COLO  
VICTOR ADDING MACHINE CO  
3900 N ROCKWELL ST CHICAGO 18 ILL  
VICTOR ELECTRIC WIRE & CABLE CORP  
618 MAIN ST W WARWICK R I  
VICTOR GLOVES  
69 E 21ST ST NEW YORK N Y  
VICTOR MANUFACTURING CO  
5616 LANDALE HOUSTON 23 TEXAS  
VICTOR RF & MICROWAVE CO  
36 W WATER ST WAKEFIELD MASS  
VICTOREEN INSTRUMENT CO  
5806 HOUGH AVE CLEVELAND 3 OHIO  
VICTORY ELECTRONICS INC  
90 BOND ST WESTBURY L I N Y  
VICTORY ENGG CO  
121 SPRINGFIELD RD UNION N J  
VICTORY ENGRG CORP  
103A SPRINGFIELD RD UNION N J  
VICTORY MFG CORP  
1722-1724 W ARCADE PL CHICAGO 12 ILL  
VIDAINE ELECTRONICS MFG CORP  
44 CHURCH ST BALDWIN N Y  
VIDAR CORP  
2246 MORA DR MOUNTAIN VIEW CALIF  
VIDEO ACCESSORY MFG CO  
P O BOX 223 TULSA 1 OKLA  
VIDEO ELECTRONICS MFG CO INC  
8101 UNIVERSITY DES MOINES IOWA  
VIDEO INDUSTRIES CO  
242 MADISON AVE PORT CHESTER NY  
VIDEO INSTRUMENT CO INC  
3002 PENNSYLVANIA AVE SANTA MONICA CALIF  
VIDEOCRAFT MFG CO  
5720 W ARMITAGE AVE CHICAGO 39 ILL  
VIDEO ELECTRONICS CORP  
952 E MICHIGAN ST INDIANAPOLIS IND  
VIDYA INC  
2624 HANOVER ST PALO ALTO CALIF  
VIKING INDUSTRIES INC  
21343 ROSCOE BLVD CANOGA PARK CALIF  
VIKING INSTRUMENTS INC  
EAST HADDAM CONN  
VIKING OF MINN  
9600 ALDRICH AVE S MINNEAPOLIS 20 MINN  
VIKING PUMP CO  
4 & VAN TASSEL STS CEDAR FALLS IOWA  
VIKING TOOL & MACHINE CORP  
20 MAIN ST BELLEVILLE N J  
VIKING WIRE CO INC  
P O BOX 104 DANBURY CONN  
VINCO ELECTRONICS CORP  
65 WALLACE ST NEW HAVEN CONN  
VINELAND ELECTRONIC MFG  
6127 VINELAND AVE NO HOLLYWOOD CALIF  
VINSON CO E R  
1401 ALL CORP  
VINSON ENGG & SALES CORP  
8644 WOODLEY AVE VAN NUYS CALIF  
VIRGINIA ELECTRONICS CO  
RIVER RD & B & O R R WASHINGTON 16 D C  
VIRGINIA FLAK COMPANY  
270 MADISON AVE NEW YORK 16 N Y  
VIS U ALL CORP  
5643 W NORTH AVE CHICAGO ILL  
VIS-U-ALL PRODUCTS CO  
303 FULLER AVE N E GRAND RAPIDS 3 MICH  
VISKING CO  
P O BOX 1410 TERRE HAUTE IND  
VITRAMON INC  
BOX 544 BRIDGEPORT 1 CONN  
VITRO CHEMICAL CO  
261 MADISON AVE NEW YORK 16 N Y

VITRO ELECTRONICS DIV VITRO CORP OF AMERICA  
919 JESUP BLAIR DR SILVER SPRING MD  
VITRO LABORATORIES  
200 PLEASANT VALLEY WAY WEST ORANGE N J  
VITROSEAL CORP  
RACE & VINE STRS RIDGWAY PA  
V-M CORP  
305 TERRIOTIAL P O BOX 659 BENTON HARBOR MICH  
VOAK ENG CO  
129 EAST A ST UPLAND CALIF  
VOCALINE CO OF AMERICA  
COULTER ST OLD SAYBROOK CONN  
VOGUE FILM PRODUCTIONS ADMINISTRATION BLDG  
LOUISVILLE KY  
VOI-SHAN ELECTRONICS  
13259 SHERMAN WAY NORTH HOLLYWOOD CALIF  
VOKAR PRODUCTS INC  
201 CATHERINE ST ANN ARBOR MICH  
VOLDERS & SCHAFFER MFG CORP  
2315 2ND AVE SCHENECTADY N Y  
VOLK RADIOCHEMICAL CO  
5412 N CLARK ST CHICAGO 40 ILL  
VOLKERT STAMPINGS INC  
222-34 96 AVE QUEENS VILLAGE 29 N Y  
VOLTA MFG CO  
1934 W NORTH AVE CHICAGO ILL  
VOLTRON PRODUCTS  
1020 S ARROYO PARKWAY PASADENA CALIF  
VOLVUBE CORP  
LINCOLN HWY MENLO PARK N J  
VORAC CO  
147 MEADOW RD RUTHERFORD N J  
VORON & CO GEORGE  
635 N 19 ST PHILADELPHIA 30 PA  
VOUGHT CO  
P O BOX 1350 8907 MELROSE AVE BEVERLY  
CORP 300 N MAIN VERSAILLES KY  
VULCAN ELECTRIC CO  
88 HOLTEN ST DANVERS MASS  
VULCAN-TV MAST & TOWER CO INC  
RD BOX 6537 BIRMINGHAM 7 ALA  
VALTEL INC  
SUPV PROD ENGRG WATERTOWN WISC

## W

WAAGE ELECTRIC INC  
720 COLFAX AVE KENILWORTH N J  
WABASH METAL PRODUCTS CO  
1569 MORRIS ST WABASH IND  
WABER ELECTRONICS INC  
HANCOCK & SOMERSET STS PHILA 33 PA  
WALINE INC  
35 S ST CLAIR ST DAYTON 2 OHIO  
WACO INC  
2032 BROADWAY SANTA MONICA CALIF  
WADE ELECTRIC PRODUCTS CO  
BOX 271 STURGIS MICH  
WADSWORTH MFG ASSOC  
1509 BALSAM ST LIVERPOOL N Y  
WAGNER CO H &  
14707 KESWICK ST VAN NUYS CALIF  
WAGNER ELECTRIC CORP  
6454 PLUMOUTH AVE ST LOUIS MO  
WAHLGREN MAGNETICS  
1900 WALKER AVE MONROVIA CALIF  
WAHNET ALLOYS CO  
5320 GAKMAN BLVD DEARBORN 2 MICH  
WALD ELECTRONICS  
3395 RESERVOIR OVAL NEW YORK N Y  
WALDES KSHINDOR INC  
47-16 AUSTE PL LONG ISLAND CITY 1 N Y  
WALDMAN & SONS JOSEPH  
133 COIT ST IRVINGTON 11 N J  
WALDOH ELECTRONICS INC  
4625 W 53 ST CHICAGO 32 ILL  
WALDORF CONTROLS CORP  
129-07 18TH AVE COLLEGE POINT L I 56 N Y  
WALDORF ELECTRONICS & DIV F C HUYCK & SONS  
PARK AVE HUNTINGTON STA N Y  
WALDORF INSTRUMENT CO  
31 ROOSEVELT AVE GLENHEAD N Y  
WALES STRIPPIT INC UNIT OF HOUDAILLE IND INC  
AKRON N Y  
WALKER CO GEORGE  
119 AMSTERDAM AVE PASSAIC N J  
WALKER CO J H  
1209 SO RECORD AVE LOS ANGELES 23 CALIF  
WALKIRY CO  
141 W HAZEL ST INGLEWOOD 3 CALIF  
WALL MFG CO P  
ERIC ST GROVE CITY PA  
WALLIN OPTICAL SYSTEMS INC  
18670 VENTURA BLVD TARZANA CALIF  
WALLINGFORD STEEL CO  
VALLEY ST WALLINGFORD CONN  
WALLSON ASSOC INC  
35 E RUNYON ST NEWARK 8 N J  
WALLSON ASSOCIATES INC  
913 WESTFIELD AVE ELIZABETH N J  
WALSCO ELECTRONICS MFG CO  
100 W GREEN ST ROCKFORD ILL  
WALTHAM ELECTRONICS CORP  
751 MAIN ST WALTHAM MASS  
WALTHAM HOROLOGICAL CORP  
395 LYNNWAY LYNN MASS  
WALTHAM PRECISION INSTRUMENT  
221 CRESCENT STREET WALTHAM 54 MASS  
WALTHAM SCREW CO  
77 RUMFORD AVE WALTHAM 54 MASS  
WALTON TOOL & DIE CO  
2707 EMPIRE AVE BURBANK CALIF  
WANG LABS INC  
12 HURON DRIVE NATICK MASS  
WARD ASSOCIATES  
2926 BALVOA AVE SAN DIEGO 9 CALIF

## The ELECTRONIC INDUSTRIES Marketing Assistance Program

# MAP

MARKETING ASSISTANCE PROGRAM

The ELECTRONIC INDUSTRIES' Marketing Assistance Program was the first such project to be offered to electronic manufacturers. At present, it consists of seven aids. Each an industry first, and, each has proven its worth countless times.

### Census of Electronic Plants

Coded into over 40,000 IBM cards are company names and addresses; number of employees; number of electronic engineers; telephone numbers; state, city and metropolitan area code; plus other pertinent data.

### Electronic Industries Marketing Map

This is the first map of its kind designed specifically for the electronic industry. Some of the outstanding features which make this map so unique are:

1. A county breakdown of electronic plant locations in the United States.
2. A detailed description of eight major marketing areas.
3. A distribution of electronic engineers and plant locations in the most concentrated States.
4. Four color codes which pinpoint the distribution of plants in the United States.

### Electronic Industries Marketing Guide

A 376 page book giving you name, city and state, ELECTRONIC INDUSTRIES Classification Codes for major products produced at reporting locations, plant size code, etc.

The listings are not intended for direct mail purposes; they were developed to enable companies selling to the electronic industries to: (1) pinpoint prospects (2) plot sales territories and other applications devoted to marketing problems.

### Electronic Industries Market Studies

The Electronic Industries Research Department consists of a headquarters staff headed by an industry experienced expert. Also available are the service of over 250 strategically located, experienced field investigators.

Surveys are conducted through personal interviews or mail questionnaires, single or in combination.

Electronic Industries research facilities are continually being used by major companies and their agencies in determining among other things:

- Sales potentials by industry and by territory
- Buying Influences
- Product recognition and company acceptance
- Standing of competitors
- Product Applications
- Buyer job interests and attitudes

### Electronic Industries Inquiry Processing Program

Of all publications in its field, only "EI" utilizes the services of a Computer Center for the processing of inquiries and compilation of market research statistics.

With hundreds of thousands of inquiries stored in "Univac" we can:

- Evaluate Readership Potentialities
- Study New Product Potentialities
- Find Product Areas of Greatest Interest
- Analyze Readership Geographically or by Titles

### Plus

Profile of Today's Electronic Engineers  
Starch Reports.



ELECTRONIC INDUSTRIES magazine—a Chilton Publication—is the pioneer and leader in the producing of marketing assistance tools for companies serving the electronic original equipment market. This pioneering is now backed by years of experience and has produced the aids pictured above. A brief description of these and other marketing tools are found at your left.

## What's the Size of Your Stake in America's Fastest Growing Market!

How do you determine potential for your share in the electronic original equipment market? How do you analyze sales performances, establish territories, or explore new markets? How do you pinpoint good prospects, etc.?

Advertisers and agency men have been learning ways to get the answers to these questions in a series of marketing meetings conducted by "EI" Marketing Manager, Don Moran, and each of the "EI" sales representatives.

### Information Available

If you didn't attend one of the meetings and would like similar marketing assistance, you can get it from the brochure, "ELECTRONIC INDUSTRIES Marketing Assistance Program."

This brochure highlights the seven major tools developed by "EI" to pinpoint your market to the electronic industry. And indicates various ways they can help your marketing program.

These marketing assistance aids were developed and are maintained at a cost well over hundreds of thousands of dollars. Each is an industry first, and, each has proven its worth countless times.

### \$14 Billion Growth in Next 5 Years

If you are typical of the firms selling to the electronic original equipment market, your stake has increased from \$2.6 billion to over \$10.2 billion during the period 1950 to 1959 . . . and will reach \$24 billion by 1965 according to ELECTRONIC INDUSTRIES estimates.

To keep step with the dynamic industry it serves, "EI" is building a library of vital reference data, marketing statistics, and case history reports. Let ELECTRONIC INDUSTRIES' Marketing Manager or your "EI" sales representative advise you on how to use our IBM facilities or Univac at the Computer Center to probe the electronic market.

### Electronic Industries Marketing Assistance Program Can Help You

The first step you can take is to write—on your company letterhead—to D. J. Moran, Marketing Manager, and ask for the "EI" Marketing Assistance Brochure. Further details, if desired, will be explained to you by either Don or the "EI" sales representative serving your area. Don't delay—take advantage of this offer today! Make use of the "EI" Market Assistance Program—the Key to effective electronic industry marketing.

# ELECTRONIC MANUFACTURERS-A-Z

**BARD LEONARD ELECTRIC CO**  
 MT VERNON W V  
**BARD PRODUCTS CORP**  
 EDSON ST AMSTERDAM N Y  
**BARNER & BRADY CO**  
 52-10 DOERING ST FLUSHING 54 N Y  
**BARNER ELECTRIC BRAKE & CLUTCH CO**  
 BELLEVILLE WISCONSIN  
**BARNER ELECTRIC BRAKE & CLUTCH CO**  
 INDUSTRIAL DIV BELLEVILLE WISCONSIN  
**BARNER COMPONENTS DIV EL-TRONICS INC**  
 5 IRVING ST BARRON PA  
**BARNER CORP**  
 2301 BRADY RD PITTSBURGH 12 PA  
**BARNER MFG CO**  
 NEWTON RD LITTLETON MASS  
**BARNER PLASTICS CORP**  
 BARRON PENNA  
**BARNER WIRE CO**  
 POWELL VT  
**BARRICK & CO F P**  
 CLARKSTON MICH  
**BARRICK CO CHARLES F**  
 1944 W 11 MILE RD BARKLEY MICH  
**BARSAW COIL CO**  
 SEGAL ST BARSAW IND  
**BARTRICK CORP**  
 7300 N LEHIGH AVE MILES ILL  
**BARTRICK MANUFACTURING CORP**  
 27TH & DEBORAH STS ZION ILL  
**BARTRICK MFG CORP**  
 7300 N LEHIGH AVE CHICAGO 31 ILL  
**WASHINGTON MACHINE & TOOL WORKS**  
 17111 BAYFATA BLVD MINNEAPOLIS 26 MINN  
**BASCO ELECTRIC PRODUCTS CORP**  
 2032 2ND AVE 50 ST PETERSBURG 12 FLA  
**WASTE KING CORP**  
 5550 HARBOR ST LOS ANGELES 72 CALIF  
**WATERBURY CO INC**  
 835 S MAIN ST P O BOX 1032 WATERBURY CONN  
**WATERBURY PRESSED METAL CO**  
 900 CHASE AVE WATERBURY 14 CONN  
**WATERBURY PRESSED METAL CO**  
 900 CHASE AVE  
**WATERMAN PRODUCTS CO**  
 2445 EMERALD ST PHILADELPHIA 25 PA  
**WATERS CONLEY CO INC**  
 ROCHESTER MINN  
**WATERS MFG INC**  
 801 368 50 SAUBURY MASS  
**WATERS MFG INC**  
 BOSTON POST RD WAYLAND MASS  
**WATKINS-JOHNSON CO**  
 3333 HILLVIEW AVE PALO ALTO CALIF  
**WATSON ELECTRIC MFG CO**  
 1376 FERGUSON AVE ST LOUIS 14 MO  
**WATSON INDUSTRIES**  
 110 MILLBURN AVE VENICE CALIF  
**WATSON MFG CO**  
 3700 TAYLOR ST JAMESTOWN N Y  
**WAUSH ENG G CO**  
 7842 BURNET AVE VAN NUYS CALIF  
**WAUKESHA MOTOR CO**  
 5711 W 57TH AVE WAUKESHA WISCONSIN  
**WAVE ELECTRIC DIV RAMAGE & MILLER INC**  
 3221 FLORIDA AVE RICHMOND CALIF  
**WAVEFORMS INC**  
 333 6 AVE NEW YORK 10 N Y  
**WAVEGUIDE INC**  
 1769 PLACENTIA COSTA MESA CALIF  
**WAVELINE INC**  
 P O BOX 718 CALDWELL 4 N J  
**WAVE/PARTICLE CORP**  
 P O BOX 252 MENLO PARK CALIF  
**WAVETRONICS INC**  
 ROSELAND PARK N J  
**WAYNE REAR CORP**  
 1633 RACE ST PHILA 3 PA  
**WAYNE PRODUCTIONS LES**  
 1801 W 18TH ST WICHITA 17 KAN  
**WAYNE REAR CORP**  
 GRIFFIN ST FORT WAYNE IND  
**WAYNE-GEORGE CORP**  
 1117 COMMONWEALTH AVE BOSTON MASS  
 0 INC  
**WAYNE BARRICK ST CINCINNATI 27 OHIO**  
**WEATHERHEAD CO AVIATION & ORDNANCE**  
 300 EAST 131ST STREET CLEVELAND 8 OHIO  
**WEATHERS INDUSTRIES DIV ADVANCE INDS**  
 66 E BLOUCESTER PIKE BARRINGTON NJ  
**WEBER ENGINEERING CORP**  
 P O BOX 217 INDIANAPOLIS IND  
**WEBER MANUFACTURING CO INC**  
 P O BOX 217 INDIANAPOLIS 6 IND  
**WEBER INC**  
 5610 W BLOOMINGDALE AVE CHICAGO 39 ILL  
**WEBCOR INC-ELECTRONICS DIV**  
 616 N WEDDIE CHICAGO 51 ILL  
**WEBER AIRCRAFT CORP**  
 2820 ONTARIO ST BURBANK CALIF  
**WEBSTER ELECTRIC CO**  
 1300 CLARK ST RACINE WISCONSIN  
**WEBSTER MFG CO**  
 317 ROEBLING RD S SAN FRANCISCO CALIF  
**WEBSTER MFG CO**  
 242 SHORELIN RD MILL VALLEY CALIF  
**WEBSTER SPRING CORP**  
 176 JOHNSON ST BROOKLYN 1 N Y  
**WEBESSER**  
 1900 SOUTHWEST HWY CHICAGO 46 ILL  
**WEBERLOCK CORP OF CALIF**  
 3446 SATSUMA AVE N HOLLYWOOD CALIF  
**WEIGHING & CONTROL COMPONENTS INC**  
 206 LINCOLN AVE HATBORO PENNA  
**WEINSCHEL ENGS**  
 10503 METROPOLITAN AVE KENSINGTON MD  
**WEKSLER INSTRUMENTS CORP**  
 195 E HERRICK RD FREEPORT L I N Y  
**WELCH ELECTRIC CO**  
 2778 ST VINCENT TERRACE CINCINNATI 36 OHIO  
**WELCH MFG CO**  
 1515 SEDGWICK ST CHICAGO 10 ILL  
**WELCH SCIENTIFIC CO W N**  
 1515 SEDGWICK ST CHICAGO 10 ILL

**WELCRAFT PRODUCTS CO INC**  
 234 RICHMAN AVE NEW CARLISLE IND  
**WELDRATIC DIV UNITER CORP**  
 950 ROYAL OAKS DRIVE MONROVIA CALIF  
**WELLER ELECTRIC CORP**  
 601 STONES CROSSING RD EASTON PENNA  
**WELLMAN BRONZE & ALUMINUM CO**  
 9401 WOODLAND AVE CLEVELAND 4 OHIO  
**WELLS INDUSTRIES CORP**  
 4880 TROOBY AVE N HOLLYWOOD CALIF  
**WELLS-GARDNER & CO**  
 2701 N KILDARE AVE CHICAGO ILL  
**WELSH CO INC BR M**  
 2281 INDIANA AVE CHICAGO 16 ILL  
**WELTRONIC CO**  
 19500 B E MILE RD DETROIT 19 MICH  
**WELBYN CANADA LTD**  
 1255 BRYDGES ST LONDON CANADA  
**WELBYN ELECTRICAL LABS**  
 BEDLINGTON NORTHUMBERLAND ENGLAND  
**WELBYN INTL INC**  
 3355 EDGECLIFF TERRACE CLEVELAND 11 OHIO  
**WEN PRODUCTS INC**  
 3606 NORTHWEST INC HIGHWAY CHICAGO 31 ILL  
**WENZEL PROJECT CO**  
 2311 S STATE ST CHICAGO 16 ILL  
**WERNER CO INC R D**  
 GREENVILLE PA  
**WERNER CO R D**  
 295 S AVE NEW YORK 16 N Y  
**WERNER ELECTRONICS INC**  
 BOX 111 SCOTCH PLAINES N J  
**WESCHE ELECTRIC CO B A**  
 9027 SHELLE RD CINCINNATI OHIO  
**WESCO ELECTRIC & MFG CO**  
 27 OLIVE ST GREENFIELD MASS  
**WEST BEND ALUMINUM CO**  
 WEST BEND WISCONSIN  
**WEST COAST ELECTRICAL MFG CORP**  
 233 W 116 PL LOS ANGELES 61 CALIF  
**WEST COAST ELECTRONICS**  
 9241 B 3RD ST BEVERLY HILLS CALIF  
**WEST COAST RESEARCH CORP**  
 2371 1/2 WESTWOOD BLVD LOS ANGELES CALIF  
**WEST INSTRUMENT CORP**  
 4363 N MONTROSE AVE CHICAGO 41 ILL  
**WEST VIRGINIA PULP & PAPER CO**  
 COVINGTON VA  
**WESTAMP CO**  
 11277 MASSACHUSETTS AVE B LOS ANGELES 25  
 CALIF  
**WESTBERG MFG CO**  
 144 S COOMBS ST NAPA CALIF  
**WESTBURY ELECTRONICS INC**  
 300 SHAMES DR WESTBURY N Y  
**WESTCHESTER ELECTRIC MFG CO**  
 519 S 5TH AVE MT VERNON N Y  
**WESTCLOX**  
 LA SALLE ILLINOIS  
**WESTDAM INST CO**  
 MILLINGTON N J  
**WESTERN APPARATUS CO DIV COMPOTOMETER CORP**  
 5400 W JARVIS AVE CHICAGO 48 ILL  
**WESTERN AERONAUTICS CORP**  
 4626 SANTA FE ST SAN DIEGO 9 CALIF  
**WESTERN COATING CO**  
 BOX 598 OAKRIDGE STA ROYAL DAK MICH  
**WESTERN COIL & ELECTRICAL CO**  
 215 STATE ST RACINE WISCONSIN  
**WESTERN COIL PRODUCTS CO**  
 949 COMMERCIAL ST PALO ALTO CALIF  
**WESTERN DESIGN DIV U S INDUSTRIES INC**  
 SANTA BARBARA AIRPORT GOLETA CALIF  
**WESTERN DEVICES INC**  
 600 B FLORENCE AVE INGLEWOOD 1 CALIF  
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**WESTERN ELECTRIC CO**  
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**WESTERN ELECTRIC CO**  
 100 CENTRAL AVE REARBY N J  
**WESTERN ELECTRIC CO**  
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 BURLINGTON N C  
**WESTERN ELECTRIC CO**  
 1201 REVEREND RD ABILENE TEXAS  
**WESTERN ELECTRIC CO**  
 4211 VERDUN AVE LOS ANGELES 43 CALIF  
**WESTERN ELECTRIC CO**  
 1587 FRANKLIN ST OAKLAND 12 CALIF  
**WESTERN ELECTRIC CO**  
 6200 BROAD ST COLUMBUS 13 OHIO  
**WESTERN ELECTRIC CO**  
 1800 OSBORN ST W ANDOVER MASS  
**WESTERN ELECTRIC CO**  
 P O BOX 817 TWENTY NINE PALMS CALIF  
**WESTERN ELECTRIC CO**  
 BOX 608 COCOA FLA  
**WESTERN ELECTRIC CO**  
 SOUTH UNION ST LAWRENCE MASS  
**WESTERN ELECTRIC CO**  
 14-213 HURRAY HILL N J  
**WESTERN ELECTRIC CO INC**  
 164 SPEEDWELL AVE MORRISTOWN N J  
**WESTERN ELECTRIC CO INC**  
 BOX 1400 PEONY PARK STA OMAHA 14 NEBR

**WESTERN ELECTRIC CO INC**  
 1380 HAMPTON RD MT CLEMENS MICH  
**WESTERN ELECTRIC CO INC LAURELDALE SHOPS**  
 HARTON B VINE STS LAURELDALE PA  
**WESTERN ELECTRIC CO INC**  
 804 6027 FORT BLISS EL PASO TEXAS  
**WESTERN ELECTRIC CO INC**  
 1227 EAST 119TH ST GRANDVIEW MO  
**WESTERN ELECTRIC CO INC**  
 17284 LENNADE DETROIT 40 MICH  
**WESTERN ELECTRIC CORP**  
 801 MERRITT DR GREENSBORO N C  
**WESTERN ELECTRO ACOUSTIC LAB INC**  
 11700 SAN VICENTE BLVD LOS ANGELES 49  
 CALIF  
**WESTERN ELECTRONIC CO**  
 717 DEATER AVE SEATTLE 9 WASH  
**WESTERN ELECTRONIC PRODUCTS CO**  
 2420 NORTH LAKE AVE ALTADENA CALIF  
**WESTERN ENGINEERS**  
 ELK GROVE CALIF  
**WESTERN FELT BOARDS**  
 4029 OGDEN AVE CHICAGO ILL  
**WESTERN GEAR CORP**  
 2700 E IMPERIAL HWY LYNBWOOD CALIF  
**WESTERN GEAR CORP**  
 P O BOX 126 BELMONT CALIF  
**WESTERN GEAR CORP ELECTRO PRODUCTS DIV**  
 132 W COLORADO ST PASADENA 1 CALIF  
**WESTERN GOLD & PLATINUM CO**  
 525 HARBOR BLVD BELMONT CALIF  
**WESTERN INSTRUMENT CO**  
 888 N VICTORY BLVD BURBANK CALIF  
**WESTERN INSULATED WIRE CO**  
 2925 E 30 LOS ANGELES 38 CALIF  
**WESTERN INTALCO INC**  
 1710 W WASHINGTON BLVD LOS ANGELES CALIF  
**WESTERN INTL CO**  
 45 VESEY ST NEW YORK 7 N Y  
**WESTERN RADIATION LAB**  
 1107 W 24 ST LOS ANGELES 7 CALIF  
**WESTERN RUBBER CO**  
 620 E DUNLAPS ST BOSHEEN IND  
**WESTERN SKY INDUSTRIES DEPT E1**  
 21301 CLOUD BAY HAYWARD CALIF  
**WESTERN SWITCHBOARD CO**  
 474 BRYANT ST SAN FRANCISCO 7 CALIF  
**WESTFIELD METAL PRODUCTS CO**  
 1035 LOBER UNION ST WESTFIELD MASS  
**WESTGATE LAB INC**  
 900 S HIGH ST YELLOW SPRINGS OHIO  
**WESTINGHOUSE DEFENSE PRODUCTS**  
 1625 R ST N WASHINGTON D C  
**WESTINGHOUSE ELEC CORP**  
 POWER TUBE DEPT HORSE HEAD N Y  
**WESTINGHOUSE ELEC CORP**  
 BOX 288 ELMHURST N Y  
**WESTINGHOUSE ELEC CORP**  
 PLANE 6 THRU 8 STS NEWARK 1 N J  
**WESTINGHOUSE ELECT CORP GEN'L TRANSFORMER**  
 ENG'G 449 SHARPS VILLE AVE SHARON PA  
**WESTINGHOUSE ELECT CORP**  
 10 HIGH ST BOSTON 10 MASS  
**WESTINGHOUSE ELECT CORP**  
 BOX 940 LIMA OHIO  
**WESTINGHOUSE ELECT CORP**  
 ELECTRONIC TUBE DIV BLOOMFIELD N J  
**WESTINGHOUSE ELECTRIC EDAP**  
 1237 FIDELITY UNION LIFE BLDG DALLAS 1  
 TEXAS  
**WESTINGHOUSE ELECTRIC COAP**  
 3451 F MARGINAL WAY SEATTLE 4 WASH  
**WESTINGHOUSE ELECTRIC CORP**  
 246 E 4TH ST MANSFIELD OHIO  
**WESTINGHOUSE ELECTRIC CORP**  
 P O BOX 526 BATH N Y  
**WESTINGHOUSE ELECTRIC CORP**  
 40 WALL ST NEW YORK 5 N Y  
**WESTINGHOUSE ELECTRIC CORP**  
 P O BOX 5817 CLEVELAND 2 OHIO  
**WESTINGHOUSE ELECTRIC CORP**  
 SUNNYVALE CALIF  
**WESTINGHOUSE ELECTRIC CORP**  
 BEAVER PA  
**WESTINGHOUSE ELECTRIC CORP**  
 P O BOX 370 KEY WEST FLA  
**WESTINGHOUSE ELECTRIC CO**  
 P O BOX 2048 IDAHO FALLS IDAHO  
**WESTINGHOUSE ELECTRIC CORP DEFENSE PROJ**  
 600 ST PAUL AVE LOS ANGELES 17 CALIF  
**WESTINGHOUSE ELECTRIC CORP**  
 2933 N SHERIDAN RD CHICAGO 14 ILL  
**WESTINGHOUSE ELECTRIC CORP**  
 BOX 381 BLJONINGTON IND  
**WESTINGHOUSE ELECTRIC CORP**  
 1405 PARKER RD ARBUTUS 27 MD  
**WESTINGHOUSE ELECTRIC CORP**  
 345 FRETWORN DRIVE MONROEVILLE PA  
**CARRIER MICROVAE DEPT BOX 7425 MALETHORPE**  
 27 MD  
**WESTINGHOUSE ELECTRIC CORP**  
 RADAR FIELD SITE BOX 307 CRYSTAL SPRING  
 MISS  
**WESTINGHOUSE ELECTRIC CORP**  
 P O BOX 231 GREENVILLE PENNA  
**WESTINGHOUSE ELECTRIC CORP**  
 SEMICONDUCTOR DEPT YOUNGWOOD PA  
**WESTINGHOUSE ELECTRIC CORP**  
 2519 BILKENS AVE BALTIMORE MD  
**WESTINGHOUSE ELECTRIC CO DIV AIR ARM DIV**  
 P O BOX 746 FRIENDSHIP INTL A P BALTIMORE  
 MD

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exclusive

**ELECTRONIC INDUSTRIES****Marketing Map***A distribution of electronic plants in the United States on a county basis***Marketing Map of the United States**

showing

- *Distribution of electronic plants in the United States on a county basis*
  - *Detailed breakdown of 8 major metropolitan areas*
    - *Distribution of plant locations & electronic engineers in major states*
      - *4 color codes indicating number of plants by county*
        - *Suitable for framing and wall mount*
          - *52 x 33 inches in size*
            - *Orders filled and mailed same day*

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2623 O STREET LINCOLN 8 NEB

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ZACHARIAS ELECTRIC CORP  
P O BOX 246 BHIPPANY N J

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ZALYTRON TUBE CORP  
220 B 42ND ST NEW YORK 36 N Y

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ZENITH OPTICAL LAB  
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ZENITH RADIO CORP  
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P O BOX 759 INGLEWOOD CALIF

ZEPHYR PRODUCTS CO  
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ZIERICK MFG CORP  
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ZOOMAR INC  
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ZOPHAR MILLS INC  
112 26 ST BROOKLYN 32 N Y

Z & W MFG CORP  
30240 LAKELAND BLVD WICKLIFFE OHIO







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Overhead Door Co  
Atlas "Spartan"—Atlas  
Overhead Door Co  
Atlas "Torque Lift"—Atlas  
Overhead Door Co  
Atlas "Torque Hoist"—Atlas  
Overhead Door Co  
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Athen—Athom Electronics  
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Refining  
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Bema—Electric Machinery Mfg  
Co  
Benchmaster—Benchmaster Mfg  
Co  
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Co  
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Co  
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Inc  
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America  
Blue Jacket—Sprague Electric  
Co  
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Burroughs 205—Burroughs  
Corp/Electrodata Div  
Burroughs 220—Burroughs  
Corp/Electrodata Div  
Burroughs E 101—Burroughs  
Corp/Electrodata Div  
Bushead—Buchanan Electrical  
Prod Corp  
Buss—Bussman Mfg Co  
Butarone—General Cable Corp  
Buton—Eric Resistor Corp/  
Electronics Div  
Button Micax—Eric Resistor of  
Canada Ltd  
B & W—Barber & Williamson  
Inc  
Bytrex—Bytrex Corp

## C

Cadaltune—Hanson Van Winkle  
Munton Co  
Cadet—Honeywell Controls Ltd  
Cadet—Linemaster Switch Corp  
Cadpac—American-Monarch  
Corp  
Cadra—Chrono-Log Corp  
"C a e"—Canadian Avia Elects  
CAE—Controlled Atmosphere  
Enclosures Corp  
Calbest—Calbest Electronics Co  
Cal-Conn—Cal-Connector Co  
Calido—Driver-Harris Co  
Call-Ident Tymeter—Penwood  
Numechron Co  
Callmaster—Lyman Electronic  
Corp  
Calmap—Calmap Div/Calif  
Magnetic Cont Corp  
Cal Matic—North Shore Name-  
plate  
Calstone—Technicraft Co  
Caltron—Caltron Products Co  
Caltron—Caltron Products Co  
Camart—Camera Mart Inc  
Combion—Cambridge Thermionic  
Corp  
Cambricoid—American Electric  
Cable Co  
Cambridge—Burke & James Inc  
Camera-Sync—Chadwick-Helmuth  
Co  
CamerMax—Federal Mfg & Engr  
Corp  
Cammagat—Canadian Curtiss-  
Wright Ltd  
Camtran—Campbell X-Ray Corp  
Camtran—Lemert Eng'g Co  
Candu 1—Franklin Electronics  
Inc  
Cannon—Cannon Electric Co  
Cannon—Progress Electronics  
Co  
Cannon Ball—Cannon Co C F  
Cansels—Cannon Electric Co  
Capcon—Capcon Inc  
Capital—Hanson Van Winkle  
Munton Co  
Capps—Capps & Co  
Capscuttlers—Capps & Co  
Capri—Hartley Products Co  
Capri—General Instrument  
Corp/Semiconductor Div  
Carbolim—Aerovox Corp  
Carbo-Korax—Atlas Mineral  
Products Co

Carbomatics—Carbolim Co  
Carbomold—Aerovox Corp  
Carbon-Istor—Kido Inc  
Carbox—Patterson Moss  
Research  
Carbo-Zinc #11—Carbolim Co  
Car-Call—Electronic Equipment  
Supply  
Cardatron—Burroughs Corp/  
Electrodata Div  
Cardatype—Int'l Business Ma-  
chines Corp  
Cardivox—Par Products Corp  
Cardolite—Minnesota Mining &  
Mfg Co  
Cardosi—Minnesota Mining &  
Mfg Co  
Carbolmold—Aerovox Corp  
Carling—Carling Electric Inc  
Carlet Cable—Carol Cable Co  
Carrier—Carrier Parkway  
Carrier Ecliptic—Carrier Motor  
Co  
Cartridge Screwdriver—Hunter  
Tools  
Cartri-Lamp—Cartrisal Corp  
Cartrisal—Cartrisal Corp  
Cartwheel—Aerovox Corp  
Carver—Carver Inc Fred S  
Carv—Applied Physics Corp  
Cash Acme—Cash Valve Mfg  
Corp A W  
Caster X-75—Self-Lifting Piano  
Truck Co  
Cathaly—Superior Tube Co  
Cathalys—Superior Tube Co  
Cavitometer—Poole Instruments  
Inc  
CB 100—Globe Electronics Div  
CB 200—Globe Electronics Div  
CBS—CBS Electronics Div/  
Columbia Broadcasting System  
CBS-Colortron—CBS Electronics  
Div/Columbia Broadcasting  
System  
CBS-Rolette—CBS Electronics  
Div/Columbia Broadcasting  
System  
C D M—Curtis Dev & Mfg Co  
CDS-9—Hugg Electronics Co  
Div Hugg Corp  
CDB-10—Hugg Electronics Co  
Div Hugg Corp  
CEC—Consolidated Electro-  
dynamics Corp  
Cec—Control Electronics Co Inc  
Ceco—Amera Equipment Co Inc  
Ceco—Community Eng'g Corp  
Cedax—Barber Colman Co  
CEECO—Communications Equip-  
ment & Eng'g Co  
CEG-Ohm—Bradford Com-  
ponents Inc  
Celnamec—Belden Mfg  
Cellulino—Belden Mfg  
Cemco—Eti-Hobin & Galvan  
Cenco—Central Scientific Co of  
Canada Ltd  
Center-Line—Topatron Inc  
Centralab—Centralab Elec-  
tronics/Div Globe Union Inc  
Centronics—Magnetic Metals Co  
Centrum—Reeves Equipment  
Corp  
Century—Electro-Voice Inc  
Century 21—Lac Inc  
Cesac—Chemical Development  
Corp  
Cerafil—Aerovox Corp  
Cerafil—Aerovox Corp  
Cera-Lytic—Sprague Electric  
Co  
Ceramac—Stackpole Carbon Co  
Ceramacet—Stackpole Carbon  
Co  
Ceramatemp—Miteamp Wires Inc  
Cerametals—Eric Resistor Corp/  
Electronics Div  
Ceramerem—Bendix/Red Bank  
Ceramic—Ceramic Spec Co Inc  
Ceramicite—Consolidated Elec-  
trodynamics Corp  
Ceramicite—Frying Electric  
Products  
Ceramics—Eric Resistor  
Corp/Electronics Div  
Ceramics—Eric Resistor of  
Canada Ltd  
Ceramikouple—Smith Mfg Co  
Inc E C  
Ceramisite—Gulton Industries  
Cera-Mite—Sprague Electric Co  
Ceramerit—Bendix/Red Bank  
Div  
Ceramo—Thermo Electric Co  
Cerberus—Cerberus AG  
Cerdismag—Stackpole Carbon  
Co  
Cerdmg—Stackpole Carbon Co  
Cercoc—Sprague Electric Co  
Cercod—Sprague Electric Co  
Cercos—Sprague Electric Co

Certain Curtain—Naves Inc C I  
 Certified—Certified Radio Labs  
 Colson—Continental Electric  
 Chain Mate—Radio Wire Co  
 Challenger—Roh-O-Kut Co Inc  
 Challenger—Dreier Bros Inc  
 Cham—Bosch Inc W Ten  
 Champion—Channel Master  
 Corp  
 Champion DeArment—Champion  
 DeArment Tool Co  
 "Change-A-Cycle"—Carter Motor  
 Co  
 Change-A-Volt—Carter Motor Co  
 Channelock—Champion DeArment  
 Tool Co  
 Chasbestos—Chase Foster Inc  
 Chase-Shawmut—Chase-Shawmut  
 Co  
 Chassis-Trak—Western Devices  
 Inc  
 Chassis-Trak—Chassis-Trak Inc  
 Chatham/Tung-Sol—Chatham  
 Electronics Div/Tung-Sol  
 Electric Inc  
 Chester—Chester Moist  
 Chemalloy—Chemalloy Electronics  
 Corp  
 Chemalloy-Kahl—Chemalloy  
 Electronics Corp  
 Chemalyzer—Suncom Instru-  
 ments  
 Chemalyzer—Milton Roy Co  
 Chem-Blank—U S Chemical  
 Milling Corp  
 Chemelac—Garlock Packing  
 Chemfluor—Chemplant Inc  
 Chemites—Technicraft Co  
 Cheminas—Raychem Corp  
 Chem-o-seal—Chemical Products  
 Corp  
 Chemoxide—Colonial Alloys Co  
 Chem-Rite—Hanson Van Winkle  
 Munning Co  
 Che-Tel—U S Chemical Milling  
 Corp  
 Chemware—Chemplast Inc  
 Cherry—Toussend Co/Cherry  
 Riet Div  
 Chestex—Panalyt Div/St Regis  
 Paper Co  
 Chester Zephyr Spar—Chester  
 Moist Div  
 Chevron—Garlock Packing  
 Chisholm—Chisholm Industries  
 Chi-Tran—Chicago Standard  
 Transformer Corp  
 Chobert—Aviation Development  
 Inc  
 Chopperette—Victory Eng'g Co  
 Chromaloy—Wiegand Co Edwin L  
 Chromapix—Littion Industries/  
 Electron Tube Div  
 Chromax—Driver-Harris Co  
 Chromel—Hoskins Mfg Co  
 Chromel—Hoskins Alloys of  
 Canada Ltd  
 Chromethrombino—Modern  
 Lab Equip Co  
 Chromic—Porter Co Inc N K  
 Chromolytic—Brimstead Elec-  
 tronics Mfg Co  
 Chromistor—Bergen Labs Inc  
 Chromotest—Sticht Co Herman M  
 Cinet—Driver-Harris Co  
 Cincadograph—Cincadograph Inc  
 Cinech—Ucinite Co/Div United-  
 Carr Fastener Corp  
 Cincinnati—Cincinnati Cleaning  
 & Finishing Machines Co  
 Cincinnati Sub Zero—Cincinnati  
 Sub Zero Products  
 Cine King—Natural Lighting  
 Corp  
 Cineson—Camerasax Corp  
 Cineson—Federal Mfg & Engr  
 Corp  
 Cintel—Rand Cintel Ltd  
 Cintel—Marconi Instruments Ltd  
 Circle Esp—Stewart Corp F W  
 "Circle L"—Lebanon Steel  
 Foundry  
 Circ-Ohm—Bradford Com-  
 ponents Inc  
 Circon—Circon Components Corp  
 Circom—Universal Circuit Con-  
 trols  
 Circosonic—Circo Ultrasonic  
 Corp  
 Circucontrol—Universal Circuit  
 Controls  
 Circuitester—Ultraudio Div/  
 Oberline Inc  
 Circuitmaster—Fordham Mfg Co  
 Circuit-Pak—Raytheon Co/  
 Semiconductor Div  
 Citi-Fone—Mullard Equipment  
 Ltd  
 Citi-Fone—Multi-Products Co  
 K—Farmer Electric Products  
 Co Inc

Clamp Lock—Simmons Fastener  
 Corp  
 Clarast—Clare & Co C P  
 Clarb—Clorast—Clarb Controller  
 Co  
 Clars—Clarostat Mfg Co  
 Clarostat—Clarostat Mfg Co  
 "Classic"—Carter Motor Co  
 Classic—Newcomb Audio Prod-  
 ucts Co  
 Clasmaster—Nuclear-Chicago  
 Corp  
 Claus—Claus Cutlery Co  
 Cleanline—Taylor Instruments  
 Co  
 Clear Air—Radio Merchandise  
 Sales Inc  
 Clearflex—Columbia Wire & Sup-  
 ply Co  
 Clear Print—Phillips Process Co  
 Inc  
 Cletron—Cleveland Electronics  
 Inc  
 Clewite—Cleveland Container  
 Co  
 Clewite—Cleveland Graphite  
 Bronze Div/Clewite Corp  
 Clewite—Clewite Transistor  
 Products  
 Climate-Lab—American Instru-  
 ment Co  
 Climatite—Canadian Astatic Ltd  
 Climatort—BTU Eng'g Corp  
 Climax—Driver-Harris Co  
 Climet—American Metal  
 Climax Inc  
 Climatite—Littion Industries  
 Climate—Sage Electronics Corp  
 Line—Clarostat Mfg Co  
 Clipper—Cincinnati Time Rec-  
 order Co  
 Clipper—Linemaster Switch Corp  
 Clipper Series—Sterling Trans-  
 former Corp  
 Clockmaster—Honeywell Controls  
 Ltd  
 Clorinal—Savage Electric Co  
 CMS—Shamban & Co W S  
 Coasguide—Alitron Inc  
 Coasguide—Littion Industries/  
 Electronic Equipment Div  
 Coasomatic—Tennalab  
 Coaswitch—Bird Electronics  
 Corp  
 Cobanic—Driver Co Wilber B  
 Cobenium—Driver Co Wilber B  
 Cobrex—University Loud-  
 speakers Inc  
 Code Bar Switch—Computer  
 Control Co Inc  
 Code Call—Wheelock Signals Inc  
 Colbrastic—Conn Hard Rubber  
 Co  
 Cold-Aire—Ed Berl Products Inc  
 Coldite 70+—Stackpole Carbon  
 Co  
 Cole-Hersee—Cole-Hersee Co  
 Collectric Ring—Industrial Elec-  
 trical Works  
 Colobal—Colonial Alloys Co  
 Colgram—Radio Corp of  
 America/Electron Tube Div  
 Colortar—Newcomb Audio  
 Products Co  
 Colorbeam—Tennalab  
 Color Chief—Trio Mfg Co  
 Colorgraphic—Honeywells Controls  
 Ltd  
 Color-Keye—Thomas & Betts  
 Co Inc  
 Color King—Channel Master  
 Corp  
 Color Royal—Trio Mfg Co  
 Colortran—Natural Lighting  
 Corp  
 Color Wing—Trio Mfg Co  
 Col-R-Tel—Whitley Electronics  
 Inc  
 Colson—Colson Corp  
 Columbia—Columbia Electric  
 Mfg Co  
 Columbia—Standard Pressed  
 Steel Co  
 Columbia BD—CBS Electronics  
 Div  
 Columbia Professional SS—CBS  
 Electronics Div  
 Columbus—Columbus Electronics  
 Corp  
 Columns of Sound—Part-O-Vox  
 Corp  
 Comet—Antronic Corp  
 Comet—Driver-Harris Co  
 Comfort-Shield—Lincoln Electric  
 Co  
 Comaire—Vocaline Co of  
 America  
 Commander—Sensitive Research  
 Instrument Corp  
 Commando—Dreier Bros Inc  
 Commercial—Trimm Inc

Communicall—Sperti Faraday  
 Inc  
 Communicator—Littion Indus-  
 tries/Electronic Equip Div  
 Co-Mg-Tri—Welltronic Co  
 Compact—General Cable Corp  
 Compact—Linemaster Switch  
 Corp  
 Compass Saw—Dreier Bros Inc  
 Compatible—Single-Sideband—  
 Kahn Research Labs  
 Compo—Compo Corp  
 Comprol—Centralab Elec-  
 tronics  
 Compositis—Littion Industries/  
 Electron Tube Div  
 Comaudyne Systems—CDC Con-  
 trol Services Inc  
 Compuhlic—Sprague Electric Co  
 Computer Dial—Packard Bell  
 Electronics Corp  
 Compu-Tran—Int'l Resistance Co  
 Concas—Fairchild Recording  
 Equip  
 Concertapes—Concertapes Inc  
 Concertapes—Grove Enterprises  
 Concert-Disc—Concertapes Inc  
 Condit Series—Electro-Sonic  
 Labs  
 ConDiesel—Consolidated Diesel  
 Electric Corp  
 Confesmaire—Audiq. Equipment  
 Co  
 Confidencer—Roanwell Corp  
 Conical-V-Beam—Telrex Labs  
 Conitex—Sealstro Corp  
 Conn—Conn Ltd C G  
 Connecticut—Stess Inc W  
 Whitney  
 Conolon—Narmco Materials Div  
 Conrac—Conrac Inc  
 Consolet—Audiomatic Labs  
 Consi—Mandy & Harman  
 Constants—Constanta Co of  
 Canada Ltd  
 Constant K—Magnetron Inc  
 Constant—Green Rectifier Co  
 Constant—Lamarche Mfg Co  
 Continental—Continental Elec-  
 tronics Corp  
 Continental Connectors—Con-  
 tinental Connectors Corp  
 Continuous Systemic Monitor—  
 Biophysical Electronics Inc  
 Control—Control/Div Magnetics  
 Inc  
 Control-A-Matic—Rockwell Eng'g  
 Controller—Vickers Inc  
 Controller—Communication Co  
 Control Master—Honeywell Con-  
 trols Ltd  
 Controlmag—Research Industrial  
 Labs  
 Convert-O-Matic—Hanson Van  
 Winkle Munning Co  
 Coolano—Monsanto Chemical Co  
 Coolong—Lincoln Electric Co  
 Cooper—Standard Pressed Steel  
 Co  
 Coordinated Process Control—  
 Bristol Co  
 Copel—Hoskins Mfg Co  
 Copper-Lume—Hanson Van  
 Winkle Munning Co  
 Copperly—National-Standard Co  
 Copperly—Reynolds Wire  
 Coprox—Bradley Semiconductor  
 Corp  
 Corbin—Corbin Corp  
 Core-Lock—Feltner Mfg  
 Coronet—Electro-Voice Inc  
 Corothane—Tranco Chemical  
 Corp  
 Coratron—Victoreen Instrument  
 Co  
 Corson—Corson Electric Mfg  
 Corp  
 Corvel—Jamac Products Co  
 Corvel—Polymer Corp  
 Corvette—Dreier Bros Inc  
 Cottonite—Acme Wire  
 Coulter Counter—Coulter Elec-  
 tronics  
 Counterpulse—Diaphex Div  
 Count-O-Scope—Fisher Research  
 Lab  
 Couplate—Centralab Electronics  
 Counter—Coulter Products  
 Cox—Cox Instruments Div  
 Cox & Stevens Products—Revere  
 Corp of America  
 CPX—Aerovox Corp  
 C/R—Chicago Rawhide Mfg Co  
 CraftScope—Waterman Products  
 Co  
 Craip—Kalart Co Inc  
 Cramer—Cramer Controls Corp  
 Cramolin—Cals Labs  
 Cratex—Cratex Mfg Co  
 Crescent—Waldes Kohinor Inc  
 Crest—Ario Electronics Corp  
 CrimCut—Vaco Products Co

Crimpeo—Cannon Electric Co  
 Criterion—Canadian Research In-  
 stitute  
 CRI—Centralab Electronics  
 Crown—Croname Inc  
 Crosby—Subacch & Wilcox Co/  
 Tubular Products Div  
 Crosby—Smith Corp A O  
 Cromag—Smith Corp A O  
 Cromin—Liberty Mirror Div/  
 Libbey Owens Ford Glass Co  
 Croname—Croname Inc  
 Croname—Waldom Electronics Inc  
 Crostat—Croname Inc  
 Crowave—Croname Inc  
 Crown—Int'l Radio & Electronics  
 Corp  
 Cra-Xi—Croname Inc  
 Crusilite—Morganite Inc  
 Crystal Air—Radio Merchandise  
 Sales Inc  
 Crystolon—Norton Co  
 CTP—Cincinnati Time Recorder  
 Co  
 CTB—Chicago Telephone of Calif  
 CTS—CTS Inc  
 CU BE 250—Telcon Metals  
 Cub-Mailer—Audio Equipment Co  
 Cuboid Laminate—Mica Insulator  
 Co-Co—Electrolab Printed Elec-  
 tronics Corp  
 Cummins—Oster Mfg Co  
 Cunningham—Cunningham Son &  
 Co James  
 Cuposit—Shipley Co Inc  
 Cuprochome—Driver Co Wilber B  
 Cuprox—Driver Co Wilber B  
 Current Controller—Technique  
 Assoc  
 Current Governor—North Hills  
 Electric Co Inc  
 Curvrol—Lincoln Electric Co  
 Cory-X Cassette—Campbell X-Ray  
 Corp  
 Customer—Ultraudio Div  
 Culo—Greene Tweed & Co  
 Cy-An-In—Indium Corp of  
 America  
 Cyclomag—Acromag Inc  
 Cycle-Mite—Minster Machine Co  
 Cyclograph—Dico Co J W  
 Cyclomag—Sigma Instruments  
 Inc  
 Cyclar—Gordon Enterprises  
 Cyclocol—Marbon Chemical Div  
 Borg-Warner Corp

D

Dacyno—Bach Aurlen Inc  
 DataTape—Consolidated Electro-  
 dynamics Corp  
 Data Tel—Data Technology Inc  
 DataTel—Lenurt Electric Co  
 Data-Tran—General Railway Sig-  
 nal  
 Datab—Datab Corp  
 Dabran—Dabron Div/Automation  
 Industries  
 Davonil—Daven Co  
 Davis—Davis Electronics  
 Davoh—Daven Co  
 Day-Nite—Honeywell Controls  
 Ltd  
 "Day-Ray"—Day-Ray Products  
 Inc  
 Dazic—Winterburn Mfg Co  
 Dazor—Dazor Mfg Corp  
 DB—Beckman Instrument/  
 Scientific & Prec Inst Div  
 DBM—DBM Research Corp  
 Dear Guard—Kay-Townes  
 Antenna Co  
 DeArmond—Rowe Industries  
 DEC—Digital Equipment Corp  
 Decadal—Kilo Eng'g Co  
 Decaso—Decimeter Products Co  
 Decohm—Davis Electric Co  
 Decorator Design—Newcastle  
 Fabrics Corp  
 Dec-Dee Electric Co  
 D-855 Gaussmeter—Dyna-Empire  
 Inc  
 D-862 Demagnetizer—Dyna-  
 Empire Inc  
 D-873 Plateage—Dyna-Empire  
 Inc  
 DeFiance—All Star Products Inc  
 DeJaur—DeJaur-Amsco Corp/  
 Electronics Div  
 Deba—Electro Scientific Ind Inc  
 Debatron—Baird-Atomic Inc  
 Delco Cooling—Delco Appliance  
 Div GMC  
 Delco Heat—Delco Appliance Div  
 GMC  
 De-Line—Scam Instrument Corp  
 Delparh—Commercial Filters  
 Corp  
 Delrin—DuPont de Nemours &  
 Co I  
 Delta—Educational Electronics  
 Co  
 Delta-Couple—Advanced Techno-  
 logic Labs  
 Deltamax—Arnold Eng'g Co  
 DeMagly—Darrborn Electronics  
 Lab  
 Deltawitch—Advanced Technology  
 Labs  
 Delux—Linemaster Switch Corp  
 De Luxe Junior—Webster Mfg Co  
 Denlex—Dennis Chemical Co  
 Denistral—Precision Thermometer  
 & Instrument Co  
 Denrad—Denrad Mfg Co Inc  
 Densi-Color—Letkra Labs Inc  
 Densi-Lux—Letkra Labs Inc  
 Densimatic—Nat'l Instrument  
 Labs Inc  
 Densi-Timer—Letkra Labs Inc  
 Densitrol—Precision Thermometer  
 & Instrument Co  
 Densomix—Poole Instruments  
 Inc  
 Deocon—Englehard Ind Inc  
 Dependable—Trimm Inc  
 Depoltherm—Saine Equipment  
 Lab Harry T  
 Dermatron—Unit Process Assem-  
 blies Inc  
 Desco—Diets Design & Mfg Co  
 Desmond—Desmond Stephen Mfg  
 Co  
 Destron—Destron Co  
 Detect-A-Fire—Fenwel Inc  
 Detectolab—Borg-Warner Con-  
 trols  
 Detectolab—B J Electronics  
 Div/Borg-Warner Corp  
 Detecto-Lite—Eagle Electric Mfg  
 Co Inc  
 Detectron—Computer Measure-  
 ments Co  
 Develco—Developmental Elec-  
 tronics Corp  
 Developer—Geotechnical  
 DeWald—Donald Radio Mfg Corp  
 DFI Cleveland—Designers for  
 Industry  
 D-Frost-O-Matic—Paragon  
 Electric Co  
 Diagnostic—Comet Ltd  
 Diaphyx—Apparatus Development  
 Co  
 Dial—Dial Products Co  
 Dialco—Diallight Corp  
 Diall—Mesa Plastics Co  
 Dialog—Link Div  
 Dial Saw—Erwood Inc  
 Dialtrol—Jordan Co



Exide—Electric Storage Battery Co/Exide Div  
 Exide—Willard Storage Battery Div  
 Exide Horizontal Motor-Generators—Electric Storage Battery/Exide Ind Div  
 Exide Manchest Batteries—Electric Storage Battery/Exide Ind Div  
 Exide Silicon Rectifiers—Exide Silicon Rectifiers  
 Exide Vertical Motor-Generators—Electric Storage Battery/Exide Ind Div  
 Explorformer—Geotronic Labs  
 Expresso—Waber Electronics Inc  
 E-Z—Abro-Mis Inc  
 "E-Z"—Ideal Industries Inc  
 E-Z-C—Kleer-Vue Co Inc  
 E-Z Code—Westline Products  
 E-Z Code Jr—Aerovox Corp  
 E-Z Hook Clip—E-Z-Hook Test Products  
 E-Z-Hook Custom Probe—E-Z-Hook Test Products  
 E-Z-Hook Sub—E-Z-Hook Test Products  
 E-Z-Hook Tip—E-Z-Hook Test Products  
 EZ1 3-Way—Liberty Mirror-Libbey Owens Ford Glass Co Div  
 E-Z Mate—Elco Pacific  
 E-Z Release Connectors—Continental Connector Corp  
 E-Z-Trim—Bourns Inc

F

Fabrika—Sprague Electric Co  
 Fabricator—Wales Stripit Inc  
 Facecell—Lincoln Electric Co  
 Fadac—Automatics  
 Fafner—Fafner Bearing Co  
 Fafner—Fafner Bearing Co  
 Fair Safe—Diatron Inc  
 Fair-Rite—Fair-Rite Products Corp  
 Fanfar—Fanon Electronic Industries Inc  
 Fanon-Fone—Fanon Electronics Inc  
 Faraday—Sperti Faraday Inc  
 Farinon Type PT—Farinon Electric  
 Farlite—Farley & Loetscher/Plastics Div  
 Farm-O-Stat—Honeywell Controls Ltd  
 Farlboro—Farley & Loetscher/Plastics Div  
 Fasco—Fasco Industries  
 Fastair—Wellens Optical Co  
 Fastatch—Centralab Electronics  
 Fastax—Wellens Optical Co  
 Fas-Tin-Flux—Hanson Van Winkle Munning Co  
 Fat Phoebe—Waber Electronics Inc  
 Fault Finder—Smith & Florence Inc  
 Favorite—Greene Tweed & Co  
 Fawciter—Littion Industries  
 F & B—Florman & Babb Inc  
 FBI—U S Components  
 FD & ID—Aerotec Industries Inc  
 Featherweight—Barnett Instrument Co  
 Featherweight—Trimm Inc  
 Federal—Federal Mfg & Eng Corp  
 Feeduc—Columbia Metal Box Co  
 Felker—Felker Mfg  
 Felker-Di-Met—Felker Mfg  
 Fellows—Fellows Gear Shaper Co  
 Fen-Tone—Fen-Tone Corp  
 Fenwal—Fenwal Electronics Inc  
 Ferlon—Wyandotte Chemicals Corp  
 Ferrac—Aerpac Electronics Inc/Seminole Div  
 Ferricode—Consolidated Controls Corp  
 Ferricore—Nat'l Moldite Co  
 Ferrimag—Crucible Steel Co of America  
 FerroCell—Topatron Inc  
 Ferruline—Altron Canada Ltd  
 Ferrulite—Altron Inc  
 Ferrugide—Littion Ind/Electronic Equip Div  
 Ferruline—Altron Inc  
 Ferruline—Littion Industries/Electronic Equip Div  
 Ferrulite—Lincoln Electric Co  
 FF-Switches—Switchcraft Inc  
 Fibramat—Minnesota Mining & Mfg Co  
 Fibrograph—Special Instruments Lab Inc

Fidelisac—Conley Electronics Corp  
 Fidelitone—Fidelitone Inc  
 Fido—Controls for Radiation Inc  
 Fil-Cap—Filtron Co Inc/Western Div  
 Filmcard—Filmohm Corp  
 Filmore—Sprague Electric Co  
 Filmore—Sprague Electric Co  
 Filmohm—Filmohm Corp  
 Filmotop—Fairchild Controls Corp  
 Fill-A-Cor—Magnetic Core Corp  
 Filter—Hanson Van Winkle Munning Co  
 Filnic—Driver-Harris Co  
 Filterol—Sprague Electric Co  
 Fil-Therm—Filtron Co Inc/Western Div  
 Filteroids—Magnetic Metals Co  
 Filters—Filters Inc  
 Filtrix—Draco Industrial Corp  
 Finco—Finney Co  
 Finnell—Finnell System Inc  
 Fireban—Taylor Fibre Co  
 Firex—Electronics Corp of America  
 Firezone—Rochbestos Wire & Cable Co  
 Firthaloy—Firth Sterling Inc  
 Firthite—Firth Sterling Inc  
 Fisherfone—Fisher Research Lab  
 Fisher Turned—Fisher Special Mfg Co  
 Fiske—Advanced Instruments  
 Fitgo—Beckman Instruments Inc/Systems Div  
 Five Star—Fire Star Co  
 Five Star Tubes—General Electric  
 Fixed—Cima Resistor Corp  
 Fixohm—Campbell Industries Inc  
 Fixohm—Clarostat Mfg Co  
 Flameguard—Honeywell Controls Ltd  
 Flame-O-Matic—Instruments Inc  
 Flame Stop—Phelps Dodge Copper Products Corp  
 Flame-Lok—Set Screw & Mfg Co  
 Flash-Flow—Ewald Instruments  
 Flash Magnetiser—Diatron Inc  
 Fleetcom—Communications Co  
 Fleetwood—Lincoln Electric Co  
 Fleetwood—Conrac Inc  
 Flexa-action—Merkle Korff Gear Co  
 Flexapulse—Airtion Canada Ltd  
 Flexapulse—Airtion Inc  
 Flexapulse—Littion Ind/Electronic Equip Div  
 Flexator—Hunter Springs Co  
 Flexaust—Flexaust Co  
 Flexdur—Gulton Industries  
 Flexform—Columbia Wire & Supply Co  
 Flexformer—Superior Electric Co  
 Flexhead—Marbel & Sons L Frank  
 Fleximatic—Hanson Van Winkle Munning Co  
 Flexisor—Bradford Components Inc  
 Flexite—Marbel & Sons L Frank  
 Flexitomp—C I Hayes Inc  
 Flexitone—DuKane Corp  
 Flexlab—Standard Electric Time Co  
 Flexloc—Standard Pressed Steel Co  
 Flexnet—Breeze Corp  
 Flexograin—Porter Co Inc M K  
 Flex-O-Drill—Wales Stripit Inc  
 Flexohm—Clarostat Mfg Co  
 Flexo—Flexo Int'l  
 Flexoprene—Standard Wire & Cable Co  
 Flexotemp—Hayes Inc C I  
 Flexpak—Hinde & Dauch  
 Flexprint—Sanders Associates  
 Flex-Seal Pumps—Bart Mfg Corp  
 Flexshield—American Electric Cable Co  
 Flex Weave—Insp Products Ltd  
 Flightcom—Communications Co  
 Flig-Loc—Instrument Case Div  
 Flig-Loc—TA Mfg Corp  
 Flipped Over—Falls—Modern Adhesives & Electronics Inc  
 Floptop—DuKane Corp  
 Floatless—B/W Controller Corp  
 Flox—Thermal Refractories Corp  
 Flowator—Fischer & Porter  
 Flowair—Minnesota Mining & Mfg Co  
 FluoroBond—Jocline Mfg Co  
 Fluorocell—Jocline Mfg Co  
 Fluoroflex—Resistoflex Corp  
 FluoroGreen—Dore Co John L  
 Fluorolastic—Jocline Mfg Co  
 Fluorolins—Jocline Mfg Co

Fluorolube—Hooker Chemical Corp  
 Fluoropoly—Int'l Resistance Co  
 Fluorosint TFE—Polymer Corp  
 Flush-Lok—Set Screw & Mfg Co  
 Flush-Wall—Flush Wall Radio Co  
 Fluxamp—Sprague Electric Co  
 Flux—England Ind Inc  
 Flux-N-Solder—Johnson Mfg Co Inc  
 Flux-Sil Bonds—United Wire & Supply Corp  
 Fluxvalve—Pickering & Co Inc  
 F M E—Federal Mfg & Engr Corp  
 F M E Camerflex—Camerflex Corp  
 FM/Q—Apparatus Development Co  
 Foamax—Royal Electric Corp  
 Foamflex—American Tube Bending  
 Foamflex—Phelps Dodge Copper Products Corp  
 Foamline—Plastoid Corp  
 Foamtube—Plastoid Corp  
 F O Line—Fine Organics Inc  
 Footril—General Control Co  
 Foot Switch—Chicago Telephone of Calif  
 Formbond—Acme Wire  
 Formbond—Belden Mfg  
 Formez—General Cable Corp  
 Form Flow—Standard Register Co  
 Formlon—General Cable Corp  
 Formsprag—Formsprag Inc  
 Formvar—Acme Wire  
 Fortiflex—Celanese Plastics Co  
 4-J—Fourjay Industries  
 402—Elliott Brothers Ltd  
 405—Elliott Brothers Ltd  
 444-C—Wysandotte Chemicals Corp  
 Frakh—Biddle Co James G  
 Frako—Gary Wells Co  
 Free Cone—Stephens Tru-Sonic Inc  
 Freepot—Munston Mfg & Service Inc  
 Free-Vane—Bristol Co  
 Free-Lock—Feltner Mfg  
 Frieishe & Hoepfer—Electromatic Equip Co  
 Frigistat—Honeywell Controls Ltd  
 Fringecount—Link Div General Precision Inc  
 Fringe Master—Radio Merchandise Sales Inc  
 Fruehauf—Fruehauf Trailer Co  
 FS-80—Electronic Production & Development  
 Fullo—Commercial Filters Corp  
 Full-View—Brooks Rotameter Co  
 Fulcrone—Taylor Instruments Co  
 Ful-Vit—Service Parts Systems  
 Furnacostat—Honeywell Controls Ltd  
 Fuse-Flex—Inso Products Ltd  
 Fusetron—Busman Mfg Co  
 Fusion Alloy—Raytheon Co/Semiconductor Div  
 Fusionbrake—Avon Tube Div/Higbie Mfg Co  
 Fusionwell—Avon Tube Div/Higbie Mfg Co  
 Fusistor—Bradford Components Inc  
 Fuslat—Busman Mfg Co  
 Futuro—Canadian Astatic Ltd  
 Futuro—Ohio Brass Co  
 Futurist—Radio Merchandise Sales Inc  
 Fuzohm—Clarostat Mfg Co  
 Fyberoid—Wilmington Fibre Specialty Co  
 FXR—FXR Inc

G

GAC—General Automatic Corp  
 Gaertner—Gaertner Scientific Corp  
 Gagnetron—Instruments Inc  
 Gaganon—Gaganon Inc  
 Galaxy Tape—Tanzian Inc Sarkis  
 Galatroid—Bart Mfg Corp  
 Gamm—Instruments Inc  
 GAB/R—Philbrick Researches Inc George A  
 Gardner—Gardner Lab Inc  
 "Gardrol"—Shan & Jurs Co  
 Garrard Record Changers—Garrard Sales Corp  
 Gask-O-Seal—Parker Seal Co/Parker-Hannifin Corp Div  
 Gas Pointer—Johnson-Williams Inc

GE—General Electric  
 Geared Servomotors—American Electronics Inc Inst Div  
 Gearmotors—Link-Belt Co  
 GEC—General Electrodynamics Corp  
 "GEEGR00"—General-American Valve  
 G-25—Bendix Computer/Bendix Corp  
 GE Fire Star Tube—General Electric  
 Gehalex—Imtra Corp  
 Geloso—American Geloso Electronics Inc  
 GEM—Mallory & Co P R  
 GEM—Radio Merchandise Sales Inc  
 Gemcor—General Electro Mechanical  
 Gemcraft—G M Mfg Co  
 Geminol—Driver Harris Co  
 Genalex—Connolly & Co Wallace  
 Genalex Tubes—Tenalex Div  
 British Industries  
 Genamic Coreactants—General Mills  
 Genalloy-A—General Cable Corp  
 Genacase—General Cable Corp  
 Genathene—General Cable Corp  
 Genatrol—General Cable Corp  
 Gencon—General Cable Corp  
 Gen Epoxy—General Mills  
 "General"—Dunton Co M W  
 General Automatic—General Automatic Corp  
 General Crystal—General Crystal Co  
 General Electric—General Electric Co  
 General Metal Products Co—Reiner Electronics Co  
 General Mills "2003 Computer"—General Mills Inc  
 General Tire & Rubber Co—Amet Corp  
 Genie-Lift-A-Dor—Alliance Mfg Co Inc  
 GEN-PRO—General Products Gen Res—General Resistance Inc  
 Gentac—Gentape Corp  
 Genware—G M Mfg Co  
 Geoformer—Littion Ind—Electronic Equip Div  
 Geon Vinyls—Goodrich Chemical Co B F  
 Geotrom—Geotronic Labs  
 G-15—Bendix Corp /Bendix Computer Div  
 "G-Fuse"—Bergen Labs Inc  
 G.I.—General Industries Co  
 Giant—Benson-Lehner  
 Gibsilly—Gibson Electric Co  
 Gibson Girl—Robins Industries Corp  
 Girard—Higgins—Girard-Hopkins  
 Gisholt—Gisholt Machine Co  
 GKI—General Kinetics Inc  
 Glaabond—Polymer Industries Inc  
 Glaser-Steers—Glaser Steers  
 Glaser—Clarostat Mfg Co  
 Glass-to-Metal Hermetic Corp  
 Glasters—Chase-Foster Inc  
 Glastic—Glastic Corp  
 Glastite—Wire Co of America  
 Glaswitch Relays—Revere Corp of America  
 Glennite—Gulton Industries  
 Glogar—Carborundum Co/Glogar Plant  
 Globe—Globe Electronics Inc Div  
 Tectron Electronics Inc  
 "Glo-Plug"—Industrial Devices Inc  
 "Glow-Dot"—Industrial Devices Inc  
 GNOME—Carter Parts Co  
 G-Gelton—Resistor Co  
 "Gold-Cup"—Carbonneau Industries Inc  
 Golden-D—Cannon Electric Co  
 Golden G—Filtros Inc  
 Gold-F—Parker Metal Goods Co  
 Gold Line—KFR Corp  
 Gordent—Gorden Enterprises  
 Gp—Erie Resistor Corp/Electronics Div  
 G-Par—Elliott Bros (London)  
 GPE—G P E Controls Inc  
 GPD—U-Flow—Honeywell Controls Ltd  
 "Grad-U-Motor"—Honeywell Controls Ltd  
 "Grad-U-Relay"—Honeywell Controls Ltd  
 "Grad-U-Stat"—Honeywell Controls Ltd  
 "Grad-U-Switch"—Honeywell Controls Ltd

"Grad-U-Therm"—Honeywell Controls Ltd  
 "Gradutrol"—Honeywell Controls Ltd  
 Grafo Concentrate—Grafo Colloids Corp  
 Grain-Oriented—Vickers Inc/Electronic Products Div  
 Gramin—U S Graphite Co  
 Gramin—Reeves Equipment Corp  
 Granco—Granco Products Inc  
 Grandine—Amchem Products Inc  
 Grant—Willard Storage Battery Div  
 Graphalloy—Graphite Metallizing Corp  
 Graph-A-Plan—Labelon Tape Co  
 Graphix Circuits—L & R Mfg Co  
 Graphilix—Pettinos Graphite Corp  
 Graphitar—U S Graphite Co  
 Wickes Corp  
 G-Rater—Cyrex Corp  
 Grayline—Harditch Hindle Inc  
 GRG—Gries Reproducer Corp  
 Greenbit—Equipment & Service  
 Greenohm—Clarostat Mfg Co  
 Greenohm V—Clarostat Mfg Co  
 Greinar—Progress Electronics Co  
 Gridalloy—Molecu-Wire Corp  
 Gridaloy P—Molecu-Wire Corp  
 Gridric—Driver-Harris Co  
 Griuzex—Phelps Dodge Copper Products Corp  
 "Grip"—Barrett Varnish Co  
 "Grip-Seal"—Adadel Mfg Co  
 Griswold—Griswold Machine Works  
 Grov-Pin—Grov-Pin Corp  
 GSM "Positive Slide Lok"—Grand Sliding Mechanisms  
 GS-400—Glaser Steers  
 GSM "Positive Lok"—Grand Sliding Machines  
 GS-77—Glaser Steers  
 G-T Ring—Greene, Tweed & Co  
 E T Tapes—Schjeldahl Co G T  
 Guardian—General Cable Corp  
 Guardian—Garlock Packing  
 Guardian—Guardian Electric Mfg Co  
 Guardian MK-11 Radio—Electronic Systems  
 Gude-Glass—Gudebrod Bros Silb Co  
 Gudeface—Gudebrod Bros Silb Co  
 Gude-Nylace—Gudebrod Bros Silb Co  
 Guideline—Airtion Canada Ltd  
 Guideline—Airtion Inc/Div Littion Ind  
 Guideline—Littion Ind/Electronic Equip Div  
 Guide Line—Delegrator Mfg Co  
 Guide-O-Mable—Barrett Electronics Corp  
 Gulton Industries Inc—Engineered Magnetics/Div Gulton Ind Inc  
 "Gum Rosin"—Dunton Co M W  
 Gurlie—Gurley W & L E  
 "Gyro"—Scientific Glass Apparatus Co  
 Gyra Electronics Corp—Gyra Electronics Corp  
 "Gyruline"—Cascade Research Div  
 Gyrex—Gyrex Corp  
 Gyro/Balance—Electro-Sonic Labs  
 Gyr/Jewel—Electro-Sonic Labs  
 Gyzomet—Mallory Metallurgical Co  
 Gyrposite—Pickering & Co Inc  
 Gyropolot—Sperry Piedmont Co/Div Sperry Rand Corp

H

Habir-Bus—Phelps Dodge Copper Products Corp  
 Habirdy—Phelps Dodge Copper Products Corp  
 Habirdure—Phelps Dodge Copper Products Corp  
 Habirite—Phelps Dodge Copper Products Corp  
 Habiriana—Phelps Dodge Copper Products Corp  
 Habirshaw—Phelps Dodge Copper Products Corp  
 "Hachensack"—Hachensack Cable Corp

# BRAND & TRADE NAMES

Nadley—Thomas Instrument Co  
 Nafox—Natl Beryllia Corp  
 Nailes—Armour Alliance Industries  
 Naledy—Naledy Electronics Co  
 Nallikainen—Nallikainen Instruments  
 Nallowell—Standard Pressed Steel Co  
 Nalight—Sylvania Electric Products Inc  
 Namico—Miller Corp Harry Namiler—Miller Corp Harry Hamilton—Hamilton Watch Co/ Allied Prods Div  
 Nandivolt—Nutron Mfg Co Inc  
 "Handy-Bins"—Corrugated Paper Products  
 Harmony—CBS Electronics Div/ Columbia Broadcasting System  
 Harper—Harper Electric Furnace Corp  
 Hawley—Hawley Products Co  
 Haydon—Haydon Div/General Time Corp  
 "Haynes"—Haynes Stellite  
 "Haynes Stellite"—Haynes Stellite  
 Mayrite—Hays Mfg Co  
 Naz-Bin—Atra-Mills Inc  
 N C R Alloy—Telcon Metals/ Telcon Works  
 NCX—Sprague Electric Co  
 "Health Air"—Banco Corp  
 Near Rings—Banco Electronics Inc/Sub W A Sheaffer Pen Co  
 Neathits—Heath Co  
 Heating Equipment—General Electric  
 Heat-Loz—Trinity Equipment Corp  
 Heatron—Heatron Co  
 Heat-X—Dunham Bush Inc  
 Heatzone—Rockbestos Wire & Cable Co  
 Medic—General Automatic Corp  
 Memco—Hill Electronics Inc  
 Height Master—U S Chemical Milling Corp  
 "Heland"—Honeywell Controls Ltd  
 Helco—Hoover Electric Co  
 "Heli-con"—U S Radium Corp  
 Heliax—Andrew Antenna Corp  
 Heliax—Andrew California Heliax—Andrew Corp  
 Heli Coil—Premco Inc  
 Helicore—Geotechnical Helitars—STU Eng'g Corp  
 Helidex—Beckman Instruments/ Helipot Div  
 Helikut—Pioneer Broach Co  
 Helipot—Beckman Instruments/ Helipot Div  
 Helitris—Beckman Instruments/ Helipot Div  
 Heli-Tube—Newman Corp H H  
 "Heliwhip"—Mark Products Co  
 Helix—Biggs Co Carl H  
 Hellige—Hellige Inc  
 Hercite—Hercion Electronics Corp  
 Hercules—Acracrom Co Inc  
 Hercules—Bache & Co  
 Hercules—Linemaster Switch Corp  
 Hercules Swift Solder—Hercules Chemical  
 Herculon—Dessert Mfg Co  
 Herculoy—Revere Copper & Brass Inc  
 Heric—Sprague Electric Co  
 Hermes—Sonic—Hermes Sonic Corp  
 Hetherington—Control Switch Div/Controls Co of America  
 Hetrone—Durez Plastic Div/ Hooter Chemical  
 Hew-Duty—Ninde & Dauch  
 Hexaclad—Hexacon Electric Co  
 Hexacon—Hexacon Electric Co  
 Hexcel—Hexcel Products Inc  
 Hex-Ohm—Bradford Components Inc  
 Hexwound—Monitor Controller  
 HEYCO—Heyman Mfg Co  
 H G X—Stiehl Chemical Inc  
 "H G X"—Nalob Industries Inc  
 HiBarrier—Colonial Alloy Co  
 Hi-CRA—Busmann Mfg Co  
 Nichok-RD—Nichok Electrical Instrument Co  
 Hi-D—United Aircraft Products Inc  
 Hi-Parad—Aerovox Corp  
 "HIFI"—Egrad Inc  
 HiFi Types—Grove Enterprises  
 Hi-Flux—Ammis Co R B  
 Hi-G Aircraft—General Controls Co  
 Highland—Highland Design

High Speed—High Speed Hammer Co  
 High-Speed Microscopograph—Central Research Labs  
 High-Tek—Electro-Mechanical Insty Co  
 High Viability—Lincoln Electric Co  
 Hi-K—American Metal Climax Inc  
 Hi-Kaps—Centralab Electronics/ Globe Union Inc Div  
 Hi-K Ceramic—Erie Resistor Corp/Electronics Div  
 HiLab—Holt Instrument Labs  
 "Hi-Lo"—Industrial Devices Inc  
 Hi-Lo—Hi Shear Rivet Co  
 HiLux Screen—Technikote Corp  
 Hi-Meg—Victoreon Instrument Co  
 Hinge Lock—Simmons Fastener Corp  
 Hipermalloy—United Transformer Corp  
 Hi-Phase—Jack & Meints Inc  
 Hi-Power—Yash Corp  
 HiR—Aerovox Corp  
 Hi-R—Bourns Inc  
 "Hi-Red"—Holub Industries Inc  
 Hi-Reli—Armal Electronics Inc  
 Hirschmann—Rye Sound Corp  
 Hi-SEAL—Greene Tweed Co  
 Hi-Shear—Hi Shear Rivet Tool Co  
 "Hi-Speed"—Holub Industries Inc  
 Hi-Stab—Erie Resistor Corp/ Electronic Div  
 Hi-Temp—Premco Inc  
 Hi-Temp—Parker-Kalon  
 HiTone—American Geleso Electronics Inc  
 Hi-Torque—Hi Shear Rivet Tool Co  
 Hi-Treadite—Linemaster Switch Corp  
 HiTrim—Bourns Inc  
 Hi-Vo-Kaps—Centralab Electronics/Globe Union Inc Div  
 "Hi-Volt"—Industrial Devices Inc  
 Hi-way—Electronics Corp of America  
 HKP—Porter Inc H K  
 H-Lab—Harrison Labs  
 H L Emery—Manson Van Winkle Munning Co  
 HO—Pheps Dodge Copper Products Corp  
 Hoffman—Hoffman Electronics Corp/Military Products Div  
 Hoffman—Hoffman Eng Corp  
 Hoffman—Progress Electronics Co  
 Hogan Faximile—Hogan Faximile Corp  
 Hogan—Hogan Faximile Corp  
 Hogan—Teletograph Corp  
 "Hold-Title"—Titchener & Co E H  
 Holgun—Blach & Decker  
 "Holiday"—Webcor Inc  
 Hollshaft—U S Electrical Motors Inc  
 Hottle Straps—Continental Screw Co  
 "Holt"—Hartley Products Co  
 "Homon-Crane"—Commercial Filters Corp  
 "Honeywell"—Honeywell Controls Ltd  
 Hook Lock—Simmons Fastener Corp  
 Hook Switch—Switchcraft Inc  
 Hopkins—Hopkins Eng Co  
 Hornet—New York Transformer Co  
 "Hospital Master"—Honeywell Controls Ltd  
 "Hotel Master"—Honeywell Controls Ltd  
 "Hotip"—Contact Inc  
 Hotpack—Electric Hotpack Co  
 "Hotshot"—Egrad Inc  
 Hotwatt Inc—Hotwatt Inc  
 House of Resistors—Clarestat Mfg Co  
 Howell Red Band Motors—Howell Electric Motors Co  
 Hoyt—Hoyt Electric Instrument Works  
 H P Ceramics—Aerovox Corp  
 H-Series Flux—Fairmount Chemical Co Inc  
 HTT—Acherman-Gould Co Inc  
 Hubloc—Andrew California  
 Hubloc—Andrew Corp  
 Hudson—Hudson Lamp Co  
 Hudson—Oxford Components/Oxford Electric Corp Div  
 Hudson—Oxford Electric Corp  
 Hug-A-Plug—Page Fogwell Corp

Human Engineer—Bristol Co  
 "Humdinger"—Egrad Inc  
 Humdinger—Clarestat Mfg Co  
 Humidigraph—Bristol Co  
 Humidolain—Star Porcelain Co  
 Humidometer—Paris Lab  
 Henry Francis  
 "Humid-U-Stat"—Honeywell Controls Ltd  
 "Humistat"—American Instrument Co  
 Hummingbird—Pesco Products  
 "Humpback"—Hayes Inc C I  
 Hunt—Hunt Co Philip A  
 Hurleton—Electric Eye Equipment Co  
 "Husite"—Huse-Liberty Mica Co  
 Husky Relays—Price Electric Corp  
 Hy-A-Sil—Sanford Miller Co  
 Hybridge—Alford Mfg Co  
 Hycar Rubber—Goodrich Chemical Co B F  
 "Hydrashaker"—Wyle Mfg Corp/Mantec Div  
 "Hydrofused"—Components Corp  
 Hydrofused—Grafo Colloids Corp  
 Hydrofile—Dension Eng'g  
 "Hydrostat"—American Instrument Co  
 Hydrovoid—Air-Shields Inc  
 "Hydrox"—Patterson Moos Research/Leeson Corp Div  
 Hydrol Switch—Diaphlex Div  
 Hy-EP—Molelectric Products Corp  
 Hyflex—Minnesota Mining & Mfg Co  
 HV-G-200—Bendix Corp/Red Bank Div  
 HV-G-300—Bendix Corp/Red Bank Div  
 HV-G-500—Bendix Corp/Red Bank Div  
 Hy-G—Diaphlex Div  
 Hygrade—Marlet & Sons L Frank  
 "Hygrostat"—Electron-Radar Products  
 Hy-Met—Astron Corp  
 Hypac—Era Pacific Inc  
 Hypass—Sprague Electric Co  
 Hypercon—Sprague Electric Co  
 HyperCore—Moloney Electric Co  
 Hyperion—Hyperion Inc  
 Hyper-Pure—Alloys Unlimited Inc  
 Hypot—Associated Research Inc  
 Hyrad—Sequoia Wire  
 Hyrel—Sprague Electric Co  
 Hyshrink—Sequoia Wire  
 Hysol—Mysol Corp  
 Hysol—Mysol Canada Ltd  
 Hy-Spar—Harrison Paint & Varnish Co  
 Hy-Speed—Alson Engrg Corp  
 Myster Challenger—Myster Co  
 Myster Kary Krane—Myster Co  
 Myster Spacemaker—Myster Co  
 Myster Straddle Truck—Myster Co  
 Mytemco—Driver-Harris Co  
 "Nytren"—Studio Electronics Corp  
 Mytronic—United Shoe Machinery Corp  
 Nymol—Aerovox Corp

IMP—Pyramid Electric Co  
 Imperial—Reb-O-Kat Co Inc  
 Imperial—Trans-Tel Corp  
 Imperor-A-Lite—General Electric Co/Wiring Device Dept  
 Impervohm—Sage Electronics Corp  
 Impulse Sequence—Bristol Co  
 Imra—Warner & Seasey Co/Control Instrument Div  
 Inc—Phelps Dodge Copper Products Corp  
 "Incoloid"—American Products Mfg Co  
 "Inco"—Int'l Nickel Co  
 Inconel—Driver Co Wilber B  
 Increductor—CGB Labs Inc  
 "Indalloy"—Indium Corp of America  
 Indec—Industrial Eng'g & Equip Co  
 Indiac—Cleveland Instrument Co  
 Indirac—Cleveland Instrument Co  
 Inditron—National Union Electric Corp/Electronics Div  
 Indox—Indiana Steel Products  
 Induction Potentiometers—American Electronics Inc Instr Inductum—Mallory Electronics  
 Induflux—Irwin Labs Inc  
 Induction Potentiometers—American Electronics Inc Instr  
 "Industraw"—Electronic Eng'g Co  
 Induro—Induro Transistor Corp  
 Inertia Switch—Inertia Switch Instral—Leach Corp/Inet Div  
 Infrabeam—Cramer Controls Corp  
 Infratron—Biophysical Electronics Inc  
 Infratron—Infrared Industries Inc  
 Infrared—Burb & James Inc  
 Infrared—Infrared Co  
 "Inisaid"—Metallic Plastic Corp  
 Inmaeco—Insulation Mfrs Corp  
 Inner-Fin—Dunham Bush Inc  
 Innershield—Lincoln Electric Co  
 In'Resico—Instrument Resistor Co  
 Inso—Barry Controls  
 Insetro—Rosan Inc  
 Inspectroscopes—Eder Instrument Co  
 Instan-Forms—Teletograph Corp  
 Instansolder—Code Radio Works  
 Instr/Mation—Erie Resistor Corp/Erie-Pacific Div  
 Instrument—Bushing Inc  
 Instru/mation—Erie Resistor Corp/Erie-Pacific Div  
 "Instrumentation"—Honeywell Controls Ltd  
 Insulated Wire & Cable—Boston Insulated Wire & Cable Co  
 Insulcor—Armstrong Cork Co  
 Insulpak—Ninde & Dauch  
 "Instan-Set"—Phila Scientific Glass Co  
 Instapac—Onan & Sons D W  
 Insulpak—Ninde & Dauch  
 Intec—Intercontinental Electronics Corp  
 "Integrity Series"—Stramberg-Carlson Div/General Dynamics Corp  
 Intermatic—Int'l Register Co  
 Interwoven—Greene Tweed & Co  
 Interzone—Rockbestos Wire & Cable Co  
 InVar—Invar Electronics Corp  
 Invertron—Behlman Egg Co  
 Invincible—Hanson Van Winkle Munning Co  
 Ione—Instruments of New England  
 "Ionostat"—U S Radium Corp  
 "Ionotron"—U S Radium Corp  
 Ionovac—Electro-Vac Inc  
 Iorio Accorgan—Winshall Organ Inc  
 IPC—Amphenol-Borg Electronics Corp/Ind Prod-Danbury Knudsen Div  
 IPC—Progress Electronics Co  
 IR—Industrial Radio Corp  
 IRC—Int'l Resistance Co  
 IRC—Renfrew Electric Co Ltd  
 Irish—Amplex Corp  
 IRN—Williams & Co C K  
 Iron Powder—Magnetic Powders Inc  
 I R Pak-Fone—Industrial Radio Corp  
 "Irvington"—Minnesota Mining & Mfg Co  
 I R Volunteer—Industrial Radio Corp  
 Irwin—Irwin Labs Inc  
 Isatron—Consolidated Electrodynamics Corp

ISI 607—Elliott Bros (London)  
 Iso 609—Elliott Bros (London)  
 Iso—Chattillon & Sons John  
 Isochemcoat—Isochem Resins Co  
 IsochemFI—Isochem Resins Co  
 Isochemgel—Isochem Resins Co  
 IsochemKex—Isochem Resins Co  
 Isochemstrip—Isochem Resins Co  
 Isochem Yerge—Isochem Resins Co  
 Isoform—Egor Inc  
 Isoform—Egor Corp  
 Isolantite—Isolantite Mfg Corp  
 Isolastane—Natar Corp  
 Isolators—Barry Controls  
 Isolite—Schenectady Varnish Co Inc  
 "Isolite"—U S Radium Corp  
 Iso Metall—Schenectady Varnish Co Inc  
 Isotherm—Mica Insulator Co  
 Isozomed—MB Electronics/Div  
 Itron Elec  
 Isomel—Acme Wire  
 Isomel—Schenectady Varnish Co Inc  
 Isophase—Pichering & Co Inc  
 Isoprene Sealers—Arnold Ceramics Inc  
 Isoplex—Natar Corp  
 Isoquy—Egor Inc  
 Isoquy—Schenectady Varnish Co Inc  
 Iso-Silicone—Isolantite Mfg Co  
 Iso-X—Litton Industries/  
 Electronic Equipments Div  
 Itaco—Industrial Test Equip Co  
 Itvac—Induro Transistor Corp  
 IVD—Prestin Co

J

Jab Saw—Dreier Bros Inc  
 Jackson—Jackson Electrical Instrument Co  
 Jagabi—Biddle Co James G  
 James—James Int'l Corp  
 Janitrol—Janitrol Aircraft Div/  
 Midland Ross Corp  
 Janzen—Neshaminy Electronic Corp  
 Jaquet—Sticht Co Herman H  
 Jaxco—Jacksonville Metals  
 Plastics Co  
 J B—Jackson Bros (London) Ltd  
 Jeco—Jarvis Electronics Corp  
 Jecobax—Jefferson Wire & Cable Corp  
 Jemes—Jefferson Wire & Cable Corp  
 Jensen—Jensen Industries Inc  
 Jensen—Renfrew Co Ltd  
 Jerguson Truckaxle—Jerguson Gage & Valve Co  
 Jet-Hard—BU-90—Lincoln  
 Jetweld—Lincoln Electric Co  
 Jiffy Cabinets—Campro Co  
 Jiffy Push—Eagle Electric Mfg Co Inc  
 JK—Knights Co James  
 "Johnster"—Cincinnati Tire Recorder Co  
 Jo Interven—Greene Tweed & Co  
 John Crane—Crane Packing Co  
 Johnson Mount—Johnson & Co K W  
 Johnson's & Lloyd's—Johnson Mfg Co Inc  
 Jo-Line—Jo-Line Tools Inc  
 Jolla—Jan Hardward Mfg Co  
 Jontz Tower—Jontz Mfg Co Inc  
 Joy-Joy Mfg Co/Electrical Prods Div  
 J S G—Jersey Specialty Co Inc  
 Jupiter—Chrysler Corp/Missile Div  
 J-W Sentinel—Johnson-Williams Inc  
 J-W Sniffer—Johnson-Williams Inc

K

Kaar "D" Phone—Kaar Eng'g Corp  
 Kaar Marlin—Kaar Eng'g Corp  
 Kabl King—Shylene Electronics  
 Kactemp—Gordon Co Claude B  
 Kahlenberg—Kahlenberg Bros Co  
 Kaiser—Kaiser Electronics Inc  
 Kalart—Kalart Co Inc  
 Kambol—DPW Jordan  
 Kantlink—National Lock Washer Co

Kagan—Kaiser Electronics Inc  
 "Kappa"—Wright & Sons Co  
 WE  
 Karadio—American Television & Radio Co  
 Karab—Ohio Carbon Co  
 Karatlad—Sel Rex Corp  
 Karbonet—Driver-Harris Co  
 Karlon—Karlon Assoc Inc  
 Karma—Driver-Harris Co  
 Kasil—Philadelphia Quartz Co  
 Kavlico—Vinson Eng'g & Sales Corp  
 Kaylock—Kaynar Mfg Co Inc  
 Kearfott—Kearfott Co Inc  
 KEL-F—Minnesota Mining & Mfg Co  
 K E—Kurman Electric Co/Bob Crescent Petroleum Corp  
 Kelon-C—Shamban & Co W S  
 Kelon-T—Shamban & Co W S  
 "Kemet"—Kemet Co Div/Union Carbide Corp  
 Kemfuz—Beiffuse Inc  
 Kemp—Kemp Aero Products  
 Kemtron—Kemtron Electron Products Inc  
 Kenco—Kenwood Eng'g Co  
 Kennett—Natl Vulcanized Fibre Co  
 Kent—Kent Lighting Corp  
 Kentlite—Kent Lighting Corp  
 Kentron—Kentron  
 Keps—Kell Eng'g Products Co  
 Keps—Shabproof Div/Illinois Tool Works  
 Keranute—Ceramic Soc Co Inc  
 Kernel—Burnell & Co Inc  
 Kern (Buriss)—Ken Instruments Inc  
 Kerro's "E-Bond"—Kerroc Products  
 Kester—Kester Solder Co  
 "Key-municator"—Stromberg Carlson/General Dynamics Corp Div  
 "Kic"—Kemet Co/Union Carbide Corp Div  
 Kilde—Kilde & Co Walter  
 Kilde Temp-O-Larm—Kilde  
 Ultrasonic & Detection Alarm Inc  
 Kiodial—Kilo Eng'g Co  
 KioKnob—Kilo Eng'g Co  
 Kilgash—Wesco Electric & Mfg Co  
 Kilonet—Kilo Eng'g Co  
 Kilatrol Switch—Diaphex Div  
 Kilovolt Corp—Kilovolt Corp  
 Kimball Electronic Organ—Gibbs Mfg Research  
 Kimberley—Feiber Mfg  
 Kinco—Kine Iron & Steel Co  
 Kincaid—Callins Radio Co  
 Kinplex—Collins Radio Co  
 Kinotape—Collins Radio Co  
 King—Arie Electronics Corp  
 "Kingsley"—Kingsley Machine Co  
 Kinney—New York Air Brake Co/Kinney Vacuum Div  
 Kip—Kip Electronics Corp  
 Kit-Tronics—Kit-Tronics  
 Kler-Pak—Sprague Electric Co  
 Kler-Vue—Kler-Vue Mfg Co Inc  
 Klein Pliers—Klein & Sons Mathias  
 Kleinschmidt—Smith-Corona Merchant Inc/Kleinschmidt Div  
 Kler—Greene Tweed & Co  
 Klieglights—Kileal Bros  
 Kliepsun—Kliegl Bros  
 Klikhit—Rau Fastener Co  
 Klincher Locknuts—Klincher Locknut Corp  
 K-Lob—Erie Resistor Corp—Electronics Div  
 Kluzur—Sackel Packing  
 Knight Hi-Fi—Allied Radio Corp  
 Knight-Kit—Allied Radio Corp  
 "Knurl-Tite"—Chase Mfg Co  
 Kocour—Kocour Co  
 Koll Kradle—Benchmaster Mfg Co  
 Koldub—Baffee Glass Co  
 KOLD-Pak—Tanner Eng'g Inc  
 Kold Phil—Phillips Mfg Co  
 Kolochem—Sprague Electric Co  
 Koolpak—Sprague Electric Co  
 Kooltronics—Kooltronics Fm Co  
 Kopp—Kopp Glass Inc  
 Kop-R-Klad—Shamban & Co W S  
 Korda-Flex—Chicago Gasket Co  
 Korell—Burke & James Inc  
 "Kostreel"—Kost Products Co  
 Kover—Carborandum Co/  
 Karab—Carborandum Co Latrobe Plant/Refractories Div

Kovar Alloy—Carborandum Co/  
 Latrobe Plant  
 Kraft—Stevens Paper Mills Inc  
 Kraft—Hov Kreckman Co  
 Kris-Tel—Kris Electronics Inc  
 Kromore—Driver-Harris Co  
 Krylon—Krylon Inc  
 Kryston 85—Leosona Corp/  
 Patterson-Moos Research Div  
 KTY—KTY Tower & Communica-  
 tions Equipment Co  
 Kulgrig—Sylvania Electric  
 Products Inc  
 Kulite—Bytrax Corp  
 "Kultra"—Kultra Elec Corp  
 KUP—Greene Tweed & Co  
 Kurelo—Kurtson Electronics  
 Kurman Electric—Relay Sales Inc  
 Kurmelco—Kurman Electric Co/  
 Sub Crescent Petroleum Corp  
 K V Corp—Kilovolt Corp  
 KVO—Sprague Electric Co  
 Kwik-Chek—Hamilton Watch  
 Co/Allied Prods Div  
 Kwik-Kwik—Special Chemical Corp  
 Kwik-Kwik—Lone Sound Engrs  
 J M  
 Kwik Klip—South River Metal  
 Products Co  
 Kwik Release—Burblyn  
 Kwilbits—University Loudspeakers  
 Inc  
 Kwik-Term—Cannon Electric Co  
 "Kwily-Dot"—By Bul Co

L

La Belle—Labelle Industries Inc  
 Labelon—Labelon Tape Co  
 "Labiron"—Nuclear-Chicago  
 Corp  
 Labmaster—General Nuclear Corp  
 Lab-Volt—Buch Eng'g Co  
 "Lacbon"—U S Radium Corp  
 Lac-O-Weld—Nu Steel Co  
 "Lak"—Lak Mfg Co  
 Lake City Synchronous Motors—  
 Controls Co of America  
 "LAMB"—Lamb Electric Co/  
 American Machine & Metals  
 Inc Div  
 "Lamator"—Lamaco Inc  
 Laminic—Mica Insulator Co  
 Laminox—Laminated Shim Co  
 Lancaster—Electro-Voice Inc  
 Lancaster Glass—Lancaster Glass  
 Corp  
 Lancer—P & M Sales Corp  
 Lave—Maryland Lava Co  
 Lave—Rawlston Rand Union  
 Lavis—Steward Mfg Co D M  
 Laveland—Star Porcelain Co  
 L C Checker—Aerovox Corp  
 L-C—JFD Electronic Corp  
 Leadtek—Revere Copper & Brass  
 Inc  
 "Leak Lock"—Highside Chemicals  
 Leatherwood—Masonite Corp  
 LeBeck—LeBeck Chemical Corp  
 Leclanche—Leclanche S-A  
 "Leclanche Aire"—Rader Corp  
 Lectra-Breath—McGraw-Edison  
 Co/Pittsburgh Lectrodryer Div  
 Lectro-Cals—Bart Mfg Corp  
 Lectrodryer—McGraw-Edison  
 Co/Pittsburgh Lectrodryer Div  
 Lectrofliter—McGraw-Edison  
 Co/Pittsburgh Lectrodryer Div  
 Lectro-Forms—Bart Mfg Corp  
 Lectro-Mic—Sel Rex Corp  
 "Lectroscope"—Namin Inc  
 Lectroscope—Babcock & Wilcox  
 Co/Tubular Products Div  
 Lectro-Sync—American Speedlight  
 Corp  
 Ledex—Leland Inc G H  
 Lee—Lee Spring Co  
 Leosona—Leosona Corp  
 Letra-Lob—Linemaster Switch  
 Corp  
 Letrite—Lab-Tronics Inc  
 Letrosette—Metamc Inc  
 Letrosette—Burke & James Inc  
 Letro—Lercs Electronics Inc  
 Less—LESA  
 Levell—Scapes Co Inc  
 Level-Log—Robert-Shaw Fulton  
 Controls Co  
 Level Master—JoBell Products  
 Inc  
 Level-Set—Robert-Shaw Fulton  
 Controls Co  
 Level-Tab—Robert-Shaw Fulton  
 Controls Co  
 Level-Tel—Robert-Shaw Fulton  
 Controls Co  
 Leveltronics—Instruments Inc  
 Levelmate—Nanson Van Winkle  
 Manning Co

Levi—Switches—Switchcraft Inc  
 Leyton—Electro-Voice Inc  
 LF-Jax—Switchcraft Inc  
 LGP-50—Librascope Div/General  
 Precision Inc  
 Liberty—Grove Enterprises  
 Libratrac—2000—Librascope Div/  
 General Precision Inc  
 Libratrol-500—Librascope Div/  
 General Precision Inc  
 Lic—Life Instrument Co  
 Licco—Illinois Tool Works/  
 Licen Div  
 Life—Life Instrument Co  
 Lifeite—Gulton Industries  
 "Light Saver"—Honeywell Con-  
 trols Ltd  
 Light Warden Chemoanalytical  
 Electric Cord  
 Limit—James Int'l Corp  
 Limatron—Bussmann Mfg Co  
 Limander—Electronic System  
 Eng'g Co  
 Lincoln Corp—Lincoln Electric  
 Co  
 Lincolnweld—Lincoln Electric Co  
 Lincoln—Lincoln Electric Co  
 Line-Tham—Lincoln Electric Co  
 Linewelder—Lincoln Electric Co  
 Lindon—Electro-Voice Inc  
 Linder—Nortlic Co Inc W I  
 Linear—F & M Scientific Corp  
 Linear Standard—United Trans-  
 former Corp  
 Linestar—Airborne Accessories  
 Corp  
 Linemaster—Linemaster Switch  
 Corp  
 "Line-O-Life"—Carter Motor Co  
 Linimeter—Bourne, Inc  
 Link Lock—Bimmons Fastener  
 Corp  
 "Linq"—Mull-head & Co Ltd  
 Lion—South Chester Corp/  
 Southco Div  
 Lipps—Lipps Edwin A  
 LIQIDensitometer—Liquidim-  
 eter Corp  
 Listener—Otarion Listener Corp  
 Lite-Mite—White Sales Co C C  
 "Litstrip"—Civcon Components  
 Corp  
 Lithofrax—Carborandum Co/  
 Refractories Div  
 Lithoform—Amchem Products  
 Inc  
 Little Gem—Aerospac Corp  
 "Little Gem"—Sjoberg & Son C  
 Little Jax—Switchcraft Inc  
 Little Jewel—Argonne Electronics  
 Mfg  
 Littl-Lytic—Sprague Electric Co  
 Little Plugs—Switchcraft Inc  
 Little Switches—Switchcraft Inc  
 Livermont—Richmont Inc  
 Livingston—Grove Enterprises  
 Load—Standard Instrument Corp  
 Load—Simmonds Aerorecessories  
 Inc  
 Loc-Fit—U S Eng'g Co/Litten  
 Div  
 "Loche"—GE Insulator Dept  
 Lock-Extension-Jax—Switch-  
 craft Inc  
 Lock-Griffier 3800—X-Acto Inc  
 Lock-O-Seal—Parber Seal Co/  
 Parker-Hannifin Corp Div  
 Lock-Plug—Switchcraft Inc  
 "Lockswitch"—Honeywell Con-  
 trols Ltd  
 Loecique Cleaner—American Seal-  
 ants Co  
 Loctite Sealant—American  
 Sealants Co  
 "LoDrill"—Crown Ltd  
 Logeltronic—Logeltronic Inc  
 Logger—Audio Instrument Co  
 Logo—Bee Chemical Co  
 Logoquant—Bee Chemical Co  
 Lohm—Driver-Harris Co  
 Lubants—Shakeproof Div/  
 Illinois Tool Works  
 L O H M—Bradford Components  
 Inc  
 "Lorac"—Selcor Mfg Co/  
 Seismograph Service Corp Div  
 Loraine—Electro-Voice Inc  
 "Lorain"—Lorain County Radio  
 Corp  
 Lorro—Wheelabrator Corp  
 Lotem—Mico Instrument Co  
 "Lo-Volt"—Industrial Devices  
 Inc  
 Lowell—Lowell Mfg Co  
 Low-Peak—Bussmann Mfg Co  
 L-R—Ripley Co  
 L-Y—Lab-Tronics Inc  
 Lube-Lok—Electrofilm Inc  
 Lubri-Bond—Electrofilm Inc  
 Lubri-Stat—Fidellone Inc  
 Lucuro—Driver-Harris Co  
 Lumatron—Micro Balancing Inc

Lumetron—Photovolt Corp  
 Lumicon—Bendix Aviation  
 Corp/Friez Instrument Div  
 Lunday—Lunday Associates Inc  
 "Lusterized"—American Electric  
 Cable Co  
 "Lusterite"—American Electric  
 Cable Co  
 Luxo—Begen Co M  
 Luxo-Lamp—Luxo Lamp (Can-  
 ada) Ltd  
 Luxtrol—Superior Electric Co  
 Lycoman—Burke & James Inc  
 Lyn-A-Syn—Minatron Corp  
 Lyncach—Lyncach & Truck Co  
 Inc  
 "LynnLighting"—Vaco Products  
 Co  
 Lyon—Lyon Metal Products Inc  
 Lytle DigiStat—Lytle Corp  
 Lytlelevision—Lytle Corp

M

McAlister Inc—McAlister Inc J G  
 McDonnell—McDonnell & Miller  
 Inc  
 McDonnell & Miller—McDonnell  
 & Miller Inc  
 McKenna Kleaner—McKenna  
 Labs  
 McLean—McLean Eng'g Labs  
 McMartin—Continental Mfg  
 Machay—Machay Radio & Tele-  
 graph Co/Warner Div  
 "Macroscope"—Douglas Micro-  
 scope Co  
 Magadony—Richardson Labs  
 Kenneth  
 Magdel—Automation Inc  
 Magic Circle—A R F Products  
 Inc  
 Magicores—Smith Corp A O  
 "Magiscope"—Kost Products Co  
 "Magic Wand"—Sticht Co Norma  
 man H  
 Magi-Mix—Technical Appliance  
 Corp  
 Magmeter—Airtax Electronics  
 Inc/Seminole Div  
 "MAG-MOD"—General Mag-  
 netics  
 Magnacard—Magnavox Co Re-  
 search Lab  
 Magnaflex—Magnaflex—Magnaflex  
 Corp  
 Magnaflex—Carborandum Co/  
 Refractories Div  
 Magnaloc—Hoffman Electronics  
 Magna-Phone—Kay-Tomms An-  
 tenna Co  
 Magnaphonic—Magnasync Mfg Co  
 Mag Na Probe—Eng'g Dev Inc  
 Magna Set—Precision Thermom-  
 eter & Instru Co  
 Magnasync—Magnasync Mfg Co  
 Magnetrol—Magnaflex Corp  
 Magnetron—Hansen Mfg  
 Magnetron—Magnastron Inc  
 Magnetrol—Dynamic Controls Co  
 Magna-Phone—Kay-Tomms An-  
 tenna Co  
 Magnavision—Eng'g Dev Inc  
 Magnebrake—Vickers Inc/Electric  
 Products Div  
 Magneclutch—Vickers Inc/Elec-  
 trical Products Div  
 Magnecord—Midwestern Instru-  
 ments  
 Magnehehl gage—Dwyer Mfg Co  
 F M  
 Magneline—Patwin/Patent Button  
 Div  
 Magne-Pak 40—Magnetic Con-  
 trols Co  
 Magne-Pak 60—Magnetic Con-  
 trols Co  
 Magne-Plexor—San Diego  
 Scientific Corp  
 "Magnevac 31"—Electro-Voice  
 Inc  
 Magnesound—Panga Electronics  
 Corp  
 Magnetat—Magnetic Research  
 Corp  
 Magnasyn—Friez Instrument/  
 Bendix Corp Div  
 Magnetic Rubber—Clevite Harris  
 Prods Inc  
 Magnett—Heinemann Electric Co  
 Magnifax—Beckman & Whitley  
 "Magniphase"—Continental Elec  
 Mfg Co  
 Magnivision—Engineering De-  
 velopments Inc  
 Magni-Whirl—Blue M Electric Co  
 Magne—Driver-Harris Co  
 Magnocarb—Driver Co Wilber  
 Magnorite—Norton Co  
 Magri-Lite—White Sales Co O C

Majestic—Nanson Van Winkle  
 Manning Co  
 "Malco"—Malco Mfg Co  
 "Malcomatic"—Malco Mfg Co  
 Mallory 1000—Mallory Metal-  
 lurgical Co  
 "Mallo-Seal"—Mallory & Co Inc  
 P R/Vibrator Div  
 Maltesa—Buche & Co  
 Man-Au-Trol—Bullard  
 Manco—Manco Mfg Co  
 Mangawald—Lincoln Electric Co  
 Manglet—Lincoln Electric Co  
 Mangrid—Driver Co Wilber  
 Manhattan—Greene Tweed & Co  
 Manning 100—Manning Paper Co  
 John A  
 Manual Lincolnweld—Lincoln  
 Electric Co  
 "Marscon"—Marscon's Wireless  
 Telegraph Co Ltd  
 Markanic—Acromark Co Inc  
 Markes—Markem Machine Co  
 Mark II—Technical Devices Co  
 "Mark V"—Technical Devices Co  
 Mark-IV-Vro—Par Products Corp  
 Marking Specialist—Acromark Co  
 Inc  
 Markite—Marlito Corp  
 Mark 11—Electra Tec Corp  
 Mark 11—Pacific Scientific Co  
 "Mark 11"—Technical Devices Co  
 Marquis—Electro-Voice Inc  
 "Marstrand"—Marstrand Eng'g Ltd  
 Masco—Simpson Mfg Co Mark  
 Mascoat—Western Coating Co  
 Masonite—Masonite Corp  
 Master-Cal—Master Etching Corp  
 Masterline—Blonder-Tongue Labs  
 Mastermet—Cannon-Mustepon  
 Corp  
 Master Pro—Cincinnati Time Re-  
 corder Co  
 Master-Slow Manipulator—Can-  
 ter Research Lab  
 Matzoran—Nanson Van Winkle  
 Manning Co  
 Matchmaker—Channel Master  
 Corp  
 Matrixix—Liton Industries/  
 Electronic Tube Div  
 Matrix—Engis Equipment Co  
 Matto White—Technikote Corp  
 "Maxar"—Oster Mfg Co/John  
 Cummings Portable Tool Div  
 Max-C—JFD Electronic Corp  
 "M C"—Link-Belt Co  
 MDL—Microwave Development  
 Labs  
 MD 20—Liton Industries Inc/  
 Potentiometer Prod Dept  
 Matzoran—Sheffield Corp/Sub  
 Bendix Aviation Corp  
 "Mc"—Milgo Electronic Corp  
 Mecap—Micamold Electronics  
 Mfg Corp  
 Mecatron—Torgren Co C W  
 Mechanical—Garlock Paching  
 Mechanical Squirt Welder—  
 Lincoln Electric Co  
 Mechrolat—Servomechanisms  
 Canada Ltd  
 M E C Inc—M E C Inc  
 Mechantronic—Poussard Mfg  
 Medalist—Marion Instrument  
 Div/Min Honeywell Regulator  
 Co  
 Medcraft—Medcraft Electronic  
 Corp  
 Megacorp—Scientific & Prec  
 Inst Div/Beckman Instrument  
 "Meg-A-Life"—Semiconductor  
 Products Div/Metrolabs Inc  
 Megalume—Remy-Clarke Co/  
 Vitro Corp of America  
 Megareel—Guttmann Co of Calif  
 Corp  
 "Megacorb"—Continental Elec  
 Mfg Co  
 Megger—Biddle Co James G  
 Meg-meter—Winslow Co  
 "Megohm"—Sticht Co Norma  
 man H  
 Meg-O-Max—Sprague Electric Co  
 "MEK"—Machinery Electrica-  
 tion Inc  
 Meleomatic—Meleton Corp  
 Melex—Meleton Corp  
 Melitone—Electron Enterprises  
 "Melotone"—Egrad Inc  
 Melody Mite—Audio Equipment  
 Co  
 Memco—De-Lux Mfg

# BRAND & TRADE NAMES

Memcor—Model Eng'g & Mfg Inc  
 Memo-Lite—Transistor Electronics Co  
 Memotron—Hughes Aircraft Co  
 Vacuum Tube Products Div  
 Mer-A-Punch—American Electronics Inc  
 Merc-Arc—News-Clarke Co/Vibro Corp of America  
 Mercil—Hanson Van Winkle Munning Co  
 Mercotrol—Meredol Corp  
 Mercury—Electro-Voice Inc  
 Mercury—Grove Enterprises  
 Mercury—Petlibone Mulliken Corp  
 Mercury—Vulcan Electric Co  
 "Merit"—Egrad Inc  
 Merit—Merit Coil & Transformer Corp  
 Meritone—Autocrat Electronics Co  
 Merix—Merix Chemical Co  
 "Frost-Off"—Merix Chemical Co  
 Merix "Rins"—Merix Chemical Co  
 Merix "Wipe"—Merix Chemical Co  
 Merkle-Korff—Merkle-Korff Gear Co  
 Merl—Miller-Electro-Research Labs  
 Message Repeater—Mohawk Business Machines Corp  
 Met-A-Caps—Chicago Condenser Corp  
 Metaphraphic—Bristol Co  
 Metal-Cal—C H Supply  
 Metalcor—Phillips Process Co Inc  
 Metaphraphic—Bristol Co  
 "Metal-Cell"—Tonatron Inc  
 Metal-ists—Kidco Inc  
 Metalite—Astron Corp  
 Metallic—Metallic Plastics Corp  
 "Metallo"—Metallo Gasket Co  
 Metalohm—Liton Industries/  
 Electronic Equipments Div  
 Metal "O" Rings—Advanced Products  
 "Metalset"—Smooth-On Mfg Co  
 "Metal Shielded Wire"—Uniform Tubes Inc  
 Metameter—Bristol Co  
 "Metaphram"—Honeywell Controls Ltd  
 Metavane—Bristol Co  
 Metcom—Microwave Electronic Tube Co Inc  
 Meteor—Associated American Winding Machinery Inc  
 Meteor—Astron Corp  
 Meterite—Cohu Electronics Inc./Massa Div  
 Methbond—Narmex Industries Inc./Narmco Materials Div  
 Met-L-Flex—Robinson Technical Products Inc  
 Met-L-Wood—Met-L-Wood Corp  
 Met-D-Seat—Parter Seal Co/  
 Parker Hannifin Corp Div  
 Metox—Welywn Int'l Inc  
 Metox—Metox  
 Metrisite—Brush Instruments  
 Metrix—Compagnie Generale De Metrologie  
 Metro—Metrocolitan Supply Co  
 Metroscopic—Photocron Research Products  
 Metrology—Molecu-Wire Corp  
 Mexican—U S Graphite Co/  
 Wickes Corp Div  
 MF—Millipore Filter Corp  
 "Mf Brown Elektronik"—Honeywell Controls Ltd  
 Mica-Glass—National Electric Coil Co/Edison McGraw Co  
 Mica-Matt—National Electric Coil Co/Edison McGraw Co  
 Micanite—Mica Insulator Co  
 Micanite—Mica Insulator Mfg Corp  
 Mica-Micamold Electronics Mfg Corp  
 Mica-rt—Westinghouse Electric Corp  
 Micania—Commercial Filters Corp  
 "Micaply"—Mica Corp  
 Michiana—Commercial Filters Corp  
 Mic-3-Final—Instruments Inc  
 Mico-Mille—Mico Instrument Co  
 Mico Lablite—Mico Instrument Co  
 Micolite—Mico Instrument Co  
 Mico—Dossier Mfg Corp  
 Mico-Diode—Pacific Semiconductor  
 "Mico-Shim"—Staver Co  
 Mico Vileite—Mico Instrument Co  
 Micro-Just—Fairchild Recording Equipment  
 Micrelay—Ebert Electronics

"Micro"—Honeywell Controls Ltd  
 Micro-AC—Cleveland Instrument Co  
 Microcast—Bristol Co  
 Microcast—Austenal Co/Howe Sound Co Div  
 "Microcom"—General Devices Inc Princeton N J  
 Microcorder—Micrometrical Mfg Co  
 Microdial—Amphenol-Borg Electronic  
 Micro-Dial—Cubic Corp  
 Micro/Flex—Electro-Sonic Labs  
 Microforms—Anchor Metal Co Inc  
 Microid—Burnell & Co Inc  
 Micro-Letric—Micro Machine Works Inc/Micro-Letric Div  
 Microlevel Relays—Stevens-Arnold Inc  
 Microline—Sperry Microwave Electronics Co/Sperry Rand Corp Div  
 Microlytic—Micamold Electronics Mfg Corp  
 Micromag—Magnetic Research Corp  
 Micromaster—Jones & Wetlaufer Eng Corp  
 MicroMatch—Jones Electronics Co Inc M C  
 Micromatic—Dukane Corp  
 Micromat—Waldorf Electronics Laboratory—Lambdin Labs Inc  
 Micro-Mid—Amphenol-Borg Electronics Corp/Amphenol Connector Div  
 Micro-Miniature—Atlantis Electronics  
 Micromotor—Redmond Co  
 Micro-Namic—Micro Balancing Corp  
 Micropac—Era Pacific Inc  
 Micropan—Micro-Circuits Co  
 Micropix—Liton Industries/  
 Electronic Equipments Div  
 Microplex—Liton Industries/  
 Electronic Tube Div  
 Microposis—Cook Electric Co  
 Micro-Printer—Diapher Div  
 Micro-Poise—Ret-O-Kut Co Inc  
 Micropositioner—Barber Colman Co/Electrical Comp Div  
 Microprot—Borg Equip/Amphenol-Borg Electronic Corp  
 Microptic—Engis Equipment Co  
 Micro Ribbon—Amphenol Connector/Amphenol-Borg Electronics Corp  
 MicroSADIC—Consolidated Electrodynamics Corp  
 Microsire—Cook Electric Co  
 Micro—Fairchild Recording Equipment  
 "Microstat"—Int'l Resistance Co  
 "Micro-Stat"—Pulse Eng'g Inc  
 "Microsyn"—Minn-Honeywell/Boston Div  
 Microtel—Lenkurt Electric Co  
 Microthin—Shamban & Co W S  
 Micro-Tip—National Standard Co  
 Micro-Transistor—Pacific Semiconductor  
 Microtrim—Bourns Inc  
 Microvac—Stokes Corp F J  
 Microvoid—Air-Shields Inc  
 Microwave Dielectrometer—Central Research Labs  
 Microweb—Millipore Filter Corp  
 Middlesex—Wood Products—Bowl-Mol Co Inc  
 Midget—Midget Lower Co  
 Midget—Sprague Electric Co  
 Midgetape—Mohawk Business Machines Corp  
 Midgetrol—Mallory & Co P R  
 Middle—Roovers-Lotsh Corp  
 Middle-Matic—Roovers Lotsh Corp  
 Widthom—Driver-Narris Co  
 Mid-Rip—General Cable Corp  
 MIG—Minatron Corp  
 "Mighty-Mite"—Mechanical Industries Prods Co  
 Mico-Meter—Sprague Electric Co  
 Mico-Norm—Superior Electric Co  
 Mil-Ac—Ellis & Watts Products Inc  
 Mil-Etch—Wyandotte Chemicals Corp  
 Mils-E-Trim—Bourns Inc  
 Millex—Milex Instrument Prods Corp  
 Milford Rivets—Milford Rivet & Machine Co  
 Milipot—Voah Eng'g Co  
 Millen—Millen Mfg Co James Miller-Trojan  
 Miller-Trojan  
 Milli-Mite—Edgerton Gernsheim & Grier

Millipore—Millipore Filter Corp  
 MilliSADIC—Consolidated Electrodynamics Corp  
 Millises Relays—Stevens-Arnold Inc  
 Milli-Switch—Milli-Switch Corp  
 Millivac—Bristol Co  
 Mikroyal—Milton Roy Co  
 Mil-Stub—Telemeter Magnetics Inc  
 Mimiplate—Gulton Industries  
 Min-Amp—E O Electronics Inc  
 Minerva Timers—Ducumom Co M  
 "Miniature Meter"—Welywn Canada Ltd  
 Mini Buzzer—Line Electric Co  
 "Mini-Cator"—Industrial Devices Inc  
 Minichron—Jordan Electronics/Victoreen Div  
 "Minicom"—General Devices Inc  
 Mini-Com—Switchcraft Inc  
 "Minicord"—Minicord Corp of America  
 "Minidrive"—Aerolab Development Co/Semiconductor Systems Div  
 Miniductors—United Transformer Corp  
 Minifan "2"—Airesearch Mfg Co  
 "Minifiers"—Int'l Resistance Co  
 Minifilters—United Transformer Corp  
 Minihed—Smith Mfg Co Inc  
 Mini-Mod—Cleveland Metal Specialties Co  
 Mini-Jector—Newbury Industries Inc  
 Mini-Labs—Stanley Aviation Corp  
 Mini-Line—Magnetic Corp  
 Mini-Lit—Transistor Electronics Co  
 Mini-Load—Bogart Mfg Co  
 Mini-Log—Elliott Bros (London)  
 Mini-Markers—Westline Products/Western Lithograph Co Div  
 Minimate—Astron Corp  
 "MiniMite"—Thermo Electric Co  
 Mini-Wix—Switchcraft Inc  
 Mini-Molds—Cleveland Metal Specialties Co  
 "Mini-noise"—Microdot Inc  
 Mini-Ohm—Sprague Electric Co  
 Minipak—Radio Specialty Mfg Co  
 Minisel—Electronic Devices Inc  
 Mini-Shield—Staver Co  
 Minisource—Electronic Assembly  
 Mini-Spot—Pesco Products  
 Mini-Spring—Staver Co  
 Minitapes—Stancil-Hoffman Corp  
 Minitests—Seromachisms Inc./Los Angeles Div  
 Minitec—Westrex Corp/Litton Industries Div  
 Mini-Trak—Thermawire Corp  
 Mini-Trak—Western Devices Inc  
 Minitron—Radio Eng'g Co  
 "Mini-Volt"—Industrial Devices Inc  
 "Minneapolis-Honeywell"—Honeywell Controls Ltd  
 Minn-Honeywell  
 Aeronautical Div/Aeronautical Div/Minn-Honeywell  
 Minneapolis-Honeywell Regulator Co—Rubicon Instruments/Minnapolis-Honeywell  
 Minnie—Amphenol Connector/Amphenol-Borg Electronics Corp Div  
 Minirelay—Ebert Electronics  
 Minishall—Minshall Organ Inc  
 Minister—Minister Machine Co  
 Mir—Hinde & Dauch  
 Miraco—Mitchell Rand Mfg Corp  
 Mirrorite—Wollensak Optical Co  
 Missilimit—Micamold Electronics Mfg Corp  
 Mitchell—Compro Corp  
 "Mitchell"—Mitchell Industries  
 Mi-T-Mag—Nat'l Moldite Co  
 Mix-Amps—Switchcraft Inc  
 Mi-Jax—Switchcraft Inc  
 MM-4—Acherman-Gould Co Inc  
 MM-6—Acherman-Gould Co Inc  
 MM-2—Acherman-Gould Co Inc  
 "Mobile"—Sylvania Electronic Systems  
 Mobilphone—Mobil Electronics Mfg Co  
 Mobilmatic—Mobil Electronics Mfg Co  
 Mobilite—Lenkurt Electric Co  
 Mobiltron—Mobil Electronics Mfg Co  
 Modeler—Modeler Products Corp  
 Model 5P—Miller Harris Instrument Co  
 Model NR—Segal Edward  
 Model NR-ESSM—Segal Edward  
 Modern—Modern Wire Co

Modern Design—Modern Design Div/Schloer Inc H L  
 Modernes—Modern Lab Equip Co  
 Modified Hilo—Driver Co Wilber B  
 "Moducell"—Tonatron Inc  
 "Modulow"—Honeywell Controls Ltd  
 Modular—U S Components  
 Moduline—Sprague Electric Co  
 Mod-U-Rob—Premier Metal Products Co  
 "Modusnap"—Honeywell Controls Ltd  
 "Modustat"—Honeywell Controls Ltd  
 "Modutrol System"—Honeywell Controls Ltd  
 Modu-Wave—Sciaky Bros Inc  
 Mohawk—Mohawk Wire & Cable Corp  
 "Moist-O-Graph"—Honeywell Controls Ltd  
 Moisture Gage—Parks Lab Henry Francis  
 Moisture Monitor—Strandberg Eng'g Labs Inc  
 "Moist-On"—Component Mfg Service Inc  
 Molded Rubber Parts—Clevite Harris Prods Inc  
 Moldite—Nat'l Moldite Co  
 "Molecu-Dryer"—Hayes Inc C I  
 Molecu-Loc—Molecu-Wire Corp  
 Moler—Moler Products Co  
 Molly Jack Nuts—Molly Corp  
 Molly Screw Anchors—Molly Corp  
 Molykote—Alpha Molykote Corp  
 MonadLoc—Monadnock Mills  
 Monarch—Hanson Van Winkle Munning Co  
 Monastrip EP—Mona Industries Inc  
 Monatel—Liton Industries/Westrex Corp Div  
 Monel—Driver Co Wilber B  
 Monicon—Cathodeon Ltd  
 Monitor—Radio Merchandise Sales Inc  
 Monitor—Monitor Controller  
 Monitor—Moore Associates Inc  
 Monolythic—Sprague Electric Co  
 Monomotor—Redmond Co  
 "Monopak"—Alexandria Div Amf  
 "Monop-Tet"—Gore & Assoc Inc W  
 Monorbot—Liton Industries/  
 Electronic Equipments Div  
 Monrobot—Monroe Calculating Machines Co  
 Monroe—Monroe Calculating Machines Co  
 Montaub—Munston Mfg & Service Inc  
 Montek—Montek Associates Inc  
 Moodmaster—Conley Electronics Corp  
 Moody—Moody Machine Products Co  
 Moody Kit—Moody Machine Products Co  
 Moran—Ince Tweed & Co  
 Morganite—Morganite Inc  
 Morpho—Cannon Electric Co  
 "Morsehouse"—Thermec Eng'g Corp  
 Morris-Omega—Robert E Morris Co/Rem Sales Div  
 Mosley—Mosley Electronics Inc  
 "Mosquito"—Bosto Electronics Inc Don  
 "Motel Waster"—Honeywell Controls Ltd  
 Motodrive—Reeves Pulley Co/  
 Reliance Elec & Eng Co Div  
 "Motobears"—Link-Belt Co  
 Motola Mesa—Motorola Inc./Semiconductor Products Div  
 Moto-Mite—Globe Industries  
 Motor-Magnetic Metals Co  
 Motolytic—Micamold Electronics Mfg Corp  
 Motorola—Laetronics Inc  
 "Motrola"—Addison Industries Ltd  
 Motorator—Apparatus Development Co  
 Motortron—Bussman Mfg Co  
 Moulie/Lite—Moulie Specialties Co  
 "Moviola"—Moriola Mfg Co  
 Mox-Tase—Moxems Products Inc  
 "MP"—Murray Mfg Corp  
 M-PAC—Computer Control Co Inc  
 MPT—Brooks Rotameter Co  
 MRA—Munston Mfg & Service Inc  
 M/R Board—Hinde & Dauch  
 M-R-C—Marlin-Rockwell Corp  
 MRM—Ross Metals Co Milton  
 MRT—Munston Mfg & Service Inc

M-Scope—Fisher Research Lab  
 M T Emy—Hanson Van Winkle Munning Co  
 M-T-Jax—Switchcraft Inc  
 "Muta"—Muirhead & Co Ltd  
 Mufax—Muirhead Instruments Inc  
 Muffin—Rotron Mfg Co  
 Multi-Amp—Multi Amp Electronic Corp  
 Multi-Au-Matic—Bullard  
 "Multi-Cell"—Shielding Inc  
 "Multicoder"—General Devices Inc  
 Multi-Comp—Sprague Electric Co  
 Multicycle—Merlich Co Inc W I  
 Multidata—Flight Research Inc  
 Multi-Elmac—Mullard Equipment Ltd  
 Multi-Elmac—Multi-Products Co  
 Multi-Flt—Burblyn Co  
 Multiform—Precision Thermometer & Instrument Co  
 Multiograph—Addressograph-Multigraph Corp  
 Multi-guard—Lincoln Electric Co  
 Multitok—Robert-Shaw Fulton Controls Co  
 Millimeters—Rawson Electrical Instrument Co  
 Multiphase—General Electronics Inc  
 Multiplot—Daystrom Inc/Pacific Div  
 Multipress—Denison Eng'g Div/  
 American Brake Shoe  
 Multiprinter—National Lighting Corp  
 Multisource—Applied Research Labs  
 Multi-Swage—Bead Chain Mfg  
 MULTI-Switches—Switchcraft Inc  
 Multiplate—Rawdon Smith Assoc Inc  
 "Multi-Tet"—Gore & Assoc Inc W L  
 Multiverter—Packard Bell Computer Corp  
 Mumental—Telcon Metals/Telcon Works  
 Munning—Hanson Van Winkle Munning Co  
 Munston—Munston Mfg & Service Inc  
 Mur—Sorensen & Co  
 "Murasode"—Whitley Electronic Inc  
 Musi-Talk—Fanon Electronics Inc  
 M V-J—Technique Assoc Div/  
 Duncan Electric Co Inc  
 Mycalex—Mycalex Corp of America  
 Mycon—Southern Electronics Corp  
 Myka-Trip—Industrial Electronics Inc  
 Mykroy—Electronic Mechanics Inc  
 Mykroy—Mykroy Inc  
 My-T-Grip—My-T-Grip Mfg Co  
 My-T-Grip—American Rectifier Corp

## N

N-4—Nippert Electric Products Co  
 N/A—Emerson Plastics Corp  
 Naald—Alden Products Co  
 "Naclibadge"—Nuclear-Chicago Corp  
 Nadar—Autonetics  
 "Nagograph"—Nat'l Ceramic Machine Co  
 Nardco—NRC Equipment Corp  
 Narda—Narda Microwave Corp  
 Narmtape—Narmco Materials Div/Narmes Industries Inc  
 Nasary—Autonetics  
 Nassau—Munston Mfg & Service Inc  
 National—Nat'l Cash Register Co  
 "National"—Nat'l Electronics Inc  
 National—Nat'l Vulcanized Fibre Co  
 National—Valco Mfg Co  
 "Natile"—Nat'l Ceramic Machine Co  
 "NAT"—Murray Mfg Corp  
 N-PAC—Computer Control Co Inc  
 MPT—Brooks Rotameter Co  
 MRA—Munston Mfg & Service Inc  
 M/R Board—Hinde & Dauch  
 M-R-C—Marlin-Rockwell Corp  
 MRM—Ross Metals Co Milton  
 MRT—Munston Mfg & Service Inc

# BRAND & TRADE NAMES

- Neccobond—National Electric Coil/Edison McGraw Co Div  
 Neelium—Atlas Minerals Products Co  
 Neg'ator—Munter Springs Co  
 Nejelad—New England Laminates Co  
 Nelo—Chemical Products Corp  
 Nelo—New England Laminates Co  
 "Nemo"—Nuclear-Chicago Corp  
 Neobon—Atlas Mineral Products Co  
 "Neo-Corn"—Auburn Mfg Co  
 Neolite—G C Electronics Co  
 Neolube—Muron Industries  
 Neotele—General Cable Corp  
 Neoxide—Atlas Mineral Products Co  
 "Netco"—New England Tape Co  
 "Netcosol"—New England Tape Co  
 Neumann—Gotham Audio Development  
 "Neuro"—Dunton Co M W  
 "Neuro-Dull"—Basch Co George  
 Nevers-Stain—Nichols Wire & Aluminum Co  
 Newark Controls—Newark Controls Co  
 Newcomb—Newcomb Audio Products Co  
 Newdecon—Newton Co  
 New-Easy—Porter Inc H K  
 New England—Hanson Van Winkle Munning Co  
 Newport—New-Tronics Corp  
 New-Tronic—New-Tronics Corp  
 New York—New York Twist Drill Co Inc  
 Nevaco—Nelson Vacuum Pump Co Geo F  
 NF-Switches—Switchcraft Inc  
 Nialheat—Hooker Chemical Corp  
 Ni-Cad—Acme Model Eng'g Co  
 Nicad—Nicad Div/Gould-Nat'l Batteries Inc  
 Nichols—Rem Sales Div/Robert E Morris Co  
 Nichrome V—Driver-Harris Co  
 Nichrome—Driver-Harris Co  
 Nickel—Driver Co Wilber B  
 Nicloy—Babcock & Wilcox Co/Tubular Products Div  
 Nielsen—Nielsen Hardware Corp  
 Nifty Cabinets—Akro-Mils Inc  
 Nilstain—Driver Co Wilber B  
 Nivar—Driver-Harris Co  
 9-H Cobalt—Hanson Van Winkle Munning Co  
 Ni-Plex—Hanson Van Winkle Munning Co  
 Nirex—Driver-Harris Co  
 Niromet 46—Driver Co Wilber B  
 Nironze—Bridgeport Brass Co  
 Ni-Span C—Driver Co Wilber B  
 Nile-Eye—Q & S Corp  
 Niteflight—Fisher-Pierce Co  
 "Niton-Gen"—Hayes Inc C I  
 Nitro 52—Driver Co Wilber B  
 Nixie—Burroughs Corp/Electronic Tube Div  
 NLS Inc—Nat'l Scientific Labs Inc  
 NLS Ltd—Nat'l Scientific Labs Inc  
 Nobairon—Sorenson & Co  
 No-Batt—Bristol Co  
 Noblewest—Noble & Westroth Mfg Co  
 Nobl-Ohm—Fairchild Controls Corp  
 No-Cast—Hanson Van Winkle Munning Co  
 NoName-Cor—Cornish Wire Co  
 Noiseraser—Librascope Div  
 "NoKorode"—Dunton Co M W  
 "No Noise"—Electronic Chemical Corp  
 "No Noise Rubber Coat Spray"—Electronic Chemical Corp  
 "No Noise Toner-Tonic"—Electronic Chemical Corp  
 Non-Spatter—Lincoln Electric Co  
 Nopcofoam—Nopco Chemical Co  
 Nopco Lockfoam—Nopco Chemical Co  
 Norbide—Norton Co  
 Norcol—Phillips Electronic Instruments  
 Norlox—Northern Plastics Corp  
 Northern Radio—Northern Radio Mfg Co Ltd  
 Northmoor—Northmoor Engineering  
 No Scale—Sargeant & Wilber Heat Treating Corp  
 New-Women—Minnesota Mining & Mfg Co  
 NPC—Nucleonic Products Co  
 NRD—Nuclear Corp of America/Instruments & Research Div  
 NSL—Nat'l Semiconductors Ltd  
 Nu-Blac—Star Porcelain Co  
 NuClean—Star Ultrasonic Corp  
 Nucor—Central Electronic Mfrs/Nuclear Corp of America Div  
 Nucor—Nuclear Corp of America/Instrument & Research Div  
 Nu-Cup—Set Screw & Mfg Co  
 Numechron Tymeter—Pennwood Numechron Co  
 Numill—Autonetics  
 Nu Steel—Nu Steel Co  
 Nutt-Shel—Standard Pressed Steel Co  
 Nu-Way—Marshall Assoc Inc John  
 Ny-Grip—Wechesser Co  
 Nylaflo—Polymer Corp  
 Nylasint—Polymer Corp  
 Nylatron G S—Polymer Corp  
 Nylafad—Belden Mfg  
 Nylze—Phelos Dodge Copper Products Corp  
 Nylo-Fast—Anti-Corrosive Metal Products Co  
 Nytolfin—Shamban & Co W B  
 Nytolube—Shamban & Co W B  
 Nytran—New York Transformer Co  
 Nyvar—Acme Wire  
 Observer—Blonder-Tongue Labs  
 "OFC"—Ortho Filter Corp  
 OFC—American Metal Climax Inc  
 Optran—Oden Coil & Transformer Co  
 Ohio—Ohio Carbon Co  
 Ohio—Ohio Chemical Pacific Co  
 Ohio—Ohio Chemical & Surgical Equipment Co  
 Ohio—Ohio Chemical & Surgical Equipment Co  
 OHIDHM—Ohio Carbon Co  
 "Ohio Special Quality"—Ohio Seamless Tube/Copperweld Steel Co  
 Ohm—Driver-Harris Co  
 Ohmic—Wilmington Fibre Specialty Co  
 OhmSnub—States Co  
 Ohm-Tek—Montek Associates Inc  
 Ohmwave—Ohmwave Co Inc  
 "O.K."—General Cable Corp  
 Olivetti—Telautograph Corp  
 Omegalette—Omega Labs Inc  
 Omega-Tek—Grove Enterprises  
 "Omni-Glow"—Industrial Devices Inc  
 Omnigard—Edison Industries Thomas A  
 Omega—Kent Lighting Corp  
 111—Pyramid Electric Co  
 "On-Piece"—Buchanan Electrical Prods Co  
 Onnitenna—Tennalab  
 Opal—Chance Vought Electronics Div  
 OPTEL—Presin Co  
 "Optimistic"—Honeywell Controls Ltd  
 Orange Drop—Sprague Electric Co  
 "Orthoflex"—Lamaecha Mfg Co  
 Orthoflow—Simplex Valve & Meter Co  
 Ortholog—Gulton Industries  
 Orthomumetal—Telcon Metals/Telcon Works  
 Orthono—Magnetics Inc  
 Ortholul—General Radio  
 Orthoplex—Simplex Valve & Meter Co  
 Orthosil—Thomas & Skinner Inc  
 OSCAR—Benson-Lehner (G.B.) Ltd  
 Oscilloclast—Saine Equipment Lab Harry T  
 Oscilloscope—Saine Equipment Lab Harry T  
 "Ostucuo"—Ohio Seamless Tube/Copperweld Steel Co Div  
 Otrac—Non-Linear Systems Inc  
 Ouncer—United Transformer Corp  
 Ovaltube—Plastoid Corp  
 Oxalloy—Sylvania Electronic Products Inc/Parts Div  
 Ozequip—Oxygen Equipment & Service Co  
 "Oxford"—Oxford Components  
 Oxford—Oxford Electric Corp  
 "O-Z"—Zernickow Co O  
 P.173—Insl X Co Inc  
 PA—Aerovox Corp  
 Pac—Erie Resistor Corp/Electronics Div  
 Pace—Electronic Associates  
 Pace—Paco Precision  
 Pace—Precision Apparatus Co Inc  
 Pace—Pace Electrical Instruments Co  
 Pacer—Sorapue Electric Co  
 Pacific ElectroKinetics—Pacific Electro Kinetics  
 Pacitron—Simmonds Aerocessories Inc  
 Paco—Paco Electronics Co Inc  
 Paco—Paco Precision  
 Paco—Precision Apparatus Co  
 Pacitor—Simmonds Aerocessories Inc  
 "Paco"—Palo Alto Eng Co  
 "Pagemaster"—General Dynamics Corp/Stromberg-Carlson Div  
 Palco—Greene Tweed & Co  
 "Palletto"—M H Standard Corp  
 Palmetto—Greene Tweed & Co  
 Pampa 5-20—Pampa Electronics Corp  
 Panacoustic—U S Recording Co  
 Pandator—Panoramic Radio Prods Inc  
 Panalarm—Panellit Inc/Information Systems Inc Div  
 Panalyzer—Panoramic Radio Prods Inc  
 Panastat—Panellit Inc/Information Systems Inc Div  
 "Panclimatic"—Welwyn Canada Ltd  
 Panclimatic—Welwyn Int'l Inc  
 Pandux—Pacific Transducer Corp  
 Pan-El—Pan-Electronics Corp  
 Panel Chanal—Stahlbin Bros Inc  
 Panelgraph—Panellit Inc/Information Systems Inc Div  
 Panelgroove—Masonite Corp  
 Panelpack—Waterman Products Co  
 Panelscope—Waterman Products Co  
 Panelwood—Masonite Corp  
 Panelyte—St Regis Paper Co/Panelyte Div  
 Panelyte—St Regis Paper Co  
 Panto-Set—Design Tool Corp  
 Pap-Code—Pacific Automation Products  
 Paperite—Acme Wire  
 Paprene—Pacific Automation Products  
 Parafac—Cleveland Instrument Co  
 Parafactor—Scala Radio Co  
 Paraflex—Audax Inc  
 Parafomed—Paramount Paper Tube Corp  
 Paragon—Paranon Electric Co  
 Param—Parsons Co Ralph M/-Electronics Div  
 Paracode—North Electric Co  
 Paraflex—Parker Electronics Co  
 Parker O Rings—Parker Seal Co/Parker-Hannifin Corp Div  
 Parset—Parsons Co Ralph M/-Electronics Div  
 Partridge—Partridge Transformers Ltd  
 Pathfinder—Newcomb Audio Products Co  
 Patricia—Electro-Voice Inc  
 Paxar—Pacific Optical Corp/Chicago Aerial Ind Div  
 Paxor—Pacific Optical Corp/Chicago Aerial Ind Div  
 "Paymaster"—Cincinnati Time Recorder Co  
 PB250—Packard Bell Computer Corp  
 P & B Relays—Potter & Brumfield Inc  
 P C Kits—Keil Eng's Products Co  
 PD-X—Phelps Dodge Copper Products Corp  
 PEE—Cenlab Electronics/Globe Union Inc Div  
 Peco—Pomona Electronics Co Inc  
 "Pedigree"—George Co P D  
 Peco—Automation Devices Inc  
 Peer—Peer Inc  
 Peerless—General Cable Corp  
 Peerless—Peerless Electric Co  
 "Pee Wee"—Pee Wee Molding Corp  
 Peg-Board—Masonite Corp  
 "Pegi"—Adsett Mfg Co  
 Peiro—Greene Tweed & Co  
 Pen—Dudch & Co R C  
 Penn—Penn Eng's & Mfg Corp  
 Penberthy Hi-D Glass—Penberthy Instrument Co  
 Penberthy Me-D Glass—Penberthy Instrument Co  
 "Penco"—Alan Wood Steel Co/Penco Div  
 Penetray—Verd-A-Ray Corp  
 Penn-Tran—Penn Transformer Corp  
 Penn-Tran—Penn Tran Corp  
 Penntube—Pennsylvania Fluorocarbon Co Inc  
 Penta—Penta Labs Inc  
 Pereco—Pereny Equipment Co Inc  
 Perfetone—Audiomation Labs  
 Perfetone—Jensen Industries Inc  
 Perigraph—Advanced Instrument Corp  
 Perle—Burke & James Inc  
 Perlon Monofilament—Factory Enterprises Inc  
 "Permabrush"—General Devices Inc  
 Perma-Caps—Chicago Condenser Corp  
 Permacel—Permacel  
 Perma-Code—Brady Co W H  
 Perma-Dry—Phelos Dodge Copper Products Corp  
 Perma-Dur—Phelos Dodge Copper Products Corp  
 Permadyn—Melody Master Mfg Co  
 Permafoam—Columbia Wire & Supply Co  
 Permaglass—Smith Corp A II  
 Permagrid—Driver Co Wilber B  
 Perma-Grit—Balt Corp  
 Permakoube—Smith Mfg Co Inc E C  
 Permalin—Permalin Inc  
 Permaline—Columbia Wire & Supply Co  
 Permalloy—Arnold Eng's Co G  
 Permapaper—Sanborn Co  
 Perma-Phig—Vocaline Co of America  
 Permascope—Siastron Electronics TV Corp  
 Permaseal—Guardian Electric Mfg Co  
 Permaseal—Sprague Electric Co  
 Perma-Skin—Dennis Chemical Co  
 "Permatags"—Actioncraft Products  
 Perma-Torp—Cambridge Thermionic Corp  
 Permatred—Permalin Inc  
 "Permtaltch"—Hitchiner Mfg Co Inc  
 Permenodur—Telcon Metals/Telcon Works  
 Permi-Cal—Toplight Corp  
 Permocarb—Driver Co Wilber B  
 Permoflux—Permoflux Corp  
 Permohtm—Belden Mfg  
 Permo pivots—Fidelitone Inc  
 Permo Points—Fidelitone Inc  
 Personal Page—Nuclear-Electronics Corp  
 Pet—Portable Electric Tools Inc  
 Peter Pan—Electronics Creations Corp  
 Peter Pan—Teletone Co of America  
 Petro-Dur—Phelos Dodge Copper Products Corp  
 Pettibone—Pettibone Mulliken Corp  
 Pexto—Peck Stowe & Wilcox Co  
 P F Potting Forms—Electronic Production & Development/Chemical Div  
 Phaostran—Phaostran Instrument & Electronic Co  
 Phazor—Industrial Test Equip Co  
 Phenoline—Carbolite Co  
 Phenolite—Nat'l Vulcanized Fibre Co  
 Philbrick—Philbrick Researches Inc George A  
 Philco 2000—Philco Corp/G & I Div  
 Phillex—Phillips Mfg Co  
 Phillips Built—B W Mfgers Inc/Phillips Radio Div  
 Phillips—Phillips Mfg Co  
 Phil-trol—Phillips Control Corp  
 Phonart—Teletone Co of America  
 Phonatar—American District Telegraph Co  
 Phonocal—Sparta Faraday Inc  
 Phonon—United Wire & Supply Corp  
 Photicon—Cathodeon Ltd  
 Photochron Color Analyzer—Photochron Research Inc  
 Photo-Lok—Bastian Bros  
 Photomask—Simmonds Aerocessories Inc  
 Photo-Sonics—Photo-Sonics Inc  
 Photo-Stress—Budd Co/Instruments Div  
 Photoswitch—Electronics Corp of America  
 Photovision—Automation Inc  
 Phototron—Jones & Wettlaufer Engr Corp  
 Pi-Caps—Chicago Condenser Corp  
 Pick-A-Shaft—Clarostat Mfg Co  
 Pico-Transistor—Pacific Semiconductor  
 Pic-Sync—Fairchild Recording Equipment  
 Piece-Maker—Minster Machine Co  
 Plexite—Endevco Corp  
 "Piezo"—Piezo Crystal Co  
 Piezoelectric Transducers—Automation Industries  
 Pigm—Benson-Lehner  
 "Pig-Tailor"—Bruno-New York Industries Corp  
 Line—Antenna & Radome Research Assoc  
 Pilot—Pilot Radio Corp  
 Pilot Guard—Instruments Inc  
 "Pilot Scintillator B"—Pilot Chemicals Inc  
 "Pilotstat"—Honeywell Controls Ltd  
 Pinhead—Sprague Electric Co  
 Pinpit—Bourns Inc  
 "Pioneer"—Chase Mfg Co  
 Pioneer—Pioneer Broach Co  
 Pistogrip—Wall Mfg Co P  
 Pisto-Ring—Greene Tweed & Co  
 Pitlog—Pitometer Log Corp  
 Pittco—Ronan & Kunz Inc  
 Pittcomatic—Ronan & Kunz Inc  
 "P.I.V."—Link-Belt Co  
 "Piveter Pole"—Electric Products Co  
 Pixie—Burroughs Corp/Electronic Tube Div  
 Pixie—Diaphlex Div  
 Pixieweld—Lincoln Electric Co  
 Planofax—Littion Industries/Electronic Equipments Div  
 Plastallions—Bastian Bros Co  
 Plastallions—Bastian Bros Co  
 Plasti-Brass—Anchor Plastics Co  
 Plasti-Cal—Anchor Plastics Co  
 Plastic Braid-Cor—Cornish Wire Co  
 Plasti-Cord—Chester Cable Corp  
 Plasticorb—Armstrong Cork Co  
 Plastic Steel—Chemical Development Corp  
 "Plasti-Flex"—Auburn Mfg Co  
 Plasti-Form—Era Eng's Inc  
 PlastiForm—Leyman Corp  
 Plasti-Gold—Anchor Plastics Co  
 Plastiote—Chester Cable Corp  
 Plasti-Krome—Anchor Plastics Co  
 Plastilex—Electronic Devices Inc  
 Plastifilm—Plastifilm Inc  
 Plastiometer—Fischer & Porter  
 "Plasturbo"—Mamea Corp  
 Planex—Sel Rex Corp  
 Plectron—Plectron Corp  
 Plexicoder—Consolidated Electrodynamics Corp  
 Plexicon—Andover Industries Inc  
 Plexite—Westrex Corp Div/Littion Industries  
 Plexite—Littion Industries/Electronic Equipments Div  
 Plexitel H F—Westrex Corp Div/Littion Industries  
 Plexitel-SSB H F—Westrex Corp Div/Littion Industries  
 Plica—Flexast Co  
 "Plybord"—Vector Electronic Co  
 "Plug-In-Limit"—Honeywell Controls Ltd  
 "Plug-In-Limit"—Micro Switch Div Minn-Honeywell Regulator Co  
 "Plug-Stat"—Control Products Inc  
 Plymaster—Rubber & Asbestos Corp  
 Plyphen—Reichhold Chemicals Inc  
 Plypak—Hinde & Dauch  
 Plytubula—Tennalab  
 PMS—Ross Metals Co Milton  
 Pneumal—Pneumal Corp  
 Pneum-O-Tral—Instruments Inc  
 Pneuwend—Pneumal Corp  
 P N R—Rockbeston Wire & Cable Corp  
 P-Nuts—H I Shear Rivet Co  
 P-O-C—Table & Ticket Co  
 Pocketphone—Globe Electronics Div/Teltron Electronics Inc  
 Pocketscope—Waterman Products Co  
 Point-Lok—Set Screw & Mfg Co  
 Point One Stereo—Leak Div/British Industries Corp



# BRAND & TRADE NAMES

Pole Home—Amphenol-Borg Electronics Corp./Amphenol Connector Div  
 Pole R—Amphenol-Borg Electronics Corp./Amphenol Connector Div  
 Polarflex 2210—Western Casting Co  
 Polarizing Screws—Continental Connector Corp  
 Policarb—Driver Co Wilber B  
 Pol-Mat—Precision Paper Tube Co  
 Polybond—Polymer Industries Inc  
 Poly-Cap—Aerovox Corp  
 Polyclad—Carbolite Co  
 Polycron—Southern Electronics Corp  
 Polycoupler—CGS Labs Inc  
 "Poly-EP"—Thermoch Eng'g Corp  
 Polyera—Smith Corp A 8  
 Polyethylene—American Agile Corp  
 Polyfoam—Amphenol-Borg Electronics Corp./Amphenol Cable & Wire Div  
 Polyfoam Packers—Glo-Brite Products Inc  
 Polyform—Raychem Corp  
 Polyken—Kendall Co/Polyken Sales Div  
 Polyken—Kendall Co  
 PolyLite—Reichhold Chemicals Inc  
 Polymica—Polymica & Insulation Co Inc  
 Poly-Pedance—Chicago Standard Transformer Corp  
 Polypenco—Polymer Corp  
 Polypenco K 51—Polymer Corp  
 Polypenco TFE—Polymer Corp  
 Polyranger—Sensitive Research Instrument Corp  
 Poly-Savers—Poly-Scientific Corp  
 Polysonic—McKenna Laboratories  
 Polystrip—Int'l Resistance Co  
 Poly Styrene Machine—Schjeldahl Co G T  
 Poly-Varico—Knee Wire  
 Poly-Varico—Argonne Electronics Mfg  
 Polyvinyl Chloride—American Agile Corp  
 Pool-Gard—Consolidated Productions Inc  
 "POP"—United Shoe Machinery Corp  
 Porta-Chief—Audio Equipment Co  
 Portacom—Communications Co  
 Porta-Bell—Packard Bell Electronics Corp  
 Porta-Kall—Loge Sound Engrs J M  
 "Portapex"—Apex Coated Fabrics Co  
 Port-A-Phone—Feiler Eng'g & Mfg Co  
 Porta Vox—Polytronic Research Inc  
 Porter-Cable—Porter Cable Machine Co  
 Portovent—Flexaust Co  
 "Port-O-Vox"—Port-O-Vox Corp  
 Post-Rite—General Railway Signal  
 Potassium Silicate—Philadelphia Quartz Co  
 Potpot—ClaroStat Mfg Co  
 "Potter"—Potter Instrument Co  
 "Potter"—Potter Co  
 Pottermeter—Potter Aeronautical Corp  
 Potter & Brumfield—Relay Sales Inc  
 "Powair"—Dean & Benson Research Div/Benson Mfg Co  
 Powerair—United Shoe Machinery Corp  
 Power Bar & Battery—Electric Auto-Lite Co  
 "Powerzel"—Industrial Electrical Works  
 Powerloid—Guardian Electric Mfg Co  
 Powerlytic—Sprague Electric Co  
 Power Mark—Pryor Marking Products  
 Powermaster—JEM Electronics Corp  
 Power-Master—Mosley Electronics Inc  
 Power-Mite—Johnson Electronics Inc  
 Power-O-Matic—Blue M Electric Co  
 "Power Oxide"—Wehway Canada Ltd  
 Power Packer—Dyrex Inc  
 "Powerpike"—Honeywell Controls Ltd

"Power-Point"—Electro-Voice Inc  
 Powerel—Electronic Devices Inc  
 Powerstat—Superior Electric Co  
 "Power Streak"—American Electric Cable Co  
 Power Tip Spark Plug—Electric Auto-Lite Co  
 Powertron—Ferrotron Electronics Powertron—Industrial Test Equip Co  
 Powermits—Filters Inc  
 Powerpage—University Loudspeakers Inc  
 PPI Instruments—Phoenix Precision Instrument Co  
 Preac—Alrax Electronics Inc/-Seminole Div  
 Pre Carb—Precision Carbide Co  
 Precision Coaxial—Precision Tube Co  
 Precision Potentiometers—Int'l Resistance Co  
 Precision—Precision Apparatus Co Inc  
 Precision—Precision Carbide Co  
 Precision-Charge—Lincoln Electric Co  
 Precision Wire Wound Resistors—Tegro Electric Corp  
 Precision Springs—Marquette Div/-Curtiss-Wright Corp  
 Precisor—Taylor Instruments Co  
 Precisor—Int'l Resistance Co  
 Preis-Panto—Preis Engraving Machine Co H P  
 Premabrazz—Handy & Harmon  
 Premaloy—Handy & Harmon  
 Premax—Premax Products Div/-Chisholm-Ryder Co  
 Premier—Nat'l Television Tube Inc  
 Premier-Atlas—Hanson Van Winkle Munning Co  
 Premier—United Speaker Systems Inc  
 Pre-Monitor—Audiometric Labs  
 Prem-O-Rak—Premier Metal Products Co  
 Preswood—Masonite Corp  
 Preshlock—Whitso Inc  
 Press Fit—Sealotro Corp  
 "Pressurafal"—Honeywell Controls Ltd  
 "Pres-Sure"—Buchanan Electrical Prods Corp  
 Pressure-Lock—General Electric Co/Wiring Device Dept  
 Prestet—Cutler-Hammer Inc  
 Presto—Bogen-Presto Div/-Siegler Corp  
 Prest-O-Lite—Electric Auto-Lite Co  
 Presto Splicer—Prestoseal Mfg Corp  
 Princeton—Burke & James Inc  
 Princic—Amphenol-Borg Electronics Corp./Amphenol Connector Div  
 Princic—Precision Thermometer & Instr Co  
 Printapix—Littion Industries  
 Printate—American Printed Circuits Co  
 Printer—S O S Cinema Supply Corp  
 Printek—Sprague Electric Co  
 Printom—Sprague Electric Co  
 "Private Eye"—Television Utilities Corp/Nord Div  
 Private—North Electric Co  
 Probragh—Warner & Swasey Co  
 Probramat—Warner & Swasey Co  
 Prodelin Antennas—Trilsch Inc John D  
 "Professional"—Components Corp  
 Professional—Trim Inc  
 Profiforder—Micrometrical Mfg Co  
 Profimeter—Micrometrical Mfg Co  
 Profile Monitor—Advanced Technology Labs  
 "Pro-Glo"—Alexandria Div-Amf Programming—Guardian Electric Mfg Co  
 Prograss-O-Matic—Minster Machine Co  
 Protar—Sprague Electric Co  
 "Promal"—Link-Belt Co  
 Promatic—General Control Co  
 Promag-Lock—Waldes Kohinoar Inc  
 Promax—Retron Mfg Co  
 Pro-Seal—Coast Pro-Seal & Mfg Co  
 "Protoglo"—Honeywell Controls Ltd  
 "Protorelay"—Honeywell Controls Ltd

Protecto-Seal—Phelps Dodge Copper Products Corp  
 "Protostat"—Honeywell Controls Ltd  
 "Pro-TeX"—Pro-TeX Wire Band Co  
 Protology—Malco-Wire Corp  
 "Protomata"—Electralab Printed Electronics Co  
 Proto Tools—Proto Tool Co  
 "Prototyping Dept"—Electralab Printed Electronics Co  
 Pro-A-Pickup—Minstron Corp  
 Prototron—Automation Devices Inc  
 PRP—Photocon Research Products  
 PS-56—Control Corp  
 P & S—Renfrew Electric Co Ltd  
 Pul-Jal—Custom Products Corp  
 Pulscopac—Waterman Products Co  
 Pulsite—Airpax Electronics Inc  
 Pultec—Pulse Techniques Inc  
 Push-Lob—Sprague Electric Co  
 Pyle Miniature—Pyle National Co  
 Pyle-Star-Line—Pyle National Co  
 Pyramid—Greene Tweed & Co  
 Pyramid Point—Fidelitone Inc  
 Pyridicator—McCormick Selph Assoc  
 Pyro—Pyrometer Instrument Co  
 Pyro-Coin—Raybestos-Manhattan Inc  
 Pyrofuse—Cohn Corp Sigmund  
 Pyrohm Jr—Aerovox Corp  
 Pyromaster—Bristol Co  
 Pyrolytic—Stydyne Inc  
 Pyro-Seal—Pyrofilm Resistor Co  
 Pyrostat—Technique Assoc Div/-Duncan Electric Co Inc  
 Pyrotex—Raybestos-Manhattan Inc  
 Pyrotrol—Bristol Co  
 Pyr-O-Vane—Honeywell Controls Ltd  
 Pyrisor—Bristol Co  
 "Pyramid"—Technicraft Co

QAF—Waldes Kohinoar Inc  
 "Quality"—Quality Control Corp  
 Qual-Kits—Quality Electronics Inc  
 Quam Adjust-A-Cone—Quam Nichols Co  
 Quantascan—Quantametric Devices Inc  
 Quantichem—Suncoast Instruments/Milton Ray Co Div  
 Quantichem Analyzers—Roy Co Milton  
 Quantizer—Austin Co/Austin Electronics Div  
 Quantograph—Applied Research Labs  
 Quantometer—Applied Research Labs  
 Quantovac—Applied Research Labs  
 Quantrol—Applied Research Labs  
 Quaric—Quaric Controllers  
 Quartecor—Trans-Sonics Inc  
 Quartzid—Grinnel Corp  
 QuelArc—Pyle Nat'l Co  
 Quick Lock—Symmons Fastener Corp  
 "Quick Set"—Phila Scientific Glass Co  
 Quiet Kool—Emerson Radio & Phonograph Corp  
 Quietrol—Quietrol Co  
 Quik-Keg—Hinde & Dauch Quik-Labry—Brady Co W H  
 Quincy—Quincy Compressor Co  
 Quintess—Nuclear-Electronics Corp

R  
 R/A—Radio Activities Inc  
 Race—Sperry Microwave Electronics Co/Sperry Rand Div  
 Rackvolts—Nutron Mfg Co Inc  
 Rad-A-Cor—Magnetic Core Corp  
 "Rad-A-Lert"—U S Radium Corp  
 Radan—General Precision Inc/-GPL Div  
 Rad-Eye—Electro Security Corp  
 "Radelin"—U S Radium Corp  
 Radex—Aire-Reynolds Electric Co  
 "Radiamatic"—Honeywell Controls Ltd  
 Radilo—American Electronics Inc

Radimatic—Mosler Research Products Inc  
 Radiocarb—Driver Co Wilber B  
 Radi-O-Com—Trans-Tel Corp  
 Radiocarb—Myers & Sons Inc E A  
 Radiomh—Globe Union Inc/-Centralab Electronics Div  
 Radiomh—Driver-Harris Co  
 Radiometal—Telcon Metals/-Telcon Works  
 Radionc—Instruments Inc  
 Radiotron—Radio Corp of America/Electron Tube Div  
 Radite 275—Radar Design Corp  
 Radax—Electro-Voice Inc  
 Radox—Barrett Electronics Corp  
 Rafax—HRB-Singer Inc  
 Rainbow—Channel Master Corp  
 RainScope—Waterman Products Co  
 Ramac—Int'l Business Machines Corp  
 Ramco—Ramco Products  
 Randac—Mitchell Rand Mfg Corp  
 Rand-O-Matic—Ling-Altec Electronics/Ling Electronics Div  
 Rangars—Roberts Mfg Co  
 Rapid—Rapid Electroplating Process Inc  
 "Ratel Products"—Ratel Inc  
 Rauland—Zenith Radio Corp  
 Rawson—Formsprag Inc  
 Raybestos—Raybestos-Manhattan Inc  
 Raybond—Raybestos-Manhattan Inc  
 Raychronic—Nuclear Corp of America/Instrument & Research Div  
 Rayfoam—Raychem Corp  
 "Raymaster"—Gates & Co Inc Geo W  
 Raymond Atchley—Atchley Inc Raymond  
 Rayolin—Raychem Corp  
 Rayonic—Waterman Products Co  
 Ray-O-Vac—Ray-O-Vac Co  
 Ray Proof—Ray Proof Corp  
 "Raytector"—Miller Assoc  
 Raytheon—Raytheon Co/-Industrial Components Div  
 RBI—Automation Industries Inc  
 R Bunting Rouge—Hanson Van Winkle Munning Co  
 R/C—Radio Condenser Co Ltd  
 Rdf Stikon—Ruge Assoc Inc Arthur C  
 Rdf Strapon—Ruge Assoc Inc Arthur C  
 Rea—Aluminum Co of America J B Res—Rea Co J B/Electronics Div  
 REAC—Reeves Instrument Corp  
 Read—Temo Electronics  
 Readall—Union Switch & Signal Div  
 Ready-Power—Ready Power Co  
 ReaPab—Rea Magnet Wire Co  
 Reasist—Western Electronic Co  
 Rebat—Electric Auto-Lite Co  
 R E C—Rosemount Eng'g Co  
 "Recharger"—Lamarck Mfg Co  
 Re-Cirk-it—Heinemann Electric Co  
 Reco—Reynolds Electric Co  
 RECOMP—Autonetics  
 Reconfax—HRB-Singer Inc  
 Recorder—Mile Reproducer Co  
 Recorder Mark II—Brush Instruments  
 Recoton—Recoton Corp  
 Recoton-Goldring—Recoton Corp  
 Rectisel—Electronic Devices Inc  
 "Rectodyne"—Christie Electric Corp  
 "Red Cap"—Vaco Products Co  
 Red-E-To-Use—Hanson Van Winkle Munning Co  
 Red Giant—Revolver Co  
 Red Label Ink—Electronic Production & Development/Chemical Div  
 Red Point Corp—Red Point Corp  
 Redstone—Chrysler Corp/Missile Div  
 Red Streak—Brown-Bridge Mills Inc  
 "Redtop"—Bradley Semiconductor Corp  
 Red-Top—H B Instrument Co  
 Reeves—Reeves Electronics Inc  
 Reflex Loudspeakers—University Loudspeakers Inc  
 Revolt—Consolidated Controls Corp  
 "Regain"—Popper & Sons  
 Regal 300—Electro-Voice Inc  
 Regency—Electro-Voice Inc  
 Regency—Industrial Dev'l Eng'g Assoc  
 Regency Mike—Audio Equipment Co  
 "Regent"—Webcor Inc

"Regular"—Continental Elec Mfg Co  
 "Reliable Mailers"—Corrugated Paper Products  
 Reliancap—Micamold Electronics Mfg Corp  
 Reliance—Reliance Automatic Lighting Co  
 Relo—Railroad Electronic Labs of Omaha Inc  
 Reloid—Guardian Electric Mfg Co  
 Rembrandt—All Channel Products Corp  
 Rembrandt—Burke & James Inc  
 REM-U S Components  
 Remotomike—Poole Instruments Inc  
 Remotrol—Midwest Electric Products Inc  
 Rembrandt—Rembrandt Inc  
 Rencrest—Reynolds Industries Inc  
 Renewatron—Bussem Mfg Co  
 Repcobord—Russell Reinforced Plastics Corp  
 Repeater—Kealite Labs Inc  
 Republic Lens Co Inc—Republic Lens Co Inc  
 Resinite—Precision Paper Tube Co  
 Resino—Allied Resinums Prod Inc  
 Resistex—Int'l Resistance Co  
 Resistim—Bowus Inc  
 Resistron—Resistron Labs Inc  
 Resoliner—American Electronics Inc Instrument  
 Restrictor—North Electric Co  
 Retico—Rectico Inc  
 Retro-lar—Precision Paper Tube Co  
 Revalon—Revere Copper & Brass Inc  
 Revalum—Revere Copper & Brass Inc  
 Revere Products—Revere Corp of America  
 Reversol—Miller Corp Harry  
 Rev-Loi—Formsprag Inc  
 Revolute—Int'l Resistance Co  
 Revolute—Charles Branning Co  
 Revolution—Revolver Co  
 Rev-O-Matic—Applied Technology Corp  
 Rex—Trim Inc  
 Rex—Burke & James Inc  
 Rexon—Hamilton Steel Mfg Co  
 Rexwell—Crucible Steel Co of America  
 Rezzel—Sprague Electric Co  
 R F Adhesive—Electronic Production & Development/Chemical Div  
 RFC—Radio Frequency Co Inc  
 RF Coils—Barber & Williamson Inc  
 RF-Jack & Plugs—Switchcraft Inc  
 "Rhino"—Sector Mfg Co  
 Rhodex—Vel Rex Corp  
 Rhometal—Telcon Metals/Telcon Works  
 Rhymaster—Web-O-Kut Co Inc  
 Ribbon Heat Aeronautical—Cox & Co  
 RI-Cad—Radio Frequency Inc  
 Richardson-Allen—Richardson-Allen Corp  
 Richmond—Lowell Mfg Co  
 Ridgegrove—Masonite Corp  
 Ridgeline—Masonite Corp  
 RID—Radiation Instrument Development Lab Inc  
 Ridling—Amchem Products Inc  
 Ridosol—Amchem Products Inc  
 RIFA—Presin Co  
 RIGID-lex METAL—Rigidized Metals Corp  
 RI-Ion—Radio Frequency Inc  
 Rimguard—Parber-Kalen  
 Rimlock—Fisher Mfg  
 Ring-Jet—Sikes Corp F J  
 RI-tran—Radio Industries Inc  
 Rival—Hanson Van Winkle Munning Co  
 River Edge—British Industries Corp/River Edge Sales Corp Div  
 Riverside—Porter Co Inc H K  
 "Rivett"—Rivett Lathe & Grinder Inc  
 Rivnuts—Goodrich Aviation Products  
 Riv-O-Seal—Parker-Mannin Corp/Parker Seal Co Div  
 R-J Speaker Enclosures and Systems—R J Audio Products  
 R&K—Ronan & Kozal Inc  
 RMB—Lendis & Gyr  
 R M C—Radio Materials Corp



# BRAND & TRADE NAMES

- Sonek—Harris Transducer Corp  
Sonic Depth Sounder—Automation Industries  
Sonic Energy Cleaning (46-23)—Bendix/Pioneer-Central Div  
Sonic Energy Cleaning (69-B)—Bendix/Pioneer-Central Div  
Sonic Energy Cleaning (31-23)—Bendix/Pioneer-Central Div  
Sonicizer—Ultrasonic Industries Inc.  
Sonicon—Magnaflux Corp  
Sono-Probe—Advanced Electronics Inc.  
Sonoramic—Ferro Dynamics Corp  
Sonosuper—Soc Inc  
So-PreFix—S O S Cinema Supply Corp  
Sorensen—Sorensen Industrial Electronic Co  
Sorelution—S O S Cinema Supply Corp  
Sound Flo—Canadian Astatic Ltd  
Soundview—Kalarl Co Inc  
"South Bend"—South Bend Lath Works  
Southco—South Chester Corp./Southco Div  
"Space-master"—Educational Electronics Co  
Spanish Prison Battle—Barnstead Still & Demineralizer Co  
Spartan—Spartan Corp./Electronics Div  
Spartite—Spaulding Fibre Co  
Spartite—Spaulding Fibre Co  
Speakeasy—Chance Vought/Electronics Div  
Spec—Computer Control Co Inc  
Specialine—Hanson Van Winkle Munning Co  
Spectels—Kollmorgen Optical Corp  
Spectra-Flex—Spectra-Strip Wire & Cable Corp  
Spectra-Int—Spectra-Strip Wire & Cable Corp  
Spectra-Strip—Spectra-Strip Wire & Cable Corp  
Spectroline Scanne—Applied Research Labs  
Spectromet—Baird-Atomic Inc  
Spectror—Consolidated Electro-dynamics Corp  
SpectroSADIC—Consolidated Electro-dynamics Corp  
Speed Coat—Micro-Circuits Co  
Speedcraft—Wire Stripper Co  
Speeder—C Electronics Inc  
"Speedivac"—Getters Electronics Inc  
Speedized—Elco Tool & Screw Corp  
"Speedmaster"—P & H Sales Corp  
Speedmax—Leeds & Northrup Co  
Speed-Test—Paco Electronics Co Inc  
Speedy CAL—Anodyne Inc./North Shore Nameplate Div  
Speedy Marx—Anodyne Inc./North Shore Nameplate Div  
Speedaluminite—Special Chemical Corp  
Sperry Gurlin—Sperry Rand Corp./Sperry Piedmont Co Div  
Sperry (SS)—Sperry Rand Corp./Sperry Semiconductor Div  
Sperry—Sperry Faraday Inc  
Spheratrol Switch—Diaphlex Div  
Spherex—Electro-Voice Inc  
Spincasting—Kennedy & Co B C  
Spinlab—Special Instruments Lab Inc  
"Spin-Pin"—Bruno-New York Industries Corp  
Spiral—American Tube Bending Co  
Spirafix—Phelps Dodge Copper Products Corp  
Spiral-Jector—Fourjay Industries  
Spiral Sound—Fourjay Industries  
Spirameg—Sprague Electric Co  
Spir-A-Tor—Hunter Spring Co  
Spir-O-Line—Prodelin Inc  
Spir-O-Lok—Prodelin Inc  
Spiral Pins—Cemco  
Spiric—Western Lithograph Co./Westline Products Div  
"Splice Caps"—Buchanan Electrical Prods Corp  
Sprotesman—Winton Electronics Inc./Aetronic Ind Div  
Sponco—De-Lux Mfg Co  
"Sportaire"—Educational Electronics Co  
Spotcheck—Magnaflux Corp  
Sprague—Sprague Electric Co  
Sporant—Waldom Electronics Inc  
Spreardar—Lincoln Electric Co  
Spre-Lok—Set Screw & Mfg Co  
"Spring Clip"—Vector Electronic Co  
Springer Black Box—Springer Aircraft Radio Co  
Spring-Life—Diaphlex Div  
Spring-Lock—Simmons Fastener Corp  
"Spring-O-Matic"—Industrial Electrical Works  
Sps ComPARTments—Service Parts Systems  
Square-Dhm—Bradford Components Inc  
Squaretrim—Daystrom Inc./Pacific Div  
Squib Firing—Curtiss-Wright Corp./Electronics Div  
Squirrmobile—Lincoln Electric Co  
SquirrWelder—Lincoln Electric Co  
Sreco—Superior Resistor & Electronics Corp  
Stabelex—Industrial Condenser Corp  
Stabilene—Kueffel & Esser Co  
Stabiline—Superior Electric Co  
Stabil-Therm—Blue M Electric Co  
Stable-Aro—Lincoln Electric Co  
Stablott—Magnetic Research Corp  
Stackbin—Stackbin Corp  
Stackbom—Sprague Electric Co  
"Stainless Steel"—Dunton Co M W  
Stainweld—Lincoln Electric Co  
Staircraft—Oncl-irwin Mfg Co  
Sta-Kon—Thomas & Betts Co Inc  
Staley—Berco Engineering Corp  
Stal-Loc—Mallory Controls Co  
Stal-Lok—Shur-Lok Corp  
Stanal—Stanat Mfg Co  
Stanal-Mann—Stanat Mfg Co  
Stancon—Chicago Standard Transformer Corp  
"Stancote"—Standard Wire & Cable Co  
Stand—S O S Cinema Supply Corp  
Standard—Hull-Standard Corp  
Standard—New York Solder Co  
Standard—Webster Mfg Co  
Standard Rectifier Corp—Audio Devices Inc./Rectifier Div  
Standard Reels—Standard Record Mfg Co  
Standard Tuner—Standard Coil Products Co  
"Standard"—Slicht Co Herman M  
Standco—Clarostat Mfg Co  
Standco—Parke Metal Goods Co  
Stand-Dhm—Bradford Components Inc  
Stanoen—General Cable  
"Stanlex"—Standard Wire & Cable Co  
"Stanomatic"—Standard Register Co  
Stanpact—Stanpact Co  
Stanscrew Fasteners—Standard Screw Co  
Stapilbond—Hanson Van Winkle Munning Co  
Staple—Blagg Co  
Star-A—Star-A Electric Mfg Co  
Starclax—Star Engraving Co Ltd  
Starline—Electro-Mechanical Instr Co  
Staticon—Cathodeon Ltd  
Stat-O-Seal—Parke Seal Co./Parke-Hannifin Corp Div  
"Stat-Tan"—Pulse Eng'g Inc  
"Stavol"—Christie Electric Corp  
Stazon—Precision Thermometer & Instrument Co  
Steacop—Micamold Electronics Mfg Corp  
Steatite—National Ceramic Co  
Steeldar—Miller Corp Harry  
Steelmex—Merold Radio & Electronics Corp  
Steelmot—Mallory Metallurgical Co  
"Steelsel"—Fish-Schurman Corp  
"Steeway"—Titchener & Co E H  
Stemco—Arnhold Ceramics Inc  
Stenco—Stevens Mfg Co Inc  
Stenafax—Littion Industries/.Electronic Equipments Div  
Stenotape—American Geleso Electronics Inc  
"Stenotron"—Autron Eng Inc  
"Step Control"—Honeywell Controls Ltd  
Step-Trol—Control Corp  
Stercotod—Stephens Tri-Sonic Inc  
Stereo-Fax—Gaylor Products Co  
Steroflex—University Loud speakers Inc  
"Stereo-Magic"—Pentron Sales Co Inc  
Stereo-O-Matic—V M Corp  
Stereon—Electro-Voice Inc  
Sterephones—Linlar Inc  
Sterephones—Permallex Products Co  
Stereosound—Rye Sound Corp  
Sterilshield—Baker Co  
Sterling—Sterling Mfg Co  
Sterling—Sterling Precision Corp  
Stermatic—Waber Electronic Inc  
Stetholon—Maico Electronics Inc/W A Sheaffer Pen Co Div  
Stetson—Rye Sound Corp  
Stevens—Leupold & Stevens Instruments Inc  
Strbalcon—Green Rectifier Co  
"St. Mary's"—St. Mary's Carbon Co  
"Stokerswitch"—Honeywell Controls Ltd  
Stonclad—Stonhard Co Inc  
Stonclix—Stonhard Co Inc  
Stonhard—Stonhard Co Inc  
Stonlast—Stonhard Co Inc  
Stonatic—Stonhard Co Inc  
Stonmax—Stonhard Co Inc  
Stor-A-Tape—Concertapes Inc  
"Storatron"—Dumont Labs Inc Allen B  
Storway—Birdair Structures Inc  
Store-Master—Utility Metal Products Co Inc  
Stow—Stow Mfg Co  
Strainistor—Century Electronics & Instruments Inc  
Straplock—Whitso Inc  
Strato Line—Fine Organics Inc  
Strat-O-Lite—Strat-O-Seal Mfg Co  
Strat-O-Seal—Strat-O-Seal Mfg Co  
Strato TV Towers—Pipestone Sales Co  
Stresscoat—Magnaflux Corp  
Strip-Case—Radix Wire Co  
"Stripmaster"—Ideal Industries Inc  
Strip-O-Seal—Parke Seal Co./Parke-Hannifin Corp Div  
Strippit—Wais Strippit Inc  
Stroheacon—Kerlite Labs Inc  
STRODEX—Helmuth Co  
Strobliex—Strobliex Co  
Strobolamp—Switchcraft Inc  
Strobonar—Minneapolis Honeywell/Heland Div  
Strobe-Sync—Winnlar Labs  
Strobotech—General Radio  
"Stromberg"—Stromberg Time Corp  
Struthers-Dunn—Relay Sales Inc  
Struthers-Dunn—Renfrew Electric Co Ltd  
Stubs—Amphenol/Berg Electronics Corp/Amphenol Connector Div  
"StudioSound"—Studio Electronics Corp  
Stur-D-Lace—Gudebrod Bras Gilt Co  
Stycast—Emerson & Coming Inc  
Style A-75—Hanson Van Winkle Munning Co  
Style 98—Hanson Van Winkle Munning Co  
Style NW—Hanson Van Winkle Munning Co  
Style R—Hanson Van Winkle Munning Co  
Style R R—Hanson Van Winkle Munning Co  
Styracon—Sprague Electric Co  
Styrolflex—American Tube Bending Co  
Styrolflex—Natrax Corp  
S.U.—Simmonds Accessories Inc  
Subminax—Amphenol/Berg Electronics Div/Amphenol Connector Div  
Subouncer—United Transformer Corp  
Subscriber-Vision—Skatron Electronics TV Corp  
Sulfalk—Munston Mfg & Service Inc  
Sunswitch—Ripley Co  
"Super"—Dunton Co M W  
Super—Saflee Glass Co  
Super Beam Guard—Kay-Townes Antenna Co  
Supercad—United Electronic Mfg Corp  
"Supercon"—Computer Instruments Corp  
Supercor—Superior Electric Co  
Super Cutno—Greene Tweed & Co  
"Super Davonm"—Daven Co  
Super-Ear-Protector—Rye Sound Corp  
Superector—United-Greenfield Corp/William Co J H Div  
Super-Fan—Channel Master Corp  
"Super-Gem"—Aerogrip Corp  
Super-Heiler—Audio Equipment Co  
Superior 5-Way—Superior Electric Co  
Super Kaly—Kay-Townes Antenna Co  
Super-Lap—Bussmann Mfg Co  
Superlume—Hanson Van Winkle Munning Co  
Supermalloy—Arnold Eng'g G Co  
Supermendur—Arnold Eng'g G Co  
Supermetal—Telcon Metals/.Telcon Works  
Super-Radiometal—Telcon Metals/Telcon Works  
Superrench—United-Greenfield Corp/Williams Co J H Div  
Superscope—Superscope Inc  
Super Service—General Cable  
Superheat—Greene Tweed & Co  
Superhealth—General Cable  
Supersil—Carstedt Research  
Supersocket—United-Greenfield Corp/Williams Co J H Div  
Supertel—General Cable  
Supertemp—Modern Lab Equip Co  
Supertenna—Tennalab Specialties Control Corp  
Supra—General Cable  
Super-Visibility—Lincoln Electric Co  
"Supervisory Data Center"—Honeywell Controls Ltd  
Supramica—Mycalox Corp of America  
Su-Pr Circuits—Cleveland Metal Formers Corp  
Supreme—Oxford Components/.Oxford Electric Corp Div  
Supro—Valco Mfg Co  
Surco—Suprenant Mfg Co  
Surco-Rad—Suprenant Mfg Co  
SureBrazo—Dalwell Co Inc  
Sure Flux—New York Solder Co  
Surfaceweld—Lincoln Electric Co  
Surfindicator—Brush Instruments  
Surflene—Suprenant Mfg Co  
Surflex—Kemlite Labs Inc  
Suspension System—Service Parts Systems  
Sus-Subouncer—United Transformer Corp  
Swede—Alan Wood Steel Co  
S-Y Bondexz—Phelps Dodge Copper Products Corp  
"SVE"—GB Electronics  
Sweep-Sync—Chadwick-Helmuth Co  
Swiftol—Southwest Products Inc  
Swiftrol—Moody Machine Products Co  
Sword-Beam—Radio Merchandise Sales Inc  
"S-Y" Bondexz—Phelps Dodge Copper Products Corp  
Sylgard—Dow Corning Corp  
Sylbar—Dow Corning Corp  
Sylbaric—Primer Co Wilber B  
"Sylvania"—Sylvania Electric Products Inc  
Symmetru-peak-a-peak—Kahn Research Labs  
Syncap—Wesco Electric & Mfg Co  
Synchro—Hansen Mfg  
Synchros—American Electronics Inc Instrument  
"Synchro-Sped"—Allis Co Louis  
Synchro-Valve—Bristol Co  
Synchromental—Leland Inc G M  
Synchrogear—U S Electrical Motors Inc  
Synclon—Fairchild Recording Equipment  
Syncrossan—General Railway Signal  
Syncrossed—General Railway Signal  
Synconverter—Bristol Co  
Synkote—Plastoid Corp  
Synthamix—Mycalox Corp of America  
Synthane—Synthane Corp  
Synthographic—Synthane Corp  
Syntron—Syntron Co  
TACO—Technical Appliance Corp  
Yadnac—Consolidated Mining & Smelting Co Ltd  
Talkmaster—Talkmaster Inc  
Tallowene—Hanson Van Winkle Munning Co  
Tally—Tally Register Corp  
Tally-Count—Standard Instrument Corp  
Tally-Print—Standard Instrument Corp  
Talos—Bendix Prods/Missile Dn  
Tanatherm—Trans-Sonics Inc  
Tandberg—Reeves Equipment Corp  
Tantalex—Sprague Electric Co  
Tantalytic—General Electric  
Capacitor Dept  
Tantapac—Sprague Electric Co  
Tantumcap—Micamold Electronics Mfg Corp  
Tape-Ard—Textron Inc/Calif Technical Industries Div  
Tape Cable—Tape Cable Corp  
Tapedcode Plastics—Tapedcode  
Tape-O-Matic—V M Corp  
Tape Stroke—Scott Instrument Lab  
Taqgun—Blip & Decker  
"Tap-Lite"—Honeywell Controls Ltd  
Tap-Lob—Groov-Pin Corp  
Tap-Lok Insert—Groov-Pin  
Tap-Pot—Howell Instrument Co  
Tapee—Sarton Products Inc  
Target—S A Electronics  
"Tarreyton"—Cook Electric Co  
Terryton—Diaphlex Div  
Taskline—Task Corp  
Tatnal—Budd Co/Instruments Div  
Tatnal-Krouse—Budd Co/Instruments Div  
Taylorells—Taylorell Corp  
Taylor-Hobson—Engis Equipment Co  
Taylorite—Taylor Fibre Co  
T-Bloc—Computer Control Co Inc  
TCC—Telegraph Condenser Co  
TC Inserts—Electronic Production & Development/Chemical Div  
TC Studs—Electronic Production & Development/Chemical Div  
TC-300—Electronic Production & Development/Chemical Div  
TC-338—Electronic Production & Development/Chemical Div  
TC-413—Electronic Production & Development/Chemical Div  
TC-438—Electronic Production & Development/Chemical Div  
TC-440—Electronic Production & Development/Chemical Div  
TC-447—Electronic Production & Development/Chemical Div  
TC-450—Electronic Production & Development/Chemical Div  
TC-522—Electronic Production & Development/Chemical Div  
TC-523—Electronic Production & Development/Chemical Div  
TC-527—Electronic Production & Development/Chemical Div  
TC-1438—Electronic Production & Development/Chemical Div  
TC-2080—Electronic Production & Development/Chemical Div  
TC-2415—Electronic Production & Development/Chemical Div  
TC-3047—Electronic Production & Development/Chemical Div  
TC-3070—Electronic Production & Development/Chemical Div  
TC-4060—Electronic Production & Development/Chemical Div  
TC-6040—Electronic Production & Development/Chemical Div  
T-D—Chase-Chawnt Co  
"TD"—Technical Devices Co  
TE—Transformer Engg Technic—Wheelabrator Corp  
Tec-Lite—Transformer Technicums Inc  
"Technigraph"—Technicraft Co  
Technite—General Precision Inc  
Turbank Branch/Librascope Div  
Technite—General Precision Inc  
Tendrite Branch/Librascope Div  
Technograph—Technograph Printed Electronics Inc  
Teckart—Technical Wire Products Inc  
Techstrip—Technical Wire Products Inc  
"Tedo"—Technical Development Co  
Teco—Trufone Electronics Inc  
Teflon—Dore Co John L  
Teflon Bearings—Clevite Harris Prods Inc  
Tel-A-Cor—Magnetic Core Corp  
Tel-Amatic—S O S Cinema Supply Corp

## BRAND & TRADE NAMES

- Tel-Anemia—S O S Cinema Supply Corp  
 Telaproc—American District Telegraph Co  
 TELAutograph—Telautograph Corp  
 Telautotision—Telautograph Corp  
 Telocap—Sprague Electric Co  
 Telecard—Taber Instrument Corp  
 Telecch—Tabor Instrument Corp  
 Telecom—Webster Electric Co  
 Telecord—Dictaphone Corp  
 Telefoto—Telefoto Industries Corp  
 Teletron—Teletron Co  
 Teledyne—Tabor Instrument Corp  
 Tele-Flex—Telrad Mfg Corp  
 Teleflight—Tabor Instrument Corp  
 Tele-Form—Telrad Mfg Corp  
 Telefunken—American Elite Inc  
 Telegraph Signal Analyzer—Towaco Electronics  
 Tele-Guide—Telrad Mfg Corp  
 "Telemark"—Leopold & Stevens Instruments Inc  
 Telemile—Miles Reproducer Co  
 Telegnosis—Littion Industries/Westrex Corp Div  
 "Telonic"—Telonic Industries Inc  
 "Telepath"—Seisior Mfg Co/Seismograph Service Corp Div  
 Telepix—Telepix Corp  
 "Telepulse"—Shand & Jurs Co  
 Telequipment—Scopes Co Inc  
 "Telering"—Telcor Inc  
 Teletalk—Webster Electric Co  
 Teleterm—American District Telegraph Co  
 Teletone—Teletone Co of America  
 Teletone—Electronics Creations Corp  
 Tele-Twist—Telrad Mfg Corp  
 Teletype—Teletype Corp  
 "Televac"—Fredericks Co Geo E  
 Teletv Switches—Switchcraft Inc  
 "Televox"—Aldisair Mfg Co Inc  
 Telex—Telex Corp  
 Telexideo—KFR Corp  
 "Telhor"—Telcor Inc  
 Tel-Labs Inc—Tel-Labs Inc  
 "Telite"—Master Specialties Co  
 Tel-O-Kid—Fisher Research Lab  
 Tel-O-Matic—Sprague Electric Co  
 Tel-O-Master—Fisher Research Lab  
 Telonic Engineering Corp—Telonic Egg Corp  
 "Tel-O-Set"—Honeywell Controls Ltd  
 Tel-Tro—Hill & Co E Vernon  
 TEMCO—Thermo Electric Mfg Co  
 Tempometer—Thermo Electric Mfg Co  
 Temflex—Minnesota Mining & Mfg Co/Irvington Div  
 "Temp-Cap"—Minn-Honeywell Regulator Co/Micro Switch Div  
 "Tempco"—Temple Steel Co  
 "Tempel"—Temple Steel Co  
 Tempex—Nitemp Wires Inc  
 Temporex—Sci Rex Corp  
 Temp-Guard Thermostats—Dales Co Franklin  
 Templog—Templog Corp  
 Templog Pellets—Templog Corp  
 Templogits—Templog Corp  
 Temp-Loc—Gudebrod Bros Silt Co  
 Tempo—Oxford Electric Cor/Oxford Components Div  
 Tempore—Nitemp Wires Inc  
 Tempore—Nitemp Wires Inc  
 Temp-R-Tape—Conn Hard Rubber Co  
 Tempic—Eastman Chemical Products Inc  
 Tennabit—Tennalab  
 Tenn-A-Liner—Channel Master Corp  
 Tennamatic—Tenna Mfg Co  
 Tenney-Mite—Tenney Engg Inc  
 Tenneytherm—Tenney Engg Inc  
 Tensite—General Cable  
 Tensitron—Tensitron Inc  
 Tensolux—Tensolite Insulated Wire Co Inc  
 Tensolon—Tensolite Insulated Wire Co Inc  
 Terasdo—Relay Sales Inc  
 Terasdo—Terasdo Corp  
 Terminalite—Bird Electronics Corp  
 "Termend"—Buchanan Electrical Prods Corp  
 Terry Tools—Terry Co George A  
 "Tescro"—Eastern Specialty Co  
 Test Master—Precision Apparatus Co Inc  
 "Testometer—United Mfg Co/W L Mason Corp Div  
 Tecto—Electric Tachometer Corp  
 Teltion Terminal—Senlectra Corp  
 Teltrac—Monrovia Aviation Corp  
 "Tetra-Elch"—Gore & Assoc Inc W L  
 Tetrafilm—Shamban & Co W B  
 "Tetra-Seal"—Gore & Assoc Inc W L  
 "Tetra-Tube"—Gore & Assoc Inc W L  
 Tetroc—Sprague Electric Co  
 Texco—Teco Insulated Wire  
 Texas Crystals—Texas Crystals  
 "Tex-Cap"—Texas Capacitor Co./K-C-K Corp Div  
 Textolite—General Electric Co  
 Textolite—General Electric/Laminated Products Div  
 Tggf—Wire Co of America  
 T G S 250—Radix Wire Co  
 Thayer—Thayer Scale Corp  
 The Fisher—Fisher Radio Corp  
 The Moisture Monitor—Strandberg Engg Labs Inc  
 Therio—Driver-Harris Co  
 Therma Cal—North Shore Nameplate/Anodyne Inc Div  
 Thermax "B"—Phelps Dodge Copper Products Corp  
 Thermax "F"—Phelps Dodge Copper Products Corp  
 Thermal Harness Products—Revere Corp of America  
 ThermoLine—International Radiant Corp  
 Thermo-Monitor Controller  
 Thermal Set—Robert-Shaw Fulton Controls Co  
 Thermo Mark—North Shore Nameplate/Anodyne Inc Div  
 "Thermatrol"—New Rochelle/Thermatrol Corp  
 Thermo—General Cable  
 Thermo-W—General Cable  
 Thermo-Houston Co  
 Thermo-L—Mitemp Wires Inc  
 Thermo—Electronic Mechanics Inc  
 Thermoindex—Temill Corp  
 Thermo Stamp—Yellow Springs Instr Co  
 Thermo-bonder—Standard Register Co  
 "Thermo-Cable"—Thermo Electric Co  
 Thermo-D-Disc—Thermo-D-Disc Inc  
 Thermo-dyne—Modern Lab Equipment Co  
 Thermo-Mat—Raychem Corp  
 Thermo-pag—Paris Lab Henry Francis  
 "Thermo-Grip"—Ideal Industries Inc  
 Thermo-Humidigraph—Bristol Co  
 Thermo-karat—Sel Rex Corp  
 Thermo-lin—Star Porcelain Co  
 Thermo-elastic—Cox & Co  
 Thermo-Lok—Cable Electric Products  
 Thermo-Lyne—Thermo Electric Mfg Co  
 Thermo-patch—Cox & Co  
 Thermo-seal—Cox & Co  
 Thermo-steel—Brain—Wall Mfg Co P  
 Thermo-strip—Driver-Harris Co  
 Thermo-strict—Fannal Inc  
 Thermo-test—Technique Assoc./Duncan Electric Co Inc Div  
 "Thermo-Tip"—Ideal Industries Inc  
 Thermo-veyor—Bristol Co  
 Thermo-voxe—Cox & Co  
 Thermo-Vis—Parh Nameplate Co  
 Thin-Trip—Electro-Voice Inc  
 "Thinwall"—Cleveland Graphite Bronze/Clevite Corp Div  
 Thomas Organ—Thomas Organ Co  
 Thorex—Ohio Brass Co  
 Thorex—Natl Beryllium Corp  
 THPC—Hooker Chemical Corp  
 3c-BLOC—Computer Control Co Inc  
 3c-PAC—Computer Control Co Inc  
 3M—Minnesota Mining & Mfg Co  
 Three-Phase—Sciaby Bros Inc  
 Thrifty—Marathon Battery Co  
 Thryling—Bird Electronics Corp  
 Thryling—Sprague Electric Co  
 Thunderbird—Industrial TV Inc  
 Thyra-control—Vectrol Engg Inc  
 Thyra-Line—Hanson-Gerrill-Brian Corp  
 Thyra-Pulse—Hanson-Gerrill-Brian Corp  
 Thyrite—General Electric Co/Magnetic Material Section  
 Thyrite—General Electric Co/Metallurgical Prods Dept  
 TI-Co—Thomas Instrument Co  
 Time-All—Intl Register Co  
 Timefax—Littion Industries/Electronic Equipments Div  
 Timefax—Littion Industries/Westrex Corp Div  
 "Time-O-Stat"—Honeywell Controls Ltd  
 "Time-O-Switch"—Honeywell Controls Ltd  
 Time-O-Temp—Time-O-Matic Inc  
 "Time Pattern"—Honeywell Controls Ltd  
 Time Recorder—Standard Instrument Corp  
 Times Wire—Progress Electronics Co  
 Time Totalizer—Standard Instrument Corp  
 Ti-Mite—Paragon Electric Co  
 Timm—General Electric  
 Tini-Extension Jax—Switchcraft Inc  
 Tini-Jax—Switchcraft Inc  
 Tini-Plugg—Switchcraft Inc  
 "Tini-Glow"—Industrial Devices Inc  
 Tiny Hand Tools—Woody Machine Products Co  
 Tinymax—Torwico Electronics Inc  
 Tinymax—Torwico Electronics Inc  
 Tiny-mite—Rembrandt Inc  
 Tiny Switches—Switchcraft Inc  
 Tigg-Trom—Tigtronic Inc  
 Tig-Top—General Cable  
 Titebilt—Phelps Dodge Copper Products Corp  
 Titroline—Consolidated Electro-dynamics Corp  
 Titramatic Analyzers—Milton Roy Co  
 T-Jax—Switchcraft Inc  
 "IMC"—General RF Fittings  
 "IMC"—Technical Measurement Corp  
 TM-5—Control Corp  
 TM-6—Control Corp  
 TM-16—Control Corp  
 TM-13A—Control Corp  
 TM-15—Control Corp  
 TM-19A—Control Corp  
 TMT—Diaphex Div  
 Tobavox—Cooper Electronics Inc  
 Tom Thumb—Automatic Radio Mfg Co  
 Tompax—Lee Electric Inc  
 Tom-Tel—Columbia Electric Mfg Co  
 Tonotron—Hughes Aircraft Co/Vacuum Tube Products Div  
 Toolwell—Lincoln Electric Co  
 Toplight—Toplight Corp  
 Topmat—Littion Industries/Electronic Equipments Div  
 Top-Wat—Littion Industries/Westrex Corp Div  
 Tophet A—Driver Co Wilber B  
 Tophet C—Driver Co Wilber B  
 Topliner—Technical Appliance Corp  
 Tor-A-Cor—Magnetic Core Corp  
 Torbal—Torsion Balance Co  
 Torconductors—Forbes & Wagner Inc  
 Toronado Hammermill—Stokes Corp F J  
 Toray—Toray Inc  
 Toray—Universal Mfg Co Inc  
 Torque—Overload Control Co  
 Torrington—Torrington Co  
 "Total Flow Meter"—Loupold & Stevens Instruments Inc  
 Totolizer—Standard Instrument Corp  
 Totco—Technical Oil Tool Corp  
 Tote Boxes—Mastra Co  
 Toteline—Parhar Metal Goods Co  
 "Totelite"—Parhar Metal Goods Co  
 Totemaster—Mastra Co  
 Tot Pedal—Klann Organ Supply Co  
 Touch-A-Matic—Felter Mfg  
 Touchette—Rodele Mfg Co  
 T-PAC—Computer Control Co Inc  
 T-Pacs—Computer Control Co Inc  
 TR—Industrie Transistor Corp  
 "Trace"—Highside Chemical Inc  
 Tracer—General Precision Inc./Link Div  
 Trac-Master—Mosley Electronics Inc  
 Traffic Master—General Railway Signal  
 Trak—CGS Labs Inc  
 Trakbond—General Railway Signal  
 Tramp—Bosch Inc M Ten  
 "Transactor"—Stromberg Time Corp  
 Transair—Taylor Instruments Co  
 Trans-citer—Multi-Products Co  
 Trans-citer—Mullard Equipment Ltd  
 Transcope—Taylor Instruments Co  
 Trans Electronics Inc—Trans Electronics Inc  
 Transflex—Minnesota Mining & Mfg Co  
 Transformer Technicians Inc—Transformer Technicians Inc  
 "Transhield"—Pye Corp of America  
 Transheat—BTU Engg Corp  
 "Transicon"—DuMont Labs Inc Allen B  
 Transidyne—Spectral Electronics Corp  
 Trans-Lytic—Sprague Electric Co  
 Transimulater—Sprague Electric Co  
 Transipads—Ross Metals Co Milton  
 Transiphone—Fisher Research Lab  
 Transistor—Mallinckrodt Chemical Works  
 Transistor Machine—DesignTool Corp  
 Transistors—E Bauches S A  
 Transistrol—Dynamic Controls Co  
 Transistron—Van Norman Industries Inc/Electronics Div  
 "Trans-Master"—Educational Electronics Co  
 Trans-O-Netic—Heinemann Electric Co  
 TRANS-Scan-LOG—Taylor Instruments Cos  
 Transstat—Taylor Instruments Cos  
 Translite—Star Engraving Co Ltd  
 Translytic—Micamold Electronics Mfg Corp  
 Transpac—Era Pacific Inc  
 "Transtal"—Reeves Instrument Corp/Standard Electronics Div  
 Transvar—Sperry Microwave Electronics Co/Sperry Rand Div  
 Trapper—Technical Appliance Corp  
 Treadlite—Linemaster Switch Corp  
 Trehsiloh—Tech-Ohm Resistor Corp  
 Trenchlay—General Cable  
 Trenchlay-U—General Cable  
 "Tri-Amp"—Radio Receptor Co Inc/Belenium  
 "Tri-Band"—Telrex Labs  
 Trice—Packard Bell Computer Corp  
 Trice—Packard Bell Electronics Corp  
 "Tri-Ex"—Tri-Ex Tower Corp  
 Tri-Flux—Redmond Co  
 Trighrest—Wall Mfg Co P  
 Trig Towers—Rostan Corp  
 Trisch Towers—Trisch Inc John D  
 Tridimensional Stereo Speaker—University Loudspeakers Inc  
 Trimit—Bourns, Inc  
 Trimpot—Bourns, Inc  
 Trimeter—Bourns, Inc  
 Trimtrac—Drice Industrial Corp  
 Trim-Tite—Fairchild Controls Corp  
 "Trinistor"—Westinghouse Electric Corp/Semiconductor Dept  
 Trinox—Trinity Equipment Corp  
 Tri-O-Matic—V M Corp  
 Trion—Trion Inc  
 Tri-Onic—Chase-Shawmut Co  
 Trionic-Dual—Chase Shawmut Co  
 "Tri-Planar"—Technical Devices  
 Tri-Plate—Sanders Associates  
 Triple "A"—Acromark Co Inc  
 Triple M Products—Midwest Molding & Mfg Co  
 Triplet—Triplet Electrical Instrument Co  
 Triples—Dossert Mfg Corp  
 Triplex—Hanson Van Winkle Munning Co  
 Triplog—Pyle-National Co  
 "Tristat"—Tri-Ex Tower Corp  
 Triton—Viking Instruments Inc  
 Trixite—Burrhoughs Corp/Electronics Tube Div  
 Trojan—Hexacon Electric Co  
 Trolex—Chicago Telephone of Calif  
 Trox—Bussmann Mfg Co  
 Tropica—Micamold Electronics Mfg Corp  
 Tropiglas—Russell Reinforced Plastics Corp  
 Tropmaster—Mosley Electronics Inc  
 Trough-Line LI—British Industries Corp/Lant Div  
 Truair—Waldes Kohinson Inc  
 Trucut Wire—National-Standard Co  
 True Stereo—Linar Inc  
 True Stereo—Permaflux Products Co  
 Truform—Republic Aviation Corp  
 Tru-Ground—Allen Mfg Co  
 Truiles—Zimmer Inc  
 Trullium—Hanson Van Winkle Munning Co  
 Trullite—Republic Aviation Corp  
 Tru-Ohm—Tru-Ohm Mode Engg & Mfg Co Inc  
 Tru-Ohm—Medal Engg & Mfg Inc  
 Truon—Berg Mfg Corp  
 Tru-Rib—Tru-Ohm Model Engg & Mfg Inc  
 Tru-Round—Allen Mfg Co  
 Tru-sonic—Stevens Tru-Sonic Inc  
 Trylon—Wind Turbine Co  
 TSA—Tenney Engg Inc  
 T.S.C.—Federal Mfg & Engg Corp  
 TSC—Television Specialty Co Inc  
 TSC 4000—Television Specialty Co Inc  
 T-Switches—Switchcraft Inc  
 T Y T Y Electronics Inc  
 "TTR"—Biddle Co James G  
 Tube Caddy—Argos Products Co  
 Tube Master—Precision Apparatus Co Inc  
 Tube-R-Cap—Globe Union Inc/Centralab Electronics Div  
 "Tuck"—Technical Tape Corp  
 "Tuf-On"—Thermec Engg Corp  
 Tuf-Plate—Photocircuits Corp  
 Tufts-Flex—Hanson Van Winkle Munning Co  
 Turbo—American Enha Corp./William Brand-Rex Div  
 Turboglass—American Enha Corp./William Brand-Rex Div  
 Turbolene—American Enha Corp./William Brand-Rex Div  
 Turbolox—American Enha Corp./William Brand-Rex Div  
 Turbopower—Turbo Jet Products Inc  
 Turbulit—American Enha Corp./William Brand-Rex Div  
 Turbotemp—American Enha Corp./William Brand-Rex Div  
 Turbotop—American Enha Corp./William Brand-Rex Div  
 Turbo Tuffex—American Enha Corp./William Brand-Rex Div  
 Turbotherm—American Enha Corp./William Brand-Rex Div  
 Turbotrans—American Enha Corp./William Brand-Rex Div  
 Turbozone—American Enha Corp./William Brand-Rex Div  
 Turbo 117—American Enha Corp./William Brand-Rex Div  
 Turbul—Minnesota Mining & Mfg Co  
 Turner—Turner Co  
 Turner System—Factory Service Co  
 Turret-Head—Fairchild Recording Equipment  
 Tusk—Greene Tweed & Co  
 "Tu-WAY"—Parhar Metal Goods Co  
 TW—Channel Master Corp  
 #20—Hanson Van Winkle Munning Co  
 Twinarz—Lincoln Electric Co  
 Twimfilm—Sprague Electric Co  
 Twin-Plugs—Switchcraft Inc  
 Twinpot—Bourns Inc  
 TwinP—Bourns Inc  
 Twistaguide—Airton Inc  
 Twistaguide—Littion Industries/Electronic Equipments Div  
 "Twist-Free"—Sphere Co Inc  
 Twist-Lok—Sprague Electric Co  
 Twistoguide—Airton Canada Ltd  
 2K Series—Starling Transformer Corp  
 260 VOM—Simpson Electric Co  
 Tylox—Hamilton Kent Mfg Co  
 "Tym and Dater"—Cincinnati Time Recorder Co  
 Tymeter—Penwood Numechron Co  
 Tynee Dry—Pyramid Electric Co  
 Tyne-switch—American-Standard/Detroit Controls Div  
 Type 505 Pulcras—News-Clarke Co/Vitro Corp of America Div  
 Type 505 Zenarc—News-Clarke Co/Vitro Corp of America Div  
 Typotron—Hughes Aircraft Co/Vacuum Tube Products Div  
 TyPR—Bullard  
 Ty-Ply—Borg Warner Corp/Walton Chemical Div  
 Ty-Rap—Thomas & Betts Co Inc  
 Tyson—SKF Industries Inc

U

# BRAND & TRADE NAMES

U-95—Inst X Co Inc  
 Ultragraph—Automation Industries Inc  
 Ultra Compact—United Trans-Former Corp  
 Ultradyne—Ultradyne Inc  
 Ultralite—Bridgeson Brass Co  
 Ultra-Kap—Globe Union Inc/  
 Centralab Electronics Div  
 "Ultramicrowave"—Demarney-Bonardi Corp  
 Ultra-MW-Elec—Argonne Electronics Mfg  
 "Ultrapeaker"—Nuclear-Chicago Corp  
 Ultratube—Plastoid Corp  
 Ultratone—Oberline Inc./Ultratone Div  
 Ultratube—Plastoid Corp  
 Ultratruer—Blonder-Tongue Labs  
 Ultraham—Ultraham Inc  
 Ultratrim—Ultratrim Inc  
 Ultronic—Overhead Door Corp  
 Unbrako—Standard Pressed Steel Co  
 Unbrako—Unbrako Satchet Screw Co Ltd  
 "Undark"—U S Radium Corp  
 Unecap—United Electronic Mfg Corp  
 Unepac—Ungar Electric Tools Inc  
 Uniblast—Narda Ultrasonic Corp  
 Unical—Aeronautical Electronics Inc  
 Uni-Coat—Redmond Co  
 Unicorn—Computer Measurements Co/Pacific Industries Inc Div  
 Unidial—Chicago Industrial Instrument Co  
 "Unidial"—Barnett Instrument Co  
 Unigrain Brass—Somers Brass Co  
 "Uniline"—Monogram Precision Industries Inc/Cascade Research Div  
 "Uni-Magic"—Pentron Sales Co Inc  
 Unimax—W L Maxon Corp./Unimax Corp Div  
 Unimode—M B Electronics/Texttron Elec Div  
 Union—Hanson Van Winkle Munning Co  
 "Union Carbide"—Union Carbide Corp/Silicones Div  
 Unipak—Sprague Electric Co  
 Unipose Pickup Arm—Pichering & Co Inc  
 Unipole—Andrew Antenna Corp  
 Unigrane—General Cable  
 Unisec—Gurley W & L E  
 Unilab—Dorsett Mfg Corp  
 United—Hanson Van Winkle Munning Co  
 United—United Aircraft Products Inc  
 United—United Carbon Products Co  
 "United"—United Mfg Co/W L Maxon Corp Div  
 United Metallic—United Aircraft Products Inc  
 United Metallic O-Rings—United Aircraft Products Inc  
 United Scientific Labs—Dewald Radio Mfg Corp  
 United Rectifier—Magnatran Inc  
 United—Cutter-Hammer Inc  
 Unizac—Sperry Rand Corp./Remington Rand Univac Div  
 Universal—Dolgorukov Mfg Co  
 "Universal"—K-W Engineering Works  
 "Universal"—Shielding Inc  
 Universal—Universal Motor Co  
 Universal—Universal Products Eng'g Co  
 Universal—Hanson Van Winkle Munning Co  
 Universal—Wai Met Alloys Co  
 Universal—Zenith Radio Corp  
 Universal Testing Instrument—Instron Eng'g Corp  
 University—University Loudspeakers Inc  
 Upr Lifter—Revolator Corp  
 Uranium Scout—Fisher Research Lab  
 USC—Us Components  
 Useco—Littion Industries/Electronic Equipment Div  
 Useco—Littion Industries/U S Eng Div  
 Useco—Littion Industries/U S Engineering Co Div  
 USC—U S Graphite Co/Wiches Corp Div  
 U S Bencor—U S Semiconductor Products  
 U S Bencor—U S Semiconductor Products/United Industrial Corp Div

U S T—U S Transistor Corp  
 Ullica—Ullica Drop Forge & Tool/Kelsey-Hayes Co Div  
 "Vaco"—Vaco Products Co  
 Vacudent—Vacudent Mfg Co  
 "Vaco-Master"—Hayes Inc C  
 "Vacumstat"—Honeywell Controls Ltd  
 Val—Tri-Ohm Model Eng'g & Mfg Inc  
 Valcor—Valcor Eng Corp  
 Valor—Valor Electronics Co  
 ValuLine—International Radiant Corp  
 Val-50—Valverde Labs  
 Vamp—Antenna & Radome Research Assoc  
 "Van de Graaff"—High Voltage Eng Corp  
 Vanguard—Springfield Enterprises  
 Vapor-Temp—Blum M Electric Co  
 "Varec"—Vapor Recovery Systems Co  
 Varex—Fisher-Pierce Co  
 Varex—Ohio Brass Co  
 Var-F—Var-L Co  
 Var-Gen—General Radio  
 Varico—Pacific Semiconductor  
 Variel—Superior Electric Co  
 Varichron—Biophysical Electronics Inc  
 Varicon—Elco Corp  
 Varicord—Photovolt Corp  
 Varidrive—U S Electrical Motors Inc  
 Variductors—United Transformer Corp  
 Variadyne—U S Electrical Motors Inc  
 Vari-L—Vari-L Co  
 Variogon—Nilsen Mfg Co  
 Variapak—Elco Corp  
 Variapak Printed Card Enclosures—Elco Pacific  
 Vari/Phase—Clorostat Mfg Co  
 Variplotter—Electronic Associates  
 Varius 111—British Industries Corp/Lab Div  
 Varitran—Par Products Corp  
 Varitran—United Transformer Corp  
 "VarMat"—New Jersey Wood Finishing Co  
 Vargometer—Micrometrical Mfg Co  
 "VarSil"—New Jersey Wood Finishing Co  
 "Varstel"—New Jersey Wood Finishing Co  
 Varytate—Audimation Labs  
 V-Dot Indicator—Inertia Switch  
 Veco—Victory Eng'g Co  
 "Vector"—Vector Mfg Co  
 "Vectorbord"—Vector Electronic Co  
 "VecCo"—Voron & Co Geo  
 "VecCo"—Vought Co  
 Veclo—Virginia Electronics Co  
 Venisele—Electronic Devices Inc  
 Venral—Western Devices Inc  
 Verdan—Autometics  
 Verd-A-Ray—Verd-A-Ray Corp  
 Verilo Cap—Spectra-Strip Wire & Cable Corp  
 Vermitempo—Modern Laboratory Equip Co  
 Vernac—Simson Optical Mfg Co  
 VernDial—Howell Instrument Co  
 VernDial—Howell Instrument Co  
 Vernistat—Pen-Elmer Corp./Vernistat Div  
 Vernitel—Hoover Electronics Co  
 Versamid Polyamide Resins—General Mills  
 "Versarack"—M H Standard Corp  
 Versatrol—Assembly Products  
 Versilube—General Electric Co  
 Versi-Trol Switch—Diaphex Div  
 Vextar—Par Products Corp  
 Verti-Lytic—Sprague Electric Co  
 Verti-Ohm—Tri-Ohm Model Eng'g & Mfg Inc  
 Vecco—Vinson Eng'g & Sales  
 "Vartex"—New Jersey Wood & Finishing Co  
 Vest Pocket—Mosley Electronics Inc  
 VFC—Automation Devices Inc  
 VHF—Parker Metals Goods Co  
 Vibrapak—Elten Div  
 Vibrapak—Mallory & Co P R  
 Vibrashock—Robinson Technical Products Inc  
 Vibra-Tine—The Cyrex Corp  
 Vibration—Barry Controls  
 Vibration Mounts—Cletrix Harris Prods Inc

Vibrex Fasteners—Amvet Corp  
 Vibrator—Vibration Research Labs Inc  
 Vibro-Centric—Black & Decker  
 Vibroground—Associated Research Inc  
 Vibro-Leveler—Bushing Inc  
 Vibron Electrometers—Milton Roy Co  
 Vibrotest—Associated Research Inc  
 Vibrator—Borg-Warner Corp./Borg-Warner Controls  
 Vical—Par Products Corp  
 Vicalloy—Telcon Metals/Telcon Works  
 Vicon—Insul-B-Vicon Corp  
 Victor—Kalart Co Inc  
 Victory—Hanson Van Winkle Munning Co  
 Videotape Recorder—Ampex Corp  
 Videoptics—Burke & James Inc  
 Video Telegaus—Grimson Color Inc  
 Vidicon—Gordon Enterprises  
 Vidiotomat—Burke & James Inc  
 "Viv-Master"—Educational Electronics Co  
 "Viking"—Forsberg Mfg Co  
 "Viking"—Hansen Co Wm  
 Viking—Viking Instruments Inc  
 Viking Snap-E-Lock—Viking Industries Inc  
 "Vinoxep"—Apex Coated Fabrics Co  
 Vinco—Vincio Electronics Corp  
 Vinylipin—Adhesive Products Corp  
 Vinyl Tubing—Minnesota Mining & Mfg Co/Imington Div  
 Vinyl Hooked Chemical Corp  
 "Viron"—Kost Products Co  
 Viscolfin—Industrial Condenser Corp  
 ViscoMatic—Minster Machine Co  
 Visette—Sanborn Co  
 "Visicorder"—Honeywell Controls Ltd  
 Visicorder—Minneapolis Honeywell/Heiland Div  
 Visi-Lok—Bastian Bros  
 Visi-Mag—Magneprocessors  
 Viso-Cardette—Sanborn Co  
 Visoton—Biophysical Electronics Inc  
 Visoton—Biophysical Electronics Inc  
 Visotrol—Steward Instrument Co  
 Vitamin Q—Sprague Electric Co  
 "Vitramon"—Vitramon Inc  
 "Vitresol"—Thermal American Fused Quartz Co  
 Vitrex—Atlas Mineral Products Co  
 Vitrolbond—Atlas Mineral Products Co  
 Vitrolain—Star Porcelain Co  
 Vitrox "C"—Vitro Chemical Co  
 Vitrox "R"—Vitro Chemical Co  
 "VK"—Vitramon Inc  
 VM—Harmon Lichtenstein & Co  
 Vocatron—Vocaline Co of America  
 Voice of Music—V M Corp  
 Voiceplex—Kahn Research Labs  
 Voice II—Television Specialty Co Inc  
 Vokar Imperial Brand—Vokar Products Inc  
 Volar Quality Brand—Vokar Products Inc  
 Voldicon—Adage Inc  
 Vol-D-Fig—Natl Instrument Labs Inc  
 Voltage Controller—Duncan Electronic Co Inc/Technique Assoc Div  
 Voltomyst—Radio Corp of America/Electron Tube Div  
 Volttron—Volttron Products  
 "Volumatic"—Honeywell Controls Ltd  
 Voxette—Amplivox Ltd  
 "Voycall"—Lake Mfg Co  
 VSCF—Jack & Heinz Inc  
 Vuc-Mone—Brewel Products Corp  
 Vuc-Tronics—Prescott TV Co  
 Vulcan—Vulcan Electric Co  
 Vulcan—United Greenfield Corp./Williams Co J H Div  
 Vyna-Kote—Spectra-Strip Wire & Cable Co

Wallingford—Wallingford Steel Co  
 Waller—Wall Mfg Co P  
 Warco—Warren Corp  
 Warner—Warner Electric Brake & Clutch Co  
 Warren—Wire Co of America/Warren Wire Co Div  
 Warrenite—Wire Co of America/Warren Wire Co Sub  
 Wasco Glomelt—Wasco Electric Products Corp  
 Watch Dog Starters—General Electric Co/Wiring Device Dept  
 Watchmaster—American Time Products Inc  
 Waterite—Bache & Co  
 Watson—Watson Mfg Co  
 Waugh-Johnson—Walter A Johnson Assoc  
 Warebooster—Radio Merchandise Sales Inc  
 Wavometer—Micrometrical Mfg Co  
 W-C—Weighing & Control Components Inc  
 WEAC—Western Electronic Co  
 Wearveld—Lincoln Electric Co  
 "Westerchase"—Honeywell Controls Ltd  
 Weatherfax—Littion Industries/Westrex Corp Div  
 Weather-Proof Rodale Mfg Co  
 "Wetherstat"—Honeywell Controls Ltd  
 Webcor—Webcor Inc  
 Webster—Webster Electric Co  
 Web Wh—Webster Mfg Co  
 Wedgit—Monadnock Mills  
 Wedmore—Superior Tube Co  
 "Wee Ductor"—Nytronics Inc./Essex Electronics Div  
 Wee Pol—Handley Inc  
 Wee Trim—Handley Inc  
 "Weir"—Wen Products Inc  
 WELCO—Wesche Electric Co B A  
 Weldanpower—Lincoln Electric Co  
 Weldmatic—Unitex Corp./Weldmatic Div  
 Weld More—Lincoln Electric Co  
 Weldohm—Belden Mfg  
 "Weldon"—Continental Elec Mfg Co  
 WeldPak—Raytheon Co/Industrial Components Div  
 Weldram—Superior Tube Co  
 Weldram—U S Plywood Corp  
 Weller—Weller Electric Corp  
 Welmeq—Welywn Electrical Labs  
 Welmeq—Welywn Int'l Inc  
 Wemet—Welywn Int'l Inc  
 Welltronax—Welltronax Co  
 "Welywn"—Welywn Canada Ltd  
 Wepny—Westfield Metal Products Co  
 WesCo—West Coast Electrical Mfg Corp  
 Wesgo—Western Gold & Platinum Co  
 Westach—Westberg Mfg Co  
 West-Cap—San Fernando Electric Mfg Co  
 Westcoat—Western Coating Co  
 Westtime—Westlab Inc  
 Westinghouse—Westinghouse Elec Corp/TV-Radio Div  
 "Westinghouse"—Westinghouse Elec Corp/X-Ray & Industrial Electronics Div  
 West-X—Hanson Van Winkle Munning Co  
 "Whale"—Forsberg Mfg Co  
 "Whalquist"—Nilsson Electrical Lab Inc  
 Wheelabrator—Wheelabrator Corp  
 Whirlclad—Polymer Corp  
 Whirlwinds—Black & Decker  
 Whispermate—Otarion Listener Corp  
 White-Lites—White Sales Co O C  
 "Whitley"—Whitley Electronics Inc  
 Whitman—Whitman Saddle Mfg Co  
 "Whip Saws"—Forsberg Mfg Co  
 WIDCO—Electro-Technical Labs  
 Wide Strip—Bristol Co  
 Windex—Hal Hen  
 Wilbro—Wildberg Bros Smelting & Refining Co  
 Wilcoltr—Wikelator Co  
 Wilder—Wilder Mfg Co  
 Wilkor Resistors—Aerovox Corp  
 Willard—Willard Storage Battery Div  
 Williams—United Greenfield Corp/Williams Co J H Div  
 Williamsgrip—Garrett Corp./Airssearch Mfg Co Div  
 Wilrite—Wilrite Products Inc  
 Wilson—Ray-D-Vac Co  
 Wincharger—Zenith Radio Corp  
 Winco—Wincharger Corp  
 Winco—Zenith Radio Corp  
 Windsor—James Int'l Corp  
 Winegard Co—Winegard Co

"Wing-Nut"—Ideal Industries Inc  
 Wintrenix—Wintrenix Electronics Inc/Jetronic Ind Div  
 Winzeler—Winzeler Mfg & Tool Co  
 Wirco—Wirco Electronics Inc  
 Wirecutter—Diaphex Div  
 WireCutter—Porter Inc H K  
 Wire Joiner—Lincoln Electric Co  
 "Wire-Nut"—Ideal Industries Inc  
 "Wire-Wrap"—Gardner-Denver  
 Wisco—Willard Storage Battery Div  
 "Wizard"—Television Utilitina Corp/Nord Div  
 Wobulator—Underwood Corp./Canoga Div  
 Wonderware—Radio Merchandise Sales Inc  
 Workometer—Stewart Instrument Co  
 "World-Over"—Educational Electronics Co  
 W-Point—Parker-Kalgn  
 Wrap-Rex—Hanson Van Winkle Munning Co  
 "Wright"—Wright Steel & Wire Co  
 Wright Zimmerman—Wright Zimmerman Inc  
 Wurliizer—Wurliizer Co  
 W W—Tel-Labs Inc  
 W. W. Power—Cima Resistor Corp  
 WW400—Wire Co of America  
 WW500—Wire Co of America/Warren Wire Co Sub  
 WW500—Wire Co of America/Warren Wire Co Sub  
 WW1000—Wire Co of America/Warren Wire Co Sub  
 Wycor—Wyzanbeck & Staff Inc  
 X  
 Xela—Klein & Sons Mathias  
 Xeristat—Advanced Instrument Corp  
 "XL"—Essex Electronics of Canada Ltd  
 "XP"—Hartley Products Co  
 XR-171—Technikote Corp  
 Xtrad—Hexacon Electric Co  
 X-Var—Fidelity Chemical Products Corp  
 XX "Little Joe"—MacDonald & Co  
 XXX—Hanson Van Winkle Munning Co  
 XXXG—Hanson Van Winkle Munning Co  
 X-Y—Benson-Lehner (G B) Ltd  
 "X"—General Dynamics Corp./Stromberg-Carlson Div  
 Y  
 "Y"—Switchcraft Inc  
 Yardmaster—Reeves Instrument Corp  
 Yellow Jacket—Sprague Electric Co  
 Yorkmate—York Co Inc Otto M  
 "Y-Series"—Tung-Sol Electric Inc/Chatham Electronics Div  
 Z  
 ZA—Hanson Van Winkle Munning Co  
 Zalytron—Zalytron Tube Corp  
 "Zelex"—du Pont de Nemours & Co E I  
 Zelco—Zacharias Electronics Corp  
 Zenith—Zenith Radio Corp  
 Zephyr Royal—Trio Mfg Co  
 "Zero"—Zero Mfg Co  
 Zerob—Atlas Mineral Products Co  
 Zeromatic—Beckman Instrument-Scientific & Proc Inst Div  
 Zero-Max—Zero-Max Co  
 Zeus—Borg-Warner Corp Western Branch/Pasco Products Div  
 Zifon—Collins Radio Co  
 Zinealume—Hanson Van Winkle Munning Co  
 Zipcote—Adhesive Products Corp  
 Zip-Grip—Set Screw & Mfg Co  
 "Zip-Strap"—Western Coil & Electrical Co  
 "Zirconarc"—Fish-Schurman Corp  
 Zircono—Natl Beryllia Corp  
 Zoomar—Zoomar Inc  
 Zoomatar—Zoomar Inc  
 Zyglo—Magnadux Corp  
 "Zylex"—Preservation Packaging Inc

# ELECTRONIC INDUSTRIES DIRECTORY of *Manufacturers' Representatives*

This section of the 1961 Electronic Industries Directory lists those independent sales organizations selling electronic products. Factory staff salesmen are not included. The Representative organizations are listed alphabetically by state and city. The information describes the general types and products handled, the territory covered

and whether warehousing facilities are available. Membership in one of the two principal organizations is indicated by  $\Delta$  or \* preceding the name. The  $\Delta$  denotes the Manufacturers Agents National Association; the \* denotes the "Electronic Representatives Association."

## ALABAMA

### BIRMINGHAM

EDWARDS CO INC GEORGE S 1913-27th Ave So TR 9-1638—Ala & NW Fla—Process Instruments & Controls—Warehouse

\*JESSE ASSOC GEORGE O 104 Broadway TR 9-6016—Industrial OEM

VEENSCHOTEN W E 2115 8th Ave S AL 1-3567—Ala & NW Fla

### MONTGOMERY

\*FRED WAMBLE SALES CO 3745 Marie Cook Dr 263-1573—Ala, Fla, Ga, Miss, NC, SC, Tenn—Components

## ARIZONA

### PHOENIX

GRAMER & CO 444 W Camelback Rd Suite 305 CR 9-1231—Ariz—Components

HOWE & HOWE SALES 4328 N 42nd Pl P O Box 10497 AM 5-9186—Ariz—Components

\*NEELY ENTERPRISES 641 E Missouri Ave CR 4-5431—Calif, Ariz, Nev, N M—Electronic Instruments & Technical Components—Warehouse

SHEPLER-KAHN CO 2017 N 7th St AL 8-7893—Ariz, N M, El Paso Tex—Warehouse

WESTERN ENGG CO 1644 W Hatcher Rd P O Box 9887 WI 4-0431—(Br) Suite 209 1515 Cleveland Pl Denver 3 Colo AM 6-2714—Ariz, Colo, S Idaho, N M, Mont, Tex, Utah, Wyo—Components—Warehouse

### SCOTTSDALE

CARL HOWER & CO 340 N Marshall WH 5-2471—Ariz—Components & Materials

### TUCSON

\*NEELY ENTERPRISES 222 S Tucson Blvd MA 3-2564—Calif, Ariz, Nev, N M—Electronic Instruments & Technical Components

## ARKANSAS

### BATESVILLE

DAVCO ELECTRONICS CORP Box 861 RI 3-3916—Ala, Ark, La, Miss, Mo—Community Antenna Systems, Electronic Components—Warehouse

### EL DORADO

BELLEW SALES CO DICK & DICK JR 314 Melrose UN 38-8325—Ark, La, Miss, W Tenn—Warehouse

## CALIFORNIA

### LOS ANGELES AREA

\*A-F SALES ENGG INC 285 E Green St (Pasadena) MU 1-5631—Industrial OEM, Instrument

\*ALDERSON CO WES 3050 Overland Ave TR 0-1030

ALERT SUPPLY CO 2041 S Davie Ave RA 3-8641—(Br) 923 Harrison St San Francisco Calif SU 1-5540—Ariz, Calif, N M—Electroplating Supplies & Equipment—Warehouse

\*BELL CO ARVIN 385 E Green St (Pasadena) MU 1-6317—Industrial OEM

\*BARRON CO BERT 15166 Ventura Blvd (Sherman Oaks) ST 4-7800—Industrial OEM

\*BARSTOW & DORAN INC 1406 S Grand Ave RI 8-6191—(Br) 1253 S King St Honolulu Hawaii, 647 Avenida Felix, Tucson Ariz—S Calif, Hawaii, Ariz, S Nev—Components, HI-FI, T V, Radio—Warehouse

\*BASSETT & MOORE 12045 Magnolia Blvd (N Hollywood) TR 7-7129—Industrial OEM, HI-FI/Audio

\*BECKER CO HERBERT 1146 Crenshaw Blvd WE 1-1257—Industrial OEM

\*BERMAN CO INC JACK 1141 S La Cienega Blvd OL 5-9820—HI-FI/Audio, Industrial OEM—Warehouse

\*BRAY CO BOB 18 N Mentor Ave (Pasadena) MU 1-3751—Components, Industrial OEM—Warehouse

CAPELL CO RICHARD 2639 S LaCienega Blvd UP 0-8616—(Br) P O Box 1431 Palo Alto Calif DA 1-2194—Calif—Military Components

\*CARTER ASSOC JACK 2232 W 11th St DU 9-3173—Warehouse

\*COCHRANE ELECTRONIC SALES CO 544 S Mariposa DU 6-0095—Instrument, Industrial OEM, HI-FI/Audio

\*COHN SALES CO S H 920 S Mansfield Ave WE 3-8617—HI-FI/Audio

\*COLMAN & ASSOC EDDIE 1503 S Marie RI 9-6591—HI-FI/Audio—Warehouse

COMPONENT SALES CALIF INC 4626 Van Nuys Blvd (Sherman Oaks) ST 8-4550—Ariz, Calif—Components

CORMAN CO WALTER W 7433 W 80th St Or 0-2520—Ariz, S Calif—Warehouse

\*COSTELL & CO 2740 S La Cienega Blvd—UP 0-8537—Industrial OEM, Instrument

DAVIS SALES GEORGE 2119 S Atlantic Blvd AN 8-7231—HI-FI/Audio—Warehouse

DEWCO SALES INC 6915 San Fernando Rd (Glendale Calif)—(Br) 444 Page Mill Rd Palo Alto Calif, 2223 El Cajon Blvd Rm 324 San Diego Calif—11 Western States—Electronic Components

DUDEK CO R C 407 N Maple Dr (Beverly Hills) BR 2-8097—(Br) 201 Town & Country Village Palo Alto Calif DA 6-6342—Ariz, Calif—Electronic Hardware—Warehouse

ELECTRO-MEDICAL ENGG CO INC 703 Main St (Burbank) VI 9-1618—Calif—Medical Electronic Instruments

\*EMMET CO FRANK A 1810 Fair Oaks (S Pasadena) MU 2-3721—Industrial OEM

\*ERLANGER SALES CO 4217 W Jefferson Blvd RE 1-2238—HI-FI/Audio—Warehouse

\*FELDMAN CO HENRY Box 66367 RI

9-8803—HI-FI/Audio—Warehouse

FERRIS W E 422 W Roses Rd (San Gabriel) AT 1-8389—S Calif—Controlled Temp Ovens, Vacuum Equipment, Components

FRANTZ CO CLAUDE C 701 S Gramercy Dr DU 7-1166—Calif, Ariz—Components

FREEMAN CO L H 4063 Radford Ave (Studio City) TR 7-0356—Ariz, S Calif, S Nev—Temperature Measurement, Research & Industrial Instrumentation, Lab Supplies—Warehouse

FREEMAN SALES CO MAURY 11422 Tobie St (Garden Grove) LE 9-5574—Ariz, S Calif, Nev, N M—Electronic HI-FI Components & Parts—Warehouse

\*GEIST CO W K 3177 Glendale Blvd NO 5-1195—Instrument—Warehouse

\*GILBERT CO INC M B 7923 Emerson Ave OR 8-3418—Instrument, Industrial OEM

\*HAESTROM-THOMPSON ASSOC INC 7460 Girard Ave (La Jolla) GL 4-1155—Industrial OEM—Warehouse

\*HAMILTON ELECTRO SALES 12308 Wilshire Blvd EX 3-0441—Industrial OEM, Instrument—Warehouse

\*HANSEN 1406 S Grand Ave RI 8-6191—HI-FI/Audio, Industrial OEM—Warehouse

\*HARMON CO W S 121 N Robertson Blvd (Beverly Hills) OL 5-6340—Industrial OEM

\*HEGER INC 2529 W 9th St DU 7-6995—Industrial OEM—Warehouse

\*HEIM & SCHEER INC 11168 Santa Monica Blvd BR 2-5133—Industrial OEM—Warehouse

\*HILL CO J T 420 S Pine St (San Gabriel) CU 3-6555—Industrial OEM, Instrument

\*HOLMES CO CARL E 107 N Ave 64 CL 6-2255—Industrial OEM, Instrument—Warehouse

HOPKINS CO R S 15016 Ventura Blvd (Sherman Oaks) ST 8-5501—Ariz & West Coast—Components

\*INSTRUMENTS FOR MEASUREMENTS 3455 Cabuenga Blvd (Hollywood) HO 9-7294—Industrial OEM, Instrument—Warehouse

JACKSON EDWARDS COMPANY 4101 Lankershim Blvd (N Hollywood) TR 7-9603—(Br) P O Box 10025 3336 E Colter St Phoenix 16 Ariz AM 5-1104—Ariz, S Calif—Components & Instruments—Warehouse

\*JEWETT CO SAMUEL O 13111 Ventura Blvd (N Hollywood) ST 9-8103—Industrial OEM

\*JURIN CO SYD 1628 S Bentley Ave GR 7-7768—HI-FI/Audio, Industrial OEM—Warehouse

\*KERSHNER CO WENDELL T 65344 Whittier Blvd RA 3-5500—Industrial OEM, Instrument

## REPRESENTATIVES

KEY ELECTRONICS INC 8533 Sunset Blvd OL 5-9140—Industrial OEM

KITTLESON CO 416 N La Brea Ave WE 3-7371—Industrial OEM, Instrument—Warehouse

\*KNIGHT CO W BERT 10377 W Pico Blvd BR 2-0101—Industrial OEM, Instrument—Warehouse

\*KOESSLER SALES CO 818 N Fairfax Ave OL 3-1605—Hi-Fi/Audio, Industrial OEM—Warehouse

LAMOREE C D 2433 Birkdale CA 5-5666—(Br) 2221 4th St Berkeley 10 Calif—Ariz, Calif, Nev—Electrical Insulation—Warehouse

\*LANDIS ASSOC 8588 W Washington Blvd (Culver City) UP 0-8697—Industrial OEM, Instrument—Warehouse

\*LUSCOMBE ENGG CO 1020 S Arroyo Pkwy (Pasadena) MU 2-3396—Industrial OEM, Instrument

\*LYNCH & SON C R 3307 Glendale Blvd NO 3-8236—Industrial OEM, Instrument—Warehouse

\*MC CARTHY ASSOC INC 1055 E Walnut (Pasadena) MU 1-7411—Instrument

\*MARKMAN CO R MARK 4260 Lankershim Blvd (N Hollywood) TR 7-3368—Hi-Fi/Audio, Industrial OEM—Warehouse

\*MARSH CO J W 4216 W Jefferson Blvd RE 2-0145—Hi-Fi/Audio, Industrial OEM, Instrument—Warehouse

\*MARSHANK SALES CO 7422 Melrose Ave WE 8-2591—Hi-Fi/Audio, Industrial OEM

\*MITCHELL CO C H 13504 Ventura Blvd (Sherman Oaks) ST 8-1013—Hi-Fi/Audio, Industrial OEM, Instrument—Warehouse

\*MOXON ELECTRONICS CORP 489 S Robertson Blvd (Beverly Hills) BR 2-9311—Industrial OEM, Instrument

MOYE CO ROBERT G 116 S Stoneman Ave P O Box 224 (Alhambra) CU 3-1663—Ariz, S Calif, S Nev—Industrial Components & Instruments

\*MUELLER ELECTRONIC SALES 3225 Exposition Pl AX 5-3239—Hi-Fi/Audio

\*NEELY ENTERPRISES (Main Office) 3939 Lankershim Blvd (N Hollywood Calif) TR 7-0721—Calif, Ariz, Nevada, N M—Electronic Instruments and Technical Components—Warehouse

\*NURCHES CO PAUL 2396 E Foothill Blvd (Pasadena) MU 1-8957—Industrial OEM, Instrument

\*O'HALLORAN & ASSOC JOHN FRANCIS 11636 Ventura Blvd (N Hollywood) TR 7-0173—Industrial OEM, Instrument

\*OLANDER & CO INC ROLAND 6313 Santa Monica Blvd HO 9-6313—Hi-Fi/Audio, Instrument—Warehouse

\*OSBORNE R E "DICK" 1757 Garfield Ave (S Pasadena) MU 2-3175—Warehouse

\*OWENS CO LEE H 1102 S Western RE 5-0203—Industrial OEM, Instrument—Warehouse

\*PACIFIC ELECTRO-SALES INC 6053 1/2 Whittier Blvd RA 3-3396—Industrial OEM, Instrument—Warehouse

PENWARDEN/DAILY ASSOC 7311 Van Nuya Blvd (Van Nuya) ST 2-4920—(Br) 509 Pearl Ave San Carlos Calif FR 5-2663—Components—Warehouse

\*PERLMUTH ELECTRONIC ASSOC 5057 W Washington Blvd WE 1-1041—Hi-Fi/Audio, Industrial OEM, Instrument—Warehouse

APORTER CO DON 1117 S Robertson Blvd BR 2-4263—S Calif—Electric & Electronic Components—Warehouse

RAINVILLE CO OF CALIF INC 1420 S Garfield (Alhambra) AT 4-3940—11 Western States

\*RISSI AL J 8417 E las Tunas Dr (San

Gabriel) CU 3-7614—Hi-Fi/Audio, Industrial OEM—Warehouse

\*ROBERTS & ASSOC INC E V 5068 W Washington Blvd WE 8-2541—Industrial OEM, Instrument—Warehouse

\*ROSS & CO MALCOLM 1623 S La Cienega BR 2-3103—Hi-Fi/Audio, Industrial OEM, Instrument

\*RUPP CO V T 307 Parkman Ave DU 7-8224—Instrument

\*RUSH & ASSOC C H 3757 Wilshire Blvd DU 8-7111—Industrial OEM, Instrument

\*SAUL & ASSOC HOWARD M 5015 San Vicente Blvd WE 8-3591—Industrial OEM, Instrument

\*SHEPARD-WINTERS CO 3193 Cahuenga Blvd HO 6-2171—Industrial OEM, Instrument—Warehouse

\*SIMONITE W C 10623 Burbank Blvd (N Hollywood) TR 7-1674—Ariz, S Calif, S Nev—Components, Test Equipment, Audio Lines—Warehouse

\*SNITZER CO T LOUIS 5354 W Pico Blvd WE 8-2073—Industrial OEM, Instrument

\*SNYDER CO LEE GRANT 1418 N Highland (Hollywood 28) HO 9-6278—Industrial OEM

SODARO CO 3753 S Robertson Blvd (Culver City) UP 0-6001—(Br) 329 Clay St San Francisco 11 Calif DO 2-0616—Calif

\*SPRAGGINS CO S L Box 217 Sec 2 (Encino) 5-1544—Industrial OEM

STARR EDWIN E 4101 Rhodes Ave (N Hollywood) TR 7-5879—S Calif—Hermetic & Ceramic Seals

\*STERN & CO INC I R Box 1055 (Burbank Calif) VI 9-1195—Hi-Fi/Audio—Warehouse

STEVENS CO INC THOMAS L 7648 San Fernando Rd (Sun Valley) CH 7-8716—Ariz, Calif—Components—Warehouse

\*STOLAROFF CO M A 4622 W Slauson Ave AX 3-6226—Industrial OEM

\*STONE CO R L 8971 National Blvd UP 0-5973—Hi-Fi/Audio, Industrial OEM—Warehouse

\*STRASSNER CO ELLARD E 1865 N Western Ave HO 2-0916—Hi-Fi/Audio, Industrial OEM, Instrument—Warehouse

\*THORSON CO 7361 Melrose Ave WE 4-1191—Industrial OEM

\*TIM-CO SALES 6845 Louise Ave (Van Nuya) DI 4-7803—Industrial OEM, Instrument

TRANS DYNAMICS INC 4450 Lakeside Dr (Burbank) VI 9-6262—Ariz, Calif, Colo, Idaho, Kansas, Mo, Nev, N M, Ore, Tex, Utah, Wash

TRIER & ASSOC J S 208 Standard St (El Segundo) EA 2-5547—Ariz, S Calif, S Nev—Components—Warehouse

\*UNGER SALES ASSOC 9925 Venice Blvd UP 0-6116—Industrial OEM—Warehouse

\*VAUGHAN CO G H 2366 E Foothill Blvd (Pasadena) MU 1-4511—Instrument

\*VELAND & BURKE ASSOC 491 N Los Robles Ave (Pasadena) MU 1-4421—Ariz, Calif, Nev—Instruments, Materials, Components

\*WALLACE & WALLACE CORP 1206 Maple Ave RI 7-0401—Industrial OEM, Instrument—Warehouse

WEDGE WEBER CO 12171 Venice Blvd DU 7-2111—Hi-Fi/Audio—Warehouse

\*WEIGHTMAN & ASSOC 4029 W Burbank Blvd (Burbank) VI 9-2435—Industrial OEM

\*WESREP CORP 2022 S Sepulveda Blvd BR 2-3757—Industrial OEM, Instrument—Warehouse

\*WESTRON SALES & ENG 7407 Melrose Ave WE 3-7276—Industrial OEM

\*WILEY CO PAUL F 1632 Silverlake Blvd NO 3-8028—Hi-Fi/Audio, Industrial OEM—Warehouse

WOOD ASH M P O Box 1158 (Arcadia) CU 3-1201—Ariz S Calif, S Nev—Components, Radio, TV

WRIGHT ENGG CO INC 180 E Calif Blvd (Pasadena) MU 1-8488—(Br) Wright Engg Co 126 25th Ave San Mateo Calif FI 5-3157—Ariz, Calif, Nev—Instruments

\*YARBROUGH SALES CO 192 E Glenarm St (Pasadena) RY 1-3331—Industrial OEM—Warehouse

ZIMMERMAN CO W E 407 Maple Dr (Beverly Hills) BR 2-1181—(Br) 201 Town & Country Village Palo Alto Calif DA 1-2008—Ariz, Calif, S Nev—Components—Warehouse

### SAN DIEGO AREA

DAWSON CO SAM 3424 Kurtz St CY 5-6671—Calif (Imperial and San Diego Cos)—Components

\*HAFSTROM-THOMPSON ASSOC 7460 Girard Ave (La Jolla Calif) GL 4-4271—(Br) 5603 North Figueroa Los Angeles 42 Calif CL 4-3995—Southern Calif, S Nev—Components, Instruments for Industry

JUPIN GEO 7705 Fay Ave (La Jolla Calif) GL 4-1120—San Diego Co

\*NEELY ENTERPRISES 1055 Shafter St AC 3-8103—Calif, Ariz, Nev, N M—Electronic Instruments & Technical Components—Warehouse

### SAN FRANCISCO AREA

\*ALLAN-COCHRANE CO 2215 S El Camino Real (San Mateo)

ASTROEL INC P O Box 1161 349 First St (Los Altos) WH 8-3636—(Br) J K Dooley 3215 Western Ave Seattle Wash—N Calif, Pacific N W—Components, Instruments

\*AULT ASSOC 120 Santa Margarita Ave (Menlo Park) DA 6-1760—Industrial OEM

\*BELCHAMBER & FRENCH SHERWOOD P 1485 Bayshore Blvd JU 6-0406—Industrial OEM

BELILOVE CO 420 Market St YU 2-3713—N Calif—Warehouse

\*BRAINARD BILL 715 Hamilton Ave (Palo Alto) DA 6-5421—Industrial OEM

\*BRANDT CO E W 1122 Folsom St HE 1-7710—Hi-Fi/Audio, Industrial OEM—Warehouse

CAHN CO BERNARD 420 Market St SU 1-7981—N Calif, Hawaii, N Nev—Components, Instruments—Warehouse

\*CERRUTI & ASSOC Box 507 (Redwood City) EM 9-3354—Industrial OEM, Instrument

\*DALTON ASSOC C R 1037 Laurel St P O Box 487 (San Carlos) LY 1-2654—Industrial OEM, Instrument

DAVIDSON & ASSOC JOE 2803 Los Flores Blvd (Lynwood) NE 6-2245

DEERE ELECTRONICS INC 1575 Laurel St #3 (San Carlos) LY 1-4423—N Calif—Components

\*DEL BUCCHIA & ASSOC R 179 S Mayfair Ave (Daly City)

EALY & COMPANY Box 238 (Northridge) TR 3-1775—Ariz, S Calif, S Nev

\*EICHORN & MELCHOIR INC 932 Terminal Way (San Carlos) LY 1-7383—Industrial OEM

ELECTRICAL SPECIALTY CO 158-168 11th St HE 1-8460—(Br) 2026 Arapahoe St Denver 5 Colo CH 4-4588, 1822 N W 25th Ave Portland 10 Ore CA 7-3601, 2820 E 12th St Los Angeles 23 Calif AN 9-9511, 2442 1st Ave S Seattle 4 Wash—MU 2-3434, P O Box 232 Phoenix Ariz AL 2-2107—eleven Western States—Warehouse

ELLENJE CO 345 California Ave (Palo Alto) DA 6-1655—Calif (N of San Luis Obispo, Kern & San Bernardino Counties), Nev (Reno)

\*ELLIS SALES CO G B 2316 El Camino Real (Mt View) YO 7-5531—Industrial OEM—Warehouse

\*GRAY CO HUGH 2166 Market St KL 2-1777—Industrial OEM, Instrument

\*HARRIS-KOETKE SALES CO 204 E Hillside Blvd (San Mateo) FI 1-2909—Industrial OEM—Warehouse

\*HEATON CO JAMES S 413 Lathrop St (Redwood City) EM 9-5278—N Calif, Nev—Components

\*HEATON MARCO ASSOC 413 Lathrop St (Redwood City) EM 9-5278—HI-FI/Audio, Industrial OEM, Instrument—Warehouse

\*HOWARD & ASSOC G M 727 Industrial Rd (San Carlos) LY 1-5736—Industrial OEM, Instrument—Warehouse

\*KOLANS & CO BILL 219 California Dr (Hurlingame) DI 4-7111—Industrial OEM—Warehouse

\*LEBEL-L-WARREN ASSOC 1667 Laurel St (San Carlos) LY 3-7688—Industrial OEM, Instrument—Warehouse

LOGAN SALES CO 150-8th St HE 1-0692—HI-FI/Audio, Industrial OEM

\*LOGAN & STONE CO 1845 Baystone Blvd DE 4-1200—Industrial OEM

\*LONG ASSOC INC 505 Middlefield Rd (Redwood City) EM 9-3324—HI-FI/Audio, Industrial OEM, Instrument—Warehouse

\*McKNIGHT CO JEFF 1436 El Camino Real (Menlo Park) DA 6-3762—Industrial OEM

MARSHALL CO G S 2065 Huntington Dr (San Marino) SY 5-4304—(Br) 2030 Broadway Plaza Plaza #38 Tucaon Ariz MA 2-4719, 801 Woodside Rd Redwood City Calif EM 6-8214, #30 Plaza Scottsdale Ariz WH 6-5521—Ariz, Calif, Nev, N M—Components, Instruments—Warehouse

\*MAULDIN CO C W 441 W California (Palo Alto) DA 6-5291—Industrial OEM, Instrument

\*MEYER & ROSS 113 10th St HE 1-0652—HI-FI/Audio, Industrial OEM—Warehouse

MORRISON & SON LESLIE D 704 The Alameda (Berkeley) LA 6-2451—N Cal, Western Nev

\*MOULTHROP CO F W 575 Tenth St MA 1-0722—HI-FI/Audio, Industrial OEM—Warehouse

\*MOUTHROP & HUNTER 165-11th St UN 3-7880—HI-FI/Audio, Industrial OEM, Instrument—Warehouse

\*NEELY ENTERPRISES 1317 Fifteenth St (Sacramento) GI 2-8901—Calif, Ariz, Nev, N M—Electronic Instruments & Technical Components—Warehouse

\*NEELY ENTERPRISES 501 Laurel St (San Carlos Calif) LY 1-2626—Calif, Ariz, Nev, N M—Electronic Instruments & Technical Components—Warehouse

\*NEWMAN CO H L 1299 Bayshore Hwy (Hurlingame) DI 2-7494—Industrial OEM—Warehouse

\*NICKERSON-GRAY & ASSOC INC 2434 Park Blvd (Palo Alto) DA 6-0152—HI-FI/Audio, Industrial OEM—Warehouse

NORTHWEST SALES & ENGINEERING SERVICE CO Terminal Sales Bldg MA 2-3860—(Br) 420 Market St San Francisco 11 Calif EX 2-9154—Northern Calif, Idaho, Mont, Ore, Wash—Components

\*NOTT & CO L A 1061 Howard St HE 1-4738—Industrial OEM—Warehouse

ORMOND CO JOHN H 600-16th St (Oakland) TW 3-3235—N Calif, N Nev—Warehouse

OWEN & ASSOC W A 10419 Long Beach Blvd (Lynwood) LO 7-8887—Ariz, Colo, Nev, N M, Ore, Utah, Wash—Warehouse

PENINSULA ASSOC 1345 Hancock St (Redwood City) EM 9-1226—(Br) 3215 Western Ave Seattle ZE 9-9987—Calif, Ore, Wash—Instruments—Warehouse

\*PFLEGER CO INC ROBERT L 652 Laurel St (San Carlos) LY 1-0395—Industrial OEM, Instrument—Warehouse

\*PURDY CO WILLIAM J 312 Seventh St UN 3-4321—Industrial OEM—Warehouse

ROSS CO DAVID H 534 El Camino Real (San Carlos) LY 1-4411—HI-FI/Audio Industrial OEM—Warehouse

\*RUDAT & EWING 636 W Waverly St (Palo Alto) RE 2-5232—Industrial OEM

SACRAMENTO ELECTRONIC SUPPLY CO 1219 "S" St (Sacramento) GI 1-4821—(Br) Stockton Electronics 710 E Main St Stockton Calif—N Calif, Nev (Reno)—Warehouse

\*SINIA-JOHNSON INC 845 Jessie St UN 1-6259—HI-FI/Audio, Industrial OEM—Warehouse

\*STONE & ASSOC JAY Box 583 (Sunnyvale) YO 8-2770—Industrial OEM

\*THEISNER & CO WM 405 S Sunnyvale (Sunnyvale) RE 9-6460—Industrial OEM, Instrument

\*TOMPKINS & CO WIN W 3944 El Camino Real (Palo Alto) DA 6-7940—Industrial OEM

VAN GROOS CO 21051 Costanzo (Woodland Hills) DI 0-3131—(Br) 1178 Lor Alta Ave Los Altos Calif WH 8-7266—Calif—Instruments

\*WHITE & COMPANY 788 Mayview Ave (Palo Alto) DA 1-3350—Industrial OEM, Instrument

## COLORADO

### AURORA

\*GOLLIHER W H 1559 Chester St EH 6-0208—HI-FI/Audio, Industrial OEM

### COLORADO SPRINGS

\*PEYSER & CO 1501 N Weber ME 4-3401—HI-FI/Audio, Industrial OEM—Warehouse

### DENVER

BARNHILL ASSOC 1170 S Sheridan Blvd WE 5-4645—(Br) PO Box 1790 2352 Apache La Alamosordo N M HE 7-2787, 660 E First No Centerville Utah AX 5-7519—Colo, S Idaho, N M, El Paso, Texas, Utah—Electronic Components & Instruments, Packages & Systems

\*BOWEN CO INC R G 721 S Broadway RA 2-4641—Industrial OEM

\*CLUPHE & ASSOC STAN 75 S Cody Ct BE 2-6025—HI-FI/Audio—Warehouse

\*CONNORS CO W H 375 Birch St DE 3-7628

DAWSON CO JIM 661 Delaware St AL 5-7194—Colo, Mont, Nev (Scotts Bluff Co), N M, Tex (El Paso Co), Utah, Wyo—Warehouse

\*"ELCOM" ELECTRONIC COMPONENT SALES INC 2149 S Clermont St SK 7-1261—Industrial OEM

HIEBERT CO 5595 W Iowa Ave WA 2-1973—Colo, Idaho, N M, Mont, Utah, Wyo—Nondestructive Testing—Warehouse

\*HYDE ELECTRONICS CO 881 S Lipan St WE 6-3456—HI-FI/Audio, Industrial OEM, Instrument—Warehouse

\*HYTRONIC MEASUREMENTS INC 1295 S Bannock St PE 3-3703—Industrial OEM, Instrument—Warehouse

\*KORTHER-COX CO 1325 S Inco St PE 3-5561—HI-FI/Audio, Industrial OEM—Warehouse

\*LAHANA & COMPANY 1886 S Broadway PE 3-3791—(Br) 1482 Major St Salt Lake City 15 Utah HU 6-8166—Industrial OEM, Instruments

\*LONGSTREET-SMITH ASSOC INC 1013-15th St KE 4-5091—Industrial OEM

\*McCLOUD & RAYMOND CO 5403 E Evans Ave P O Box 8848 SK 6-1589—HI-FI/Audio, Industrial OEM, Instrument

\*NELSON CO 710 E Louisiana Ave PE

## "REPRESENTATIVES"

3-5528—Industrial OEM—Warehouse

PARRISH ELECTRONICS 2130 So Albion St SK 6-9455—(Br) 12 East Stratford Ave Salt Lake City Utah HU 7-7847, 1437 San Mateo N E Albuquerque N Mex 268-6791—Colo, Utah, N Mex, Southeast Idaho—Instruments

\*PEARSON & CO MEL 1860 S Acoma St SP 7-8646—HI-FI/Audio, Industrial OEM, Instrument—Warehouse

SPICER-LINDSAY ASSOCIATES 4950 E Evans Ave SK 6-0627—Colo, N M, Utah, Wyo—Components

\*WILLIAMS CO ALLEN I 2261 S Albion St SK 6-9403—Industrial OEM, Instrument—Warehouse

### GREELEY

\*MOSS ELECTRONICS INC GORDON Box 428 1530-13th Ave EL 3-1452—HI-FI/Audio, Industrial OEM, Instrument—Warehouse

### LITTLETON

PRICE ENG'G SALES INC P O Box 421 DY 4-6367—(Br) Salt Lake City Utah P O Box 13 AM 2-1655—Colo, N M, Utah, Wyo—Miscellaneous Components

## CONNECTICUT

### BRIDGEPORT AREA

HOFFMAN ENG'G CORP 183 R Sound Beach Ave (Old Greenwich) NE 7-1719—Eastern U S—Instrumentation

### HARTFORD AREA

ABBOTT-ALLISON CO P O Box 467 (Meriden) BE 7-9232—Components & Instruments

\*COLDWELL INC MICHAEL S 289 Fairfield Ave JA 2-5832—Industrial OEM, Instrument

\*HATTON & CO ARTHUR T 1000 Farmington Ave (W Hartford) AD 3-3613—Industrial OEM, Instrument

\*LAVIN ASSOC INC HENRY P O Box 921 (Meriden) BE 7-5527—(Br) 82 Curve St Needham Mass—New England—Components—Warehouse

\*PETTIGREW & CO INC 10 N Main St (W Hartford) AD 3-8533—HI-FI/Audio, Instrument, Industrial OEM

ASHICKS SELLING SERVICE 766 Main St MO 6-4233—New England & N Y Hudson Valley

\*ZASLOW SALES CO INC 108 Foxcroft Rd (W Hartford) AD 6-3265—(Br) 371 Howard St Northboro Mass EX 3-8150—New England—Electromechanical Components—Warehouse

### NEW HAVEN AREA

\*BAHR SALES CO Spring Valley Rd (Woodbridge) FU 7-8712—Industrial OEM

GEIST-HOTZ INC 200 5th St (Stamford) DA 4-7309—(Br) 14 Wedgewood Rd Natick Mass OL 3-6510, 201 Crescent Ave Leonia N J WI 4-6488, 11 Robert Rd Penfield N Y DU 1-2002—New England, N J, New York State, E Penna—Components & Systems

\*NEIF ASSOC PAUL W 15 Oak St (Westport) CA 7-3834—HI-FI/Audio

\*WHITEHEAD CO JOHN F Box 177 (Gulfport) GL 3-3855—Industrial OEM

### NEWTON AREA

\*SALES ENGG CO Sugar Lane GA 6-4434—Industrial OEM

### TOLLAND

\*STOCKWELL TECHNICAL SALES CO Box 118 TR 5-5414—(Br) 44 Wacker St Cambridge Mass PR 6-6115—Industrial OEM

## DELAWARE

### NEWARK

CARMINE CO FERRELL S 14 Knickerbocker Dr Newark Del EN 8-7603—HI-FI/Audio



## REPRESENTATIVES

### DISTRICT OF COLUMBIA

#### WASHINGTON

BRADLET CO INC 3341 Arch St EV 2-4040—(Br) 212 H St N W Washington D C RE 7-1300—Washington D C, Del. Md, Southern N J, Eastern Penna, Va—Warehouse

\*BRIMBERG ASSOC INC 225 Investment Building Washington 5 D C DE 2-8000—Industrial OEM

DUNCAN ASSOC INC WILLIAM I 5452 Charles St CU 9-7840—Washington D C, Del. Md, Southern N J, Eastern Penna, Va—Components

\*FINKE ENGINEERING ASSOC RICHARD S 412 Albee Bldg Washington 5 D C ST 3-7319—Industrial OEM

ISRAEL ASSOC FRED Bank Commerce 101g Suite 406 Washington 5 D C

KALWEY ASSOC 1725 I St N W FE 8-4095—D C, Md, Va

MAC DONALD CO WILLIAM E 1835 K Street N W FE 3-8385—Washington D C, Md, Va, N C—Electronic Equipment, Controls—Warehouse

SOMMERBELL CO WILLIAM E 804 Dupont Circle Bldg 1346 Connecticut Ave N W HU 3-3354—DC, Md, Va

\*WARREN MOUNT CO National Press Bldg (14th & F Sts) Washington D C ME 8-0221—Industrial OEM, Instrument

WHITFIELD JAMES W 6006 Onondage Rd EN 3-4560—Del, DC, Md, Va—Components

### FLORIDA

#### CASSELBERRY

JOHNSON ASSOC OF FLORIDA P O Box 1675 62 S Highway TE 8-2111—Florida—Components

#### CLEARWATER

WIMBERLY CO W BEN 532 S Ft Harri-son CL 3-7072—Industrial OEM

#### COCOA BEACH

DBM RESEARCH CORP Atlantic Ave P O Box 521 ST 3-2438—Ala, Fla, Ga, Pan Handle of Tenn—Instruments—Warehouse

SPECIALIZED ELECTRONIC CORP 1201 Bay Shore Dr SU 3-2088—(Br) 529 N 18th St Birmingham Ala FA 4-1615, 711 Magnolia Ave Orlando Fla GA 4-0433—Ala, Fla, Ga, Miss, NC, SC, Tenn

#### FERN PARK

ATCHESON & ADAMS P O Box 138 Fern Park Fla—Instrument, Industrial OEM

#### HOLLYWOOD

SHARAF ASSOC TED 910 Van Buren St WA 2-4430—Industrial OEM, Hi-Fi/Audio

#### INDIAN RIVER CITY

BROWN & ASSOC INC W A 201 Capron Rd AM 7-0411—(Br) 104 E Gore Orlando Fla 222 Weber Orlando Fla GA 5-5682, 3610 Mt Vernon Ave Alexandria Va TE 6-1800—Ala, Del, Wash DC, Fla, Ga, Md, Miss, NC, SC, Tenn, Va—Components, Instruments—Warehouse

#### JACKSONVILLE

BARNHART CO L E 1003 Gunka Rd (Jacksonville 11)

#### LUTZ

WALLACE ASSOC INC STANLEY K P O Box 67 WE 9-3241—Instrument, Industrial OEM, Hi-Fi/Audio

#### MAITLAND

MILLAR ASSOC JAMES P O Box 96—Industrial OEM, Instrument, Hi-Fi/Audio

NICKERSON CO FRANK C 140 Derbyshire Rd—Industrial OEM—Warehouse

#### MELBOURNE

ADAMS ASSOC JOSEPH A P O Box 1322 PA 3-1931—Components—Warehouse

### MIAMI BEACH

BENZ SALES CO P O Box 178 (Miami Beach 62) WI 5-7721—Industrial OEM—Warehouse

GEARTNER CO JACK 235 Lincoln Rd JE 1-0200—Industrial OEM, Hi-Fi/Audio

HEMMINGER CO WILLIAM F 624 NE 79th St (Miami Beach 38) PL 9-0300—Industrial OEM—Warehouse

### MIAMI

FLORIDA PRECISION INST CORP 1221 Biscayne Blvd FR 1-0105—Industrial Instruments

NEAL & COMPANY J 3931 SW 5th Terrace HI 4-1118—Industrial OEM

SHAW HARDY CO 846 Ingraham Bldg FR 4-8342—Ala, Fla, Ga, Miss

### NORTH MIAMI BEACH

CARTWRIGHT & BEAN 20100 NE 25th Crt

HAYDEN & ASSOC PAUL 1060 NE 180th Terrace—Industrial OEM, Hi-Fi/Audio, Instrument—Warehouse

MARK ELECTRONIC SALES CO 410 NE 147th Terrace P O Box 291 WI 7-5080—Industrial OEM

WINFIELD ELECTRONIC SALES CO 66 NE 125th St PL 1-5566—Industrial OEM, Hi-Fi/Audio

### ORLANDO

BOHMAN CO G F 1239 Newcastle Dr

BUCHANAN & ABRAMS ASSOC INC 1224-6 E Colonial Dr P O Box 6026 GA 3-8995—Industrial OEM

CARLSON SALES CO P O Box 7035 GA 2-6885—Fla—Power Transmission Lines—Warehouse

COL-INS CO INC 5728 Precision Dr CH 1-1501—(Br) Atlanta GA CE 7-1494—Ala, Fla, Ga, Miss, N C, S C, Tenn, Langley Field Va—Instruments (Electro-Mechanical)

LEE ASSOC INC S S 719 W Smith Ave CH 1-4445—(Br) Room 300 Utilites Bldg Huntsville Ala, PO Box 205 Lutherville Md, 2521 Ennalls Ave Wheaton Md, PO Box 906 Winston-Salem N C—Ala, D C, Fla, Ga, Md, Miss, N C, S C, Tenn, Va, NE section of W Va—Instruments—Warehouse & Service

LEHMANN CO WILLIAM R P O Box 1224 108 Hillcrest Ave GA 2-9848—Industrial OEM

McCORVEY CO V AVIS 780 San Juan Blvd—Industrial OEM, Hi-Fi/Audio

MURPHY & COTA 2538 Overlake Ave—Industrial OEM, Instrument

PROCTOR CO CHARLES Box 3185 GA 5-7603

SMALL CO CHRIS P O Box 1346 GA 1-4622—Fla—Components

STILES ASSOC INC 1226 E Colonial Dr P O Box 6115 GA 5-5541—(Br) 410-150th Ave P O Box 8457 Madeira Beach St Petersburg 8 Fla WA 1-0211—Precision Electronic Instrumentation

### ORMOND BEACH

SMITH CO MAITLAND K 322 Riverside Dr OR 7-2298—Industrial OEM, Hi-Fi/Audio—Warehouse

### ST PETERSBURG

RAYMUND & ASSOC INC E C P O Box 8215 Maderia Beach WA 1-9735—Industrial OEM, Instrument—Warehouse

### STUART

SMITH-DUCKETT ASSOC P O Box 1016 Stuart Fla AT 7-1252

### WINTER HAVEN

TAYLOR CO MORRIS F 940 Lake Elbert Dr—Hi-Fi/Audio, Industrial OEM, Instrument

### WINTER PARK

FAUSETT & CO FLOYD 2277 Aloma Ave—Industrial OEM, Hi-Fi/Audio

HOLLINGSWORTH & STILL 1211 Oaks Blvd

### GEORGIA

#### ATLANTA

\*ADAIR CO CLARK 1426 High Point PL NE TR 5-3979—Industrial OEM—Warehouse

\*BURWELL CO HENRY W 422 Ponce De Leon Ave NE TR 4-2127—Industrial OEM

CHAPMAN & CO CARY 672 Whitehall St SW JA 4-7388—Hi-Fi/Audio, Industrial OEM—Warehouse

DUCKETT SALES CO GRADY P O Box 11657 CE 3-5808—Industrial OEM—Warehouse

FAUSETT CO FLOYD 777 Pinehurst Ter SW PL 3-3104—Hi-Fi/Audio, Industrial OEM

HAYDEN ASSOC PAUL P O Box 331 East Point PO 6-0261—Hi-Fi/Audio, Industrial OEM, Instrument—Warehouse

HOLLINGSWORTH & STILL INC 508 Whitehead Bldg MU 8-5878—Hi-Fi/Audio, Industrial OEM

JOY MFG CO c/o O J Cameron 3252 Peachtree Rd NE

JOYNER & ASSOC J E P O Box 10821 Station "A" PL 8-7496—Industrial OEM—Warehouse

KENNON CO W N 7 Camden Rd NE TR 4-5566—Hi-Fi/Audio

MARCHBANKS CO 4824 Northside Drive NW BL 5-0251

MILLAR ASSOC JAMES 1036 Peachtree St NE TR 6-0919—Hi-Fi/Audio, Industrial OEM

MURPHY & COTA 2110 Peachtree Rd NW TR 6-3020—Hi-Fi/Audio, Industrial OEM, Instrument

SCIENTIFIC SALES ENGINEERING CO 2162 Piedmont Rd NE TR 3-2475—Industrial OEM, Instrument

SMITH CO MAITLAND K 208-14th St NW TR 5-8031—Hi-Fi/Audio, Industrial OEM—Warehouse

### DECATUR

McCORVEY CO V AVIS 105 W Howard Ave DR 7-6167—Hi-Fi/Audio

NICKERSON CO FRANK C P O Box 1185 ME 6-2752—Industrial OEM

### HAWAII

#### HONOLULU

DOUGHERTY ENTERPRISES P O Box 334 Ilimalia Loop Kailua (Phone Honolulu) 253-666—Hi-Fi/Audio, Components, Instrument—Warehouse

ELECTRONICS ENGG OF HAWAII 2030 Home Rule St Honolulu 17 Hawaii 83105—Hawaii—Instrumentation

\*HASTIN SALES CORP P O Box 2663 Terrace Dr Honolulu 998-910—Hi-Fi/Audio, Industrial OEM—Warehouse

\*PIETY FACTORS INC GENE 2030 Home Rule St Honolulu 83105—Hi-Fi/Audio, Industrial OEM, Instrument—Warehouse

### ILLINOIS

#### AURORA

\*SMITH & ASSOC DWIGHT 9 So River St TW 7-5752—Hi-Fi/Audio, Industrial OEM, Instrument

#### BELLEVIEW

\*KNAGGS CO H W 7503 Melba Lane EX 7-2398—Hi-Fi/Audio

#### CHICAGO AREA

ABBOTT SPECIALTY METALS CO 7409 N Clark St RO 1-4774—Ill, Ind, Iowa, Lake Shore Co in Mich, Wisc—Specialty Metals

\*ANDERSON & ASSOC INC BURT 6414 W Higinia SP 4-4174—Industrial OEM—Warehouse

ANDERSON ENGR CO K G P O Box 246 (Western Springs) CH 6-5371

ANGEL & CO JAY C 2743 W Peterson Ave UP 8-0653—Industrial OEM, Instrument

\*BACHER & ASSOCIATES LOW 4216 W Division St BE 5-6601—HI-FI/Audio, Industrial OEM

BAUMAN & BLUZAT 2753 W North Ave HU 6-6809—Ill, Ind, Wisc—Components

\*BEIER CO LEROY W 6518 W NORTH BE 7-2420—HI-FI/Audio, Industrial OEM

BERNARDO & CO EVERETT 5625 W Fullerton Ave BE 7-1030—N Ill, NW Ind, E Iowa, W Wisc

\*BERNDT & ASSOC 6322 N Milwaukee Ave SP 5-2488—HI-FI/Audio, Industrial OEM, Instrument

\*BIERHAUS-BALHORN SALES INC 7185 W Armitage Ave TU 9-5011—Industrial OEM

\*BLAKER CO S C 2353 N California Bl 8-1220—Industrial OEM, Instrument—Warehouse

\*BLUZAT CO C R 5306 W Lawrence Ave KI 5-0244—HI-FI/Audio, Industrial OEM, Instrument

\*BOOTH & ASSOC CLAUDE 4000 W North Ave CA 7-2810—HI-FI/Audio, Industrial OEM

\*BROUILLETTE & ASSOC W G 1558 Newcastle Ave (Westchester) FI 5-6500—Industrial OEM

\*BRUNING CO A H 4120 W Peterson ED 4-0989—HI-FI/Audio, Industrial OEM, Instrument—Warehouse

\*BURGOYNE CO WILLIAM 7001 N Clark St HO 5-2112—Industrial OEM

\*CAINE ELECTRONICS SALES CO 4120 W Lawrence Ave SP 7-4022—Industrial OEM

CARRIER CO G R 10340 S Western Ave HI 5-6300—Industrial OEM

\*COLE CO G McL 6514 Higgins Rd SP 4-3535—HI-FI/Audio, Industrial OEM, Instrument—Warehouse

CONTINENTAL SENSING INC 1550 N Ruby St (Melrose Park) MU 1-1950—U S—Components

\*COZZENS & DUDAHY INC 125 Old Orchard Arcade (Skokie) OR 5-6700—Industrial OEM, Instrument

\*CROSSLEY ASSOC INC 2501 W Peterson Ave BR 5-1600—Industrial OEM, Instrument—Warehouse

\*CUMMING & ASSOC INC BRUCE 6029 W Belmont Ave ME 7-3770—Industrial OEM—Warehouse

DANIELS SERVICE PARTS CO Sub of Durham Aircraft Inc 4431 Diversey DI 2-3140—Ill, Ind, Mich, Minn, Western Ohio, Wisc—Fasteners—Warehouse

\*DIERTHERT CO INC RUSS 2030 W Montrose Ave LO 1-7627—Industrial OEM

\*DOLIN SALES D 3553 W Peterson JU 9-3738—HI-FI/Audio, Industrial OEM—Warehouse

\*DOYLE CO WILLIAM J 2600 W Touhy Ave RO 1-3130—HI-FI/Audio, Industrial OEM

\*ELLINGER SALES CORP 6540 N Northwest Highway RO 3-1570—Industrial OEM, Instrument

ELLMAN & ZUCKERMAN 119 S Jefferson St CE 6-3905 (Br) E A Dickinson Assoc 4417 N Greenbay Ave Milwaukee—Wisc, Chicago—Instruments—Warehouse

\*ENGINEERED SALES CO INC 3592 Milwaukee Ave PE 6-0555—Industrial OEM

\*ENGLE CO KARL D 4724 N Sheridan Rd UP 8-6363—Industrial OEM

AEPCO SERVICES 838 E Northwest Highway (Mt Prospect) CL 9-3060—N

Ill, N Ind, E Wisc—Instrument & Control Panels, Alarm Systems, Thickness Gages (radiation Source), Density Gages (radiation Source), Name Plates, Mercurial Switches—Warehouse

\*FELLESSEN CO THEODORE E 5841 W Montrose Ave SP 7-1060—HI-FI/Audio, Industrial OEM—Warehouse

\*FITZSIMMONS ASSOC INC 6124 Milwaukee Ave NE 1-7660—Instrument

\*FRIEDMAN CO MORTON L 4751 N Rockwell LO 1-4257—HI-FI/Audio, Industrial OEM, Instrument—Warehouse

\*GASSNER & CLARK CO 6644 N Western Ave RO 4-6121—Industrial OEM—Warehouse

\*GEBHARD CO HARRY W 5129 W Devon Ave RO 3-3636—Industrial OEM, Instrument

\*GENE F SALES CO 5306 W Lawrence Ave KIL 5-5562—Industrial OEM, Instrument

\*GIANARAS SALES CO 5435 N W Highway SP 4-4600—HI-FI/Audio, Industrial OEM

GOLTEN CO INC JERRY 2750 W North Ave EV 4-5959—Ill, Ind, W Mich, E Wisc—Components

\*GORMAK CO 7001 N Clark St RO 4-6366—Industrial OEM

\*GREEN & ASSOC LOREN F 5218 W Diversey Ave AVE 6-6824—HI-FI/Audio, Industrial OEM, Instrument—Warehouse

GROTZ & ASSOC ANTHONY N 5811 West Montrose Ave SP 7-9525—(Br) 4051 N 69th St Milwaukee 18 Wisc HO 3-7726—Ill, Upper Mich, Minn, Wisc—Components—Warehouse

HAINES F RALPH 949 Lake St (Oak Park) EU 6-4476—Ill & Wisc

\*HALINTON ENGINEERING CO HARRY 6400 N Leoti Ave RO 3-2131—Industrial OEM—Warehouse

\*HAMILTON CO 5517 N Elston Ave SP 5-2288—HI-FI/Audio, Industrial OEM

\*HASKEIL ASSOC 202 N Marion (Oak Park) EU 6-5741—HI-FI/Audio—Warehouse

\*HIGGINS CO ROYAL J 10105 S Western Ave BE 3-7388—Industrial OEM, Instrument—Warehouse

\*HILL-GORDON INC RALPH M & E GARY Box 1127 (Oak Park) EU 3-0373—Industrial OEM

\*HUNTER ASSOC THOMAS B 4441 W Irving Park Rd SP 7-2500—Industrial OEM, Instrument

\*HUFMACHER ASSOC INC RAY R 6868 Northwest Hwy NE 1-3248—HI-FI/Audio, Instrument

\*KADELL SALES ASSOC INC 5875 N Lincoln Ave LO 1-3042—Industrial OEM

\*KARET-MARGOLINING 1803 W Belle Plaine Ave WE 5-4642—HI-FI/Audio, Industrial OEM, Instrument—Warehouse

\*KNOBLOCK & MALONE INC 1603 N Newland NA 2-4005—Industrial OEM, Instrument—Warehouse

\*KRUEGER CO RINGLAND M 4738 N Harlem Ave UN 7-7100

\*LANG CLAESON & ASSOC 6733 N Olmstead Ave SP 4-3610—Instrument

\*LANGHAUS-LEVY ASSOC 5317 So Cottage Grove Ave DO 3-5344—HI-FI/Audio—warehouse

\*LEFF ASSOC ARNOLD 1046 Wilson Ave LO 1-6831—Industrial OEM, Instrument

\*LEVIN-SACKS & ASSOC 2639 Peterson LO 1-7290—HI-FI/Audio, Industrial OEM

\*LIGHTNER ASSOC 6322 N Milwaukee Ave SP 4-1500—Industrial OEM, Instrument

\*LINZ & ASSOC WILLIAM M 6322 N Cicero MU 5-2022

## "REPRESENTATIVES"

\*MCBRIDE SALES CO J J 328 E Burlington St (Riverside) HI 7-8131—HI-FI/Audio, Industrial OEM

\*McCARTY CO L C 7117 Addison St KI 5-7976—Industrial OEM

\*MADNUSON ASSOC 3347 W Irving Park Rd KE 9-7555—Industrial OEM, Instruments

\*MARSH & ASSOC INC WALTER F 244 Chicago Ave (Oak Park) EU 6-2967—N Ill, N Ind, E Iowa, E Wisc—Components, Instruments, HI-FI/Audio

\*MEMAC SALES CO 4740 N Austin Ave KI 5-1033—Industrial OEM—Warehouse

\*MEYERS CO KENNETH W 6713 N Oliphant Ave SP 4-6440—Industrial OEM, Instrument

\*MULAY CO SAM J 1717 W 74th St GR 6-4000—Industrial OEM

MURPHY & DICKEY 537 S Dearborn St HA 7-7953—Ill, Ind, Iowa—Instruments

NEWMAN KRAUSE CO 5451 W Lawrence Ave PE 6-6777—N Ill, N Ind, E Iowa, E Wisc—Components

\*PETITT CO INC GEORGE 349 Ashland Ave (River Forest) FO 9-8940—HI-FI/Audio, Industrial OEM, Instrument—Warehouse

\*PETTERSON SALES ARTHUR H 3647 W 62nd St RE 5-0846—HI-FI/Audio, Industrial OEM—Warehouse

\*PIVAN ENGINEERING CO 3542 Peterson Ave KE 9-4833—Instrument

\*RACINE & CO L S 6617 W North Ave (Oak Park)

RIDGWAY ASSOC 6100 W North Ave TU 9-5715—(Br) 1224 N Capitol Ave Indianapolis 2 Ind ME 5-2401, 5915 Schaaf Rd Cleveland Ohio LA 4-1421, 3384 W 12 Mile Rd Berkley Mich LI 6-3312, 3898 Linden Ave Rm 209 Dayton 32 Ohio CL 2-5604—Ill, Ind, Iowa, Ky, Mich, Minn, Ohio, W Penna, W Va, Wisc—Instruments & Precision Components

\*RIDLEY ASSOC 1551 N Austin Blvd TU 9-2940—Industrial OEM

\*ROSE & ASSOC IRVING W Space 6-126 Merchandise Mart SU 7-5246—HI-FI/Audio

\*ROSE & CO J K 1116 Lincoln Ave (Highland Park) ID 3-1116—HI-FI/Audio, Instrument

\*ROSSI SALES CO CHARLES 2429 N 73rd Ave GL 6-4710—Industrial OEM

\*ROUSSEY & ASSOC INC RALPH F 7709 W Lake St (River Forest) FO 9-6523—Industrial OEM

\*SABERSON C J 1791 Howard St BR 4-9663—N Ill & Iowa—Components

\*SAFFRO & ASSOC 5209 N Kimball Ave JU 8-0905—Instrument, Industrial OEM

\*SARKIS INC HENRY 5604 N Western Ave AR 1-3774—HI-FI/Audio, Industrial OEM, Instrument

ASHERERTZ-HENDERSON CO 5707 W Lake St CO 1-1032—Chicago & Ind—Instruments for Measurement & Control

\*SISSON SALES CO D L P O Box 226 113 Bradley (Roselle) TW 4-3837—Industrial OEM

SIZE CONTROL CO Div of American Gage & Machine Co 2500 W Washington Blvd MO 6-6710—U S—Inspection Items, Gages, Gage Engineering

\*SMITH CO OREN H 221 W Hurrion St SU 7-7919—HI-FI/Audio, Industrial OEM

SNYDER SALES CO 4900 W Madison St CO 1-1717—N Ill, N W Ind, Davenport Iowa—Components

\*STEMM INC R EDWARD 5681 W Lake Street ES 9-2700—Industrial OEM, Instrument

## "REPRESENTATIVES"

\*STEMM ROYAL A 21 Van Buren St  
WE 9-4840—Industrial OEM—Warehouse

STEVENS ENG'G CO 5306 W Lawrence  
Ave PE 6-0432—(Br) Lubermans Exch  
Bldg 5th & Hennepin Minn 1 Minn FE  
5-7533, 5916 W Wisconsin Ave Milwaukee  
Wis GL 3-1884—N Ill, Minn, Wisc—  
Electrical Components to OEM

\*SWINK & CO W F 541 Diversey Pkwy  
BI 8-4343—Industrial OEM—Warehouse

\*TATRO & ASSOC FRANK B 6022 N  
Rogers Ave KE 9-4535—Industrial OEM,  
Instrument—Warehouse

\*TAYLOR CO ROBERT F 308 W Wash-  
ington St AN 3-1808—Industrial OEM

\*TRIMBLE ELECTRONICS SALES 77  
East Fairfax (Palatine) FL 9-1859—In-  
dustrial OEM

\*TWIST CO JOHN G 5232 W Diversey  
Ave SP 7-2250—Industrial OEM—Ware-  
house

\*TYE SALES FRANK 1039 W Willow St  
WH 4-6681—Chicago—Components to In-  
dustrial OEM

\*WADE J WALTER 333 N Michigan Ave  
FR 2-6582—Ill, Ind, Wisc—Components

\*WARNER CO DAYTON L 815 Mac-  
Arthur Drive (Chicago Heights) SK 4-  
0028

WEST JACK 6747 N Octavia Ave RO  
3-3590—Ill & Wisc

\*WHITMORE & ASSOC R C 520 N Michi-  
gan Ave Suite 430 MO 4-1904—Industrial  
OEM

\*WILEY CO SAMUEL J 2060 W Birch-  
wood UP 8-3313

\*WITHERS & ROPEK ENGINEERING  
5439 W Division St AU 7-7292—Industrial  
OEM

### DEERFIELD

\*RITTER SALES CO P O Box 64 WI  
5-1400—Industrial OEM

### GLEN ELLYN

\*KLEKER CO JEROME H 177 Sunset  
Ave HO 9-2297—HI-FI/Audio, Industrial  
OEM, Instrument

\*ROCKFORD CONTROLS CO P O Box  
671 324 Woodstock Ave HO 9-6016—In-  
dustrial OEM

### LOMBARD

\*BAUMAN SALES CO ROBERT H 210  
S Lodge Lane LO 18—Industrial OEM

### MOLINE

\*WILSON CO H 10th St 762-7113—North  
& Central Ill (except Chicago), Iowa—  
Components & Instruments

\*HAUSTEN CO DAVE 607 E Willow Ave  
MO 8-7312—Industrial OEM

### INDIANA

#### ANGOLA

\*CLANCY & CO INC JOE PO Box 269  
AN 792—HI-FI/Audio, Industrial OEM,  
Instrument—Warehouse

LAW INSTRUMENT CO 519 W Gilmore  
St PO Box 95 Tel #217—(Br) M F Welch  
State 7-0009 Indianapolis, M C Duncan  
1207 E 3rd St Mishawaka Ind, R C Culler  
Rt 1 Hicksville Ohio—Ind, S Mich, N W  
Ohio—Instruments & Controls—Ware-  
house

\*SOUTHERN SALES CO 105 Lakeshore  
Dr (Phone) 777—HI-FI/Audio, Industrial  
OEM

### FORT WAYNE

\*BIEBERICH & SONS WALTER W  
2817 Plaza Dr KE 2928—Industrial OEM,  
Instrument

FREDERICK & NEARING 1601 Hanna  
St HA 0641—Ind, N Ky, Mich, Ohio—  
Components

\*HOEMIG SALES CO PO Box 2606 Sta  
"D" A 2083—HI-FI/Audio, Industrial  
OEM

\*HOMSHER CO BURTON F 4320 Dodge  
EA 4920—HI-FI/Audio, Industrial OEM

MATTHEWS & CO R T 1127 Wells St E-  
3917—(Br) 1435 N Hudson St Chicago 8 Ill  
—Ill, Ind, Iowa, Ky, Mich, Minn, Mo,  
Ohio, Wisc—Components & Small Instru-  
ments

\*MEHLY CO WILLIAM A 4017 S Harrison  
KE 2461—Industrial OEM

\*MENZE SALES CO 729 W Parkard Ave  
K-3171—Industrial OEM, HI-FI/Audio

\*NEEDLER SALES CO Sta "C" PO Box  
2407 HA 9726—Industrial OEM

\*VALENTINE INC FORREST C 511 Ft  
Wayne Bank Bldg AN 9122—Industrial  
OEM

### INDIANAPOLIS

ARNOLD C D 2123 N Meridian St WA  
5-7561—Ind (except Counties Lake,  
Porter & LaPorte)—Instrumentation—  
Warehouse

\*BLIND & ASSOC HARRISON J 5762  
Cadillac Dr CH 4-0191—HI-FI/Audio, In-  
dustrial OEM

COUCHMAN-CONANT INC Station A  
PO Box 88023 1400 N Illinois St ME 5-2313  
—Ind.

CRANDALL & ASSOCIATES R M 6220 E  
56th St Broadwood LI 6-8373—All of Ind  
(except Lake, Porter & LaPorte Cos),  
Eastern Ill, Ky, Southwestern Ohio—  
Components & Instruments to Industrials  
& Distributors—Limited Warehouse

\*DELTA SALES INC 2136 E 52nd St CL  
1-3564—(Br) 1126 Broadfields Dr Louis-  
ville Ky TW 5-8301—Components, OEM  
—Warehouse

\*DE VOE CO LESLIE M 4010 Washing-  
ton Blvd AT 3-1395—Ind, Ky, SW Ohio—  
Components

\*FISHMAN ASSOC 1836 Nottingham Dr  
VI 6-8221—HI-FI/Audio, Industrial OEM,  
Instrument—Warehouse

\*KIRSCH SALES CO 107 Wabash La-  
Fontaine YU 1-2801—HI-FI/Audio, Indus-  
trial OEM

\*MACNABB - SCHROEDER & LOOMIS  
820 E 64th St CL 5-6770—HI-FI/Audio,  
Industrial OEM

ΔMEANS & ASSOC E A JACK 5625 N  
College Ave CL 5-2736—(Br) EM Pete  
Sefton, Anderson Ind, Mechanicsburg  
2969, Harry A Harlan 3440 E Kessler  
Blvd Indianapolis Ind CL 5-8752—Ind, Ky  
—Components

\*MORRIS-CUNNINGHAM & ASSOC 6208  
N College Ave CL 1-3222—HI-FI/Audio,  
Industrial OEM

O E M SALES CO PO Box 55232 LI 5-  
1267—S Ill, Ind, St Louis Mo—Compo-  
nents & Fasteners (Selflocking), Plastics

\*SCHEFFLER CO CHARLES 1133 Navajo  
Trail CL 3-6337—HI-FI/Audio, Industrial  
OEM

\*SCHULZ CO EDWIN A 721 Sherwood  
Dr CL 5-1933—HI-FI/Audio, Industrial  
OEM, Instrument

\*THOMAS & SUKUP INC 5226 N Key-  
stone Ave CL 1-6915—HI-FI/Audio, In-  
dustrial OEM, Instrument

\*WEBER AGENCY JACK E 9007 El Rico  
Rd VI 6-0504—HI-FI/Audio, Industrial  
OEM, Instrument

\*WHITESSELL & ASSOC R O 6620 E  
Washington St FL 9-5374—HI-FI/Audio,  
Industrial OEM—Warehouse

WRIGHT ENG'G CORP 4241 Melbourne  
Rd WA 3-8388—Ind, Ky—Electronic Compo-  
nents

YOUNG CO A B 711 E 65th St CL 5-5416  
—Ind, Chicago, Louisville Area & Cincin-  
nati Ind—Warehouse

### IOWA

#### CEDAR RAPIDS

\*VRBIK CO JERRY 419 3rd St—Indus-  
trial OEM, Instrument

### KANSAS

#### MISSION

\*HALGIN SALES COMPANY 5920 Nall  
Ave RA 2-2441—Industrial OEM

INLAND ASSOC 6047 Howe Dr EN 2-2366  
—Industrial OEM

#### WICHITA

ΔAVIATION PRODUCTS CO INC 6631 E  
Kellogg MU 4-0218—(Br) Denver Colo EM  
6-7631, Texas Terminal Ft Worth 8-7954—  
Colo, Ill, Iowa, Kan, Mo, Neb, N M, Okla,  
Tex, Utah, Wyo

ΔD & O ENG'G CO INC 211 N Minne-  
apolis AM 2-3052—Colo, Kan, Mo, Okla,  
N Tex, (Including Dallas & Ft Worth)—  
Components, Plastics (Raw & Shapes)  
Assemblies—Warehouse

ΔHARRIS CO INC GEORGE E 2522 E  
Douglas St MU 2-2731—(Br) 3527 Broad-  
way Congress Bldg Kansas City Mo WE  
1-4884, 444 Dexter Horton Bldg Seattle  
Wash Main 1-4673, 526 Merchants Nat'l  
Bank Bldg Cedar Rapids Iowa EM 2-6302,  
Old Nat'l Guard Hangar Hazelwood Mo  
PE 1-6848, 1345 W Hurst Blvd PO Box  
787 Hurst Texas AT 4-0551—Colo, Iowa,  
Kan, La, Mo, Neb, Okla, Ore, Wash—  
Aircraft & Electronic Components

\*ZIMMER SALES INC 5620 Woodward  
(Merriam) HE 2-8900—HI-FI/Audio, In-  
dustrial OEM—Warehouse

### KENTUCKY

#### LOUISVILLE

\*COBB SALES CO 220 W Breckinridge St  
JU 4-6094—Warehouse

### MARYLAND

#### BALTIMORE

ΔDURLING ELECTRIC CO 301 E 25th  
St HO 7-5560—Del, D C, Md, Va—Ware-  
house

\*EASTERN INSTRUMENTATION INC  
808 Ingleside Ave RI 4-3676—(Br) 8016  
Georgia Ave Silver Spring Md JU 9-6100,  
613 Cheltenham Ave Phila 26 Pa WA 7-  
6269, 211-02 Northern Blvd Bayside L I  
N Y HA 8-1661—Del, D C, Md, Met N Y,  
Southern N J (Cos of Monmouth &  
South), E Penna (State College & East),  
VA—Electronic Test Equipment, Micro-  
wave Equipment & Devices

\*EBERLE-SCHAAR CO 425 Stratford Rd  
RI 7-3227—Industrial OEM, HI-FI/Audio

ENGINEERING ASSOC 2125 Maryland  
Ave HO 7-1966—(Br) 507 Sheraton Bldg  
Washington D C—Del, D C, Md, Va—  
Microwave

\*JONES CO DAVID K 31 E 21st St  
HO 7-3766—Industrial OEM—Warehouse

\*MacDONALD INC SAMUEL K 2016  
Winford Rd ID 5-1760

\*STEMELER ASSOC & CO 511 N Charles  
St PL 2-3211—Industrial OEM, Instru-  
ment

\*WHITCOMB MARTIN F 730 Deepdene  
Rd HO 7-2290—Industrial OEM, Instru-  
ment

\*WILKINSON INC ROBT L 707 Steven-  
son La DR 7-7800—(Br) 245 Kenwick Ave  
PO Box 215 Glenside Pa HA 4-8400, P O  
Box 218 Falls Church Va JE 2-6076—  
Middle Atlantic States—Components

### BETHESDA

JORDAN F R 4922 St Elmo Ave OL 2-  
5110—(Br) 2408 Burrigle Rd NO 8-1933—  
Del, D C, Md, Va—Instruments & Compo-  
nents

\*ROSEN & ASSOC INC GENE 9501  
Wadsworth Dr OL 6-6300—HI-FI/Audio,  
Industrial OEM, Instrument—Warehouse

### LUTHERVILLE

EAST COAST LIAISON INC P O Box  
243 VA 5-4449—Middle Atlantic States—

Telemetering & Servomechanism Equipment

#### PHOENIX

ΔMcCORMICK H A Phoenix P O No 6-2333—(Del cos of Kent & Sussex), D C, Md (except Garrett & Allegheny Cos), Pa (York & Adams Cos), Va (Arlington, Fairfax, Loudon Cos)—Warehouse

#### RIVERDALE

\*MASSEY ASSOC 6607 Riverdale Rd GR 7-5010—Industrial OEM, Instrument

#### ROCKVILLE

\*HORMAN ASSOC INC 941 Rollins Ave HA 7-7560—(Br) 3006 W Cold Spring Ln Baltimore Md MO 4-4401—Del, D C Md—Instruments, Microwave Components

#### SILVER SPRING

ANSELL ENG'G CO 880 Bonifant St JU 8-4222—D C, Md, Va, W Va—Components

\*LIENAU CO CHARLES 9427 Georgia Ave JU 7-5888—Hi-Fi/Audio, Industrial OEM—Warehouse

\*PASQUALE ELECTRONICS GEORGE J 9421 Thornhill Rd

\*TAYLOR CO INC MORRIS F 9431 Georgia Ave P O Box 111—Hi-Fi/Audio, Industrial OEM, Instrument

\*WHITE & CO L G 880 Bonifant St JU 5-3141 — Industrial OEM, Instrument—Warehouse

#### TOWSON

\*BARNHILL & ASSOC R B 15 W Pennsylvania Ave P O Box 6992 VA 5-3900—Industrial OEM

CLOSS CO THOMAS H 21 W Pennsylvania Ave VA 5-4445—Del, D C, Md, Va—Instruments & Components

\*J H ELECTRONIC SALES CO Box 6844 VA 5-4441—Industrial OEM

\*HARCO ELECTRONICS 603 Alleghany Ave VA 5-9637—Industrial OEM

HOLDEN ENG'G SALES CO 1133 Gypsy La W VA 3-3763—Del, D C, Md, N C, VA—Components & Instruments

\*JONES CO INC WILLIAM M 1107 Echo Ct N VA 3-5721—Industrial OEM

McCOURT & SON LEO T 610 Washington Ave VA 3-3455—D C, Md, Va

\*STEMLER ASSOC & CO 25 West Pennsylvania Ave VA 8-8553—(Br) Moorestown N J NO 2-1313, Hawthorne N J SW 1-1744—Del, D C, Md, N J, N Y (Long Island), N C, Eastern Pa, Va—Components & Instruments

TESSCO INC 19 W Pennsylvania Ave P O Box 6892 VA 5-3590—(Br) Washington D C EN 1-3431, Phila area Enterprise 6431—Del, D C, Fla, Md, Southern N J, N C, E Penna, Va—Instruments—Warehouse

VALLEY ELECTRONICS 1735 E Joppa lrd VA 5-7820—(Br) P O Box 22 Barrington N J LI 7-1610—D C, Md, E Penna, Va—Components—Warehouse

\*WILKINSON INC ROBERT L 707 Stevenson La DR 7-7800—Hi-Fi/Audio, Industrial OEM

#### MASSACHUSETTS

##### BOSTON AREA

\*ABBETT & HUSTIS 1253 Highland Ave (Needham) HI 4-5470—Industrial OEM

\*AKEROLD CO ARTHUR E 70 Reservoir lrd (Chestnut Hill 67) HA 6-2433—Industrial OEM

\*ANDERSON SALES CO 177 State St CA 7-2980—Hi-Fi/Audio, Industrial OEM

BORDEWIECK ENG'G SALES CO 221 Grove St (Braintree Boston 85) VI 3-0845—New England States—Transducers, Special Electronic Components, Electronic Instruments—Warehouse

\*BORING CO JOHN E Box 235 (Lexington 73) VO 2-5000—Industrial OEM

\*BROGER INSTRUMENT SALES CO

INC 48 Pearl St (Brookline) BE 2-4804—Industrial OEM, Instrument

\*BROWN CO KENNETH L 54 Atherton lrd (Brookline 54) BE 2-3969—Hi-Fi/Audio, Instrument OEM

\*CHAMBERLIN CO HAROLD A Civilian Air Terminal Bedford A/P (Bedford) CR 4-0044—Hi-Fi/Audio, Industrial OEM

\*COAKLEY INC TIM 148 Needham St (Newton Highlands 61) DE 2-4500—Hi-Fi/Audio, Industrial OEM, Instrument

\*COLE & CO LAWRENCE B 21 Radcliffe Rd (Weston) CE 5-3197—Hi-Fi/Audio, Industrial OEM, Instrument

CONNECTRONICS CO 669 S Ave (Weston 93) CE 5-2165—New England States—Special Equipment, Wave Soldering, Resistance Soldering, Mechanical Wire Stripping, Thermal Wire Stripping Machines

\*DEVEER SALES CO 1492 Highland Ave (Needham 92) HI 4-4200—Industrial OEM

\*DREW ASSOC INC Box 467 (Bedford) CR 4-7232—Industrial OEM

\*EASTERN ELECTRONIC SALES CO 145 University Rd (Brookline) AS 7-5675—Hi-Fi/Audio, Industrial OEM

ELECTRICAL APPARATUS CO INC 1200 Soldiers Field Rd ST 2-7440—(Br) R A Bradford Brimfield Mass CH 5-9877, E F Baker Holbrook Mass WO 3-1478—New England States—Electro-Mechanical Components, Air Hydraulic Components, Instruments

\*ELTRON ENG'G SALES INC 246 Walnut St (Newtonville 60) DE 2-6975—Industrial OEM—Warehouse

\*ELECTRONIC COMPONENTS & SERVICES 30 Huntington Ave KE 6-8581—Industrial OEM

FORSBERG SALES 125 Perkins Ave (Brockton) JU 3-0033 — New England States—Components

\*GERBER SALES CO INC 48 Pearl St (Brookline 47) BE 2-2425—Industrial OEM—Warehouse

\*GOSTENHOFFER & ASSOC INC GEORGE 7 Wellington St (Waltham 34) TW 4-9500—Industrial OEM, Hi-Fi/Audio

\*GRAY INC ROBERT W 572 Washington St (Wellesley 81) CE 5-5296—Industrial OEM

\*GREENE ORGANIZATION INC DAN Box 124 (Cambridge 38) UN 4-2220—Industrial OEM

GREGORY ASSOC GEORGE 7 Erie Dr (Natick) OL 5-1330—(Br) PO Box 243 Cheshire Conn AT 8-2900—New England States—Instruments

\*GROSSMAN SALES CO M C 339 Auburn St (Auburndale) LA 7-7753

\*GYSON ASSOC 756 Bay Rd (Hamilton) WA 2-5770—Industrial OEM

\*HARRIS CO STANLEY A 1241 Highland Ave (Needham) HI 4-4780—Industrial OEM

\*HATHAWAY ELECTRONICS INC GLENN M 238 Main St (Cambridge 42) KI 7-0380—(Br) Duclillo Bldg Canaan Conn TA 4-7215—Industrial OEM

HATZIS & SONS THOMAS J Statler Office Bldg HA 6-2332—Canada (East of Manitoba Prov), New England States—Components, Metal Parts, Fasteners

\*HENDRICKSON CO W A 291 First Parish Rd (Scituate) LI 5-0652—Industrial OEM

\*HOOKER INC SAMUEL C 2 Winchester Pl (Winchester) WI 6-2745—Industrial OEM

HUBERT ASSOC ALEXANDER P O Box 143 (Brookline 46) CO 2-0027—(Br) George Chambers 175 White Rock Dr Windsor Conn JA 2-2767, Alan W. Crowell 11 Spring La W Hartford Conn AD 6-1181—New England States—Components & Instruments

HUNTOON ASSOC INC V J 908 Belmont

#### "REPRESENTATIVES"

Ave (Springfield 8) ST 8-8516—(Br) 272 Centre St Newton 58 Mass BI 4-5871—New England States—Components

\*INSTRUMENT ASSOC 30 Park Ave (Arlington 74) MI 8-2922—Industrial OEM, Instrument

\*INSTRUMENT DYNAMICS INC 11 Alblon St (Wakefield) CR 6-5100—Industrial OEM, Instrument

\*JAPPE CO HOWARD C 27 Hillcrest lrd (Wakefield) CR 6-4816 — Industrial OEM—Warehouse

\*KEENE SALES CO 25 Tremont St RI 2-0466 — Hi-Fi/Audio, Industrial OEM, Instrument

\*KELLY CO WILLIAM T 77 Lovett St (Beverly) WA 2-0065—Hi-Fi/Audio, Industrial OEM

\*LERLANE SALES CO INC CIROLIA 885 Main St (Waltham) TW 4-2977—Industrial OEM

LUNDEY SALES CORP 694 Main St (Waltham) TW 3-6064—New England States & N E New York State—Components, Fastening Devices—Warehouse

\*MacDONALD-WADMAN CO INC 1213 Chestnut St (Newton Upper Falls 64) WO 9-8980—Industrial OEM

MEASUREMENT EQUIPMENT CO INC 244 Main St N (Reading) 944-2300—New England States—Instruments

MONAHAN & CO ANDREW M P P O Box 474 (Norwood Mass) NO 7-5961—New England States—Electronic Components

\*MOSHER & PEYSER CO 945 Great Plain Ave (Needham) HI 4-1400—Industrial OEM, Instrument

\*MUDDLE ASSOC JOHN V 74 Union St (Ashland) TR 3-7091—Industrial OEM—Warehouse

NEUMAN & CO GEORGE J 91 Fairfield St (Needham 92)—New England States—Components, Sub-Systems

\*NEW ENGLAND AREA REPRESENTATIVES INC (NEAR INC) 99 Highland Ave (Somerville) PR 6-2262

\*PALIOCA INC WAYNE B 175 Massachusetts Ave (Lexington) VO 2-7224—Industrial OEM

PARKER SALES AGENCY B H 610 Atlantic Ave LI 2-9214—Maine, Mass, N H, R I Vt—Signal Equipment—Warehouse

\*PERRON & CO INC RAY 1870 Centre St FA 3-1008—Industrial OEM, Instrument

\*PIERCE ASSOC STANLEY B 583 Nesponset St (Norwood) NO 7-3164—Hi-Fi/Audio, Industrial OEM

\*PRAY SALES W B 44 Washington St (Wellesley Hills 81) CE 4-3199—Hi-Fi/Audio, Industrial OEM

\*PURINTON INC RICHARD 11 Muzzey St (Lexington 73) VO 2-8300—Industrial OEM—Warehouse

RAYTRONICS CO 11 Brown Rd (Swampscott) LY 2-7601—New England States—Instruments—Warehouse

\*REINHERZ CO ALBERT N 45 Chestnut Hill Ave (Brighton 35) ST 2-6422

\*REPRESENTATIVES CORP 10 High St HA 6-0541—Industrial OEM

ROWLEY CO DAVID M P O Box 131 West Roxbury FA 3-1173—New England States—Components

\*SAUNDERS & CO 8 Prospect St (Waltham 54) TW 4-6071—Hi-Fi/Audio, Industrial OEM, Instrument

ΔSCHAAL ASSOC INC 11 Muzzey St (Lexington 73) VO 2-3578—New England States—Components—Warehouse

\*SCHLEY CO L L 70 Coolidge Hill Rd (Watertown 72) WA 6-0235

## REPRESENTATIVES

\*SCHUFT CO INC HOWARD J 815 Washington St (Newtonville) LA 7-5304—Industrial OEM, Instrument

\*SCOTT CO INC MICHAEL 836 Washington St (Wellesley Hills 81) CE 6-0102—Hi-Fi/Audio, Industrial OEM

\*SEGEL CO CHARLES 1262 Commonwealth Ave BE 2-4334—Industrial OEM—Warehouse

\*SEGEL CO INC HENRY P 386 Washington St (Brookline 46) BE 2-7525—Hi-Fi/Audio, Industrial OEM, Instrument—Warehouse

STERLING SALES INC 770 Grafton St (Shrewsbury) PL 7-0800—New England States—Instruments—Warehouse

STEVENS & CO K C 235 Bedford St (Lexington 73) VO 2-1812—New England States—Electro Mechanical Components—Warehouse

\*STURGEON INC PAUL R 25 Huntington Ave CO 6-7705—Industrial OEM

TECHNICAL INSTRUMENTS INC 90 Main St (Reading) 944-3930—(Br) Bridgeport Conn FO 8-4582—New England States—Test & Production Equipment

\*TODINO ENG'G INC 50 Kearny Rd (Needham Heights 94) HI 4-7925—Industrial OEM

YALE ASSOC (Marblehead) N E 1-0068—(Br) Springfield Mass—New England States—Instruments for Measurement & Control—Warehouse

\*YEWELL ASSOC INC Middlesex Tpk (Burlington) BR 2-9000—Industrial OEM, Instrument—Warehouse

\*WHITE SALES CO INC 945 Great Plain Ave (Needham 92) HI 4-3676—Industrial OEM, Instrument

\*WILSON SALES CO 6 Mohawk Rd (Marblehead) NE 1-4016—Hi-Fi/Audio, Industrial OEM—Warehouse

### SPRINGFIELD AREA

MacDOWELL CO INC RICHARD F Marion Bldg (Melrose) NO 5-8093—New England States—Instruments

\*Mac INNIS CO NORMAN R 53 Youle St (Melrose 76) NO 5-0579—Hi-Fi/Audio, Industrial OEM, Instrument

\*RODGERS ASSOC 717 Main St (Holyoke) JE 3-4301—Hi-Fi/Audio—Warehouse

### MICHIGAN

#### DETROIT AREA

\*ABM SALES CO 10116 Puritan UN 2-1300—Hi-Fi/Audio, Industrial OEM, Instrument—Warehouse

ADAMS INC CARMAN 17360 W Eight Mile Rd KE 8-2100—Six N W Cos of Ohio, Mich—Electrical Heating Equipment & Related Controls

ΔARMSTRONG CO CLIFFORD 16913 Wyoming St UN 4-6871—Mich, Toledo Ohio, Sarnia Ontario—Warehouse

BASIC SERVICE CORP 16544 Plymouth Rd VE 7-8820—Mich & Northern Cos in Ohio—Instruments

\*BEITEL CO WAYNE 13209 Fenkell VE 8-9100—Hi-Fi/Audio, Industrial OEM—Warehouse

\*BURCAW COWAN & CO Suite 207 23128 Grand River Ave KE 3-7700—Hi-Fi/Audio, Industrial OEM, Instrument—Warehouse

\*BUTCHART CO ROD 16637 E Warren TU 2-6666—Hi-Fi/Audio, Industrial OEM—Warehouse

\*CENTRAL ELECTRONICS SALES CO 19303 Fairport St LA 6-5841—Industrial OEM

\*CLARK CO NELSON J 17136 E Warren Ave—Industrial OEM

ELECTRO-MATION ASSOC 4070 W Maple Rd JO 4-6517—Mich, N Ohio—Components, Controls, Instruments & Systems

ERNEST ASSOC INC RALPH D 12818 Puritan Ave UN 1 7311—Mich (Lower Penn), N Ohio—Instruments for Automation—Warehouse

\*FLORA INC J MALCOLM Territorial at Ildge (Plymouth) GL 3-4296—Hi-Fi/Audio—Warehouse

\*GAIN ENG'G CO 1474 E Outer Dr—Industrial OEM, Instrument

\*HENSCHEN JENSEN & CO 2842 W Grand Blvd TR 1-0308—Industrial OEM, Hi-Fi/Audio, Instrument

\*KOEHLER-PASMORE CO 11833 Hamilton Ave TO 8-3322—Industrial OEM

\*KURTZ CO PAUL 18121 James Couzens Hwy UN 4-8957—Hi-Fi/Audio—Warehouse

\*LEE & HALE CO 10432 W McNichols BR 2-0606—Hi-Fi/Audio, Industrial OEM

\*LIDDLE CO EDWAIN F 18925 Grand River Ave VE 7-5310—Industrial OEM

LITTLE CO A E 19753 James Couzens Hwy BR 2-2717—Mich (Lower Peninsula) & Toledo Ohio—Electrical Heating Elements, Controls & Electrical Components

\*LOHMANN CO R S 12730 Fenkell UN 2-9465—Hi-Fi/Audio, Industrial OEM, Instrument

\*MERCHANT & CO INC R C 18411 W McNichols KE 5-6000—Industrial OEM, Instrument

METROL CO 7145 E Davison TW 3-6300—(Br) 420 W South St Kalamazoo Mich FI 2-6097—Mich (Lower Pen), N W Ohio—Control Valves & Instruments—Warehouse

MICHIGAN OHIO PRODUCTS CO 18450 Livernois Ave UN 2-1788—(Br) (Wm H Jarner) 2925 Oakwood Dr S E CH 1-2577—Mich

\*MILSK CO ROBERT 19371 James Couzens Hwy BR 3-8552—Hi-Fi/Audio, Industrial OEM, Instrument—Warehouse

\*MOORE SALES CO HOWARD W 401 Margaret W TU 3-0218—Hi-Fi/Audio, Industrial OEM, Instrument

ΔMORROW SALES JIM 13149 Hamilton Ave (Highland Park) TO 5-7600—Mich—Components

\*NORDSTROM & CO R C 216 Briggs Bldg (Birmingham) JO 4-6128—Industrial OEM

PIERCE CO J L 16666 James Couzens Hwy UN 2-2571—Instruments & Components

\*RATHSBURG ASSOC JACK 3539 Townsend Ave WA 5-8850—Hi-Fi/Audio, Industrial OEM—Warehouse

RUBIN CO BEN A 12838 Fenkell Ave UN 4-4958—(Br) 607 N Grove Oak Park III EU 3-0171, 515 E Grand Springfield Ohio FA 2-5893—N Ill, Ind, Ky, Mich, Ohio, Wisc—Nuclear Instruments

\*SATULLO COMPANY 4514 N Woodward (Royal Oak) LI 9-3910—Industrial OEM, Instrument

\*SHAFFER CO GRANT 14241 Fenkell Ave BR 3-5390—Hi-Fi/Audio, Industrial OEM, Instrument—Warehouse

\*SHALCO INC 23525 Woodward Ave (Ferndale 20) LI 7-4771—Hi-Fi/Audio, Industrial OEM—Warehouse

STEAM SPECIALTIES CO 15794 Wyoming UN 4-2082—Mich—Instruments—Warehouse

\*STERLING CO S 15310 W McNichols BR BR 3-2900—Industrial OEM, Instrument—Warehouse

\*THORPE JACK M 640 Hidden La TU 4-4360—Hi-Fi/Audio, Industrial OEM, Instrument

\*ZAFFINA CO LAWRENCE F 7351 Grafton Ave WA 1-2885—Hi-Fi/Audio, Industrial OEM—Warehouse

### HOLLAND

CONRAD INC 141 Jefferson St EX 2-3161—(Br) Box 278 Kent Conn WA 7-3319, 21 Park Pl N Y BA 7-7583, 3212 Weston Rd Weston Ont Canada CH 4-8051, 6111 W Diversey St Chicago ME 7-3303, 828 Thornberry St St Louis TA 2-2241, 532 S Ft Harrison Ave Clearwater Fla 3-7072, Orlando Fla GA 5-3083, 3548 E Colorado Blvd MU 1-0181, Wash D C DI 7-2896, 5738 N Central Expressway Dallas Texas TA 4-2571, 1803 Calumet St Houston Tex JA 3-5651, 2130 S Albion Denver 22 Colo SK 6-9455—U S & Canada—Instruments—Warehouse

### MINNESOTA

#### MINNEAPOLIS

\*ANDERSON & ASSOC 3825 York Ave JU 8-2523—Industrial OEM

ARLAN ASSOC INC 209 E Lake St TA 7-3679—Mich, Minn, Mont, N D, S D, Wisc—Instruments—Warehouse

\*BARTLESON CO BILL 3390 Oak Grove Suite 502 FE 3-6709—Industrial OEM, Instrument—Warehouse

\*BONAMENT HEYDA CO 6101 Auto Club Rd TU 1-9166—Iowa, Minn, N D, S D, Wisc—Components

CLOTHIER CO INC STAN 12 W 58th St TA 5-1234—Industrial OEM

FOSTER CO MEL 2402 Hennepin Ave FR 4-2612—Industrial OEM, Instrument—Warehouse

FRANKLIN CO MERRILL 338 E Franklin Ave FE 6-2315—Hi-Fi/Audio, Industrial OEM—Warehouse

\*GIBB CO CLARK R 2400 Hennepin FR 7-1200—Hi-Fi/Audio, Industrial OEM

\*HAGESTAD & ASSOC E O 4519 Lakuna Dr WA 2-2034—Hi-Fi/Audio, Industrial OEM

\*HAMMOND CO 3324 Hiawatha Ave PA 1-5174—Hi-Fi/Audio, Industrial OEM

\*HILL CO FRED R 6110 Excelsior Blvd WE 9-6727—Hi-Fi/Audio, Industrial OEM

INDUSTRA CO 6504 Walker WE 9-6224—Minn, W Wisc—Components—Warehouse

\*KIRKEBY CO MARVIN H 204 Sunnyridge Ave FR 7-3289—Hi-Fi/Audio, Industrial OEM, Instrument—Warehouse

MARTIN MACHINE TOOL CO 2817 Hennepin Ave TA 4-4703—Minn, N D, S D, Western Wisc—Warehouse

MILLER & SON ARCH S 6608 17th Ave Union 6-6677—Northern Iowa, Minn, N D, S D, N W Wisc

\*NORTHERN STATES SALES CO 1400 Park Ave FE 6-4808—Hi-Fi/Audio, Industrial OEM, Instrument—Warehouse

\*OSZMAN CO ELMER W 12 E 25th St FE 9-0891—Hi-Fi/Audio

\*RICHARDSON & CO INC H M 9 E 22nd St FE 6-4078—Industrial OEM

\*RIPLEY & ASSOC RAY 7222 James Ave UN 6-8682—Hi-Fi/Audio, Industrial OEM, Instrument

ΔSCHULTZ CO D A 801 S E 8th St FE 9-7701—Minn, Western Wisc—Components—Warehouse

\*STEMM EDWARD R 123 S 3rd St Rm 1137 FE 5-7172—Industrial OEM, Instrument

\*WARNER CO A J 5022-29th Ave PA 9-7371—Hi-Fi/Audio, Industrial OEM

#### ST. PAUL

DAYCO INC 850 Cromwell Ave MI 6-2671—Minn, N D, S D, Northwestern Wisc—Instruments

\*ENGELBRETON CO WM 906 Ottawa Ave CA 2-2338—Hi-Fi/Audio, Industrial OEM, Instrument

FORCEY MACHINE TOOL SALES 445 Endicott on Fourth CA 2-1600—Minn, Eastern N D, Eastern S D, N Wisc—Components—Warehouse

\*NORTHPORT ENGG INC 1729 Selby Ave MI 6-2621—Industrial OEM, Instrument—Warehouse

### MISSISSIPPI

#### GREENWOOD

\*MASSEY CO L R P O Box 724 304 E Jefferson GL 2-3038—Hi-Fi/Audio, Industrial OEM

### MISSOURI

#### CLAYTON

\*MAYNARD CO L W 139 N Central Ave PA 5-3723—Hi-Fi/Audio—Warehouse

MOONEY CO EDWARD W 110 S Central PA 5-4271—Cent & So Ill, E Mo

SOBEL & ASSOC 7603 Forsyth—S Ill, Mo, Kan, Neb—Components, Hi-Fi/Audio, Instruments OEM

#### FLOISSANT

\*MCCLURE CO JOHN N P O Box 16 TE 7-3188—Industrial OEM

#### JEFFERSON CITY

\*VIGNOLA ASSOC CARMINE A 1202 Peyton Dr Box 569 5-1023—Hi-Fi/Audio, Industrial OEM—Warehouse

#### KANSAS CITY

AUTOMATIC GENERAL ELECTRONIC SALES INC 6550 B Troost Ave DE 3-8206—(Br) Harlan Weisler 8990 Lackland Rd St Louis Mo HA 8-3934, Richard Kimball 2527 B McKinney Ave Dallas Texas RI 7-8779—E Colo, N W & S W Ill, Iowa, Kansas, Mo, Neb, Okla, Tex—Electronic Components

\*BETTIS CO MAURY E 3706 Broadway LO 1-0772—Industrial OEM—Warehouse

\*CLEMENSEN-LARRABEE CO 436 E 79th St JA 3-3005—Hi-Fi/Audio, Industrial OEM, Instruments

\*COLLINS - HAVERCAMP ASSOC INC 6525 N Baltimore GL 3-4497—Industrial OEM, Instrument—Warehouse

\*ELLIOTT CO ARTHUR K 211 Westport Rd LO 1-9594—Hi-Fi/Audio

\*FARRIS CO INC R W 406 W 34th St PL 3-5350—Hi-Fi/Audio, Industrial OEM, Instrument

\*FLORENCE CO L F W 34th St LO 1-7282—Industrial OEM

\*FORRISTAL YOUNG SALES CO 4053 Broadway VA 1-5330—Hi-Fi/Audio, Industrial OEM, Instrument

\*FRY & CO INC W E 406 W 34th St JE 1-5236—Industrial OEM

GILBERT CO JACK M 131 E 70th St DE 3-8830—Kan, W Mo, S Neb, N Okla—Control Devices—Warehouse

\*KAY SALES CO 2600 Grand Ave BA 1-3800—Hi-Fi/Audio, Industrial OEM—Warehouse

\*KELLY-SCHMITZ-WINKELER ASSOC 407 W 74th St Terr P O Box 8456 EM 1-3651—Hi-Fi/Audio, Industrial OEM—Warehouse

\*KOENIG-MYERS ASSOC 4536 Main JE 1-7221—Hi-Fi/Audio, Industrial OEM

LEE MARK ASSOC INC P O Box 8467 NI 2-3318—(Br) 2001 Big Bend Blvd St Louis Mo—S Ill, Kansas, Mo, Nev—Test Measuring Instruments & Selected Components

\*MCDOWELL - REDLINGSHAFFER SALES CO 1103 E Armour WE 1-5622—Hi-Fi/Audio, Industrial OEM—Warehouse

\*ROSS & CO H A 2601 Cherry BA 1-0866—Industrial OEM, Instrument

\*SCHOLZ CO PAUL G 8402 Longview Rd SO 1-6757

\*SOMERS & CO F C Suite 500 Davidson Bldg 17th & Main Sta GR 1-1355—Hi-Fi/Audio, Industrial OEM—Warehouse

\*TERWILLIGER SALES CO 9304 High Dr MI 9-0188—Hi-Fi/Audio, Industrial OEM, Instrument

\*THIBAU CO A R 210 W 8th St VI 2-7657—Hi-Fi/Audio, Industrial OEM

### KIRKWOOD

\*KELLY SALES CO JACK 972 N Geyer Rd TA 2-1791—S Ill, S W Ind, W Ky, E Mo—Components

### ST LOUIS

DAVIES CUPPLEY & MFG CO 4160 Meramec St MO 4-9332—(Br) 814 W 17th St Kansas City Mo BA 1-2128, 2547 Farrington Dallas Tex RI 7-5423, 1395 W Quincy St Englewood Colo SU 1-3314—Ark, Colo, Kan, La, Mo, Okla, Tex/Equipment & Supplies—Warehouse

DESIGN AND SALES ENGG CO 7601 Forsyth Blvd PA 1-6403—(Br) 2600 Grand Ave Kansas City Mo GR 1-1640, 400 North Emporia Wichita Kan HO 4-2893, 2702 11st St Pl Des Moines Iowa BL 5-4584—S Ill, Iowa, Kan, Mo, Nev—Components & Instruments for OEM

ENGG SERVICES CO 6717 Vernon PA 6-2233—(Br) 247 S Pinecrest Wichita Kan MU 3-3751, 106 29th St N E Cedar Rapids Iowa EM 5-6183, 4550 Main Kan City PL 3-7227—S Ill (cons of Henry Knox, McLean, Peoria, Champaign, Rock Island, Vermillion & Tazewell), Miss, Kan, Nev, Iowa—Instruments & Components—warehouse

FIXMAN ENGG CO GORDON 8160 Stanford Ave PA 5-5219—S Ill, Kan, Mo—Components & Instruments

\*FORRISTAL-YOUNG SALES CO INC 8247 Delmar PA 5-7701—Hi-Fi/Audio, Industrial OEM, Instrument

\*KATHRINE'S & CO NORMAN W 4356 Duncan Ave OL 2-7005—Hi-Fi/Audio, Industrial OEM, Instrument—Warehouse

\*KELLY SALES CO JACK 972 N Geyer Rd TA 2-1791

\*KELLY-SCHMITZ-WINKELER ASSOC 3938 Lindell Blvd OL 2-6455—Hi-Fi/Audio, Industrial OEM—Warehouse

\*LOWELL CO THEODORE B P O Box 26 Creve Coeur Br MI 7-1111—Industrial OEM

\*LOWELL INTER-AMERICAN SALES E A 3030 Laclede Sta Rd ST 1-9058

\*MCDOWELL-REDINGSHAFFER SALES CO 3615 Olive St JE 3-3277—Industrial OEM, Instrument

MUNROE EQUIPMENT CO W W 9870 Big Bend Blvd YO 5-2500—S Ill, E Mo & St Louis—Warehouse

Δ SEBRIGHT & CO RUSS D 7120 W Florissant Ave CO 1-0055—(Br) 2601 Cherry St Kansas City Mo BA 1-0866—S Ill, Iowa, Kan, Mo, Neb—Components

Δ SHEKELTON J F 11726 Sappington Barracks Rd VI 3-0203—Mo—Raw Materials

STAHLHUT & ASSOC ROBERT B 110 S Central PA 5-7793—S Ill, Kan, Mo—Components

### WEBSTER GROVES

\*SHAW CO ROBERT 7800 Kenridge La WO 2-4590—Hi-Fi/Audio, Industrial OEM, Instrument

### NEVADA

#### RENO

RADIO SUPPLY CO OF NEVADA 720 Tahoe FA 3-2766—Northeastern Counties Calif (including portions of Mono & Inyo Counties, also portions East of Sierra Nev Divide), Nev (excepting southern & eastern portions)—Warehouse

### NEW MEXICO

#### ALBUQUERQUE

AZTEC ENTERPRISES 525 San Pedro NE AM 8-6421

\*FRENCH CO GENE 7900 Zuni Rd SE Albuquerque N Mex AM 8-2478—(Br) P O Box 15275 Denver 15 Colo MA 3-1458, 138 South 2nd East Salt Lake City Utah EM 4-3057, Tucson & Phoenix Enterprise 873—Ariz, Colo, Clark Co Nev, N Mex, El Paso Texas, Utah, Wyo—Instruments—Warehouse

McCLENDON CO R E 915 Yale Blvd S E CH 3-4551—(Br)—R E McClendon Co 137

## "REPRESENTATIVES"

Walnut Hill Village Sulte 14 Dallas 20 Texas FL 2-4054—Ariz, N M, Okla, Texas—Components

\*NEELY ENTERPRISES 6501 Lomas Blvd N E AL 5-5586—Calif, Ariz, Nev, N M—Electronic Instruments & Technical Components—Warehouse

### LAS CRUCES

\*NEELY ENTERPRISES 114 S Water St JA 6-2486—Calif, Ariz, Nev, N M—Electronic Instruments & Technical Components

### NEW YORK

#### ALBANY

\*CALLAHAN CO W J 107 Greenhedge Drive (Camillus N Y) HU 8-5518—Hi-Fi/Audio, Warehouse

\*CARSE ELECTRIC CORP 1044 Broadway HO 2-5364—Industrial OEM, Instrument

REAGAN CO INC J A 45 Lake Ave HE 6-9649—(Br) 528 Crestmont Rd Binghamton RA 3-9661, 145 Millbrook Dr Williamsville (Buffalo) PL 2727, 5 E Bayberry Circle Liverpool (Syracuse) HO 3-8301, 10 Humphreys Terrace New Hartford (Utica) RE 2-3775—N Y State (except N Y City & Long Island)—Instruments & Specialized Components

#### BUFFALO

\*Δ BROWN CO VINCENT J 564 Elliott Sq TL 2-1122—(Br) Syracuse N Y HO 3-9161—Upstate N Y—Components

CHIPPWA INDUSTRIAL SALES CORP 318 Franklin St TL 6-1730—New York State West of the Hudson River & N Penna—Instrument—Warehouse

\*COMPONENTS FOR INDUSTRY 103 Greenhaven Terrace (Tonawanda N Y) JA 5900—Industrial OEM—Warehouse

\*JACKSON CO ROBERT W 4446 Main Street MA 3306—Industrial OEM

\*JACOBSON CO INC LEO 1366 Kenmore Ave DE 0442—Hi-Fi/Audio, Industrial OEM—Warehouse

Δ JOHNSON AGENCIES INC H C 111 Mt Hope Ave HA 6-1090—(Br) 9 Ivan La Ringhamton N Y RA 3-5389, 8 Los Robles Ave Williamsville al N Y NF 2-7880, Fayetteville N Y NE 7-9383—Upper New York (excluding Met New York City) Western Penna—Components—Warehouse

LAMB CO ROBERT F 3407 Delaware Ave TR 6-3757—Western N Y State—Instruments

McTAGGART ASSOC LORNE J 2451 Wehrle Dr NF 4-2030—(Br) 420 Mohawk Ave Schenectady N Y

\*MAURY FARBER ASSOC 417 Root Bldg MO 3543—Hi-Fi/Audio, Industrial OEM, Instrument—Warehouse

SCHNITZER SALES JAMES C 109 Easton Ave TX 2-6551—Upstate N Y—Electronic Distributors

### DEWITT

MARTIN SALES CORP C L 103 Pickwick Rd GL 6-2540—Central & South Central New York State—Components

### MT VERNON

\*BURLINGAME ASSOC 510 So Fulton Ave MO 4-7530—Industrial OEM—Warehouse

\*KOPPLE ASSOC JOHN H 9 W Prospect Ave MO 4-5577—Hi-Fi/Audio, Industrial OEM, Instrument

\*DAVID SONKIN ASSOC 10 Fiske Pl MO 8-9809—Industrial OEM, Instrument

### NEW YORK CITY & METROPOLITAN AREA

Including Northern New Jersey "Representatives" having no city following local address are in New York City Proper

\*AARON BERTRAM D P O Box 186 (Roslyn L I) MA 7-0630—Industrial OEM, Instrument

\*AARON PAUL D Professional Bldg

## "REPRESENTATIVES"

(Port Washington) PO 7-8450—Instrument, Industrial OEM, Hi-Fi/Audio—Warehouse

ΔA-D ASSOCIATES 891 Fulton St (Valley Stream N Y) VA 5-8955—(Br) Helen St Warren Township Plainfield N J—N J, Met N Y—Components

\*ADELMAN CO LEON L 25 Chittenden Ave SW 5-1145—Industrial OEM, Hi-Fi/Audio

AIDLIN & ASSOC S F 2180 Bergen St (Brooklyn 33) EV 5-4248—Met N Y & N Y State

\*AIRONIC ACCESSORY CO INC 161 Orinoco Dr (Brightwaters L I) MO 6-6510—Industrial OEM

\*BACH SALES CO 26 Mahan Rd (Old Bethpage N Y) CH 9-1324—Hi-Fi/Audio

\*BAUM CO SYDNEY H 70-15 Fleet St (Forest Hills 75) HO 3-8101—Industrial OEM

BAUME ELECTRONIC CO 44 Cranberry Lane P O Box 114 (Bethpage N Y) WE 1-7769—Met N Y—Warehouse

\*BECKER CO IRVING 635 E 14th St PL 7-6454—Hi-Fi/Audio

\*BETTAN SALES MARTY 77-15 164th (Flushing 66) OL 7-6659—Hi-Fi/Audio—Warehouse

\*BITTAN CO D R 104 S Central Ave (Valley Stream L I N Y) LO 1-2444—Industrial OEM—Warehouse

\*BORDER & CO BARRETT 121 Oak St (Tenafly N J) LO 8-2354—Industrial OEM

BRADLEY ASSOC CORP 9 Dash Place KI 9-8500—New York City, Westchester (Nassau & Suffolk Cos)

\*BRENNAN CO F X 150 Glenridge Ave (Montclair N J) PI 6-4640—Industrial OEM

\*BRESSLER CO JULES J 4508 Bergenline Ave (Union City N J) UN 4-9577—Hi-Fi/Audio, Industrial OEM

\*BREUER CO INC R E 10 Columbus Circle CO 5-0440—Hi-Fi/Audio, Industrial OEM, Instrument

\*BROGAN ASSOC INC 220 Jericho Turnpike (Mineola N Y) PL 7-3230—Industrial OEM—Warehouse

\*BROWN CO INC IRV 1500 Carroll St (Brooklyn 13 N Y) HY 3-1379—Hi-Fi/Audio—Warehouse

\*CAMBER CO MARTY 1700 York Ave EN 9-4222—Industrial OEM

\*CARDNER SALES CORP 80 Shore Rd (Port Washington N Y) PO 7-7700—Hi-Fi/Audio, Industrial OEM, Instruments—Warehouse

CAROL MACHINE TOOL CO P O Box 301 82 Nottingham Rd (Ramsey N J) DA 7-0390—Northern N J, Met N Y—Warehouse

CENTRAL ASSOC 44 N Dean St (Englewood N J) LO 8-0809—Northern N J (North of the Southern Boundaries of Monmouth & Mercer Cos), Southern N Y (South of Northern Boundaries of Orange & Putman Cos)—Systems, Components, Instruments

\*CERF & CO ART 744 Broad St (Newark N J) MI 2-6734—Hi-Fi/Audio, Industrial OEM, Instrument

CHRISTIE & CO R S 175 5th Ave GR 7-4226—Northern N J, S E New York

CLARFIELD ASSOC ALBERT 90 Roberts Pl (Roosevelt L I N Y) PL 7-6454—Northern N J, New York City, Long Island & Westchester Co N Y—Electronic Components

COMPONENTS FOR ELECTRONICS INC 91 B Shore Rd (Mtn Lakes N J) DE 4-2921—N J & Penna (Cos of Pike, Monroe, Northampton, Bucks), Long Island, Northern N J, New York City, Westchester Co—Components

\*COMPONENTS SALES CORP 218 E

Hartsdale Ave (Hartsdale N Y) SC 5-1050—Industrial OEM, Instrument

\*COOPER-SIMON & COOPER INC 400 E 79th St LE 5-2900—Industrial OEM, Instrument—Warehouse

\*CRANE & EGERT CORP 97 Reads St WO 4-0996—Industrial OEM, Instrument—Warehouse

DAVIS CO E R 33 River Rd (Chatham N J) CR 3-7300—Conn, N J, Lower N Y, Eastern Pa—Components & Instruments

\*ADEARIE CO J P P O Box 66 (Mtn Lakes N J) DE 4-4848—New Jersey, New York, E Penna—Components & Capital Equipment

DE CEW AGENCY ALAN E 14 Main St E (Sodus N Y) HT 3-3261—Upper New York State (except Orange & Putman Cos), Erie Co of Penna—Components—Warehouse

DIBLASI ASSOC INC JOHN 90 Main St (Port Washington) PO 7-0470—Industrial OEM

\*DICKISON SALES CO INC 302 Marlton Pike (Earlton N J) HA 8-4086—Industrial OEM

DIETRICH CO EARL Apt 8-K 110 E End Ave LE 5-6590—Industrial OEM

DOMESCO SALES CO 171 Madison Ave MU 5-3148—Long Island, Northern N J, Met New York—Hi-Fi/Audio

\*DREXLER CO CHESTER J Lee Dr So (Farmingdale L I N Y) CH 9-8206—Industrial OEM

\*EGERT CO SAMUEL S 97 Reade St WO 4-0996—Industrial OEM, Instrument—Warehouse

ELECTRONICS MFGS EXPORT CO 127 Grace St (Plainville L I) WE 1-3700—World Wide—Instruments, Components—Warehouse

\*ELLS-HABER CORP 11 Northern Blvd (Great Neck L I N Y) HU 7-5145—Industrial OEM

ENERGY CONTROL CO INC 5 Beekman St BA 7-0457—(Br) 472 E Westfield Ave Roselle Park N J CH 1-1300, 9 Highland Ave Albany 5 N Y AL 2-2938—Conn, Mass, N J, Met New York, Part of New York State, Vt—Instruments & Controls

\*ENGEL & ASSOC G CURTIS 210 S Broad St (Ridgewood N J) GI 4-1400—Industrial OEM, Instrument

EVERETT SALES ENG'G 154 Plandome Rd (Manhasset L I N Y) MA 7-7750—Bronx, Brooklyn, Long Island, Manhattan, Westchester Co, Fairfield Co—Components

FABER & ASSOC INC R L 1246 Broad St (Bloomfield N J) ED 8-6900, WO 4-2990—Long Island, Northern N J, Greater N Y, Lower N Y State—Electric Heat & Temperature Controls

\*FIELDS & SIMON SALES CO 109 Valley Rd (Montclair N J) WO 2-8318—Hi-Fi/Audio, Industrial OEM—Warehouse

\*FINLAY CO ROBERT 307 Lincoln Bldg (Ridgewood N J) OL 2-0088—Industrial OEM, Instrument

\*FISHER CO D J 8 Depot Square (Englewood N J) LO 8-0090—Industrial OEM

\*FISHER SALES CO STEVE 800 Greenwood Ave (Brooklyn 18 N Y) CH 2-5825—Industrial OEM, Hi-Fi/Audio—Warehouse

\*FRED & CO LEO 120 Lexington Ave LE 2-4771—Hi-Fi/Audio, Industrial OEM, Instrument

\*FRIEDMAN & ASSOC A 188-16 Jamaica Ave (Jamaica 23) SP 6-4800—Industrial OEM

\*GALASSO CO DAVID P 382 Franklin Ave (Nutley 10 N J) NO 1-1300—Industrial OEM

GARTEN & ASSOC LOUIS A 375 Passaic Ave (Caldwell N J) CA 6-7800—(Br) 730 Washington Lane Jenkintown Pa WA 7-1200—Instruments, Test Equipment & Components

GAWLER-KNOOP CO 178 Eagle Rock Ave (Roseland N J) CA 6-4545—(Br) 8732 Flower Ave Silver Spring Md JU

5-7550, 835 Glenside Ave Wyncoote Pa WA 7-1820—Del, Wash D C, Long Island, Md, N J, N Y City, Penna (east of Harrisburg), Westchester County, Va—Instruments & Components—Warehouse

\*GLASS ASSOC EDW 250 W 57th St JU 6-8440—Hi-Fi/Audio, Industrial OEM

GLASSMAN ASSOC S 28 Prestwick Terr (Glen Cove N Y) OR 6-1039—(Br) 250 Mt Vernon Pl Newark N J ES 1-2257—Long Island, New York City, N J, Lower Westchester—Components

\*GOLDBERG ASSOC MAX G 270 Lafayette St CA 6-7468—Industrial OEM

\*GRAY ASSOC HAROLD 46 Tenafly Rd (Tenafly N J) LO 7-3585—Industrial OEM

\*GREENBERG ASSOC JERRY 16 Hudson St WO 4-7150—Hi-Fi/Audio, Industrial OEM—Warehouse

HAF ASSOC 430 E 86th St RE 7-5850—N Y State, Northern N J—Components

\*HARRIS INC ARTHUR M 42-34 195th St (Flushing N Y) FL 7-7350—Hi-Fi/Audio

HEFT HAROLD B P O Box 623 Lynbrook N Y LY 9-3351—Met New York, New York City, (Nassau, Suffolk, Westchester Cos)—Insulation Materials

\*HELLER ASSOC JOSEPH L 139-30 34th Rd FL 3-8900—Industrial OEM—Warehouse

\*HICKS W M 4 Spruce Dr (Roslyn N Y) MA 7-6150—Industrial OEM, Hi-Fi/Audio

\*HINCK SALES CO EDWIN 270 N Mountain Ave (Upper Montclair N J) PI 6-2625—Industrial OEM

\*HOUSER ASSOC 188 Water St (Perth Amboy N J) HI 2-3159—(Br) 734 15th St NW Washington D C ME 8-0084—Del, Wash D C, Md, N J, E Penna, Va—Components & Test Equipment, Antennas, Power Supplies

HOYETTE CO INC PAUL B 401 N Broad St WA 2-6070—(Br) 205 E 42nd St N Y 17 N Y MU 4-7112—Del, Md (East of Baltimore), New Jersey, Eastern Penna—Warehouse

\*HUGHES CO INC KENNETH E 4808 Bergenline Ave (Union City N J) UN 7-3204—Industrial OEM, Instrument—Warehouse

INSTRUMENTATION ASSOC INC 17 W 60th St CI 5-5590—National—Instruments—Warehouse

\*JOSEPH ASSOC BEN 43 S Middle Neck Rd (Great Neck N Y) HU 7-9395

\*KAELBER & MACK 1 Park Ave (Manhasset L I N Y) MA 7-6620—Industrial OEM

\*KAHGAN SALES CORP 1261 Broadway MU 4-7772—Industrial OEM—Warehouse

K D ASSOC INC 64 Fulton St BE 3-0644—(Br) 1065 Valencia Fullerton Calif TR 1-3728—Middle Atlantic States & Calif, Ore, Wash

\*KIRSHBAUM CO JERRY 1533 Peninsula Blvd (Hewlett N Y) FR 4-0111

\*KUBICK & YUMAN 475 S Franklin St (Hempstead L I N Y) IV 3-7230—Hi-Fi/Audio, Industrial OEM, Instrument—Warehouse

\*LANDIS SALES CO B C 76-11 97th Ave (Jackson Heights 72 N Y) IL 8-7900—Industrial OEM

\*LEROY & MCGUIRE INC RD No 1 (Phelps N Y) KI 8-4981—Hi-Fi/Audio

\*LEVISON SALES CO INC 172-15 Hillside Ave (Jamaica 32 N Y) AX 1-5610—Hi-Fi/Audio, Industrial OEM

\*LICHTER CO WILLIAM 26 Teakwood Lane (Roslyn N Y) MA 1-2636—Hi-Fi/Audio, Industrial OEM—Warehouse

LUCE & CO INC R P 7 Beechwood Rd (Summit N J) CR 3-9250—(Br) 1300 Jericho Twp New Hyde Park L I N Y GE 7-4550, 130 E Easton Rd Glenside Pa TU 4-8365—Del, Wash D C, Eastern Md, N J, Lower N Y, Eastern Pa, Va—Precision Electro-Mechanical Devices & Electronic Components

ΔMACNEILL PAUL G 100 Wellwood Dr (Fayetteville N Y) NE 7-9206—Eastern Upstate N Y—Components

\*MARCY ASSOC ROBERT 1776 Broadway CI 5-3880—Hi-Fi/Audio, Industrial OEM, Instrument

MARTIN INC HAROLD 165 Palisades Ave (Cresskill N J) LO 7-4836—(Br) Alfred Galletta 4 Via Continental (Huntington Station L I N Y) MY 2-6920, Howard Kagen 40 Old Orchard Ct (Cedar Grove N J) CE 9-4717—Northern N J, Met New York

\*MASIN CO O F 1 Wolf\* Lane (Pelham N Y) PE 8-4510—Hi-Fi/Audio, Industrial OEM

MERICAN CO J C 1 Christopher St AL 5-6387—Del, D C, Md, Southern N J, Eastern Pa, Va

\*MILLER ASSOC GILBERT F 47 Birchwood Park Dr (Jericho L I N Y) OV 1-6325—Hi-Fi/Audio—Warehouse

\*MILLER CO BEN P O Box 721 (Little Neck 63 N Y) BA 4-4673—Industrial OEM

\*MILLER CO JACK One Continental Ave (Forest Hills 75 N Y) BO 3-4446—Industrial OEM

MILLER-ELECTRONICS 27 Mechanic St (Red Bank N J) SH 1-9300—Hi-Fi/Audio, Industrial OEM—Warehouse

\*MORSE SALES IRV 150 Broadway CO 7-2913—Hi-Fi/Audio, Industrial OEM—Warehouse

\*MURRAY DIRECTOR ASSOC 115-62-237th St (Elmont N Y) CU 5-6823—Hi-Fi/Audio, Industrial OEM—Warehouse

\*NACO ELECTRONICS CORP 119 Luther Ave (Liverpool N Y) GR 4-7481—Industrial OEM, Instrument—Warehouse

\*NEWHOPE CORP 6 E 39th St LE 2-7372—Hi-Fi/Audio

N L R ASSOCS 15 Tenney Court (West Orange N J) RE 1-0774—(Br) 529 Shoemaker Rd Phila 17 Pa CA 4-1663—Del, N J, N Y (including Long Island & Westchester Co), Penna (east of State College)—Instruments

NORBELL SALES CO 211-02 Northern Blvd (Flushing 61 N Y) FL 7-9400—Northern N J, Met N Y—Components

PACENT ENG'G CORP 300 Northern Blvd (Great Neck L I) HU 2-4678—(Br) F A Welling Co Inc 20 Providence St Boston MA 6-2248, 119 E Butler Ave Ambler Pa MI 6-0405—Maine to Baltimore Md—Components

PLASENCIA INC JOSEPH 401 Broadway WA 5-3410—Export Sales

\*REED & RIDDETT CO 1106 Jericho Turnpike (New Hyde Park N Y) FL 4-6719—Hi-Fi/Audio, Industrial OEM

\*REPCO-ELECT SALES CO INC 356 W 40th St 5-6980—Industrial OEM

\*RICHARDT CO JOHN W Route 46 (Pine Brook N J) CA 8-0600—Industrial OEM, Instrument—Warehouse

ΔRICHTER CO INC HENRY G 467 Hillside Ave (Westfield N J) AD 3-4615—Wash D C, Balt Md, New England, Met N Y, N J, Phila Area—components

RINGER CO R L P O Box 114 14 Glen Ave (Glen Rock N J) GI 4-1434—Met N Y—Components & Hardware

RMC Associates 236 E 75th St TR 9-2023—(Br) 391 Grand Ave Englewood N J LO 7-3933—Northern N J, Met N Y (including Long Island, Staten Island, Westchester, Putman & Rockland Cos)—Instruments

ROBURN AGENCIES INC 431 Greenwich St WO 6-2130—Warehouse

ROHER LAWRENCE E 39 Delaware Ave (Bloomfield N J)—PI 3-9834—N J, Met N Y—Electrical Instruments

\*ROSS CO MILTON 550 Fifth Ave JU 6-0653—Industrial OEM

ROTHMAN ARTHUR M 147-10 41st Ave (Flushing 55 L I N Y) IN 3-1707—Met N Y, N J, Wash D C, Balt, Phila Area—Microwave Tubes & Parts, Vacuum Equipment, Radar Test Sets

H & S ELECTRONIC SALES CORP P O Box 217 (Hempstead N Y) IV 5-1040—Del, New England States, N J, N Y, Eastern Penna—Wire Stripping Equipment, Component Forming Equipment, Printed Circuit Holding Fixtures—Warehouse

\*RUTT CO WILLIAM 123 Middle Neck Rd (Great Neck L I) HU 2-8160—Industrial OEM—Warehouse

\*RYWELL SALES INC 100 N Village (Rockville Centre L I) RO 4-2666—Industrial OEM, Instrument

\*SAFTLER ASSOC INC P 157 W 57th St CI 7-3855—Hi-Fi/Audio, Industrial OEM

\*SALSBUARY ASSOC INC 57 Broadway (Hicksville L I) WE 8-1080—N J (north of & including Monmouth & Mercer Cos), N Y (south of & including Putman & Rockland Cos)—Microwave Components, Instruments, Materials

SANFORD CO L C 202 Woodland Ave (Rutherford N J) WE 9-0979—Northern N J, Met N Y City (including Long Island & Westchester County)—Thermostats, Heaters, Ovens

SCHMITT CO INC F EDWIN 136 Liberty St WO 2-6550—Washington D C, Eastern Md, Met N Y, Eastern Penna—Components—Warehouse

\*SCHWARTZ CO ADOLPH 15 Exchange Pl (Jersey City 2) DE 4-2424—Industrial OEM

SCIENTIFIC SYSTEMS SALES CORP P O Box 3 (Bayside L I)

SHPRENTZ CO HERBERT 126 Deertrack Lane (Irvington N Y) SC 5-0485—Fairfield County Conn, Northern N J, New York City & Dutchess, Orange, Putman, Rockland & Westchester Counties N Y—Instruments, Test Equipment, High Vacuum Equipment

\*SIMBERKOFF SALES CO 68 Hudson Street (Hoboken N J) OL 6-5251—Hi-Fi/Audio, Industrial OEM, Instrument—Warehouse

\*S-J SALES ENGINEERING CO 148-05 Archer Ave (Jamaica 35) AX 1-2332—Industrial OEM, Instrument—Warehouse

\*SMITH HOWARD F CO 250 W 14th Street CH 2-2398—Hi-Fi/Audio, Industrial OEM, Instrument—Warehouse

\*SPELLMAN FRED CO 1295 Northern Blvd (Manhasset L I) MA 7-3399—Hi-Fi/Audio, Industrial OEM, Instrument

\*SPRUNG ASSOC INC JOSEPH 245 W 31st St LO 5-1820—Northern N J, Met N Y City (including Long Island & Westchester Cos)—Components, Instrument, Industrial OEM

\*STANG SALES CO 271 Columbus Ave (Tuckahoe) SP 9-6868—Hi-Fi/Audio—Warehouse

\*STEINBERG SALES CO H A 880 Bergen Ave (Jersey City 6) SU 5-2255—Hi-Fi/Audio, Industrial OEM

\*TAYLOR CORP B B 2270 Grand Ave Baldwin L I) BA 3-8000—Industrial OEM—Warehouse

\*TOBINS & CO INC D F 30 Church St CO 7-4349—Industrial OEM, Instruments—Warehouse

\*TOWER SALES ENGINEERING CO P O Box 3146 Grand Central Station LO 9-2807—Industrial OEM

\*TRAVCO ASSOC INC 45 No Station Plaza (Great Neck) HU 7-9666—Industrial OEM

\*TYLINSKI CO FRANK 73-63 Bell Blvd (Bayside 64) HO 4-8927—Industrial OEM

VAEN ASSOCIATED INC 177 White Plains Rd (Tarrytown) ME 1-2579—Conn, Mass, N J, N Y, Penna—Components

VERTER SALES CO 2352 E 66th St (Brooklyn 34) HI 4-3880—Northern N J (south to & including Monmouth County) Met New York & Nassau, Suffolk & Westchester Cos—Components, Hi-Fi, Instruments

\*WADSWORTH MFG ASSOC 509 Balsam St (Liverpool) OL 2-7043—Industrial OEM

## "REPRESENTATIVES"

\*SHULAN & CO WALLY 880 Bergen Ave (Jersey City) WO 2-0365—Industrial OEM

\*WEBER ASSOC JACK 63 E 9th St GR 3-7813—Industrial OEM

WEBER CO R E 10 Moline Rd (East Brunswick N J) CL 7-5243—Northern N J, Met N Y, Eastern Penna—Transducer Instrumentation, Primary Standards

\*WEILAND CO GEORGE H 76-49 168th St (Flushing) OL 8-4061—Industrial OEM

\*WEISS & ASSOC WILLIAM W 1780 Broadway CI 6-5777—Northern N J, Greater N Y—Components (magnetic), Motors, Transformers

\*WILGOLD ELECTRONIC SALES CORP 100 North Village Ave (Rockwell Centre) RO 4-4022—Hi-Fi/Audio Industrial OEM, Instrument

\*WIMPIE ASSOC INC S 510 W Boston Post Rd (Mamaroneck) OW 8-7100—Industrial OEM

\*WOLF ASSOC IRVING W 104 So Central Ave (Valley Stream L I) LO 1-0122—Hi-Fi/Audio

\*ZLOWE CO LEONARD 15 No Central Ave (Hartsdale) OW 3-2922—Hi-Fi/Audio

### ROCHELLE

GATES CO CLAUDE A 27 Locust Ave NE 2-1465—W Conn, Northern N J, N Y City, S E N Y State—Ovens, Furnaces, Pyrometers

### ROCHESTER

\*ELECTRO-REP SALES CO 187 Culver Rd GR 3-7398—Hi-Fi/Audio, Industrial OEM—Warehouse

JAWESCO INC 535 Buffalo Rd BE 5-2920—New York State (No & West of Albany)—Joining & Cleaning of Metals

KELLER INDUSTRIAL PRODUCTS INC 70 Mt Hope Ave HA 6-3255—(Br) 1399 Fillmore Ave Buffalo 11 N Y, P O Box 132 Skaneateles N Y OV 5-6662—Upstate New York—Electrical Rotating Equipment—Warehouse

\*KENNEDY CO INC R P 182 Mayflower Drive BR 1-6322—Industrial OEM

\*MARSEY SALES CO 529 Merchants Rd HU 2-4133—Hi-Fi/Audio, Industrial OEM

\*OSMANN & ASSOC EDWARD A 830 Linden Ave LU 6-4940—(Br) 101 Picard Dr Syracuse GL 4-2461, 149 Front St Vestal St 5-0296—Upper N Y State (except Met N Y City)—Components & Instruments—Warehouse

SBM ASSOCIATES INC 177 Winton Rd (No Rochester 10), OL 4-8440—(Br) 1943 W Fayette St Syracuse HO 8-5041, 232 Roosevelt Dr Utica RE 2-4410, Nowlan Rd RD #3 Binghamton RA 2-2648—Electronic Test Equipment

YOUNG ASSOCIATES 907 Monroe Ave BR 1-2136—(Br) Manhasset N Y MA 7-6956—N J, N Y State—Engineering Services, Electronic Systems, Components

### SCHENECTADY

\*WINICK CO CHARLES A 926 Riverview Rd ST 5-8133—Industrial OEM, Instrument

### SYRACUSE

\*ALLEN INC LEONARD D 115-117 Luther Ave P O Box 32 Salina Sta GR 1-3105—Hi-Fi/Audio, Industrial OEM

COMPONENTS FOR INDUSTRY 110 Woodmanly La (Fayetteville N Y) NE 7-9601—(Br) 23 Sedgemoor Ct Buffalo 21 N Y NF 3-8900—Western & Central N Y—Components & Environmental test equipment

\*D-B ASSOC INC 3310 Erie Blvd East Dewitt GI 6-0220—Industrial OEM, Instrument

\*FRANKLIN & ANDREWS SALES CORP 2 Standish Terr GI 6-1120—(Br) 43 Kent Rd (Tenafly N J) LO 9-0007—Upstate N Y (except Rockland & Westchester Cos) Met N Y C (including Rockland & Westchester Cos) Northern N J—Components



## REPRESENTATIVES

HITZE CO INC I A 112 Dewitt St GR 9-6641—Upstate N Y (North of Westchester & Rockland Cos)—Components

\*LIGHTSTONE J B 220 Westminister Ave GR 2-6333—Upstate New York—Components & Instruments

\*PASTON-HUNTER CO 3307 Erie Blvd East P O Box 123 Dewitt Sta GI 6-2180—Industrial OEM—Warehouse

PERKINS CO ARTHUR L 639 S Warren St GR 1-8828—Upper New York State

RICHTER CORP WILLIAM 107 Dolores Terr So North GL 4-1051—(Br) P O Box 158 (Pittsford) LU 6-6464—New York State—north & west of Rockland & Westchester Cos—Electronic Components

\*RYERSON ASSOC INC J D P O Box 1400 GI 6-1771—Industrial OEM, Instrument

\*SWANK INC WALLY B 2310 Bellevue Ave GR 6-2141—Industrial OEM, Components

\*TENCO ASSOC 114 Miles Ave HO 3-4533—Industrial OEM

\*WILBUR CO D L 572 Oakwood Ave GR 6-2706—Industrial OEM

\*ZIMMERMAN INC WILSON H 112 Dewitt St GR 4-4889—Industrial OEM—Warehouse

### TUCKAHOE

\*LAND-C-AIR SALES CO 76 Main St WO 1-4700—Hi-Fi/Audio, Industrial OEM, Instrument

### YONKERS

\*BE-ESCO SALES CORP 45 So Broadway YO 3-0150—Hi-Fi/Audio, Industrial OEM—Warehouse

\*BROWN ASSOC JACK 207 Rodedal Rd SP 9-7330—Hi-Fi/Audio, Industrial OEM—Warehouse

\*SHAW CO INC S A 361 Central Park Ave YO 3-5700—Industrial OEM, Instrument—Warehouse

## NORTH CAROLINA

### BURLINGTON

\*PAUL HAYDEN ASSOC 423 Guthrie St —Hi-Fi/Audio, Industrial OEM, Instrument—Warehouse

### CHARLOTTE

\*CARTWRIGHT & BEAN 625 Harwyn—Hi-Fi/Audio, Industrial OEM, Instrument—Warehouse

\*FANNING-DUCKETT SALES CO PO Box 11402—Industrial OEM—Warehouse

\*HELLINGSWORTH & STILL 4837 Gilmore Dr—Hi-Fi/Audio, Industrial OEM

\*HENRY ASSOC BILL PO Box 6073—FR 5-8958—Industrial OEM, Instrument

\*HIGHSMITH & CO JAMES L 3733 Monroe Rd FR 7-2540—Industrial OEM, Instrument

ΔHILE CO INC W K 1236 E Moorehead St PO Box 8165 FR 7-5062—Ga, N C, S C, Eastern Tenn, Va—Components, Instruments

\*MILLAR ASSOC JAMES 4023 Arbor Way—Hi-Fi/Audio, Industrial OEM

\*MURPHY & COTA 221 Latta Arcade FR 5-2317—Hi-Fi/Audio, Industrial OEM, Instrument

\*NICKERSON CO FRANK 2334 Orton—Industrial OEM

\*SMITH CO MAITLAND K PO Box 8401, 920 Hill St FR 6-5950—Hi-Fi/Audio, Industrial OEM, Instrument—Warehouse

\*TAYLOR CO MORRIS F 1224 Dresden Dr

\*WALLACE ASSOC STANLEY K 5621 Murray Hill Rd

### GREENSBORO

ASSOCIATED AGENTS INC 3408 Rockingham Rd CY 9-5832

\*ATCHESON & ADAMS 601 N Elm St BR 2-6838—Industrial OEM, Instrument

\*BROWN & CO K O PO Box 1791 BR 3-5973—Hi-Fi/Audio, Industrial OEM, Instrument—Warehouse

\*SCHIFFER CO G F PO Box 6365 1013 Huffman St BR 3-5578—Industrial OEM—Warehouse

### HIGH POINT

BIVINS & CALDWELL INC PO Box 5187, 1923 N Main 888-6875—(Br) Orlando Fla CH 1-1091, Atlanta Ga 233-1141, Richmond Va EL 5-7931—Ala, Fla, Ga, Ky, N C, S C, Miss, Tenn, Va, W Va (Excepting northern portion)—Instruments—Warehouse

### WILMINGTON

\*BUTHAN INC 4924 Oleander Dr RO 2-5749—Industrial OEM, Hi-Fi/Audio

### WINSTON-SALEM

\*HILKER CO 3007 Kinnaman Rd PA 5-8588—(Br) Rt 8 Box 3K-351—Ga, N C, S C, Eastern Tenn, Va—Components

SIMPSON & SON PAUL M 717 Byrd Park Court—Va—Instrument

## OHIO

### AKRON

ΔPETERSON SALES 1436 Chippewa Ave ST 4-5769—Ohio—Components

### BRECKSVILLE

\*DEUNK & ASSOC ROBERT K 10005 Chippewa Rd JA 6-4317

\*NACE CO INC ALLEN Box 153 JA 6-4323—(Br) Box 93 Dayton 5 Ohio CR 7-8215—Ohio, W Penna, West Va—Components

### CHAGRIN FALLS

\*TECHNICAL ASSOC INC 4475 Lander Rd TE 1-9884—(Br) 1724 Hillwood Dr Dayton 39 AX 9-5374—S Ind, Ky, Ohio, W Penna, West Va—Electrical & Electronic OEM Components

### CINCINNATI

ΔCAMPISANO FRANK J 3985 Race Rd MO 2-1616—Ind, Ky, S Ohio—Components

ENGINEERING SPECIALTIES 8115 Canargo Rd—S Ind, Ky, S Ohio—Instrument, Medical, Nuclear, Industrial

GALLAGHER CO 15 Ritchie Ave PO 1-1288—(Br) Gallagher Co 320 William Rd Rochester Mich OL 2-4776—Ky, Mich, Ohio—Electrical/Electronic (Components & Instruments)

\*MURRAY CO JAMES A 3985 Race Rd Box 28 HU 1-9726—Hi-Fi/Audio, Industrial OEM

ELECTRO SALES ASSOCIATES 335 East 200 Street RE 2-7444—(Br) 15324 Mack Ave Detroit 24 Michigan TI 6-2280, Dabel Sta Box 143 Dayton 20 Ohio CH 4-5551—S Ind, N Ky, Mich, Ohio, W Penna—Instruments, Precision Components

\*SHERIDAN ASSOC INC Roselawn Center Bldg ME 1-2460—Industrial OEM—Warehouse

### CLEVELAND

ALEXANDER CO E H 545 Hemlock Point Rd (Chagrin Falls) ED 8-6861—(Br) 295 Nantucket Dr Pittsburgh Pa—Ohio, Western Penna—OEM Components

\*BAEHR GREENLEAF & ASSOC INC 14700 Detroit Ave AC 1-9030—Industrial OEM, Instrument

\*BAIER ARTHUR H 18236 S Miles Pkwy GR 5-3080—Industrial OEM

BRAUER & ASSOC INC WALTER J 15631 Lakewood Heights Blvd LA 1-7268—Industrial OEM, Instrument—Warehouse

COMPONENTS ENG'G CO 7461 N Linden Lane VI 2-2737—(Br) 11880 Lakeview Ave Glendale Ohio FR 1-2137—Ohio, W Penna—Components

\*DAUGHERTY CO F A 6025 Mayfield Rd HI 9-1122—Hi-Fi/Audio—Warehouse

\*DEUNK ROBERT K & ASSOC 1005 Chippewa Rd JA 6-4317—Ohio, W Penna—Components

\*DOLFUSS CO & CHAS H JR 2108 Payne Ave PR 1-1270—Industrial OEM, Instrument

\*EDWARDS-LOHSE & CO 2123 E 9th St TO 1-5753—Hi-Fi/Audio, Industrial OEM, Instrument—Warehouse

FINNICUM & ASSOC J L 4500 Euclid Ave HE 1-7477—North & Central Ohio, W Penna—Automation Equipment

\*GOHRY SALES CO 19535 Henry Rd ED 1-1500—Industrial OEM

HENGER FAIRFIELD CO 1812 Columbus Rd CH 1-1018—(Br) 415 Fourth St NW Canton 2 Ohio GL 5-6833, 124 E 7th St Cincinnati 2 Ohio MA 1-4749, 101 N High St Columbus 15 Ohio CA 4-7510, Commercial Bldg Dayton 2 Ohio HA 3-6724—Ohio—Components—Warehouse

ΔHILTEBRANT GREENLEAF CO 8905 Lake Ave OL 1-6900—(Br) 788 Ludlow Ave Cincinnati 20 Ohio—S Ind, N Ky, Ohio, W Penna—OEM Components, Electrical & Plastics

INDUSTRIAL DISTRIBUTORS INC 18234 Smiles Pkwy GR 5-1300—Ohio—Warehouse

ΔJAY ENGG CO 1721 E Third St CL 3-2151—(Br) 4712 W 130th St Cleveland 35 Ohio 252-0486—Ohio—Electrical & Electronic Components—Warehouse

JOY CO CLARKE H 27005 Kniekerbocker Rd TR 1-3900—Ohio—Temperature & Industrial Control Systems

\*LANDFEAR CO INC J M 12429 Cedar Rd FA 1-4533—Hi-Fi/Audio, Industrial OEM, Instrument—Warehouse

\*LEVIN & ASSOC SID 6252 Mayfield Rd HI 2-8340—Industrial OEM

MARTIN-RETTGER INC 11855 Shaker Blvd SW 1-8787—Ohio (excluding SW), Erie Co Pa—Electrical & Electronic Components

\*MIDWEST SALES CO 3219 W 117th St WI 1-2700—Industrial OEM—Warehouse

\*MORROW CO LES A 3123 W 117th St CL 1-5700—Hi-Fi/Audio, Industrial OEM—Warehouse

\*OLSEN CO JOHN O 16201 Shaker Blvd SK 2-5444—(Br) 4016 Diehl Ave Cincinnati 36 Ohio SY 1-1297, 7870 Jolain Dr Cincinnati 42 Ohio TW 1-6140, 104 Elatan Dr Pittsburgh 16 Pa BR 9-2550, 1843 Maydell St Pittsburgh 16 Pa FI 1-8391—Ky, parts of Md, Ohio, W Penna, West Va—Components & Hi-Fi & Sound Equipment

\*PETERS CO ROBERT W 350 E 215th St AN 1-2330—Hi-Fi/Audio, Industrial OEM

PNEU-HYDRAULICS INC 4330 Ridge Rd SH 9-5400—N Ohio—Pneumatics, Hydraulics & Instrumentation—Warehouse

POWERS & POWELL CO 1390 E 30th St PR 1-7333—Ohio—Electrical & Electronics—Warehouse

\*RAUER CO FRANK W 4144 Marvin Ave ME 1-8350—Hi-Fi/Audio, Industrial OEM

\*ROSENWASSER SALES F A 13781 Cedar Rd FA 1-0463—Hi-Fi/Audio, Industrial—Warehouse

\*ROTH SALES CO MIKE 13947 Cedar Rd YE 2-4262—Hi-Fi/Audio, Industrial OEM

\*SCHROEDER SALES CO 2309 Prospect Ave MA 1-5075—Hi-Fi/Audio—Warehouse

\*SCOTT AND STEFFEN INC 1836 Euclid Ave TO 1-2626—Industrial OEM, Instrument

SERVICE EQUIPMENT ELECTRONICS INC 4500 Euclid Ave HE 1-7030—(Br) 231 Buena Vista Ave Ann Arbor Mich NO 8-5860—Mich, Ohio, W Penna

SIDNELL & CO R G 1229 Westlake Ave AC 1-1313—(Br) 675 Princeton Blvd Pittsburgh 21, Pa CH 2-1476—Ohio, W Penna—Components & Instruments

ΔSMITH CO FRANK WALES 12417 Cedar Rd ER 14882-11 Coa in W Ind, Ohio

TIBY CO 2245 Warrensville Center Rd ER 1-5335-(Br) 3701 Fenkell Ave Detroit 38 Mich Texas 4-9211, 645 Salem Ave Dayton 6 Ohio CR 7-3822-Mich, Ohio, W Penna-Instruments, Components

ΔVAN HALA INDUSTRIAL CO PO Box 2602 LA 1-6283-N Ohio-Instruments

#### COLUMBUS

\*LEHNER CO J W 367 Brynild Rd AM 8-5260-HI-FI/Audio

\*McFADDEN SALES CO 150 E Broad St CA 1-3363-HI-FI/Audio, Industrial OEM

\*PUGH CO C L 2144 Riverside Dr HU 8-4856-HI-FI/Audio

\*SEAY CO H H 3850 Fairlington Dr HU 8-9994-HI-FI/Audio, Industrial OEM

#### DAYTON

BRUNO & CO L D PO Box 61 Far Hills Br AX 3-8703-E Ind, Ky, S Mich, Ohio-Instruments, Electronic Components & Control Systems

LOMBARD CO J A 1447 Amberly Dr CR 5-6336-Ohio (except greater Cleveland area)

OHIO INSTRUMENT CO 7316 Winston Churchill Dr CH 4-2744-Ky, Mich, Ohio, W Penna, W Va-Instruments, Special Components & Electronic Controls

SCARP ENGG SALES CO Box 2003 Kettering Branch TU 5-2661-Ind, Mich, Ohio-Components

TEPLITZ & CO HARVEY 3543 Cornell Dr CR 7-9178-(Br) 19942 Inkster Rd Detroit 19 Mich KE 7-9058, 671 Sycamore Dr Cleveland 32 Ohio RE 1-5676-Mich, Ohio, W Penna-Test Equipment & Precision Components

TOWER ENGG CO 3898 Linden Ave CL 6-0931-(Br) 19362 James Couzens, Detroit 25 Mich DI 1-2332, 2138 Lee Rd Cleveland Ohio YE 2-8563-Mich, Ohio, W Penna

#### NEW BREMEN

\*SHELBY & CO THOMAS 319 S Franklin St Tel: 6511-Industrial OEM, Instrument

#### STOW

\*BLOCKI ASSOC BILL 2280 Liberty Rd OV 8-4277-Industrial OEM

\*NATALINO ASSOC AUGHEY PO Box 644 OV 8-3930-Industrial OEM, Instrument

#### TOLEDO

\*CHILCOTE SALES CO 626 Nesselwood Ave CH 1-3826-HI-FI/Audio-Warehouse

INDUSTRIAL ELECTRONIC LAB INC 606 Lagrange St CH 4-5827-N W Ohio-Timing & Temperature Control-Warehouse

SALLADE ANDREW 3683 River Rd CH 1-1141-(Br) 4095A Malcott Dr Novi Mich GR 4-1505 (Sub Detroit Mich)-E Ind, Mich, Ohio-Winding Equipment & Insulation

SAUBER & CO 5222 Sandra Dr GR 5-5764-Columbus & N Ohio-Industrial

#### TROTWOOD

ATKIND & ASSOC IRVING Box 4003 TE 7-4750-S W Ohio

#### WESTLAKE

ELLIOTT SARLES CO 23473 Concord Dr ED 1-8911-(Br) 1025 E Maple Ave Birmingham Mich MI 4-4660, 1815 Brownsville Rd Pittsburgh 10 Pa TU 1-4545-Mich, Ohio, W Penna-Instrumentation, Transducers, Lab Standards

JONES CO R STANLEY 2743 Horseshoe Blvd ED 15514-Del, Ill, Ind, Ky, Mich, Minn, Southern N J, Ohio, Penna, W Va, Wisc-Tool Items-Warehouse

\*ODELL CO M P 26614 Center Ridge Rd TR 1-8000-Industrial OEM, Instrument-Warehouse

#### WEST RICHFIELD

\*BEAR CORP NEAL 3435 Streetsboro Rd OL 9-3331-Industrial OEM-Warehouse

#### WORTHINGTON

ROC ENGINEERING & SALES PO Box 241 TU 5-1057-Ohio-Defense Items

\*WELLER-RAHE CO PO Box 212 TU 5-7819-Industrial OEM

#### XENIA

\*MICHAELSON CO BERNARD L 312 N Monroe St PO Box 173 DR 2-5496-Industrial OEM

#### OKLAHOMA

##### TULSA

ELDER CO JOHN W Box 3395 LU 3-9149-Okla-Components-Warehouse

#### OREGON

##### DAYTON

BLAINE DABNEY SALES CO Box 240 6 x 13-Ida, Ore, Wash-Components-Warehouse

#### PORTLAND

\*BURCHAM CO DON H PO Box 4095 610 N W 19th Ave CA 6-4148-HI-FI/Audio, Industrial OEM, Instruments-Warehouse

\*ECKERNLEY CO JAMES W 3150 S W Hamilton St CH 6-3183-Industrial OEM

HAWTHORNE ELECTRONICS 700 S E Hawthorne Blvd BE 4-9377-(Br) 112 Adm Bldg Box 7 Boeing Field Seattle 8 Wash PA 5-1460-Alaska, British Columbia, Alberta, Manitoba, Saskatchewan, Idaho, Ore, Wash-Electronic Test Equipment

\*LEE CO INC DAVE M 3527 N E Union Ave AT 8-5796-HI-FI/Audio, Industrial OEM-Warehouse

\*LEGG CO INC RICHARD 1633 N W 21st Ave CA 3-9720-Industrial OEM-Warehouse

\*MILLAN ELECTRONICS 10111 S W 62nd Ave CH 4-7830-Industrial OEM-Warehouse

\*MINTHORNE CO ROGER M 9673 S W Taylor's Ferry Rd CH 6-4556-HI-FI/Audio, Industrial OEM-Warehouse

\*WEBER CO DALE G 8 S E Clay St BE 4-7871-HI-FI/Audio, Industrial OEM-Warehouse

#### RHODE ISLAND

##### CRANSTON

PAISNER MILTON 706 Pontiac Ave JA 1-3522-New England-Parts & Components

##### LINCOLN

\*ADAMS MCGREGOR ASSOC 66 Lakeview Rd PA 6-1300-Industrial OEM, Instrument

#### PENNSYLVANIA

##### PHILADELPHIA AREA Including Southern New Jersey

\*ANDCO SALES-ENGINEERING INC 5823 Greene St VI 4-9100-Industrial OEM, Instrument

ANGUS-SLOANE ASSOC INC Rt 38 PO Box 126 Moorestown N J BE 5-1900-(Br) Washington D C Enterprise 1-1500, Baltimore Area EN 9-1901-Components-Warehouse

ARNOLD ASSOC INC 528 Ryers Ave (Cheltenham Pa) PI 2-0600-Washington D C, Del, Md, Southern N J, Eastern Penna, Va-Components

\*BANCROFT & CO 209 Cooper St Westmont (Collingswood 7 N J) CO 5-5215-Industrial OEM-Warehouse

\*BARTLETT & CO FRED F 18 West Ave (Wayne Pa) MU 8-7325-Industrial OEM

BELL CO P F 112 Hunters La (Devon Pa) MI 3-5011-Washington D C, Del, Md, Southern N J, Eastern Penna

\*BIGGS & CO INC J ALAN (Gardenville Pa) FI 8-9457-Industrial OEM-Warehouse

\*BLUMENSTEIN CO HAL 123 Crosshill Rd MI 9-9528-HI-FI/Audio-Warehouse

#### "REPRESENTATIVES"

\*BOENECKE ASSOC 5505 Westfield Ave (Pennsauken N J) NO 2-8650-HI-FI/Audio, Industrial OEM

BRADDOCK EDWARD PO Box 305 (Haddonfield N J) HA 9-0087-Washington D C, Del, Md, Southern N J, Eastern Penna, Va (Arlington & Fairfax Cos, city of Alexandria-Components)

\*BRESSON ASSOC JERRY 246 Haverford Ave (Narberth Pa) GR 7-3800-Industrial OEM

BRIGGS ASSOC C A 220 S Easton Rd PO Box 151 (Glenside Pa) TU 7-4080-(Br) C A Briggs Assoc c/o J W Pickell R D #1 Dover Pa Dover 3399-Washington D C, Del, Md, Southern N J, E Penna, Va (Arlington and Fairfax Cos)-Components

BROTHERS & CONNEEN ASSOC 131 Harned Rd (Springfield Del Co Pa) KI 3-8641-(Br) Washington D C, Del, Md, Southern N J, Eastern Pa, Va-Components, HI-FI/Audio

CASHMAN & NORTON 100 E Broad St (Palmyra N J) Wash D C, Del, Md, Southern N J, E Penna

\*CATO ASSOC BUDD 235 Parker Ave (Manasquan N J) CA 3-3842-Industrial OEM-Warehouse

\*CHURCHILL CO FLOYD W 50 Upland Way (Haddonfield N J)

\*CORDRAY SALES CO 18 Chelton Ave VI 5-0447-Industrial OEM

ΔDAGGON & POTTER 64 Woodland Ave (Summit N J) CR 7-0220-(Br) 209 Ocean Dr E Stamford Conn FI 8-2210-Del, D C, Md, E New England, N J, N Y, Penna, Va-Components

EASTERN INSTRUMENTATION INC 613 Cheltenham Ave WA 7-6268-(Br) 808 Ingleside Ave Baltimore 28 Md RI 4-3676, 211-02 Northern Blvd Bayside L I N Y HA 8-1661, (Wash D C Area) 8616 Georgia Ave Silver Spring Md JU 9-0100-Washington D C, Del, Md, Southern N J, Eastern Penna, Va-Components, Instruments

\*EMLEN-PETERSON CO King of Prussia Rd (Radnor Pa) MU 8-0151-Industrial OEM, Instrument-Warehouse

\*FRIDMAN CO KENNETH B 7908 High School Rd (Elkins Park) CA 4-1833-Industrial OEM

\*ESTERSON HARRY 5727 Winter St VI 8-8484-HI-FI/Audio, Industrial OEM-Warehouse

\*FAIRBANKS CO HOWARD J 1615 Darby Rd Waybar Bldg (Havertown Pa) GR 2-2467-Industrial OEM

\*FOLEY ASSOC ANDREW A PO Box 155 (Moorestown N J) NO 3-4545-Industrial OEM

\*FREDERICK CO WILLIAM C JR 800 W Washington St (Norristown Pa) BR 9-7560-Warehouse

\*FRIEDMAN & ASSOC MARTIN 7 Heather Rd (Bala-Cynwyd Pa) MO 4-6090-HI-FI/Audio, Industrial OEM, Instrument-Warehouse

FULLER LAWRENCE C 32 Rittenhouse Pl (Ardmore) MI 2-2468-Washington D C, Del, Md, Southern N J, Eastern Penna, Va

\*GRAHAM ASSOC WILFRID 610 Latham Dr (Wynnwood Pa) MI 9-3027-HI-FI/Audio

\*HAUTENSCHILD CO GEORGE 949 E Godfrey Ave PI 4-0847-HI-FI/Audio, Industrial OEM

\*HUGHES CO INC KENNETH E 101 N 33rd St EV 6-3130-Industrial OEM, Instrument-Warehouse

\*HUMES SALES 124 Lee Circle (Bryn Mawr Pa) LA 5-6469-Industrial OEM

\*JEFFRIES INC SAMUEL A 105 Forrest Ave (Narberth Pa) MO 4-8500-Industrial OEM, Instrument-Warehouse

## REPRESENTATIVES

\*KEEFE ELECTRONIC SALES CO 228 E Kings Hwy (Haddonfield N J) HA 9-4650—Del, Md, N J, Penna (East of State College Pa)—Components & Materials

KEEGAN & CO W F 771 Shelbourne Rd (Upper Darby Pa) FL 2-1125—Del, Southern N J (Trenton included), Eastern Penna—Components—Warehouse

\*KERRAR & CO HAL 653 Ferne Blvd (Drexel Hill Pa) CL 9-6758—Hi-Fi/Audio, Industrial OEM—Warehouse

KESSLER ASSOC 31 Larkspur Rd (Levittown Pa) WI 5-0250—Penna (Ft Monmouth, Johnsville, Mechanicsburg, Phila)

KOENIG CO WALTER A P O Box 57 2522 S Lumber St (Allentown Penna) SW 7-1564—(Br) Wilmington, Del, Enterprise 1-0208, Phila, Pa ENterprise 6298—Del, Southeastern N J, Eastern Penna (Franklin Co to Tloga Co southward to Md, northward to N Y)—Instruments—Warehouse

LAIRD EQUIPMENT CO 204 Wyncote Rd (Jenkintown Penna) TU 4-8198—Washington D C, Del, Md, Southeastern N J, Eastern Penna, Va (Norfolk to Roanoke)—Instruments—Warehouse

\*LEBAN ASSOC ALBERT D 218 Lloyd La MI 2-9047—Hi-Fi/Audio

\*LEWIS CO HERMAN 1622-68th Ave LI 8-1281—Hi-Fi/Audio, Industrial OEM—Warehouse

\*LIENAU CO CHARLES 1148 Greentree La (Narberth Pa) MO 4-6924—Hi-Fi/Audio, Industrial OEM—Warehouse

LINZ DAVID S 238 Shelmire St ES 9-0734—Washington D C, Del, Md, Southern N J, Eastern Pa—Components—Warehouse

LORMONT ASSOC Box 72 (Horsham Pa) OS 5-8133—Southern N J, Eastern Penna

\*LOWRY INC L D 50 E Wynnwood Rd (Wynnwood Pa) MI 2-9100—Industrial OEM—Warehouse

\*MC COY CO JACK 300 Broadway (Camden 3 N J) WO 6-1800—Industrial OEM, Hi-Fi/Audio

MAC CALLUM-GIBB-CLISBY INC 28 S Delaware Ave WA 2-7252

\*MAC DONALD INC SAMUEL K 1531 Spruce St KI 5-1205—Hi-Fi/Audio, Industrial OEM—Instrument

\*MAGUIRE & CO J A N 7th St (Camden 2 N J) WO 6-3118—Hi-Fi/Audio, Industrial OEM, Instrument

\*MASSEY ASSOC 529 Brookhurst Ave (Narberth Pa) MO 4-4200—(Br) 6607 Riverdale Rd Riverdale Md AP 7-1023—Washington D C, Del, Md, Southern N J, Eastern Penna, Va—Components

\*MEYER CO HAROLD A Box 14 (Haddonfield N J) HA 9-7792—Hi-Fi/Audio, Industrial OEM—Warehouse

MOLER CO G W P O Box 240 (Haddonfield N J) HA 8-2440—Washington D C, Del, Md, Southern N J, Eastern Penna, Va—Components

M & S ELECTRONICS P O Box 185 (Haddonfield N J) PO 5-0460—(Br) Haddonfield N J HA 9-1909, Audubon N J LI 7-6390, Sellersville Penna AL 7-4308—Mid-Atlantic Area

\*MUSTICO CO JOHN 312 Bewley Rd (Havertown Pa) HI 6-1961—Industrial OEM—Warehouse

\*NAUDAIN-BOHAKER CO 846 Suburban Sta Bldg LO 4-3194—Industrial OEM

NELSON-PLATT SALES CO 300 Marlton Pike (Earlton N J) HA 9-4095—Hi-Fi/Audio, Industrial OEM

\*NEWSON & ASSOC C H 813 Bethlehem Pike CH 8-3377—Industrial OEM

NORTON & BLOCK (JOSEPH F & DANIEL) 91 E Shore Rd (Mt Lakes N J) DE 4-2921—N J, NE Penna, Met N Y (Long Island & West Chester Cos)—Components

\*O'HARA CO BRENDAN C 4952 Wynnefield Ave GR 3-3654—Hi-Fi/Audio—Warehouse

\*PARAGON SALES CO 11 S 22nd St RI 6-7060—Industrial OEM—Warehouse

\*PARK E L 651 Paddock Rd (Southampton Pa) EL 7-7805—Hi-Fi/Audio

\*PEARSON SALES CO R T 1125 York Rd (Abington Pa) TU 7-0186—Industrial OEM

\*POLYMETRIC DEVICES CO INC P O Box 236 (Glenside Pa) TU 7-4873—(Br) Silver Spring Md JU 8-1600—Washington D C, Del, Md, Southern N J, Eastern Penna, Va—Instruments

\*PUNNETT CO W M 74 Deer Path (Princeton N J) AS 1-6766—Industrial OEM

\*QUINLAN CO D G National Bank Bldg (Ambler Pa) MI 6-7250—Industrial OEM

\*RANDALL CO KEN 121 N Broad St LO 4-2151—Industrial OEM, Instrument—Warehouse

\*ROBINSON CO I E 144 Elizabeth St (W Conshohocken Pa) CH 8-1690—(Br) Park Pl Office Bldg Carlyle & Orchard Rds (Camp Hill Pa) RE 7-6791, 1317 Railroad Ave Asbury Park N J KE 1-3150—Southern N J, Eastern Penna—Instruments

\*ROTHENHEBER & CO 53 Crickett Ave (Ardmore Pa) TR 7-9090—Hi-Fi/Audio, Industrial OEM

\*SATTERTHWAITE CO W F Box 664 (Havertown Pa) SU 9-9600—Industrial OEM, Instrument

\*SCHOLLES CO WILLIAM R Box 104 (Cheltenham Pa) PI 5-2765—Industrial OEM, Instrument

\*SHELPS CO GEORGE A Box 254 (Glenside Pa) KI 6-1066—Industrial OEM

\*SIMBERKOFF SALES CO 1021 Levick St PI 3-2512—Hi-Fi/Audio, Industrial OEM, Instrument

SLUBIN & CO LEWIS 2305 Fairmont Ave (F E 6-2072—Washington D C, Del, Md, Southern N J, Penna, Va—Components

S & M ASSOC 595 Broad Ave (Ridgefield N J) WH 5-0080—Northern N J, Met N Y, Long Island—Components

SMITH OF PHILADELPHIA INC 1024 Race St WA 2-4393—Phila Area—Electrical Insulating Materials, Motor and Control Parts—Warehouse

S & S ASSOC INC 750 W De Kalb Pike P O Box 6 (King of Prussia) BR 9-7192—(Br) College Park Md AP 7-3777, Pittsburgh Pa CH 2-8594, Cleveland Ohio ME 1-7600—Southern N J (Including Mercer, Monmouth Cos) Penna, Del, Md, Va, W Va, Ohio, Wash D C

\*STRATTON CO C H 514 E Wadsworth Ave CH 7-7869—Industrial OEM

\*STINSON CO JOHN T 2124 Darby Rd (Havertown Pa) SU 9-7111—Hi-Fi/Audio, Industrial OEM

\*STOBBART CO ARTHUR J 56-14 Revere Rd (Drexel Hill Pa) CL 9-3881—Hi-Fi/Audio, Industrial OEM

\*TAYLOR CO MORRIS F 255 Bryn Mawr Ave (Lansdowne Pa) MA 2-0383—Hi-Fi/Audio, Industrial OEM, Instrument

\*TECHNICAL REPRESENTATION 220 S Easton Rd (Glenside Pa) TU 7-1325—Industrial OEM

△TEMCO INC 10 Tanner St (Haddonfield N J) HA 8-4400—Del, Ind, Md, N J, N Y, Ohio, Penna, W Va—Components, Instruments, Hi-Fi/Audio

\*TRINKLE SALES Manor Bldg West 7675 Maple Ave (Merchantville N J) NO 3-0363—Industrial OEM

\*WETTERHAHN CO 538 Buena Vista Ave (Maple Shade N J) NO 2-1611—Industrial OEM

WHIDDETT CO JOHN C 7714 West Chester Pike (Upper Darby Pa) TR 8-6400—Del, Southern N J, Eastern Penna—Instruments, Components—Warehouse

\*WHITE CO INC HARRY J 121 Covered Bridge Rd Barclay Farms (Haddonfield N J) HA 8-2304—Industrial OEM

### PITTSBURGH AREA

AUTOMATED EQUIPMENT AND ENGINEERING INC 9401 Northgate Dr (Allison Park) WE 1-7616—Eastern U S—Instruments

\*BEAR CORP NEAL 1974 Gregory Ave (Monroeville Pa) VA 3-5117—Industrial OEM—Warehouse

BILTMORE PRODUCTS CO INC 1501 Potomac Ave P O Box 7963—Northern Md, Eastern Ohio, Western Penna, W Va—Instruments

\*BEIL & WHITAKER INC 3623 Jacksonwald Ave (Reading Pa) FR 5-6837—Industrial OEM—Warehouse

\*COVERT ASSOC JACK 320 Jonquil Pl LE 1-4471—Industrial OEM

\*DIETRICH CO 703 Clairton Blvd TU 1-2228—Industrial OEM, Instrument

HOLLIDAY ROBERT L Box 10333 LO 1-7620—(Br) 1643 Lee Rd, Cleveland 18 Ohio FA 1-9339—Western N Y, Northeastern Ohio, Western Penna, W Va—Instruments—Warehouse

LASKA WALTER N 530 Sixth Ave GR 1-0490—Western Penna, W Va—Components, Instruments

LESKER CO KURT J 4535 Veman Ave Box 981444 TU 1-4666—(Br) 2014 E 46th St Cleveland 3 Ohio EX 1-7360—Ohio, Western Penna, W Va—Instruments—Warehouse

\*LEVINE ALBERT 11 Jonquil Pl LO 1-0772

\*LOWRY CO WILLIAM F 1494 Swantek St WA 1-2959—Industrial OEM, Instrument

\*MAC DONALD INC SAMUEL 335 Fifth Ave AT 1-2258—Hi-Fi/Audio, Instrument, Industrial OEM

\*MATES HY 5510 Hobart St HA 1-8998—Hi-Fi/Audio

\*OLSEN CO JOHN O 104 Elatan Dr BR 9-2250—Hi-Fi/Audio, Industrial OEM

\*PODOLNY CO JAMES H 5912 Penn Ave HI 1-0800—Hi-Fi/Audio, Industrial OEM—Warehouse

\*ROOT & CO GENE S 733 Vallejista Ave LO 1-4125—Industrial OEM

\*TANNER CO GEORGE 720 Gypsy La PI 1-5263—Hi-Fi/Audio, Industrial OEM

\*TAYLOR CO MORRIS F 5436 Youngridge Dr OL 5-7712—Hi-Fi/Audio, Industrial OEM, Instrument

AWHITAKER & SON EARL E 822 Wood St—FR 1-6220—Md, Ohio, W Penna, W Va—Instruments—Warehouse

\*YARUSSI CO F P 312 Spring Valley Rd CA 1-4676—Hi-Fi/Audio, Industrial OEM—Warehouse

### SOUTH CAROLINA

#### GREENWOOD

\*FAUSETT CO FLOYD Stony Point

#### ROCK HILL

\*JOYNER ASSOC J E Route 2 P O Box 182-A—Industrial OEM—Warehouse

### TENNESSEE

#### CHATTANOOGA

\*JOHNSON CO JESSIE P 413 Dome Bldg AM 6-1610—Industrial OEM, Hi-Fi/Audio

#### MEMPHIS

BRANCH-MERWIN TOOL SPECIALISTS 477 N Bellevue BR 4-6102—Ala, Ark, La, Miss, Tenn—Instruments

\*CARTWRIGHT & BEAN 5605 S Cooper St P O Box 5838 BR 6-4442—Hi-Fi/Audio, Industrial OEM, Instrument—Warehouse

\*ERGELMAN CO AL 3205 Crump Ave  
GL 8-6263—Hi-Fi/Audio, Industrial OEM,  
Instrument

ODEEN MARSHALL H 506 Cherry Rd  
MU 3-8505—Ala, Ark, W Fla, Ky, Miss,  
Tenn

#### NASHVILLE

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N Gallatin Rd AL 5-1344—Hi-Fi/Audio,  
Industrial OEM—Warehouse

#### TEXAS

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Kan, La, Okla, Tex—Components & In-  
struments

\*ALLIED COMPONENTS INC P O Box  
10203 RI 2-2830—Industrial OEM

\*ANDERSON CO GEO E 1901 Griffin RI  
1-5931—Warehouse

ANDY & ASSOC 5531 Dyer St Rm 216  
EM 8-8811—La, Okla, Tex, Ark

\*ANTLE-SMITH-DELZELL SALES 2721  
Brookfield Ave FL 7-7279—Hi-Fi/Audio,  
Industrial OEM—Warehouse

\*ASSOCIATED ELECTRONICS INC 6115  
Denton Dr FL 2-3389—Hi-Fi/Audio, In-  
dustrial OEM, Instrument—Warehouse

\*ATHANS SALES CO 516 S Central RI  
2-4450 — Hi-Fi/Audio, Industrial OEM,  
Warehouse

\*AYMOND CO EDWARD F 4312 Maple  
Ave LA 6-5233—Industrial OEM—Ware-  
house

\*BARNES CO ARNOLD 3606 Lemmon  
Ave LA 6-8735—(Br) T J Ray P O Box  
5417 Tulsa Okla NA 7-1515—Tex, Okla,  
La, Ark—Instruments, Data Sys, Test  
Eqmt, Microwave Eqmt—Warehouse

BENSON ENG'G CO 2514 W Mocking-  
bird Lane FL 2-7541—(Br) 2106 W 75th  
St Prairie Village 15 Kansas EN 2-2843,  
519 S Broadway Wichita Kansas AM 2-  
6971—Ark, Ia, Miss, Mo, Okla, Neb, Tex

\*BERTHOLD SALES CO 4411 Maple Ave  
LA 6-8329—Warehouse

\*BRANUM CO Box 14348 CH 7-7128—In-  
dustrial OEM—Warehouse

\*CAMPION SALES CO 9002 Chancellor  
Row FL 7-4095—Hi-Fi/Audio, Industrial  
OEM—Warehouse

\*CORRY CO HAL F 6315 Hillcrest Ave  
LA 8-9172—Hi-Fi/Audio, Instrument —  
Warehouse

COTTINGHAM BEARING & SERVICES  
Box 7606 401 Exposition Ave TA 4-2581—  
(Br) 2745 Irving Blvd Dallas Tex, 1015  
Riverside Rd Fort Worth Tex—150 Mille  
Radius of Dallas—Bearings, Seals, Power  
Transmission—Warehouse

\*CROCKETT SALES CO 2204 Griffin St  
RI 2-1777—Hi-Fi/Audio, Industrial OEM  
—Warehouse

\*GROSS & CO FRED P O Box 1926  
10665 Harry Hines Blvd FL 1-1837—In-  
dustrial OEM, Instrument—Warehouse

\*GUENTHER JOHN B 4533 N Central  
Expressway LA 6-6286—Industrial OEM,  
Instrument

HALE ENG'G SALES CO 3000 Bryn  
Mawr EM 8-1695—Tex, Okla, La, Ark—  
Components

\*HAYS CO W R 3416 Rosedale St EM  
3-2021—Hi-Fi/Audio—Warehouse

KEMP ENG'G CO 2618 Manana Dr FL  
7-6663—(Br) Kemp Eng'g Co 2020 Con-  
gress St Houston Tex CA 7-0748, 507  
Franklin St S E Huntsville Ala 534-5351,  
6414A Hampton St St Louis Mo FL 1-  
2175—Kan, Mo, Okla, Tex—Components  
& Instruments—Warehouse

\*KOCH ENG & SALES CO 309 Meadows  
Bldg EM 1-1765—Industrial OEM, In-  
strument—Warehouse

\*LIEBERMAN & ASSOC INC HANK

P O Box 12262 6170 Sherry Lane EM 3-  
8452—Hi-Fi/Audio—Warehouse

LIPSCOMB ASSOC EARL P O Box 7084  
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Stanton El Paso Tex, P O Box 6646 3825  
Richmond Ave Houston Tex—Ark, La,  
Miss, New Mex, Okla, Tex—Instruments  
—Warehouse

\*LUCAS SALES CO CHAS P O Box  
8606 WH 2-5958—Hi-Fi/Audio

\*LUND & CO 2215 N Olive St RI 8-8839  
—Industrial OEM

MC ADAMS CO W H "JACK" 6115  
Denton Dr FL 2-1551—(Br) 4211 Lurlene  
Houston Tex MI 9-8879—Shreveport, La,  
Okla, Texas—Electrical—Warehouse

MC CLINTOCK SALES CO INC 2631-37  
Commerce St RI 7-1519—Ark, La, Okla,  
Texas — Radio, Electronics, Hardware,  
Automotive Parts & Accessories

MC KINNEY SALES CO JACK F 1302  
Chemical St RI 1-1368—Hi-Fi/Audio, In-  
dustrial OEM, Instrument—Warehouse

MACRAE-SMITH CO P O Box 35113, FL  
1-1615—(Br) P O Box 19387 Houston 24  
Tex HO 5-7780—Ark, La, Okla, Texas—  
Electronic & Electromechanical Com-  
ponents, Instruments

MAYNARD SALES CO 2013 Cedar Springs  
RI 2-2027—Hi-Fi/Audio, Industrial OEM  
—Warehouse

\*NESBITT CO ROBERT E 1925 Cedar  
Springs RI 7-5824—Industrial OEM

NORVELL ASSOC INC 3603 Lemmon  
Ave LA 6-7861—Ark, La, Okla, Texas—  
Components

\*PACKARD ASSOC 404 Love Field Air  
Terminal Bldg FL 7-5713 — Industrial  
OEM, Instrument—Warehouse

\*PECK CO GORDON V 130 Casa Linda  
Plaza DA 1-6579—Industrial OEM—Ware-  
house

RIDER CO W N 6234 Peeler St FL 7-  
2246—Texas, Okla, Kansas, Mo—Com-  
ponents, Instrument

SCANLON CO P J 2608 Inwood Rd FL  
1-9991—Ark, La, Okla, Tex—Components  
—Warehouse

\*SCHOONMAKER CO INC J Y P O Box  
35266 LA 6-7233—Hi-Fi/Audio, Industrial  
OEM, Instrument—Warehouse

\*SMITH CO J EARL P O Box 35331 Air-  
lawn St FL 7-1727—Hi-Fi/Audio, Indus-  
trial OEM—Warehouse

\*SOUTHWEST ELECTRONIC INDUS-  
TRIES 273 Meadows Bldg EM 3-1671—  
Industrial OEM, Instrument

SYKES ASSOC INC V J P O Box 35012  
2608 Inwood Rd—Tex, Ark, Kan, La,  
Okla—Components Instruments

\*TEXPORT CO 2147 Farrington RI 7-  
6886 — Hi-Fi/Audio, Industrial OEM—  
Warehouse

\*THOMSON ENGINEERING SERVICE  
2520 Oak Lawn LA 6-8741—(Br) 8230  
Forsyth Blvd St Louis 5 Mo—Kan, Mo,  
Okla, Tex—Components, Instruments

\*WILKS CO ERNEST L 1212 Camp St  
RI 7-2637—Hi-Fi/Audio—Warehouse

AWRIGHT INDUSTRIAL PRODUCTS  
CO 5738 N Central Expwy TA 4-2571—  
(Br) 1931 Lexington Houston Tex JA 6-  
3509—S Kansas, Okla, Texas—Compon-  
ents—Warehouse

\*WYBORN SALES CO 408 Merchan-  
dise Mart Bldg RI 8-6139—Hi-Fi/Audio,  
Industrial OEM, Instrument—Warehouse

\*YOUNT CO JACK 1431 Pleasant Dr  
P O Box 17270 Ex 1-1631—Hi-Fi/Audio,  
Industrial OEM Warehouse

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ΔKRUTILEK GEO A P O Box 227 LO  
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Instruments, Hi-Fi/Audio, Radio TV  
Sets, Citizen Band & Amateur Equip-  
ment

\*ΔSTEPCO 1035 Eastside P O Box 8626

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Tex DU 2-6017

HOOD OSCAR H P O Box 11027 WA  
6-1381—Ark, La, Okla, Texas—Casting &  
Fasteners

KENCAR CO 3405 Bilglade Rd P O Box  
6770 WA 3-4476—Okla, Texas—Compon-  
ents, Instruments, Hi-Fi, Radio, TV

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WA 3-4657 — (Br) Dallas Texas TA  
3-3013, Houston Tex MA 3-4112, Joplin  
Mo SU 1-0333—Ark, La, Okla, Tex, Kan,  
(part of Mo)—Electronic Instruments

#### HOUSTON

BRENNER ELECTRICAL SALES 305  
Velasco St P O Box 51 CA 5-0766—La,  
Okla, Texas—Warehouse

EADS CO 1115 Dunlavy P O Box 13071  
JA 6-1646—(Br) P O Box 8204 Dallas  
5 Texas EM 3-3637—Tex—Components  
—Warehouse

GAY SALES CO INC 5425 Blossom St  
P O Box 13232 UN 9-3306—La, Tex,  
Components—Warehouse

HOUSTON INDUSTRIAL SUPPLY CO  
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\*KLICPERA Co M F P O Box 3113 JA  
2-3459—Industrial OEM—Warehouse

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ern Texas—Warehouse

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EL 9-1101—Industrial OEM, Instrument

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CR 7-7712—(Br) 3105 N 6th Ave Phoenix  
Ariz CR 9-0434, 1248 Santa Fe Dr Den-  
ver Colo AL 5-1287—Ariz, Colo, Ida,  
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Utah—Instrument—Warehouse

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13th CR 7-0459—Idaho, Nev, Utah, Wyo—  
Instruments—Warehouse

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South P O Box 1054 IN 6-8683—Utah,  
S Idaho, E Nev, W Wyo—Warehouse

\*STEVENSON CO RALPH 2045 Walker  
Lane P O Box 17495 CR 7-2515—Hi-  
Fi/Audio, Industrial OEM, Instrument—  
Warehouse

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Eastern Nevada, Utah, Western Wyo

UTAH COMMUNICATIONS INC 50 S  
W Temple DA 8-0251—Salt Lake City &  
Surrounding Area—Radio—Warehouse

VAN WAGONER CO T R 1415 S Main  
St IN 8-2461—Idaho, Mont, Utah, Colo,  
Wyo—Components

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D C, Del, Md, Va—Instruments, Com-  
ponents

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HILDENBRAND CO P O Box 1061 CR  
3-2334—D C, Md, Va

#### RICHMOND

MARTIN & CO E P O Box 4586 1306 Vas-  
sar Rd AT 8-8985—Va

#### SALEM

MORRIS PE LYNN H P O Box 349 DU  
9-5788—Tenn (Eastern Cos), Va (excepting  
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\*ARVA INC 1320 Prospect MA 2-0177—  
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house

\*BACKER CO JAMES J 221 W Galer  
St P O Box 9077 AT 3-6470—Hi-Fi/Au-  
dio, Industrial OEM, Instrument—  
Warehouse

\*CHAMPLIN CO DAVE 12528 22nd N  
E EM 2-0401—Industrial OEM, Hi-Fi/  
Audio—Warehouse

DOOLEY CO INC J K 3215 Western  
Ave AT 4-8313—W Idaho, W Mont,  
Ore, Wash—Components, Instrumenta-  
tion OEM—Warehouse

\*DRAKE ASSOC INC RUSH S 1817 Nor-  
man St EA 3-8545—Industrial OEM, In-  
strument

EICHER & CO 5 W Harrison St AT  
4-1811—Northern Idaho, Ore, Wash—  
Components, Instruments—Warehouse

FIBERGLASS & CHEMICAL SERV-  
ICES 1220 W Nickerson AT 3-1995—  
Alaska, Idaho, Mont, Ore, Wash, B C  
Canada—Warehouse

\*HAIGHT CO FRED H 3212 Eastlake  
Ave EA 2-1818—Hi-Fi/Audio, Industrial  
OEM, Instrument—Warehouse

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Boeing Field Pa 5-7990—Idaho, Mont,  
Ore, Wash, B C Canada

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69th LA 4-5170—Hi-Fi/Audio, Industrial  
OEM, Instrument—Warehouse

\*LANPHEAR CO WILLIAM R 3215  
Western Ave AT 4-8150—Hi-Fi/Audio,  
Industrial OEM—Warehouse

\*LEVINSON CO HARRY 1117 Second  
Ave MA 2-5433—Industrial OEM, In-  
strument—Warehouse

McDOUGALL CO J C 520 First Ave  
MA 2-7667—Alaska, Northern Idaho,  
Ore, Wash, B C Canada—Instruments  
—Warehouse

\*MARSH AGENCIES INC 2601 First  
Ave MA 2-8761—Hi-Fi/Audio, Industrial  
OEM, Instrument—Warehouse

\*MERRITT CO RON 1320 Prospect MU  
2-7337—Hi-Fi/Audio—Warehouse

\*NORTHWESTERN AGENCIES INC  
4130 1st Ave MA 3-8882—Hi-Fi/Audio,  
Industrial OEM—Warehouse

\*PARAMOUNT 9210 28th Ave SU 4-6447  
—Hi-Fi/Audio, Industrial OEM, Instru-  
ment—Warehouse

\*PARSON & CO C B 3028 First Ave MU  
2-6780—Hi-Fi/Audio, Industrial OEM,  
Instrument—Warehouse

\*PORTER CO BURT C 1209 Poplar  
Place EA 3-8330—Hi-Fi/Audio Industrial  
OEM, Instrument—Warehouse

REMCO 2745 Mt St Helens PA 3-3400—  
Ida, Ore, Wash—Instruments—Compo-  
nents

RYBERG ROY E PO Box 4112 AT 2-4627  
—Western Idaho, Ore, Wash, B C Canada

\*SCHULTZ CO N R 4227 Airport Way  
MA 4-8650—Ida, Ore, Wash—Industrial  
OEM, Instrument—Warehouse

\*SEATRONICS INC 1817 Norman St EA  
3-8545—Industrial OEM—Warehouse

SELO ELECTRIC CO INC 1050 N 38th St  
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Warehouse

\*SMITH SALES CO DON 2320 N 45th  
St ME 3-3160—Industrial OEM, Instru-  
ment—Warehouse

SMITH & CO MYRON R 6359 First  
Ave So PA 5-1665—Electronic Compon-  
ents

\*STROUM CO INC SAMUEL N 621  
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STULGIS CO INC W J 608 W Crockett  
AT 2-7870—Idaho, Ore, Wash, B C  
(Canada)—Components

TECHNICAL SALES CO 204 West Lu-  
cile PA 5-9440—Northwest States—Air-  
craft—Missile Instrumentation

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Control Systems, Test Equipment

\*WIDDEKIND CO M K 222 First St  
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Instrument—Warehouse

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\*AARON & ASSOC IRVIN I 829 N  
Marshall St BR 6-8515—(Br) 614 E Grant  
St Minneapolis 4 Minn FE 6-6659—Upper  
Mich, Minn, N D, S D, Wis—Components

\*DICKINSON & ASSOC E A 4117 N  
Green Bay Ave CO 4-1080—Industrial  
OEM

ΔHONKAMP SALES CO 2223 N 70th  
St SP 4-6258—(Br) WO 4-2111—Minn,  
Wisc—Electrical Components & Parts

JACOBS CO MORRIS F 2218 N Third  
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tawa CE 2-9821—Canada—Instruments &  
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ton BE 1-7633—Ont & Que—Industrial  
Components—Warehouse

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CONSTELLATION COMPONENTS CO  
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NESS & CO H A 698 Weston Rd (To-  
ronto) 9 RO 6-4151—Canada—Fastening  
Devices—Warehouse

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# ALPHABETICAL LISTING OF

CIRCLE THE NUMBERS OPPOSITE THE NAMES OF THE

- 185 Acme Electric Corporation—High reliability transformers.
- 22 ADC Incorporated—Transformers filters reactors.
- 32 Adelman Co., Leon L.—Manufacturers representative.
- 174 Aerovox Corporation—Solid tantalum capacitors.
- 175 Aerovox Corporation—Solid tantalum capacitors distribution.
- 230 Aladdin Electronics—Pulse and wide-band transformers and inductors.
- 84 Allam Products Company—Plug-in components, plugs and connectors.
- 11 Allford Manufacturing Co.—RF instruments and coaxial components.
- 22 Allen-Bradley Company—Adjustable fixed resistors.
- 61 Alite Division U. S. Stoneware—Ceramic to metal seals.
- 39 Allied Chemical Division General Chemical—Electronic chemicals.
- 235 Alpha Metals—Flux filled solder waxes, etc.
- 29 Alpha Wire Corporation—Wire & cable.
- 216 Alpha Wire Corporation—Shrinkable tubing.
- 99 American Airlines—Air Transportation.
- 193 American Machine & Foundry Company—Multi-color indicators and switches.
- 41 American Optical Company—A channel direct writing recorder.
- 111 American Semiconductor Corp.—Silicon diodes & rectifiers.
- 119 American Sterilizer—Flexible film laboratory dry box.
- 80 American Super—Temperature Wires Inc.—High temperature wire and cable.
- 45 AMP Inc.—Crimped splices.
- 212 Ampere Electronic Corporation—Electronic tubes.
- 143 Amphenol Connector Division Amphenol-Borg Electronics Corp.—Microminiature connectors.
- 66 Amphenol RF Products Division Amphenol-Borg Electronics Corp.—Coaxial switches & connectors & coaxial cable & wire.
- 136 Antenna Systems Inc.—30 foot mobile antenna.
- 173 Arco Electronics Inc.—Transformer distribution.
- 214 Arco Electronics Inc.—Capacitors distribution.
- 72 Arco Steel Corporation—Magnetic alloys.
- 73 Arnold Magnetics Corp.—Solid state power supplies.
- 182 Arns Research Associates—Ultra broadband variable attenuators.
- 234 Artus Engineering Co.—Wire finishing machine.
- 242 Associated Testing Laboratories, Inc.—Environmental chambers, product testing.
- 142 Avco Corporation—Space & Missile engineering.
- 38 Ballantine Laboratories, Inc.—Electronic voltmeters.
- 229 Bead Chain Manufacturing Co., The—Tiny metal tubular parts.
- 254 Beckman Helipot Division of Beckman Instruments, Inc.—Trimming potentiometers.
- 74 Bendix Corporation Electron Tube Products, Red Hook Div.—Ceramic terminals.
- 154 Bendix Corporation Pioneer-Central Div.—Ultrasonic cleaner.
- 113 Bendix Corporation Semiconductor Division—Power switching translators.
- 36 Bendix Corporation Scintilla Division—High temperature capacitors.
- 120 Bishop & Company, J.—Tubing alloys wires & fabricated specialties.
- 161 Boehme, Inc., H. O.—Precision electrical, electro-mechanical and electronic equipment.
- 147 Bounton Electronics Corp.—Test equipment.
- 28 Borg Equipment Division—Potentiometers turn-counting dials & frequency standards.
- 27 Bourne Inc.—Trimmer potentiometer.
- 122 Bradley Semiconductor Corp.—Silicon rectifiers.
- 243 Branson Corp.—4 pole crystal can relay.
- 193 Bruno-New York Industries Corp.—Pig tailoring machine.
- 19 Brush Instruments Div. of Clevite Corp.—Data recorder.
- 249 Bulova Electronics Division—Narrow band filter.
- 149 Burgess Battery Company—Batteries of all types.
- 217 Burroughs Corp.—Indicator tubes.
- 60 Bussmann Mfg. Division—Fuses.

YOUR NAME ..... TITLE ..... **JUNE 1961**

FIRM ADDRESS .....

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## ELECTRONIC INDUSTRIES

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Philadelphia 4, Pennsylvania



- 163 Cannon Electric Co.—Audio plugs.
- 90 CBS Electronics Semiconductor Div.—Micro alloy resistors.
- 168 Celco Constantine Engineering Laboratories Co.—Yokes.
- 186 Celco Constantine Engineering Laboratories Co.—Deflection yokes.
- 12 Centralab Electronics Div. of Globe-Union Inc.—Rotary switches.
- 148 Chicago Dynamic Industries Inc.—Thumbwheel switch modules.
- 124 Christie Electric Corp.—I-C power supplies.
- 227 Chromalloy Corp.—Chromalized glass to metal seals.
- 66 Cinch Manufacturing Company—Connector blocks.
- 268 Clare & Co., C. P.—Mercury-wetted relays.
- 20 Clarostat Mfg. Company, Inc.—Encapsulated potentiometers.
- 14 Cleveland Container Company, The—Phenolic tubing.
- 106 Clevite Transistor—Power transistors.
- 73 Columbian Carbon Company—Iron oxide reagents.
- 257 Columbian Financial Corp.—Investment opportunities.
- 118 Conforming Matrix Corp.—Remote masking spray coater.
- 64 Conra—Broadcast TV monitors.
- 64 Consolidated Electrodynamics—Leak detector.
- 241 Consolidated Vacuum Corp.—Vacuum pumping system.
- 143 Continental Connector Corp.—Precision electronic connectors.
- 123 Controls Company of America—Push-button switches.
- 84 Corning Electronic Components—Trimmer capacitors.
- 249 Curtiss-Wright Corp.—Thermal time delay relays.
- 250 Curtiss-Wright Corp.—Low cost time delay relays.
- 213 Custom Components Inc.—Attenuator materials.
- 88 Dale Electronics, Inc.—Miniature power resistors, deposited carbon and metal film resistors & wire wound trimmer potentiometers.
- 192 Daven Company, The—Wire wound resistor networks.
- 169 Davies Molding Company, Harry—Knobs, handles, feet, pulls, etc.
- 47 Daystrom, Inc.—Square trimming potentiometers.
- 87 Deleo Radio—Power transistors.
- 124 Deleo Radio—Lower power silicon digital modules.
- 210 Deutsch Company—Miniature electrical connectors.
- 196 Dialight Corporation—Multiple indicator lights.
- 49 Dit-Mco, Inc.—Automatic logic circuit tester.
- 234 Dorsett Electronics, Inc.—Electronic orxen kit.
- 21 Dow Corning Corp.—Dielectric silicone encapsulating compound.

# ADVERTISERS IN THIS ISSUE

ADVERTISERS FROM WHOM YOU DESIRE FURTHER INFORMATION

- 22 Dow Corning Corp.—Silicon-glass laminate.
- 23 Dow Corning Corp.—Fluid silicone rubber.
- 24 Dow Corning Corp.—Heat-sink sealant.
- 259 EICO Electronic Instruments Co., Inc.—Electronics catalog.
- 67 Eitel-McCullough, Inc.—Klystron.
- 232 Eisler Engineering Co., Inc.—Welders and accessories.
- 133 Electrical Industries — Glass-to-metal seals.
- 178 Electrical Manufactures Services—Solid tantalum capacitors distribution.
- 138 Electra Manufacturing Co.—Metal film and carbon film resistors.
- 226 Electro Impulse Laboratory—Power and meters cooling units.
- 110 Electro Motive Mfg. Co., Inc., The—Mylar-paper dipped capacitors.
- 30 Elgin National Watch Co., Electronics Div.—Miniature dpdt relay.
- 44 Engineered Electronics Co.—Packaged circuit modules.
- 181 Fairchild Semiconductor Corp. — Transistor/diode multiples.
- 199 Fenwal Electronics—Thermistors.
- 61 Film Capacitors, Inc.—Precision capacitors.
- 146 Fluke Mfg. Co., Inc., John—Precision test instruments.
- 94 Frequency Standards — Direct reading microwave wavemeters.
- 97 Franco County—Industrial plant sites.
- 220 Frontier Electronics Co. — Missile and military systems components.

- 65 General Electric, Power Tube Dept.—Voltage-tunable magnetrons and traveling-wave tubes.
- 83 General Electric, Semiconductor Products Dept.—Medium power silicon mesa transistors.
- 59 General Instrument Corp.—Germanium alloyed-junction and diffusion-base transistors, double-diffused silicon mesa transistor.

## PROFESSIONAL ENGINEERING OPPORTUNITIES

Circle number of company on card at right whom you desire further information.

- 803 Argonne National Laboratory.
- 801 Boeing Airplane Company, Wichita Division.
- 802 National Cash Register Company, The.

- 109 General Instrument Corp.—Silicon diodes and germanium glass diodes.
- 49 General Magnetics, Inc. — Magnetic modulators.
- 197 General Products Corp. — Solid-block terminal boards.
- 100 General Radio Company—Transfer function and impedance bridge.
- 238 Gertsch Products, Inc.—Complex ratio bridges.
- 207 Good-All Electric Mfg. Co.—Mylar dielectric capacitors.
- 150 Gould-National Batteries, Inc.—Nickel cadmium rechargeable batteries.
- 239 Graphic Systems—Visual control board.
- 164 Greiner Mfg. Co.—R F adapters.

- 201 Havig Industries, Taunton Div.—Precision molded insulating material.
- 144 Hewlett-Packard Company—Audio telemetry and low frequency oscillators.
- 148 Hewlett-Packard Company—Null voltmeter.
- 46 Hewlett-Packard Company—Individually calibrated voltmeters.
- 5 Hill Electronics, Inc.—Electronic filters.
- 106 Hoffman Electronics Corp.—Silicon semiconductor devices.
- 91 Honeywell—Power transistors.
- 69 Hughes Aircraft Company, Microwave Tube Div.—Traveling wave tube.
- 20 Hughes Aircraft Company, Semiconductor Div.—Silicon alloy diodes.
- 71 Hughes Aircraft Company, Vacuum Tube Products Div.—Cathode ray storage tube.
- 240 Hughey & Phillips, Inc.—Obstruction lighting.

Employment—Use the handy card below to get more information on the engineering positions.

- 86 Industrial Electronic Engineers, Inc.—Binary decoding digital readout devices.
- 18 Industrial Test Equipment Co. — AC electronic generator.
- 155 Ingersoll Products Division of Borg-Warner Corp.—Standard cabinets.
- 189 Institute of Radio Engineers, The—Proceedings of the IRE.
- 129 International Electronic Research Corp.—Heat dissipating electron tube shields.
- 107 International Rectifier Corp. — Diodes and rectifying cells.
- 25 International Resistance Company — Trimmer potentiometers.
- 7 ITT Electron Tube Dept. Electron tube products.
- 162 Jennings Radio Mfg Corp. — Vacuum capacitors.
- 76 JFD Electronics Corp.—Trimmer piston capacitors.
- 80 Johnson Company, E. F.—Nylon printed circuit plug and jacks.
- 194 Jones Division, Howard B.—Plugs and sockets.
- 15 Julie Research Laboratories, Inc.—Precision table encapsulated resistors.
- 133 Kahle Engineering Company—Automation equipment for semiconductors & tubes.
- 181 Kay Electric Company—Sweeping oscillator.
- 219 Kelvin Electric Company—Precision resistors.
- 176 Kemet Company Div. Union Carbide—Solid tantalum capacitors.
- 177 Kemet Company Div. Union Carbide—Solid tantalum capacitors distributor.
- 53 Keyatone Carbon Company—Thermistor.
- 182 Klein & Sons, Mathias—Electronic pliers.
- 17 Kulka Electric Corp.—Toggle switches.
- 245 Lavoie Laboratories, Inc.—Resistance & impedance tester.
- 128 Lel Inc.—Telemetry preamplifier.
- 260 Lens Electric Manufacturing Co.—Double channel audio cable.
- 10 Lionel Corp., The Telrad Division—R-F systems, instruments and components.
- 6 Magnetic Shield Div. Perfection Mica Co.—Magnetic shielding foils.
- 204 Marconi Instruments—Universal bridge.
- 179 Marshall Company, G. S.—High voltage solid tantalum capacitors distributors.
- 255 Masterite Industries — Printed circuit connectors.
- 232 McLann Engineering Laboratories — Electronic fans and blowers.

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## PROFESSIONAL ENGINEERING OPPORTUNITIES

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801	806	811	816	821
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YOUR NAME ..... TITLE .....

HOME ADDRESS .....

CITY OR TOWN ..... ZONE ..... STATE .....

YOUR NAME ..... TITLE .....

JUNE 1961

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- 266 Mepec, Inc. — Precision wire wound power resistors.
- 134 Metals & Controls Inc. Div. Texas Instruments, Inc.—Silver Electroplated strips.
- 65 Methode Manufacturing Corp.—Printed wiring boards.
- 247 Microlab—Microwave component catalog.
- 102 Microwave Associates, Inc.—Computer diodes.
- 76 Midland Manufacturing Co.—Bandwidth crystal filters.
- 82 Miller-Stephenson Chemical Co., Inc.—Fluorocarbon mold release-lubricant.
- 6 Minnesota Mining and Manufacturing Co., Irvington Division—Heat reactive tubing.
- 40 Minnesota Mining and Manufacturing Co., Magnetic Products Div.—High resolution tapes.
- 77 Motorola Communications & Electronics, Inc.—Precision frequency standards.
- 92 Motorola Semiconductor Products, Inc.—Power transistor.
- 88 Mueller Brass Co.—Brass component design and manufacture.
- 69 Mueller Brass Co.—Design assistance.
- 60 National Ultrasonic Corporation—Ultrasonic cleaner.
- 221 Non-Linear Systems, Inc.—Digital voltmeter.
- 202 Oak Manufacturing Co.—High temperature switch sections.
- 81 Ohmite Manufacturing Company—Adjustable resistors.
- 106 Pacific Semiconductors, Inc.—Reference zener diodes.
- 172 Panoramic Electronics, Inc.—Spectrum analysis.
- 262 Pennwood Numechron Co.—Digital clock.
- 195 Philco Lansdale Division—Transistors.
- 218 Plastic Capacitors, Inc.—Plastic capacitors.
- 43 Polarad Electronics Corp.—Microwave equipment.
- 223 Polyphase Instrument Co.—Transistor pulse transformers.
- 246 Potter & Brumfield—4PDT power relay switches.
- 190 Potter Instrument Company, Inc.—High speed digital magnetic tape handler.
- 131 Power Designs Inc.—Semi-conductor power supply.
- 167 Powertron Ultrasonics Corp.—Ultrasonic cleaning equipment.
- 3 PRD Electronics, Inc.—Portable klystron power supply.
- 188 Precision Instrument Company—All-solid-state instrumentation tape recorder.
- 244 Pyramid Electric Company—Tantalum capacitors.
- 220 Radiation Research Corp.—Teflon coated capacitors.
- 140 Radio Corporation of America Defense Electronic Products—Missile & space equipment engineering.
- 86 Rayclad Tubes Inc.—Heat shrinkable sleeves.
- 154 Raytheon Company Industrial Components Div.—Frame grid subminiature tubes.
- 224 Reeves-Hoffman Div. of Dynamics Corp. of America—Precision crystal oscillator.
- 187 Reeves Soundcraft Corp.—Instrumentation tape.
- 178 Rockwell Products Corp.—Leak sealing gasket assembly.
- 161 Rohn Manufacturing Co.—Communication tower.
- 206 Rondo of America Inc.—Paper packaging units.
- 191 Rotax Inc.—Hysteresis synchronous motors.
- 157 Rotron Mfg. Co., Inc.—Cooling fans.
- 2 Sanganio Electric Company—Electrolytic paper & mica capacitors & inductive components.
- 1 Sanganio Electric Company—Magnetic tape instrumentation recorder reproducers.
- 114 Sarks-Tarjian, Inc.—Silicon rectifiers.
- 42 Scientific-Atlantic, Inc.—Antenna pattern analyzers.
- 189 Selectrons, Ltd.—Wave guide plating.
- 120 Semiconductor Specialists Inc.—Semi-conductor distributors.
- 82 Shalcruss Manufacturing Co.—Miniature switches.
- 112 Shockley Transistor—4-layer diode.
- 167 Shure Brothers, Inc.—Communications microphones.
- 103 Slater Electric Inc.—Silicon rectifier.
- 127 Sola Electric Co.—D-C power supply.
- 163 Sonotone Corp.—Electronic tubes.
- 169 Sonotone Corp.—Ceramic microphones.
- 206 Spectrol Electronics Corporation—Trimming potentiometers.
- 117 Sperry Semiconductor—Silicon transistors.
- 180 Sprague Electric Co.—Metal film resistors.
- 118 Sprague Electric Co.—MADT transistors.
- 62 Sprague Electric Co.—Ceramic capacitors.
- 8 Stackpole Carbon Company—Slide switches.
- 166 Stainiams, Inc.—Tower tips.
- 130 Standard Glove Co. of New Jersey—Electronic assembly work gloves.
- 64 Stevens Manufacturing Co., Inc.—Thermostats.
- 223 Stewart Engineering Corp.—Barkward wave oscillators.
- 170 Stromberg-Carlson—Telephone-type components.
- 260 Su-Mark Roat Inc.—Fibreglass.
- 253 Superior Steatite & Lava Corp.—Steatite ceramic & lava insulators.
- 116 Superior Tube—Glass sealing alloy for semiconductors.
- 63 Syntronic Instruments, Inc.—Yokes.

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Philadelphia 4, Pennsylvania

- 231 TA Mfg. Corp.—Instrument cases.
- 13 Technical Wire Products, Inc.—Dry circuit contact.
- 81 Tektronix, Inc.—Oscilloscopes engineering service.
- 16 Telechrome Mfg. Corp.—Teletyping transmitter.
- 163 Tensar Electric Development Co., Inc.—Test equipment.
- 79 Texas Instruments Inc.—Hard glass encapsulated resistors.
- 182 Times Wire & Cable Division—Connectable assemblies.
- 156 Times Wire & Cable Division—Coaxial cables.
- 251 Tower Construction Co.—Erection of towers, reflectors, buildings, etc.
- 96 Transistor Electronics Corp.—Transistor-diode tester.
- 110 Transistron Electronic Corp.—Silicon controlled rectifiers.
- 95 Tung-sol Electric Inc.—Germanium transistors.
- 70 Tung-Sol Electric Inc.—Electron tubes.
- 171 Ultrasonic Industries—Ultrasonic cleaner.
- 67 United Van Lines—Transportation & moving.
- 87 Vapor Heating Corp.—Mercury thermopiles.
- 261 Varflex Corporation—Electrical insulating tubing and sleeving.
- 98 Varian Associates—Reflex klystrons.
- 208 Vector Electronic Company—Structures for circuitry.
- 211 Victoreen—High impedance low current resistors.
- 209 Walker Company, George—Strain reliefs.
- 237 Waveline Inc.—Microwave instruments and components.
- 105 Werkesser Company—Wedge lock band clamp.
- 238 Weller Electric Corp.—Controlled temperature soldering irons.
- 104 Westinghouse Electric Corp., Semiconductor Div.—Silicon rectifiers.
- 186 Neelite Hand Tools—Soldering gun.
- 256 Zieris Manufacturing Corp.—Hooks, clips & terminals.



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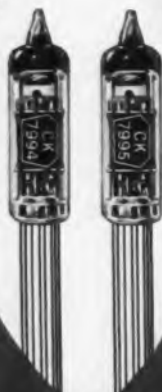
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# Standard Frequency Stations

*Increased space exploration requires extremely accurate time at widely separated earth locations.*

*This article lists most of the standard frequency stations heard throughout the world.*

WHILE we can usually receive at least one time station at any time, a great part of the time we may receive more than one station on the same frequency. Thus, caution should be exercised in the use of the stations.

Table 1 lists the more popular time and standard frequency stations in the h-f band. They generally operate 24 hrs./day on frequencies allocated by international agreement in 1947. These frequency bands are 2500  $\pm$  5KC; 5000  $\pm$  5KC; 10,000  $\pm$  5KC; 15,00  $\pm$  10KC; 20,000  $\pm$  10KC; 25,000  $\pm$  10KC.

Most of the stations listed have been received in San Antonio, Texas, at one time or another; some of them, many hours per day throughout the year. These are as follows, with the frequencies and distance from San Antonio given:

WWV, 2.5-25MC, 1200 statute miles; WWVH, 5, 10, 15MC, 3600 mi; JJY, 5, 10, 15MC, 6700 mi; LOL, 5, 10, 15MC, 5200 mi; MSF, 10MC, 5000 mi; RES/RWM, 10MC, 10,000 mi (night time great circle); BPV, 5, 10MC, 7,000 mi; ZUO, 5MC, 9300 mi; CHU, 3.330, 7.335, 14.670MC, 1600 mi.

The largest number received at one time on one frequency (5MC, 0800 CST) is four: WWV, WWVH, JJY, BPV.

During the four-minute silent period of WWVH, 45 min. past the hour, it is possible to "look out" and hear the weaker ones. How-

ever, sometimes propagation conditions are such that the distant stations override WWVH, as when receiving ZUO on 5MC using a transistor radio with a 2 ft. whip, inside a frame house.

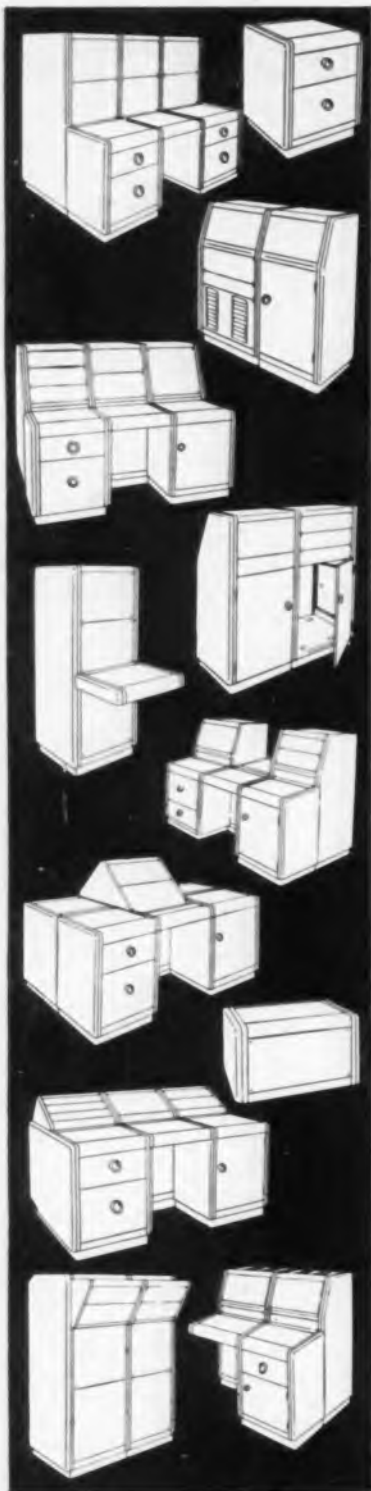
When using the occurrence of the time ticks as a reference, it is necessary to consider the ionospheric transit time. The local clock must be set to be fast by the amount of expected transit time to the station. There are times when ticks received from distant stations are tenths of a second behind the nearest time station used as a reference. The ear can resolve two pulses which are separated by the order of one-tenth second. This is the length of the double tick given on the minute by WWVH. At times, the ticks from WWV and LOL arrive with sufficient difference to have this double tick when received in the late afternoon. Occasionally, double ticks are heard on WWVH, though the ticks are usually blended into one by the ear.

The tick pulses of most of the time stations are .005 sec. long, or 5 cycles of a 1000 cycle tone. The pulse is resolved by the ear as a tick instead of a tone. If the tone is made to last for about .1 sec., as MSF does on the minute, the ear hears a tone instead of a tick. With practice the ear can tell the difference between the 5 cycles of 1000 cps of WWV and the 6 cycles of 1200 cps of WWVH. When com-

pared, the WWV pulses sound like "tock" and WWVH pulses sound like "tick." This is due to the higher frequency of the WWVH pulses.

Radiated harmonics of the various time stations are easily received, even at great distances. They are not ordinarily noticed because they fall on top of other authorized frequencies. In almost all cases, the weak harmonic is covered up by a strong fundamental. However, harmonics of WWVH are quite easily observed at 30MC since there are presently no fundamentals of any of the time stations at that frequency. Depending on the MUF, WWVH is received on 30MC usually in the afternoon in San Antonio. Since these stations use single upper sideband to generate the 440 and 600 cycle tones, the resultant harmonic tones at 30MC are displayed by 2 or 3 times the tone frequency and appear as 1200 and 1800 cycle tones in the case of the 600 cycle tone. These sidetone carriers are produced by the 2nd harmonic of 15MC and the 3rd harmonic of 10MC. The voice announcements, code announcements and time ticks sound natural at the harmonic frequencies because the harmonics are modulated, along with the fundamental, after they are generated (undesirably) within the transmitter.

WWVH power output is 2kw on  
(Continued on page 441)



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each frequency. Harmonic radiation at 30MC is more than 40db down so that the amount of power radiated at 30MC is less than 0.2 watts from the antenna not matched. Thirty-six hundred miles is quite a distance to receive a 0.2

## STANDARD FREQUENCY STATIONS

watt signal after sky wave losses! In the event time station reception is not strong enough to hear the ticks or tones, it is possible to

note the appearance and disappearance of the sideband carrier through use of the receiver beat  
(Continued on page 443)

### L-F STANDARD FREQUENCY AND TIME STATIONS

Station Call	WWVL	WWVB	NBA	MSF	GBR	DCF77	OMA
Location	Sunset Canyon, Colo.	Boulder, Colo.	Balboa, Canal Zone	Rugby, England	Rugby, England	Federal German Republic	Czechoslovakia
Frequency (KC)	20	60	18	80	16	77.5	50
Power (KW)	.02	.0015	100	10	300	12	5
Identification (Emission)	A0; WWVL A1 code sent every 20 min	A0; WWVB A1 code sent every 20 min	Carrier keyed dashes sent each sec; 29th and 58-59th dash omitted ea. min NBA A1 call sent	.....	second dashes are .1 sec; minute pulses .5 sec long. Beginning of pulse is exact time. GBR call sent 4 times	1, 200, 440 cps	.....
Duration of Service	continuous	continuous 1530 UT Monday to 2400 UT Friday	continuous	from 1429 to 1530 UT	from 0955-1000 and 1755-1800 UT	.....	.....

### H-F STANDARD FREQUENCY AND TIME STATIONS

Station Call	WWV	WWVH	JJY	MSF	LOL	RES RWM	BPV
Location	Washington, D. C. (Beltsville, Md.)	Maui, Hawaii	Tokyo, Japan	Rugby, England	Buenos Aires, Argentina	Moscow, Russia	Peking, China
Frequency (MC S)	2.5, 5, 10, 15, 20, 25	5, 10, 15	2.5, <sup>11</sup> 5, 10, 15	2.5, 5, 10	5, 10, 15	5, 10	5, 10
Power (KW)	1, 8, 9, 9, 1, .1	2	1	2	2	.....	.....
Tone (cps)	440 <sup>1</sup> or 600 <sup>1,2,3</sup>	440 <sup>1</sup> or 600 <sup>1,3,4</sup>	1000	none	440, 1000	none	none
Duration of Tone (min)	3 in every 5 <sup>4</sup>	3 in every 5	4 in every 5	none	4 in every 5	none	none
Time Pulse (pps)	1 <sup>4</sup> , 5 cycle of 1000 cps	1 <sup>4</sup> , 6 cycle of 1200 cps	1 <sup>4</sup>	1, 5 cycle of 1000 cps	1, 5 cycle of 1000 cps	none	1 <sup>20</sup>
Identification	voice every 5 min	code every 5 min	code, voice every 5 min	code, voice every 15 min	code, voice every 5 min	code every 15 min <sup>19</sup>	code <sup>21</sup>
Duration of Service	continuous <sup>7</sup>	continuous <sup>8</sup>	continuous <sup>12</sup>	continuous <sup>16</sup>	.....	.....	.....
Announcements	voice, code <sup>10,11</sup>	code <sup>12</sup>	code, voice <sup>15</sup>	voice, code <sup>17</sup>	code, voice <sup>13</sup>	code <sup>19</sup>	code <sup>21</sup>

Station Call	ZUO	IBF	CHU	ATA	FFH	HBN	IAM	OMA
Location	Johannesburg, So. Africa	Torino, Italy	Ottawa, Canada	New Delhi, India	Paris, France	Weuchatel, Switz.	Rome, Italy	Prague, Czech.
Frequency (MC S)	5, 10	5	3.330, 7.335, 14.670	10	2.5, 5, 10	2.5, 5	5	2.5
Power (KW)	.25	.3	.3, 3, 5	1	.3	.5	1	1
Tone (cps)	none	440, 1000	none	.....	440	.....	440, 600	.....
Duration of Tone (min)	none	.....	none	.....	.....	.....	.....	.....
Time Pulse (pps)	1 <sup>22</sup>	1	1 <sup>24</sup>	1	1	1	1	1
Identification	code <sup>23</sup>	.....	code <sup>25</sup>	.....	.....	.....	.....	.....
Duration of Service	.....	.....	continuous	.....	.....	.....	.....	.....
Announcements	code <sup>23</sup>	.....	voice <sup>16</sup>	.....	.....	.....	.....	.....

1. Tone interrupted for 40 MS while time pulse is sent. Beginning of tick is exact time.  
 2. 440 or 600 cps alternately every 5 min. beginning with 600 cps on hour.  
 3. Tones are single upper side band except on 25 MC which is double sideband.  
 4. 440 or 600 cps alternately every 5 min. beginning with 400 cps 5 min. past hour.  
 5. Experimental 100 bit time code sent each sec. from 2nd to 3rd min. of every 5.  
 6. 59th pulse of each min. omitted. Double tick spaced 0.1 sec. sent on min. 1st pulse is exact time.  
 7. Continuous except for 4 min. from xx45:20 to xx49:20 plus or minus few sec.  
 8. Continuous except for 8 min. from xx45:05 to xx48:20 plus or minus few sec., repeated each 15 min. and for 34 min. beginning at 1900 UT.  
 9. Each 5 min., voice identification and time in EST. UT given in A2.  
 10. At xx19:30 and xx49:30 A2 code giving North Atlantic propagation forecast.

11. At xx04:20 and xx34:20 IWDS warnings in A2 code.  
 12. U.T. given each 5 min.; North Pacific propagation conditions given at 9.4 and 39.4 min. past hr.; IWDS warnings at 14.4 and 44.4 min. past hr.; in A2 code.  
 13. JJY 2.5 MC continuous from 0645-2259 UT; 5, 10, 15 MC continuous, except for 29 to 39 min. past hr.  
 14. JJY interrupts carrier and tone for 0.02 sec. each sec. and 0.2 sec. each min. Resumption is exact time.  
 15. JJY sends call and propagation conditions (N.U. or W.) in A2 code, call and JST in Japanese and English during 4th min. of every 5.  
 16. MSF continuous carrier except for break from 15-20 min. after hour.  
 17. MSF sends 10 min. of ticks, minute pulse is lengthened. 4 min. of carrier only, 1 min. of code/voice announcement.  
 18. LOL sends call in A2 code and time announcement in Spanish during 4th min. of every 5.

19. Sends A2 code V.V.V.CQ.CQ.CQ. de RES.RWM. 1st min. of every 15.  
 20. BPV sends a dot each sec. and dash each min., keyed carrier.  
 21. Sends BPV in A1 code for 1 min.  
 22. ZUO sends a tick each sec. and dash on min.; A2 keyed tone.  
 23. Sends ZUO and time in A2 code from 4th to 5th min.  
 24. CHU second pulse is short tone of 1000 cps except for 29, and 51-59 sec. omitted.  
 25. CHU Canada sent twice in A2 code on hour to 1 min. past.  
 26. Between 50-60 sec. of each min. voice announcement "CHU, Dominion observatory, Canada; EST. xx hrs. xx min."

Note: A0 is carrier only, A1 is carrier keyed code, A2 is tone keyed code, A3 is voice type modulation. UT, GMT, GCT, Zebra time are identical.



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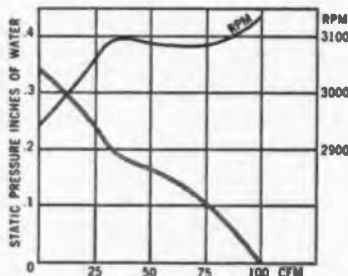
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frequency oscillator (BFO). WWV-20 can be received in San Antonio almost 24 hrs. per day in this manner. This includes ionospheric scatter at night after the sky-wave signal has faded. The sideband on and off times every 5 min., are accurately timed, but the carrier silent periods are only accurate to within a few seconds. WWVH goes off the air at XX45:05 and WWV at XX45:20, plus or minus a few seconds. WWVH stays off for about 3 min. and WWV for about 4 min. It is during these silent periods that many of the other standard stations are received. Note that WWVH is on the air by itself for one minute prior to WWV's carrier return.

Often in the late afternoon and evening, WWV can be received on all frequencies from 2.5-30MC. They have also been received at night during disturbed propagation conditions from 2.5-25MC.

Recently much emphasis has been placed on the use of very low frequencies (VLF, 3-30KC) and low frequencies (LF, 30-300KC) for frequency standards, Table 2. Ionospheric conditions at these fre-

## STANDARD FREQUENCY STATIONS

quencies are less disturbed than at h-f and greater stability (a few parts in  $10^{10}$ ) can be obtained in a much shorter period of observation. The National Bureau of Standards now operates WWVL, Boulder, Colo., at 20KC and WWVB, Boulder, at 60KC. GBR, Rugby, England, has been on 16KC since 1927 and MSF, Rugby, on 60KC since 1950. The Navy operates NBA, Canal Zone, on 18KC which sends sec. dashes 24 hrs. daily. NBA can be received in San Antonio using a 6 in. diameter loop for an antenna inside a concrete building. NBA and other VLF stations are also received on a whistler receiver or a tape recorder audio amplifier using a 5 ft. square loop, which attests to the VLF signal strength.

The 60 cycle power line frequency in Central Texas is maintained and controlled so that a synchronous electric clock is at all times within  $\pm 3$  secs. of WWV time. A test run over a three-month period showed that 2 ordinary electric clocks located 10 miles apart kept within .1 sec. of each other and

within  $\pm 2$  sec. of WWV time. This test also indicates the service reliability of ordinary house power over an extended period. This electric clock time is accurate to several parts in  $10^7$  per year.

Equipment used by the writer for listening consists of h-f receivers SP-600, R-390/URR, NC 240D, SX-28, with a 2 element 20mc Yagi; Grundig transistor h-f receiver with 2 ft. whip; AN/URM-6 receiver (15-250KC) with 6 in. and 30 in. loop.

Acknowledgment is due O. G. Villard, Jr., C. C. Laster, H. A. Jordan, F. Sera, and A. H. Morgan.

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In March of 1959, the FCC asked for opinions on FM stereophonic broadcasting. After a thorough testing of the proposed systems, courtesy of NSRC, and evaluation by FCC engineers, the Commission adopted a composite system. Here are the highlights and the new standards.

## FCC Adopts FM-Stereo Standards

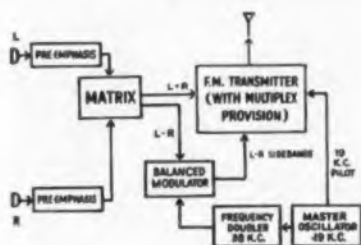
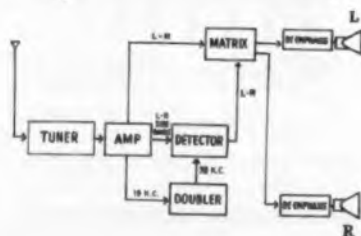


Fig. 1: Operation of GE's transmitter.

ON 19 April 1961, the FCC ordered the amendment of its rules to include provisions for FM-Stereophonic Transmission. The rule changes were effective June 1, 1961. As in most such decisions affecting the public, compatibility and cost were influencing factors. Of interest to the broadcaster, in addition to its monophonic compatibility, and hi-fidelity stereophonic sound, was the maintenance of revenues from Subsidiary Communications Authorizations (SCA). SCA, probably better known as Storecasting, is the broadcaster's main source of revenue for FM operations. There are approximately 240 such multiplex operators at the present time.

The system adopted was actually a combination of systems proposed by the General Electric Co. and

Fig. 2: The receiver proposed by GE.



Zenith Radio Corp. Actually General Electric had proposed two systems.

### System Capabilities

The system is capable of producing hi-fidelity stereophonic sound, fully separated, at frequencies from 50 to 15,000 cps.

Distortion and frequency response standards for the new transmissions are equal to those prevailing for existing FM monophonic broadcasting. Therefore, FM's reputation for serving as the broadcasting outlet for hi-fi will be maintained.

The FCC's consideration for compatibility is not without reason. There are approximately 15 million owners of FM radios today. These listeners will continue to receive a fully balanced program with an imperceptible signal to noise change.

Under the stereo setup, however, there will be some loss of station coverage area. But most stereophonic receiving equipment will probably incorporate a "stereomonophonic" switch by which the

listener will be able to continue to tune in distant stations if he is willing to sacrifice receiving the signal stereophonically.

### System Operation

The new system features sum and difference matrixing with the sum transmitted as main carrier frequency modulation and the difference signal transmitted as suppressed carrier amplitude modulation of a ultrasonic subcarrier. Transmission of a pilot signal, at half subcarrier frequency provides for recovery of the carrier at the receiver.

Simplified block diagrams for the transmitter and receiver, shown in Figs. 1-4, are those of the sponsors of the approved system, i.e., Zenith and General Electric.

### Discriminator

The discriminator output spectrum, Fig. 5, provides a better understanding of the system.

The left hand block represents the monophonic or what would normally be the 50 to 15,000 cps audio  
(Continued on page 447)

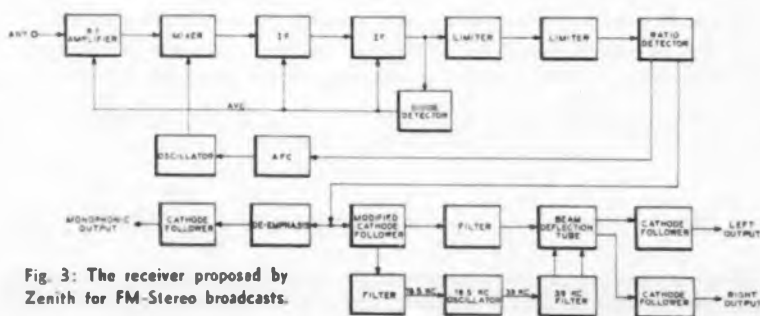


Fig. 3: The receiver proposed by Zenith for FM-Stereo broadcasts.



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## FM-STEREO

program. The SCA signal with the carrier at 67 KC deviated  $\pm 6$  KC by the SCA program is shown on the right. The new rules permit simultaneous SCA from 53 to 75 KC.

The stereo signal with a lower sideband from 23 to 38 KC and an upper sideband from 38 to 53 KC is just above the monophonic signal.

Note the absence of the 38 KC carrier itself and the presence of the 19 KC pilot carrier at reduced amplitude.

Suppressing the carrier and transmitting a subharmonic pilot results in an interleaving effect which permits 90% of maximum deviation on the main channel, as well as 90% on the subchannel, with the other 10% in each case being reserved for the pilot carrier.

A most important feature of the system is that the 19 KC pilot falls in a clear channel portion of the discriminator output — with the L + R audio 4 KC below and the L—R lower sideband 4 KC above. This affords the use of relatively simple filter circuits in the receiver for isolating the pilot signal so that it may be doubled to recover the subcarrier.

### Interleaving

The interleaving effect of L + R main channel signal and the L — R generated sidebands on the sub-channel is most interesting.

Because of this effect, 90% of normal deviation can be used on

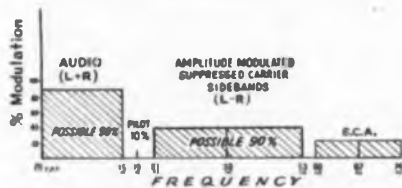


Fig. 5: Discriminator output spectrum.

the main channel and also the sub-channel, for one is producing peak main carrier deviation while the other is 0, and vice versa. Thus, the monophonic listener experiences a signal to noise, loss of less than 1 db.

This interleaving effect arises from the fact that the sum of two variables (L + R) is high when their difference is low (L — R), and vice versa. Since the sideband en-

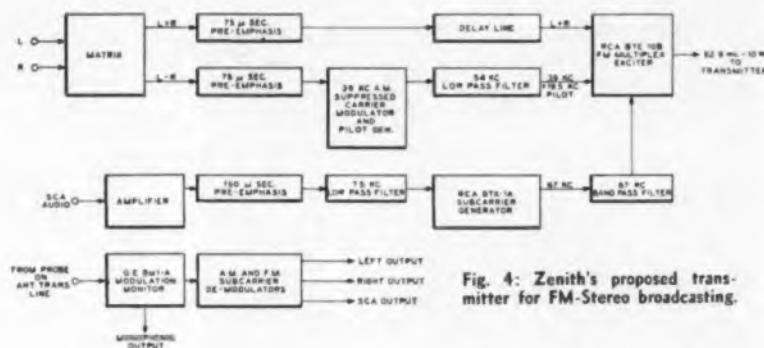


Fig. 4: Zenith's proposed transmitter for FM-Stereo broadcasting.

velope produced by the L — R signal is directly proportional to L — R, this relationship between a sum of two variables and their difference is maintained and the main and subchannel will interleave.

### Broadcasting

Stations with SCA multiplexing equipments will probably only need to obtain a stereo signal generator and the adapter for the monitor receiver. The signal generator will develop L + R audio, L — R subcarrier sidebands and the 19 KC pilot carrier. It will probably be necessary to modify the subcarrier inserter to accept this stereo-signal because of the high deviation levels

associated with the L — R 38 KC sidebands.

The importance of maintaining proper phase and amplitude correspondence between the main channel and subchannel or between the sum (L + R) and the difference (L — R) signals anywhere in the equipment lineup cannot be over-emphasized. A non-compensated time delay larger than  $\frac{1}{2}$  of a microsecond at 15 KC or a relative amplitude change of 3.5% will preclude compliance with the Commission's rules and regulations. This means transmission of the composite signal over a telephone line or UHF studio to transmitter link is ruled out.

## Section 3.322

### Stereophonic Transmission Standards

(a) The modulating signal for the main channel shall consist of the sum of the left and right signals.

(b) A pilot subcarrier at 19,000 cps  $\pm 2$  cps shall be transmitted that shall frequency modulate the main carrier between the limits of 8 and 10%.

(c) The stereophonic subcarrier shall be the second harmonic of the pilot subcarrier and shall cross the time axis with a positive slope simultaneously with each crossing of the time axis by the pilot subcarrier.

(d) Amplitude modulation of the stereophonic subcarrier shall be used.

(e) The stereophonic subcarrier shall be suppressed to a level less than 1% modulation of the main carrier.

(f) The stereophonic subcarrier shall be capable of accepting audio frequencies from 50 to 15,000 cps.

(g) The modulating signal for the stereophonic subcarrier shall be equal to the difference of the left and right signals.

(h) The pre-emphasis characteristics of the stereophonic subchannel shall be identical with those of the main channel with respect to phase and amplitude at all frequencies.

(i) The sum of the sidebands resulting from amplitude modulation of the stereophonic subcarrier shall not cause a peak deviation of the main carrier in excess of 45% of total modulation (excluding SCA subcarriers) when only a left (or right) signal exists; simultaneously in the main channel, the deviation when only a left (or right) signal exists shall not exceed 45% of total modulation (excluding SCA subcarriers).

(j) Total modulation of the main carrier including pilot subcarrier and SCA subcarriers shall meet the requirements of Section 3.268 with maximum modulation of the main carrier by all SCA subcarriers limited to 10%.

(k) At the instant when only a positive left signal is applied, the main chan-

nel modulation shall cause an upward deviation of the main carrier frequency; and the stereophonic subcarrier and its sidebands signal shall cross the time axis simultaneously and in the same direction.

(l) The ratio of peak main channel deviation to peak stereophonic subchannel deviation when only a steady state left (or right) signal exists shall be within  $\pm 3.5\%$  of unity for all levels of this signal and all frequencies from 50 to 15,000 cps.

(m) The phase difference between the zero points of the main channel signal and the stereophonic subcarrier sidebands envelope, when only a steady state left (or right) signal exists, shall not exceed  $\pm 3^\circ$  for audio modulating frequencies from 50 to 15,000 cps.

NOTE: If the stereophonic separation between left and right stereophonic channels is better than 29.7 db at audio modulating frequencies between 50 and 15,000 cps, it will be assumed that paragraphs (l) and (m) of this section have been complied with.

(n) Cross-talk into the main channel caused by a signal in the stereophonic subchannel shall be attenuated at least 40 db below 90° modulation.

(o) Cross-talk into the stereophonic subchannel caused by a signal in the main channel shall be attenuated at least 40db below 90° modulation.

(p) For required transmitter performance, all of the requirements of Section 3.254 shall apply with the exception that the maximum modulation to be employed is 90° (excluding pilot subcarrier) rather than 100%.

(q) For electrical performance standards of the transmitter and associated equipment, the requirements of Section 3.317 (a)(2), (3), (4) and (5) shall apply to the main channel and stereophonic subchannel alike, except that where 100% modulation is referred to, this figure shall include the pilot subcarrier.

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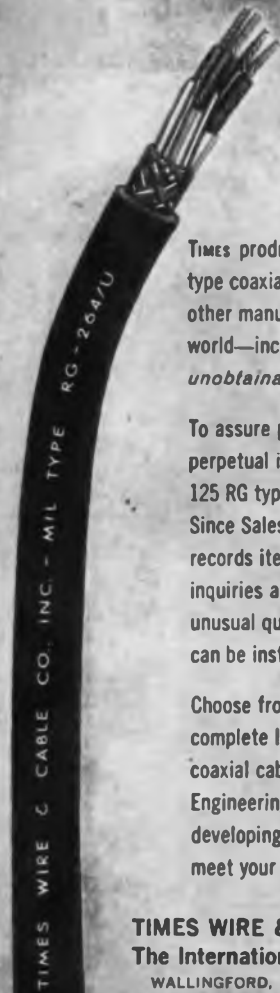
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# "Cues For Broadcasters -1950-1961"

More than 550 items have appeared in EI's "Cues for Broadcasters" Section since it was started in 1950. They are presented in a complete index, grouped by subject, and including the month and year in which they first appeared.

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# TOWER TIPS

## COLD WEATHER AND TOWER STRENGTH

How does cold weather affect the strength of a steel tower? Good question! Sometimes it is written into a tower specification.

Worry-warts and steel salesmen point out that "Charpy-Impact" values for mild carbon steel fall off rapidly with falling ambient temperature—(although yield does not). Therefore, you must buy and use high priced fancy steel alloys whose Charpy values do not fall off as fast as those for mild steel.

Let us think a moment. Let us look around. We know, for example, that there are literally thousands of mild carbon steel towers in service for dozens of years in both the Arctic and the Antarctic. They work! I guess they never heard of Charpy. Is not this an indicator of something?

Well, the worried physicist and engineer say: "yes, but our new requirements have more impact loads imposed upon our towers." Oh yeah? Let us assume they do. Define the new impact load. Would you say shooting a .45 bullet through the steel column constitutes an impact condition? Too severe a condition?

Several winters ago, we had the opportunity to modify a number of mild steel towers in Canada. A portion of the work constituted in making hundreds of holes in the steel columns. Electric hand drills, hundreds of feet in the air, in isolated locations, long leads, cold hands, did not appeal as an efficient way. We decided to try using a Ramset to shoot the holes. This tool uses an explosive cartridge which shoots a slug into the steel, and upon withdrawing the slug, you have a nice round hole. *It worked!* Hundreds of holes! And the temperature was never above 20 below zero (°F). Would you say that was a mild impact test?

There is nothing wrong with Charpy impact tests. But, do not misuse them. Or, how do you correlate Charpy Impact numbers with actual working conditions? High nickel steel alloys, high Charpy numbers, are all good and wonderful. But—do we need them? For my buck, I will use mild carbon steel to build towers anywhere on this old globe—and sleep well.

Walter L. Guzewicz



**Stainless, inc.**

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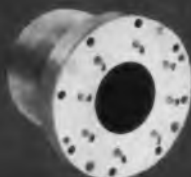
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<b>CM-11A</b> —Where greater sensitivity is desired	Frequency response . . . . . 80 to 9,000 cps	<b>CM-17A</b> —"Flex-Mike". For audio-visual labs, etc.
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<b>CM-116A</b> —For stereo taping	Frequency response . . . . . 50 to 11,000 cps	Sensitivity . . . . . —56 decibels ±2db
Sensitivity . . . . .	—56 decibels ±2db	<b>CM-30</b> —Coiled Cord, Switch. For citizen's band use—
<b>CM-111A</b> —For stereo taping, also greater sensitivity	Frequency response . . . . . 80 to 9,000 cps	Frequency response . . . . . 100 to 6,000 cps
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<b>CM-12A</b> —For long lead installations—PA systems, etc.	with push-to-talk switch	<b>CM-31</b> —Coiled Cord. For communication use—
		Frequency response . . . . . 100 to 6,000 cps
		Sensitivity . . . . . —49 decibels ±2db
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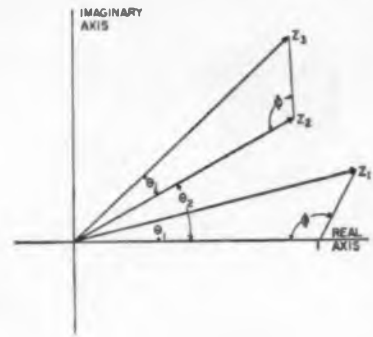
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Circle 170 on Inquiry Card

By **MORTON A. LIPMAN**

Electronics Engineer  
Convair  
San Diego 12, Calif.

# Multiplying Complex Numbers



**E**NGINEERS often multiply two complex numbers, e.g., finding the complex product of impedance and current to yield voltage. If the quantities are shown graphically, there is a simple method for performing this operation. Here's how:

1. Locate unity on the real axis.
2. Construct line  $Z_1 - 1$ .

3. Construct angle  $\theta_1$  on vector  $Z_2$  at 0.

4. Construct angle  $\phi$  on vector  $Z_2$  at  $Z_2$ .

5. The intersection of the last two lines constructed,  $Z_3$ , is the complex product of  $Z_1$  and  $Z_2$ .

If  $Z_1$  and  $Z_2$  lie on opposite sides of the real axis Step 3 should be carried out such that  $\theta_1$  subtracts from  $\theta_2$ . Proof:

A. By construction,  $\arg Z_3 = \arg Z_1 + \arg Z_2$ .

B. Triangles 0-1- $Z_1$  and 0- $Z_2$ - $Z_3$  are similar because their angles are equal by construction. This permits establishing the relationship:

$$\frac{|Z_3|}{|Z_1|} = \frac{|Z_2|}{1}$$

$$|Z_3| = |Z_1| \cdot |Z_2|$$

Facts A and B taken together show  $Z_3 = Z_1 Z_2$ .

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Generator: Model G-40C1H 80 watt average, 320 watt peak power output, 110V-60c input.

Tanks: Model T-40C1 full 1/2 gal. stainless steel tank, 5 1/2" L x 5 1/4" W x 4" D.

Extra Tanks: Model T-40C1: \$49.95 ea. Model T-40C2 (1/2 gal.) 5 1/4" L x 5 1/4" W x 6" D.: \$59.95 ea.

Junction Box: Model TSJB-3 (for alternate operation of 2 or 3 T-40C1 or T-40C2 tanks): \$15.95.

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## System 520

Generator: Model G-520C1 520 watt average, 2080 watt peak power output, 110V-50/60c input.

Tank: Model T-520C1 full 13 gal. stainless steel tank 20" L x 16" W x 10" D.

Extra Tanks: Model T-520C1: \$399.95 ea. Model T-520C2 (12 gal.) 40" L x 5" W x 10" D.: \$599.95 ea.

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Generator: Model G-80C1 120 watt average, 480 watt peak power output 110V-50/60c input.

Tank: Model T-80C1 full 1 1/2 gal. stainless steel tank 12" L x 6" W x 6" D.

Extra Tanks: Model T-80C1: \$89.95 ea. Model T-80C2 (2 gal.) 12" L x 6" W x 9" D.: \$179.95 ea.

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PRICE RANGE \$340-597



## System 1040

Generator: Model G-1040C2 1040 watt average, 4160 watt peak power output, 220V-50/60c, 1ϕ input.

Tank: Model T-1040C1 full 30 gal. stainless steel tank 24" L x 18" W x 16" D.

Extra Tanks: Model T-1040C1: \$799.95 ea. Model T-1040C2 (33 gal.) 48" L x 10" W x 16" D.: \$999.95 ea.

Junction Box: Model TSJB-3 (for alternate operation of 2 or 3 T-1040C1 or T-1040C2 tanks): \$15.95.

**\$1999.95**  
TYPICAL COMPETITIVE  
PRICE RANGE  
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## System 320

Generators: Model G-320C1 320 watt average, 1280 watt peak power output, 110V-50/60c input.

Tank: Model T-320C1 full 5 gal. stainless steel tank, 14" L x 10" W x 9" D.

Extra Tanks: Model T-320C1: \$199.95 ea. Model T-320C2 (7 gal.) 14" L x 10" W x 12" D.: \$299.95 ea.

Junction Box: Model TSJB-3 (for alternate operation of 2 or 3 T-320C1 or T-320C2 tanks): \$15.95.

**\$499.95**  
TYPICAL COMPETITIVE  
PRICE RANGE  
\$675-1040



## System 2080

Generator: Model G-2080C2 2080 watt average, 8320 watt peak power output, 220V-50/60c, 1ϕ input.

Tank: Model T-2080C1 full 80 gal. stainless steel tank 52" L x 20" W x 18" D.

Extra Tanks: Model T-2080C1: \$1750 ea.

Junction Box: Model TSJB-3 (for alternate operation of 2 or 3 T-2080C1 tanks): \$15.95.

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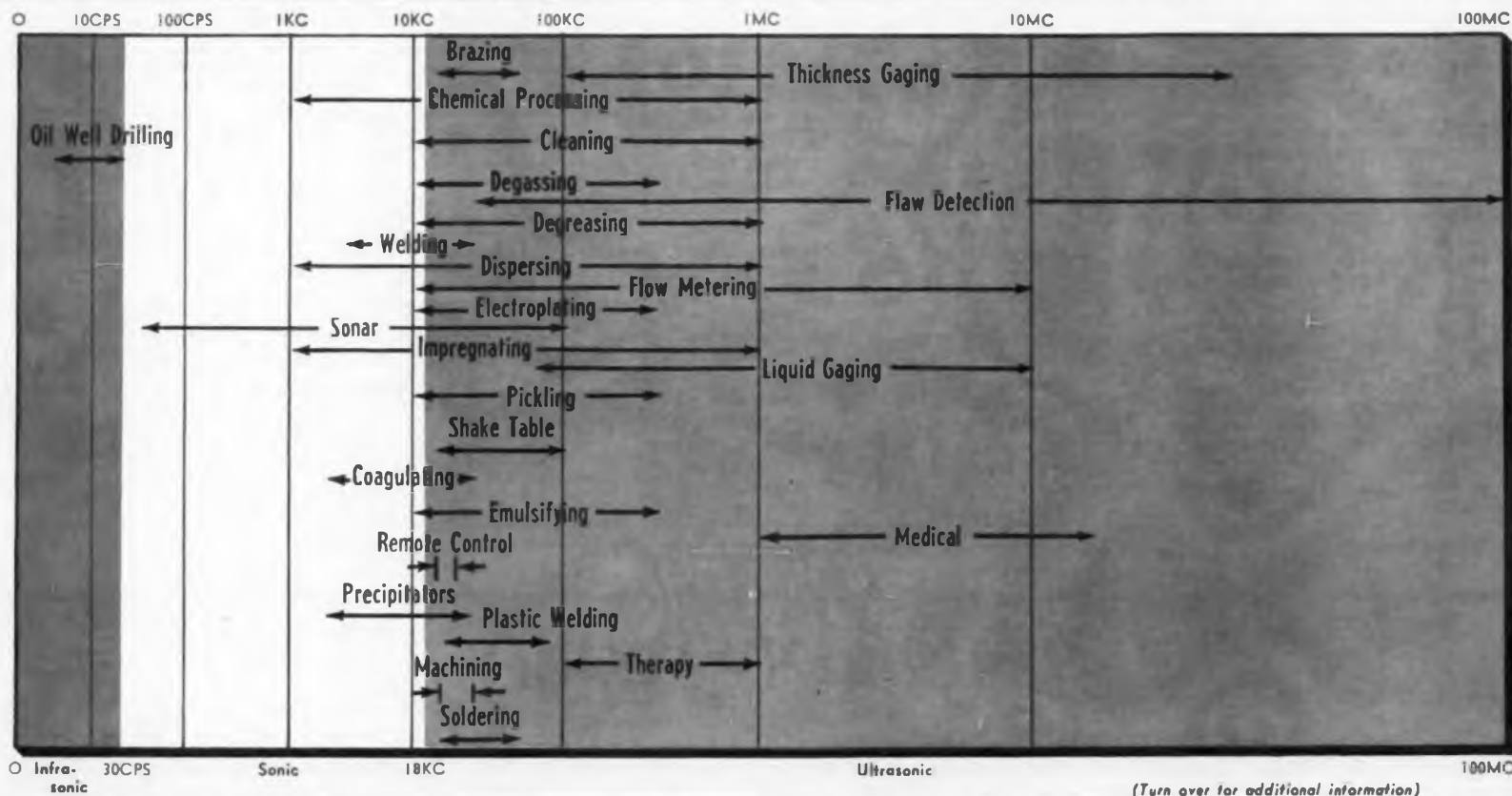


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# Ultrasonic Frequency Spectrum



(Turn over for additional information)



# Ultrasonic Notes

## TRANSDUCER MATERIALS

Piezoelectric			
Material	Freq. Range	Max. Safe° C Oper. Temp.	Typical Uses
Quartz	100 KC- 35 MC*	550	Medical and non-destructive testing
Barium Titanate	5 KC- 10 MC	100	Most cleaning and processing applications
Lead Zirconate Titanate	5 KC- 10 MC	320	Most cleaning and processing applications and high-temp. uses
Rochelle Salt	20 CPS- 1 MC	45	Sonar and depth finding
ADP	20 CPS- 1 MC	100	Sonar and electro-optics
Magnetostrictive			
Nickel	10 KC-100 KC	—	Ultrasonic cleaning, machining, drilling, soldering, melt treatment and applications where transducer has pressure applied.
Vanadium Permendur	10 KC-100 KC	—	Same as nickel
Ferrite	10 KC- 1 MC*	—	—

\*Frequencies used are based on information supplied by Ultrasonic Manufacturers Association.

## POWER APPLICATIONS

Brazing	15 KC- 70 KC
Chemical Processing	1 KC- 1 MC
Cleaning	10 KC- 1 MC
Coagulating	3 KC- 40 KC
Degassing	10 KC-500 KC
Degreasing	10 KC- 1 MC
Dispersing	1 KC- 1 MC
Electroplating	10 KC-500 KC
Emulsifying	10 KC-500 KC
Impregnating	1 KC- 1 MC
Machining	15 KC- 40 KC
Medical Therapy	100 KC- 1 MC
Oil Well Drilling	5 CPS- 30 CPS
Precipitators	3 KC- 40 KC
Pickling	10 KC-500 KC
Plastic Welding	20 KC- 90 KC
Shake Table	15 KC-100 KC
Soldering	15 KC- 70 KC
Welding	4 KC- 40 KC

## INSTRUMENTATION & SENSING

Burglar Alarms	20 KC
Flaw Detection	40 KC-100 MC
Flow Metering	10 KC- 10 MC
Liquid Gaging	80 KC- 10 MC
Medical	1 MC- 15 MC
Oral Dentistry	25 KC
Remote Control	15 KC- 25 KC
Sonar	50 CPS-100 KC
Thickness Gaging	100 KC- 50 MC

## GENERAL CLEANING AGENTS

**SOAPS:** Used for removal of buffing compounds, washing, and other compounds.

**SYNTHETIC DETERGENTS:** Wetting and emulsifying, washing, where high rinsability and non-staining is desired, and augmenting alkaline cleaners.

**ALKALINE CLEANERS:** Cleaning shop dirt, lubricants and oils.

**ACID CLEANERS:** Descaling, rust removal, and bright dipping brass, zinc, and aluminum.

**SOLVENT CLEANERS:** Used for electrical cleaning or where water is prohibited.

**DIPHASE CLEANERS** (forming unstable water emulsions): Removal of polishing and buffing compounds.

**STRIPPERS:** Alkaline stripping of finishes from steel, solvent stripping of finishes from any metal, and stripping large equipment with non-flammable viscous liquid which is rinsable by water or steam.

**EMULSION CLEANERS:** Removal of soils not susceptible to alkaline cleaning or where metal could be tarnished by alkaline cleaning. Removal of carbonized oils. Between operation of removing chips and oil where light film of anti-rusting oil should be left on work for protection.

# PANORAMIC PANADAPTORS give you continuous visual spectrum analysis of communications signals

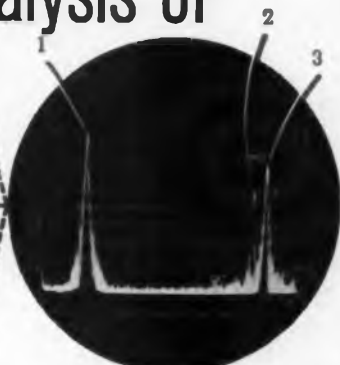
- Detecting and investigating interference caused by splatter, harmonics, r.f. parasites and multipath transmissions.
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- Rapidly locating and identifying intermittent and irregular transmissions.
- Spotting inadvertent off-frequency transmissions.
- Band occupancy studies.

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PANORAMIC'S PANADAPTOR MODEL SA-3 is a rugged, compact, easy to operate unit with a 3" CRT. Only three controls are needed—sweep width, gain and center frequency. Cabinet or rack mounting optional.



Interference analysis with Model SA-8b Panadaptor. Sidebands from AM channel 21 are seen to spill into band occupied by intermittent CW channel 22.



	Model SA-8b				Model SA-3											
	Type T-100	Type T-200	Type T-1000	Type T-10,000	Type T-50	Type T-100	Type T-200	Type T-1000	Type T-1000	Type T-2000TD1	Type T-2000MC	Type T-3000	Type T-3000C1	Type T-6000		
For receivers with	455kc or 500kc (Specify)	455kc	8.25mc	30mc	455kc	455kc or 500kc	455kc	8.25mc	10.2mc or 10.7mc (Specify)	30mc	30mc	30mc	21.4mc	30mc		
Sweep Width	0-100kc	0-200kc	0-1mc	0-10mc	0-50kc	0-100kc	0-200kc	0-1mc	0-1mc	0-2mc	0-2mc	0-3mc	0-3mc	0-6mc		
Direct Sensitivity(*)	1000µv	2000µv	2000µv	150µv	200µv	200µv	200µv	200µv	200µv	500µv	10µv	1mv	50µv	10mv		
Sweep Rate	Sweep may be synch'd externally or to power line or free running.				30 sweeps per second, line synchronized (25 sweeps/sec with 60-cps power line.)											
Amplitude Scale	Linear (calibrated from 0 to 1.0). Logarithmic (from 0 db to -40 db). Power.				Nominally linear											
Resolution Capabilities. Depends upon sweep rate and sweep width	80cps to 4kc Variable		200cps to 10kc Variable		80cps to 4kc Variable		11kc		11kc		20kc		25kc		50kc	
	At maximum sweep width															
Approximately 20% improvement at 20% of full sweep width.																

\* Direct sensitivity (Model SA-8b) is the maximum voltage at the center frequency required for a full scale deflection on the linear amplitude scale. Direct sensitivity (Model SA-3) is the maximum voltage at the center frequency required for 1/4 inch deflection.

Panadaptors are available for most receivers. For best over-all response the receiver type should be mentioned when inquiring about Panadaptors. Write today for detailed specifications bulletin. Also send for new Catalog Digest and ask to be put on the regular mailing list for The Panoramc Analyzer, featuring application data.

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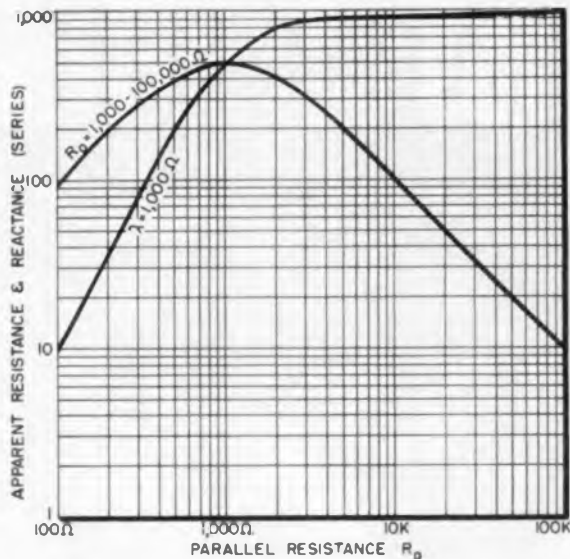


\* Dresser Electronics  
HST Division

A technique is developed which allows accurate adjustment of reactances. Shunting resistors were used in the adjustment of L and C values.

**GENE J. HEGEDUS**

Senior Engineer  
Ryan Electronics  
Torrance, California



# Adjusting L and C Values

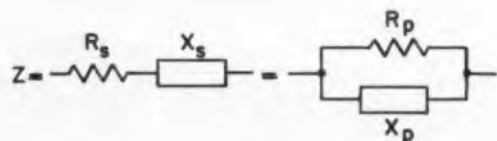
WHEN studying transformation of series parallel equivalent networks—even though both networks have fixed reactances—the reactance appears to change. Its apparent numerical value is a function of the shunting resistance. A plot of the series transformation values of such parallel combinations with resistors of different values will yield a curve which can be used for the equivalent vectorial (series) representation of the parallel network. Thus a technique can be developed which allows the accurate adjustment of reactances to any desired value within the characteristic range of the function.

**Definitions**

To keep equations simple, angular velocity is omitted. L and C are defined in terms of positive and negative reactances X.

Thus  $X = \omega L$   
and  $-X = 1/\omega C$   
also + or -  $X = \omega L - 1/\omega C = \frac{\omega^2 LC - 1}{\omega C}$

**Series Parallel Transformations**



From series to parallel

$$Z = \frac{R_p \cdot jX_p}{R_p + jX_p} = R_s + jX_s \cdot \frac{(R_s - jX_s)}{(R_s - jX_s)} = \frac{R_s^2 + X_s^2}{R_s - jX_s}$$

Active component

$$R_p = \frac{R_s^2 + X_s^2}{R_s} \quad (1)$$

From parallel to series

Reactive component

$$X_p = \frac{R_s^2 + X_s^2}{X_s} \quad (2)$$

$$Z = R_s + jX_s = \frac{R_p \cdot jX_p}{R_p + jX_p} \cdot \frac{(R_p - jX_p)}{(R_p - jX_p)} = \frac{R_p X_p^2 + jR_p^2 X_p}{R_p^2 + X_p^2}$$

Active component

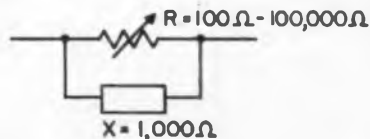
$$R_s = \frac{R_p X_p^2}{R_p^2 + X_p^2} \quad (3)$$

Reactive component

$$X_s = \frac{R_p^2 X_p}{R_p^2 + X_p^2} \quad (4)$$

To define references to "apparent" reactances and resistances, since there is a controversy in the interpretation of the word "Apparent": Here it is used to designate how a component or a network "appears to the circuit" in which it is used. The criterion is the effect on the circuit. However, circuits see, and act on, the effect of the values of the polar parameters only. To represent parallel networks as impedance vectors, they have to be transformed into series networks in which process the apparent orthogonal components are also extrapolated.

Considering a reactor of .1 hy at 1600 cps = 1,000 ohms (for the sake of simplicity, this reactor is "ideal" without series resistance), or a (no loss) capacitor of .1 uf at 1600 cps = 1,000 ohms.



To represent this network as an impedance vector  $R + (\pm) jX$ , it has to be transformed into a series equivalent network.

Using equations (3) and (4), by plugging in the constant value of 1,000 ohms for the reactance and successively changing values along the  $R_p$  scale of the graph, the apparent series values for  $R_s$  and  $X_s$  can be plotted along corresponding points of the vertical scale.

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Rated Voltage	$+65^{\circ}\text{C}$	$+85^{\circ}\text{C}$	$+125^{\circ}\text{C}$
6 VDC	6 VDC	4 VDC	4 VDC
10 VDC	10 VDC	10 VDC	7 VDC
15 VDC	15 VDC	13 VDC	10 VDC
20 VDC	20 VDC	17 VDC	13 VDC
35 VDC	35 VDC	28 VDC	20 VDC

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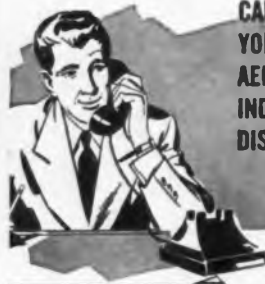
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## L AND C VALUES

These curves disclose the relationships of the two parallel components. The phase angle  $\phi$  of the network is:

$$\phi = \tan^{-1} \frac{X_{app.}}{R_{app.}}$$

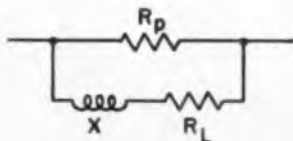
This is one of the points to be considered. While the apparent value of the reactance changed, the resulting impedance has a significant angle.

The curve as it is, can be used for capacitors in most cases. By substituting  $1/\omega C$  for  $-jX$  and adding corresponding scales for capacitor values, the curves can be plotted directly in terms of capacitance and resistance. In this case the transformation equations are:

$$R_{app.} = \frac{R_p}{R_p^2 \omega^2 C^2 + 1}$$

$$\text{resp. } C_{app.} = \frac{R_p^2 \omega^2 C^2 + 1}{R_p^2 \omega^2 C}$$

In practical reactor network analysis, the in phase component of the coil  $R_L$  must be considered in series with it.



The equation of the network becomes:

$$Z = \frac{R_p \cdot (R_L + jX)}{R_p + R_L + jX}$$

Transforming this in a series network:

$$Z = R_{app.} + R_L + jX_{app.}$$

$$= \frac{R_p \cdot (R_L + jX)}{R_p + R_L + jX} \cdot \left[ \frac{(R_p + R_L) - jX}{(R_p + R_L) - jX} \right]$$

$$= \frac{R_p [R_L (R_p + R_L) + X^2 + jX R_p]}{(R_p + R_L)^2 + X^2}$$

Then:

$$X_{app.} = \frac{R_p X}{(R_p + R_L)^2 + X^2} \quad \text{or since } X = \omega L$$

$$L_{app.} = \frac{R_p L}{(R_p + R_L)^2 + \omega^2 L^2}$$

$$R_{app.} = \frac{R_p [R_L (R_p + R_L) + X^2]}{(R_p + R_L)^2 + X^2}$$

### Reference:

C. Niven: On some methods of determining and comparing coefficients of mutual induction, *Phil. Mag.*: A.D. 1887, Vol. 24, page 225.



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A catalog of the properties of ferromagnetic materials at microwave frequencies is presented. It is a result of measurements which were made of nearly two hundred samples delivered to the Signal Corps.

# Properties of Ferromagnetic Materials

IRVING REINGOLD & JOHN L. CARTER  
 U. S. Army Signal Research & Development  
 Laboratory  
 Fort Monmouth, New Jersey

**N**EARLY two hundred samples of ferromagnetic materials have been delivered to the Signal Corps over a period of several years as a result of research and development programs. Measurements were made of these samples to determine their microwave properties.

The materials consist of various mole per cent composition of iron oxide ( $Fe_2O_3$ ) with manganese-magnesium, with aluminates, and with nickel aluminates having copper or cobalt additives. Different firing schedules were used in the processing of samples of the above compositions.

Measurements were made at the X-band frequency (9000 MCS) to determine the real and imaginary portions of the dielectric constant. Values for the loss tangent were calculated from these measurements. "Figures of merit" for the samples were determined at X- and S-band (2800 MC) frequencies. Values of saturation magnetization were also determined. All measurements were made at low incident power levels.

## Measurement Procedures

### Dielectric Constant Measurements

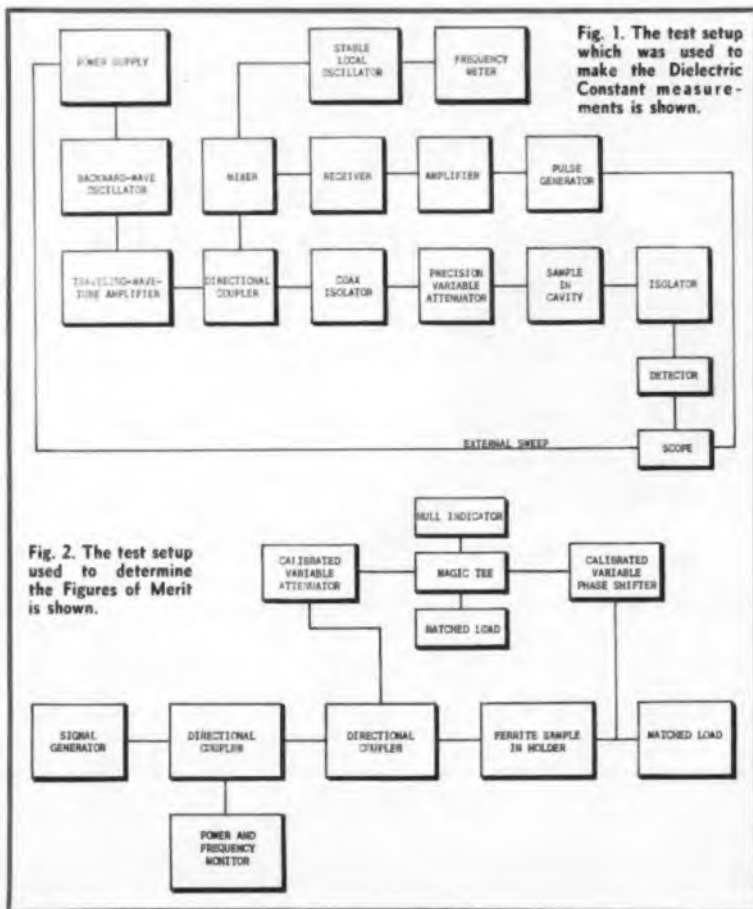
Conventional microwave techniques were used to measure the dielectric constant. Test equipment was calibrated periodically by means of a sample of 707 glass whose characteristics are accurately known. Cylindrical rods of ferromagnetic material, precisely ground

to 0.080 inch in diameter and 1.5 inches in length, were used in the experiments. A diagram of the test setup is shown in Fig. 1.

### Figures of Merit

The figures of merit were arbitrarily defined as degrees phase shift per db loss or db loss per inch of sample length. Measurements were made at X- and S-band frequencies using conventional techniques. Rectangular slabs of

(Continued on page 469)



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**Sweep Width:** Linear, continuously variable, 4.0 mc to 50 mc.  
**Sweep Rate:** Variable around 60 cps; locks to line frequency.  
**RF Output:** Continuously variable, zero to 1.0 V, peak-to-peak, into nom. 70 ohms (50 ohms upon request). Flat to within  $\pm 0.5$  db over widest sweep.  
**Attenuators:** Switched 20 db, 20 db, 10 db, 8 db and 3 db steps plus 3 db (approx.) variable.  
**Markers:** Eight sharp, pulse-type, crystal-pulsed markers; usable singly or collectively. Produced either as positive pulses with separate am-

plitude control and separate output or as keying pulses in sweeping RF signal. Five markers, at 10, 20, 30, 40 and 50 mc, are standard. Substitute frequencies or (up to 3) additional frequencies on special order in the range of 10 mc to 50 mc.  
**Marker Amplitude:** As positive pulse of separate output, continuously variable, zero to 5 V peak. As "negative" keying pulses, same amplitude as RF output.  
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2-3414-30	.8-2.5	30	1.5	\$260.
3414-30	1.0-2.0	30	1.4	\$240.
4414-30	2.0-4.0	30	1.3	\$220.
4-5414-30	2.0-6.0	30	1.3	\$230.
5414-30	4.0-7.0	30	1.3	\$220.
6414-30	7.0-11.0	30	1.3	\$220.

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## FERROMAGNETIC MATERIALS

ferrite in rectangular waveguide were used in the X-band measurements. Cylindrical rods and sleeves in coaxial transmission line were used in the S-band experiments. A diagram of the test setup is shown in Fig. 2.

The results are presented in Tables I and II. Each of the material characteristics is given for the particular chemical composition of the ferrite sample.

### Acknowledgment

Saturation magnetization measurements were made by personnel of the Electronic Parts and Materials Division, Electronic Components Research Department, USASRDL, under the direction of Mr. I. Bady. The microwave measurements were made by Samuel

Dixon and Arthur Wachtenheim of the Electron Tubes Division.

### References

1. Signal Corps Contract DA 36-039 sc-73124, Trans-Tech Inc.
2. Signal Corps Contract R54-61 sc-91, Bureau of Mines.
3. *Microwave Susceptibility Measurements in Ferrites*, Artman and Tannenwald, MIT Lincoln Labs Report No. 70, 27 Oct. 54.

**Table I**

Microwave Properties of Ferromagnetic Materials Manganese-Magnesium Compositions

Mole Per Cent Composition of Materials			Firing Temperature (°C)	Saturation Magnetization (Gauss)	Dielectric Constant		Loss Tangent ( $\epsilon''/\epsilon'$ )	$\lambda$ -Band Figure of Merit (Degrees Phase Shift per $\lambda/3$ of Loss)
MnO	MgO	Fe <sub>2</sub> O <sub>3</sub>			$\epsilon'$	$\epsilon''$		
30	40	30	1350	1750	9.70	0.285	0.029	100.5
30	40	30	1400	1880	9.70	0.362	0.037	—
10	40	50	1250	—	9.95	0.202	0.023	47.3
10	40	50	1300	1770	10.80	0.215	0.020	—
10	40	50	1350	—	11.40	0.271	0.021	—
0	40	60	1250	680	7.95	0.149	0.019	63.0
0	40	60	1300	770	12.86	0.918	0.071	4.95
0	40	60	1350	—	9.06	0.623	0.068	—
30	50	20	1350	1280	10.20	0.364	0.035	58.3
30	50	20	1400	1430	9.95	0.317	0.032	—
20	50	30	1250	1620	9.06	0.269	0.029	52.0
20	50	30	1350	1750	10.22	0.345	0.034	—
20	50	30	1400	1820	9.95	0.368	0.037	88.4
10	60	30	1250	1160	7.98	0.080	0.010	598.0
10	60	30	1300	—	10.20	0.189	0.019	—
10	60	30	1350	2010	10.20	0.241	0.023	34.6
10	60	30	1400	—	10.20	0.288	0.028	59.4
0	60	40	1250	—	9.06	0.165	0.018	—
0	60	40	1300	—	9.95	0.276	0.029	—
0	60	40	1350	1800	12.00	1.050	0.088	1.5
0	70	30	1250	—	8.21	0.085	0.010	120.2
0	70	30	1300	—	9.06	0.134	0.015	104.3
0	80	20	1350	890	8.50	0.072	0.008	177.2
0	80	20	1400	1140	11.40	1.790	0.158	21.0
5	55	40	1250	1510	11.10	0.567	0.051	18.6
5	55	40	1300	—	12.50	0.197	0.016	21.4
5	55	40	1350	2200	12.30	0.597	0.048	26.7
5	45	50	1250	1290	11.00	0.032	0.003	61.3
5	45	50	1300	1380	12.00	0.036	0.003	70.9
5	40	55	1250	1480	10.80	0.033	0.003	93.8
5	40	55	1300	1580	11.30	0.033	0.003	—
5	40	55	1350	1620	11.40	0.265	0.002	57.9
5	35	60	1250	—	12.00	0.221	0.018	340.7
5	35	60	1300	910	11.40	0.172	0.015	69.7
5	30	65	1250	—	11.70	0.145	0.012	—

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Table 1(Cont.)

## FERROMAGNETIC MATERIALS

Mole Per Cent Composition of Materials			Firing Temperature (°C)	Saturation Magnetization (Gauss)	Dielectric Constant		Loss Tangent ( $\epsilon''/\epsilon'$ )	$\lambda$ -Band Figure of Merit (Degrees Phase Shift per DB of Loss)
MnO	MgO	Fe <sub>2</sub> O <sub>3</sub>			$\epsilon'$	$\epsilon''$		
10	35	55	1250	—	10.20	0.114	0.011	44.4
10	35	55	1300	1230	12.00	0.245	0.020	24.6
15	35	50	1250	—	11.40	0.287	0.025	71.8
15	35	50	1300	2060	11.70	0.373	0.032	25.1
15	30	55	1250	—	11.40	0.364	0.032	10.2
15	30	55	1300	1970	11.40	0.320	0.028	39.7
15	30	55	1350	2310	12.50	0.274	0.022	—
15	20	65	1300	2120	11.40	0.575	0.050	3.92
20	35	45	1250	—	12.50	1.050	0.084	18.1
20	35	45	1300	2520	12.86	1.370	0.110	16.5
25	35	40	1350	2660	12.50	1.340	0.110	147.7
30	25	45	1250	—	13.20	0.058	0.004	11.6
25	20	55	1250	—	7.40	0.052	0.007	17.9
30	35	35	1250	—	9.70	0.287	0.029	420.0
30	35	35	1350	—	11.40	0.890	0.078	46.4
20	65	15	1200	—	7.10	0.139	0.020	—
20	65	15	1250	—	9.38	0.321	0.034	—
15	70	15	1200	—	9.06	0.166	0.018	—
15	75	10	1300	1000	8.80	0.146	0.017	—
15	75	10	1250	430	8.50	0.215	0.025	40.3
15	70	15	1300	1480	10.20	0.559	0.055	—
10	75	15	1200	—	7.70	0.261	0.034	—
10	75	15	1250	890	9.06	0.158	0.018	144.0
10	75	15	1300	1290	7.98	0.051	0.006	—
5	85	10	1200	—	6.20	0.065	0.011	—
5	85	10	1250	730	7.70	0.055	0.007	—
5	85	10	1300	880	8.80	0.039	0.005	144.1
5	80	15	1200	—	7.40	0.117	0.016	—
5	80	15	1250	1030	8.20	0.086	0.010	912.0
5	80	15	1300	—	10.30	0.021	0.002	257.1
40	25	35	1350	—	11.40	0.924	0.080	22.9
35	30	35	1350	—	10.80	0.744	0.069	—
35	25	40	1250	—	12.28	1.200	0.098	33.8
35	25	40	1300	2020	12.28	1.150	0.093	25.1
35	25	40	1350	—	11.40	1.110	0.097	21.4
30	25	45	1250	—	12.28	1.260	0.102	13.3
25	25	50	1400	2770	14.90	0.180	0.012	—
5	75	20	1250	—	10.80	0.439	0.040	36.3
50	10	40	1400	2860	12.50	1.220	0.098	—
50	30	20	1400	1590	10.52	0.236	0.023	92.5
50	30	20	1300	1530	9.06	0.254	0.028	152.5
30	30	40	1300	2500	12.50	1.090	0.087	28.1
30	30	40	1400	2090	11.40	1.130	0.099	2.1
20	30	50	1250	2170	12.50	0.792	0.063	25.3
10	30	60	1250	1090	12.28	0.238	0.019	23.8
10	30	60	1300	—	9.95	0.162	0.016	—



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ELECTRONIC INDUSTRIES • June 1961

**Table 2**

Microwave Properties of Ferromagnetic Materials Nickel-Aluminate Compositions, Including Copper or Cobalt Additives

Mole Per Cent Composition of Materials					Firing Temperature (°C)	Saturation Magnetization (Gauss)	Dielectric Constant		Loss Tangent (ε'/ε'')	S-Band Figure of Merit	
NiO	Al <sub>2</sub> O <sub>3</sub>	Fe <sub>2</sub> O <sub>3</sub>	Cu	Co			ε'	ε''		dB Loss per Inch of Sample Length (Cylindrical Sleeve Geometry)	Degrees Phase Shift per dB of Loss (Cylindrical Rod Geometry)
51.3	0	48.7	0	0	1350	560	16.90	0.0032	0.00019	1.2	12.5
51.3	4.0	44.7	0	0	1250	1900	9.69	0.0030	0.00031	0.8	12.7
51.3	4.0	44.7	0	0	1300	2700	10.11	0.0030	0.00029	0.4	15.0
51.3	8.0	40.7	0	0	1250	1210	10.61	0.0030	0.00028	0.8	25.0
51.3	8.0	40.7	0	0	1350	1380	10.94	0.0029	0.00027	0.4	13.8
53.0	0	47.0	0	0	1300	2040	12.53	0.0076	0.00061	0.6	10.0
53.0	4.0	43.0	0	0	1350	2100	14.25	0.0110	0.00077	0.8	4.3
53.0	8.0	39.0	0	0	1250	1250	13.59	0.0016	0.00012	0.8	40.0
53.0	8.0	39.0	0	0	1300	1300	9.88	0.0005	0.00005	0.8	6.3
53.0	8.0	39.0	0	0	1350	1380	10.93	0.0017	0.00016	0.7	—
53.0	12.0	35.0	0	0	1250	810	7.36	0.0008	0.00011	0.5	15.0
53.0	12.0	35.0	0	0	1300	860	8.15	0.0011	0.00014	0.7	55.0
53.0	12.0	35.0	0	0	1350	830	12.53	0.0047	0.00038	—	20.0
55.0	0	45.0	0	0	1250	2680	13.80	0.0128	0.00093	0.8	—
55.0	0	45.0	0	0	1300	2660	13.46	0.0130	0.00097	0.4	—
55.0	0	45.0	0	0	1350	2730	14.12	0.0244	0.00170	—	17.0
55.0	3.5	41.5	0	0	1250	2020	11.60	0.0034	0.00029	1.2	3.8
55.0	3.5	41.5	0	0	1300	2130	12.66	0.0014	0.00011	0.5	—
55.0	3.5	41.5	0	0	1350	3010	8.15	0.0013	0.00016	—	17.8
55.0	7.5	37.5	0	0	1250	1230	13.19	0.0064	0.00049	0.9	—
55.0	7.5	37.5	0	0	1300	1270	10.01	0.0022	0.00022	0.7	25.0
55.0	7.5	37.5	0	0	1350	1260	11.60	0.0023	0.00020	2.3	—
55.0	11.0	34.0	0	0	1250	680	6.30	0.0009	0.00014	1.6	6.7
55.0	11.0	34.0	0	0	1300	810	8.16	0.0015	0.00018	—	—
46.17	12.0	36.7	0	5.13	1250	500	11.60	0.0020	0.00017	—	—
46.17	12.0	36.7	0	5.13	1350	460	10.34	0.0010	0.00098	—	34.8
47.7	8.0	39.0	0	5.3	1350	1410	10.86	0.0023	0.00021	—	—
46.17	0	48.7	5.13	0	1250	2904	10.80	0.0029	0.00027	—	20.2
46.17	0	48.7	5.13	0	1300	2700	10.94	0.0037	0.00034	—	—
46.17	0	48.7	5.13	0	1350	2890	13.58	0.0045	0.00033	1.4	18.9
46.17	4.0	44.7	5.13	0	1250	2090	12.39	0.0040	0.00032	0.7	—
46.17	4.0	44.7	5.13	0	1300	2070	12.66	0.0037	0.00029	0.5	—
46.17	4.0	44.7	5.13	0	1350	2080	12.53	0.0037	0.00029	0.9	6.8
46.17	8.0	40.7	5.13	0	1250	1390	11.91	0.0045	0.00038	0.6	90.0
46.17	8.0	40.7	5.13	0	1300	1490	12.00	0.0037	0.00031	0.7	—
46.17	8.0	40.7	5.13	0	1350	1440	11.87	0.0034	0.00029	1.0	—
46.17	12.0	36.7	5.13	0	1250	920	12.00	0.0027	0.00022	—	10.3
46.17	12.0	36.7	5.13	0	1300	950	12.00	0.0031	0.00026	—	—
46.17	12.0	36.7	5.13	0	1350	930	12.00	0.0037	0.00031	0.7	37.5
47.7	0	47.0	5.3	0	1250	2550	11.01	0.0190	0.00170	0.8	—
47.7	0	47.0	5.3	0	1300	2540	10.76	0.0030	0.00028	0.8	10.2
47.7	0	47.0	5.3	0	1350	2590	10.69	0.0260	0.00240	0.4	—
47.7	4.0	43.0	5.3	0	1250	—	7.62	0.0016	0.00021	0.4	6.0
47.7	4.0	43.0	5.3	0	1300	1820	11.86	0.0036	0.00030	0.8	3.3
47.7	4.0	43.0	5.3	0	1350	—	14.57	0.0370	0.00250	0.7	—
47.7	8.0	39.0	5.3	0	1250	1410	12.10	0.0033	0.00027	—	24.4
47.7	8.0	39.0	5.3	0	1300	1290	11.57	0.0048	0.00041	—	—
47.7	8.0	39.0	5.3	0	1350	1230	11.39	0.0027	0.00024	—	18.8
47.7	12.0	35.0	5.3	0	1250	830	11.78	0.0017	0.00014	—	—
49.5	0	45.5	5.5	0	1250	1980	10.59	0.0030	0.00028	—	5.9
49.5	0	45.5	5.5	0	1300	2200	11.50	0.0041	0.00036	—	—
49.5	0	45.5	5.5	0	1350	2250	10.21	0.0014	0.00013	—	1.6
49.5	4.0	41.0	5.5	0	1250	1720	11.91	0.0100	0.00084	—	8.2
49.5	4.0	41.0	5.5	0	1350	1680	9.82	0.0100	0.00100	—	15.9
49.5	8.0	37.0	5.5	0	1250	1300	9.81	0.0028	0.00029	—	90.0
49.5	8.0	37.0	5.5	0	1300	1240	11.47	0.0058	0.00050	—	30.0
49.5	12.0	33.0	5.5	0	1350	790	10.86	0.0012	0.00011	—	9.5



*Business or mathematical problems are now easier to communicate to computers. The high efficiencies of the new languages provide an important time saving for management, scientists and engineers.*

## PROGRAMMING

# 'LANGUAGES' SIMPLIFY COMPUTER

• COBOL • ALGOL • FACT • COMTRAN • MACRO • AMACO •

COMPUTERS have been singularly successful in removing the tedious, time consuming tasks from human effort. But they have had to suffer with a similar problem of their own; the exhausting process of preparing a set of instructions to "program" the computer.

The program preparation process has lagged behind so badly that complete computer systems have been installed before the programs were completed.

It has been recognized that the solution to this problem was in the development of a simplified method of writing an English language program. Ideally, a single English word, or a simple statement should automatically instruct a computer to perform hundreds of machine steps. The programmer would then be saved the laborious task of writing a mass of complex detailed steps.

In parallel with this concept was another consideration. A "language" designed to operate one firm's computers was applicable only to that line, not to other manufacturers' products. Because of this common concern a group of manufacturers formed a consortium to establish a basic computer language. Since the project began, an imaginative flow of language concepts has emerged, which will have a profound effect upon the industry, and data processing technology.

### *Commercial Development of Languages*

Probably, the U.S.A.F. Air Materiel Command has had the greatest experience in commercial use of the new languages. One of the first language forms used was GPX, or Generalized Programming Extended, which first utilized MACRO instructions. At the same time another form was developed known as FLOWMATIC; this was the first attempt at an English

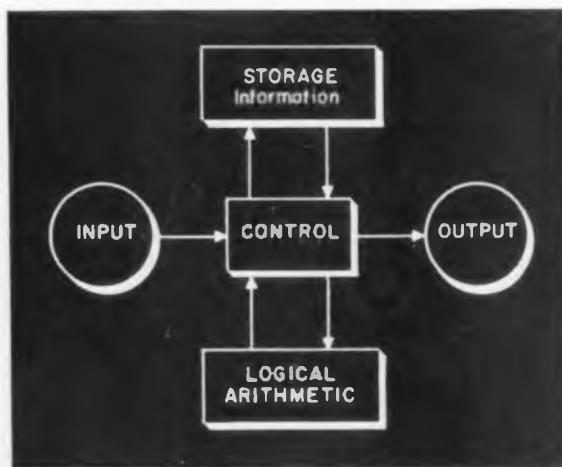


Fig. 1: Control operates between the arithmetic functions and the information stored in the memory for the solution of problems.

language format. From this development a more comprehensive form of language known as AMACO evolved. This is the language now used by Air Materiel Command to compile programming on the Remington Rand Univac system. It is the only programming language which has been running for any appreciable period—nearly three years—to compute all Air Force inventories, payrolls and related data. In other fields, FLOWMATIC language is currently being used by many users, including Ontario Hydro, and United States Steel.

The most important of the new languages is COBOL, which is now widely accepted. It has been in commercial use since December 1960.

# SCIENCE

GPX • FLOMATIC • FORTRAN



At the RCA Electronics Systems Center in Wall St., N. Y., instructor shows how COBOL shortens computed program. Blackboard shows old and new methods.

### Origination of COBOL language

Common Business Oriented Language, or COBOL was developed by a committee of electronic data processing systems manufacturers, who were represented by CODASYL, a committee name for Conference of Data Systems Languages. The first of the conferences was held in Washington, D. C., in May, 1959.

The interested participants in this project included:

- Burroughs Corp.
- International Business Machines Corp.
- Minneapolis Honeywell Corp.
- Radio Corp. of America.
- Remington Rand Univac.
- Sylvania Corp.

Representing the users of the systems on behalf of the U.S. Government were:

- The USAF Air Materiel Command.
- The Navy Bureau of Ships.

COBOL was required to fulfill several conditions. They were all resolved into a set of rules to describe the problems and solutions for different types of computer systems.

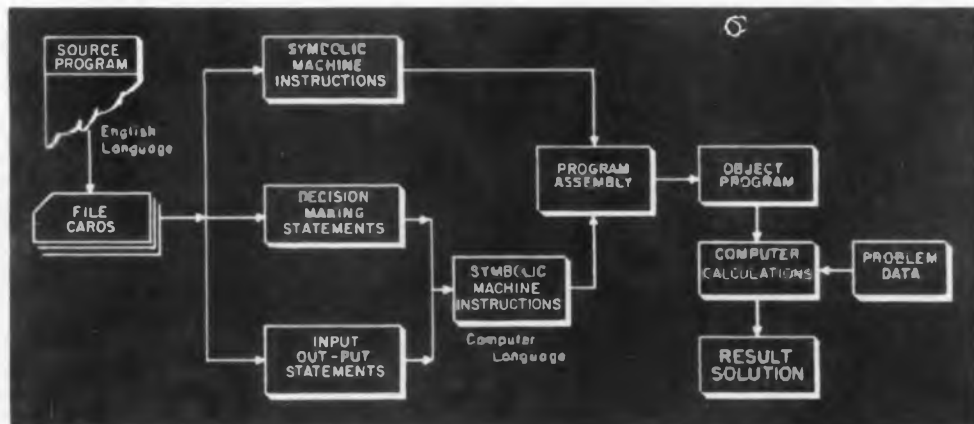
The function of the computer language is to state in English words a program able to translate the instructions into a machine-coded program.

### Word Meanings

The meaning of words is extremely important in the development of computer languages. When a machine language is used to communicate to a computer system, a single error in the coding may alter the meaning, or make nonsense of the message. Therefore, a language must be completely capable to interpret the functions of a computer system.

The initial breakthrough started with the evolution of "macro" instructions. A "macro" instruction is a

Fig. 2: Flow - chart showing conversion of a program using packaged routines.





This Honeywell installation shows an output printing unit in the foreground (left). The reams of paper folding in continuous flow indicate the volume of data in process.

synthetic command word, which tells a "processor" routine to generate the required steps to execute commands in the computer. A "processor" is a special program which translates the new language into the machine code format. Hence, the complex steps which were expressed as a symbolized code are handled automatically by the translator. In almost all cases the computer is used as the translator.

#### *Programming a Computer*

To put the significance of the new languages into a clear perspective it is necessary to outline the technique used for programming.

An example in human analogy will help. If you were asked to "type an address on an envelope"; you could do so without further instructions. A computer, however, must have every single step detailed by a program of instructions. It must be told where the envelope is located, where to put the envelope, how to roll it in the desired position. Then, which knob to turn, and which hand to use. Where to find the address, and read it. Then decide each key to be pressed, and how to type a capital letter, and so on, and so on, until every possible step is detailed in full to complete the operation.

Just as it is necessary for a human to learn how to type an address on an envelope, so a computer must be told what to do, but there is no need to spell out to you each step of the process. However, in this case, you would have an option to determine the address. With the computer, instead of writing out the steps for each address, each time, the programmer would enter

the macro instruction for "type address on envelope" and indicate the "address" to be used. The computer would then operate on the macro command to produce the individual steps generated in the "processor" routine. These instructions are then automatically passed to the computer to execute the commands. Refer to Fig. 1.

A "program" therefore is a prepared sequence of instructions to be used for a particular computation. The computer control system "reads" the program, and accepts, and acts on these instructions in the desired sequence. With fully automatic computers, each program has to be worked out in minute detail by a specially trained programmer. As the computer can only work to the orders fed to it, the programmer has to work out every single step which the machine will perform. A program can direct that certain parts of the sequences be repeated, or operate on its instructions to delete certain parts in the sequence. This ability within the function of a program indicates the possibilities inherent in the process of manipulation. Any abbreviations can effect enormous time savings, as a program may contain several hundreds of orders, which may amount to a million, or more individual steps on the computation.

#### *Integration in Industry*

Industry uses data processing computers to analyze, store, and make calculations on a vast range of data common to many businesses. Much of this data and information required is similar in most business applications. However, as these applications are processed

by each computer manufacturer using his own technique, the operational sequences of each step, and function of these steps will vary . . . but the point is, that all these variations do achieve the same result.

The new languages offer a high degree of integration between management and the complexities of computer technology. It provides far-reaching benefits for training personnel, and generally improving commercial appreciation.

The previously used programs written in numerical codes presented a meaningless jargon to the uninitiated, but the new languages give a clear interpretation between the computer machine codes, and normal English.

#### Practical Advantages

Considering that different data processing machines have varied repertoires the programmer encounters certain limitations.

This problem has been overcome by IBM's development of two highly workable computer languages. (FORTRAN AND COMMERCIAL TRANSLATOR.) Both languages are problem-oriented. FORTRAN, one of the earliest of the mathematical languages is used to greatest advantage in the solution of mathematical problem analysis of quantities, and similar applications in engineering formulas. The word FORTRAN is derived from FORMula TRANslation.

The other language, known as COMMERCIAL TRANSLATOR, or COMTRAN, is a machine-independent language, which utilizes familiar business terms. It is used in the business data processing field for accounting, sorting, inventories, etc.; though at present COMTRAN is a laboratory development, and not yet in commercial use. These abbreviated languages, using such a sophisticated system of automatic interpretation, provide other important benefits:

1. The complexity and cost of converting programs prepared for one computer into the requirements of another is minimized.
2. The time to train a programmer, is reduced to less than a quarter of the time usually taken.
3. Revision and adaption of existing programs is reduced to a minimum.
4. Prospective customers, and management in general can easily comprehend, and appreciate, the capabilities of the machine. The ease of communicating the needs of managers to programmers, through the terms used in everyday business, creates a new understanding, and improved coordination.
5. The programmer is able to translate business terms into one of these new languages quickly, and simply. The automatic processor translates the terms into computer instructions and produces a workable program in a fraction of the previous time . . . minutes, or hours, instead of weeks, or months.

The importance of this development, in man-to-machine communication may be better appreciated when IBM alone, employ more than 1000 men, and women, on the development of programming systems. For a large system, a complete set of programs may cost one-and-a-half million dollars. The man-hours

involved in such an effort would amount to 50 or 60 years.

This investment of time and expense for programming is considered justified by the tremendously increased use of computers made possible by these simplified systems.

#### ALGOL Language

Some of the new languages express mathematical processes, one of these is ALGOL. In December, 1958, an international group of mathematicians and computer specialists met in Zurich to set the specifications for an international algebraic language. Its objective was two-fold.

1. To serve as a standard of notation for papers on numerical analysis.
2. To serve as a guide for the construction of algebraic compilers, to simplify the communication difficulties.

An ALGOL translation program is manually prepared for a problem on an IBM card. This card is then fed to the computer, which translates the ALGOL language to computer language. The "output" of the computer, then produces a program which is a complete set of operating instructions. When this program is again fed into the "input" of the computer, the machine is loaded and ready for operation. Refer Fig. 2. The problem data to be operated on is now fed to the computer and processed. The output solutions and information, will be printed out, or recorded in the desired format. ALGOL allows computer commands to be expressed in almost pure algebra, the mathematicians' normal problem-solving language.

Burroughs Corp. was the first manufacturer to implement the use of ALGOL in communication with a computer. Their experience with this language provided a base for the design of the B5000 solid state information processing system. This was the first system specifically designed for maximum utilization of automatic programming languages.

ALGOL is based on Polish Algebra symbolization.

(Continued on page 479)

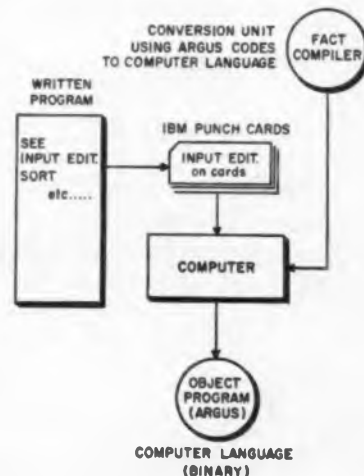


Fig. 3: Simplified chart showing FACT operation.



3.141592653589793238462643383279502884197169399375105820974

## symbol of precision

It's a simple matter for today's computer to extend the accuracy of the symbol  $\pi$  to a fantastic 10,000 decimal places and beyond, thanks to such advances as solid-state electronics. Thus the symbol  $\pi$  is a logical name for Precision's new all-solid-state instrumentation tape recorder, which has dramatically extended performance levels to literally *twice* those of ordinary magnetic tape instruments. The Precision  $\pi$  recorder offers:

**TWICE** the frequency response previously obtainable with conventional recorders

**TWICE** the recording time for a given length of tape—as much data on a 10½ inch reel as previously on a 14 inch reel

**TWICE** the economy **HIGHER** reliability, **LOWER** flutter, **LESS** maintenance

Write for your copy of Bulletin 59, which describes the new Precision  $\pi$  Recorder, based on the thoroughly tested and field-proven design of the FIRST all-solid-state instrumentation tape recorder, the Precision PS-200 Series.



Open door view of 7-channel machine, showing loaded tape magazine which can be interchanged in 5 seconds.



Rear view of 14-channel recorder which weighs only 105 pounds, fits in only 26½ inches of rack space.



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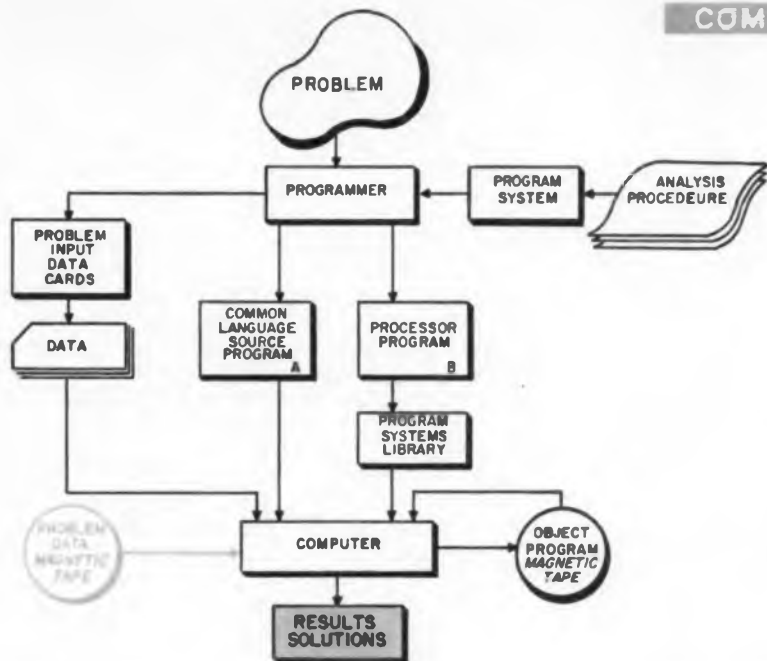


Fig. 4: The programming system consists of two major parts: a 'language', and a 'processor' shown above as A B. The programs stored in the 'library' are used as needed by the 'processor', which supplies routines as required. From the information received the computer generates the 'object program'. (Completion of first stage). The object program is then fed into the computer to set the system for automatic operation on the problem. The problem data is fed to the computer in the final operation and is processed and compared with the information stored in the system by the 'object program'. (Final stage, shown in red).

The similarity of ALGOL as a compiler statement is shown below.

The algebra is written thus . . .

$$Re = \frac{2050}{D} Q f = 0.1 \left[ \frac{K_1}{\log Re} - K_2 \right] \Delta P = \frac{0.135 f L Q^2}{D^5}$$

An ALGOL statement is written . . .

$$RE = 2050 \cdot Q / D; F = 0.1 (K_1 / \log (RE) - K_2);$$

$$DP = 0.135 \cdot F \cdot L \cdot Q^2 / D^5;$$

It can be seen that the influence of ALGOL has already brought a higher degree of sophistication to computer programming. To enhance this trend, functions are also built in to the computer system to make translations even more efficient. For example, control mechanisms for program sub-routine operations can instruct themselves to operate on a program and tell it to use other pre-stored programs. This self-function enables a programmer to write even less in ALGOL, because he may now couple two programs together when desired.

ALGOL compiler programming utilizes approximately 3500 instructions, and 2000 words of tabular storage. It requires a 5000 word memory in order to operate when used with the B5000 system.

An example of an ALGOL problem is shown below which clearly demonstrates the economy of effort in preparing an ALGOL program with a machine program.

Problem in Algebraic Notation

$$\int_0^x \frac{X^2 dX}{(A + BX)^2}$$

$$= \frac{1}{B^2} \left[ A + BX - 2A \log(A + BX) - \frac{A^2}{A + BX} \right]$$

Burroughs ALGOL Program

$$S = A + B \cdot X \text{ §}$$

$$\text{INTEGRAL} = (S - 2A \cdot \text{LOG}(S) - A^2/S) / B^2 \text{ § §}$$

Burroughs 220 Machine Language Program, below, is automatically translated from the two ALGOL statements above by the Burroughs ALGOL compiler.

0200	0 0000 10 0001
0201	0 0000 24 0002
0202	0 0000 22 0003
0203	0 0000 40 0004
0204	0 0000 10 0004
0205	0 0000 44 0005
0206	0 0000 30 0005
0207	0 0000 24 0003
0082	0 5120 00 0000
0208	0 0000 24 0092
0209	0 0000 23 0004
0210	0 0000 40 0093
0211	0 0000 10 0003
0212	0 0000 24 0003
0213	0 0002 45 0000
0214	0 0000 25 0004
0215	0 0000 22 0093

0094	0 0000 00 0003
0216	0 0000 41 0094
0217	0 0000 40 0093
0218	0 0000 10 0001
0219	0 0000 44 0095
0220	0 0000 30 0095
0221	0 0000 40 0133
0222	0 0000 11 0093
0223	0 0002 45 0000
0224	0 0000 25 0133
0225	0 0000 40 0134

*An Example in FORTRAN Language*

The mathematical language of FORTRAN provides a simple method for the programmer to prepare a mathematical problem for computer processing. The example given below is taken from IBM and is programmed for their IBM 7090 or the 709. It shows a typical problem faced by a scientist or engineer. "Find the velocity of the center of a mass in the collision of two particles of mass, m and M."

The equation is: (Continued on page 481)

## COMPUTER "LANGUAGES"

(Continued from page 479)

$$V = c \frac{\sqrt{E^2 + 2mc^2 E}}{E + (m + M)c^2}$$

Where:

*c* is SPDLT (Speed of light)  
*E* is ENERGY  
*m* is FMASS  
*M* is RMASS  
*V* is VELCTY

For the first step the engineer has the required equation with which to work. Using the language of FORTRAN he easily translates the equation into a source statement, which closely resembles the mathematical format, as follows:

```
VELCTY = (SPDLT*SQRTF(ENERGY** 2+2
*FMASS * SPDLT**2*ENERGY)) /
(ENERGY + (FMASS + RMASS) *SPDLT **2)
```

This source program statement is then punched into IBM cards.

In the second step the 7090 FORTRAN programming system takes over. The source statement is translated into the machine language program, which is then written on magnetic tape, or punched cards, or listed. The report statement will show the machine coded instructions in detail, generated from the FORTRAN language statements, written by the engineer.

The third step provides the condition where the 7090 computer is ready to solve the problem. Finally, the input data is fed into the computer and the answer is produced.

### Easier Research

An important advantage in the application of such mathematical languages is that an engineer or scientist can prepare his own research study program and almost immediately use the computer, so avoiding previous delays, when waiting for specialist programmers. This point alone can contribute directly to the more rapid solution of problems in design and development, for now many engineers can make use of the services of computers, instead of only a few. An engineer, or scientist, preparing such programs, for his own particular applications, may compile a set of punched cards containing specialized programming routines, to which he can refer any time he is preparing a program.

Many users, are taking advantage of this new system, in the preparation of scientific contract computing. Stamford, Caltech and others are utilizing this principle.

### FACT Business Data Language

FACT, one of the most recent business languages, is a development of Minneapolis Honeywell Corp. It is being implemented for the Honeywell 800 data processing system, and can be implemented for other machines, if desired.

With FACT it is possible to solve a data processing problem without recourse to any other symbols, codes, or characters. It operates and remains in its own language through all processing sequences. This presents certain advantages over COBOL, or COMTRAM, as these require at times to resort to other means for input editing, or sorting in a different sequence, to extract and operate specific data, out of normal sequence.

The FACT compiler contains a computer INPUT-EDIT routine, which is coded in another method known as ARGUS coding. This is a method of communication between computer machine language, and FACT. A programmer is not required to use ARGUS, as it is pre-set in the interpretation process. Therefore, the edit routine is automatically converted to the master magnetic-tape program, Fig. 3.

A first command written in FACT will be written as: SEE INPUT EDITOR, CLOSE INPUT EDITOR.

This FACT instruction will then be matched against the FACT compiler mag-tape, and a series of machine language instructions on the master program, known as the Object Program. After which it will finish, or close the EDIT routine. Another important area in data processing is the sorting of data. An instruction can be written:

```
SORT INPUT FILE NAME TO OUTPUT FILE
NAME. CONTROL ON FILED NAME.
```

This first instruction SORT INPUT FILE NAME, tells the fact compiler to generate a series of machine instructions to sort the data as specified, being all the information to be processed under its title name. By using these simple instructions we have caused the computer to process a total of 5000 or more machine steps, thereby completing part of a sorting operation.

### Updating Using FACT

Bringing data up-to-date is known as updating. A basic updating routine is generated by executing a statement of the form:

```
UPDATE A BY B, CONTROL ON Kn, Kn-1, . . . . .
```

(Continued on page 483)

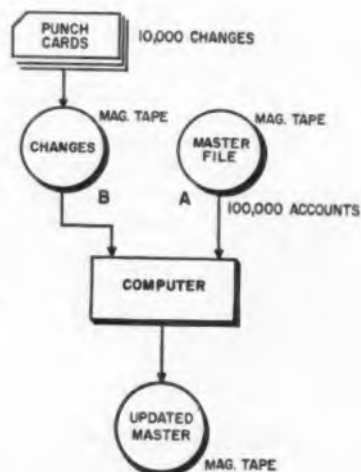


Fig. 5: Simplified diagram showing flow of data and hardware.

**K<sub>2</sub> and K<sub>1</sub> WITH UNMATCHED-MASTER (ALPHA), MATCHED-MASTER (BETA) . . . etc. PROCEDURES.**

ALPHA, BETA, etc., are the names assigned to the various procedures which the programmer writes to perform the operations. A is the name of the old master file, or the name of a special secondary file. B is a detail file, or a special secondary group. K<sub>n</sub> indicates field keys for matching the master and detail parts in a decreasing order of significance. This process can extend to cover a sequence of these operations. Refer to Fig. 4. In the words of the new languages, there are verbs, adjectives, and conjunctions, as in normal grammar. The important words are verbs. A verb states what is being done. Verbs like ADD, CLOSE, DELETE, GET, IGNORE, REWIND, are all verbs of the FACT language. The value of such verbs in terms of actually doing a task gives a precise idea of the profoundness of a language. For example the verb UPDATE, which has been discussed, performs a most involved sequence of operations in filing data. File maintenance is the most important daily work of data processing, and involves complex matching of transactions from the master file, comparing the records and then "doing" all the complex procedures to update the matched records. All these functions are handled automatically by the UPDATE verb.

To realize the simplicity of programming in these terms, the reader may actually write a program himself from the following information: Refer to Fig. 5.

In this example we state a situation:

"Master file contains present active accounts. A change file contains today's changes relating to payments on the above accounts."

Operation wanted:

To transfer relevant information from the change file, to the master file, and make a record of this on the master file.

Produce an updated master file. (Mag-tape)

The change file data is in the field identified as B.

The master file data is in the field identified as A, and is to receive the records of the changes made.

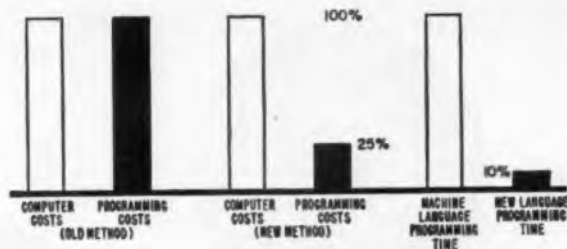
From a few words extracted from a FACT vocabulary below select the words to program the instructions to do the operation.

SUBTRACT  
PUT  
FROM  
INTO

The program will read . . .

1. SUBTRACT B FROM A. (Gives new balance in master file)
2. PUT B INTO A. (Records payment on master file)

This segment of an operation may then be automatically performed on a hundred thousand accounts, and the updated master file will contain a complete record of the status of every single account, which might have involved ten thousand changes. FACT is



This graph shows the comparative improvements between the previous methods of programming and the new language methods. The computer costs represented by the white bar will soon be reduced also, as new hardware techniques are utilized.

currently in use in many applications presently confined to Honeywell installations.

**Future Considerations**

Computers are often mistakenly envisioned as the do-all and end-all in electronic processing. It is becoming more apparent that the art is only just beginning. As an illustration, if a similar algebraic language to ALGOL was developed, it would be feasible to express a problem for a computer in normal algebraic terms—where an algebraic operation could be carried out directly without using numerical symbols.

Theoretically, this language would then extend the use of the computer to non-computational problems; which would directly analyze mathematical equations, and so absorb much of the workload which is now consuming the mathematicians' time. In practice, it would reduce algebraic equations by direct analysis in the computer.

As an example, under present conditions we can express an equation:

$$X^2 + 2aX = a^2$$

The computer will provide the solution  $a(1 \pm \sqrt{2})$ . Our objective in the method described above, is to have the computer recognize this solution in a literal evaluation, instead of numerically. Admittedly, it is possible to do this with the present state of the art, but it is a very slow process. It is desirable, to eventually recognize it instantly on future computers.

Another simple illustration will show how cumbersome a computer can be. Assume, that:

John Edwards 192863

was printed out as one of a list of names from a processed data operation, and we required to have the name reversed in the format shown below:

192863 Edwards, John

To do this, and to add the coma, requires a mass of further programming. Furthermore, all the names will have a varying number of letters. This would create more complexity in the computer system.

It is obvious that if it was required to extract a set of facts from a Corporation-Report in any special order, it would need a difficult editing and format program, because information is stored in a special operational sequence. To extract it in a different sequence requires a new program study. Therefore,

(Continued on page 483)



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Permanent error rate... 1 in 10<sup>8</sup> to 10<sup>9</sup> max. at 1500 ppi  
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- ERROR CORRECTION** Single parity channel makes possible single error correction
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## Glossary of Programming Terms

The following glossary of computer terms apply principally to programming, and language terminology. It is included here to clarify the more recent terms in relation to the new computer languages.

**ALGOL**—(for ALCOrithmic Language) an international problem language designed for the concise, efficient expression of arithmetic and logical processes, and the control (iterative, etc.) of these processes.

**ASSEMBLY** — Process whereby instructions written in a symbolic form by the programmer are changed by the computer to machine language.

**AUTOMATIC PROGRAMMING**—Any technique whereby the computer itself is used to transform programming from a form that is easy for any programmer to produce into a form that is efficient for the computer to carry out.

**BINARY CODED DECIMAL**—A system of representing decimal numbers in which each decimal digit is represented by a combination of four binary digits.

**BIT**—A binary digit (contraction); the smallest unit of information in a computer; a single pulse in a group of pulses. Groups of bits represent decimal numbers and/or characters.

**CHARACTER**—A decimal digit, alphabetic letter or a special symbol such as \$, %, etc.

**COBOL** — A COmmon Business Oriented Language designed for expressing problems of data manipulation and processing in English narrative form.

**CODING**—Converting program flow charts to machine language used by the computer; the assignments of identification codes to a transaction, such as a customer code number; a method of representing characters within the computer.

**COMMAND**—A word that initiates one step in the performance of a computer operation. An instruction.

**COMPARE**—To examine the representation of a quantity for the purpose of discovering identity or magnitude.

**COMPILER**—An automatic coding system which generates and assembles a computer problem from pseudo-language instructions written by a programmer.

**DATA PROCESSING MACHINE**—A general name for a machine which can store and process numeric and alphabetic information.

**EDIT**—To rearrange information. Editing may involve the deletion of unwanted data, the selection of pertinent data, the insertion of invariant symbols such as page numbers and typewriter characters, and the application of standard processes such as zero suppression. Editing may also involve expanding a 4 bit character into a 6 bit character and compressing a 6 bit character into a 4 bit character.

**FIELD**—A group of characters which identifies measures, classifies or shows the status of an entity in the format of an "item."

**FILE**—A collection of records pertaining to one function. Usually arranged in an ascending sequence—e.g., inventory file.

**HARDWARE**—The mechanical, electronic,

(Continued from page 481)

a language which can express this operation sequence and format, in simple language (as COBOL, FACT or COMTRAN, for example), makes such a task easier.

#### Immediate Objectives

The COBOL language policy is to utilize its application over a wide range of data processing configurations. This broad machine application restricts the range of COBOL to suit the most common denominator of the environmental hardware of each machine. Further sophistication depends on the standardization of hardware, and the related objectives of a system. At the moment there are twelve different manufacturers with various models, currently adapting COBOL.

To elaborate on language sophistication, there is a further study underway to consider a language which will encompass a far more profound objective; in which a single word will operate a completely integrated sequence of operations. For example, the word PAYROLL would cause a computer to produce all the data of a payroll. This concept is not available yet, however, it can be seen that such a language would reduce the extent of analysis of computer systems' hardware, and give greater flexibility to the programmer. The amount of machine information which is digested in an imperative command word, defines the amount of writing involved in the programming.

## COMPUTER "LANGUAGES"

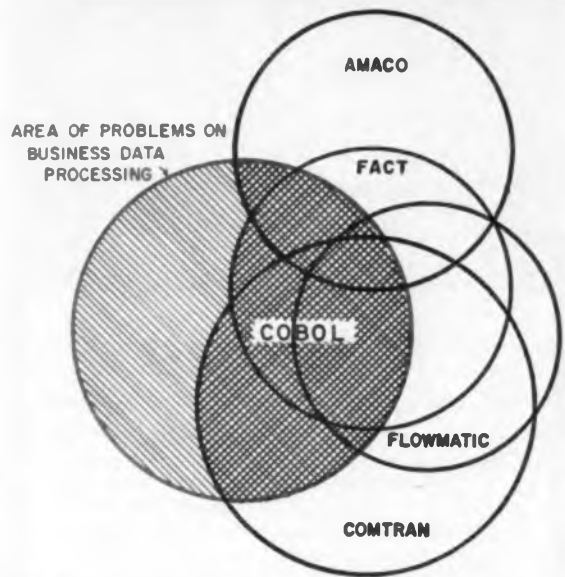


Fig. 6: Each language is superimposed on the major area of data processing problems, as shown by the red hatching. It can be seen that there is much common agreement in each language. However COBOL is the most 'pure' in its confinement to one purpose, the machine-independent language applicable to all machines. The red cross-hatching indicates the unsolved problem area. N.B. This diagram is not intended to represent actual proportions.

magnetic and electrical components of a computer system.

**INPUT**—Transfer of information from an external storage media into the internal storage unit of the computer.

**INSTRUCTION**—An order to the machine to perform some operation. The instruction usually contains also the storage address(es) to be acted upon.

**KEY**—A set of characters, forming a field, used to identify an item.

**LIBRARY**—In computer programming, refers to ordered collection of proven routines and subroutines by which problems and parts of problems may be solved. These instructions are usually written and stored in some form of relative addressing.

**LOGICAL OPERATIONS**—The operations of comparing, selecting, searching, matching, sorting, merging, etc.

**MACHINE LANGUAGE**—The coded operations that control information and addresses employed within the Processor to express a program.

**MICROSECOND**—One-millionth of a second.

**OPERATION**—A specific action which the machine will automatically perform whenever the command (instruction) calls for it.

**PARALLEL OPERATION**—Flow of data through the system or any part of it, using two or more communication lines or channels simultaneously.

**PARALLEL PROCESSING**—Processing more than one program at a time on a parallel basis, where more than one Processor is active at a time (distinguished from Multi-Processing where only one Processor is active on one program at a time).

**POLISH NOTATION**—A method of writing logical and arithmetic expressions without the need for parentheses, originated by the Polish logician J. Lukasiewicz. For example: Normal algebraic notation  $(X+Y) \times (A-B)$ , in Polish Notation:  $XY+AB -x$ .

**PROBLEM LANGUAGE**—The language used by the programmer to state the definition of a problem. ALGOL and COBOL are examples of problem languages. Problem languages are closely related to the type of problem being stated—i.e., algebraic statements for mathematical problems (ALGOL) and narrative English statements for commercial problems (COBOL). Problem language should not be confused with machine language. A program is written in problem language by the programmer. This source is then translated to the object program (in machine language) by a compiler program.

**PROGRAM (noun)**—A plan for the solution of a problem. A B5000 program may be a statement of the problem in ALGOL or COBOL or the translated, segments object (compilation result) program.

**PROGRAM (verb)**—To plan a computation or process from the original statement of the problem to the delivery of the results, including the integration of the operation of the resulting program into an existing system (for conventional computers). For the B5000: A system analysis and statement of the problem in common language.

**READ**—To copy from one storage to another, usually from external storage to internal storage.

**RECORD**—A single item or a group of items

which are read into the computer or written out from the computer.

**ROUTINE**—A set of coded instructions arranged in proper sequence to direct the computer to perform the desired operation or series of operations.

**SEGMENT (verb)**—To divide a program into an integral number of parts, each of which performs some part of the total program and is capable of being completely stored in internal memory.

**SOFTWARE**—Programs, routines, and procedures which augment and support a computer system (the Master Control Program, compilers, etc.).

**STACK**—A portion of memory and/or registers used for temporarily holding information. A Stack, as used in the B5000, operates on the "last-in first-out" principle, that is, the last item of information placed in the Stack will be the first item of information used when information is required from the Stack. Operators perform their operations on information at the top of the Stack.

**STORAGE**—Any device into which information can be copied, which holds this information, and from which the information can be obtained at a later time.

**SUBROUTINE**—The set of instructions necessary to carry out a defined operation; a sub-unit of a program.

**TRANSLATE**—To produce a statement in one language equivalent in meaning to a statement in a different language.

**WRITE**—To transfer information from one type of storage to another.

**WORD**—A group of characters fixed in length consisting of 48 bits.



## Catalog

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### Design Potentials

The current pattern of development indicates that tomorrows computers will be built to suit problems, instead of adapting problems to suit machines. It is conceivable that progressive technology is generating problems so quickly that we may find ourselves overcome by it, before the solutions are found. By planning ahead, and analyzing these probabilities, it may one day be possible to build perception capabilities into computers, which will exhibit behavior reflexes, or a form of anticipated responses, able to solve such conditions in advance.

### Diagnostic Computers

The uses of computer science will extend to many more fields in the imminent future. Most of the professions have their special languages, such as Chemistry, Mathematics, Medicine and Law. A means to communicate their problems to computers through a special language will assist every aspect of their work: just as the languages in data processing operations assist business.

If medicine is considered, it may be possible to diagnose any human ailment in a few seconds, and recommend the optimum method of treatment. The diseases are already cataloged, the treatment, the surgery and medicines are known. There are cardiographs, bloodcounts, and pressures, pulse rates, age, and sex of the person to be considered. There are complications, psychological conditions and a mass of details, all related in some way. It is an ideal problem needing rapid analysis and decisions, which can be rapidly analyzed by a computer. A Medical computer-translated language could enable the medical staff of several hospitals to consult the encyclopedic range of medical knowledge held in such a system. In addition it would maintain the complete records on all patients, and even handle the medical accounts. Of course, the end possibilities are unlimited, as doctors would be able to assess their results most accurately and have more time for research. In fact a new era in efficient medical treatment could emerge.

As a result of this new application of words, there is an agitation for a deep study program on the immediate analysis of the "science of words." CODASYL is considering this problem at the moment, but are faced with the poser of who can construct an artificial language, to meet the exacting needs of a universal computer language, designated as UNCOL.

A visual concept of the problem is shown on Fig. 6.

It is suggested that the logical functions of a digital computer language and its subsequent binary operation, may be algebraically analyzed. Such a diagnostic concept, presents an interesting potential, perhaps using ALGOL, to resolve some of the basic arguments in the current studies.

# New Technical Data for



These bulletins, data sheets, brochures and catalogs are available to the readers of *Electronic Industries*. For your convenience, items related to specific technical fields have been grouped together. Included in this section are:

- Power Supplies
- Ceramics
- Tubes
- Ultrasonics
- Facilities/Capabilities
- Chemicals/Compounds
- Motors
- Synchros & Accessories
- Sensing Devices
- Systems
- Ovens & Accessories
- Rectifiers
- Microwave
- Industrial Machinery
- Cabinets & Panels
- Hardware
- Recorders & Accessories
- Semiconductors
- Resins & Plastics
- Switches & Relays
- General
- Components
- Instruments & Meters
- Amplifiers

## POWER SUPPLIES

### Power Supply Catalog

Complete data is included on more than 150 standard models in their line of Regulated DC Power Supplies, including semiconductor, vacuum tube, magnetic and hybrid designs. Kepeco, Inc., 131-38 Sanford Ave., Flushing 52, N. Y.

Circle 263 on Inquiry Card

### Power Supply Catalog

Transistorized dc, silicon controlled rectifier dc, transistor regulated power supply modules, solid state dc, silicon brute force dc, Constant voltage and/or current, high voltage dc, regulated high voltage dc and solid state dc to dc converters, dc to ac converters, freq. changers, dynamotor replacements and blower inverters are covered in a catalog available from NJE Corp., Kenilworth, N. J.

Circle 264 on Inquiry Card

### AC/DC Supply

American Rectifier Corp., 95 Lafayette St., New York 13, N. Y., has available a tech. pamphlet on TM® power supplies. The output may be either ac or dc. The TM may also be used for alarm systems where either an excess or a loss of current or volts may be detrimental to the testing or the processes under control. Examples of applications and brief descriptions of set-up procedures are included.

Circle 265 on Inquiry Card

### Modular Supplies

Brochure No. 61A from Consolidated Avionics Corp., 800 Shames Dr., Westbury, L. I., N. Y., gives complete specs., features and descriptions of Con Avionics' line of transistorized power supplies. Included in the brochure are wide range, modular, low cost and switching types.

Circle 266 on Inquiry Card

### Regulated Solid State

A 1961 short form catalog covering the 22 major regulated power supplies designed and manufactured by Harrison Laboratories, Inc., 45 Industrial Rd., Berkeley Heights, N. J., is now available. The catalog covers the latest developments in regulated transistorized power supplies and lists complete specs. and latest engineering features.

Circle 267 on Inquiry Card

## CERAMICS

### Industrial Ceramics

A 17 page catalog is available from Saxonburg Ceramics, Inc., Saxonburg, Pa., on their complete line of industrial ceramics. Featured in the catalog are ceramics for: electrical and electronic components; instrument and measuring apparatus; nuclear energy applications; and laboratory testing and analysis.

Circle 268 on Inquiry Card

### High Q Cores

Bulletin #167 covering 3 new types of temp. stable cup cores for filter networks and delay lines is available from General Ceramics, Keasbey, N. J. The bulletin covers core types ranging in typical "Q" factors from 450 to 625 based on predetermined test conditions. Literature is complete with curves, dimensions and electrical specs.

Circle 269 on Inquiry Card

### Ceramic Research

Bulletin S-1063 entitled "Heat Processing Ceramics with Selas Gradation" presents an inside look at some of the research work being done in the Selas Research Laboratory on ceramics, as well as actual installations in the field. The Research section shows engineers conducting such tests as the firing ceramic test pieces at temps up to and above 3900°F, and how these and other advances are being made possible. Selas Corp. of America, Dresher, Pa.

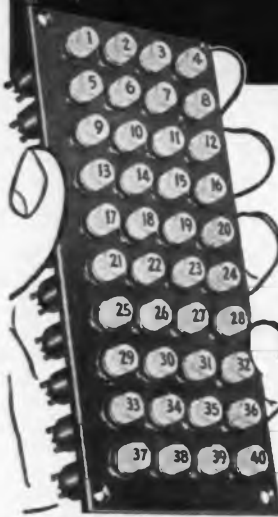
Circle 270 on Inquiry Card

### Property Charts

American Lava Corp., Sub. of Minnesota Mining and Mfg. Co., Chattanooga 5, Tenn., has available their newest chart on AISiMag® ceramics. Chart #611 contains specs. on their complete line of ceramics including Alumina, Leachable Ceramics, Zircon, Titania and Cordierite. Thermal expansion, dielectric strength and volume resistivity charts are included.

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# New Tech Data

## for Engineers

### Control Meters

A new engineering fact file with complete data on its line of Contactless Electronic Control Meters has been issued by International Instruments, Inc., 88 Marsh Hill Rd., Orange, Conn. The meters are completely self-contained instruments with one or two adjustable control arms that perform the dual functions of indication and control.

Circle 505 on Inquiry Card

### Portable Transceiver

Tech. information is available on Karr Engineering Corp.'s portable Transceiver. The TR 330 is a hand held, fully transistorized Class D unit. It features 4 battery option, collapsible antenna, transmitter and receiver crystals to Mil specs., and squelch circuit. Kaar Engineering Corp., 2995 Middlefield Rd., Palo Alto, Calif.

Circle 506 on Inquiry Card

### Printed Circuits

Mykroy® Glass-Bonded Mica Substrates and Printed Circuits are described in a bulletin available from Electronic Mechanics, Inc., 101 Clifton Blvd., Clifton, N. J. The bulletin contains drawings which illustrate fabrication and application of these components as well as graphs and diagrams covering electrical characteristics.

Circle 507 on Inquiry Card

### Flexible Couplings

Photographs, diagrams, lateral deflection and torsional deflection charts, dimensions and weights and torque and flex data are included in a brochure offered by Naugler Engineering, Inc., 19 Madison Ave., Beverly, Mass. The flexible coupling is a compact and lightweight (aluminum hubs and center members) yet provides high torque capacity through the hardened beryllium copper leaves. Size range ½ to 1½ in. O.D. Catalog No. 40.

Circle 508 on Inquiry Card

### Digital Modules

A 12-page catalog is available which describes 10 and 16 megacycle H-PACs® H-PACs are compatible family of high-speed, plug-in digital modules. The catalog's foreword is a reprint of a tech. paper entitled, "A Synchronous Logic Technique for Sixteen Megacycles Clock Rate." The pages also include a detailed description of each package, electrical specs. and functional diagrams. Computer Control Co., 983 Concord St., Framingham, Mass.

Circle 509 on Inquiry Card

### Microscopes

Bausch & Lomb Optical Co., Rochester 2, N. Y., is offering Tech. data on their 3D Stereomicroscopes. Features include interchangeable optical systems fitting any stand; Power Pods—2 variable and 2 fixed models. The variable Models offer 1.0X thru 2.0X and 0.7X thru 3.0X. The fixed models are 1.0X and 2.0X. Also offered are Wide Field Eyepieces in 10X, 15X and 20X. Catalog D-15.

Circle 510 on Inquiry Card

### Resistance Standards

Tech. Data EB2(1) describing precise dc electrical resistance standards is now available from Leeds & Northrup Co., 4934 Stenton Ave., Philadelphia 44, Pa. The electrical standards described include the Thomas-Type One-ohm Standard with a measured value given to one part/million, N.B.S. Type Resistance Standards, Reichsanstalt-Type Resistance Standards, secondary standard dc resistors, a mercury-cup stand, shunts for large currents and secondary-standard ac resistors.

Circle 511 on Inquiry Card

### Transformers

A new 8-page general information catalog is available on PCA's new line of Datapulse® Transformers. Featured in the catalog is a variety of basic tech. data related to pulse transformers, parameters, information on winding ratios, equivalent circuits, a selection of transformer equations, inductance and resistance charts. PCA Electronics, Inc., 16799 Schoenborn St., Sepulveda, Calif.

Circle 512 on Inquiry Card

### Laboratory Equipment

New developments for platers are displayed in an illustrated proprietary product brochure now offered by The Singleton Co., 11770 Berea Rd., Cleveland, Ohio. The brochure highlights a wide variety of high-performance original and replacement plating cylinders, superstructures, tanks and components to fit its own and all makes of barrel equipment, any type, size, and age.

Circle 513 on Inquiry Card

### Ultrasonic Cleaners

A Tech Data Bulletin from Acoustica Associates, Inc., 10400 Aviation Blvd., Los Angeles 45, Calif., describes the self-tuning transistorized 20-KC line of ultrasonic cleaners. Advantages pointed out in the bulletin are lighter weight and compactness, choice of selectable power levels, automatic compensation for load and liquid levels, on-off control, no warm-up time, limited maintenance, and high efficiency.

Circle 514 on Inquiry Card

### Digital Modules

A 16 page Catalog on 300 Series Transistorized Digital System Modules is available from Navigation Computer Corp., Valley Forge Industrial Park, Norristown, Pa. The catalog describes the System Functions which are packaged on each gold plated module. Block diagrams, logical design considerations and input-output specs. are included.

Circle 515 on Inquiry Card

### Deviation Calibrator

A new tech. bulletin describing the "Monocal 500" FM-Monitor Deviation Calibrator is now available from Advanced Measurement Instruments, Inc., 109 Dover St., Somerville 44, Mass. The A-M-I "Monocal 500" provides better than 0.5% deviation accuracy, and determines the peak deviation of an FM signal by the carrier-dropout method. Bulletin 500.

Circle 516 on Inquiry Card

### Power Tubes

Machlett Laboratories Inc., Springdale, Conn., has available an electron tube catalog containing condensed data on all their tube types. The catalog is arranged so that engineers can readily determine the electron tube they wish by consulting the Index or "Quick Reference Guide" located on pages 2 and 3. An asterisk is used to designate tubes of "New Equipment Design Interest."

Circle 517 on Inquiry Card

### Pressure Measuring Tube

Type VG1A Ionization Gauge Tube is a hot cathode triode that uses positive ion current for vacuum measuring purposes. When connected in the vacuum system to be measured, this tube in conjunction with its electronic control, is capable of measuring pressures in the range of  $10^{-3}$  through  $10^{-5}$  Torr (mm Hg). Electron Technology, Inc., 626 Schuyler Ave., Kearny, N. J.

Circle 518 on Inquiry Card

### Tunnel Diodes

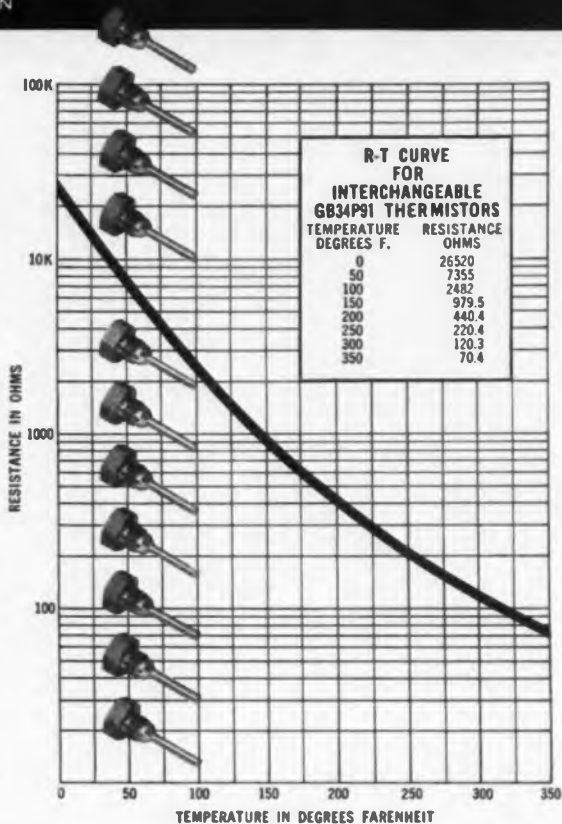
Tech. information is available from Micro State Electronics Corp., 152 Floral Ave., Murray Hill, N. J., on their line of Germanium tunnel diodes including Types MS222, 223, 224 and 242. These tunnel diodes are designed for UHF and microwave amplifier and oscillator applications in communication systems. They feature low noise constants as well as typical cutoff freq. of 3.5 gc. Design and specs. on these Micro State diodes are oriented towards communication applications.

Circle 519 on Inquiry Card

**BREAKTHROUGH! IN THERMISTOR DESIGN**

Fenwal Electronics' new "identical" thermistors permit complete interchangeability! What do you need from a thermistor in the way of performance? Reliability? Extreme stability? High shock resistance? Long life? Fenwal Electronics can supply it. But Fenwal Electronics' thermistors provide an additional important characteristic all their own: they can be supplied with identical resistance temperature curves.

That means that now, for the first time, you can have complete interchangeability. It means you can rely absolutely on consistently accurate resistance changes versus temperature of Fenwal Electronics' thermistors. It means also you can now achieve accurate, multi-point temperature indication or control through a single system without having to calibrate out each individual sensor.



**FROM FENWAL ELECTRONICS... THE MOST COMPLETE LINE OF PRECISION THERMISTORS**

**GLASS PROBES & BEADS**



— 0.006" to 0.100" diameter. Resistance values: 500 ohms to 100 megohms

**DISCS ...**



— 0.1" to 1" diameter. Resistance values: 5 ohms to 1,000 ohms

**WASHERS ...**



— .75" diameter. Resistance values: 5 ohms to 3000 ohms

**RODS ...**



— 0.053" to 0.173" diameter varying lengths. Resistance values: 500 ohms to 500,000 ohms

**PROBE Assemblies ...**



— Built to your specific requirements,\* enclosed and mounted in individual housings or "packages" and ready to install

**EJ Matched pairs**



— Thermistor beads matched to voltage current characteristics and mounted on special hermetically sealed stems, designed for use in thermal conductivity gas analysis instruments.

**FROM FENWAL ELECTRONICS... MORE HELP ON THERMISTOR PROBLEMS**



\* Complete thermistor engineering service backed by 20 years field experience



\* Thermistor Experimental Kit — to help you expedite operations at the bread board stage. Just \$19.95 at electronics jobbers



\* New Thermistor "Computer" — 5" X 8" "computer" reduces lengthy computations to single "slide rule" setting. Yours for the asking



\* New Thermistor Catalog EMC-3



\* New Probe and Housing Brochure — Gives selection of probe designs

For complete information, or the name of the Fenwal Representative in your area, write:



33 MELLEN STREET, FRAMINGHAM, MASSACHUSETTS

\*Probes can be supplied individually calibrated at all desired temperatures. When interchangeability is required, they can be supplied with identical resistance-temperature characteristics.

# Tech Data

for Engineers

## TUBES

### Application Notes

A new booklet entitled, "Electron Tube Application Notes" has been announced by Sylvania Electric Products, Inc., a sub. of General Telephone & Electronics Corp., 1100 Main St., Buffalo 9, N. Y. The 58-page illustrated brochure will help new and experienced electronic engineers by reviewing many of the do's and don't's of tube applications.

Circle 272 on Inquiry Card

### V-R Tubes

Complete information including specs., dimensional drawings and circuit diagrams is included on the following: Corotron® Voltage Regulator Tubes; high voltage vacuum tubes; glow discharge tubes; glass sealed resistors; electrometer tubes; and G-M counter tubes. The Victoreen Instrument Co., 5806 Hough Ave., Cleveland 3, Ohio.

Circle 273 on Inquiry Card

### Tube Catalog

A 70-page catalog listing 201 microwave tube types is available from Raytheon Co., Microwave and Power Tube Div., Waltham 54, Mass. Included are magnetrons, klystrons, Amplitrons/Stabilotrons, "O" and "M" type BWO's, TWT's and crossed field amplifiers. Information is also included on infrared detectors, ferrite devices, ceramics, power and pulse transformers and microwave test equip. Reference charts, specs., drawings and application data along with photographs are included.

Circle 274 on Inquiry Card

### Switching Tubes

Characteristics and application data for high-vacuum switch tubes for pulse modulation make up a new brochure available from Westinghouse Electronic Tube Div., Box 284, Elmira, N. Y. The brochure includes summarized characteristics for 19 tube types, 15 triodes, 2 tetrodes, and 2 diodes and a useful bar-chart showing relative peak power capabilities for all tubes in the group. "Pulse Tubes" (Booklet ET 1273).

Circle 275 on Inquiry Card

### Multi-Mode Tube

A brochure describing the operation of the new Multi-Mode Tonotron & Storage Tube is available from Hughes Aircraft Co., Vacuum Tube Products Div., 2020 Short St., Ocean-side, Calif. The brochure compares the operation of conventional storage tubes with the Multi-Mode tube which employs bombardment induced conductivity as well as secondary emission effects. The new tube displays high contrast, high resolution stored and nonstored information simultaneously in either dark or light trace modes.

Circle 276 on Inquiry Card



**ROBERT E. ARNE,  
CHIEF ENGINEER,  
KTVU-SAN FRANCISCO,  
SAYS:**

Mr. Arne states the Conrac case quite simply when he says: "I don't know of anyone that provides the combination of features that Conrac provides!"

Conrac monitors offer uniform, dependable quality in a complete range of types and sizes for every broadcast application.

Look to Conrac for quality in video monitoring equipment.

**EVERY CONRAC MONITOR FROM 8" THROUGH 27", BROADCAST AND UTILITY, INCLUDES THESE IMPORTANT FEATURES:**

- ★ Video response flat to 10 megacycles
- ★ DC restorer with "In-Out" switch
- ★ Provision for operation from external sync — with selector switch
- ★ Video line terminating resistor and switch



**CONRAC** DIVISION Glendora, California

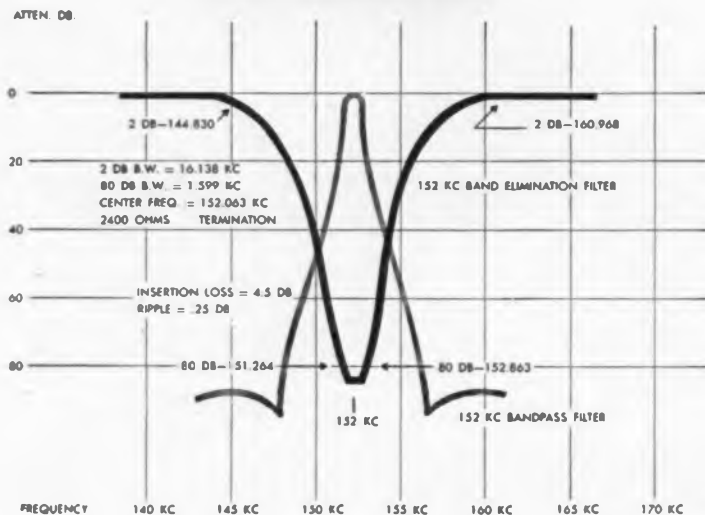
Makers of Fine Fleetwood Home Television Systems • Telephone: Covina, California, EDgewood 5-0541  
CONRAC MONITORS ARE DISTRIBUTED BY — RCA, GENERAL ELECTRIC, AMPEX, AND VISUAL ELECTRONICS  
CONRAC IS A DIVISION OF GIANNINI CONTROLS CORPORATION

CCC 1-38



High selectivity,  
attenuation and precision matching of . . .

# NEW HILL FILTERS ASSURE FAST, PRECISE MEASUREMENT OF INTER-MODULATION DISTORTION



Actual operational curves, obtained from point-to-point readings, from Hill 34900 and 34800 filters developed to fulfill customers' specific requirements.

These two highly stable, precision-matched Hill Electronic filters permit fast, exceptionally accurate measurement of inter-modulation distortion in communications systems. A band elimination filter places a narrow, deep notch in the white noise being passed through the equipment under test. Distortion generated in the notch is then isolated for measurement by the narrow band filter.

The high degree of selectivity and attenuation of these filters, and the excellent alignment of one within the other are demonstrated in the actual operational curves shown above. Used together, these filters provide 80 db attenuation from 6 to 252 kc.

This is a typical example of Hill's creative engineering that develops outstanding solutions to customers' specific problems involving LC and crystal control filters as well as precision frequency sources and other crystal devices.

## WRITE FOR BULLETINS 34800/900

They contain details and specifications concerning the filters described above.



**HILL ELECTRONICS, INC.**

MECHANICSBURG, PENNSYLVANIA

Circle 5 on Inquiry Card

## Tech Data for Engineers

### ULTRASONICS

#### Short Form Catalog

Powertron Ultrasonics Corp., Patterson Place, Roosevelt Field, Garden City, Long Island, N. Y., offers a short form catalog on their line of ultrasonic cleaning equipment. Featured are their Autosonic® Vapor Degreasers and Autosonic Consoles. Photographs, complete specs. and prices are included.

Circle 277 on Inquiry Card

#### Ultrasonic Cleaners

National Ultrasonic Corp., 95 Park Ave., Nutley 10, N. J., is offering tech. data on: Self-Contained Ultrasonic Cleaner Model 940, a 250 w average, 1000 w peak, single tube in a half-wave self-rectifying oscillator circuit model; Automated Printed Circuit Cleaner; and Ultrasonic Vapor Degreasers.

Circle 278 on Inquiry Card

#### Cleaning Tips

CiRICO Corp., Ultrasonic Div., 51 Terminal Ave., Clark, N. J., is offering a pamphlet entitled "Tips on Ultrasonic Cleaning." Subtitles include: General Discussion; Generating Equipment; Transducers; Applications; and Questions and Answers.

Circle 279 on Inquiry Card

#### Processing System

Gulton Industries, Inc., Vibro-Ceramics Div., 212 Durham Ave., Metuchen, N. J., offers tech. data on their Glennite® 10 Watt Ultrasonic Processing System. The system, one generator and five ultrasonic tools, includes Generator G-10 which will run a Foil Welder, Soldering Iron, Cleaner, Drill and Solder Pot. Complete specs. and photographs are included.

Circle 280 on Inquiry Card

#### Ultrasonic Cleaner

Pioneer Central Div. Bendix Corp., Davenport, Iowa, has tech. data available on their compact sonic energy cleaner. Generator - Cleaner - Filter Type SEC 1825-A has a cleaning chamber 18 by 25 by 14½ in. It is for continuous duty at 21 kc, 1500 w average. Cooling is by forced air.

Circle 281 on Inquiry Card

#### Cleaning Chemicals

A 14-page booklet entitled, "Chemicals for Ultrasonic Cleaning" is available from the Ultrasonic Power Div., Branson Instruments, Inc., 40 Brown House Rd., Stamford, Conn. Practically a handbook, it gives extensive information on physical properties of most commonly used cleaning chemicals, as well as suggested applications, working temps. and procedures. Fourteen different types of cleaning media are tabulated, divided into 2 main groups—aqueous solutions, and solvents.

Circle 282 on Inquiry Card



## WHAT HAPPENS?



What happens to an aircraft's many systems when subjected to the stresses of low-level flight at high speeds? ••• One of our most important current projects is to advance the state of the art for low-level, high-speed capabilities of present and future land- and carrier-based aircraft. Development activities in this area include ADVANCE CAPABILITY RADAR, STRUCTURES, SYSTEMS DESIGN, AERODYNAMICS, AIR CONDITIONING, and FLIGHT TEST. ••• If you are a qualified design, test, or research engineer with experience in any of these areas, we would like to hear from you immediately. For complete information about present assignments, opportunities for professional advancement and living conditions in Wichita, write in complete confidence to Mr. Melvin Vobach, Dept. OE 6, Boeing Airplane Company, Wichita 1, Kansas. Equal job opportunities for all qualified applicants.

**BOEING / WICHITA**

# MINIATURIZATION PLUS LOWER COST



## Thin Versatile Co-Netic and Netic Magnetic Shielding Foils

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.

# PROTECT VITAL MAGNETIC TAPES

When accidentally exposed to unpredictable magnetic fields, presto!—your valuable data is combined with confusing signals or even erased.



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.

Write for further details today.

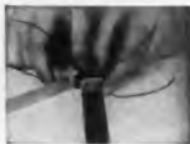
MAGNETIC SHIELD DIVISION PERFECTION MICA CO.

1322 No. Elston Avenue, Chicago 22, Illinois

ORIGINATORS OF PERMANENTLY EFFECTIVE NETIC CO-NETIC MAGNETIC SHIELDING



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.

## Tech Data

for Engineers

### FACILITIES, CAPABILITIES

#### Magnetic Memory Devices

AMP Inc., Harrisburg, Pa., has issued a brochure which defines the functions of their research laboratory in industrial progress. The brochure details the activities of their various research laboratories in the development of a product, in product testing, inspection standards and procedures. Some of the fields of interest are all-magnetic memory devices and 3-dimensional electronic packaging assemblies.

Circle 283 on Inquiry Card

#### Radiation Facilities

High Voltage Engineering Corp., Burlington, Mass., has available a 31-page handbook of high voltage electron beam processing. The handbook includes types of radiation and their sources, developing radiation processes from research, engineering factors in design for processing, electron-beam radiation dosage, electron-beam penetration, and thickness efficiency of absorption. Photographs, charts, and specs are included.

Circle 284 on Inquiry Card

#### Microwave Facilities

Dorne and Margolin, Inc., 29 New York Ave., Westbury, L. I., N. Y., have available an 8-page brochure on their antenna and microwave facilities. Included is information on their capability techniques and electromechanical devices, circuitry and radio frequency microwave hardware and information on their applications, communication and navigation equipment, electronic countermeasures and ground base navigation equipment.

Circle 285 on Inquiry Card

#### Electro-Optical

FMA, Inc., 142 Nevada St., El Segundo, Calif., has available a corporate brochure outlining its research, development and production capabilities in the electro-optical field. The 24-page, 2-color booklet describes special areas of competence are: information storage and handling, electronics systems, optics and photography, quantum electronics, and mechanical and electro-mechanical systems.

Circle 286 on Inquiry Card

#### Ceramic Facilities

A brochure entitled, "Facilities/Capabilities" is available from Ceramics International Corp., 39 Siding Place, Mahwah, N. J. The brochure introduces this new firm of ceramic-metalizing experts and facilities designed and constructed for the production of high temp ceramic-to-metal products. The 8-page brochure describes Ceramic International's contamination-free facility, and the company's production methods which permit the first mass production of ceramic-to-metal components.

Circle 287 on Inquiry Card



# ELECTRON TUBE PRODUCTS

partial listing

## C W POWER TRIODES

Type	Cooling <sup>1</sup>	Plate Dissipation <sup>2</sup> (KW)	Ma <sup>2</sup>	Plate Input <sup>2</sup> (KW)	DC Voltage <sup>2</sup> (KV)	Freq. <sup>2</sup> (Max. Ratings) (mc)
F-7C25	A	2.5	25	7	5.5	30
F-8C25	A	12	6	30	8	30
F-1200	W	7.5	26	18	12	30
F-1300	W	150	21	450	20	22
F-802A	W	100	45	200	20	1.6
F-801	W	6	9	20	15	1.6
F-801B	A	4	9	15	10	1.6
F-9020	A	4	50	18	12.5	1.6
F-898A	W	100	50	200	20	1.6
F-5604	A	10	19.5	32.5	12.5	22.5
F-5606A	W	10	36	30	15	1.6
F-5619	W	20	19.5	32.5	12.5	22.5
F-5666	W	12.5	21	20	10	22.5
F-5607	A	7.5	21	20	10	22.5
F-5668	W	20	50	28	14	5
F-5669	W	10	50	28	14	5
F-5771/300	W	22.5	20	60	12.5	25
F-8074	W	15	6	30	8	22
F-5018A	W	70	41	175	19	22
F-5019	A	35	41	125	17.5	22
F-6009	W	6	25	12	6	30
F-6386	A	3	25	7	5.5	30
F-6370	W	70	5	150	17.5	30
F-6398	W	225	21	400	20	22
F-6399	W	6	25	19	6.2	30
F-6400	W	6	25	19	6.2	30
F-6001	A	17	21	60	15	30
F-6002	W	30	21	90	15	30
F-6000	W	20	19.5	45	15	22.5
F-6001	A	10	19.5	40	15	22.5
F-6003	W	70	17	175	19	22
F-6004	A	35	41	150	19	22
F-6021	W	30	4.25	60	15	30
F-6020	A	3	17	12	6.5	30
F-6020	W	6	17	12	6.5	30
F-7200	W	20	18	55	12.5	30
F-7207	A	17	6	30	10	30
F-7220	A	20	6	50	10	30
F-7522	V	10	5.5	18	6	30
F-7831	W	20	18	60	10	50
B-1010	W	40	15	125	15	22
B-1011	A	5	5	18	6	30
F-7820	A	4.3	6	30	8	30
S-7837	W	90	41	200	17.5	22
F-7830	A	25	41	150	17.5	22
*B-1058A	W	40	17	80	12	50
B-1011	V	30	18	60	12.5	15
*F-7832	V	30	18	60	10	50

(1) A = Forced air cooled; W = Water cooled; V = Vapor cooled.  
(2) Independent maximum ratings.  
\*Ceramic construction.

## HYDROGEN THYRATRONS

Type	Pd, K10 <sup>2</sup>	avg kv	Pd Mw	ib a	ib Adc
3C45	0.3	3.0	052	35.0	045
6777	0.75	8.0	12	35.0	045
KU-70	1.0	6.0	3	90.	10
4C 35A	2.0	8.0	35	90.0	100
8887/E37B	2.5	8.0	33	83.0	100
KU-71	4.0	10.0	1.0	200.	20
8C22/M1019	3.2	16.0	2.0	325.	200
6307	3.9	16.0	2.0	325.	225
*7889/KU-72	7.0	20.0	3.5	350.	300
8888A/1007A	6.25	25.0	6.0	500.	500
8888A/179AA	9.0	25.0	12.0	1000.	1.0
*7886/KU-74	20.0	25.0	12.5	1000.	1.5
1287	20.0	33.0	33	2000.	2.6
*7887/KU-74	40.0	33.0	33	2000.	4.0
*7888/KU-274	45	50	50	2000.	4.0

\*Ceramic Construction

## TRAVELING WAVE TUBES

Type	Frequency RMC	Power Output (Watts)	Body	Style
F-6056	1.7-4.0	7	CW	L
F-6060	1.7-4.0	10	CW	L
F-6025	2.0-4.0	1000	P	L
F-6026	2.0-4.0	1000	P	L
F-7328	2.0-4.0	1000	P	L
F-7347	2.0-4.0	1000	P	S
B-2023	4.0-8.0	1000	P	S
X-370	4.0-8.0	18	SW	P
X-382	4.0-8.0	10	CW	P
B-2008	4.0-8.0	2	P	P
X-382	4.0-8.0	05	CW	P
X-383	4.0-8.0	2	P	P
X-403	4.0-8.0	2	P	P
X-371	4.0-8.0	1000	P	P
B-307	5.4-5.9	2000	P	P
F-7640	5.0-6.0	2000	P	S
F-7647	3.0-6.0	10	CW	S
E-304	8.0-12.0	5	CW	P
F-7524	8.0-12.0	5	CW	S
F-7520	8.0-12.0	5	CW	PK
X-380	8.0-12.0	05	CW	P
F-7905	8.0-12.0	05	CW	S
F-7526	8.0-12.0	05	CW	PK
F-7340	8.0-8.6	1000	P	L
B-804	8.0-8.6	1000	P	L
B-806	8.0-8.6	1000	P	L
F-8000	8.0-8.6	10	CW	L
B-2020	8.0-8.6	10	CW	L
F-7241	8.0-9.6	5	P	L
F-8007	8.0-9.6	0.1	CW	L
F-7330	8.5-9.6	1000	P	L

L = Large Diameter (both R-F leads at same end)  
S = Small Diameter (both R-F leads at opposite ends)  
PK = Packaged with solenoid as integral part  
P = PPM focused

## PULSE POWER TRIODES

Type	Epx	Pulse Current Rated Fil. Ipk	Pulse Current Elevated Fil. Ipk	Pd	Cooling
F-8023	65	850	1000	225	W
F-8200	65	400	550	225	W
F-7837	65	160	230	90	W
F-7830	65	160	230	25	A
F-7820	65	160	230	10	A
F-8010	35	140	200	80	W
F-6020	35	140	200	10	A
F-7220	20	100	160	20	A
F-7200	18	220	350	30	W
F-7200A	18	220	350	13	A
F-7012	17.5	40	65	2.5	A
F-5600	17.5	35	55	2.5	A
F-7822	17.5	25	40	2.5	A

Epx = Maximum Peak Inverse Voltage—Kilovolts  
Ipk = Peak Cathode Current—Amperes  
Ipc = Plate Current—Amperes  
Pd = Plate Dissipation—Kilowatts  
W = Water Cooled  
A = Forced Air Cooled

## IATRON STORAGE TUBES

Type	Diameter (in.)	Special Features	Focus	Deflection
7172	2 1/2	Coaxial Gun	ES	ES
FW-211	2 1/2	Coaxial Gun	ES	ES
7173	4	—	EM	EM
7174	4	—	EM	EM
FW-227	4	2 Writing Gun	ES	ES
7423	5	—	ES	ES
FW-204	5	Coaxial Gun	ES	EM
B-3001	5	—	ES	ES
FW-212	5	Coaxial Gun	ES	ES
FW-223	5	Coaxial Gun	ES	EM
FW-208	7	—	EM	EM

EM = Electromagnet ES = Electrostatic

## HYDROGEN DIODES

Type	Clipper Diode Ratings			Rectifier Ratings		
	Epx Kv	ib a	ib Adc	Epx Kv	ib a	ib Adc
KU-81	16	85	0.1	10	0.8	0.2
KU-82	25	325	0.2	15	2.0	0.5
*KU-82	25	300	0.2	15	2.0	0.5
*KU-83	33	500	0.5	15	4.0	1.0
*KU-83	33	500	0.5	20	8.0	2.0
*KU-84	33	2000	2.0	20	16.0	4.0

Epx = Peak Inverse Voltage—kilovolts  
ib = Peak forward current—amperes  
Ipc = Max. Average current—amperes  
\*Ceramic Construction

## POWER DIODES

Type	Epx	Rectifier Operation		Clipper Operation		Pd	Cooling
		Ipk	Ipc	Ipk	Ipc		
B-1016	100	120	40	400	225	W	
B-1022A	80	60	20	200	70	W	
F-7009	65	21	5	100	3.5	A	
B-1032A	60	36	12	150	20	W	
B-1033B	60	36	12	150	13	A	
F-7006	50	45	15	200	50	W	
F-7007	50	45	15	200	20	A	
B-1038	40	20	6	150*	5	A	
F-7131	40	10	3	150*	3	A	
F-7030	30	20	6	75*	2.5	A	
F-7770	25	30	6	75*	3	A	
F-7050	25	30	4	50*	2.5	A	

Epx = Maximum Peak Inverse Voltage—Kilovolts  
Ipk = Peak Plate Current—Amperes  
Ipc = Plate Current—Amperes  
Pd = Plate Dissipation—Kilowatts  
W = Water Cooled  
A = Forced Air Cooled  
\* = Elevated Filament Voltage

Write for complete technical data on ITT Electron Tube Products



ELECTRON TUBE DEPARTMENT ■ COMPONENTS DIVISION  
INTERNATIONAL TELEPHONE AND TELEGRAPH CORPORATION, ELSTON, NEW JERSEY



# WHAT DEPENDABLE 15 SLIDE SWITCHES CAN DO FOR YOUR PRODUCTS

**ADD COLOR**—Trigger knobs in 10 attractive colors add decorative and functional touches to switching operations.

**CUT COSTS**—Low in initial cost, Stackpole Slide Switches often reduce costs up to 50% over other type switches.

**SAVE SPACE**—Stackpole Slide Switches take less panel area, often less depth than conventional switches.

**SIMPLIFY PRODUCTION**—Choice of solder lug or printed wiring terminals, clearance or tapped-extrusion mounting holes.

**HANDLE HIGHER LOADS**—0.5- to 1-amp types for electronic equipment. 1-, 3-, and 6-amp types for appliances and power tools.

**SWITCH COMPLEX CIRCUITS**—1- to 3-poles, 2- to 4-positions for real switching versatility.

**FACILITATE OPERATION**—Trend-setting slide action available with or without detents and spring returns. Plunger-operated and matching pushbutton styles also available.

Write for Slide Switch Bulletin

## STACKPOLE

ELECTRONIC COMPONENTS DIVISION  
STACKPOLE CARBON COMPANY, St. Marys, Pennsylvania

Circle 8 on Inquiry Card

## Tech Data

for Engineers

### Defense Electronics

This facilities brochure outlines capabilities for defense electronics. The 3-color, 16-page booklet contains a profile of the company's products and services, divisions, research and advanced systems engineering, management and facilities. Loral Electronics Corp., 825 Bronx River Ave., New York 72, N. Y.

Circle 288 on Inquiry Card

### Electro-Mechanical

McKiernan-Terry Corp., Harrison, N. J., has prepared a 6-page pictorial brief on the company's products and capabilities in varied electro-mechanical fields, covering radar, sonar, missiles, marine products, heavy construction and bulk-material handling equipment, and dynamic flight simulators. Featured is the world's largest human centrifuge, built for the Navy at Johnsville, Pa.

Circle 289 on Inquiry Card

### Facilities

A new 4-page facility brochure is now available from The Fluorocarbon Co., processors and fabricators of Teflon® and Kel-F®. The new brochure details processes and products developed by the company and explains quality and control procedures. The Fluorocarbon Co., 1754 So. Clementine St., Anaheim, Calif.

Circle 290 on Inquiry Card

### Ground Support

Ground Support Equipment—Facilities Resume, Saginaw Products Corp.'s complete line of ground support equipment for the aircraft and missile industries is presented in this illustrated booklet. Photographs of products, facilities and actual defense and industrial product applications are featured. Included are leveling jacks, actuators, running gear, trailers, casters, and wheels to military specs. Saginaw Products Corp., 68 Williamson St., Saginaw, Mich.

Circle 291 on Inquiry Card

### Magnetic Amplifiers

Wickes Engineering and Construction Co., 12th St. and Ferry Ave., Camden 4, N. J. has available a facilities and equipment brochure, featuring mobile communications systems, airport control systems, ground support equipment for missile systems and magnetic amplifier equipment. Included in the brochure is their Automatic Cable Tester for missile and industrial use "in the field."

Circle 292 on Inquiry Card

### Grating Facilities

The Jarrell-Ash Co., Newtonville, Mass., announced that they have expanded their grating production facilities and are now able to produce replica gratings up to 3 x 7 in. in size. A new grating catalog containing a complete list of all plane and concave gratings has been prepared and is available.

Circle 293 on Inquiry Card



**In your  
sealing orbit!**

**E-I  
GLASS-TO-METAL  
SEALS**

**SEALS FOR ALL APPLICATIONS**

<b>INDIVIDUAL TERMINALS</b>	
<b>MULTI-LEAD TERMINALS</b>	
<b>THREADED SEALS</b>	
<b>MINIATURE CLOSURES</b>	
<b>SPECIAL SEALS</b>	
<b>COLOR CODED TERMINALS</b>	

**Ruggedized E-I Glass-to-Metal Seals** have demonstrated their complete reliability in severe environments in thousands of critical commercial and space age applications. From individual terminals to sub-miniature closures, E-I offers widest possible design flexibility, plus the economy of standardized production on every type of seal.

Complete "on-the-spot" engineering service is available nationwide, in Canada and abroad. A large, strategically located staff of qualified sales engineers provides the assistance needed to help solve your hermetic sealing problems. Call or write for literature or recommendations on specific applications.

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**MURRAY HILL, NEW JERSEY**

*A Division of Philips Electronics & Pharmaceutical Industries Corp.*

NOW FROM 3M RESEARCH

## Two new unique tubing discoveries

# SCOTCHTITE<sup>®</sup>

Heat Reactive Tubing for class A applications



Slips on loose

Shrinks with heat

Now you can add a tough, smooth, protective vinyl covering to bus bars, wire harness, ground cable, coils, even odd-shaped objects with "SCOTCHTITE" Heat Reactive Tubing. Just slip "SCOTCHTITE" Tubing over the object to be covered—apply heat—and almost immediately the tubing contracts to form a skin-tight seamless wrapping. Provides top electric strength along with resistance to chemicals, flame, and abrasion. Available in sizes from 3/64 to 5 1/2 inches in diameter. "SCOTCHTITE" Tubing is economical in comparison with other materials and easy to use on production operations.

## Temflex<sup>®</sup> BRAND

Transparent Tubing for high temp and UL applications



A new crystal-clear tubing that offers exceptional stability—retains its transparency even under heat, light and aging. "Temflex" Brand Transparent Vinyl Tubing No. 105 lets you easily color identify and read printed information on the wires it protects. "Temflex" tubing remains extremely flexible in a temperature range from 105° to -10°C.; it is fungus-resistant and flame-retardant, and highly resistant to cut-through. Will not corrode copper. Available in sizes from #24 to 2 1/2 inches in diameter, in lengths up to and over 1,000 feet, "Temflex" is ideally suited to production line operations.

**FREE SAMPLES:** For a free sample and technical information on "SCOTCHTITE" Heat Reactive Tubing or "Temflex" Vinyl Tubing No. 105, write: 3M Co., Irvington Division, 900 Bush Ave., St. Paul 6, Minn. Dept. EBY-61.

**Irvington Division**

"SCOTCHTITE", "IRVINGTON" AND "TEMFLEX" ARE REGISTERED TRADEMARKS OF 3M CO., ST. PAUL 6, MINN.

**MINNESOTA MINING AND MANUFACTURING COMPANY**

... WHERE RESEARCH IS THE KEY TO TOMORROW



## Tech Data

for Engineers

### CHEMICALS & COMPOUNDS

#### Silicones

A new 8-page, 2-color catalog describing the complete line of General Electric silicones and their uses is now available from General Electric Co., Silicone Products Dept., Waterford, N. Y. Designated CDS-129C, the catalog illustrated with photos and containing data on various silicone products, includes a complete selector guide for silicone rubber. Four general categories deal with silicone fluids, silicone protective coatings, silicone electrical insulation, and silicone rubber.

Circle 294 on Inquiry Card

#### Casting Resin

Melpak® E-200 epoxy resins is for general purpose potting, encapsulating, and casting application. It offers crack-free castings without oven cure and good adhesion to most plastics, metals and ceramics. It is readily machinable, meets self-extinguishing requirements of ASTM D63556 and produces bubble-free castings without vacuum treatment. Special Products Div., Melpar, Inc. 3000 Arlington Blvd., Falls Church, Va.

Circle 295 on Inquiry Card

#### Potting Compound

An epoxy-silicone rubber combination material for potting, impregnating, caulking and molding in a variety of applications has been developed to capture the best features of silicone rubber and epoxy resins in a moderate-price compound. These compounds belong to a new family of easily pourable materials known as Eccosil®, developed by Emerson & Cuming, Inc. Canton, Mass.

Circle 296 on Inquiry Card

#### Rust Preventative

A brochure entitled, "Rust Preventative" No. 611 covers features, applications and packaging of Rust-Lick 606, a specially formulated spray-on, moisture-absorbing, lubricating mist which can be used on wet or dry surfaces and provides positive long-term protection against rust. Rust-Lick, Inc., 755 Boylston St., Boston 16, Mass.

Circle 297 on Inquiry Card

#### Plasma Spray Coating

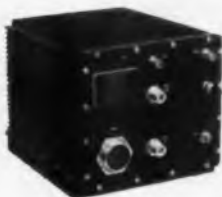
Progress in the process of plasma spray coating for space materials and critical defense parts are described in a bulletin published by Space Materials Laboratories, Systems Management Div., Western Gear Corp., P. O. Box 182, Lynwood, Calif. Included are capabilities for the coating of re-entry bodies, development of thermal-erosion barrier coatings for rocket engine applications, and coatings for nuclear applications.

Circle 298 on Inquiry Card

*from an established source,  
a newly-widened line...*



Mixer-Duplexer Assemblies



1000 Watt S-Band  
High-Power Beacons



Frequency Meters



Transponder Beacons



Signal Generators



3/4 Rotary Joint



Flexible Waveguides



3/4-180° Sweep Elbow



Tuning Cavities;  
Directional Couplers; Feeds



Waveguide Assemblies



Dual Directional Coupler



Waveguide Components

## TELERAD R-F Systems, Instruments, and Components

At Telerad Division of The Lionel Corporation, we are continually broadening our line of products and services in r-f communications. We offer complete transmission systems, a full line of waveguide and coaxial components, and custom-engineered instrumentation on request. Telerad has long held an excellent reputation for precision products, manufactured to the most demanding industrial and MIL specifications. The Telerad/Lionel force gives an ever increased capability in the field of r-f communications, both in an expanded line of hardware and in special orders for systems constructed to your specifications.—■—A few of the instruments and components available from Telerad include: power supplies, signal generators, antennas, feeds and horns, missile radar beacons, mixers, duplexers, directional couplers, rotary joints, filters, attenuators, wavemeters, frequency meters, fixed and flexible waveguides, and many other products.—■—For an established source of radio-frequency systems or components, contact:



*Send for new  
expanded line  
product catalog.*



Telerad Division  
**THE LIONEL CORPORATION**  
Route 69-202, Flemington, New Jersey





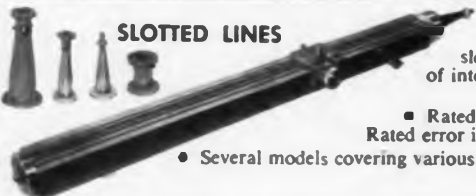
# rf instruments and coaxial components

## AUTOMATIC IMPEDANCE PLOTTERS

- Measure and plot rf impedance or transfer characteristic as a continuous function of frequency from 0.1 to 1700 mc.
- Impedance versus frequency curve is automatically plotted as it would be seen at any point desired.
- Entirely self-contained, except for use of an external oscillator.



## SLOTTED LINES



- High-precision universal slotted lines with a wide variety of interchangeable tapered reducers and tunable probes.
- Rated residual SWR is under 1.010. Rated error in detected signal under 1.005.
- Several models covering various bands from 37.5 to 4,000 mc.

## COAXIAL SWITCHES

- For use in rigid 3/8" and 6/8" coaxial transmission line.
- Low SWR.
- Motor-driven or manually operated.
- Very high peak power models for radar applications.



## INSTRUMENT HYBRIDS

- Inherent high isolation independent of frequency. Rated residual unbalance from 40 to 60 db.
- Wide range of frequency bands from 45 mc to 3600 mc for use with all transmission line sizes from Type N to 6/8".
- Constant coupling in both magnitude and phase over the frequency range, with equal loads.

## INSTRUMENT LOADS

- Excellent stability and low reflection. Suitable as secondary standards.
- SWR of Type N termination under 1.02. 0-1100 mc.
- Available in nearly all rigid and flexible coaxial transmission line sizes.
- Models for use at liquid nitrogen temperatures.



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Line Stretchers  
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Please write for complete catalog or specific information.

ANTENNA SYSTEMS - COMPONENTS - AIR NAVIGATION AIDS - INSTRUMENTS

# ALFORD

Manufacturing Company  
299 ATLANTIC AVE., BOSTON, MASS

## Tech Data

for Engineers

### MOTORS

#### Motor Controls

Publication 3100-PRD-202 describes a line of magnetic, low voltage, synchronous motor controls using auto-transformer or part winding starting. Both methods use kva reduction. The controls are particularly suited to motor starting where across-the-line starting is difficult. The publication shows dimensions and weights and details of construction. Electric Machinery Mfg. Co., Minneapolis 13, Minn.

Circle 299 on Inquiry Card

#### Timing Motors

The A. W. Haydon Co., 232 N. Elm St., Waterbury 20, Conn., has available tech. literature describing their line of military, industrial and commercial repeat cycle timers, precision timing motors and new stepping devices. Complete specs. and photographs are contained in bulletin A.W.H. MS-100.

Circle 300 on Inquiry Card

#### Variable Speed Catalog

A new 112-page variable speed catalog features lube-free integral and fractional HP variable speed drives. Cut-away drawings and photos are used to detail working parts. A number of integral and fractional modifications are illustrated, including single, double and triple reductions, as well as various horizontal and single and double form assemblies. Modifications and accessories, dimensions, and technical information are also included. Sterling Electric Motors, Inc., 5401 Telegraph Rd. Los Angeles 22, Calif.

Circle 301 on Inquiry Card

#### Instrument Motors

The new 28-page brochure describing the construction and operation of the various different types and models of Bodine Instrument Motors is available from the Bodine Electric Co., 2500 W. Bradley Place, Chicago 18, Ill. This new brochure includes dimensional drawings, rating charts, wiring diagrams, listings and photographs of all motors.

Circle 302 on Inquiry Card

#### Motor Generators

The William I. Horlick Co. Inc., 266 Summer St., Boston 10, Mass., has available a 16-page brochure which describes their line of motor generators. Included is information on 400 cycle motor-generators, variable freq. motor-generators, 400 cycle high freq. equipment, combination low voltage and 400 cycle motor-generator sets, and miscellaneous converting equipment.

Circle 303 on Inquiry Card

Are there limits to Centralab

Rotary  
Switch  
Design?



Of course—but they are much broader than you might think. The illustrated units are just a few of the difficult and unusual switches that CENTRALAB has been called upon to design.

What kind of special switch do you need? CENTRALAB engineers can modify an existing type, or design an entirely new switch to solve your problems.

For immediate attention, write directly to CENTRALAB's Switch Sales Manager, outlining your problem.

1. Switches 26 circuits progressively in missile check-out application. Used with stepping relay in limited equipment area. Glass silicone insulation.
2. Sub-miniature 24 position switch provides 50% space reduction over conventional switch construction. Has rugged, accurate indexing for long life. Glass epoxy insulation.
3. Low voltage switch with auxiliary high voltage snap action switch which breaks heavy load to rotary switch during switch cycle. Has guarded detent.
4. 5 pole, 9 position low voltage switch with locking action make and break on integral snap action switch. Snap action switch breaks load to rotary switch during switch cycle.
5. Dual concentric switch in which inner shaft operates rotors of all 3 sections while outer shaft operates rotor on front section independently. Used in aerial photography equipment.
6. 3 pole, 18 position unit with 6 positions on each section. Has high torque for positive positioning of contacts. Glass epoxy insulation. Used in ground support equipment.



**Centralab**

THE ELECTRONICS DIVISION OF GLOBE-UNION INC.  
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P-6131

ELECTRONIC SWITCHES • VARIABLE RESISTORS • CERAMIC CAPACITORS • PACKAGED ELECTRONIC CIRCUITS • ENGINEERED CERAMICS

# TECKNIT FUZZ BUTTON —



*The ultra-reliable*  
**dry circuit contact  
available today!**

Tecknit Fuzz Buttons, a new concept in high-reliability contact design, are made of knitted wire mesh compressed into a resilient form.

These Fuzz Buttons make reliable contact under dry circuit conditions. They are made of wire having a contact radius of .0005" to .0015", resulting in a pressure high enough to break through non-conducting films with a relatively small total force. Additional reliability is gained from the redundancy of contact made to the same wire

in at least four or more places.

For anti-bounce characteristics, Fuzz Buttons have a built-in mechanical hysteresis. Impact energy is absorbed by internal friction and softened by the non-linearity of compression. This makes Fuzz Buttons ideally suited for relays, switches, choppers and similar devices where contact bounce is a difficult problem.

For a free sample and technical literature from Tecknit Design Service, mail the coupon below—today!



**Technical Wire Products, Inc.**

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48 Brown Avenue, Springfield, N. J.  
Please send me  
Fuzz Button samples and literature.

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COMPANY \_\_\_\_\_  
ADDRESS \_\_\_\_\_  
CITY \_\_\_\_\_ ZONE \_\_\_\_\_ STATE \_\_\_\_\_

PS-380

500

Circle 13 on Inquiry Card

## Tech Data

for Engineers

### SYNCHROS & ACCESSORIES

#### Slip Clutches

Northfield Precision Instrument Corp., Island Park, L.I., N.Y., is making available a catalog which describes their line of miniaturized precision BUORD size 5 and 8 limit stops, and precision slip clutches. The limit stops, designed to conform to MIL-E-5272 C feature a non-jamming design. The miniaturized slip clutches include a precision Class I stainless steel gear in 72, 96, or 120 pitch.

Circle 304 on Inquiry Card

#### Control Units

Bowmar Instrument Corp., 8000 Bluffton Rd., Fort Wayne, Ind. offers a folder entitled "Precision Products for Precision Control." Some of the classifications include mechanical components, counters and indicators, timing and programming devices, and servo packages.

Circle 305 on Inquiry Card

#### Servo-Component Mount

Angler Industries, Metuchen, N.J., announces a new line of precise sub-miniature dial controlled front-panel mounts for synchros, resolvers, and other servo mount components. They feature sizes from 5 to 35 with shaft positioning accuracy of 1/2° and resolution of 1/4°. Mounting to panel is accomplished by drilling 3 holes in accordance with stick-on template supplied.

Circle 306 on Inquiry Card

#### Size 23 Synchros

Detailed specs. to aid in rapid selection of Size 23, 60 cps Thru-Bore Synchros for servo applications are given in a new data sheet issued by Vernitron Corp., 125 Old Country Rd., Carle Place, L.I., N.Y. Schematic drawings with dimensions show body terminal block, spline and other data. Wiring diagrams and terminal designations are also included.

Circle 307 on Inquiry Card

### SENSING DEVICES

#### Transducer

Phys-Chemical Research Corp., 40 E. 12th St., New York 3, N. Y., has a tech. bulletin which explains their electro-humidity transducer. The PCRC electro-humidity transducer is an electric hygrometric circuit element which senses changes in relative humidity by changes in ohmic resistance. The transducer is a processed plastic wafer—a chemically treated styrene copolymer—which has an electrically conducting surface layer that is integral with the non-conducting substrate.

Circle 308 on Inquiry Card

ELECTRONIC INDUSTRIES • June 1961

# Tech Data

for Engineers

## Digital Transducers

Electronics Div. DeJur-Amsco Corp., 45-01 Northern Blvd., long Island City 1, N.Y. has tech. data available on their line of digital transducers and subminiature pressure instruments. The digital transducers are designed to measure various parameters such as pressure, temp., flow and acceleration, and supply a digital output without the use of auxiliary equipment.

Circle 309 on Inquiry Card

## Temp. Controls

Brief descriptions and specs are given for 17 different types of temp. controls in a new 8-page brochure issued by Fenwal Inc., Pleasant St., Ashland, Mass. The brochure was designed as a handy reference folder for engineers and enables the engineer to request more details on the controller best suited for his particular requirements. Catalog MC-203.

Circle 310 on Inquiry Card

## Thermostats

A new illustrated brochure on Stevens Mfg. Co., Inc., P.O. Box 1007, Mansfield, Ohio on their complete line of Type A Certified Thermostats for electronic and avionic applications, is available. Covering both hermetically sealed and semi-enclosed styles, the 4-page tech data sheet is illustrated with photographs, cutaway section and line drawings of the units comprising the line.

Circle 311 on Inquiry Card

## Transducer

Century Electronics & Instruments, Inc., 515 S. Main St., Tulsa, Okla., has tech. data available on a rugged, low-cost pressure transducer. Of bonded silicon strainage construction, the new unit requires no amplifier or associated equipment. Normal output resistance is 350 ohms, with 28 v. max. power required. Bulletin CEI 902 on the Model 750.

Circle 312 on Inquiry Card

## Piezoelectric Devices

A 16-page illustrated booklet on the application of piezoelectric devices highlights new developments in high-power handling abilities of the materials. Text and tables cover piezoelectricity as applied to convert mechanical energy to electrical energy and the reverse. Clevite Electronic Components, Bedford, Ohio.

Circle 313 on Inquiry Card

## Transducer

Consolidated Electrodynamics Corp., Sub. of Bell & Howell, 360 Sierra Madre Villa, Pasadena, Calif., has a brochure which describes the capabilities of CEC's new Type 4-329 Airborne Pressure Transducer. The 4-329 is a medium-to-high range unit measuring pressures from 0-100 psi to 0-5000 psi absolute. Bulletin 4329.

Circle 314 on Inquiry Card

**CLEVELITE\***

**PHENOLIC TUBING**

**MAKES THE GRADE**

**FOR HUNDREDS OF PROVEN APPLICATIONS!**

CLEVELITE'S dependable combination of Electrical and Physical Properties have made many different kinds of products **BETTER... at LOWER cost.**

**CHOICE OF 7 TIME-TESTED GRADES**

Grade	Special Properties
E	Improved post-cure fabrication and stapling;
EX	Special punching grade;
EE	Improved general purpose;
EEX	Superior electrical and moisture absorption properties;
EEE	Critical electrical and high voltage application;
XAX	Special grade for government phenolic specifications;
SLF	Special for very thin wall tubing having less than .010 wall.

Available in diameters, wall thicknesses and lengths as required.

Write for latest CLEVELITE brochure; also samples of the tubing.

\* Reg. U. S. Pat. Off.

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THE LEADER  IN ACCURACY



**FIVE YEARS OF LABORATORY AND FIELD TESTING INDICATE THAT EQUIPMENT PERFORMANCE CAN BE SUBSTANTIALLY UP-GRADED USING PRECISION/STABLE ENCAPSULATED RESISTORS - ACCURACY 0.005%**

Uniform levels of resistor accuracy and reliability previously available only by expensive individual selection and calibration methods are now offered with mass-produced JRL Precision/Stable Resistors.

The lower cost of these resistors permits manufacturers to upgrade their products by building laboratory accuracy into production-line equipment. Important savings can be realized by shortened lead time, reduced in-plant rejects and customer rejects.

A unique basic design coupled with JRL experience in the manufacture of style NB-1 Primary Standards has made possible the efficient commercial production of Precision/Stable resistors.

Complete technical specification and performance data is available on request.



**JULIE RESEARCH  
LABORATORIES INC.**

603 West 130th St., New York 27, N. Y.

## Tech Data

for Engineers

### Thermocouples

The new 4-page tech. bulletin describing gold-cobalt vs. copper thermocouples is offered by Cryogenics, Inc., Stafford, Va. A chart shows comparisons of sensitivities over temp. spans encompassing some normal boiling points. Some possible thermocouple configurations are illustrated along with a typical rake installation, and specs. and available options are listed. Bulletin CG 357.

Circle 315 on Inquiry Card

### Environmental Controls

Newark Controls Co., 15 Ward St., Bloomfield, N.J., has prepared 2 ready-reference data tables for use by design engineers concerned with altitude pressure and altitude density, and specs. of environmental controls for measurement and monitoring. Standard pressures (lb/in<sup>2</sup>) and densities (10<sup>-4</sup> lb/ft<sup>3</sup>) are given for each 100 ft. of altitude from 0 to 100,000 ft.

Circle 316 on Inquiry Card

### Temp. Sensors

Trans-Sonics, Inc., P. O. Box 328, Lexington 37, Mass., has just introduced a family of precision temp. sensors for use with its wide range electronic thermometer. As described in its new Special Product Note 140A, surface, bulb, and open type platinum resistance transducers may now be used interchangeably to provide an extremely versatile precision temp. system.

Circle 317 on Inquiry Card

## SYSTEMS

### Electric Eye Automation

Photomation, Inc., 96 South Washington Ave., Bergenfield, N. J., has just released a 22-page booklet (Bulletin No. 611) covering all phases of electric eye applications in automation. Included is a wide range of illustrations and schematics showing diversified photoelectric systems. Of special interest are the detailed illustrations and mechanical characteristics of these photoelectric units.

Circle 318 on Inquiry Card

### Programming Aid

Minneapolis - Honeywell, Electronic Data Processing Div., 60 Walnut St., Wellesley Hills 81, Mass., has published a brochure describing its EASY automatic programming aid for the Honeywell 400 EDP system. The system simplifies the programming task by eliminating the need for the programmer to be completely familiar with the complex language of the machine. Programs written in EASY can be run on either the Honeywell 400 or 800 computer.

Circle 319 on Inquiry Card



small packages for big telemetry jobs...



**Model 1475-B Transistorized Hybrid FM/AM Transmitter (Left)** 215 to 265 mc (235 to 260 mc on order); 2 watts output; stability  $\pm 0.01\%$ ; 4" L. x 2.78" W. x 1.4" H.

**Model 1476-BB Transmitter (Right)** 215 to 260 mc; 1.5 watts output, nominal; stability  $\pm 0.01\%$ ; 7.25" L. x 2.75" W. x 1.26" H.



**Model 1440-B RF Amplifier (Left)** 200 to 250 mc; 10 watts output; 3.37" L. x 2" W. x 3.25" H.

**Model 1427-BF Amplifier (Right)** 215 to 260 mc; 25 watts output; 4.14" L. x 2.88" W. x 3.18" H.

ALL DIMENSIONS SHOWN ARE NOMINAL

Model 1423 FM/AM transmitter shows there is another approach to Telechrome's advanced engineering in R-F telemetry. Offering the highest gain in the smallest package available anywhere, its modular construction permits easy field servicing with replaceable spare modules; assures exceptional ruggedness; and provides dependability over environmental extremes. Its features include:

Frequency Range 215-260 mc • Power 4 watts minimum •  $\pm 0.01\%$  stability •  $\pm 0.01\%$  accuracy with adjustable position of MIL-S-8836C • Modulation Distortion less than 1% in an FM/PM system • Spurious Radiation better than 30 dB • Variable temperature compensation • Operational altitude better than 100,000 feet without pressurization or hermetic sealing. Size 3.87" W x 4.13" L x 1.65" H.

The Model 1423 transmitter is just one of the comprehensive family of high performance telemetry equipment that Telechrome has supplied for 17 programs including Discoverer, Jupiter, and Scout. For complete technical data on any component, call or write today.

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Circle 18 on Reader Card



# Switch to **Kulka** TOGGLE SWITCHES

Designed and built for long, rugged, dependable service, Kulka Toggle Switches provide positive, precise switching for electronic and electrical circuits. Made to Joint Army and Navy Specifications JAN-S-23, MIL-S-21195, MIL-S-6745 and MIL-S-3950A. Available in SPST, SPDT, DPST and DPDT types, DC and AC up to 1600 cps.

## NOW ... YOUR CHOICE OF TERMINALS

SCREW —  
SOLDER —  
OR TAB

Now, specify the terminal type best suited to your needs. Standard screw terminal, hole-through solder type, or male tab for accepting Burndy, AMP or Kent female slip-on connectors.

WRITE FOR COMPLETE DETAILS

## KULKA ELECTRIC CORP.

633-643 SO. FULTON AVENUE, MOUNT VERNON, N. Y.

Circle 17 on Inquiry Card

# NEW Powertron

## AC ELECTRONIC GENERATOR

MODEL 150  
**\$525<sup>00</sup>**

PRECISION  
AC POWER  
SUPPLY FOR  
LABORATORY &  
PRODUCTION USE



### SPECIFICATIONS

Power Output .....	160 V.A.	Total Distortion .....	Less than 1%
Fixed Frequency 400 CPS (other freq. avail.)		Regulation .....	Less than 1%
Variable Frequency .....	350-450 CPS	Operates with load of any power factor	
External Frequency .....	50-4000 CPS	Small size .....	8 <sup>3</sup> / <sub>4</sub> " x 19" Panel

Also Available — Model 250 — 250 VA Power Output

Representatives in Principal Cities



**INDUSTRIAL TEST EQUIPMENT CO.**  
55 EAST 11th STREET • NEW YORK 3, N. Y.

## Tech Data

for Engineers

### Telemetry Systems

Literature on the Type 1440 Satellite Tracking Telemetry Receiver is announced by Vitro Electronics, Div. of Vitro Corp. of America, 919 Jesup-Blair Dr., Silver Spring, Md. Data Sheet C-006 describes the new FM Crystal Controlled Phase-lock Telemetry Receiver which features a low noise figure of  $\bar{n}$  db. It has a tuning range from 130-140 MC covering the recently assigned satellite band.

Circle 320 on Inquiry Card

### Analog Computer

Applied Dynamics, Inc., Ann Arbor, Mich., has available a 6-page brochure on their series of AD-1 Analog Computers. These computers repetitively solve linear and nonlinear equations and simulates physical systems. Table top to large console computers are offered with pre-wired cabinets capable of being expanded to handle all problems which lend themselves to a solution by analog techniques. Modules are used throughout.

Circle 321 on Inquiry Card

### Optical Systems

A tech. data bulletin on light-weight mirrors for airborne optical systems and other systems requiring low-inertia components, has just been issued by Precision Lapping Co., Inc., 34 Clinton Ave., Valley Stream, L. I. It illustrates and describes a new type of mirror construction—a honey-comb cross section which achieves a great weight saving without sacrificing rigidity or stability.

Circle 322 on Inquiry Card

### Computer System

Ferranti Electric, Inc., Industrial Park No. 1, Plainview, L. I., N. Y., has tech data available concerning the design and development of computer systems and components. One such system is a boiler control. Receiving information from conventional instrumentation, the computer system will perform all preliminary checks before starting up the unit. It will then start up individual items of the plant such as fans and coal pulverizers.

Circle 323 on Inquiry Card

### Telemetry Systems

A new brochure describing various telemetering, remote control, data processing and data transmitting systems is available from the Hammarlund Automation Div. of Telechrome Mfg. Corp., Amityville, L. I., N. Y. Information on automatic electro-mechanical systems, errorless transmission systems and standardized automation components is also included in this brochure.

Circle 324 on Inquiry Card



**MEPCO  
EXTENDS  
ITS  
LINE  
OF**

# POWER RESISTORS

MEPCO has extended its line of miniature precision wire wound power resistors. The new units combined with those previously available provide a complete selection of power resistors for today's critical applications where maximum power dissipation and limited space are the primary requisites.

## SPECIFICATIONS

\*The following power resistors conform to MIL-R-20C

TYPE	P-1	P-3	P-5	P-7	P-10	P-15	P-90	P-100	P-200	P-300	P-301	P-500	P-700	P-1000*	RW55C	RW56C	RW57C	RW58C	RW59C	
WATTS @ 25 C	2.5	3.5	5	8	10	15	1.5	2	3	3	3.5	5	7	10	5	10	5	8	2.5	
RESISTANCE	Min.	.15 $\Omega$	.25 $\Omega$	.5 $\Omega$	1.25 $\Omega$	1.5 $\Omega$	2.5 $\Omega$	.1 $\Omega$	.18 $\Omega$	.19 $\Omega$	.3 $\Omega$	.48 $\Omega$	.5 $\Omega$	1.0 $\Omega$	1.5 $\Omega$	1.25 $\Omega$	2.5 $\Omega$	.5 $\Omega$	1.5 $\Omega$	.15 $\Omega$
	Max.	15 K	32 K	58 K	158 K	179 K	275 K	7.9 K	14 K	18 K	23 K	36 K	55 K	87 K	179 K	5.1 K	9.1 K	3.3 K	7.5 K	820 $\Omega$
DIMENSIONS IN INCHES	Lgh	1/2	25/32	15/16	1-3/8	1-7/8	2	3/8	1/2	9/16	5/8	13/16	7/8	1-7/32	1-25/32	1-3/8	2	31/32	1-7/8	1/2
	Dia.	7/32	7/32	5/16	1/2	3/8	1/2	5/32	5/32	3/16	7/32	3/16	5/16	5/16	3/8	1/2	1/2	5/16	3/8	7/32

**MEPCO**



Available with tolerances down to 0.05%.  
Send today for complete descriptive literature.

**MEPCO, INC.**  
**Morristown, New Jersey**

*manufacturers of precision resistors*

Circle 200 on Inquiry Card



# Here's How Haveg Solved the Problem... with **HAVELEX**<sup>®</sup>

PRECISION MOLDED RIGID INORGANIC INSULATING MATERIAL

APPROXIMATE SIZE  
OF BASE PICTURED  
1 INCH LONG,  
¼ INCH WIDE,  
¼ INCH HIGH



This miniature switch base molded with Havelex, contains four different stainless steel inserts with precious metal plating. Three inserts (which include #0-80 male threads) go all the way through the mold and provide precision mountings on both sides for assembly. The #0-80 female threaded insert is designed to protrude from one face and is approached by a molded counterbore from the other. Mold is designed to accommodate alternate terminal inserts when unthreaded models are required.

Haveg engineers recommended Havelex for this particular molding because of its combination of properties. Completely inorganic, with metal inserts integrally molded in place. Precision tolerances with faithful reproduction from part to part. Heat resistance for continuous operation in excess of 700°F.

Haveg engineers will be happy to work with you on your particular project—to help you "Keep ahead with Haveg." Remember—Havelex offers all of these unique features: **Dimensional Stability • 1000°F. Continuous Temperature Resistance • Dielectric Strength • Mechanical Strength • Low Loss, Low Power Factor • Arc Resistance • No Moisture Absorption • Integrally Molded Metal Inserts • Hermetically Sealed Inserts.**

Keep Ahead with



FIRST in Engineering PLASTICS

TAUNTON DIVISION  
**HAVEG INDUSTRIES, INC.**

336 Weir Street • Taunton, Massachusetts

Telephone VANDYKE 4-4011

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for fast, expert  
**electronic supply**  
at factory prices

call your man...

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Connectors  
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Switches  
Resistors  
Industrial Tubes  
Test Equipment  
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He's your electronic supply specialist, an expert on your needs. He serves you best because he's backed by the world's most complete stocks—all major lines, all types available—at factory prices. For complete supply, for expert help, for same-day shipment—call your man at Allied."

**Taylor 9-9100**  
TWX: CG-2898

Always refer to your 576-page Allied Catalog—the most complete electronics supply source for industry. We stock everything we list...



**ALLIED RADIO**

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LOS ANGELES, CALIF.: Murray 1-3291 • INDIANAPOLIS, FT. WAYNE, MISHAWAKA, SOUTH BEND, IND.: Enterprise 6096 • GRAND RAPIDS, MICH.: Enterprise 7606 • MINNEAPOLIS, ST. PAUL, MINN.: Zenith 6666 • ST. LOUIS, MO.: Enterprise 8826 • MILWAUKEE, WISC.: Hilltop 4-8229

One Order to Allied Fills the Whole Bill

## Tech Data

for Engineers

### Control Systems

General Electric Co., Schenectady 5, N. Y., has available a bulletin GET-2916B (revised), 4 pages, which describes load control systems for industrial plants which generate all or a part of their electrical requirements. Systems described in the bulletin include tie-line and freq. control, reactive power control and power limiting control.

Circle 325 on Inquiry Card

### OVENS & ACCESSORIES

#### Convection Ovens

A new 12-page, 3-color bulletin No. 1960 entitled "BLUE M POWER-O-MATIC 60 Mechanical Convection Ovens with Blue M Saturable Power Reactor Control" is available from the Blue M Electric Co., 138th & Chatham Sts., Blue Island, Ill. It illustrates and describes Blue M's new line of mechanical convection ovens, such as laboratory/production ovens, aging ovens, miniature batch ovens, 5-drawer ovens, sterilizers, and conditioning cabinets.

Circle 326 on Inquiry Card

#### High Vacuum Oven

A brochure describing a new line of high vacuum, high temp. ovens and packaged pumping systems together with fabricating services for custom-made high vacuum equipment and metal working facilities, is available from Tri Metal Works, Inc., Industrial Div., 1600 Bannard St., Riverton, N. J.

Circle 327 on Inquiry Card

#### Heating Units

The new 16-page brochure, Bulletin 103-T, is now available from Trent, Inc., 211 Leverington Ave., Philadelphia 27, Pa. The bulletin describes in detail a new series of "Folded and Formed" industrial electric heating units for furnaces, ovens and dryers. Included are sections on application, performance, dimensional

Circle 328 on Inquiry Card

### RECTIFIERS

#### Silicon Rectifier

Texas Instruments Incorporated, Semiconductor Components Div., P. O. Box 5012, Dallas 22, Tex., has available tech. data sheets on a variety of diffused silicon rectifiers. Drawings and complete charts cover Types 1N2069, 1N2070, 1N2071, 1N1612, 1N1613, 1N1614, 1N1615 and 1N1616.

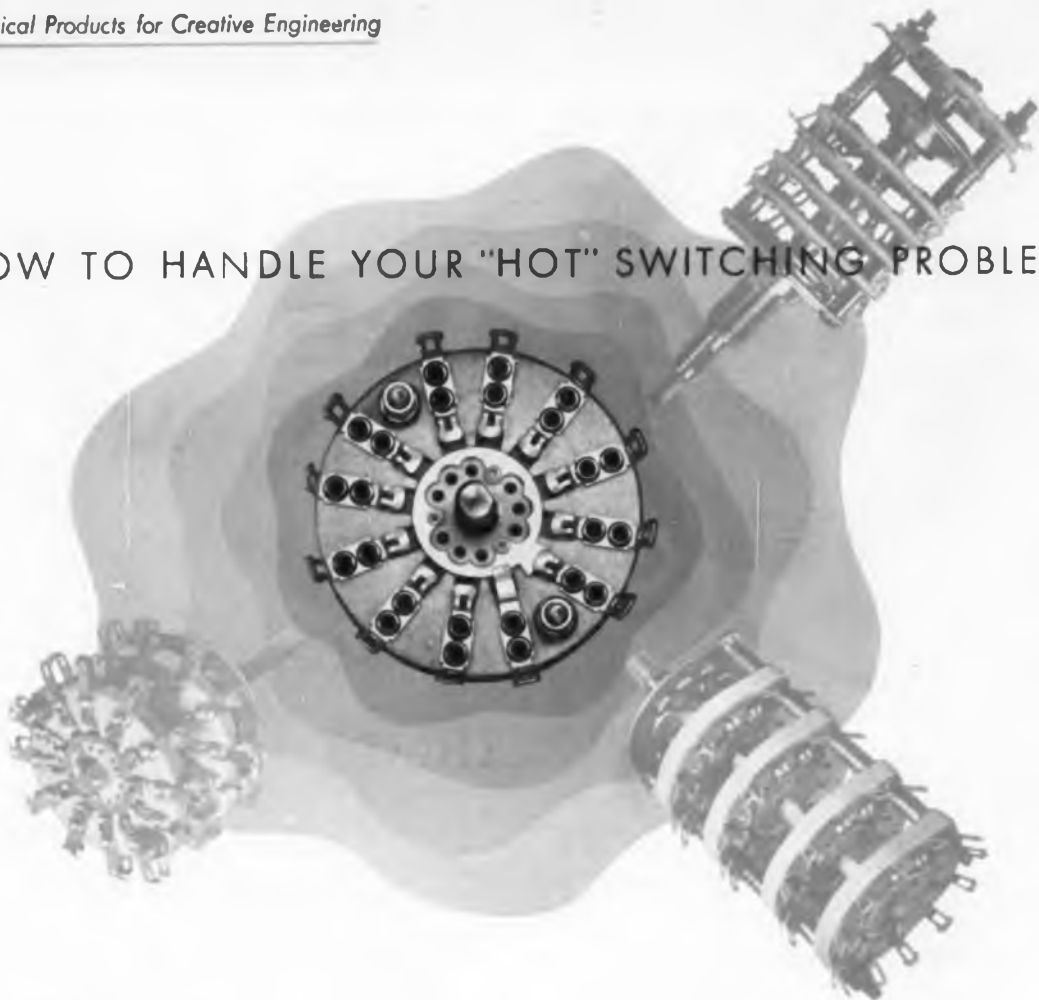
Circle 329 on Inquiry Card

#### Cartridge Rectifiers

A tech. bulletin on its new line of silicon SerieSil<sup>®</sup> high voltage cartridge rectifiers is available from Electronic Devices, Inc., New Rochelle, N. Y. It covers such JEDEC types as 1N1134 to 1139, 1N1730 to 1734, and 1N2373 to 2385.

Circle 330 on Inquiry Card

## HOW TO HANDLE YOUR "HOT" SWITCHING PROBLEMS



# 160° C

OAK HIGH TEMPERATURE SWITCH SECTIONS have the stamina to stand up under a constant ambient temperature of 160°C. In fact, their clips have been life-tested for more than 800 hours at this temperature and still maintained their tension. There are several reasons why Oak high temperature switch sections perform with such exceptional reliability. First, positive contact is maintained by Oak's special double-wiping, spring clip contact design. Next, Oak has developed a

special alloy that's downright reluctant to lose its spring tension at these high temperatures. Last, Oak rolls a .0006" layer of gold on this clip to doubly-assure exceptional stability and contact performance. You can order these sections in ceramic or Mycalex insulation for Types FIX, HC, DHX, DHC, NC, JC, DLX, FC, and FX switches. For more information, contact your local Oak sales representative or send details of your application to our Applications Engineering department.



Creative Engineering • Quality Components

## OAK MANUFACTURING CO.

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OAK ELECTRONICS CORPORATION (Subsidiary) • Culver City, California

POWER AND PUSHBUTTON SWITCHES • TELEVISION AND FM TUNERS • SUBASSEMBLIES  
APPLIANCE CONTROLS • CHOPPERS • ROTARY SOLENOIDS • VIBRATORS

# HIGH-SPEED SWITCHING



## CLARE

Check these

Mercury-Wetted  
Relays

against your  
design needs

### Choice of two basic switches

#### SPEED TO 200 CPS



This CLARE TYPE HGS is the fastest operating, most sensitive mercury-wetted contact relay obtainable. It will operate at speeds to 200 cps with sensitivity as low as 2.5 milliwatts with a contact rating of 2 amperes, 500 volts (100va max.). Two permanent magnets provide single-side stable and bi-stable adjustments. Available with Form D (bridging) contacts.

#### LOADS TO 250 VA



This CLARE HG capsule will handle contact loads as high as 5 amperes, 500 volts (250va max.). Operating time may be as low as 3 milliseconds. It is also available equipped with two permanent magnets (HGP TYPE) for single-side stable, bi-stable or chopper operation.

### The Clare Mercury-Wetted Relay Principle

The remarkably long life of CLARE mercury-wetted relays is the result of a design principle whereby a film of mercury on the contact is constantly renewed, by capillary action, from a mercury pool. Both CLARE HGS and HG switch capsules employ this principle. Both switches are sealed in high-pressure hydrogen atmosphere. Certain construction differences, however, give greater speed and sensitivity to the HGS switch.

# FOR BILLIONS OF OPERATIONS

## Choice of three convenient packages

### ENCLOSED MODULES



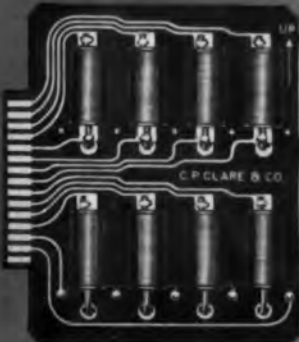
Both CLARE HGS and HG switch capsules are available in steel-enclosed modules for convenient mounting on printed circuit boards in the same manner as resistors, capacitors and similar components. The enclosure is ruggedly designed and provides both excellent mechanical protection and magnetic shielding. These modules are ideal for design and prototype work.

### CONVENTIONAL PLUG-IN RELAYS



CLARE HGS switch capsules are available in single switch units, surrounded by a coil, mounted in high-melting point wax and encased in cylindrical steel containers provided with plug-in base. A smaller type (HGSS) is designed for use where space is limited. HG relays are available with one, two, three, or four capsules, surrounded by a single coil. Also with permanent magnets (HGP) for single-side stable, bi-stable or chopper operation.

### PCB ASSEMBLIES



Printed circuit board assemblies are available with either HGS or HG switch capsules to meet design specifications. These may be designed to customer specifications by CLARE or mounted on boards supplied by the customer. Number of relays is limited only by the dimensions of the printed circuit board.



### NEW! Design Manual 201A

Complete data on characteristics, circuitry, mountings, coil tables and information for ordering CLARE mercury-wetted contact relays.

See your nearest CLARE representative or address: C. P. Clare & Co., 3101 Pratt Blvd., Chicago 45, Illinois. In Canada: C. P. Clare Canada Ltd., 840 Caledonia Road, Toronto 19, Ontario. Cable Address: CLARELAY.



**C. P. CLARE & CO.**

*Relays and related control components*

Circle 203 on Inquiry Card



Model 1313 \$590

**1/4% ACCURACY WANTED?**

This new Universal Bridge adds to the wide variety from which an engineer must choose. But Model 1313 has both 1/4% Accuracy and Direct Readout; combines high discrimination with exceptional ease of use. Detector AGC, variable frequency operation and functional styling are all plus features.

L: ..... 1 $\mu$ H to 110H, 7 decades  
 C: ..... 1 $\mu$ F to 110 $\mu$ F, 7 decades  
 R: ..... .01 $\Omega$  to 110M $\Omega$ , 8 Decades  
 Accuracy: ..... 1/4%  
 Discrimination: 5000 div's/Decade  
 Frequency: 1Kc, 10Kc, 100 cps to 20Kc  
 with est. osc.  
 Readout: ..... Direct—no multiplying factors

MAKE NO MISTAKE  
MEASURE WITH :

**MARCONI**  
INSTRUMENTS

111 CEDAR LANE • ENGLEWOOD, NEW JERSEY  
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# 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 3/8" to 1 1/4" in diameter.

**ANTI-TARNISH BOARD SUPPLIED**  
Further information on request.

RONDO process and designs patented in all major countries.

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Representatives: C. S. Shotwell, 527 S. Alexandria Ave., Los Angeles 5, Cal., Phone: DUinkirk 9-8879

510 Circle 205 on Inquiry Card

## Tech Data

for Engineers

### Rectifier Modules

Varo, Inc., 2201 Walnut St., Garland, Texas, is offering tech. information on their silicon high voltage Rectifier Modules. The units are diffused silicon junctions with PIV to 20 kv, low leakage and high forward current. Photograph and complete specs. are included.

Circle 331 on Inquiry Card

### Silicon Rectifiers

Solitron Devices, Inc., 500 Livingston St., Norwood, N. J., has a tech data sheet on their hermetically sealed double diffused silicon rectifiers. Information covers their medium and high voltage, Gold Star, Mag-Amp and Super "V" Very High Voltage diffused, hermetically sealed silicon rectifier. PIV ranges up to 100,000 v. and 1100 ma average rectified current.

Circle 332 on Inquiry Card

### Rectifier Catalog

Conant Laboratories, Lincoln 5, Nebr., has available a list of catalog numbers and rectifier types. This list is divided into two sections. Section 1, copper oxide types and section 2, selenium types. Information included is catalog number, type and description.

Circle 333 on Inquiry Card

## MICROWAVE

### Microwave Components

Varian Associates, Tube Div., 611 Hansen Way, Palo Alto, Calif., has available a 9-page brochure on their complete line of microwave tubes and components. Included in the catalog are BWO's, X-band oscillators, Ku-band amplifier klystrons, UHF CW klystrons, K-band magnetrons, and Ku-band and TR tubes.

Circle 334 on Inquiry Card

### Test Equipment

Waveline Inc., Caldwell, N. J., has available a 90-page catalog which describes over 600 instruments and presents photos, electrical and mechanical data, charts, curves, and engineering information on their complete line of test instruments. These instruments are precision built, rugged in design, easy to maintain and operate and are for laboratory or field use.

Circle 335 on Inquiry Card

### Antenna Equipment

A new Condensed Catalog describing Antenna Pattern Instrumentation, Positioners and Accessories is available from Scientific-Atlanta, Inc., 2162 Piedmont Rd., N. E. Atlanta 9, Ga. Included are recording, receiving, and control equipment, transmitting equipment, auxiliary equipment and supplies. Also included is a Three-Dimensional Antenna Pattern Analyzer.

Circle 336 on Inquiry Card

# 13 MOVES TO RELIABLE TRIMMING

**SPECTROL'S FULL LINE** of trimming potentiometers features 10 of the smallest square trimmers ever made, plus the only *transistor-size* units for solid state circuitry. This selection covers almost every conceivable application—a sure way to avoid checkmate when you need reliable trimmers.

**SQUARE TRIMMER DATA.** Models 50 and 60 measure  $\frac{3}{8}$ " and  $\frac{1}{2}$ " square respectively • humidity proofing a standard feature • available in resistances to 100K • greater surface contact between mandrel and aluminum case for better heat dissipation, no external heat sinks needed • dual wiper for positive contact under all conditions of shock and vibration.

**SINGLE TURN TRIMMER DATA.** Model 80 built into TO-9 transistor type case • measures less than  $\frac{1}{3}$ " in diameter, weighs 1 gram—smallest trimmer on the market • completely sealed against moisture and humidity • resistance element twice as long as ordinary trimmers • designed for complete package encapsulation with other printed circuit components • available in 3 case styles with resistance range to 20K.

**IMMEDIATE DELIVERY.** Your nearby Spectrol distributor stocks standard models of trimmers and miniature potentiometers as well as other standard Spectrol precision potentiometers and turns indicating dials. Prices are \$6 to \$8 in quantities of 1-9 for most styles and resistances.

**MORE DATA AVAILABLE.** Contact your Spectrol engineering representative or drop us a line at the factory. Please address Dept. 44.

ALL TRIMMERS SHOWN ACTUAL SIZE

## SPECTROL

### ELECTRONICS CORPORATION

1704 South Del Mar Avenue • San Gabriel, California  
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Phone: WElls 8-4000

Circle 206 on Inquiry Card

MODEL 60



Printed circuit pins, top adjust

MODEL 50



Teflon insulated leads

MODEL 60



Teflon insulated leads

MODEL 80



Transistor size case

MODEL 80



Transistor size case, bushing mount

MODEL 50



Printed circuit pins from base

MODEL 60



Printed circuit pins, side adjust

MODEL 50



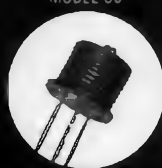
Bushing panel mount

MODEL 50



Printed circuit pins, top adjust

MODEL 80



Transistor size threaded case

MODEL 50



Printed circuit pins side adjust

MODEL 60



Printed circuit pins from base

MODEL 60



Bushing panel mount

NOW IT'S YOUR MOVE

HIGHLY RELIABLE  
SUB MINIATURES

HIGHLY RELIABLE  
SUB MINIATURES

# Good-All CAPACITOR Reliability

HIGHLY RELIABLE  
SUB MINIATURES

backed by

## ACCURATE DATA on FAILURE RATES with HIGH CONFIDENCE LEVELS

Many Good-All types and styles are being produced to extreme levels of reliability. The program is unique in that it achieves HIGH RELIABILITY while retaining SUB-MINIATURE SIZE. Extraordinary care and emphasis is placed on these fundamental items:

1. Quality control of all materials.
2. "Pre-testing" of dielectric.
3. Controlled environments for processing operations.
4. Quality oriented assembly personnel and supervisors.
5. Rigid in-process inspection.
6. Lot acceptance testing to level specified.
7. Special protective packaging.

Failure rate percentages are maintained by a well defined Failure Mode Analysis and Feedback system which operates under the control of a separate High Reliability group. Failure rates are available on all standard product lines. Graphs are included to permit quick conversion of these rates to your special operating conditions.

Write for  
detailed  
literature on  
GOOD-ALL  
HIGH-REL  
CAPACITORS

**TYPE 663F** A widely accepted SUB-MINIATURE capacitor, capable of being built to HIGH-RELIABILITY SPECS. Features: Flat shape that invites crowding • Mylar® dielectric • High insulation resistance • Space saving Mylar wrap case.

### SPECIFICATIONS

**Temperature Range** — Full rating from -55°C to +85°C and to +125°C with 50% derating.

**Insulation Resistance** — Greater than 100,000 megohm-mfs. at 25°C — See curve below.

**Life Test** — 250 hours at +85°C and 125% of rated voltage.

**Dielectric Strength** — Twice rated voltage for one minute.  
**Winding Construction** — Extended foil (non-inductive) MYLAR Dielectric.

**Humidity Resistance** — Far exceeds requirements of EIA-Spec RS164 Para. 2, 3, 8.

**Tolerance** — Standard ±20% ±10% ±5% thru ±1%.

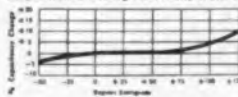
**Voltage Range** — 100, 200, 400, 600 and 1000 VDC.

### DIMENSIONS (100 Volt Rating)

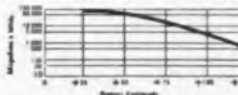
CAP. MFD.	T	W	L
.022	.156	.397	3/8
.047	.219	.328	3/8
.1	.219	.359	7/8
.22	.328	.547	1
.47	.359	.673	1 1/8
1.00	.453	.859	1 1/2



### Capacitance Change vs. Temperature



### Insulation Resistance vs. Temperature



\*DuPont's trademark for polyester film.



**GOOD-ALL ELECTRIC MFG. CO.** Ogallala, Nebr.

## Tech Data

for Engineers

### Microwave Meters

Bulletin 700, from PRD Electronics, Inc., 202 Tillary St., Brooklyn 1, N. Y., features their coaxial and waveguide frequency meters available in more than 50 models in the range from 0.1 to 40gc. Charts and photographs indicate freq., type, accuracy, dimensions, length, etc.

Circle 337 on Inquiry Card

### Coaxial Tuner

FXR, Inc., 25-26 50th St., Woodside 77, N. Y., offers tech. data on their Coaxial Slide Screw Tuner, which covers from 1.0 to 10.0 gc with VSWR's up to 10:1 matched to 1.00. Complete specs., drawings and a photograph are included.

Circle 338 on Inquiry Card

### Microwave Oscillators

Miniature oscillator Trak Type 2958, 2959 and Miniature L-band, SL-band (Types 9127 SL (CW) 1.9-2.1 gc SL (CW) 2.15-2.45 gc and 9127 SL 2.4-2.7 gc) and Miniature S-band 9150S, 9127S 2.7-3.0 gc and Trak Type C3136 S-band are described in a brochure from Trak® Microwave Corp., 5006 N. Coolidge Ave., Tampa 3, Fla.

Circle 339 on Inquiry Card

### Microwave Check List

A microwave tower inspection and maintenance check list is being offered by Tower Construction, 2700 Hawkeye Dr., Sioux City, Ia. The list emphasizes what should be checked, and the frequency with which inspection should be made on all parts of the equipment.

Circle 340 on Inquiry Card

### Transmission Line

Technical Appliance Corp., Sherburne, N. Y., has an 11-page brochure which describes their line of rigid coaxial transmission line. Drawings, complete specs. and graphs are included.

Circle 341 on Inquiry Card

## INDUSTRIAL MACHINERY

### Coating Machine

An automatic organic spray coating machine for rapid, continuous finishing of electrical and electronic components having axial leads is described in a new brochure available from Conforming Matrix Corp., 839 New York Ave., Toledo 10, Ohio.

Circle 342 on Inquiry Card

### Centrifugal Tinning

The Leon J. Barrett Co., P. O. Box 378, Worcester, Mass., has available a brochure which contains facts about centrifugal tinning, specs., descriptions and application data for their complete line of Barrett tinner.

Circle 343 on Inquiry Card

# *National*\* offers new and expanding opportunities at Dayton, Ohio in **MILITARY AND COMMERCIAL RESEARCH AND DEVELOPMENT**

- Electronic Engineers
- Component Engineers
- Semiconductor Research Physicists
- Solid State Physicists

- Digital Circuit & Logic Designers
- Test Equipment Engineers
- Electronic Systems Engineers
- Technical Writers

## **SOME OF THE IMMEDIATE OPENINGS**

**SCIENTIFIC AND TECHNICAL MANAGER:** PhD and 10 years' experience in Air to Ground Comm. and Digital Data Processing Systems.

**PROJECT ENGINEER—SYSTEM FUNCTIONAL:** MSEE and 5-7 years' experience design of military electronic equipment with some experience in logic design, electronic packaging, and test equipment design.

**PROJECT ENGINEER—AIRBORNE EQUIPMENT DESIGN:** MSEE and 5-7 years' experience in design of airborne military equipment of comm. and digital type crystal oscillator and crystal filter experience desired.

**PROJECT ENGINEER—RELIABILITY:** BSEE and 5-7 years' experience with reliability techniques applied to military electronic equipment.

**SENIOR ENGINEER—SUBCONTRACT LIAISON:** BSEE and 3-5 years' experience procurement of electronic equipment, contracts, and specifications.

**LOGIC ENGINEER:** BSEE and 3-5 years' experience in design of logic systems in digital data processing equipment.

**COMMUNICATIONS ENGINEER:** BSEE with 3-5 years' communications experience specializing in long distance propagation techniques with particular emphasis on solutions to multipath effects in the high frequency range.

**CIRCUIT DESIGN ENGINEER:** BSEE and 3-5 years' experience in design and development of solid state digital circuitry. Must have experience in circuit design for reliable opera-

tion under worst case conditions. Background in airborne and ground support test equipment desired.

**TEST ENGINEER—ENVIRONMENTAL:** BSEE 2-3 years' experience planning and performing environmental tests on military electronic equipment.

**ENGINEERING SPECIALIST:** BS and 3-5 years' experience in preparation of technical reports and documents. Must have good working knowledge of electronic equipment.

**FILTER DESIGN ENGINEER:** BSEE and 3-5 years' experience in design and development of bandpass filter networks.

**COMPONENT ENGINEERS:** BSEE and 3-5 years' experience in specifications and testing components for reliability determination in military environments.

**FABRICATION MANAGER:** BSEE plus 5-7 years' experience in fabrication of military electronic equipment including some subcontract liaison and supervisory experience.

**MECHANICAL ENGINEER:** BSME plus 3-5 years' experience in layout of electronic assemblies and shock mounting.

For these and other professional level opportunities in challenging areas of work, write to:

T. F. Wade, Technical Placement G9-3,  
The National Cash Register Company,  
Dayton 9, Ohio

**THE NATIONAL CASH REGISTER COMPANY, DAYTON 9, OHIO**

**ONE OF THE WORLD'S MOST SUCCESSFUL CORPORATIONS**

**77 YEARS OF HELPING BUSINESS SAVE MONEY**

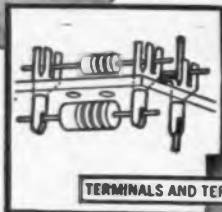






Vector Electronics manufactures a complete line of structures for mounting circuitry easily, compactly and with good accessibility.

Vector experience and facilities guarantee delivery, performance and economical prices.



Write for catalog to:

**VECTOR ELECTRONIC COMPANY**  
1100 FLOWER STREET, GLENDALE 1, CALIFORNIA  
TELEPHONE: CHAPMAN 5-1076  
Circle 208 on Inquiry Card

## Tech Data

for Engineers

### Work-Holding Devices

A new bulletin illustrating and describing special work-holding devices is available from Sutton Tool Co., Sturgis, Mich. The 20-page bulletin contains 57 illustrations showing the different types of collet chucks, diaphragm chucks, mandrels, collets, adapters, and other work-holding devices of special design, both power and mechanically operated. Bulletin No. 70.

Circle 344 on Inquiry Card

### Compresses and Pumps

Tech. data is available from the American Instrument Co., Inc., 8030 Georgia Ave., Silver Spring, Md., which describes a full selection of pumps and compressors which are available for routine or special insulations. Bulletin 4074 also features information on gas compression without contamination and diaphragm-type compressors and pumps.

Circle 345 on Inquiry Card

### Wire De-Reelers

Wire de-reelers designed to suit any winding conditions and to fit every wire gauge are presented in a new brochure just published by Associated American Winding Machinery, Inc., 750 St. Ann's Ave., New York 56, N. Y. The bulletin offers a full line of Amacoil® payoffs, tensioners, takeoffs and feeders for both rolling reels and over-the-end (stationary) reels.

Circle 346 on Inquiry Card

### Safety Catalog

A new, complete and comprehensive "Safety Catalog" outlining the full range of safety gloves, clothing and equipment is available from Advance Glove Mfg. Co., 901 W. Lafayette Blvd., Detroit 26, Mich. Information covers asbestos and welder's gloves, finger guards, and many other essential items.

Circle 347 on Inquiry Card

### Armature Winder

A new time-saving Double Flier Automatic Model Armature Winder is described in a bulletin published by Possis Machine Corp., 825 Rhode Island Ave., So., Minneapolis 26, Minn. Bulletin #613AH describes operating time and initial costs savings possible with this new machine.

Circle 348 on Inquiry Card

### Crimping Tool

Harrison-Sharp Corp., 8060 Salt Lake Ave., Huntington Park, Calif., has a tech. data sheet available on their pneumatic crimping tool. Dimensional drawings, photographs and complete specs. are available on a portable field unit and a universal bench mount.

Circle 349 on Inquiry Card



### PROTECT YOUR PRODUCT

at point of strain

Protect product reliability too—by insuring long life for cords, cables and conductors. Genuine "GRIPMASTER" Strain Reliefs provide these vital features—

- ★ Anchor cords to housing
- ★ Eliminate taping or threading
- ★ Prevent unraveling
- ★ Prevent cord pull damage
- ★ All sizes and styles
- ★ Easy to apply
- ★ Inexpensive

Gripmaster Strain Reliefs are "tremendous trifles" that make good products better!

Ask for Samples.

## 4 WAYS TO END ALL CORD AND CABLE SERVICE FAILURES

*Economically*

## GRIPMASTER STRAIN RELIEFS



**WIRE BINDING SLEEVES**—Preventing fraying of cord ends, these specially-treated rubber tubes are available in five sizes to fit wires to .790

Interruptions due to cable and cord connection failures are eliminated because they anchor the cord to the product at the point of strain. GRIPMASTER Strain Reliefs can withstand pulls up to 100 lbs., and are acceptable to Underwriters Laboratories. All types Reg. U. S. Pat. Off.

WRITE FOR SAMPLES AND LITERATURE TODAY!

**GEORGE WALKER COMPANY**

118 AMSTERDAM AVE., PASSAIC, NEW JERSEY



**Quick delivery... a specialty at Deutsch!** Naturally, we can't make delivery on the 1st if you order on the 7th ... unless you let us use the calendar shown above. But we can promise delivery of catalog items in a week or less from either our eastern or western stock locations. As a matter of fact, we usually ship on receipt of your advance order, without waiting for confirmation. And this goes for our entire line of standard environmental miniature electrical connectors: solder or snap-in types, self-aligning cylindrical and rectangular rack-and-panel models, and hermetics that never leak. If you have a tight production schedule staring you in the face, contact your local Deutschman today. He'll do his best to make delivery yesterday. For location of your nearest Deutschman write for Data File **A-6**.

# DEUTSCH

*Electronic Components Division • Municipal Airport • Banning, California*

**ADVANCED SPECIFICATION MINIATURE ELECTRICAL CONNECTORS**

# Resistance Values up to 100,000,000 Megohms



■ Model RX-1 Hi-Meg Resistor

*Victoreen Hi-Meg Resistors —  
Standard of the Industry  
for Over 18 Years*

#### Available tolerances

1% 2% 5% 10%

■ For longer life, Victoreen Hi-Meg Resistors are in a class by themselves, especially for all high-impedance, low-current applications. Hi-Meg Resistors have a carbon-coated glass rod element with silver-banded ends for best electrical contact . . . are vacuum sealed in a glass envelope treated with special silicone varnish that minimizes moisture effects. Always specify Victoreen Hi-Meg Resistors for the ultimate in long-term stability.

5806 HOUGH AVENUE • CLEVELAND 3, OHIO  
EXPORT: 240 WEST 17TH ST. • NEW YORK 17, NEW YORK

Circle 211 on Inquiry Card

## Tech Data

for Engineers

### CABINETS & PANELS

#### Panels

The Astromatic Div., Controls Co. of America, 4218 W. Lake St., Chicago 24, Ill., has available a brochure on their new Electroluminescence Panels. The brochure covers in detail all plastic construction, ease of machine ability, long life, thin area source of E-L panels presently being manufactured.

Circle 350 on Inquiry Card

#### Expanded Metals

Designers Metal Div., Southern Electric, Inc., 8701 So. Greenwood Ave., Chicago 19, Ill., has a new DEMCOR catalog #61 which illustrates 38 decorative expanded metal designs and gives specs. of each as to weight, dimensions, percentage of open area, and materials available.

Circle 351 on Inquiry Card

#### Dust-Free Cabinet

The Cleannaire® cabinet for use wherever a dust-free environment is required in precision and high reliability operations, such as white rooms, laboratories and model shops, is described in a new brochure from Plastigage Corp., 915 E. South St., Jackson, Mich. Photographs and descriptions are included.

Circle 352 on Inquiry Card

#### Cabinet Racks

Catalog #61 from Par-Metal Products Corp., 32-62 49th St., Long Island City 3, N. Y., contains illustrations, descriptions, and complete specs. on Universal Cabinet Racks and DeLuxe Console Assemblies. Universal cabinet racks are furnished with solid side walls or with detachable side panels.

Circle 353 on Inquiry Card

#### Test Benches

Product Catalog, from Skydyne, Inc., River Rd., Port Jervis, N. Y., is a 6-page short form catalog of operational and transit equipment featuring photographs and drawings of both standard and custom operation sandwich material transit cases as well as Skydyne molded fiberglass cases and mobile test benches.

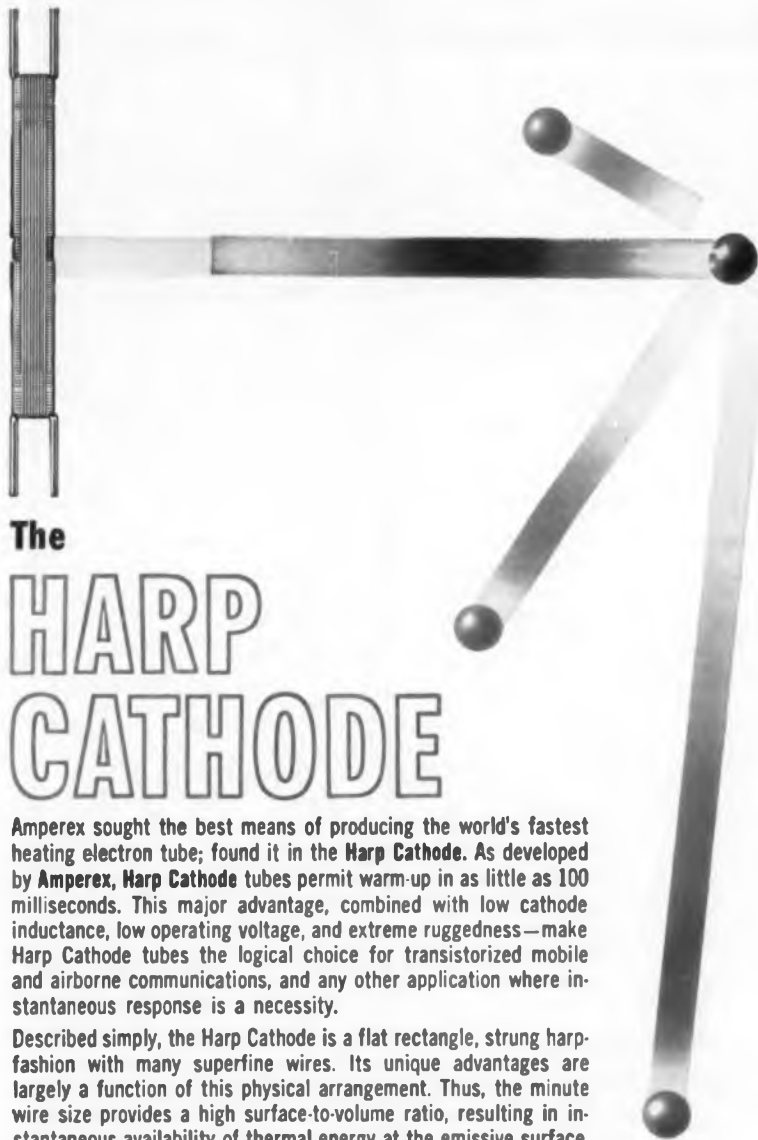
Circle 354 on Inquiry Card

#### Cabinet Racks

Bulletin S-6060 contains tech. data on Upright Cabinet Racks, inclined panel cabinet racks, Series Sixty Desk Tops, Series Sixty Drawers, Add-A-Rack Series, Series Sixty Turrets, handles, chassis slides, Trans-aire® Blowers, and Dual-View Panel Supports. The bulletin is available from Bud Radio, Inc., Cleveland 3, Ohio.

Circle 355 on Inquiry Card

**Amperex<sup>®</sup>**  
announces  
a significant  
step  
toward  
*instantaneous*  
electron  
emission . . .

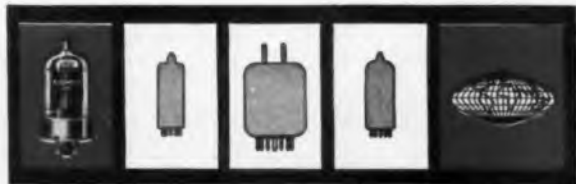


The  
**HARP  
CATHODE**

Amperex sought the best means of producing the world's fastest heating electron tube; found it in the **Harp Cathode**. As developed by Amperex, **Harp Cathode** tubes permit warm-up in as little as 100 milliseconds. This major advantage, combined with low cathode inductance, low operating voltage, and extreme ruggedness—make Harp Cathode tubes the logical choice for transistorized mobile and airborne communications, and any other application where instantaneous response is a necessity.

Described simply, the Harp Cathode is a flat rectangle, strung harp-fashion with many superfine wires. Its unique advantages are largely a function of this physical arrangement. Thus, the minute wire size provides a high surface-to-volume ratio, resulting in instantaneous availability of thermal energy at the emissive surface. The quantity of electrically parallel, directly heated wires assures low cathode inductance. The low (1.6V) filament voltage affords the closest approach to the "unipotential" cathode. Moreover, in actual tests, tubes incorporating the Harp Cathode have given longer service life than tubes with conventional cathodes.

The **Amperex Harp Cathode Type 8042 RF power Amplifier** (25 watts Diss.; 175mc ICAS) is available in pre-production quantities. It is the forerunner of an entire family of **Amperex fast-heating Harp Cathode power tubes**, which will include fast-heating versions of the type 6360 twin tetrode (12 w, 300mc); the 6939 miniature twin tetrode (7.5 w, 500mc); and the 6907 double tetrode (15 w, 450 mc).



ask Amperex about the fast-heating tube best suited to your particular application.

**AMPEREX ELECTRONIC CORPORATION • 230 Duffy Avenue • Hicksville, Long Island, New York**

*In Canada: Philips Electronics Industries Ltd., Tube, Semiconductor & Component Depts., 116 Vanderhaal Avenue, Toronto 17, Ontario*



## WHEN IS AN ABSORBER AN ABSORBER?

When it's a symbol on the drawing board ... a sample under test ... a finished product?

The same question can be asked about a dielectric material, a ferrite, a core.

The answer: any microwave or rf attenuator is satisfactory only when it fulfills the requirements of the system.

As our name implies, Custom Components is more than a manufacturer of attenuator materials. We are a facility that translates the performance specifications of your system into specific materials, shapes, weights and sizes.

When is an absorber an absorber? When your attenuation problem becomes our attenuation problem!

## CUSTOM COMPONENTS,

P.O. Box 248, Caldwell, N.J. inc.

CApital 6-3404

Circle 213 on Inquiry Card

## Tech Data

for Engineers

### HARDWARE

#### Wire

Tensolite Insulated Wire Co., Inc., W. Main St., Tarrytown, N. Y., has a catalog available which features their Teflon® insulated hook-up wire, kits and coaxial cable in compliance with MIL-C-17B. Complete specs. and photographs are included.

Circle 356 on Inquiry Card

#### Electrical Tapes

Permacel®, New Brunswick, N. J., is offering a catalog on their complete line of electrical products. Included in the catalog are: paper-film-cloth-laminated electrical tapes, silicone rubber tapes, products of Teflon®, epoxy resin systems and plastic tapes and metal foils. Included is a chart on Government Self-Sticking Tape Specifications.

Circle 357 on Inquiry Card

#### Terminals

Sealctro Corp., 139 Hoyt St., Mamaroneck, N. Y., has a 22-page catalog available which describes their Pres-Fit® Teflon® Terminals. Some of the terminals included in the catalog are stand-offs, feed-thrus, connectors, miniatures and subminiatures, test point jacks and taper pin receptacles. Complete specs., photographs, and dimensional drawings are included.

Circle 358 on Inquiry Card

#### Metals

J. Bishop & Co., Platinum Works, Malvern, Pa., has available a tech. catalog featuring: Glass-to-Metal Sealing Alloy; Tantalum Tubing; Type 310 Stainless Steel; Columbium Tubing; Hypodermic Tubing; and Capillary Tubing. Descriptions and complete specs. are included.

Circle 359 on Inquiry Card

#### Components Catalog

Cambridge Thermionic Corp., 445 Concord Ave., Cambridge 38, Mass., is offering Catalog S600 listing their complete line of electronic and electrical components. Included are: insulated terminals, battery holders, ceramic stand-off terminals, tuning slugs, brackets and shielded coil forms.

Circle 360 on Inquiry Card

#### Set Screws

Three important holding powers of a properly tightened set screw are analyzed in an 8-page tech. bulletin (Form 2067) published by Standard Pressed Steel Co., Box 899, Jenkintown, Pa. The well illustrated pamphlet is a review of the company's Unbrako high-torque socket set screws. The installed set screws, used to hold a collar or gear on a shaft, have axial, torsional and vibrational holding powers.

Circle 361 on Inquiry Card

Immediate  
delivery!

# ELMENCO

## CAPACITORS

in quantities up to

### 500 Per Item

CONTACT THESE AUTHORIZED  
ELMENCO INDUSTRIAL DISTRIBUTORS

ARIZONA: Radio Specialties & Appl. Corp., 917 N. 7th St., Phoenix.

CALIFORNIA: Brill Elect., 610 E. 10th St., Oakland; Electronic Supply Corp., 2085 E. Foothill Blvd., Pasadena; Federated Purchaser Inc., 11275 W. Olympic Blvd., L. A. 64; Hollywood Radio & Electronics Inc., 5250 Hollywood Blvd., Hollywood 27; Newark Electronics Corp., 4747 W. Century Blvd., Inglewood; Pacific Wholesale Co., 1850 Mission St., San Francisco 3; Peninsula Elect., 656 S. 1st St., San Jose; Shanks & Wright Inc., 2045 Kettner Blvd., San Diego; Shelley Radio Co. Inc., 2008 Westwood Blvd., L. A. 25; R. V. Weatherford Co., 6921 San Fernando Rd., Glendale 1; Zack Electronics, 654 High St., Palo Alto.

COLORADO: Denver Electronics Supply Co., 1254 Arapahoe St., Denver 4.

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

FLORIDA: Elect. Supply, 1301 Hibiscus Blvd., Melbourne; Elect. Supply, 61 N. E. 9th St., Miami.

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

MARYLAND: D & M Distributing Company, Inc., 2025 Worcester St., Baltimore 30; Kam-Eliert Electronics, Inc., 2050 Rock Rose Avenue, Baltimore; 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: Electronics Parts Co., Inc., 222 Truman St., N. E., Albuquerque; 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.; Electronic Center, Inc., 160-5th Ave., N. Y.; Harvey Radio Co., Inc., 103 W. 43rd St., N. Y. 36; Lafayette Radio Elect. Corp., 100 Sixth Ave., N. Y. 13; Stack Industrial Elect. Inc., 45 Washington St., Binghamton; Terminal-Hudson Elect. Inc., 236 W. 17th St., N. Y. 17.

NORTH CAROLINA: Balten-Hoge Radio Supply Co., Inc., 938 Burke St., Winston-Salem.

PENNSYLVANIA: Almo Radio Co., 913 Arch St., Philadelphia; George D. Barby Co. Inc., 622 Columbia Ave., Lancaster; George D. Barby Co. Inc., 2nd & Penn Sts., Reading; D. & M. Distributing Co., Inc., 2535 N. 7th St., Harrisburg; Phila. Elect. Inc., 1225 Vine St., Phila. 7; Radio Elec. Service Co., Inc., 701 Arch St., Phila. 6; A. Steinhilber & Co., 2520 N. Broad St., Phila.; Wholesale Radio Parts Co., Inc., 1650 Whitford Rd., York.

TENNESSEE: Electro Distributing Co., 1914 West End Ave., Nashville 4.

TEXAS: All-State Elect. Inc., 2411 Ross Ave., Dallas 1; Rescator Elect. Equip. Co. Inc., 1216 W. Clay, Houston 19; Engineering Supply Co., 6000 Denton Dr., Dallas 35; Midland Specialty Co., 500 W. Paisano Dr., El Paso; The Perry Shankie 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.

# ARCO electronics inc

NEW YORK \* DALLAS \* LOS ANGELES  
Exclusive Supplier of ELMENCO Capacitors to  
Distributors and Jobbers in U.S.A. and Canada

Circle 214 on Inquiry Card

*Another New High Order of Reliability!*

**EI-Menco**

**\*MYLAR-PAPER DIPPED CAPACITORS**

TYPE  
MFD

**ASSURE A LOW FAILURE RATE OF**  
Only 1 Failure in ~~7,168,000~~ Unit-Hours for 0.1 MFD Capacitors\*

*14,336,000*

**Setting A New High Standard Of Performance!**

Life tests have proved that EI-Menco Mylar-Paper Dipped Capacitors — tested at 105°C with rated voltage applied — have yielded a failure rate of only 1 per 1,433,600 unit-hours for 1.0 MFD. Since the number of unit-hours of these capacitors is inversely proportional to the capacitance, 0.1 MFD EI-Menco Mylar-Paper Dipped Capacitors will yield ONLY 1 FAILURE IN 14,336,000 UNIT-HOURS.

**CAPACITANCE AND VOLTAGE CHART**

• Five case sizes in working voltages and ranges:

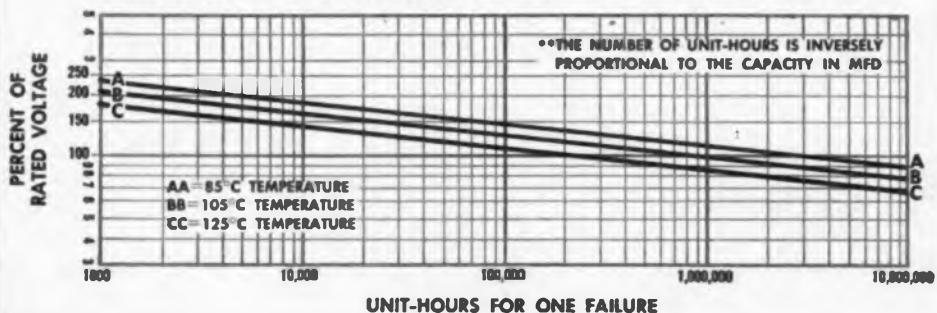
200 WVDC —	.018 to .3 MFD
400 WVDC —	.0082 to .33 MFD
600 WVDC —	.0018 to .35 MFD
1000 WVDC —	.001 to .1 MFD
1600 WVDC —	.001 to .05 MFD

**SPECIFICATIONS**

- TOLERANCES: 10% and 20%. Closer tolerances available on request.
- INSULATION: Durez phenolic, epoxy vacuum impregnated.
- LEADS: No. 20 B & S (.032") annealed copper clad steel wire crimped leads for printed circuit application.
- DIELECTRIC STRENGTH: 2 or 2½ times rated voltage, depending upon working voltage.
- INSULATION RESISTANCE AT 25°C: For .05MFD or less, 100,000 megohms minimum. Greater than .05MFD, 5000 megohm-microfarads.
- INSULATION RESISTANCE AT 105°C: For .05MFD or less, 1400 megohms minimum. Greater than .05MFD, 70 megohm-microfarads.
- POWER FACTOR AT 25°C: 1.0% maximum at 1 KC

These capacitors will exceed all the electrical requirements of E. I. A. specification RS-164 and Military specifications MIL-C-91B and MIL-C-25C. Write for Technical Brochure

**MINIMUM LIFE EXPECTANCY FOR \*\*1.0 MFD \*MYLAR-PAPER DIPPED CAPACITORS AS A FUNCTION OF VOLTAGE & TEMPERATURE**



\* Registered Trade Mark of DuPont Co.

**THE ELECTRO MOTIVE MFG. CO., INC.**

• multi-d mica • mica trimmer • dipped mica • silvered mica films  
• tubular paper • mylar-paper dipped • ceramic feed-thrus • ceramic discs

**SHRINKS SKIN-TIGHT  
THEN STOPS!**

**NEW  
ALPHLEX®  
SHRINKABLE  
TUBING  
WITH CONTROLLED  
SHRINKAGE**



**WHAT IT IS:** An IRRADIATED POLYOLEFIN INSULATION that is simple to use and shrinks when heated (275°F) to form a permanent, durable, tight-fitting mechanical bond. This new versatile tubing is supplied in expanded form and shrinks to the exact configuration of the object to be covered WITHIN 7 SECONDS of application of heat, and WILL WITHSTAND CONTINUOUSLY TEMPERATURES OF 135°C. WITHOUT FURTHER SHRINKAGE.

**WHERE TO USE:** Invaluable in laboratory, prototype, or production use wherever a tight, moisture- and chemical-resistant, electrically insulated covering is required. Use for insulating, jacketing, splicing, encapsulating, cable marking, weatherproofing, harnessing, and the insulation of connectors and other components.

**HOW TO USE:** The use of a hot air gun is recommended; however, excellent results may be obtained by oven heating, radiant heat, soldering iron, burner, or dipping in hot fluids.



**CONNECTOR INSULATION** — ALPHLEX SHRINKABLE TUBING encapsulates both connector and wire to form a tight, moisture-proof, insulated connection. It is excellent for weatherproofing in-line connectors.



**BONDS** — Provides a tight concentric flexible insulation that is heat- and chemical-resistant. Especially suitable to completely jacket the termination between multi-pin connectors and cables.



**SLEEVES** — Forms a heat-resistant insulation over wire and crimped terminals. Acts as a strain relief to protect crimped or soldered points when wire is flexed.



**TERMINALS** — Marked or color-coded SHRINKABLE TUBING sleeves simplify identification of cables and provide excellent insulation.

Write for descriptive catalog #ST-275.

**ALPHA WIRE CORPORATION**

Subsidiary of LORAI Electronics Corporation  
200 Varick Street, New York 14, N.Y.

Pacific Division: 1871 So. Orange Dr., Los Angeles 19, Calif.



IMMEDIATE DELIVERY FROM YOUR LOCAL ALPHA ELECTRONICS PARTS DISTRIBUTOR

**Tech Data**

for Engineers

**Insulating Tape**

Tech. data is available from the Mica Coated Products Div., McMillan Laboratory, Inc., 47 Congress St., Salem, Mass., on 300°C Mica Coated insulating tape. This flexible mica coated glass tape is for operation up to 300°C and is available in thicknesses of 2 to 10 mils, widths up to 36 in., and lengths up to 200 yds.

Circle 362 on Inquiry Card

**Coaxial Cables**

Times Wire & Cable, Wallingford, Conn., has a 15-page catalog available on their line of coaxial cables. Features of the catalog are choosing the proper coaxial cable, production facilities, complete specs. on RG/U type coaxial cables, data cable and low-loss coax cable.

Circle 363 on Inquiry Card

**Ball Bearings**

A folder, giving dimensional data on in., metric, pivot and special series RMB miniature ball bearings is available from Landis & Gyr, Inc., 45 W. 45th st., New York 36, N. Y. Catalog 4E features listing the part numbers of in. series bearings produced by other leading bearing manufacturers, which are interchangeable with RMB bearings.

Circle 364 on Inquiry Card

**Parts Catalog**

The Sterling Instrument Div. of Designatronics, Inc., has a 552-page catalog (#65) which contains a list of over 20,000 stock items. The catalog is divided into 67 product categories including speed reducers, magnetic clutches and brakes, differentials, electronic hardware, Teflon terminals and limit stops. Within each category, part numbers, OEM list prices, specs., and test reports useful in design and prototype work are presented. Sterling Instrument Div. of Designatronics, 5 Sintsink Dr., Port Washington, N. Y.

Circle 365 on Inquiry Card

**Encapsulation Cups**

Electronic Products & Development Inc., 205 So. Beverly Hills, Calif., has tech. data available on their electronic encapsulation cups. These cups are designed to withstand severe mechanical vibration and shock; are miniaturized and permit flexibility in the placement of magnetic components due to the high insulating nature of the cup material.

Circle 366 on Inquiry Card

**Tapping Screws**

A value analysis chart for tapping screws, designed as an aid for tapping screw evaluation in inspection and production depts., is available from Parker-Kalon, Div. of General American Transportation Corp., Clifton, N. J. The 20 by 18 in. chart is heavy coated suitable for mounting.

Circle 367 on Inquiry Card

A NEW LINE OF

NIXIE®

INDICATOR TUBES



BEST FROM EVERY ANGLE

NIXIE Tubes, the established readout standard for the electronics industry, now have another major feature . . . . 160° viewing angle. These tubes which are noted for their constant brightness, outstanding life (100 times that of any other readout), low cost, small size, light weight and excellent readability, have the widest viewing angle ever achieved in a direct decimal readout device. NIXIE Indicator Tubes . . . . . Best From Every Angle.

Write for complete data on the new  
NIXIE Indicator Tube line.

Circle 217 on Inquiry Card

ANOTHER ELECTRONIC CONTRIBUTION BY  
**Burroughs Corporation**

ELECTRONIC COMPONENTS DIVISION

PLAINFIELD, NEW JERSEY  
Formerly Electronic Tube Division



**VERSATILITY**  
**DESIGN**  
**ECONOMY**  
In  
**PULSE FORMING**  
**NETWORKS**

For the Pulse Forming Networks that meet critical Mil. Specs., for environmental conditions . . . specify Plastic Capacitors . . . the name of proved reliability in plastic film dielectric units. These superior units have a range in standard design from 0.1 microseconds up. Operation up to 125°C. Designed to match any impedance. Here is "on the job" performance you can count on. Special applications invited.

Get the complete quality story.  
Write today to:

**Plastic Capacitors, INC.**  
2620 N. Clybourn • Chicago 14, Ill.  
DI 8-3735

Circle 218 on Inquiry Card



Custom  Engineering at  
Production Prices

## Tech Data

for Engineers

### Eyelets

Circon Component Corp., Santa Barbara, Goleta, Calif., has tech. information available on their gold plated and shot burnished instrument eyelets. Dimensional drawings, application data and complete specs. are included.

Circle 368 on Inquiry Card

### Detector Mount

An application note is now available from Hewlett-Packard Co., 1501 Page Mill Rd., Palo Alto, Calif., which describes a simple modification to adapt a Hewlett-Packard X-band or H-band crystal detector mount for use as an inexpensive mixer for a laboratory receiver. Application Note, #51 describes and illustrates the mod. in detail and shows how the detector can be used in a complete receiver arrangement.

Circle 369 on Inquiry Card

### Grip Handles

Brochure No. 204G describes complete engineering data and price information on a new line of aluminum, vinyl grip handles. Mounting methods to cut cost in installation is included. TA Mfg. Corp., 4607 Alger St., Los Angeles 39, Calif.

Circle 370 on Inquiry Card

### Terminal Boards

Kulka Electric Corp., 633-643 So. Fulton Ave., Mt. Vernon, N. Y., has an 8-page catalog covering their complete line of military terminal boards. Photographs, complete specs., and dimensional drawings are included.

Circle 371 on Inquiry Card

### Precision Dials

PIC Design Corp., Sub. of Benrus Watch Co., E. Rockaway, L. I., N. Y., has tech. data available on precision dials, "No-Mar" set screws, gear train packages, gear differentials, clutches and precision instruments. 15,000 precision instrument components are included in PIC master catalog.

Circle 372 on Inquiry Card

### R-F Connector

A new, 120-page, 2-color catalog containing illustrations and full tech. data on its complete line of r-f connectors including the K-Grip® connectors, is available from Kings Electronics Co., Inc., 40 Marbledale, Rd., Tuckahoe, N. Y. This catalog has detailed information on the following connectors: BN, BNC, C, HN, LC-LT, LN, N, Pulse Miniature and Subminiature Twin Connectors UHF, Miscellaneous Connectors and Adapters, Adapters to Rigid Line, Waveguide Adapters, TNC, K-Grip, 125 ohm High Impedance, and Hermaphrodite. A 15-page cross-referencing index, Kings-to-Military numbers and Military-to-Kings numbers is also incorporated.

Circle 373 on Inquiry Card

## Computer Circuit Performance enhanced by Kelvin Series "O" precision resistors

**GUARANTEED STABLE**  
**...NOW AND LATER!**

Kelvin's new high performance Series "O" resistors, designed and manufactured under laboratory conditions, are specifically intended for applications requiring long term electrical stability of the highest order.

**Guaranteed stability:** .003% per year max. under reasonable environmental conditions; **Temperature coefficient range:** .001%/°C max., .0001%/°C min.; **Standard accuracies:** to ±.005%; **Matching or ratio accuracies:** to ±.002%; **Rise time characteristics:** as low as .05 micro-seconds for 100K ohm range; **Wattage range:** .15 watt to 2.50 watts; **Resistance range:** .1 ohm to 15 meg-ohms; **Physical size range:** .187 dia. x .375 length to 1.000 dia. x 2.125 length.

These units feature "relaxed," pre-aged windings, all welded terminations and unique encapsulation techniques which ensure accuracy both now and later! Your inquiry is also invited concerning RESISTIVE NETWORKS in prototype or production quantities available in virtually any arrangement of values and physical configurations to meet the most exacting specifications.

Representatives in  
principal cities



**KELVIN**  
ELECTRIC COMPANY

5907 Noble Ave., Van Nuys, Calif., TRiangle 3-3430  
New York: Yonkers, 916 McLean Ave., BEverly 7-2500

*If You Specify*

Teflon, Mylar and other film or Tantalum capacitors from these reputable manufacturers, you should know about Glofilm immediately.

AEROVOX  
 ARCO  
 ASTRON  
 BALCO CAPACITOR DIVISION  
 CORNELL-DUBILIER  
 ELECTRON PRODUCTS  
 JOHN E. FAST  
 FILM CAPACITORS  
 GENERAL ELECTRIC  
 GOOD-ALL  
 GUDEMAN  
 MICAMOLD  
 PLASTIC CAPACITORS  
 SAN FERNANDO ELECTRIC  
 SPRAGUE  
 SOUTHERN ELECTRONICS  
 AND OTHERS

GLOFILM CAPACITORS  
 —AVAILABLE FOR ENGINEERING EVALUATION  
 0.5 mfd 50 WVDC  
 1.0 mfd 50 WVDC  
 Hermetically sealed, metal tubulars, both leads insulated. Order from Style "C" or Style "D" Glofilm as required.

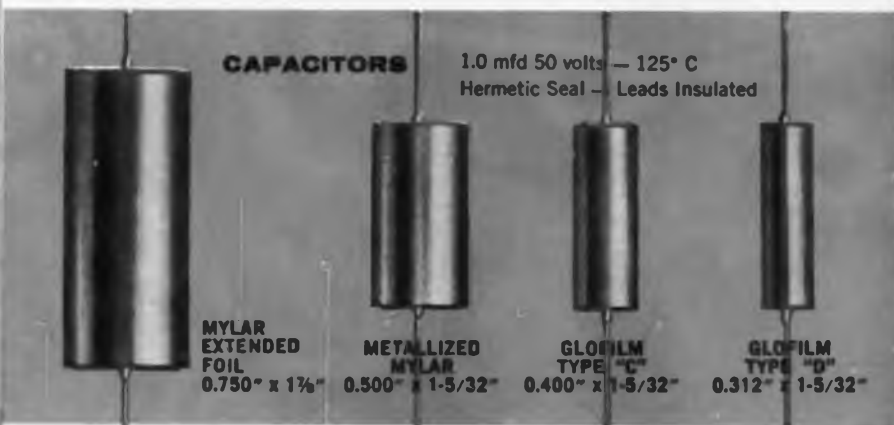
ANOTHER RADIATION RESEARCH TECHNOLOGICAL BREAKTHROUGH

# GLOFILM\*

TEFLON<sup>†</sup> COATED-MYLAR<sup>†</sup> COST RANGE

New technique to revolutionize Capacitor MANUFACTURING and USE

\* Trademark — Radiation Research Corporation  
 † Registered trademarks — E. I. Dupont & Company

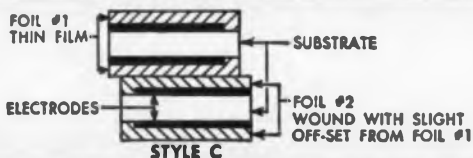


- Highest capacitance per unit volume now provided for conventional "miniature" capacitors. Style "C" — Teflon dielectric — size reduction to 35%. Style "D" — Dual dielectric (Teflon plus Mylar) size reduction to 70%.
- Glow discharge process assures film uniformity.
- High reliability ensured through pin-hole-free film deposition.
- Extra protection of two thin films in series for wound capacitor.
- 50 volts WVDC available. Higher to 100 volts on request.
- Operates without derating to 125° C.
- Ideal for transistorized RF circuits.

This breakthrough for new capacitor designs, was accomplished by RRC during the course of research into insulation for nuclear batteries. A technique for depositing a micron-thin film of dielectric on a metallized surface was discovered and later perfected by RRC. The process is called "glow discharge".

RRC has provided Glofilm capacitors with Teflon characteristics for your personal evaluation . . . They are available in 50 volt ratings and are smaller than conventional units . . . hermetically sealed, insulated leads, light weight, and feature highest capacitance per unit volume.

Capacitors using Glofilm have been successfully produced by several progressive manufacturers using conventional equipment and techniques . . . Check your supplier after learning about Glofilm — write for technical Bulletins which contain electrical and mechanical specifications, performance data and engineering information.



RADIATION RESEARCH CORPORATION

1150 SHAMES DRIVE • WESTBURY, LONG ISLAND, NEW YORK

# When does it pay to pay more for a digital voltmeter?



1

**WHEN RELIABILITY** is of uncompromising importance, consider NLS Series 20 instruments with advanced transistorized logic and mercury-wetted relays. The M24, above, which measures DC voltage, DC voltage ratio or resistance in  $\frac{1}{3}$  second, has been selected by major missile manufacturers after thousands of hours of competitive life testing.



2

**WHEN SPEED**, in the order of 200 measurements per second, is required, specify the NLS V44 All-Electronic DVM. Here is an instrument specifically designed to solve the special problems encountered in high-speed measuring and data logging.



3

**WHEN ACCURACY**—full five-digit accuracy—is demanded by your application, use the NLS V35A. This instrument features resolution of 0.001% over the entire range, a result of mathematically perfect "No-Needless-Nines" logic.



4

**WHEN EASE OF SERVICING** is of vital concern, you will find it in any NLS premium instrument. The higher-priced V44, M24, V24, R24 or the medium-priced V35A and V34A (shown above)—all feature 99% plug-in modular construction for spotting and correcting malfunctions in minutes instead of hours or days.



Originator of the Digital Voltmeter

**non-linear systems inc.**

DEL MAR, CALIFORNIA

Circle 221 on Inquiry Card



## You can buy an NLS Digital Voltmeter for as little as \$1,125...

...but there are many times when it pays to pay much more! When accuracy, reliability, speed, servicing ease or versatility cannot be compromised, you'll gain far greater long-term economy by specifying one of these premium NLS instruments:

**1 M24 Multi-Purpose Instrument**—Measures DC voltage from  $\pm 0.001$  to  $\pm 999.9$  and DC voltage ratio to  $\pm 9999$  ( $\pm 0.01\%$  accuracy), resistance from 0.1 ohm to 1 megohm...  $\frac{1}{2}$  second balancing time... with accessories, measures AC voltage or AC ratio, low-level DC... completely automatic... output for data logging. **\$5,650**

**V24 Voltmeter-Ratiometer**—Similar to M24 except it does not measure resistance. **\$4,950**

**R24 Ratiometer**—Measures DC ratio with ranges of  $\pm 9999/9.999$ . **\$4,650**

**2 V44 All-Electronic Voltmeter**—200 readings per second... measures DC voltages from  $\pm 0.001$  to  $\pm 999.9$ ... output for data logging... input impedance 10 megohms on all ranges without internal or external preamplifiers... recommended for high-speed applications requiring maximum reliability and dependable  $\pm 0.01\%$  accuracy... there are no decade or amplifier potentiometers to trim; the V44's "NO POTS AT ALL" stability is designed in, not trimmed in. **\$6,150**

**3 V35A Transistorized Voltmeter-Ratiometer**—This all-transistorized instrument is the fastest, most versatile, true 5-digit voltmeter with the Factual Fifth Figure, full 5-digit resolution of 0.001%... measures DC voltage from  $\pm 0.0001$  to  $\pm 999.99$ , DC voltage ratio from  $\pm 00.001\%$  to  $\pm 99.999\%$ ... with accessories, measures AC voltage, low-level DC... features No-Needless-Nines logic, plug-in oil bath stepping switches... output for data logging. **\$3,750**

**4 V34A Transistorized Voltmeter Ratiometer**—4-digit quality and performance companion to V35A. **\$3,150**

*NLS offers a complete line of digital voltmeters... both by purpose and by price. In addition to these premium instruments, six low-cost models in the Industrial Series are offered by NLS, pioneer of low-cost DVMs. To see any NLS instrument in action or receive more information, write NLS or contact any NLS office or representative.*



**non-linear systems, inc.**  
DEL MAR, CALIFORNIA  
Circle 221 on Inquiry Card

## Tech Data

for Engineers

### Precision Springs

"Springs and SpringLike Things," a new 16-page manual published by Associated Spring Corp., Bristol, Conn., gives engineers and purchasing executives authoritative information needed to specify custom-designed and standardized precision springs. The new manual gives basic information on helical springs, flat springs, wire forms, and assembled spring-like devices.

Circle 374 on Inquiry Card

### Drive Sprockets

Brochure SP-52 contains information of interest to designers, engineers, and original equipment manufacturers working with tapes and films actuated by driving perforations. The brochure released by LaVeZZi Machine Works, 4635 W. Lake St., Chicago 44, Ill., contains illustrations, diagrams and descriptions of many different types and sizes of sprockets available from stock.

Circle 375 on Inquiry Card

### Electronic Enclosures

A new technical report issued by the Amco Engineering Co., 7333 W. Ainslie St., Chicago 31, Ill. Supplement E to Catalog C-201 describes the modular instrument enclosures which withstood tests in accordance with MIL E-5272C Procedure 12, MIL Standard S901B and MIL Standard E-4970 Procedure B.

Circle 376 on Inquiry Card

### Self-Locking Nuts

Kaylock Div., Kaynar Mfg. Co., Inc., Box 2001, Terminal Annex, Los Angeles 54, Calif., has just released its new 1961 Kaylock catalog, containing a large and complete selection of lightweight, all-metal, self-locking nuts for the airframe, propulsion and electronic industries.

Circle 377 on Inquiry Card

### Socket Screws

The Bristol Co., Waterbury 20, Conn., has issued an illustrated catalog No. 783 containing information on their socket screws with the Nylok<sup>®</sup> self-locking insert. In addition to a discussion on advantages and special features, the catalog includes tech. data and dimensional standards.

Circle 378 on Inquiry Card

### Inserts and Studs

Newton Insert Co., 6500 Avalon Blvd., Los Angeles 3, Calif., has available a revised, completely illustrated 28-page catalog containing tech. data on 20 different series of Keenserts<sup>®</sup> threaded inserts and studs, as well as specs. on Keenserts equivalent to NAS drawings 1394 and 1395. Catalog D features advantages of the different types and complete instructions for installation and removal of inserts and studs.

Circle 379 on Inquiry Card

## we're probably a little backward about the way we make Backward Wave Oscillators

Automation, mass production? They're just the thing if you're making automobiles or terminal lugs or even transistors. But for making backward wave tubes, we still hold to the old-fashioned tenets of skilled craftsmanship. And we even admit to using such bygone techniques as trial-and-error.

This is simply because we know of no other way to build tubes with the fantastic precision and extremely minute tolerances required in a BWO.

There are some shortcomings to making tubes the way we do. The attrition rate on some of the parts is scandalously high. But when we finish a tube, like the Type OD 1-2 shown below, we know it will live up to its specifications, and then some. We guarantee a minimum of 500 hours service from it, and are hurt way down deep if it doesn't last several times that long.



Our new brochure tells some of the secrets of making BWOs. Along with it we'll send you a set of specification sheets on our tubes covering the range 1-18 kmc. Write today.

**STEWART  
ENGINEERING  
CORPORATION**



SANTA CRUZ • CALIF.

Circle 223 on Inquiry Card



## DON'T MISS THIS

New, Miniaturized  
**1-MC PRECISION  
CRYSTAL OSCILLATOR**  
with transistorized,  
proportional-controlled oven

**BULLETIN S-1159**

contains typical specifications and characteristics. Write for your copy.

**REEVES-HOFFMAN**

DIVISION OF DYNAMICS CORPORATION OF AMERICA  
CARLISLE, PENNSYLVANIA

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## Frontier



Frontier "standards" or custom-packaged "specials" ... to meet any requirement

proven on major missile and military systems

- **EXTREME ACCURACY**
- **ABSOLUTE RELIABILITY**
- **SUBMINIATURE PACKAGING**

on these frequency • time • digital products

### frequency

oscillators • secondary and portable standards • converters (frequency and subminiature DC-DC voltage) • R. F. oscillators • frequency control systems • special developments

### time

programmers • intervalometers • timers • digital clocks • on-missile (launch vehicle and payload) command program timers (fixed and variable instruction) • electromechanical and solid state • single and multi-channel • time reference and memory command systems • special developments

### telemetry

oscillators • transmitters • C. W.—F. M.—P. C. M. • "specials" • transponders • special developments

### digital modules

• complementary logic modules that are quickly and specifically "Frontier-Tailored" for your particular system • master clocks • flip-flops • scalars • comparators (parallel and serial) • pre-set counters • amplifiers • drivers • shift registers • redundant output selectors (w or w/o comparison monitors) • binary-decimal decoders • indicator drivers • special developments

**Frontier**

ELECTRONICS CO.

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4608 Memphis Avenue • Cleveland 9, Ohio

526

Circle 225 on Inquiry Card

## Tech Data

for Engineers

### Hi Temp Tubing

Tech. data is available on Flexite® SR 200 Silicone Rubber Extruded Tubing, Teflon® Extruded Tubing and Teflon Thin Wall Tubing from L. Frank Markel & Sons, Norristown, Pa. Flexite SR 200 Silicone Rubber Extruded Tubing is a flexible, tough and durable material possessing excellent heat stability (continuous operation at 400°F), high dielectric strength and corona resistance.

Circle 380 on Inquiry Card

### RECORDERS & ACCESSORIES

#### Tape Reader

Tech. data are available from Electronic Engineering Co., 1601 E. Chestnut Ave., Santa Ana, Calif., on their 80 Bit Bi-Directional Punched Tape Reader. This unit is for automatic search and programming, reads 80 bits of information/1 in. frame of tape, has a common return for contacts, and rewinds in forward or reverse direction at 12 ips.

Circle 381 on Inquiry Card

#### Chart Drives

Inco Co., Div. of Barry Wright Corp., Groton, Mass., has published a condensed product catalog describing, in some detail, its multi-speed chart, step-function speed reducers and instrument drive systems. Five models of chart drives for use with Bristol, Wheelco, Leeds and Northrup, General Electric and Brown recorders are described at length.

Circle 382 on Inquiry Card

#### Miniature Recorder

Pacific Electro Magnetics Co., Inc., 942 Commercial St., Palo Alto, Calif., has tech. data available on their PMR-500, a miniature recorder for instrumentation and industry use. Features are: portable & mobile (11½ lbs.); low power (20 w for 7 channels); extended freq. response (100 kc direct, 10 kc FM @ 30 ips.); and end-of-reel shut-off.

Circle 383 on Inquiry Card

#### Tape Recorders

Precision Instrument Co., 1011 Commercial St., San Carlos, Calif., is offering tech. data on their line of instrumentation tape recorders. Featured is the PS-250L Multi-Channel Simulator, which is a compact rack-mounted continuous tape loop signal source with simultaneous reproduction available from up to 50 channels. Also included are miniature recorders PS-300 and PS-303M.

Circle 384 on Inquiry Card

## NEW! HI-POWER COAXIAL CALORIMETRIC POWER METER

DIRECT READING—5 to 50 KW

DC—1000 MC • VSWR less than 1.3



These power meters are greatly simplified Calorimeters which use water to carry the heat away, for economy of space and cost. The instrument is fully self-contained, portable, water cooled and requires only connection to the power line and water supply. It does not use any flow meters, thermometers or any other controls. There is only the "ON" and "OFF" switch for the operator to use on the front panel when a measurement is to be made. A sensitive thermopile and microammeter measure the power dissipated in the R.F. load. The microammeter is calibrated in watts, is direct reading and can be remotely located.

The radio frequency load has a low, VSWR between DC to 1000 MC. This feature makes it possible to calibrate this instrument at 60 cps against an accurate laboratory type wattmeter, and then use it at any frequency up to 1000 MC. Thus an accuracy at 2% can be easily accomplished. This recalibration is necessary only when measurements are made at extreme temperatures or when wear is suspected.

This Calorimeter is particularly recommended for field service where a rugged and yet accurate Power Meter is required for use by unskilled personnel.

Model	Power Rating	Connector	Max. VSWR	Water Supply	Price
CX-5	5 KW	1-1/2"	1.3	1.5 G.P.M.	\$1050.00
CX-10	10 KW	2-1/2"	1.3	3 G.P.M.	1250.00
CX-20	20 KW	3-1/2"	1.3	6 G.P.M.	2250.00
CX-50	50 KW	6-1/2"	1.3	18 G.P.M.	4500.00
CX-100	100 KW	9-1/2"	1.3	30 G.P.M.	6500.00



## COOLING UNITS

### MODEL CU-1500

(Illustrated) dissipates 1500 watts and sells for \$325.00.

These packaged cooling units are completely self-contained and consist of a liquid circulator, a liquid to air heat exchanger, a reservoir and flow and temperature interlocks as required. They transfer the heat from congested locations, where high temperature is detrimental to the operation of other components, to remotely located locations where the heat can be dumped conveniently and where it will not affect the operation of other equipment.



Model CU-5000 (Illustrated) dissipates 5000 watts, is designed to mount in standard 19" rack and sells for \$395.00.

MODEL	CAPACITY
CU-50	50 watts
CU-150	150 watts
CU-200W	200 watts
CU-500	500 watts
CU-500W	500 watts
CU-1500	1500 watts
CU-1500W	1500 watts
CU-5000	5000 watts
CU-10,000	10,000 watts
CU-50,000	50,000 watts
CU-100,000	100,000 watts

# Electro IMPULSE LABORATORY INC.

208 RIVER STREET • RED BANK, NEW JERSEY  
Phone: SHadyside 1-0404

DIRECT READING

## Calorimetric Power Meter



ACCURACY: 2% (less load error)

These power meters are greatly simplified Calorimeters, which use an accurate metering pump of the gear type driven by an over-powered synchronous motor to keep the fluid flow constant. The instrument is fully self-contained, portable, self-cooled and requires only connection to the power line. It does not use any flow meters, thermometers or any other controls. There is only the "ON" & "OFF" switch for the operator to use on the front panel, when a measurement is to be made. A sensitive thermopile and microammeter measure the power dissipated in the R.F. load. The microammeter is calibrated in watts and is direct reading. These Calorimeters are available with either a coaxial or a waveguide load.

### COAXIAL CALORIMETERS

Type	Full Scale Power	Freq. Range KMC	Price
CPM-10	10	DC-10	\$950.00
CPM-50	50	DC-10	950.00
CPM-100	100	DC-10	950.00
CPM-500	500	DC-10	950.00
CPM-5000	5000	DC-1	1400.00
CPM-10000	10000	DC-1	2000.00
CPM-20000	20000	DC-1	3250.00

### WAVEGUIDE CALORIMETERS

Type	Full Scale Power	Price
CPW-10	10	\$850.00
CPW-50	50	800.00
CPW-100	100	800.00
CPW-500	500	800.00
CPW-5000	5000	1200.00
CPW-10000	10000	1750.00
CPW-20000	20000	2950.00

DIRECT READING

## Calorimeter Bridge



With Self-Contained Calorimeter Loads, Cooling System & Circulating System.

ACCURACY: 2% (less load error)

This Calorimeter is completely self-contained with its own circulating system, cooling system and the radio frequency dummy load and requires only connection to the regular power line. The R.F. power is read directly on a 4 1/2" meter in watts. A single coaxial dummy load is available to cover the frequency range from DC to 10,000 Mc and for the power range from 1 to 1000 watts. The overall accuracy of this Calorimeter is 2%. However, this accuracy can be improved greatly by calibrating the Calorimeter by means of an external laboratory-type wattmeter.

Model	Range	Frequency	Price
CB-11	1 watt	DC-4 KMC	\$900.00
CB-12	5 watts	"	900.00
CB-13	25 watts	"	1250.00
CB-14	150 watts	"	1250.00
CB-15	500 watts	"	1450.00
CB-16	1000 watts	"	1650.00
CBW-1	1 watt	7-12 KMC	1450.00
CBW-2	1 watt	"	1450.00
CBW-3	15 watts	"	1450.00
CBW-4	100 watts	2.4-12 KMC	1100.00
CBW-5	750 watts	1-12 KMC	1500.00
CBW-6	1000 watts	"	2400.00
CBW-7	6000 watts	"	3000.00

## CHROMALLIZING

Solves High Temperature  
GLASS TO METAL  
Sealing Problems

Traditionally, glass to metal sealing is achieved by oxidizing the metal and then bonding this oxide to the glass for a vacuum-tight seal. The oxide must have a strong affinity to the base metal and strong wetting action with glass.

CHROMALLIZING of metals used in the manufacture of electronic devices provides a seal of extremely high strength, so that even CHROMALLIZED tungsten can be sealed directly to Pyrex. CHROMALLIZED molybdenum and related metals can be sealed in open air, eliminating the need for a controlled atmosphere.

CHROMALLIZING of other sealing metals makes possible a tight oxide film which readily seals to glass, and will not strip during the fabrication of button stems or headers.

CHROMALLIZED molybdenum and tungsten in conjunction with aluminosilicate glasses can withstand sealing temperatures over 1200°C.

CHROMALLIZING is a reliable process for diffusing chromium and other elements into the surface of metals and provides an alloy case which is integral with the base metals. It cannot peel or flake. The chromium diffuses uniformly into recesses, pores, cracks and even blind holes.



WRITE FOR FURTHER INFORMATION

## CHROMALLOY CORPORATION

West Nyack, N. Y.—Elmwood 8-5900

CHROMIZING CORPORATION, HAWTHORNE, CALIFORNIA  
PROPELLEX CHEMICAL DIVISION, EDWARDSVILLE, ILLINOIS  
ELYRIA FOUNDRY DIVISION, ELYRIA, OHIO  
SINTERCAST DIVISION, WEST NYACK, N. Y.  
SHUNK MANUFACTURING CO. INC., BUCYRUS, OHIO



## Tech Data

for Engineers

### Air Line Recorders

United Data Control, Inc., 380 N. Halstead St., Pasadena, Calif., has published a bulletin describing commercial air line recorders. The bulletin discusses recorder applications for continuous monitoring of commercial aircraft for accident analysis, airworthiness and maintenance.

Circle 385 on Inquiry Card

### Magnetic Recorder

Bulletin 3.3 available from Westrex Recording Equipment Dept., 6601 Romaine St., Hollywood 38, Calif., describes Westrex Type RA-1653 airborne magnetic recorder, which records through 500-g shock and survives 1500-g impact without loss of data. Complete specs. and description are included in the bulletin.

Circle 386 on Inquiry Card

### Miniature Recorders

Curtiss Wright Corp., Princeton Div., Princeton, N. J., has available tech. data on their miniature recorders. Some features are ink or inkless recording, permanent-magnet moving-coil movement, 3-speed transmission, hour/minute feed and sensitivity to 250  $\mu$ a dc without amplification.

Circle 387 on Inquiry Card

## SEMICONDUCTORS

### Silicon Diodes

A new 12-page, 3-color diode catalog which describes more than 200 "IN" and "FD" series silicon Planar diodes is available from Fairchild Semiconductor Corp., 4300 Redwood Hwy., San Rafael, Calif. The catalog features several new products including FD 400, a high conductance ultrafast Planar diode with a 500 mw power dissipation (Forward conductance 150 ma min. at 1.0 v.; reverse recovery time, 75 nsec. max., switching 200 ma).

Circle 388 on Inquiry Card

### Semiconductor Alloys

Semi-Alloys Inc., 550 S. Fulton Ave., Mt. Vernon, N. Y., is making available literature dealing with the melting point of alloys most commonly used in the fabrication of semiconductor products. The 4 basic alloys described are aluminum, gold, indium and silver and depending on particular composition, the various melting points range from 29.8°C to 1430°C.

Circle 389 on Inquiry Card

Circle 227 on Inquiry Card

## PARAMETRIC Telemetry Preamplifier



### SPECIFICATIONS:

Passband	225-260mc
Gain	25db
Noise Figure	1-2db
Load Impedance	50 ohms
Power Input	115v, 60cps



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AMityville 4-2100

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## YOU CAN PROFIT

with the **BEAD CHAIN**  
ECONOMICAL  
MULTI-SWAGE  
METHOD



this  
**FREE**  
catalog  
can help  
you to...

## LOWER PRODUCTION COSTS on Tiny Metal Tubular Parts

Bead Chain's exclusive multi-swage method automatically swages almost any type of tiny metal tubular part from flat stock into precision forms with positive, tight seams. High-volume production can be delivered speedily and at far less cost than with conventional methods of manufacture! Parts can be beaded, grooved, shouldered and made of almost any metal. Diameters up to 1/4", lengths to 1 1/2".



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TODAY!

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MANUFACTURING CO.**

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*when reliability is  
designed into a component,  
it costs no more!*



## Aladdin DURA-CLAD TRANSFORMERS



A Division of Aladdin Industries, Inc.

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PULSE AND WIDE-BAND TRANSFORMERS AND INDUCTORS

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Instrument Cases  
4 PAGES

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20 PAGES

Learn how TA's new predesigned Instrument  
Cases solve your equipment housing problems.

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THESE EXCLUSIVE FEATURES—STANDARD WITH TA—SAVE YOU TIME AND COST

1. Predesigned panel-layouts for perfect fit.
2. Large selection of standard sizes and styles.
3. Wide choice of standard handles, access doors, panels, and other accessories.
4. All standard Cases include panel gaskets.
5. All Cases protected by air relief valves.
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9. Precision quality.
10. Reinforced aluminum construction.
11. TA Cases are color matched to, and integrated with, the instruments they are to contain.

**INSTRUMENT MANUFACTURERS:**  
If you make portable instruments or equipment, you can't afford not to investigate the TA line.

TA Cases come in a diversity of standard lid sizes, and are sold at proprietary prices. During assembly the depth can be cut to your exact specifications. Or, if you like, TA will furnish you free vellums and templates so you can save yourself money by designing your product to fit one of the many standard sizes.

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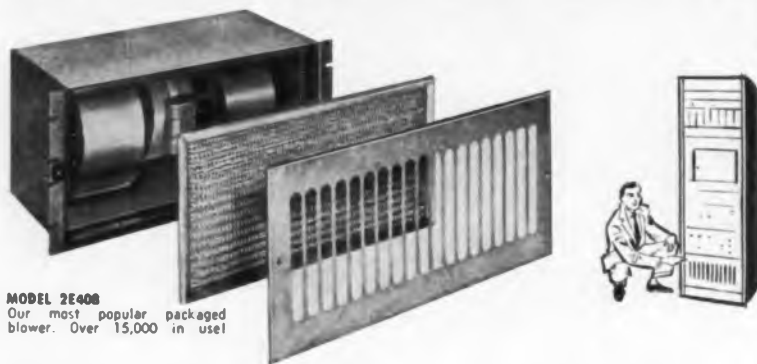
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Circle 231 on Inquiry Card



# McLEAN

for the World's Finest and Largest Line of  
**Electronic Fans and Blowers**



**MODEL 2E408**  
Our most popular packaged blower. Over 15,000 in use!

McLean fans and blowers are compact, packaged units that pressurize the cabinet with cool, filtered air, preventing dust from entering through cracks or joints. The units are complete, and ready for use. No cutting or fitting is necessary... standard EIA natching is used. All units contain easily replaceable filters. Smart, stainless steel grilles eliminate the necessity of matching special finishes. All components provide long service-free life, reliability, long-term economy, maximum safety and quiet operation.

### SPECIFICATIONS FOR 19" RACK MODELS

Panel Height	Model	CFM	Remarks	Type
3 1/2"	2E300E	150	Case Height 5 1/2" Recessed	Blower
5/4"	2E300A	150	Basic Model	Blower
5 1/4"	3E408	180	For Low Rear Head Room	Propeller
5 1/4"	2E408E	300	Case Height 7" Recessed	Blower
7"	2E408A	300	Basic Model (Silent Operation)	Blower
7"	2E55B	250	Basic Model	Propeller
7"	M2E55B	300	400 Cycle Mil-Spec	Propeller
7"	2E8508E	500	Case Height 8 3/4" Recessed	Blower
8 3/4"	2E8508A	500	Basic Model	Blower
8 3/4"	2E808	475	Basic Model	Propeller
8 3/4"	2E8610E	800	Case Height 10 1/2" Recessed	Blower
10 1/2"	2E8610A	800	Basic Model	Blower
10 1/2"	2E808S1	500	Basic Model	Propeller
10 1/2"	1E8800	1000	Case Height 12 1/4" Recessed	Blower

Modifications of Above Models Can be Made to  
Other Width Racks



**RECESSED MODELS**  
For maximum air delivery where panel space is limited.



**FILTER GRILLE ASSEMBLIES**  
For cabinets lacking sufficient louvre area to permit an adequate air change.



**RING AND PANEL FANS**  
Mount easily and quickly against bottom, top or sides of cabinet with shaft in any position.



**SINGLE AND DUAL CENTRIFUGAL BLOWERS**  
For spot cooling, pressurizing or general purpose use where filtered air is not essential.



**HALF PANEL WIDTH FANS AND BLOWERS**  
For narrow width panels or full width where space is a problem. Same high quality as full width units.



**REVERSIBLE FANS**  
Easy to install, great mounting flexibility. Can be installed as blow or suck.

**McLEAN**  
ENGINEERING LABORATORIES

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Ask about our line  
of Mil-Spec fractional  
horsepower motors.

## Tech Data

for Engineers

### Adhesive Resins

Isochem Resins Co., 221 Oak St., Providence 9, R. I., has released a tech. data sheet designated "Epoxy Casting and Adhesive Resins of Adjustable Flexibility." These hardeners are based on improved versions of Versamide, Thiokol and a new type modified flexible amine.

Circle 390 on Inquiry Card

### Plastics

The Polymer Corp., Reading, Pa., offers a 16-page brochure entitled "Industrial Plastics" covering their line of plastics for the mechanical, chemical and electrical industries. Some of the unit titles are: Mill Shapes and Machined Parts; Tubing and Hose; Sintered Plastic Parts; Molding Resins; and Plastic Coatings.

Circle 391 on Inquiry Card

### Plastics Properties

Commercial Plastics & Supply Corp., 630 Broadway, New York 12, N. Y., has available a 16-page brochure containing charts which cover the plastics properties of thermoplastics, thermosetting and high-pressure laminates. Also included are 4 units beginning with description, applications, and characteristics of phenolics, silicones, melamines and the epoxies, followed by mechanical, electrical and physical and thermal properties.

Circle 392 on Inquiry Card

### Printed Circuit Aids

By-Buk Co., 4314 W. Pico Blvd., Los Angeles 19, Calif., has available a printed circuit drafting aids chart. This copyrighted 6-page illustrated table which includes all of the pre-cut pressure sensitive shapes and narrow tapes required to make pasteup printed circuit drawings that will conform to military specs, together with many new non-military configurations.

Circle 393 on Inquiry Card

### Machining Thermoplastics

An 8-page booklet outlines the recommended procedures for machining and finishing of thermoplastic sheets, rods and tubes. Procedures discussed include sawing, routing, drilling, turning, shearing, punching, grinding and finishing. General recommendations for tool design, feed and speed, and use of coolants are presented. Cadillac Plastic & Chemical Co., 15111 Second Ave., Detroit 3, Mich.

Circle 394 on Inquiry Card

### Mobile Antennas

Tech data is available from Master Mobile Mounts, Inc., Los Angeles, Calif., on their complete line of mobile antennas mounts. Complete specs are included on their base mount, double tapered, base mount heavy duty, universal mount and whip antennas.

Circle 395 on Inquiry Card

# Weller MAGNASTAT<sup>®</sup>

## Controlled Temperature Soldering Irons



... with advanced features for greater efficiency, longer life.

- Various Magnastat Tip Types Now Available
- New Tip Retaining Nut Minimizes Freezing
- New Rubber Shock Absorber Prevents Sliding
- New, Rugged Non-arcing Snap Switch
- Plastic Handle—Extra Strong, Cooler
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- 2 or 3-Wire Cords Now Available
- Correct Soldering Temperature is Automatically Maintained
- Half the Weight of Uncontrolled Irons

Model TC-552 provides

### 2 SOLDERING TEMPERATURES

... low heat for heat-sensitive soldering and higher heat for regular work. Accomplished by merely interchanging high and low heat tips.

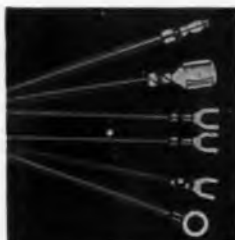
**\$900**  
list

Magnastat Soldering Irons are available from 55 to 120 watts. Send for new Magnastat Soldering Iron literature.

## WELLER ELECTRIC CORP.

601 Stone's Crossing Rd., Easton, Pa.

Circle 233 on Inquiry Card



**DO YOU NEED  
AUTOMATION**  
for  
**FINISHED WIRE LEADS**  
with  
**Terminals Attached?**

### NEW ARTOS TA-20-S

Performs 4 Operations Automatically!

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".
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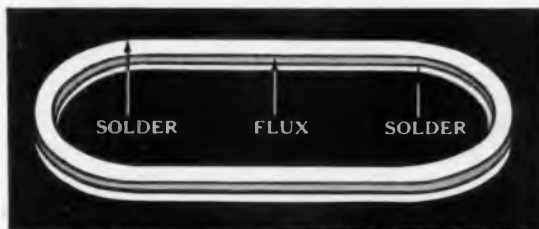
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THROUGHOUT THE  
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## Tech Data

for Engineers

### Diode

"The Zener Diode," latest bulletin in the Tech Tips series is available from CBS Electronics, Div. of Columbia Broadcasting System, Inc., 100 Endicott St., Danvers, Mass. The bulletin covers zener diode theory, characteristics and applications. Bulletin PA-502 describes typical circuits using zener diodes such as the shunt regulation of both ac and dc voltages, the voltage reference element in a transistor-controlled regulated power supply, and the cathode resistor in vacuum tube amplifiers.

Circle 396 on Inquiry Card

### High Freq. Transistor

Motorola Semiconductor Products Inc., 5005 E. McDowell Rd., Phoenix, Ariz., has tech. information available on their high freq. germanium transistor, Type 2N700A which is capable of an oscillating freq. in excess of 1000 mc. The unit is supplied to military spec. MIL-S-19500/123 and is a 25 v. (VCE), 75 mW (free air), germanium PNP, diffused-base mesa transistor.

Circle 397 on Inquiry Card

### Semiconductor Devices

Radio Corp. of America, Semiconductor and Materials Div., Somerville, N. J., has tech. literature available on 9 volume produced general purpose semiconductor devices, 1N1763, 2N217, 2N270, 2N301, 2N218, 2N1524, 2N1632, 2N370, and 2N1177. Uses range from R-F amplifiers, switch and amplifier, I-F amplifiers, audio and power amplifiers. Specs. and characteristics charts are included.

Circle 398 on Inquiry Card

### Diodes

Shockley Transistor, Unit of Cleveite Transistor, Stanford Industrial Park, Palo Alto, Calif., offers a catalog of Shockley 4-Layer Diodes. Complete specs. cover: Commercial Series of Type D for 2a. pulse currents and Type AD and J for 20 a. pulse currents, and Mil-Line Series Type D for 4 a. pulse currents and AD and J for 20 a. pulse currents.

Circle 399 on Inquiry Card

### Facilities Brochure

Ohio Semiconductors, Div. of Tecumseh Products Co., 1205 Chesapeake Ave., Columbus 12, Ohio, has literature available on their facilities and capabilities in the semiconductor field. Material includes some of their products, materials and sub-systems, and control mechanisms and information on their research and development activities.

Circle 400 on Inquiry Card



## THE NEW **707** **ASTROJET** JET AGE: STAGE II

Now offered in regular transcontinental passenger service, American Airlines' new 707 Astrojet brings you a new standard of jet performance by the airline that's *first choice of experienced travelers*.

Powered by revolutionary new Jet-Fan engines, the 707 Astrojet greatly outperforms all other airliners. It takes off more quickly, uses far less runway than the best of standard jets. Aboard it, you experience a wonderful feeling of confidence as the Astrojet climbs swiftly to

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The Branson Type AR 4PDT relay. 2 amp. contacts. Withstands 2000 cps at 20G. -65°C to +125°C. Hermetically sealed and dry nitrogen filled for high altitudes. Wt. 15-20 gms. Dim. .384 x .784 x .882. Hook, plug-in or wire leads available. Std. 0.1 in. grid spacing. Suitable for dry circuit conditions. Meets specs: MIL-R-25018, MIL-R-5757C, MIL-E-5272C.

Delivery from stock, special orders in 4 weeks.

Write for technical bulletin



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Whippany, New Jersey  
TU 7-1100

Circle 243 on Inquiry Card

## New Tech Data

for Engineers

### RESINS & PLASTICS

#### Epoxy Resin

"Flame Retardant Bakelite® Epoxy Resin ERL-0625"—Tech information on a new flame retardant epoxy resin for hot-melt castings and dry lay-up laminating systems. Instructions for using the resin Bakelite are included, together with tables illustrating physical, electrical, and chemical resistance properties of finished castings and laminates. Union Carbide Plastics Co., 270 Park Ave., New York 17, N. Y.

Circle 407 on Inquiry Card

#### Printed Circuits

Keuffel & Esser Co., Hoboken, N. J., has tech. data available on preparing printed circuits on Stabilene® Film. Information is contained in the booklet on 4 methods of preparation: Inking, Taping, Cut'N'Strip and Scribing. Photographs and brief descriptions of each step required in each method are included.

Circle 408 on Inquiry Card

#### Insulating Chart

Resilient epoxy resins which possess not only the capacity for good thermal shock resistance, but also high electrical properties at both low and high temps. are described in these electrical insulating materials charts. Epocast® 251, 253 and 257 are described in the chart with a complete summary of epoxy insulating materials. Furane Plastics, Inc., 4516 Brazil St., Los Angeles 39, Calif.

Circle 409 on Inquiry Card

#### Flexible Laminates

"Irvington" brand flexible laminates for temp. Classes A and B are described in an 8-page brochure, available from Dept. W1-193 Irvington Div., Minnesota Mining and Mfg. Co., 900 Bush Ave., St. Paul 6, Minn. The publication lists standard combinations and typical properties of varnished cambric and polyester film laminations with other materials, including fish, rag, kraft and asbestos papers and glass fabrics.

Circle 410 on Inquiry Card

#### Thermoplastics

National Vulcanized Fibre Co., Wilmington 99, Del., is offering a tech. brochure entitled, "Selecting The One Best Material," which describes National's line of vulcanized fibre, thermoplastic material, and Phenolite® laminated plastic. Included in the brochure is a Basic Materials Comparator Chart, a chart on Phenolite plastics, and charts on vulcanized fibre, extruded thermoplastics and flame retardant materials.

Circle 411 on Inquiry Card

#### Chopper Transistors

Tech. literature is available from Sperry Semiconductor Div., Sperry Rand Corp., Norwalk, Conn., on their 2N1917, 2N1918, 2N1919, 2N1920, 2N1921 and 2N1922 transistors designed for use in low level, high speed, critical and high level chopper applications. Characteristics, charts and graphs are included.

Circle 401 on Inquiry Card

#### Reference Chart

Philco Corp., Lansdale Div., Lansdale, Pa., is offering a Transistor Reference Chart covering low to high speed; high current; control and switching; chopper; video amplifier; general purpose; low, medium and high freq.; VHF and UHF applications for their transistors. Ratings, characteristics, dimensional drawings and complete specs. are included.

Circle 402 on Inquiry Card

#### Semiconductor Catalog

General Electric Co., Semiconductor Products Dept., Syracuse, & Rectifier Components Dept., Auburn, N. Y., have available a tech. catalog covering transistors, tunnel diodes, rectifier cells, rectifier stacks and controlled silicon rectifiers. Photographs, dimensional outlines and specs. are included.

Circle 403 on Inquiry Card

#### Power Transistors

A new short-form catalog covering its line of silicon power transistors and silicon glass diodes is available from Silicon Transistor Corp., Carle Place, N. Y. The brochure lists STC's line of intermediate and high power transistors and a JEDEC and STC types cross reference chart. The silicon glass diode listing includes military types, general purpose types, fast switching, and a high current switching series.

Circle 404 on Inquiry Card

#### Tunnel Diodes

A 16-page handbook on circuit design of the tunnel diode is available from Transistron Electronic Corp., 168 Albion St., Wakefield, Mass. Booklet #AN-1359A entitled, "Tunnel Diode Circuit Design Handbook" contains sections on the theory of tunneling action; various general circuit considerations; simple switching circuits and 4 common digital circuits including shift register, ring counter, binary counter and memory circuit.

Circle 405 on Inquiry Card

#### Computer Diodes

Computer Diode Corp., 250 Garibaldi Ave., Lodi, N. J., has available tech. data which lists their complete line of general purpose silicon diodes and silicon computer diodes. Complete characteristics information is included in 2 graphs.

Circle 406 on Inquiry Card



## TANTALUM CAPACITORS...NEW HEIGHTS IN RELIABILITY ENGINEERED BY PYRAMID

When Pyramid tantalum capacitors with proven dependability are incorporated into essential electronic equipment you manufacture... greater reliability of your product is assured.

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Where time and reliability are critical, the Robotester sets the pace in precision electronic checkout. New levels of speed and accuracy are made possible through pre-programmed acceptance standards. High speed sampling and comparison yield split second recognition, isolation and identification of abnormal functions. Up to 100 tests per minute can be made between any two of 250 circuit points randomly selected. When out-of-tolerance value is met, operation stops, and the isolated faulty circuit is identified by digital readout.

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**MEASURES:**

Resistance  
Insulation Resistance  
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Write for complete technical details and applications.

*Larvic Laboratories, Inc.*

MORGANVILLE, NEW JERSEY

Circle 245 on Inquiry Card

## New Tech Data

for Engineers

### Laminated Plastics

Basic application information and engineering data on Taylor laminated plastics and Tayloron® vulcanized fibre is contained in an 8-page, 2-color catalog provided to aid engineers in selecting and applying these basic materials for electrical, electronic and mechanical components. One 2-page spread lists general and engineering data for 21 of the most common grades of Taylor Fibre's laminated plastics. A second section gives substantially the same type of information for 6 grades of Taylorite® vulcanized fibre. Taylor Fibre Co., Norristown, Pa.

Circle 412 on Inquiry Card

### Copper-Clad Laminates

Synthane Corp., Oaks, Pa., has issued revised standards for copper-clad laminated plastics conforming to the latest issue of Mil Spec MIL-P-13949B (plastic sheet, laminated, copper-clad for printed wiring) in a brochure which tells of 10 Synthane copper-clad grades most useful for printed or etched circuits. Grades FR-2, EP-22, FR-3, and FR-4, are detailed as well as information on copper-clad materials.

Circle 413 on Inquiry Card

### Properties Book

A new, 12-page brochure, describing the properties and characteristics of Ameripol® Polyethylene, a new ethylene plastic polymer that combines durability with processability is available from Goodrich-Gulk Chemicals, Inc., 1717 E. 9th St., Cleveland 14, Ohio. Brochure contains physical, chemical and electrical property charts and graphs comparing environmental stress cracking and resistance of Ameripol to other high density materials.

Circle 414 on Inquiry Card

### Printed Circuits

Flexible Printed Circuitry with Teflon® FEP is described in tech. data from Garlock Electronic Products, Garlock Inc., Camden 1, N. J. These flexible printed circuits can be bent or twisted into any shape with no compromise to overall reliability. Complete information and photographs are included.

Circle 415 on Inquiry Card

### Reinforced Plastics

Reinforced Plastics Div., Society of the Plastics Industry, Inc., 250 Park Ave., New York 17, N. Y., has a brochure available which is a guide and contains data for engineers and purchasing agents on reinforced plastics. Information contained is on hand lay-up, spray-up, preform and mat and premix. Complete characteristics and properties are contained in the brochure for each of the different types of techniques.

Circle 416 on Inquiry Card

### Printed Circuit Boards

Various stages of manufacture of printed circuits and subminiature precision parts are described in an 8-page brochure available from Komak, Inc., 2632 W. Cumberland St., Phila. 32, Pa. The brochure shows methods and facilities used in the manufacture of printed circuit boards and assemblies, and subminiature precision parts.

Circle 417 on Inquiry Card

### Plastics

Taunton Div., Haveg Industries, Inc., 336 Weir St., Taunton, Mass., is offering a 15-page brochure containing information on: custom compression and transfer molding; custom injection molding; custom specialty molding; sealing caps and tubes and custom elastomers and foam products. Featured is a chart on Plastic Materials Comparison.

Circle 418 on Inquiry Card

## SWITCHES & RELAYS

### Rotary Switches

J-B-T Instruments, Inc., 133 Hamilton St., New Haven 8, Conn., has tech. information available on their subminiature rotary switches. These J-B-T switches are interchangeable with the Series 7000 and 5000 switches formerly manufactured by International Instruments, Inc. Latest MIL materials are used throughout.

Circle 419 on Inquiry Card

### Precision Switches

A new 20-page catalog covering a representative selection of products from the complete Micro Switch line of precision switches for industrial, commercial, data processing, airborne and electronic applications, is available from Micro Switch, Freeport, Ill. Catalog 104 has photos and condensed descriptions on over 200 items.

Circle 420 on Inquiry Card

### Indicators & Switches

Amfite® Multi-Color Indicators and Switches are covered in tech. data available from American Machine & Foundry Co., Alexandria Div., 1025-EM N. Royal St., Alexandria, Va. Photographs, dimensional drawings and complete specs. are included. Also featured is their line of frequency meters and voltmeters.

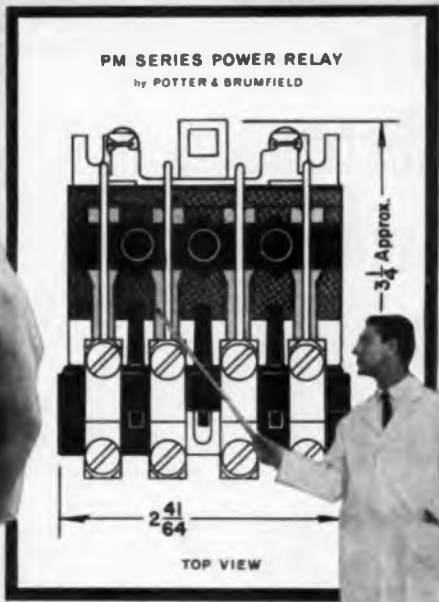
Circle 421 on Inquiry Card

### Miniature Relay

Union Switch & Signal, Div. of Westinghouse Air Brake Co., Pittsburgh 18, Pa., is offering tech. data on 4 PDT 10 a. miniature relay; 2 PDT Crystal Case Relay. Dimensional drawings, photographs and complete specs. are included.

Circle 422 on Inquiry Card

Circle 246 on Inquiry Card →



## ANNOUNCING AN IMPORTANT NEW SPACE SAVER

### P&B compact 4PDT power relay switches one H.P. per moveable arm

Save panel space! This new 4-pole relay is only  $\frac{3}{8}$ " wider than our PR Series, America's most popular 2-pole power relay! Yet, it is engineered for reliable heavy-duty switching . . . and you can confidently expect 10 million mechanical operations.

PM Series relays are rated at 16 amperes (or 1 H.P.) at 115 volts, 50/60 cycles resistive . . . and special relays can be supplied for loads up to 25 amperes, at 220 volts, 50/60 cycles resistive. Heavy screw terminals are arranged for fast, easy hook up. An adapter plate is available for mounting PM relays in the same location used for 2-pole relays.

For full information, write today or call your nearest P&B representative.

#### PM ENGINEERING DATA

##### GENERAL:

- Description:** Heavy-duty AC power relay.
- Insulating Material:** Molded phenolic.
- Insulation Resistance:** 100 megohms minimum.
- Mechanical Life:** 10 million operations minimum.
- Contact Life:** 100,000 operations minimum at rated load.
- Breakdown Voltage:** 2,000 volts rms minimum between all elements and ground.
- Ambient Temperature:** -55°C to +55°C.
- Weight:** Approximately 14 ozs.
- Pull-In:** 78% of nominal voltage.
- Terminals:** Heavy-duty screw type with No. 8-32 BH screw.

##### CONTACTS:

- Arrangements:** 4PDT or 4PST—normally open.
- Material:**  $\frac{1}{8}$ " dia. silver-cadmium-oxide.
- Rating:** 16 amps @ 115 volts, 50/60 cps resistive.  
8 amps @ 220 volts, 50/60 cps resistive.  
1 H.P. per moveable, 115 or 220 volts AC single phase.  
25 amps @ 220 volts, 50/60 cps resistive available on special order.

##### COILS:

- Voltage:** 6 to 230 volts AC 50/60 cycles.
- Power:** 14 volt-amps average at nominal voltage.
- Duty:** Continuous.



PR Series



MR Series



AB Series

A whole family of power relays for a wide range of applications carry the P&B symbol of quality. Call P&B first for all your power relay requirements.

P&B STANDARD RELAYS ARE AVAILABLE AT YOUR LOCAL ELECTRONICS PARTS DISTRIBUTORS



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Circle 247 on Inquiry Card

## New Tech Data

for Engineers

### GENERAL

#### Time Delay Relays

Hi-G, Inc., Bradley Field, Windson Locks, Conn., is offering a 24-page catalog on their Balanced Rotary Armature Relays, Electronic Time Delay Relays and special products. Information is included on contact load & life, contact resistance, relay materials, shock & vibration, dry circuit relays, and operate & release time. Catalog No. 860.

Circle 423 on Inquiry Card

#### Miniaturized Relay

Electrical and physical characteristics of Wheelock Signals' Series 200 miniaturized 10 u relay are detailed in a tech Bulletin No. 200 from Wheelock Signals, Inc., 273 Branchport Ave., Long Branch, N. J. This hermetically sealed relay is designed to operate under stresses of space environment and will withstand shock and sustained acceleration of 50G and vibrations of 30G up to 2000CPS.

Circle 424 on Inquiry Card

#### Telemetry Switch

Electro-Tec Corp., 10 Romanelli Ave., South Hackensack, N. J., is offering tech. information on their new microminiature 450-circuit switch. The 8 oz. ETC switch provides various combinations of circuitry up to a max. of 5 poles with 90 channels per pole. Size: Type A—1 3/4 by 1 3/8 by 2 1/2 in.; Type B—3 3/8 by 7/8 in. Complete specs. are included.

Circle 425 on Inquiry Card

#### Coaxial Switches

RF Products, Div. of Amphenol-Borg Electronics Corp., 33 E. Franklin St., Danbury, Conn., has available a new 28-page catalog describing its standard line of DK coaxial switches and relays. Featured in the catalog is a resume of the chief characteristics and operating principles of the coaxial switch and a complete summary of 125 standard switches available from stock.

Circle 426 on Inquiry Card

#### Photo Equipment

Increased emphasis on specialized and scientific photographic equipment makes this latest catalog from Burke & James real value to the industrial and scientific, etc., photographer. Micro and microphotography cameras for pathology, copying equipment, as well as complete listings of "Lens Bank" services and lenses, laboratory and darkroom needs and temp. control systems are only a few of the equipment categories covered. The 148-page long catalog is a valuable reference source for the photographic specialists. Burke & James, Inc., 321 S. Wabash Ave., Chicago 4, Ill.

Circle 427 on Inquiry Card

#### Soldering Iron

An 8-page, 4-color catalog on its new Imperial soldering iron is available from Ungar Electric Tools, Electronic Div. of Eldon Industries, Inc., 1475 E. El Segundo Blvd., Hawthorne, Calif. Complete with photos, illustrations and specs, the catalog covers Ungar's complete Imperial component line.

Circle 428 on Inquiry Card

#### Vacuum Gauges

Consolidated Vacuum Corp., Rochester 3, N. Y. has available tech. data on their line of High Vacuum Gauges. Bulletin 9-1, 31 pages, contains photograph specs. and charts on Absolute Manometers, Thermal Gauges, Ionization Gauges, Combination Thermal-Ionization Gauge, Magamp Controllers and sensing tubes.

Circle 429 on Inquiry Card

#### Standards Catalog

Publication of a 1961 catalog of American Standards which now number 1,973 is available from American Standards Assoc., Dept. PR 214, 10 E. 40th St., New York 16, N. Y. The booklet contains a listing of special publications in the standardization field, pamphlets and standards recommendations of the International Organization for Standardization and the International Electrotechnical Commission.

Circle 430 on Inquiry Card

#### Plating Equipment

A new bulletin on selective plating equipment has been issued by Selectrons, Ltd., 520 Fifth Ave., New York 36, N. Y. The 6-page folder describes several of the company's "package" plating plants, some of which are small enough to fit on a table top. The bulletin also lists more than 2 doz. engineering applications for the Selectron process. Bulletin SP-201.

Circle 431 on Inquiry Card

#### Space Information

Space Technology Laboratories, Inc., Sub. of Thompson Ramo Wooldridge, Inc., P. O. Box 95001, Los Angeles 45, Calif., has available a space log. Contents are: satellites injected into orbit both U. S. and Russian; spacecraft now in orbit; spacecraft weight injected into orbit; launch rating; box score of U. S. spacecraft launches; condensed log of space programs and spacecraft totals.

Circle 432 on Inquiry Card

#### Packaged Circuits

Centralab, The Electronics Div. of Globe-Union Inc., 900 E. Keefe Ave., Milwaukee 1, Wis., has available a brochure describing a wide variety of basic PEC® packaged circuits for use in television receiver design. A total of 58 circuits are described.

Circle 433 on Inquiry Card

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## Thermal Time Delay Relays

Precision-built Curtiss-Wright thermal time delay relays reset instantly when de-energized — provide the same delay period for each succeeding cycle. Compensated for wide voltage variations. Available in either 28V DC or 115V AC, 60 or 400 cps. Chatter-free operation, under severe shock and vibration conditions. Small sized, hermetically sealed, temperature compensated for precise, reliable operation and long life. Preset time delays from 10 to 180 seconds with SPST, SPDT or DPDT snap action contacts.



Write for latest complete components catalog # 504

TIME DELAY RELAYS • DELAY LINES • ROTARY SOLENOIDS • DIGITAL MOTORS • TIMING DEVICES • DUAL RELAYS • SOLID STATE COMPONENTS

Electronics Division  
**CURTISS-WRIGHT CORPORATION**  
East Paterson, New Jersey  
Circle 248 on Inquiry Card

# New Tech Data

for Engineers

## Welding Report

A new tech. report on the metallurgy of electronic welding prepared by the tech. staff of Hughes Aircraft Co. is now available from the company's Vacuum Tube Products Div., Hughes Aircraft Co., 2020 Short St., Oceanside, Calif. The report covers laboratory studies which includes the resistance welding process, significant factors in resistance welding, evaluation of weldability of various materials, weldability of clad materials, and dissimilar materials. The report is illustrated with photographs of magnified welds and includes several charts and graphs.

Circle 434 on Inquiry Card

## Formulae Booklet

A 32-page booklet, "Tables and Formulae" has been prepared by Automatic Electric, sub. of General Telephone & Electronics Corp., Northlake, Ill. The booklet, the 4th of a series, provides valuable engineering information in a handy form.

Circle 435 on Inquiry Card

## Modulator Catalog

A new catalog giving complete electronic and mechanical specs, circuit diagrams, mechanical drawings and application data on a new long life, highly stable solid state/magnetic system, which provides the equivalent of a chopper and a high quality input transformer, is now available from James Electronics Inc., 4050 No. Rockwell St., Chicago 18, Ill.

Circle 436 on Inquiry Card

## Vaneaxial Fan

Tech data is available from Rotron Mfg. Co., Inc., Hasbrouck Lane, Woodstock, N. Y., on their Rotron Aximax® 3 vaneaxial fan. The fan is designed for high freq. cooling uses where large air deliveries are obtained in a min. of space. The Aximax 3 is available for both pressurized and non-pressurized applications and is built for 1 phase or 3 phase operation. No. 50201-3D.

Circle 437 on Inquiry Card

## COMPONENTS

### Vacuum Capacitors

Jennings Radio Manufacturing Co., 970 McLaughlin Ave., San Jose, Calif., offers tech. data on their line of Fixed-Variable Vacuum Capacitors. Photographs, and complete tech. information are included in the bulletin on 14 different types. Peak voltages range from 2 to 120 kv.

Circle 438 on Inquiry Card

### Tantalum Capacitors

Aerovox Corp., New Bedford, Mass., has tech. data available on solid tantalum capacitors. Bulletin 215 B2.2 Rev. 1, gives complete characteristics and dimensional drawings on Types ST12 (uninsulated) and ST13 (insulated).

Circle 439 on Inquiry Card

## Variable Inductors

Reference data sheets are available from the Electronic Components Div., Corning Glass Works, Bradford, Pa., on 11 models of standardized variable inductors. The inductors are 0.275 in. in dia. Silver conductor fused into special glass coil forms provides no drift under shock, vibration or temp. cycling. CE-5.03, includes typical inductance and Q curves, typical Q-vs-freq. curve, engineering drawing, and table of performance characteristics.

Circle 440 on Inquiry Card

## Tuning Fork Oscillators

Fork Standards, Inc., 1915 N. Harlem Ave., Chicago 35, Ill., is offering a bulletin describing tuning fork oscillators. Included in the bulletin is information on the various features and specs. pertinent to describing such a unit. Featured are two models, a Custom built, and their Economy model which is a standard unit but lower priced.

Circle 441 on Inquiry Card

## Resistor Catalog

Dale Electronics, Inc., Columbus, Neb., is offering a bulletin R-26, which covers their line of miniature power resistors, encapsulated, Bobbin Type precision wire wound resistors, wire wound power resistors, and deposited carbon resistors. Specs. and photographs are included.

Circle 442 on Inquiry Card

## Coil Catalog

Delta Coils, Inc., 1128 Madison Ave., Paterson, N. J., offers Catalog 60A describing their line of: R-F chokes; I-F, R-F transformers; line filter chokes; industrial coils; printed circuit coils; special windings; antenna rods; miniaturized coils; toroids; and filters.

Circle 443 on Inquiry Card

## Electrolytic Capacitors

Type CQM Electrolytic Storage Capacitors are designed for use in power supply filter circuits in digital computers, and energy storage circuits for electronic controls. Temp. range: -20°C to +85°C. Capacity and voltage range from: 185 pf at 2.5 v to 4.8 pf at 150 v. Largest case is 3 by 5% in. Pyramid Electric Co., Darlington, S. C.

Circle 444 on Inquiry Card

## Potentiometers

New Short-Form Brochure is available from Borg Equipment Div. Amphenol-Borg Electronics Corp., 120 South Main St., Janesville, Wis., describing their line of Micropot® Potentiometers, Microdial® Turns-Counting Dials and Sub-Fractional Horsepower Instrument and Control Motors.

Circle 445 on Inquiry Card



New

## BULOVA 5 WNS NARROW BAND FILTER

Now Bulova Electronics pioneers a symmetrical narrow band type 5 WNS Crystal Filter having a 40 db to 2 db shape factor of 1.25:1. The Bulova 5 WNS is designed with a 2 db bandwidth of less than 0.5% of its center frequency and excellent phase linearity of 90% of the pass band. It features Center Frequency—16.0kc; 2 db Bandwidth—75 cps; 40 db Bandwidth—100 cps; Passband Ripple— $\pm 0.5$  db; Insertion Loss—6 db max.; Input & Output Impedance—2 k $\Omega$ —10%; Overshoot to a pulsed carrier—less than 10%; Operating Temperature—0° to 50°C; Mounting—Ortal header or studs.

In addition, the 5 WNS type filter is available at frequencies between 10 kc and 10 mc with .5% to 2% of figure 2 dd of center frequency. For additional information or application assistance, write Department 2106, Bulova Electronics, Woodside 77, N. Y.



**BULOVA**  
ELECTRONICS  
DIVISION

Circle 249 on Inquiry Card

ELECTRONIC INDUSTRIES • June 1961

## Tech Data

for Engineers

### Capacitor Wall Chart

Selection chart and price list of General Electric's new single-section tabular electrolytic capacitors is now available from General Electric Co., Electronic Components Div., Owensboro, Ky. The listings on the new chart (ETR-2609A) are arranged according to capacity and specify max. voltage, physical size and manufacturer's list price. The sheet measures 14 x 20 in., printed in 2 colors on heavy stock suitable for wall mounting.

Circle 446 on Inquiry Card

### Piston Capacitors

Photographs, dimensional drawings, electrical data, physical data, data for panel mount and data for printed circuit board types of variable piston trimmer capacitors are contained in a 23-page catalog available from JFD Electronics Corp., Components Div., 6101 16th Ave., Brooklyn 4, N. Y. Also included in the catalog is an article entitled "Why Solid Dielectric Variable Piston Trimmer Capacitors!" and information on LC tuners, metalized inductors and delay lines.

Circle 447 on Inquiry Card

### Pulse Transformers

Design and test specs. for Hamilton pulse transformers are described in 2 new tech. bulletins available from the Electronics Div., Hamilton Watch Co., Lancaster, Pa. Tech. Data Sheet 901 details test procedures used for the evaluation of pulse transformers. Tech. Data Sheet 920 describes pulse transformer kit PTK-1 used to assist in the design of new circuits where the exact transformer need is not known.

Circle 448 on Inquiry Card

### Heat Sink

A new 16-page catalog (1-HR) describes Birtcher's transistor/diode heat radiators available from stock. Details and drawings of more than 72 semiconductor radiators are listed for most TO case outlines. The catalog also includes a comprehensive handbook on thermal cooling. The Birtcher Corp., Industrial Div., 745 S. Monterey Pass Rd., Monterey Park, Calif.

Circle 449 on Inquiry Card

### Transformers

Catalog CS-101 lists almost 900 stock transformers for industrial applications. The catalog is extensively cross-indexed to assist the engineer in quickly locating the desired listings. Each transformer is fully described and illustrated. Detailed dimensional information as well as complete electrical specs. are given for all units. Where applicable, performance curves are included. Chicago Standard Transformer Corp., 3501 W. Addison St., Chicago 18, Ill.

Circle 450 on Inquiry Card

## MINIATURE SNAP ACTION LOW COST Time Delay Relays

For commercial use, economical Curtiss-Wright thermal time delay relays, hermetically sealed in glass, are a compact and reliable design for many control, switching and timing applications. Precision built for high performance and long life. Ambient temperature compensated. Conservatively rated, these new rugged, small sized units are preset for time delays from 3 to 60 seconds.



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## New Tech Data

for Engineers

### Potentiometers

Daystrom Pacific, div. of Daystrom, Inc., 9320 Lincoln Blvd., Los Angeles 45, Calif., has tech. literature available on their Autopot® self-balancing potentiometer. The Autopot is an indicating device for use in flight test instrumentation. It was developed for a standard instrument configuration that can be used with a variety of inputs.

Circle 451 on Inquiry Card

### Transformers

A new 4-page brochure on Standard Sinusoidal Constant Voltage transformers is now available from Sola Electric Co., Elk Grove Village, Ill. The bulletin deals primarily with the Standard Sinusoidal unit as a solution to a wide variety of requirements for a highly stable ac voltage source. Outline dimensions are illustrated plus a listing of electrical and mechanical specs. Bulletin CVS-3631.

Circle 452 on Inquiry Card

### Power Resistors

Close tolerance, power wire wound resistors are described in a bulletin P-8 available from International Resistance Co., 401 N. Broad St., Philadelphia 8, Pa. The resistors meet MIL Characteristic V (MIL-R-26C) with an allowable 350°C hot spot. Minimum resistance range is 0.1 ohm, and max. is 20K to 175K ohms.

Circle 453 on Inquiry Card

### Mica Capacitors

Cornell-Dubilier Electronics Div., Federal Pacific Electric Co., 55 Cromwell St., Providence, R. I., is offering a bulletin on their line of Customized Mica Capacitor Packages. Information on controlled temp. coefficient, high-temp. operation, mountings and terminals, printed circuit types and packaged circuitry is included in Bulletin 203-70.

Circle 454 on Inquiry Card

### Miniature Electrolytics

Single-ended plastic-encased miniature electrolytics for use on printed wiring boards used for transistor-type electronic circuits are now available from the Sprague Electric Co., 233 Marshall St., No. Adams, Mass. Engineering Bulletin No. 3060A, contains information on a series of 142 standard ratings ranging from 3 to 50 v.

Circle 455 on Inquiry Card

### Wire Wound Resistors

Dimensional drawings, characteristics tables, tables on printed circuit types and engineering notes describe precision wire wound resistors available from Ortho Precision Resistors, Inc., sub. of Ortho Industries, Inc., 7 Paterson St., Paterson 1, N. J. Information covers axial lead types, axial lead-metal cased-oil filled-hermetically sealed and printed circuit types.

Circle 456 on Inquiry Card

### Subminiature Capacitors

Mucon Corp., Dept. K, 9 St. Francis St., Newark 5, N. J., announces its new 6-page bulletin L-1, describing their complete line of subminiature ceramic capacitors. The bulletin gives properties of subminiature capacitors made from any one of 13 different ceramics, and shows range of capacitance values.

Circle 457 on Inquiry Card

### Delay Line

Type 129 extra-compact magnetostrictive long-delay line is for use where long delays are involved, longer than 100  $\mu$ sec. The Type 129 has a 400  $\mu$ sec. delay, but may be varied from 390 to 410  $\mu$ sec. by means of a trimmer adjustment on its front face. Insertion loss is 45 to 60 db. Delttime, Inc., 608 Fayette Ave., Mamaroneck, N. Y.

Circle 458 on Inquiry Card

### Feed-Thru Capacitors

Tech. data is offered on feed-thru capacitors and filters, by Astron Corp., 255 Grant Ave., East Newark, N. J. They are paper capacitors designed for use in broad-band, radio-interference applications. Charts, dimensional drawings, and complete specs. are included.

Circle 459 on Inquiry Card

### Crystal Filters

KCF Series is designed in 3 standard sizes covering the range of 1 to 21 MC. Center freq. stability is  $\pm 0.005\%$  over ambient temp. range  $-55^\circ$  to  $+105^\circ$ C. Complete specs., dimensional drawings and graphs are contained in tech. data available from the Keystone Electronics Co., 65 Seventh Ave. Newark 4, N. J.

Circle 460 on Inquiry Card

### Capacitor Catalog

Catalog No. 1961-1, 16 pages, describes and illustrates complete line of VYT<sup>™</sup> Solid State Porcelain Capacitors and VK<sup>®</sup> Microminiature Ceramic Capacitors. Includes complete military and commercial part numbers and specs., typical curves, dimensional drawings and special designs. Vitamon, Inc., Box 544, Bridgeport 1, Conn.

Circle 461 on Inquiry Card

### Delay Lines

Columbia Technical Corp., 61-02 31st Ave., Woodside 77, N. Y., has tech. data available on high impedance delay lines with magnetic core, Delay-line Flats<sup>®</sup>, MiniLines<sup>®</sup>, wide-band R-F transformers, audio delay lines, and fixed, variable and multi-tapped magnetostrictive delay lines. Also included are ultra-selective, ultra-flat telemetering and utility low pass & high pass filters.

Circle 462 on Inquiry Card

## INSTRUMENTS & METERS

### Component Tester

Special instrument arrays for automated testing of electronic cables, components, assemblies and insulating materials are described in a new bulletin from Associated Research, Inc., 3777 W. Belmont Ave., Chicago 18, Ill. Applications for these automatic testers are the high voltage breakdown tests made on cables and harnesses used in missile control and guidance systems.

Circle 463 on Inquiry Card

### Oscilloscope

This 8-page booklet gives a detailed presentation of Tektronix new high-speed laboratory oscilloscope. Designed for observation, measurement, and photographic recording of wide band phenomena, the Type 519 clearly displays waveforms with fractional-nanosecond risetime. The booklet contains specs. performance characteristics, pertinent illustrations. Tektronix, Inc., P. O. Box 500, Beavertown, Ore.

Circle 464 on Inquiry Card

### Cable Analyzer

Micro Balancing, Inc., Herricks Rd., New Hyde Park, L. I., N. Y., has available tech. information which fully describes the company's new Mark 75 Transistorized Cable Analyzer. Completely transistorized, it will operate continuously on 110 to 125 v. 50 to 60 cycle ac, or for a 4-hr period from self contained chargeable nickel-cadmium batteries.

Circle 465 on Inquiry Card

### Panel Meters

Ideal Precision Meter Co., Inc., 214 Franklin St., Brooklyn 22, N. Y., has available catalog #42, which contains their complete new line of panel meters. Photographs and complete specs. describe Ideal's line of edge-wise meters, round clear plastic models, rectangular bakelite meters and rectangular clear plastic meters. Dimensional drawings are included.

Circle 466 on Inquiry Card

### Phasemeter

Model 1010 Precision Phasemeter with 0.1° absolute accuracy and a freq. range from 30-20 KC; and a UHF Wide Range Power Oscillator and Power Supply with an output of 40 w. and a range of 200 to 2500 MC continuously variable in two bands are covered in tech. data available from Instruments Div., The W. L. Maxon Corp., 475 Tenth Ave., New York 18, N. Y. Complete specs. and photographs are included.

Circle 467 on Inquiry Card

### Condensed Catalog

General Radio Co., West Concord, Mass., is offering a catalog covering their line of oscillators, sweep drives, data recording instruments, signal & noise generators, pulse equipment, bridges, null detectors, filters, freq. standards, wave analyzers and sound measuring equipment.

Circle 468 on Inquiry Card

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Circle 254 on Inquiry Card

# New Tech Data

for Engineers

## Loading Manual

"Loading Manual for T-Series Germanium Transistor Circuit Modules," is available from Engineered Electronics Co., 1441 E. Chestnut Ave., Santa Ana, Calif. Complete information is contained on loading rules and a loading chart for the T-Series germanium transistor circuit modules. This manual supplements EECO Catalog 859.

Circle 469 on Inquiry Card

## Test Equipment

R-F Transistor Test Sets, Transistor Parameter Test Sets, Wide Range Diode Test Sets, Millimicroammeter, 100 mc & Gain Bandwidth Test Set, Automatic Diode Classifier and a High Voltage Rectifier Test Set are included in tech. data available from Dynatran Electronics Corp., 178 Herricks Rd., Mineola, N. Y.

Circle 470 on Inquiry Card

## Environmental Tester

Cincinnati Sub-Zero Products, 3932 Reading Rd., Cincinnati 29, Ohio, has a brochure available on Custom Built Production Chilling and Environmental Test Equipment. Charts for varied environments and characteristics are included along with specs. on portable refrigeration systems, chilling or testing chambers, and units for minimizing oxidation, metal stabilization, normalizing, and expansion-fit assembly.

Circle 471 on Inquiry Card

## Clock Catalog

Penwood Numechron Co., Electronics Timing Div., Pennwood Bldg., 7249 Frankstown Ave., Pittsburgh 8, Pa., is offering a catalog which covers their complete line of Tymeter® Digital Read Out Clocks. All pertinent information is enclosed. Featured is their new #110 Gradnetic Five Digit Second by Second Read Out Digital Clock.

Circle 472 on Inquiry Card

## Calibrators

Ballantine Laboratories, Boonton, N. J., announces a new Short-Form Catalog of 8 pages. Contains illustrations and tech. data of precision, laboratory-type Voltmeters, Decade Amplifiers, Calibrators, Capacitance Meters, AC/DC Converters, and DC/AC Inverters.

Circle 473 on Inquiry Card

## Variable Delay Line

ESC Electronics Corp., 534 Bergen Blvd., Palisades Park, N. J., has tech. data available on their new Direct Readout Variable Decade Delay Line. Three models are available with delay ranging from 9.99-999  $\mu$ sec. Constant impedance of 1,000 ohms between input and output. Delay/rise time ratio at max. delay is 33:1.

Circle 474 on Inquiry Card

## Temperature Recording

A 12 page booklet entitled "Temperature Recording from Platinum Sensors" is available from Brush Instruments, Div. of Clevite Corp., 37th & Perkins, Cleveland 14, Ohio. The booklet describes and illustrates how a Brush Universal Carrier Amplifier and a platinum resistance sensor are applied to provide a combination for recording temps. from -320 to +2000°F. Recording technique displays temp. deviation of 1/100 of one degree. Booklet Form No. TR.

Circle 475 on Inquiry Card

## Transistor Testers

Boonton Radio Corp., Sub. of Hewlett-Packard Co., Boonton, N. J., has tech. literature available on their extended transistor parameter characterization. Transistor Test Set Type 275-A and RX Meter, Type 250-A, have a freq. range from 1 kc to 1 gc. Photographs, charts and complete specs are included in the bulletin.

Circle 476 on Inquiry Card

## Oscilloscope

Tech. information is available from the Allen B. Du Mont Laboratories, Div. of Fairchild Camera and Instrument Corp., Clifton, N. J., on their storage oscilloscope Type 430. The Du Mont 430 is a one-piece unit, compactly housed in a 8 $\frac{1}{4}$  x 15 $\frac{1}{4}$  x 23 $\frac{1}{4}$  in. cabinet for greater mobility.

Circle 477 on Inquiry Card

## Test Instruments

"Microwave Electronic Test Instruments" catalog digest 61 from Polarad Electronics Corp., 43-20 34th St., Long Island City 1, N. Y., contains photographs and specs. on spectrum analyzers and transistorized microwave test equipment. Featured is a Transistorized Microwave Receiver in the 950 to 11,260 mc range, and a Transistorized Calibrated Field Intensity Receiver in the 1 to 10 GC range.

Circle 478 on Inquiry Card

## Sweeping Oscillators

Tech. information is available from Kay Electric Co., Maple Ave., Pine Brook, N. J., on their audio spectrum analyzers, precision high freq. attenuators, precision random noise generators, sweeping oscillators in the video-audio, audio-VHF and Video-VHF ranges.

Circle 479 on Inquiry Card

## Cable Tracer

Details of a new instrument designed to speed the tracing of electrical conductors are available in a new catalog sheet offered by Pyramid Instrument Corp., 630 Merrick Rd., Lynbrook, N. Y. The sheet describes 2 methods by which one man can trace conductors in pipe, conduit and non-metallic sheathed cable in 1/10 of the time normally required.

Circle 480 on Inquiry Card

### Computer Resolvers

A 16-page, illustrated monograph describes the characteristics of computing resolvers. Such definitive properties as function error and axis error are explained, and the techniques are set forth in great detail. These basic tests will yield enough data for both system calculation and competitive evaluation. Theta Instrument Corp., 520 Victor St., Saddle Brook, N. J.

Circle 481 on Inquiry Card

### Spectrophotometers

Tech literature available on a new "A" series of double-beam, ratio-recording DK spectrophotometers. Bulletin 735-B available from Beckman®/Scientific and Process Instruments Div., 2500 Fullerton Rd., Fullerton, Calif., gives complete information on the DK-1A and DK-2A and the Far UV DK-A in each of the 2 models.

Circle 482 on Inquiry Card

### RMS Decade Voltmeter

Tech. information is available from Muirhead Instruments, Inc., 441 Lexington Ave., New York 17, N. Y., of their D-930-A Precision R.M.S. Decade Voltmeter. Voltage range is from 1 mv to 300 v. Freq. range from 5 cps to 100 kc. Measurement accuracy over greater part of the ranges is 0.05%. Bulletin 150.

Circle 483 on Inquiry Card

### Integrating Gyros

Reeves Instrument Corp., Roosevelt Field, Garden City, N. Y., has tech. data available on their Zero One Series of Integrating Gyros, 121G Miniature Integrating Gyro, Ten Second Pancake Resolver, React® Diode Function Generator and Diode Electronic Multiplier Console.

Circle 484 on Inquiry Card

### Welding Information

Arco Welder Mfg. Co., 1719 W. St. Paul Ave., Milwaukee 3, Wis., has available a Bulletin #261 entitled, "Welding Automation." The 16-page catalog illustrates 68 special welding units with brief captions where necessary to describe the specific function of the unit.

Circle 485 on Inquiry Card

### Torque Measurer

Literature on their new pocket dynamometer for measuring torque and power loading of small electric motors in the field is announced by Micro Pump Corp., Box 392, Danville, Calif. The instrument has an accuracy within 1/2 of 1%.

Circle 486 on Inquiry Card

### Nuclear Density Gauges

Two new 2-page spec. sheets describes features and technical characteristics of nuclear density measuring gauges for processing applications employing pipe 3 in. in dia. or smaller. Main differences in 2 gauges are methods of creating null measurement. Ohmart Corp., 2236 Bogen St., Cincinnati 22, Ohio. Bulletins ASR-3 and LASR-3.

Circle 487 on Inquiry Card

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Circle 260 on Inquiry Card

# New Tech Data

for Engineers

## Optical Instruments

Jones & Lamson Machine Co., Springfield, Vt., offers tech. data on their Optical Comparator. These are precision inspection and measuring machines that provide fast, simple and reliable quality control. Measurements possible are angle, lateral, vertical and table angle. They work on the concentrated parallel beam of light directed on piece to be inspected and resultant shadow magnified principle.

Circle 488 on Inquiry Card

## SSB Communications

Kahn Research Laboratories Inc., 81 South Bergen Place, Freeport, L. I., N. Y., has tech. data available on their Transmitter Adapter Model SSB-58-1B. Features include: adapts any AM transmitter to SSB operation; greater undesired sideband rejection; and uses including voice, Facsimile and Multi-channel FSK. Covers freq. range from 1 to 50 mc.

Circle 489 on Inquiry Card

## Infrared Instruments

Information on an Off-Axis Collimator, All-Altitude Horizon Sensors, Portable Radiation Thermometer, Wide-Field Radiometer Model R-4K1, and Infrared Radiation Reference Sources is included in tech. data available from Barnes Engineering Co., 30 Commerce Rd., Stamford, Conn. Photographs and complete specs. are included.

Circle 490 on Inquiry Card

## Chromatogram Scanner

Information on a new, completely automatic, windowless 4-pi chromatogram scanner that simultaneously traces a scan and integrates the area under each peak, giving total counts, is available from Atomic Accessories, Inc., 811 W. Merrick Rd., Valley Stream, N. Y.

Circle 491 on Inquiry Card

## Surge Test Set

Newly-issued data sheet #113 covers a 600 a. surge test set that permits surge testing of silicon rectifiers in accordance with JAN specs. The reference provides full information as to features, specs and price. Wallson Associates, Inc., 912-914 Westfield Ave., Elizabeth, N. J.

Circle 492 on Inquiry Card

## AMPLIFIERS

### Miniature Pre-Amp.

Ad-Yu Electronics Lab., Inc., 249 Terhune Ave., Passaic, N. J., has tech. information on their miniature pre-amps, Types A102 and A102S. These miniature pre-amps plug into the input terminals of laboratory instruments or electronic devices and increase the sensitivity up to 100 times. Photographs, freq. response curve chart and complete specs. are included.

Circle 493 on Inquiry Card

## Computing Amplifiers

"Applications Manual for Philbrick Octal Plug-In Computing Amplifiers" is available from George A. Philbrick Researches, Inc., 127 Clarendon St., Boston 16, Mass. This booklet, 28 pages, deals with the theory, performance, and applications of Philbrick Computing Amplifiers. Detailed are the design features and functions of the GAP/R K2-Series Plug-in Amplifiers.

Circle 494 on Inquiry Card

## H-V Amplifier

Elcor, Inc., sub. of Welx Electronics Corp., 1225 W. Broad St., Falls Church, Va., has tech. information available on their complete line of isolated power supplies, isolated isoformers, dc and high voltage amplifiers, indicators, and integrators. Complete specs., photographs and charts are included.

Circle 495 on Inquiry Card

## Millivolt Amplifier

A new bulletin available from Magnetic Research Corp., 3160 W. El Segundo Blvd., Hawthorne, Calif., explains how "second harmonic" modulation is used to achieve high gain characteristics in MRC's new dc amplifier. The unit amplifies millivolt signals from such low output devices as thermocouples, resistance thermometers, thermistors and strain gages.

Circle 496 on Inquiry Card

## Low-Noise Amplifier

Detailed tech. literature on a transistorized, high-gain, low-noise amplifier, Model 203, is available from Quan-Tech Laboratories, Inc., Boonton, N. J. Details concerning the units self-powering battery life, off-ground operation and its application to other instruments and systems are provided.

Circle 497 on Inquiry Card

## Power Amplifier

Bergen Laboratories, Inc., 60 Spruce St., Paterson, N. J., has tech. information available under miniature power amplifier (25 w output) for temp. control and other high power gain applications. Charts, electrical specs., and dimensional drawings are included.

Circle 498 on Inquiry Card

## Module-Amplifier

Datex Corp., 1307 S. Myrtle Ave., Monrovia, Calif., has tech. information available on their CM-114 Transistorized Printed Circuit Module-Amplifier. The amplifier contains a group of 20 single-stage amplifiers for general switch applications. Photographs, specs. and hook-up information are included.

Circle 499 on Inquiry Card

# Tech Data

for Engineers

## Ferrite Components

Caswell Electronics Corp., 414 Queens Lane, San Jose 12, Calif., announces the availability of their new condensed catalog and price list for ferrite microwave components and sub-assemblies. Products include waveguide and coaxial ferrite load isolators, mechanical variable attenuators, ferrite modulators, adjustable and reversible isolators, and various other components and sub-assemblies.

Circle 500 on Inquiry Card

## Antennas

A 12 page Antenna and Microwave Brochure is now available from AEL, Inc., 121 N. 7th St., Phila., 6, Pa. The brochure describes their line of microwave products including antennas and components as well as custom developments and systems. Information is included on integrated systems such as panoramic receiving systems, susceptibility analyzers and a line of video amplifiers.

Circle 501 on Inquiry Card

## Transmission Line

Phalo Plastics Corp. has compiled two compact tech. bulletins which define typical constructions of transmission line, Rotor and H-V line. Copies of these bulletins, which are identified as Nos. 34 and 35, are available from Phalo Plastics Corp., 530 Boston Tpke., Shrewsbury, Mass. Bulletin #34 is on transmission line and rotor cables and bulletin #35 is on high voltage cables.

Circle 502 on Inquiry Card

## Industrial Tubes

Three 12-page handbooks describing cathode subminiature, filamentary subminiature, and gas and vapor electron tubes are available for equipment design engineers from Raytheon Co.'s Industrial Components Div., 55 Chapel St., Newton 58, Mass. Complete specs are charted for some 340 industrial and military types in the 3 multi-color handbooks, which also have diagram base and envelope connections and picture preferred tube types.

Circle 503 on Inquiry Card

## Interference Filters

Interference filters, both long wave pass and narrow band pass types are offered in a bulletin from Infrared Industries, Inc., Waltham, Mass. Filters are of multi-layer dielectric type and are non-heat absorbent. Substrates are mostly 0.008 in. microscope cover glass, 1.0 in. dia., although other diameters as well as quartz and sapphire substrates are available. Narrow band pass filters have center wavelengths ranging from less than 1.0 to more than 5.5 microns; passband transmission of 50-80% and transmission for rejected wavelengths of 0.1 to 0.5%.

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Sleeving and Tubing...

*and get these 5 BIG Advantages*

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- GREATER FLEXIBILITY
- MORE HEAT RESISTANCE
- AVAILABLE IN COILS
- CAN BE AFTER-TREATED

Even under the most severe operating conditions, Varfil Sleeve 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

- CLASS B-A-1 1000 VOLT AVERAGE
- CLASS B-B-1 2000 VOLT AVERAGE
- CLASS B-C-1 5000 VOLT AVERAGE
- CLASS B-C-2 10000 VOLT AVERAGE

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Circle 261 on Inquiry Card

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Circle 222 on Inquiry Card

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Circle 262 on Inquiry Card



All cables listed here are from conversion kits manufactured for Lockheed Aircraft and bear inspection stamps and 1958 Date of Manufacture. New, clean, made up cables at a fraction of the true value. **IN STOCK—IMMEDIATE SHIPMENT.**

RG 71/U or RG 71 A/U 93 $\Omega$ Coax Cable	UG260B/U each end	50 Up
Length	11.49	\$ .90
2 ft. 6 in.	\$1.09	.99
4 ft. 6 in.	1.21	.99
6 ft.	1.30	1.05
9 ft.	1.48	1.20
10 ft.	1.54	1.26
11 ft.	1.60	1.30
16 ft.	1.90	1.54
17 ft.	1.96	1.60
18 ft.	2.02	1.64
31 ft.	2.80	2.27
33 ft.	2.92	2.37
35 ft.	3.04	2.47
UG260B/U One end		
95 ft.	\$6.19	\$5.00
110 ft.	7.07	5.73
130 ft.	8.27	6.70
140 ft.	8.87	7.20
UG260B/U One end UG603A/U One end		
2 ft. 6 in.	\$1.42	\$1.15
35 ft.	3.37	2.65
UG603 A/U One end		
85 ft.	\$5.90	\$4.77
130 ft.	8.60	6.97
RG 9 B/U 52 $\Omega$ CoAx Cable	UG 1185/U Each end	
1 ft. 3 in.	\$2.21	\$1.80
1 ft. 8 in.	2.31	1.88
2 ft. 10 in.	2.52	2.04
3 ft.	2.56	2.07
4 ft.	2.76	2.23
6 ft. 6 in.	3.26	2.64
7 ft. 6 in.	3.46	2.80
8 ft. 6 in.	3.66	2.97
18 ft.	5.56	4.50
26 ft.	7.16	5.80
UG 1185/U One End UG 573 A/U One End		
1 ft. 3 in.	\$2.96	\$2.40
1 ft. 10 in.	3.09	2.50
2 ft. 6 in.	3.21	2.60
UG 1185/U One End UG 571/U One End		
3 ft.	\$2.86	\$2.30
4 ft. 8 in.	3.20	2.60
PL 259 One End		
25 ft.	\$5.49	\$4.44
RG 8 A/U with UG 1185/U One End UG 573 A/U One End		
6 ft.	\$3.43	\$3.10
RG 59 A/U 73 $\Omega$ CoAx Cable	UG 260 B/U Each End	
3 ft. 6 in.	\$1.12	\$1.00
3 ft. 9 in.	1.12	1.00
35 ft.	2.69	2.40
36 ft. 6 in.	2.77	2.50
UG 260 B/U One End UG 603 A/U One End		
1 ft. 10 in.	\$1.35	\$1.09
2 ft.	1.37	1.10
4 ft.	1.47	1.32
10 ft.	1.77	1.60
10 ft. 6 in.	1.80	1.62
36 ft. 6 in.	3.10	2.79

### TRANSCO "Y" Type Coaxial Switch

SPDT

Miniature Light weight CoAx switch with low VSWR and broad band width. Works to 11 KMC. Separate actuator coils for each circuit. Type "N" connectors, 50 Ohm nominal impedance. Actuator voltage 28 volts DC, 6 Watts each coil. TRANSCO Number 11100. Our price \$20.00 each. LARGE QUANTITY AVAILABLE.

### TRANSCO "A" Type Coaxial Switch

SP4T

Same action and specs. as the above "Y" type but has 4 solenoids to operate the contacts, allowing complete control over make-before-break or break-before-make and contact of all positions simultaneously. TRANSCO Number 14100. Our Price \$30.00 each.

### SAGE Broadband Coaxial Crystal Holders

Type 101BDJ 150 to 4000 MCS.—Uses SYLVANIA TRIPOLAR CRYSTAL IN358A Type N Male to BNC output (female)—With DC Return. Our Price \$18.00 Complete IN358A Crystal only \$10.00—Sage Mount only \$9.00.

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**TUBE #2:** VA-244B 6.5-7.3 kMc

**TUBE #3:** VA-244C 7.1-7.9 kMc

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RATINGS AND CHARACTERISTICS

	2N1700 (TO-5 Outline)		2N1701 (TO-8 Outline)		2N1701 (TO-3)** 2N1703 (TO-36 Outline)	
	Min.	Max.	Min.	Max.	Min.	Max.
Collector-to-Emitter Voltage (Reverse Bias) ( $V_{CEZ}$ )	60v	---	60v	---	60v	---
Collector-to-Emitter Sustaining Voltage base open	40v	---	40v	---	40v	---
DC Current Transfer Ratio ( $h_{FE}$ )	20	80	20	80	15	60
DC Collector-to-Emitter Saturation Resistance ( $R_c$ ) ohms	---	10	---	5	---	4
Max. Transistor Dissipation*	---	5w	---	25w	---	75w
Max. Collector Current	---	1 amp.	---	2.5 amp.	---	5 amp.

\*At or below 25°C case or mounting flange temperature.  
\*\*Similar to TO-3 outline.

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