Nomograms 1 and 2 represent these equations. Nomogram 1 serves to determine β from given values of τ_0, R, and $(C_1 + C_2)$. The five scales to the left are used for this purpose. γ is then determined from C_1 and $(C_1 + C_2)$. The five scales to the right are then used to find V_{2max} from the known values of γ, E, and β. Nomogram 2 yields the duration of the pulse and the delay in its peak relative to the start of the differentiated waveform.

Illustrative Problem

Assume a voltage drop $E = 100$ v with a time constant $\tau_0 = 0.25$ µsec is differentiated with a circuit having $C_1 = 90$ µµf, and $C_2 = 10$ µµf, and $R = 5000$ ohm. Determine the characteristics of the differentiated pulse.

Procedure

Determine V_{2max} on monogram 1 by joining $\tau_0 = 0.25$ and $(C_1 + C_2) = 100$. Joining the intersection between this line and auxiliary scale 1 with 5000 ohm on the R scale yields $\beta = 0.5$. Similarly, joining the values on the $(C_1 + C_2)$ and C^1 scales (100 and 90 respectively yields $\gamma = 0.9$. Join 0.9 on the γ axis and 100 on the E axis, and connect the intersection on auxiliary scale 2 with the value 0.5 on the β' axis. This intersects V_{2max} at 45 v.

Now, on nomogram 2, $\beta = 0.5$ is located on the abscissa of the graph. Assume it is necessary to know the duration of the pulse at one per cent of the amplitude of V_{2max}. The point corresponding to $\beta = 0.5$ is located on the upper curve for one per cent. This point is projected horizontally to the T scale of the graph. The new point is joined with $\tau_0 = 0.25$ to obtain $t_r = 3$ µsec as the duration of the pulse at the one per cent level.

To determine the time delay of the peak of the curve relative to the start of the voltage drop, an analogous procedure is employed. However, in this case the T_{max} curve on the graph is used. This yields, in the example cited, a time delay $t_3 = 0.35$ µsec.

From Nomogram Collection on Radio Engineering *by V. M. Rodionov published by Soviet Radio.*

GERMAN ABSTRACTS

Time Delays In Pulsed Germanium Diodes

E. Brenner

IT HAS already been well established that pulsed germanium diodes distort a signal. This can be accounted for by insertion of an inductance in the equivalent circuit when the diode is conducting in the forward direction; and by capacitances when conduction is in the transition region or in the reverse direction. The common cause of all these time lags is the storage of charge in the diffusion region of the *p-n* junction (in a junction diode). This stored charge disappears partly by recombination and partly returns into the circuit as back current. In diodes in which the diffusion regions are very large, it is possible to verify these results by measurements.

The parameter which describes this stored charge in the diffusion region is the parameter τ, the life-time of the charge carriers in the region. It can be shown that the stored hole-charge in the diffusion region (of a *p-n* junction) into which a current i_d is injected varies with time according to the formula

$$Q_o(t) = i_d \tau (1 - e^{-t/\tau}) \qquad (1)$$

The distortion which occurs when the attempt to cut the diode off is made can be observed in the circuit shown in Fig. 1. The diode current and the diode voltage waveforms which are observed are shown in Fig. 2. Since it is assumed that the parallel combination of R_1 and R_2 is sufficiently large so that the current $i_d = E_0/R_2 + e/R_1$ was impressed prior to $t = 0$. At $t = 0$ the diode voltage drops abruptly to the value v_o (which is about 0.2 v.) while the current drops to the cut-off value, $i_c = v_c\,(1/R_1 + 1/R_2)$ where v_c is the cut-off voltage. The diode voltage now starts to decay toward zero. This exponential decay can be approximated by a straight line and it can then be shown that the voltage follows in the time interval between $t = 0$ and $t = t_o$ the equation

$$v_D \approx (v_o + v_c)\left(1 - \frac{t}{R_1R_2C_2/R_1+R_2}\right) - v_c \quad (2)$$

where the capacitance C_2 is related to t_o through

$$C_2 = \frac{v_o + v_c}{v_o\,R_1R_2/(R_1+R_2)}\,t_o$$

It can further be shown that the value of C_2 is related to the storage charge Q_o through the equation

$$C_2 = \frac{Q_o}{u_o}\,\frac{\tau}{\tau_o}\ln\,(1 + \tau_o/\tau) \quad (3)$$

where

$$\tau_o = Q_o\,R_1R_2/(R_1+R_2)\,v_c$$

and for small currents C_2 is approximated by $C_2 = Q_o/u_o$.

Referring again to Fig. 2, after t_o the diode voltage approaches the cut-off value exponentially, controlled by the time constant $C_1R_1R_2/(R_1\,R_2)$. The value of C_1 increases with cut-off voltage and also depends on the diode current and the resistance in the external circuit. With diode currents, i_d, above about 8 ms., the value of this capacitance is independent of the current. Values of C_1 in typical cases range from about 400 to 1100 μμfd.

Considering the conditions in the diode when it is operating in the forward direction it can be shown that every change in current is associated with a motion of charge and consequently a change in conductance. Hence all currents in the diffusion region are basically subject to inductive time lags, even in the reverse direction. The capacitive effects which are discussed above, i.e. those observed when the diode is operating in the reverse direction, simply overshadow the inductive effect. There is in fact no sharp division between these two effects, only a point at which one overshadows the other. For germanium this happens when the diode voltage has a magnitude of about 0.2 v. *(Abstracted from an article by W. Heinlein,* Archiv der Elektrischen Uebertragung, *Vol. 11, No. 10, October 1957, pp 387-396).*

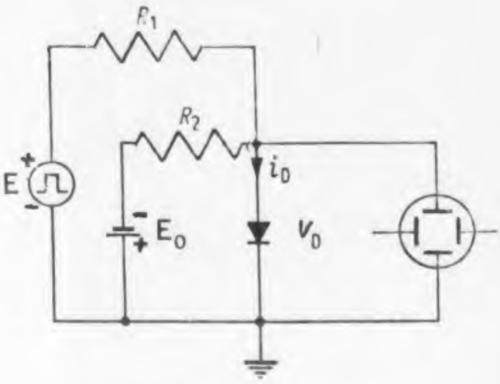

Fig. 1. Circuit for measuring the switching effects.

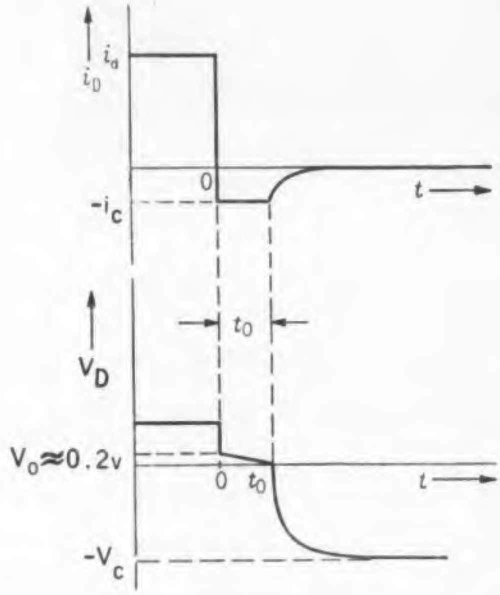

Fig. 2. Waveforms observed when the diode is cut-off.


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Whether it's a complex 10 winding magnetic amplifier or a simple choke . . . at Celco each toroid is precision-made. New core materials are used in Toroidal magnetic amplifiers, reactors and transformers to achieve maximum performance.
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REPORT BRIEFS

Elastic Properties of Solids

Data accumulated during a six-year study of the dynamic elastic properties of solids are contained in a final report of the Navy-sponsored project. The research was primarily concerned with determination of the elastic modulus and internal friction of solids under alternating stresses. It was divided into two phases: measurements on metals, mostly single crystals; and measurements on plastics and elastometers. *Data Show Dynamic Elastic Properties of Solids, T. R. Cukendall and H. S. Sack, Cornell University for Office of Naval Research, Nov., 1955, 115 pp, $3.00. Order PB 121701, from OTS, U. S. Department of Commerce, Washington 25, D. C.*

Ultrasonic Welding

Significant improvements in ultrasonic welding techniques and equipment, and considerable extension of the range of similar and dissimilar metals which can be effectively joined by the process, have been accomplished by researchers for the Army.

According to a final report of the project, successful welds were produced in gages of 1100 aluminum through .062 inches, as well as in several other metals and alloys. Shear strengths of the welds equalled those of the materials themselves. No reduction in strength was observed after 5000 hours exposure in each of two corrosion environments. Best welds were produced with elastic vibratory energy introduced into the weld zone as shear-type vibration.

Among the many general conclusions, it was shown that ultrasonic welding is effective in the joining of metal thicknesses previously difficult or impossible by other methods. Compared with pressure welding, the ultrasonic technique was quicker and resulted in much lower deformation. The welding mechanism did not appear to be a recrystallization process. The effect of grain orientation of the unwelded components did not appear to be significant. Surface films were found to adversely affect the process, although ultrasonic welds could be produced when surface film existed. Polished surfaces appeared to be more readily weldable than rough surfaces, at least in sheet-to-sheet welding. *Gains Made in Ultrasonic Welding, J. B. Jones, C. F. DePrisco, and J. G. Thomas, Aeroprojects, Inc. for Frankfort Arsenal, U. S. Army, Apr., 1955, 105 pp, $2.75. Order PB 131084, from OTS, U. S. Department of Commerce, Washington 25, D. C.*

Miniature Blower

This design study showed a 400 cycle motor-driven fan controlled by a temperature sensitive bridge circuit to be an effective means of maintaining constant ambient temperature in a chamber containing electronic equipment. The blower system operates through an axial flow impeller driven by a high-slip three-phase 400-cycle AC motor with a speed range from 3000 to 22,000 rpm, a wide range necessary for constant cooling effect at both sea level and high altitude. A three-phase magnetic amplifier, with one bias and one signal winding, serves as a variable voltage source for the motor. The winding is connected directly to the output of a bridge circuit, one leg of which is a thermistor or temperature transducer. A small change in the resistance of the thermistor, which is affected by changes in temperature, causes a change in the bridge output or signal winding input, which in turn regulates the output voltage of the magnetic amplifier and the speed of the motor. The transducer is placed in the outlet airstream of the electronic equipment. *Miniature, High Altitude Constant Cooling Capacity Blower for Electronic Equipment, Cromwell, Gray and Huleguard, Inc. for Wright Air Development Center, U. S. Air Force, Apr. 1957, 45 pp, $1.25. Order PB 131184 from OTS, U. S. Department of Commerce, Washington 25, D. C.*

Streamlined Lens-Radomes

Feasibility of unifying the design of a lens focussing element with a radome for streamlined nose applications was investigated. A design technique was developed for variable refractive index lens-radomes with streamlining which satisfied the requirements of perfect axial focussing and the Abbe sine condition. The resulting lens-radomes were analyzed for weight, dielectric losses, fabrication techniques, and methods of feeding. Beam shaping ability off-axis was studied by means of a ripple tank hydrodynamic analogue in two special cases. It was concluded that scanning range in these cases was about 30 deg. The range could be substantially increased, it was believed, by redesign. The lens-radome was very similar to a conventional Luneberg lens capped by a thin wall dielectric radome, with the region between filled with foam. It differed in that small deviations from the Luneberg index variation compensated for the additional dielectric in the foam and radome. *Streamlined Lens-Radomes, A. F. Kay, Wright Air Development Center, U. S. Air Force, Dec., 1956, 49 pp, $1.25. Order PB 131041, from OTS, U. S. Department of Commerce, Washington 25, D. C.*

REPORT BRIEFS

Quartz Impurities Identified

The current high level of precision in the fabrication of crystal units, coupled with improved techniques of controlled introduction of large amounts of impurities into the lattice of the synthetic material, makes possible the identification of the effect of each impurity. This leads to the possibility of a custom made material with characteristics superior to those of natural quartz.

With this ultimate objective, the Army has made a study of the effects of impurities on the properties of quartz. The work involved synthesis of quartz with added impurities, investigation of the resonator properties of the doped material, and examination of lattice spacing, and the form and width of diffraction patterns in the synthetic materials.

It was shown that the impurities, aluminum, lead, tin, and silver can be incorporated in the crystal lattice in concentrations much larger than those found in natural quartz. Some impurities in the solution appeared to influence growth rate. Impurities in quartz resonators induced an appreciable change in their temperature behavior, a change which may be beneficial in the application of quartz to frequency control problems over high temperature ranges. *Effect of Impurities on Quartz Identified, D. L. Hammond, A. R. Chi, and J. M. Stanley, Signal Corps, U. S. Army, Nov., 1955, 24 pp, $.75. Order PB 131087, from OTS, U. S. Department of Commerce, Washington 25, D. C.*

Free-Air Ionization Chambers

This publication presents general design characteristics for standard free-air type ionization chambers for X-rays from 50 to 500 kv. Since all of the factors influencing the accuracy of the primary instrument must be known to a few tenths of 1%, a review of the design criteria and their absolute accuracies is desirable.

A discussion of the general characteristics of all free-air chambers is included, as well as a section covering the details of chamber design. The accuracy of free-air chamber measurements is given in a table which lists the estimated maximum error for each experimental factor. A list of further references is included. *Design of Free-Air Ionization Chambers, H. O. Wyckoff and F. H. Attix, National Bureau of Standards Handbook 64, Dec. 13, 1957, 16 pp, $.20. Order from Superintendent of Documents, U. S. Government Printing Office, Washington 25, D. C.*

Radome Material Development

Radomes in use by the Air Force permit operation of radar antennas under adverse conditions and wind velocities higher than those for which the antennas were designed. They also allow reduction of weight in radar design. This report reviews the fabrication of air supported and rigid radomes and the development of lightweight fabric materials. Properties of the Dacralon fabric are given, and the material is compared to fabrics used in earlier stages of radome development. Formulation of weather coating compounds and their uses are discussed and results of service life tests are given. Development and fabrication characteristics of the rigid reinforced plastic radome are described and the advantages of such radomes are listed. *Materials Developments and Fabrication Process in Radomes for USAF Ground Electronic Equipment, S. C. Nilo, Rome Air Development Center, U. S. Air Force, Feb., 1956, 35 pp, $1.00. Order PB 121272, from OTS, U. S. Department of Commerce, Washington 25, D. C.*

Communication Theory

This article indicates in general terms, certain relations of an embryonic theory of storage and retrieval systems to the mathematical theory of communication developed by Claude Shannon and others. *Communication theory and storage and retrieval systems, by Mortimer Taube, Documentation, Inc., Oct. 1955, 11 pp, microfilm $2.40, photocopy $3.30. Order PB 124515 from Library of Congress, Washington 25, D. C.*

Ferroelectric Survey

The increasing demand for ferroelectric materials for use above Curie temperature 120 C, the maximum for $BaTiO_3$, prompted this compilation of data on materials of the oxygen octahedra type. Considered were ferroelectrics without H_2O molecules, or those which are chemically and physically stable. Data for different materials are arranged individually, and brief descriptions of their known crystal and ferroelectric properties are included. All available literature references are presented for each material. Materials covered include titanates, niobates, tantalates, stannates, zirconates, vanadates, rhenium trioxide, gallates, and fenates. *Ferroelectric Materials Survey with Particular Interest in Their Possible Use at High Temperatures, C. F. Pulvari, Catholic University, Wright Air Development Center, U.S. Air Force, Feb., 1957, 74 pp, $2.00. Order PB 121949 from OTS, U. S. Department of Commerce, Washington 25, D.C.*

REPORT BRIEFS

Automatic Techniques for Minifying Equipment

This report summarizes a long-range program. The specific objectives have been to study the relationship of the design of the electronic package, the electrical performance of the product, and the problems of automatic materials processing and machine fabrication. Initial phases of the program were carried out under Contract AF 33(038)-18976, SRI Project 413. *Development and application of automatic techniques for miniaturized electronic equipment, by Freeman M. Hom, Low K. Lee, Edward R. Gramson and Raymond F. Newton, Stanford Research Institute, Stanford, Calif, May 1955, 315 pp, microfilm $11.10, photocopy $48.60. Order PB 128059 from Library of Congress, Washington 25, D. C.*

Low Pass Filters Stripline

This report presents a design procedure for stripline low pass filters at microwave frequencies and includes the following: a. A new technique for increasing the frequency of the spurious responses for a stripline low pass filter. b. A formula, valid for high impedance, for the characteristics impedance of a strip transmission line using two dielectric materials. This formula, important to the new technique, is derived by the method of conformal transformations. *Design of microwave low pass filters using stripline techniques, by Richard A. Van Patten, U.S. Air Force, Air Research and Development Command, Rome Air Development Center, Griffiss Air Force Base, Rome, N. Y. Oct. 1956, 57 pp, microfilm $3.60, photocopy $9.30. Order PB 125877 from Library of Congress, Washington 25, D. C.*

Synthesis With Time Delay

The investigation shows that the modified z-transform can be extended so that linear sampled-data systems with arbitrary pure delays can be analyzed and synthesized to obtain responses with zero steady-state error after a finite transient response. The report discusses the development of mathematical methods, analysis of continuous systems with pure time delays. *Analysis and synthesis of sampled-data and continuous control systems with pure time delays, by W. Schroeder, California University, Division of Electronics Research Laboratory, Berkeley, Calif., June 1956, 90 pp, microfilm $4.80, photocopy $13.80. Order PB 125876 from Library of Congress, Washington 25, D. C.*

Build Satellite Tracking System

A guide to construction of the Mark II Minitrack, the tracking system with which the Navy hopes to enlist the aid of many serious amateur radio groups in plotting the course of its Vanguard Earth Satellite, has just been released to the public through the Office of Technical Services, U. S. Department of Commerce.

The guide describes two relatively inexpensive designs for the Mark II. One is a simple system which merely records the passage of the satellite. A more complicated version contains tracking and data-recording modifications which provide computational material valuable to the Navy's Vanguard Computing Center.

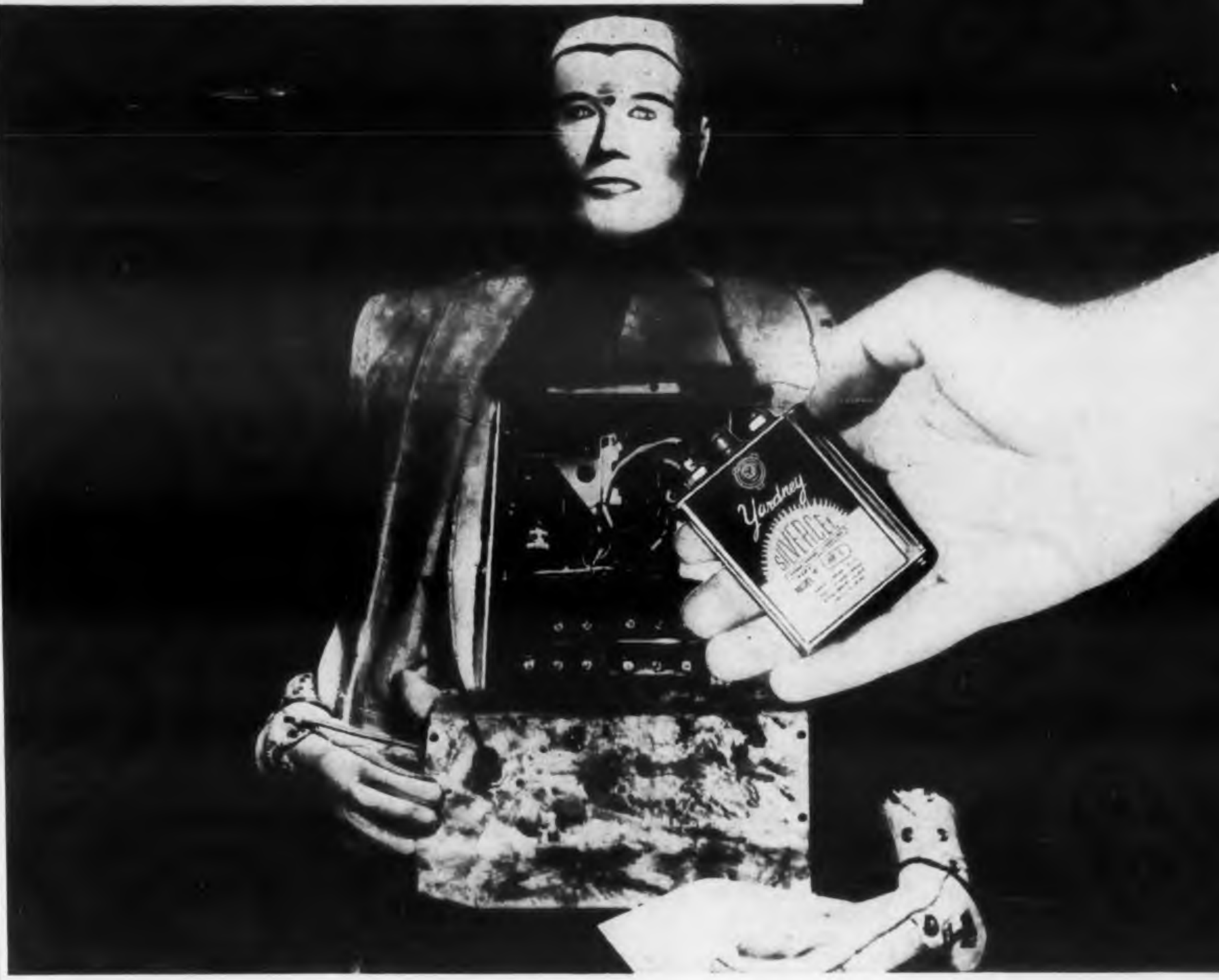
Like its complex parent system, the Prime Minitrack, the Mark II is based on the interferometer principle, which is discussed in the report. All other aspects of design, construction, and calibration of the system are contained in the illustrated publication. *Project Vanguard Report No. 21, Minitrack Report No. 2—The Mark II Minitrack System, R. L. Easton, Naval Research Laboratory, Sept., 1957, 32 pp, $1.00. Order PB 131330, from OTS, U. S. Department of Commerce, Washington 25, D. C.*

Automatic Component Assembly

The primary objective of the program covered by this project is to develop a system for the automatic assembly of lead-mounted components and printed circuit boards to form complete units of subassemblies of military electronic equipment. *Automatic component assembly system: Phase I and Phase II. Quarterly Engineering Report No. I covering period July 1953 to Oct. 1953. General Electric Co., Electronics Div., Syracuse, N. Y., Dec. 1953, 43 pp, microfilm $3.30, photocopy $7.80. Order PB 125905 from Library of Congress, Washington 25, D. C.*

New Information Theory

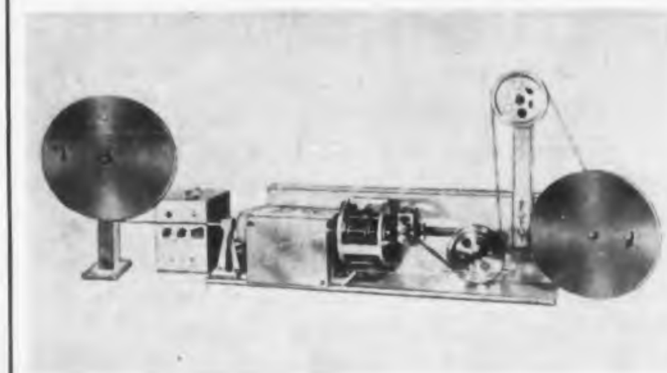
A new theorem for noisy channels, similar to Shannon's in its general statement but giving sharper results, is formulated and proven. It is shown that the equivocation of the channel defined by the present theorem vanishes with increasing code length. A continuous channel is defined in a manner that permits the application of these results. Detailed proof of the equivalence of this definition and Shannon's is given in an appendix. *New Basic Theorem of Information Theory, by Amiel Feinstein, Massachusetts Institute of Technology, Research Laboratory of Electronics, June 1954, 30 pp, microfilm $2.70, photocopy $4.80. Order PB 125016 from Library of Congress, Washington 25, D. C.*



PRODUCTION PRODUCTS

Continuous Resistance Winder

Fully Automatic



A completely automatic continuous resistance winder requires no operator and runs fully automatically with manual start and stop. Optional pre-determining counter can be supplied at extra cost to stop machine at any given footage length. Model 209 winds resistance wire on continuous lengths of flat or round core material to be cut to any desired length and made into flexible wire wound resistors, heating elements, attenuators, rheostats, but is not designed for precision potentiometer windings. Machine will wind upon any material that can be drawn through a 1/4 in. ID spindle.

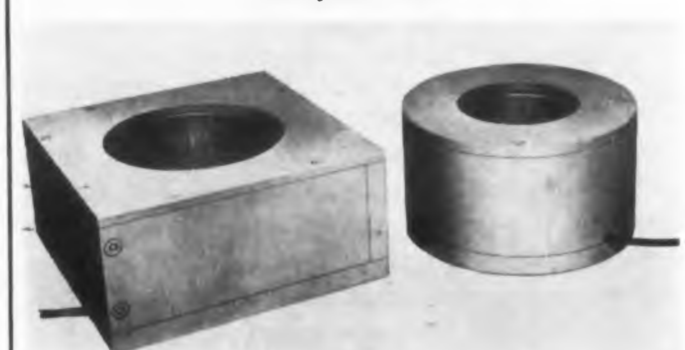
Wire sizes wound are .0012 in. through .010 in. and winding range is 100 through 600 turns per in. Thyratron variable speed control permits uniform torque in winding at speeds as low as 200 rpm and as high as 1400 rpm.

Geo. Stevens Mfg. Co. Inc., Dept. ED, Pulaski Rd. at Peterson, Chicago 30, Ill.

CIRCLE 454 ON READER-SERVICE CARD

Heavy Duty Magnetizer

Compact Unit



Designed for production needs, the Model 6800 Magnetizer, charges any permanent magnet within the size limitations of the coil dimensions. Magnets to be charged may be in their assemblies, provided certain considerations are met. Two sizes of coil structures are standard accessory items. Special custom made coils can also be designed for specific applications.

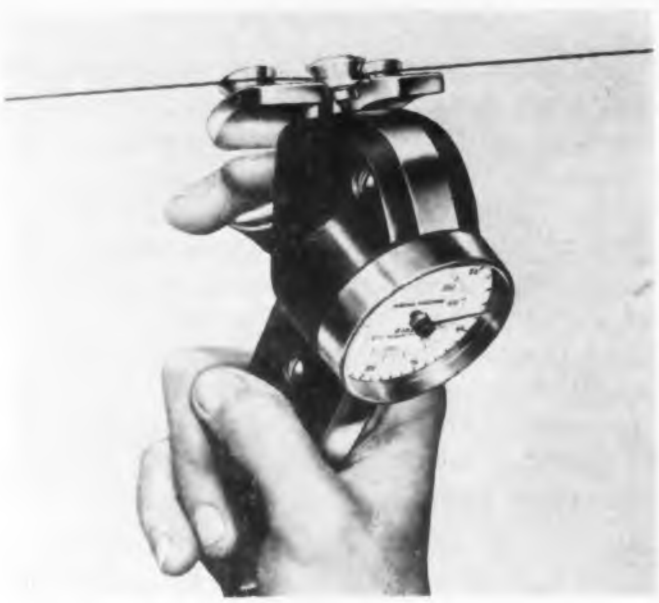
To eliminate the necessity for a bulky, short-lived condenser bank, push-pull ignitrons are utilized across a 220 volt line. They are triggered by a pair of mercury vapor rectifiers, which in turn are controlled by Agastat time delay relays. Provisions are made for remote triggering also. Approximate ampere turns are 50,000, depending on coil type; duty cycle is one second on—ten seconds off. Tubes used are 2-5550 ignitrons, 2-872A rectifiers. Power source needed—three wire 220 v, 60 cps, single phase.

EV Instruments, Div. of Electro-Voice, Inc., Dept. ED, Buchanan, Michigan.

CIRCLE 455 ON READER-SERVICE CARD

Wire Tension Meter

Trigger Gage



Featuring low deflection and negligible wire contraction, this new tension meter has automatic trigger action for the measurement of tension during wire processing. By measuring tension, deformative strains on conductor and insulation can be avoided and better geometric shapes can be maintained on a winding to fill a given cavity.

To use the tension meter, the trigger is pulled, opening the 3-roller mechanism for quick wire insertion. The wire is then placed upon the two lower rollers which are recessed into the plate. Upon release of the trigger, the wire slips automatically into the pulley grooves. This eliminates wire breaks and bending of the wire between the rollers. The center roller deflects against the restraint of a calibrating spring. This motion is mechanically amplified over a precise gage movement. A special design steadies the readings giving smooth averaging of all practical tensions encountered in reciprocating machinery.

Tensitron, Inc., Dept. ED, Harvard, Mass.

CIRCLE 456 ON READER-SERVICE CARD

two more UNIT PREAMPLIFIERS

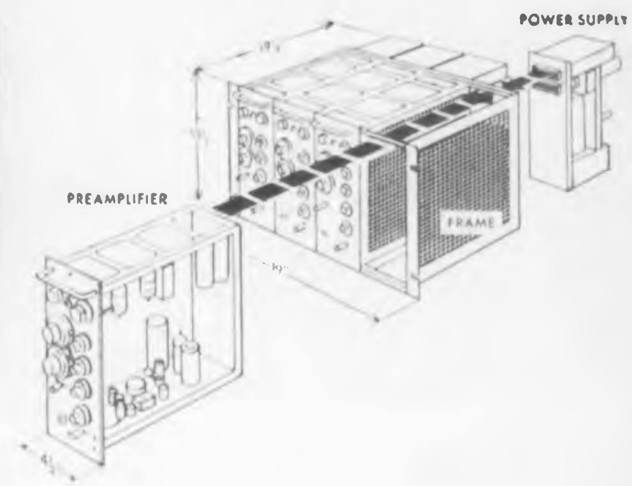
in the new

SANBORN "450" SERIES

Here are the newest of the recently introduced Sanborn "450" Series Unit Preamplifiers—compact, lightweight, self-contained instruments for use with optical and tape recorders, wide band 'scopes, panel meters, computers, etc. (For use with high speed optical galvanometers at frequencies above 500 cps, requiring larger current swings, a transistor output amplifier is built into the 450-1800A True Differential DC type and available as optional equipment on other 450's.) As with all 450 Unit Preamplifiers, the new Servo Monitor and DC Coupling models mount in either individual portable cases or in the four-unit 19" module frame (#354-1100-C2) shown. The *450* designation refers to *unit packaging* of Sanborn 350 Preamplifiers and Power Supplies in individual 450 cases. Loosening two front panel thumbscrews allows quick, simple interchangeability. Since *all* "450" Preamps use the 350-500 Power Supply (which remains in place at the rear of the frame or case), new requirements necessitate only additional *Preamplifier* units, permitting sizable savings in equipment investment.

The Model 450-1200 is a phase-sensitive demodulator, whose DC output voltage is proportional to the in-phase (or 180° out-of-phase) component of an AC signal with respect to a reference. Precision measurement is realized by such characteristics as negligible quadrature signal error, provision for floating signal and reference inputs, front panel VTVM for accurate calibration signals. The 450-1200 accepts the outputs of resolvers, synchros, differential transformers and other transducers. The 450-1300A is a moderate gain, balanced input—balanced output DC amplifier. Its input circuit performs equally well with single-ended or balanced signals.

The "450" Series Unit Preamplifiers presently include the Model 450-1100 Carrier, 450-1200 Servo Monitor, 450-1300A DC Coupling and 450-1800A True Differential DC types. Following these will be "450" Series Logarithmic and Low Level types. Further data and application information on present models is available on request.



Model 450-1200 Servo Monitor (Demodulator) Preamplifier

Model 450-1300A DC Coupling Preamplifier

MAJOR SPECIFICATIONS

MODEL 450-1200 SERVO MONITOR PREAMPLIFIER

Sensitivity: 5 mv (in phase) produces 1 volt at output jack under maximum output load conditions
Input Impedance: Signal 100k
Reference 12.5k for 15 volts, 55k for 120 volts
Frequency Response: 3db down at 20% of carrier frequency filter position
Carrier Frequency Filter: Selected by a switch (three positions)
Low 60 cycles
Med 400 cycles
Hi 1000 cycles (5000 cycles optional)
Reference Voltage: Internal selection accepts voltages from 15 to 120 volts
Quadrature Rejection: Ratio better than 100:1
Maximum permissible quadrature before overload indicator lights is twice full scale (in phase)
Calibrate Voltage: 10 millivolts internal (set by meter on panel)
Drift: Less than 0.1% of full scale per hour
Preamplifier Output Jack: ±3 volts available into 2.2k minimum load resistance. Output appears across two cathodes at approximately ground potential
Rear inputs and **overload indicator lights** are included
Output Impedance: 1k
Overall Linearity: ±¼%
Power Requirements: 115 volts, 50-400 cycles, approximately 35 watts

MODEL 450-1300A DC COUPLING PREAMPLIFIER

Sensitivity: 50 mv produces 1 volt at output jack under maximum output load conditions

Input Impedance: 5 megohms each input side to ground

Input: Single-ended or push-pull

Preamplifier Output Jack: ±3 volts into 2.2k minimum load resistance. Output is balanced and appears across 2 cathodes at approx. ground potential

Output Impedance: 1k

Drift: Referred to input 2 mv/hr. line voltages change less than 10%

Frequency Response: 0-20kc

Calibration: 100 millivolts internal

Linearity: ±¼%

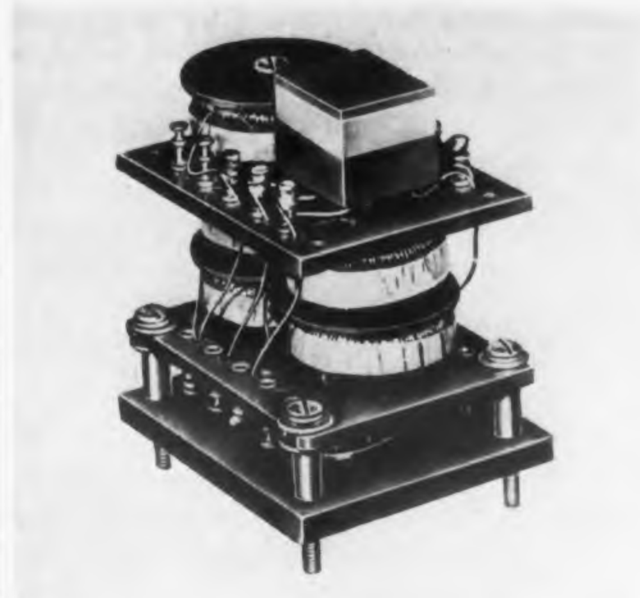
Rear inputs included

See the new "450's" and other Sanborn equipment at Booth 3601-3603 I. R. E. Show

SANBORN COMPANY
INDUSTRIAL DIVISION
175 WYMAN STREET, WALTHAM 54, MASS.

CIRCLE 457 ON READER-SERVICE CARD

SERVICES FOR DESIGNERS



Custom Designed Filters

Micromag Instrument Co. has a new division to custom design and manufacture wave filters. Specialty of the division will be audio to one megacycle high, low, band pass, and band stop filters, constructed of temperature stabilized toroidal inductors and temperature compensated capacitors. Filters meeting extreme specifications of shock, environment, or vibration will also be produced. The division is equipped to deliver sample units within a few days and production quantities to meet manufacturers' schedules.

Micromag Instrument Co., Dept. ED, Parmelee St., Boston, Mass.

Liquid Oxygen Testing

A high-flow liquid and gaseous oxygen facility for testing missile components and systems, as well as for cleaning and packaging components for operational use is now being constructed by Wyle Laboratories. A feature of the program, according to Wyle, is an arrangement with the Linde Company, a Division of Union Carbide Corp., whereby Linde will provide technical assistance to the project. Construction of the new facility and conduct of its testing operations are under direct supervision of Wyle cryogenics experts with assistance from Linde.

First phase of the new plant will consist of a 1000 gpm closed loop, liquid oxygen system; a 35 lb/sec gaseous oxygen system; a certified weight-rate calibration system; and a certified oxygen component cleaning and packaging system. Subsequent phases will increase the flow capacity to 6000 gpm with closed loop and weight-rate systems. The operation will be capable of full scale developmental, qualification and reliability performance testing under temperature, altitude and vibration conditions, for these types of oxygen control systems:

Flow measuring devices, including calibration of all types of flowmeters; topping and transfer pumps; low or high flow remote operating transfer systems; flow control valves; immersion type high pressure reciprocating pumps; transport Dewars and high capacity fueling trailers; relief valves, vent valves, and liquid oxygen pressurization systems.

Wyle Laboratories, Dept. ED, 128 Maryland St., El Segundo, Calif.

Computer Laboratory

A new section of General Electric's Computer Department has recently begun operation, the Computer Applications Laboratory. This facility has been formed to render business and industry computational services capable of providing an economical approach to the solution of an entire problem, regardless of size.

The laboratory is engaged in problem analysis, mathematical analysis, programming, coding, reporting functions, computer techniques, personnel training, commercial and applied science applications. It is staffed by 70 specialists qualified to perform advanced research and application in these fields, and is equipped with an IBM 704 computer.

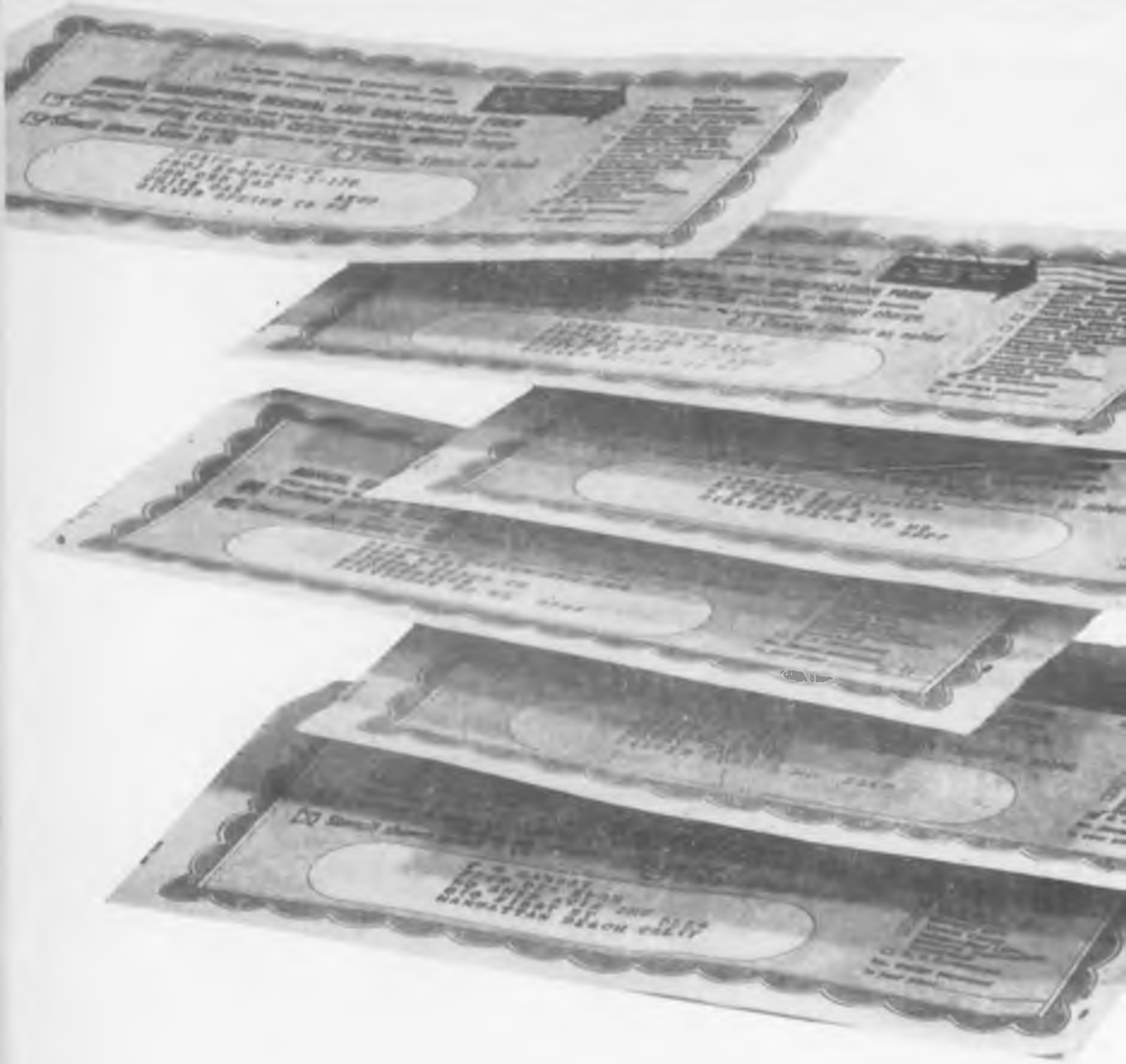
The Computer Center is located on the campus of Arizona State College at Tempe. Regular classes in computer theory and maintenance are available for credit to the college students.

General Electric Co., Computer Dept., Dept. ED, 1103 N. Central Ave., Phoenix, Ariz.

Chemical Research Group

With the formation of a special Contract Research Group research and development programs will be undertaken either on a single project or a long-range basis. The new Houdry research service is expected to be especially attractive to companies concerned with solid state chemistry, such as manufacturers of transistors, diodes and miniature ferro-electronic devices; fine chemical producers, heavy chemicals plants having special problems in hydrogen treating and catalysis; and plastics and rubber processors and manufacturers.

Houdry Process Corp., Dept. ED, 1528 Walnut St., Philadelphia 2, Pa.



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Periodic Focuser Design

Complete design and production facilities for permanent magnet type periodic focusers for traveling wave tubes, used as broadband amplifiers in microwave applications are offered by the Glaser-Steers Corp. The company designs periodic focusers to provide peak field and period required for optimum operation of a given tube. Peak fields are adjusted to close tolerances around the nominal value required thus insuring maximum beam stability. Transverse fields, which might cause bending of the electron stream, are minimized by precision component parts and careful assembly. Magnetic fields of high uniformity are used to charge the individual magnets. All the magnetic and mechanical parts for traveling wave tube periodic focusers with the exception of the microwave couplers can be supplied.

Glaser-Steers Corp., Dept. ED, 20 Main Street, Belleville, N.J.

Teflon Fabrication

A customized service for the fabrication of Teflon and Kel-F is available from Fluorulon Laboratories, Inc. An engineering and design department offers a highly specialized service to those using the heavy duty plastics of the fluorocarbon family. The company is equipped to experiment with new uses of Tetrafluoroethylene Resin, Trifluorochloroethylene Polymer, Genetron, Fluorethylene, and Polyfluoron.

Fluroglas and Fluromat provide higher tensile strength at temperatures approaching absolute zero and greater rigidity at 424 F and above. The process improves the basic high mechanical properties and expands the low and high operating temperature range of the basic Kel-F. The departments have been equipped with a substantial amount of new equipment solely for experimental purposes. Users of Fluorocarbons now need only send their plans and specifications, as to mechanical design, to Flurorulon and the Laboratories will develop the plastic to meet the requirements of the user.

Fluorulon Laboratories, Inc., Dept. ED, Caldwell, N.J.

Quiggle Quells the Query

...where to get the best bandpass filters?

Major Quiggle*, KC, AC, DC, MC, fixed his procurement manager with a withering stare. "So now our whole production line is held up," he barked, "while you try to find a good bandpass filter with a flat response between 17 and 20 kcs. And you also insist that it have sharp low and high frequency cut-off," he added.

The manager reeled with the outburst. Never had he seen the old man in such a fury over a simple question of where to get the best bandpass filters.

Quiggle continued, "Haven't you been reading the trade paper advertisements? Why don't you call Barker & Williamson! They've been making filters of all types such as Band Elimination, High-Pass and Low-Pass for years . . . must be experts on the subject, they'll have the answer."

And B&W did have the answer. The Model 360 torroidal bandpass filter was perfect. With a flat response between 17.2 and 20.2 kcs, Quiggle's engineers found many other favorable characteristics when they obtained a spec sheet on the unit by the simple expedient of calling B&W.

*Now a confirmed customer and friend, name is withheld intentionally

Barker & Williamson, Inc.
Canal Street, Bristol, Penna.

B&W also design and manufacture filters for: ANTENNAS • RADIO INTERFERENCE • RADIO RANGE • UHF and VHF as well as many special types designed to performance specifications. Available to commercial or military standards.

CIRCLE 534 ON READER-SERVICE CARD

STANDARDS AND SPECS

Sherman H. Hubelbank

Export Receivers

RS-201, Recommended Standards for Export Receivers, November, 1957

Included in this publication are standards for specifying the number of tubes in radio receivers, specifying the frequency coverage of broadcast receivers, and specifying the power supply voltage and power supply frequency. Also included are standards for safety or shock prevention of broadcast receivers and for packaging of radio receivers for export. This standard is a reaffirmation of REC-112. Copies of this standard are available from the Electronic Industries Association, 11 West 42nd Street, New York 36, N.Y. for 25 cents.

Industrial Control

ASA C42.25-1957, Definitions of Electrical Terms, Group 25, Industrial Control Equipment

Control, as used in this standard, is broadly the methods and means of governing the performance of any electrical apparatus, machine, or system. The various sections of this standard cover definitions of parts and enclosures; switches, relays, and contactors; controllers and starters; electric drives; electronic control; qualifying terms; duty, service, and rating, and protection. This standard contains 215 definitions. Copies of this standard are available from the American Institute of Electrical Engineers, 33 West 39th Street, New York 18, N.Y. or from the American Standards Association.

Army Specs Recently Issued

The Department of the Army has recently announced the issuing of the following specs:

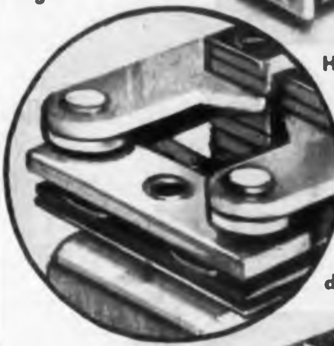
MIL-C-17/27A, Cable, Radio Frequency, Twin Conductor, RG-57A/U, 20 September, 1957

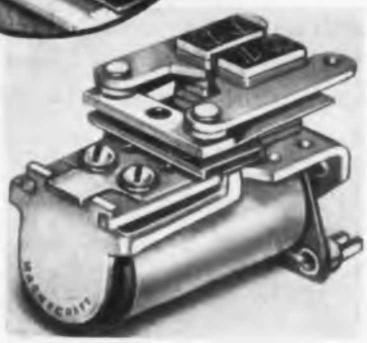
MIL-C-17/50A, Cable, Radio Frequency, Coaxial, RG-117/U, 19 September, 1957

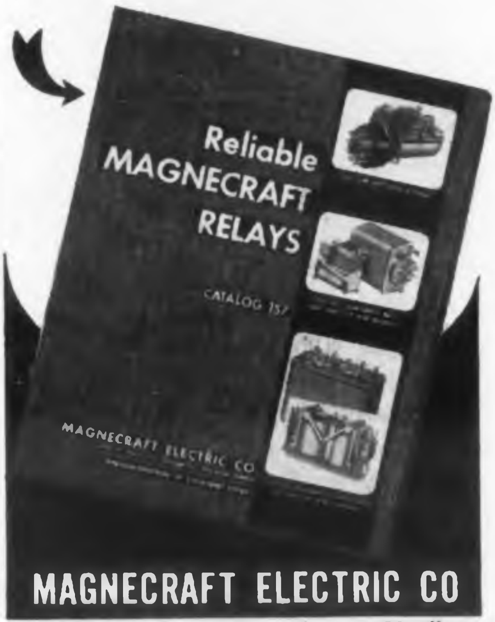
MIL-W-85C, Waveguides, Rigid, Rectangular, Amendment 3, 26 September, 1957

MIL-I-1361A, Instruments, Electrical Measuring: Shunts, Resistors, and Transformers, 29 August, 1957

MIL-I-3064, Insulation, Electrical, Plastic Sealer, 21 June, 1957







MIL-B-3743A, Brushes, Electrical Contact; and Carbon Stock, Electrical Contact Brush, 3 May, 1957

MIL-I-10986B, Indicators and Transmitters, 13 May, 1957

MIL-C-13721, Cable, Electrical; Low-tension, Single-conductor (for Extreme Temperature Applications), 25 April, 1957

MIL-W-14593, Wire, Resistance, Enameled, 13 August, 1957

MIL-I-16923C, Insulating Compound, Electrical Embedding, 19 June, 1957

MIL-T-19500/4, Transistor, Audio, Germanium, PNP, Type Jan-2N331, 30 July, 1957

Book on Safer Shipping

Preservation, Packaging, and Packing of Military Supplies and Equipment

One of the primary lessons of recent years, is that close coordinated control of all phases of preservation and packaging of equipment and supplies, is essential to the material readiness of the Armed Services. Further, the cost of proper preservation and packaging can be materially reduced through strict adherence to this manual. The purpose of the manual is to present proven methods which by their utilization will protect material from deterioration such as damage by moisture, living organisms, or from physical damage. Copies of this 326-page publication are available from the Government Printing Office for $1.75. Specify Catalog No. D101.11:38-230/3.

Electron Devices

ASA C42.70-1957, Definitions of Electrical Terms, Group 70, Electron Devices

An electron device, as used in this standard, is a device in which conduction of electrons takes place through a vacuum, gas, or semi-conductor. The various sections of this standard cover definitions of electron emission; elements and electrodes; electrode voltage, current, and power; circuit characteristics of electrodes; electrode admittances; tube definitions; beam tubes; phototubes, gas tubes, gas-filled radiation counter tubes; magnetrons; semiconductor devices; and miscellaneous devices. Few definitions in the semiconductor field will be found since it was felt that there is not as yet sufficient agreement to warrant inclusion of these definitions. The same comment applies to certain types of electron tubes, klystrons, traveling wave tubes, and storage tubes, and also to definitions pertaining to noise in electron devices. Copies of this standard

(Continued on page 213)

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The new KINNEY VO-3 Oven is an important development for drying and aging of transistors, diodes and other semiconductors. It features three separate chambers so manifolded that each chamber may be independently evacuated. Pyrex glass windows enable operator to observe work at all times. Forced draft heating provides temperatures to 400° F and the equipment may be used with inert gas atmosphere or high vacuum.

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STANDARDS AND SPECS

Contacts

ASTM No. 56-K, 1956 SUPPLEMENT TO THE BIBLIOGRAPHY AND ABSTRACTS ON ELECTRICAL CONTACTS

The 1956 supplement includes 165 references bringing the total references, for the basic publication and its supplements, to 2,447. In addition, 13 references were picked up for the period 1948 to 1954. Most references include abstracts of the article. The value of the booklet is increased by a subject and author index and a list of the publications referenced in the bibliography. Copies of this supplement may be purchased from the American Society for Testing Materials, 1916 Race Street, Philadelphia 3, Pa., at $1.75 a copy.

Instruments

ASA C42.30-1957, DEFINITIONS OF ELECTRICAL TERMS, GROUP 30, INSTRUMENTS, METERS, AND METER TESTING

This 39-page publication covers definitions of terms encountered in instrumentation. Detailed definitions are included for the following topics: terms used in the analysis of measurement; general instrument terms; characteristics of instruments; basic types of instruments; parts of instruments; instrument testing; specific electric instruments; instruments used principally in communication; instruments used for magnetic measurements; bridges (drawings are used to help clarify the definitions of various bridges); instruments used for temperature measurements; miscellaneous instruments; telemetering; meters; characteristics of meters; basic types of meters; parts of meters; meter testing; instrument transformers; and miscellaneous measurement devices. This standard is highly recommended as a vital portion of any complete electronic library. Copies of this publication are available from the American Institute of Electrical Engineers, 33 West 39th Street, New York 18, N.Y. or from the American Standards Association.

Cancelled Navy Specs

INDEX OF SPECIFICATIONS AND STANDARDS (USED BY) DEPARTMENT OF THE NAVY, MILITARY INDEX, VOLUME 3, SPECIFICATIONS CANCELLED OR SUPERSEDED SINCE JANUARY 1, 1947

This is a list of specs and standards that were used by the Navy, but are now superseded or cancelled since January 1, 1947. No reference to these specs and standards is made in the basic index of current and active specs. This 113-page index is available from the Government Printing Office for 65 cents per copy. Specify Catalog number D212.10/2:957.

are available from the American Institute of Electrical Engineers, 33 West 39th Street, New York 18, N.Y. or from the American Standards Association.

Capacitors

RS-198, CERAMIC DIELECTRIC CAPACITORS CLASSES 1 AND 2, NOVEMBER, 1957

Class 1 capacitors are fixed ceramic capacitors of a type specifically suited for resonant circuit applications or any other applications where high Q and stability of capacitance characteristics are essential. A typical class 1 capacitor type designation is R1CC20U2J470G. Class 2 capacitors are fixed, ceramic dielectric capacitors of a type specifically suited for by-pass and coupling applications, or for frequency discriminating circuits where Q and stability of capacitance characteristics are not of major importance. A typical class 2 designation is R2CC20Z5S221M. This standard is a revision of REC-107-A. Copies of this standard are available from the Electronic Industries Association, 11 West 42nd Street, New York 36, N.Y. for 80 cents per copy.

EIA Standards

EIA RS-202, RECOMMENDED PRACTICE FOR PREPARATION OF OUTLINE DRAWINGS OF ELECTRON TUBES AND BASES, DECEMBER, 1957

Formulated by the Joint Electron Tube Engineering Council, and jointly published by NEMA and EIA, this publication supplies the essential information required for the preparation of satisfactory tube and base outline drawings on electron tubes and vacuum sealed devices for JETEC application. A tube outline is defined as a drawing of a tube which included the dimensional characteristics required for interchangeability. Copies of this publication are available from either the Electronic Industries Association, 11 West 42nd Street, New York 36, N.Y. or the National Electrical Manufacturers' Association, 155 East 44th Street, New York 17, N.Y. for $1.20 per copy.

EIA RS-199, SOLID TRANSMISSION LINES, DECEMBER, 1957

This standard refers to solid and semi-solid dielectric transmission lines consisting of one or more inner conductors, a covering of a layer of flexible low-loss r-f dielectric material, surrounding this a braided outer conductor, the whole covered by a protective sheath and in some instances a braided armor. Cables covered by this standard are primarily intended for use at radio frequencies. In general, they have been designed for low-loss, stable operation at frequencies up to

3000 megacycles, but certain types are suitable for operation at higher frequencies. Typical uses include runs of cable between or within units of radio or television transmitting or other electronic equipment. Copies of this standard are available from the Electronic Industries Association, 11 West 42nd Street, New York 36, N.Y. for $1.20 per copy. This standard is a revision of TR-143.

EIA RS-154-A, POLARIZED DRY ELECTROLYTIC CAPACITORS FOR GENERAL USE, DECEMBER, 1957
Dry electrolytic capacitors intended primarily for use in low-frequency filter and by-pass circuits where the service is normally dc are covered in this spec. Ratings, styles, case sizes, test conditions and requirements are established by this spec. The capacitors covered are of the general purpose types usually used where the application requires a performance level devoid of extreme conditions of temperature ranges, ripple current, and other requirements making necessary specialized processing of constructions. Capacitors covered by this spec and capable of meeting the performance requirements are expected to have a useful operating life of one to five years, provided that they are operated within their dc rating, surge voltage, ripple current, and ambient temperature ratings. Copies of this publication are available from the Electronic Industries Association, 11 West 42nd Street, New York 36, N.Y. for $1.10 per copy.

Television Standard

RS-170, ELECTRICAL PERFORMANCE STANDARDS—MONOCHROME TELEVISION STUDIO FACILITIES, NOVEMBER, 1957

Included in this standard are definitions, minimum standards, and methods of measurement for those parameters that are believed to be important. These standards are intended to apply only to locally generated signals; that is, signals generated in the studio itself or at a nearby point where control can be exercised over picture quality. The material covered within this standard includes: the picture line amplifier output and equipment standardization. Under equipment standardization, topics such as picture signal measuring equipment, picture signal monitoring equipment, and synchronizing signal generating equipment are covered. This standard is a revision of TR-135. Copies of this standard are available from the Electronic Industries Association, 11 West 42nd Street, New York 36, N.Y. for $1.10 per copy.

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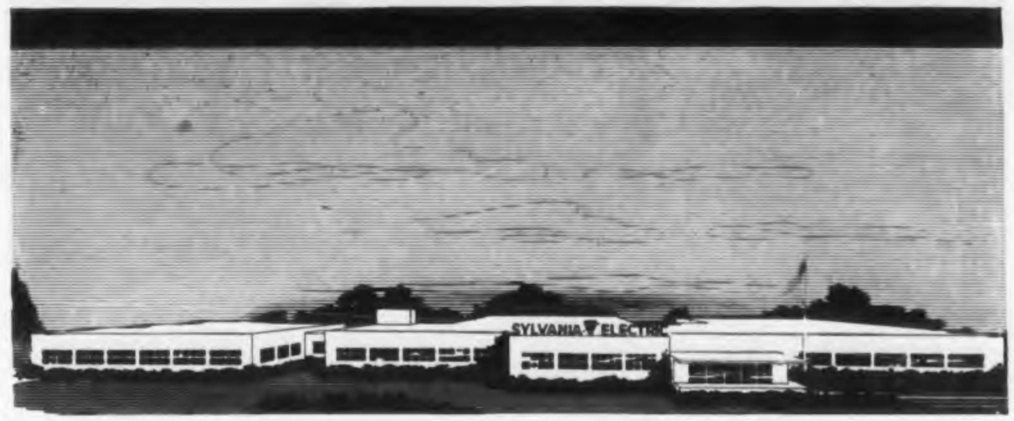

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Sr. Engineer	B.S. or M.S. in E.E. or Physics	5	Computers—circuit and/or logical design, primarily digital.
Sr. Engineer	B.S. or M.S. in E.E.	7	Communications equipment design. Transceivers, microwave, UHF, VHF, SSB.
Systems Engineer	B.S. in E.E.	2	Carrier or multiplex, telephone switching systems.
Design Engineer	B.S. in E.E.	2	Transistorized circuitry.
Communications Engineer	M.S. in E.E.	5	Communication systems design. Emphasis on modulation techniques.

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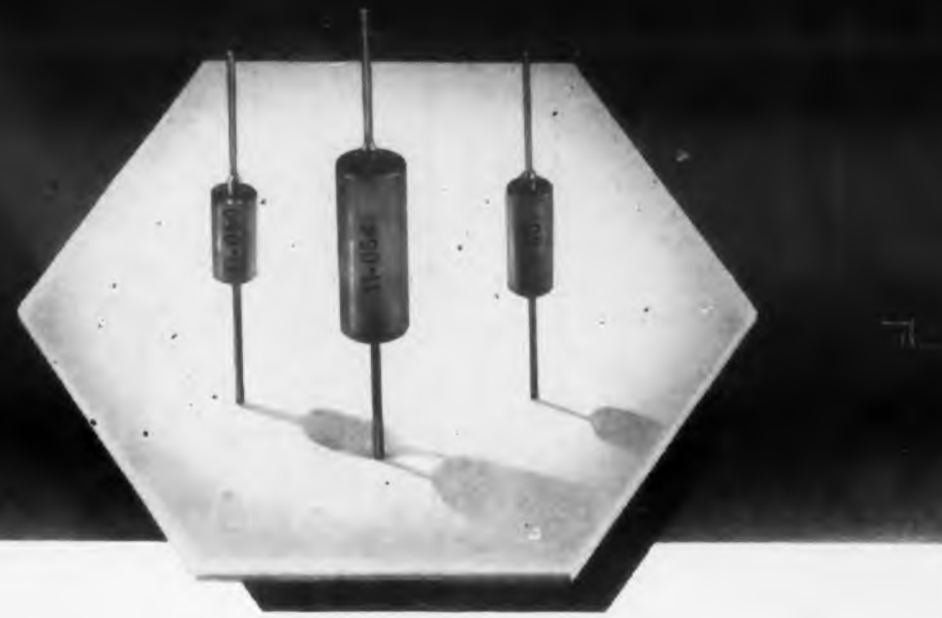

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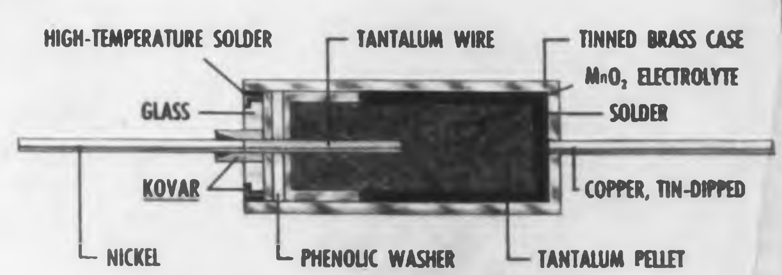

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