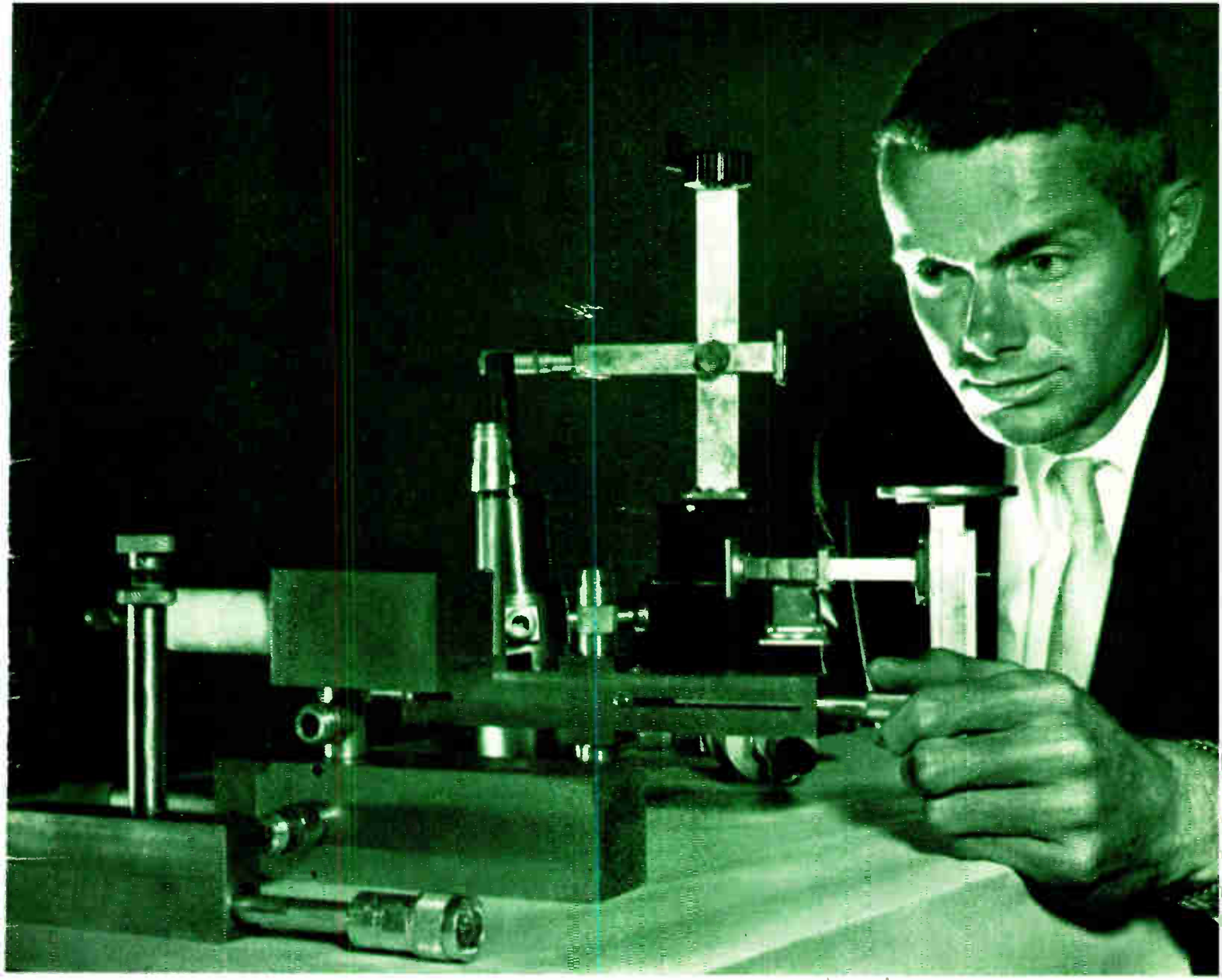

Parametric amplifiers developed by Hughes Aircraft Company scientists (see story page 5)

electronics and communications

an age publication
JULY 1960

HAMMOND Transformers for Electronic Equipment

Hermetically Sealed • Plate Supply • Filament • Multi-winding • Input and Filter • Silicon, Selenium Power Rectifier • Input, Interstage and Output in all types • Cathode Ray • Modulation • High "Q" Inductors • Transistor . . . and other special type Transformers.

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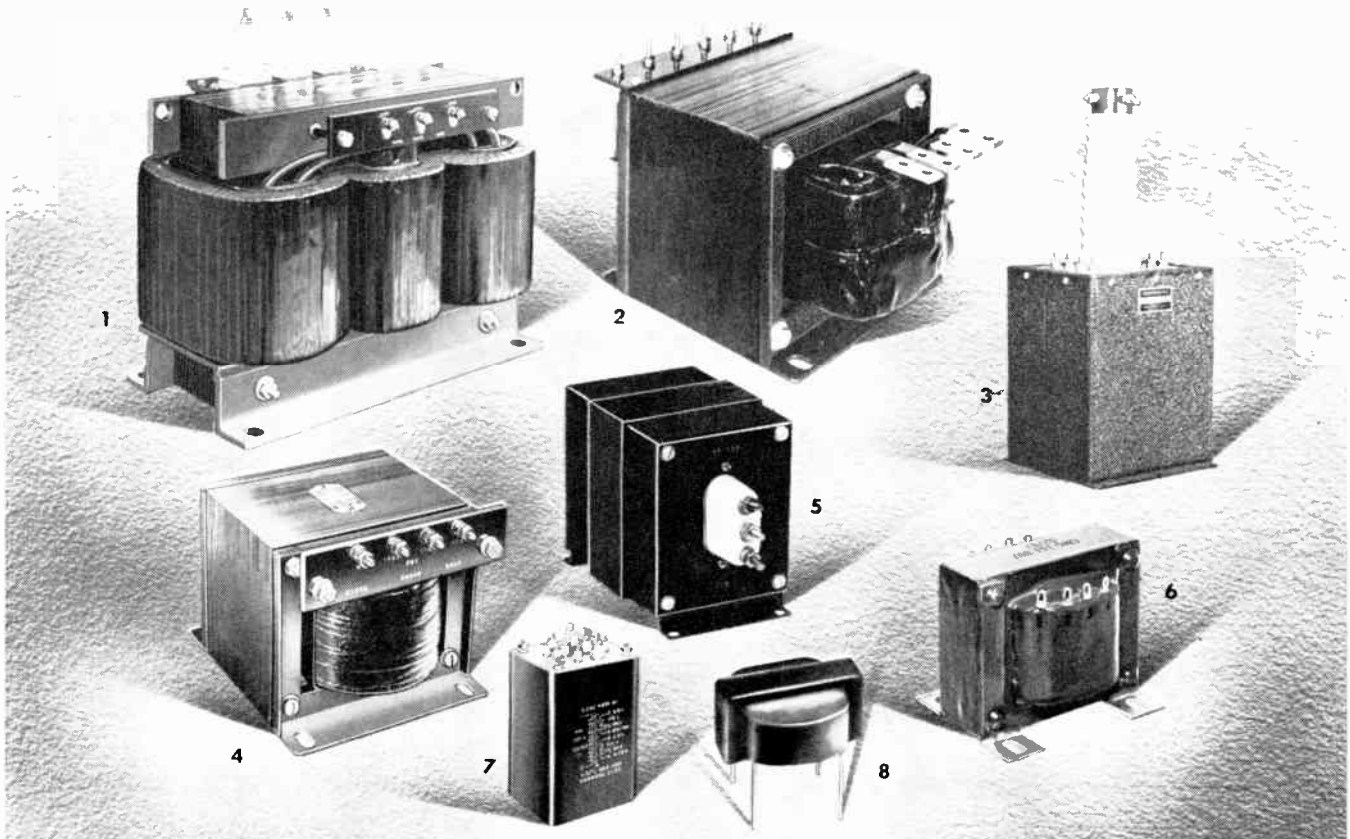
7. Military Transformers . . . to all specifications oil or epoxy filled.
8. Transistor Transformers . . . with solid leads or pins, for printed circuits.



Transformers to over 54,000 specifications

Hammond makes and stocks more than 1,000 items in ratings from a few millivolts to 40 K.V.A. and offers the experience and facilities to engineer special transformers as single units or in production quantities. Hammond has built transformers to more than 54,000 *different specifications.*

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ELECTRONIC TRANSFORMERS

Standard Items Stocked by Leading Jobbers

H2

HAMMOND MANUFACTURING COMPANY LIMITED • GUELPH, ONTARIO, CANADA

For complete details check No. 19 on handy card, page 47

NOW BUILT INTO EVERY G-E PICTURE TUBE...

20% MORE BRIGHTNESS

SHARPER FOCUS

BETTER RESOLUTION

INCREASED CONTRAST

Television set manufacturers are constantly striving to obtain even better video performance from their sets. One way this can now be done is to install new, improved GE picture tubes. At C.G.E., engineers have developed a new screen manufacturing process that produces 20% greater brightness and increased contrast on every GE picture tube.

In addition, sharper focus and better resolution result because usual brightness levels are obtained with lower beam current. These new GE picture tubes set new standards for picture tube performance.

For best video performance from your television receivers, specify new 20% brighter GE picture tubes.

Electronic TUBES

Electronic Tube Section

1822-160

CANADIAN GENERAL ELECTRIC COMPANY LIMITED

For complete details check No. 10 on handy card, page 47

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60

electronics and communications

Canada's pioneer journal in the field of electronics and communications engineering

JULY 1960 Vol. 8, No. 7

contents

departments

COVER STORY

The "parametric amplifiers", called "Paramps" by their developers, Hughes Aircraft Company, shown on our front cover, can increase microwave signals picked up by air traffic control radar antennas in such a way as to double the distance at which multiple planes travelling at jet speeds can be detected.

CRTPB newsletter

Prepared by Canadian Radio Technical Planning Board

Committees reconstituted

CRTPB announces the reconstitution of two new committees, the Maritime Committee and the Land Fixed and Mobile Committee. These were formerly one committee, the Fixed Land and Maritime Mobile Committee.

P. R. G. Cahn of Montreal has accepted the Chairmanship of the Maritime Committee, and W. Ornstein, also of Montreal, former Chairman of the Fixed Land and Maritime Mobile Committee will chair the new Land Fixed and Mobile Committee.

The inaugural meeting of the Land Fixed and Mobile Committee, was held in the Board of Trade Building, Toronto, on June 10. In opening the meeting, the Chairman outlined the terms of reference very fully, pointing out the importance of the work the Committee will have in dealing with draft specifications and other work relating to land fixed and mobile equipment and systems. Considerable discussion ensued and it was agreed that the Committee would meet monthly and that all data relating to the heavy program of work confronting the Committee would be supplied to each member so that there could be preliminary study of the material to allow full discussion at all subsequent meetings.

The Chairman went over draft specifications and other material and the meeting prepared a full agenda for use at subsequent meetings. It is hoped that the procedure agreed upon would make it possible to deal with the volume of work as expeditiously as possible. The meeting was also attended by R. C. Poulter representing the Executive Committee and by Wilbur Smith of the Department of Transport.

Members of the Land Fixed and Mobile Committee are as follows: W. Ornstein, Chairman; N. Redsell; Staff Inspector G. H. Long; J. L. Marshall; T. S. Dutton; E. V. Collier; J. C. Cline; J. W. Ormiston; A. K. Hansen; Lt. Col. J. C. Gornall; S. Bonneville; J. Hurtibise; J. C. D. Mallet-Paret; R. A. Marsh; A. J. Spilsbury; B. R. Tupper; J. Ross.

Members of the Maritime Committee are as follows: P. R. G. Cahn, Chairman; N. Redsell; F. G. Stiles; M. A. Robbins; R. P. Schwalm; W. A. Logan; B. R. Tupper; R. A. Marsh; A. J. Spilsbury; J. Ross.

RSS-134 second draft issued

The second draft of the Department of Transport Radio Standards Specification 134, Issue 1, has been issued to all sponsors. The specification which is entitled "Ship Station A.M. Radiotelephone Transmitters and Receivers Operating In The 1605-5000 Kc/s Band With R.F. Power Outputs Under 15 Watts" combines the two original drafts of Specifications 134 and 135 into one document. The problems concerned with this draft specification will require prompt consideration by the reconstituted Maritime Committee so that CRTPB recommendations can be formally approved and transmitted to Department of Transport as soon as possible.

Canadian railroads frequency assignment plan

The Revised Canadian Railroads Radio Frequency Assignment Plan for 30 Kc narrow band assignments has been issued for information to all contributing sponsors. The Department of Transport has announced acceptance of this Plan subject to some special conditions, particularly co-ordination with FCC.

The Plan incorporated changes required to eliminate minor conflicts between the Canadian and American Railroad Assignment plans. In addition some modifications were made at the request of certain Canadian railways and the plan had their approval. In view of the minor revisions to the then existing plan this revised plan was submitted directly to the Department of Transport by the Railroad, Highway and Transit Utilities Committee with knowledge of the Executive Committee.

Simpson WIDE BAND LABORATORY OSCILLOSCOPE

Model 2610

1958
I. R. E. AWARD

The wide and immediate acceptance of the Model 2610 has provided ample justification for the original techniques adopted in the design of this instrument. Versatility and convenience, allied with precision performance, make this an ideal oscilloscope for general laboratory use.

The vertical deflection system has a sensitivity in excess of 3.3 millivolts r.m.s./cm. and offers a choice of A.C. or D.C. coupling with either a linear response to 6 Mc/s or a suitable roll-off for transient observations; in the latter condition the rise-time is 80 millimicroseconds with overshoot less than 3%. For pulse observation a 0.3 microsecond signal delay can be switched in. Marker signals can be applied via a differential input terminal.

Associated with the vertical deflection system is a unique and permanent internal calibration circuit which, in conjunction with the built-in meter, permits the measurement of waveform amplitudes to an accuracy of 3%.

The horizontal deflection system offers recurrent sweeps from 3 c/s to 500 Kc/s and precalibrated triggered sweeps of 5, 50, 500 and 5,000 microseconds duration; triggering and blanking can be either internal or external or an external time base signal can be applied.

A flat-faced 5" C.R.T. is used and provision is made for camera mounting.

Conservative operation of components, combined with ingenious design, makes it possible to provide this high standard of performance with reliability, and at a remarkably modest cost.

Price, including signal cables, line cord, graticule and filter — $550.00, f.o.b. London, Sales Tax Extra.

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For complete details check No. 8 on handy card, page 47

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SIDNEY, NEW YORK

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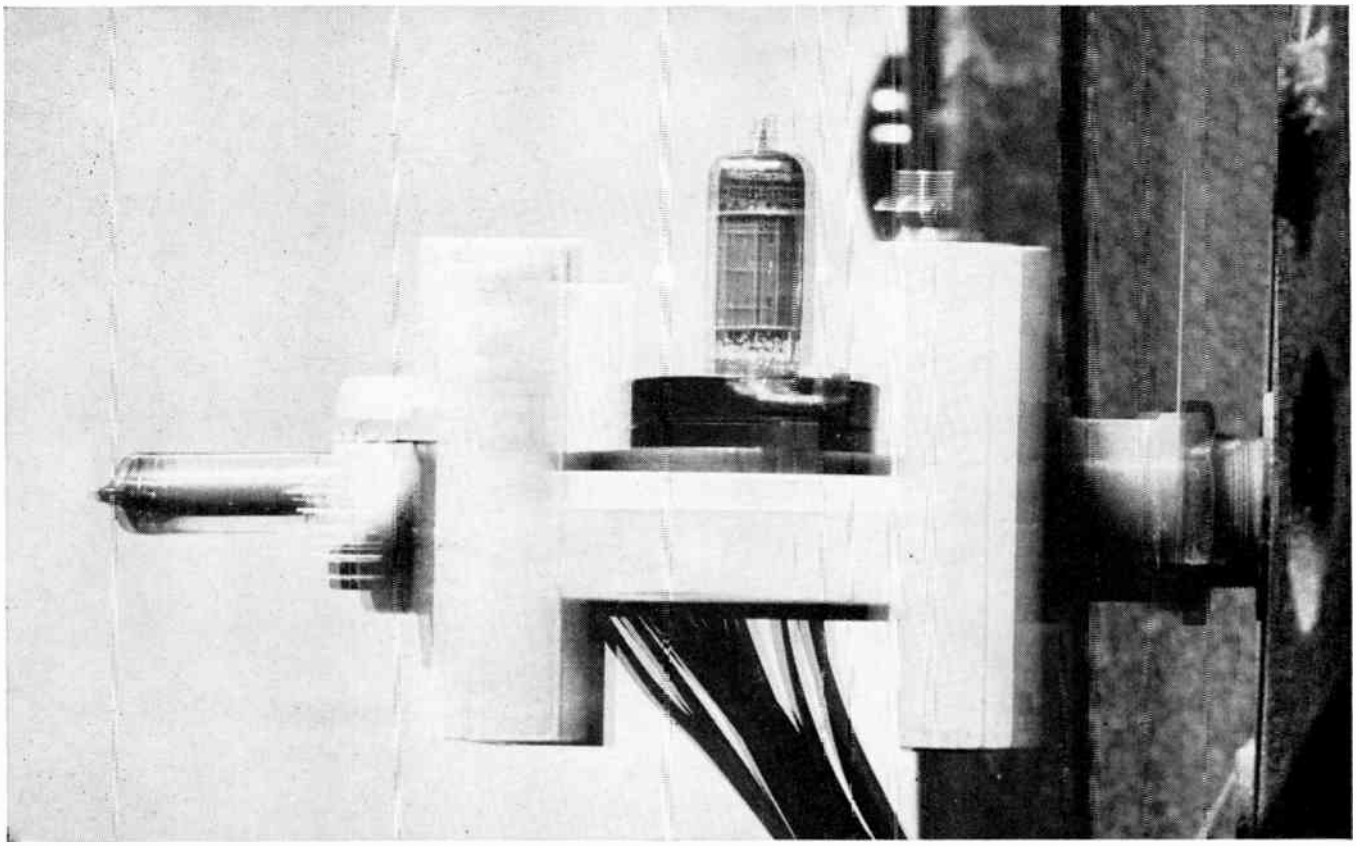
THE Bendix CORPORATION

For complete details check No. 9 on handy card, page 47

VIBRATION



EXTRA SEVERE VIBRATION TEST. In this device daily samples of General Electric 5-Star tubes are given a vibrational acceleration of 2.5 G for 32 hours maximum in each of three different positions. The sinusoidal vibration is applied at a fixed frequency between 25 and 60 cycles per second.

ONE FACTOR IN THE HIGH RELIABILITY OF GENERAL ELECTRIC 5-STAR TUBES

Ensure the dependable operation of your equipment by specifying General Electric 5-Star tubes for all critical sockets. They are specifically designed and ruggedly constructed to resist environmental vibration.

General Electric 5-Star tubes have shorter, sturdier cages . . . double mica spacers . . . welded heater bars and base leads . . . double-staked getters.

High resistance to vibration is only one factor that contributes to the ultra-reliability and long life of General Electric 5-Star tubes. There are many others.

Give your equipment the extra protection of Canadian-made General Electric 5-Star tubes. For full information contact: Electronic Tube Section, Canadian General Electric Co. Ltd., 189 Dufferin Street, Toronto, Ontario.

GE Electronic TUBES

TAD-1795-260

ELECTRONIC TUBE SECTION,
CANADIAN GENERAL ELECTRIC COMPANY LIMITED

For complete details check No. 11 on handy card, page 47

the industry's business

Stuart Brownlee

James Key

31st annual meeting of EIA indicates get tough policy

In his address to the 31st Annual Meeting of the Electronic Industries Association of Canada held at Mont Tremblant Lodge, June 15 to 16, Stuart Brownlee, retiring president of the Association had the following to say:

Distasteful though it might be this morning in this pleasant environment, we cannot truthfully say that "all is well". Defense production sharing has not done for us what we had high hopes of its doing at its inception. It just has not resulted in sufficient contracts. The program has been actively promoted by this association during the past 18 months and I can only urge a vigorous continuation of this program. Through our many presentations and the distribution of a manufacturers' guide outlining company facilities and products, the United States Government agencies and prime contractors now know who the Canadian electronic defense manufacturers are and what they can do. They can more readily recognize these manufacturers for what they are — among the finest in the world! But we must do more. We must be able to say, "Wherever in the world there are electronics, there are Canadian electronic products". I think it safe to say that our industry, big as it is, is only beginning to tap its productive potential. Only in the application of Canada's high degree of technical skill, and in our aggressiveness in pursuing them, will Canada get the fair share of defense production contracts. We must continue to provide the challenging opportunities to keep our research and engineering teams gainfully employed in this country — otherwise we will continue to lose them, and with them will go the assurance of the jobs and wealth which would be the firm foundation for our industry's future. Gentlemen, I cannot stress too strongly the urgent need of getting the most out of defense production sharing. Our electronic defense orders have dropped alarmingly since the present concept was adopted. Where we had an annual volume of $100 million, in 1959 we received an estimated $35 million. Each company interested must make sure it is asking for contracts actively and constantly. Like all selling we must go right to the customer and put forth our best arguments to secure contracts. We must use the advantage of our lower labor rate and we must take full advantage of the ways and means which our government liaison agencies are providing for us to prove conclusively that, not only has Canada's electronic industry got it — we can sell it.

Continued on page 50

James Key named president of EIA

James Key, general manager of Aerovox Canada Limited, Hamilton, was named president of the Electronic Industries Association of Canada. Mr. Key was chosen to lead the 114-company membership at the Association's 31st Annual Meeting held at Mont Tremblant, Quebec.

Born in England in 1915, Mr. Key was educated in the Hamilton area, graduating from the Hamilton Technical Institute and the Central Collegiate Institute. Since joining the Aerovox Company 25 years ago he has held a number of appointments in the production departments, was appointed assistant general manager in 1951 and one year later had earned the position of general manager of the company. He was elected to the board of directors in 1956.

Since 1951, when he was his company's representative to what was then the parts division, Mr. Key has held various important posts in the Association up to first vice-president and chairman of the components division for the 1959-60 term.

Consulting engineers move offices

The firm of Hoyles, Niblock and Associates of North Vancouver, consulting telecommunication engineers and attorneys, announce their recent move to new offices at 1234 Marine Drive, North Vancouver, B.C.

Herbert A. Hoyles, principal of the organization, says that the rapid development of the communications and broadcasting industries in Western Canada has opened many opportunities resulting in new projects, in which his firm has been fortunate in sharing.

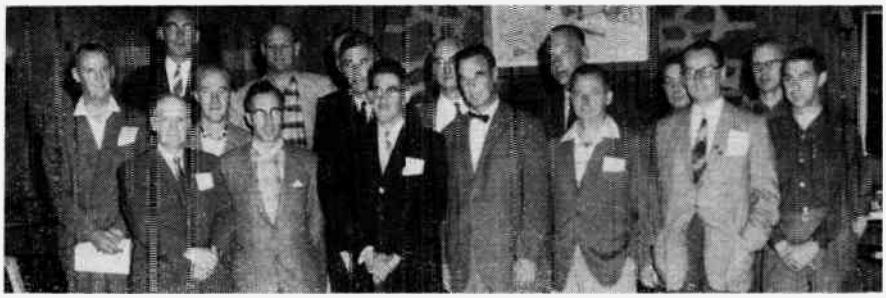
Adams Engineering appointed Canadian reps.

Adams Engineering Limited has been appointed to represent Clevite Transistor Products for transistor and diode manufacturing, according to an announcement by Allen J. Dusault, general sales manager of Clevite Transistor Products.

Adams Engineering has been active in the semiconductor field for the past six years and is headed by Clyde Adams. The organization has offices located at 1500 St. Catherine Street, Montreal, and 1999 Avenue Road, Toronto.

EIA board of directors for 1960-61

Following is the complete board of directors who will guide the destiny of the Electronic Industries Association of Canada for the term 1960-61. The elections and appointments were announced at the Association's annual meeting, held at Mont Tremblant, Quebec, June 16 and 17, 1960: president of EIA and chairman of board — James Key; 1st vice-president and chairman, Electronics Division — J. D. Houlding; vice-president and chairman, Receiver Division — W. F. Wansbrough; vice-president and chairman, Components Division — David Knapp; vice-chairman, Electronics Division — W. S. Kendall; vice-chairman, Receiver Division — R. J. M. Allan; vice-chairman, Components Division — A. J. Bauer; director of engineering — R. A. Hackbusch; honorary legal counsel — C. S. Martin; general manger and secretary — F. W. Radcliffe.



Photographed at the 31st annual meeting of the Electronic Industries Association of Canada held at Mont Tremblant Lodge, Quebec, June 15-17, is the board of directors of the Association. Included in the photograph are: C. S. Martin, W. S. Kendall, R. M. Robinson, J. P. Giacoletto, J. D. Houlding, W. F. Wansbrough, A. J. Bauer, P. J. Heenan, W. E. Curry, F. W. Radcliffe, W. H. Jeffery, J. C. R. Punchard, James Key, David Knapp, D. C. Marrs, W. J. Bushnell, and J. G. Hutchison. On the board of directors of EIA, but absent from the picture, are: D. C. F. van Eendenburg, W. J. Collins, R. W. Cooke, R. J. M. Allan, L. M. Daley, R. A. Hackbusch, M. C. Patterson, D. Lou Harris, C. D. Murdock, and S. M. Finlayson.

At left, Ron Robinson is shown making a presentation to Stuart Brownlee on the occasion of his retirement as president of the Electronic Industries Association of Canada at the Association's 31st annual meeting held at Mont Tremblant, Quebec.

Distributor for Motorola Semiconductor

Motorola Semiconductor Products, Inc. has named Canadian Motorola Electronics, Limited of 105 Bartley Drive, Toronto, Ontario as an industrial distributor for the Dominion of Canada.

CME will stock to service Canadian research and development requirements with immediate delivery. In addition the firm will also handle Canadian OEM requirements for Motorola semiconductors.

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

Standard Wire & Cable opens new plant

Ahead of schedule, the ultra-modern Standard Wire & Cable plant will be completed in July. Located on No. 27 highway, north-west of Toronto on a 14 acre site, the new plant will house the most advanced wire and cable making machinery in the world.

Against stiff competition the company has grown to three times its size in less than two years — currently claims to hold 3 per cent of the Canadian market with present production capacity — and plans to capture over 10 per cent by the end of 1961.

Standard Wire & Cable recently purchased the manufacturing facilities of the Windsor Wire & Fence Co. Ltd. and is now one of the two companies on this continent manufacturing plastic-coated chain-link fencing.

The president of Standard Wire & Cable Ltd. is Edmund S. Rose.

Canadian Goverment policy creating unemployment

See editorial page 56

The following announcement was made during an Electronic Industries Association of Canada Press Conference at the Association's 31st Annual Meeting, Mont Tremblant, Que., June 17, 1960.

The survival of the manufacturing industry, which comprises 45 per cent of the working population of this country today, is being undermined by our government. Foreign imports are being favored by a government policy which is forcing thousands of Canadians out of work.

Electronics, a key industry in Canada's future, both in manufacturing and defense, is being sacrificed because of "subsidized imports".

The electronics industry is essential to the survival of any modern industrial nation. Our Federal Government is neglecting its responsibilities to the most important section of our job producing economy and is rapidly forcing the Canadian electronics industry out of business.

At the present time, electronic tube manufacturing, which is at the heart of the whole electronics industry in Canada, is being systematically destroyed by government discrimination at no benefit to the consumer. This has been drawn to the attention of our government, but despite the urgency of this situation nothing has yet been done to aid the tube manufacturers in Canada.

In addition, the radio receiver manufacturers last year lost over forty-five per cent of their domestic market to foreign imports despite repeated appeals to government for assistance. Again, no action has been taken. Canada is in danger of losing its key electronic industry and unless something is done to effectively curb imports, our government will be directly responsible for increasing unemployment in this industry.

The fine points of marine radar maintenance are discussed with visiting Transport Department officials during the special course held at the departmental Air Services School at Ottawa airport. In the photo are, from left, Cy. Mayo, representing Raytheon of Canada; F. G. Nixon, Director of Telecommunications and Electronics Branch; Sidney Snook, Edward Hanash and S. A. McGowan, students taking the course.

Barry Controls merges with The Wright Line

The board of directors of Barry Controls, Inc. and The Wright Line, Inc. recently voted to recommend to their respective stockholders that there be a merger of the two companies. The consolidated company will be named Barry-Wright Corporation.

The Wright Line, which has one subsidiary — The Wright Line of Canada, Ltd. of Toronto — manufactures accessory and punched card handling equipment for data processing and computer systems.

Barry Controls manufactures shock and vibration isolators and suspension systems for aircraft, missiles, electronic equipment, and industrial machinery.

Eimac announces expansion plans

Announcement of plant expansions in 1960, totalling 83,000 square feet and costing over $1¼ million, was made at the annual stockholders' meeting of Eitel-McCullough, Inc., San Carlos, California, manufacturer of Eimac electron-power tubes.

The new facilities will give Eimac approximately 240,000 square feet in San Carlos in addition to facilities in other U.S. cities.

Industrial Production Show

The third biennial National Industrial Production Show of Canada will be held in the Industry and Coliseum Buildings, Canadian National Exhibition Park, Toronto, from May 8 to 12, 1961.

CGE supplying equipment for CF-104 fighter aircraft

An "extensive program" to provide fire control equipment for the RCAF's new CF-104 fighter aircraft is under way at Canadian General Electric, according to a company announcement.

The firm's Electronic Equipment and Tube department is engaged in a program to produce computer and display sub systems which automatically calculate and display to the pilot necessary data for a successful tactical mission. The project is covered by preproduction engineering and planning contracts from the Department of Defense Production.

The fire control equipment to be produced uses signals from other equipment in the aircraft, including the radar, navigational devices, and air data computer. A capability is provided for analog computation, sighting, and display, using advanced techniques to provide reliable, compact equipment.

I. A. Mayson, manager — Marketing for the firm's electronic operation, said the basic design represents adaptations of advanced fighter-bomber armament equipment developed and manufactured by General Electric in the United States. Up to now, no equipment of this type has been designed and produced in Canada.

Canadian General Electric provided the fire control radar for Canadian-built F-86 Sabre jet fighters now in service in the air forces of Canada, West Germany, South Africa, Greece and Turkey, Mr. Mayson said.

Stark appoints distributors

Stark Electronic Sales Co., of Ajax, Ontario, has announced further distributor appointments for the Stark Gold Brand line of meters.

Distributors for Western Provinces are: Manitoba — Lee Bern & Co., Limited, 347 William Ave., Winnipeg; Saskatchewan — Radio Supply Co., 561 — 2nd Ave. N., Saskatoon; Northern Alberta — Radio Supply Co., 10184 — 104 St., Edmonton; Southern Alberta — Smalley's Radio Ltd., Box 220, 1105 — 7th Ave. W., Calgary; British Columbia — Western Agencies, Ltd., 951 Seymour Street, Vancouver 2.

Atlas Wholesale Radio, 4985 Buchan St., Montreal, Que. will be the Gold Brand distributor for Quebec and the Eastern Provinces.

Marconi to get Montreal TV station

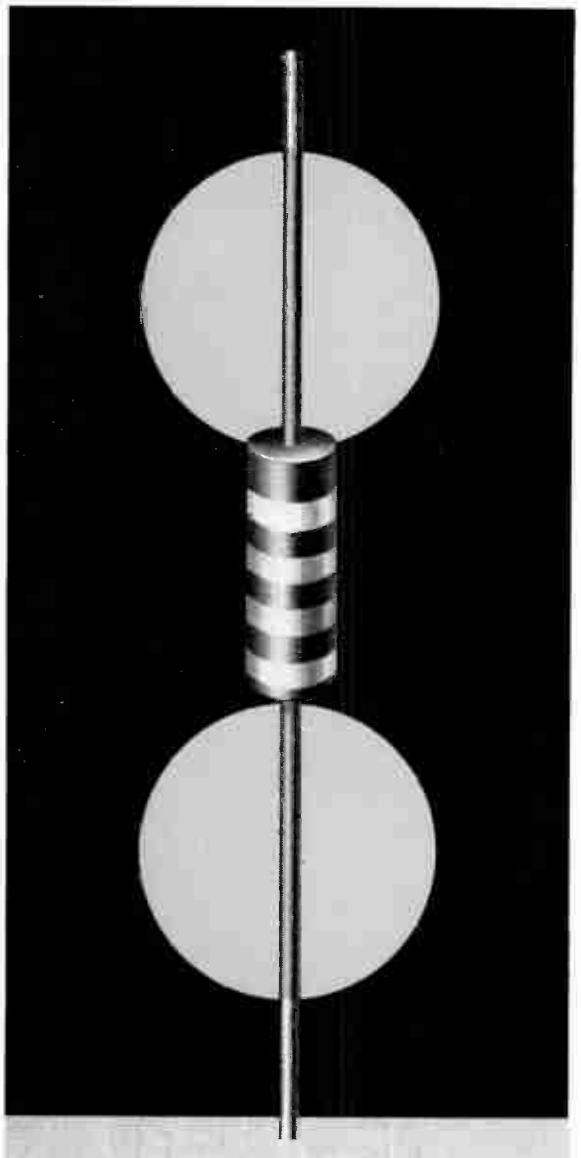
The Board of Broadcast Governors has recommended that a license be granted to Canadian Marconi Company to operate an English-language TV station in the Montreal area.

Commenting on the announcement, Stuart M. Finlayson, president, Canadian Marconi Company, said: "We regard this recommendation as an honor, and fully appreciate the importance of the responsibility entrusted to us." Mr. Finlayson said this marked a milestone in the history of the 58-year-old company, which opened in 1919, and still operates, Canada's oldest radio station — CFCF-Montreal.

The recommendation of the Board of Broadcast Governors must be approved by the Federal Cabinet before a license is issued by the Department of Transport. The new television station will be known as CFCF-TV.

Toronto firm agent for Elmes

Staub and Co., Richterswil, Switzerland have appointed Canadian Research Institute, sole Canadian agent for sales and service on the Elmes electrical recorder. The Elmes, an outstanding example of Swiss instrument precision is available as switchboard and portable recording meters for voltage, wattage, current, speed, temperature, indeed any function which can be reduced to electrical terms. This line will be stocked and serviced by the Criterion Division of Canadian Research Institute in Canada.



Coldite 70+ Resistors Save You Money on Assembly Work!

Stackpole Coldite 70+ resistors solder easier and stay soldered more surely. Thanks to an extra solder coating applied AFTER the usual tin-lead coating, they solder perfectly by ANY method — dip or iron. Moreover, resistance variations from normal soldering heat are negligible.

Get a head-start on production

with "solder-coated" resistors

You can pretty well take for granted that any one of several leading resistor brands will meet or exceed your performance requirements. But there's another factor to be considered too—ease of handling on your assembly lines. Mainly that means ease of soldering — and here Stackpole Coldite 70+ "solder-coated" fixed composition resistors stand head and shoulders above the field. Not only do these famous cold-molded resistors meet today's critical specifications, but they provide unmatched "solderability" on any hand or automatic, open wiring or printed circuit operation. That makes not only for a real saving in assembly work, but also stands to reduce subsequent service costs resulting from poor soldered connections.

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STACKPOLE

Coldite 70®+

FIXED COMPOSITION RESISTORS

CERAMAG® FERROMAGNETIC CORES • SLIDE AND SNAP SWITCHES • VARIABLE COMPOSITION RESISTORS • CERAMAGNET® CERAMIC MAGNETS • FIXED COMPOSITION CAPACITORS • ELECTRICAL CONTACTS • BRUSHES FOR ALL ROTATING ELECTRICAL EQUIPMENT • HUNDREDS OF RELATED CARBON, GRAPHITE, AND METAL POWDER PRODUCTS

For complete details check No. 12 on handy card, page 47

techdata for engineers

Rectifier manual

Item 538

A new design manual for applying silicon controlled rectifiers in electronic and electrical equipment is now available from Canadian General Electric's Electronic Tube Section. The 13-chapter, 255-page Controlled Rectifier Manual was written by five members of the General Electric Company's Semiconductor application engineering organization, who specialize in helping customers use the SCR in circuits. The book contains information on voltage transients in SCR circuits, test circuits, turn-off characteristics of the device and methods, firing characteristics and firing circuits, and series and parallel operation of SCR's.

Canadian General Electric Company, Electronic Tube Section, 189 Dufferin Street, Toronto 3, Ontario.

Winding machines

Item 539

Boesch Manufacturing Company of Danbury, Conn., have issued a new comprehensive catalog on their line of winding machines and accessories for the electronics industry. The 40-page catalog contains complete descriptions and specifications on Boesch toroidal coil winders and bobbin winders.

A copy may be obtained by requesting catalog 60 from **Bayly Engineering Limited, Hunt Street, Ajax, Ont.**

Hermetic seals

Item 540

Dage Catalog 1259 lists basic types of precision hermetic seals which are regularly available for evacuated or pressurized enclosures. Each type of seal is clearly illustrated and listings give complete dimensional specifications. A special section gives latest accepted glass seal nomenclature. To assist the designer who requires custom-made seals, the 28-page catalog also covers general manufacturing techniques and usage recommendations. Dage precision hermetic seals are tested to insure unit integrity with respect to moisture, corrosion, extreme pressures, vibration and rare atmospheres.

Copies of Dage Catalog 1259 may be obtained from Dage representatives or by writing **Dage Electric Company, Inc., Beech Grove, Indiana.**

Relay manual

Item 541

Diaphlex Division, Cook Electric Company, announces the release of a new Relay Manual featuring 30 types of relays (with 1,000 variations), for communications, computers, industry and the military. Using photographs, line drawings, tables and descriptive material, the publication presents detailed data on the many established pile-up relay types, variations in spring arrangement, timing, coil voltage, contact ratings and other useful classifications are outlined.

Manual requests may be sent to **Diaphlex Division, Cook Electric Company, 2700 Southport Ave., Chicago 14, Illinois.**

Telemetering bulletin

Item 542

The Bristol Company has released a new 52-page bulletin, M1715, which describes Bristol Metameter Telemeters. Contents of the bulletin include: principles of operation; types of Bristol Telemeters; application to various measurands, including pressure, water level, temperature, flow, motion, and position; and electrical quantities. Applications in various industries and utilities illustrated include gas distribution and transmission, oil transmission, and water distribution. Computer control, pump control, remote control, selective calling, and Metaphone are also illustrated.

Available on request from **The Bristol Company of Canada Limited, 71-79 Duchess Street, Toronto, Ont.**

Microwave equipment

Item 543

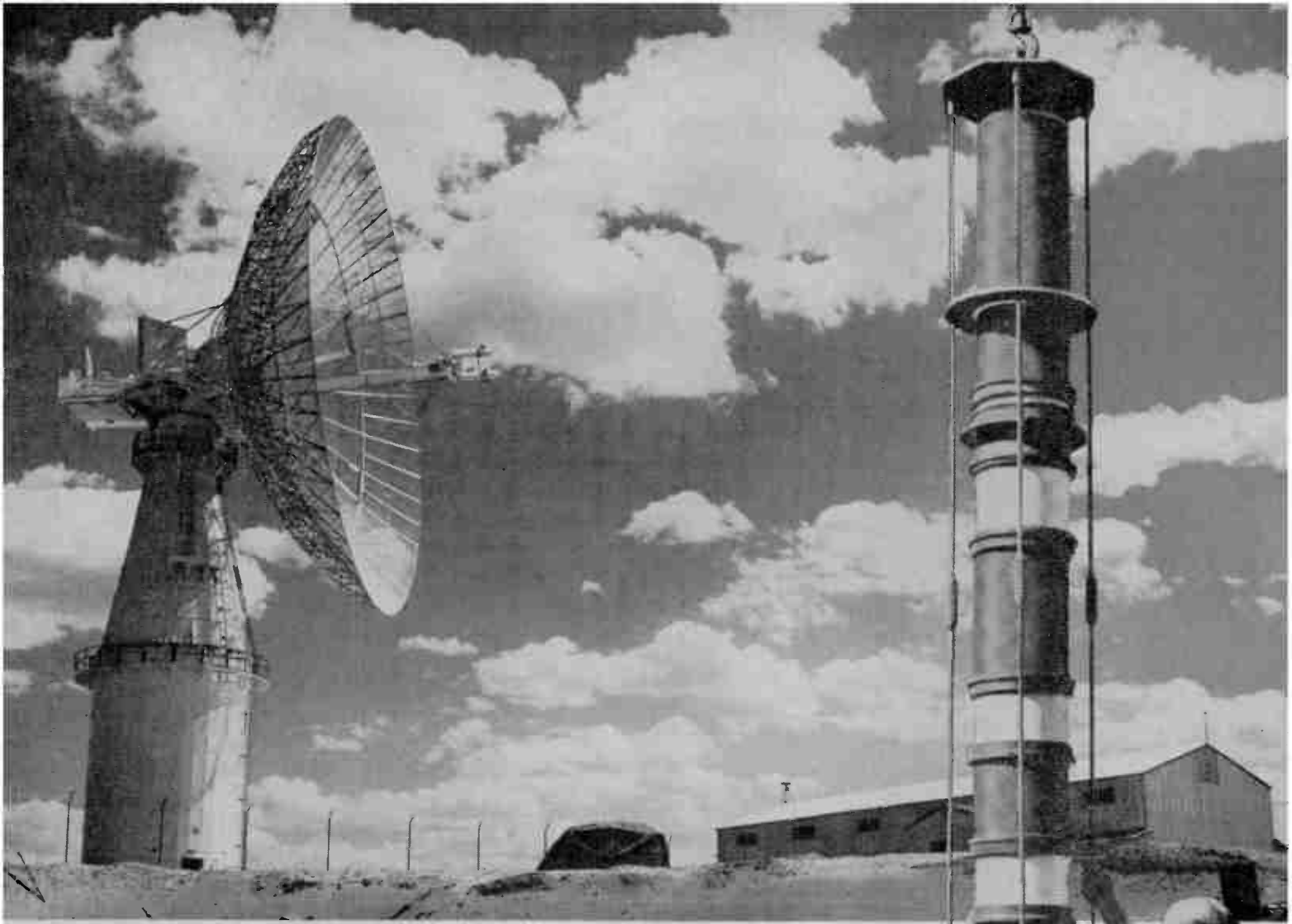
LEL Catalog No. 60 provides 32 pages of information on microwave receiver front ends including data on a number of waveguide and coaxial mixer-amplifier assemblies. Other products described include solid-state, miniature and sub-miniature IF amplifiers, TWT amplifiers, octave RF amplifiers, beacons and AFC units.

Copy of this catalog available upon request to **LEL Inc., 380 Oak Street, Copiague, L.I., N.Y.**

Microwave antennas

Item 544

Andrew Corporation, manufacturer of antenna systems, have issued their new 1960 Microwave Antenna Catalog. This 16 page catalog provides detailed engineering data on 60 antennas covering all current commercial and military microwave frequency ranges. Selected cables, waveguides and anti-icing devices are also offered. Andrew Catalog CM is available upon request by writing **Andrew Antenna Corporation Ltd., 606 Beech St., Whitby, Ont., Canada.**



Site of the Canadian Defence Research Board's Prince Albert Radar Laboratory, Prince Albert, Saskatchewan

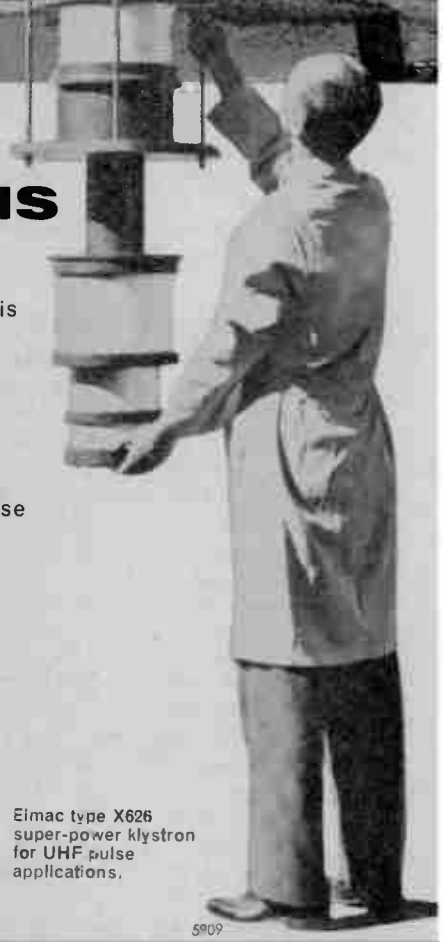
PROBING THE AURORA BOREALIS

Studying the effects of auroral echoes at UHF on radar detection and tracking of satellites and missiles, the Prince Albert Radar Laboratory is playing an important part in the defense of North America.

The Prince Albert radar antenna and some associated equipment, loaned to the Board by the USAF for studies of mutual interest, is similar to the Millstone Hill Radar at Massachussetts Institute of Technology's Lincoln Laboratory which made radar contact with Venus . . . the longest radio contact on record . . . 56,000,000 miles.

Two Giant Eimac type X626 klystrons, rated at 1.25 megawatts long-pulse power are used in the transmitter. These super power klystrons represent the most reliable, reproducible and economical answer to the problems of pulsed super-power UHF.

Wherever high quality amplifier klystrons are required, investigate the incomparable Eimac line. Call or write for information and literature.



Eimac type X626 super-power klystron for UHF pulse applications.

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Eimac first for high power amplifier klystrons

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Vacuum Pumps

Includes the most extensive line of ceramic electron tubes

industry personnel

C. D. Murdock

C. D. Murdock named VP of Radio Condenser

Russell E. Cramer, Jr. has been elected president of the Radio Condenser Company, Ltd., of Toronto, Canada, a wholly-owned subsidiary of Radio Condenser Company, Camden, New Jersey.

At the same time, the board of directors of the Canadian company elected **Clarence D. Murdock** vice-president. Mr. Murdock who is widely known in Canadian electronic circles, joined the firm in 1950 as chief engineer and assistant manager. He became general manager in 1957 and has scored a record of steady growth with 1959 having been the best year in the company's history.

Willer Engineering rep for four U.S. companies

Willer Engineering & Sales Company, of 676 Richmond St. W., Toronto 3, Ontario, has been appointed Canadian representative by the following four U.S. companies in the electronics field: Acromag Inc., Southfield, Mich. (Precision magnetic amplifiers, frequency detectors); ADC. Inc., Minneapolis, Minn. (Precision transformers, filters, reactors, jacks and plugs, jack panels); Mid-Eastern Electronics, Inc., Springfield, N.J. (Transistorized power supplies, ultra-high resistance measuring equipment and standards, meter calibration equipment); Technical Devices Co., Los Angeles, California (Wire-cutting and stripping equipment, component lead-forming equipment, circuit board fixtures).

Announcement of the various appointments was made by **Murray D. Willer,** president of Willer Engineering & Sales Co.

D. G. Paterson

J. W. Barnes

Northern Electric executive wins high honor

The Canadian Association of Purchasing Agents, at its annual meeting recently, conferred its highest honor upon a Montreal business man. **Fred G. Samis,** formerly controller of purchasing, Northern Electric Company Limited, and now marketing manager in the company's sales division, was made a Fellow of the Association for having "distinguished himself by his contribution to business through the field of Purchasing".

Mr. Samis served as president of the Canadian Association of Purchasing Agents during its first year as an independent Canadian organization.

Former Torontonian joins Sperry Rand

Donald G. Paterson has been appointed Applications Engineering Manager of the Sperry Semiconductor Division of Sperry Rand Corporation, South Norwalk, Connecticut.

Mr. Paterson, a native of Toronto, Ontario, joined Sperry Semiconductor earlier this year from Motorola where he was Senior Applications Engineer and Group Leader in the semiconductor products division. He was an electrical engineer with Orenda Engines, Ltd. from 1957 to 1958 and held a similar position with Ferranti Electric Ltd. in 1956.

P. J. Serheniuk service organization

Paul J. Serheniuk, formerly nine years with Canadian General Electric Mobile Equipment, has resigned to form an independent commercial service organization in the Toronto area. Known as Canadian Electronics Service Ltd., this company is primarily devoted to mobile and industrial electronics rentals, installation and service. Shop and testing facilities are located at 1180 Castlefield Avenue, Toronto 19, Ont. Phone: RU. 7-8691.

F. G. Samis

M. D. Willer

J. W. Barnes joins IRC Resistor Division

J. W. Barnes has been appointed chief engineer of the IRC Resistor Division of Renfrew Electric Co. Limited.

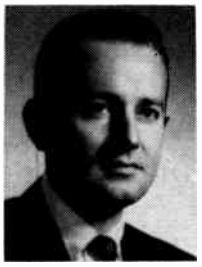
Initially Mr. Barnes is responsible for establishing Canadian manufacturing facilities for molded metal film resistors. Eventually he will assume complete engineering responsibility for the manufacture of IRC Resistor products in Canada.

Prior to joining IRC, Mr. Barnes served as an aeronautical engineering officer with the RCAF Air Defense Command.

R. H. Hogue

H. E. Parkes

J. I. Shalinsky



W. D. West

R. G. Simpson

L. D. Headley

Liaison manager named by Honeywell Controls

The assignment of **R. H. Hogue** as Ottawa technical liaison manager for Military Products has been announced by O. M. Cepella, manager of Service Engineering, Honeywell Controls Limited.

A graduate of the University of Toronto in Mechanical Engineering, Mr. Hogue has had considerable experience in the electronics and avionics fields in Canada. His military background includes service both with the RCAF and the Royal Canadian Electrical and Mechanical Engineers. Prior to joining Honeywell in 1956, he was Inspector of Electronics with the Department of National Defense, Inspection Services. Mr. Hogue's work with Honeywell has included technical liaison on automatic flight control systems.

George Kelk Ltd. sales manager

Appointment of **Herbert E. Parkes** to the position of sales manager of George Kelk Limited, Willowdale, Ontario, has been announced by George F. Kelk, president.

Mr. Parkes, formerly with the Electronic Computer Division of Burroughs has had broad experience in technical sales liaison, engineering writing and industrial electronics. He will be responsible for consolidating the sales and advertising activities of the Kelk organization.

RCA Victor appointments

B. R. Machum, manager of the Technical Products Marketing Division of RCA Victor Company, Ltd., has recently announced the appointment of **W. D. West** as technical representative, special accounts, for the Marketing Division. Mr. Machum also announced the appointment of **J. I. Shalinsky** as technical field sales representative.

Mr. West, who will be located at the company's head office in Montreal, will be responsible for sales of all technical products to non-Defense Government Departments, and other special accounts.

As technical representative, Mr. Shalinsky will be responsible for sales of scientific instruments and industrial electronic products, including electron microscopes, industrial closed-circuit TV and automation, beverage inspection and food handling equipment. He will be located in Montreal and will handle customers' requirements in both Ontario and Quebec.

Pictured in the above photograph at the official opening in Toronto of Ultrasonic Industries (Canada) Ltd. are, left to right: Herbert Frankel, vice-president of Ultrasonic Industries, Inc., Albertson, N.Y.; Dick Richards of Ultrasonic Industries (Canada) Ltd., Toronto; Barbara Jewett, secretary-treasurer, Ultrasonic Industries, Inc., Albertson, N.Y.; Julian Conway, president, Ultrasonic Industries (Canada) Ltd., and Bill Givens, sales manager, Ultrasonic Industries (Canada) Ltd.

Ultrasonics (Canada) Limited to provide specialized service

On Tuesday, June 14, the unveiling took place of the first ultrasonic organization in Canada. This event marked the entrée into the Canadian field of Ultrasonic Industries (Canada) Ltd., at 1512 Eglinton Avenue West, Toronto, Ontario. The company is a Canadian subsidiary of Ultrasonic Industries Inc. of Albertson, L.I., N.Y.

Ultrasonic Industries (Canada) Ltd. is the first company exclusively devoted to ultrasonics to be incorporated in Canada. Initially, the Toronto based company will direct the marketing, distribution and service activities for its parent U.S. company in Canada's rapidly expanding technical economy. The new organization will act as sole sales agent co-ordinating the affairs of diSONtegrator distributors throughout the Dominion now serving the dental, optical, medical, jewelry, electronic and precision instrument industries.

Julian Conway has been elected president of the new company. Other officers and directors are as follows: Paul M. Platzman, chairman of the board; Herbert A. Frankel, vice-president and director; Barbara A. Jewett, secretary-treasurer and director; and Harold S. Remz, director.

Assisting Mr. Conway will be Warren M. Givins, distributor sales manager and Dick Richards, industrial sales manager.

Staff appointments for RCA Victor

G. L. Mansour, vice-president, Consumer Products, RCA Victor Company, Ltd., has announced the appointments of **R. G. Simpson** as his assistant, and **L. D. Headley** as general manager of the Record Division.

Mr. Simpson has been with RCA Victor since 1947, and has had experience in the advertising, organization development and marketing functions of the company. Since 1947 he has been with the Record Division as sales manager, and more recently as general manager.

Mr. Headley was born in England and had wide experience in sales management and public relations before joining RCA Victor in 1939. Since 1956 he has been manager of the company's Custom Record Department, located in Toronto.

Ferritronics' appointment

Bernard Tennent, P.Eng., has joined the firm of Ferritronics Limited, as vice-president and chief engineer, according to a recent announcement by **George G. Armitage,** president of the company.

Mr. Tennent is a graduate of the University of Warsaw and of the first course in the world in electronics — L'Ecole Supérieure d'Electricité in Paris — 1933. He has been involved in the design of filters since graduation and has held patents on crystal filters.

Mr. Tennent worked in France until the Second World War when he left France and joined the Belgian Marconi Company in England. He came to Canada in 1952 and was engaged on the design of military equipment for Philips, where he has remained until his recent appointment with Ferritronics.

Flight Lieutenant Charles Mason, Senior Telecommunications Officer, RCAF, Upland Air Base, Ottawa, Ontario, discusses with F/O Lester Taylor, navigator (center), and F/O Grant Baker, pilot, 428th All-Weather Fighter Squadron, the operating principle of Nixie tube radio channel indicators used by RCAF in the CF-100 jet fighters. Glowing numbers in tubes, designed and built by Burroughs Corporation, enable pilot to change radio frequencies without diverting his attention from the main business of flying.

IBM equipment goes on tour

An IBM 1401 Data Processing System left Montreal on its world tour at the end of May 1960. It was first shown in Toronto, at the Canadian National Business Show, after which it was flown to Rome where it became the feature of an IBM display on June 13. On completion of this exhibition, it began a series of showings all across Europe — Milan, London, Stockholm, Copenhagen, Zurich, Paris, and Amsterdam — until the end of October.

The 1401 is a medium-sized data processing system (costing approximately $400,000 to buy) and was manufactured by International Business Machines in the United States. The first machines are now being produced and are being shipped out to customers. Eventually they will be manufactured in the IBM Don Mills plant.

Ferranti-Packard reservations system

A $3½ million electronic reservations system has been developed by Ferranti-Packard Electric, Ltd., Toronto, for use by Trans Canada Airlines.

A central registry center, itself costing $1½ million, is being built in Toronto, and the company is at work on some $2 million worth of field equipment for the system.

The system is comprised of a number of transactors located in reservations and ticket offices across the airline system and linked by standard telephone-type lines to a central binary computer in Toronto.

This new development will permit TCA reservations and counter agents in the United States or Canada to receive flight information and to confirm bookings in the space of a few seconds.

Commercial jet airline operators purchase Marconi equipment

Canadian Pacific Airlines have decided to purchase the Canadian Marconi Company's Airborne Doppler Navigation aid known as the CMA-623. They have at the same time placed an order for the Navigation Computer which is used in conjunction with the CMA-623 and goes to make up an advanced navigation system for high-speed jet airliners.

It is reported that although the basic system has been adopted by four other major world airlines, this purchase, the fifth, marks the second occasion within a few weeks that a major international airline has decided upon the Canadian Marconi Company's total system, i.e., the sensor and the computer.

Deliveries for the Canadian Pacific Airlines DC-8's are scheduled to begin in August and will consist of twin sensor and computer systems.

B. J. Kaganov takes post with CAE

A recent appointment to the newly created position of executive vice-president of the company was announced by J. F. Tooley, president of Canadian Aviation Electronics Ltd. The new position is held by **Benjamin J. Kaganov,** who was formerly director, Research and Advanced Development, at Canadair Ltd.

Mr. Kaganov, a graduate of Louisiana State University in Aeronautical Engineering and in possession of a Master's Degree from the New York University, has been associated with the aircraft industry for the past twenty years. Prior to joining Canadair in 1950, Mr. Kaganov was a project engineer with the Boeing Airplane Company and the chief aeronautical engineering inspector of Naval Aircraft for the United States Navy, Long Island, New York.

Union of Canada Wire and Western Wire

A joint announcement was recently made by O. W. Titus, president of Canada Wire and Cable Company Limited, and J. E. Termuende, president of Western Wire & Cable Co. Ltd., that negotiations were under way which will result in a union of the two organizations.

It is expected that with the pooling of resources of equipment and experience there will emerge a fully integrated, Canadian-owned wire and cable enterprise, with manufacturing plants in all major market areas from coast to coast.

ANC system for B.C. Telephone Co.

The British Columbia Telephone Company has announced it will use all-numeral telephone numbers in places scheduled for dial telephone service in the future.

A company spokesman said the new system, known as ANC — All Number Calling — using seven-digit numbers, will be introduced this year in Sooke, near Victoria; Whonnock in the Fraser Valley, and Gibsons and Sechelt near Vancouver. Next year Kamloops, Trail and Merritt in the interior of the province, which are scheduled for conversion to automatic service, will also have the seven-digit system.

briefing the industry

■ A $4 million contract for a turbo-generator to be installed in the Douglas Point nuclear electric plant near Kincardine, Ontario, has been awarded by Atomic Energy of Canada Ltd. to Associated Electric Industries (Canada). A portion of the work on the 200,000-kw unit will be carried out at the Peterborough plant of Canadian General Electric Company Ltd.

■ Canada's second nuclear research center will be located on 11,000 acres of land some sixty miles east-north-east of Winnipeg, Manitoba. The new center, to be known as the Whiteshell Nuclear Research Establishment, will begin as a small unit, to be expanded as requirements warrant and it may ultimately grow to a size comparable with that of the Chalk River atomic plant.

■ Addressing members of Toronto Rotary Club recently, John D. Campbell of Hamilton, executive vice-president of Canadian Westinghouse Company Limited, pointed out that secondary manufacturing had become the most dynamic element in Canada's economy. He said: "Any check on the development of secondary manufacturing in Canada, at a time when we have half a million people unemployed and a serious adverse trade balance abroad, would automatically worsen the present unemployment problem and have a deleterious effect on the Canadian economy."

■ The importance of high reliability in the structure and maintenance of space vehicles and missiles was pointed out by Chester I. Soucy, aeronautical engineering expert attached to Air Materiel Command, RCAF, Ottawa, in a recent address before the Canadian Aeronautical Institute. Mr. Soucy contended that, in missiles, 60 to 80 per cent of failures are attributable to mechanical elements. He stressed the need for provision of technical reliability specialists to ensure future reliability and dependability in military electronic equipment.

■ The 56th annual report of Canadian Westinghouse Company Limited reveals that sales of the company's products in 1959 totalled $134,303,663, a four per cent decline from $139,408,471 in the previous year and eleven per cent off the 1957 record high of $150,182,572. In the consumer products field, including all types of television, radios, lamps and other household items, 1959 sales exceeded 1958 and 1957 levels. In the last quarter of 1959 the company's Electronics Division was awarded a major contract for production of the fire control system for the RCAF's CF-104 interceptor aircraft.

■ Closed-circuit television as an educational tool took another giant step forward recently when students at the Faculty of Dentistry of the University of Toronto began watching TV as a part of their curriculum. Officials at the school had studied for years the effect of supplementing regular teaching methods with closed circuit instruction in dentistry and other educational fields. Convinced that it definitely had something to offer, they committed themselves to it last year (1959).

■ The University of British Columbia is planning the establishment of a communications research center in 1961 through a $300,000 memorial fund pledged by the Canadian Association of Broadcasters. The fund will be budgeted and spread evenly over the next five years. Communications research to be conducted at the new center will include all mass media, including newspapers, radio, television and advertising.

■ The Northern Telephone Company, the largest independent telephone operating company in Ontario, will spend some $1¼ million during 1960. For the past few years Northern Telephone Company has spent more than $2 million annually on its expansion program.

The Canadian Radio Technical Planning Board consists of twelve standing technical committees, an amortization committee, West Coast panel, and executive committee. Pictured above are some of the members of the Tropospheric Scatter Committee at work in Toronto.

GOVERNMENT

Let's take a look at the Canadian Radio Technical Planning Board

A spectacular example of co-operation between industry and government — over 200 electronics engineers serve on the Board's committees and panels

by R. C. Poulter, P.Eng., Associate Editor

The growth in the application of radio in Canada in recent years has been little short of phenomenal as might be expected in a country of such vast area. The need for reliable communications between expanding centers of population scattered, often at great distances, along a 3000 mile border, as well as to points extending northward to within a few hundred miles of the Pole, is obviously of prime importance.

However, the rapid expansion of communication services and the continual introduction of new and complex equipment and techniques has introduced a serious problem in finding adequate spectrum space, so as to avoid chaotic interference situations. It is a problem which can hardly be expected to diminish to any extent in the foreseeable future.

It is therefore necessary first of all to ensure efficient management of the radio spectrum including the effective allocation of frequencies and the establishment and enforcement of technical standards for equipment, having in mind local, national and international requirements since radio waves do not conveniently stop at boundaries between districts or countries.

In the communications field there are three major interested groups. One consists of the users of the equipment or systems who expect reliable, interference-free service, as well as the opportunity to expand their systems from time to time.

The second is comprised of manufacturers who must always keep costs uppermost in mind; unrealistically stringent technical requirements might conceivably force them into untenable competitive situations.

The third is the regulating body. The promulgation of suitable regulations and their enforcement under The Radio Act is the prerogative of the Telecommunications and Electronics Branch of the Department of Transport and it is to the credit of the Department that this difficult task has been performed with high technical skill, discretion and fairness.

But the users and manufacturers, the former particularly, are large in number, and their problems differ widely requiring unending engineering and economic studies and a keen realization of the absolute necessity of insuring adequate spectrum conservation and maximum freedom from interference.

In 1944 it became apparent that the many prob-

lems created by the increasing complexity of equipment and systems which utilize or affect the radio spectrum required a special organization in order that the whole field of frequency allocation and conservation, equipment specifications, interference and related subjects might be studied objectively. It was felt that such an organization could make it possible for government and non-government interests to co-operate to their mutual benefit having in mind at all times that the radio spectrum is in the public domain, that the rights of all Canadians must be protected, and that international treaties and agreements must always be respected.

The Canadian Radio Technical Planning Board was therefore organized to meet this urgent need and to provide a forum where common problems could be discussed, studied and resolved. The Board was formed in September 1944 at a meeting convened by the Telecommunications Branch of the Department of Transport as a non-political, non-profit organization of users of radio communications and certain allied equipment, manufacturers, engineering and education societies and other interested associations and organizations.

The Board had not been in existence very long before it was realized that it constituted an unparalleled example of how the engineering profession, industry and government can co-operate in solving important mutual problems. Some idea of the magnitude of the Board's work will be seen in the fact that there are now twelve standing technical committees functioning on a regular basis in addition to an amortization committee, a West Coast panel and of course the executive committee, the total number of professional engineers serving on these committees being nearly two hundred. In addition ad hoc committees are set up from time to time to deal with special short-term problems.

Sometimes these problems affect several fields but through the Board's technical co-ordination, joint action can be taken as required.

Here therefore is a large organization composed of highly competent technical specialists devoting their time and talents to problems which are common to their respective fields. The cost of such specialized engineering services to individual users, manufacturers and other interests would be enormous. But these experts all serve without remuneration of any sort other than the satisfaction of doing the job well. The Department of Transport, too, benefits not only in being able to obtain the opinions of these engineers but in saving countless hours of valuable time. The heavy work load under which the Department operates would undoubtedly be increased if it had to deal in all instances with the briefs and petitions of users and manufacturers on an individual basis.

Problems assigned by Board

In actual practice the CRTPB committees deal with problems assigned to them by the Board. These may require studies, investigations, recommendations or specifications as required, based on suggestions from sponsor organizations, the Government or from other groups interested in the use of radio in Canada. The Board itself is made up of accredited representatives of the sponsors, the chairmen of the various technical and other committees and panels, and the officers.

Committee reports are presented to the Board for consideration and subsequent action. Mainly, the reports have to do with equipment specifications for various services utilizing the spectrum, but amortization periods and effective dates, frequency allocations, interference, procedures, all come within the scope of the Board's work, as well as the study of newly contemplated or existing techniques. The problems involve all classes of electronic communications equipment and systems as well as industrial, scientific and other apparatus employing radio principles and utilizing the spectrum or capable of interfering with its effective use. In actual practice, preliminary specifications drawn by the Department of Transport's engineers are referred to the Board for study. On the basis of the Board's recommendations as to technical factors and amortization periods the Department makes whatever revisions are deemed advisable after which the Specifications are promulgated and an effective date established. In a sense, therefore, the Board is a technical advisory body to the Telecommunications and Electronic Branch of the Department of Transport and its work is of major importance, possessing incalculable value to the Canadian economy.

It is not possible to list here the hundreds of problems dealt with by the Board during its sixteen years of operation. A few typical examples will however, serve to illustrate the nature of the work as follows:

1. The almost incredible increase in the demand for spectrum space has made it necessary for the government to review the assignment of frequencies in the 152-174 megacycle land mobile services. In this band of frequencies, 60 kilocycles spacing was employed. The demand for assignments in this field has however increased out of all proportion to the space available but since the design of land mobile equipment has now progressed to the point where 30 kc spacing is practical, with consequent doubling of spectrum space, the Department (and the FCC in the United States) have considered it desirable to take full advantage of this technological development, having in mind the special requirements on both sides of the Canada-U.S. border. The problems of both users and manufacturers in such a move have however required intensive study. How can the much more rigid technical specifications best be met with reasonable economy? What, for example, about the increased difficulty of maintaining adequate frequency stability in the field? What hardship would result from the enforcement of such specifications where users have perhaps recently purchased 60 kc equipment? What length of amortization period should the user be allowed and what then should be the effective date?

The problem has been investigated and the Department of Transport will extend the split channel Specifications 126-127 which are now applicable to land mobile equipment operating in the 150.8 - 152 mc. band, to apply to such equipment operating in the 152 - 174 mc. band on a progressive basis, starting with frequency congested areas. On and after April 1, 1960 these specifications will therefore apply to new 152 - 174 mc. land mobile systems located within certain specified areas.

2. Another example of the Board's work consisted of a thorough investigation made by the Amortization Committee of a suitable amortization period for non-type approved equipment falling within the scope of Radio Standard Specification 112. In this case the Committee recommended a period of seven years effective from the provisional effective date of the Specification (April 1, 1958), with a further recommendation to DOT that it extend this amortization

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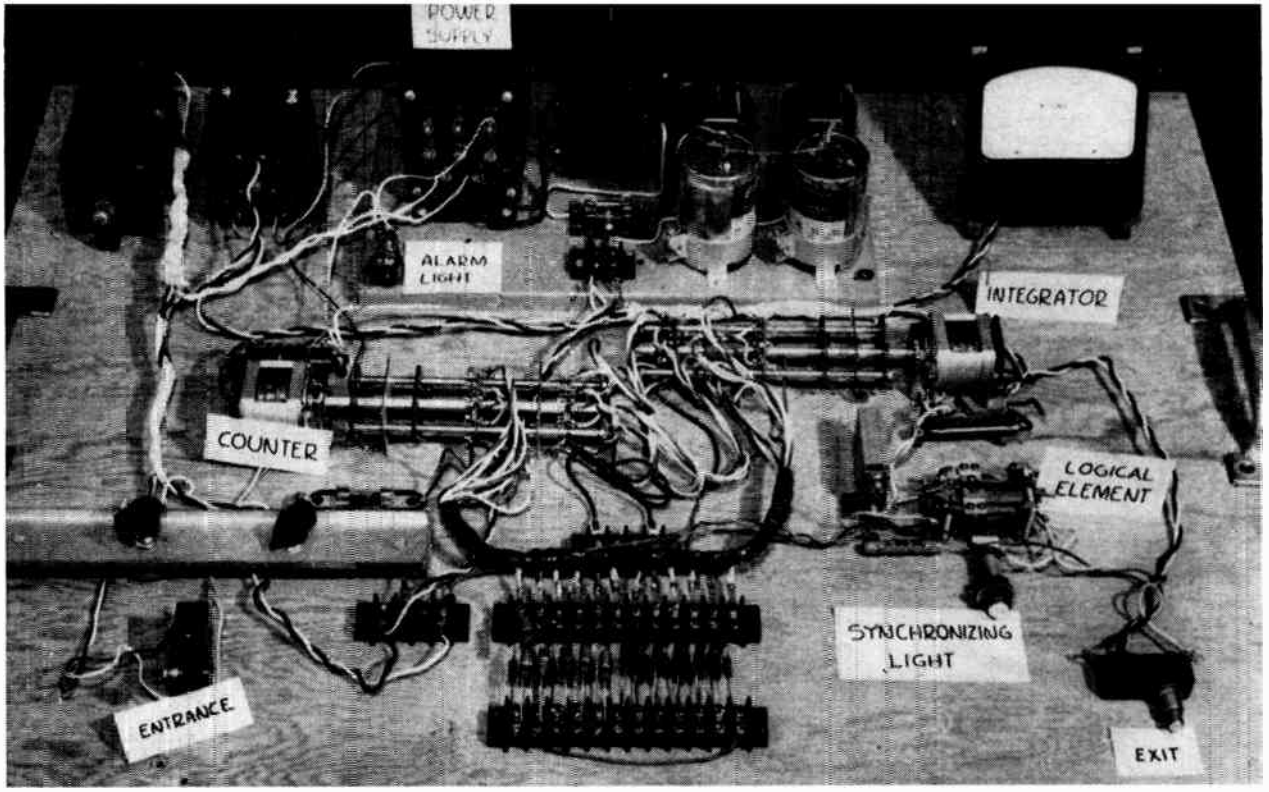


Figure 1 — Breadboard model of experimental computer

COMPUTER APPLICATION

Simple relay computer handles B.C. tunnel traffic problems with ease

Contrary to general belief computers need not be "exotic" nor expensive to fulfill functional tasks

by Karl Haselsteiner, P.Eng.*

Complex circuitry, high price and fabulous speed are commonly associated with computers. Thrilled by microseconds, high speed memory, delay lines. transistorized function generators, dividing net work, flip-flop circuits, etc., one has almost forgotten that the ancestor of the computer of today was a simple relay device, inexpensive and admittedly not too speedy. But speed is not always required to this extent and reliability of the equipment, besides its low cost, will compensate for a lot of it. Such a simple computer is described here, which, for this particular application, could not be out-performed by any one existing computing device.

The problem in general

To integrate events against time and/or unit counts into rate does not seem to be too big a problem. But it is a problem when you try to integrate counts and want a continuous indication of rate or percentage. To bring one or more events into the proper relationship to time is not too difficult. The difficulty arises when you try to do it in any one instant for the total time of observation. Here the answer seems to point exclusively to the electronic computer; it alone being able, in almost infinitesimal steps, to record and integrate the event and to come forth with an endless stream of answers, which, due to the density of information produced, seems to be continuous. But is continuity necessary? Not at all. Since Planck, the term continuity has become dubious and the question arises, what elements in time and space provide for sufficient information to fake — for our unreliable senses — a continuous sensation? While 24 frames per second in the moving picture suffice, the related televised picture requires more than 6×10^6 informations per second.

This large difference in the number of "bits" required to give seemingly identical results, tends to indicate that the number of informations necessary depends on the transmitting medium. It does, but on the other hand. the number of informations required can be drastically reduced by the use of "memory". If we can recall what information we received a moment ago we do not need the repetition of another identical information. As a matter of fact, we are only interested when some new information, different from the previous one, is available. In a very general way it can be said:

$$\Sigma_I = B + \Sigma E \quad . \quad . \quad . \quad . \quad . \quad . \quad . \quad (1)$$

where Σ_I is the required total of informations, B the

At the time of writing this article Mr. Haselsteiner was associated with the Foundation of Canada Engineering Corporation and Christiani and Nielsen of Canada Limited.

basic information or starting point, with a numerical value of 1 and ΣE the number of events; E being large compared to 1, the accuracy is not much affected by simplifying the formula

$$\Sigma_I = \Sigma E \quad . \quad . \quad . \quad . \quad . \quad . \quad . \quad . \quad . \quad . \quad . \quad (2)$$

Fortunately, there is an endless variety of industrial applications requiring the counting and integrating of physical objects, which by virtue of existing in space, allow for recording in time. For this type of operation no attack and recovery time in the order of microseconds is required and the time lag between input and output can reasonably be neglected as long as a ratio of 1 : 10 in favor of the computer in regard to the interpreting medium (the human observer or servomechanism) is maintained.

Having determined that features such as the speed of lightning, short attack and recovery time and a minimum time lag available only with electronic computers, are not required for many applications, the time seems ripe to look for other computing devices of a much simpler nature.

These devices exist, and the speedometer on your car is one "integral computer", although hardly recognized as such. Another such device is a mechanical continuous rate computer called "Unilog". As can be seen from Figure 2, this ingenuous innovation uses two rotating discs in such a way that the rim of one contacts the face of the other. While one disc is positioned by a threaded shaft, with a predetermined degree of angular rotation corresponding to each event, the other disc is the time base, or distance, or total units.

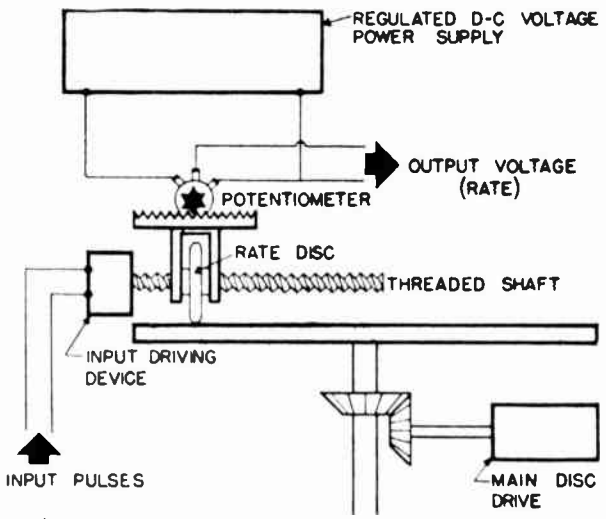


Figure 2 — Continuous mechanical rate computer.

One possible application

To count the number of cars for instance going through a tunnel and to integrate the results against time in order to obtain a more suitable unit — namely, cars per hour, the author undertook to design a highly

Continued on page 42

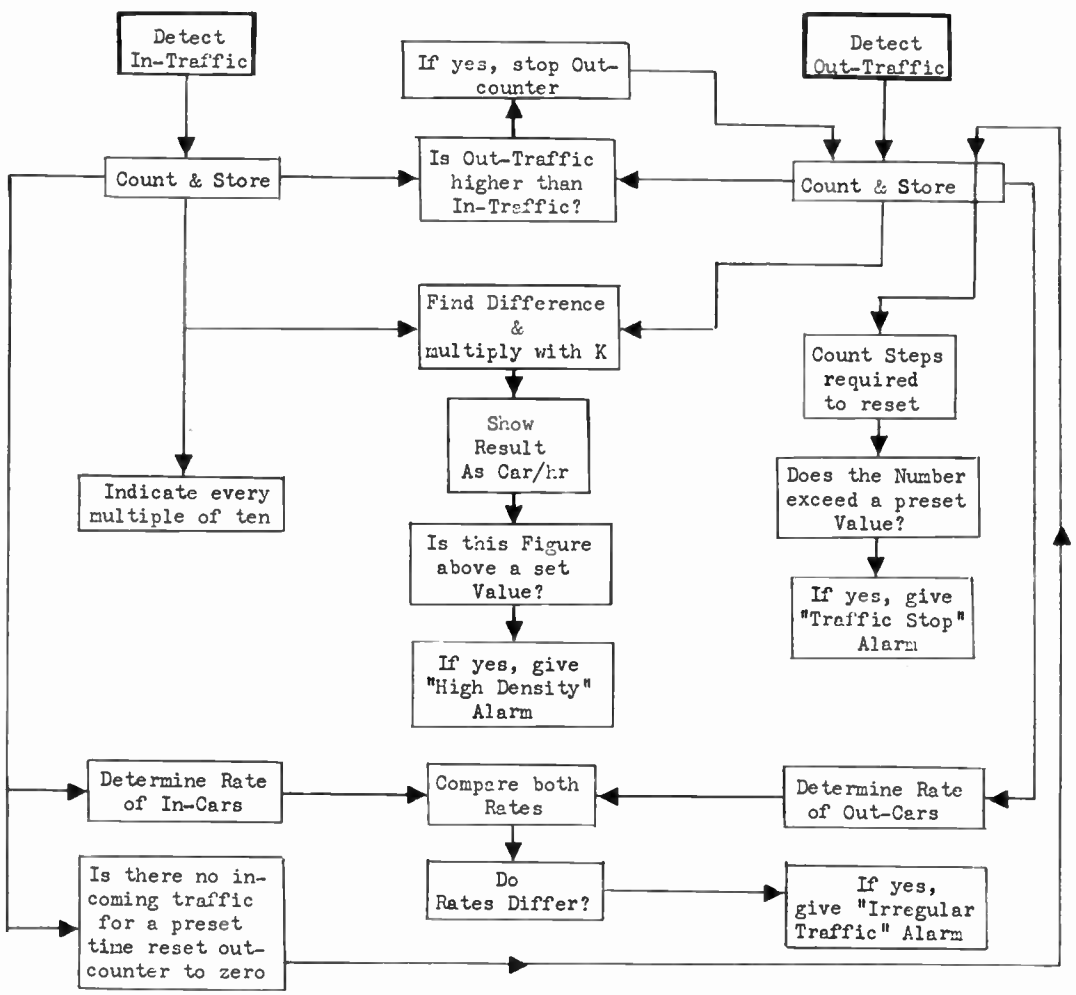


Figure 3 — Block diagram showing general logic of the relay computer.

Overall view of the laboratory facilities of Needco Cooling Semiconductors Ltd., 5701 Cote St. Paul Road, Montreal, Que.

RESEARCH

Review and forecast of tellurium and thermoelectricity research in Canada

Recent research into thermoelectric alloys has provided many significant electronic applications

by S. R. Mester, P.Eng.*

To trace the history of Tellurium one has to go back as far as 1782 when Muller von Reichenstein suspected the presence of a new metal in an auriferous mineral from the Mariahilf mine near Zalethna, in the Fatzburg Mountains of Transylvania. Tellurium was isolated from this mineral by Kitaibel in 1789, and in 1798 the existence of the new element was confirmed by Klaproth, who gave it the name of Tellurium from the Latin word tellus, the earth.

To trace the beginning of thermoelectricity one has to go back as far as 1821 when Seebeck reported that he obtained a potential difference by heating the junction between two dissimilar conductors. Although Seebeck did not understand fully the meaning of his results he was able to arrange his conductors in more or less the thermoelectric series which is recognized today.

In 1834 Peltier discovered that when a current is passed through a junction between two different conductors there is an absorption or generation of heat, depending on the direction of the current. This effect is superimposed upon but quite distinct from the Joule resistant heating effect. In 1838 Lenz demonstrated the true nature of Peltier's observations by freezing a drop of water at a bismuth-antimony junction when the current was passed through it. On reversing the current the ice was melted.

Although the discovery of Tellurium and first observations of thermoelectric effects took place over a century ago, little progress was made in the utilization of Tellurium and very little use was made of the thermoelectric effects.

The principal uses of Tellurium up to the present time were in the manufacture of alloys such as Tellurium lead, stainless steel, Tellurium copper and Tellurium bronzes, and in the rubber industry as a vulcanizing agent. Minor uses were as an additive and a core wash to reduce chill in manufacturing iron castings and as a coloring agent in the manufacture of art glass and ceramics.

The only devices until the past few years utilizing thermoelectric effects were metallic thermocouples for the measurement of temperature and thermopiles for deduction of radiant energy. Both utilized the Seebeck effect.

In the past few years substantial progress has been made in the field of thermoelectricity. Very important contributions were made in the theory as well as in the development of thermoelectric materials. The main drawback that kept the utilization of thermoelectric effects in the fields of refrigeration and generation was extremely low efficiency of materials used. Thermoelectric research carried on in various countries has pointed to the fact that the highest values of figure of merit Z lie in semiconductor materials. To appreciate recent improvements in thermoelectric materials one has to compare the value of Z of about $.01 \times 10^{-3} \times {}^{\circ}K^{-1}$ for a chromel-constantan couple such as used in the measurement of temperature, to the values of Z in the order of $3.0 \times 10^{-3} \times {}^{\circ}K^{-1}$ obtained for Needco's thermoelectric couples. Tellurium, due to its high thermoelectric power, has become the most important

*Sales Manager, Needco Cooling Semiconductors Ltd., Montreal, Canada.

thermoelectric material today. As such one of the most important uses of Tellurium will be in manufacturing of thermoelectric materials.

Various Tellurium grades are available at present from different manufacturers, depending on the intended use of the material. All of the grades contain a certain amount of metallic impurities which are undesirable in the thermoelectric applications. Even in the highest purity Tellurium grade (commercially available today) traces of these impurities still exist.

Unavailability on the market of special thermoelectric grade of Tellurium has created a gap in the thermoelectric industry. As a result Needco Group of Companies, being a manufacturer of thermoelectric materials and devices, has decided upon refining for its own use a special thermoelectric grade of Tellurium which lacks the above-mentioned undesirable impurities. Needco Group of Companies has further decided to make available to other manufacturers this special thermoelectric grade of Tellurium. This grade of Tellurium passes through the most rigid control analysis in the company's analytical laboratories and therefore eliminates the necessity for expensive chemical analysis by the user. Even if the user has all the necessary equipment and established methods for analysis — it is not the question of how much of the impurities are removed — but rather which ones have to be removed and which to be retained to make better thermoelectric grade of Tellurium. List of possibilities is almost endless — but the search is not a blind one and certain rules make it possible to predict results.

Thermoelectric alloys

Recent developments in thermoelectric research have produced alloys which make direct conversion of thermal energy into electrical energy economically feasible, even in the domestic refrigeration and air conditioning fields. Thermoelectric power generation is also becoming an economic reality. This is especially true in small power packages. The main advantages of thermoelectric devices are compact design, and silent, maintenance-free operation.

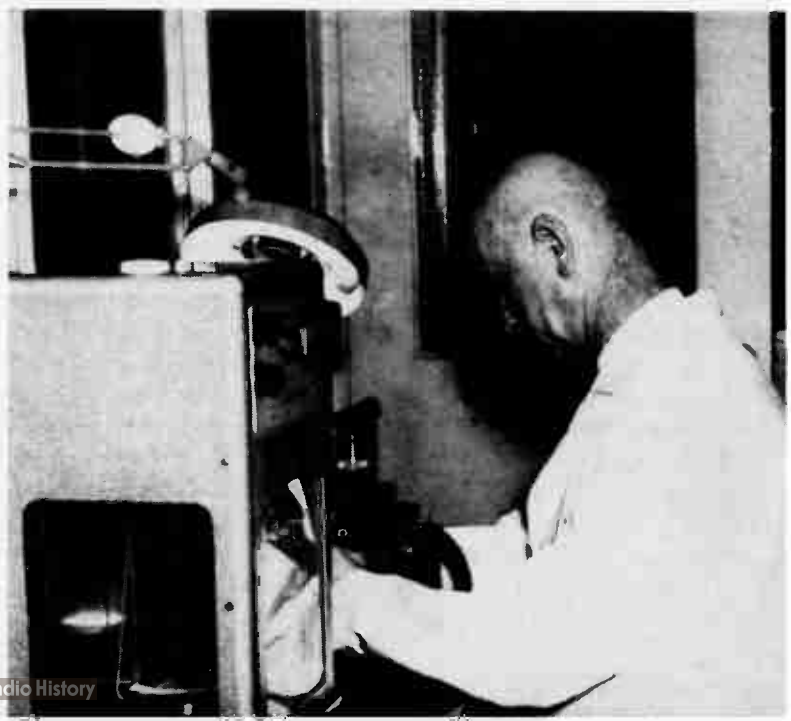
Post-war research in the thermoelectric semiconductor field has produced bismuth telluride and bismuth couples. These couples were able to give a maximum temperature differential of 26°C. Later developments in this field produced a thermocouple which attained a 40°C temperature differential. This was done by replacing the bismuth leg of the above-mentioned thermocouple with the N type of bismuth telluride, thus producing an N type and P type bismuth telluride couple. However, it was established that 40°C is a theoretical limit of maximum temperature differential that can be attained by the binary system i.e. system that has two elements.

Several interesting binary systems were investigated in the past few years. Among them cadmium telluride was found to be potentially useful for very high temperature rectifiers, solar batteries and infra-red optical system applications. Another interesting binary system was copper telluride which had a large abrupt change in conductivity occurring at about 270°C as a result of change in crystal structure. This property may possibly be exploited in certain switching devices.

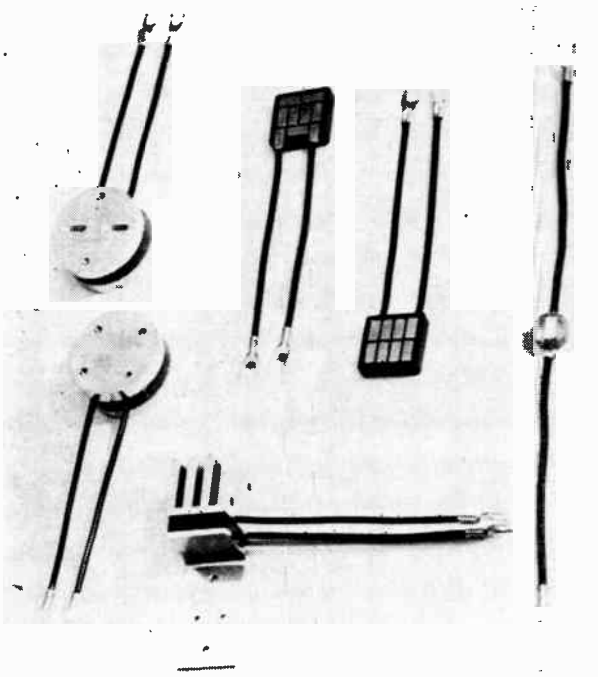
In order to get greater temperature differences it became necessary to develop other combinations. Since the electrical properties of a semiconductor can be controlled over wide limits by variation of the density of free electrons or holes which is done by adding to the pure material minute quantities of foreign atoms or molecules, the search for better combinations led initially into ternary systems and finally into quaternary systems.

In the ternary systems (i.e. system that has 3 elements) the most promising one under investigation was silver — antimony — telluride.

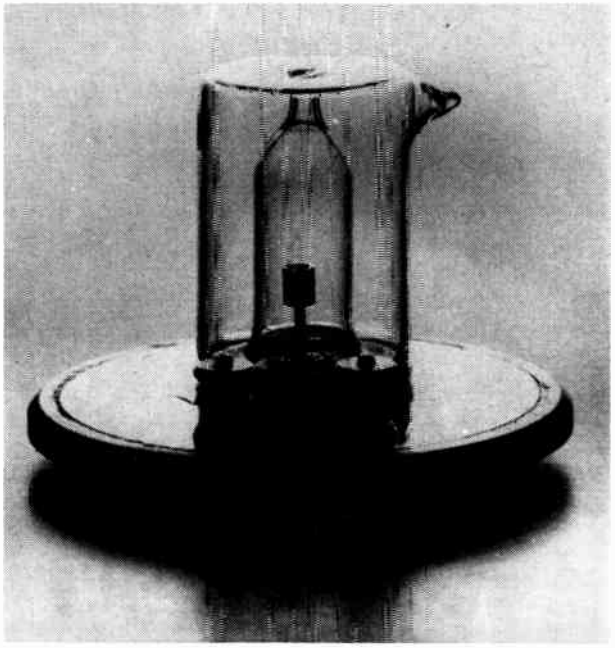
Needco scientists have now developed a quaternary system which is superior to other thermoelectric systems available. This system is a solid solution of bismuth, tellurium, selenium and antimony. The proper doping



Top right. C. A. A. MacPhee, Solid State Physicist and head of the laboratories in Montreal, examining a Neelium block. Lower right. Dr. Keil — at work in his chemical laboratory.



Top — Frigistor F1 (single couple); Left — 2 Frigistors F8 (8 couple modules); Right — Frigistor F8S (transistor cooler with heat sink and Cold Fin L type); Bottom — transistor coolers to be attached to chassis directly.



0°C reference junction — this device will maintain temperature at 0° level with the help of a Frigistor and will be used in calibration of thermocouples.

of this solution produces N and P type alloys which form the legs of thermoelectric couples. This quaternary system is called Neelium.

Thermoelectric devices

Needco has designed a wide variety of thermoelectric devices utilizing its thermoelectric elements manufactured from Neelium.

Some of the thermoelectric devices manufactured include: transistor coolers, electronic thermostats, quartz crystal coolers, O C reference junction for calibration of thermocouples, cold trap and baffle valves for high vacuum systems, dew point hygrometers, photomultiplier coolers, coolers for ferrite memory cores in the computers, water distillation units.

Transistor coolers

Most of the semiconductor properties which determine the parameters of a transistor are to some extent temperature dependent. The most noticeable effect is the increase in the concentration of free electrons and holes due to excitation across the forbidden gap if the temperature is raised. This leads to an increase in the collector leakage (back) current which affects the bias conditions and can alter the gain.

Silicon devices may be used at higher temperatures than those made from germanium, but from other points of view silicon is inferior. Its higher melting point makes the manufacture of transistors more difficult. A more important factor is the lower mobility for both electrons and holes in silicon as compared with germanium. This tends to reduce the maximum operating frequency for a transistor and its current gain. It may be concluded that at present for use at the highest frequencies and at temperatures above 100°C it might be preferable to refrigerate germanium transistors rather than to employ those made from silicon.

At the moment the use of any transistor above 200°C is only possible if refrigeration is provided. Cooling of transistors by conventional form of refrigeration presents several problems. Probably the most important one is the extremely low coefficient of performance when very small quantities of heat at the rate of perhaps 1 or 2 watts have to be removed from transistors. The great advantage of thermoelectric cooling is that its coefficient of performance is more or less independent of the cooling capacity. Moreover, thermoelectric cooling has no moving parts and therefore presents no maintenance problems. Bulky refrigeration equipment of the conventional systems is replaced by very small compact cooling blocks of thermoelectric material. (Neelium blocks are 4 x 4 x 4 mm.).

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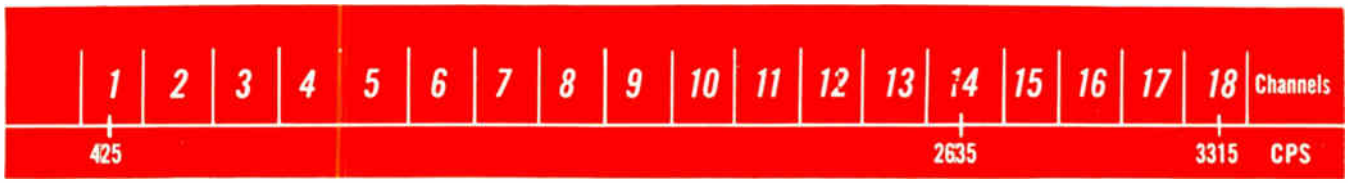
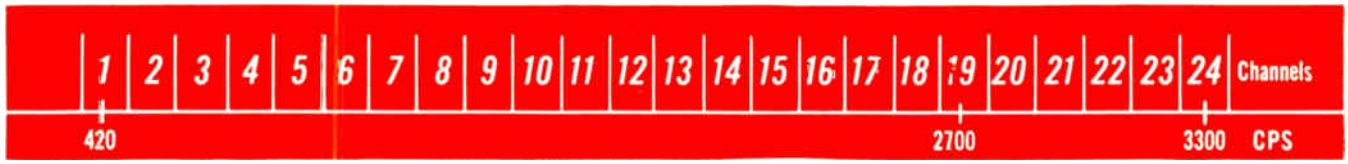


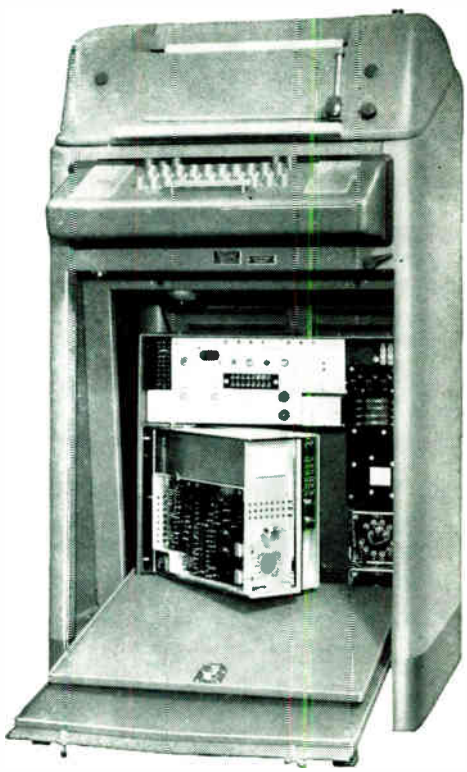
170 CPS CHANNEL SPACING



120 CPS CHANNEL SPACING

MAXIMUM SPECTRUM UTILIZATION

WITH Lenkurt 23A FM TELEGRAPH CARRIER



Type 2340A Subscriber Set mounted in the knee-well of a Model 28 Teletypewriter

A new version of Lenkurt 23A FM Telegraph Carrier, the 23A-120, permits the application of 24 frequency-shift telegraph channels to a single voice channel, using 120-cycle spacing.

The reduced spacing increases by six the number of VFCT channels available between 400 and 3300 cycles, and by four the number that can be applied to a 2800-cycle voice channel. The system will operate at 66 WPM with less than 5% distortion. It is fully transistorized, provides all standard loop options, and a complete twenty-four channel terminal can be mounted in a single rack.

Lenkurt 23A equipment is also available with standard 170-cycle channel spacing.

Call or write any Automatic Electric sales office for further details.

AUTOMATIC ELECTRIC GENERAL SYSTEM

Subsidiary of

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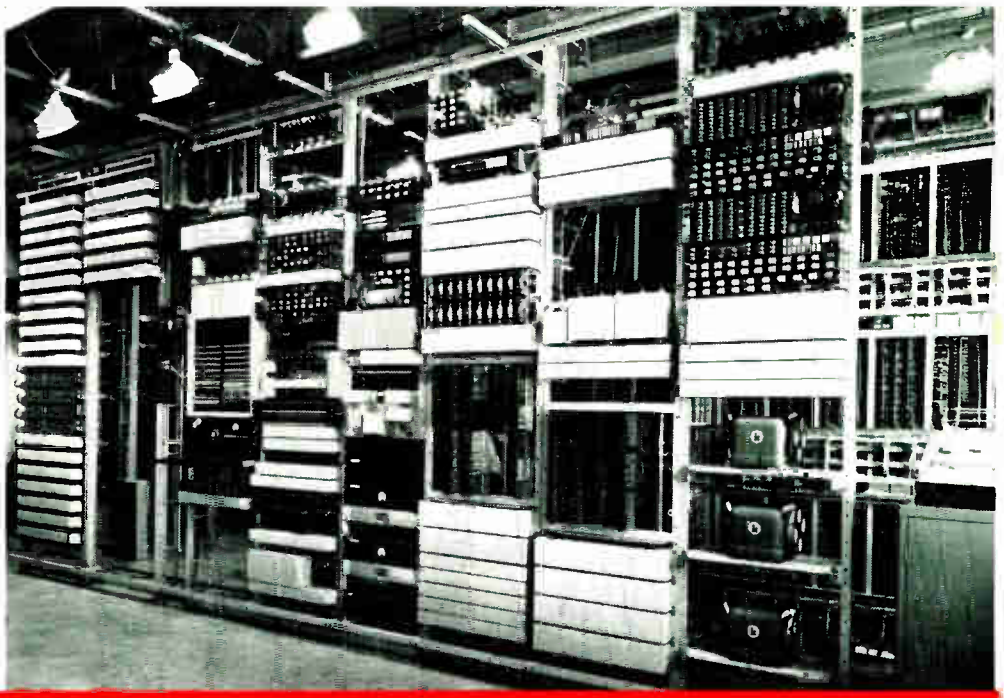
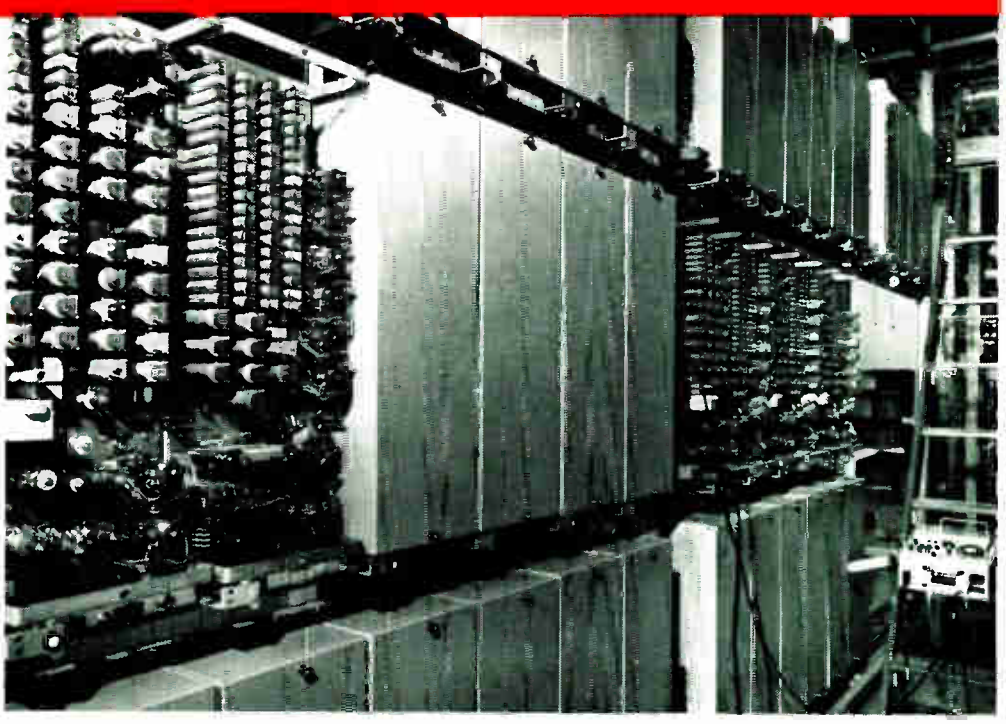
For complete details check No. 5 on handy card, page 47



Some of the Strowger Automatic Toll Ticketing equipment now in service at Penticton, B.C.



Some more of the equipment. Installation includes 20 ticketers, brings more than 50 B.C. communities into direct dialing range.

Ralph Robinson, president of the Penticton Board of Trade, and A. G. DesBrisay, director of Okanagan Telephone Company, during a tour of the SATT installations.

For complete details check No. 6 on handy card, page 47

Strowger Automatic Toll Ticketing chosen by Okanagan Telephone Co.

FIRST IN CANADA

The first Strowger Automatic Toll Ticketing installation in Canada, went into service at Penticton, B.C., on May 11, bringing Direct Distance Dialing to 25,000 people in Okanagan Valley, who may now dial their own station-to-station Long Distance calls to more than 50 other B.C. communities with approximately 400,000 telephones. The equipment was Canadian made by Automatic Electric.

Strowger Automatic Toll Ticketing has been ordered for Red Deer, by Alberta Government Telephones, and similar installations—by large *and* small companies, are expected to follow, right across Canada.

SATT OFFERS CLEAR ADVANTAGES

COST SAVING. Strowger Automatic Toll Ticketing was chosen only after careful study. But the facts spoke for themselves. The saving in traffic expense and the fact that customers like the new service will amply justify the initial expenditure.

COMPLETE COMPATIBILITY. The SATT equipment is completely compatible with other switching equipment in use in Canada *and* the United States. And because of its basic simplicity, new units can be quickly added, immediately expansion needs arise.

IMPORTANT SOURCE OF REVENUE. Popularity of the new system and its revenue earning potential was quickly demonstrated. By noon of the first day, yards of perforated tape had been processed by the computer and converted into toll tickets.

MEETS TODAY'S NEEDS—NOW. The Strowger Automatic Toll Ticketing equipment provides tremendous flexibility—can meet *all* to-day's DDD requirements—is designed for fast, easy, economical adaptation to to-morrow's needs as well.

If you would like further information on reliable, economical SATT equipment, call or write any Automatic Electric office, to-day.

George Begg, Pacific district sales manager, and Stuart Bird, vice-president and general manager, Automatic Electric Sales (Canada) Ltd., Martin Conroy, superintendent, and F. A. Sherrin, president, Okanagan Telephone Company, at the cutover ceremony.

AUTOMATIC ELECTRIC GENERAL SYSTEM

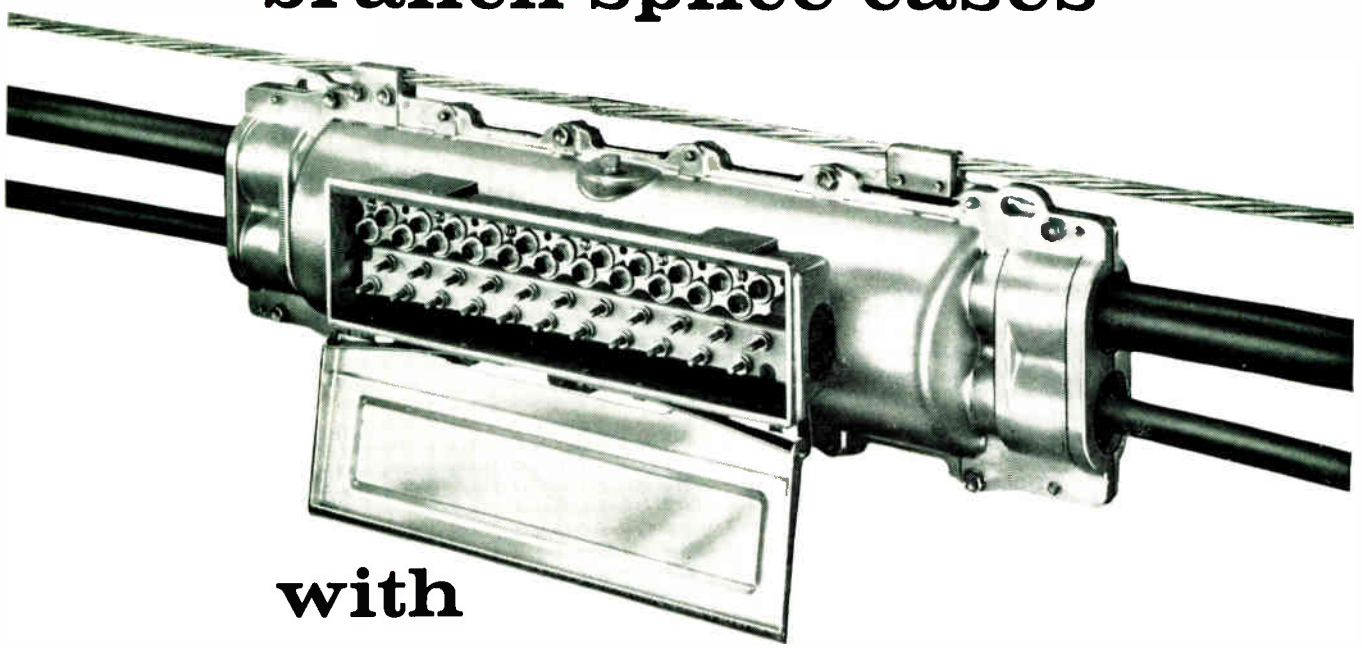
Subsidiary of

GENERAL TELEPHONE & ELECTRONICS

6047

NOW...

Reliable Type "X" branch splice cases



with

BRANCH OUTLETS AT BOTH ENDS

New, Reliable Type "X" splice cases and terminals are now available from Automatic Electric. This new model offers all the advantages of the standard Reliable models *plus* the added feature of branch outlets at both ends of the case.

Protected or unprotected, Type "X" splice case terminals are available for 6, 11 or 16 pair. Or two units can be used together for 12, 17, 22, 27 and 32 pair terminals. Cable size—1″ to 1.6″ O.D., with adapter available for .3″ to 1″.

Automatic Electric Sales (Canada) Limited, 185 Bartley Drive, Toronto, Ontario. Branches across Canada.

AUTOMATIC ELECTRIC

GENERAL SYSTEM

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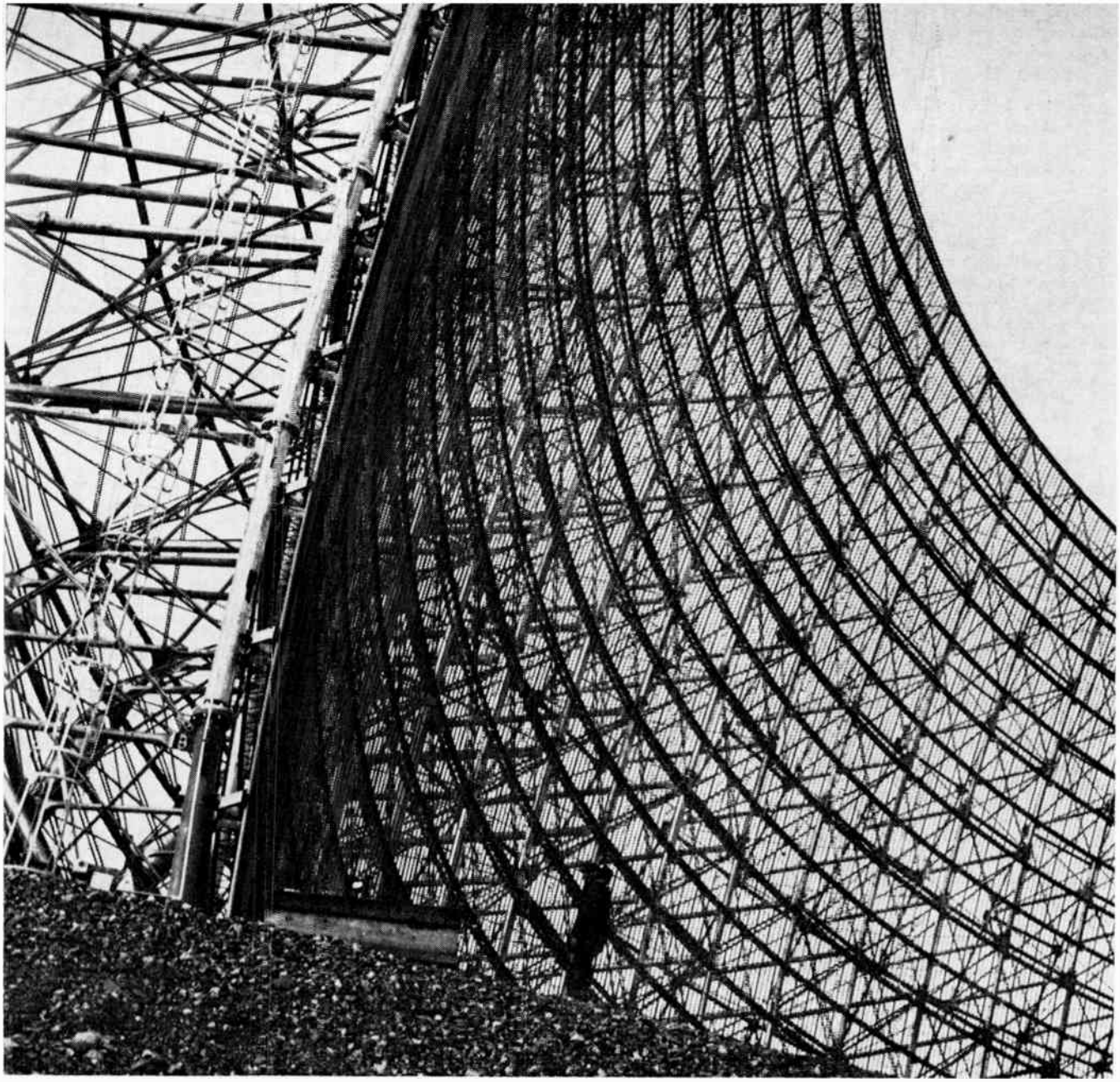
6041

For complete details check No. 7 on handy card, page 47



Workman and bulldozer are dwarfed by the "bigger than a football field" antenna reflector being erected in Canada's Arctic as part of the Ballistic Missile Early Warning System designed to afford a fifteen minute warning in the event of missile attack.

DEFENSE

What's up–in Canada's Northland?

The answer is plenty as the following article indicates

The largest long-range surveillance radar subsystem in the Free World is being installed in the Canadian Arctic. It is the Ballistic Missile Early Warning System.

This long-range surveillance radar system will generate a gigantic curtain of radio frequency energy over the northern polar regions of Canada insuring the detection of intercontinental ballistic missiles as they rise over the horizon at distances of several thousands of miles.

The Ballistic Missile Early Warning System, for which the Radio Corporation of America is the prime contractor, is designed to provide about a fifteen-minute warning for the North American Air Defense Command, in case of a missile attack on the North American Continent. Wherever possible, it will use existing communications, including those already installed for the DEW (Distant Early Warning) line in Canada and Alaska.

The heart of the long-range detection radar subsystem developed and produced by General Electric's Heavy Military Electronics Department is a combination transmitter-receiver unit which transmits many times each second an extremely brief burst of energy, at a power level which is greater than that transmitted by a total of 100 large radio stations.

After each of these "radar pulses", the transmitter automatically shuts down and an extremely sensitive

receiver listens for the tiny echo being reflected from the target, which may be thousands of miles away. The echo reflected from long-range targets will not contain enough energy to light the smallest lamp bulb.

The receiver side of the unit is automatically blocked off for a few microseconds while the high energy radar pulse is being transmitted. Then the transmitter side of the unit must be blocked off so as not to interfere with the radar's receiving capabilities. This complete cycle is programmed many times per second.

A component known as a modulator acts as an electronic switch, or valve, to furnish the high voltage to the transmitter in short pulses, and to control the transmitter's off-time, permitting the receiver to pick up any signal reflected from a target.

When a target reflects a radar echo, this extremely weak radio-frequency pulse is converted into video pulses and fed into a video-amplifier. Here the pulse is increased and fed into an indicator, or "scope", where it can be spotted visually as a potential target. Since radar pulses travel at the rate of 186,000 miles per second, very accurate measurements of time in "microseconds", which is a millionth part of a second, must be made to accurately control the radar's transmission and receiving cycle, and to measure the distance to the target.

More than 21 miles of waveguide are needed to direct the radio frequency energy generated by the transmitters through miles of passageways to the high-speed scanning switch and the antenna feedhorns which bounce the energy off huge antenna reflectors, each larger than a football field.

Problems posed by climate

Because of the extreme arctic conditions which are unusual to radar installations, it was necessary to design the 165 feet high, 400 feet wide torus-shaped reflectors to withstand the severe arctic cold and hurricane-like winds. In addition, the special chrome-nickel steel structures are built to withstand a six-inch coating of ice, which might double the weight of the reflector.

Fifteen-hundred (1500) tons of steel are used in each reflector. The extremely low temperatures in the polar regions and their effect on the expansion and contraction of the giant steel structures were important factors in the reflector design. Extremely high winds also necessitated the use of 10,000 cubic yards of concrete for the 160 foundations.

In the usual radar antenna design, the feedhorn reflectors and other equipments are combined as one unit. However, the gigantic size of the BMEWS Surveillance Radar Subsystem requires a separate building to house the scanning switches, waveguides and feedhorns. Extremely close tolerances were required throughout all phases of construction.

One of the problems solved in the unique design of the scanner building was to make proper provisions for the different rates of expansion between the steel beams, which must be exposed to the arctic temperatures, and those which are enclosed in heated areas.

The reason for this concern, and resulting requirement for extreme accuracy in construction is that the 704 feedhorns necessary for this system must be set to within one-sixteenth of an inch tolerance, in order to bounce the RF energy off the huge reflectors at the precise angle for the required coverage.

The waveguide, which transmits the RF energy from the transmitter to the feedhorns, has the external appearance of oversized heating and ventilating ducting used in home hot-air systems. However, the aluminum waveguide must be accurately constructed, polished internally and cleaned thoroughly to prevent arc over of the very high level RF energy. Any scratches or small dents make the waveguide unserviceable. Careful handling was one of the major transportation problems in shipping the required 21 miles of aluminum waveguide, which weigh a total of 1500 tons, into the arctic area.

The connecting flanges between the lengths of waveguide are machined to a 63 micro-inch finish and each of the 24 connection bolts must be tightened with a torque wrench to assure uniform tightness. All welding is external, leaving the inside of the waveguide with a smooth finish.

More than 200 horsepower is required to run the compressors which dehydrate the air before it is pumped into the massive pressurized waveguide system. Hot air is blown over the plastic windows of the exposed feedhorns to prevent ice formation during the sub-zero arctic weather. A special sensing device automatically regulates the flow of hot air to the de-icer units.

An estimated 27 million lbs. of equipment are necessary for this super surveillance radar system. The complexity of the logistics problem can be visualized by the approximately 17,000 packaging units needed to ship the material to this "land of the midnight sun" where the sea lanes are open just three months of the year.

A total of 450 businesses, both large and small, have supplied equipment for the radar subsystem in accordance with General Electric design specifications. An estimated 42 per cent of these suppliers were small business firms each with less than 500 employees. Likewise, 44 per cent of the dollars subcontracted have gone to small business.

The General Electric Company's Heavy Military Electronics Department is responsible for designing, developing, producing, testing and placing in operation the surveillance radar subsystem for BMEWS under a subcontract with the Radio Corporation of America.

Overall Statistics Site 1

- Radar System AN/FPS-50 includes a total of 290 cabinets of electronic equipment, and ten monitor and control consoles at BMEWS Site 1.
- Total estimated weight of equipment supplied by General Electric for BMEWS Site 1 — 26,700,000 lbs. (13,350 tons).
- Total number of electrical cables — 15,000 pieces of cable (1600 test cables for checking out electronic cabinets) Estimated total weight — 175 tons.
- Total weight of feedhorn enclosures for 4 Scanner Buildings at Site 1 — 2,423,200 lbs. (1,210 tons).
- 21 miles of aluminum waveguide needed to direct the RF energy through miles of passageways to organ pipe scanners and the feedhorns where it is bounced off the huge reflectors.
- A total of 110,000 ½" bolts were used to connect the lengths of waveguide (all torqued for uniform tightness).
- Total weight of aluminum waveguide — 1,574 tons (3,147,740 lbs.).

- A total of 16 De-icing Heater Units (4 per Scanner Building), capable of providing a total of 3,360 BTU per hour, or enough to heat 42 average-size homes, keep the RF (radio frequency) energy feedhorn windows free of ice during the sub-zero arctic weather. De-icing units deliver a total of 168,000 cubic feet of heated air per minute and were produced by Carrier Corporation, Syracuse, New York to General Electric specifications.

Personnel engaged in BMEWS project

- Engineering, scientific and technical personnel — More than 350 with an accumulated total of approximately 2,500 years of design, development and production experience in electronics and related fields.
- Installation Engineering, Field Operations and Logistics Support Group — 55 men with more than 600 years' experience in electronics, manufacturing, transportation, installations and logistics.
- Field Service Group on-site ranges in size from 80-200 men, all highly skilled in the installation of complex electronic equipments.

Suppliers:

- A total of 450 suppliers are producing equipment to General Electric specifications for the BMEWS radar sub-system. 42 per cent of the 7,000 orders placed have gone to small business (500 employees or less); 44 per cent of the dollars sub-contracted have gone to small business.

Major Equipments:

- A total of 224 cabinets of electronic equipments and 10 consoles were designed and produced by the General Electric Company.
- These equipments included Low Power Duplexers, Intermediate Duplexers, Detection Radar Monitor Consoles, Stable Local Oscillators (STALO). Performance Monitors, RF Switch Controls, Receivers, Exciters, Synchronizer Generators, Intermediate Frequency (IF) Equipments, IF Switching Equipment, Doppler Filter Detectors, Doppler Filter Monitors, Environmental Display Consoles, and Doppler Filter Bank Switching Equipment.

Antenna Reflectors (4 at BMEWS, Site 1)

- Manufactured for General Electric by D. S. Kennedy & Company, Cohassett, Mass.
- Description: Torus shaped.
- Overall Size: 165 feet high, 400 feet wide (each reflector).
- Weight: 1,500 tons (3,000,000 lbs.) per reflector.
- Construction: 20 trusses and 20 backstays per reflector. Each backstay is 60 feet long, 42 inches in diameter, and weighs 7½ tons (15,000 lbs.).

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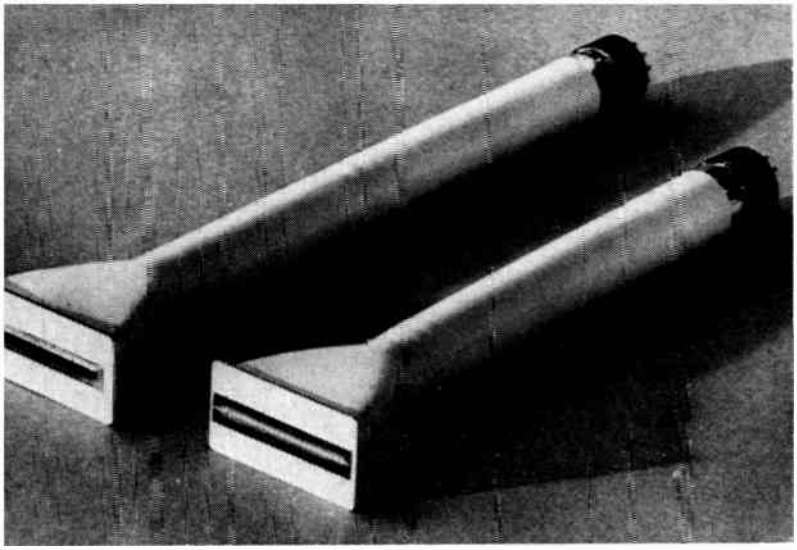
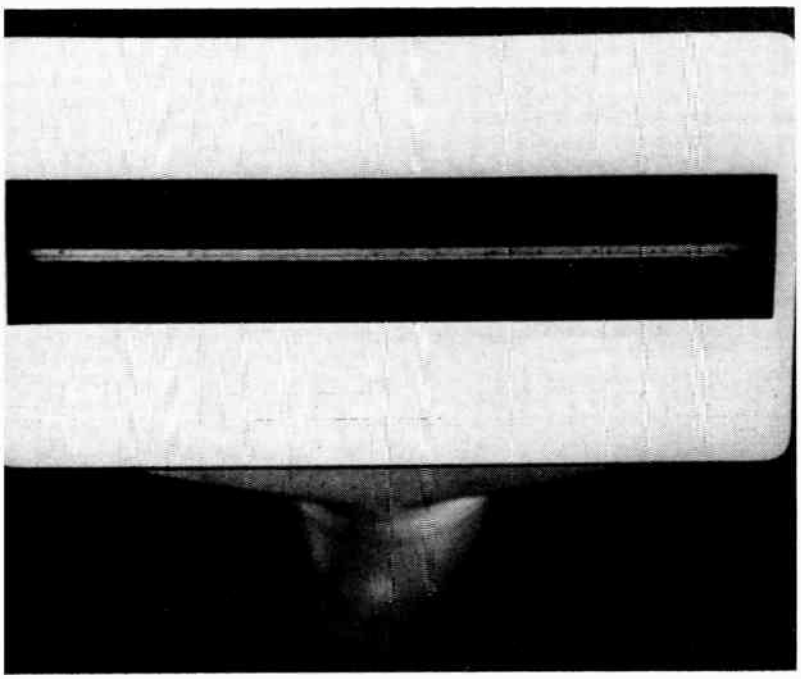
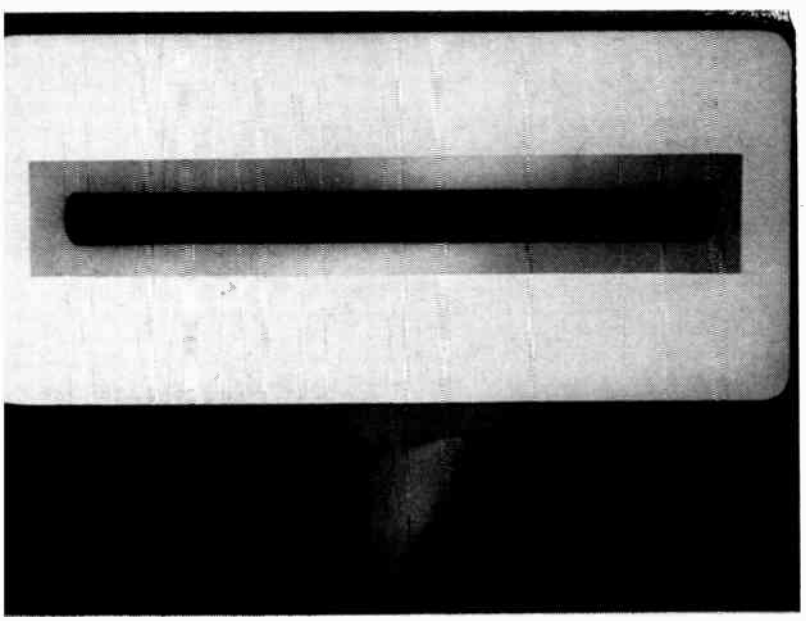


A general view of the first two forms of the new Printapix cathode ray tube.



A close-up of the printing head of the linear mosaic head of the tube.



A close-up of the rectangular mosaic array printing head of the Model L-4013 tube.

DEVELOPMENT

New CRT provides advanced method of electronic reproduction

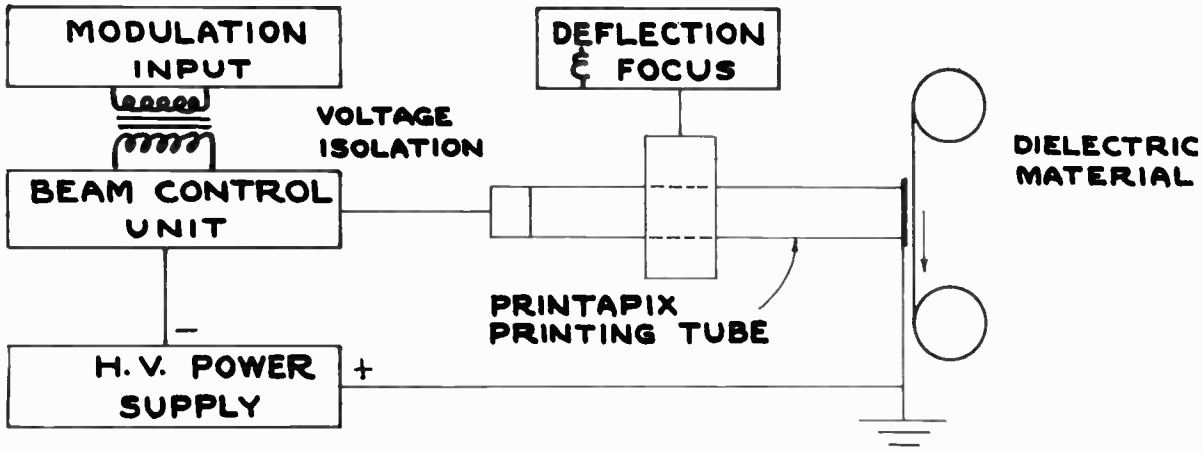
Writing rates of 0.1 microsecond per element are achieved with new tube

A new Litton Industries' cathode ray tube type has been developed for direct electronic printing at high speed on non-sensitized dielectric material and is already being incorporated in facsimile, oscillography, address labeling and television type image reproduction equipment. Other applications soon will include high speed computer readout, controlled information storage and erase for military tactical display maps and stock control uses, projection transparency generation, multiple copy reproduction, and simultaneous recording at any number of dispersed stations.

Tubes employing the above techniques, but utilizing much closer spacing of the writing elements, in order to accurately print minute detail are also being produced. Element densities up to one million per square inch are feasible.

Operating circuitry and components of the new Litton Printapix, as the tube has been trade-named, are similar to those normally used for display, readout or oscillographic applications. Ordinary television components and techniques are quite satisfactory in many instances. For operating convenience, the tube is frequently run with the printing head at ground potential.

Used with the new Printapix direct writing tube, ordinary paper provides a low cost base material for image rendition. Paper with a glossy surface, commonly used in many printing applications, will provide excellent results. Printing quality can be improved by rendering the opposite side of the paper slightly conductive. Various transparent media, such as glass and thin transparent plastic or commercial sheet polyesters, may be used with Printapix. Dielectric material transport requirements depend on the proposed application.



Schematic diagram showing the operating circuitry and components of the new printing tube.

Image development with the new Printapix direct writing tube is a simple, inexpensive, instantaneous and dry operation. One system employs a developing powder with two components, a toner and a carrier. Agitation of the combination produces a tribo-electric charging. The toner is a finely pigmented plastic material which becomes positively charged, and is thus attracted to the negative charge image on the dielectric material. A typical carrier material is powdered iron.

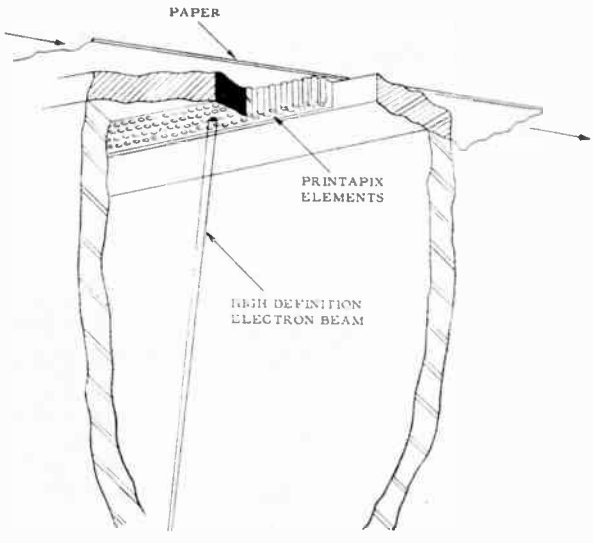
Variety of applications

The developing powder is released as a cloud or fog in close proximity to the charged dielectric surface. Pigmented plastic is attracted to and retained on the charged areas by the coulomb force. The resultant image can subsequently be erased for reuse of the base material and powder, or be permanently fixed by a rapid heat cycle, pressure or other means. Since the resultant image color is determined by the pigment, multicolor reproductions may be obtained by proper development.

Uses of the new Printapix direct electronic printing tube are limited only by the imagination of creative electronic engineers, open new vistas for space age designers and engineers and provide the critical and much needed high speed machine-to-man coupling for modern computers and advanced data handling equipments.

To achieve this state of the art of display by electronic printing, meant the prior development of the high definition electron gun, exploration of techniques in vacuum sealing, especially microscopic sized uniform arrays, application of electron optics, and determination of operational parameters.

The engineering design and combination of specialized arts have been completed just in time for present application in the rapidly evolving space age, when purposeful use of products such as the Printapix tube places man in the position of comprehending information at speeds necessary to abide with the new technology. In fact, man's very existence may depend upon this instantaneous reaction and judgment of complex data.



High speed rectangular direct printing tube (CRT) mosaic depicting the general working characteristics of the new Printapix tube.

Direct communication of information has immediate and practical application. For example, immediate distribution of communiqués within the vast network of government offices, either military or civil, could be effected through systems incorporating a Printapix direct printing tube. This would serve the same function, but in a much faster way, as most current facsimile writing devices, none of which produces instantaneous and complete copies in quantity which are possible with the new tube.

In the commercial field the new tube will greatly speed up transmission of messages and provide a permanent record of such messages in areas such as parking garages, inventory control offices in warehouses, yard control operation in railroads, weather mapping, news transmission and multi-reproduction.

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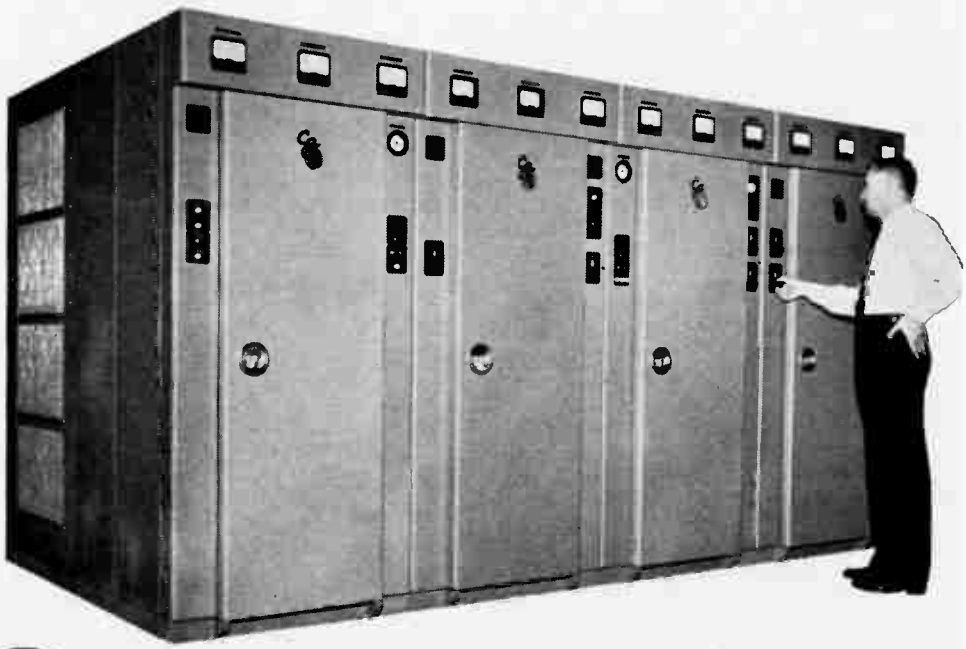
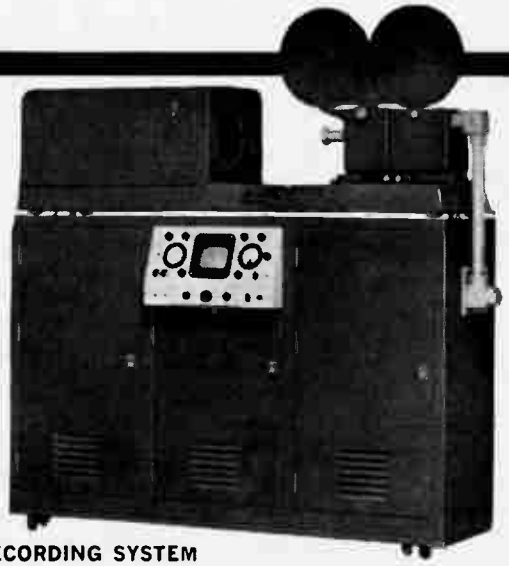
GPL GENERAL PRECISION LABORATORY

NE NORTHERN ELECTRIC

AM TRANSMITTERS

The Type 317B transmitter is a standard AM broadcast transmitter with a power output of 50,000 watts. High level screen modulation of the 5 KW RF driver stage makes possible excellent performance. The 50 KW amplifier is a high efficiency linear stage using the "Weldon Grounded Grid" circuit. The advantages realized in this circuit are many, including high over-all efficiency, extreme stability and the absence of critical neutralizing and tuning adjustment.





VIDEO RECORDING SYSTEM

The GPL Video Recorder is a complete high quality TV recording system which produces standard 24-frame-per-second motion picture film with excellent picture resolution and correct grey scale.
The system is designed for 525-line 60-fields-per-second FCC standard TV. The input signal is standard 0.5 to 2 volt white positive composite video.
This is equivalent to better than 1000 lines resolution in television terms. A non-linear amplifier having an effective "gamma" of 0.5, is included in the system and may be used at will to provide the correct grey scale rendition.

GPL

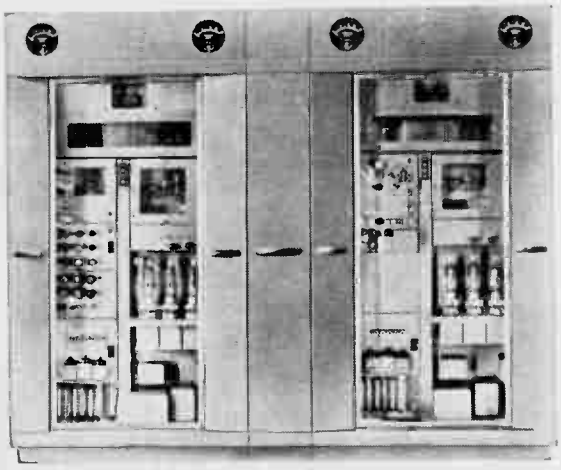
VIDICON FILM CHAIN

The GPL Vidicon Film Chain is specifically designed to replace your iconoscope camera with a minimum rearrangement of your present facilities. Optical system provides throw distances approximating those used with the iconoscope camera. Thus the Vidicon Film Camera can be easily substituted for an iconoscope. This installation can be accomplished over night. All your present projectors, master monitors, utility monitors and standard racks can be used.

AM-FM-TV BROADCAST EQUIPMENT

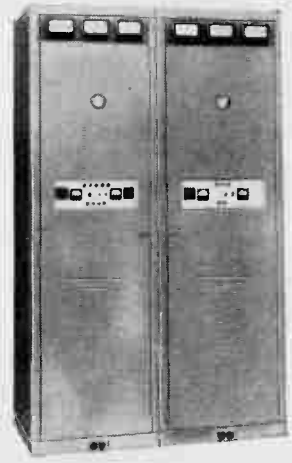
CONTINENTAL ELECTRONICS

STANDARD ELECTRONICS



500 WATT VHF-TV TRANSMITTER (Low Band and High Band)

The 500 watt transmitter is the basic unit in the Standard Electronics VHF television transmitter product line. The visual portion of the transmitter is designed to deliver a standard AM signal of 500 watts peak power, when a standard composite video signal is fed to the visual transmitter input. Together with the aural portion, the equipment comprises a complete 500 watt television transmitter, the output of which after diplexing, may be fed into a suitable television antenna. This transmitter can be used, without modification, as the driver for a 10 KW, 25 KW or 50 KW transmitter by means of Standard Electronics' "Add-A-Unit" feature.

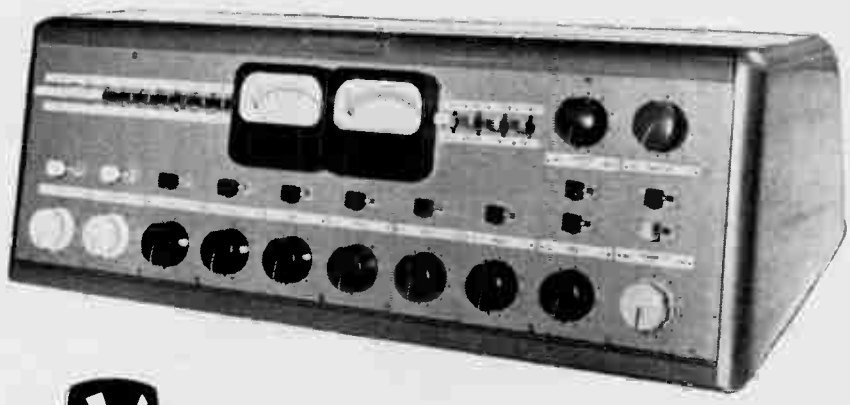


VERSATILE FM TRANSMITTERS

Standard Electronics has a new range of equipment for simplex, FM/FM stereo, and other multiplex operations. Features include built-in "Patchover" system, provision for multiplexing as standard equipment, Serrasoid modulator for inherent stability, and compact accessibility that saves as much as 45% of space.

TRANSISTORIZED PORTABLE AUDIO CONSOLE R5460B

An AC or battery operated, all transistor, single channel console type program mixing unit designed expressly for the amplification, control and monitoring of program material originating at microphone level in remote broadcast operations.



SPEECH INPUT CONSOLE R5430A

An audio console having two main program channels which are capable of simultaneous operation on separate programs without interfering with one another.

NORTHERN ELECTRIC COMPANY LIMITED

product panorama

For further information on New Products use Readers' Service Cards on pages 47 and 48.

Size 18 encoders

Item 511

A new line of Size 18 shaft position-to-digital encoders has been announced by Librascope Division, General Precision, Inc., Glendale, California. The new encoders use the well-tried disk-and-brush principle to convert shaft-position data into highly accurate binary readout.

The first product of this line, identified as Model 773, is a 13-bit encoder with a resolution of 128 counts per input shaft revolution and a full-scale capacity of 8192 counts. Because of the V-scan feature of its pick-off brush circuit, the accuracy of this encoder can never be less than the least significant digit in 8192 binary counts. Seven-bit and 19-bit encoders, packaged in the same cylindrical 1.72-inch diameter Size 18 mounting, are planned for the near future. The 13-bit Model 773 weighs only 7.6 ounces and has a starting torque of less than 0.2 in. -oz and a moment of inertia of 0.0480 oz-in.^{2}

Both serial and parallel read-outs are possible in these encoders. Isolation diodes are provided for installations in which several encoders are multiplexed or timeshared. Average life expectancy of the new units is 3×10^6 revolutions of the input shaft. Recommended reading speed is 200 rpm maximum. Slewing speed is 2000 rpm. Recommended load per bit brush is 20 volts at 2 ma.

Special precision machining techniques and preloaded bearings assure constant accuracy during the entire useful life of these units. Their compact size, low weight, and low starting torque make them especially adaptable for use with highspeed digital computers, fire control and automatic navigation systems, airborne digital servos, radar antennas, radio astronomy, and telemetering equipment.

For further information, contact **John E. English, Publicity Manager, Librascope Division, General Precision, Inc., 808 Western Avenue, Glendale 1, California.**

7/8" potentiometer and dial

Item 512

A scaled-down, "economy model" precision potentiometer and turns-counting dial provide the subject matter for two new data sheets recently published by Helipot Division of Beckman Instruments, Toronto, Ontario.

Data Sheet 60272 describes Helipot's model 7216, a 10-turn bushing mount potentiometer measuring only 7/8" in diameter. Although properly classified as a precision pot, it is said to be ideally suited for trim applications. A resistance range of 10 to 125,000 ohms is stated, and standard linearity tolerance listed at ±0.50%.

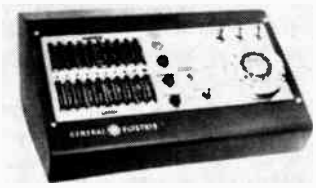
The pot's associated turns-counting dial, Series 2600 Duodial, also 7/8" in diameter, is fully covered by Data Sheet 60273. Both publications include detailed descriptions, photographs, dimensional drawings and complete specifications. Copies are available without charge from **R-O-R Associates, Ltd., 1470 Don Mills Road, Don Mills, Ontario,** sales representatives for Helipot Division of Beckman Instruments, Inc.

Alarm/control system

Item 513

Designed primarily for utilities, pipelines, railroads and similar companies which monitor and control unattended locations remotely from a central control point, a new Alarm/Control system is being made available by the Electronic Equipment and Tube Department of Canadian General Electric Company Limited.

The new equipment may be used with various types of transmission media, such as microwave, carrier current, or wire lines. The control signals employed are in the form of tones which provide communication between the control point and remote locations. They may be used to check a single location or as many as 100 different points. Ten functions may be checked at each point. The signals will indicate whether a certain pre-scheduled action is taking place at a remote location or whether faults have occurred.



At the control terminal, a small console is mounted on the operator's desk and a cable connects this with rack-mounted tone equipment. The console has a bank of 10 indicator lamps to show the stations being selected and a second bank to show whether any faults are present. A dial is employed to select and check the desired station and to operate remotely-controlled equipment at unattended distant points.

Canadian General Electric Company Ltd., Electronic Equipment and Tube Dept., 830 Lansdowne Ave., Toronto 4, Ontario.

Single sideband receiver

Item 514

For the first time, a single sideband receiver using modern communications techniques is available for AM broadcast use. Specifically designed for relaying radio broadcast signals, program monitoring in difficult reception areas and various Conelrad applications, Kahn Research Laboratories' Model RSSB-59-1A Receiver brings to the broadcast industry the most advanced techniques ever developed for minimizing selective fading distortion and improving the signal-to-noise ratio of conventional AM and Compatible Single-Sideband transmissions. High front end selectivity materially reduces adjacent channel interference, even when interfering signals are many times stronger than desired station. Product demodulation, utilizing local carrier or reconditioned carrier insertion to minimize selective fading distortion, or conventional AM diode detection can be selected by front panel switch to suit local reception conditions.

Conservative design and long life transistors insure maximum reliability for continuous duty service.

Kahn Research Laboratories, Inc., 81 South Bergen Place, Freeport, N.Y., U.S.A.

Instrument calibration standard

Item 515

The Radio Frequency Laboratories Model 1967 is a wide range, stable source of AC voltage and current for calibrating AC voltmeters, ammeters and wattmeters to within 0.1% of reading.

The 1967 is a compact, mobile console of standard desk height. All controls necessary for calibration are located on a sloping panel for maximum operator convenience. Adequate work space is provided to accommodate instruments under test. Two 250 watt power supplies are included for 50 to 2400 c.p.s. operation — one for voltage and one for current. Voltage ranges are from 1.5 millivolts to 1500 volts, and current ranges from 15 microamperes to 15 amperes.

Instronics Limited, P.O. Box 100, Stittsville, Ontario.

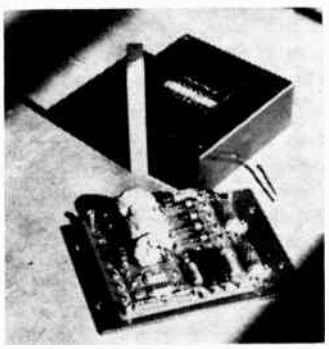
Linear magnetic amplifier

Item 516

A highly versatile, linear, magnetic amplifier for instrumentation work involving low level signal sources has been developed by CONTROL, a division of Magnetics Inc., Butler, Pennsylvania.

Designated the Type 4511 Instrumentation Amplifier, it is compatible with such typical low level transducers as photocells, shunts, strain gauges, thermistors, and thermocouples. The unit has an output of ±10 volts d-c in response to signals of ±50 microamperes d-c, with linearity of ±1% in this range. Its nominal termination load is 2,000 ohms.

The Type 4511 is ideal for driving d-c meters and electromechanical recording instruments. No filtering of the unit's output is required for operation of meters and recorders, since its d-c output is a pulse width modulated series of pulses with a basic 6 kilocycle repetition rate.



Although it is a single package unit, the Type 4511 consists of d-c to a-c static converter, and a double-ended center type magnetic amplifier which is excited by the converter

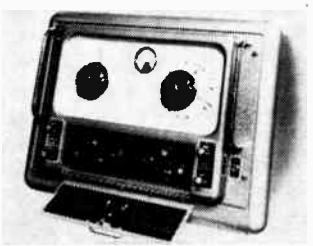
Additional information may be obtained by writing to **CONTROL, a division of Magnetics Inc., Butler, Pennsylvania.**

Direction finder *Item 517*

The Type ND 103 Direction Finder produced by Marconi's Wireless Telegraph Company Ltd. embodies the Bellini-Tosi fixed-loops system, and the rotatable element is an automatically adjusted goniometer coil, operating on the null-signal method.

A sensitive receiver and radio goniometer are housed in a single compact unit, suitable for bench mounting. Although designed primarily to function automatically, manual controls are also fitted, under a hinged plate, the essential controls for automatic use of the unit being readily accessible and conveniently situated.

The equipment is suitable for fitting with all leading makes of



gyroscopic repeaters, thereby obviating the necessity of plotting ship's head.

Marconi's Wireless Telegraph Company Ltd., Marconi House, Chelmsford, Essex, England.

Portable magnetometer

Item 518

The Type 323 Portable Magnetometer, engineered and produced by Canadian Applied Research Limited, has been designed to measure declination, inclination, and total field intensity of the earth's magnetic field. The circuits of the Portable Magnetometer are transistorized and are operated by a battery supply in the control box.

The Portable Magnetometer was designed by Dr. P. Serson of the Dominion Observatory, who originated the Type 613 Station Magnetometer used in the IGY program. The Portable Magnetometer is used at field magnetic stations in all parts of Canada, and at some of the permanent magnetic observatories. With this instrument it is possible to make a complete observation of declination, inclination and total intensity in 15 minutes at any magnetic latitude.

The Portable Magnetometer uses a detector of the saturated transformer type. The detector head is mounted on the telescope of a non-magnetic theodolite, with its axis of sensitivity parallel to the optical axis of the telescope. The detector head is connected by a 30 foot cable to a control box which must be kept at a distance from the point of observation because it contains magnetic parts.

A center-zero meter on the front of the control box indicates the magnitude and sense of the component of the geomagnetic field along the axis of sensitivity of the detector. The sensitivity of the meter indication is usually set at 30 gammas full scale. A large positive lens mounted in front of the meter makes its reading clearly visible from the theodolite. A potentiometer circuit is included on the control box to obtain each field intensity measurement accurately.

Canadian Applied Research Limited, 750 Lawrence Ave. West, Toronto 19, Ontario.

"v.t." transformers

Item 519

Three new models have made their entry into Ohmite Manufacturing Company's rapidly growing line of "v.t." brand variable transformers. Designated the "LN" series, these transformers are intended for low voltage operation and high current output. Input voltage rating is 36 volts or less and output current ratings are 5, 12, and 22 amperes depending upon the model selected. Overvoltage is not provided on these units.

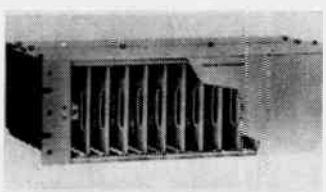
Series "LN" units meet the requirements of low voltage power supplies such as transistorized power supplies or supplies used to power transistorized equipment. Also, they may be used in supplies employed for plating operations. The three LN models are based on the conventional Ohmite frame sizes and embody the same advanced construction. However, LN units employ very heavy wire and "beefed-up" brushes to handle the considerably heavier currents.

With the addition of the Series LN transformers, Ohmite is now providing a line sufficiently large to satisfy a high percentage of industrial needs. For information concerning the new Series LN transformers and the complete Ohmite variable transformer line, request Bulletin 151 from **Ohmite Manufacturing Company, 3606 Howard Street, Skokie, Illinois, U.S.A.**

Transistor switching unit

Item 520

A new compact transistor switching unit with high input impedance accepts up to 100 different on-off signals in a broad range of voltages and pulse shapes, and within 100 microseconds displays graphically the signal condition on a direct writing sequence recorder. Designated Trans-Switcher, the new



unit which occupies only 5¼" of rack height is now available from Brush Instruments, Division of Clevite Corporation, 37th and Perkins, Cleveland 14, Ohio.

The solid-state switching unit is designed to take full advantage of the high resolution and fast response of the Brush Operations Monitor. The Operations Monitor records 100 events electrically on a moving chart 12 inches wide. On-off input data appears on the chart and provides a record of events, their duration and their time relationship to each other.

The new Trans-Switcher unit has no moving parts which might wear out. It contains ten decade boards with each one capable of handling 10 signals in a wide range of voltages and pulse shapes. The decade boards are plug-in units, such as those found in computers, and can be easily replaced for rapid servicing or for recording signals in another voltage range and/or in a different mode of operation.

Switching decades are available for signal levels as low as five volts DC and can be designed for either positive or negative pulses of duration as short as four milliseconds. A relatively high input impedance in the circuits minimizes loading and signal disturbance. Mode of operation can be SP-ST, SP-DT, or DP-ST.

Canadian representative for this equipment is **Bayly Engineering, Ltd., Hunt St., Ajax, Ontario.**

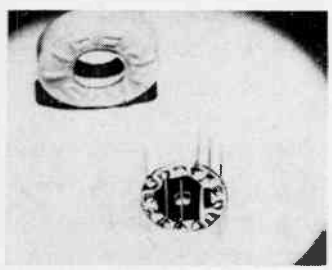
Packaged transistor amplifier

Item 521

A brand new era in the technique of packaging electronic components is introduced by Centralab's TA 12 Packaged Transistor Amplifier. By completely new processes, transistors are combined with resistors, capacitors and wiring into a single package designed to meet specific performance requirements.

The amplifier features patented layerized construction techniques, now utilized in Centralab Packaged Electronic Circuits. The technique enables Centralab to meet demands of the electronic industry for a truly small resistor amplifier — compact yet extremely efficient.

Centralab's ultra miniature transistor amplifiers are intended for use in hearing aids, pocket-



size radios and recorders, preamplifiers, and wherever an ultra miniature high gain audio amplifier is desired.

For full details and descriptive literature on Centralab's Packaged Transistor Amplifier please write **Centralab Canada Ltd., Ajax, Ontario.**

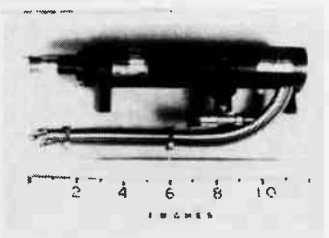
Traveling wave tubes

Item 522

Two new metal and ceramic PPM-focused X-band traveling wave tubes are now in production at Litton Industries, Electron Tube Division, San Carlos, Calif.

Ideally suited to operate in series as an amplifier chain, these two tubes, designated L-3266 and L-3236, cover the frequency band of 7,000 to 11,000 megacycles with minimum saturated CW power of 20 milliwatts and two watts respectively. Each tube provides small signal gain in excess of 33 db. Both tubes weigh less than four pounds each and are about 12 inches long, including their shielded, temperature- compensated, periodic permanent magnets.

The I-3266 and L-3236 are suitable for use in ECM repeaters, radar-target enhancement systems, frequency diversity radar transmitters, and equipments requiring general purpose microwave amplifiers.



Data sheets and applications information will be supplied upon request to the **Marketing Department, Litton Industries, Electron Tube Division, 960 Industrial Road, San Carlos, Calif., U.S.A.**

Five-element yagi

Item 523

Hackbusch Electronics Limited announces a five-element yagi of extra-heavy aluminum designed to withstand the most adverse weather and operational conditions by Technical Appliance Corporation. The new antenna elements are made of ¾" O.D. aluminum tubing with ⅞" O.D. sleeves for additional support at the crossarm, which is 2" square.

The new TACO Y-54-5 Yagi consists of two active dipoles, two parasitic directors and one parasitic reflector. The two driven dipoles are interconnected and terminate in a female type "N" coaxial connector. Input impedance is 50 ohms. A matching transformer is available for raising the impedance to 72 ohm input.

The antenna is designed to handle up to 750 watts. The antenna is designed for use in the 76 to 82 MCS range and may be stacked for greater power handling.

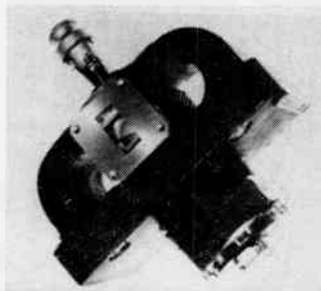
Hackbusch Electronics Limited, 23 Primrose Avenue, Toronto, Ontario.

Pulse magnetron

Item 524

Frequency diversity and higher definition airborne radars are achievable with a new X-band hydraulically tunable magnetron developed and manufactured by Litton Industries' Electron Tube Division, San Carlos, Calif. It is another in the growing family of hydraulically tuned pulse magnetrons introduced two years ago by Litton Industries for new equipment and retrofit frequency diversity requirements.

Designated type L-3305, this magnetron can be tuned at rates up to 100,000 megacycles per second over the frequency range of 8600 to 9500 megacycles. Pulse stability at peak power output in excess of 65 Kw is maintained while the tube is tuned at these extremely rapid rates.



The design and capability of this tube reflects Litton's experience as a major supplier of many thousands of hydraulically tuned CW magnetrons for countermeasures. The ruggedized design permits application of the L-3305 magnetron where severe shock and vibration conditions may exist. The hydraulic actuator is an integral part of the tube design, resulting in smooth, positive tuning action.

Reliability, longer service life and immediate fullpower operability at any time are built-in features of this tube.

For further information, please write: **Litton Industries, Electron Tube Division, 960 Industrial Road, San Carlos, Calif., U.S.A.**

Speed transducer

Item 525

Canadian Westinghouse has introduced a new frequency responsive speed transducer which responds to pulse or a frequency type input. By connecting in the proper arrangement to a rotating device, speeds as low as 25 rpm full-scale and as high as 15,000 rpm can be measured. The full scale output is 1 milliamp d-c and the calibration is obtained by a single resistance adjustment.

Unlike conventional tachometers, this transducer needs no mechanical connection between the rotating and the pick-up assembly. It can be supplied self-contained in the KR-241 taut band suspension instrument or separate for other instruments or computers.

The unit is available with an input frequency rating up to 6,000 cycles. A separate 120 volt 60 cycle or 12 volt d-c power supply is required.

For further details, please write **Information Department, Canadian Westinghouse Company Limited, Hamilton, Ontario.**

Power connector

Item 526

A revolutionary non-reversing hermaphrodite power connector has been developed by Specialty Electronics Development Corporation, modeled after its own unique fully-interchangeable telephone connector. A "hermophrodite" connector automatically mates with any other of its kind without regard to which end is which. Each unit is both a plug and a socket at the same time.

The immediate need for such connectors is in highly mobile military communication and power equipment and there is a huge market for them in telephone, telegraph and public utility circuits, as well as in factories and other industrial applications.

The new connectors have a power rating of up to 100 amperes, 440 volts AC, and are suitable for two, three or four-wire cables. Only one solder connection is necessary for each conductor. Built-in safety ground contacts mate before any power contacts are mated.

A connector measures 2¾ inches in diameter. In a housing of dull black, anodized aluminum, it weighs 1¼ pounds. Both cable and panel types are available.

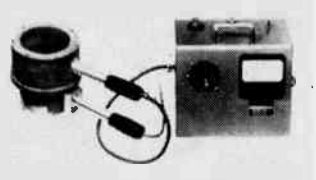
Specialty Electronics Development Corp. is represented in Canada by the **Ahearn and Soper Company Limited, 850 Belfast Road, Elmvale Acres, Ottawa, Ontario.**

Hycon tester

Item 527

The Hycon Tester is an instrument for precisely determining the hydrogen content of molten aluminum by the "Initial Bubble Principle". It was developed for practical use by A. C. Burr and D. J. Neill of Aluminum Laboratories Ltd. and produced by Measurement Engineering Ltd., Arnprior, Ontario.

Control of hydrogen content is necessary for the maintenance of high quality aluminum alloys.



Since the adjustment of gas content is most readily done prior to casting, a knowledge of the impurity level makes possible intelligent remedial measures at the appropriate time. With the Hycon Tester, measurements of the hydrogen content of molten aluminum can be made quickly and easily on the spot, giving immediate information for production control.

The Hycon Tester is designed for use in the foundry and is so simple and quick to use that it can serve as an excellent quality control on hydrogen content — reducing reject castings due to porosity.

For further information, contact **Measurement Engineering Ltd., Arnprior, Ontario.**

Continued on page 41

engineers' book-case

Introduction to Modern Network Synthesis by M. E. Van Valkenburg.

This book presents a lucid treatment of topics essential to an understanding of modern methods of network synthesis. The book begins with a study of Brune's positive real functions, followed by an enumeration of synthesis procedures for LC, RC, RL, and RLC one terminal-pair networks. Other subjects treated are: approximation, the relationship of parts of network functions, and methods for the synthesis of two terminal-pair networks, including the Cauer ladder development, the Guillemin and Darlington methods, and the synthesis of networks by the image-parameter method.

John Wiley & Sons, Inc., 440 Fourth Avenue, New York 16, N.Y., contains 498 pages, hard cover bound, price $11.75.

Electricity and Magnetism by Henry E. Duckworth, McMaster University, Hamilton, Ontario.

The text of this book is written for students who have studied general physics and the calculus and who are in the act of acquiring an elementary knowledge of differential equations. The method of presentation of the subject is governed by two considerations. First, the subject is presented for its own sake, as fundamental to much of science and engineering. Second, cognizance is taken of the fact that the study of electricity and magnetism provides many students with their first real opportunity to apply the calculus to physical problems. With this consideration in mind, a number of problems are included for the express purpose of providing practice in the setting-up and subsequent solution of integrals. In keeping with the modern point of view, many natural excursions are made into important areas of atomic, nuclear, and solid state physics.

The Macmillan Company of Canada Limited, 70 Bond St., Toronto, Ont., contains 424 pages, hard cover bound, price $7.00.

Hydromagnetic Channel Flows by Lawson P. Harris.

This book presents analyses for three flows of viscous, incompressible, electrically conducting fluids in high-aspect-ratio rectangular channels subjected to transverse magnetic fields. The situations considered in this book are turbulent flow in the presence of a DC magnetic field and both laminar and turbulent flows in induction-driven flows. The methods used are analogous to the "semi-empirical" techniques of fluid mechanics in depending for their success on the combined use of the basic hydromagnetic equations, a dimensional analysis, and the results of experiment. Principal results of this study include a scheme for correlating experimental friction-factor data and methods for computing mean-velocity profiles, mean magnetic-field distortion, current distributions, and turbulent-shear distributions in the DC turbulent flow.

Published jointly by The Technology Press of M.I.T. and John Wiley & Sons, Inc., 440 Fourth Avenue, New York 16, N.Y., contains 90 pages, hard cover bound, price $2.75.

Probability: An Introduction by Samuel Goldberg.

Based on many years of teaching experience, this definitive volume deals fully with the essentials needed by all who use probability concepts, apply statistical techniques, or measure the effects of chance phenomena. Logical in its approach, the book formulates its probabilistic theory by employing the language and notation of sets. By emphasizing experiments with a finite number of possible outcomes, the study requires no previous knowledge of calculus and can be readily understood by the reader with a good background in high school algebra.

Prentice-Hall, Inc., 70 Fifth Ave., New York 11, N.Y., contains 322 pages, hard cover bound, price $7.95.

Basics of Induction Heating (Volumes 1 and 2) by Chester A. Tudbury.

These two volumes present the fundamental principles underlying the induction heating art, as well as the application of induction heating equipment, using the "pictured text" approach. This style of presentation makes it readily understandable to any reader who is familiar with the basic laws of electricity. The electrical and thermal aspects of induction heating, and the mechanical problems associated with fixturing, are thoroughly and lucidly explained.

John F. Rider Publisher, Inc., 116 West 14th St., New York, N.Y., soft cover, Vol. 1 — 140 pages, $3.90; Vol. 2 — 144 pages, $3.90; set of 2 (soft cover) $7.80; cloth binding $8.90.

Miniature mV recorders

Item 528

The Research and Control Instruments group of Philips Electronics Industries Limited have recently added four new miniature mV recorders to their present recorder line.

These 4 inch chart recorders require just a 5¾" square of panel space and may be used in a multitude of applications for normal or high speed recording. Watertight and sturdy the units offer reliable null balancing potentiometer systems, easily interchangeable ranges; transistorized plug-in amplifiers with dependable printed wiring zener diode stabilized standard current supply and a unique 3 speed chart drive system. The units also offer a high indicating speed and critical damping as well as scales calibrated for mV and all conventional thermocouples.

Completely mains operated on 110 or 220V, 60c/s, these miniature recorders have been expensively field tested and accepted in many phases of industry and research. They have proved highly efficient in the measurement of crucible temperatures, fuel oil temperature and the temperature of stack gases and many more applications.

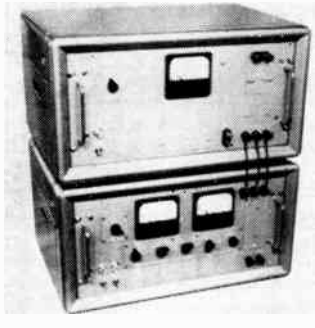
Scientific and Industrial Division, Philips Electronics Industries Ltd., 116 Vanderhoof Avenue, Toronto 17, Ontario.

Microwave wattmeter

Item 529

A new microwave wattmeter, designed for highly accurate bolometric power measurements and featuring a self-balancing bolometer bridge, has been announced by Daystrom Ltd.

The precision laboratory instrument comprises two basic units — a self-balancing bolometer bridge, Weston Model 1493, and a reference-current generator, Weston Model 1494. Required external accessories include a bolometer in a mount, a source of microwave power, and the means for making accurate measurements of direct current up to 30 ma.



The Model 1493 Bolometer Bridge by itself is capable of measuring power from the highest value for which the connected external bolometer is suited, down to about half that value. When the Model 1494 Reference-current Generator is used with the bridge, power can be measured in the microwatt range.

An adjustable direct current with excellent short-time stability is delivered by the generator. This output is connected differentially to the output of the bolometer bridge supply circuit and is adjusted to balance the bridge current before r-f power is supplied to the bolometer. When r-f power is applied to the bolometer, the bridge current is automatically reduced to maintain bridge balance, but the reference current remains constant. The difference between the two currents can be measured with high accuracy, even when the difference is relatively small.

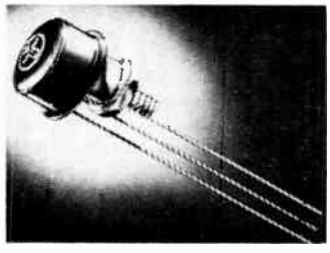
Daystrom Limited, 840 Caledonia Rd., Toronto 19, Ontario.

Power transistors

Item 530

A new series of silicon intermediate power transistors was recently announced by Silicon Transistor Corp., Carle Place, N.Y., manufacturers of semiconductors.

The types, 2N1047, 2N1048, 2N1049 and 2N1050, are diffused-junction NPN transistors, designed for power-switching and amplifier applications operating in the temperature range of —65°C to +200°C. Collector to emitter voltage is 80 volts for the 2N1047 and 2N1049, and 120 volts for 2N1048 and 2N1050. Power dissipation at case temperature of 25°C is 40 watts.



The units, which are available for immediate delivery, are hermetically sealed in a stud mounted welded case with the collector in electrical contact with the case. These transistors meet the environmenal requirements of MIL-S-19500B.

STC is represented in Canada by **A. T. R. Armstrong Limited, 700 Weston Road, Toronto 9, Ont.**

K-band magnetron

Item 531

Rogers Electronic Tubes and Components announce the availability of the Philips type 7093 K-Band magnetron. The Philips 7093 has been developed for use in extremely compact, short range radar systems providing resolution of 4 meters at 1000 yards and a minimum range of only a few yards.

Operating in the frequency range 34,512 to 35,208 M/c with a power output of 25 kW, the 7093 has one of the shortest pulse on record — only 0.02 microseconds. The rise time is 600 KV per microsecond; weight is 4.2 lbs. and the cathode is the Philips dispenser type.

Complete details are available from **Rogers Electronic Tubes and Components, 116 Vanderhoof Avenue, Toronto 17, Ontario.**

Electrolytic capacitors

Item 532

Three case sizes in etched foil tantalum electrolytic capacitors are now available from Ohmite Manufacturing Company. These sizes are equivalent to case sizes C1, C2 and C3 of MIL-C-3965B and collectively provide a range of 0.5 to 200 microfarads and working voltages to 150 VDC depending upon capacitance. The etched foil variety provides higher maximum capacitances and has somewhat lower leakage current characteristics than the plain foil type which Ohmite also supplies in the same case sizes.

In common with tantalum metal electrolytic capacitors, tantalum foil capacitors feature high capacitance for small size, exceptional stability in storage and use, unimpaired performance at temperature extremes. Both foil varieties are available in either polar or non-polar types. Ohmite stocks a wide range of values in both varieties, including all MIL values listed by MIL-C-3965B for case sizes C1, C2, C3. Ohmite distributors stock MIL values for the plain foil variety. For complete information request Bulletin 152F from **Ohmite Manufacturing Company, 3684 Howard Street, Skokie, Illinois.**

Continued on page 43

Simple relay computer

Continued from page 23

reliable differential computer of the relay type, with little need for maintenance and of low cost. This device also possesses the very desirable feature of giving an alarm when a stoppage occurs in the tunnel, because any disturbance in the flow of ingoing and outgoing cars can easily be detected. The formula used to determine the number of cars per hour going through the tunnel utilizes the actual number of cars in the tunnel between two control points located near the portals:

$$C/_{hr} = \frac{(\Sigma C_I - \Sigma C_O) \cdot S_A \cdot 5280}{L_{P1 - P2}} \quad (3)$$

where $C/_{hr}$ represents the number of cars per hour, ΣC_I the total of ingoing cars, ΣC_O the total of outgoing cars, S_A the average speed in miles per hour, and $L_{P1 - P2}$ the distance in feet between the two control points. For a given average speed $\frac{S_A \cdot 5280}{L_{P1 - P2}}$ becomes a constant and the formula, easily digestible for our computer, becomes

$$C/_{hr} = K \cdot (\Sigma C_I - \Sigma C_O) \quad . \quad . \quad . \quad (4)$$

In other words, the difference between the cars which have gone into the tunnel and the cars which have left the tunnel in any one lane or tube, has to be multiplied with a constant, to be varied only when the average speed of the vehicles should change, by allowing higher speed limits.

In order to allow for the proper calibration of the indicating device, it is essential to take the capacity of the traffic facility into account and to add a safe margin. As in the case of the tunnel, the capacity is computed as 7,000 cars per hour — i.e., one quarter of it in each lane, the indicating device allowing for maximum of 3,000 cars per hour per lane seems to be adequate.

The maximum number of informations to be handled under the most adverse conditions may be derived from the formula

$$I_{MAX} = \frac{L_{P1 - P2}}{L + D} \quad . \quad . \quad . \quad . \quad . \quad . \quad . \quad . \quad (5)$$

where I_{max} is the maximum number of informations, $L_{P1 - P2}$ the distance between the control points, and L the average length of a car, and D the average safety distance maintained by drivers between cars. Assuming a blockage at the exit and a complete standstill and inserting the figures $L_{P1 - P2} = 2000$, $L = 20$ and $D = 3$ in formula (5), we find that the capacity of our differential counter does not have to exceed 86 plus a sound safety margin. Without waiting for this maximum condition, the alarm to indicate irregularity in the flow of vehicles can arbitrarily be set at a much earlier stage.

The differential computer

Essentially the device consists of two unidirectional counters in the form of stepswitches and wired in such a way that the difference of counts originating from conventional counters, one located at the entrance and one at the exit, is registered. Stepswitches were chosen because they are standard elements in telephone circuitry and of high reliability. D.C. is used and germanium diodes, by virtue of their resistance characteristic, provide for registration of counts in one direction only. The voltage generated across the resistances is directly proportional to the number of cars per hour. In this way a properly calibrated milliampmeter, or any other type of indicating or recording device, indicates the number of cars per hour going through the tunnel at any one time.

Two logical elements have been built into the unit. One feature does not allow registering more outgoing cars than incoming cars. This is necessary, as cars may change lanes or may bypass the magnetic detector used in the installation. The second logical element built into the computer is the reset feature. A suitably wired time delay relay resets the differential counter to zero after a certain time has elapsed — no incoming cars registered and still cars indicated in the tunnel.

A control feature showing a light whenever the differential counter passes through 10, or a multiple of 10, allows for checking the proper synchronization of the computer and the conventional counters providing the impulses, and after a certain time gives proper account of the reliability of the computer. If the rate of incoming cars does not correspond to the rate of outgoing cars, an alarm is sounded indicating irregularity in traffic flow. At an arbitrarily set number of cars in the tunnel another alarm goes on. With a few potentiometers, a wide range of indications can be chosen and it is reasonable that maximum performance will only be obtained after careful study of traffic pattern and behavior.

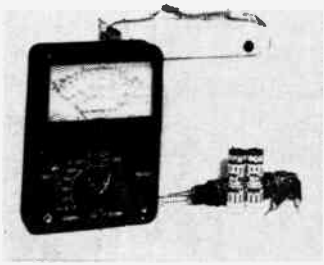
Conclusion

This relay type computer fulfills all the conditions of an inexpensive, reliable and low maintenance cost supervising computer. It is conceivable that simple, reliable computers of this type may take over completely the running of a tunnel, or similar traffic facility, under normal conditions and provide an economical answer to an automatic traffic control.

Volt multimeter

Item 533

The Model A-20 is a 2,000 ohms per volt multitester with 14 switch selected ranges. These are 5 AC and DC voltage ranges: 0-6, 0-12, 0-60, 0-300, 0-1200 at 2,000 ohms /volt; 3 DC current ranges: 0-300 microamperes, 0-3 milliamperes and 0-300 milliamperes; 2 resistance ranges: 0-10K ohms and 0-1 megohm; 2 decibel ranges: —20 to plus 15 db and plus 15 db to plus 37 db. The Model A-20 also measures capacity from 250 mmf to .05 mf; and inductance from 10 henries to 500 henries. All ranges are selected by a rotary switch.



Compact in size, only 3¾ x 5¼ x 1¾, this ruggedly built instrument has a sensitivity of 140 microamperes. It uses 2 internal penlight cells for the resistance measurements and has an ohmeter adjustment control on the front. The Model A-20 Multitester comes complete with a tan colored genuine pigskin leather case and strap, test leads, batteries and instruction sheet.

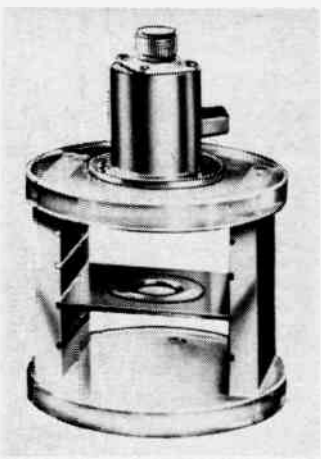
This compact, sensitive tester will be useful to anyone in the electronic or electrical field: servicemen, electricians, technicians, amateurs, kit builders, hobbyists, etc. Further information available from the exclusive Canadian distributor, **Alpha Aracon Radio Co. Ltd., 555 Wilson Ave., Downsview, Ontario.**

Thin-window flow counter

Item 534

A new thin-window flow counter for detecting and counting all types of ionizing radiation is announced by The Victoreen Instruments Company, of Cleveland, Ohio.

The Victoreen Model FCS-1 is especially suitable for beta counting in the proportional region. Operating points are 2800 volts for the alpha proportional region, and 4000 volts for the beta proportional region. Average plateau slopes are 2% per 100 volts for both alpha and beta plateau regions. The unit is filled with pure methane.



Design features include a cylindrical counting chamber with 1.0 mil wire loop anode, covered by a tough, aluminum-coated Mylar window having a total thickness of less than 1.0 mg/cm², and a Lucite mount with five positions for a sliding source tray. The latter feature permits source-detector geometry to be varied from approximately 50% to 1% of 4 pi steradians. A small bubbler mounted on the side of the instrument indicates gas flow rate.

A detailed bulletin on this flow counter is available upon request to the Canadian reps., **Radionics Limited, 8230 Mayrand Street, Montreal 9, Quebec.**

Storage cathode-ray tube

Item 535

The FW-211 Iatron, newest of a family of storage tubes available from ITT Laboratories in Fort Wayne, Indiana, is the brightest, lightest, and smallest of its type. Used as a panel-mounted radar or infrared indicator in aircraft, its fast writing and high deflection speed permits accurate and instantaneous presentations. A special ITT-developed coaxial electron gun system eliminates trapezoidal distortion of the scanning pattern.

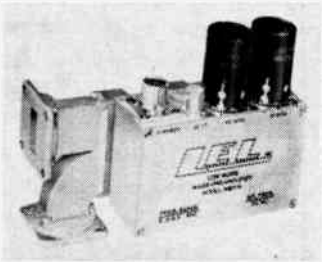
Other special features include full daylight viewing of electrical signals by image intensification and the ability to write, store and erase information at will. A display exceeding 4000 foot-lamberts brightness is obtained at a phosphor voltage of only 8.5 kv. The tube fits within standard case dimensions for a 2¾-inch dial instrument and meets all of the environmental requirements of MIL-E-5400.

Complete technical specifications and price information available on request to **ITT Laboratories, 3700 East Pontiac St., Fort Wayne, Indiana, U.S.A.**

Microwave receiver assembly

Item 536

The MMX-6 is a new matched X band microwave receiver head end assembly covering the 8.5 to 9.6kmc range with a maximum



noise figure of 7.5db, and a typical noise figure of less than 7db. IF bandwidth is 8mc and IF gain 25db.

The MMX-6 is electrically similar to the MMX-2 introduced earlier but has been improved mechanically to provide rugged design at lower cost.

For further information contact **E. G. Lomas, 227 Laurier Avenue West, Ottawa 4, Ontario.**

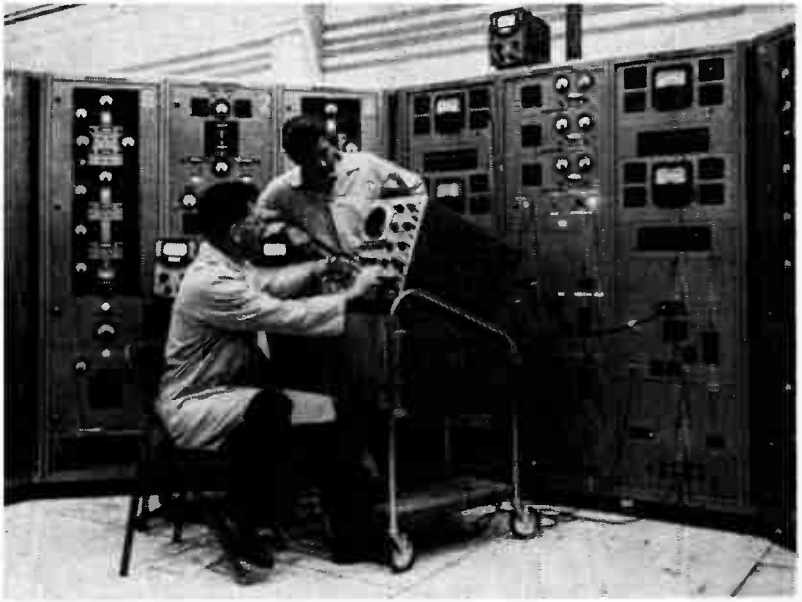
Micro-energy switch

Item 537

The Micro-Energy Switch, developed by the Lansdale Division of the Philco Corporation, is a hermetically sealed, germanium MADT* field flow transistor designed for use in ultra high reliability, low-current, low-voltage saturated switching circuits. The Micro-Energy Switch is capable of switching at frequencies in excess of 15 megacycles in micro-energy circuits. Polarities are similar to PNP junction types. It is intended to be used as a logic element in high speed computers, data processing and automation equipment. It is provided in a TO-18 package.

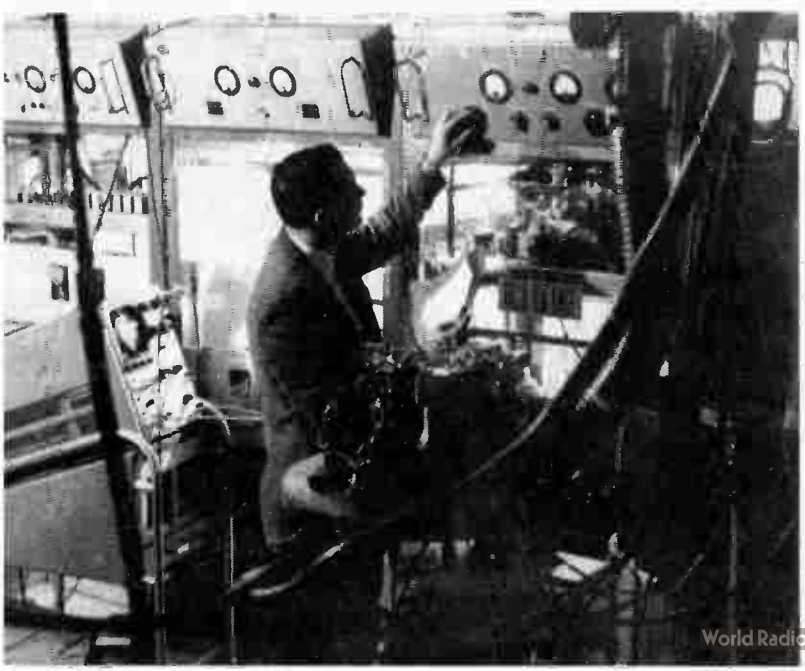
Philco Corporation, Lansdale Division, Lansdale, Pa., U.S.A.

* Trademark Philco Corporation for Micro Alloy Diffused-base Transistor



BMEWS transmitter performance is monitored by General Electric engineers during developmental tests at the company's high power radar laboratory.

Laboratory engineer in the microwave section of Convair is shown making standing wave measurements on radar waveguides with the slotted line technique.



Collins Radio Company engineer is pictured recording a radiation pattern from the bicone antenna to be used in Project Mercury. The Collins Antenna Laboratory is utilizing two full scale models of the Mercury capsule for testing all the antennas.

close-up

looking lenswise at your industry in action

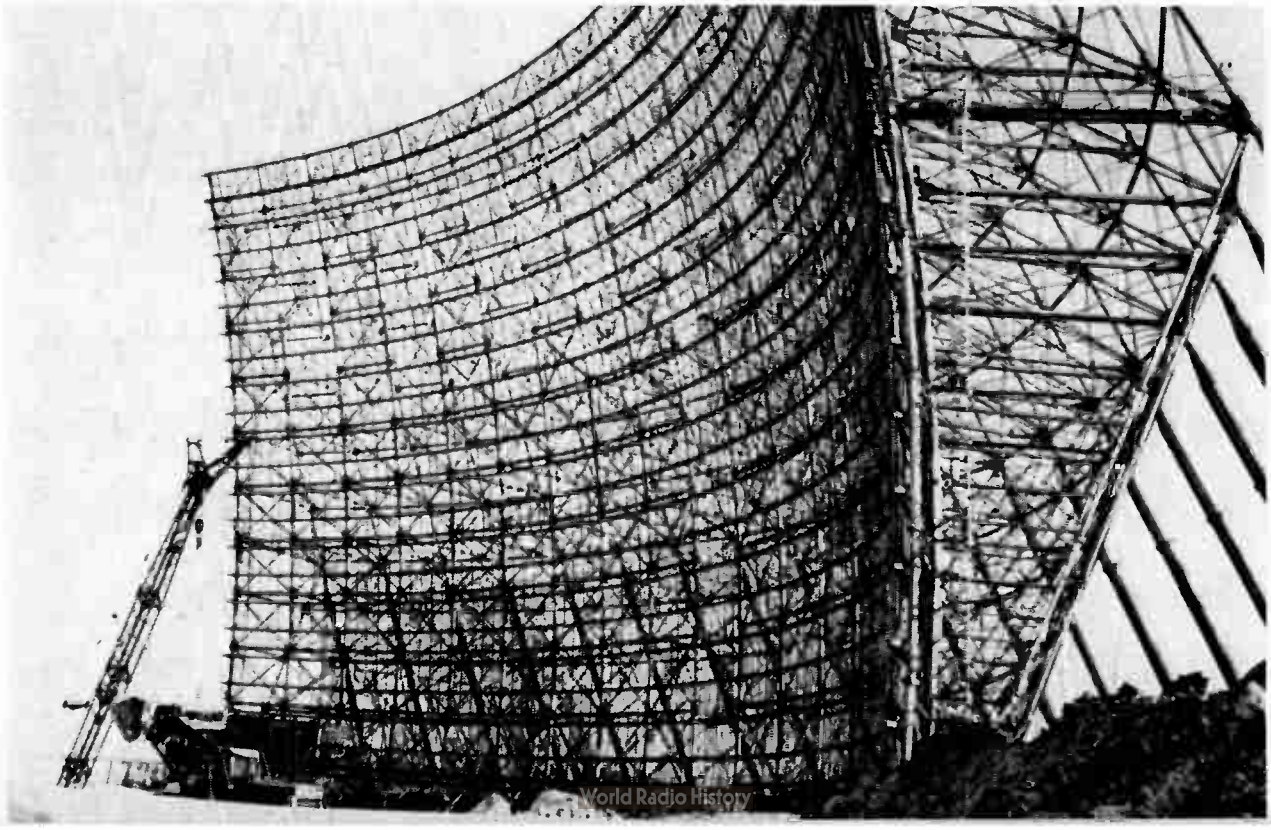
View of special facility at Sperry Gyroscope Company's Great Neck plant shows radar transmitter for the U.S. Army's ZEUS anti-missile missile system under test. In the foreground is the exceptionally high powered klystron. In the background are the transmitter cabinets. The equipment is completely checked for power output, stability, and fidelity.

In the assembly shop of Mechron Engineering Products, a technician assembles and wires a control panel for the No-Break diesel electric power plants for the Air Defense Communication System.

One of the tiniest exhibits at the ninth electrical engineers' exhibition which opened at Earls Court, London, recently was a British-made sub-miniature mercury relay.

Half-inch square crystal of synthetic ruby at tip of copper transition section is held above a 12-ounce magnet to dramatize the "heart" of the revolutionary "ruby maser" developed by Hughes Aircraft for the U.S. Army Signal Corps.

Torus-shaped antenna reflector for the U.S. Air Force's BMEWS surveillance radar subsystem is shown under construction at Site I in the Canadian Arctic. Measuring 165 feet high and 400 feet long, the huge reflector is built to withstand a six-inch coating of ice in winds of 185 mph.



Canadian Radio Technical Planning Board

Continued from page 21

period on a pro-rata basis for non-type approved equipment which may have been licensed between the Provisional and Final effective dates of this specification.

3. Still another case currently under consideration involves Radio Standards Specification 155 which will govern all low-powered VHF television satellite transmitting equipment. In this case there was urgency in establishing a control on television satellite operations in Canada and a draft specification was prepared which will be used as a guide in determining the technical acceptability of these transmitters, until such time as it is possible to make the final Specification effective. An effective date of April 1, 1961 has been proposed.

In the meantime the Board has been asked to make such comments or suggestions as it sees fit and the matter has therefore been referred to the Television Committee which will study the specification and make its recommendation in due course.

4. Another case currently under consideration by the Board involves Radio Standards Specifications 119 and 120 for low power VHF radiotelephones. This specification covers equipments which will normally be used as hand-carried portable radiotelephones or for short range point-to-point operations and limit the transmitter RF power output to 5 watts, requiring that the transmitter and/or receiver units provide a self-contained primary power supply which means that the batteries employed must form an integral part of the unit.

The Board has been asked for its suggestions and comments on this Specification and has accordingly referred it to the Land Fixed and Mobile Committee for study and report.

5. Other studies underway at the present time involve tropospheric and ionospheric scatter, communications system parameters (by the Microwave Task Force), the revision of rules for VHF television broadcasting, stereophonic broadcasting, single-side band transmission, color television standards, and many others.

The above are of course only a few recent examples of the work which has been going on for sixteen years.

The Board is constantly studying the changing state of the Art and other committees will be appointed as the need arises. For example, it may not be long before a committee on space electronics will be required — the United States government has already announced its intentions of experimenting with satellites as reflectors for radio signals, and some concern has already been expressed by a CRTPB sponsor that such experiments may create interference to microwave systems.

Incidentally the reader who is seriously interested in spectrum conservation should read the excellent paper entitled "A Canadian Viewpoint on Radio Frequency Spectrum Management" by C. M. Brant of the Department of Transport. A limited number of copies are still available at the offices of the Canadian Radio Technical Planning Board, 200 St. Clair Avenue West, Toronto. An article "Radio Allocation Engineering" by W. B. Smith of the Department, which appeared in *Electronics and Communications*, September 1959, is also worthy of careful study.

Letters to the editor

Wide engineering readership

The Editor:

Thanks very much for the copy of the June *Communications* Issue of your magazine carrying the story on CNT expansion.

We were very pleased with the presentation given our story in your magazine. As I believe I have mentioned to you before, *Electronics and Communications* receives wide readership among our engineers and your "roundup" issue is especially interesting to them since it keeps them posted on developments in companies other than their own. I have checked around for a day or so now and heard nothing but favorable comments.

George Hancocks
for John C. Noel,
Regional Manager,
Public Relations,
Canadian National Railways
Toronto, Ontario.

A good issue

The Editor:

I am grateful to you for having sent along a copy of the June issue of *Electronics and Communications.*

Indeed the story presentation takes full marks and its prominence at the head of the index puts the frosting on the cake.

A good issue, well rounded out, and I am sure one which will be well received in the industry.

Thanks again and hope to see you on one of my Toronto visits.

C. A. O'Brien
Manager, Public Relations
Canadian Overseas
Telecommunications
Corporation
Montreal, Que.

Holding for reference

The Editor:

Thank you for sending along the copy of your June *Communications* issue. We were pleased that you used our photograph on the cover and found our contribution worth a two-page spread inside. I found so much general telephone information in the issue that I am holding it for future reference.

H. R. Redmond
News Representative
HG Staff—Public Relations
The Bell Telephone
Company of Canada

Packed with material

The Editor:

A preliminary look through your June issue of *Electronics and Communications* magazine indicates that it is packed with interesting and well-presented material for the communication industry. Certainly the use of our material has been very well handled. We are pleased to have been able to contribute something towards the production of another excellent issue.

A. S. Nelson
Publicity
Okanagan Telephone Co.
Vernon, B.C.

Feature article pleases

The Editor:

I would like to thank you for running the feature article entitled, "Mill precision earns savings with I-beam weighing system", in the April issue of *Electronics and Communications.*

I visited our agency people in Philadelphia the other day and Ed Peeples, who handles BLH public relations, brought the article to my attention. He seemed quite pleased that you had published it and we both look forward to seeing similar BLH articles in the future. Many thanks for your co-operation and best personal regards.

George H. Blinn
Baldwin-Lima-Hamilton
Corporation
Electronics &
Instrumentation Division
Waltham 54, Mass.

Pictorial presentation timely

The Editor:

We agree that the pictorial presentation in *Electronics and Communications* of manufacturing operations in Canada is both timely and of great interest. We also believe that it is of utmost importance for everyone to recognize and understand the extent of Canada's electronic manufacturing industry, and the special skills and services which are provided by this industry. We recognize and welcome the contributions which your publication has made and hope you will make even greater contributions in the months ahead.

We believe your publication can make real contributions to the electronics industry in Canada by emphasizing the facilities, products and services available, and that by so doing, the added prosperity will be reflected in the success and growth of your own publication.

V. B. Dowdell
Manager — Marketing
Electronic Tube Section
Canadian General Electric
Company Limited.

Medium of keeping informed

The Editor:

We have recently moved our practice as consulting telecommunication engineers and attorneys to new offices and, in view of this change brought about by our growth, are writing to ask your support in publishing this move as a news announcement.

As subscribers to *Electronics and Communications,* we look forward to each monthly issue as a medium of keeping informed on new technological developments and industry changes which is such an inherent part of our service to our clients.

Herbert A. Hoyles
Hoyles, Niblock and
Associates
North Vancouver, B.C.

Effective cover

The Editor:

I'd like to comment on the excellence of the April cover design of your magazine. This is certainly a smart and effective cover. Undoubtedly you'll receive much favorable comment on the clarity and interest that the illustration invokes. I'm especially impressed with the almost "third-dimension" effect of the photograph.

This is a very fine issue for instrumentation engineers to read. I would like to see more articles written in the field of Automation - Instrumentation Development.

David Early
The Electronic Guide
Burbank, California.

Excellent mediam

The Editor:

Along with many of your other readers, we pay particular attention to the New Products Section of your magazine. This section is an excellent medium for keeping posted.

John Thomson
Stevens Tubing Corp.
East Orange, N.J.

scatter matter

Scanning the international scene

The first data communications networks in the United States for transmitting business, scientific, military and industrial information over telephone lines at the highest speeds ever achieved with commercial-type equipment have recently gone into operation. One of the networks uses a Collins' magnetic tape transmission system for inventory control between two Army Signal Corps supply points 650 miles apart; the other sends missile design problems and answers on a Collins' punched card transmission system back and forth between Charlotte, N.C., and Santa Monica, California.

An agreement providing for general technical collaboration in the field of point-to-point communication has been reached between Hermes Electronics Co. of Cambridge, Massachusetts, and Marconi's Wireless Telegraph Company, Ltd. of England. The agreement, in the future, may be expected to lead to cross-licensing arrangements between the two companies and may also broaden their product lines.

A Russian authority on television statistics is reported to have said recently: "The number of television sets in the U.S.S.R. was 45,000 in 1955 and 4 million in 1959; by 1965 it will be 25 million."

The world's largest radio telescope reflector — bigger in area than six football fields — will be built as part of an installation operated by the Radio Astronomy Branch of the U.S. Naval Research Laboratory. The dish will measure more than 600 feet in diameter across the top, and provide a concave surface of more than seven acres. It will rise higher than a 60-storey building, and will be able to revolve in a complete 360-degree circle, tilting up and down from 0 to 90 degrees.

The largest television studio in Europe and the British Commonwealth was opened during June as Associated-Rediffusion's mammoth new Studio Five. All the TV camera channels and associated video equipment used in the studio were supplied by E.M.I. Electronics Ltd., which was also responsible for the wiring and installation of all technical equipment. It is believed that the total order is the largest ever entrusted to a single manufacturer for installing TV equipment in one studio. Altogether 673 items of equipment of 81 different types were supplied by E.M.I.

The United Kingdom's **first university research chair in communication** has been endowed by a British commercial television company in Granada for the new University College of North Staffordshire. The first professor will be physicist Dr. Donald MacKay, of London University, who will establish a team including two medical scientists, one or two psychologists, three or four physicists and electronics engineers and eventually some sociologists.

The Government of Israel is encouraging and supporting the efforts of an Electronic Manufacturers Association, recently formed by a group of Israeli electronic device manufacturers and scientific institutions to help promote the industry's growth. The electronics industry of Israel hopes to attract foreign investors and to be in a position to add to its production of electronic equipment.

In view of expanding overseas distribution of its products, increasing participation in continental trade and technical shows has been scheduled by the General Radio Company. Among the cities on the European exhibit agenda are Paris, Milan, London, Stockholm and Dusseldorf.

EIA indicates get tough policy

Continued from page 10

Importation problem

The most important problem besetting our industry in the past two years has been the disruptive effect on our production and employment caused by fast growing importations — chiefly of radio receivers and electronic tubes. These importations from very low labor rate countries, particularly Japan, have been most difficult to cope with and they have had the constant attention of Bill Curry's Ad Hoc Committee on Importation, especially appointed to deal with them, Morley Patterson's Electronic Tube and Semi-Conductor Committee, your Board of Directors, and the EIA management. Representations to the federal authorities over a year ago were successful in amending regulations to provide markings as to country of origin of home instruments and electronic tubes. The Canadian consumer, as a result, can now identify a foreign product in these categories.

Representations to Ministers of the Crown have been under way for over a year requesting government assistance in dealing with foreign exporters to impose voluntary quotas. These appeals to our government have not been too successful. It appears that those now in control in Ottawa are not overly sympathetic to the problems of secondary industry in Canada and the best we could get from them was a suggestion that we contact Japanese Embassy officials. This was done May 24 on radio receivers and a similar approach on electronic tubes is in the final stage of preparation now. It is hoped that the Japanese will voluntarily set quotas on their exports to Canada and that these quotas will be at levels we can live with. Another phase of our work is to attack the inequities of the present basis for appraising excise tax on these imports, to the disadvantage of our Canadian made products. The 395,000 Japanese radio receivers imported in 1959 represented 2,370,000 man hours of labor lost to Canada or, over 1000 jobs. Such employment losses are of great seriousness and these are important factors which should not be ignored by those who claim responsibility for keeping Canada's economy on an even keel.

It is interesting to note from the annual report of the retiring president of the United States E.I.A. that our American friends have been faced

with the same importation problem and are asking the U.S. Congress to enact legislation to require the marking of imported electronic products in a similar manner to the markings now required by Canadian order-in-council. We hope that this change in our Canadian legislation for which this association was directly responsible, will have some curbing effect on low-wage country exportation, but quotas seem to offer the only real solution and in asking that Japanese exports of radio receivers be kept to the 1958 levels of 155,000 units rather than the 1959 level of 395,000, we are but seeking treatment only on a par with that recently given to Canadian producers of textiles, hardwood, plywood, and stainless steelware.

Color TV

On March 14 we presented a brief to the new Board of Broadcast Governors urging removal of the two obstacles which are holding up the normal progress of color TV in Canada.

These two roadblocks are well known to the members of this association because they have been with us for a long time:

First — The Department of Transport's continuing delay in approving the NTSC color television technical standards despite the fact that they have been recommended for approval by all interested groups in Canada.

Second — The restrictive nature of the present telecasting licenses which treat color as a separate entity from black and white and actually prohibit use of existing color telecasting facilities in Canada.

Our brief appeared to be well received by the Board but no reply has been forthcoming, despite repeated follow-ups, and we are beginning to fear that this may be another group that responds only to political pressures rather than to the glaring facts of life.

Continued on page 54

opportunities

These classified advertisements are published to assist those in the trade who have articles for sale, positions available, positions desired, sales agency openings or business opportunities. Charges are 25c per word or figure, not including heading or box number. Minimum charge is $5.00 payable on submission. No agency commission paid. There is absolutely NO CHARGE for "positions desired" advts.

Send all material to the attention of the advertising manager of ELECTRONICS AND COMMUNICATIONS, 450 Alliance Ave., Toronto 9, Ontario.

SALES ENGINEER

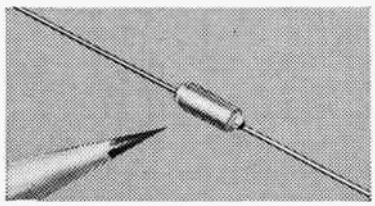
required to establish and take full charge of Toronto Office. Applicant must have had previous experience in the sale of electronic components. Must be mature and responsible. Excellent remuneration for right party. For further details contact:

DESSER E-E LTD.
441 St. Francois Xavier St., Montreal, P.Q.
Victor 5-6570

RELAY SALES ENGINEER

A major supplier of telephone type, electromagnetic relays, requires an experienced sales engineer for the Toronto area. A professional engineer, with experience in the design, manufacture, sales and application of telephone type relays, is preferred, but not essential if technical qualifications and experience are equal. Duties will be to assist the sales force in the application and sale of the products. Reply in confidence giving a full résumé to —

Box 5035
Electronics and Communications
450 Alliance Avenue, Toronto 9, Ontario.



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TECHNICAL AUTHORS WANTED

The editors of Electronics and Communications magazine are seeking manuscripts on the subject of electronic development and design from Canadian authors. Articles up to a maximum of 3000 words in length accompanied by glossy photographs and/or schematic illustrations are preferred but articles of greater length will be considered. Notification of acceptance of work for publication is given within one week to ten days of receipt of the manuscripts and payment is made on publication. Manuscripts should be addressed to the Editor, Electronics and Communications, 450 Alliance Avenue, Toronto 9, Ontario.

For complete details check No. 32

What's up — in Canada's Northland?

Continued from page 33

- Surface of each reflector is made up of 2,240 steel screen panels (5 x 7 feet in size) each of which is bolted to the truss structure.
- Antenna reflector has a design deviation of + 2.2 inches under full wind and ice load. It is erected to a ¾" tolerance. Built to withstand 6" coating of ice, in winds of 185 mph.
- 4½ miles of nickel steel pipe varying in size from 6" to 12" in diameter and ⅜" to 1⅜" in wall thickness were needed for four antenna reflectors constructed at Site 1.
- 10,000 cubic yards of concrete were poured in the 160 foundation footings required for the antenna supports.

Transmitter (generates radar pulse)

- Manufactured for General Electric by Continental Electronics Manufacturing Company, Dallas, Texas.
- Total weight of transmitters supplied for Site 1 — 2,221 tons (4,442,000 lbs.).
- Transmitter cooling oil needed — 2,022-55 gallon drums (111,110 gallons).
- High Power Klystron Tubes manufactured by Eitel-McCullough, San Bruno, California and Varian Associates, Palo Alto, Calif. Klystron tubes are 9 feet high and weigh 1600 lbs. packaged.

High speed scanning switch

- The high speed scanning switch assembly sprays the RF (radio frequency) energy through an upper and lower array of feed-horns producing beams which are rapidly scanned in azimuth. The scanner assemblies (2 per building) will be installed in huge buildings located directly in front of each of the four antenna reflectors.
- Manufactured for General Electric by General Bronze Corporation, Garden City, Long Island, New York.
- Overall Dimensions: The distribution switch is cylinder shaped, 16½ feet high and 21 feet in diameter.
- Total Weight of 8 Scanner Assemblies supplied for BMEWS, Site 1 — 613,000 lbs., or 76,600 lbs. each.

If the address on the front of this magazine is in any way incorrect, please fill out and mail the card on page 47. In doing this, you will help us to keep our mailing list up-to-date and will also ensure the regular and prompt delivery of your copies of:

ELECTRONICS & COMMUNICATIONS

EIA indicates get tough policy

Continued from page 51

Despite the seriousness of these problems confronting our industry at this time, I want to say that my confidence in the future growth of the Canadian electronics industry is unlimited. Electronics has become such a vital part of so many operations — military, commerce and industry, home entertainment and space exploration — that it cannot fail to go forward.

Not only will we double our membership and sales volume in the next decade but we will continue to broaden our services to the nation. Great challenges confront us. With each new technical breakthrough, new opportunities for industry expansion arise. I feel sure we will measure up to them as an industry and as an association.

To my successor, Jim Key, I bequeath an industry organization of which we all may be proud, an industry which is still youthful and challenging. I have thoroughly enjoyed my terms as your president. I thank you again for your support and I shall make myself available for such future chores as I am capable of.

Thank you.

Industrial electronics national symposium

The Ninth Annual National Symposium on Industrial Electronics is scheduled for September 21 and 22, 1960, at the Manger Hotel, Cleveland, Ohio. The symposium is jointly sponsored by the AIEE and the IRE, Professional Group Industrial Electronics.

editorial

Why make a pariah of the electronics industry?

The general tenor of utterances made by officials of the Electronic Industries Association of Canada at their 31st annual meeting held at Mont Tremblant Lodge, Quebec, June 15-17, left little doubt in the mind of this observer that a get tough policy with the Canadian Government respecting quotas on the importation of Japanese manufactured electronic products is in the making.

The following excerpt from a statement issued to the press on the occasion of the annual meeting is indicative of the angered mood of the E.I.A. insofar as the treatment it has received from the government, as a result of continued representations to Ottawa in an effort to obtain some measure of protective legislation against the importation of electronic products from low wage rate countries. The statement says in part ". . . . . Electronics, a key industry of Canada's future, both in manufacturing and defense, is being sacrificed because of 'subsidized imports'. The electronics industry is essential to the survival of any modern nation. Our Federal Government is neglecting its responsibilities to the most important section of our job-producing economy and is rapidly forcing the Canadian electronics industry out of business . . . . . "

The sum and substance of the whole issue, insofar as the Canadian electronics industry is concerned, is that it has been largely deprived of defense contracts upon which the industry thrived from World War II up until as late as 1958, and now must depend to a large extent on the manufacture of domestic type products, radios, television receivers, etc., as the mainstay of its survival. Unfortunately the Canadian industry cannot and never will be able to compete price-wise with imported Japanese products and the Canadian Government has indicated by its negative reaction to the industry's representations that it is not anxious to enact any protective legislation on behalf of the Canadian electronics industry that may disturb the status quo of existing Canadian-Japanese trade agreements.

This course of action on the part of the Canadian Government is obviously dictated by political and economic expediency and, while no fault can be found with such a policy predicated on such terms, it does nevertheless expose an alarming lack of appreciation on the part of our government authorities with respect to the vital necessity of affording every facility in keeping alive and healthy an electronics industry without which this country, in time of national emergency, would find itself begging both for electronic equipment and the people to produce it as it had to do in the first years of the last war.

It would seem to us that an electronics industry would be far more essential to the national welfare of Canada in times of national emergency than an industry producing flatware — an industry by the way which has already received the favor of government protection — unless of course government planners propose to instruct our armed services in the use of knives and forks as defensive weapons as well as culinary utensils.

If for no other reason whatsoever, it is the duty of the Canadian Government, as we see it, to exert every possible effort not only on behalf of those people associated with the electronics industry but on behalf of the Canadian people as a whole to protect and assure a continuing active electronics industry as a measure of self-protection and self-sufficiency against the day when its need may constitute one of the most vital bulwarks in the Canadian defense complex.

Surely in this day of angered international emotions there is no clearer obligation on the part of governments than to subscribe to a policy of national preparedness in whatever areas it is within their power to do so. If, therefore, the Canadian Government is to pursue such a policy, it cannot neglect any longer to enact reasonable sustaining legislation on behalf of the Canadian electronics industry. Such concessions have been made on behalf of other industries. Why make a pariah of the electronics industry?

EDITOR

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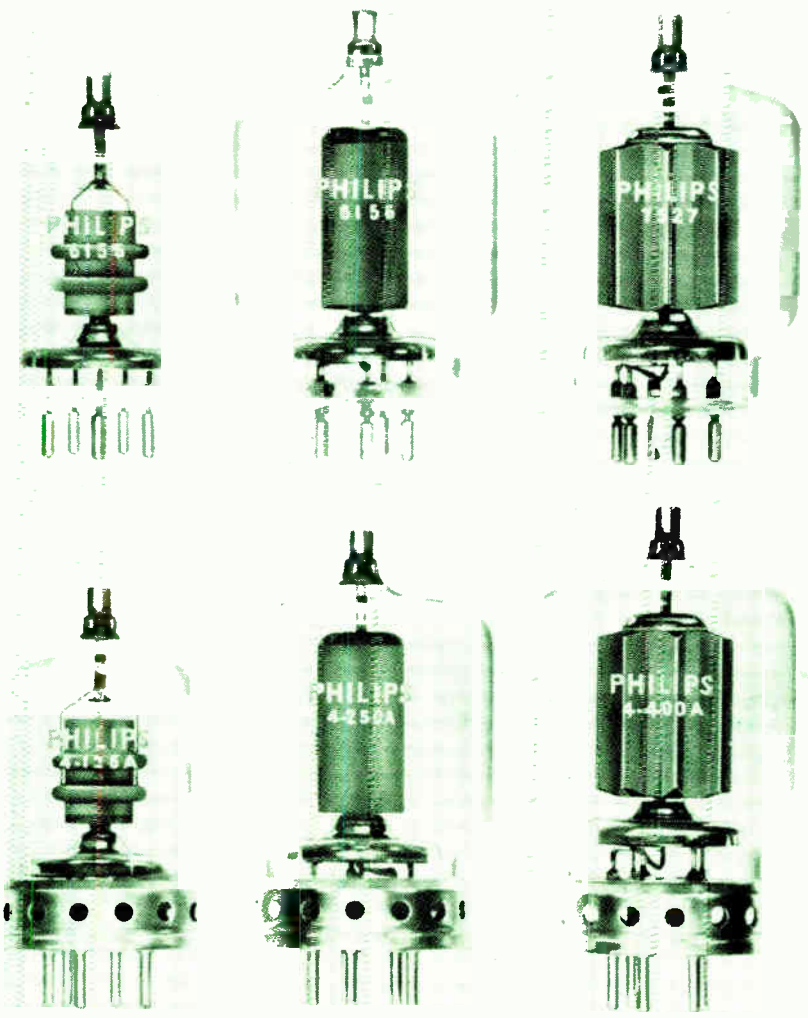

Philips tetrodes in six designs for original equipment or improved plug-in replacements

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6156	4-250A	250
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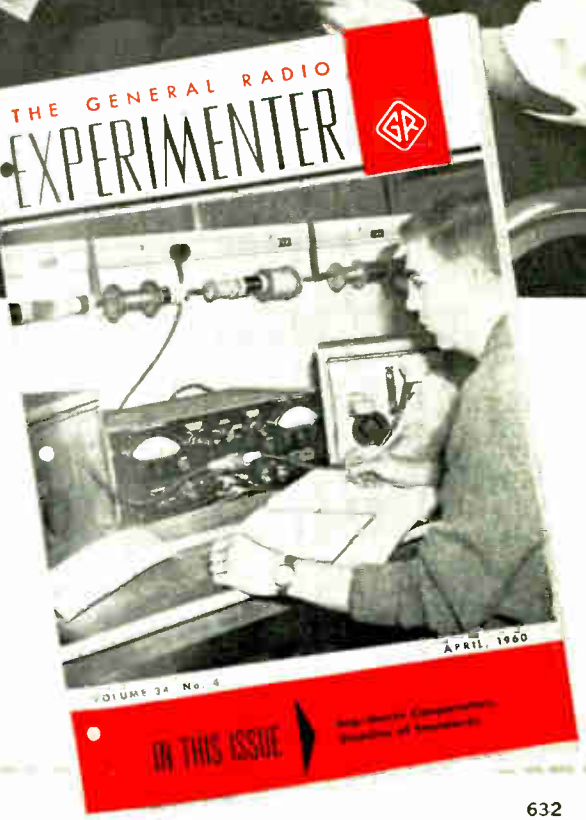

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In the *Experimenter's* pages you'll find descriptions of new G-R products, details of electronic measuring techniques, tips on how to get more use out of your test equipment, and accounts of interesting and unusual measurements problems and their solutions.

Many informative articles are scheduled for the *Experimenter's* pages, including: details of a new high-speed stroboscope; a discussion of the characteristics of tunnel diodes at ultra-high frequencies; and an announcement of a new Frequency Meter and F-M Discriminator that will measure from a few cycles to 1.5 Mc with ¼% accuracy. This new instrument is also capable of measuring one part-per-million of incidental fm.

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