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electronics • and communications



an age publication
JUNE 1960

Communications Issue

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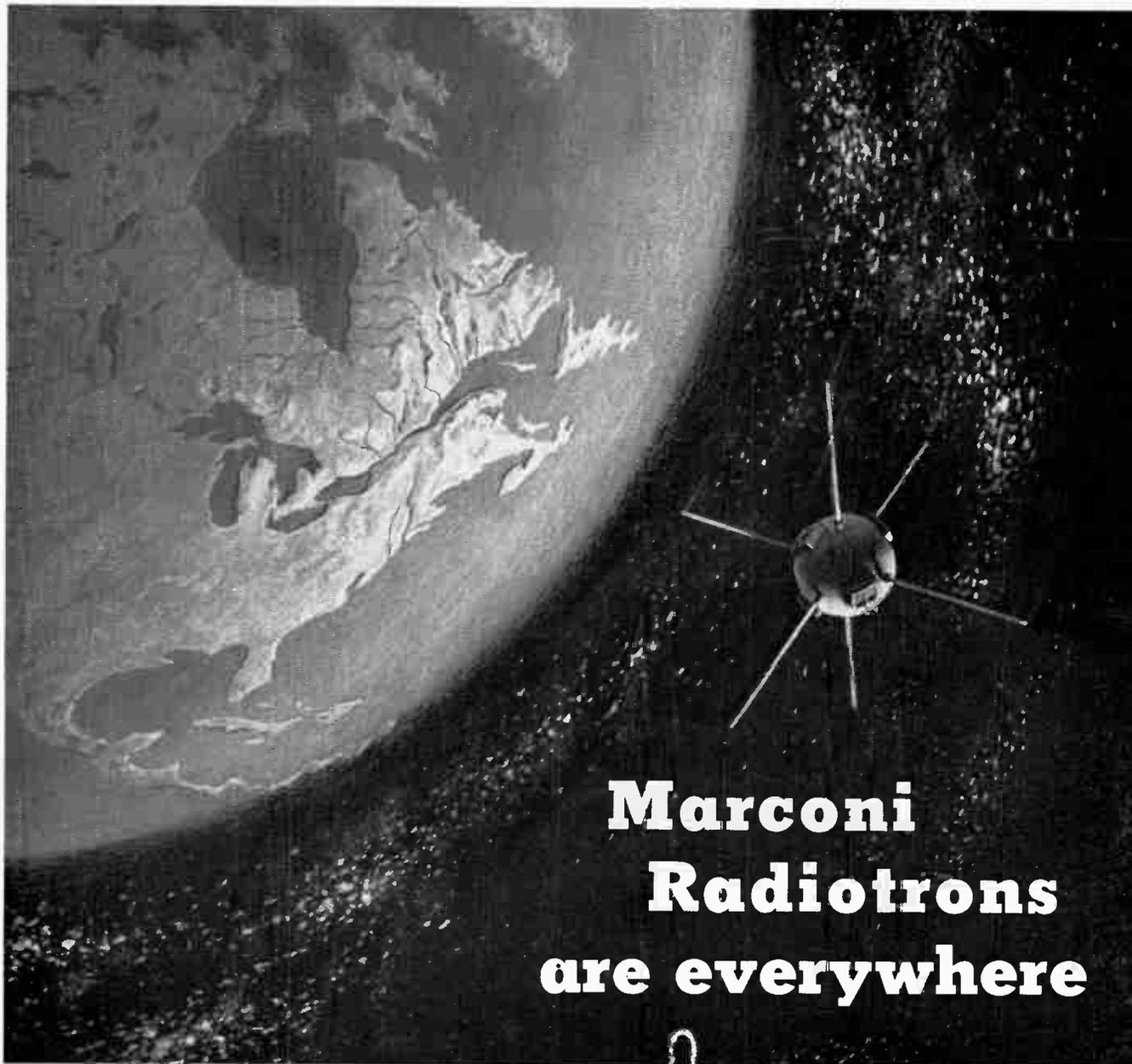
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ELECTRONICS AND COMMUNICATIONS, June, 1960

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Indexed in the Canadian Business and
Technical Index of the Toronto Public Library.

Subscription Rates: Canada, British Possessions
and United States: 1 year — \$5.00; 2 years — \$9.00;
3 years — \$12.00. Foreign 1 year — \$10.00.

Member Canadian Circulations Audit Board

Authorized as second class mail
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Canada's pioneer journal in the field of
electronics and communications engineering

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CRTPB newsletter

Prepared by Canadian Radio Technical Planning Board

DOT Establishes New Telecom Services

A substantial change in the organization of the Telecommunications Branch recently has been effected. The name has been changed to "Telecommunications and Electronics Branch" to bring into focus the expanding services of electronic systems and equipment and the technological changes which have taken place in the field of communication. The branch is headed by the Director, F. G. Nixon.

The structure of the three new divisions emphasizes specialization and makes provision for future expansion. A fourth division, Radio Regulations, reorganized in 1957, remains unchanged, but the Radio Aids Division as such has been abolished.

New Division, Design and Construction

A new division, Design and Construction, has been established which plans and directs the construction program for installation of radio and electronic equipment and systems for all services in the Department. It is sub-divided into sections under the following specialized functions: Radio Communications Engineering; Navigation Aids Engineering; Radar and Special Devices Engineering; Specifications and Project Control; and Test Room.

H. E. Walsh is chief of the new division and J. R. MacKay is associate chief. The superintendents, in order of above category are: D. J. McIntyre, R. M. Bennett, F. L. Bentley and D. A. Moore. The officer in charge of the test room is J. G. T. Arial.

Maintenance and Operations

Another division bears the title Maintenance and Operations and is sub-divided into four sections, each under a superintendent: Maintenance and Engineering; Air and Marine Operations; Technical Training and Manuals; and Teletype Operations. E. F. Porter is chief of this division and the superintendents are J. G. C. Thompson, G. Wells, W. M. Marshall and E. T. English.

Technical and Policy Co-Ordination

The third division, Technical and Policy Co-Ordination comes under C. M. Brant who will also assist the director in branch policy development and technical co-ordination. The three sections in this new division are: Research Development and Programming; Emergency Measures Planning; and Common Carrier and Landlines.

O. L. Britney, as Chief Engineer of Research Development and Programming, is responsible for systems analysis, equipment research and for programming branch electronic aids activities. The accelerated growth and complexity of electronic systems and closer co-operation between Department and the users of systems have made it necessary to establish a special section for this work.

In the Common Carrier and Landlines Section under W. E. Connelly, superintendent, more emphasis is to be given to the technical side of landline and associated services leased or provided by the Department. Problems relating to domestic and international communications carriers are also a special function of this section. W. R. Butler is superintendent of Emergency and Measures Planning.

Radio Regulations

The Radio Regulations Division is under W. A. Caton, Controller. The sections in this division are: Regulations and International Agreements under C. J. Acton, superintendent; Authorization and Enforcement under H. R. Newcombe, superintendent; Radio Regulations, Engineering, under W. B. Smith, superintendent; and Radio Regulations Services, under B. V. Lott, office manager.

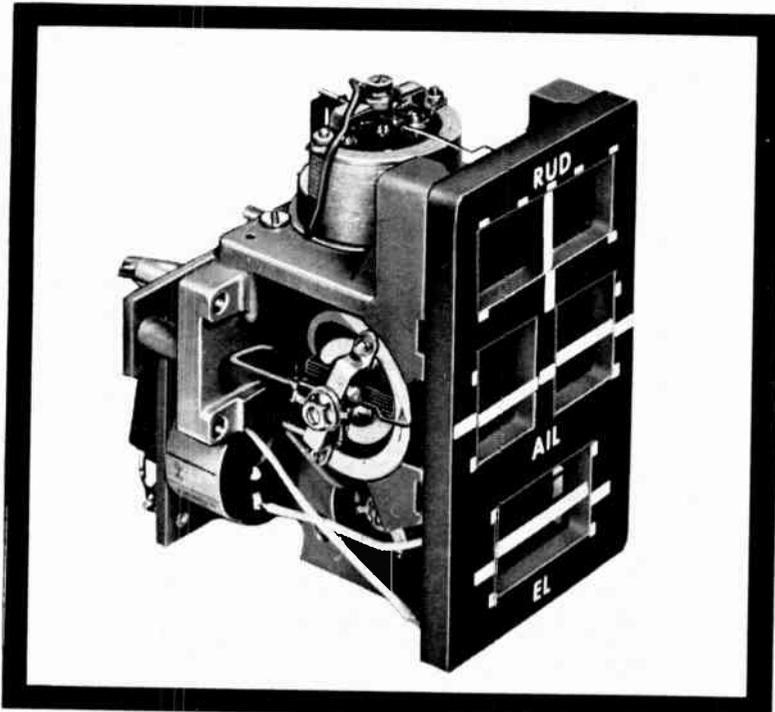
New Radio Standards Effective

Specifications 112 and 116 became effective April 1, 1960. The former sets forth the minimum standards required for type-approval of communication transmitters and receivers in ship stations operating in the 1.6 Mc/s to 10 Mc/s band with power outputs not less than 15 watts while Specification 116 deals with the standards for type-approval of land stations transmitters active in the 1.6 Mc/s to 20 Mc/s Band with power outputs not exceeding 500 watts.

We've tackled some

BIG

problems...

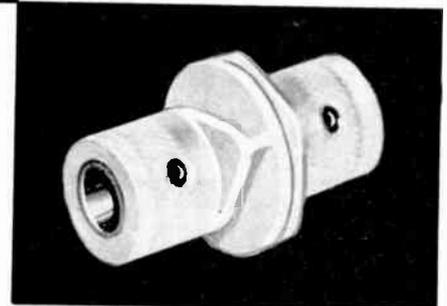


The pilot of today's supersonic fighter aircraft — as heavy as yesterday's airliner — no longer **FEELS** the controls in the old sense. Instruments like the one at left indicate the position of the control surfaces.

The problem of squeezing the necessary four instruments — rudder, left and right aileron, and elevator — into a space only 3" x 3" x 2" was solved by the use of Bach-Simpson's core-magnet movement. Eliminating the effect of variations in the aircraft supply voltage — our biggest headache — necessitated our designing and tooling a new ratio-type movement from scratch!

...and some little ones!

By contrast, the problem of creating a flexible coupling — to eliminate binding of the long control and switch shafts in the Bach-Simpson Model 2610 Oscilloscope — seems minute! Yet in its own way, the resulting component at right also exemplifies the versatility of Bach-Simpson's unique Engineering, Tooling and Production facilities — a combination which is at **YOUR** service!



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MODEL 999
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MODEL OER-1
5" Oscilloscope Kit. 3" C.R.T. Push-Pull Horizontal and Vertical Amplifiers.
Kit \$39.95
Wired \$99.50



MODEL MK-3
Multi-Range Multimeter. 20,000 Ohms/Volt. Molded Case. Unbreakable Meter Front.
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Vacuum Tube Voltmeter. Full View meter. Input impedance 100 Megohms. Proven Pinhead Circuit.
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MODEL RFG-3
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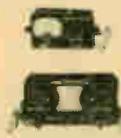
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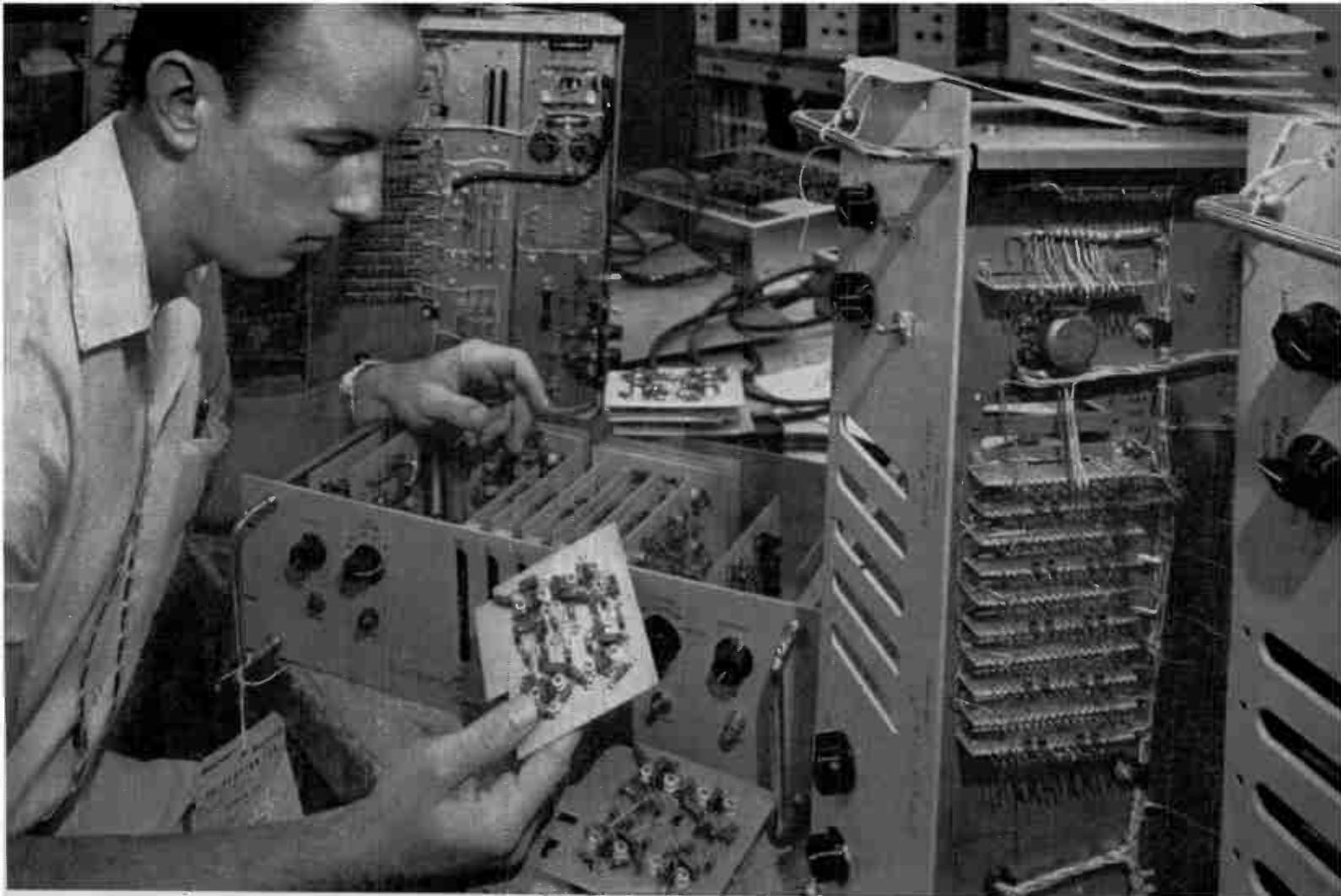
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Tung-Sol transistors handle four major jobs in Beckman[®]/Berkeley peak accuracy frequency counter

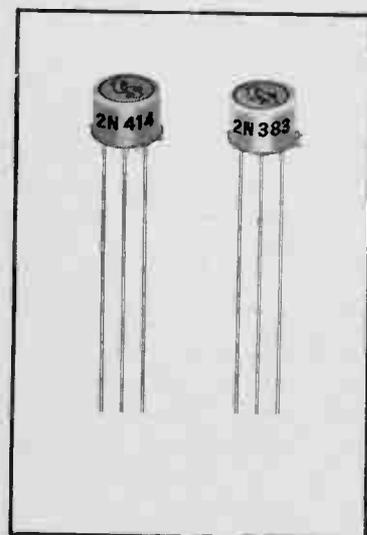
The Beckman/Berkeley Model 5310 EPUT Meter makes frequency measurements from 10 cps to 200 kc with an accuracy of up to 1 part in 10⁶. In military applications, such as missile check-out, where operating time is brief but success "a must", the EPUT Meter "gets in and gets out" quickly with fire-away data. Where long-term service with minimum downtime is a critical requirement, as in industrial monitoring processes, the equipment is also ideally suited.

Naturally, this exacting combination of highest accuracy and greatest dependability demands the most reliable component performance. And that's precisely why Beckman/Berkeley chose Tung-Sol transistors to assume four of the unit's primary operations. Tung-Sol's 2N414 high speed computer logic germanium transistors handle time division and frequency counting. The tasks of conversion

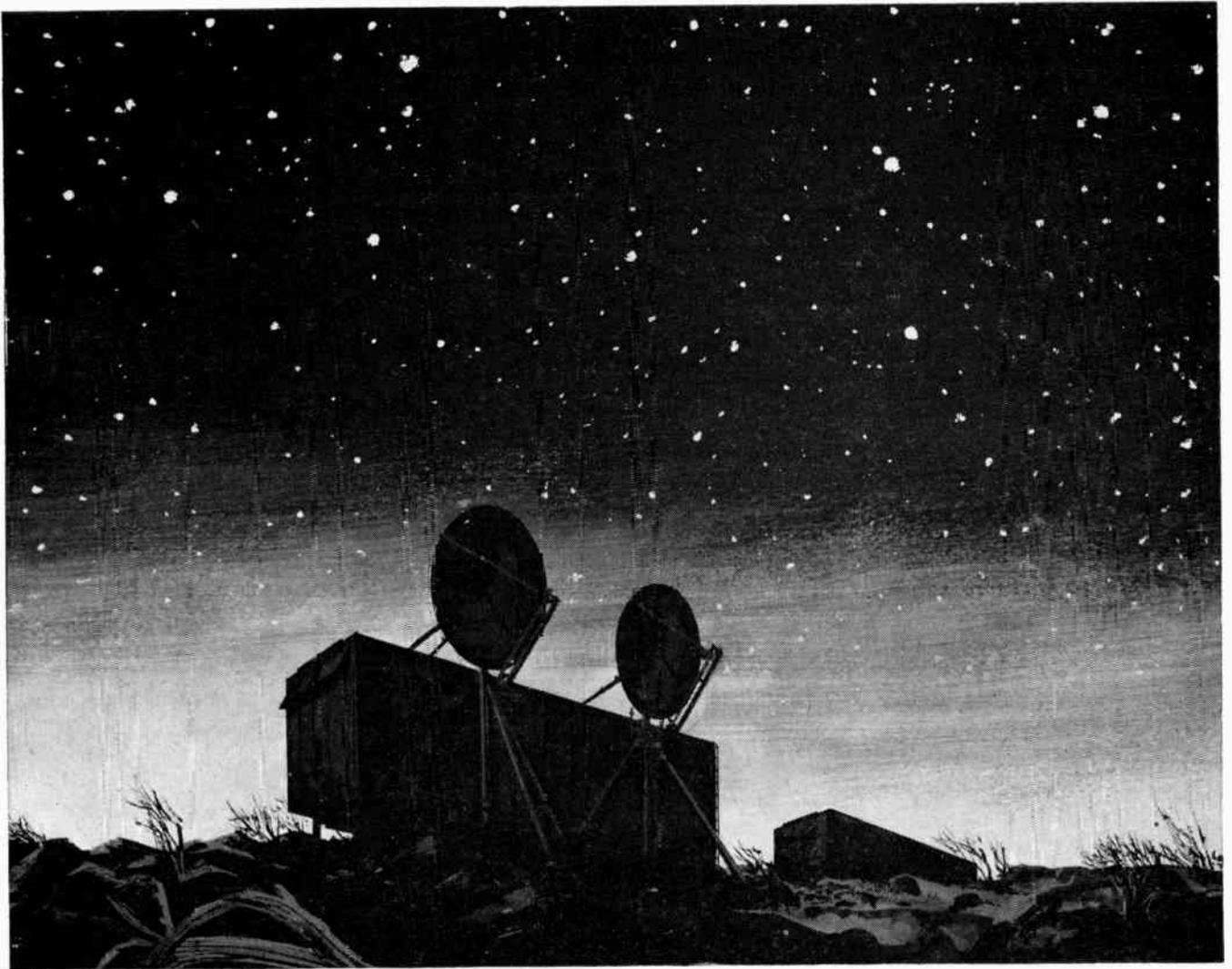
and current amplification for digital read-out are assigned to Tung-Sol's 2N383 medium power germanium transistors.

Why don't you get the benefit of Tung-Sol's component know-how too? Whether it's tubes or semiconductors — and there's a premium Tung-Sol unit for virtually every military and industrial need — you'll be designing only the best components into your circuit. You'll be getting quality units that have made the name of Tung-Sol synonymous with the finest componentry. In Canada: Abbey Electronics, Downsview, Ontario.

For prompt and competent technical consultation on Tung-Sol components call the Tung-Sol Commercial Engineering office nearest you. Atlanta, Ga.; Columbus, Ohio; Culver City, Calif.; Dallas, Texas; Denver, Colo.; Detroit, Mich.; Irvington, N. J.; Melrose Park, Ill.; Newark, N. J.; Philadelphia, Pa.; Seattle, Wash. Canada: Montreal, P. Q.



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... and 200 miles away a telephone rings!

Eight hours ago, an expanse of barren mountainous country made communication impossible. Tonight, 60 telephone channels and teletype span the wilderness.

Transportable MICROSCATTER is a super high frequency radio system for long-range communication. Developed by Canadian Westinghouse, MICROSCATTER beams signals high above the earth sending two-way voice and teletype messages up to 200 miles over land and water . . . *without* costly relay stations.

The compact MICROSCATTER radio system fits in a standard 30 ft. truck trailer. Now, whenever men and equipment move, MICROSCATTER moves right along with them. It is particularly suited to military and government projects in remote locations. Units designed for self-contained field operations are set down by helicopter.

A Westinghouse communications specialist will be pleased to explain fully the MICROSCATTER operation and relate it to your problem. Contact your nearest Westinghouse office, or write to Canadian Westinghouse Company Limited, Electronics Division, Hamilton, Canada. **YOU CAN BE SURE . . . IF IT'S WESTINGHOUSE.**

MICROSCATTER APPLICATIONS

COMMERCIAL		MILITARY	
Fixed Station—120 telephone channels	—television and sound	Wide Band—radar	—data
Transportable—60 telephone channels	—teletype	Tactical and Transportable—teletype	—60 voice channels
			—data

FEATURES

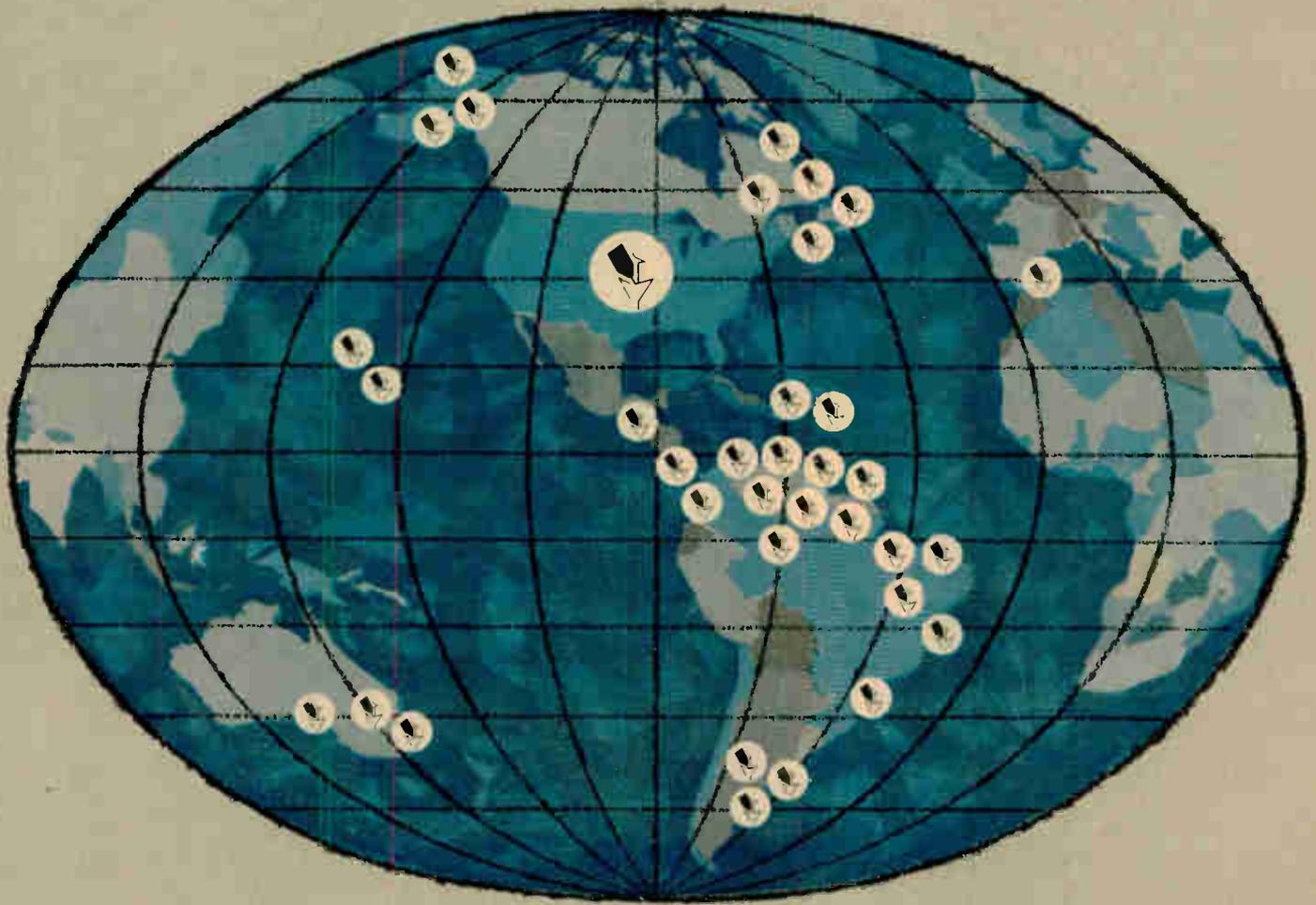
- Frequency—4400-5000 mc
- Antennas —10 to 28 ft. diameter
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- Range—100 to 200 miles

CANADIAN Westinghouse Microscatter

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the industry's business

Sola-Basic Products opens new plant

To keep abreast of Canadian industry's fast-growing demand for electrical equipment, Sola-Basic Products Ltd. recently opened a one-half million dollar plant in Metropolitan Toronto. The official opening was performed on May 19 by the Deputy Reeve of Etobicoke Township, Murray H. Johnson.

Situated on a four and one-half acre tract of land in Long Branch Industrial Park, Etobicoke Township, the 31,000 square foot plant is considerably larger than the former location and allows for further expansion. The address of the new plant is 377 Evans Avenue, Toronto 18, Ontario.

John R. McGovern, a graduate of McGill University and a Registered Professional Engineer, is vice-president and general manager of Sola-Basic Products Ltd.

Dr. B. G. Ballard addresses EIA annual meeting

The Electronic Industries Association of Canada announces that the guest speaker at the association's 31st annual meeting to be held at Mont Tremblant Lodge, Mont Tremblant, P.Q., will be Dr. B. G. Ballard, Vice-President (Scientific) and Director (Radio and Electrical Engineering Division), National Research Council. Dr. Ballard will speak on "The National Research Council and the Electronics Industry".

Dr. Ballard is scheduled to address the annual general meeting at 10:30 a.m. on Friday, June 17.



Department of Transport's training school for Air Traffic Controllers makes use of an ICAO-developed synthetic traffic control trainer which provides primary training in this field. Canada was the first country to adopt trainer which is now in use for first time.



Tactical scatter communications equipment valued at more than one million dollars is shown above being shipped by Canadian Westinghouse to the U.S. Air Force. Mobile and light in weight, the system combines good voice channel quality with high reliability for varied tactical situations.

Toronto Section IRE elects officers

The Toronto Section of the Institute of Radio Engineers recently held its annual elections for the coming 1960-61 season. The following officers were elected: Chairman — K. MacKenzie; Vice-Chairman — G. T. Quigley; Secretary-Treasurer — W. H. Anderson.

The final meeting of the season, a joint meeting with the Kitchener-Waterloo Section, consisted of a tour of the McMaster Reactor. After the tour Dr. Fleming described the reactor in greater detail by means of slides and answered numerous questions from the floor.

Canadian research exported to U.S.

A Canadian survey company, Hunting Associates Ltd., Toronto, began delivery during May of a \$100,000 "Stereomat" automatic mapping system to the Engineering Research and Development Laboratories of the U.S. Army Corps of Engineers, Fort Belvoir, Virginia.

Export of this basic Canadian research is the culmination of four years' work by inventor Gilbert Hobrough of Hunting's research and development division.

Hunting has licensed the Benson-Lehner Corporation of Los Angeles to manufacture and market the Stereomat systems throughout the world in exchange for royalty payments. The development of the system has been carried out entirely by Hunting with its own funds. The Canadian Government has the Stereomat under study and other governments have indicated considerable interest. The purpose of the system is the automation of the delicate and fatiguing task of establishing contours on photogrammetric maps made from aerial photography.

D.D.P. Contracts

The following is a list of unclassified electronic defense contracts for \$10,000 or over awarded to Canadian firms by the Department of Defense Production during the period March 16-31, 1960, effective during the year ending March 31, 1961.

- Abbey Electronics Ltd., Downsview, Ont., tubes, \$14,075.
- Aircraft Appliances & Equipment Ltd., Weston, Ont., aeronautical instrument repair, \$47,000.
- Aviation Electric Ltd., Montreal, Quebec, aircraft instruments. \$29,332; aeronautical instrument repairs, \$4,060,000.
- Aviation Electric Pacific Ltd., Vancouver, B.C., aircraft instrument repair, \$185,000.
- Bayly Engineering Ltd., Ajax, Ont., tubes, \$12,620.
- Beatty Bros. Ltd., Fergus, Ont., antenna towers \$41,811.
- Brunswick-Balke-Collender Co. of Canada Ltd., Toronto, Ont., repair of radomes, \$50,000.
- Canadian Applied Research Ltd., Toronto, Ont., instrument repairs, \$1,781,647.
- Canadian General Electric Co. Ltd., Toronto, Ont., aircraft instrument, \$38,938.
- Canadian Marconi Co., Montreal, Que., preproduction engineering for doppler navigation equipment, \$623,906; oscillator, \$11,378; research contract, \$120,217.
- Canadian National Railway Co. Ottawa, Ont., rental of telephone facilities, \$24,374.
- Canadian National Telegraphs, telephone plant maintenance, \$14,663.
- Carrier & MacFeeters Ltd., Scarborough, Ont., aeronautical instrument repairs, \$19,160.
- Computing Devices of Canada Ltd., Ottawa, Ont., instrument repairs, \$230,000; telemetry and data reduction equipment spares, \$10,000.
- E.M.I.-Cossor Electronics Ltd., Dartmouth, N.S., simulators, \$198,874.
- Edo (Canada) Ltd., Cornwall, Ont., sonar testing equipment, \$46,054.
- Garrett Manufacturing Corp. of Canada Ltd., Rexdale, Ont., aircraft instrument repairs, \$10,000.

Continued on page 73



Among the many guests attending the recent official opening of RCA's Montreal laboratories were the Hon. C. D. Howe, shown above center, with John D. Houlding, president of RCA Victor Company, Ltd., second from right, observing an experiment in the semiconductor laboratory.

Industry and Government leaders attend opening of RCA labs.

A group of top government officials and leaders in science, industry and education recently made a tour of inspection of the newly expanded research laboratories and other facilities at RCA Victor Company, Ltd., where major research and development projects for both the military services and private industry are being carried out.

Major points of interest in the tour were: The basic research laboratories, doubled in size in the last six months, where much exploration is under way in fields important to both current developments in the electronics field and future Space Age ventures. These laboratories now engage more physicists in basic research than any other non-governmental laboratories in Canada and are working on projects — some highly classified — of vital interest to the defense agencies of both Canada and the United States.

Sensitive Research and Tinsley sign agreement

Sensitive Research Instrument Corporation of New Rochelle, N.Y., announces the signing of an international sales agreement with Tinsley Instruments (Canada) Ltd. Effective immediately, all Tinsley equipment will be marketed in the United States and its possessions through Sensitive Research and its authorized field representatives as the "Commander" instrument line.

Tinsley Instruments (Canada) Ltd. has a record of over 50 years in the business of producing primary standards such as DC potentiometers, volt

2. The newly opened RCA Victor Environmental Test Laboratory, which is now making available to both private industry and government agencies facilities to test equipment, components and materials — and even animals and men — in almost any conceivable environment including the conditions of outer space. This facility, one of three commercial laboratories of this type in Canada, is the only one that offers a complete "engineering package" service, from the basic measurement of environmental conditions to the final engineering required in such conditions.

3. The semiconductor and tube division of the Montreal plant, where the basic research of the RCA Victor laboratories in solid state materials is being translated into advanced products and systems for industrial and military uses.

ratio boxes, standard resistors, high sensitivity galvanometers and amplifiers, and related equipment. They have exclusive manufacturing rights for several items originated and patented by the National Research Council in Ottawa, Ontario.

Selco's new address

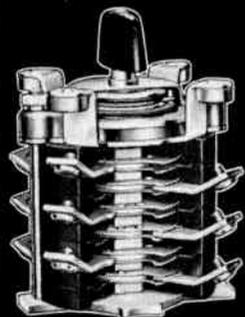
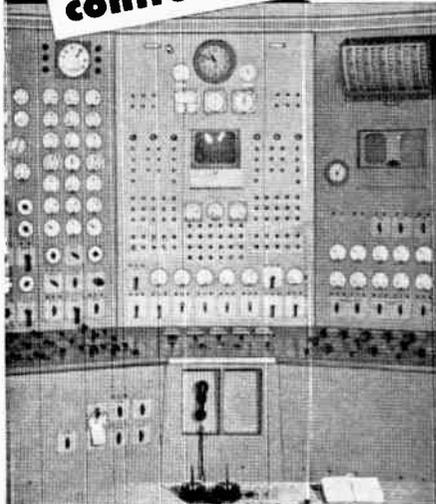
The Selco Exploration Company Limited recently announced that, effective May 2, 1960, its Airborne and Technical Services Division had moved from 79 Torbarrie Road to: 145 Belfield Road, Rexdale, Ontario. The telephone number, CHerry 4-4491 remains unchanged.

Continued on page 58

ESCO



instrument and control switches



TYPE JR

For Every Control and Transfer Application. The Type JR rotary switch is rated at 10 amperes, 125 volts AC, or 5 amperes, 125 volts DC.

TYPE P

Standard or Special Applications. The Type P rotary switch, a high speed snap action switch is rated at 10 amperes, 125 volts AC or 5 amperes, 125 volts DC. Also available in heavier designs for 30, 60, 100 or 200 amperes at 600 volts AC or 250 volts DC.



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For complete details check No. 33

engineers' book-case

Experiments In Electronics by W. H. Evans.

This manual provides the basis for laboratory exercises for introductory electronic courses. One hundred carefully planned experiments form the basis for this new volume. To insure wide scope and practicality, two experiments are given on each subject. The book takes into account the problem of availability of equipment, and the choice of experiments is geared to easily obtained laboratory materials.

Subjects covered include: Cathode-Ray Oscillographs, Thermionic Emission and Space Charge, Q-Measurements, Doubly Tuned Radio Frequency Amplifiers, Frequency Conversion, R-C Transients.

The material in this manual assures complete understanding of terms and experiments.

Prentice-Hall, Inc., 70 Fifth Avenue, New York 11, N.Y., contains 374 pages, hard cover bound, price \$6.95.

Circuit Theory of Linear Noisy Networks by Hermann A. Haus and Richard B. Adler.

The great need for low-noise amplifiers inspired Professors Haus and Adler of the Massachusetts Institute of Technology to look for a rational approach to the characterization of amplifier spot-noise performance.

This study, based on a single hypothesis concerning the essential function of an amplifier, leads to a characterization that avoids pitfalls previously associated with the effect of feedback upon noise performance.

Published jointly by The Technology Press of The Massachusetts Institute of Technology and John Wiley & Sons, Inc., 440 Fourth Avenue, New York 16, N.Y., contains 79 pages, hard cover bound, price \$4.50.

Fundamentals of Electronics by Matthew Mandl.

This volume gives a valuable background of information to readers whose ultimate goal may be in such diverse fields as digital and analog computer systems, automation, radar, microwaves, television, radio, or who hope to play a role in such activities as ICBM tracking in the coming age of space.

Completely reliable and informative, this timely book will not only interest educators, government specialists and professional engineers in the industry, but also offers essential help to those

who hope to specialize in the many branches of electronic art.

Prentice-Hall, Inc., 70 Fifth Avenue, New York 11, N.Y., contains 574 pages, hard cover bound, price \$10.60.

Programming Business Computers by Daniel D. McCracken, Harold Weiss and Tsai-Hwa Lee.

This volume is directed to the reader who lacks an extensive background in mathematics but who is involved, or expects to be involved, in day-to-day application of electronic computers to business data processing problems.

The book begins with a discussion of fundamental topics, such as: the nature of the data processing problem, the central concept of the file, flow and charting and the general characteristics of electronic computers. The authors then employ numerous examples to explain all the standard techniques of coding. These examples are written in terms of a hypothetical computer called DATAC, which is a compilation of the features of many machines.

The book concludes with a summary of the steps involved in establishing a computer application, and a critical examination of the accounting and auditing problems associated with electronic data processing.

John Wiley & Sons, Inc., 440 Fourth Avenue, New York 16, N.Y., contains 510 pages, hard cover bound, price \$10.25.

Automation and Computing by Andrew D. Booth, D.Sc., Ph.D.

This clear and informed account of the structure of calculating machines and some aspects and implications of automation will be of vital interest to engineers, mathematicians and all those concerned with modern industrial and economic developments.

The author deals with the history of automation and of analog and digital calculation, the logical design of calculating machines and the application of digital and analog techniques to automatic process control, machine tool control and assembly. He assesses the achievements of computing machines in various fields, including sport and translation: he shows that automation can play an increasingly important part in office procedure and in strategic and economic planning.

Brett-Macmillan Ltd., 132 Water St. South, Galt, Ontario, contains 158 pages, hard cover bound, price \$5.00.

weather conditioned microwave

ANDREW RADOME EQUIPPED ANTENNAS DEFY ICE...SNOW...WIND

Andrew radomes provide excellent 2-way year-round protection for Andrew microwave antenna systems. First, they protect feed and reflecting surface against the attenuating effects of snow, ice and debris accumulation. Secondly, for tower mounted antennas they reduce the effects of wind thrust by 35%.

All Andrew radomes are lightweight and easy to install—clip directly to the dish rim of existing antennas. Unheated radomes are suitable for all but exceptional cases. In areas where freezing rain occurs, heated radomes can be provided.

SPECIFICATIONS STANDARD RADOMES

Dia. Feet	Type No.	Attenuation @ 6 kmc. db	VSWR Contribution @ 6 kmc	Thrust at* 30 psf (Flats), lbs.
10	R10	0.4	0.02	1,990
8	R8	0.4	0.02	1,270
6	R6	0.4	0.02	714
4	R4	0.4	0.02	320
2	R2	0.4	0.02	75

*Including antenna

HEATED RADOMES

Dia. Feet	Type No.	Attenuation @ 6 kmc. db	VSWR Contribution @ 6 kmc.	Thrust at* 30 psf. (Flats), lbs.	Power** Reqmts.
10	HR10	0.7	0.02	1,990	3,400 watts
8	HR8	0.7	0.02	1,270	2,400 watts
6	HR6	0.7	0.02	714	1,200 watts
4	HR4	0.7	0.02	320	550 watts
2	HR2	0.7	0.02	75	150 watts

*including antenna

**Power requirements for HR10 and HR8 are 3 wire single phase 60 cycle 220 volts.

Power requirements for HR6, HR4 and HR2 are single phase 60 cycle 115 v.

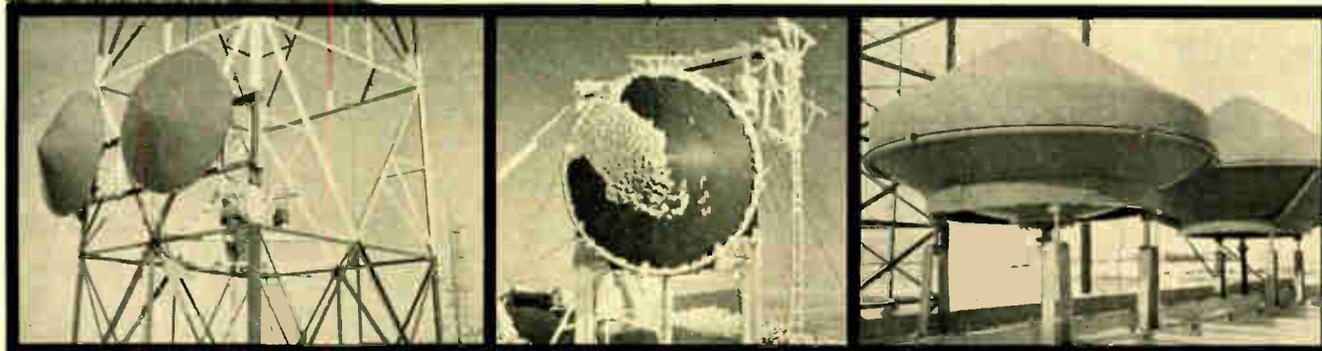
For further details on ANDREW Microwave Antennas, Radomes, Wave Guides write for new Andrew Catalog CM.

ANTENNAS
ANTENNA SYSTEMS
TRANSMISSION LINES

Andrew

ANTENNA CORPORATION LTD.

606 Beech Street · Whitby, Ontario
Telephone: MOhawk 8-3348



"We have paid particular attention to antennas during extremely high wind conditions of gusts up to 40-60 m.p.h. It is very obvious that these radomes quite materially reduce the wind loading on the parabolas—due to their shape factor." (Police Broadcast)

"We have had up to four inches of ice on the radome with practically no reduction of antenna effectiveness. During high winds, radome reduces pressure on the dish. (AM-TV Station)

"Our field forces report that the radomes produce a signal loss of less than 1 db per antenna. Several radomes were removed and antennas inspected following a heavy snowstorm and no snow or ice was found in the antennas." (Gas Pipeline Company)

For complete details check No. 7 on handy card, page 85

Your guide to

BENDIX SEMICONDUCTORS

MAXIMUM RATINGS AND TYPICAL OPERATION OF BENDIX* GERMANIUM PNP TRANSISTORS

TYPE NUMBER	PRIMARY APPLICATIONS				MAXIMUM RATINGS					TYPICAL OPERATION		CASE TYPE
	Audio	Push-Pull	Switch	Power Supply	Collector Voltage V _{ce} (a)	Collector Current I _c	Collector Dissipation P _c	Thermal Resistance	Junction Temp. T _j	Current Gain	hFE	
High Power Transistors												
2N176	X				40 Vcb	3 Adc	25 W	—	90°C	45 (c)	0.5	TO-3 (P)
2N234A	X				30	3	25	2° C/W	90°C	25 (c)	0.5	TO-3 (P)
2N235A, B	X				40	3	25	2	90	40, 60 (c)	0.5	TO-3 (P)
2N236A, B	X			X	40	3	25	2	95	40, 60 (c)	0.75	TO-3 (P)
2N242	X				45 Vcb	2	25	3	100	—	—	TO-3 (P)
2N255	X	X			15 Vcb	3	25	3	85	40	0.5	TO-3 (P)
2N256	X	X			30 Vcb	3	25	3	85	40	0.5	TO-3 (P)
2N285A	X			X	40	3	25	2	95	150 (c)	0.5	TO-3 (P)
2N307, A	X				35 Vcb	1, 2	10, 17	5, 3	75	80	0.2	TO-3 (P)
2N399	X	X			40	3	25	2	90	40 (c)	0.75	TO-3 (P)
2N401	X	X			40	3	25	2	90	40 (c)	0.5	TO-3 (P)
2N418			X	X	80	5	25	2	100	50	4.0	TO-3 (P)
2N420, A			X	X	40, 70	5	25	2	100	50	4.0	TO-3 (P)
2N637, A, B	X		X	X	40, 70, 80	5	25	2	100	45	3.0	TO-3 (P)
2N638, A, B	X		X	X	40, 70, 80	5	25	2	100	30	3.0	TO-3 (P)
2N639, A, B	X		X	X	40, 70, 80	5	25	2	100	23	3.0	TO-3 (P)
2N677, A, B, C	X		X	X	30, 40, 70, 80	25 (b)	50	1.5	100	40	10.0	TO-3 (P)
2N678, A, B, C	X		X	X	30, 40, 70, 80	25 (b)	50	1.5	100	75	10.0	TO-3 (P)
2N1031, A, B, C	X		X	X	30, 40, 70, 80	25 (b)	50	1.5	100	40	10.0	TO-3 (L)
2N1032, A, B, C	X		X	X	30, 40, 70, 80	25 (b)	50	1.5	100	75	10.0	TO-3 (L)
2N1073, A, B (d)	X		X		40, 80, 120	10	35	2.0	100	40	5.0	TO-3 (L)
2N1136, A, B	X		X	X	40, 70, 80	6	37	2.0	100	75	3.0	TO-3 (P)
2N1137, A, B	X		X	X	40, 70, 80	6	37	2.0	100	115	3.0	TO-3 (P)
2N1138, A, B	X		X	X	40, 70, 80	6	37	2.0	100	150	3.0	TO-3 (P)
B-177	X			X	30	3	25	2.2	90	150 (c)	0.5	TO-3 (P)
B-178	X				30	3	25	2.2	90	40 (c)	0.5	TO-3 (P)
B-179	X				40	3	25	2.2	90	25 (c)	0.5	TO-3 (P)
B-1017	X				20	3	25	2	85	25 (c)	0.5	TO-3 (P)



TO-3 (P)



TO-3 (L)

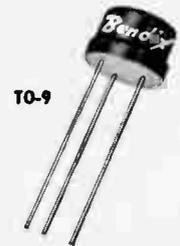
Medium Power Transistors												
2N1008, A, B	X	X	X		20, 40, 60	300mA	400mW	0.15°C/mW	85	95 (c)	10mA	TO-9
2N1176, A, B	X		X		15, 40, 60	300mA	300mW	0.20°C/mW	85	70 (c)	10mA	TO-9
Military Types												
2N297A	X		X	X	50	5	35W	2.0	95	70	0.5	TO-3 (P)
2N331	X		X		30 Vcb	200mA	200mW	0.15°C/mW	85	50 (c)	1.0mA	TO-9
2N1011	X		X	X	70	5	35W	2.0	95	55	3.0	TO-3 (P)
2N1120	X		X	X	70	15	45W	1.5	95	35	10.0	TO-3 (L)

(a) V_{ce} except where noted. Equivalent V_{cb}'s are 20-50% higher. (b) Peak collector current. (c) h_{fe}, AC current gain. (d) Diffused—Alloy—Power DAP transistor.

MAXIMUM RATINGS OF BENDIX* SILICON RECTIFIERS

Commercial Types							
Type Number	I _o Adc	PRV Vdc	Lib @150°C	Case Type			
1N1612	5	50	1 mAdc	DO-4			
1N1613	5	100	1 mAdc	DO-4			
1N1614	5	200	1 mAdc	DO-4			
1N1615	5	400	1 mAdc	DO-4			
1N1616	5	600	1 mAdc	DO-4			
Military Types							
Type Number	MIL-E-	I _o @150°C	PRV Vdc	Lib @25°C	Epp	Lib @150°C	Case Type
1N1614	1/1240	5 Adc	200	50 μAdc	140	750 μAdc	DO-4
1N1615	1/1241	5 Adc	400	50 μAdc	280	750 μAdc	DO-4
1N1616	1/1242	5 Adc	600	50 μAdc	420	750 μAdc	DO-4

*Trademark



TO-9



DO-4

CDC 6004



FOR FURTHER INFORMATION WRITE

COMPUTING DEVICES OF CANADA LIMITED
P.O. BOX 508 · OTTAWA · CANADA

For complete details check No. 26 on handy card, page 85

EIMAC CERAMIC TUBES DESIGNED FOR SPACE WITH RUGGED NEW 26.5 VOLT HEATERS

Three extremely sturdy Eimac ceramic tetrodes have been specially designed for missile telemetry and airborne military communication systems—with rugged new 26.5 volt heaters.

In actual missile systems and current key projects, these tubes have passed severe tests with flying colors. And have dramatically proved that they *can take it!*

For your space age needs, investigate the many advantages of these pioneering Eimac tubes: the X578G, X578H and X578J. Write for complete information.



EITEL-McCULLOUGH, INC.
San Carlos, California



CANADIAN REPRESENTATIVE:
R. D. B. SHEPPARD
2036 Prince Charles Road, Ottawa

GENERAL CHARACTERISTICS EIMAC 26.5 VOLT CERAMIC TUBES

Tube	Eimac Tube With Similar Characteristics	Length	Diameter	Frequency for Max. Ratings	Max. Plate-Diss. Rating	Heater Voltage
X578G	4CX300A	2.5"	1.65"	500 mc	300 watts	26.5
X578H	4CX125C	2.5"	1.25"	500 mc	125 watts	26.5
X578J	4CN15A	2.5"	0.9"	500 mc	15* watts	26.5

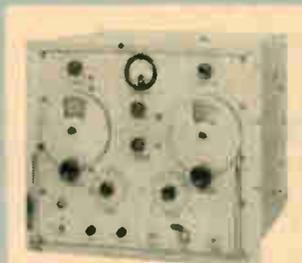
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*A nominal rating. May be increased by employing a suitable heat sink or liquid immersion.
For complete details check No. 31 on handy card, page 85

FOR COMMUNICATION INSTRUMENTATION

HEWLETT-PACKARD Model 302A

— presenting improved design in wave analyzers, featuring low power consumption (in the order of 3 watts), provision for battery operation (18 to 28 volts) as well as ac line power, and elimination of warmup time.

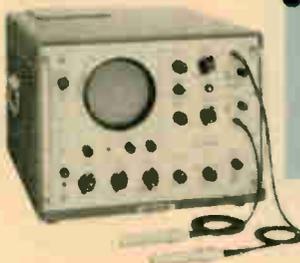


● SIERRA Model 201B

— a new FM signal generator, 1300 to 2500 MC in one band, designed for telemetry and data transmission applications in the 1.3 to 2.5 KMC range. Features a 1% deviation linearity; utilizes signals having modulation bandwidths up to 500 KC.

● HEWLETT-PACKARD Model 185A

— this oscilloscope features easy viewing, rise time less than 0.7 millimicroseconds, full 10 cm vertical display, built-in amplitude and time calibrators, sweep magnifier, high impedance probes, X-Y recorder output, sweep delay and beam finder.



SIERRA Model 210A

— a UHF power amplifier, 7125 and 7750 mc, two kilowatt broad band amplifier with power gain of over 40 db, requires only 100 milliwatts of r-f drive. Seven VA 856 klystrons are available for full coverage of the 625-mc span, the cavities of each tunable over a 100-mc range.

SIERRA Model 125A

— a compact V.T.M., 3 to 600 KC with narrow and wide selectivity settings plus a flat voltmeter position. Its measurement range (tunable mode) is
— 90 dbm to + 32 dbm;
flat mode,
— 30 dbm to + 32 dbm.



HEWLETT-PACKARD Model 606A

— a new signal generator covering the H.F. spectrum (including 30 and 60 MC radar IF bands). Output is constant within ± 1 db over the full frequency range, and is adjustable from +20 dbm (3 volts rms) to -110 dbm (0.1 μ v rms). Can be provided with a 10:1 voltage divider and dummy antenna lowering minimum output to 0.01 μ v.

GERTSCH Model FM-7

— a portable VHF Frequency meter with minimum accuracy of .0002% (direct reading) or .0001% (with correction curve) over frequency range of 20 to 1000 Mcs. May be used as a signal generator. Combined with the DM-3 and RFA-1, provides a complete communications servicing package.



HEWLETT-PACKARD Model 524D

— a Precision Electronic Counter with bright number readout, stability — 3 parts in 10 short-term, covers frequencies 10 cps to 220 MC, measures time interval 1 μ sec to 100 days, measures period 0 cps to 10 KC, resolution 0.1 microseconds.



● T.I.C. Model 1105

— Video Sweep Generator has high output, low harmonic distortion for observation of frequency versus amplitude characteristics of wide band circuitry. RF output adjustable from 1 millivolt to 2.0 volts peak-to-peak into a 75 ohm load from a 75 ohm source.



ATLAS INSTRUMENT CORPORATION LTD.

50 Wingold Avenue, Toronto 19, Canada

BRANCHES IN: MONTREAL • OTTAWA • VANCOUVER

For complete details check No. 11 on handy card, page 85



8,088 DIFFERENT
WIRES AND CABLES . . . and more being added every week!

BUILDING WIRES and CABLES

Flame-seal—Types TW & TWU
 Flexible Armoured Cable—Types AC & ACL
 Philex Cable—Types NMD-3 & NMW-10
 Rubber Braided—Type RH-RW
 Rubber Neoprene Cables
 Service Entrance Cables

BARE CONDUCTORS—LINE WIRE

Electrolytic Copper Rod
 Solid & Stranded Copper Conductors
 Aluminum & ACSR
 Brass & Bronze Wire
 Copperweld Wire & Cable
 Trolley Wire
 Furnace Cables
 Soaking Pit Cable
 Polyethylene & Neoprene Line Wire
 Weatherproof Line Wire

CONTROL CABLES

Traffic Signal Control
 Railway Control
 Elevator Cable
 Thermostat Control
 Organ Cable
 PVC & Polyethylene Control
 Rubber Neoprene Cable

MAGNET WIRES

Round, Square, Rectangular
 Enamel, Formel
 Paper, Cotton
 Polyester, Nylon
 Polyurethane

FLEXIBLE WIRES, CABLES and CORDS

Annunciator
 Aircraft Cable
 Fixture Wires
 Flexible Cords
 Railway Cables
 Military Wire
 Neon Sign Cable
 Oil Burner Cable
 Office Wire
 Portable Cords—SV, SJ, S, SJO, SO
 Portable Cables—SW, SWO, W, G, SH
 Motor Lead Cables
 Welding Cable

MISCELLANEOUS

TV Camera Cables
 Cable Terminations
 Junction Boxes
 Potheaus
 Splicing Materials

COMMUNICATIONS WIRES and CABLES

Alpheth Cables
 Stalpath Cables
 Radio & Coaxial Cables
 Fire Alarm & Signal Cables
 Interphone Cables
 Paper Lead Telephone Cables
 Philex Switchboard Cables
 Telephone Wires & Cables
 Telegraphic Cables
 Terminating Cables

ROCKBESTOS CABLES

Boiler Room Wires
 Fixture Wire—Type AF
 Power—Types A1, A2 & A7
 Range & Stove Wires
 Switchboard—Types A1B, A19
 Appliance Lead Wires
 Special High Temperature Wires
 Soil Heating Cable

Phillips Electrical Company
 Limited, Head office—Brockville,
 Ontario, Branches—Halifax,
 Montreal, Ottawa, Toronto,
 Hamilton, Winnipeg, Edmonton,
 Vancouver.

POWER CABLES

Armoured—DSTA, SWA
 Neoprene, PVC and Polyethylene Protected
 Rubber Neoprene Cables
 Paper Lead Cables
 Varnish Cambric Insulated
 Marine Cables
 Mining Cables
 Submarine Cables
 Lead Sheathed Cables
 High Voltage Cables—69Kv and Higher

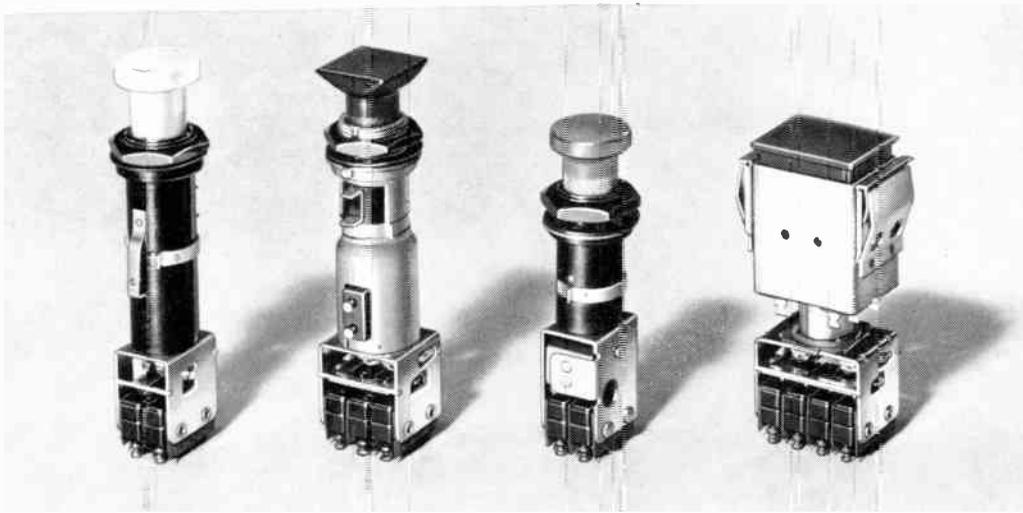


WIRES CABLES

6004



MICRO SWITCH Precision Switches



LIGHTED PUSHBUTTON SWITCHES—MICRO SWITCH manufactures a complete line of lighted pushbutton switches that saves wiring, cuts panel space. Available in momentary,

maintained, alternate-action and magnetically held versions. Up to 4-pole double-throw circuitry and a choice of button sizes, shapes and colors. Write for Catalog 67.

ONE COMPLETE SWITCH SOURCE when you must be sure of Precision and Reliability



..... **SUBMINIATURE TOGGLE**—Perfect combination of high capacity and small size. Part of a complete line of toggles, including hermetically sealed models, multiple unit toggle assemblies and virtually any type of circuit arrangement you may need. Write for Catalog 73.



..... **"SM" SERIES**—Small size, light weight and high electrical capacity. May be assembled into auxiliary actuator brackets, gang-mounted or used in pushbutton assemblies and rotary selectors. Precise operation and long life. Also available sealed in metal housings. Write for Catalog 63.



..... **SUBMINIATURE MERCURY SWITCH**—Ideal for locations where a minimum of operating energy is available. MICRO SWITCH manufactures over 1,000 different types of mercury switches, including enclosed models sealed in a resilient material with a protective case to guard against shock and vibration. Write for Catalog 90.



..... **SEALED SUBMINIATURE**—"SE" switches are available in 3 different circuit designs, with environment-free seal, corrosion-resistant aluminum housing. A smaller "XE" version now available is the smallest and lightest environment-free switch available. Write for catalog 78.



..... **SUB-SUBMINIATURE SWITCHES**—Smallest single-pole double-throw, snap-action switches available, yet have ample electrical capacity and will give long, precise service. Write for Catalog 63.

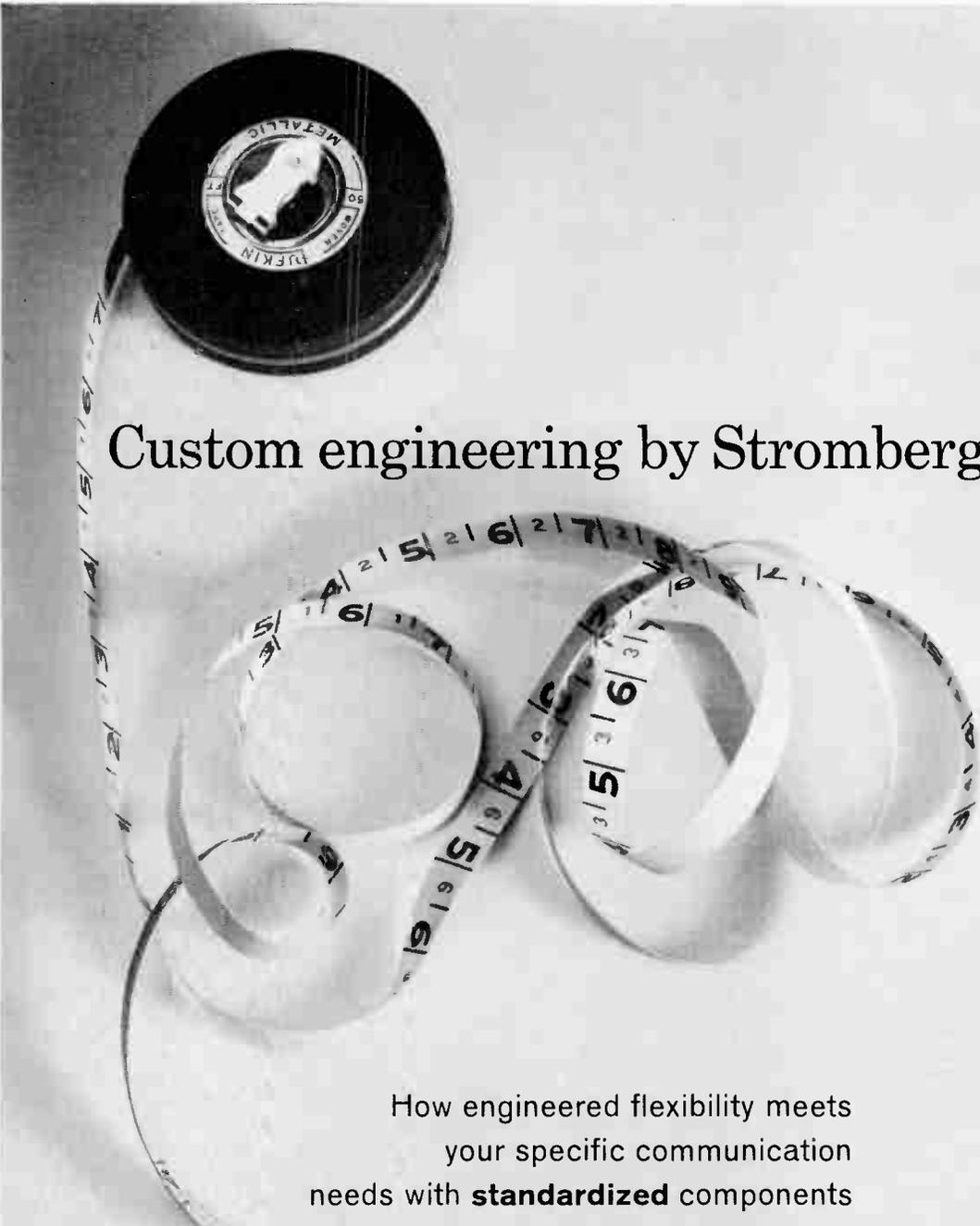
For further information on these switches or for expert advice on any switching problem, call your nearest Honeywell office or write Honeywell Controls Limited, Precision Components Division, Toronto 17, Ontario.



Honeywell

MICRO SWITCH Precision Switches

For complete details check No. 42 on handy card, page 85



Custom engineering by Stromberg-Carlson

How engineered flexibility meets
your specific communication
needs with **standardized** components

"Custom engineering" by Stromberg-Carlson means a communication system that is ideally suited to your specific application—without the maintenance and service problems that can accompany custom-made equipment.

Each Stromberg-Carlson system is composed of standardized components—the basic building blocks—and is fashioned by customized application engineering to meet the requirements of your plant. This arrangement assures the greatest possible flexibility at the lowest possible cost.

What's more, you get the reliability, minimum maintenance and minimum service requirement inherent in using proven, standard components. And you have a built-in guarantee against obsolescence, because your system can be expanded or adapted to meet changing conditions—still with standard Stromberg-Carlson components.

The Stromberg-Carlson distributor, an expert Communications Consultant, will be happy to discuss with you the specific needs of your plant and help you decide how a communication system by Stromberg-Carlson can best meet them. Find him in the Yellow Pages under "Public Address & Sound Equipment," or write to Special Products DIVISION, HACKBUSCH ELECTRONICS LTD., 23 PRIMROSE AVE., TORONTO 4, ONTARIO

Exclusive Canadian Representatives

HACKBUSCH ELECTRONICS LIMITED

STROMBERG-CARLSON

A DIVISION OF GENERAL DYNAMICS CORPORATION

For complete details check No. 38 on handy card, page 85

ELECTRONICS AND COMMUNICATIONS. June, 1960

Illustrated is a typical SS-800 "custom-engineered" paging or background music system, one of many possible customized arrangements of standard Stromberg-Carlson components.

A Dial-X® private telephone intercom system can either be "tied in" to the paging system or used independently.

Perhaps the needs of your plant can best be met by a Pagemaster® selective radio-paging system.

"Key-municator" loudspeaking intercom system is still another aid to more efficient operation.



industry personnel



C. A. Pollock

C. A. Pollock elected CMA Ontario chairman

Carl A. Pollock, president of Dominion Electrohome Industries Limited, of Kitchener, Ontario, was recently elected chairman of the Ontario division of the Canadian Manufacturers' Association, when manufacturers from all over Ontario met at Hamilton for the division's 41st annual meeting. Mr. Pollock succeeds Donald M. Chishold, vice-president and managing director of Norton Company of Canada, Limited, Hamilton.

Al Hoffman sets up hi-fi business

Al Hoffman, who for many years headed the advertising and sales promotion department of Atlas Radio Corporation Ltd., Toronto, has resigned from that company to set up his own high fidelity business. The new firm, which will be known as **Majestic Sound Company**, will specialize in tape recorders and components. Sound room and offices are temporarily located at 552 Cranbrooke Ave., Toronto 12, Ontario.

Represents Cambion in Western Canada

Cambridge Thermionic Corporation of Cambridge, Massachusetts, has recently announced the appointment of **William G. Nowlin** as one of its regional sales managers.

Mr. Nowlin will cover Cambion sales in Western Canada as well as areas in the United States.



A. Hoffman



R. J. Duncliffe



P. G. Landolt



W. G. Nowlin



G. N. Brearley



S. A. Rybb



V. H. Young



H. J. Cotton



J. E. MacArthur

Atlas Radio appoints advertising manager

Atlas Radio Corporation Limited announces the appointment of **Harold J. Cotton** as manager of advertising and sales promotion. He succeeds A. Hoffman who has resigned his post to set up his own business.

Mr. Cotton has been associated with the Canadian electronics industry since 1954, starting in the servicing field. For the past five years he has been employed in the technical publications branch of the industry.

Glendon Instrument appointments

The Glendon Instrument Co. Ltd. of 46 Crockford Blvd., Scarborough, Ontario, has announced the appointment of **Peter G. Landolt** as sales engineer. Mr. Landolt is a graduate in electrical engineering from McGill University and served with the RCAF as navigator and observer.

Concurrent with the above announcement the election of **Stan Rybb** to the board of directors and his appointment as treasurer of the company were made known.

Canadian Admiral Corp. appointments

Stuart D. Brownlee, president, Canadian Admiral Corporation, Ltd., Port Credit, Ontario, recently announced two new appointments for the company's National Service Division.

R. J. "Bob" Duncliffe has been appointed general manager of the Service Division and **G. N. "Nick" Brearley** has been appointed manager of National Service Parts & Accessories.

Mr. Duncliffe has been with the company since 1948, beginning as a technical inspector. He was formerly service manager with the Toronto sales branch of Canadian Admiral, and more recently was field representative for the Service Division.

Mr. Brearley has been with Admiral since 1951 and has served as service manager at the Toronto branch and field engineer. Before joining Canadian Admiral he was service manager with an Admiral distributor and previously instructed in electronics at the Rehabilitation Center (now Ryerson Institute).

Officers named for Radio Condenser Co.

Russel 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. He succeeds Russell E. Cramer, Sr. who continues as a director.

At the same time, the board of directors of the Canadian company elected Clarence M. 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.

William W. Paul continues as secretary-treasurer of the Canadian company. Headquarters are at 6 Bermondsey Road, Toronto 13, Ontario.

RCA Victor appointment

R. H. Newton, vice-president and general manager, Service Division, RCA Victor Company, Ltd., has announced the appointment of V. H. Young as manager, Technical Products Service, effective May 1.

Mr. Young has been with the Service Division of RCA Victor since 1946. Initially he worked as sales engineer in the Engineering Products Division; in 1952 he was appointed manager of the Commercial Service Section of the new Technical Products Service Division.

In his new position, Mr. Young will maintain control of industrial service, and will also be in charge of service for government contracts.

CNT appoints wire services supervisor

The appointment of Joseph C. O'Leary as supervisor of wire services, Canadian National Telegraphs, is announced by J. S. Ford, chief engineer.

Mr. O'Leary joined the CNR's communications arm in 1927 as an operator in the testing and regulating department. Between 1936 and 1946 he served in various capacities ranging from morse operator to repeater station attendant in such places as Toronto, Kingston and Nakina. In 1946 he was appointed despatcher in the office of chief of traffic, Toronto. Three years later he was made despatcher in CNT's engineering department, the position he held at the time of his present appointment.

Transitron opens Toronto office

Transitron Electronic Corporation of Wakefield, Mass., has announced the opening of a Canadian office in Toronto, Ontario. Field engineering representative is Jay E. MacArthur. The new office will represent Transitron in eastern Canada, including Toronto and Montreal.

A native of Toronto, Mr. MacArthur is a graduate of Ryerson Institute of Technology and formerly was associated with Sonograph Engineering & Manufacturing Company of Toronto.

One of three largest producers of semiconductors, Transitron manufactures transistors, diodes and rectifiers for industrial, commercial and military use.

Mr. MacArthur's office is located at 1229 The Queensway, Toronto. Telephone number: CLifford 9-5461.

Thermoelectric devices produced in Canada

Roman Post, president of Nucleonic Electric Equipment and Development

Company, recently announced the formation of a new subsidiary of the company, Needco Cooling Semiconductors Ltd.

Needco Cooling Semiconductors Ltd. will be the first company in Canada to be engaged in the mass production of thermoelectric material and devices for defense, scientific and industrial purposes.

Mr. Post also announced the appointment of S. R. Mester, P.Eng., as sales manager for Needco Cooling Semiconductors Ltd.

The new company is located at 5701 Cote St. Paul Road, Montreal, Que., which is also the headquarters of the parent company.

GE executive elected president of EIA

L. Berkley Davis, vice-president and general manager of the General Electric Company's Electronic Components Division, at Owensboro, Ky., was recently elected president of the Electronic Industries Association. He succeeds David R. Hull, a vice-president of the Raytheon Co., of Waltham, Mass.

CEWA annual meeting and convention

The fifth annual meeting and national convention of the Canadian Electronic Wholesalers' Association was held April 25, 26 and 27, 1960, in the Queen Elizabeth Hotel, Montreal. Attendance of members from Eastern and Western Canada was the largest of any previous annual meeting.

O. L. Bell, of the Big "A" Company Limited, Belleville, Ont., CEWA president, was convention chairman, assisted by Leo Rosenberg, chairman of the board and other national directors.

Officers elected at the convention for the forthcoming year included O.

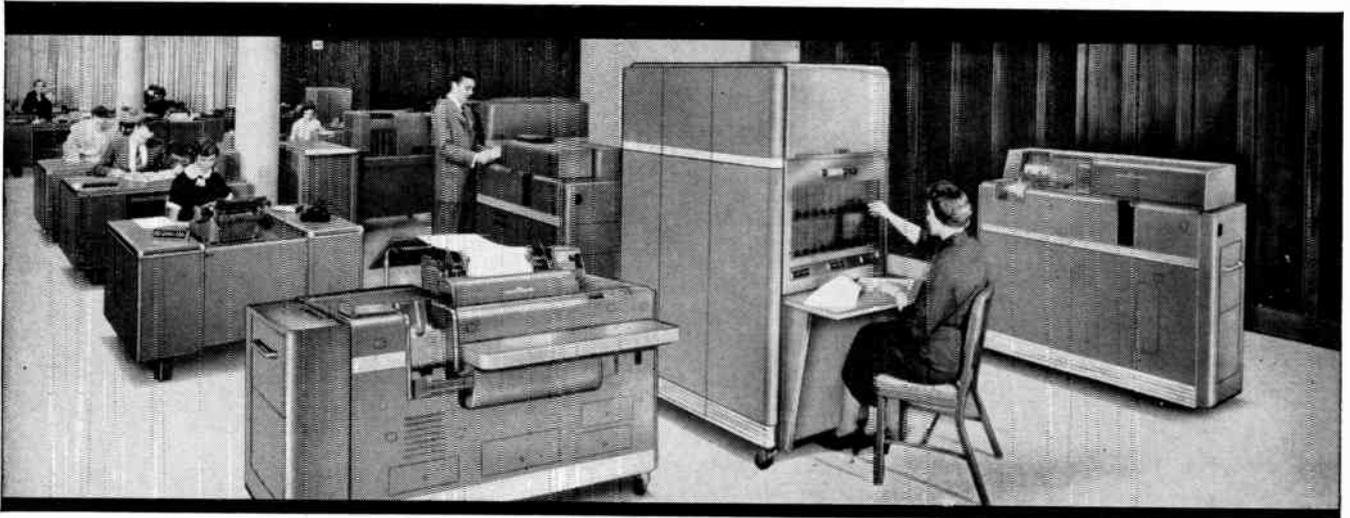
L. Bell, chairman of the board; Arnot M. Clark, president; A. G. Johnson, vice-president. John T. Rochford of 25 Taylor Drive, Toronto 6, Ontario, is national secretary-treasurer.

Prior to the opening of the national convention, both the Eastern and Western Divisions held divisional meetings. Both the national and divisional meetings closed with a marked feeling of optimism on the part of CEWA members as to the future growth and development of the Canadian electronics industry and the strengthening of the bonds which unite the electronics distributor to the other branches of the industry.



The newly elected board of directors of the Canadian Electronic Wholesalers' Association are shown above. Left to right: O. L. Bell, chairman of the board; Al. Manis, Al. G. Johnson, vice-presidents; Arnot M. Clark, president; Fred Fucile; Ralph Bryanton, Leo Rosenberg, chairman emeritus, and John T. Rochford, secretary-treasurer. (Guy Packford was absent when this picture was taken.)

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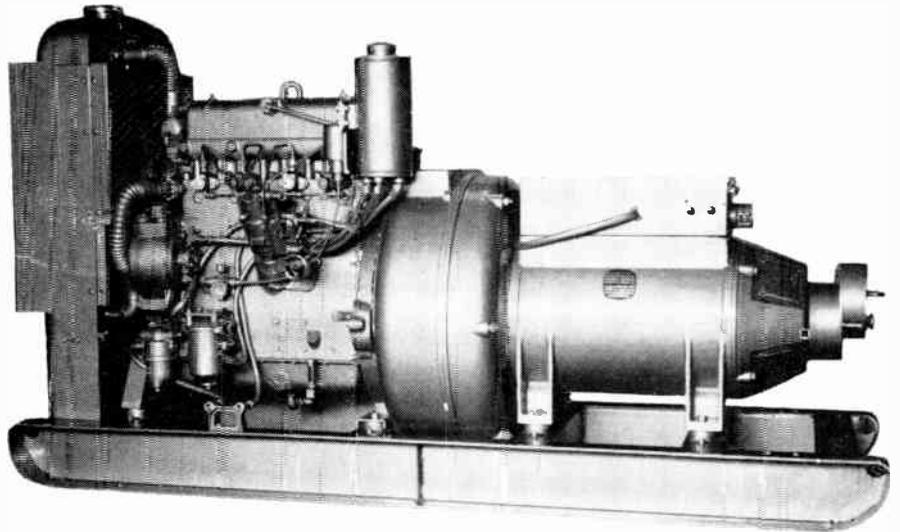
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Branches in principal cities.

For complete details check No. 44 on handy card, page 85

PUZZLE:

FIND THE POWER BREAK



"WE'LL BET YOU DIDN'T FIND IT!" —
*... and you won't!**

THE GRAPH reproduced on this page shows an actual voltage record during a power interruption from normal source — and protected by the new lightweight 10 KW U.S. Motors DIESEL "Micro Power" no-break generator.

WHAT IS MICRO POWER? . . . Micro Power is a stand-by or auxiliary power plant for use with equipment that cannot tolerate even a momentary interruption of electrical power. Micro Power provides a constant source of electrical power, despite voltage fluctuations and power failures from prime source, and maintains voltage and frequency output at useable values.

Unlike existing equipment, Micro Power is lightweight and compact in design, weighs only 2,300 lbs., and is just 80½ ins. in length — a definite advantage in simplifying installation on hilltops and other difficult locations where space and weight present a problem.

Micro Power is available with the following engine power options: DIESEL, GASOLINE, NATURAL GAS, and PROPANE, and a full range of electrical ratings. Write for detailed information and specifications.

There are over 50 Micro Power units in use by communication companies in Canada.

* The power break occurred at 3rd line past 6 AM point.

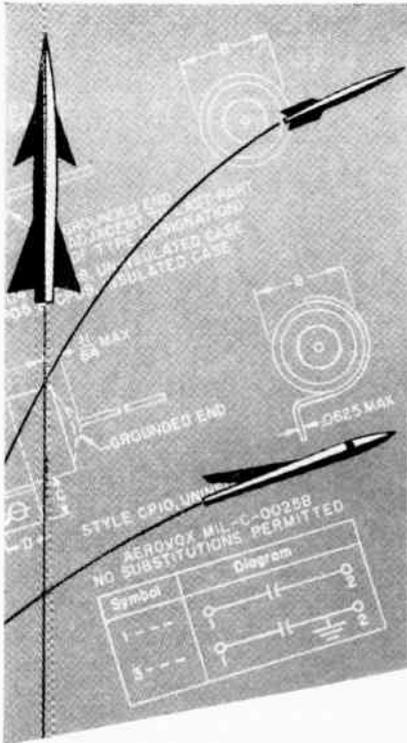
AP 902

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LIMITED

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For complete details check No. 12 on handy card, page 85



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26

EIA report

by R. T. O'Brien

Color TV

The EIA has forwarded to the Board of Broadcast Governors a supplement to the brief which was reported in the April issue of *Electronics and Communications*. The supplement outlines the expenditure that would be necessary to convert present monochrome telecasting facilities to color transmission. It is hoped that if the restrictive nature of the present licenses could be altered the introduction of color telecasting could give the whole Canadian electronic industry a refreshing shot in the arm. Although the expenditure for Canada's 62 stations would be relatively small the industry stands ready to begin production for a very lucrative market for color home receiving sets.

Director of Engineering Asks for Plan on Spectrum Space

Speaking at a recent meeting of the EIA Board of Directors the Director of Engineering, Ralph A. Hackbusch, made a strong recommendation that EIA set up a committee on international frequency allocations to formulate a long range plan on spectrum space. He suggested that, if Canadian manufacturers are to share in the world market for telecommunications equipment, production planners should be more informed on the international radio spectrum allocations controlled by the ITU and its associated agencies. He said that it was significant that the Canadian electronics industry has not come forward with any specific recommendations as to any blocks of frequencies we require for long range use. In making his plea for an EIA planning committee Mr. Hackbusch said that the ITU had indicated that the solutions to radio spectrum allocations were in the hands of the IRE and the industry and he emphasized that industry must participate to a larger degree in the field of technical assistance.

Important New EIA Standards

An important new EIA Standard, entitled "Power Output Ratings of Packaged Audio Equipment for Home Use", has been issued effective February 1960. This Standard, RS-234, outlines test frequencies for power outputs and establishes the method of measurement and test conditions. Two other Standards have been issued effective March and April 1960, respectively: RS-235 "Color Code for Travelling Wave Tube Wired Leads" and RS-236 "Color Coding Semi-Conductor Devices (Diodes and Rectifiers)".

New EIA Memberships

Two new EIA memberships have been approved. CLAIRTONE SOUND CORPORATION, Weston, Ontario, manufacturers of stereo high-fidelity and AM/FM combinations, have been admitted to limited product membership in the Receiver Division while CAPACITORS OF CANADA LIMITED, Scarborough, Ontario, manufacturers of paper tubular and mylar tubular capacitors, joins the Components Division.

FLEETWOOD CORPORATION is the new name of Electrical Products Manufacturing Company, Mount Royal, Quebec. The change of name is by supplementary letters patent dated 11th February 1960.

EIA Cooperates in Sponsoring Radio Week

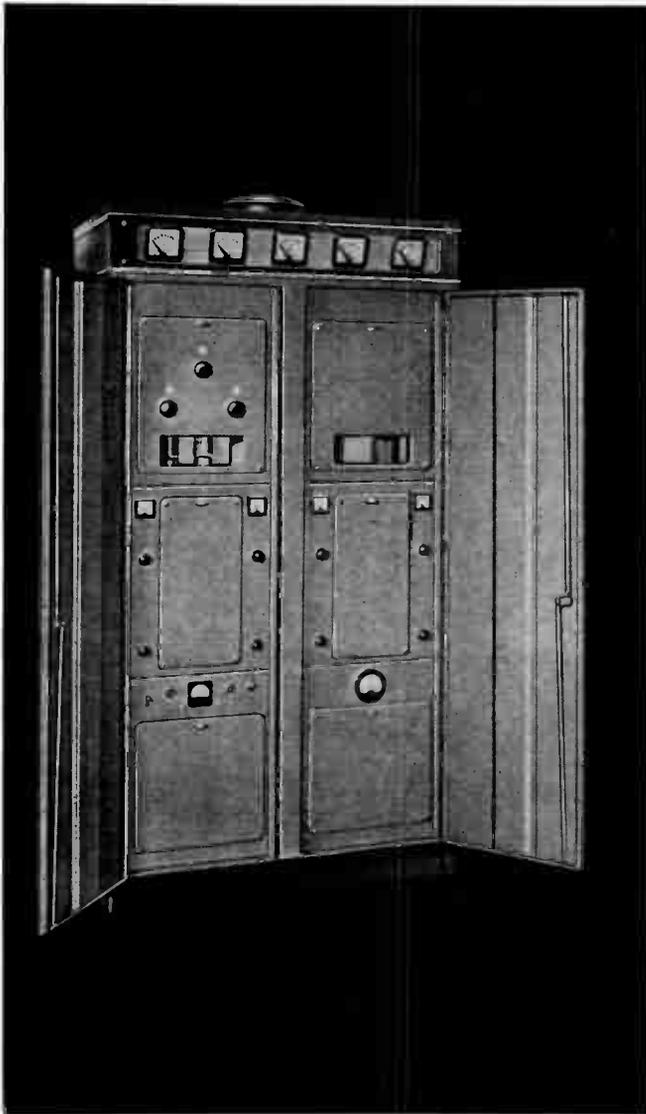
The Electronic Industries Association co-operated with the Canadian Association of Broadcasters in the promotion of Canadian Radio Week — May 1 to May 7, 1960. Radio manufacturers again donated prize mantel radios for contests run by radio stations while dealers and the public were urged to "BUY A CANADIAN RADIO — KEEP CANADIANS WORKING".

Aid to Vocational Guidance Counsellors

The Industrial Relations Committee of the EIA is meeting this month to consider proposed revisions and move towards finalizing a reprint of the EIA Booklet "Your Future in Electronics". The original booklet, published in 1957, has become one of the most requested items on the list of EIA publications since being distributed to vocational guidance departments in schools right across Canada.



LEADS THE WORLD IN ELECTRONICS



1 kW V.H.F. Transmitter

The Pye PTC 3600 1 kW V.H.F. Transmitter is a medium power communications equipment. It is very suitable for long range en-route ground-to-air operation and also for airport ground-to-air control, teleprinter and V.F. point-to-point links. Comprehensive metering facilities are included.

Brief Specification

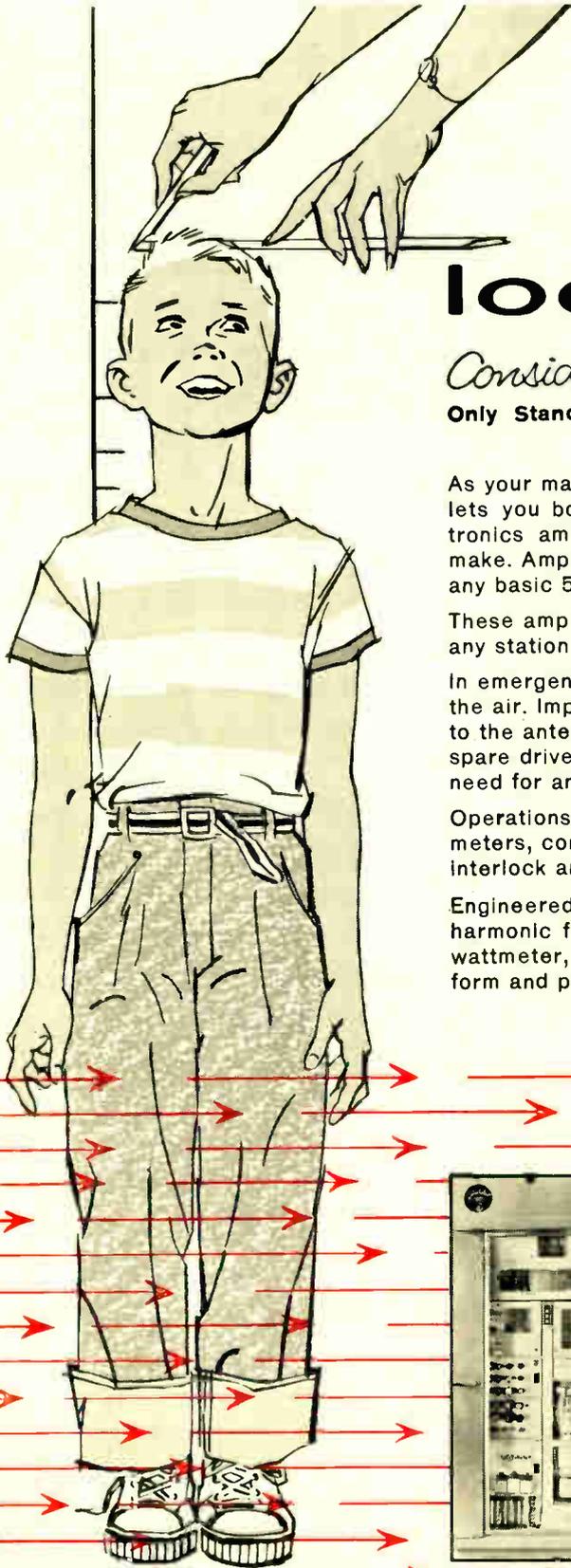
Service	A3 Radiotelephony—Amplitude modulation.
Frequency Range	118—138 Mc/s. Continuously covered in one band.
Modulation Capability	100%

PYE CANADA LIMITED • 84 NORTHLINE ROAD • TORONTO 16 • ONTARIO

For complete details check No. 56 on handy card, page 85

ELECTRONICS AND COMMUNICATIONS. June, 1960

27



look ahead

Consider **"Growth Potential"**

Only Standard Electronics TV transmitting equipment can grow from 500 to over 50,000 watts.

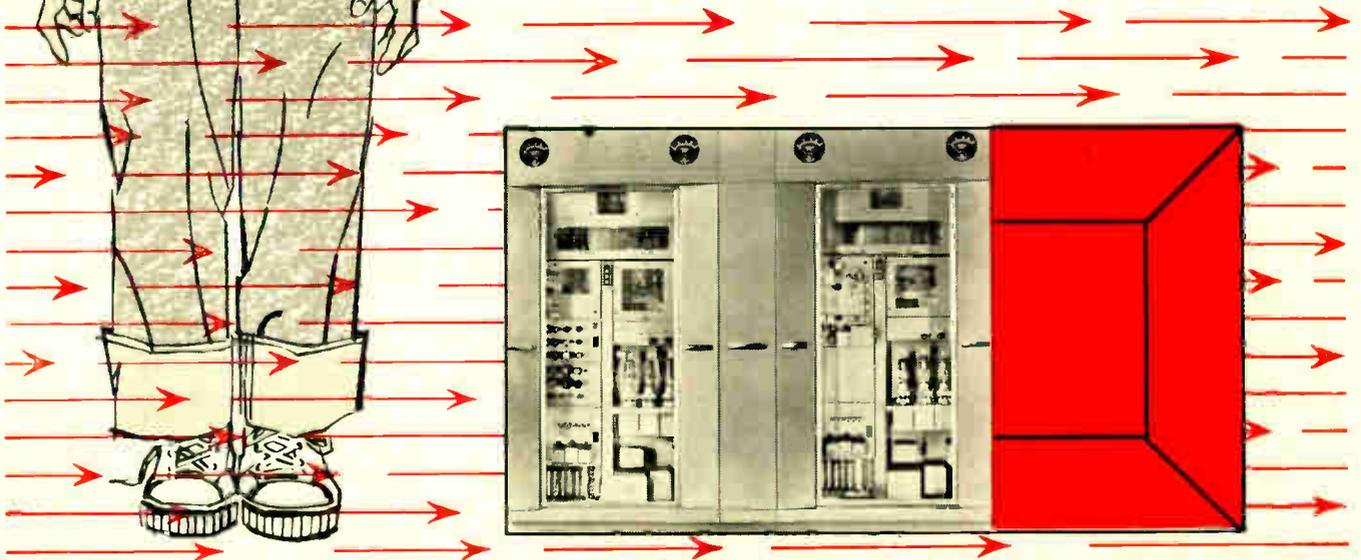
As your market grows, so can your station. "Growth Potential" lets you boost power economically by **adding** Standard Electronics amplifiers to your present equipment, regardless of make. Amplifiers of 10 - 25 and 50 KW output may be used with any basic 500 watt driver.

These amplifiers are self-contained units; easily adaptable to any station layout.

In emergencies, the built-in Patchover protection keeps you on the air. Impedance matched units permit connecting the driver to the antenna in seconds, in the event of amplifier trouble. A spare driver can provide full power in reserve, eliminating the need for an entire transmitter line-up for standby.

Operations and maintenance are planned-for. Large-faced meters, controls mounted in front, full length glass doors, and interlock and overload systems make daily work easier.

Engineered auxiliary equipment includes: antenna diplexer, harmonic filter, linearity correction amplifier, RF dummy load wattmeter, vestigial side-band filter, visual demodulator, wave-form and picture monitoring console.



Standard Electronics TV transmitting equipment is distributed in
Canada by

Northern Electric
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For complete details check No. 50 on handy card, page 85

scatter matter

Scanning the international scene

Television by open wire transmission is now undergoing tests in Austria and is said to be a cheaper system for relaying TV to small outlying districts. The new method of transmission employs a single insulated cable and metal horns to join the line to the aerial at one end and to the television receiver at the other. Electricity for the aerial is being drawn from nearby farms and if necessary the line itself can be made as an ordinary twisted 2-way cable to connect to the electric grid. Reception during the tests proved satisfactory even during adverse weather.

Japan's Sony Corporation is expected to commence the marketing of their tunnel diodes in the United States almost immediately. Predictions for the tunnel diode by leading authorities suggest that they will eventually become cheaper than transistors, that they will do many jobs better and faster and that computers using tunnel diodes will dominate the market within five years.

The British Government has suggested that all Western powers should purchase their missile requirements from the United States rather than indulge in costly research and production duplication. To this end the British Government has scrapped its 'Bluestreak' missile, the most advanced missile in the British inventory of weapons.

Gresham Transformers Limited of Middlesex, England, have just built what is believed to be the world's largest electro-magnetic control system or transducer. The equipment which weighs over 20 tons will be used with germanium rectifiers manufactured by Westinghouse Brake and Signal Company Limited to control an output current of 12,000 amperes. The equipment is to be used for research work in Holland.

A recent survey carried out by the largest electronic concerns in West Germany indicates that the German electronics industry is short of some 13,000 electronic engineers. Expansion plans of the industry for the next ten years will require about 3,800 new engineers annually which is about 1500 more than training facilities of the country can produce.

Hughes Aircraft Company's Ground Systems Group will hire 600 engineers and scientists in the next nine months to help execute 26 military contracts involving more than \$200,000,000. The current work force of the Hughes Fullerton facility is 6000 and with the addition of 600 engineers and scientists the weekly payroll will amount to something in the order of \$700,000.

James G. Flynn Jr., vice-president of Collins Radio Company has announced the formation of an Australian subsidiary. The new subsidiary, Collins Radio Company (Australasia) PTY, Limited, located at Stanhil, Saint Kilda Road, Melbourne, Victoria, Australia will serve Australia, New Zealand and South East Asia.

Japanese resistor manufacturers are planning a resistor inspection center to assure high quality in resistors manufactured for export. A Japanese spokesman said the move was intended to improve the quality of resistors in view of keener competition on world markets.

An Electronics Industry Council has been established in the United Kingdom. Purpose of the Council is to press for greater government spending and support for the British electronics industry.

CANNON

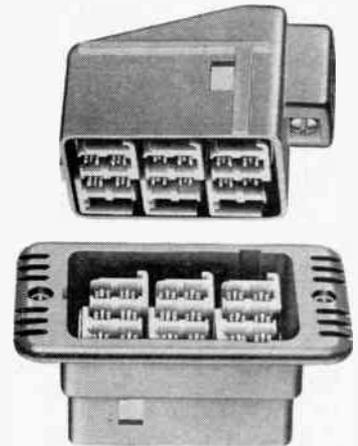
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CANNON "MORPHO"*

Hermaphrodite connector



An unusual new development, the Cannon Morpho series MH meets many industrial and military requirements inexpensively. It features snap-in crimp-type contacts, module insulators designed for alternate positioning and hermaphrodite design — contacts and insulators can be used in either plug or receptacle. A variety of layouts is possible within each shell style. Write today for catalogue MH-1.

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* trade name patent pending.



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For complete details check No. 24

NEW SEMICONDUCTOR-DIODE Test Unit

for measuring recovery characteristics

TEKTRONIX TYPE S PLUG-IN UNIT



You can now display semiconductor-diode switching characteristics on your Tektronix Plug-In Oscilloscope. With Tektronix Type 540-Series and Type 550-Series Oscilloscopes you can find:

- Effective lifetimes to 2 nanoseconds
- Stored charge to 10 picocoulombs
- Junction capacitance to 2 picofarads
- Base resistance to 0.25 ohm

The Type S Unit describes the diode in terms of its parameters, while most other currently employed methods describe the diode in terms of its performance in a particular circuit—not necessarily the one in which it will be used. With the Type S method you can predict the behavior of many diodes in many circuits, as well as compare diodes for performance in a particular circuit.

A Type S Unit, plugged into your Tektronix Oscilloscope, can save you many hours of experimentation. Call your Tektronix Field Engineer for a demonstration in your application.

MAIN CHARACTERISTICS

- Calibrated Forward Currents
1, 2, 5, 10, and 20 milliams.
- Calibrated Reverse Currents
0, 0.1, 0.2, 0.5, 1, and 2 milliams.
- Diode Shunt Capacitance
9 picofarads.
- Amplifier Sensitivity
0.05 v/cm and 0.5 v/cm, calibrated.
- Type S Diode Recovery Unit **\$250**
f.o.b. factory

Note: Risetime of the Type S Unit depends on the capabilities of the oscilloscope with which it is used, therefore the ability to analyze fast diodes with Tektronix Type 530-Series Oscilloscopes will be affected by the lower risetimes of these instruments.

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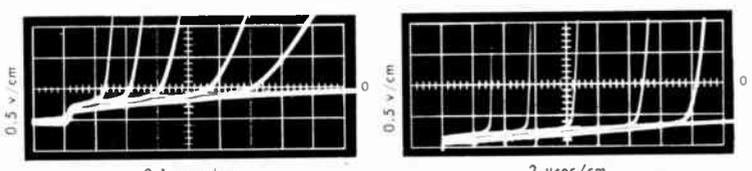
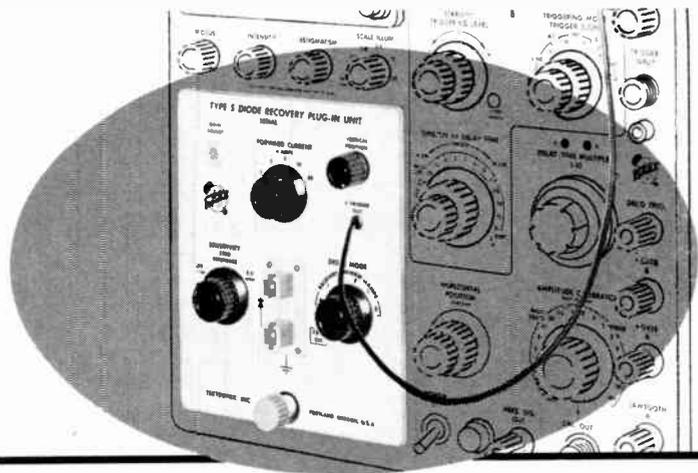


Fig. 1—Diode A
Fig. 2—Diode B
I forward—10 ma. I reverse—2, 1, 0.5, 0.2, 0.1, 0 ma.

Observation of the recovery curves of Figures 1 & 2 shows both reverse current and recombination accounting for removal of the stored charge. It is thus possible to determine not only the stored charge for any of the five forward currents available, but also the rate of recombination. With this information, it is possible to predict diode action to fast transients in any circuit.

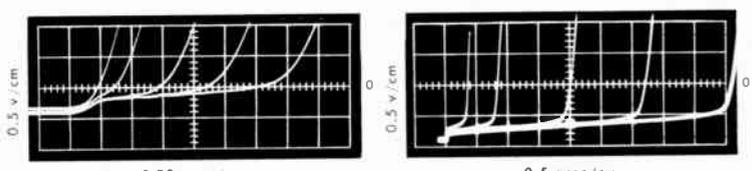


Fig. 3—Diode A
Fig. 4—Diode B
I forward—1, 2, 5, 10, 20 ma. I reverse—2 ma.

Observation of the recovery curves of Figures 3 & 4 shows that the amount of stored charge is proportional to forward current while the recovery time is so short that negligible recombination occurs. Under this condition, after the stored charge is cleared the reverse bias increase is limited only by the diode capacitance (and the shunt capacitance of the instrument). This rate of increase is easily measured at a particular reverse voltage, and thus, the diode capacitance at that voltage can also be determined.

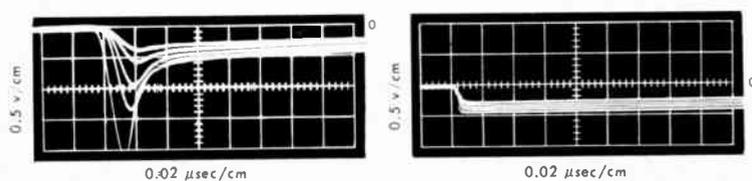


Fig. 5—Diode A
Fig. 6—Diode C
Turn-on—magnified. I forward—1, 2, 5, 10, 20 ma.

Observation of the turn-on characteristics of Figures 5 & 6 shows that the voltage drop across a diode suddenly switched on is not always initially as low as the steady-state drop. It is important to remember that the leading edge of any fast transient passed by a diode may be modified by this phenomenon.

NOTE: The above waveform photos are multiple exposures.

CAREER OPPORTUNITIES now exist at Tektronix in the following fields: Instrument design, Circuit design and engineering, Cathode ray tubes, Electron physics, Solid state and semi-conductor devices. For information write to . . . Irving Smith, Personnel Director.



*"As an RCA Victor distributor,
I offer customers*

convenience and economy in tube buying"

says Ted Bodman of Waterloo Electronics Supply Co. Limited.

"The range of tubes, transistors and other electronic components I offer is the most comprehensive available. This means my customers can get all their needs at one source—resulting in greater convenience and economy in buying."

As an RCA Victor distributor, Ted Bodman also offers you several other benefits—

- you get unequalled delivery service, for behind Waterloo Electronics Supply are RCA Victor's unique distribution methods and new manufacturing facilities.
- your orders are filled from *factory-fresh* stock.
- you get *sales and service aids*—free! Also useful product information.
- you have access, through Waterloo Electronics Supply, to RCA Victor's advanced electronic knowledge and research facilities. This means valuable advice, when needed, on electronic problems.
- you are offered products with the most respected and dependable name in electronics — RCA Victor.

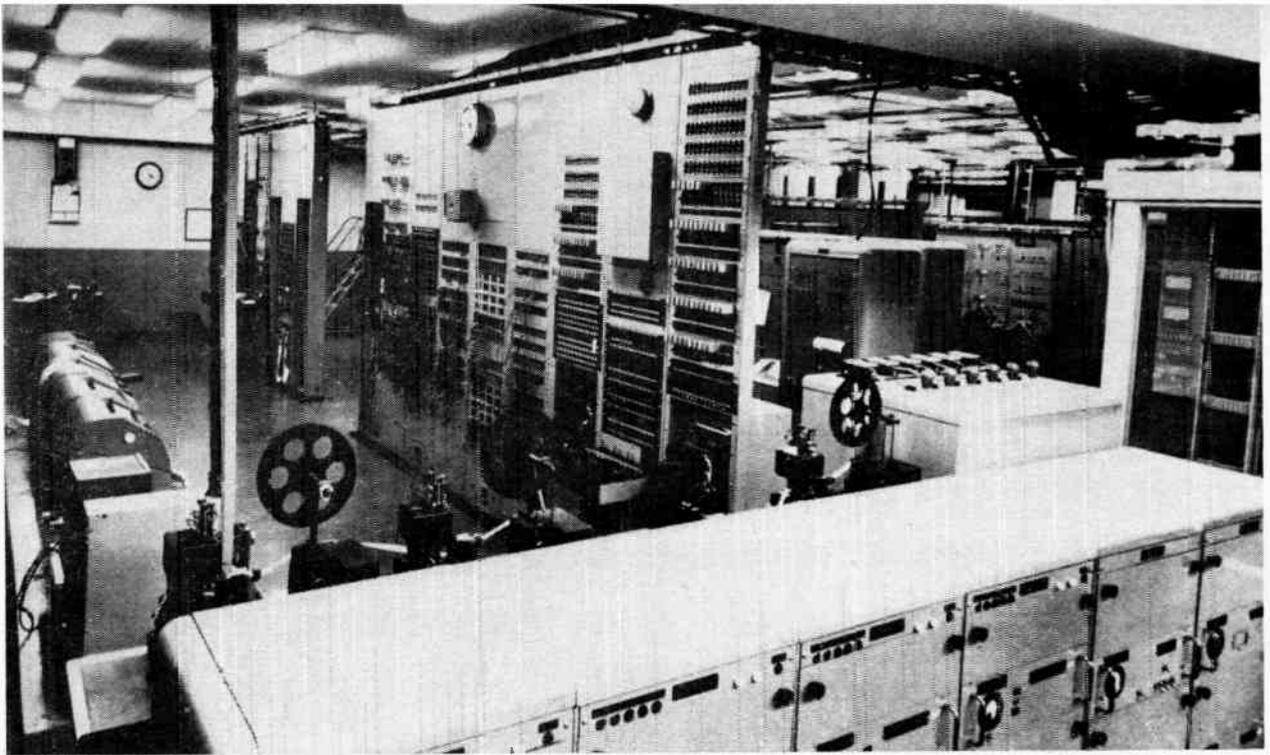
Wherever you are in Canada, there's an RCA Victor Tube distributor as near as your phone.

Tube & Semi-Conductor Division

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The above photograph shows the Montreal terminal of the Canadian Overseas Telecommunication Corporation nerve center for Canada's traffic requirements in telegraph, telephone, telex, broadcast, and facsimile services to the world.

Canada's share in 'round-the-world' communications cable

*Pacific link to cost \$75,000,000
of which Canada will pay one third*

When the Canadian Overseas Telecommunication Corporation came into being in 1950 as a crown company under the Federal Department of Transport, its modest assets totalled \$2½ millions. By the time the trans-Pacific link of the round-the-world cable is completed in 1964 the total assets of the company will have reached a staggering value of \$73 millions.

Douglas F. Bowie was named president of the publicly-owned enterprise in 1951 and in that year the Corporation's annual report recorded revenues of just over \$1½ millions. The revenue forecast for the Tenth Annual Report which will be tabled when this issue of *Electronics and Communications* has gone to press is expected to reach \$5½ millions.

This growth has been accelerated with the development of the coaxial, repeatered under-ocean multi-purpose cables. The first of these cables, (the Trans-Atlantic Telephone Cable No. 1), came into service September 25, 1956, under joint ownership of COTC, British Post Office, and the American Telephone & Telegraph Company. The advantages of this cable in giving perfect speech across the oceans, with complete certainty of connection, and in providing channels for high quality music and picture transmissions are generally well known by now.

The greatly improved quality of service provided by this new cable proved so satisfactory that, although the new facilities were in use only during the latter

six months of COTC's 1956-57 fiscal year, revenues for the whole year increased by some 300 per cent.

The success of the first Trans-Atlantic Telephone Cable immediately sparked activity for further development. Canada, through Bowie and COTC, led the way for a proposal to build a repeatered multi-purpose cable round-the-world. The proposal was placed before the Commonwealth Trade & Economic Conference held in Montreal in 1958 and accepted in principle.

During the planning for this global system, Canada and the United Kingdom went ahead on plans for the second Canada-UK Trans-Atlantic cable. This cable, scheduled for completion in 1961, will originate in Scotland and land at White Bay, on the Northeast coast of Newfoundland, across the province to Cornerbrook, then across the Gulf of St. Lawrence, up the river and land at Grosse Roches, Que. This cable will form the first leg of the round-the-world cable system.

Further progress on the round-the-world cable was announced just recently when Transport Minister Hees announced Federal Cabinet ratification of Canada's share in the second leg which will cross the Pacific Ocean and terminate in Australia via New Zealand.

At that time, Hees said "Canadians have cause to be proud of the prominent part taken by COTC for Canada in the planning of this global telecommunication system."

Mr. Bowie returned recently from Sydney, Australia,

Year to:	Revenue	Capital Assets (in thousands)	Net profit — after interest & income tax
Dec. 31 1950	\$1,021	\$2,800	\$ 87
51	1,666	3,100	290
52	1,569	3,400	144
53	1,574	4,000	88
54	1,630	4,700	108
Mar. 31 1956 (15 months)	2,166	9,600	217
57	2,827	14,000	307
58	4,230	14,400	434
59	4,773	19,500	626
60	5,337	(Forecast) 28,500	—
61	—	45,000	—
62	—	57,000	—
63	—	64,000	—
64	—	73,000	—

accompanied by R. G. Griffith, vice-president and chief engineer of COTC, and two Department of Transport men — W. E. Connelly, superintendent of Telecommunication, and D. S. Robertson, superintendent of Domestic Carrier Services. Along with other commonwealth cable experts, they virtually completed plans for the long Trans-Pacific link. This link will cost some \$75,000,000 of which Canada's share will be about \$25,000,000. COTC will operate on behalf of Canada the portion from Vancouver to a point approaching 2,700 miles distant, and the section beyond that point to Sydney will be owned jointly by Australia, New Zealand and the United Kingdom. Tentative completion date for the Trans-Pacific section is early 1964.

Expected overall cost of the round-the-world system is forecast at \$250 millions, take about 10 years to complete, and will require about 24,000 nautical miles of cable. The whole system will include (1) the new Trans-Atlantic repeatered cable being laid by Canada (COTC) and the United Kingdom to be ready in 1961; (2) the existing micro-wave system across Canada; (3) the Trans-Pacific cable now being planned from British Columbia to Australia and New Zealand via the Fanning and Fiji Islands; (4) cables from Australia through principal Commonwealth Territories in the Indian Ocean and in Continental Africa and up into the United Kingdom.

In a recent statement, Mr. Bowie said that the growth of Canada's external telecommunication services (which COTC administers) is pretty well illustrated by the total of capital assets and revenue figures. The accompanying progress chart tells the story.

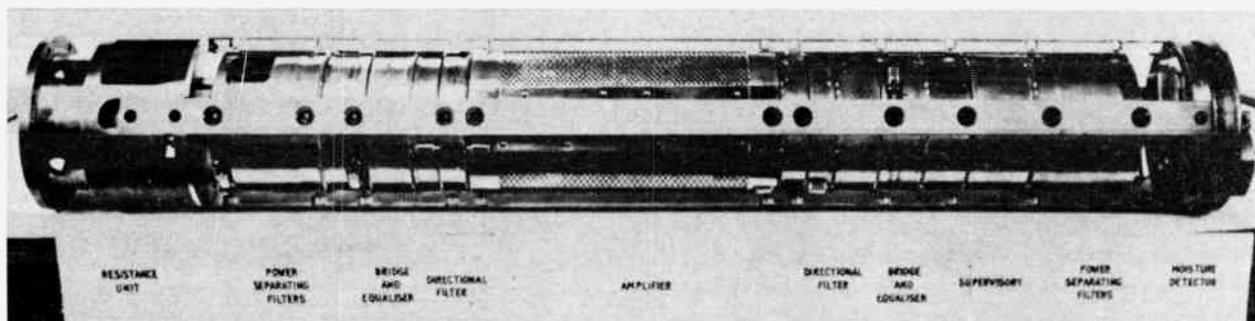
Mr. Bowie adds that the Corporation has paid interest to the government on all monies advanced to

it and income tax on profits, and when the 10th Annual Report is tabled in the House of Commons this month it will record its tenth successive profitable year of operation.

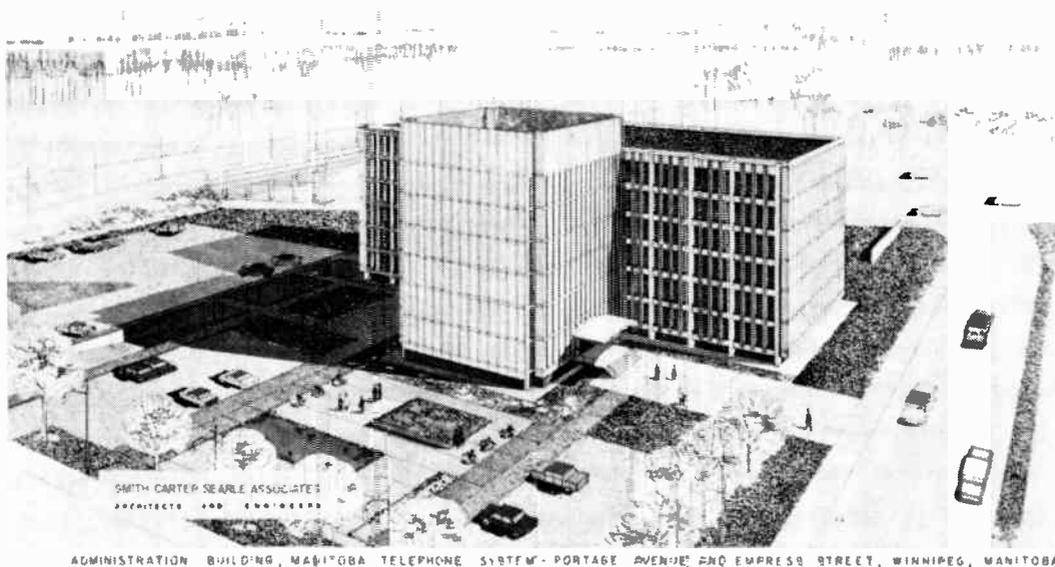
RECENT INNOVATIONS

During the past five years these overseas service developments have been introduced:

- Direct high-speed radiotelegraph circuits opened between Canada and — (1) Frankfurt, (2) Paris, (3) Tokyo, (4) Rome.
- Two radio stations built in British Columbia to provide direct radio-telephone service between Canada and Australia and New Zealand. (These were formerly handled through Oakland, Calif.)
- Radiotelegraph channels to the Far East.
- First Trans-Atlantic repeatered coaxial cable (Canada-UK-USA-ownership) (TAT 1).
- International Telex introduced — Canada now serves 45 countries of the world.
- Direct radiotelephone service between Canada and Japan.
- Work begun on 60 channel Canada-UK cable (CANTAT).
- Work begun on ICECAN — airways communication multichannel cable to UK via Greenland and Iceland.
- Special multichannel defense cable.
- Round-the-world cable Trans-Pacific link planning.



Repeaters such as this are sealed into submarine cables. Amplifying both directions and including directional filters, they will permit bothway transmission through one cable. Some 300 component parts, gold-plated, form its content with a tested life span up to 20 years on the ocean bottom.



The above picture shows an architect's sketch of the Manitoba Telephone System's new six-storey administration building to be located on the north side of Portage Avenue at Empress St. in Winnipeg. Construction will commence in the last quarter of 1960 and will be completed in late 1962. The building will cost approximately four million dollars.

MTS subscriber total stands at all-time high of 267,044 services

Plant value increases from \$8,332,000 to \$121,000,000

Record gain in subscribers for MTS in 1959 proved a record year for the Manitoba Telephone System when subscribers' telephones increased by 18,990 to bring the total in service to 267,044 throughout the province. The System continues to rank third behind Ontario and British Columbia, with 30 telephones per 100 population. Telephone plant values went up by \$8,332,000.00 to bring the total value to \$121,000,000.00.

The publicly-owned utility employs some 3500 people and covers practically every inhabited part of the province, including Churchill, Lynn Lake and central Manitoba mining districts. Eighty-five per cent of Manitoba's phones are dial operated with Winnipeg being fully automatic. Communications needs in the form of teletype, telemetering, mobile radio, data transmission and other answering devices are offered by the system.

Manitobans continued to establish the reputation for Canadians being a talkative nation, by averaging 1.9 million local calls and 25,000 long distance calls each day.

The building program saw new buildings completed at The Pas and Steinbach and a two-storey addition started at Portage la Prairie. Nine Community Dial

Offices were also erected in the Province. This construction program provided facilities to convert 5,260 provincial subscribers to automatic dial service demands for service in Winnipeg, which has been fully automatic since 1926, continued to be met by increasing facilities in the rapidly developing suburban areas.

To keep pace with the development of northern Manitoba, the Telephone System has completed a microwave link north from Brandon to Flin Flon. This system can be expanded as the demand for long distance facilities grows. New dial telephone equipment is presently being installed at Snow Lake and Thompson. Up to a thousand subscribers will receive improved dial service from a brand new building at Thompson sometime this summer to replace their temporary service. Long distance facilities will be provided by a scatter radio relay system between Thompson and Snow Lake.

The Telephone System's microwave network, which spans Manitoba from the United States border north to Flin Flon and across the entire province from East to West, is providing reliable high quality, long distance message circuits. Additional circuits continued to be added during the year to meet traffic requirements.

Telex and microwave extensions highlight CN-CP expansion activities

Long range microwave plans include provision for expansion to 25 times present capacity

The opening of a new microwave network between Sydney, N.S. and St. John's, Nfld., and the record growth of the Canadian National-Canadian Pacific Telegraph's Telex network highlighted 1959 activities for Canadian National Telegraphs.

The year saw a rapid expansion of commercial communications facilities as the company kept abreast of continuing growth in demand. The result was a new record in revenues, which rose 13.5 per cent from \$24.0 million to \$27.2 million.

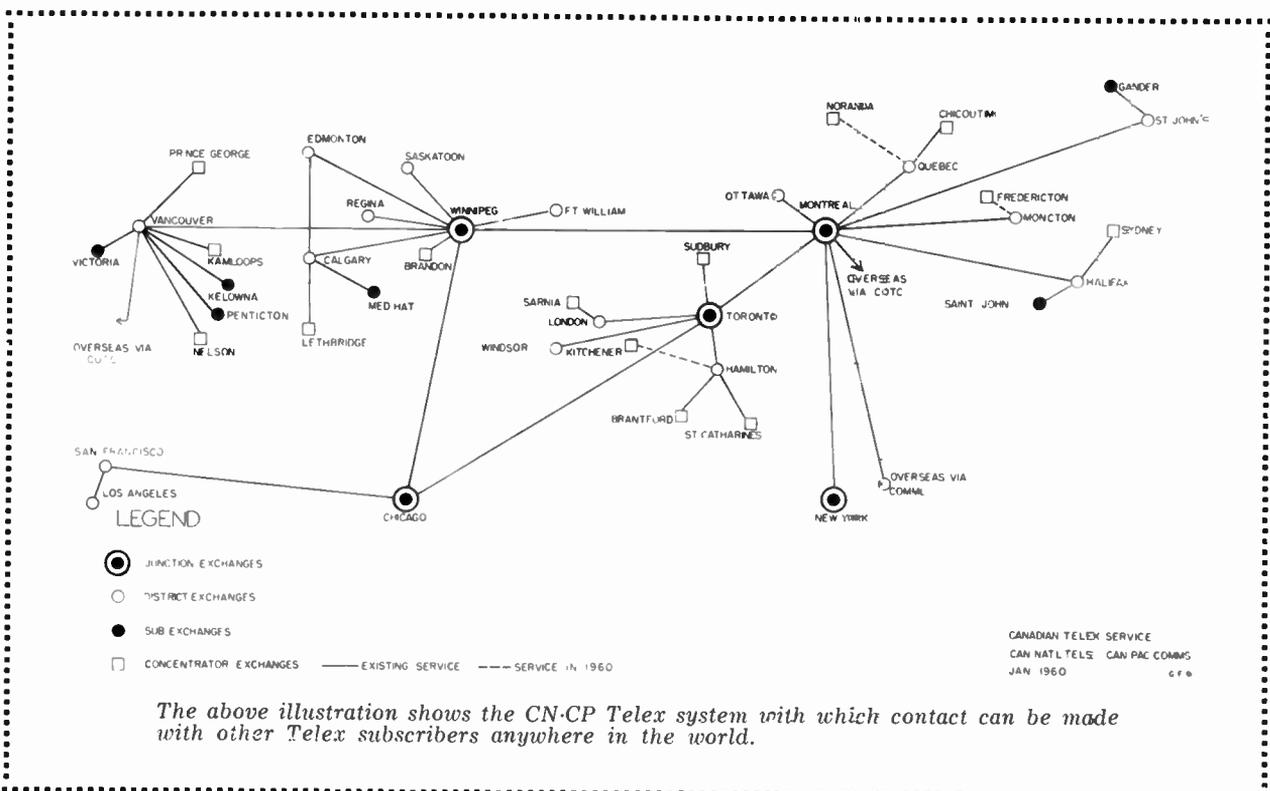
Construction work included addition of some 22,000 miles of carrier telephone channels and 125,000 miles of carrier telegraph channels. This brings total carrier telephone channel mileage to 246,000 and carrier telegraph channel mileage to 916,000.

A substantial portion of the new telegraph channels was assigned to the fast-growing Telex network which was extended in 1959 to 12 additional cities. By the end of the year, the number of Telex subscribers had grown to 2,800, an increase of 900 over 1958.

The expansion of Telex services is typical of a growing national and international demand for faster and more flexible communications facilities. The system was introduced to Canada for domestic service in July



Southern Ontario microwave monitor terminal bay at Toronto, Ontario.



The above illustration shows the CN-CP Telex system with which contact can be made with other Telex subscribers anywhere in the world.

of 1957. At its inception, about 40 subscribers were using the service in five major Canadian cities.

Less than a year later, more than 1500 installations had been ordered in 21 Canadian cities and the network expanded to include New York on a direct line. Today, a teleprinter switching network has been established by the Canadian National and Canadian Pacific between the major cities across Canada, serving 34 exchange locations at this stage with 277,000 miles of circuits, and with service extended to 86 other points.

CN-CPC hope to expand this network again during 1960 to at least 19 other points within Canada, and in co-operation with Western Union in the United States to as many U.S. points.

In the microwave field, Canadian National Telegraphs engineers completed and put into operation a new multi-million-dollar communications system that triples the capacity of Newfoundland's present service. The system successfully faced its inaugural test with a telecast of Queen Elizabeth's arrival at Torbay, Nfld., to begin her Canadian visit.

This \$9,000,000 network carries not only Canadian Broadcasting Corporation television, completing the Trans-Canada network, but also gives CNT 85 new telephone circuits in Newfoundland. Long-range plans for the network include provision for expansion to about 25 times present capacity.

CN-CPC engineers also started construction of a new microwave system which will provide a French language television signal to New Carlisle, Que. The network, running 142 miles from Rimouski, Que., to New Carlisle, is being built by Canadian Pacific Communications, and will be maintained and operated by Canadian National Telegraphs. It is expected to be ready by June 1960.

A second section of the network will be built from Dalhousie to Moncton, N.B., in a later stage. In addition to carrying CBC-TV signals, the microwave system will be expanded in future by the addition of radio channels, each capable of bearing up to 600 telephone circuits.

Northern development

A major contract was negotiated between the CNR and the Alaska Communications System, representing the Government of the United States, which provided for the construction of microwave communications facilities between Grande Prairie, Alta., and the Yukon-Alaska border. This network, to be owned and operated by the CNR, will form the major section of a new communications link between the State of Alaska and the continental United States.

In the northwest, the company also went ahead with construction work on a communications network to serve Whitehorse, Dawson City, Mayo and Elsa in the Yukon Territory, and plans were completed for a similar network in the Northwest Territories.

The 400-mile Yukon expansion will take the CNT owned Northwest Communications System from Whitehorse through Braeburn, Montague, Carmacks, Minto and Pelly Crossing to Stewart River Crossing, a distance of 214 miles; then to Mayo, Elsa and Keno on the east (64 miles), where CNT operates radio-telephone

circuits. From Stewart River Crossing the new line will also branch west 120 miles through McQuesten and Barlow to Dawson City.

Services provided will include trunk long distance telephone circuits, radio programs, private wire teletype, government teletype and "intermediate" or "party line" telephone service to isolated roadside points. Concurrent with the expansion, Canadian National Telegraphs engineers, in co-operation with equipment manufacturers, carried out extensive tests on a new technique in wire line transmission of broadcast material. These were designed to enable standard CBC Trans-Canada Network program service to be established to Whitehorse from Edmonton.

In the engineering field, CNT continued to push ahead with new installations and new equipment designed specifically to customer specifications.

One of the most extensive and modern airport communications systems in Canada was placed in service during the year at Gander. The facilities, planned and installed by CNT, represent an investment of more than \$200,000.

In addition to the terminal facilities, CNT supplies many essential communications services to the airport. These include a tape relay center, designed by company engineers and installed in the DOT's new signal center at a cost of about \$750,000. This installation provides direct contact with most mainland airports and makes possible the relay of vital flight information to pilots in the air.

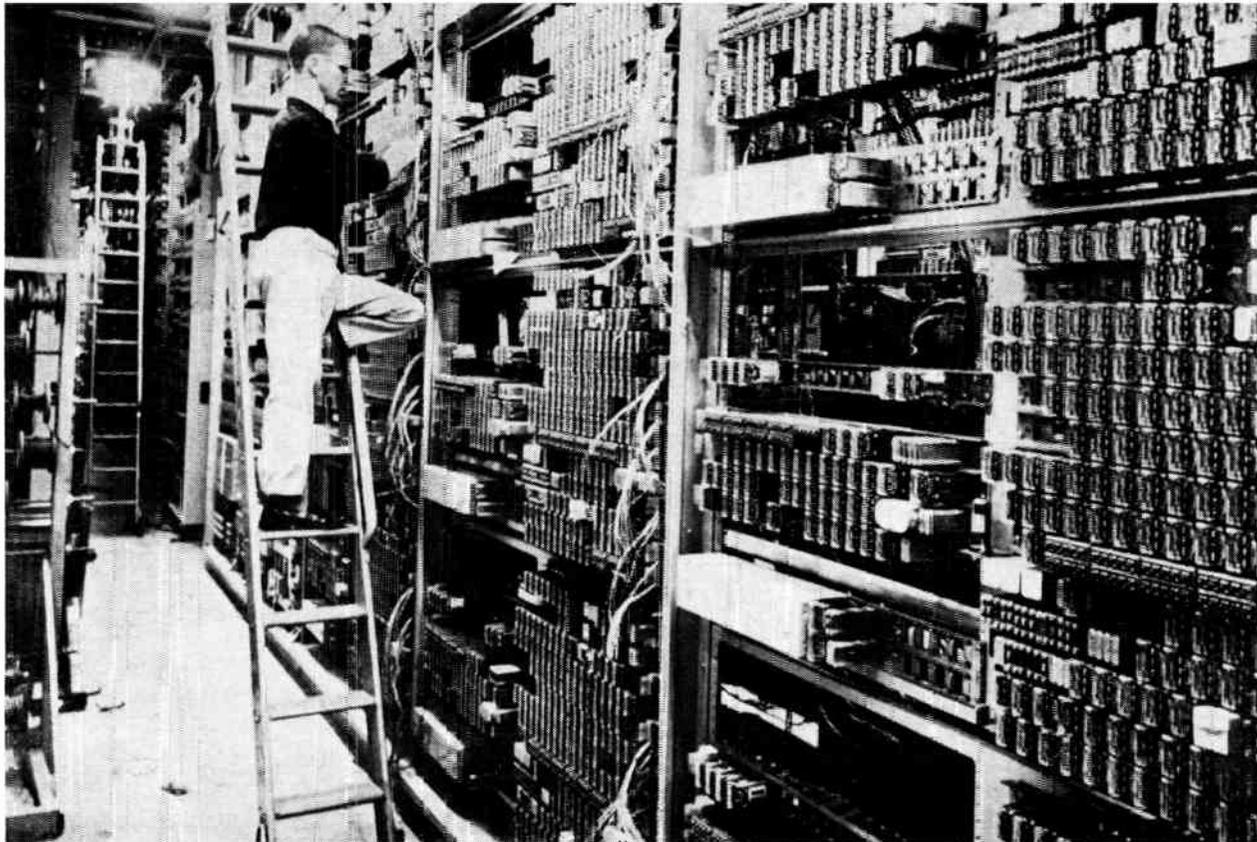
Gander extension

The company also began construction of a new telephone exchange building in Gander to handle more efficiently its rapidly-expanding telephone business in the area. The \$200,000 building will house a new 2000-line exchange.

Notable engineering achievements include development of an automatic selector system which provides for maximum possible utilization of a teletype circuit. The system, now in operation in several large private wire teletype networks, provides for automatic sending of a call-in sequence to all stations on a party-line circuit.

The Canadian National Railways continues to be one of CNT's biggest "customers", and the telegraph company, as the communications arm of the railway, is actively working on such varied projects as a diesel motive power control bureau, which will increase the utilization of locomotives, and train radio. First installations of end-to-end and train-to-wayside radio communications were begun in the territory between Edmonton, Vancouver and Prince George.

CNT also installed circuits for a railway integrated data processing circuit for the transmission of waybill and train consist data between yard offices, and between yard offices and a central car record bureau. Yard office and car tracing procedures are now fully mechanized between Moncton, Joffre, Garneau, Montreal, Belleville and Toronto, and partially mechanized at Fort Erie and Sarnia.



One of the major advances in telephony in Canada this year was the inauguration of Direct Distance Dialing in Montreal and vicinity on March 6. This installation brought 35,000,000 telephones into direct dialing range of Montrealers. Here, a technician works on equipment in Bell Telephone's DDD center on Orenden Avenue, in Montreal, during the advanced stages of the installation.

Bell Telephone anticipates billion dollar spending over next five years

Construction projects range from sub-arctic barrens to cities, towns and suburbs

Like the man in the song about Kansas City, a few Canadians might think that telephone services in this country "have gone about as far as they can go", but The Bell Telephone Company of Canada has other plans. After last year's record expenditures of more than \$196,000,000 for expansion and improvement, Bell is carrying out a growth and development program of at least equal magnitude this year.

This company, operating in Ontario and Quebec, expects to spend about one billion dollars on additions to its plant during the next five years. This compares with expenditures of nearly \$1,500,000 since its post-war expansion began in 1946.

During 1959 telephone engineers and technicians worked in the sub-Arctic barrens and in the cities, towns and rural areas of the more populous sections of the company's territory, to add 190,528 telephones to its system, bringing the total telephones in service at the end of the year to 3,330,877. Forty manual central offices were converted to dial operation, and new buildings were erected or existing buildings enlarged to provide space for additional equipment in 97 communities.

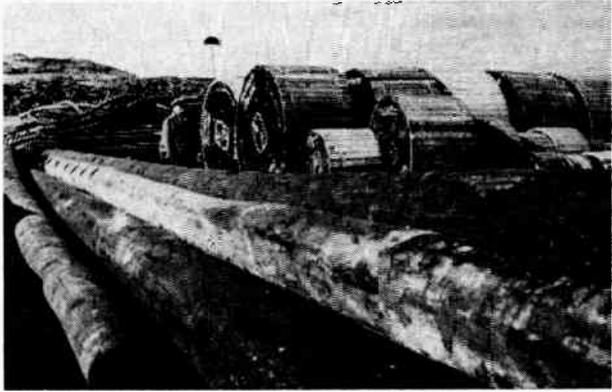
Last year, Bell Telephone opened Canada's most

Fabulous Paul Bunyan accomplished prodigious feats with the aid of his Blue Ox, and The Bell Telephone Company of Canada is attempting to do the same.

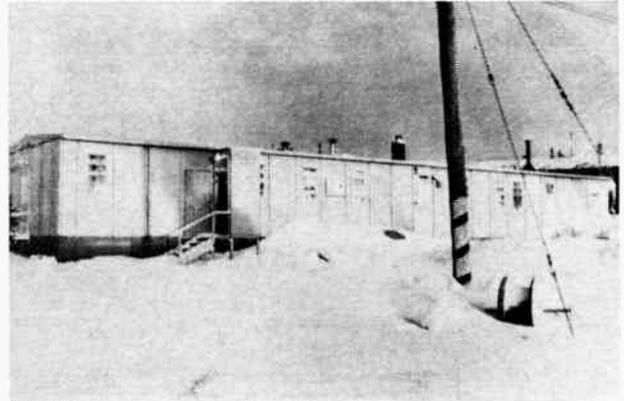
The telephone company, with an annual construction budget now running to about \$200,000,000, last year purchased a Blue Ox digging machine — a truck-mounted, mechanical auger — to speed construction of pole lines. The Bell's annual pole line construction budget alone is some \$7,500,000.

northerly telephone exchange, at Frobisher on Baffin Island to serve some 1,200 persons, including Eskimos, living near that air base 1,300 miles north of Ottawa. It carried out numerous major underground cable projects and laid a submarine cable on the St. Lawrence River bed between Quebec City and Levis.

In radio relay field, a new link between Montreal and North Bay went into service and the "skyway" connecting Toronto, London and Windsor was brought



Here are some of the "makings" of a telephone system which went into service at Frobisher Bay, near the Arctic Circle, late in 1959.



Most northerly of all telephone exchanges in Canada is at Frobisher Bay, N.W.T., where The Bell Telephone Company of Canada began to provide local telephone service late last year.

close to completion. The capacity of the system between Sudbury and Sault Ste. Marie was increased, and another channel for television added to the Toronto-Buffalo microwave link.

The year 1959 saw Extended Area Service (local, toll-free calling) introduced or expanded in scope in 78 communities. In Greater Montreal, for example, 11 suburban exchanges were added to the local calling area.

Another major improvement in telephone service is Direct Distance Dialing, which enables telephone users to dial their own station-to-station long distance calls. This new service greatly reduces the time required to make a connection. It also eases the demand for operators which would pose a difficult problem with long distance calling increasing substantially each year.

"But for DDD, we would eventually be unable to find enough girls to operate the switchboards," a Bell official says.

DDD began in May 1958, in Toronto, where Canada's first installation of DDD switching equipment (tandem crossbar) was made. The service became available in Montreal area in March, and in Valleyfield in April, this year, and will be introduced in Cornwall, Ont., and London, Ont. during the summer. Telephone users in these centers will be able to dial directly to more than 35,000,000 telephones in Canada and the United States, and as the required equipment is installed in other centers, nearly all of the 70,000,000 telephones in the two countries will be in direct dialing range of each other.

Technology produces new techniques

Although telephony has been advancing for many years, telephone technology is beginning to produce new techniques, systems and devices at such a rate that foreseeable developments in the near future could be described as almost revolutionary, according to Bell Telephone.

By 1970, the company predicts, virtually every household in its territory will have basic telephone service; all telephones will have extended area service or broader flat-rate service of some sort; nine out of 10 of its subscribers will be able to dial their own long distance calls, both station-to-station and person-to-person; and all of its telephones will be dial operated. The company also expects that 80 to 85 per cent of its telephones will be in color. In 1959 the company installed 130,000 colored telephones.

Since the company is now in a position to provide service without delay almost anywhere it is required, it is devoting more of its effort to service improvement

and has begun to offer a wider range of services and instruments closely matched to customers' requirements. To help carry out this policy, with its strong emphasis on the customer's point of view, Bell last year established a marketing department responsible for assessing customers' needs and preferences, and "packaging" and selling its services.

"It's not a case of selling something we make," commented a Marketing Department spokesman, "but rather of making something that will sell."

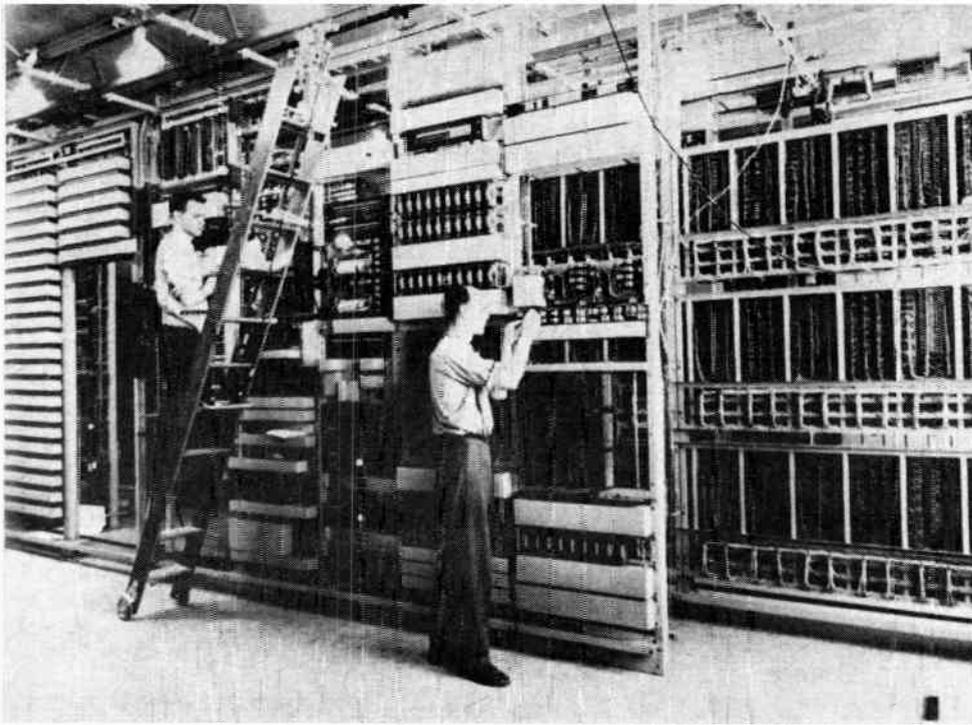
An example of the flow of new devices beginning to appear is The Call Director, introduced last fall. This compact business telephone with as many as 30 buttons can provide intercommunication and centralized answering. Its features include "camp-on" whereby a call from another extension (local) telephone "camps on" a busy line until it is free; "add-on", which permits a third telephone to be added to a telephone connection; pre-set conference circuits; and "wink-hold" a flashing button light to remind a secretary or businessman that a call has been held on a line.

Another new service is provided by a system known as the Automatic Call Distributor. Developed for use by firms receiving a great volume of incoming calls — department stores, airlines, railways etc. — this system distributes calls evenly among available attendants, and in the order in which calls are received. It makes for faster service to customers and fair sharing of attendants' work loads. Although such a service has been available for some time for companies requiring up to 200 lines, it is now "packaged" in units for 40 lines or less.

But, apart from technological developments in the telephone field, Canada still has some geographical frontiers in communications. The completion of the tropospheric scatter system between Quebec City and Goose Bay and the trans-Canada microwave system, both in 1958, were examples of this type of pioneering. Opening of the Frobisher exchange last year is another. And as the nation's northland is developed, communication facilities are certain to be in demand.

In areas far from the frontier the telephone growth potential is still great. Bell Telephone in recent years has greatly reduced the number of manual exchanges, but during the next four years expects to convert some 300 exchanges from manual to dial operation.

Thomas W. Eadie, the company's president recently stated: "There is every reason to expect continued high demand for service with its many varied advantages that can be adapted to the particular requirements of our customers."



The above photograph shows typical ranks of SATT (Strowger Automatic Toll Ticketing) equipment installed in the Penticton, B.C., Toll Center of the Okanagan Telephone Company. Similar equipment is also to be installed in the Toll Center offices at Kelowna, Vernon and Salmon Arm.
(Photograph courtesy Redivo Camera Centre & Studio, Penticton, B.C.)

Okanagan Telephone Company score significant firsts in communications

SATT equipment brings DDD closer for west coast telephone subscribers

First incorporated on April 25, 1907 — with one exchange at Vernon serving 200 customers — the Okanagan Telephone Company is now in its 54th year with 20 dial exchanges serving 26,000 telephones — all on dial service.

In the course of a decade-long, multi-million dollar dial modernization program the Okanagan Telephone Company has established some noteworthy service "firsts":

- 1953 — the first telephone company in B.C. to provide Operator Toll Dialing on a system-wide basis.
- 1959 — the first telephone company in Canada with an "all-dial" system for local service.
- 1960 — the first telephone company in Western Canada to provide Direct Distance Dialing for its customers.

"First in B.C. — with DDD"

This will be the rightful claim of the Okanagan Telephone Company when the Penticton Toll Center unit is placed in service. Direct Distance Dialing service will then be available for some 7,650 dial telephones in Okanagan Telephone Exchanges at Kaleden, Naramata, Penticton and Summerland, and B.C. Telephone exchanges at Oliver and Osoyoos. Initially limited to calls within B.C., subscribers will ultimately be able to dial to any one of 71 million telephones on the North American continent

DDD program to date

This, briefly, is the history of the Okanagan Telephone Company's Direct Distance Dialing program and what has been done so far —

In August 1956, company directors approved plans to install SATT equipment to provide DDD service on a system-wide basis and following an extended period of engineering, planning and consultation with equipment manufacturers — a \$476,000 order for SATT (Strowger Automatic Toll Ticketing) equipment was placed with Automatic Electric Sales (Canada) Ltd. in August 1957.

During the past two years (1958-1959) the company also has installed SATT co-ordinating equipment in all exchanges in preparation for DDD. This was a \$151,000 program.

The installation of this first unit of SATT equipment started in the Penticton Toll Center in early January and a similar unit is now being installed in Kelowna to be placed "in service" this summer. Vernon and Salmon Arm are scheduled for service early in 1961.

When completed in the Spring of 1961 the company's DDD program will represent a \$627,000 expenditure in new equipment — to ensure faster long distance service for subscribers.

\$300,000 on Toll Line growth

During the past two years (1958-1959) the Okanagan Telephone Company has also expended \$300,000 on Toll Circuit service improvements, increased growth in channel facilities for long distance calling and to meet the needs of Direct Distance Dialing service.

During the year 1959 Okanagan Telephone Company operators completed 1,155,380 long distance calls — to top the million mark for the third successive year.

Looking back 10 years — to 1949 — Okanagan

Continued on page 68

Television microwave facilities included in S.G.T. expansion program

Planned additions include operator distance dialing, switching equipment and six new exchanges for Province of Saskatchewan

Improvement and expansion of local telephone service, extension of Operator Distance Dialing, and the addition of 3 more television stations to the TV microwave network were the main highlights of the 1959 construction program at Saskatchewan Government Telephones.

A record number of telephones — 13,214 — were installed by the corporation last year bringing the total number of system-owned telephones to 172,769. At the same time the number of applicants waiting for service was reduced to 283 at December 31, 1959, from 701 at January 1, 1959. Another 50,568 non-system telephones are provided with local and long distance switching facilities by the corporation.

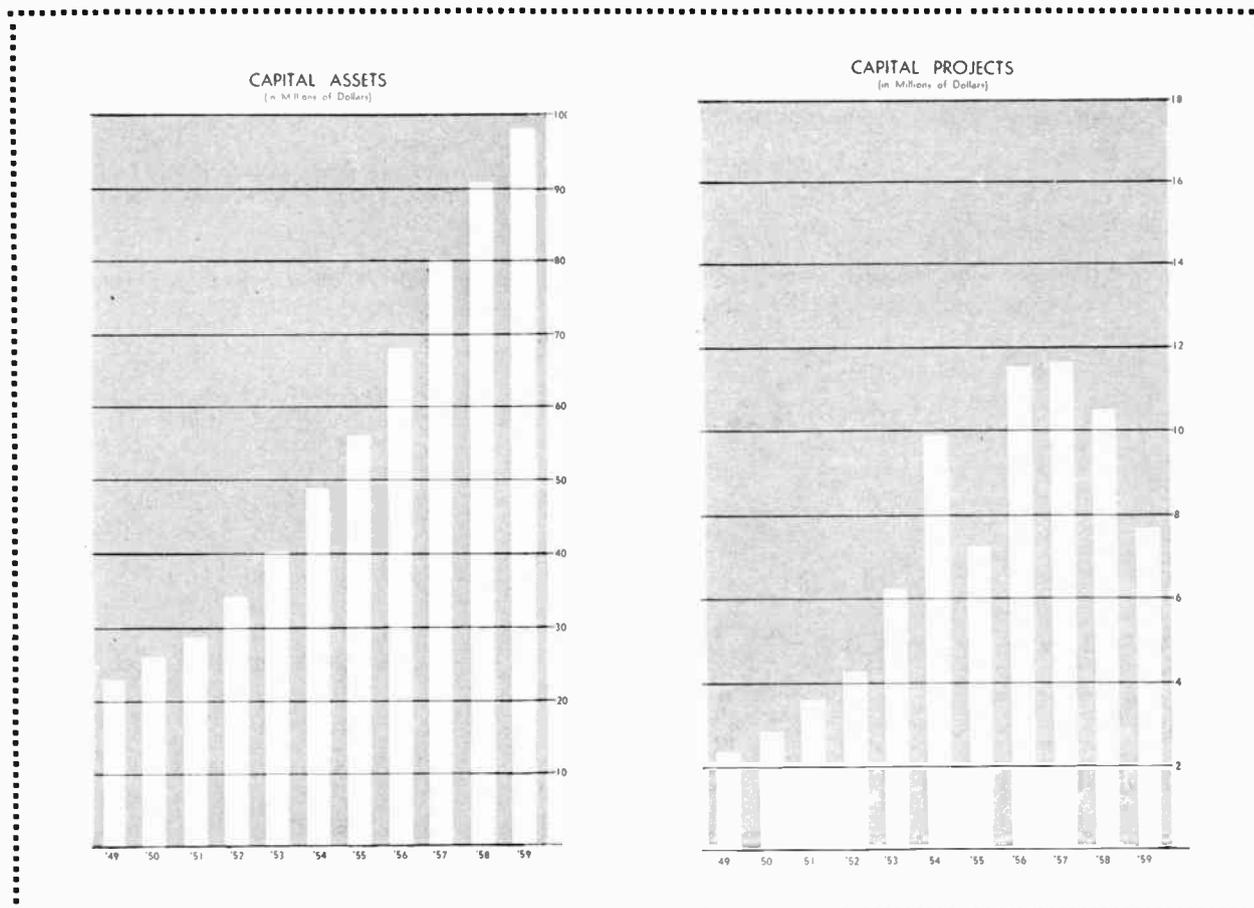
More than nine out of ten — 93.6 per cent — telephone subscribers on both system-owned and rural telephones are now receiving 24 hour telephone service. This is due to two factors. First, all communities with more than 200 subscribers have been put on 24 hour

service. Second, as a result of recently established policy, all centers served by a local hospital or resident physician, no matter how small the community, are now provided with 24 hour service.

At the end of 1959, the number of long distance calls originating in Saskatchewan totalled 9,729,999 an increase of more than nine per cent over 1958. This increase has been attributed to the increased number of local telephones in use, additional long distance facilities, and improved economic conditions within the province and in Canada as a whole.

As of May 1 of this year subscribers in 31 Saskatchewan Government Telephones exchanges enjoyed automatic switching for local service, with approximately 80 per cent of the system-owned telephones operated by dial. The latest addition to the list of automatic exchanges was Canora on April 21. The Canora cut-over was the first to adopt All Number Calling, a system of

Continued on page 69





The long distance room in the B.C. Telephone Company's Vancouver headquarters buildings, showing most of the 192-position cordless switchboard. The board went into service in 1959, making it possible for operators to ring any one of some 50 million telephones in North America, without the intervention of operators at the called points.

Dial conversion marks continued growth of B.C. Telephone Company

Assets totalling \$230,000,000 to be increased substantially by new construction

B.C. Telephone Company, Canada's second-largest telephone system and the second-largest telephone independent on the continent, headed into 1960 with the largest dial conversion program in its history.

Ten central offices are on the year's cutover agenda, including full conversion of Vancouver's Hastings system, originally scheduled for progressive conversion beginning in May and not ending until a year later. This together with the on-schedule conversion of the city's Alma exchange in March, will make the Greater Vancouver area 100 per cent automatic by the end of the year.

Also being converted to dial in 1960 are Balfour, Nanaimo, Chemainus, Parksville, Williams Lake, Gibsons, Sechelt and Sooke. The Company also will open automatic systems at Britannia and Whonnock and on Thetis Island, where there are no central offices.

By the end of 1960 the B.C. Telephone Company system as a whole will be almost 90 per cent automatic.

The most fascinating and progressive development in the telephone industry in British Columbia in 1959 was the advent of operator distance dialing in most parts of the province in April. Since that time this has brought some 50,000,000 telephones in Canada and the United States within direct dialing range of hundreds of operators at various long distance centers in B.C.

The integration of the province with the international distance dialing network was made possible by the installation of intertoll switching machines in Vancouver and Victoria and the modification of toll switchboards and associated equipment at other centers.

Associated with the Vancouver installation is one of the largest cordless switchboards in North America. Known as the FW-1, the 192 position board is equipped with keys, instead of dials, so that operators can pulse out calls direct to distance telephones in a matter of seconds, without the services of operators at the called points. Victoria has a similar, 36-position board associated with a smaller intertoll machine.

The Vancouver intertoll machine, which occupies approximately 12,000 square feet of floor space in the Company's William Farrell Building headquarters, channels the bulk of the 50,000 long distance calls made daily between points in B.C. and between B.C. and outside centers.

Continued on page 68

North-west Telephone Company an associate of B.C. Telephone Company, has opened a new radio-telephone relay station at Newcastle Ridge, four miles west of Kelsey Bay on Vancouver Island, replacing two stations on the north coast radiotelephone system from Vancouver to Prince Rupert.

The relay station at the 4,200-foot level replaces Turn Harbor and Hardwieke Island stations which were not suited for expansion of the west coast service. The system is connected through Prince Rupert to Alaska.

The station includes 900-megacycle radio equipment, two 10-foot parabolic type antennas mounted atop a 60-foot steel H-frame, and three 15KW diesel generators supplied from a 16,000-gallon fuel tank. Only one generator is required for power. The others are held as reserve units.

Newcastle Ridge, according to meteorological officials, is situated in a funnel drawing all types of storms, including rare hurricane force winds of up to 100 miles an hour. Average storms are from 45 to 65 miles-an-hour in the funnel formed between Newcastle Mountain Range and Johnstone Strait.

Snow up to 30 feet deep on sections of a seven-mile access road around the ridge resulted in North-west Telephone Company purchasing a vehicle equipped with tracks 40-inches wide, for travel over the snow.



Shown on map at left is the proposed route of a new microwave system now under construction by The New Brunswick Telephone Company, Limited between Moncton, Newcastle, Bathurst and Campbellton. Also pictured are existing microwave networks extending from Saint John to the N.B.-Que. border along the western part of the province and between Moncton and Saint John. Included in the company's work program for 1960 is a new system to Sydney and extensive modification of the Saint John to Halifax leg. The microwave systems, when completed, will form a \$4,000,000 network blanketing the Maritime provinces.

New Brunswick Telephones engage in \$7,000,000 construction program

Decade of progress shows gain of 230 per cent in plant equipment

Improvement and expansion of local telephone service in communities throughout New Brunswick and continual development of long distance facilities will highlight a work program estimated at \$7,000,000 for The New Brunswick Telephone Company, Limited in 1960. Of this amount, approximately \$5,200,000 will be for new construction.

This expenditure follows on the heels of a program completed last year costing nearly \$6,000,000 with close to \$5,000,000 invested in capital plant. Chief projects for 1959 were the installation of a new toll switching office at Newcastle together with the introduction of dial service to that center. This new switching machine — first of its kind in the Atlantic Provinces — has become the nucleus for the transfer of long distance traffic to and from the entire north-eastern area of the province.

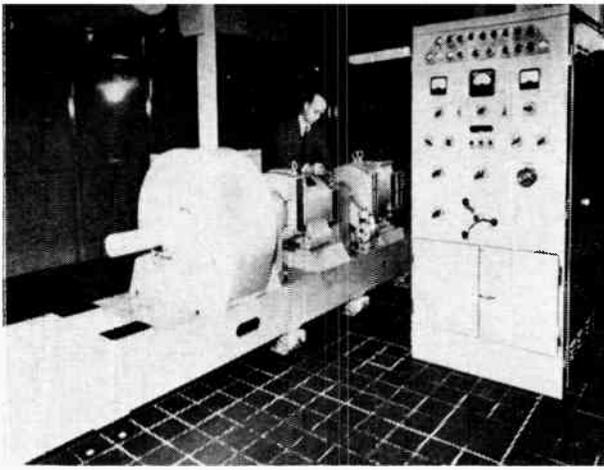
The second major job completed during the year was the building of a 120 mile microwave network between Saint John and Moncton to provide increased facilities between these two principal centers. Costing in the vicinity of \$600,000, the system was turned over to commercial traffic in December.

Operating on a frequency band between 1800-2300

An examination of the New Brunswick Company's report of last year's operations reveals an almost phenomenal growth which has taken place in the past decade. In this period alone, the Company's investment in plant has leaped from \$19,000,000 to \$63,000,000 a gain of nearly 230 per cent. During the same period, stations in service have risen from 66,000 to over 121,000 at the close of 1959.

megacycles per second, the network is equipped with a regular and a protection Radio Frequency Channel. The RF channel is presently equipped with 36 voice channels with each RF channel capable of growth to an ultimate of 240 channels. The system can be expanded to 6 RF channels (including protection) giving a maximum of 1200 voice channels.

The regular RF channel is equipped with automatic switching to provide transfer to the protection channel in the event of failure or interruption on the regular facility.



A New Brunswick Telephone Company craftsman performs a routine on an Austinlite 20 kw motor fly-wheel alternator unit, one of two such units in service with the company.

Designed and manufactured by the General Electric Company of England this was the first installation of the equipment in Canada for telephone message use.

Describing 1959 as "another year of progress and achievement" and one in which new equipment and operating techniques were widely used to enhance efficiency, the company showed a net gain of 5400 telephones for the year bringing the total to more than 121,000, of which over 75 per cent are dial operated. The Company completed over 4,100,000 toll messages in the twelve month period, an increase of 3 per cent over the preceding year.

The expansion of service to customers was achieved in part through the establishment of three additional exchanges making a year-end total of 90. Outstanding orders for service were reduced from 1014 at the end of 1958 to 613 at December 31. Extended Area Service providing for free calling between adjoining exchanges was inaugurated in several additional areas, increasing to more than 50,000 the number of customers benefiting from the plan.

Planned construction for 1960

Of the \$7,000,000 earmarked for spending in 1960 the program breaks down something like this: \$2,400,000 for exchange central office equipment, most of it for dial conversions and additions; \$1,750,000 for subscriber station equipment; \$1,950,000 for exchange and toll cable and wire and \$900,000 for land, buildings, and other miscellaneous equipment.

First major project to see completion this year will come next month when the exchanges of Woodstock, Hartland and Florenceville are converted to dial operation, bringing to an end a job which got underway in 1958. Involved in the conversion program was the erection of a new building at Hartland and extensive additions to the Woodstock and Florenceville offices. Approximately 4000 subscribers will be affected by the service improvement. The building phase of the project, together with central office and station equipment will represent an expenditure of about \$1,100,000. Launching this work was the burying last fall of a 50 pair polyethylene insulated cable between the three communities, a distance of some 22 miles. Cost of the job was reported at \$200,000 and is the longest underground cable in service with the company for inter-office trunking.

The second principal task undertaken by the company will end sometime next December when a new \$1,500,000 microwave network goes into service along the province's east coast between Moncton, Newcastle, Bathurst and Campbellton. Covering a distance upwards of 210 miles, the ten site network supplied by the

General Electric Company of England, will have similar characteristics to the system installed between Saint John and Moncton.

Along with this work the company is engaged in replacing existing microwave systems stretching from Saint John to Halifax and to Sydney, N.S. as part of a \$4,000,000 communication complex blanketing the Maritime Provinces. Preliminary engineering work is also in progress calling for modifications to the New Brunswick portion of the Trans-Canada microwave link to satisfy increased demands forecast.

Looking forward to the future, the Company's plans verify that its policy of providing the province's citizens with excellence in communications service will continue. On the horizon is Direct Distance Dialing. Requiring special switching equipment and accounting machines, DDD is expected to see its first use in New Brunswick within the next 5 years. Being developed on a closely co-ordinated schedule, DDD will eventually permit interconnection of all telephones on the North American continent within a matter of seconds.

Maritime Telephone Co. Limited expands toll facilities

Following initial work carried out in 1958, Maritime Telegraph and Telephone Company, Limited has, in 1959, brought the major portion of its largest toll expansion and improvement program to a successful conclusion.

As a member of the Trans-Canada Telephone System, the Company, with its Prince Edward Island affiliate, the Island Telephone Company, has important responsibilities on the eastern end of Canada's communication network. Meeting these requirements has pushed the 1959 construction costs to a new record of \$7,647,878.

The new Valley Long Distance Center at Kentville was cut into service in May and in July a second cutover enlarged and improved toll facilities to nearly every toll center in the two provinces. A total of 108 additional circuits came into service within the territory with a gross length of 7,000 miles while the Companies' portion of an additional 28 out-of-province circuits added another 4,555 to the gross mileage.

A propagation survey was completed along the route of a proposed new microwave system to be installed in 1960 between Sydney and Saint John, N.B. with a branch to Halifax. This system, when completed, will not only provide additional telephone and television facilities but will also provide protective alternate facilities for present systems.

The heavy accent on toll expansion was not offset by any comparable reductions in expenditures for other branches of the business. Dial conversions were carried out at Middleton, Chester and Pictou and installation started on dial equipment for Yarmouth. Dial extensions were carried out at North Sydney, Sydney Mines, Bedford and Halifax.

Mobile radio services were expanded to the extent of 14 base stations and 142 mobile units.

The program of purchasing connecting companies continued with the purchase of five mutual companies during the year.

The coming year will be marked by the completion of the new microwave radio system and another full schedule of dial conversion and plant extension projects.

Stripline provides microwave components quickly and cheaply

by J. H. Craven, M.A.Sc., P.Eng.**

Many microwave components for frequencies from 1000 to 10000 mc/s may be fabricated using the strip transmission line configuration. In most cases the construction is simpler and quicker than for those using the waveguide or coaxial line equivalent. The use of the photo etching technique reduces the amount of machine work required to produce the components and decreases the variation between items made to the same design. Leakage and the excitation of spurious modes is made practically negligible by a suitable choice of line dimensions and closely spaced ground plane shorting screws.

Relatively few engineers in the microwave field appear to realize that the strip transmission line technique offers a simple method of obtaining tailor-made components at mass production prices. Once the basic principles of this type of construction are clearly understood, design is a straight forward process and fabrication may be quickly carried out with readily available tools. Details of both design and fabrication have been discussed in the literature over the past few years (1-7).

A strip transmission line consists of a flat center conductor midway between two parallel ground planes, the center conductor being parallel to the ground plane in most cases (Fig. 1). The characteristic impedance of the line is dependent on the ratios of the width and thickness of the center conductor to the spacing of the ground planes and the dielectric constant of the material filling the space between the ground planes. A number of graphs which may be used to determine the characteristic impedance are to be found in the literature. One we have found useful where the center conductor is very thin is shown in Fig. 2.

The support of the center conductor is difficult when the dielectric is air. With a solid dielectric such as polystyrene or Rexolite the support problem is eased and the sandwich type transmission line results. This type of construction has been used in this laboratory with $\frac{1}{8}$ " thick Rexolite*, copper foil clad on both sides, as the basic material (Fig. 3). The center conductor configuration is photo-etched on the upper side of the lower sheet, while the lower side is left intact to form the ground plane. The foil is removed from the lower side of the upper piece and left on the upper side to form the second ground plane. In order to reduce leakage and to keep the two ground planes at

the same r-f potential, a row of screws on either side of the stripline clamps the assembly together. This method of construction is particularly suited to the photo-etching method.

In cases where the required dimensional accuracy of the center conductor is not great, i.e. at lower frequencies and for wide-band filters, it is possible to make use of a hand-cut center conductor of thin brass (shim stock) sandwiched between two sheets of dielectric, which are in turn sandwiched between two metal ground planes. With care, the center conductor may be cut to shape with a razor blade and steel straight edge to an accuracy of about a hundredth of an inch.

A means of transforming the strip transmission line to fit the cables and fittings of the equipment with which it is to be used is required. Since a large proportion of the microwave equipment in this laboratory uses type N connectors, a simple transition from stripline to type N was developed (Fig. 4). Early models required a soldered connection between the pin and the center conductor but this tended to damage the adhesive bond between the foil and the dielectric. The present design makes use of a Rexolite plug which presses the flat part of the pin against the center conductor. The pressure is applied by a set screw in the upper portion of the connector.

Filters

The filter most often used in the laboratory is a low-pass one designed to eliminate the harmonics of a particular signal source. The varying impedance type is particularly easy to construct in strip transmission line. This filter has a continuous center conductor in which the succeeding sections of the line have an impedance lower and higher than the characteristic impedance of the filter. Two sections of a typical filter are shown in Fig. 5, together with its lumped circuit equivalent (Ref. 9). Response curves are similar to those of typical constant K filters.

For low and high pass filters requiring characteristics similar to those of a lumped-constant m-derived type, configurations involving shorted or open-circuited stubs which are $\lambda/2$ and $\lambda/4$ respectively at frequencies of infinite attenuation are utilized. The configuration of a high-pass filter of this type with open-circuit stubs is shown in Fig. 6. The measured and calculated insertion loss is shown in Fig. 7.

Complimentary high and low-pass filters of the m-derived type may be combined with their inputs in parallel to form a diplexing filter (Ref. 9). A filter of this type is shown in Fig. 8 and the insertion loss

* Rexolite — cross-linked polystyrene dielectric, manufactured by Rex Corporation, West Acton, Mass., U.S.A.

** Radio & Electrical Engineering Division, National Research Council, Ottawa, Ontario.

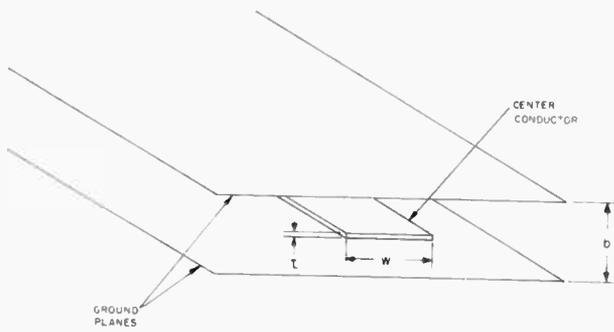


Figure 1.

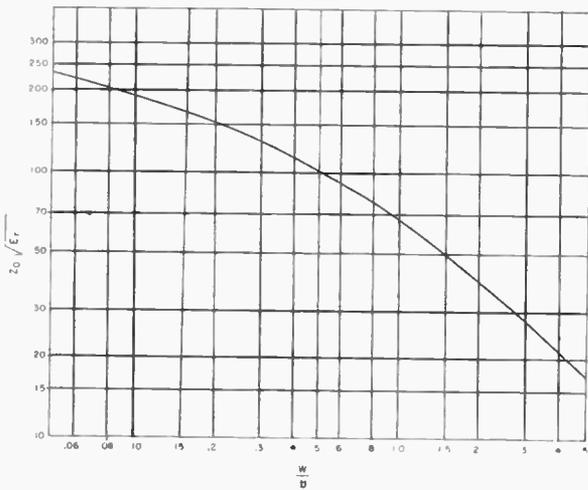
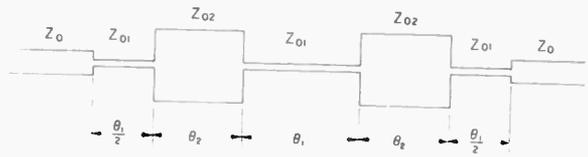


Figure 2.



(a) VARYING IMPEDANCE FILTER
2 SECTIONS



(b) LUMPED CONSTANT
EQUIVALENT CIRCUIT

Figure 5.

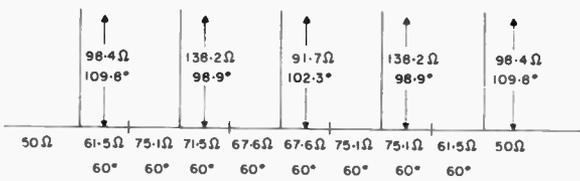


Figure 6.

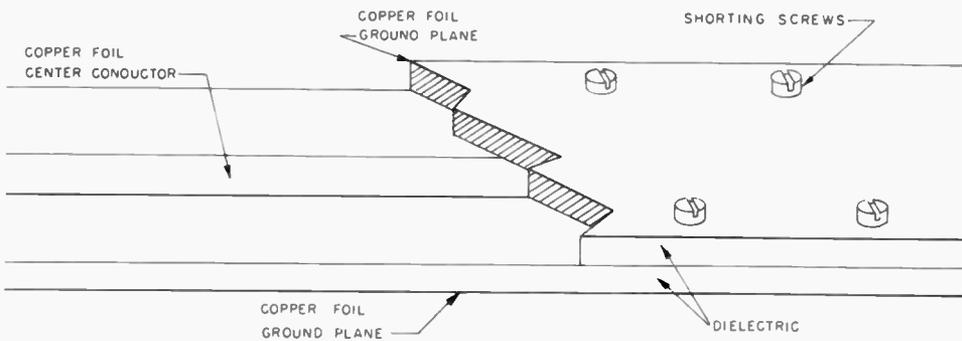


Figure 3.

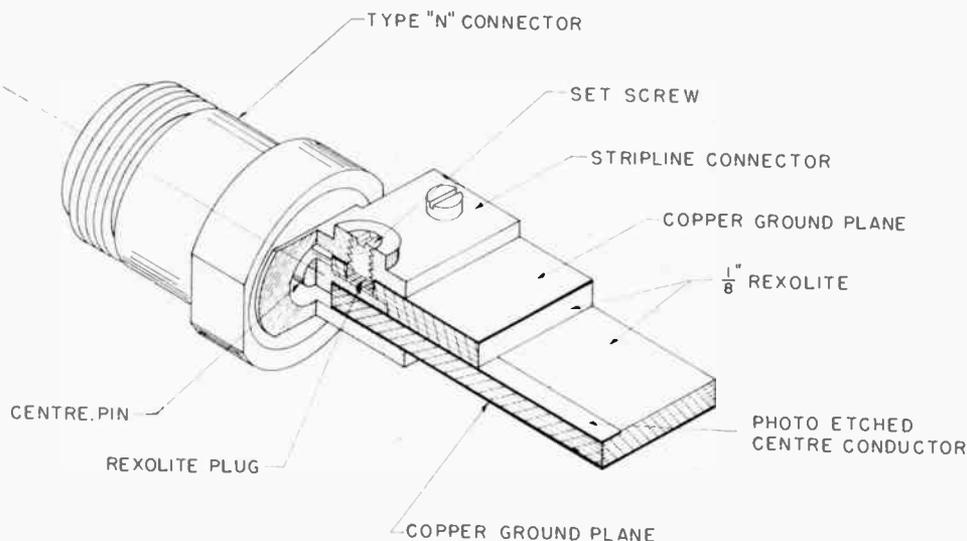


Figure 4.

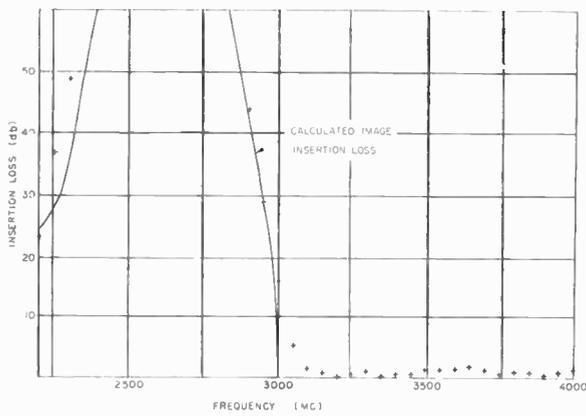


Figure 7.

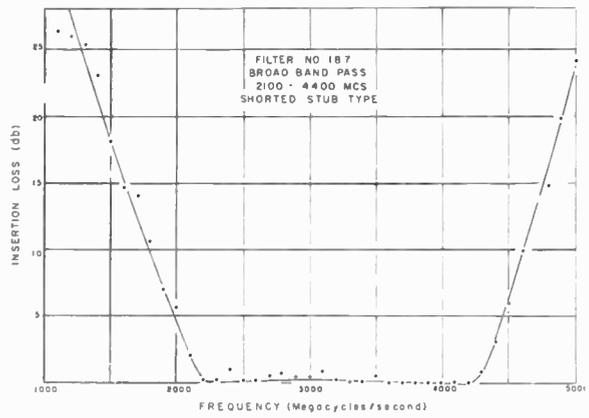


Figure 10.



Figure 8.

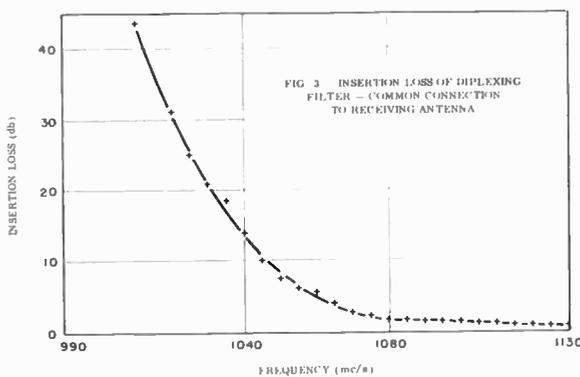
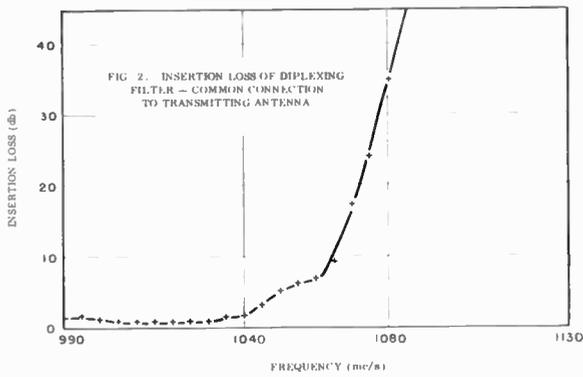


Figure 9.

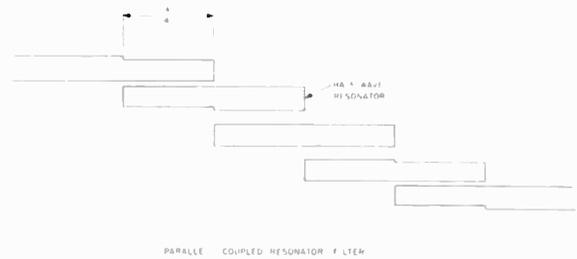


Figure 11.

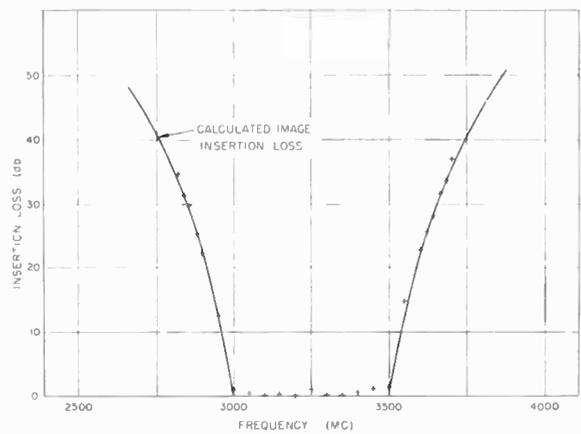


Figure 12.

Continued on page 52

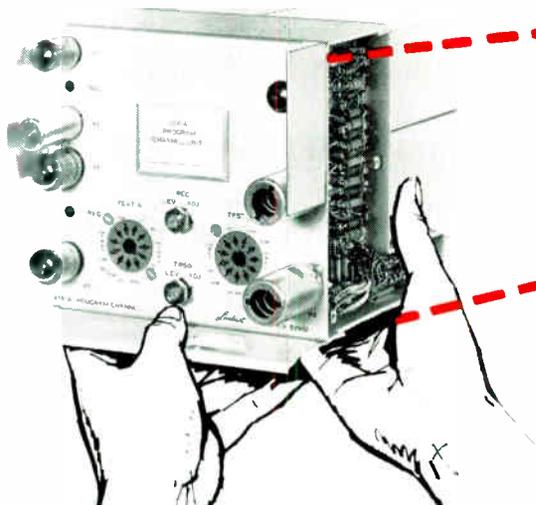
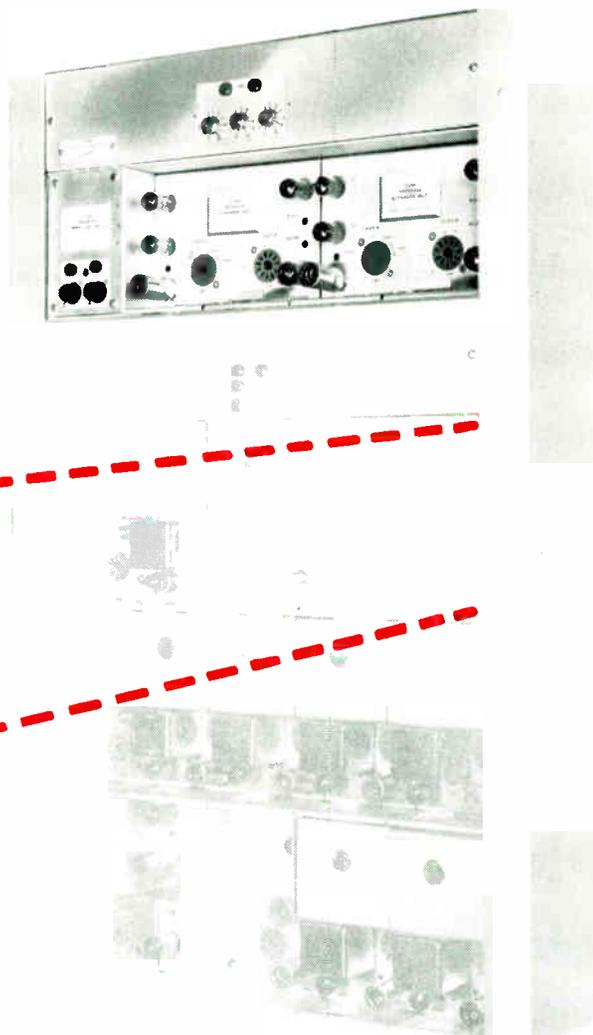
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ELECTRONICS AND COMMUNICATIONS, June, 1969

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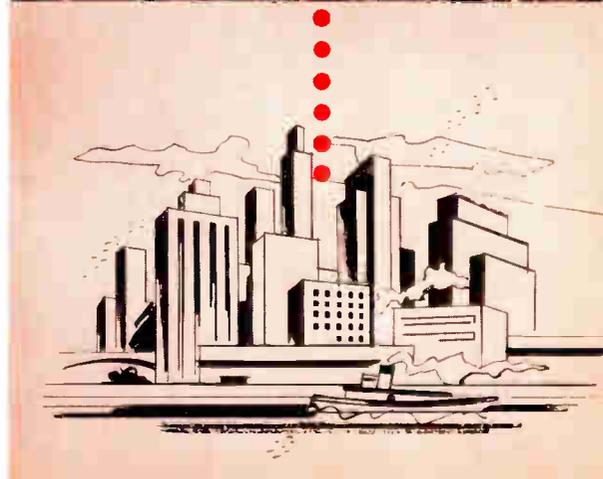
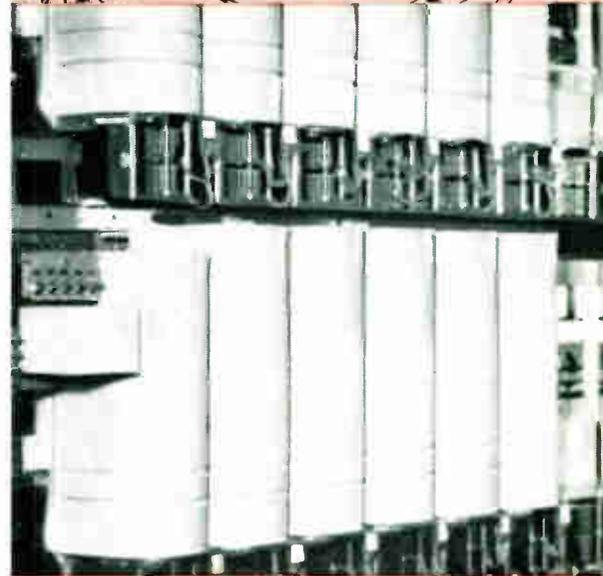
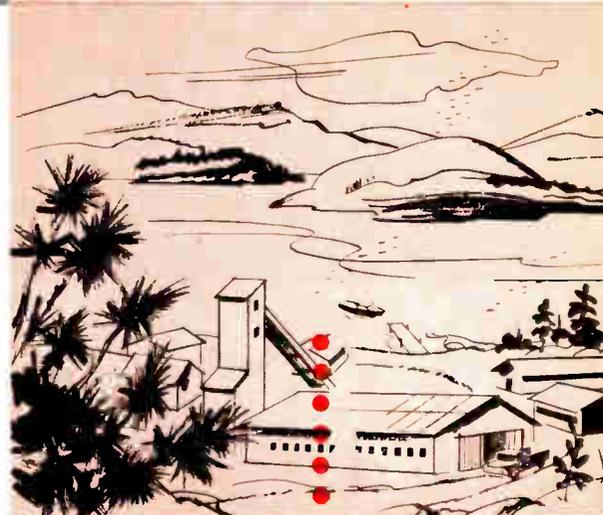
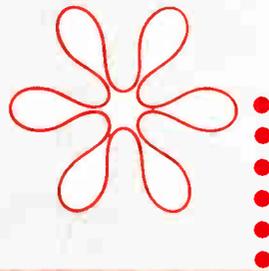
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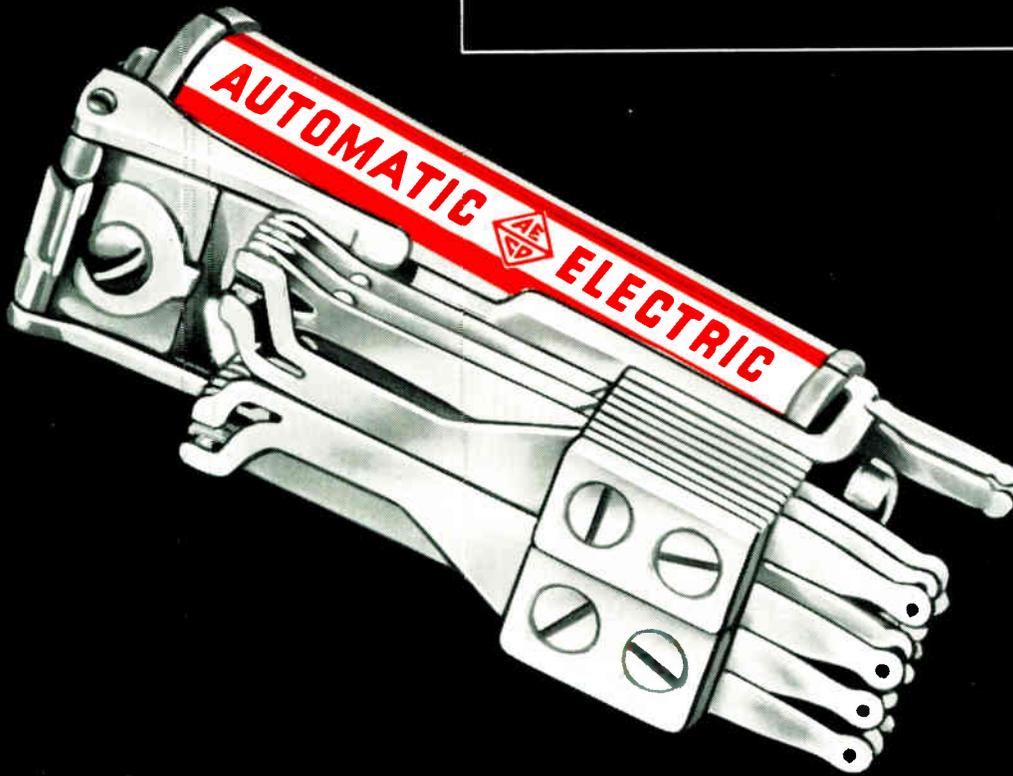


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Annual award for media research given by U.S. magazine Media/Scope came to Canada this year. Here, representatives of Business Newspapers Association of Canada display the Bronze Plaque and the BNA published report "How Industry Buys", that won the award over 93 other entries. Left to right are the past president of BNA, James A. Daly (president of The Hugh C. MacLean Publications Ltd.); A. A. Duane, chairman of the association's research committee; George Mansfield, association manager; and BNA president J. L. Craig (director of business publications division at Maclean-Hunter Publishing Co. Ltd.).

Business Newspapers Association wins coveted award for "London Study" research project!

Mediascope magazine's highest award for media research goes to the Business Newspapers Association of Canada this year for its "London Study".

Sponsorship of this major research project on industrial purchasing by Canadian business papers won the U.S. magazine's Bronze Plaque. It is presented annually "for a significant contribution to media research which has served to improve the delineation of media or their markets."

Entitled "How Industry Buys," it was one of the biggest industrial research projects ever undertaken in Canada and excited interest on both sides of the border and in the United Kingdom.

Published by BNA as a 275-page bound volume, the report probed in depth the industrial purchasing and selling processes in Canada. It was sponsored by the Business Newspapers Association of Canada with the co-operation of the Canadian Chapters of the National Industrial Advertisers Association (now the Association of Industrial Advertisers).

The study was directed by Dr. Donald H. Thain and Dr. D. S. R. Leighton, associate professors of business administration at the University of Western Ontario School of Business Administration and

Charles B. Johnston, lecturer in business administration at the school.

A. A. Duane, chairman of BNA's research committee, planned the project and edited the manuscript, a monumental task.

Graduate students from the university interviewed 36 companies in the London, Ont. area under the direction of the authors. The study examines their information on the purchasing processes of these companies, representative of the Canadian Industrial market. It covers the purchasing process for realization of need, to actual purchase of a large, medium and small item in each company.

"How Industry Buys" examines the impact of mechanized promotion and personal selling on the industrial buyer. It traces the complex process of an industrial purchase through teams of buying influences inside and outside the purchasing companies. The study also discusses advertising, direct mail and distribution as factors that influence the quality of industrial marketing.

The report was one of 94 entries in the Mediascope competition. The magazine states, "The judges in this classification reached an early unanimity in awarding (the plaque) to Business Newspapers Association of Canada . . ."

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Stripline microwave components

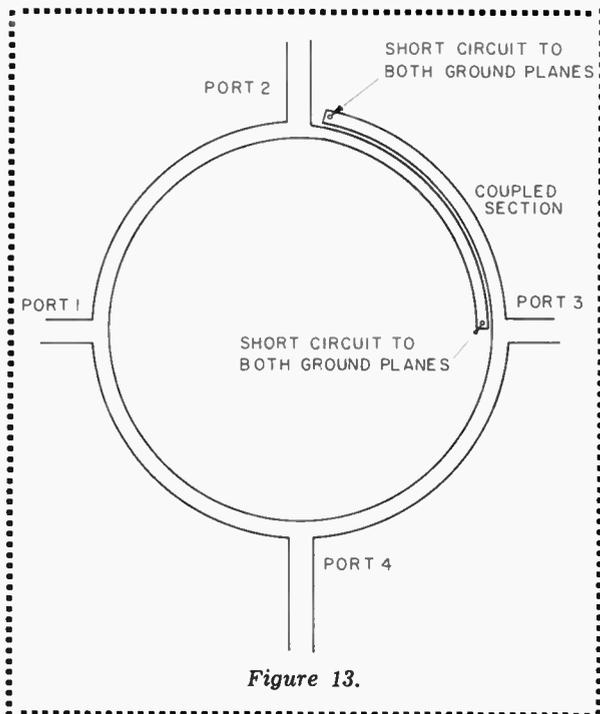


Figure 13.

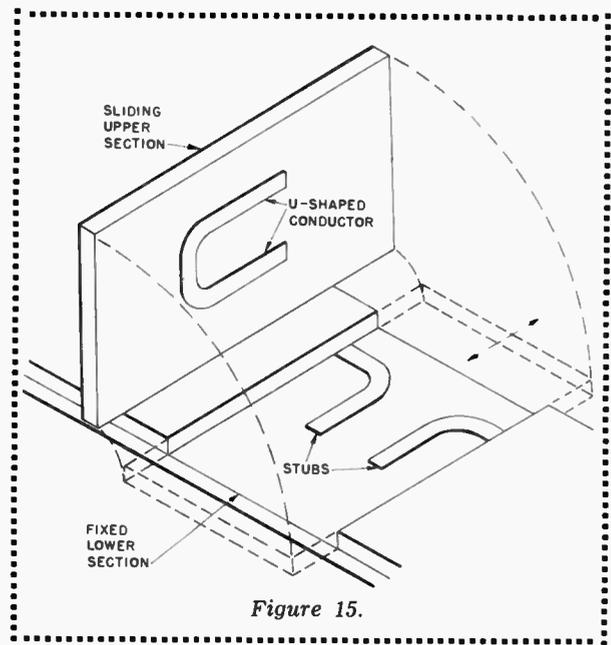


Figure 15.

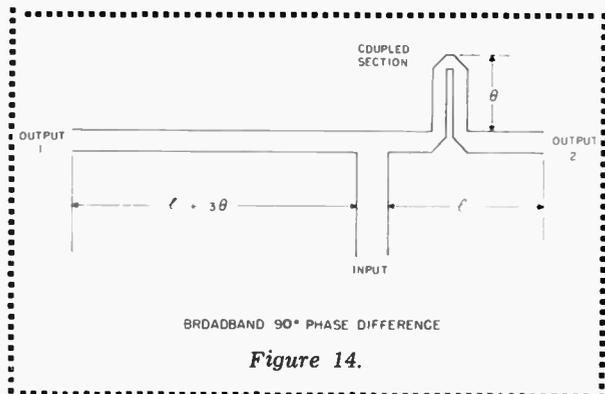


Figure 14.

Continued from page 46

between the common terminal and the other two terminals is shown in Fig. 9 (Ref. 10).

Half sections of the m -derived low pass type may be used at the ends of the varying impedance type to provide better match in the pass band and a sharper cut-off if a frequency of infinite attenuation is placed just above the cut-off frequency.

The simplest band-pass filter is obtained with short-circuited shunt stubs, $\lambda/4$ long at the center of the pass band, spaced $\lambda/4$ apart. This type is suitable when the required band pass is about an octave. A recent design resulted in the measured insertion loss shown in Fig. 10.

Since all transmission line filters tend to be periodic in nature, it is important in designing such filters to be aware that at frequencies outside of the designed pass band the insertion loss may drop to a very low value unless suitable precautions are taken. In the type just mentioned, pass bands will occur at all odd harmonics of the center frequency while with open-circuited stubs, all harmonics of the center frequency will be passed.

For pass bands of less than half of the center

frequency the parallel-coupled type of filter is recommended (Ref. 11). This consists of a series of $\lambda/2$ resonators coupled to each other and to the input and output lines by a $\lambda/4$ overlap (Fig. 11). The number of resonators and spacing will determine the shape and width of the response curve. The insertion loss curve of a typical four-section maximally-flat filter of this type is shown in Fig. 12.

Other components

Strip transmission line configurations are by no means limited to filters but have been used to produce directional couplers, hybrid rings, flat loads, variable and fixed attenuators and broad band differential delays.

Simple directional couplers which have relatively constant coupling over a 2:1 bandwidth may be made by coupled transmission lines a quarter of a wavelength long (Ref. 5). These are easily constructed for greater than 10 db decoupling. For tighter coupling strips having appreciable thickness have to be used and construction becomes more complicated (Ref. 12).

Shunt-fed hybrid rings of the standard type $3\lambda/2$ in circumference, are simple to fabricate but are inherently narrow band. This restriction may be removed by replacing the $3\lambda/4$ arm by a $\lambda/4$ arm, which includes a phase-reversing element (Ref. 13). In this case the phase reversing element is combined with the $\lambda/4$ section and consists of a coupled section of two closely spaced conductors with the diagonally opposite terminals shorted to ground (Fig. 13). A hybrid of this type operates satisfactorily over nearly an octave.

Flat loads may be made by replacing some of the dielectric by suitably shaped wedges of absorbing material. The type using a resin loaded with powdered iron (Ref. 14) is most suitable. Variable attenuators may be constructed using the same type of absorbing material arranged so that its position with respect to the center conductor may be varied.

From a single input two equal outputs with a constant phase difference between them over a wide frequency band may be obtained by the arrangement shown in Fig. 14 (Ref. 15). The length of line in the

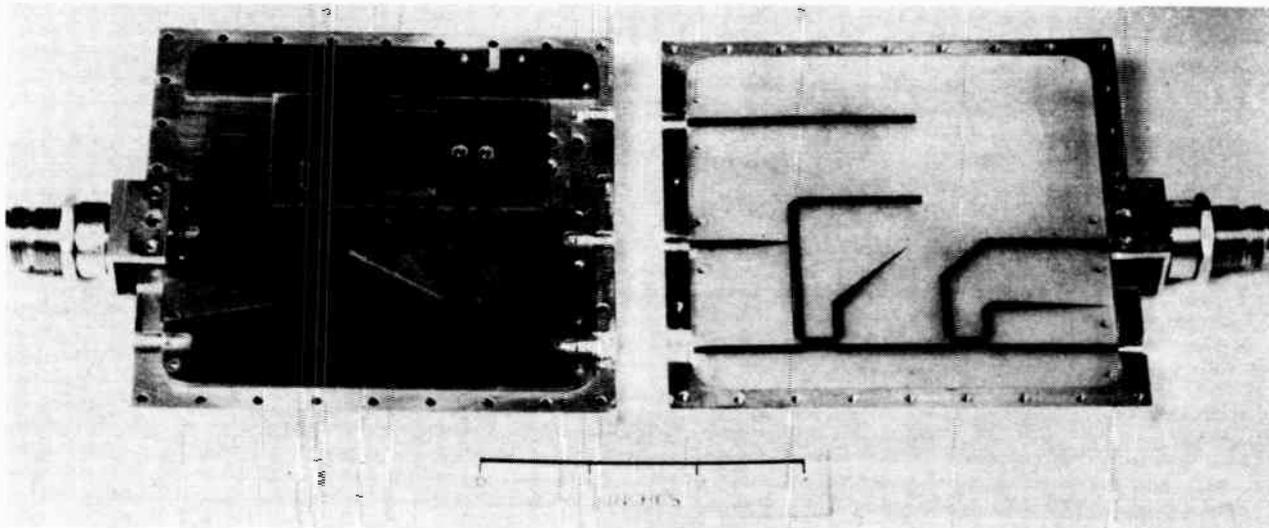


Figure 16.

first arm of the power divider produces a greater phase delay than the coupled section of the second arm. By correctly proportioning the impedances and coupling factor the phase difference between the two may be made nearly constant over a 2:1 frequency band. Phase differences up to 90° are readily obtained in stripline and greater shifts are produced by cascading two or more coupled sections.

A variable phase shifter or line stretcher may be made up as shown in Fig. 15. The upper section, which has a U-shaped center conductor on its lower surface, slides over the two stubs on the upper surface of the lower section. By so doing, the effective length of the center conductor is made longer or shorter.

A single configuration making use of a number of the components mentioned above is shown in Fig. 16. At the bottom the main transmission line passes from left to right. Coupled to it are two directional couplers with about 20 db coupling. Both have the reverse port terminated in a flat load, which can be seen in the upper section, which has been removed. The right-hand coupler feeds out of the type N connector to provide a monitoring facility. The directional coupler on the right feeds upward past a capacitively-coupled probe to a line stretcher section and thence to the connector at the top of the enclosure. The solid box-like enclosure was used in this case in order to keep any stray leakage to a minimum.

Spurious modes and leakage

The strip transmission line normally is excited in the TEM mode. However, when the width of the center conductor or the ground plane spacing become an appreciable fraction of a wavelength other unwanted modes may be set up. The width of the center conductor should be kept smaller than a half wavelength in the dielectric and the ground plane spacing less than about one eighth of a wavelength. Spurious modes may also be set up if the ground planes are not maintained at the same potential. This is best done by a line of shorting screws between the ground planes on both sides of the center conductor, with a spacing between screws of less than a quarter of a wavelength, while the spacing between the lines of screws should be less than a half wavelength at the highest operating

frequency. However, the lines of screws should be spaced at least three times the conductor width apart. This means that for best results at higher frequencies the ground plane spacing and hence the conductor width should be reduced.

Where leakage radiation is a serious problem the rows of screws may be replaced by a conducting wall to completely shield the strip transmission line.

Some of the microwave configurations which can be quickly fabricated using the stripline technique have been described. With a few exceptions components normally employing waveguide or coaxial line can more simply and at lower cost be constructed in sandwich-type strip transmission line. In general, the strip transmission line may be employed to the best advantage in the range 500 to 10000 mc/s.

REFERENCES

1. E. H. Bradley, "Design and Development of Stripline Filters", Trans. IRE MTT4, April 1956.
2. M. E. Breese and S. B. Cohn, "Diplexing Filters", Convention Record of IRE, Part 8, March 1954.
3. E. S. Coale, "A Travelling Wave Directional Filter", Trans. IRE, MTT4, October 1956.
4. S. B. Cohn, "Characteristic Impedance of the Shielded Strip Transmission Line", Trans. IRE, MTT2, July 1954.
5. E. M. T. Jones and J. T. Bolljahn, "Coupled Strip-Transmission-Line Filters and Directional Couplers", Trans. IRE, MTT4, April 1956.
6. E. M. T. Jones, "Synthesis of Wide Band Microwave Filters to have Prescribed Insertion Loss", IRE Convention Record, Part 5, 1956.
7. J. H. Craven, "Some Practical Aspects of Strip Transmission Line Filter Design", IRE Canadian Convention Record, 1958.
8. J. H. Craven, "Photo Etching for Laboratory Production of Printed Circuits", National Research Council of Canada, No. 4064.
9. Radio Research Laboratory Staff, "Very High Frequency Techniques", Vol. II. Chapter 27, McGraw-Hill, New York, N.Y., 1948.
10. J. H. Craven, "Design of a Diplexing Filter for the High Resolution IFF Antenna of the AN/FPS-3 Radar", National Research Council of Canada, ERB-476.
11. S. B. Cohn, "Parallel Coupled Transmission Line Resonator Filters", Trans. IRE, MTT6, April 1958.
12. J. K. Shimizu and E. M. T. Jones, "Coupled Transmission Line Directional Couplers", Trans. IRE, MTT6, October 1958.
13. D. A. C. Roberts, "The Development of a Wideband Balanced Mixer for the Frequency Band 7000-11500 Mc/s", G.E.C. (England) Research Laboratories, Report No. 12913C.
14. A. Staniforth and K. A. Steele, "Casting Lossy Microwave Parts in Resin Aids Design Work", Canadian Electronics Engineering, May 1958.
15. B. M. Schiffman, "A New Class of Broad Band Microwave 90° Phase Shifters", Trans. IRE, MTT6, April 1958.

Toshiba - Japan's electronic colossus

*Japan — no longer a copy-cat of western products
but a contender in the world market
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by T. W. Lazenby — Editor

There is little doubt in anyone's mind connected with the electronics industry of the significant inroads that Japanese manufactured goods are making on the Canadian scene. As a result of this we have been approached on several occasions in recent months by persons seeking general information about the Japanese electronics industry which prompted us to make a few enquiries, enquiries which in turn unearthed some rather interesting facts about Tokyo Shibaura Electric Company Limited (Toshiba).

For instance, this company, which is Japan's leading electric industrial company and largest manufacturer of transistors, is now making its first concerted effort to penetrate the United States market with transistorized scientific and industrial equipment and instruments and to this end recently exhibited ten newly-developed and advanced transistorized measuring instruments during its first participation in the Instrument Society of America's Annual Instrument Automation Conference and Exhibition.

Some completely new types, others improved models, the instruments exhibited included transistorized self-balancing recorders and indicators, radiation survey meters, mini-vibration meters, pocket insulation testers and thermistor thermometers.

The purpose of the exhibit was of an introductory nature, and Toshiba believes that its products can compete handily with those of U.S. manufacture or from other countries with respect to quality, performance and price.

Toshiba, with over 80 years of manufacturing experience, is currently capitalized at 15 billion yen or \$41.7 million, operates 19 industrial plants, maintains 4 laboratories, and employs some 39,000 persons. Organizationally, it is divided into 6 basic divisions: Heavy Apparatus Division, Lamp and Tube Division, Telecommunication and Electronic Division, Electrical Appliances Division, Automation and Instrumentation Division, and Record Division.

The company has scores of subsidiary or affiliated companies, and presently is exporting various electrical items to more than 60 countries.

A little known fact is that International General Electric Co., a division of General Electric Co., is a major stockholder in Tokyo Shibaura Electric. An agreement was reached during 1959 whereby Toshiba manufactures transistor radios and certain electronic components for I.G.E. for sale in markets outside of the U.S. and Canada.

Sales of Toshiba transistor radios in the American market have been increasing steadily and substantially, during 1958 \$5 million at retail, in 1959 they exceeded \$10 million, and for 1960 the company expects such sales in the United States to top \$15 million.

The Japanese industrial giant expects to shortly

establish an office in New York to be staffed by four of its most competent executives for the purpose of intensively studying the American market and the possibilities for expanding exports in quality electrical equipment.

Toshiba recently completed a new addition to its transistor plant and became accordingly the largest manufacturer of transistor radios in the world.

Since 1956, the Instrumentation and Automation Division at Toshiba has been actively engaged in the research and development of transistorizing various instruments, and notable success has been achieved in the application of transistors to scientific, radiation (nuclear), and industrial instruments, as well as to automation and control equipment.

Specially notable has been Toshiba's perfection of self-balancing recorders and indicators, using germanium transistors, that function properly even in environmental temperatures of 50 degrees C. and above. Heretofore, germanium transistors were considered unsuitable for industrial application because of temperature and other adverse conditions. But this has become feasible with the development of a high gain amplifier on the basis of an invention of a circuit (Japanese patent pending) permitting stable operation of transistorized circuits.

Scientific measuring devices particularly suited for automation, these instruments collect information from a variety of process sources and translate and present the accumulated data into graphic form. They find application in analytical recording, electric power and aircraft control systems, in missile telemetering, in process and quality control.

A portable transistorized Mini-Vibrometer, claimed to have no equivalent on the world market, has application in quality control in measuring vibrations of engines, motors, fans, etc., at the time of manufacture. A pocket sized transistorized Insulation Tester, believed to be the first of its kind in such small size, finds use by power companies and electrical parts manufacturers.

The Transistorized Radiation Survey Meters, one a GM survey meter, the other a scintillation survey meter, are portable instruments for use in uranium prospecting, detecting radiation contamination, and in laboratories and industrial facilities where radial rays are involved.

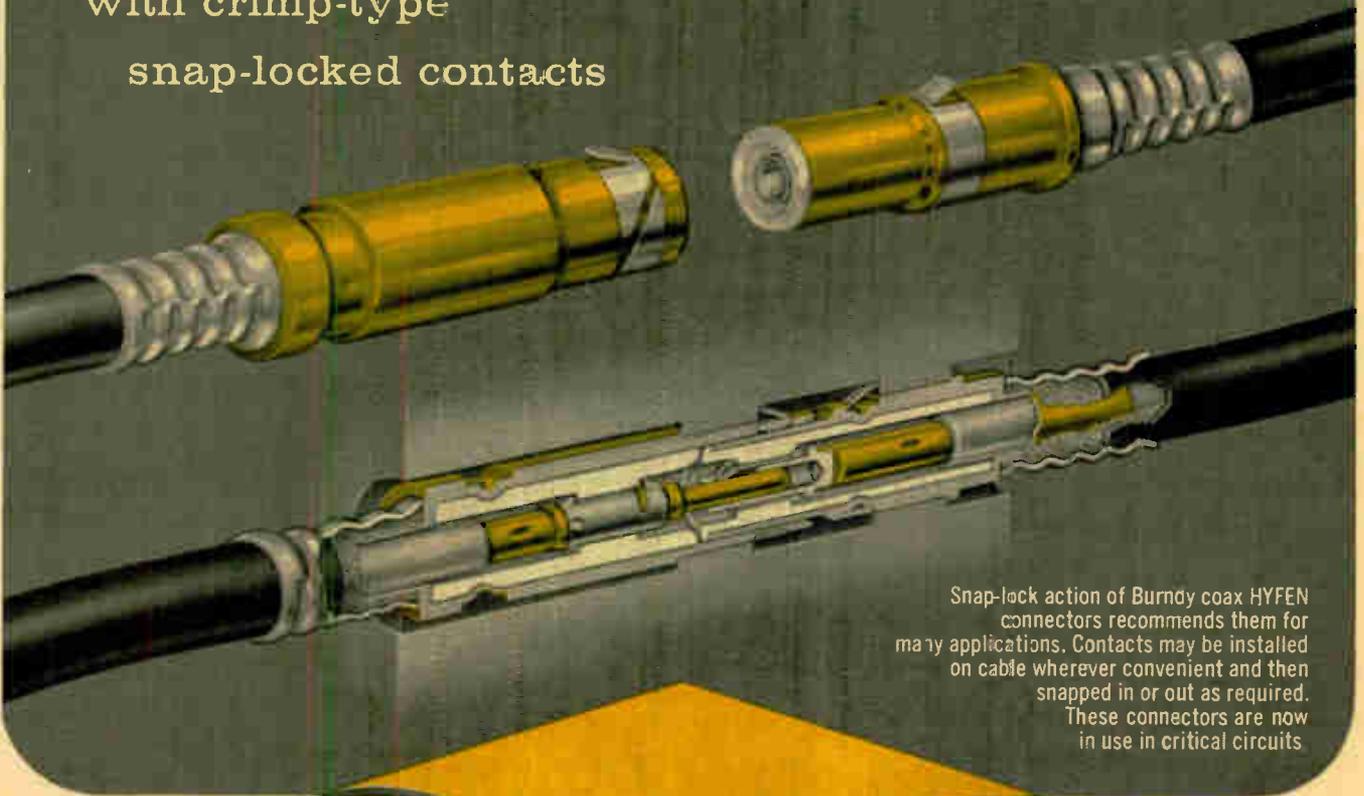
The Thermistor Thermometer, although not a transistorized product, is nevertheless also a semi-conductor-applied instrument, and finds application primarily in fields connected with electric equipment, medical equipment and the chemical industries.

Such then is a picture of Japan's expanding electronics industry and what the extent of its effect on the Canadian and American electronics industries may be is anyone's guess.

COAX HYFEN

CONNECTORS

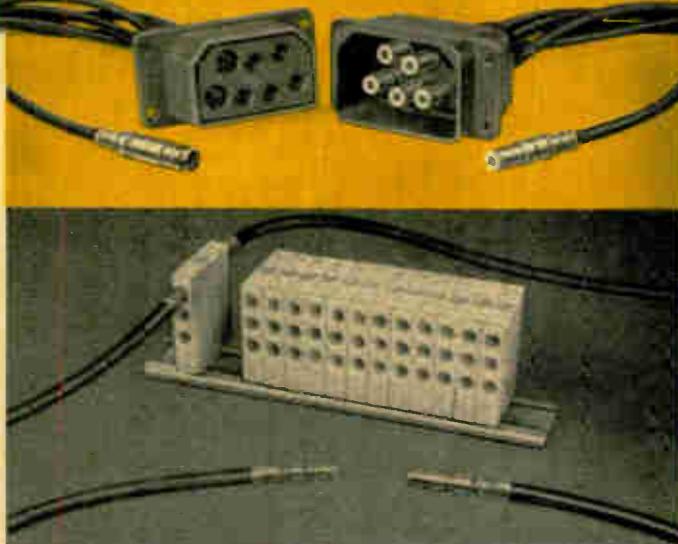
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General Electric's newly developed gallium arsenide tunnel diode works at frequencies above 4000-megacycles (4 billion cycles). G.E. expects to make samples available in about 6 months.

RESEARCH

Frequencies of 4000 megacycles claimed for tunnel diodes

Gallium arsenide tunnel diodes seen as assist to space vehicle program

General Electric research scientists have successfully made tiny, electronic parts, called tunnel diodes, work at frequencies above 4000-megacycles (four billion cycles) and in addition, most other performance characteristics exceed those of previous tunnel diodes.

Key to the improved performance is the use of gallium arsenide, a little known and rarely used semiconductor material, as the basic element in the device's construction.

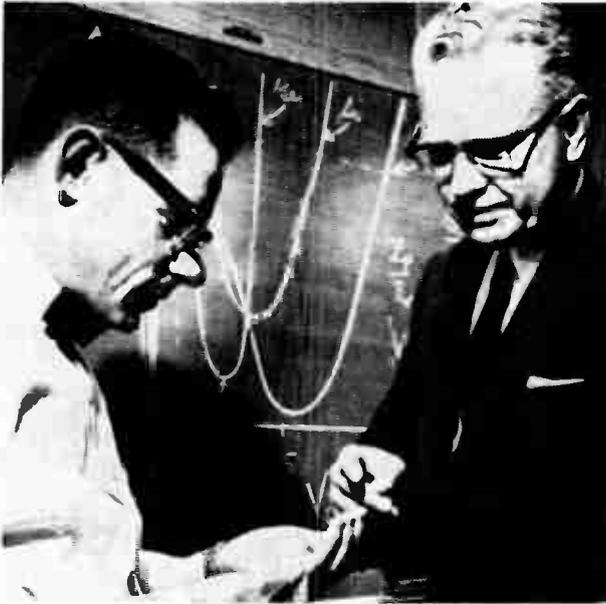
General Electric Company officials have credited Dr. R. N. Hall of its Research Laboratory in Schenectady and Drs. N. Holonyak, Jr. and I. A. Lesk of its Advanced Semiconductor Laboratory in Syracuse for the gallium arsenide tunnel diode developments. All three scientists were also responsible, with others in the company, for the significant research achievements on germanium and silicon tunnel diodes announced last summer.

Scientists stated that based on their present observations gallium arsenide is the best material for tunnel diodes so far explored and may be the ultimate material for the best overall performance.

Oscillation frequencies of 4400-megacycles have been obtained indicating that frequencies well above 10,000-megacycles are possible with tunnel diodes made of gallium arsenide.

Canadian General Electric Company currently plans to make samples of the new gallium arsenide tunnel diodes available to industry circuit designers in about six months. While cost of the samples has not been set yet, it is estimated that the price will be approximately the same as the present eighty-six dollar price for its germanium tunnel diode samples.

The tunnel diode is the latest member of a family of new solid state electron devices which includes the



General Electric research physicist, Dr. I. A. Lesk, left, shows the minute 4000-megacycle gallium arsenide tunnel diode to Dr. H. M. Sullivan, head of laboratory.



Dr. I. A. Lesk, and laboratory technician, examine one of G.E.'s gallium arsenide tunnel diodes under test.

transistor and the solar cell. Like the transistor, the tunnel diode is a basic device in an electronic circuit but it has advantages the transistor does not. It achieves high frequency easily and is relatively insensitive to temperature changes and nuclear irradiation. It is now expected that tunnel diodes will be used extensively in high speed computers, communications equipment and nuclear controls as a companion to the transistor.

Extend missile capability

In addition to the high frequency operation and the extremely small size, the new gallium arsenide tunnel diodes have other characteristics which it is believed will help extend the capabilities of the nation's missile and space vehicle systems.

More reliable, micro-powered, miniaturized electronic equipment, like computers, oscillators and amplifiers in the space vehicles themselves as well as

in ground-based launching and control systems are expected to result from the development.

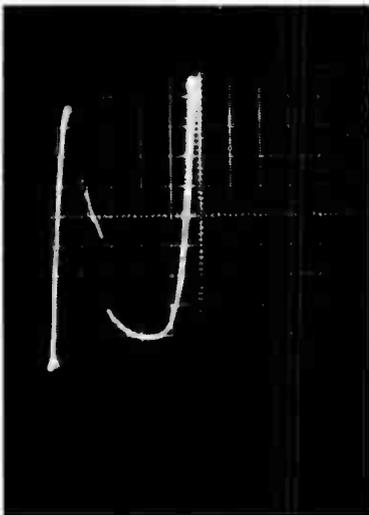
First disclosure of the intensive tunnel diode research program was made last July when research findings were announced which indicated the device possesses many desirable characteristics and was close to commercial application.

Early in September, last year, CGE started shipping samples of the germanium tunnel diodes to advanced circuit design laboratories. Since that time it has shipped several thousand devices and widespread engineering design interest confirms belief in the tunnel diode's future.

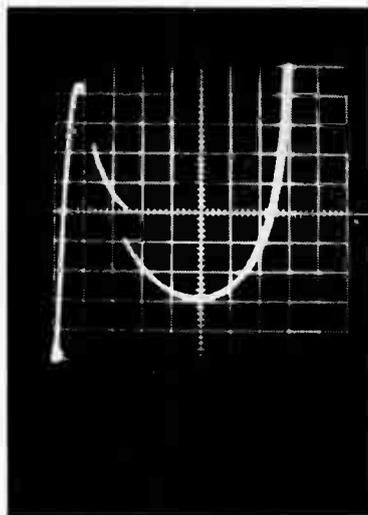
Technical details

The gallium arsenide tunnel diodes now under development by General Electric have exhibited peak-to-valley current ratios as high as 60 to 1. The highest

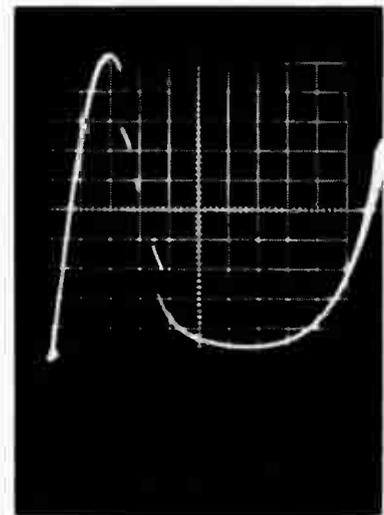
Continued on page 70



Germanium



Silicon



Gallium arsenide

This oscilloscope E-I curve trace comparison of tunnel diodes made of germanium, silicon, and gallium arsenide indicates some of the results of intensive research and development program on the new devices.

Computer conference

The Second Conference of the Computer and Data Processing Society of Canada is scheduled for June 6 and 7 at Hart House, Toronto. About 500 delegates from across Canada are expected to attend.

The conference has been planned to coincide with the third Canadian National Business Show, where an unprecedented variety of computing and data processing equipment will be displayed, much of it for the first time. The latter show will be held June 6, 7 and 8 in the Automotive Building, Exhibition Park, Toronto.

In recognition of the intricacies of computer and data processing work, CNBS exhibitors have arranged for special briefings and demonstrations for conference delegates on the night of June 7 and throughout June 8.

Central Dynamics offers repair service

Central Dynamics Ltd. maintains a modern, well equipped repair facility located in Pointe Claire, Que. A new building houses the latest in test equipment and experienced technicians are available for the repairing, overhaul-

ing and calibration of instruments and equipment.

In addition to this service, a city wide pick-up and delivery service in the greater Montreal area is offered.

Sola Electric changes name

Announcement was made recently by J. R. McGovern, vice-president and general manager, of a change of name for Sola Electric (Canada) Ltd., a subsidiary of Basic Products Corporation, Milwaukee, Wisconsin. Effective April 15, the company was renamed Sola-Basic Products Ltd.

According to Mr. McGovern, "the new name is in keeping with the company's program for growth and diversification, which includes the manufacture and sale, in Canada, of product lines now made by other Basic Products organizations elsewhere."

Sola-Basic Products Ltd.'s plant is located at 377 Evans Avenue, Township of Etobicoke, Toronto.

Eimac signs English firm

A licensing agreement between Eitel-McCullough, Inc., San Carlos, manufacturer of Eimac electron-power tubes and English Electric Valve Company of Chelmsford, England, has been arranged for the exchange of manufacturing rights and technical information.

The agreement, effective March 1, will potentially expand the product lines of the two electron-tube companies in the field of negative-grid tubes, klystrons and travelling wave tubes. For Eitel-McCullough, Inc., manufacturer of transmitting tubes, it marks the first licensing agreement with a foreign company and will further strengthen the company's position in both the U.S. and International markets.

The agreement permits each company to manufacture the other's products and market them internationally.

Last month Eimac announced the establishment of a European subsidiary, Eitel-McCullough, S. A. in Geneva, Switzerland for the marketing of Eimac products in Europe and the management of its fast growing international operations.

New offices for Haloid Xerox

Formal opening of new offices for Haloid Xerox of Canada Ltd. were held during the second week of May at the company's recently completed building at 20 Mobile Drive, Toronto.



THANKS TO OUR MANY WONDERFUL CUSTOMERS

for your kind indulgence during our recent expansion program. Our new ultra modern building and facilities, including one of North America's finest research and development laboratories for frequency control study, are now complete.

May we again offer our unparalleled service to you.

Look to **croven** for the finest — Canada's largest manufacturer of Crystals and Ovens.



croven LIMITED

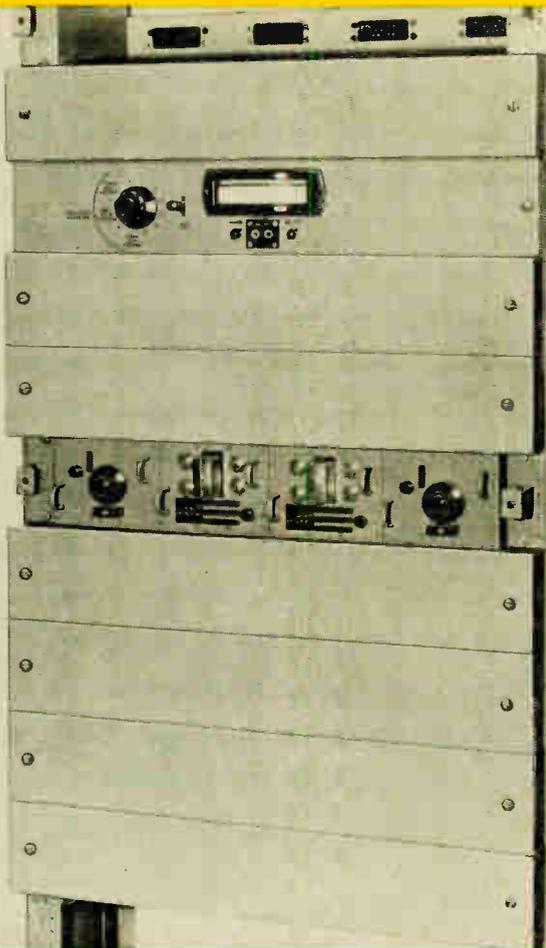
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WHITBY • ONTARIO • CANADA

Telephone: MOhawk 8-3325
Direct Toronto Line: EMpire 6-6012

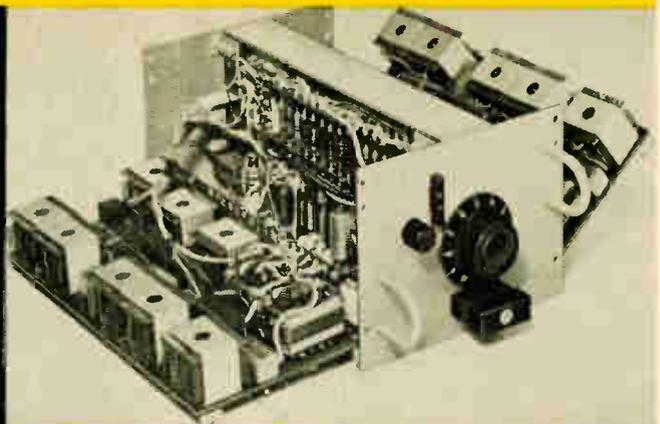
For complete details check No. 28 on handy card, page 85

FULLY TRANSISTORIZED CARRIER TELEPHONE EQUIPMENT

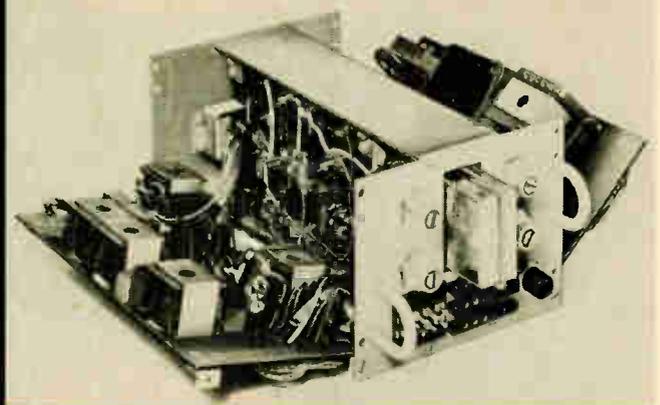
for use with RADIO and CABLE SYSTEMS



Cover removed to show Channel and Signalling Units
— 2 Channels per panel.



Channel Unit.



Signalling Unit.

TECHNICAL FEATURES:

- 300-3,400 c/s Channel Bandwidth
- 4 kc/s spaced.
- Optional Inbuilt Out-band signalling (3825 c/s at -20 dbm0).
- Fully transistorized.
- 96 Circuits without signalling or 48 circuits with signalling per 9 ft. rackside (20½ in. x 8½ in. floor dimensions).
- Compact plug-in units with hinged, card-mounted components give maximum component accessibility.
- Can be supplied on racksides or a complete basic group on a sub-frame.
- Available in 60-108 kc/s basic channel groups or as systems for 12-circuit 2-wire cable operation or multicircuit, for radio links.
- Conforms with CCITT and BPO requirements.



TELEPHONE MANUFACTURING CO., LTD.

SAXONY BUILDING, 26 DUNCAN STREET, TORONTO 2B, ONTARIO

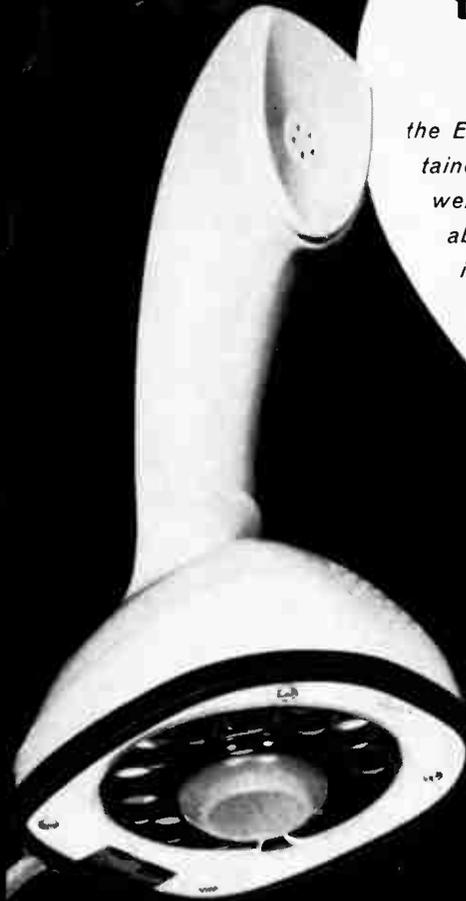
For complete details check No. 73 on handy card, page 85

ERICSSON

simplifies, beautifies the familiar telephone

L. M. Ericsson has produced a one piece telephone called the Ericofon. In a light and beautifully fashioned case are contained receiver, transmitter, line connector and dial. The Ericofon weighs less than the handpiece of most telephones. It is available in many colors for use in conjunction with Ericsson's intercom equipment, and to Canada's independent telephone companies.

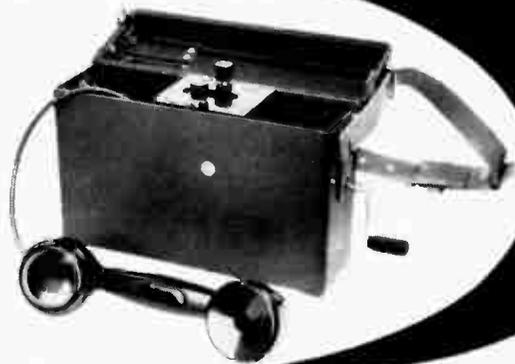
To introduce a design that is entirely new — to ignore familiar concepts and in doing so, produce a better product, requires an abundance of two things: *Imagination and technical resources.* These assets together with 80 years experience and operations in 80 countries are offered by L. M. Ericsson to buyers of telephone, intercommunications and time control equipment in Canada.



ERICSSON PORTABLE TELEPHONES

The Ericsson portable telephone DPA 1401 is designed to withstand the rough use that this sort of instrument is likely to receive. Complete with carrying case, the unit weighs less than nine pounds. Power is supplied by standard flashlight batteries.

For information on the above or any type of telephone, intercom and time control equipment contact :



ERICSSON

TELEPHONE SALES OF CANADA LIMITED

Montreal: 130 Bates Road—Tel: RE. 1-6428

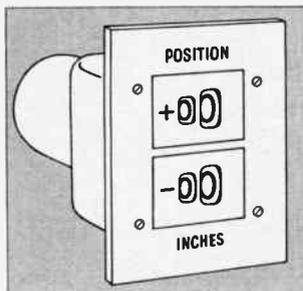
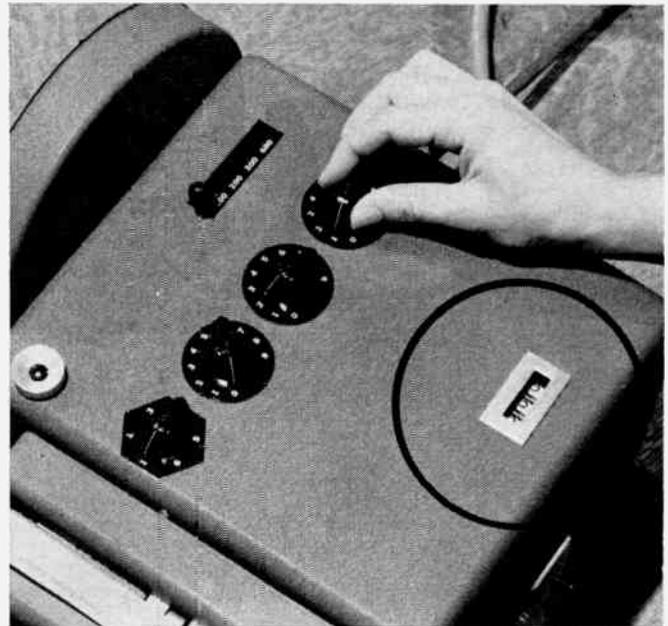
Toronto: 34 Advance Road, Etobicoke—Tel: BE. 1-1811

2229

For complete details check No. 60 on handy card, page 85

Readout Counter used in Tape Preparation for Machine Tool Control

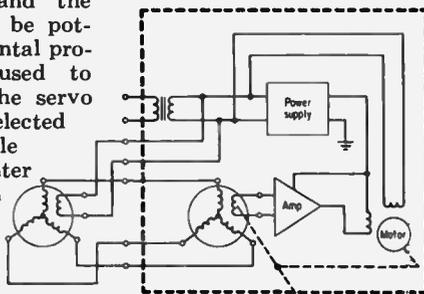
A Veeder-Root Series 1538 Remote Data Readout Counter provides tape feed control for the motorized tape punching unit of the new Potter & Johnston Tape Control System. The tape punch is used to program machine functions on P & J Automatic Turret Lathes. The counter automatically controls the amount of tape feed required for each turret face involved, and stops the tape at preselected address points. When the correct address point is reached, a combination of holes representing the machine command is punched into the tape. Counter is automatically reset for each turret face.



Servo Repeaters Drive Counters to Indicate Lineal Motion*

One of the ways to take advantage of digital readout for indicating and

recording information at remote points is through servo repeaters. Applications in aircraft, for altimeters, navigational displays and similar instrumentation, suggest many other opportunities to use counters for more positive indication and control. A typical "system" is shown here where a counter is used for indicating nuclear reactor rod position. The servo repeater and counter actually form one packaged unit, and the whole device can be potted for environmental protection. When used to drive counters, the servo gear ratio is best selected to provide full scale travel of the counter for one revolution of the control transformer shaft.



Typical servo repeater/counter device that converts synchro data to digital readout. Output shaft to counter

Let Veeder-Root help you make Counters do more! Extensive design experience and precision production techniques make it possible for Veeder-Root to help you solve a wide variety of digital, readout, control and recording problems with counters — from the simplest ratchet to advanced readout and navigational devices. Send for information on specific applications or contact your local Veeder-Root Counting Engineer.

*Reprinted from CONTROL ENGINEERING June 1959. Copyright © 1959 by McGraw-Hill Pub. Co., Inc. All rights reserved.

Veeder-Root Readout Device

This is the basic series of Remote Data Readout Counters. Some are available for standard applications, or design variations will be submitted based on requirements. They function basically as analog to digital converters.

Series 1538/electrical reset/ electrically actuated. Speed 1000 cpm, 3 or 5 figure





Series 1538/electrically actuated/ manual reset. Speed 1000 cpm, 3 or 5 figure

Series 1606/mechanically actuated manual reset standard; bi-directional (non-reset) available. Speed 5000 cpm, up to 5 figures



Veeder-Root

OF CANADA LTD.

'The Name that Counts'

26 Fieldway Rd., Toronto
Main Office & Factory: Veeder-Root Inc., Hartford 2, Conn., U.S.A.
Offices & Agents in Principal Cities

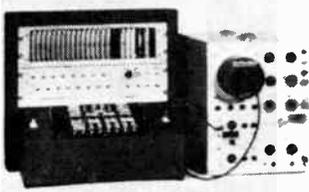


product panorama

For further information on New Products use Readers' Service Cards on pages 85 and 86.

Reliability tester Item 466

The AIL Type 90 Circuit Design Reliability Tester is used to test upper and lower limits of as many as 16 circuit components at one time. After the center values of components in a particular circuit design are computed and the effect of environmental conditions on these components is known, a circuit can be constructed on the Type 90 Tester which will include upper and lower values for all components in the circuit. The Type 90 will then check all possible combinations and permutations of component values within the circuit.

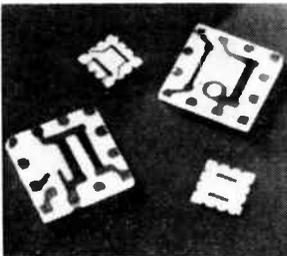


The output of the circuit is displayed on a 5-inch oscilloscope (not furnished). A mask, made up to simulate the tolerable limits of the output waveform, is placed on the face of the tube. A light shield, with an internally mounted photo-sensitive device, is then fastened to the bezel of the oscilloscope. Any deviation in the output waveform, beyond the limits set by the mask, will cause the light from the trace of the tube to trigger the photocell, indicating a failure. The Type 90 indicates the particular circuit configuration which caused failure.

Airborne Instruments Laboratory, a Division of Cutler-Hammer, Inc., 1345 New York Ave., Huntington Station, N.Y., U.S.A.

500°C resistor circuit Item 467

C. C. Meredith & Company, Ltd. announces a unique metal resistor circuit stable up to 500°C, which is available on ceramic substrates made to customer specifications for incorporation in electronic equipments where extreme stability is required. A resistance range of 30 to 70,000 ohms per square is available, making it possible to obtain resistance values of 100 ohms to several megohms in a short straight path without the use of grid or lattice patterns. An entire surface or an accurately defined pattern can be covered. Resistance patterns can be designed to permit the addition of capacitors, diodes, transistors, inductors or other electronic components for water applications.



No potting or other mechanical protection is needed, as the extremely hard surface remains impervious to environmental conditions.

For further information write C. C. Meredith & Company, Ltd., Streetsville, Ontario.

Panel bushing assembly Item 468

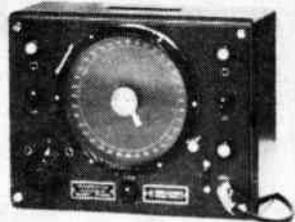
Cambridge Thermionic Corporation has added a new panel bushing assembly to its wide line of electronic components.

Designed to accommodate 1/4" diameters, this new No. 1818 assembly will broaden the range of sizes available. The complete 3-piece assembly includes: hex-ended bushing, standard hex nut, and internal tooth lock washer. Bushing is available in lengths of 3/4" (1818-1); 1/2" (1818-2); and 5/8" (1818-3) with 1/4-28 UNF Thread. Concentricity of the bushing sleeve is excellent. Hex of bushing and hex nut are 3/4" double-chamfered. Bushing and hex nut are brass, lock-washer phosphor bronze. Finish of bushing is .0003" bright nickel plate. Hex nut and lock washer are supplied with .0003" bright nickel plate finish. Like all CAMBION® components, the entire No. 1818 bushing assembly is manufactured under rigid quality control standards and is performance-guaranteed.

For further information write to Cambridge Thermionic Corporation, 445 Concord Avenue, Cambridge 38, Massachusetts, U.S.A.

Rotors Item 469

A new range of Rotors for antennae or other equipment is now available. Several types are available for supporting loads up to 10,000 pounds. A remote control unit which is calibrated against the angle of rotation to be set accurately within 2°. These rotors can be used for determining the characteristics of transmitting and receiving antennae, monitoring and reducing the



effect of interference as well as many other uses. These rotors are easily installed and masts can be provided to support the rotors. Known as the HA55 series, further information may be obtained from:

The Ahearn and Soper Company Limited, 850 Belfast Rd., Elmvalle Acres, Ottawa, Ontario.

High channel TV transmitter Item 470

Development of a new 25 KW TV high channel transmitter is announced by Canadian General Electric Company Ltd. Suitable for the transmission of either monochrome or color television signals, the new G-E transmitter (designated the TTC-99-B) has been designed for high-quality performance, and economy of operation. The new unit can be operated from 12.5 KW sync peak through to 25 KW sync peak power output. It can be used with G-E Ultrapower 24-gain directional antenna or the 24-gain omni-directional antenna to give maximum effective radiated power. The 25 KW amplifier portion of the new transmitter can also be used to increase power for existing stations.

The new TTC-99-B has many other features including: a built-

in sweep generator; automatic power failure restart operation; complete air-cooling; positive control and protective circuits, including VSWR protection, to give greater reliability.

For additional information contact Canadian General Electric Company Limited, Electronic Equipment and Tube Dept., 830 Lansdowne Ave., Toronto 4, Ont.

Diode test set Item 471

An entirely new instrument, capable of generating and displaying the millimicrosecond recovery characteristics of ultra fast switching diodes on conventional oscilloscopes, has been announced by Lumatron Electronics, Inc.

The instrument, Model 510, includes a novel test fixture for rapid, manual insertion of coaxial lead diodes, a metered regulated power supply, a mercury switching type pulse generator, a wide band delay unit and a millimicrosecond sampling converter.

The fixture has a unique, coaxial structure and includes all necessary components to display the recovery characteristics of extremely fast diodes. The power supply is current regulated, metered and capable of providing currents up to 20 ma at 15V. The pulse generator is of the mercury switch type, with regulated, precisely adjustable pulse amplitude and a risetime of less than 0.3 millimicroseconds.

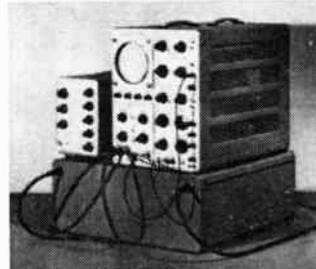
The Model 510 combines these new instruments in a single fully-transistorized unit so compact that it requires no more bench space than a standard notebook.

Write for particulars to Instronics Limited, P.O. Box 100, Stittsville, Ontario.

Pulse sampling system Item 472

Recurrent signals faster than the normal capabilities of Tektronix Type 530, 540, and 550 Series Oscilloscopes can be observed with the Tektronix Pulse Sampling System. Risetimes to approximately 0.6 nsec (bandwidth to 600 mc) can be investigated with the system. Displays with apparent sweep times of as little as one nsec can be provided (with magnifier, 100 picoseconds/cm).

The versatile system also provides general purpose medium and low speed service, convenient trigger takeoff, precise pulse gen-

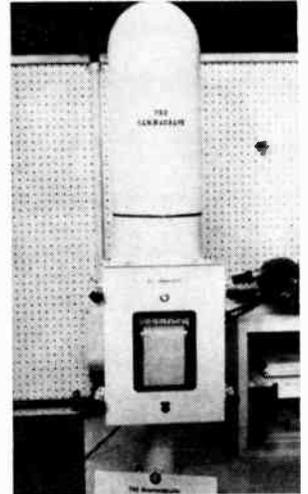


erator with repetition rate of 720 pulses/sec nominally and risetime less than 0.25 nsec, ample signal delay, superior synchronizing, bright display, and high basic repetition rate to 100 kc. Costing much less than comparable systems — especially if the user has a Tektronix Plug-in Oscilloscope — the Pulse Sampling System, in addition to the oscilloscope, consists of: Type N Sampling Plug-In Unit, Type 110 Pulse Generator and Trigger Takeoff, and Type 113 Delay Line.

Tektronix, Inc., P.O. Box 831, Portland 7, Oregon, U.S.A.

Gammagraph Item 473

The Gammagraph is the first instrument developed to measure continuously the fall-out of gamma radiation indoors or out of doors, such as in the vicinity of a nuclear power station. Powered by an ordinary car battery and completely weatherproof, it can work in isolated country places continuously for one month without any attention. Local authorities can now record gamma radiation fall-out as simply and easily as they do temperature, barometric pressure, rainfall and hours of



sunshine. The gamma radiation throughout the world could be mapped in this way.

Electronic Instruments Ltd., Richmond, Surrey, England.

Electronic time meter Item 474

A new electronic time meter manufactured by L M Ericsson is now available on the Canadian market. The operation of the time meter is based on the well known principle of charging a capacitor whereby the voltage across the capacitor will be a function of the charging current and charging time. The wide range of the meter permits measurements from fractions of a millisecond up to 10 seconds and the high impedance inputs allow the possibility of direct connection to test objects even when mounted in equipment.

Further information can be obtained from Ericsson Telephone Sales of Canada Ltd., 130 Bates Rd., Town of Mount Royal, Montreal.

Hermetically sealed relay Item 475

A new 10 ampere DPDT hermetically sealed relay FC-215 has been developed by Struthers-Dunn.

Designed to perform dependably when subject to high levels of shock and vibration.

For use in missiles, piloted aircraft, and other military devices. Features and electrical characteristics: Balance armature; Internal welded joints; Contact rating 10 ampere resistive to 26.5 VDC; Operating voltage — 18 VDC; Operating temperature range — minus 65°C to plus 125°C; 30 G vibration to 2000 cycles.

For further information and copy of data bulletin FC-215, write to: Struthers-Dunn Relays, Division of Renfrew Electric Co. Limited, 349 Carlaw Avenue, Toronto 8, Ontario.

TRIMPOT® potentiometer

Item 476

Model 215 TRIMPOT® potentiometer incorporates Bourns' exclusive Resiston® element, a high temperature carbon deposited on an inert and moisture-proof ceramic base. This combination provides temperature stability unequalled by other deposited carbon potentiometers as well as excellent shock, vibration and acceleration characteristics.

Specifications on Model 215 include — Power rating: 0.25 watt; operating temperature range: -65 to +125°C; Resistances: 1K to 10 megohms; Usable potentiometer range: 98 per cent; Resolution: infinite. Model 215 also features 22-turn screwdriver adjustment, self-locking shaft and idling wiper at the ends of adjustment travel.

Measuring only 1/4" x 1/2" x 1/4", Model 215 mounts individually or in stacked assemblies using 2-56 screws through body eyelets. Insulated stranded leads, solder lugs or printed circuit pin terminals are available to simplify mounting on a chassis or printed circuit board.

For additional information on the Model 215 or other Bourns' products, write their Canadian licensee: Douglas Randall (Canada) Limited, 126 Manville Rd., Scarborough, Ontario.

* Resiston is a trademark of Bourns, Inc.

Microwave receiver

Item 477

The Polarad Model RW-T Antenna Pattern Microwave Receiver covers a frequency range of 2,000 to 75,000 mc with a single tuning head. It has the unique feature of allowing the mixer to be located remotely from the tuning head at distances up to 75 feet. A single coax cable is all that is required between the remote mixer and the receiver head. This eliminates the need for cumbersome waveguide between the antenna and the receiver.

Internal electronic 1000 cps sweep makes the Polarad receiver



compatible with any of the commercially available antenna pattern recorders without deterioration of other specifications.

The receiver can be used for CW, AM, FM and pulse reception. Polarad Electronics Corporation, 43-20 Thirty Fourth Street, Long Island City 1, N.Y., U.S.A.

Turret TV tuner

Item 478

General Instrument — F. W. Sickles of Canada Ltd. announces the forthcoming availability of the company's Miniature Turret TV Tuner known as the Mark VIII. This tuner has been undergoing development and testing for nearly two years. The Cascade version has been specially designed for the Canadian market and the bulk of the specific development related to this version has been undertaken by the company's Canadian engineering groups in parallel with its U.S. design groups.

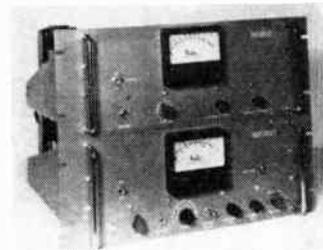
The Mark VIII Miniature Turret is a 13-mechanical/12-electrical position tuner, specifically designed with high reliability and rugged operation as the objectives. For example, the wiper contacts receive minimal flexing in operation, thus fatigue is at an extremely low level and contact pressure is uniform throughout the life of the tuner with minimum contact wear. Drift has received particular attention, and all significant areas of the oscillator circuit utilize glass based Melamine insulation. Full 12 channel adjustments are available in the oscillator circuit. Adjustments are positive and free from vibration, drift, humidity, etc.

General Instrument — F. W. Sickles of Canada Ltd., P.O. Box 408, Waterloo, Ontario.

Voiceplex system

Item 479

The Model VP-55-1A Voiceplex system, developed by Kahn Research Laboratories, Inc., permits two voice messages to be transmitted in the same frequency spectrum normally occupied by one. Total spectrum requirements are only 300 to 3,000 cps, and the system may be used wherever voice communications are required — over low-quality land lines, carrier telephone circuits, or radio links.



Voiceplex incorporates a novel time division multiplex technique for transmitting and sequentially sampling the two separate channels at a very slow rate. Thus, it may be used without obsolescence of existing equipment or increasing spectrum requirements.

Special circuitry is included for generating a new type of high-stability synchronizing wave and a sampling system for decoding and separating the two channels. Kahn Research Laboratories, Inc., 22 Pine Street, Freeport L.I., N.Y., U.S.A.

Image orthicon tube

Item 480

A new extended-life image orthicon tube developed by the Westinghouse electronic tube division for use in television cameras uses a new target material and new processing to virtually eliminate image retention and its limiting effect on operating life. The new WL-7611 image orthicon bears a 1000-hour warranty from Westinghouse rather than the 500-hour warranty applying to other image orthicons used in the industry.

The WL-7611 image orthicon is available at a suggested price to the user only very slightly higher than the cost of a standard 5820 image orthicon. This differential will make it possible for television station operators to make substantial reductions in the hourly cost of camera tube operation. Other advantages resulting from the tube's immunity to image retention are its low susceptibility to raster burn and its elimination of the need for an orbiter.

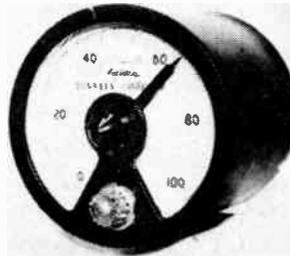
The WL-7611 orthicon is directly interchangeable with the 5820 orthicon and has identical performance characteristics, except for the WL-7611's higher level of sensitivity over a longer operating life.

For more information on the new extended-life image orthicon, write Canadian Westinghouse Company Limited, Hamilton, Ont.

Temperature controller

Item 481

The first of the new Fielden "Bikini" range of transistorized instruments is a Precision Temperature Controller with a differential of only 0.5°C, high calibration accuracy and very high long term stability.



The instrument is housed in a small meter type case and occupies a panel space of only 4 1/2" diameter. The scale, which is 9" long, is calibrated directly in °C or °F and the bold pointer is set to the required control temperature by a small knob in the center of the instrument. A red lamp visible from the front indicates the control action. Control can be at any temperature between -2000°C and +500°C with a minimum temperature range span of 50°C and there are 12 standard calibrations in °C and °F.

The electronic circuit is of an advanced design and is the result of three years' intensive work by Fielden. The instrument is completely transistorized and will operate from a 12 volt DC supply, components operating well below their maximum rating.

Inexpensive power supply units are available to provide the necessary 12 volts DC from the usual supply mains.

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

I.F. preamplifier

Item 482

A new transistorized IF preamplifier further supplements LEL's standard line of transistorized equipment designed for use in missile, space, and telemetry applications.

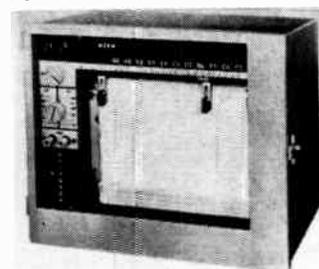
The IF 86 has a bandwidth of twenty megacycles centered at 60 MC and designed to be used with microwave receiver mixers having an IF source impedance of 300 ohms and 18 MMFD. Noise figure is better than 4.25 db. The IF 86 is also available at other center frequencies and for other source impedances.

For further information contact the Canadian representative: E. G. Lomas, 227 Laurier Ave. West, Ottawa 4, Ontario.

Microvolt-Microammeter

Item 483

The "Micrograph", a high-speed DC recording microvolt-microammeter, operates on the continuous self-balancing potentiometer principle. The moving coil detector forms part of a DC to AC photoelectric amplifier-converter. A light source projects to a beam



to a mirror on the moving coil, and is reflected to a pair of photocells. The AC signal developed by the displacement of the light

spot over the photocells is passed through a transistorized amplifier to drive a servo motor. Rotation of the motor moves the sliding contact over the potentiometer. As the compensating current becomes equal to the current being measured, the signal disappears and the servo motor stops. Thus the displacement of the sliding contact is independent of the linearity of the amplifier, and is a linear function of the input current. The displacement is recorded by a pen connected to the sliding contact.

R. H. Nichols Limited, Box 500, Downsview, Ontario.

Dished lockwasher

Item 484

A specially designed Dished Lockwasher, developed by Shakeproof Fastex Division of Canada Illinois Tools Limited, incorporates a number of features that make it useful in applications where locking is necessary. The smooth, burr-free flat rim prevents scoring of painted surfaces, plastic parts, and die cast materials.

The surface protection feature is combined with the locking action of a Shakeproof Fastex Tooth Lockwasher and the spring take-up of a cone washer. The spring take-up compensates for a large differential in expansion between plastics or die cast materials and the steel in the screw.

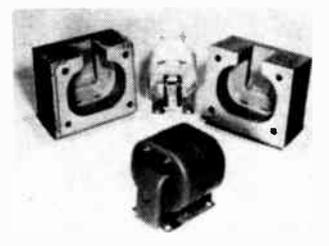
The washer can be made in small enough sizes to fit small recesses or confined areas sometimes found in electrical equipment and related fields.

Shakeproof Fastex Division of Canada Illinois Tools Limited, 67 Scarsdale Road, Don Mills, Ont.

Epoxy casting system

Item 485

A new epoxy system has been developed by Hysol (Canada) Limited, Toronto, as an immediate flame-out type. The material Hysol 15-032, is classed as "non-burning" under ASTM D635-56T, and "Self-extinguishing" under MIL-I-16923C and MIL-T-27A. Having good ther-



mal shock properties, it is suitable for electronic and electrical power applications.

Hysol (Canada) Limited, P.O. Box 53, Station "R", Toronto, Ont.

Portable oscillator unit

Item 486

Not one in a million! — but one in two and a half billion! That is the stability plus or minus of the new 5 Mc/s high stability crystal controller oscillator unit manufactured by Standard Telephones & Cables Company, occupying one quarter of the space of a static installation.

By using transistors and sub-miniature wired in tubes S.T.C. have developed a rugged portable recording frequency standard having a laboratory quality for field use. Instruments requiring calibration do not have to be removed from their environment; instead the calibration instrument is brought to them.

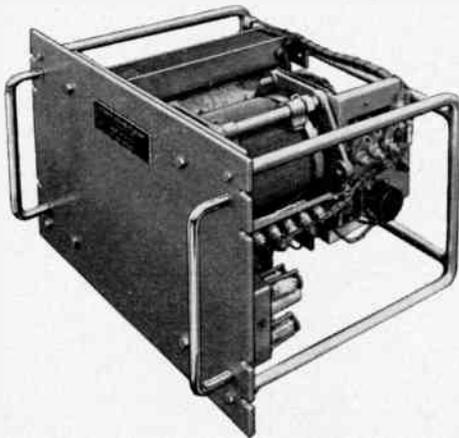
The fully portable oscillator designed by Standard Telephones & Cables Company consists of a high quality quartz crystal oscillator and carefully designed oven.

Write Standard Telephones & Cables Mfg. Co. (Canada) Ltd., 9600 St. Lawrence Blvd., Montreal 12, Que., for further details.

HIGH SPEED

PRECISE VOLTAGE REGULATION with a TCVR

The TCVR is a servomechanical automatic voltage regulator, having the very high speed of correction of 20 VOLTS PER SECOND. It provides an undistorted output, maintained constant within very close limits (normally 0.5%) from no-load to full-load, for large variations in frequency and power factor. These features are most important for the successful operation of today's complex and critical electronic and electrical equipment.



A wide range of models in the TCVR Series from 2.0 to 12 KVA single-phase, and 6.5 to 35 KVA three phase, are available to standard or tropical specifications, in cabinets or for rack mounting. Models are also available in which the output voltage is continuously adjustable over a wide range by means of a panel control. Regulators can be supplied to other specifications, and special models can be designed to order.

These regulators are the products of Claude Lyons Limited of England, and are sold and serviced in Canada exclusively by the Ahearn & Soper Company Limited. For complete information on our entire range of automatic voltage regulators and stabilizers from 500 VA to 82 KVA, request Catalogue S-592.



A&S... stands for Assured Satisfaction

AS 60-4

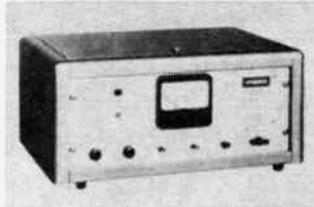
THE AHEARN and SOPER COMPANY LIMITED

850 Belfast Road • Elmvale Acres • Ottawa • Canada

For complete details check No. 3 on handy card, page 85

Ionization gauge controls Item 487

A new series of ionization gauge controls for the accurate and uniform measurement of ultra-high vacuum has been introduced by F. J. Stokes Corporation, Philadelphia. The series comprises four models: Model IG-50 and TIG-50 with a range from 10^{-8} to 10^{-9} mm. Hg., and Model IG-60 and TIG-60 with a range from 10^{-8} to 10^{-10} mm. Hg. The TIG units combine a thermocouple gauge circuit with the ionization gauge.



Simple to use, the Stokes ionization gauge controls are also flexible in application, operating most standard vacuum gauges without circuit modification. All units come with metal enclosures as standard equipment and are sized for rack mounting.

The Stokes ionization gauge controls do not contain bridge circuits, with their inherent disadvantages for this application; instead, they employ electrometer-type amplifiers with negligible feedback. This provides unusually stable and linear output unaffected by variations in tubes and other components.

For further details write Canadian representative: F. J. Stokes Company of Canada, Ltd., 4198 Dundas Street West, Toronto 18, Ontario.

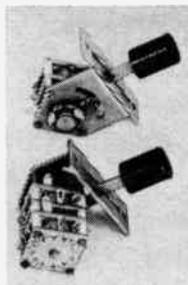
Alumina polishing crystals Item 488

The Geoscience Instruments Corporation announces two new electronic — semi-conductor grades of levigated alumina abrasives — "Corunda" (Liquid Sapphire and Liquid Ruby). These abrasive crystals meet the critical requirements of the electronic and semi-conductor industry and will produce the ultra high polished surfaces necessary for advanced device fabrication. Also used for quality infra-red lenses; spectroscopy; metallurgical investigations. Graded uniform particle sizes: .05 micron gamma Al_2O_3 and .25 micron alpha Al_2O_3 . Laboratory certified: analysis to 99.99 per cent activated Al_2O_3 . Unique packaging to avoid contamination. Consulting services available.

For additional information write: Geoscience Instruments Corporation, 425 Park Avenue, New York 22, N.Y., U.S.A.

Lever-actuated switch Item 489

The ESCO type MA-12-L miniature switch provides multi-circuit control, panel-mounting, and lever operation in a compact unit suitable for low-power and electronic



circuits. The assembly can be furnished with either one or two

sections, giving up to twelve-pole switching. The lever actuator can be arranged to be spring returned to center from either or both of the two end positions or can be maintained in any or all of the three positions, or limited to two positions. Insulation of both stationary and movable contacts is molded of alkyl type MAI-60, per MIL-M-14E, and the basic switch is designed to meet MIL-S-3786. The electrical ratings are: 3 amperes continuous current at 115 volts AC; interrupting rating, ½ ampere at 115 volts AC; voltage breakdown 1000 volts RMS.

All current carrying parts are silver-alloy material, assuring low contact resistance for the life of the switch. A "flying arm and star wheel" detent mechanism give positive non-hanging positioning.

For details write to: George M. Fraser Limited, 1554 Yonge Street, Toronto 7, Ontario.

Loading reactor Item 490

Called Exel, this new self-contained loading reactor simplifies inductive load testing in laboratory, test, inspection, research and development applications. It is designed to provide a convenient inductive load which can be made adjustable by using in conjunction with a Powerstat variable transformer.

The Exel is used primarily for testing apparatus at various lagging power factors, i.e. to simulate an inductive load. Ratings are: 120 volts, 60 cycles; 2.0 amperes at 120 volts continuous duty (3.0 amperes for intermittent duty); inductive reactance 60 ohms; DC resistance 4.0 ohms; inductance 0.16 henrys.



Essentially, an Exel consists of a gapped, strip-wound silicon steel toroid core, wire-wound and imbedded in epoxy compound. The entire assembly is enclosed in a compact phenolic case having two Superior 5-way binding posts for connections. Dimensions are 6" L x 2 5/8" W x 5 3/4" H.

For 2-page Exel data sheet SE-L2606 write: The American Superior Electric Co., Ltd., 174 Evans Avenue, Toronto 18, Ont.

Panel meter Item 491

Canadian General Electric's line of "Big Look" AC and DC panel meters has been augmented by the addition of a new 4 1/2 inch model. Available for all standard voltage and current ratings, the instrument features a 3.93 inch scale length. Accuracy is plus or minus two per cent.

The new 4 1/2 inch instrument can be supplied with custom-made scales to comply with customers' appearance design or color-coding requirements.

Method of mounting is standard, conforming to the ASA C39.1 (1955) specification for 4 1/2 inch panel meters.

CGE reports that the instrument which will be available by May 1, 1960, will be priced competitively.

For further details write to Canadian General Electric Co. Ltd., 214 King St. W., Toronto 1, Ontario.

1/8" Bit L. No. 70
Shield L. No. 68

ADCOLA
(Regd. Trade Mark)

3/16" Bit
L. No. 64



**C.S.A. APPROVED
SOLDERING
INSTRUMENTS**

Designed in Three Sizes
1/8" 3/16" & 1/4" Bits.

Manufactured for
All Supply Voltages
6/7 to 230/50 v.

Instruments maintain
soldering temperatures
and thorough jointing
is achieved in all the
fields of soldering, from
pin point to general
work in all sound equip-
ment.

Insulation standards are
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All Designs Cover the
Demands for Continual
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Canadian, British and
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Canadian
Representative:

L. J. LAMB
Box 103 - Weston, Ont.

For complete details check No. 1 on handy card, page 85



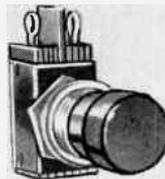
**The guaranteed
terminal boards ...
made of
certified materials**

CAMBION terminal board materials include paper, cloth, nylon or glass laminates, bonded with phenolic, epoxy, melamine or silicone resins. All stock is strictly top grade — *certified* — and all boards are made and assembled under strictest quality control. Results are no cracks, strain or chips in boards, no damaged or insecurely mounted terminals. **CAMBION** board types are standard all-set, miniature all-set, standard ceramic, standard fibreglas and custom-made. Complete boards or separate sections available. Standard or special components assembled as required. For details, write Cambridge Thermionic Corporation of Canada, Ltd., 2425 Grand Boulevard, Montreal 28, P.Q.

CAMBION

The guaranteed electronic components

For complete details check No. 19 on handy card, page 85
ELECTRONICS AND COMMUNICATIONS. June, 1960



There's a stronger,
more compact

**ARROW-HART SWITCH CONTROL
for every job!**

Arrow-Hart offers a complete range of quick make and break switches for vacuum sweepers, fans, power tools, radio and electronic equipment.

Send for your copy of the new illustrated Bulletin Z-12 today . . . and ask us for any additional advice or information you may need.



**ARROW-HART & HEGEMAN
(CANADA) LIMITED**

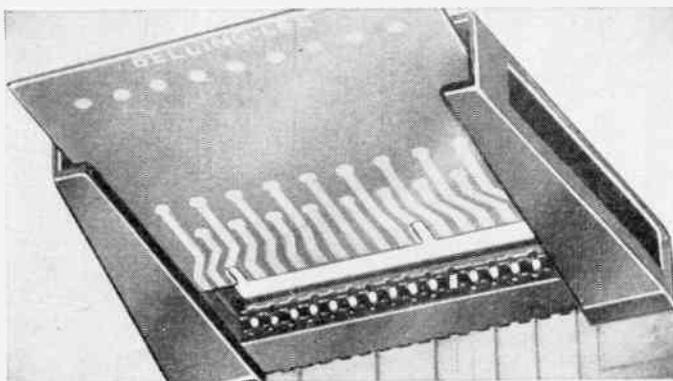
INDUSTRY STREET, TORONTO 15, ONTARIO
7365 MOUNTAIN SIGHTS, MONTREAL, QUE.

Quality MOTOR CONTROLS • WIRING DEVICES • APPLIANCE SWITCHES

6006-R

For complete details check No. 9 on handy card, page 85

**NEW . . . From BELLING & LEE England
PRINTED CIRCUIT GUIDES
for faster PANEL INSERTION**



. . . COSTS LITTLE . . . SAVES A LOT

May be used with any type of connector. The new Belling & Lee time saving Printed Circuit Guides feature:

- Moulded in strong nylon loaded phenolic material.
- Anti-twist dowels.
- Single hole mounting.

For complete information and brochures
Exclusive Canadian Distributors

ASTRAL ELECTRIC CO., LTD.
44 DANFORTH ROAD, SCARBOROUGH, ONTARIO

For complete details check No. 10 on handy card, page 85

LET'S TALK PRINTING VALUE!



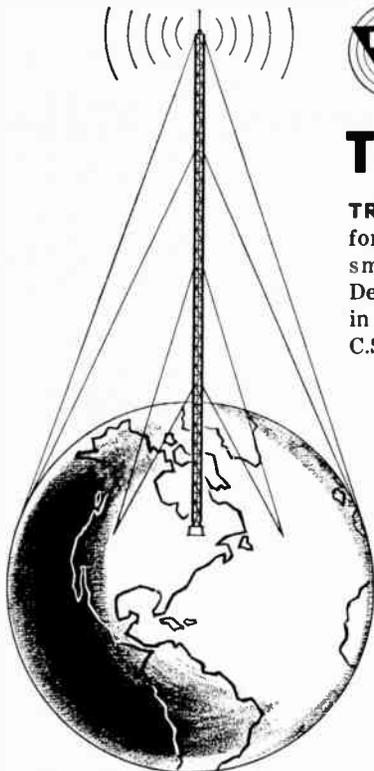
— says printing expert
Jack Sparks *

Printing value is the combination of price, service and quality you obtain from your printer. All three factors count in the final analysis.

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Toronto 9 - RO. 2-7225



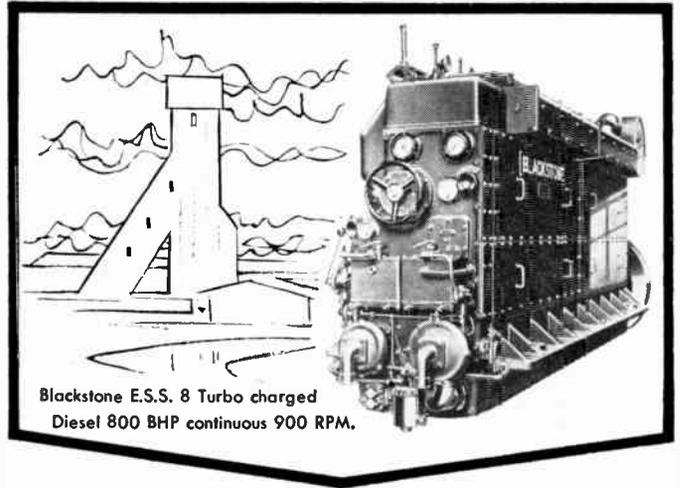
TRYLON TOWERS

TRYLON towers are available for all applications from the smallest to the largest. Designed and manufactured in Canada in accordance with C.S.A. specifications.

TRYLON towers are available for AM, TV, Microwave and Communications Antennas.

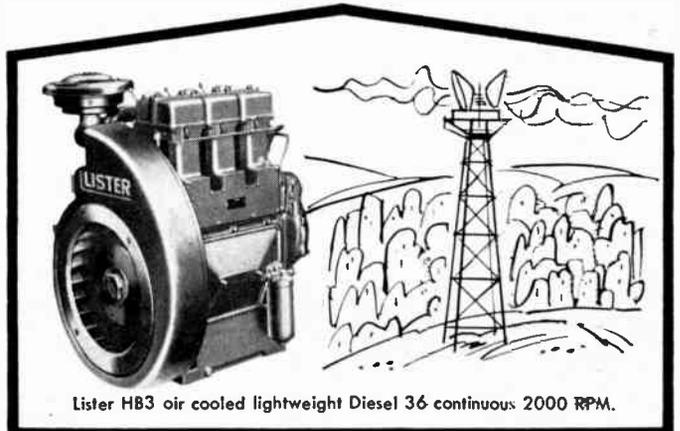
TRYLON service also includes design, development, supply, installation and maintenance by expert craftsmen.

The WIND TURBINE Co. of Canada Ltd.
145 Lucan Street
Waterloo, Ontario



Blackstone E.S.S. 8 Turbo charged
Diesel 800 BHP continuous 900 RPM.

ALL KINDS OF POWER



Lister H83 air cooled lightweight Diesel 36 continuous 2000 RPM.

LISTER-BLACKSTONE DIESEL ENGINES

Wherever you use Diesel power, there is a Lister-Blackstone engine to handle the job efficiently, economically. The full line includes units from 3½ to 1400 BHP.

Built in a tradition of reliability, all models incorporate the very latest improvements in Diesel design. Easy maintenance and dependable operation are assured when you specify Lister-Blackstone. Service and spare parts are available from coast to coast.

Write us for details indicating application.

CANADIAN LISTER-BLACKSTONE

LIMITED

1921 Eglinton Ave. E. Scarborough Toronto 13 Ontario
VANCOUVER MONTREAL

In the U.S.: Lister-Blackstone, Inc., 42-32 21st Street, Long Island City 1, N.Y.

For complete details check No. 21 on handy card, page 85

For complete details check No. 78 on handy card, page 85

Hot wire anemometer

Item 492

The Flow Corporation Model 54A1 Hot Wire Anemometer gives a continuous accurate measurement of the mass velocity of air. To get a velocity reading it is only necessary to insert a probe containing a sensing unit into the air stream. The velocity is then read directly on the meter. If desired, a recorder can be utilized to provide a continuous record of the air velocity over any designated period.



Model 54A1 measures average and instantaneous velocities in the flow of air by making use of the cooling effect of the stream on a thin electrically heated wire filament. A completely transistorized circuit maintains constant the resistance ratio of a hot and cold filament.

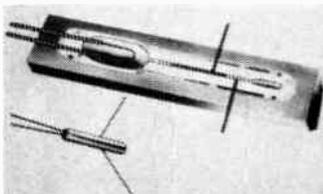
The instrument is operated by two rechargeable, sealed, nickel cadmium batteries. Recharging is accomplished by plugging into any standard 115 V AC outlet. Batteries can be recharged overnight and will run for approximately 8 hours continuously. The battery life is approximately 10 years.

For further particulars write Radionics Limited, 8230 Mayrand St., Montreal 9, Que.

New low level relay of unique design

Item 493

The Miniature Mercury Relay is essentially a glass capillary tube containing a short thread of mercury free to move in either direction. At each end of the tube are gas chambers containing nitrogen under 25-30 atmospheres. One of these chambers is a heater. Two platinum wires protrude into the capillary, one into the mercury and the other into its path. When the heater is turned on the mercury moves along the tube shorting the contacts.



Capacity between contacts is only 0.4 mmf. The switching time is never greater than 500 m/sec. from -30°C to $+90^{\circ}\text{C}$, and the relay is built to withstand 40g.

The Ahearn and Soper Company Limited, 850 Belfast Rd., Ottawa, Ontario.

Silicone varnish

Item 494

An all-new Class H silicone dipping and impregnating varnish that is as easy to process as most Class A and Class B varnishes has recently been announced by Dow Corning Silicones Limited. Designated Dow Corning 980 Varnish, this new material cures in only six hours at 150°C . This temperature is 50°C below that required

for other silicone varnishes. In addition, run-off is substantially lower than that for other varnishes, assuring appreciable savings in equipment maintenance and cleanup time.

Despite its low curing temperature, this new varnish meets AIEE requirements for use in 220°C systems . . . has greater heat stability than any other varnish known. In addition, it resists moisture and is unaffected by many corrosive atmospheres.

Supplied as 60 per cent solids in diacetone alcohol, Dow Corning 980 Varnish has a higher flash point than xylene or toluene impregnating solutions.

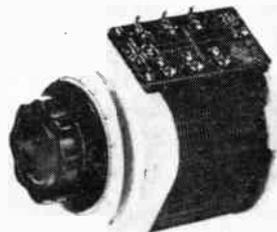
For additional information about Dow Corning 980 Varnish, contact Dow Corning Silicones Limited, 1 Tippet Road, Downsview, Ontario.

High voltage transformers

Item 495

Individual transformers operating from a single-phase, 240-volt line are now available from Ohmite Manufacturing Company. Model VT8H is rated 3 amperes and at maximum setting will deliver line voltage (240V) or over-voltage (280V). Model VT8HN is the "no-overvoltage" type which will deliver just line voltage at maximum setting, but offers a current bonus in its output rating of 4 amperes.

The "high voltage" units afford the convenience of 240-volt, single-phase operation using a single unit instead of a ganged assembly.



A noteworthy feature of these "high voltage" transformers is a tap which permits operation at 120 volts input with 280 volts output for the VT8H and 240 volts output for the VT8HN (some derating is required for output beyond 120 volts). These high voltage transformers can also be obtained in ganged assemblies to achieve 240-volt, 3-phase operation or 480-volt single phase or 3-phase operation. Request Bulletin 151 from Ohmite Manufacturing Company, 3696 Howard St., Skokie, Illinois, U.S.A.

Servo building blocks

Item 496

Servomechanisms (Canada) Limited announces a line of high-performance 60-cycle servo amplifier equipment for industrial control applications. Designed and manufactured in Canada, the equipment features high-quality, reliable components, accessible layout and sturdy construction.

SML industrial servo units fit into a wide variety of systems by simple exchange of plug-in networks. Their outputs are tuned to match popular models of servo motors.

A typical application, in which SML equipment is giving trouble-free service in a rugged environment, is a moisture-content control in an automatic cement-mixing plant. Other uses are automation of machine tools and photographic equipment, and air, gas or liquid controls in chemical or other processing systems.

For technical data, advice on applications, prices and delivery, write or phone: Servomechanisms (Canada) Limited, Technical Sales Dept., 123 Rexdale Blvd., Rexdale, Ontario. CHerry 4-5376.

TOP-RATED, LOW PRICED TEST EQUIPMENT BY HEATHKIT!



HEATHKIT 5" OSCILLOSCOPE

MODEL 0-12 \$80.95

A top performer in every respect, the Model 0-12 handles critical observations in your laboratory or shop with ease, providing clear, sharp, pattern displays in every application. Vertical frequency

response extends from 3 CPS to 5 mc — 1.5 db — 5 db without extra switching. Response is down only 2.2 db at 3.58 mc. The Heath patented sweep circuit functions effectively from 10 CPS to better than 500 kc in five steps, giving you five times the sweep range of most other scopes.

HEATHKIT VACUUM TUBE VOLTMETER

MODEL V-7A \$36.95
MODEL W-V-7A (wired) \$56.95

This exceptionally fine vacuum tube voltmeter rapidly and conveniently measures AC volts (RMS), AC volts (Peak-to-peak), DC volts, resistance and db. Convenient front panel zero adjust and ohms adjust controls. Low voltage scale provides over $2\frac{1}{4}$ " of scale length per volt measured! Features: modern circuit design for faster, easier construction and stable performance; logical and functional placement of controls for smooth, rapid operation; 1% precision resistors used for high accuracy; high impedance 11 megohm input. Comprehensive construction manual for simplified assembly.



DAYSTROM LIMITED

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6024

For complete details check No. 29 on handy card, page 85

multi-range multi-purpose

automatic cut-out

20,000 ohms/volt d.c.

a.c. & d.c. current ranges

accurate

Model 8 Universal AvoMeter

ELECTRONICS
RADIO
TELEVISION

The multi-range instrument with automatic cut-out protection for overload... just reset and carry on reading.

OTHER FEATURES:

4 Current Ranges:
100 mA. to 10 Amperes A.C.

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5011

Complete factory repair
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Okanagan Telephone Co.

Continued from page 39

Telephone Company operators that year completed 426,339 long distance calls — about one-third the volume of 1959 calling. In fact, the 1959 calling figure is greater than the combined three-year total of 1,139,204 calls for the years 1947 to 1949.

A look at the increase in toll circuits over the past ten-year period presents an interesting picture and to a large degree explains why Okanagan Telephone operators complete three times as many long distance calls today as compared to a decade ago.

In 1950 — the Okanagan Telephone Company had 58 inter-exchange toll circuits plus a further 32 circuits connecting to the B.C. Telephone Company — 90 toll circuits in all.

Today, in 1960, the Okanagan System has 134 inter-exchange toll lines, another 85 circuits to exchanges providing Extended Area Service, and inter-system toll circuits to B.C. Telephone exchanges have increased to 103 — for a total of 322 circuits — nearly 4 times the figure of ten years ago.

Automation of telephone service

In the course of a decade-long dial conversion program the Okanagan Telephone Company has introduced the automation of local telephone service — the dialing of calls has become an every-day event for the company's customers.

The introduction of Direct Distance Dialing (DDD) is actually just another phase in the automation of telephone service — as applied to long distance calling, now providing our customers with the facilities to dial their own Station-to-Station long distance calls on a "do-it-yourself" basis.

B.C. Dial Conversion

Continued from page 41

The introduction of operator distance dialing required more liberally engineered long distance circuit groups to ensure a smooth and rapid flow of traffic between points. This requirement, together with increased facilities necessitated by a continuing rise in calling, resulted in the Company adding more than 400 circuits to its network during the year.

These improvements have resulted in faster long distance service for the public at a level of transmission that ensures clear, high-fidelity conversation.

Operator distance dialing is the forerunner of DDD — Direct Distance Dialing — which will be introduced in the Nanaimo area toward the end of 1960, and in Vancouver in 1961.

The Company opened a large \$4,500,000 addition to its William Farrell Building headquarters in Vancouver last year, which made it possible to concentrate staff previously scattered throughout the city at several locations.

During 1960 the Company will construct a \$2,000,000 warehousing, purchasing, supply and repair center on a 21-acre site in Burnaby. Designed to concentrate operations now carried on at several other locations, it will be one of the largest industrial centers on the lower mainland.

The Company, with assets totalling \$230,000,000 operates more than 90 per cent of the telephones in the province. In November of last year it passed the half-million mark in number of telephones in service. Of this total, residence telephones numbered 360,000 and business telephones 145,000.

For complete details check No. 49 on handy card, page 85

S. G. T. program

Continued from page 40

numbering adopted by Saskatchewan Government Telephones earlier this year. Yorkton will be changed to ANC on August 7, 1960. Other exchanges will be changed over gradually over a period of years. New exchanges will be switched to the All Number Calling plan as they are cut over to automatic operation.

New construction continues

New construction is continuing. Community dial offices are slated for Unity and Wilkie. A sub office will also be constructed at Battleford to operate out of North Battleford. Construction on these is scheduled to start this spring. The conversion will take place early in 1961. An extension to the Prince Albert exchange will also be built to house equipment needed for the growing northern portion of the province. A point to point radio system will provide telephone service from Nipawin to the Squaw Rapids hydro project. A similar system is scheduled for the south west to link Maple Creek with Swift Current. Maple Creek will become a community dial office out of Swift Current.

Encouraging gains have been made in the provision of mobile telephone services. At December 31, 1959, there were 268 mobile telephones in operation, an increase of 62 over 1958.

Microwave facilities were extended during 1959 to television stations at Moose Jaw, Yorkton, and Prince Albert, thus connecting all six Saskatchewan TV stations to the national network. An additional microwave channel was installed on the microwave network between Calgary and Grenfell. This time delay channel enables the Saskatchewan television audience to enjoy programs originating in eastern Canada at a more appropriate viewing time.

Additional long distance circuits were completed during 1959, over 80 per cent of which were provided by relatively inexpensive extensions to the existing microwave network. The available distance circuit mileage in Saskatchewan was increased by approximately one-third over that in service at December 31, 1958. This year multiplex facilities will be extended to provide 60 additional long distance circuits from Regina to Winnipeg and 24 new circuits Regina-Calgary.

Total capital assets of Saskatchewan Government Telephones at December 31, 1959, stood at 98.3 million dollars, an increase of 7.7 million dollars from December 31, 1958.

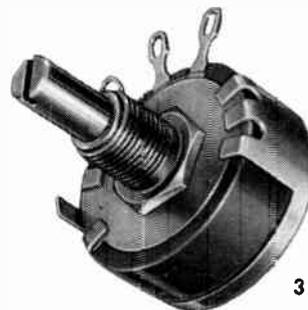
Operating revenue and net income showed increases over 1958. Net income, after interest, was \$1,614,056 in 1959, an increase of \$435,357 over 1958. Total operating revenue in 1959 amounted to \$18,880,755, an increase of \$2,209,828 over the previous year. This increase was largely due to gains in long distance and local service revenues.

Operating expenses in 1959 amounted to \$14,807,306 compared with \$13,346,100 in 1958. A major portion of this increase was due to increasing wage and material costs, higher depreciation charges, increase in volume of local and long distance services, and increases in commissions paid agency offices.

Included in the system's expansion program in 1960 is the extension of operator distance dialing to ten Saskatchewan exchanges, addition of dial switching equipment at sixteen points and construction of six new exchange buildings, three of which will be converted to automatic during the year.

CAMESA APPROVED
(C4909)

CANADIAN COMPANY LEADS IN VARIABLE COMPOSITION RESISTORS



3 WATT TYPE L

RESUME OF TESTS PERFORMED WITH 122 VARIABLE COMPOSITION RESISTORS FOR CAMESA APPROVAL.

Test	Description of Test Procedure	Max. Change	Average Change	Max. Change allowed to MIL-R-94B Specs.
Dielectric Strength	900 Volts rms for 1 min. 450 Volts rms for 1 min. at reduced pressure of 3.4 inches mercury.		O.K.	O.K.
Effect of Soldering	Terminals are immersed for 5' in a molten solder at 350°C.	0.5%	0.15%	2%
Rotational Life	25,000 rotation under load of 2 Watt	4.8%	0.9%	10%
Load Life	1000 hours at 70°C. and 2 Watt Load	8.2%	4.4%	10%
Vibration	Variant frequency from 10 to 55 cps with .03" amplitude; 2 hours in each position (6 hours total)	2%	0.95%	2.5%
Moisture	10 days humidity cycling from 25° to 65°C and 90 to 98% rel. humidity	7.2%	2.5%	10% max. 6% average
Insulation Res. (also measured under humidity as above)	102 meg Ω		312 meg Ω	100 meg Ω
Low Temp. Storage	24 hours at -63°C.	0.7%	0.1%	2%
Low Temp. Operation	1 hour 45 min. at -55°C with load	2%	0.1%	3%
Torque required to turn shaft:		5.9 i/o	4.3 i/o	48 i/o
Thermal Cycling	5 cycling from -55°C to 120°C.	4.7%	2.4%	6%
Salt Spray Acceleration	Constant acceleration of 50 G. for 5 sec. in each of 2 plans	0.3%	0.09%	3%
Shock	20 shocks 50-G 11 millisecond	1%	0.1%	2%
High-frequency Vibration	20 times exposed to vibration of 10 to 2000 cps with 10G amplitude	0.2%	0.07%	2%

No discontinuity in course of test.

The smallest Variable Composition Resistor on the Continent, which can be rated at 1 Watt at 75°C. Approved to Mil-R-94B style RV5 (C-5173).



Type "U" 3/8" diam. the smallest variable composition resistor for .200 printed Circuit outlay on the market.

CAMESA APPROVED

PRECISION ELECTRONIC COMPONENTS (1956) LTD.
50 WINGOLD AVE., TORONTO, ONTARIO RU. 1-6174

For complete details check No. 54 on handy card, page 85

THE CASE OF THE FOURTH FOOT*



EVIDENCE

- A. Drop sensitive multimeter four feet onto cement floor. Sweep up pieces before proceeding with next step.
- B. Place identical meter in Pylon transit case, Type TC-4.
- C. Drop case four feet onto cement floor.
- D. Repeat step (C) until tired of sport. Tests will show meter unharmed.

PRECEDENT

The TC-4 has been upheld in trials by major electronic equipment users from coast to coast in Canada.

SUMMARY

Pylon presents a very solid case — one that continues to win support from many learned experts.

VERDICT

The Pylon TC-4 offers unsurpassed protection for electronic equipment.

* Four feet is the mean distance your favorite shipper likes to drop electronic equipment, according to a recent government survey. Airlines average slightly more.



PYLON ELECTRONIC DEVELOPMENT company, Ltd.

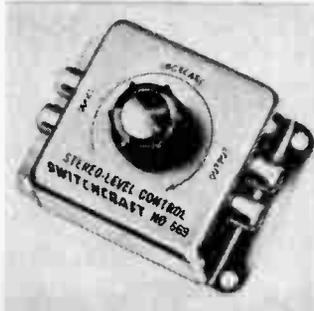
Communications Systems and Equipment

161 CLEMENT ST., LASALLE, MONTREAL 32, QUE.

Speaker accessories

Item 497

Switchcraft, Inc., of Chicago, Ill., have added four new component Speaker Accessories to their line, which now contains a complete range of controls and switches for the Hi-Fi, Stereo installation.



No. 666 unit is a Speaker Volume Control with L-Pad to reduce mismatch to amplifier at different volume settings.

No. 667 unit is a Speaker Selector Switch for connecting remote speakers to Radio, TV or Hi-Fi set.

No. 668 unit is a Stereo Selector Switch which permits selector of both channels of any one of three stereo sources to one pair of outputs.

No. 669 unit is a Stereo Volume Control for high impedance circuits.

Complete information on these units may be obtained by writing directly to the Canadian factory representative: Atlas Radio Corporation Ltd., 50 Wingold Ave., Toronto 19, Ontario.

Pneumatic controllers

Item 498

Bristol Series 650 Pneumatic Controllers which use metal bellows in the unbalance detector are now available. The metal bellows-type controllers are recommended for batch-type processes with frequent startups, and for installations where ambient temperature is variable. Lower minimum gain, reduced drift and hysteresis effects, lower temperature effects, and increased sensitivity are some of the advantages

of the new controller. Other characteristics are similar to Bristol's diaphragm-type Metagraphic Controllers.

The bellows-type models are offered with integral or remote set-point, for the following control modes: on-off, adjustable proportional, proportional plus reset, fixed proportional plus reset, and proportional plus reset, plus derivative control.

Additional information is available from The Bristol Company of Canada, 71-79 Duchess Street, Toronto, Ontario.

Low cost VTVM

Item 499

A low cost bench type VTVM is announced by Stark Electronic Sales Company. Designed for the servicing of TV, FM and Hi-Fi amplifiers, the VMK-2 combines all the features found up until now only in higher priced instruments. The VMK-2 with its 6" multi-colored scale is easy to read and interpret. The printed circuit design effects no assembly or service problems and assembly is aided by pictorial pin-up diagrams and step-by-step instructions. Measuring DC volts, AC volts, RMS and peak-to-peak in 7 useful ranges as well as resistance up to 1000 megohms. The VMK-2 has



many applications in industry, service organizations and schools.

For catalog listing and complete data on this and many other models write to Stark Electronic Sales Company, Ajax, Ontario.

Tunnel diodes

Continued from page 57

ratio previously seen was in some germanium tunnel diodes which exhibit a ratio of 14 to 1.

In addition, the gallium arsenide tunnel diodes have a voltage swing of up to 1.2-volts. According to GE engineers, the voltage swing characteristics can be used to fire transistors in ultra high speed computers. By comparison, germanium tunnel diodes have a voltage swing of up to 0.45-volts while silicon tunnel diodes have a peak 0.75-volt swing.

Another important feature of the gallium arsenide tunnel diode development is the extremely high current densities obtained. According to the scientists working on the devices, gallium arsenide tunnel diodes have current densities of five thousand to ten thousand amperes per square centimeter. By comparison, the current density of the commonly used 12-gauge house wire is seven thousand amperes per square centimeter.

As a result of the wide voltage swing and the high current densities, the gallium arsenide tunnel diodes in the kilomegacycle region are capable of handling better than four times as much power as germanium tunnel diodes.

FREED VARIABLE TEST VOLTAGE MEGOHMMETER



NO.
1620

The Freed Type 1620 Megohmmeter is a versatile insulation resistance measurement instrument with a continuously variable DC test potential from 50 to 1000 volts.

Components such as transformers, condensers, motors, printed circuits, cables and insulation material can be tested at their rated voltage and above, for safety factor.

- Resistance — 0.1 megohms to 4,000,000 megohms.
- Voltage — variable, 50 - 1000 volts.
- Accurate — plus or minus 5% on all ranges.
- Simple — for use by unskilled operators.
- Safe — high voltage relay controlled.
- Self contained — AC operated.

OTHER MEGOHMMETERS AVAILABLE:

Type 1620C MEGOHMMETER — a type 1620 with additional circuitry for testing capacitors.

Type 1020B MEGOHMMETER — a 500 volt fixed test potential. Range 1 megohm to 2 million megohms.

Type 2030 PORTABLE MEGOHMMETER — battery operated, 500 volt test potential. Range 1 megohm to 10 million megohms.

Send for **NEW 48 page transformer catalog**. Also ask for complete laboratory test instrument catalog.

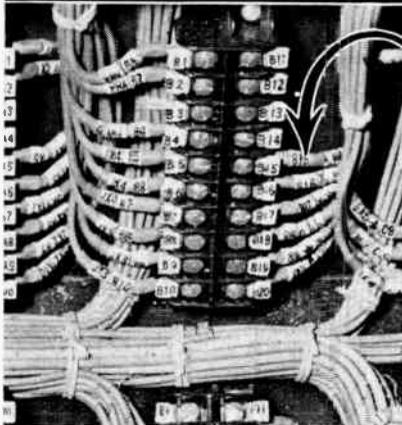
FREED TRANSFORMER CO., INC.

1716 WEIRFIELD ST., BROOKLYN (RIDGEWOOD) 27, N.Y.

Sales Agents for Canada: **CONWAY ELECTRONIC ENTERPRISES**
1514 Eglinton Ave. West, Toronto 10, Ontario

For complete details check No. 34 on handy card, page 85

CABLE MARKING PREVENTS ERRORS



DANGER

HIGH VOLTAGE

ACID

1x3L9

SAFELY AND PERMANENTLY

- MARKS
- BINDS
- COLOR CODES
- INSULATES
- TEMPERATURE RATINGS TO 300°C

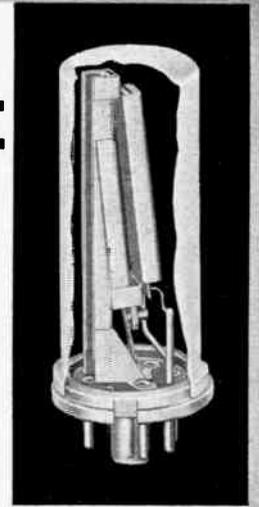
Send today For Samples and Catalog

HELLERMANN CANADA LTD.
44 DANFORTH RD. TORONTO OX. 1-1131

For complete details check No. 39 on handy card, page 85
ELECTRONICS AND COMMUNICATIONS, June, 1960

G-V RED/LINE

industrial thermal timing relays for dependability and long life previously available only in high cost relays



- Delays of 2 Seconds to 3 Minutes
- Energizing Voltages— 6.3 to 230 AC or DC
- Rugged Stainless Steel Mechanism
- Tamper Proof

- Shatterproof — No Glass
- Dust Tight Enclosure
- Steel Encased Heaters
- Directly Inter-changeable

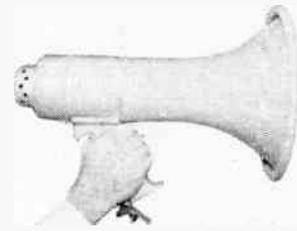


Write today for Publication 131.

G-V CONTROLS INC.
LIVINGSTON, NEW JERSEY

REPRESENTED IN CANADA BY:
LEONARD ELECTRIC LTD., 346 BERING AVE., TORONTO 18
For complete details check No. 35 on handy card, page 85

HAND MEGAPHONE



APPLICATIONS

Traffic control—fire fighting—rescue work—accidents—flood areas—mines—schools—hospitals—churches—theatres—buildings—motion picture direction—radio and television—freight handling—loading and unloading—freight cars—ships—security and police—patrol cars—prisons—warehouses—banks—stores—construction work—roads—bridges—athletic events—swimming pools—soccer—army, navy—marine, air force—airport use.

PAYETTE RADIO LTD.

730 St. James West, Montreal

UN. 6-6681

For complete details check No. 51 on handy card, page 85

Emission controller

Item 506

To enable accurate measurement of Ultra low pressures, Alpert designed a modified triode valve specially constructed to record the small micro currents associated with ionized gases at pressures of 10^{-11} Torr (mm Hg.).



Now that the specialized "Speedivac" Ultra high vacuum pumping plants are available, Edwards High Vacuum (Canada) Ltd. have designed an emission control unit and micro current amplifier purely for use with the 1G-3H Alpert type gauge head. By using the two instruments together, accurate pressure measurement over the range 10^{-4} to 10^{-11} Torr can be obtained. A further novel feature is the fact that the Emission Current as collected across the filament and grid of the gauge head, can be varied to either introduce or exclude ion pumping effects.

Edward High Vacuum (Canada) Ltd., P.O. Box 515, Cumberland Avenue, Burlington, Ontario.

Laminated plastics

Item 507

A new grade of laminated plastic for electrical applications where humid conditions are encountered is offered by Continental-Diamond Fibre of Canada. This material is available both in plain sheets, or copper-clad sheets, designated 31EFR.

It is manufactured from cellulose paper impregnated with epoxy resin, and is used as insulation for computers, radios, telemetering equipment and guidance equipment requiring permanent flame-retardant properties. The material is unusually flame-retardant, and remains rapidly self-extinguishing after five ignitions. It strongly resists humidity, absorbing only 0.35 per cent water after a twenty-four hour immersion; it features excellent cold-punching properties, and is much lighter than epoxy glass-base laminates.

Di-Clad 31EFR metal-clad material is the same material with one or two ounce copper foil on one or both surfaces.

Continental-Diamond Fibre of Canada Limited, 46 Hollinger Rd., Toronto 16, Ontario.

AF wave analyzer

Item 508

Frequency range 30 to 20,000 cps. The AF for narrow band operation bandwidth with response down 3 db — 60 cps plus or minus 20%. For wide band operation bandwidth with re-



sponses down 3 db — 200 cps plus or minus 25%. The AF wave analysis Type FTA breaks up a complex audio wave into its spectrum components, that is, it measures the amplitude of the individual frequencies.

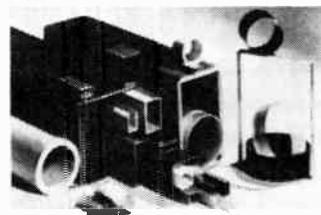
For further information write or call The Ahearn and Soper Company Limited, 850 Belfast Rd., Elmvale Acres, Ottawa, Ontario.

Transformer core tubing

Item 509

The addition of glass phenolic Plaskon material by Stevens Tubing Corp., East Orange, N.J., now means that a choice of six materials is available for core tubing from a stock of over 700 Arbor sizes.

Glass silicone for Class "H"; glass polyester, melamine, and epoxy for Class "B"; paper phenolic for Class "A" and now glass phenolic Plaskon mean a wide choice for all encapsulating systems.



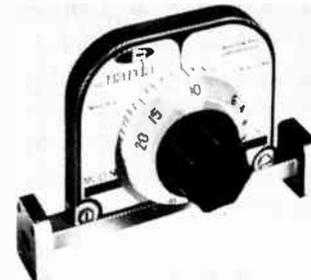
Tubing is precision made and free of annoying mold release. Available in thicknesses from .020" with plus or minus .005" tolerance; and plus .005" minus .000" on the ID. Delivery 7-10 days.

Short lengths are used for cases in encapsulation. Angles, channels, and covers are easily cut from standard lengths of tubing by Stevens Tubing Corporation, 86-88 Main Street, East Orange, N.J., U.S.A.

Variable attenuators

Item 510

A line of low-cost, direct-reading variable attenuators offering precision and accuracy nearly comparable to expensive precision attenuators has been introduced by The Narda Microwave Corporation, Mineola, L.I., N.Y.



A unique, though simple, new design principle utilizing a variable inserted Narda-Iron cam provides minimum frequency sensitivity and low VSWR over the entire frequency and attenuation range. The direct reading dial is accurately calibrated to within 1 db up to 10 db and 1.5 db up to 20 db over the entire waveguide frequency range. Maximum attenuation exceeds 25 db and minimum insertion loss is under 0.5 db.

A multi-turn knob drive permits smooth mechanical movement which is free from back lash. All models are extremely well shielded. Extremely useful in the millimeter wave region, attenuators of this type are particularly recommended for relatively precise power level setting, impedance matching, and isolation (padding).

The Narda Microwave Corporation, Mineola, L.I., N.Y., U.S.A.

CABLE STRAPPING

can now be done
QUICKLY • PERMANENTLY • ACCURATELY



with P.V.C. or NYLON
NO MORE COSTLY TYING

Send today for samples and catalog

HELLERMANN CANADA LTD.

44 DANFORTH ROAD, SCARBOROUGH, ONT., OX. 1-1131

For complete details check No. 40 on handy card, page 85

HOW CLEAN IS CLEAN?

an all important question when dealing with microscopically precise instruments so important to equipment that **MUST NOT FAIL** . . .

- A speck of dust can jamb a relay
- A sliver of metal can short a circuit
- A foreign deposit can disturb a balance

WHEN FAILURE CANNOT
BE TOLERATED

specify

SONOGEN

ULTRA-SONIC CLEANING

a size and model for every application

exclusive in Canada with

electrodesign

9124 ST. LAWRENCE BLVD., MONTREAL

For complete details check No. 32 on handy card, page 85

D.D.P. Contracts

Continued from page 13

- Honeywell Controls Ltd., Toronto, Ont., instrument repairs, \$798,000.
- Instronics Ltd., Stittsville, Ont., signal generators, \$57,570.
- International Business Machines Co. Ltd., Ottawa, Ont., components for electronic data processing machine system, \$1,871,122.
- Northern Electronic Co. Ltd., Ottawa, Ont., telephone cable, \$71,648.
- Perkin-Elmer (Canada) Ltd., Town of Mount Royal, Que., infrared spectrometer, \$14,124.
- RCA Victor Co. Ltd., Montreal, Que., installation of radar sets, \$95,253.
- Rogers Electronic Tubes and Components, Toronto, Ontario, tubes, \$40,320.
- Servomechanisms (Canada) Ltd., Toronto, Ont., intervalometers, \$23,522.
- Shakeproof Fastex, Don Mills, Ont., switches, \$32,612.
- Sperry Gyroscope Ottawa Ltd., Ottawa, Ont., instrument repairs, \$455,000.
- Sperry Gyroscope Co. of Canada Ltd., Montreal, Que., modification of gyro compass, \$14,046.
- Standard Telephones & Cables Mfg. Co. (Canada) Ltd., Montreal, Que., transmitters, \$80,012.
- F. J. Stokes Co. of Canada Ltd., Toronto, Ont., vacuum impregnator and attachments, \$13,182.

Awarded during period April 1 - 15, 1960

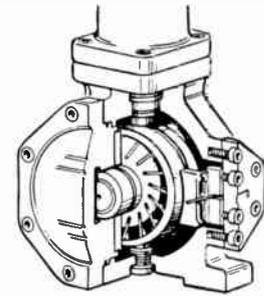
- Bell Telephone Co. of Canada, Ottawa, Ont., rental of telephone and teletype facilities, \$1,802,000.
- British Columbia Telephone Co., Vancouver, B.C., rental of telephone and teletype facilities, \$330,000.
- Canadian Applied Research Ltd., Toronto, Ont., aeronautical instrument repairs, \$93,250.
- Canadian Arsenals Limited, Ottawa, Ont., repair or transmitter countermeasures and inspection and calibration of tubes, \$10,000.
- Canadian Aviation Electronics Ltd., Montreal, Que., telecommunication materiel repairs, \$10,000.

Continued on page 74



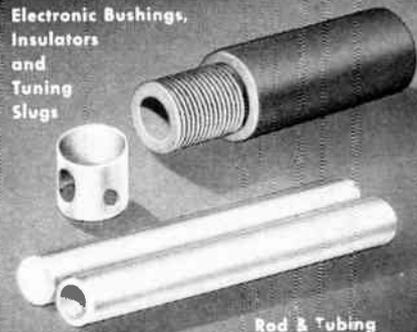
FOR:

Guide Bushings, Vanes and Wear Rings

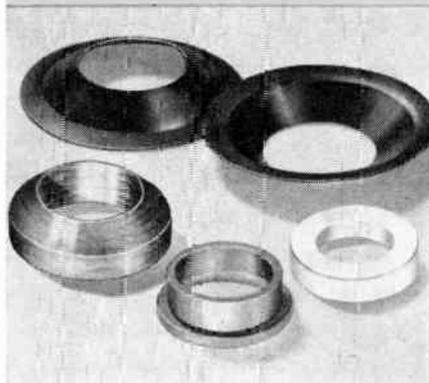


HAVE YOU
CONSIDERED
THE IMPORTANT
ADVANTAGES OF
FILLED TEFLON*?

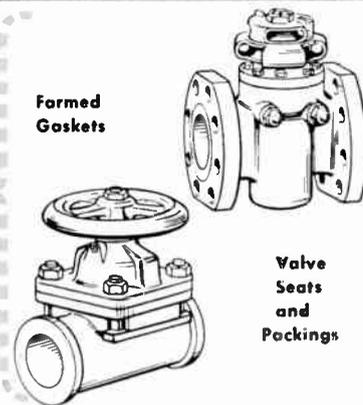
Electronic Bushings, Insulators and Tuning Slugs



Rod & Tubing



Formed Gaskets



Valve Seats and Packings

It has been definitely established that the value of Teflon can be considerably enhanced by the use of fillers in certain applications. Laboratory and field experience has demonstrated that the use of fillers permit Teflon to be more readily tailored to a wide variety of chemical, electrical and mechanical applications. Also, some mechanical properties can be improved. These include:

- 1) resistance to deformation under load
- 2) resistance to wear
- 3) thermal conductivity
- 4) compressive strength
- 5) hardness

By thus improving its properties, Teflon now offers even greater industrial potential. This is the reason filled Teflon has become an important item in the "John Crane" Chemlon® line of better Teflon products.

Chemlon is available with such fillers as glass fiber, carbon, graphite, copper and bronze, talc, calcium fluoride and other inorganic materials.

Tell us about your requirements. We'll tell you the advantages you can get from filled Chemlon. Request Bulletin T-104.

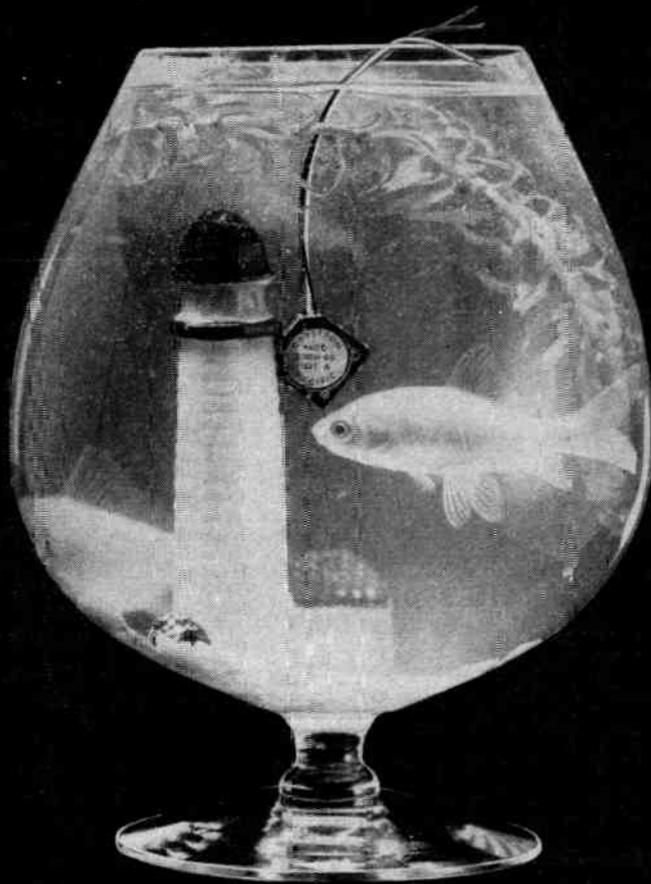
Crane Packing Company, Ltd., Box 134, Station C — Dept. DCP, Hamilton, Ontario.

* DuPont Trademark



For complete details check No. 27 on handy card, page 85

Looking for a "POT"?



Even under these conditions . . .

We'll admit a gold fish bowl is a peculiar place to use a precision-built, wire-wound, sub-miniature potentiometer . . . but, "even under these conditions," the **NEW HUMIDITY PROOF Series 300H Trimming Potentiometer** will operate with complete reliability.

NOW, the **NEW Series 300H** offers complete protection against humidity and moisture without sacrificing the other environmental and performance specifications which have made the **Daystrom Series 300** accepted as **THE** outstanding Trimming Potentiometer.

- **Finer Resolution**
- **Higher Power Rating**
- **Better Stacking (20 units in less than one cubic inch)**
- **Greater Reliability under the most adverse environment**

Write **TODAY** for complete details on this and other precision potentiometers.



DAYSTROM LIMITED

840 Caledonia Road, Toronto, Ontario,
5430 Ferrier Street, Montreal, Quebec,
a subsidiary of Daystrom Incorporated.

For complete details check No. 30 on handy card, page B5

D.D.P. Contracts

Continued from page 73

- Canadian National Railway Co., Ottawa, Ont., rental of telephone and teletype facilities, \$899,000.
- Canadian Pacific Railway Co., Ottawa, Ont., rental of telephone and teletype facilities, \$633,000.
- Canadian Westinghouse Co. Ltd., Ottawa, Ont., sonar equipment, \$1,812,961; electronic equipment repairs \$20,000.
- Carriere & MacFeeters Ltd., Scarborough, Ont., repair of ground rectifiers and auxiliary generating sets, \$14,234.
- Computing Devices of Canada Ltd., Ottawa, Ont., aeronautical electronic and electrical test equipment repairs, \$20,000.
- Croven Ltd., Whitby, Ont., radio crystals, \$53,100.
- E.M.I.-Cossor Electronics Ltd., Dartmouth, N.S., instrument repairs, \$193,650.
- Edo (Canada) Ltd., Cornwall, Ont., repair of sonar transducers, \$10,000.
- Electronic Matieriels International Ltd. Ottawa, Ont., instrument repairs, \$648,320.
- Northern Electric Co. Ltd., Ottawa, Ont., teletype spares, \$12,462.
- Northern Radio Manufacturing Co. Ltd., Ottawa, Ont., spare parts for electronic equipment, \$14,516.
- RCA Victor Co. Ltd., Montreal, Que., electronic equipment repairs, \$429,800.
- Raytheon Canada Ltd., Ottawa, Ont., spectrum analyzer, \$13,563.
- Servomechanisms (Canada) Ltd., Toronto, Ont., repair of range servomechanisms, \$10,000.
- Sperry Gyroscope Ottawa Ltd., Ottawa, Ont., instrument repairs, \$696,087.
- Sperry Gyroscope Co. of Canada Ltd. Montreal, repair of radar scanners, \$10,000.
- Standard Telephone & Cables Mfg. (Canada) Ltd., Montreal, Que., private automatic branch exchange, \$35,033.
- Stark Electronic Instruments Ltd. Ajax, Ont., ground and airborne materiel repairs, \$172,000.

Tellurometer represents Borg-Warner Controls

Tellurometer Canada, Ltd., has been appointed Canadian representative for the complete line of products manufactured by Borg-Warner Controls, of Los Angeles, California, according to an announcement by Herb Ayers, general sales manager of the Borg-Warner Division.

As representatives for Borg-Warner Controls, Tellurometer will cover all of Canada from its headquarters in Ottawa at 1562 Carling Avenue, with agents in Alberta and British Columbia. Additional coverage in Toronto is planned in the near future.



R. K. Rosebrugh

J. B. Erskine

Formed in 1957 to handle the distribution of Tellurometer equipment — a microwave distance measuring system used in surveying work — Tellurometer also represents a number of international manufacturers of instruments and related electronic products in Canada.

R. K. Rosebrugh is general manager of Tellurometer Canada, Ltd., and J. B. Erskine is technical manager of the company.

Canada gets singular honor

C. J. Acton, superintendent of Radio Regulations and International Agreements, Telecommunications and Electronics Branch, Department of Transport, brought honor to Canada when he was unanimously elected chairman of the ITU seventh Administrative Conference, held in Geneva from August to December 1959.

Millie Amp says,
"Get the Best
and pay less!"

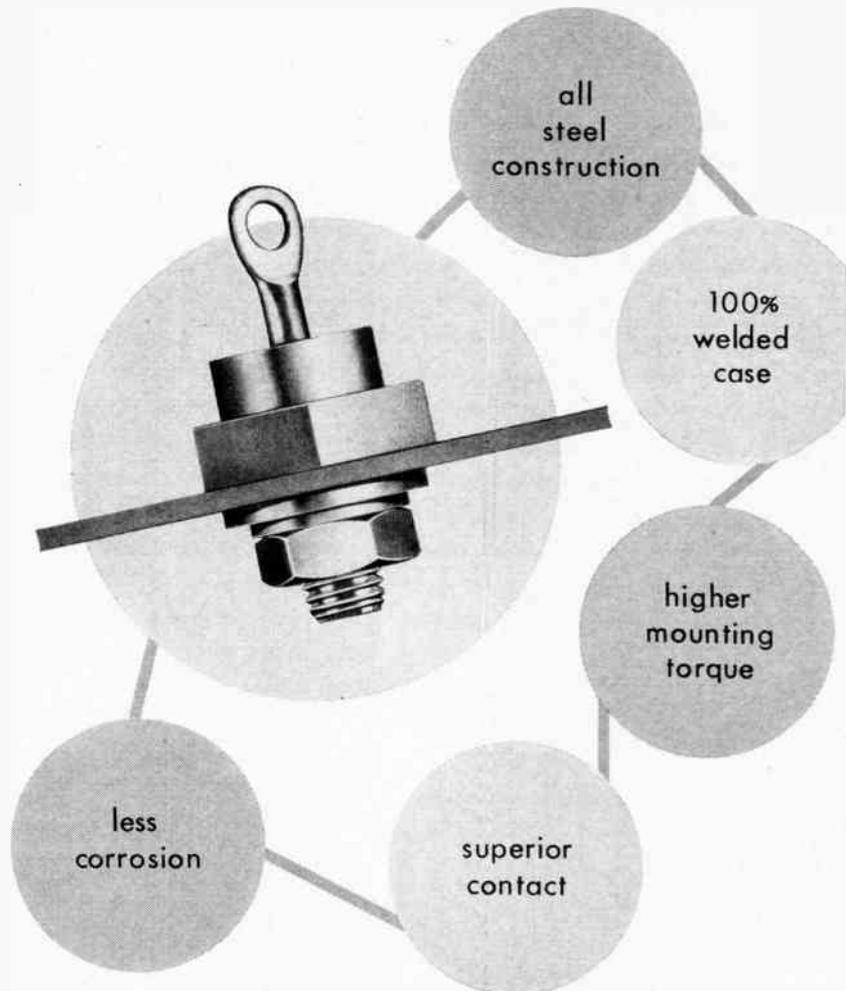
"Gold Brand"
METERS

STARK

STARK ELECTRONIC SALES COMPANY
AJAX, ONTARIO

For complete details check No. 67
ELECTRONICS AND COMMUNICATIONS, June, 1960

SYNTRON SILICON RECTIFIERS



SYNTRON'S exclusive all steel construction provides higher mounting torque, superior contact and reduces corrosion. Maximum mounting torques 50 - 100 inch #.

Their 100% welded case with no blind solder connections, assures positive contact, greater efficiency and long reliable life.



Write for complete technical data or contact
your nearest SYNTRON Sales Engineer.

SYNTRON (CANADA) LIMITED

928 Queenston Road

Dept. "K"

Stony Creek, Ontario

For complete details check No. 71 on handy card, page 85



Shown above is one of the new laboratories of the recently expanded research laboratory complex of RCA Victor Company Ltd. where major research and development projects for both the military services and private industry are being carried out. These laboratories now engage more physicists in basic research than any other non-governmental laboratory in Canada and are working on projects, some highly classified, of vital interest to the defense agencies of both Canada and the United States. The above illustration shows scientists at work in the semiconductor laboratory.



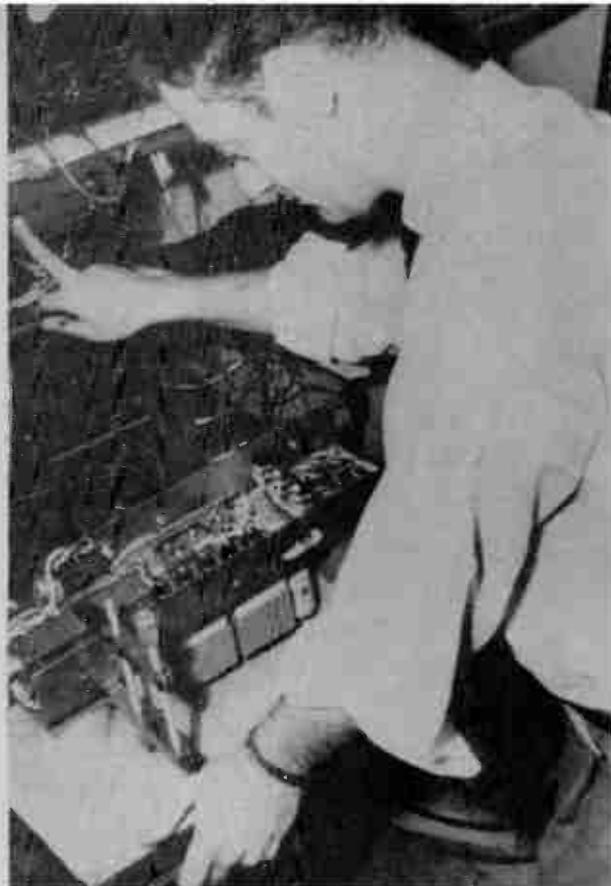
close-up

**looking lenswise
at your industry
in action**

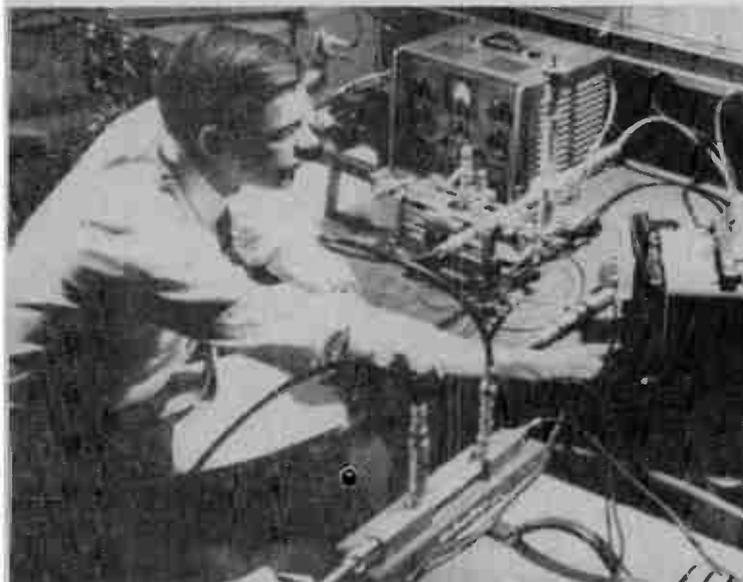
First photo of the Sperry AN/FPS-35 surveillance radar shows giant scanner atop eight storey concrete tower. One of the world's largest radars, it will help guard the New York area against air attack.



Operator of the winding machine is Mrs. Maureen McCormick, an employee of the Telegraph Condenser Company of Toronto. She is shown winding electrolytic capacitors, a highly skilled operation.



Shop foreman Norman Weiniger of Pylon Electronic Development Company, Ltd., LaSalle, Quebec, checking out a Model RTS-1 switchboard power unit in the company's test laboratory.



Low-noise parametric amplifier developed by General Electric Company was combined with an 18-foot high-gain parabolic antenna to receive signals from Pioneer IV more than 410,000 miles from earth.



Miniaturization in solid-state data processing equipment can be seen by comparing the printed wiring card (left) used in the new IBM 609 Calculator with a pluggable tube unit (right) used in vacuum tube machines.



The manufacture of thermistors at Northern Electric Company Limited. The excellent temperature sensitivity of this component has led to numerous applications in the areas of voltage suppression, temperature measurement and control.

TRULY PORTABLE



2-WAY RADIO
with the
SEISCOR

TELEPATH

MINIATURE COMMUNICATION SYSTEMS

... for intelligible communications in high noise or poor visibility conditions where direct vocal or visual contact is impossible.

BELT-CLIP MODEL

Radio unit; headset with antenna, earphones and microphone; shirt-clip controls

MODELS:

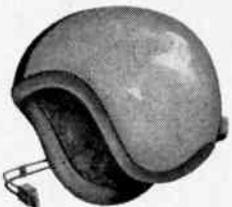
HELMET MODEL



Hard-hat with built-in radio, antenna, earphones and microphone.

OTHER MODELS:

A complete pocket-size 2-way radio



Air Force-Type for jet-engine noise.

FEATURES:

- COMPLETELY TRANSISTORIZED
- CRYSTAL-CONTROLLED RECEIVER
- CRYSTAL-CONTROLLED TRANSMITTER
- LONG BATTERY LIFE
- SIZE: 3" X 6" X 1 1/4" (BELT-CLIP MODEL) WEIGHT: 12 OZ. (BELT-CLIP MODEL) FREQUENCIES: ANY SINGLE FREQUENCY BETWEEN 20-55 M.C.
- NO LICENSE REQUIRED ON CITIZENS BAND MODELS

SEISCOR

A DIVISION OF SEISMOGRAPH SERVICE CORPORATION

ELECTROLABS, 7385 St. Lawrence Blvd., Montreal 10, Quebec. CRescent 6-6076.

Please send complete TELEPATH information.

Name

Company

Address

City Prov.

For complete details check No. 62

briefing the industry

■ Within the next five years, the data processing revolution now sweeping plants and business offices will probably wipe out up to seventy-five per cent of present clerical, typing, proofreading, key-punch, and key-verifying personnel engaged in the input of data. "Peripheral" data processing machines, gathering data right at the source, will make facts available to the data processing center directly. Information that management needs to make important decisions will be produced almost immediately.

■ **Canadian Marconi Company** has received an order for eight CMA-601 Navigation Computers as well as a repeat order for four Doppler Sensors from KLM Royal Dutch Airlines, it has been announced. The equipment will go into operation this summer aboard KLM's DC-8 jet-fleet in conjunction with the CMA-623 Doppler Sensors ordered from Canadian Marconi Company in January 1959.

■ **Plenty of tellurium is available** for thermoelectric use, according to a statement issued by U.S. and Canadian producers to counteract growing rumors of an impending shortage. The producers estimate that annual production of tellurium in the Western Hemisphere can be raised to 500,000 - 750,000 pounds a year using only present sources. Until now producers have made available limited quantities necessary to serve existing markets.

■ **The Canadian Electronics Industry** is aggressively soliciting defense business in the United States, backed by the efforts of the Department of Defense Production. Success is being achieved in the fields of both development and production as this tremendous effort continues. One Canadian electronics firm, Ferranti-Packard Electric Limited, has won several significant U.S. commercial electronic contracts completely divorced from the defense field.

■ **Agencies currently supporting research** in the new Montreal laboratories of RCA Victor are the Canadian Armament Research and Development Establishment, The Electronic Components Research and Development Committee and the Defense Research Telecommunications Establishment all operating through The Defense Research Board of Canada. Research is also being conducted for the Royal Canadian Air Force and the United States Air Force Cambridge Research Center. Company projects being conducted in the new labs are for The RCA Astro-Electronics Division of Princeton, N.J. The RCA Missile and Surface Radar Division, Moorestown, N.J., and the RCA Laboratories, Princeton, N.J.

■ **The Canadian General Electric Company** have made known the development of a low-viscosity RTV solventless silicone rubber which has been designated RTV-II. According to company spokesmen the new material is pourable in and around irregular shaped objects and is suited for potting, encapsulating and impregnating of electronic components.

■ **Annual report of Canadian Marconi Company** for the year ended December 31, 1959, shows a net profit of \$523,686, a gain of \$910,530 over the previous year, while the working capital increased by \$662,966, Stuart M. Finlayson, president, announced in Montreal recently.

Directors' report states that much of the progress was in the field of highly engineered products, where, despite substantial expenditure on development, deficits of previous years were significantly reduced.

■ **According to the Radio and Electronic Components Manufacturers Federation** of Great Britain the United States was the U.K.'s best customer for sound reproducing equipment during 1959. Sales of this type of equipment amounted to \$14 million dollars, nearly two million dollars more than the sales for 1958.

Announcing the NEW SPOOL-PAK

HIGH SPEED WIRE PAYOFF PACKAGE

for high quality magnet wire
in the most modern up-to-date package.



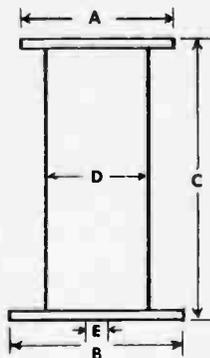
- High speed payoffs
- Instantaneous Starts and Stops
- Controlled tensions for Single & Multiple end winding operations
- A Rugged Container to protect wire in use or storage
- Large Payoff Packages
- All at regular prices

The new SPOOL-PAK, exclusive in Canada, is the most important money-saving development in wire packaging in 20 years. With many conductor and AWG sizes, users report payoff speeds in excess of 4000 feet per minute. SPOOL-PAK reduces waste from short spools. The wire being tapered on the spool — and absence of inertia found with rotating spools — permits instantaneous starts and stops with no danger of wire shakedown and tangle.



Maximum weights for copper are approximately 120 pounds from 34 AWG to 18 AWG. A 35 pound SPOOL-PAK will soon be available to handle materials and sizes now offered in the larger SPOOL-PAK, as well as finer AWG sizes.

Our modern all-Canadian plant produces a complete range of magnet wire (even to your own specifications) in sizes #18 thru #45 AWG. Standard 3", 4½", 6" and 12" spools are available.



	A	B	C	D	E
SPOOL PAK 120 lbs.	10"	11"	12½"	6½"	1¼"
SPOOL PAK 35 lbs. *	8½"	9½"	9"	6½"	1½"

* AVAILABLE SOON

- ENAMEL
- FORMVAR
- POLYURETHANE
- NYFORM
- NYPOL
- F. BONDALL

UNIVERSAL WIRE & CABLE

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For complete details check No. 75 on handy card, page 85

NEW TYPE GBT 1/2 & 1 WATT

COMPOSITION RESISTORS

New attractive appearance
New smaller size — 1 watt

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Ask our IRC salesmen
about NEW GBT
Carbon Composition Resistors

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LEADER IN RF COMPONENTS



QUICK-CRIMP TNC
QUICK-CRIMP BNC
SUB-MINAX
SERIES LT/LC

SERIES C
SERIES BNC
SERIES N
SERIES HN

1. BROAD AVAILABILITY from a single source. All popular RF Series. In addition to those above, series UHF, BN, Adapters and Specials are also manufactured by AMPHENOL.
2. SERVICE & ASSISTANCE based on the experience of over twenty years of designing and manufacturing RF connectors.
3. ENGINEERING facilities are the finest of any components manufacturer. AMPHENOL has the know-how and the equipment to assist you in "problem areas" and in special designs.

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For complete details check No. 5 on handy card, page 85

Wind Turbine of Canada has new ownership

Announcement was made recently that the stock and assets of the Wind Turbine Company of West Chester, Pa., had been sold to a group of nine associates. Concurrently, it was learned that the Wind Turbine Company of Canada Limited, Waterloo, Ontario, also had been sold to the same group.

Under the new ownership, the two companies will operate as affiliates and will stress engineering and design of antenna systems and the manufacture of radio- and television-transmitting towers and related equipment.

Canadian company officers are: J. S. Lackie, president; Albert C. Veldhuis, vice-president; and Roy Dahmer, secretary-treasurer.

In addition to Messrs. Havens, Veldhuis and Park, the nine purchasers include J. S., N. W. and G. E. Lackie of Lackie Brothers Limited, of Waterloo, Ontario — rigging and erecting contractors — as well as Roy, Earl and Sylvester Dahmer of Dahmer Sheet Metals Limited of Kitchener, Ontario — manufacturers of steel structures.

Midwestern products available in Canada

Midwestern Instruments Incorporated of Tulsa, Oklahoma and Electronic Materials International Limited, Ottawa have recently reached an agreement whereby all Midwestern products will be available in Canada from Electronic Materials International. Midwestern Instruments' products include magnetic tape equipment, oscillographs, miniature galvanometers, telemetering equipment and components and servo valves.

Electronic Materials International Limited is a 100 per cent Canadian owned and managed company whose growth has been the result of constant effort to serve the specific requirements of Canadian users.

Millie Amp says,
"I know quality
when I see it!"

"Gold Brand"

METERS

STARK ELECTRONIC SALES COMPANY
AJAX, ONTARIO

For complete details check No. 66

Change of address

A new location is announced by Associated Electronic Components Ltd., who are moving to 1560 Avenue Road, Toronto 12.

New and increased facilities for testing and evaluation of components will be available enabling them to assist customers in selecting the components giving highest degree of reliability under specific operating conditions.

Associated Electronic Components Ltd. will continue their policy of carrying out close quality control — on a 100 per cent inspection basis — for all the components they supply from the 18 factories they represent. This control is in addition to the manufacturers' own control and therefore provides double assurance against rejects or premature component failure.

SATT for Penticton B.C.

The first Strowger Automatic Toll Ticketing installation in Canada went into service on May 11, bringing Direct Distance Dialing to the Okanagan Valley community of 15,000 persons, and to five central offices toll centered on it. The coming of SATT to Penticton, B.C., was the first step in the Okanagan Telephone Company's program to put most of its system on DDD by the spring of 1961.

Manufactured by Automatic Electric (Canada) Ltd. at its Brockville, Ontario, plant, the equipment was installed by Canadian (B.C.) Telephones and Supplies Ltd. of Vancouver, B.C.

The Penticton SATT installation is of the 59 type, with automatic number identification on individual lines. On calls from party line 'phones, the caller hears a quick double tone which indicates he must give his own telephone number to a checking operator who keys this into the equipment.

As soon as the busy-out switches were thrown on the 20 ticketers forming the heart of the SATT equipment, more than fifty B.C. communities, with a total of approximately 400,000 'phones, came within direct dialing range of Penticton and the nearby points of Kaleden, Naramata, Summerland, Oliver and Osoyoos. The last-mentioned two are B.C. Telephone Co. exchanges homing on Penticton.

The new service was put to immediate use by subscribers, reported Martin Conroy, Okanagan Telephone Company superintendent, and by noon of the same day as the cut, yards of perforated tape had been processed by the computer which converts them to toll tickets.

Jensen SPEECH MASTER



MODEL AP-10

For use in field mobile radio communications, intercomm systems and control centers for aircraft, truck and railroad dispatching and classification.

Unit has good damping and talk back characteristics. Model AP-10 is attractively styled with heavy cast base for stability. Felt pad under base prevents marking.

- 5" PM speaker
- Available with 3.2 or 45 ohm voice coil
- 36" rubber covered cord supplied
- Gray hammer finish

MADE IN CANADA

Catalog Information on P. 13 Catalog 1070 Available Upon Request

Jensen SPEAKERS

Division of Renfrew Electric Co. Limited
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For complete details check No. 45 on handy card, page 85



STOCKING STRUTHERS-DUNN DISTRIBUTORS

LOCATED ACROSS CANADA

To supply your relay needs quickly the following Distributors Stock the popular SMALL POWER SENSITIVE and SEQUENCE TYPES of Struthers-Dunn relays.

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Complete Catalog J Available Upon Request

STRUTHERS-DUNN RELAYS

division of Renfrew Electric Co. Limited

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For complete details check No. 70 on handy card, page 85

IN MINIATURE RELAYS... MARSLAND has made a good name



...and that name is "FILTORS"

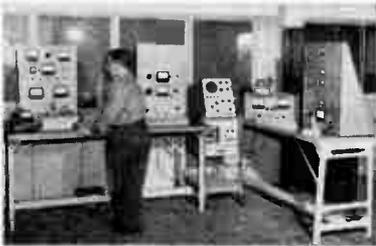
Hermetically Sealed Sub and Micro-Miniature Relays

DESIGN and CONSTRUCTION

"Filtors" Sub-Miniature and Micro-Miniature Relays meet or exceed all the requirements of MIL-R 5757C. Lightweight and rugged, they are hermetically sealed and uniquely designed to provide immunity to the forces of shock, vibration, acceleration, as well as high tolerance to extreme environmental conditions of pressure and temperature.

COMPLETE RANGE

"Filtors" Sub-Miniature and Micro-Miniature (Hermetically Sealed) Relays are available for both AC and DC operations. Non-standard terminal arrangements can be designed to meet special requirements.



*Manufactured and sold in Canada under license from
Filtors Incorporated, Port Washington, Long Island, by "FILTORS" Relay Division of*

ENVIRONMENTALLY TESTED IN MANUFACTURE

"Filtors" designs lend themselves to exacting standards of inspection. At Marsland Engineering the Filtors Relay Division is air-filtered, temperature controlled and surgically clean. Fine materials and the quality controls employed by Marsland result in Relays built to the most reliable standards available anywhere.



The "Powmite" crystal case performance package for all micro-miniature relay switching requirements. Available for plug-in or fixed-wire mounting.



These general purpose relays are applicable to instrument, geophysical, aircraft controls and circuits where high reliability, multiple switching is required. In 2, 4 and 6 pole double throw contact arrangements with many standard mountings.

MARSLAND ENGINEERING LIMITED

KITCHENER, ONTARIO

For complete details check No. 47 on handy card, page 85

M.2.59

JERROLD

PRECISION SWEEP FREQUENCY GENERATOR model 707-*

$\frac{5}{100}$ db



ULTRA

FLAT

Featuring... variable-rate, all-electronic sweep with plug-in oscillators covering 2 to 265 mcs.

The ultra flat sweep generator model 707-* is a precision instrument with an rf output that is flat within $\pm 5/100$ of a db over highest single octave. Particularly adaptable for use with an X-Y plotter, the 707-* features: plug-in oscillator heads; high output power (+20 dbm below 150 mcs.); variable sweep rate (60 per sec. to 1 per 2 min.); and harmonics down 40 db over highest single octave (down 30 db over the entire range).

*Order Model 707-1, 2, or 3 shipped respectively with oscillator heads H-71 (4-100 mcs.), H-72 (12-220 mcs.), H-73 (2-50 mcs.) **\$795.00 each**

Model 707-4 shipped with H-74 (any single octave 2-265 mcs.) special order **\$845.00 each**

Additional oscillator heads for any model 707
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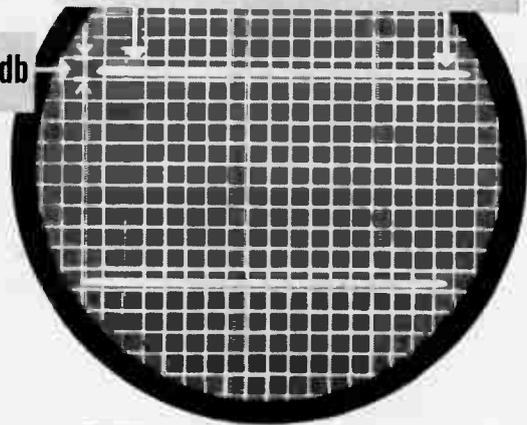
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1X | ANY OCTAVE | 2X

$\pm \frac{5}{100}$ db



HIGH

output power—
+20 dbm

WIDE

sweep width—1% to
over 120% of c.f.

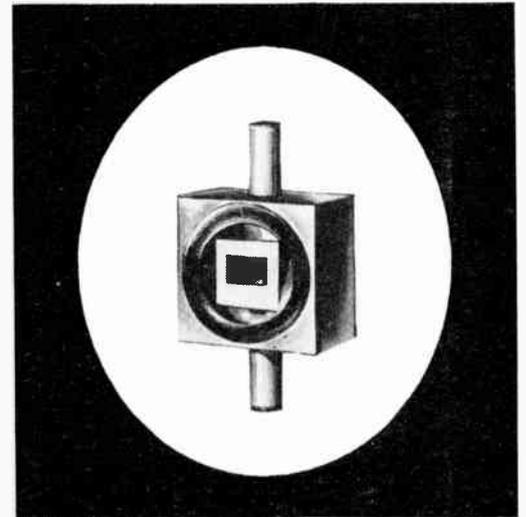
FLAT

output— $\pm .05$ db over
the highest octave

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For complete details check No. 46 on handy card, page 85

ELECTRONICS AND COMMUNICATIONS, June, 1960



The Philco 1N2792 is a symmetrical, point-contact germanium millimeter-wave diode. It has been designed especially for optimum low-noise mixer operation at 70,000 mc. It is also well suited for long-range space communications and EHF video detector applications over the 50 to 75 kmc portion of the RF spectrum.

Specify PHILCO . . . quality transistors for every purpose

If you require transistors for any of these applications or categories, Philco can supply them — and meet your highest quality standards.

Silicon Microwave Mixers • Germanium Microwave Mixers • Infrared detectors • High-frequency Surface Barrier (SBT) • Medium Power Alloy Junction • Pulse Amplifier • Bilateral Switch • Miniature Low Level Alloy Junction • High Power Alloy Junction.

The Philco 1N2792 typifies the advancements Philco is constantly making in the development of diodes and infrared detectors for EHF applications.

For further specifications and prices, write to either of these Philco distributors — or directly to Philco.

Electro Sonic Supply Co. Ltd.,
543 Yonge St., Toronto 5, Ont.

Canadian Electrical Supply Co.
Ltd.,
275 Craig St. W., Montreal, Que.



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CORRECTION

In the article "The Blip Scan Machine" published in the May 1960 issue of *Electronics and Communications* the following corrections should be noted: Caption for Figure 4, page 26 should read Target Hit Pattern Slow Effect. Caption for Figure 3, page 26 should read Histogram. On page 32 under the subtitle "The Fast Effect Channel", first word, fourth line should read 'last' and not latest. On page 33, Figure 9 the word 'sides' should read 'slides'.

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The most complete line in the industry



TAPE WOUND CORES
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SPECIAL MAGNETIC MATERIALS

THE ARNOLD ENGINEERING COMPANY, MARENGO, ILLINOIS
SPECIALISTS IN MAGNETIC MATERIALS

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Canadian Representative:

BAYLY ENGINEERING LIMITED

First Street, Ajax, Ontario

Phone: Empire 2-3741 (Toronto Exchange)

2 NEW ANTENNAS FOR 150 TO 175 MC

Model 227, A 7DB Corner Reflector

Model 228, A 10DB Corner Reflector

- *light weight*
- *rugged*
- *low cost*

Write For Further Information

SINCLAIR RADIO LABORATORIES LTD.

21 TORO RD., BOX 179, DOWNSVIEW P.O.
METROPOLITAN TORONTO, CANADA

For complete details check No. 63 on handy card, page 85



W E L W Y N

announces a FIRST in medium power resistors manufactured in Canada

Do you require a resistor which can give you:

1. Higher values than wire-wound types of a similar size?
(Values from 10 Ω to 68,000 Ω).
2. Unequaled performance for withstanding overload surges — unobtainable in wire-wound resistors?
3. Extremely rugged and durable properties?
4. Low cost with great reliability?
5. Sizes of 4, 6, 8 and 10 watts?
6. Standard tolerance of $\pm 5\%$?
7. Non-inductive up to frequencies of 10 mc/s.

The Welwyn F Series power resistors are composed of a metal oxide element, bonded to a porcelain rod at red heat. This process results in a resistor which is extremely rugged, both electrically and mechanically.

The durable coating which is applied is intended to provide an insulating cover rather than to protect the element which in itself is highly resistant to mechanical damage and effects of moisture.

Comprehensive tests have proved that operating these resistors under the most arduous conditions will not cause failure.

For further information write for data sheet W-1014.

WELWYN CANADA LIMITED

1255 BRYDGES STREET

LONDON, CANADA

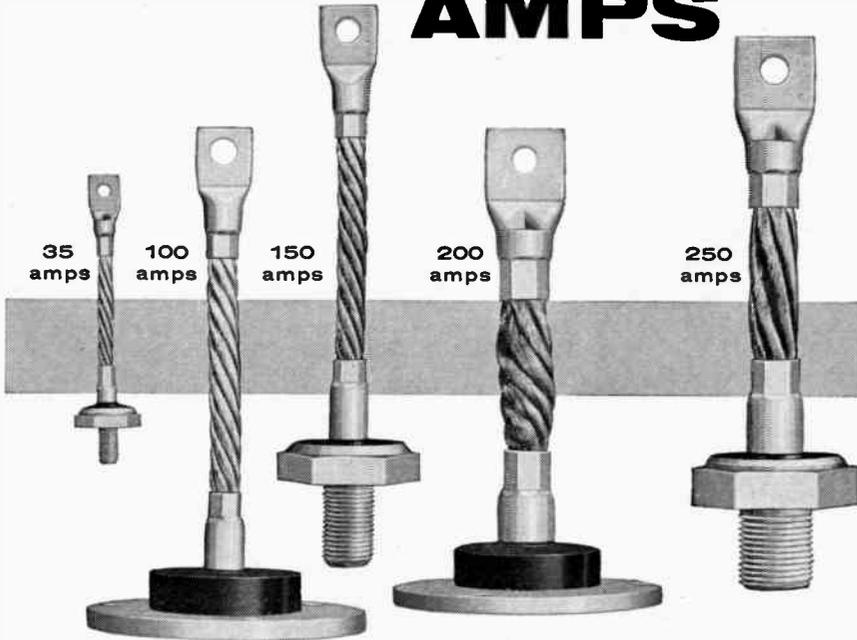
K2259

For complete details check No. 8

ELECTRONICS AND COMMUNICATIONS, June, 1960

For complete details check No. 77 on handy card, page 85

35 TO 250 AMPS



Tarzian high-current line combines thermal efficiency with mounting versatility and optional base polarity

The low junction current density of Sarkes Tarzian's high-current silicon power rectifiers results in longer, more reliable operating life. Compare these key Tarzian values with those of other comparably rated units, and you'll see why Tarzian rectifiers have won such wide acceptance among designers:

DC CURRENT	JUNCTION SIZE	THERMAL GRAOIENT (Junction to base)	JUNCTION TEMP. RISE
35 amps	.375 Inch	9° Centigrade	60°C Maximum
100 amps	.75 Inch	5° Centigrade	60°C Maximum
150 amps	.875 Inch	7° Centigrade	60°C Maximum
200 amps	1.0 Inch	9° Centigrade	60°C Maximum
*250 amps	1.125 Inch	11° Centigrade	60°C Maximum

*Available with stud mounting only

In addition to providing for maximum cooling and larger junction area, Tarzian's unique case styling produces a compact, easily mounted rectifier available in flush or stud mounting types. Tarzian high-current silicon power rectifiers are also available from stock in your choice of negative or positive base polarity.

For complete specifications and ordering information, contact your Sarkes Tarzian sales representative or write to Section 4574 M, Sarkes Tarzian, Inc., Semiconductor Division, Bloomington, Indiana.



SARKES TARZIAN, INC.

SEMICONDUCTOR DIVISION
BLOOMINGTON, INDIANA

In Canada: 700 Weston Rd., Toronto 9, Ontario
Export: Ad Auriema, Inc., New York City

For complete details check No. 61 on handy card, page 55

EIA announces staff change

The general manager of the Electronic Industries Association, Fred W. Radcliffe, has announced a change in staff appointments effective May 1, 1960. Basil Jackson, the Association's staff assistant for publicity and publications has left the Association to join one of Toronto's progressive advertising agencies. Since joining the staff of EIA in 1954 Mr. Jackson played no small part in the development of the engineering standards section of the Association.

Mr. Jackson is being replaced by R. T. O'Brien who brings to his appointment a long and varied experience gained through nearly 25 years in the Royal Canadian Signals as a technical officer and communications administrator.

Dominion Electrohome to produce electronic organs

The only electronic organ designed and currently being built by Canadians specifically for use in the home will soon be in production at Dominion Electrohome Industries Limited. A pre-production model is now being introduced to potential dealers across the country.

As far as is known, the Electrohome organ, the "Allegro", will be one of only two completely Canadian designed and constructed instruments in the electronic organ field. The Kitchener firm's model will be suitable for use in small auditoriums and churches as well as in the home.

Production of the organ marks the first time Electrohome has entered the sound producing field. The company has had more than 50 years of designing and manufacturing sound reproducing units with a full line of radios, stereophonic high-fidelity and television sets now carrying the Electrohome name.

For complete details check No. 68

ROGERS

REFERENCE BULLETIN NO. 4

EC157 Disk Sealed Triode guaranteed for 6000 hours

The EC157 triode serves as an amplifier tube in beam transmitter relay stations for the transmission of TV and telephony link broadband signals at 4000 mc/s. Station breakdowns in microwave communications are costly in time and money. The EC157, with a *guaranteed life of 6000 hours*, assures against early breakdowns, saves time and money. Its longer life means a more reasonable operating cost — *not more than 2.3¢ per hour of service*.

The EC157 triodes offer many desirable features — peak performance, dependable service and outstanding uniformity from tube to tube.

TECHNICAL DATA

HEATER	$V_h = 6.3 \text{ V}$ $I_h = 0.73 \text{ A}$
TYPICAL CHARACTERISTICS	
Anode voltage	$V_a = 180 \text{ — — } 180 \text{ V}$
Anode current	$I_a = 30 \text{ — — } 60 \text{ mA}$
Grid voltage	$V_g = -2.8 \text{ — } 4.0 \text{ — } 1.8 \text{ — } -1.6 \text{ V}$
Mutual conductance	$S = 17 \text{ — } 13.5 \text{ — } 19 \text{ mA/V}$
Amplification factor	$\mu = 43 \text{ — } 33 \text{ — } 52 \text{ — } 43$

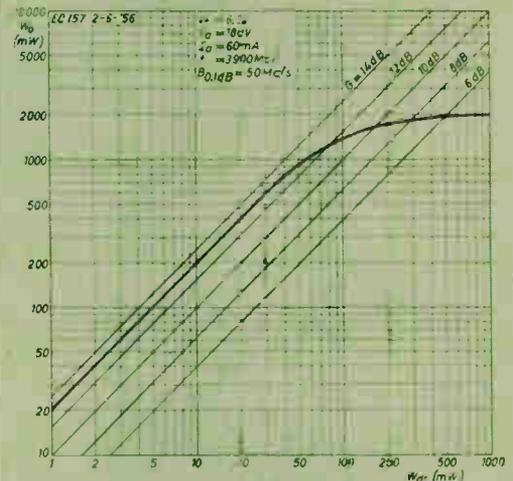
OPERATING CONDITIONS

AS GROUNDED GRID AMPLIFIER AT 4000 Mc/s

Anode supply voltage	$V_{ba} = 200 \text{ V}$
Grid supply voltage	$V_{bg} = +20 \text{ V}$
Cathode bias resistor	$R_k = \text{max. } 500 \Omega$
Anode current	$I_a = 60 \text{ mA}$
Bandwidth (0.1 dB down)	$B = 50 \text{ Mc/s}$
Output power at 8 dB power gain ($V_f = 6.3 \text{ V}$)	$W_o = 1.8 \text{ W (min. } 1.5 \text{ W)}$

MAXIMUM RATINGS (absolute maxima)

Anode voltage at zero anode current	$V_{ao} = 500 \text{ V}$
Anode voltage	$V_a = 300 \text{ V}$
Anode dissipation	$W_a = 10 \text{ W}$
Cathode current	$I_k = 70 \text{ mA}$
Grid current	$I_g = 10 \text{ mA}$
Driving power (grounded grid)	$W_{dr} = 1 \text{ W}$
Direct grid voltage (positive)	$V_g = 0 \text{ V}$
Direct grid voltage (negative)	$V_g = -50 \text{ V}$
Heater to cathode voltage	$V_{kj} = 50 \text{ V}$
External resistance between cathode and heater	$R_{kj} = 20 \text{ k}\Omega$
External resistance between grid and cathode	$R_{gk} = 25 \text{ k}\Omega$
Anode seal temperature	$t_a = 150 \text{ }^\circ\text{C}$
Grid seal temperature	$t_g = 75 \text{ }^\circ\text{C}$
Cathode seal temperature	$t_k = 75 \text{ }^\circ\text{C}$



Output power (W_o) of the EC157 as a function of the driving power (W_{dr}) with lines of constant power gain (G); ($f = 3900 \text{ Mc/s}$, $B_{0.1 \text{ dB}} = 50 \text{ Mc/s}$, $V_a = 180 \text{ V}$, $I_a = 60 \text{ mA}$).

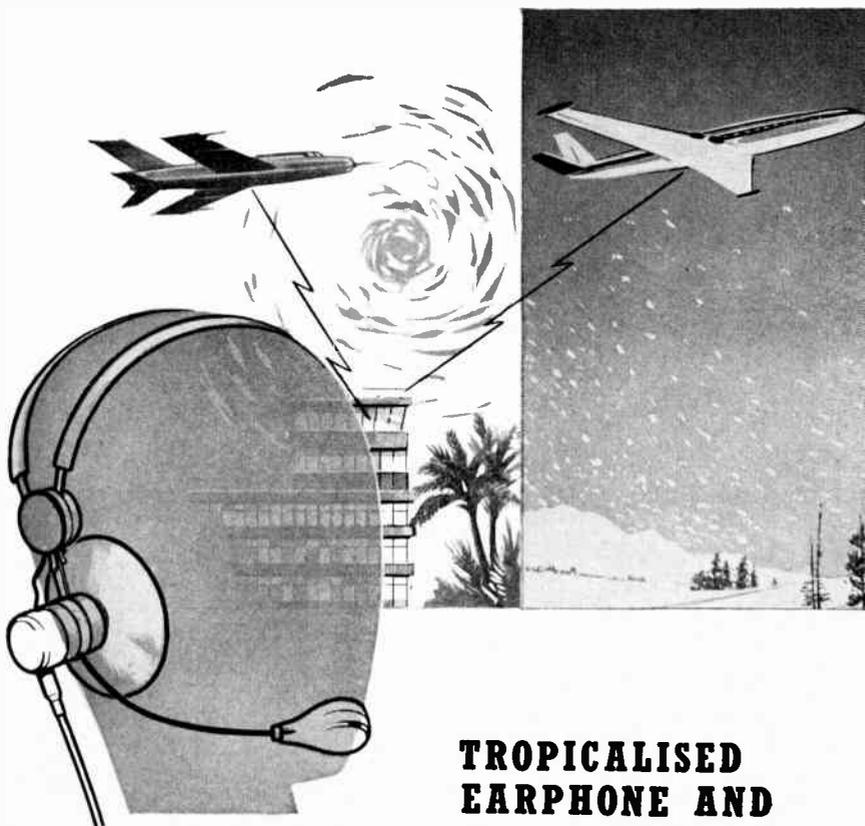
This reference sheet is one of a series from Rogers to keep you fully informed of electronic developments. A specially designed file folder for these bulletins is available from Rogers on request.

You are invited to make full use of Rogers Application Engineering Service at any time, on any problem, on any phone or drop us a line.

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electronic tubes & components

A DIVISION OF PHILIPS ELECTRONICS INDUSTRIES LTD.
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For Military and Commercial Communications



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13750 Noise Cancelling Microphone giving up to 35 dB noise reduction.



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Communication Systems,
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AMPLIVOX
LIMITED

INDUSTRIAL DIVISION

Wembley, Middlesex

Telegrams & Cables: Amplivox, Wembley

For complete details check No. 6 on handy card, page 85

CGE equips Timmins TV station

One of northern Ontario's pioneer television stations — CFCL-TV, Timmins — will switch to maximum 100 KW power in July, according to station owner-president J. Conrad Lavigne.

It is expected that, with the new General Electric 35 KW transmitter in service, the town of Moosonee, some 200 miles away, would be served by the station on a much-improved basis over the present reception of 3-4 nights per week, depending on weather conditions.

The current power increase is the sixth major expansion in both radio and TV that CFCL has undertaken since its inception ten years ago. Canadian General Electric supplied the original equipment for the radio station, the TV station, the two TV satellites, a radio power increase, and now for maximum power television.

Downtown location for IBM's Service Bureau

Effective May 16, the Service Bureau maintained by International Business Machines Company Limited will be open for business at the corner of King Street and University Avenue, in downtown Toronto. For the past six years, the Bureau has been operating as part of IBM's plant at Don Mills. Owing to the sharp increase in Service Bureau business, additional space was required, and the ground floor of the new downtown building was leased.

The move coincides with an announcement that IBM has set up a world-wide network of Datacenters which sell electronic processing machine time on an hourly basis. The Datacenters augment the present international network of Service Bureaus, of which there are 150 established around the world. Eight are located in Canada.

Millie Amp says,
"I've seen 'em all
and Gold Brand
gives you more
for less!"

"Gold Brand"
METERS

STARK

STARK ELECTRONIC SALES COMPANY
AJAX, ONTARIO

For complete details check No. 69

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

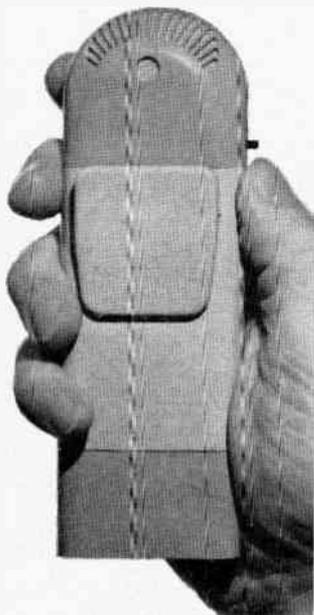
For complete details check No. 20 on handy card, page 85

ELECTRONICS AND COMMUNICATIONS, June, 1960

91

MULTITONE

Personal Call Pocket Paging Staff Locator



Series 8 Pocket
Receiver with voice,
Weight 5½ ounces.

The Multitone "Personal Call" system of staff location has been specified by hundreds of hospitals, factories and other institutions throughout the world. Why? All calls are personal. When you want Mr. Jones you call only Mr. Jones. All calls are quiet. Only Mr. Jones knows he is being called.

All calls are quick and automatic. Call goes out at the press of a button. All calls get coverage. You reach everywhere in the building, regardless of noise level.

Highest reliability and lowest operating cost.

Mfrs. of Hearing Aids,
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Electro Medical Equipment.

*For a demonstration
or simply more information,
without obligation,
please phone or write.*

Multitone of Canada

LIMITED

130 Merton St., Toronto 7, Ont.
HU. 1-0731

techdata for engineers

Silicones

Item 500

Dow Corning has completely rewritten, redesigned, and re-edited the 1960 Engineering Guide for Silicones. The 1960 Guide is 16 pages of brief product descriptions and illustrations, covering a range of Dow Corning silicone applications from adhesives to water repellents for textiles. This new Guide, besides being punched for filing and ready reference, contains a series of reply-paid postcards making it convenient for the reader to request further detailed information and prices with regard to any Dow Corning product described. This 1960 Engineering Guide for Silicones is offered free by **Dow Corning Silicones Limited, Tippet Road, Downsview, Metropolitan Toronto, Ontario.**

Ceramic insulated wire

Item 501

Ceramic insulated wire for use in high temperature and nuclear applications is the subject matter of a pamphlet issued by Secon Metals Corporation of White Plains, N.Y. This 20-page brochure bearing the title "Secon Ceramic Insulated Wire for use in High Temperature and Nuclear Environments", outlines many of the pitfalls which must be avoided if components are to operate successfully at temperatures in the 800° to 1200°F range.

A copy of this pamphlet which will be of definite assistance in the design and construction of components using ceramic insulated wire, can be obtained by writing the manufacturer, **Secon Metals Corporation, 7 Intervale Street, White Plains, N.Y.**

Transistor applications

Item 502

The Lansdale Division of Philco Corporation has made a Transistor Application Guide available in response to industry's many queries concerning the proper selection of transistor types for specific applications. The guide in booklet form, indicates suitable transistor types for each major application. Transistors are classified in terms of one or two important parameters. Information is primarily presented in graphs and curves for simplicity. Data given by charts is intended to be reasonably typical of performance that has been obtained in practical circuits. Applications covered are listed under the following general categories: Communications Circuits (tuned amplifiers and related circuits), Untuned Ampli-

fiers, Switching circuits (computer applications) and Switching Circuits (non-computer applications).

Additional information can be obtained from **Philco Corporation, Lansdale Division, Lansdale, Pennsylvania.**

Power supply handbook

Item 503

Sorensen & Company, South Norwalk, Conn., a subsidiary of Raytheon Company, announces a new 32-page power supply handbook and catalog, giving tabular specification data on more than 400 separate power supply models. The new publication covers the complete Sorensen line of regulated DC supplies, frequency changers (variable frequency power sources), high-voltage power supplies (to 600 kilovolts) and other high-voltage products, miniature transistorized power supplies inverters and converters, and AC line-voltage regulators.

Request a copy of the catalog directly from: **Bayly Engineering Limited, Ajax, Ontario.**

Plated-thru holes

Item 504

A detailed report on the reliability of plated-thru holes employed in printed wiring boards has been published by the engineering department of Photocircuits Corporation, a leading manufacturer of printed circuitry. The 59-page report contains a number of independent studies made by major suppliers of military electronics, as well as findings of the company's test laboratories. Included in the report are listings of large military programs and their prime contractors now using and planning to use plated-thru holes.

Copies of "Plated-Thru Holes for Thru Connections on Printed Wiring Boards" are available for one dollar from the **Publications Department, Photocircuits Corporation, Glen Cove, Long Island, N.Y.**

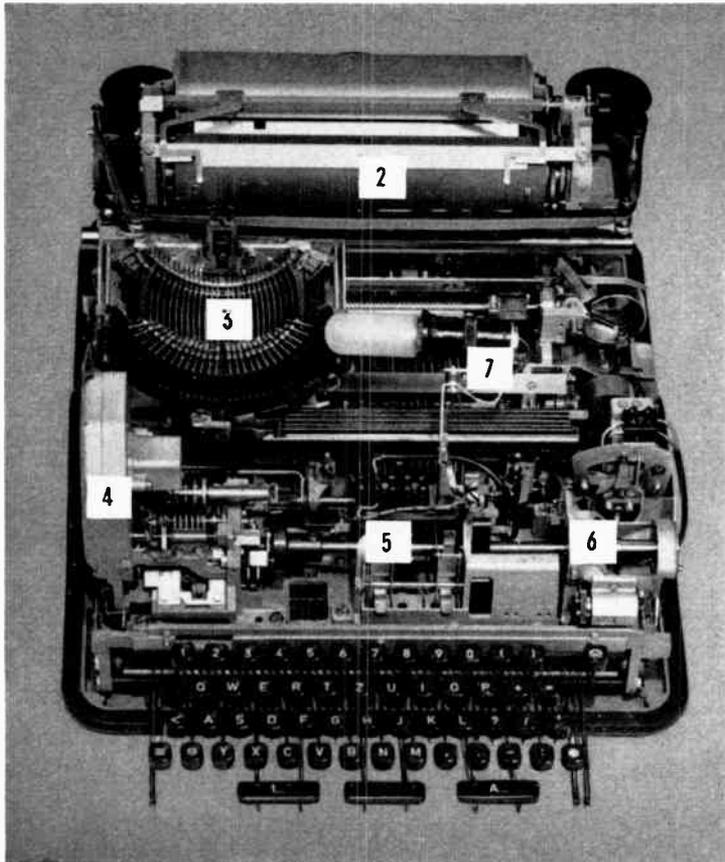
Radio parts catalog

Item 505

Believed to be the largest catalog devoted solely to electronic components and equipment ever published in North America by an independent jobber, the 452-page buying guide has recently been announced by **Electro Sonic Supply Co. Ltd., 543 Yonge St., Toronto 5.** Among the items shown are tubes, transistors, capacitors, resistors, transformers, switches, connectors, relays, public address equipment, television antennas, test equipment, amateur equipment, wire, tools and technical books.



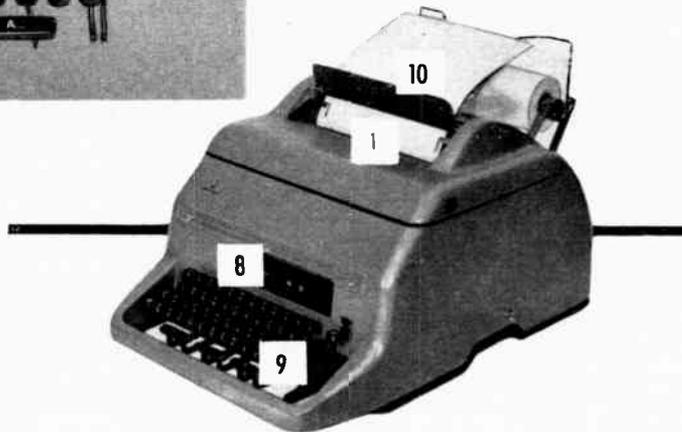
MODEL 100 PAGEPRINTER



AS-60-13

10 points that tip the scales:

- 1 Unobstructed line of sight to incoming text - no glare
- 2 Platen remains stationary even during letters-figures shift
- 3 Elegant printing with exact spacing between characters secured by type-levers
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write for brochure SH 6138

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For complete details check No. 4 on handy card, page 85

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:

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Victor 5-6570

INSTRUMENTATION SALES ENGINEER

required for the Toronto area. An excellent opportunity for a young, aggressive and experienced sales engineer. For local interview apply —

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desire electronic sub-assembly and wiring work. BE. 1-6346 after 6 p.m., or write to —

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desires position in Toronto-Hamilton area. 29 years of age, with eight years' experience in production supervision and development of industrial electronic measuring and control equipment.

Box 5037

Electronics and Communications
450 Alliance Avenue, Toronto 9, Ontario

ENGINEERS AND TECHNICIANS

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Mr. D. C. MacLean, Personnel Supervisor,
DeHavilland Aircraft Co. of Canada Ltd.,
Downsview, Ontario.

TWO-WAY RADIO TEST EQUIPMENT

For sale at sacrifice price: One signal generator TU 576; One No. 43 Thru line wattmeter; One No. 25 Thru line element; One Test Set P-8501B; Two Control Heads C-TU-376; One C.P. 255A Microphone . . . all of MOTOROLA manufacture, in use for only two months. For price or further information contact —

Mr. H. Hoefmans
930 Gerrard St. E., Toronto, Ont.

ELECTRONICS MARKETING EXECUTIVE

18 years of successful sales-product manufacturing, marketing and administration with top national electronic organizations. Knows the Canadian electronic markets and how to sell them. Shirt sleeve experience and accomplishments in: market research, sales, product development, sales promotion, advertising and public relations. Eager for a challenging proposition, will re-locate.

Box 5038

Electronics and Communications
450 Alliance Avenue, Toronto 9, Ontario

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 —

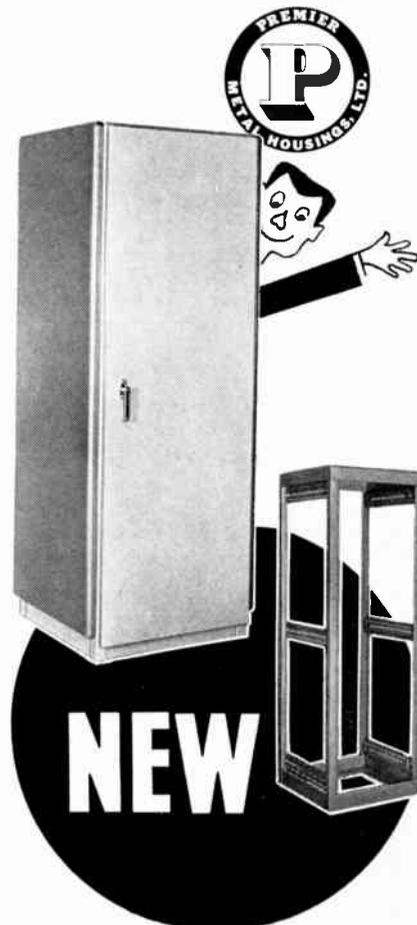
Box 5035

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

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wanted by well established sales representative company for O.E.M. and Industrial accounts.

Prime Electronic Components Ltd.
868 Dundas Highway East, Dixie, Ontario

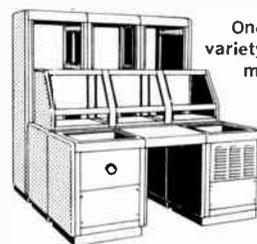


PREM-O-RAK BALL-CORNERED MODULAR TRANSMITTER RACKS

22" and 25½" DEEP FOR
STANDARD 19" RACK PANELS

Designed for MULTIPLE INSTALLATIONS and for use with PREM-O-RAK CONSOLE SYSTEMS.

RIGIDLY CONSTRUCTED • Frame made of 14 gauge steel • Panel Mounting Angles 3/16" thick • End Panels and Doors made of 16 gauge steel.



One of the unlimited variety of arrangements made possible with standard, flexible Prem-O-Rak units

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Please send complete information on the following masts I have checked.

- SINGLE MASTS
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for heights up to 150 feet.
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We will design and manufacture custom made masts and towers to suit your specific requirements.

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COMPANY.....
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467

**BEATTY BROS.
LIMITED
FERGUS, ONT.**

New Gertsch Freq Meter

MEASURES AND GENERATES: 20 mc to 1000 mc

ACCURACY: 0.0001%, exceeding FCC requirements 5 times

MODULATION: AM, 30% at 1000 cps; FM, 1 kc at 30 mc
5 kc at 150 mc, or 15 kc at 450 mc max.



This portable instrument in one complete package enables you to measure both frequency and frequency deviations in the maintenance of mobile communications systems.

As optional equipment the FM-7 Frequency Meter can be combined with the new DM-3 Deviation Meter as illustrated. The DM-3 is a dual-range deviation meter with 15 kc and 7.5 kc full scales.

By combining the FM-7 and the DM-3 you get a single instrument capable of measuring and generating carrier frequencies *plus* reading peak modulation deviation.

Write for complete literature.

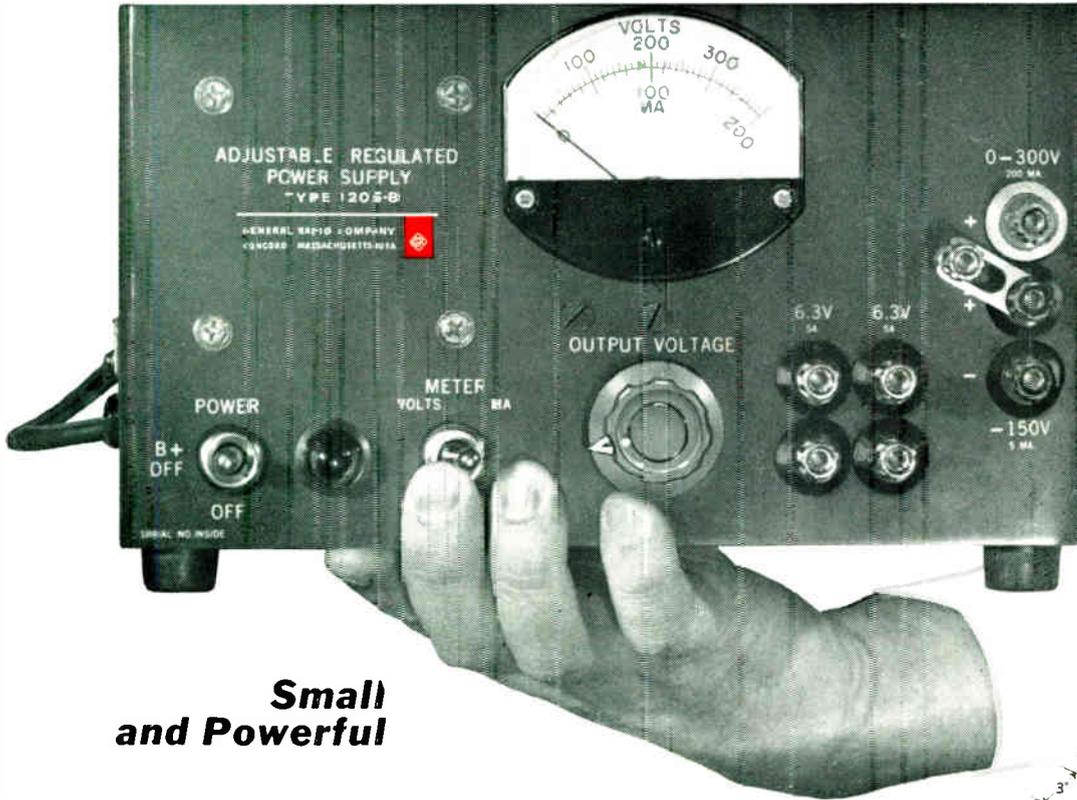
Gertsch

GERTSCH PRODUCTS, Inc.

3211 South La Cienega Boulevard, Los Angeles 16, California • Upton 0-2761 — Vermont 9-2201

Represented by: Atlas Instrument Corp. Ltd., Toronto, Ont.

For complete details check No. 37 on handy card, page 85



**Small
and Powerful**

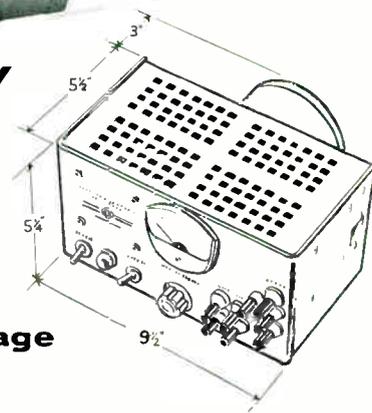
REGULATED POWER SUPPLY

Continuously Adjustable 0 to 300v, dc, at 200 ma *

Plus ... -150v, dc, at 5 ma

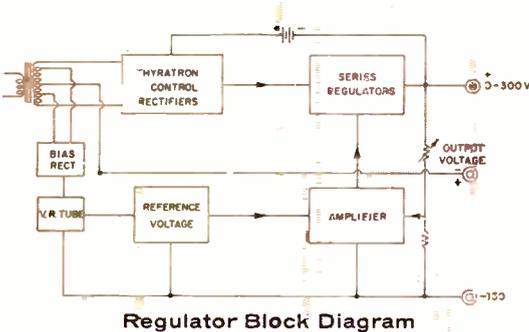
... two 6.3v, ac, unregulated outputs at 5a each
(may be connected in series or parallel)

... all from a compact package



120 Watts in 0.2 Cubic-Foot Package . . . Excellent performance is obtained by using two

regulator circuits. A high-efficiency controlled rectifier maintains the optimum operating voltage for a series regulator, regardless of line-voltage changes, load changes, or changes in output voltage setting. Wide-band regulator circuits and high-frequency by-passing of the output make for low output impedance over a wide frequency range. A large capacity fan provides cooling without dependence on convection, permitting the stacking of any number of units.



* **Ripple:** less than 1 mv (120c)
Regulation: 0.75v for $\pm 10\%$ line change; 0.1v from no load to full load
Output Impedance: Approximately 0.3Ω plus $10\mu h$

Type 1205-B Adjustable Regulated Power Supply.....\$290

Write For Complete Information

GENERAL RADIO COMPANY

WEST CONCORD, MASSACHUSETTS

Canadian Engineering Office in TORONTO

99 Floral Parkway, Toronto 15, Ontario

Arthur Kingsnorth • Richard J. Provan

Tel: CHerry 6-2171

Repair Service: Bayly Engineering Ltd., Ajax, Ontario

