

World Radio History

electronics and communications



an age publication
MAY 1960

Stereo manufacturers meet top quality equipment requirements — page 23

Microwave techniques in the United Kingdom — page 19

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For complete details check No. 13 on handy card, page 47

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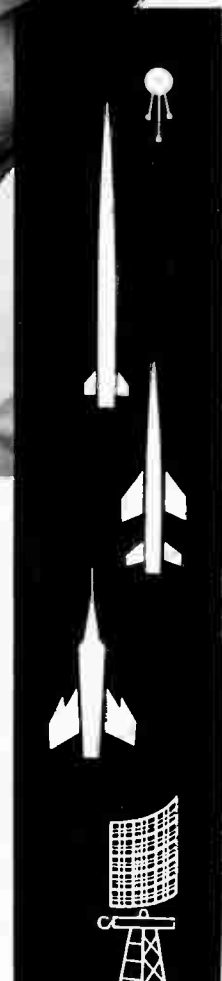
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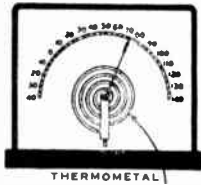
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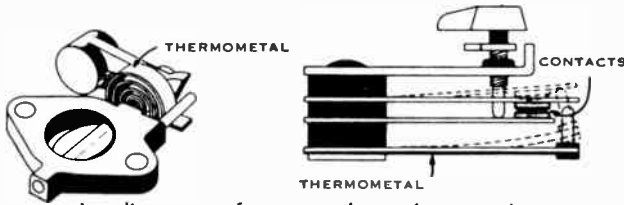
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ELECTRONICS AND COMMUNICATIONS, May, 1960





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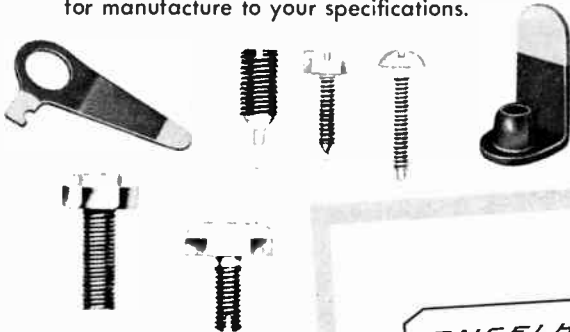


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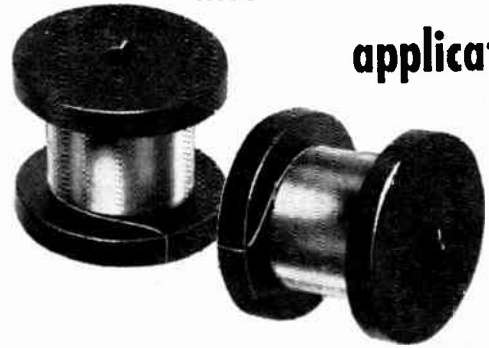
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an age publication

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Canada's pioneer journal in the field of
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COVER STORY

Technician is shown locating the optic axis of the ruby crystal to determine the frequency at which it will function within a revolutionary "ruby maser" amplifier developed by Hughes Aircraft Company (Story on page 20)

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CRTPB newsletter

Prepared by Canadian Radio Technical Planning Board.

Radio Standards Specifications 119 and 120

The CRTPB office recently distributed to all sponsor members copies of draft specifications 119 and 120. Specification 119, Issue 1, has a proposed effective date of January 1, 1962 and is entitled "FM or PM Communication Transmitters For Land And Mobile Stations Operating in 152-174 Mc/s Band At 60 Kc/s Channel Spacings With Power Outputs not Exceeding 5 Watts". Radio Specification 120, Issue 1, also has a proposed effective date of January 1, 1962. Its title is "FM or PM Communications Receivers For Land And Mobile Stations Operating in the 152-174 Mc/s Band At 60 Kc/s Channels Spacings". In sending these draft specifications for the comments of sponsor members of CRTPB, the Department of Transport points out that the specifications limit the transmitter RF power output to 5 watts and require that the transmitter and/or receiver units provide a self-contained primary power supply, i.e., all batteries must form an integral part of the unit. The DOT anticipates that equipment covered by these specifications would normally be used as hand-carried portable radiotelephones or for short range point-to-point operations.

Specifications 119 and 120 are similar to Radio Standards Specifications 106 and 107 respectively but have been slightly relaxed in several parameters.

The appropriate CRTPB committee will consider these new draft specifications of the Department of Transport.

CRTPB Voting on Specification 112

The results of the CRTPB voting on the recommendations of the Amortization Committee on Specification 112 entitled "Ship Station A.M. Communication Transmitters And Receivers Operating In the 1.6 Mc/s to 10 Mc/s Band With Power Outputs Not Less Than 15 Watts" which were sent to the Department of Transport in March were as follows. Ballots were received from thirteen sponsor members of which four completely abstained from voting. Of the remaining nine ballots, seven approved the recommended amortization period of seven years for non-type approved equipment falling within the scope of Specification 112, effective from the provisional effective date of the specification of April 1, 1958. The remaining two ballots showed no vote on this part of the question. On part two of the question, dealing with an extension of the amortization period, eight approved the recommended extension of the seven year amortization period on a pro-rata basis for non-type approved equipment which may have been licensed between the provisional and final effective dates of Specification 112. One ballot did not approve the recommended extension.

Various comments were received in conjunction with the vote and these have been passed on to the Department of Transport.

CRTPB Voting on Draft Broadcast Procedure 5

The Department of Transport has been informed of the result of the sponsor-members' votes on the recommendations of the CRTPB Television Committee referring to draft Broadcast Procedure No. 5 entitled "Protection and Coverage Rules for VHF Television, Issue 1".

Fifteen ballots were returned to the CRTPB office of which seven abstained, six approved, one vote did not approve, while one was a marginal opinion vote.

The CRTPB Television Committee revised proposed Broadcast Procedure No. 5, and the revised draft has been sent to the CRTPB sponsor-members and to the Department of Transport.

Radio Amateur Licenses in the United States

The FCC recently stated that the number of amateur radio station licenses issued in the United States approaches 204,500. "Ham" licenses have increased 285 per cent in the past twelve years.

The FCC also note that it has issued 500,000 permits in the Class D citizen's radio category since the service was established. The FCC is receiving nearly 8,000 applications a month now for licenses in this class.



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MODEL 120 A.C.

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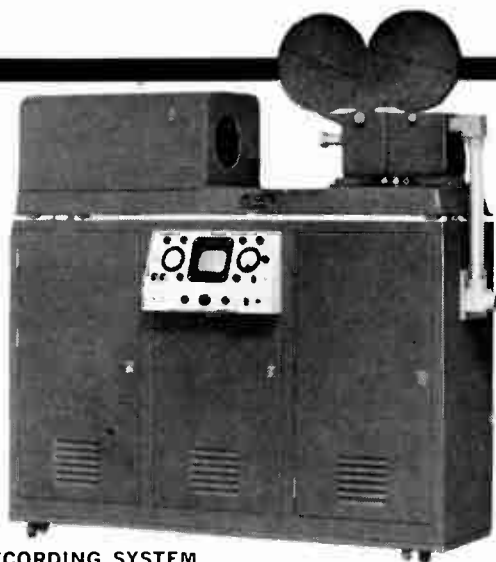


NORTHERN ELECTRIC



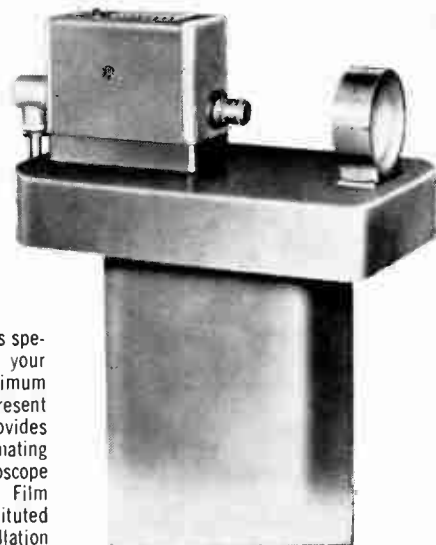
AM TRANSMITTERS

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



VIDEO RECORDING SYSTEM

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



VIDICON FILM CHAIN

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

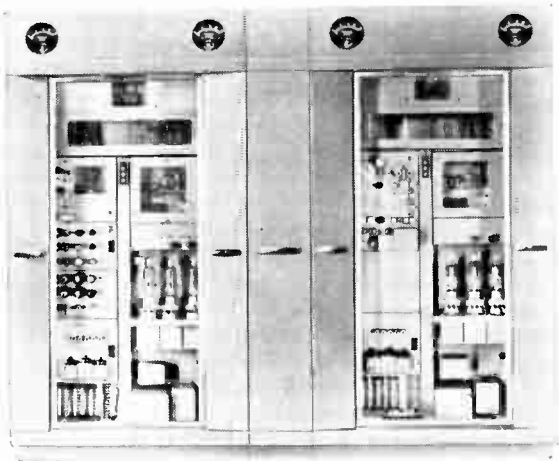
AM-FM-TV BROADCAST EQUIPMENT



CONTINENTAL ELECTRONICS

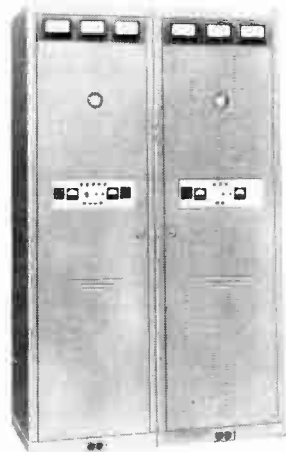


STANDARD ELECTRONICS



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

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



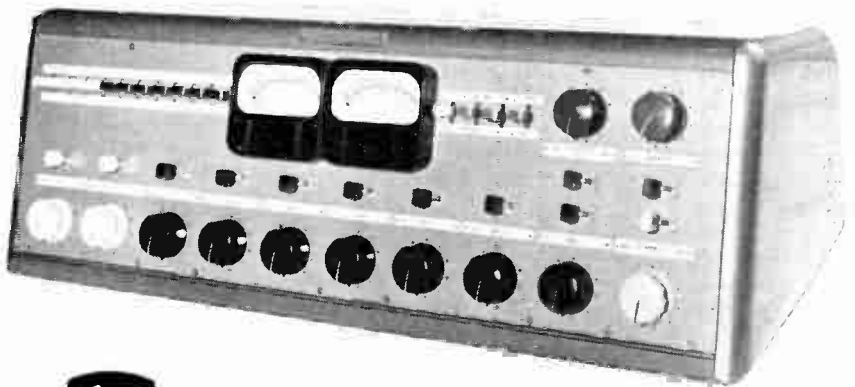
VERSATILE FM TRANSMITTERS

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



TRANSISTORIZED PORTABLE AUDIO CONSOLE R5460B

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



SPEECH INPUT CONSOLE R5430A

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



NORTHERN ELECTRIC COMPANY LIMITED

World Radio History

the industry's business

Honeywell designs moderate-priced computer

A new generation electronic data processing system, described as "the most powerful available in the moderate-price field" was introduced recently by the Electronic Data Processing Division of Honeywell Controls Limited.

W. H. Evans, Honeywell president, predicted the new system, known as the Honeywell 400 and representing a "major expansion of the company's activity in the computer field", will extend the benefits of high-speed electronic data processing to six out of ten of the top Canadian companies. He further stated that the new system can be used in conjunction with the Honeywell 800, and will permit a growing company to expand its data processing operations from the Honeywell 400 to the Honeywell 800 with ease and economy.



P. S. Suddick



F. W. Ladwig

P. S. Suddick, market manager of Electronic Data Processing Division at Honeywell, explained that the Honeywell 400 and Honeywell 800 will use identical tape systems, printers and card readers and that information recorded on one system may be read by the other system.

The basic Honeywell 400 model with a powerful central processor, four high-speed magnetic tape units, a high-speed printer and a card reader will rent for under \$10,000 a month. It will be available to users beginning in the summer of 1961.



W. H. Evans

IRE Communication Symposium seek appropriate papers

The Montreal Section of the Institute of Radio Engineers is holding a Symposium in Montreal, Que., on Friday and Saturday, November 4 and 5, 1960, in the convention rooms of Montreal's new Queen Elizabeth Hotel.

Papers will be considered on any phase of "Communications". Preliminary analysis of the subject title suggests the following topics: (1) Low frequency communication systems; (2) Broadcast communication systems; (3) Wire communications; (4) Telephone systems; (5) Mobile communications; (6) Scatter; (7) Lunar and space relays; (8) Telex; (9) Microwave relays; (10) Telemetry.

Original papers not previously presented are preferred but not mandatory. Presentations should be limited to 30 minutes allowing for a 20 to 25 minute paper and a 5 to 10 minute discussion period.

It is planned to publish for study prior to the Symposium a program agenda and abstracts of the papers to be presented, together with the

author's photograph and a short biographical note.

Persons wishing to present papers are requested to submit by June 1, 1960, the subject title, a 50 word summary, and a short biographical note for consideration by the Technical Program Committee.

The authors of accepted papers will be advised by July 1 at which time they will be requested to forward by September 1, 1960, a 200 to 350 word abstract and a personal photograph. These will be published prior to the Symposium.

Authors of original work who desire their paper to be forwarded to the IRE Editorial Department for consideration regarding publication in "Proceedings" or "Transactions", should so indicate. A complete text would be required in this instance.

Summaries and biographical notes should be forwarded in triplicate to C. F. Kipp, Chairman, Technical Program Committee, IRE Symposium on Communications, Box 802, Station "B", Montreal, Que.

DDP contracts awarded

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 1-15, 1960.

Airtron Canada Ltd., Toronto, Ont., electronic components, \$33,613; Computing Devices of Canada Ltd., Ottawa, Ont., electronic equipment, \$332,821; E.M.I.-Cossor Electronics Ltd., Dartmouth, N.S., establishment of production facilities for electronic equipment, \$125,000; Electromechanical Products, Agincourt, Ont., radiometer and electronic equipment, \$16,893; Fleet Manufacturing Ltd., Fort Erie, Ont., electronic equipment, \$21,543; Instronics Ltd., Stittsville, Ont., oscilloscopes, \$13,920; New Brunswick Telephone Co. Ltd., Saint John, N.B., telecommunication extension and cut-over dial operation, \$18,616; RCA Victor Co. Ltd., Ottawa, Ont., development of electronic test equipment, \$16,000; R-O-R Associates Ltd., Don Mills, Ont., electronic equipment, \$16,456; F. V. Topping Electronics Ltd. Toronto, Ont., oscillators, \$44,140.

Change of name

It should be noted that, effective January 1, 1960, the corporate name of The Allanson Armature Mfg. Co. Ltd. was changed to Allanson Manufacturing Corporation Limited. This organization is located at 33 Cranfield Road, Toronto 16, Ontario.

Bach-Simpson trailer tours Ontario — Quebec

A 19-foot Bach-Simpson trailer, with approximately 30 feet of counter space and back-up panels illustrating the many basic styles of panel instruments and the wide variety of test equipment designed and manufactured by Bach-Simpson Limited of London, Ontario, is presently on tour of Ontario and Quebec.

The trailer, which has already concluded a tour of Western Ontario, is scheduled to spend the week of May 2 in Ottawa, where interested persons may view its contents at the following locations: Computing Devices of Canada, Defense Research Board, Carleton University and the University of Ottawa.

From May 9 to May 20 the trailer will be in Montreal, where it will make 32 scheduled stops among which will be the Canadian Broadcasting Corporation, McGill University, University of Montreal and the Ecole Polytechnique.

En route back to Toronto the trailer will make stops at Kingston, Belleville, Trenton.

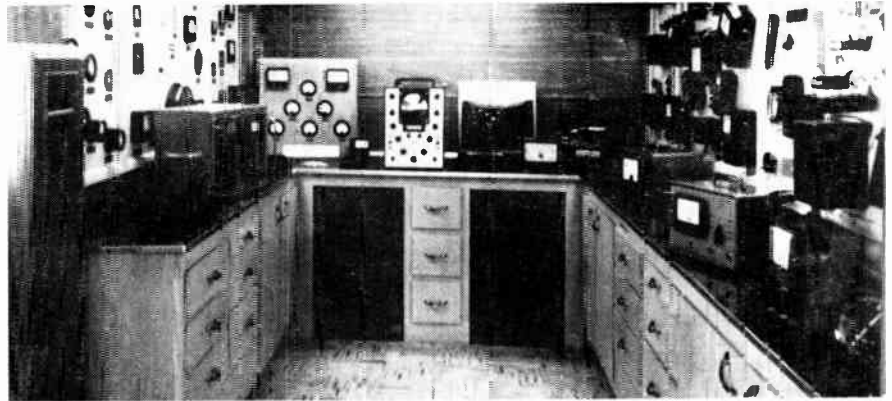
It is the plan of Bach-Simpson that the trailer be kept on the road for six months, which will permit time for a later tour of the Eastern Townships and Quebec City.

Canadian group buys Leland

Leland Electric Company Limited, recently formed by a group of Canadian investors, has purchased the Leland Electric Motor Division of AMF Canada Limited, according to a recent announcement by G. Ernest Robertson, chairman of the board.

Leland, which claims to be Canada's largest exclusive manufacturer of electric motors, generators and alternators, has manufacturing facilities located in Guelph, Ontario, comprising four buildings totalling over 150,000 sq. ft., and employs in excess of 500 persons. Branch offices and warehouses are maintained from coast to coast.

The new owners are an all Canadian group headed by Mr. Robertson, board chairman and chief executive officer. Frank S. Bush, formerly executive vice-president of the Leland Electric Motor Division, will be president and general manager of the new company. Gordon D. Tiller, formerly vice-president and general manager of Federal Wire & Cable Co. Limited, assumes the titles of vice-president, secretary and treasurer.



Interior view of the Bach-Simpson Limited travelling showroom housed in a 19-foot trailer. The wide variety of instruments exhibited in this trailer can be seen from the wall and cabinet displays in the above photograph.

Canadian Marconi to display microwave equipment in Mexico

The Canadian Marconi Company has been invited by the Mexican Government to send delegates and exhibit equipment at the forthcoming Latin American Telecommunications International Network Conference. This conference has been organized in order to bring together all the Latin American countries in an endeavor to establish a working agreement between the various nations for an integrated South American Telecommunications network. Fifty delegates have been invited and Canadian Marconi Company feel especially honored to be the only fully Canadian Telecommunications organization displaying Canadian products to the South American delegates.

In an interview with *Electronics and Communications* Canadian Marconi officials pointed out that since Canada's unfavorable balance of trade has been the subject of much concern to Canadian Government and Industry

it is the responsibility of Radio and Electronics manufacturers in Canada, where there is no foreign affiliation which would exclude them from marketing outside of Canada, to attempt to break into the non-domestic telecommunications markets.

Canada's position as an exporting nation, particularly with reference to manufacturing goods as against raw materials is such that drastic measures will be required. Either there must be more Canadian manufactured products from Canadian owned companies, or the Canadian subsidiaries of foreign companies will have to be allowed to enter into export by the controlling company.

The problem will be solved, at least in part, if our government and the management of Canadian subsidiaries bring pressure to bear on the controlling companies to allow their Canadian subsidiaries to enter export markets to a greater extent.

Appointed franchised Canadian distributor

The Semiconductor Division of Hoffman Electronics Corporation has appointed Aeromotive Engineering Products, Ltd., as its franchised Canadian distributor and sales representative.

Aeromotive will market the complete line of Hoffman diodes, rectifiers, transistors and solar devices.

The Canadian firm, with distribution centers near Montreal and in Toronto and a field organization covering the remainder of the country, will give Hoffman full representation in Canada's growing electronics industry, according to A. H. Binash, distributor sales manager for the Semiconductor Division.

Semicon Associates acquired by Varian

The forthcoming acquisition of Semicon Associates, Inc. by Varian Associates has been announced by the managements of the two electronics firms. Varian will acquire 100 per cent ownership of Semicon through an exchange of common stock. Details of the transaction are withheld pending final negotiations.

Semicon will become part of Varian's recently-formed Microwave Tube Group which also includes Bomac Laboratories, Inc., Beverly, Mass.; S-F-D Laboratories, Inc., Union, N.J.; Varian Associates of Canada, Ltd., Georgetown, Ontario; and the Varian Tube Division in Palo Alto, Calif.



Arthur Meez, left, field day co-ordinator and past president of the Nortown Amateur Radio Club, Toronto, accepts the Canadian Marconi Trophy from H. E. Buchanan, of Canadian Marconi Company at the Club's annual banquet. The Nortown Club topped entries from amateur radio groups in centers throughout Canada to win the trophy.

Servomechanisms (Canada) acquired by Litton

Litton Industries has acquired Servomechanisms (Canada) Ltd., according to an announcement made jointly by Dr. Henry E. Singleton, Litton vice-president and Electronic Equipments Division general manager, and William W. Shannon, president of Servomechanisms, Inc.

Servomechanisms (Canada) Ltd., with its main plant located in the Rexdale area of Toronto, has been a subsidiary of Servomechanisms, Inc., of Los Angeles, Calif.

Dr. Singleton said plans will be implemented immediately for expansion of the Canadian firm's operations, with particular emphasis on advanced electronic products including inertial guidance systems for the Lockheed CF-104 fighter-bomber of the Royal Canadian Air Force.

The acquisition reflects Litton's continued interest in Canada's expanding industrial activity and economy.

IRE Toronto Section reviews progress

Frank A. Ford, P.Eng., chairman of the membership committee of the Toronto Section of the Institute of Radio Engineers, in making his annual report recently, referred to the Institute, with its 77,000 members, as being the largest professional society in the free world.

Growth in the Toronto Section has kept pace, Mr. Ford stated, and shows an increase in membership of about 5 per cent in the past year. Only seven years ago, the Toronto group numbered but half of today's rota.

Mr. Ford continued by comparing the Toronto Section with the IRE group in Montreal who, percentage wise, have about 10 per cent more Fellows, 20 per cent more Senior Members, 40 per cent more Members, but 50 per cent fewer Students. "We can be proud of our Student record," said Mr. Ford, "which places the Canadian Region top in all IRE Student membership."

Toronto hams win Marconi trophy

The Canadian Marconi Trophy, awarded the amateur radio club making the greatest number of contacts at the Ham operators' annual field day, was presented Saturday night, April 2, to Arthur K. Meen, VE3DAR, representing the Nortown Amateur Radio Club, of Toronto.

During the 24 hour contest, the Nortown Club made world wide contacts including operators in Mexico, Panama, Haiti, Venezuela, England and Germany, to top entries from amateur radio groups right across Canada.

The field day contest was sponsored by the American Radio Relay League which also verified the contacts.

The Nortown Club, operating under its own call letters VE3NAR, was actively represented by 60 of its members as operators, log keepers and mechanics working on ten stations set up on North Bathurst St., Toronto for the field day.

King Radio unchanged in Canada

Although King Radio Corporation of Merriam, Kansas, announces the appointment of REA International Corporation, 80 Broad St., New York City, as export distributors for King products, distribution in the United States and Canada will continue to be handled by authorized King dealers.

General Radio's 1960 road show

The General Radio Company of 99 Floral Parkway, Toronto 15, will send its 1960 Travelling Exhibit of Electronic Test Equipment to visit areas from Hamilton, Ontario through to Quebec City.

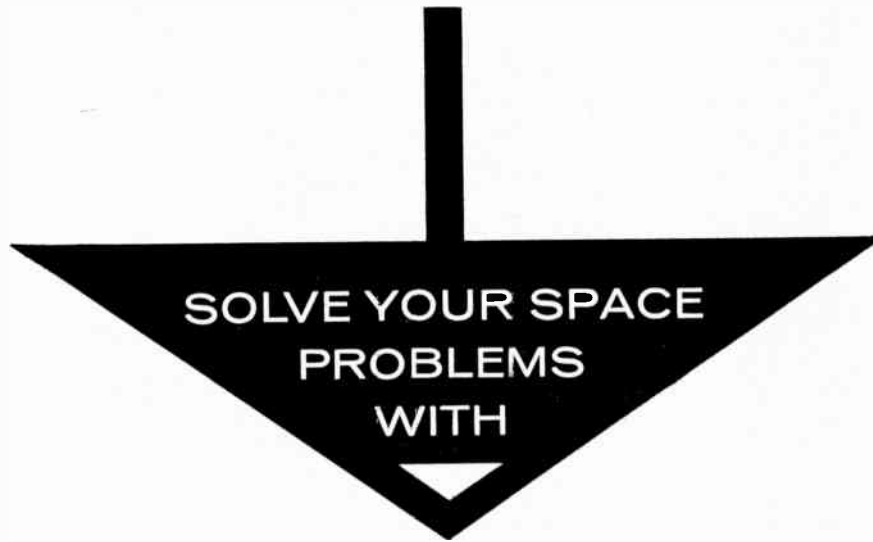
Included in the exhibit will be several new General Radio instruments such as: a Beat Frequency Generator for audio, ultrasonic, and video frequencies; a working demonstration of a Sound and Vibration Analyzer in conjunction with a Graphic Level Recorder and Random Noise Generator; and a new Adjustable Regulated Power Supply and many other instruments for research, development and production.

In addition to the approximately eighteen stops that the Travelling Road Show will make, two hotel shows are also on the itinerary: Seaway Hotel, Toronto, on Saturday, May 7, between 12:00-6:00 p.m.; and The Capri Hotel, Montreal, on Sunday, May 15, between 12:00-6:00 p.m.

Bell Telephone to spend \$200 million

In his address to shareholders at the 80th annual meeting of the Bell Telephone Company, Thomas W. Eadie, president, estimated that approximately \$200 million would be spent by his organization on construction in 1960. "The number of telephones in service," Mr. Eadie said, "rose from 1,600,000 to 3,300,000. Ten years ago 67 out of 100 households in our territory had telephone service. Today, over 90 out of every 100 households have telephone service."

Mr. Eadie in his address referred to some of the company's major undertakings during the past decade, such as: the coast-to-coast radio relay network built in partnership by the Bell and its fellow members of the Trans-Canada Telephone System; the joint construction of the Mid-Canada Line for the Canadian Government; the extension of Bell service to many locations in Northern Ontario and Quebec as well as Labrador and Baffin Island; the expansion of customer dialing of long distance calls; and the development of extended area service.



SUBMINIATURE G-E SILICON JUNCTION DIODES

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JEDEC Type Number	Maximum Reverse Working Voltage (V)	Zener (Breakdown) Voltage (at 100uA) (at 25 °C (Min. Volts))	Minimum Forward Current (at 25 °C)		Maximum Inverse Current at Maximum Reverse Working Voltage (uA)		Maximum Average Rectified Current (mA)	
			mA	(at Vdc)	(at 25 °C)	(at 150 °C)	(at 25 °C)	(at 150 °C)
IN456	25	30	40	1.0	0.25	5	90	40
IN456A	25	30	100	1.0	0.25	5	200	50
IN457	60	70	20	1.0	0.25	5	75	32
IN457A	60	70	100	1.0	0.25	5	200	50
IN458	125	150	7	1.0	0.25	5	55	23
IN458A	125	150	100	1.0	0.25	5	200	50
IN459	175	200	3	1.0	0.25	5	40	15
IN459A	175	200	100	1.0	0.25	5	200	50
IN461	25	30	15	1.0	.50	30	60	25
IN461A	25	30	100	1.0	.50	30	200	50
IN462	60	70	5	1.0	.50	30	50	22
IN462A	60	70	100	1.0	.50	30	200	50
IN463	175	200	1	1.0	.50	30	30	13
IN463A	175	200	100	1.0	.50	30	200	50
IN464	125	150	3	1.0	.50	30	40	16
IN464A	125	150	100	1.0	.50	30	200	50
IN482	30	40	100	1.1	.25	30	100	25
IN482A	30	40	100	1.0	0.25	15	200	50
IN482B	30	40	100	1.0	0.25	5	200	50
IN483	60	80	100	1.1	.25	30	100	25
IN483A	60	80	100	1.0	0.25	15	200	50
IN483B	60	80	100	1.0	0.25	5	200	50
IN484	125	150	100	1.1	.25	30	100	25
IN484A	125	150	100	1.0	0.25	15	200	50
IN484B	125	150	100	1.0	0.25	5	200	50
IN485	175	200	100	1.1	.25	30	100	25
IN485A	175	200	100	1.0	0.25	15	200	50
IN485B	175	200	100	1.0	0.25	5	200	50
IN486	225	250	100	1.1	.25	50	100	25
IN486A	225	250	100	1.0	0.25	25	200	50
IN487	300	330	100	1.1	.25	50	100	25
IN487A	300	330	100	1.0	0.25	25	200	50
IN488	380	420	100	1.1	.25	50	100	25
IN488A	380	420	100	1.0	0.25	25	200	50

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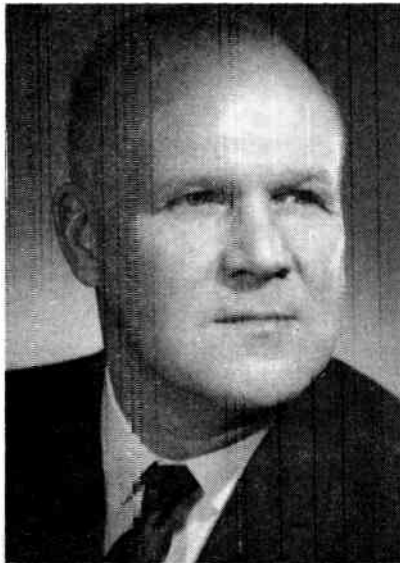
CANADIAN GENERAL ELECTRIC COMPANY LIMITED

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

ELECTRONICS AND COMMUNICATIONS, May, 1960

13

industry personnel



George Knapp

George Knapp aids AEL sales

The appointment of **George Knapp**, as assistant sales manager (industrial) of Aviation Electric Limited, was recently announced by Durham Garbutt, sales and service manager of the company.

Mr. Knapp who, for the past two years, has been responsible for the growth of the company's activities in the industrial field, will continue to co-ordinate all industrial sales activities, giving special attention to automatic control systems.

G. L. Mansour in RCA Victor post

George L. Mansour, until recently vice-president and general manager of RCA Victor's Record Division, has been appointed to a newly-made position with the company. According to the president, John D. Houlding, who made the announcement, Mr. Mansour is now vice-president, Consumer Products.

In his new appointment Mr. Mansour will assume full responsibility for all consumer product activities, from products development through to marketing, manufacturing and distribution.

Burroughs Adding Machines' appointments

M. L. Peterson, veteran business machines serviceman, has been appointed service engineering manager for Burroughs Adding Machine Company of Canada, Limited, according to J. L. Rapmund, general manager.



George L. Mansour

Mr. Peterson succeeds J. C. Chadwick, who has been named service manager of Burroughs' Toronto office.

In addition to Toronto, Burroughs maintains sales and service offices across Canada from Halifax to Vancouver.

Senior appointments by Burndy

Four new senior sales appointments in line with the company's policy of improving customer service, and linked with their current expansion program, have been announced by Guy Vandry, general sales manager of Burndy Canada Limited.

Appointed to head office in Toronto as chief sales engineer is **R. H. Davies**, who has been with Burndy for over ten years and was, until recently, industrial market manager.

John I. Croucher becomes eastern district manager, located at Montreal, and responsible for sales in Eastern Ontario, the Province of Quebec and the Maritimes. He was previously eleven years with Northern Electric and joined Burndy two years ago.

Appointed to Burndy's Calgary office as Alberta district sales manager, is **R. W. Holliday**. Mr. Holliday is a member of the Association of Professional Engineers of Ontario and has been with Burndy eight years, most recently as utility market manager.

E. R. Friars is appointed sales representative for the Maritimes and Newfoundland, located at Halifax. Mr. Friars is a native of New Brunswick and has been in the electrical industry for thirteen years.

Philips Electronics names Projects Section head

A. P. H. Barclay, general manager (Engineering and Manufacturing), Professional Equipment Division, Philips Electronics Industries Ltd. has announced the appointment of **Roy L. Adams** as head of the Projects Section of the Engineering Department of this division. This section consolidates activities associated with the translation of customers' new requirements into technical proposals and specifications. Its activities encompass the company's communications, industrial and specialty electronics, equipment and capabilities.

Mr. Adams has a background of research, development and production experience, with governmental and industrial organizations, which equips him well to co-ordinate this task. He is an electrical engineering graduate from the University of Toronto and a member of the Ontario Association of Professional Engineers, the Institute of Radio Engineers, and the Canadian Aeronautical Institute.



R. H. Davies



J. I. Croucher



R. W. Holliday



E. R. Friars



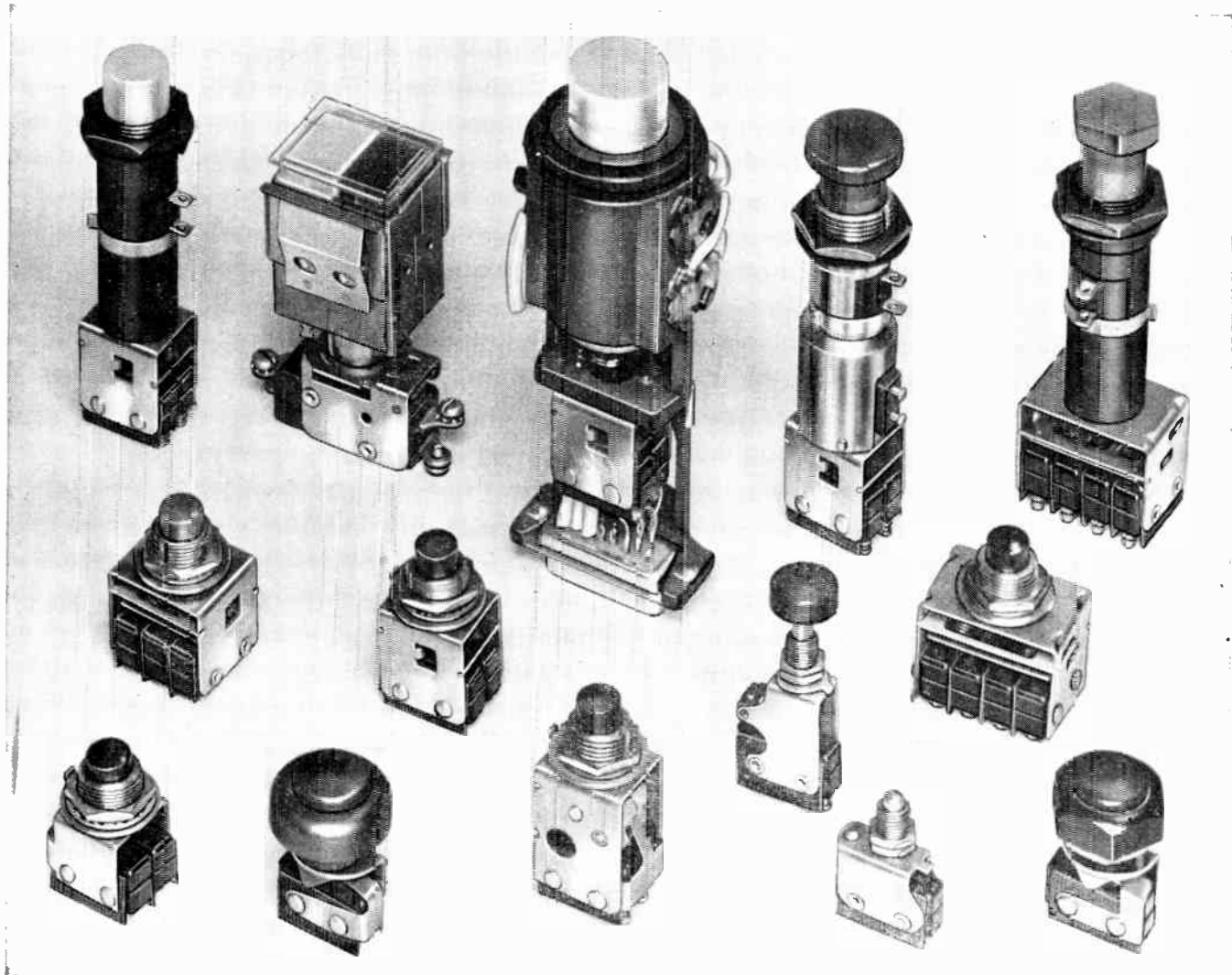
R. L. Adams



M. L. Peterson



MICRO SWITCH Precision Switches



Need pushbutton switches?

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These assemblies are typical of many different series of MICRO SWITCH pushbutton switches. Each series offers many variations of electrical and operating characteristics.

Operational characteristics include: momentary action, lock-down, alternate action, two-position alternate action, and magnetically held. Direct control of up to fourteen double-throw circuits is offered. Short and long button strokes can be provided. Sealed switches are available when protection is required from oil, water, sand, or salt spray. Special shock and vibration-resistant features are built into switches for

rugged duty service. Switches with illuminated pushbutton display are available. These include switch devices with interchangeable modular indicator and pushbutton units.

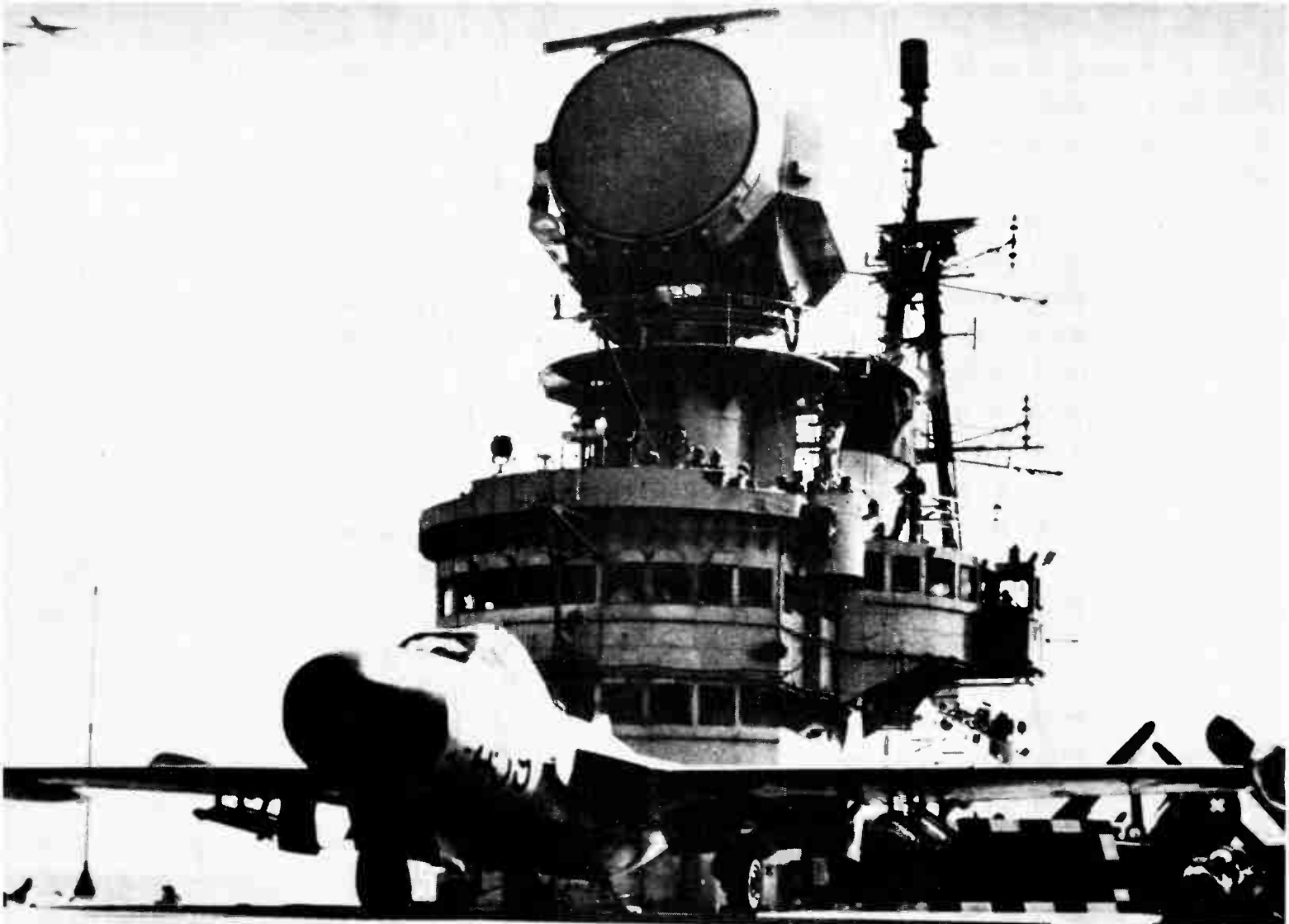
Experienced engineering assistance to help you select the pushbutton switch best suited to your requirements is as near as your nearest Honeywell office. Or write Honeywell Controls Limited, *Precision Components Division*, Toronto 17, Ont.



Honeywell

MICRO SWITCH Precision Switches

For complete details check No. 21 on handy card, page 47



A Sea Venom about to be catapulted from the deck of the Victorious, British aircraft carrier with the most efficient shipborne radar complex (3-Dimensional Radar) in the world.

RESEARCH

Current microwave techniques in the United Kingdom

by David Simpson A.M.I.E.E.* and G. T. J. Summer B.Sc.**

The microwave region is that part of the electromagnetic spectrum lying between radio waves and infra-red radiation. The frequency range is from about 1,000 to 100,000 Mc/s with corresponding free-space wavelengths of 30 cm to 3 mm. The region, however, is by no means sharply defined and is better characterized by the particular engineering techniques used. These techniques are due to the wavelength being of the same order of size as normal components and consequently are quite different from those used at lower frequencies, being somewhat akin to those used in optics.

Microwaves, unlike lower frequency radio waves, are not reflected or refracted by the ionised layers surrounding the earth but, like light rays, tend to travel in straight lines. These differences account for the

lack of attention paid to the microwave region until comparatively recent times, though the use, and particularly the theory, of microwaves is by no means modern.

The fundamental mathematical work of Scottish-born Clark Maxwell and later the Englishman Oliver Heaviside provided a theoretical basis for the numerous experiments which followed those of Hertz in 1888. It is not generally realized that devices such as horn radiators, parabolic reflectors, quarter and half-wave-length plates, artificial dielectrics, dielectric lenses and waveguides had been investigated at wavelengths down to 0.5 mm prior to 1900. In that year Marconi showed that the lower frequencies were more suitable for long-

*Manager, Electronics Division, Microcell Ltd., London, England.
**Microcell Microwave Research Unit, London, England.

The role of basic research has always been recognized in Britain and the spirit of free enquiry flourishes in the universities and government establishments

distance communication, and interest in microwaves consequently waned.

Radar Gave Lead

Sir Robert Watson Watt's experiments in radio-location (later termed radar) revived interest in the UHF (ultra high frequency) and microwave regions because of the greater aerial focussing ability and object discrimination. The famous work by Douglas Hartree of Cambridge and others on the magnetron and the intensive research carried out in Britain revived interest in microwave theory and techniques.

The second world war brought an urgent need for better, more accurate and higher powered radar, and a pool of British, American and other Allied scientists was established at the Massachusetts Institute of Technology Radiation Laboratories in the United States to design and develop suitable equipment. The consequent progress in microwave technology was immense and by 1945 microwave engineering had been established as a separate branch of technology.

Since then interest in microwaves has been diversified and increased by the requirements for advanced radar aircraft navigation systems, for wideband communication equipment, by the possibility of the use of microwave spectrometry and for examining the structure of matter and of slow waves at microwave frequencies for accelerating charged atomic particles. There has been steady progress made in all branches of microwave technology, and this field of knowledge is now very large. It is the purpose of this article to describe briefly some of the research that is now being done and the equipment that has been developed and is available in Britain.

Current research

The role of basic research has always been recognized in Britain, and the spirit of free inquiry flourishes in the Universities and Ministry Establishments. Financial support for this type of research is now being greatly increased under the auspices of the Department of Scientific and Industrial Research, and the record of achievements in solving outstanding problems is high.

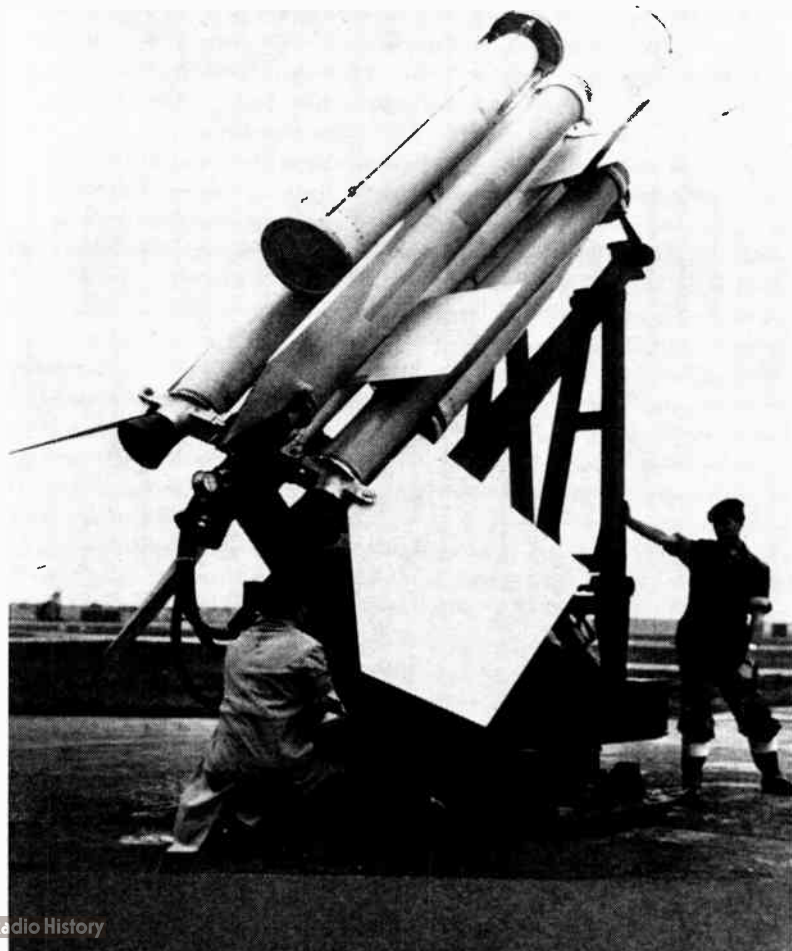
To make use of microwave energy, it is necessary to generate, amplify and detect waves of the required frequency. The reflex klystron and the magnetron developed during the war have given way to the travelling wave tube and the multi-cavity klystron as low and high power oscillators. The "Maser" and parametric amplifier or "Mavar" have been developed for amplification of low level signals, such as those from radio sources in outer space. "Masers" (Microwave Amplification by Stimulated Emission of Radiation) make use of the controlled paramagnetic resonance properties of certain substances to obtain amplification and require to be operated near absolute zero (minus 273 Centigrade). "Mavars" (Microwave Amplification

by Variation of Reactance) use a semi-conductor or ferrite material as a non-linear reactance to convert power from a pump source into the required frequency.

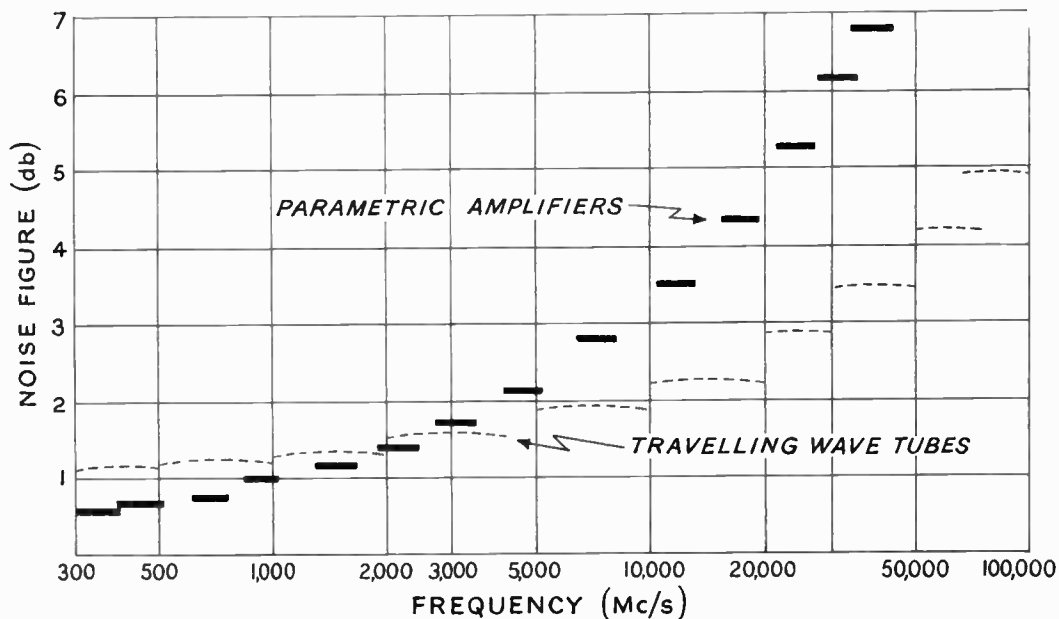
Satellite tracking

Early forms of these devices are already in use for radio-astronomy and satellite tracking and research continues to improve recovery times, stability and gain bandwidths and to produce small easily-handled units. A special type of backward wave oscillator, the carcinotron, invented in France, has been developed as a wideband tuneable coherent source for frequencies up to 10,000 Mc/s. The multi-cavity klystron capable of producing final pulse powers up to 40 megawatts at microwave frequencies is being actively developed for use in long-range radar and scatter propagation systems and for accelerating particles for nuclear research.

The generation of microwaves at the upper frequency limit of the band (wavelength about 1 millimeter) is a fascinating field of research and the Services Electronic Research Laboratories, in co-operation with several industrial firms, have given a world lead in engineering



A British "Bloodhound" surface-to-air guided weapon which used a highly successful ground-based mobile illuminating radar, regarded as one of the most advanced in the world.



This graph shows the estimated noise figure performance of parametric amplifiers and travelling wave tubes. The bandwidths indicated represent tunable bandwidths. The figure shows the expected supremacy of travelling wave tubes at frequencies above "S" band. This is due to a new technique for reducing shot noise by causing the electron beams in travelling wave tubes to be accelerated by a very small potential gradient in the vicinity of the cathode.

oscillators and harmonic generators to operate in this region.

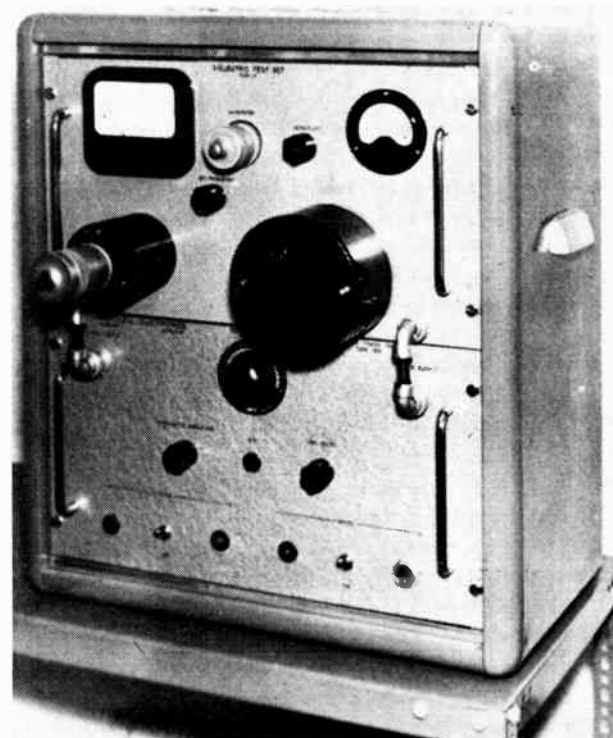
The interaction of microwave radiation with dielectric materials almost forms a branch of technology in its own right. The use of lenses and microwave transparent aerial covers (radomes), the need for reducing waveguide sizes, and the introduction of printed circuit transmission lines have all led to an intensified study

of material properties at microwave frequencies. The special problems posed by high-speed flight and missile re-entry, where temperatures of several hundred degrees Centigrade can be registered on the radome, call for the use of advanced materials such as ceramics, and the related problems in measurement techniques have led to an intensive research and development effort.

A view of the famous Jodrell Bank (Cheshire, England) radio-telescope from the desk at which the controller sits.



A Microcell dielectric test set for measurement of dielectric constant and loss tangent up to 600 degrees Centigrade. The set is made by Microcell Limited, 9 Kingsway, London, W.C. 2, England.





Millimetric waveguide research at the Post Office Research Station, London, England. The low-loss propagation of microwaves in cylindrical tubes over long distances has an enormous potential field of application in telecommunication.

Telecommunication potential

A development with an enormous potential field of application in telecommunications, is the low loss propagation of microwaves in cylindrical tubes over long distances, which has been investigated at University College, London, under the direction of Professor H. E. M. Barlow. Such a system is capable of handling several thousand channels simultaneously in a tube about two inches in diameter for distances over several hundreds of miles. Practical systems are now being developed by Britain's General Post Office and the transmission of the television programs may be one of the first applications.

Long range, very wide band communications free from seasonal and spasmodic interruptions are coming close to reality with the development of tropospheric scatter systems. In this process microwave frequencies are transmitted beyond the visible horizon by reflection and scattering at atmospheric turbulence centers. Dr. E. G. S. Megaw, at the Admiralty Surface Weapons Establishment (A.S.W.E.) carried out pioneer experiments in 1950 in this field, and since that time extensive research and development have led to the practical use of several forward scatter installations.

The development of the group of materials termed "ferrites" led to the design of many new microwave devices such as isolators and gyrators. The special properties of ferrites controllable by a magnetic field give rise to non-reciprocal attenuation or phase shift of a wave. Ferrite duplexers and modulators are now in use on microwave radar and test equipment. Ferrite rods and plates are now also used as radiating elements with entirely electronic scanning. This could have great significance for airborne radars if high power ferrites can be developed.

Some applications

The results of research and development in the Universities and Ministry Establishments are freely and quickly communicated to industry, and practical systems and devices are evolved by the company concerned either with Ministry support or as a private venture. Many of the advanced systems are subject to secrecy regulations and cannot be described, but some of the non-classified developments are reviewed.

Britain has always played a leading part in the

design of radar equipment. A recent North Atlantic Treaty Organization (NATO) exercise showed the superiority of the 3-Dimensional radar in the aircraft carrier Victorious. Developed by the Admiralty Surface Weapons Establishment, the system is the most effective ship-borne radar complex in the world. The set uses a fully stabilized microwave lens aerial with multiple feeds. A semi-automatic data processing system provides intercept information to the fighter aircraft.

The Bristol/Ferranti Bloodhound weapon system uses another highly successful and advanced ground-based mobile illuminating radar in its semi-active homing function. This radar is made by the Associated Electrical Industries group to Royal Radar Establishment designs and is regarded as one of the most advanced in the world. More powerful ground-based radars are at present being developed. The NATO European radar net is being equipped with Marconi radars which make full use of the latest constructional techniques.

High-speed interception

In airborne radars, the "Airpass" system manufactured by Ferranti Ltd., for the English Electric P1 1,500 miles per hour interceptor serves as an example of a high-precision integrated radar with radome, microwave circuitry and data computer ensuring accurate and reliable enemy interception at high speed.

Microwave links for communication, television, and so on, are now well-established, the first in the United Kingdom operating as early as 1931. Several unique systems using combinations of travelling wave tube amplifiers, time division multiplex and high-gain reflector-fed arrays are in regular use for radar repeaters, television and government communications.

"Q" band (8 mm wavelength) high-definition radar is being used for airport and harbor control. A novel application is the use by British Railways of a "Q" band radar set in an automatic marshalling yard system at Crewe. The high definition and the careful elimination of ground returns enables computer control by one man operating from a control desk even in thick fog. A British patented system is also under development for a collision-proof fog warning device for locomotives based on a guided wave concept.

Continued on page 42



A tiny half-inch-square crystal of synthetic ruby is key to the revolutionary "ruby maser" amplifier which can pick up signals from distant stars or space vehicles millions of miles away.

Pound-for-pound the "ruby maser" is described as the most sensitive listening device in the history of science.

DEVELOPMENT

Ruby maser amplifier extends range of electronic systems tenfold

by Dr. Theodore H. Maiman* and Col. Harold McD. Brown**

The existence of an "electronic ear", described as pound-for-pound the most sensitive listening device in the history of science and keen enough to pick up the faint radio signals from interplanetary rockets millions of miles in outer space, has been revealed by the U.S. Army and Hughes Aircraft Company.

The super-detector is a 25-pound "ruby maser" amplifier, which was developed by Hughes for the U.S. Army Signal Research and Development Laboratories at Fort Monmouth, N.J., where it is being used experimentally.

The new device, the smallest and easiest-to-operate detector of its kind, could extend by tenfold the range of many electronic systems and also could provide the sensitivity needed to:

1. Detect radio "beeps" from space vehicles millions of miles away, making it possible to communicate with satellites or track space-probe missiles at far greater distances than ever before.
2. Enable military defense systems using long-range high-angle radars to detect intercontinental

ballistics missiles (ICBMs) far earlier than they can now.

3. Pick up signals from distant stars (radio astronomy).
4. Eventually facilitate communication between space vehicles.

What 'Maser' means

The ruby maser derives its name from a synthetic ruby gem which is the "heart" of the device, and from the first letters of Microwave Amplification by Stimulated Emission of Radiation. The maser and the receiver (exclusive of antenna) are housed in a standard cabinet the size of a television console.

In operation, the ruby is cooled to a temperature of 452 degrees below zero F — about as cold as any object in the universe can become. At this temperature the jewel detects and amplifies almost unbelievably faint radio signals in the important high frequency range of microwaves.

*Hughes Aircraft Company.

**U.S. Army Signal Research & Development Laboratories.

The ultra-cold temperature, maintained by liquid helium, makes the atoms and electrons in the ruby move in slow motion, cutting the "noisy" natural collisions of the atomic particles to a minimum. The result is an almost static-free signal booster. Conventional amplifiers using hot radio tubes or room-temperature transistors create a great deal of their own radio noise which often overrides faint signals. This is the hissing, rumbling background noise heard, for instance, when a home radio strains to pick up a weak station.

The Hughes ruby maser and its microwave receiver were developed for use by an army in the field and together constitute the first complete package of its kind delivered for that purpose.

The new maser may be the forerunner of masers that will be completely portable and can be operated in combat.

Earlier masers are large laboratory models requiring

a large vacuum pump and a magnet weighing up to 500 pounds and costing more than \$4,000. The Signal Corps' maser does the same job with no pump at all and uses a 12-ounce magnet costing about \$10. It is smaller, lighter and cheaper than other masers.

No noise is good noise

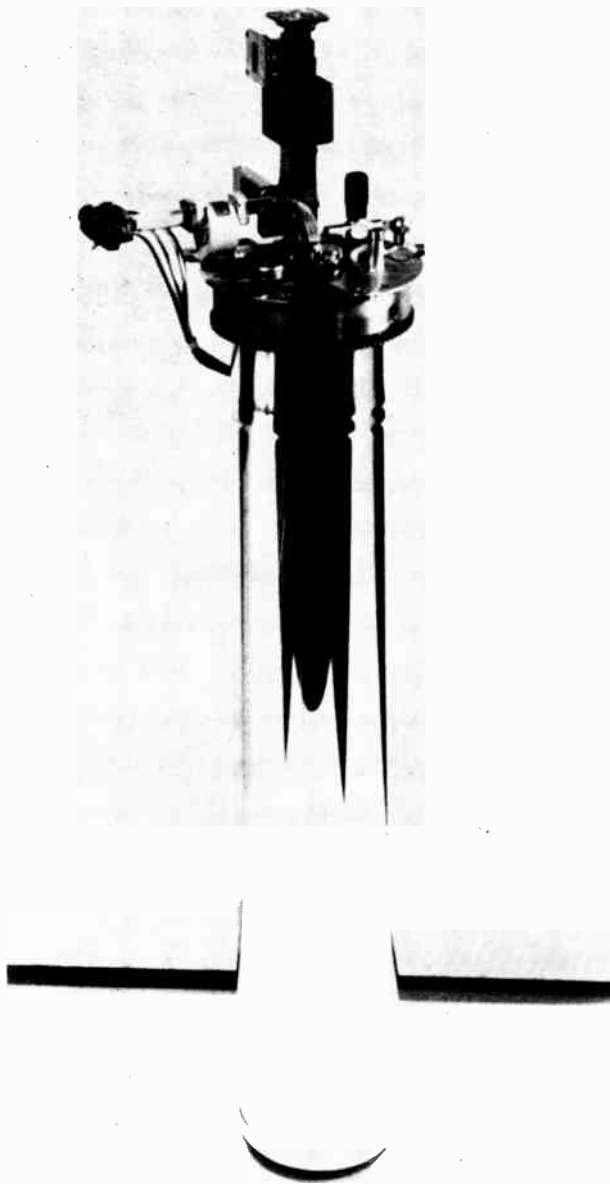
Devices such as vacuum tubes suffer from a "noisy" process stemming from fluctuations in the flow of electrons, often resulting in degradation of an input signal until it is obscured. The ruby maser's great sensitivity is gained by using the paramagnetic properties of the drastically-cooled ruby instead of a flow of electrons as used in vacuum tubes and transistors. It generates almost no "noise" and therefore can detect very weak signals, such as those from outer space.

The maser is successful not so much for what it does as for what it does not do. In the same sense that a good hi-fi set does not distort music, the ruby maser does not add noise to obscure a signal. It is an extremely-low-noise amplifier with extreme fidelity.

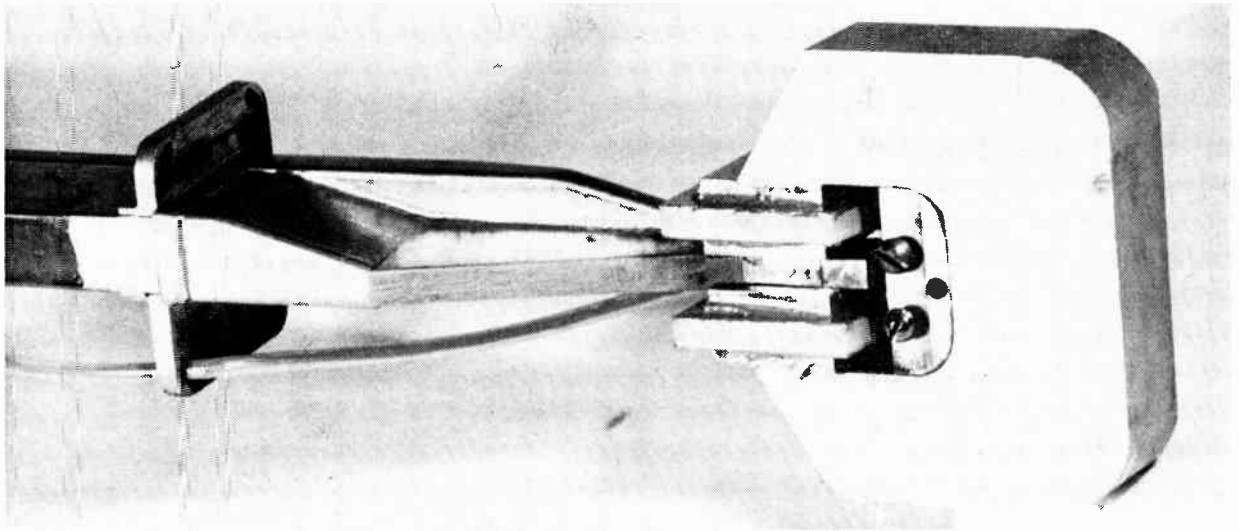
The new maser was built at Hughes in co-operation with the Atomic Resonance Devices Section of the Fort Monmouth laboratory.

Development background

Under the sponsorship of a Signal Corps research and development contract and also a separate fabrication contract, an X-band solid-state maser amplifier was developed and fabricated by Hughes Aircraft Company. The effort under the contract was directed toward obtaining the maximum gain-bandwidth product and toward making the amplifier as stable and compact as possible.



Shown at left above is the complete "ruby maser" weighing only 25 pounds and measuring 30 inches high and five inches in diameter. At right is the Hughes Aircraft Company's maser microwave circuits with an integrated permanent magnet (at bottom). In the foreground is the double coolant container into which the unit is installed to supercool the ruby crystal to a few degrees above absolute zero.



Key to high performance of the revolutionary "ruby maser" lies in a six-inch area containing a gold-plated copper transition section, a half-inch square ruby crystal and a 12-ounce magnet. The magnet, at right, "tunes" the ruby so that it will operate at the correct frequency, which is determined by the strength of the magnetic field, and the angle between the crystal axis and the direction of the magnetic field. Darker section at left is the waveguide. The entire section is installed in a double-glass vacuum filled with liquid helium and nitrogen to supercool the ruby to a few degrees above absolute zero.

Achievement of substantial miniaturization in maser design is reflected in the overall weight and size which are 25 pounds and $\frac{1}{3}$ cubic foot respectively. This is to be compared with some several hundred pounds for a maser of more conventional design.

The gain-bandwidth product of this amplifier is 105 Mc when operating at the temperature of liquid helium (4.2° K) and as such is the highest value which has been reported for a cavity type maser.

This amplifier was incorporated into a complete microwave receiver and delivered to the Signal Corps. It is the first mobile field maser to be constructed.

The paramagnetic crystal employed in the amplifier is synthetic ruby having about 0.1 per cent chromium concentration. Basically, high performance, reliability and miniaturization all are achieved by the use of a "ruby cavity".

The maser cavity is formed from a solid block of ruby cut to the correct dimensions and coated with silver. With this technique the paramagnetic properties of the ruby are fully utilized making possible the large gain-bandwidth product. Since the dielectric constant of ruby is large ($\Sigma 710$), the cavity dimensions are quite small (approximately 0.28 by 0.28 by 0.14 inch).

Substantial advantage of these small cavity dimensions was taken; instead of an external magnet weighing several hundred pounds, a small permanent magnet weighing only 12 ounces was used and was attached to the inside of the helium dewar. The crystal axis was correctly oriented by rotating the dewar with respect to the cavity and waveguide, which was kept fixed.

Coupling to the cavity was accomplished by the use of a waveguide transition having dimensions that gradually tapered from those of standard X-band waveguide to the dimensions of the cavity. The transition contained a piece of clear sapphire to keep the waveguide above cutoff, and coupling from the transition section to the cavity was effected through an iris window (a hole in the cavity silver coating). K-band pumping power was similarly coupled through a taper transition to a perpendicular face of the cavity.

Increased reliability is obtained with the solid cavity design because it eliminates liquid helium

bubbling problems and difficulties due to mechanical positioning of a small crystal in a large cavity.

History of Masers

The "maser" principle was invented in 1955 by Professor Charles H. Townes at Columbia University. He coined this acronym which stands for "Microwave Amplification by Stimulated Emission of Radiation."

The first maser (built by Townes and co-workers) used a beam of ammonia molecules as the active medium. This beam type of maser is very useful as a precise frequency and time standard; however, it is not very practical for amplification purposes — it is not tunable and has an extremely narrow bandwidth.

The basic principles for a solid-state type of maser were outlined in 1956 by Professor Bloembergen at Harvard University. Several months after the Bloembergen proposal, workers at Bell Labs were successful in constructing a solid-state maser and shortly thereafter Hughes also made a solid state maser. These two masers used a single crystal of the compound gadolinium ethyl sulphate (one of the materials suggested by Bloembergen in his proposal).

Masers as a class make use of the energy levels of atoms or molecules and are inherently extremely "low noise" devices. Because of this fact considerable interest was stirred when the solid-state maser came on the scene and several laboratories started research and development programs in this area.

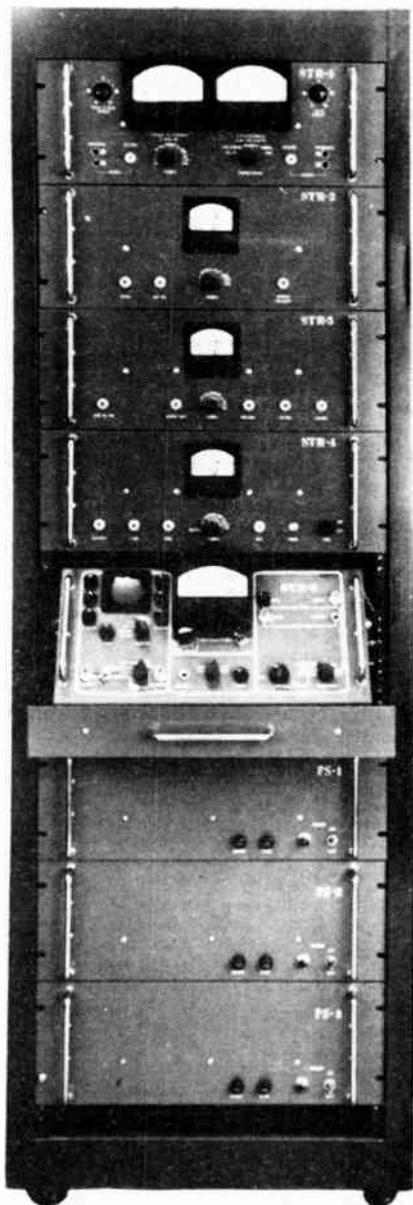
Although many different companies have since made solid-state masers, these have all been large laboratory models and, in fact, it was felt that a fundamental limitation and serious drawback of the solid-state maser was the requirement for a large magnet. This difficulty has been overcome in the Hughes-packaged maser.

Several materials have been demonstrated to operate in solid-state masers; however, the most useful to date has been the gem ruby. Ruby is a single crystal of aluminum oxide having a small amount of chromium as an impurity. The chromium is responsible for the maser properties (as well as the red color) of this stone. Ruby is made synthetically by the Linde Company and is marketed for only five cents per carat. This synthetic gem is used in the Hughes maser.

Stereo manufacturers prepare to meet top quality equipment requirements

Promising market potential for stereo receivers

by T. W. Lazenby, Editor



General view of the Kahn All AM stereo broadcast console.

Stereophonic broadcasts are now becoming available to music lovers in Canada's most thickly populated areas and already stereo enthusiasts in the Montreal area can tune in to Station CJAD, which is currently broadcasting stereophonic programs.

The system recently acquired by CJAD from the Kahn Research Laboratories is an a-m a-m installation that is capable of broadcasting stereo programs to listeners with two a-m receivers. In order to obtain the stereo effect, however, listeners must tune their receivers partially off frequency. There is no noticeable loss of broadcast quality for those who use only one receiver.

Approval for CJAD's stereo broadcasting has recently been granted by the Department of Transport on an experimental basis and plans of the station call for one half-hour of stereo broadcasting during the day and one and one-half hours during the evening.

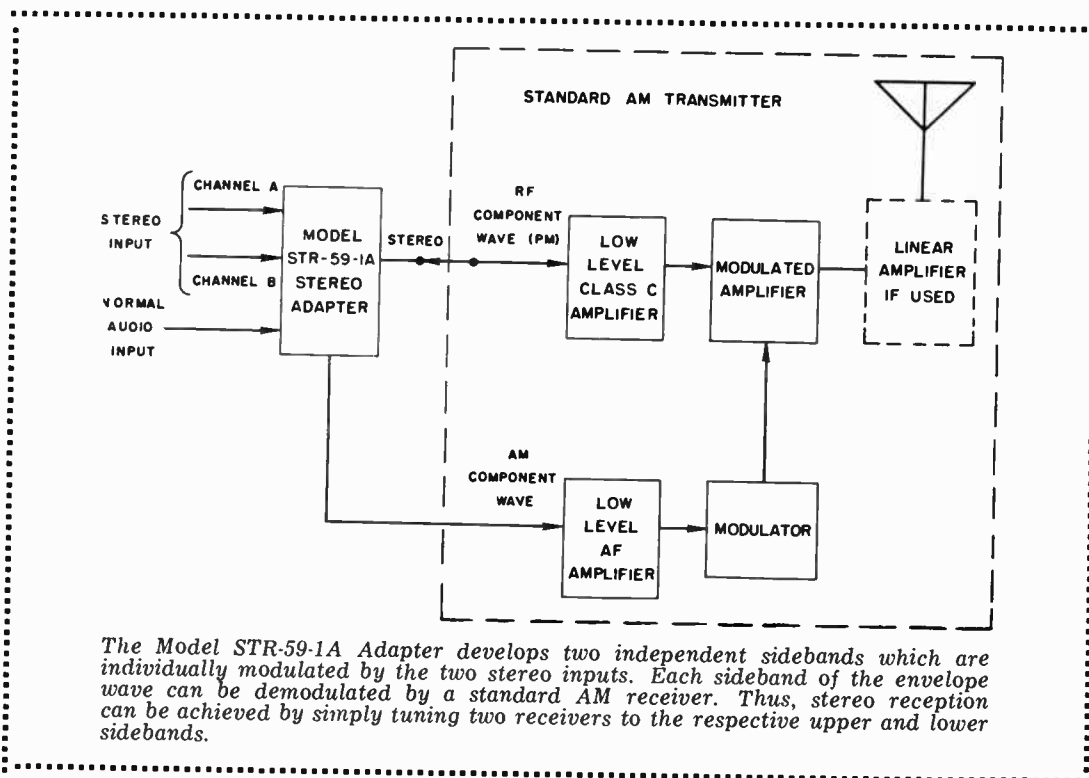
The stereo installation at Montreal's CJAD is reported to have aroused interest in other Canadian stations and the Canadian Broadcasting Corporation, who are also currently broadcasting one stereo program per week.

With interest sifting through Canadian commercial stations on the subject of stereo broadcasting, the following observations of stereo equipment manufacturers with respect to the specifications that must be met by stereo equipment in order to make it acceptable to the broadcaster, the public and the regulatory bodies are considered to be of topical interest.

Stereo systems must be compatible with existing receivers. That is, all a-m receivers now in the hands of the general public should be able to continue to monophonically receive the new type of signal without distortion or other forms of degradation. The program, when received with existing sets, should be well balanced and all instruments should be heard so that the musical arrangement is not altered.

The new stereophonic signal should not require any increase in allocated spectrum space. This requirement is extremely important because many a-m broadcasters are now suffering from severe co-channel and adjacent channel interference problems, and certainly any system that materially increases the bandwidth of the signal would not be acceptable.

Special receivers for stereophonic reception should be simple and relatively inexpensive. It is apparent that once standards have been formulated, a very large market for such receivers will be established. The cost and complexity of these home receivers must be minimized so as to insure widespread public acceptance of stereophonic broadcasting.



In order to assure success of the new stereophonic system, there is an additional specification. This specification would be that the signal must permit the listener to stereophonically receive the new signal with two conventional broadcast receivers.

Advantage to manufacturers

The possibility of stereophonic reception with conventional receivers will be advantageous to radio receiver manufacturers as well as broadcasters. It has been dramatically demonstrated in the past that the introduction of new broadcasting techniques may present "chicken and egg" type problems. It is apparent that few broadcasters will be willing to transmit stereophonically unless an appreciable percentage of their listeners could immediately avail themselves of stereo reception. Conversely, the public, except for a limited number of technically inclined people or fadists, will not purchase stereo equipment until one or a number of broadcasters are regularly transmitting stereo programs. This problem can greatly delay widespread acceptance of stereophonic transmission. However, if the public can use existing home radio sets for stereo reception, the broadcaster will have reason for broadcasting stereophonically and the "chicken and egg" problem will be solved. Once transmission standards are established, special stereo single dial receivers will have a large market.

Laboratory tests and "on the air tests" have shown that stereo systems can satisfy all these requirements.

At the present time Kahn Research Laboratories, Inc. are transmitting one stereo channel on one sideband and the other stereo channel on the remaining sideband. In this fashion, the monophonic listener may tune to the carrier and receive a proper blend of both channels. Actual measurements indicate that approximately one-half per cent distortion would be introduced by this system.

For stereo reception, all that is required is two conventional a-m sets. They would be spaced physically by some six or eight feet and one would be tuned approximately 3 kc above the carrier and the other approximately 3 kc below the carrier. Tuning is not difficult and wide variations in the amount of detuning is acceptable. Of course, improved performance can be achieved by use of special receivers wherein two IF stages would be detuned precisely at the factory and, therefore, only a single tuning adjustment need be made.

Detailed measurements have been made on the spectrum of this new stereo system and it is almost identical to standard a-m transmission. This, of course, is very important when one recognizes the interference problem existing today on the a-m band. The spectrum is not only restricted to approximately ± 10 kc but it tapers down so that the high frequency components are relatively weak. This is important when one carefully examines the limited selectivity characteristics of conventional broadcast receivers and the severe adjacent channel problems faced by the broadcasters.

Electronic exports from the United States to Canada during the year 1958 amounted to nearly 64 million dollars. During the same period exports from England to Canada amounted to 7 million dollars.

The blip scan machine

A device for simulating the blip effect in air surveillance radar

by Gerald O. Hayman and Edmond R. Pelta*

The scintillation of a target, when observed on a radar screen, is a phenomenon familiar to the radar operator. This scintillation is closely associated with the so-called blip-scan effect.

When a radar antenna scans an object, the number of returns received is generally not equal to the number of hits to which the object has been subjected. In the case of high-powered air surveillance radars, this phenomenon is largely responsible for the apparent difference in brightness of different objects.¹

Similarly, it is known that the blip is not produced every time the object is scanned by the radar antenna. The ratio of the number of times the object is seen to the number of times it is scanned by the antenna is known as the blip-scan ratio. It is expressed as a percentage.

The blip-scan ratio, measured in this way, is largely a function of the skill and alertness of the operator; it is therefore subject to considerable variation. It is generally accepted, however, that a relationship exists between blip scan-ratio and target cross-section, range, and radar power.²

For many studies relating to radar observer evaluation and training in a simulated environment, it is desirable to alter the blip-scan ratio in a controlled manner. To provide this capability, the System Development Corporation developed the blip-scan machine.

The blip-scan model

The blip-scan phenomena can be divided into two classes. The first class is the long-term effect that controls the appearance or disappearance of a target for one or more antenna scans. The second class is the short-term effect that causes individual radar pulses to produce or not produce returns.

For objects of average cross-section and range, the long-term blip-scan effect is mainly due to the variation of the reflecting area normal to the radar beam, and to a lesser extent to major weather features. When the target returns are fairly weak on a given scan, the probability of the appearance of the target is a function of the number of returns that are received above the noise. The short-term, or pulse-to-pulse, effects are determined almost entirely by random process such as receiver or atmospheric noise.

When the blip-scan situation is simulated on a radar PPI, both long- and short-term effects are required.

The device described in this paper is capable of inserting a blip-scan figure into the radar display. The short term pulse-to-pulse effects will have a pulse display ratio $N(0 < N < 1)$ that can be controlled independently of the long-term effect. The long-term effect determines whether the target is displayed with

* System Development Corporation, Santa Monica, Cal.

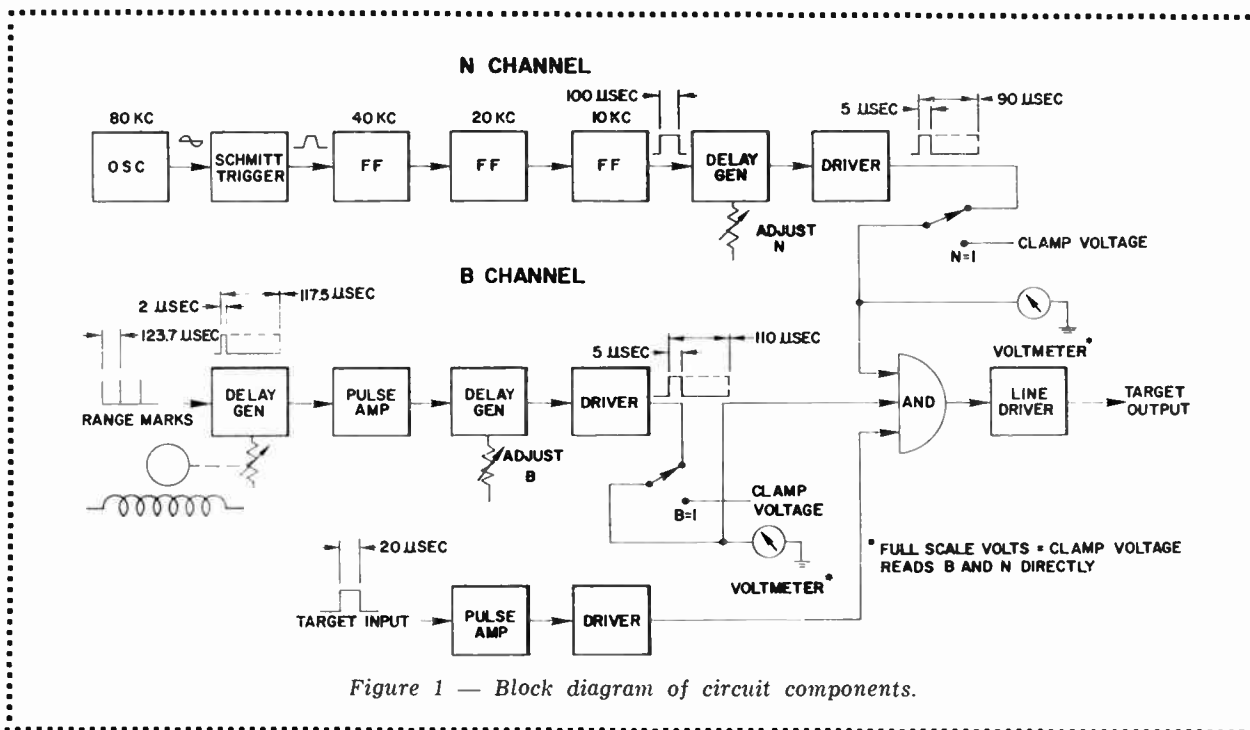
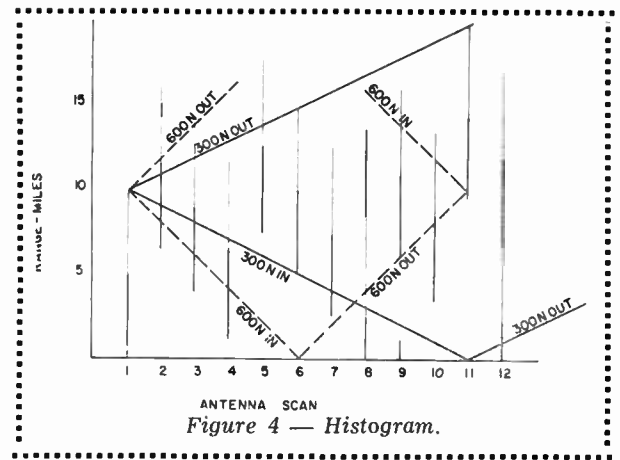
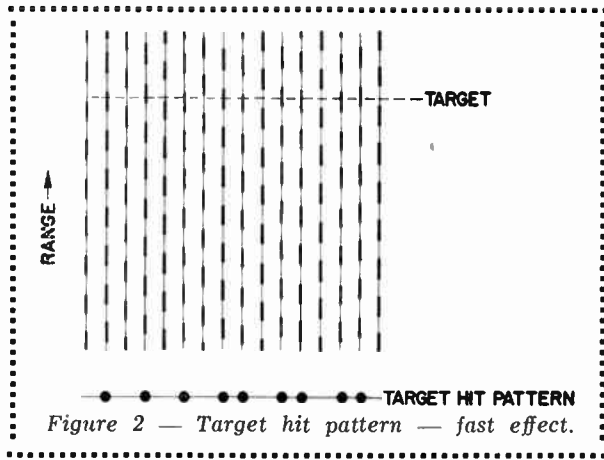


Figure 1 — Block diagram of circuit components.



a ratio N or is not displayed at all on a given scan.

The probability of a target being displayed with a ratio N for a given scan will be called B ; hence, the probability of a given target return being displayed is NB . If N is large enough so that a target is likely to be seen, the blip-scan ratio can be controlled entirely by B with N controlling the apparent intensity of the target returns.

The apparatus was designed to act on all displayed targets with the same over-all probability, although the instantaneous values of the probability function for targets at different points of the display will be independent.

The effect of range on the blip-scan ratio was neglected, since the first studies were conducted for radars with Csc^2 antennas, but the circuitry can be augmented to make the blip-scan ratio a simple function of range.

Implementation

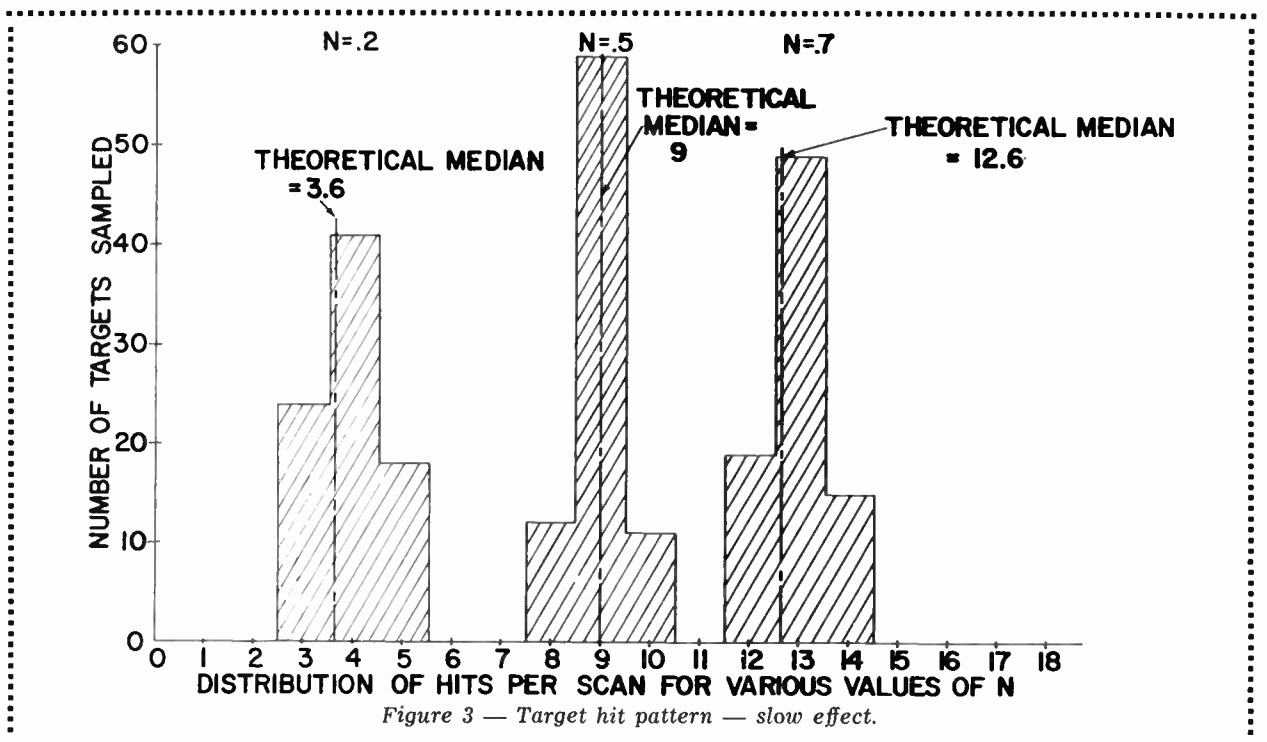
The block diagram in Figure 1 shows the circuit components used to simulate the effect of the blip-scan

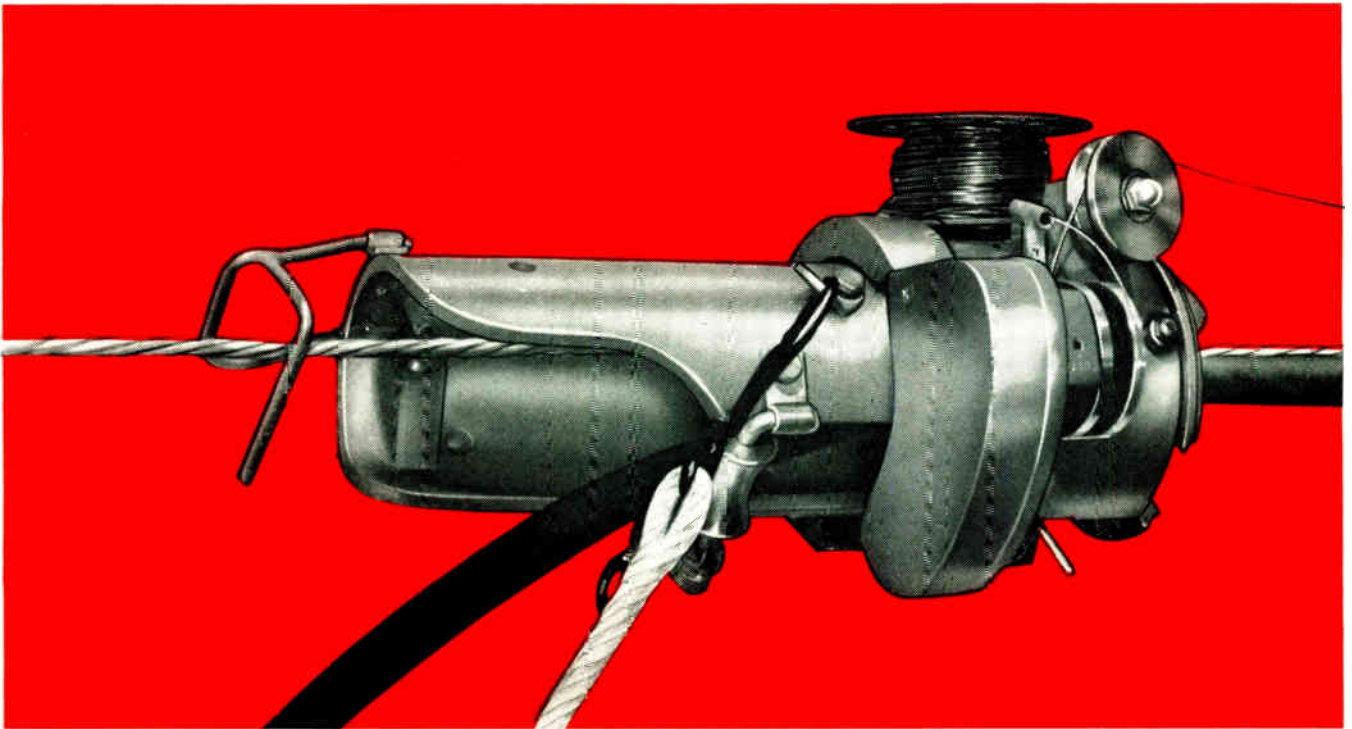
ratio N and B .

Two channels are used to develop the separate ratios. A $100\mu\text{sec}$ pulse is used for the basic timing source. These pulses are fed to a delay generator, which allows a gate to remain open for a period up to approximately $100\mu\text{sec}$ and corresponds to the ratio N .

The $100\mu\text{sec}$ gate period was chosen because it bears no harmonic relationship to the time between radar pulses for the radar being studied ($2748\mu\text{sec}$, typically). The blank areas for one scan will seldom recur at the same range for any significant number of scans. This effect is illustrated in Figure 2; the thin lines correspond to the areas where targets are inhibited and the wide lines correspond to the regions where targets are allowed to appear. The hit pattern that would result from such a situation is also illustrated. Here the gate period was drawn for $N = 0.5$ for 16 successive radar pulses. Note that approximately 50 per cent of the hits are present.

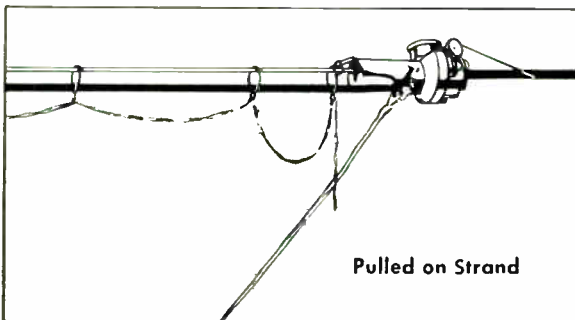
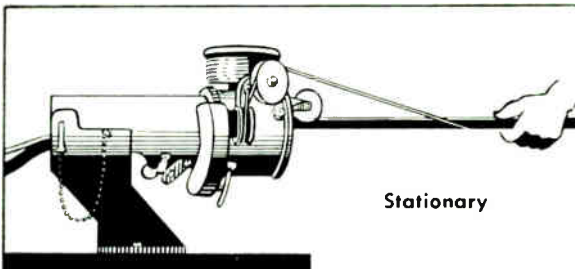
To demonstrate further the validity of the control N , 100 targets were sampled for $N = 0.2, 0.5,$ and 0.7
Continued on page 32





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ELECTRONICS AND COMMUNICATIONS, May, 1960

71A... a new family of light-route radio systems

by *Lenkurt*

The new Lenkurt 71A light-route radio equipment is available for operation in the 450 mc and 900 mc bands. It provides toll-quality transmission of up to thirty multiplexed voice channels over distances of up to 500 miles or ten tandem repeater sections. Greater channel capacity can be obtained over shorter distances.

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Transmitter power output and receiver noise alarms are provided including both local indication and facilities for connection to remote equipment.

Automatic transfer panels and combiners are available for applications requiring diversity operating standby, or hot standby systems. Service channel equipment including order-wire and supervisory units, is also available.

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±1.0 db, 3 to 150 kc, 0.2 db maximum variation in any 4 kc band in this range.

Total Noise and Distortion (*per average section*)

Less than 22 dbao in any 3 kc noncompandored channel, F1A weighted, for 24 channel loading.

Primary Power

115/230 volts a-c, 47 to 63 cps, 400 VA or 12, 24, 48 or 130 volt d-c battery.

Transmitter RF Power Output

20 watts nominal (+43 dbm).

Transmitter Frequency Stability

For a temperature range -30° to +50° C and supply voltage variations of ±10%:
±0.005% standard ±0.0005% optional

Deviation Ratio

0.7 (24 voice channels).

Receiver Noise Figure

9 db or less.

Receiver IF Bandwidth

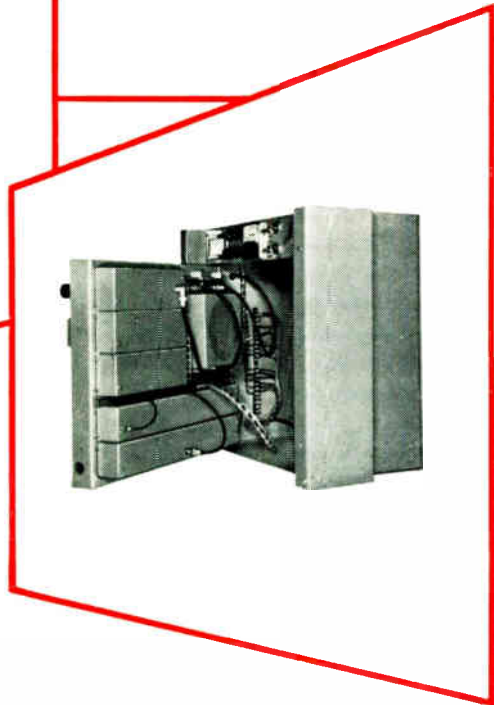
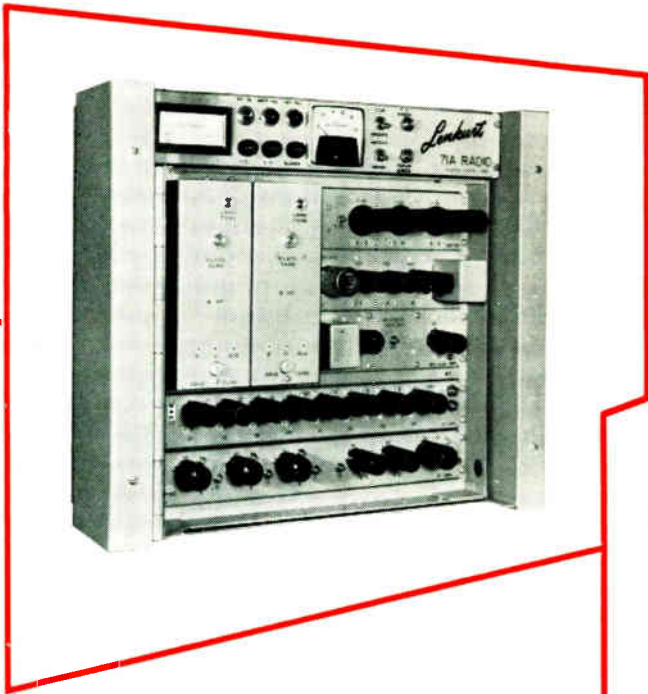
±0.5 mc (maximum) to 3 db points.

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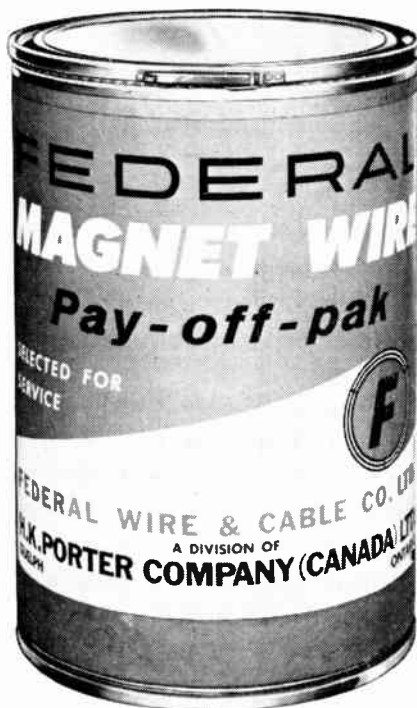
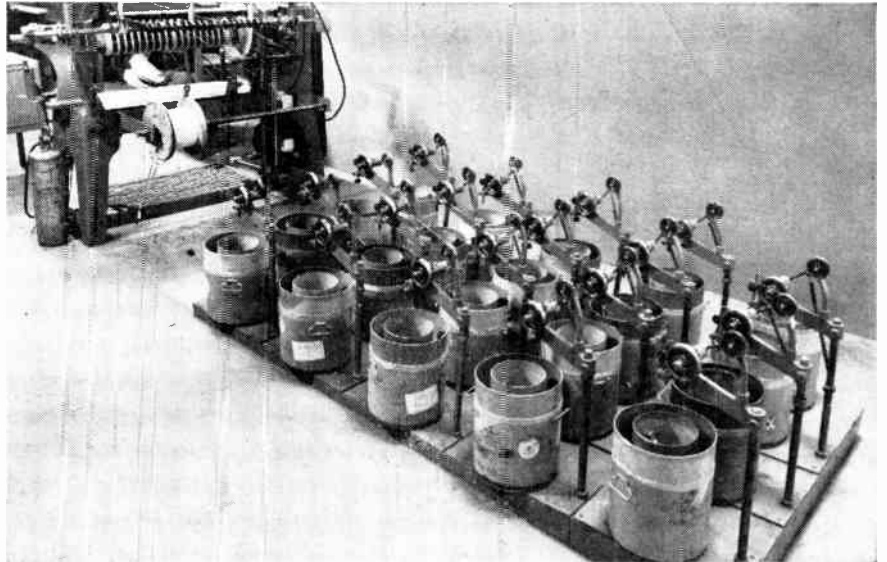
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ELECTRONICS AND COMMUNICATIONS, May, 1960

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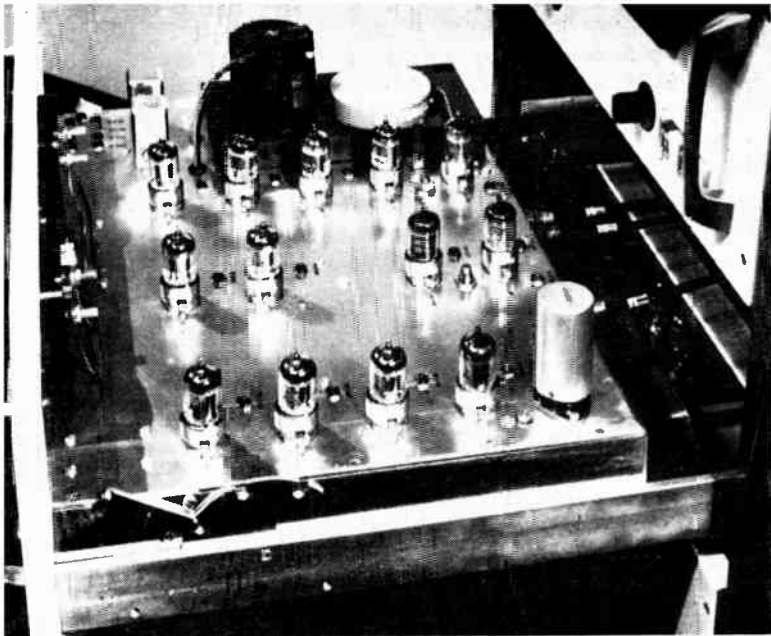


Figure 5 — Blip Scan chassis — top view.

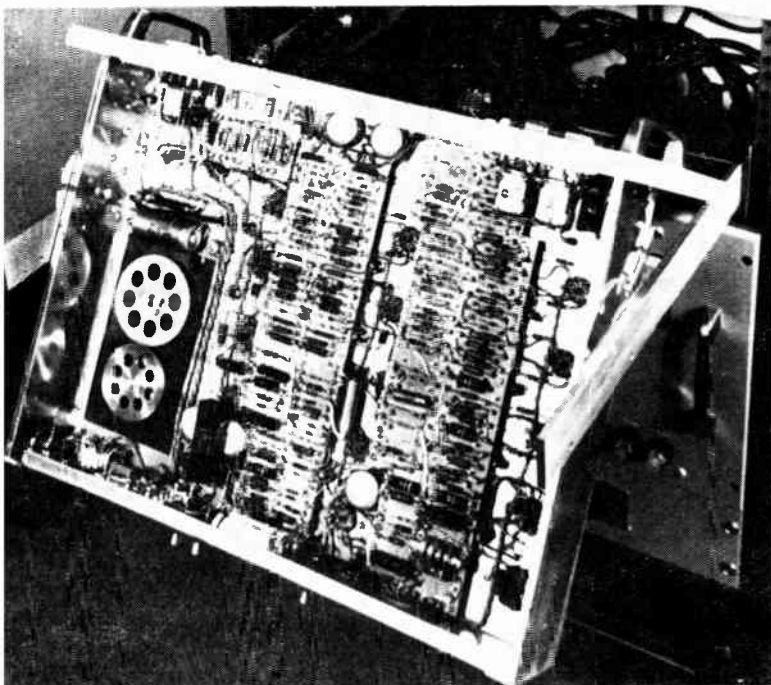
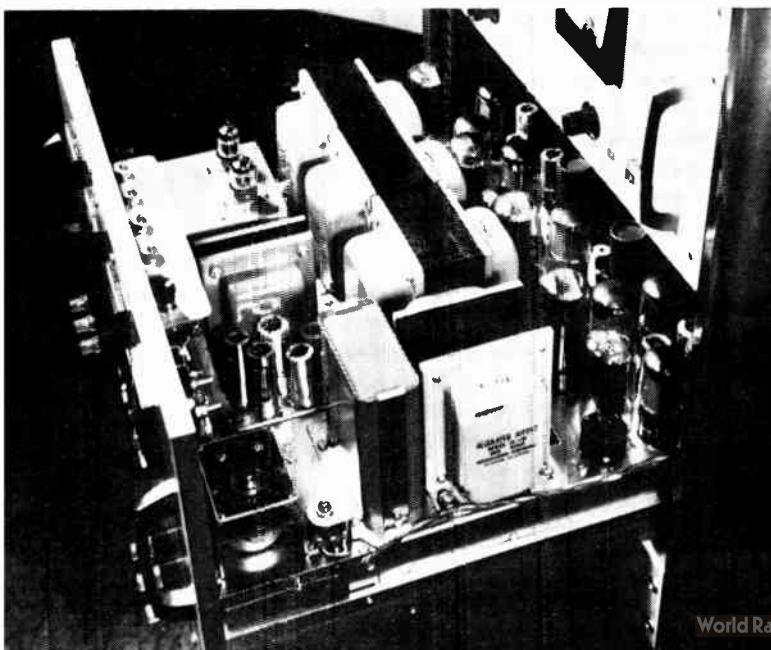


Figure 6 — Blip Scan chassis — bottom view.



Blip scan machine

Continued from page 26

for a maximum of 18 hits. Figure 3 shows the result of the computation. Notice that for three given cases, their respective medians fall near the center of the distribution.

The operation of the long-term-effect circuit that produces the scan ratio B is somewhat different. Here the basic timing source is obtained from the ten-mile-range-mark generator of the radar set. The ten-mile-range marks occur at the same time on every radar pulse. There is, therefore, a high probability that a target that is either in the "OFF" or "ON" region for this system will remain that way for the entire time the antenna sweeps the target. To prevent the scan area from being constant for successive scans, the ten-mile-range mark is slowly delayed from zero to 9.5 miles. The delay is adjusted so that it requires 17 seconds to travel over the nine-mile range. This results in a situation where, for radars with a 12-second scan period, the gate has moved about six miles on successive scans.

Figure 4 represents a position plot of the range periods for 12 scans, where the "ON" and "OFF" ratio $B = 0.5$. Also shown on the chart are lines corresponding to aircraft having radial components of 300 and 600 knots inward and outward. The chart demonstrates the ability of the system to produce reasonable patterns of hits and fades of targets flying at indicated speeds.

The outputs of the N and B channel are combined with the target channel in a three-input "and" gate, so that the output of the gate is $C = T(NB)$, where T is the target input from a simulated-target generator.

The fast-effect channel

The 100 μsec gate is derived from a crystal-controlled oscillator, followed by a Schmitt trigger for pulse shaping. The 80KC frequency is divided by 3 flip-flops, the latest one triggering a variable delay one-shot circuit the period of which is adjustable from approximately 5 μsec to 95 μsec . All two-state circuits are clamped to stable reference voltages. When a meter is adjusted for full-scale reading across the clamp voltages and then connected to the output of the one-shot, the meter will indicate the fast-effect blip-scan ratio directly.

The one-shot is connected through a driver to the output "and" gate. A switch is provided to inhibit the action of this channel, since the one-shot circuit cannot be adjusted to 100 μsec .

The slow-effect channel

The input to the slow-effect channel uses the ten-mile-range marks, which occur at the same time on every radar pulse scan. The range-mark pulses are slowly delayed to an equivalent of from zero to 9.5 miles by a delay generator. The delay of the generator is varied by means of a motor driven potentiometer. Correct speed is obtained by simple gear trains. In the present unit the speed is adjusted so that it takes 17 seconds to vary the delay from zero to maximum. The mechanical assembly is designed so that many speed combinations are obtainable by a simple change of gears. The motor driven potentiometer assembly may be seen in Figure 5.

The delayed pulse is fed through a pulse amplifier to a second manually adjustable delay one-shot that controls the gate time. It is essentially the same as that in the fast-effect channel. Here again, metering

Figure 7 — Power supply.

and channel inhibiting take place in the same fashion as previously described, and the output from the one-shot is connected through a driver to a second leg of the output "and" gate.

The target-pulse channel

The target-pulse channel consists of a two-stage amplifier. The input to the first stage is provided with circuitry that allows the pulse to be separated from noise that is frequently present in the video channel of target simulators. The second stage of the target channel is connected to the third input of the output "and" gate, and produces a target pulse the amplitude and shape of which are compatible with the gating pulses of the other two channels.

Output channel

The output channel consists of a simple feedback line driver. The output matches a 72 ohm line. Figure 6 is a bottom view of the blip-scan chassis showing the style of construction.

Power supplies

Power supplies for the blip-scan machine are assembled from commercial units, with the exception of the upper clamp supply the load of which is floating above ground and, therefore, requires special regulating circuitry.

Control of primary power is accomplished by means of push buttons. Stepping switches are used in conjunction with voltage sensitive relays to switch the various DC voltages to the load in the proper sequence. An electrical interlock is provided to prevent a reapplication of power in the event of a power failure. Indicator lights, which are an integral part of the push buttons, denote the state of all significant switch functions. The elaborate power control system is necessary to protect the large number of diodes used in the equipment. Figure 7 shows the power supply chassis.

Physical details

Both blip-scan units are identical, each occupying seven inches of panel space. The chassis are supported by tilting slides for convenient access to components and test points. Panel controls include adjustments for the slow and fast blip-scan-ratio effect. The indicating meters read the adjusted ratio. One combination push button and indicator lamp switch controls power. The two remaining switches provided a manual override for both fast- and slow-effect channels. Indicator lamps clearly show the state of the controlled circuits.

The power supplies occupy 10.5 inches of panel space. Indicating meters are provided for all significant voltages. Combination push button indicator lamp switches are used for control. The voltage adjustment potentiometers and the power failure override switch are located on a shelf behind the panel. The chassis frame is made from $\frac{3}{8}$ " aluminum stock to provide a rigid mounting for the heavy power supplies.

The enclosure that houses the three chassis is a commercial cabinet. A blower located at the bottom supplies 300 cfm of air for cooling. Air is ducted into the side panels of the cabinet, which serve as plenums, with deflectors so located that a sufficient flow of air is brought to each chassis. Figure 8 shows an over-all view of the equipment in operating position. A view of the chassis partially withdrawn from a cabinet is seen in Figure 9.

Following initial tests, the equipment operated approximately 60 days (24 hours per day) without a failure.

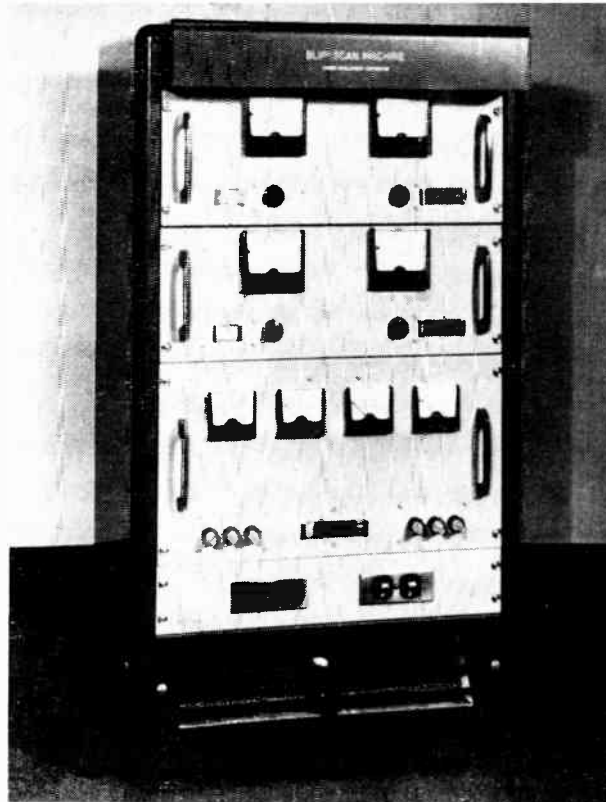


Figure 8 — Blip Scan machine — front view.

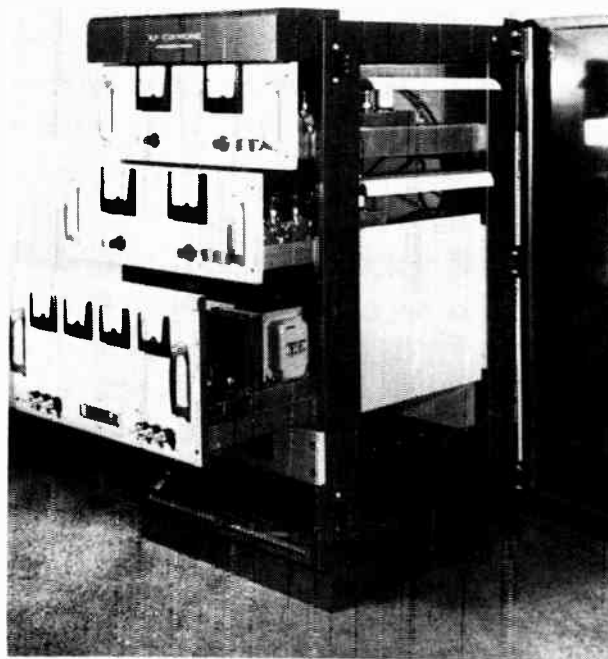


Figure 9 — Blip Scan machine — sides extended.

Acknowledgments

The authors are deeply indebted to their many colleagues who helped with the construction of the blip-scan machine, in particular to Ralph Stewart and Arthur Hahn of SDC, without whose diligent efforts the successful completion of the project would not have been possible.

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2. Louis N. Ridenour, *Radar Systems Engineering*. McGraw-Hill Book Company, Inc., New York, 1947, pp. 73-81.

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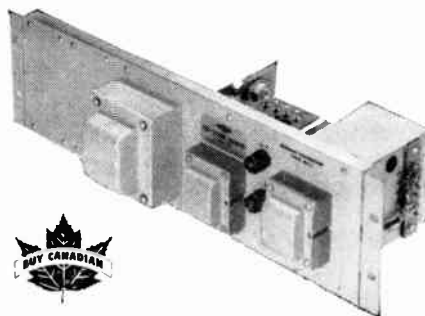
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EIA report

by Basil Jackson, A.R.Ae.S., Tech. M.C.A.I.

Electronic Defense Production Sharing

On April 26, at the Royal York Hotel, Toronto, T. J. B. Robinson, DDP Liaison Officer in the Los Angeles Air Procurement District, addressed a joint meeting of the EIA Components and Electronics Divisions on the subject of "Electronic Defense Production-Sharing Opportunities In The United States Aircraft Industry". The meeting was well attended by EIA representatives anxious to learn, at first hand, how to tackle the questions of bidding for contracts, negotiating, and other details of this complex subject.

Other important gatherings held in April were meetings of the Board of Directors, Receiver Division, Components Executive Committee, Components Engineering Committee, Service Committee, and the Sound Equipment Committee of Electronics Division. During the month various meetings of the Tariff Components Groups of the Components Division met to correlate their activities in the tariff field. The Budget Committee met also, to discuss budgetary matters for the EIA fiscal year 1960-1961.

31st Annual Meeting

The 31st Annual Meeting of the Electronic Industries Association of Canada will be held on Thursday and Friday, June the 16 and 17, at Mont Tremblant Lodge, Mont Tremblant, Quebec. The first day of the conclave will be devoted to meetings of the various committees and the three divisions. At six o'clock on Thursday a reception will be held by courtesy of the Components Division and at seven the annual industry dinner will take place followed by entertainment and dancing.

The actual 31st Annual General Meeting will take place on Friday morning at which will be present a prominent speaker, Dr. B. G. Ballard, Vice-President (Scientific) and Director, Radio and Electrical Engineering Division, National Research Council. The 31st annual meeting will conclude with a meeting of the new Board of Directors on the afternoon of Friday, June 17.

Mont Tremblant is only 90 miles north of Montreal and can easily be reached by car, train or by plane. A large EIA turnout is expected at this well-known resort.

"Temporary" Excise Tax Begins 21st Year

Budget Day in Canada did not bring any relief to the electronics industry from the discriminatory 15 per cent excise tax levied against radio sets, television receivers, record players, and electron tubes. Thus begins the twenty-first year of the collection of a tax which was introduced as a "temporary measure" in 1940.

As in past years, EIA of Canada presented a brief to the Minister of Finance. The brief submitted to Mr. Fleming stated that, while the industry was not forsaking its earlier efforts directed in an effort to have the excise tax removed from all products of the industry, special emphasis this year was directed to the collection of excise taxes on replacement electronic tubes. The brief pointed out that it was unfair for the consumer to have to pay excise tax whenever he purchased replacement tubes for the service and maintenance of equipment which had already been taxed. It was also pointed out that, because of the low-cost production and lower market value of imported tubes, the fair market value of imported tubes was always lower than the Canadian factory selling prices of comparable tubes. The end result was that while the Canadian consumer pays as much for imported tubes as for Canadian tubes, there is a direct loss of revenue to the government besides lower employment in the Canadian industry.

CANNON

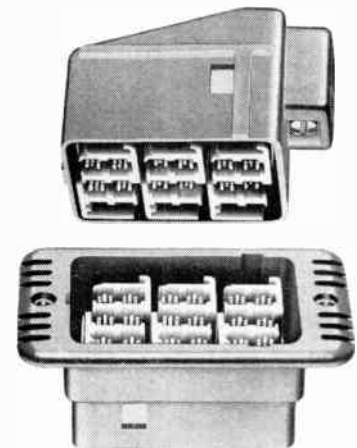
makes

PLUGS

for every purpose!

the **NEW**
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.

In Canada and throughout the free world, Cannon Plugs are answering the specialized problems of industry and defence.

* trade name patent pending.



CANNON ELECTRIC CANADA LIMITED,
160 Bartley Drive, Toronto 16, Ontario.
Montreal, Montreal Airport, Dorval, P.Q.

Ottawa, 1168 Gertrude Street 6002

For complete details check No. 14

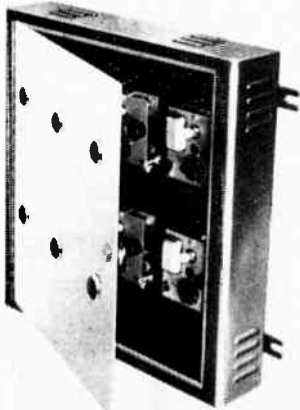
product panorama

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

Centralized level control

Item 435

Measurement Engineering Ltd. announce that a development of the well known Fielden Tektor Minor Level Controller enables up to 150 feet of coaxial cable to be used between probe and unit. Multiple construction of electronic units enables centralized or grouped indication of level.



A single Tektor consists of a probe connected to an electronic unit, the probe being installed on the container. The increase in interconnecting cable length means that the unit may be conveniently situated at ground level for ease of access or maintenance. If centralized level control is required this extension of cable length enables all electronic units to be brought together from different parts of the plant and housed in one case. The interconnecting coaxial cable is supplied with the instrument and no other cables are required from probe to unit. Installation costs are therefore cut to a minimum with multiple construction because only one mains supply cable need be run to the multiple unit. With the Fielden Capacitance system of level control (originated and patented by this company over ten years ago) there are no electronics on the container.

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

RTV silicone rubber

Item 436

The introduction of a new low-viscosity RTV (room temperature vulcanizing) silicone rubber has been announced by Canadian General Electric. Designated as RTV-11, this material offers a lower viscosity than has ever before been available in any silicone rubber compound.

As with all other RTV compounds, RTV-11 cures at room temperature to form a strong, resilient rubber, possessing excellent resistance to temperature extremes, ozone, weathering and aging. This new grade of RTV which contains no solvent is unique, however, in having a typical viscosity of 120 poises.

RTV-11 is easily pourable in and around irregularly shaped configurations and is especially suited for potting, encapsulating and impregnating of electrical and electronic components.

More detailed product information on RTV-11 may be obtained from Chemical Materials Section, Canadian General Electric Company Limited, 940 Lansdowne Avenue, Toronto 4, Ontario.

Expanded scale pH meter

Item 437

The Beckman Model 76 Expanded Scale pH Meter is a highly stable direct-reading instrument for making extremely precise pH and millivolt measurements. In addition to a standard 0 to 14 pH scale, it incorporates an expanded scale with a 2.0 pH full scale range graduated in 0.01 pH units. Any two pH units can be chosen from the full 0 to 14 pH range and read on the expanded scale. Millivolt readings on the expanded scale are attainable over any 200 mv span in the range of 0 to 1400 mv with a readability of 0.3 mv.

Push-button operation is another outstanding feature of the instrument.

The line-operated Expanded Scale pH Meter is transistorized throughout with the exception of an electrometer tube amplifying an AC signal for the high impedance preamplifier.

Details of this equipment are given in Bulletin 777 available from the Technical Information Department, Beckman Scientific and Process Instruments Division, Fullerton, California.

Induction soldering unit

Item 438

An induction soldering unit which simplifies, improves and speeds up component production and also provides local heat to otherwise inaccessible spots, has been introduced into Canada by Honeywell Controls Limited. One of Honeywell's Marion division products, it is safe and simple to operate. It has maximum power



input of 775 watts with 100 watts standby; and operates on 115 volts, 60 cycles. Dimensions are 15 $\frac{1}{4}$ " x 21 $\frac{1}{2}$ " x 15". Weight is 150 lbs.

For further information write Honeywell Controls Limited, Toronto 17, Ont.

Molded composition resistors

Item 439

Ohmite Manufacturing Company's popular line of Little Devil molded composition resistor assortments has now been expanded through the addition of a $\frac{1}{4}$ -watt assortment designated "CAB-4". There are now four such assortments, the others consisting of $\frac{1}{2}$, 1, and 2-watt resistors respectively, available from Ohmite distributors.

The new assortment contains 150, $\frac{1}{4}$ -watt resistors in the 37 values most frequently demanded by service and laboratory men. Like the other Little Devil assortments this one is offered with a handy, 5-drawer, 40-compartment plastic cabinet all for the price of the resistors alone!

Tiny $\frac{1}{4}$ -watt Little Devil resistors are one of five sizes (0.1 watt to 2 watts) offered by Ohmite. Only .250" long by .090" diameter, these units feature superior Little Devil molded composition con-

struction. Leads are integral with the resistor body which is completely surrounded with insulation. Assortments or bulk resistors are available only from Ohmite distributors. Request Catalog 30 from Ohmite Manufacturing Company, 3694 Howard Street, Skokie, Illinois.

Low background system

Item 440

Model LBS-162 Low Background System, a new concept developed by Atomic Accessories Inc., is claimed to be the simplest and most compact arrangement available for measuring the beta activity of low-intensity radioactive samples. It consists of the new AmpereX combination "sample" beta counter and "veto" cosmic ray guard tube, two Baird-Atomic 123 scalers modified with anti-coincidence circuitry, an elapsed timer, a lucille GM tube holder, and a compact iron and mercury shield with a sample slide and elevator assembly. A single cosmic ray tube now replaces up to 30 guard tubes normally used in comparable counting systems. The resultant simplification in circuitry, plus the elimination of multi-guard tube malfunctions, provide a dramatic increase in system reliability.

Details are available from Radionics Limited, 8230 Mayrand St., Montreal 9, Que.

Packaging sub-miniature diodes

Item 441

Transitron Electronic Corporation, who manufacture a broad line of silicon diodes, transistors, capacitors, rectifiers and other electronic components, wanted an inexpensive container that would protect the delicate silicon and germanium diodes as they were being packaged by automatic equipment and that would also keep them intact during shipment. Because automation is so prevalent in the electronics industry, it was also desirable that the package be able to be fed into automatic equipment used for inserting the diodes into circuits. It was important too that the wire leads be kept from tangling.

Engineers of National Vulcanized Fibre Co. were called in to solve the problem. The package they evolved makes use of .015-in. thick vulcanized fibre, a cellulose plastic, one of the lightest and strongest of packaging materials. In it, the diodes are neatly



separated by notches. Formed ribs protect the sub-miniature diodes from crushing or breakage and the fibre folds back over the wire leads to keep them from tangling or binding. Once in the hands of the user, the package is fed into automatic equipment which inserts the diodes into the electronic assembly.

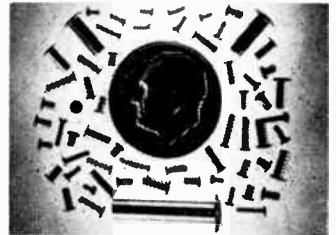
Additional information may be obtained from National Fibre Co. of Canada, Ltd., 107 Atlantic Ave., Toronto, Ontario.

Microminiature rivets

Item 442

A rivet type fastener, designed specifically for subminiature electronic and instrument needs, has been announced by the Circon Component Corporation of Santa Barbara, California.

Mechanical design of the new rivet combines advantages of both solid and tubular rivet styles in a concentrically deep drilled shank, thus providing the ease of setting so essential in small or delicate assemblies. The solid upper portion of the rivet contributes rigidity and prevents buckling or bending in the up-setting or clinching operation. The drilled section controls material flow and accomplishes an effective clinch with a minimum of pressure on the parts or material being assembled.



Material is specification, non-magnetic brass with the alloy controlled to insure setting ease and uniformity of the swaged or upset clinch. Circon instrument rivets are supplied gold plated to prevent "splatter" of plated metal when the rivet is clinched or set. Precision setting tools are supplied to facilitate proper installation of the rivets.

Circon Component Corporation, Santa Barbara Municipal Airport, Goleta, California, U.S.A.

Transwitch

Item 443

The transwitch, a new device from Transitron Electronic Corporation, is a PNP switching device analogous in many ways to the Thyatron but with the added ability to be switched "OFF" through the gate. This, together with its inherent bistable characteristics, makes the device useful in computer applications and switching operations.

If the switch "OFF" current withdrawn from the gate increases slowly, then the saturation voltage across the Transwitch in the "ON" condition will rise appreciably just prior to switch "OFF". It is not possible to turn the Transwitch "OFF" with a pulse of width less than the storage and transient time for the pulse height chosen.

Transitron Electronic Corporation, 168-182 Albion Street, Wakefield, Mass., U.S.A.

Precision wire wound resistor

Item 444

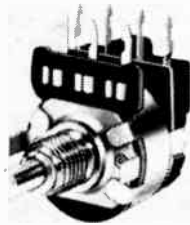
Measuring only 0.25" dia. by 0.4" long, the RM2 is claimed as the smallest precision wire wound resistor commercially available. It is the most recent addition to the range of Alma Precision Wire Wound Resistors and has been designed primarily for printed circuit applications. It has radial leads spaced 0.3" and is suitable for 0.1" or 0.15" grids. It is available from 100 Ω to 200 k Ω to a tolerance of 0.1%; temperature coefficient better than 0.002% per $^{\circ}$ C; rated at 1/10th watt when the temperature rise is 15 $^{\circ}$ C.

Alma Components Limited, 551 Holloway Road, London, N. 19, England.

Variable resistors

Item 445

A new series of $\frac{5}{8}$ " dia. miniature compact composition variable resistors is offered by C. C. Meredith & Company, Ltd., Streetsville, Ontario. Series 200 can be furnished with or without



attached switch in standard bushing mounted construction or in the more economical ear mounting. Resistance range is 250 ohms thru 2.5 megohms linear taper, wattage rating $\frac{1}{4}$ watt thru 100,000 ohms and 2/10 watt over 100,000 ohms at 55°C derated to no load at 85°C, voltage rating 750 VAC bushing to terminals for 1 minute high pot test and 500 VDC operating maximum, 350 VDC across end terminals and 280° rotation without switch, 315° with switch.

Designed for commercial applications where space is at a premium. For applications requiring extremely compact control and SPST switch combinations, unique Type QS-200 combines switch and control in a single miniature molded housing. Delivery 4 to 5 weeks after sample approval.

C. C. Meredith & Company, Ltd., Streetsville, Ontario.

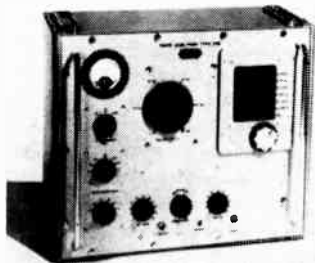
VHF wave analyzer

Item 446

The latest addition to the range of electronic instruments produced by Airmec Ltd. of High Wycombe, Bucks., England, is of particular interest to workers in the field of telecommunications research and development.

Within the frequency range 5 to 300 Mc/s, the Wave Analyzer Type 248 will efficiently replace the complex array of equipment normally used for harmonic analysis, signal strength and interference measurements, and evaluation of insertion gain and loss.

The IF amplifier, which operates at supersonic frequency, incorporates a series of accurate step attenuators, and a meter is provided for interpolation between steps. The Wave Analyzer will



accept input signals between 5 microvolts and 1.5 volts, and the sensitivity is such that second harmonics up to 55 db and higher harmonics up to 70 db below the fundamental may be measured. Three alternative IF bandwidths are provided, giving ease of tuning and reducing errors due to noise.

Full details may be had on request to Airmec Ltd., High Wycombe, Bucks., England.

Silicon power rectifiers

Item 447

New military-type silicon power rectifiers are now in production at the Semiconductor Products plant of Bendix Aviation Corporation's Red Bank Division. The 1N1614, 1N1615, and 1N1616 have

been designed to meet military specifications MIL-E-1/1240, 1/1241, and 1/1242 respectively. Featuring a high reverse voltage characteristic ranging from 200 to 600 Vdc, the new rectifiers will operate at high temperature with the low reverse current of one milliamper at 150°C. The new Bendix rectifiers are characterized by low forward voltage drop of 1.5 Vdc at 10 Adc.

Subjected to the stringent environmental testing required by the military specification, these rugged rectifiers are highly reliable. The solder lug is of one-piece construction and mechanical dimensions of the case conform to the JEDEC DO-4 configuration.

Bendix — Red Bank Division is represented in Canada by Computing Devices of Canada Limited, P.O. Box 508, Ottawa, Ontario.

Noise generator

Item 448

The AIL Type 70 Plug-In Diode Noise Generator, a product of Airborne Instruments Laboratory, uses a temperature-limited diode that permits noise-figure measurements over the 12 to 250 mc range.



Designed to operate in conjunction with the Type 74 Automatic Noise Figure Indicator, which supplies power, metering, and current controls to the AIL Type 70 Plug-In Diode Noise Generator, the latter permits either manual or automatic measurement of noise figures from 0 to 36 db. The relative excess noise provided by this noise generator is variable from 0 to 16 db. When the noise generator is used for automatic measurements, it is set at 15.28 db.

For further information contact the Canadian rep: Radionics Limited, 8230 Mayrand St., Montreal 9, Quebec.

De-soldering tiplests

Item 449

Ungar Electric Tool Company of Canada announces a complete range of de-soldering tiplests for use by radio and TV technicians and servicemen to speed up component repairs on printed circuit boards. The 8 tips available are for use with the popular Ungar pencil handle and type 4045 heater unit.

A slotted tip simultaneously melts solder and can be used to straighten component leads bent against the board. Excess solder runs up the slot in much the same manner as capillary action holds ink in a penpoint. The same tiplest may be used to reinforce a printed circuit by tracing over the line at the same time as free-flowing solder is applied.

A bar tiplest permits disconnection of multiple in-line terminated components while a triangle tiplest and a cube tiplest make easy work of those hard-to-get-at terminations.

Full literature and descriptive drawings of these revolutionary new tips are available from Ungar Electric Tool Company of Canada, 44 Danforth Road, Toronto 13, Ontario.

Rack-mounting servomechanisms

Item 450

Two new rack-mounting Dynamaster Servomechanisms are being offered by The Bristol Company of Canada. The new models are mounted in hinged swinging panels to fit standard 19-inch RETMA relay racks. Both models are suitable for applications in computing systems and all types of control systems, indicating gauge applications, etc.

Model 692 is mounted in a 19-inch panel, 7 ins. high. The drum-type scale is approximately 22 ins. long and offers superior visibility. The slidewire balancing shaft provides for mounting a retransmitting slidewire or alarm contacts.

Model 694 uses a standard 11-inch Dynamaster scale, and is mounted in a 19-inch rack panel, 8 $\frac{3}{4}$ ins. high. It is of particular advantage when the observer wishes to see the entire scale range.

Complete information may be had from The Bristol Company of Canada Limited, 71-79 Duchess Street, Toronto, Ontario.

Elapsed time indicator

Item 451

A new miniature elapsed time indicator, by Bowmar Instrument Corporation, provides high readability and accuracy through the use of a decimal type counter with large characters for readout purposes.

Easily and instantly read even at distances up to six feet away, Bowmar's Model 1440 Elapsed Time Indicator further simplifies the inherent reading problems in these miniature devices by presenting only three digits at a time, instead of many two and three digit groups of tiny numbers each only a few hundredths of an inch high. The Bowmar unit makes its presentation on a single reading line in place of the concentric circle, dial type presentation.

Overall diameter of the indicator is .670 inches, and length is $1\frac{1}{4}$ inches. It weighs approximately 1.8 ounces. Nominal input



requirement is 115 volts at 400 cps single phase. Current is approximately 10 milliamperes.

Further details can be obtained from Bowmar Instrument Corporation, 8000 Bluffton Road, Fort Wayne, Indiana.

Helix antennas

Item 452

Hackbusch Electronics Limited announce a greatly extended line of Technical Appliance Corporation antennas and matching reflectors of the helix configuration. Current models include 4, 6, 8, and 10 turn types, of various sizes. Complete units, with reflectors, are made in single, dual and quadruple assemblies for mounting on manual or mechanized mounts.

Taco helix antennas and arrays are available in all popular communications and telemetering frequency ranges. Polarization is circular, making them ideal for orbital body telemetering, or other airborne communications. Manual and remote controlled electro-mechanical mounts can be supplied.

Complete details are available upon request from Hackbusch Electronics Limited, 23 Primrose Ave., Toronto, Ontario.

Microdials

Item 453

Borg Equipment Division of the Amphenol-Borg Electronics Corporation has announced a new addition to their famous line of turns-counting Microdials. This new series, the 1360, is specially designed to add richness and style to electronic control panels and equipment by means of new, high-style package design, attractive profile and the use of colored plastics in fabrication.

Five standard or stock models are available in various combinations of red, gray and black colors.



Mechanically, Borg 1360 Series Microdials provide accurate and reliable performance due to such inherent characteristics as smoothness of action, absence of noise, lack of jumping or stepping action and fewer ambiguities in reading and setting. Contoured brake arms lock settings in place but do not interfere with reading or setting.

Catalog data sheet BED-A137 is available from Atlas Radio Corporation Ltd., 50 Wingold Ave., Toronto 10, Ontario.

Partitioned container

Item 454

Partitioned container, now "Made in Canada" for the first time, by Spaulding Fibre of Canada Limited, Toronto, Ontario, a manufacturer of vulcanized fibre.

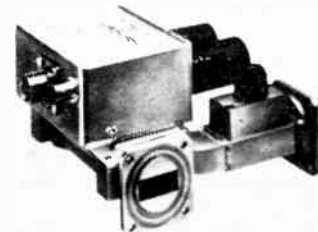
These lightweight containers provide a most efficient means of handling small parts. Inventory is cut 80% since the number available can be seen at a glance. Delicate parts are protected from damage by the vulcanized fibre itself that will not scuff, form burred edges, that may scratch the part or the operator, or oxidize and thus tarnish silver, platinum or other metals. The dividers may be permanent or removable thus permitting many variations in the compartment size while still using the same container. Available in any size.

Spaulding Fibre of Canada Limited, 70 Coronet Rd., Toronto 18, Ontario.

Microwave-mixer

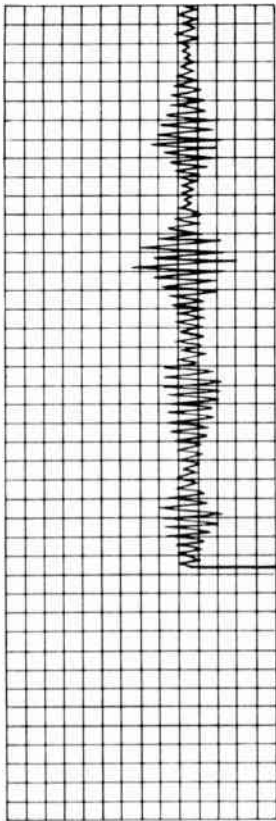
Item 455

A new unit in LEL's series of matched microwave-mixer assemblies covers the 8.5-9.6 KMC range and provides an IF output bandwidth of 100 MC. The MMX-5 Wideband Mixer-Preamplifier Assembly has an IF center frequency of 250 MC, a gain of 15 db, and an overall noise figure of 10 db. The MMX-5 provides the

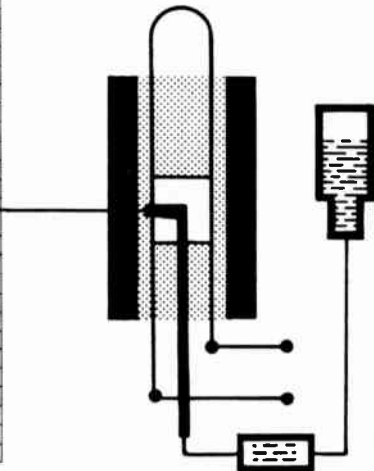


design engineer with a microwave receiver front end capable of handling the short pulses required for high resolution radar systems.

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




SIEMENS



Direct Writing

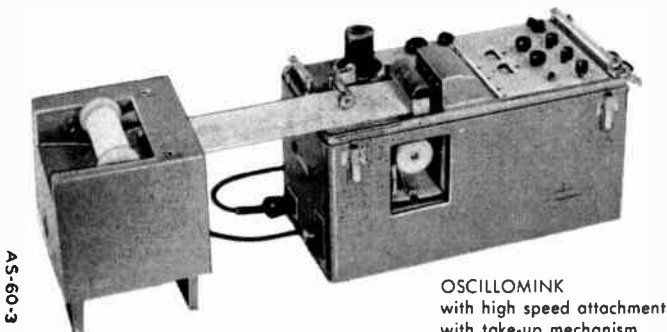
therefore immediate results for Oscillograms of phenomas to approx. 1000 c/s are achieved by direct writing jet of ink

OSCILLOMINK

The standard model of the OSCILLOMINK comprises 2 measuring channels with built-in electronic amplifier and 2 indicating (measuring) instruments for time marking.

Highest sensitivity of the measuring instrument with amplifier approx. 30 mV/cm

Highest admissible input voltage 500 V paper feed between 0.5 and 200 cm/s



OSCILLOMINK
with high speed attachment
with take-up mechanism

SIEMENS & HALSKE AKTIENGESELLSCHAFT
WERNERWERK FÜR MESSTECHNIK

Represented by



A&S... stands for Assured Satisfaction

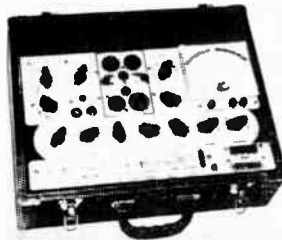
THE AHEARN & SOPER CO. LTD.
850 BELFAST ROAD • OTTAWA • CANADA

For complete details check No. 2 on handy card, page 47

Portable tube tester

Item 456

The Model 8-77 is designed as a radio and TV technicians' vacuum tube tester and has been incorporated in this compact 16 lb. portable tester. It checks filament voltages in 18 steps from U.6 to 117 volts. Checks scale readings directly on the 3" range microhmho scale (0-3, 000, 6,000, 15,000) includes such features as: Stark Hickok dynamic mutual conductance tests; high speed short test (12 times more sensitivity); grid current test; filament continuity test; reserve cathode capacity test.



New socket design slips off easily, exposing new 11-pin socket and saves time in replacing worn-out sockets.

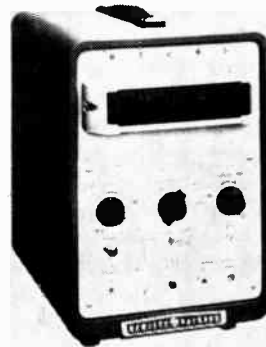
For catalog listing, complete data on this and many other models write to Stark Electronic Sales Company, Ajax, Ontario.

Electronic counters

Item 457

Two new electronic counters with a wide variety of laboratory and industrial uses are now available from Hewlett-Packard Company.

The counters, Models 521D and 521E, quickly and directly measure frequency and random events per unit of time. With transducers converting mechanical into electrical phenomena, they also measure such quantities as speed, rpm, rps, weight, pressure, temperature and acceleration. An in-line readout automatically displays results in large, bright numerals.



The counters have a frequency range of 1 cps to 120 KC. The 521E has a crystal time base assuring accuracy of 0.01%, ± 1 count, while the 521D's accuracy is controlled by power line frequency (typically 0.1%), ± 1 count. Display time can be adjusted from approximately 15 seconds, or can be held until intentionally reset.

Hewlett-Packard Co., 275 Page Mill Rd., Palo Alto, Calif., U.S.A.

Telephone cable pressure guard

Item 458

The UE Pressure Guard warns of leaks or breaks in the line in pressurized cable systems, thereby reducing cable maintenance costs and improving customer service.

Originally developed for the Bell Telephone System, UE Pressure Guards are now protecting pressurized cable systems in many locations throughout the United

States and Canada. The importance of this type of maintenance, whereby sheath breaks may be detected prior to service disruption, has led us to develop a more versatile and lower cost unit for wider application.

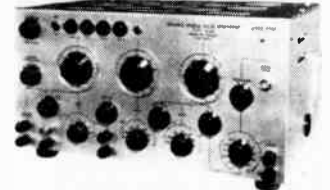
Smaller and more compact than previous models, the new J31 is suitable for cable, pole or wall mounting. It may be purchased through regular suppliers of telephone equipment such as Automatic Electric Sales (Canada) Limited and W. S. Gerrie & Associates, Ltd.

For additional information on the advantages, installation or use of the Pressure Guard on pressurized cable systems, please contact: United Electric Controls (Canada) Ltd., O'Connell Avenue, Dorval, Quebec.

Delayed double pulse generator

Item 459

This instrument was designed by Nagard Limited, of Belmont, Surrey, England, to meet the need for a generator of fast-rising pulses and square waves, while at the same time providing a wide range of amplitude, repetition rate, width and delay with direct-reading calibrations, together with full flexibility as to polarities of main pulses, pre-pulse and trigger pulse and the ability to trigger from any form of external signal.



The instrument has two output circuits. The main output consists of either a single or double pulse, as desired, of either polarity and of controllable amplitude calibrated to $\pm 2\%$. The rise time is independent of width throughout the ten million to one range available.

At the other output terminal a pre-pulse of either polarity is produced. When switched to single-pulse operation this pre-pulse precedes the main pulse output by a calibrated time interval controllable also over a range of ten million to one.

Complete information on Type 5002 Delayed Double Pulse Generator is available from Electro-design, 736 Notre Dame St. W., Montreal, Que.

Encapsulated resistors

Item 460

A newly developed mounting method for the Series "EP" encapsulated, precision wire-wound resistors, is announced by Kelvin Electric Co., 5907 Noble Ave., Van Nuys, California. Designed for quick interchangeability on computer boards or where rapid change of resistance values is required. Mounts on standard General Radio or Superior Electric binding posts.

Resistors feature Kelvin's "Relaxed" winding technique which produces tension-free windings, practically eliminating resistance drift with age and "shorts" or "opens" due to thermal shock. Lugs are available with either silver or gold plating. Maximum resistance, to 25 MEG; 0.5 watt to 2.5 watts; 400 to 1200 volts max.; Temperature co-efficient: $\pm .002/\text{°C}$ (closer upon request); Tolerance: to 0.05% (closer upon request); Size range: $\frac{1}{2}$ " to 1" dia.; Mounting centers: 1.460" to 3.085". Resistors are shock, moisture and temperature-proof, and exceed military specifications.

Literature upon request to Kelvin Canadian distributor: Conway Electronic Enterprises, 1514 Eglinton Ave. West, Toronto 10, Ontario.

Telemetry system Item 461

The Model T-108 Tone Telemetry System, a product of Solid State Electronics Co., is a totally solid state, high temperature, ruggedized tone generating system capable of operation in associated FM-FM telemetry systems. This unit is designed to



indicate the precise occurrence and sequence of remote functions through catastrophic environmental extremes. The standard unit contains 11 sine wave oscillators. Each oscillator output is controlled by means of a remote 28 volt DC supply through a gated switch. The opening of any or all gates allows the respective oscillator outputs to appear on the common bus of the summing amplifier where they are mixed. The mixed composite signal is amplified and may then be fed to a transmission line or to a voltage-controlled subcarrier oscillator for conversion to FM within a specified IRIG band.

Further details from **Radionics Limited, 8230 Mayrand St., Montreal 9, Quebec.**

Toroidal inductors Item 462

Toroidal inductors, called "Toroiductors", provide a versatile design for both wired circuit and printed circuit applications. They are encased in epoxy filled bakelite cases in sizes from $\frac{1}{4}$ " diameter by $\frac{3}{8}$ " high to 2" diameter by 1" high. Inductance values range from 100 microhenries to 20 henries. They can be supplied with any of the standard core materials, thereby providing for applications covering a frequency range from low audio to approximately 100 KC as well as special applications requiring a high degree of stability.



"Toroiductors" are a product of Forbes and Wagner, Inc., of Silver Creek, N.Y., and further details on these inductors are available from the Canadian sales representatives, **Prime Electronic Components Ltd., 868 Dundas Highway East, Dixie, Ontario.**

Robot-Eye photoelectric controls Item 463

Robot-Eye Photoelectric Controls, manufactured by Standard Instrument Corporation of New York, are designed for automatic industrial inspection, counting and control. Among the operations performed by Robot-Eye are production counting, sorting, inspecting, traffic control, machine and operator safeguard, liquid level and bin level control, cut-off control, loop regulation and precision filling. Operation is by beam interruption or by reflection.

Robot-Eye is flexible in construction. The three elements of the photoelectric system — light source, photo cell and amplifier — may be interconnected by plug-in terminals and receptacles. Miniaturization and easy mounting are prime features of Robot-Eye light sources and photo cells. Amplifiers are available in tube or transistorized form. Amplifier flexibility is extended by provision for plug-in connection of time delays and count registers.

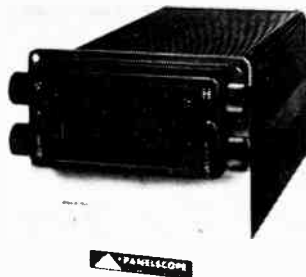
Operating range of standard units is up to 20 feet — this range may be extended to 100 feet, if necessary. Operating speeds are as high as 1000 per minute.

Write for information to Canadian distributor: **Standard Instruments (Canada) Ltd., 767 Warden Ave., Scarborough, Ont.**

Transducer preamplifier Item 464

A new instrument, manufactured by Waterman Products Co., combines the function of a preamplifier and monitor for low level signals in a package with panel dimensions of 5 $\frac{1}{2}$ " high by 5 $\frac{1}{4}$ " wide and extending 10" behind the front panel.

The preamplifier features a high impedance balanced input with a sensitivity of 3 mv rms and a 1 volt rms output (for tape recorders or similar devices) when the monitoring scope shows a one inch signal. The 1 volt output impedance is approximately 500 ohms. The amplifier has a bandwidth of 30 KC.



Repetitive sweep frequencies of 0.5, 1, 2, 4 cps, 1 KC and 5 KC are selected by a front panel control. Internal sync is provided. An input transformer is available with a gain of 3:1 which will provide ungrounded inputs with an impedance of approximately one ohm.

Aviation Electric Limited, P.O. Box 6102, Montreal, Que.

Solderless terminals Item 465

Described as the ultimate in high-performance design, a new line of solderless electrical terminals is being manufactured by ETC Incorporated, Cleveland, Ohio. Known as "Avikrimp" style, the new terminals are reinforced by a seamless, annealed, tin-plated brass sleeve permanently attached over the regular terminal barrel.

Crimped in the same operation as the barrel, the "skirt" part of the sleeve permanently grips the wire insulation, preventing creep. Any wire flexing takes place away from the crimping point, eliminating the vibration hazard.

In addition, the Avikrimp style features a permanently attached Nylon insulating sleeve which extends beyond the metal support sleeve. No extra insulation is necessary. Operating temperature range: continuous duty from -40°F to 250°F, intermittent duty to 350°F. The sleeve is color-coded for wire range.

Samples, prices and literature are available on request from ETC Incorporated, 990 East 67th St., Cleveland 3, Ohio, or from their Canadian representative, **Douglas Randall (Canada) Limited, 126 Manville Road, Scarborough, Ontario.**

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HEATHKIT "PROFESSIONAL"

TEST EQUIPMENT!



HEATHKIT TT-1

\$185.95

\$37.95 dn., \$15.00 mo.

MUTUAL CONDUCTANCE TUBE TESTER KIT (TT-1)

The impressive list of electronic and mechanical features found in this mutual conductance tube tester . . . at the low price of only \$185.95 . . . positively rates it as one of the finest test instrument values in the electronic industry!

Tests: Gm (amplifiers) 0-24,000 micromhos; Emission, rectifiers and diodes; Leakage, direct reading ohmmeter; Grid Current, $\frac{1}{4}$ microampere sensitivity; Voltage Regulators, firing voltage and regulation tolerances; Low Power Thyatron, grid characteristics, conduction capabilities; Eye Tubes, control grid characteristics. Features: 300, 450 and 600 ma constant current heater supplies, Life Test, Hybrid tube test (12 volt and space charge grid tubes), built-in switch operated calibration circuit, large easy-to-read meter and constant tension, free-rolling, illuminated chart. Selector switches allow testing of any tube regardless of base pin connections. Disconnect switch removes all voltage potentials from selector switches, protecting tubes and tester from possible damage during switching.

The extremely sensitive grid current test in the TT-1 will indicate as little as $\frac{1}{4}$ microampere thus often rejecting a tube after the transconductance test has labeled it passable. This test is of particular value to TV servicemen as grid current is often the cause of malfunctioning circuits. Wiring harnesses and power transformer terminal board simplify assembly. Black leatherette case with white trim, nylon feet, removable top. Because of the inherent complexity, assembly skill of technician or higher is recommended. Average construction time 40 hours. 27 lbs.

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Accurate and dependable, the TO-1 provides the test frequencies most often used by servicemen in the repair and alignment of all modern types of superheterodyne broadcast receivers. Instant selection of 262 kc, 455 kc, 465 kc, 600 kc and 1400 kc. Use RF modulated or unmodulated; 400 cycle audio available separately. 4 lbs.

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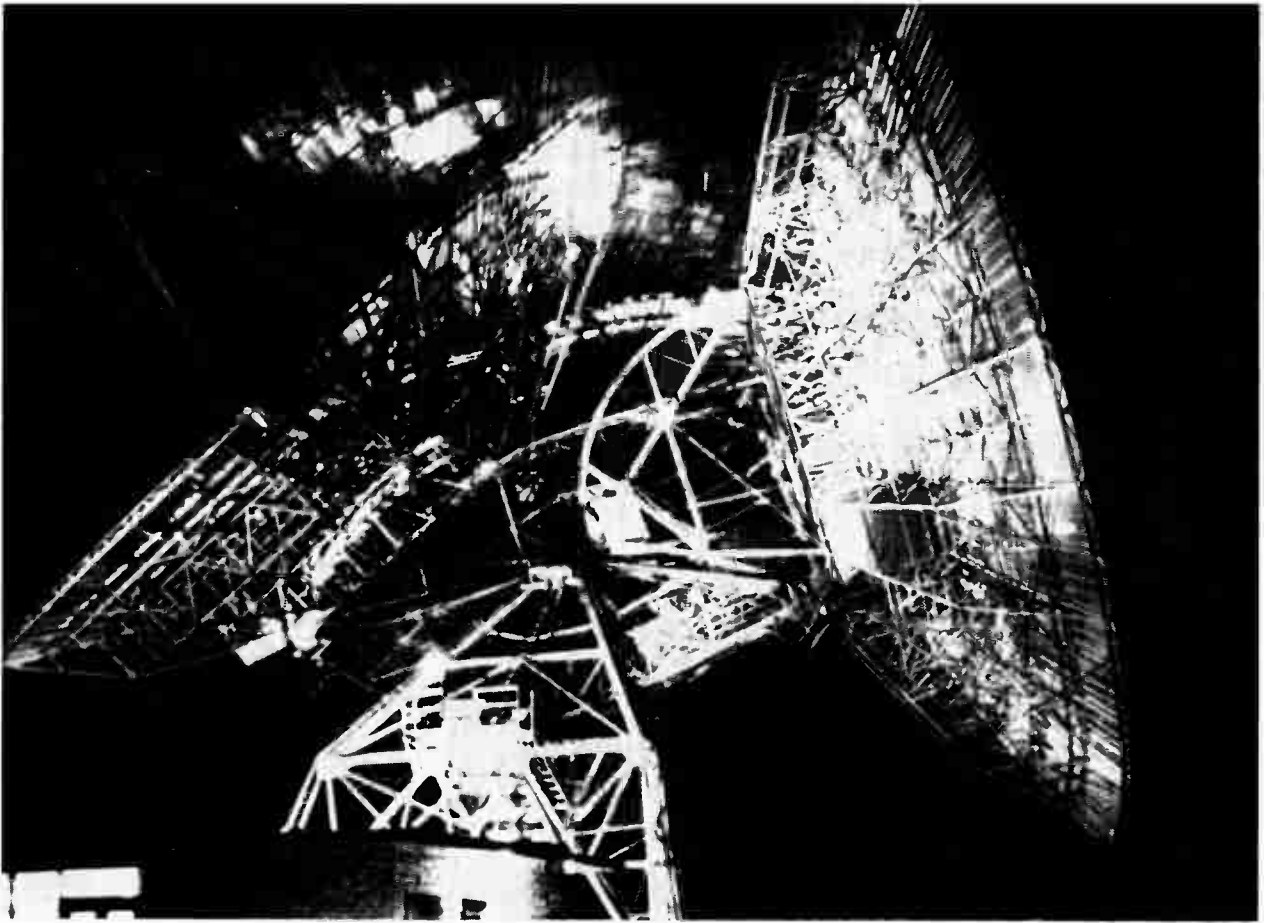
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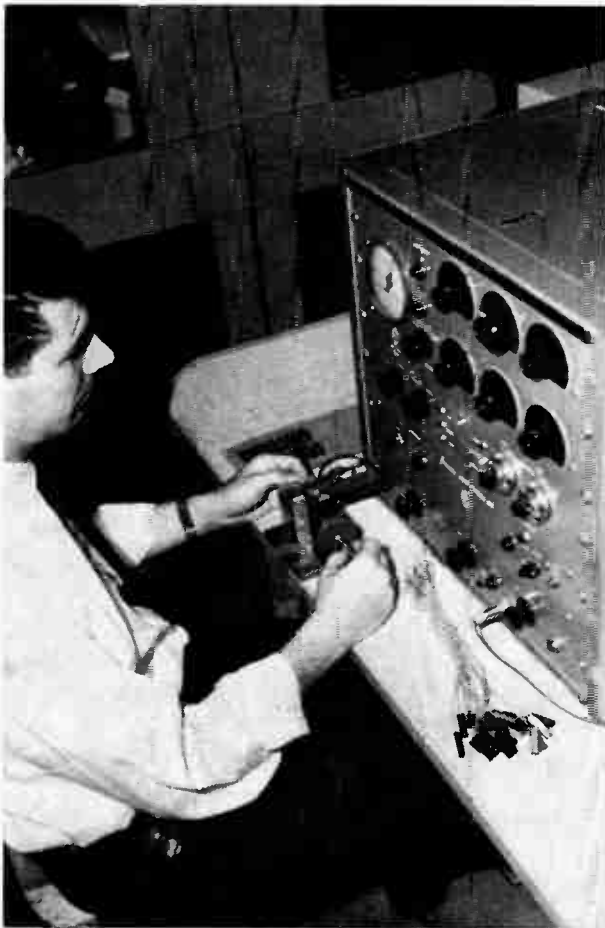
For complete details check No. 15 on handy card, page 47

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Courtesy Blaw-Knox Co.

A time exposure provided this dramatic illustration of an 85-foot diameter radio telescope in use at the National Radio Astronomy Observatory in Green Bank, W. Va., to aid the study of a wide variety of radio astronomical problems. The telescope's axis is parallel to the axis of the earth and turns at a constant rate of speed — one revolution per day, either on sidereal or solar time.



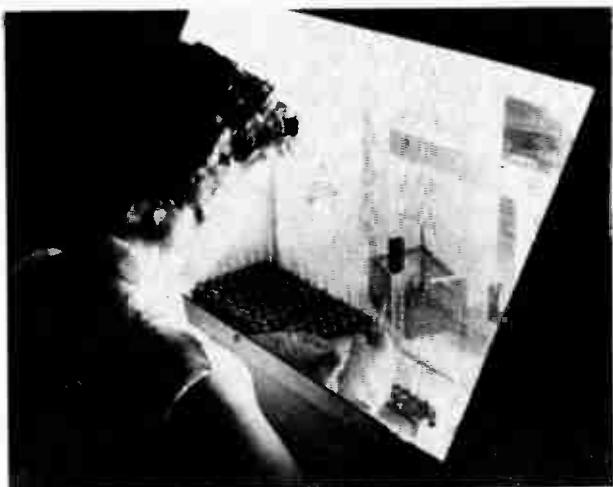
close-up

**looking lenswise
at your industry
in action**

Checking Bourns' TRIMPOT® potentiometers at Douglas Randall (Canada) Ltd., Toronto. Each TRIMPOT® is individually inspected 100 per cent for all electrical and mechanical specifications in order to maintain high quality performance standards for military and commercial applications.



Two members of the Western Primary Standards Laboratory staff at Convair (Pomona) Division of General Dynamics Corporation at Pomona, Calif., compare the performance of a "secondary standard" instrument (center) with the output of the "primary standard" dynamometer (at rear).



Assembling silicon rectifiers in a dry air compartment box at Radio Valve Co. Ltd., Toronto. Air temperature and humidity is carefully controlled, and operator's hands are covered with rubber gloves to prevent contamination of the materials which would affect their electrical properties.

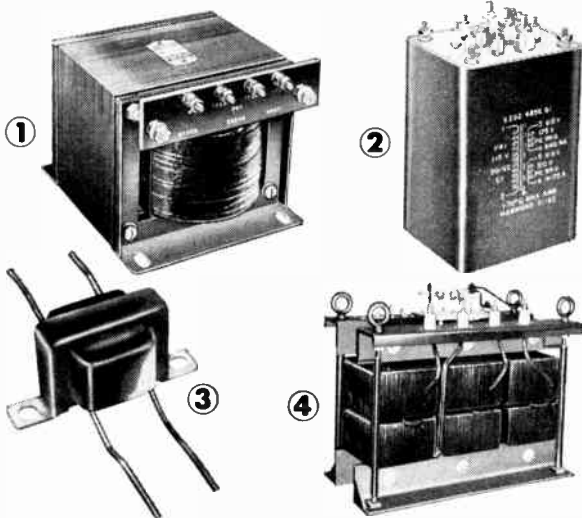


Variable resistors being checked at Precision Electronic Components (1956) Ltd., Toronto, Ontario. The above illustration shows the final inspection in which the taper-noise and the hop-off resistance of L-type variable resistors are checked in one automatic operation.



Charles W. Curtiss, manager of Hughes Aircraft Company's microwave engineering department, examines new "parametric amplifier" for use in aircraft and airport radar systems. New amplifier is expected to increase range of both systems by as much as 100 per cent.

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For complete details check No. 20 on handy card, page 47

Microwave techniques

Continued from page 19

In every branch of technology, measurement and testing techniques have been evolved, and in microwaves a whole range of special instruments are required as research tools and production test units. The microwave instrument industry in the U.K. lies mainly with relatively small companies. The instruments can be divided broadly into waveguide components (bends, attenuators, slotted lines, etc.) electronic accessory equipment (modulators, power supplies, amplifiers, etc.) and combined test sets (automatic impedance plotters, reflectometers, signal generators, etc.).

Readily available

Components are readily available in all the established radar and communication bands. Outside these bands equipments are made to order. An example of high-quality British test equipment of novel design is the Elliott rotary standing wave indicator which measure accurately impedance by means of a small spinning probe located in a circular branch from the main waveguide.

An example of a combination instrument used for the measurement of dielectric properties at microwave frequencies and elevated temperatures is the Microcell Dielectric Test Set, which uses a microwave bridge circuit analogous to the Wheatstone Bridge.

Among the many novel uses to which microwaves have been put are the determination of the dryness of bricks, the assessment of diffraction patterns from "giant" models of atoms and molecules, and the stimulation of activity in frozen rats.

Microwave technology will continue to grow as a separate branch of science, and among other exciting possibilities now being studied are very fast digital techniques using microwave frequencies, the use of tunnel diodes for oscillators and amplifiers, and the generation of super high powers.

*The Story of Canada's Booming
Communications Industry will be
told in the June Issue of*

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Authoritative construction reports and expansion plans of Canada's major telephone systems and defense communications from the Yukon to the Maritimes as well as . . .

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Letters to the editor

The article entitled "Let's Put Some 'Meat' Into Our Association Meetings", published in the April issue of *ELECTRONICS AND COMMUNICATIONS* has aroused interest among E & C readers in different cities, as will be seen from the following representative letters, which proffer suggestions as to how attendance at association meetings may be stimulated.

Engineers' meetings

The Editor:

While I do not read your good publication, *Electronics and Communications* as regularly as I would like to, I did go through the April issue rather carefully and wish to comment on your article, "Let's Put some Meat Into our Association Meetings".

In the first place, I would like to commend you on writing such an article and on stimulating the panel discussion referred to. For a number of reasons, I feel that the whole engineering profession in Canada must take a closer look at itself and realize that engineering is a profession and that all members of the profession should energetically push their participation in the association and its activities in acquainting the public with the good work which can be done by the application of science, engineering and research to business. We in Canada have for so many years relied upon our good friends in the United States for so much of the engineering which is done in this country. While this is a natural sequence of events when a company starts in business, it should not be a continuing state of operation because, without a background of engineering, no manufacturing company has an effective foundation on which to build a business. The persistence of this practice is, in my opinion, indicative that the engineers working in the companies have not sold their management on the job which engineers can do for the company as well as they should have done. Under these circumstances, management goes along blithely thinking that they are operating in a most effective manner. If management was sold on the contribution which engineering and development can contribute to a company's stature, they would be more insistent on the engineers themselves being active in their Association.

I do not wish to mention names with regard to some of the comments which arose during the question period but certainly deplored the statement that the subjects dealt with should be presented in plain and simple English, and in another case that, if a man wished to understand what transpired in a meeting, he would have to go back to college. In my opinion, these

two statements are a reflection on the status of engineering, research and design in Canada.

Keep working on the idea! You are dealing with a very important subject and one which is at the basis of the development of the industrial economy of Canada.

Carl A. Pollock, President,
Dominion Electrohome
Industries Limited,
Kitchener, Ont.

Engineers' meetings

The Editor:

Your April report of a recent joint AIEE-IRE panel discussion on poor attendance at professional society meetings brought forth some interesting explanations and suggestions.

Your suggestion of requiring members to attend a minimum number of society meetings might be turned around the other way by offering a prize or prizes for attendance. Some societies give best-paper prizes; why not best-listener prizes, based on points for attendance, with bonus points for constructive discussion, not applicable for discussions exceeding three minutes or for any discussion after 9.45 p.m., executive members not being eligible? I do not suggest draws or door prizes. Let them be earned!

C. Kent Duff
Senior Technical Engineer
System Planning Dept.
Ontario Hydro.

Engineers' meetings

The Editor:

I am very much interested in your Article "Let's Put Some Meat Into Our Association Meetings", in the April issue of *Electronics and Communications*, and I fully agree that it is a problem. I have been a member of the Institute of Radio Engineers since 1928 and have attended meetings fairly regularly both at the Toronto and Hamilton sections.

We in Hamilton attempted to deal with this problem two years ago. We put into effect extra advertisements or bulletins with phrasing to work up some enthusiasm. It helped to a degree, but invariably it was of interest to some particular group who did not attend the next time, so that we were still faced with the same

problem. I found over a period of years that the meetings that drew the largest attendance were subjects of very current interest and border on the entertainment side. By this I mean a meeting with a large display or film or a trip through a local TV station or maybe some plant, but over all that the meeting was particularly social and the members could get together without sitting through hours of heavy concentration. Of course at any time the meeting did not deviate from a strictly Engineering session.

Time and again we did not figure on that many people showing up, which leads me to believe that the subjects of the meetings should be of a different pattern than is followed by IRE sections. I could go on further and discuss other points from prescribed IRE patterns but firmly believe that to increase attendance we should change our ideas of meetings. Our industry is always bringing up new ideas, methods etc. of high interest. The lecturer may not be so informative but the open discussions or simple demonstrations really draw the crowd.

Yours truly,
J. K. Williams, Buyer,
Appliance-TV-Radio Div.,
Canadian Westinghouse
Company Limited.

Amazed at growth

The Editor:

I have just seen your Buyers' Guide issue (Dec. 59) and am amazed at the growth of the electronics industry in Canada. I left Canada in 1952 because it was not growing fast enough.

I hope you may be able to send me a copy of the December 1959 issue for my reference files. We are called upon at times to supply details of representatives throughout the U.S.A.; with a copy of your book I will be able to recommend Canadian representatives.

J. Greenblatt, Publisher,
Western States Electronics
Directory and
Buyers' Guide
Los Angeles 57, California.

Conservative handling

The Editor:

Thank you very much for the copy of *Electronics and Communications*.

I want to thank you for handling the article on Molecular Electronics in a conservative, rather than in a flamboyant manner.

S. W. Herwald,
Vice-President,
Westinghouse Electric
Corporation
Pittsburgh 35, Pa.



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FAX-FQF Zenith numbers in leading industrial areas.

For complete details check No. 25

techdata for engineers

Micro-miniature relays

A 24 page catalog covering its line of sub and micro-miniature hermetically sealed relays has been made available by Filtors, Inc., relay manufacturers.

Designated as catalog number four, the multi-colored book includes complete specifications on the firm's "Powrmite" series micro-miniature relays and its numerous sub-miniature types. The catalog includes information on mounting styles, available terminal types, sockets, ordering data, and dry circuit information.

Engineers may obtain a copy of the catalog gratis by writing to **Filtors, Inc., Port Washington, N.Y.**

DC-DC converters

An illustrated report which makes available for the first time detailed data on the design of tape wound core-transistor converters is entitled "Designing DC-DC Converters". The introductory portion presents valuable data on converter design factors, including transistor selection and characteristics of magnetic cores. The second half of the report contains complete step-by-step information on two theoretical case histories covering design of a power converter, and of a DC to DC high voltage supply. Copies of the report may be obtained by writing to **Magnetics, Inc., Butler, Pennsylvania.**

Lighting and wiring products

A 32-page quick reference condensed catalog of CSA approved electrical conduit fittings, plugs and receptacles, circuit controls, industrial lighting fixtures and floodlights has recently been announced by Pyle-National (Canada) Ltd. Simplified product description and short-cut indexing add to the convenience of this easily carried selection reference prepared especially for contractors, maintenance engineers and product designers.

Request Catalog No. 60-C from **Pyle-National (Canada) Ltd., 33 Ingram Drive, Toronto 15, Ontario.**

Transistor manual

A new edition, the fourth, of the GE Transistor manual has been published and is now available through the company's authorized semiconductor distributors. The book contains 227 pages of completely re-written information on transistors and their use in electronics circuits. Included in

the twenty chapters is information on basic semiconductor theory, transistor radio servicing techniques, and several chapters on typical circuits.

The fourth edition of the Transistor manual is priced at \$1.25 and may be purchased either from the company's distributors or from **Canadian General Electric Co. Ltd., 189 Dufferin Street, Toronto, Ontario.**

Power supplies

A 24-page Kepco catalog (B601) of Voltage Regulated Power Supplies has recently been issued. This catalog gives full descriptive data of active standard models in the transistorized, vacuum tube, magnetic and hybrid design groups of the company's wide line of power supplies. A new dual index by design group and output voltage range provides easy access to this data. Copies of Catalog B601 are available by writing to **Kepco Inc., 131-38 Sanford Ave., Flushing 55, N.Y.**

Reliability assurance

An 8-page brochure designed to familiarize components, reliability and quality control personnel with Bourns' Reliability Assurance Program is now available from Bourns, Inc., Riverside, California. This brochure illustrates the steps being taken at Bourns to comply with the increasingly stringent component reliability specifications imposed by the electronics industry.

For information on this program, write Bourns' Canadian licensee: **Douglas Randall (Canada) Limited, 126 Manville Rd., Scarborough, Ontario.**

Size 18 servomotors

A new catalog describing their full line of Size 18 Servomotors has just been released by Helipot Division of Beckman Instruments, Inc., Toronto, Ontario. Complete with typical unit characteristics, specifications, dimensionals and torque-speed curves, the 16 page catalog is directly adaptable to the needs of engineers.

The Size 18 Catalog rounds out Helipot's Servomotor catalog program, as the firm has already printed similar literature covering their Size 8, Size 11, and Size 15 rotating components. Free copies of the new Size 18 Catalog, or any of the other catalogs may be requested from **R-O-R Associates, Limited, 1470 Don Mills Road, Don Mills, Ontario,** sales representatives for Helipot Division of Beckman Instruments, Inc.

LET'S TALK



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Jack Sparks *

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* Manager, Commercial Printing Division,

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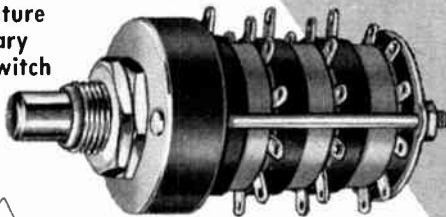
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For complete details check No. 19 on handy card, page 47
ELECTRONICS AND COMMUNICATIONS, May, 1960

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This Pocketscope leader is ideal for most industrial work and is especially useful on many circuits using thyatrons, rectifiers, etc. It is used extensively for servicing the most sensitive signaling and communication networks. It enjoys world-wide popularity due to unique performance, small size, light weight and low, low price.

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scatter matter

Scanning the international scene

The **Radio Corporation of America** has agreed to set up an electronics manufacturing complex as part of an extensive development program for southern Italy, to be financed by the Italian Government. The plan requires RCA to establish new manufacturing facilities, from tubes and transistors to a data processing center for Rome, and to enlarge and expand existing facilities. The whole project should be completed within ten years after which RCA will have the option to acquire the entire complex.

An electronic computer that can direct the running of a 10-car train is being produced by a **Latvian** factory, according to the Soviet news agency Tass, which reports that the computer during tests kept the train on schedule, controlled speed and accurately responded to other signals. Advance information on the train's route, line voltage, wind force and other essential data was fed to the machine.

An agreement between the Indian Government and **Marconi's Wireless Telegraph Co. Ltd.** has been concluded which will provide for co-operation in the local manufacture under license of equipment of **Marconi** design. The agreement, which provides also for technical assistance and the supply of materials and components, will form the basis for Indian manufacture of equipment in the aeronautical radio, sound and television broadcasting, communications and radar fields.

Canada's first satellite, to be officially known as **Topside Sounder**, is to collect information on "space music", comprising signals from the stars and the masses of gas that accumulate in outer space. This satellite, to be built and equipped by Canada, will be launched by the United States from Air Force Base at **Vandenberg, California**. It is expected to go into orbit in November, 1961.

Italian television authorities have placed an order with **E.M.I. Electronics Ltd.**, through their representatives in Milan, for four of the latest high-quality TV camera channels for use in covering events at the Olympic Games to be held in Rome next August. The order won over strong foreign competition.

The first British closed-circuit TV system to be installed in Wall Street enables busy executives of a New York stockbroking organization to study the latest ticker-tape stock market movements without leaving their offices. The television system relays a continuous picture of moving tickertapes giving price changes on the New York and American Stock Exchanges, to seven large-screen monitors in offices throughout the building.

The Japanese Government is reported to be meeting the request of **Japanese** electronics and other industries for freer imports of tantalum by specifying metal tantalum as a duty-free import item. Tantalum is used for the manufacture of capacitors and other products.

The Turkish Telephone Administration has contracted with **L. M. Ericsson Telephone Company** of Stockholm, parent of the Ericsson Group, for a \$14 million long-range development program for the national telephone system in Turkey. A telephone factory will be built in Turkey by the Swedish company, who will provide technical assistance in the manufacture of Ericsson system equipment in that locale.

It is reported that one of **Japan's** leading television manufacturers is prepared to sell color TV sets in the United States for as low as \$300. The cheapest color TV set currently sold by American manufacturers is slightly less than \$500.

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**CNT Maritime
sales supervisor**

James F. Louder, assistant plant supervisor, Canadian National Telegraphs, has been appointed district sales supervisor of the company's Maritime district, with headquarters at Moncton. The appointment, effective April 1, was announced recently by Hugh A. Marquis, CNT superintendent, for the Maritimes.

In his new position Mr. Louder will be responsible for all sales throughout the district, including private wire services and the recently developed Telex system. The district encompasses the provinces of Nova Scotia, New Brunswick, Prince Edward Island and Quebec, east of Riviere du Loup.

**Canadian Admiral Corp.
appliance engineer**

S. D. Brownlee, president, Canadian Admiral Corporation Ltd., recently announced the appointment of R. P. "Pat." Bourke, appliance engineer for the company.

Mr. Bourke is a professional member of the Chemical Institute of Canada and joins Canadian Admiral after eight years in appliance engineering with Frigidaire Products of Canada.

**TMC (Canada) engineer
assists on "Project Mercury"**

D. V. Carroll, president and managing director, Technical Materiel Corporation (Canada) Limited, Ottawa, has announced the appointment of Michael Yurko, B.Sc., M.E.-C, P.Eng., as co-ordinating engineer on the U.S. Space Program "Project Mercury". He will be working with other engineers of The Technical Materiel Corporation, Mamaroneck, N.Y. and with the Western Electrical Company. Mr. Yurko is known for the design and co-ordination of complex communication installations in use throughout the world.

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buy Gold Brand"



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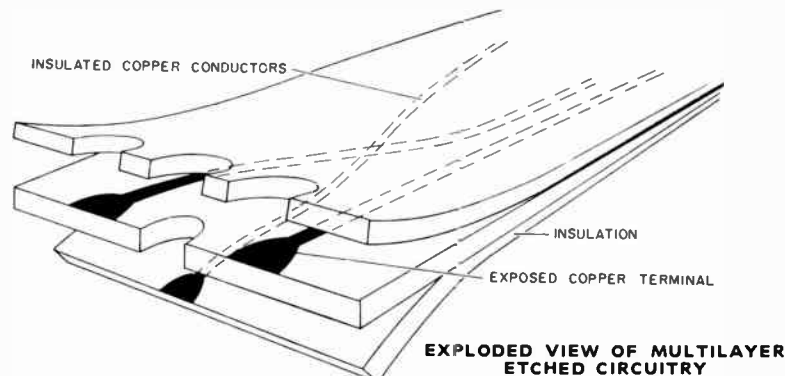


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briefing the industry

■ In releasing the 67th annual report of the **Canadian General Electric Company Limited**, **J. Herbert Smith**, president, revealed that sales billed in 1959 by the company totalled approximately \$225½ million (after elimination of sales tax for 1959, previously charged to cost of sales). This represented an increase of 2 per cent from 1958's sales level of \$222 million (after elimination of sales tax for 1958). Net earnings for 1959 were \$10,310,525, an increase of 2 per cent over 1958.

■ Beginning on May 22, the system officially known as D.I.D. (Direct in Dialing) will permit one to dial, or be connected, directly to any official Bell PBX number in Toronto. The system allows calls originating either in Toronto or in any community having Direct Dialing with Toronto to be dialed direct to the extension desired. Other out-of-town calls, though still handled by an operator, will also be connected directly.

■ Over the past decade the electronics industry in Canada has placed nearly 4 million Canadian-made television receivers in the hands of Canadians, according to **F. W. Radcliffe**, general manager of **Electronics Industries Association of Canada**.

■ In an address by **John D. Houlding**, president, **RCA Victor Company, Ltd.**, before the company's Quarter Century Club, the speaker said "We are very proud of the fact that our Canadian company is now regarded by RCA, our parent company, as its principal engineering and production source of microwave equipment for projects anywhere in the world."

■ Over 8,000 telephones are expected to be installed throughout the province of Nova Scotia during 1960 by the **Maritime Telegraph and Telephone Company**, which will more than equal the number installed in 1959. The company estimates that by 1965 there will be some 200,000 telephones in service in the province.

■ In announcing the formation by the CSA Board of Directors of a **Canadian National Committee of the International Organization for Standardization (ISO)**, **R. S. Eadie**, president of CSA, said: "Twenty-five per cent of Canada's gross national product is derived from foreign trade, and goods made in Canada are not good exports if they do not fit the standards and meet the requirements of the country to which they are exported." In order to broaden local horizons and enlarge thinking to the international level, Canada, through the CSA, is to have a more active and forceful participation in the international program.

■ **Lands and Forests Minister Ray Williston** of British Columbia predicted in the legislature recently that there would be a greater use of electronics, linked with radio, to make possible more remote control of operations in province's logging industry. The logger, he said, will tend to become a push-button man.

■ Electronic technicians of **Kimberley, B.C.**, trained in a specialized field, have formed an **Electronic Technicians Association** to encourage public confidence and to raise professionally and financially the status of the electronic technician in the area.

■ According to **Stuart D. Brownlee**, president of **Canadian Admiral Corporation**, 1960 will be the first really big trade-in year. Over 250,000 TV sets will be over eight years old, 750,000 will be over seven years old and 1¼ million will be over six years old. Approximately two million television sets in Canada are five or more years old.

■ Three major fields will be highlighted in the 1960 **Seventh Region Conference of the IRE**, to be held May 24-26 in Seattle, Washington, according to **Dr. Frank S. Holman**, chairman for the event. They are control systems, solid state electronics, and electromagnetics.

J. K. Wilson wins suggestion award

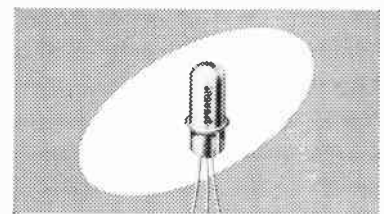
The Suggestion Award Board of the Public Service of Canada has made an award of \$335.75 to **Petty Officer John K. Wilson**, of Stoney Mountain, Manitoba, and Dartmouth, N.S., for his suggestion on modifications to radar magnetrons used by the Royal Canadian Navy. Only three months ago PO Wilson won a cash award of a lesser amount for filing a suggestion of a carrying rack for a radio unit used by the Navy.

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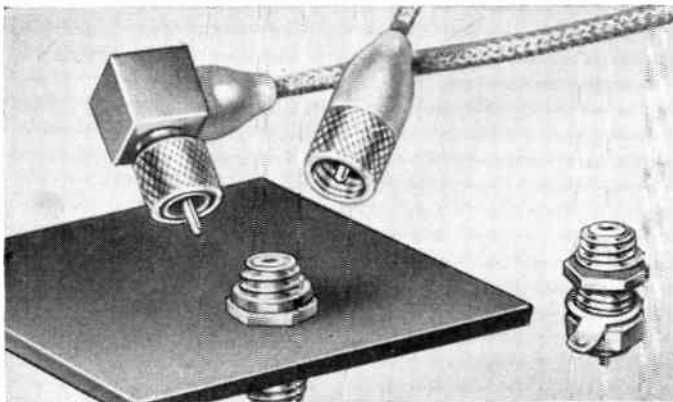
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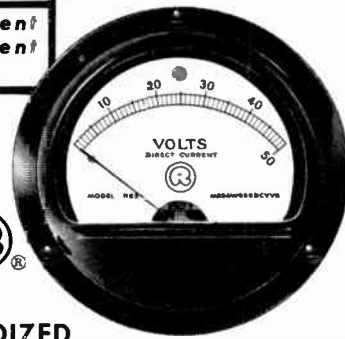
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Honeywell



For complete details check No. 22 on handy card, page 47

BENDIX SR RACK
AND PANEL CONNECTOR

with outstanding resistance
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The Bendix type SR rack and panel electrical connector provides exceptional resistance to vibration. The low engagement force gives it a decided advantage over existing connectors of this type.

Adding to the efficiency of this rack and panel connector is the performance-proven Bendix "dip-type" closed entry socket. Insert patterns are available to mate with existing equipment in the field.

Available in general duty, pressurized or potted types, each with temperature range of -67°F to +257°F.

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FEATURES:

Resilient Insert • Solid Shell Construction • Low Engagement Forces • Closed Entry Sockets • Positive Contact Alignment Contacts—heavily gold plated Cadmium Plate—clear iridite finish • Easily Pressurized to latest MIL Specifications.

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

engineers' book-case

Noise in Electron Devices edited by Louis D. Smullin and Hermann A. Haus.

This book provides a comprehensive discussion, stressing the mathematical theory and basic physical phenomena, rather than detailed design techniques. The most modern points of view are presented regarding cathode noise phenomena, signal amplification in microwave tubes, solid-state noise, and methods of designing low-noise tubes.

Since the emphasis is on fundamental processes, the material presented can well serve as background for the understanding of such devices as masers and parametric amplifiers.

The Technology Press of Massachusetts Institute of Technology and John Wiley & Sons, Inc., 440 Fourth Avenue, New York 16, N.Y., contains 413 pages, hard cover bound, price \$12.00.

Electronic Fundamentals and Applications — Second Edition by John D. Ryder.

For many years one of the most widely studied books on electronics, this Second Edition is now completely up-dated to include new material on the latest solid state devices.

Dr. Ryder believes that the transistor and other semiconductor devices have fully proved themselves and that in relatively few years the transistor will replace the vacuum tube in many of its present applications. In recognition of this trend the author discusses semiconductors as fully as vacuum and gaseous devices.

Prentice-Hall, Inc., 70 Fifth Avenue, New York 11, N.Y., contains 721 pages, hard cover bound, price \$13.35.

Yardsticks for Industrial Research by James Brian Quinn.

This book is the first full-length treatment of the problems of evaluating industrial research output for management purposes. It develops a thorough and practical system of assessing, both in technical and in economic terms, a company's past performance in research in order to guide future action. By means of the segmental approach and the quantitative and qualitative techniques suggested in the book, a company's research and development programs can be more effectively administered and controlled.

The Ronald Press Company, 15 East 26th Street, New York 10, N.Y., contains 224 pages, hard cover bound, price \$6.50.

A Primer on Television Tape Recording by George B. Goodall, Ampex Corporation.

This book is an informative, easy-reading presentation of video tape recording and video playback concepts. Basic principles and basic components are described and illustrated. Control systems, special techniques, editing, splicing and duplicating of video tapes are covered. The non-mathematical and formula-free treatment of Ampex Corporation's VIDEOTAPE* machine and methods make it possible for the layman as well as the expert to gain an insight into the use of magnetic tape recording for both video and audio applications, with emphasis on video.

* Trademark of Ampex Corp.

Robins Industries Corp., 36-27 Prince Street, Flushing 54, N.Y., contains 48 pages, soft cover, price \$1.00.

Electronic Circuits, Signals, and Systems by Samuel J. Mason and Henry J. Zimmermann.

A companion volume to Zimmermann and Mason's "Electronic Circuit Theory", this book presents matrix, topological and signal-flow-graph methods of circuit and system analyses. In each case the formulation and solution of electronic circuit problems is stressed, but the methods are applicable to many other fields. The unified treatment of signals is based on the correlation function, the Fourier integral, and the Fourier series. Pulse, periodic, almost-periodic and random signals are analyzed and synthesized.

John Wiley & Sons, Inc., 440 Fourth Ave., New York 16, N.Y., contains 616 pages, hard cover bound, price \$12.50.

The Theory of Heat Radiation, by Max Planck (\$1.50), which is Nobel laureate Planck's classic introduction to the theory of radiant heat in terms of the principle of quantum action.

Tensors for Circuits, by Gabriel Kron (\$1.85), a bold and provocative work (originally published as "A Short Course in Tensor Analysis for Electrical Engineers").

Principles of Quantum Mechanics, by William V. Houston (\$1.85), designed for the student with a knowledge of elementary mathematical physics who wishes to acquire greater familiarity with quantum analysis.

Microwave Transmission, by J. S. Slater (\$1.50), the first work to deal exclusively with microwaves, and still a basic text for students.

Dover Publications, Inc., 180 Varick Street, New York 14, N.Y.

Prime Electronic Components represents Ripley

Ripley Company Inc. of Middletown, Connecticut, have announced recently the appointment of Prime Electronic Components Ltd. as sales representatives for Canada selling to original equipment manufacturers only.

The products consist of L-R Blowers for cooling aircraft and electronic equipment; and precision motors.

Prime Electronic Components Ltd., is located at 868 Dundas Highway East, Dixie, Ontario.

Glendon Co. rep for Community Engineering

John E. Hines, Jr. sales manager of Community Engineering Corporation, has appointed The Glendon Company, Ltd., 603 Evans Avenue, Toronto, as sales representative in Eastern Canada for the company's line of series 1000 low noise VHF and UHF preamplifiers, distributed amplifiers, and band pass amplifiers.

In making this appointment, Mr. Hines said: "Sales were formerly handled directly by the factory, but the continuing growth of Community Engineering Corporation and its expanding activity in the amplifier field necessitated this step forward in our marketing program in order to efficiently service our present and potential Canadian accounts."

Ferritronics Ltd. enters field

A manufacturing concern which will specialize in the application of ferrites in electronics has begun to operate under the name of Ferritronics Ltd., according to a recent announcement by George G. Armitage, president of the company.

The frequency range Ferritronics Ltd. expects to cover is from 100 cycles to 10 Mc/s or even slightly higher. They will be manufacturing bandpass and bandstop filters, low pass and high pass filters, tuned networks, oscillators, discriminators, pulse transformers and broadband transformers.

While initial orders will be to customers' specifications, it is expected that eventually a "line" of products will be developed.

Ferritronics Ltd. is located at 157 Willowdale Ave., Willowdale, Ontario.

Federal Wire opens Moncton warehouse

Consistent with its policy of constantly improving customer service, the Federal Wire and Cable Division of H. K. Porter Company (Canada) Ltd., has opened warehouse facilities at 34 Albert Street, Moncton, New Brunswick.

Northern Electric research labs to employ 400 people

A. B. Hunt, general manager, research and development for Northern Electric Company, Limited, has announced that a contract for the first two buildings of the company's research and development center has been awarded to Doran Construction Company Limited, Ottawa. The amount of the contract is approximately two and one half million dollars.

Northern Electric's research and development laboratories have been operating on a limited scale since last October in temporary quarters at Bells Corners, Ottawa. Upon completion of the first stage of the company's pro-



A. B. Hunt

gram, in 1961, a staff of about 200 scientists and supporting personnel will move to the new location.

The new Ottawa facilities will accommodate a staff of approximately 400. Progressively the staff will be in-

creased over the next six to seven years to about that number. With the construction of two more buildings at a later date, there will be provision for future expansion as required.

The reorganization of the company's research and development activities has become necessary as a result of the expansion of Canada's economy, particularly in rugged and sparsely populated northern areas.

Today's conditions are placing ever-increasing demands upon Northern, as Canada's largest manufacturer of communications equipment, wires and cables, for new and better types of products, many of them required to meet specific Canadian conditions.

To be successful in this endeavor, the company's manufacturing organization must be supported by greater scientific knowledge. The role of Northern's laboratories will be the development of new products, in the broad fields of communications and power distribution, to meet and to anticipate the Canadian demands of the future.

CGE technique helps servicemen

A new technique for helping local independent radio and television servicemen improve their business methods is being offered by Canadian General Electric. The announcement was made by Robert S. Thompson, replacement sales manager.

A long-playing record entitled "Sounds of Success" features actual interviews with 30 of the most successful servicemen in the country. The interviews reveal the selling secrets of these successful independent businessmen in their own words. The aural presentation is supplemented by two texts. Tailored to meet the needs of these small business establishments, the course is available throughout the country from authorized wholesale distributors of General Electric receiving tubes and other electronic components.

Mr. Thompson said the new course was prepared under the direction of Dr. John K. Pfahl, associate professor of business organization, and produced by the McGraw-Hill Publishing Company under G-E sponsorship.

In addition to the LP record entitled "Sounds of Success", the course includes a 104-page book on "Sound Business Practices" and a 64-page text on "Selling Electronic Service".

Now you can try the reliable I20*

Lab-Type Volt-Ohm-Milliammeter

in your own plant—without obligation—

and convince yourself that you won't find a unit comparable to this **PRECISION** instrument for your electronic maintenance requirements



The Model 120 is the most comprehensive Volt-Ohm-Milliammeter ever offered within its price range. It features 60 ranges and functions which start lower and go higher than any other instrument of its size or type. It is specifically designed for use in industry, laboratory and maintenance shops.

*One of 25 **PRECISION** instruments listed in the new 1960 Catalog of Industrial Electronic Test Equipment and Panel Meters. Write today, for your copy

ATLAS Radio Corp., Ltd.
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- We would like to evaluate the **PRECISION** Model 120 in our own plant—with no obligation, of course.
- Send us the new **PRECISION** catalog of Industrial Electronic Test Equipment and PACE Panel Meters.

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

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wanted by well established sales representative company for O.E.M. and Industrial accounts.

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desires part-time position in Toronto. Thirty-four years of age, with 6 years' experience in design and development of electronic measuring — sound reproduction — and industrial equipment.

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Electronics and Communications
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ENGINEERS AND TECHNICIANS

required for development work on solid-state circuits and devices. Experience with power semi-conductors an advantage. Applicant should have appropriate qualifications and 3 years' experience. Send résumé quoting reference number A-1000 to:

Mr. D. C. MacLean, Personnel Supervisor,
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with unique combination of technical know-how, sales and management ability, seeks position in administration, technical liaison or sales capacity. Grade technician, radio and TV, Technical Maintenance Officer R.C.C.S. Wide experience in telecommunications systems, domestic and European, civil and military. Varied and successful sales experience coupled with technical teaching and sales management.

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- Will detect the smallest flaws in material from 1/10" to 30 feet.



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Electronic Engineers

COLLINS RADIO COMPANY OF CANADA LIMITED
TORONTO, ONTARIO

Is expanding its Development and Systems Engineering staff. Outstanding career opportunities are now available for experienced Engineers. You may be able to join one of the closely knit teams contributing significant advances in the areas of:

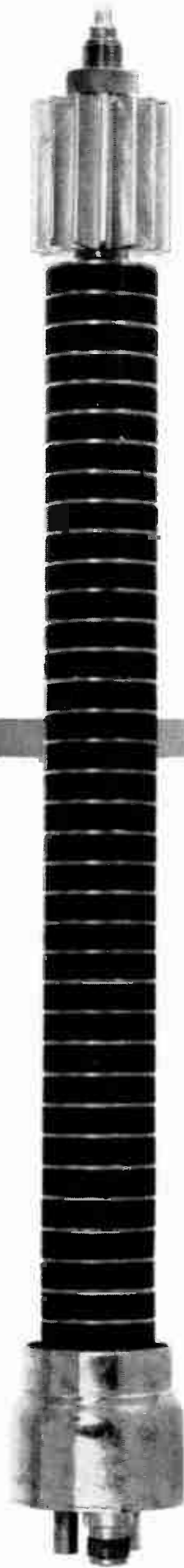
- SINGLE SIDE BAND
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Mr. J. V. Scott

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NOW AVAILABLE
Rugged New Eimac X778
Traveling Wave Tube ...
One Watt Output, 55-60 db Gain

Purchase orders are now being accepted on Eimac's pioneering new high gain traveling wave tube, the X778.

Unique features of this advanced one watt CW traveling wave tube include its exceptionally wide frequency range—5.0 to 11.0 KMc., small signal power gain of 55-60 db. and light weight permanent magnet focusing.

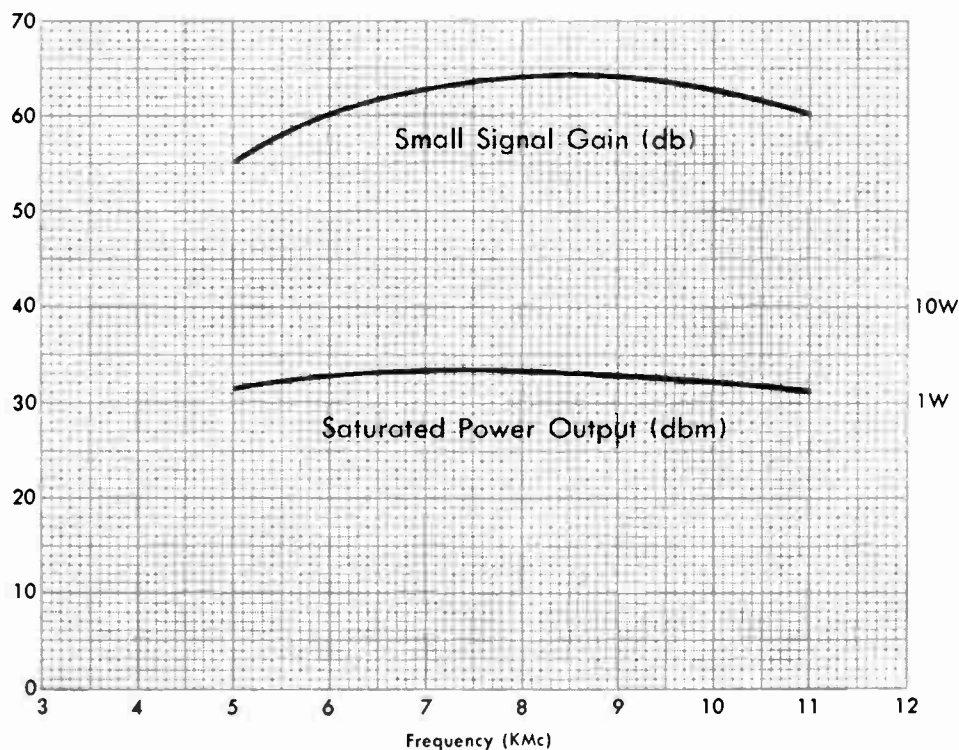
Like all other Eimac ceramic-metal tubes, this TWT "can take it."

The X778 was especially designed to operate under severe environmental conditions of shock, vibration, temperature variation and high altitude. Breakage is a thing of the past, resulting in greatly reduced tube replacement costs.

The Eimac X778 finds wide usage in electronic counter-measures, radar augmentors, data links—in any application where more than one tube would normally be required to cover the C and X bands. This means significant cost reduction and increased system reliability.

Contact R & D Marketing Department for additional details and information on how this tube type may be modified for your requirements.

General Performance Characteristics
Eimac X778 Traveling Wave Tube



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R. D. B. SHEPPARD, 2036 Prince Charles Road, Ottawa 3, Ontario.



6004

For complete details check No. 16 on handy card, page 47

Political hocus pocus or color TV?

During the past few years the Electronic Industries Association of Canada have approached the Canadian Broadcasting Corporation several times with the object of obtaining from CBC authorities the right for Canadian television stations to televise programs in color. According to the EIA there are two main obstacles that presently stand in the way of color telecasting in Canada and these two obstacles were recently pointed out by the EIA in a presentation to the Board of Broadcast Governors, the first presentation made by the EIA to the Board of Broadcast Governors since this body took over as the regulatory organization of Canadian radio and television.

The obstacles pointed out were:

1. The delay by the Department of Transport in approving the color television technical standards recommended for approval by all interested parties.
2. The restrictive nature of the present telecasting licenses issued to stations which treat color telecasting as a separate entity from black and white telecasting.

It is well known that there are no technical obstacles standing in the way of re-telecasting to Canadian audiences color programs which originate in the United States. For this reason then, the delay on the part of the Department of Transport in approving for Canadian use the National Television Color Standards, on which color telecasts in the United States are based, is beginning to take on the aspect of a delaying action on behalf of Canadian radio and television authorities who, it is reported, are reluctant to permit the telecasting of English language programs to Ontario audiences without at the same time providing simultaneous French language color telecasts for the French-speaking population of Quebec.

If such an attitude in the matter of color telecasting American-originated programs to Ontario viewers has been part and parcel of the old regulatory regime of the Canadian Broadcasting Corporation, then it is hoped that a less myopic attitude will be adopted by the Board of Broadcast Governors.

If the Board of Broadcast Governors is to serve the best interests of television in Canada, it will surely not allow itself to be dominated by political influences, and the best way it can indicate its stand in this matter is to permit forthwith the telecasting of color programs in Canada without any further hocus-pocus concerning simultaneous English and French-language telecasts.

Permission for Canadian stations to re-telecast American-originated color programs would undoubtedly create a market for color television receivers in Canada and thereby lend stimulus to the Canadian electronics industry, a consideration which the Board of Broadcast Governors should ponder well as opposed to the parochial attitude of providing English and French-language color telecasts simultaneously.

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Clip and file this reference sheet for future use

TRANSISTORS

Germanium Audio Frequency

- OC70 General purpose BETA = 30
- OC71 Medium gain BETA = 41
- OC72 Low power audio output
- 2-OC72 Matched pair of OC72
- OC73 Close tolerance medium gain
- OC74 Medium power audio output
- OC75 High gain BETA = 90
- OC76 Low power switching
- OC77 High voltage switching
- OC80 High current switching

Germanium Audio Frequency Power

- 2N1314 37 watts dissipation BETA = 45
- 2N1315 37 watts dissipation BETA = 85
- OC28 37 watts dissipation High I_c, High V_c
- OC29 37 watts dissipation High I_c, High V_c
- OC30 4 watts dissipation
- 2-OC30 matched pair OC30
- OC35 37 watts dissipation High I_c
- OC36 37 watts dissipation High I_c

Germanium High Frequency Power

- OC22
- OC23 } 10 watt dissipation at 2.5 Mc/s.
- OC24 }

Germanium Phototransistor

- OC71 General purpose phototransistor

Silicon Junction

- OC200 General purpose P-N-P
- OC201 General purpose BETA = 30 P-N-P
- OC203 High voltage, medium gain, P-N-P

Germanium Radio Frequency

- OC44 Converter for broadcast receivers
f_{co} 15.0 Mc/s.
- OC45 I.F. amplifier for broadcast receivers
f_{co} 6.9 Mc/s.
- OC46 High speed switching transistor
f_{co} 3.0 Mc/s.
- OC47 High speed switching transistor
f_{co} 4.5 Mc/s.
- OC139 Symmetrical N-P-N switching transistor
- OC140 Symmetrical N-P-N switching transistor
- OC141 Symmetrical N-P-N switching transistor
- OC169 High frequency alloy diffused transistor
- OC170 High frequency alloy diffused transistor
- OC171 High frequency alloy diffused transistor

Germanium Subminiature

- OC57 General purpose subminiature
- OC58 General purpose subminiature
- OC59 General purpose subminiature
- OC60 General purpose subminiature output amplifier

DIODES AND RECTIFIERS

Germanium Junction Rectifier

- OA31 Medium current power diode
I = 3.5A

Silicon Junction Rectifiers

- OA210 I max. 0.5 A P.I.V. 400
- OA211 I max. 0.4 A P.I.V. 800
- OA214 I max. 0.5 A P.I.V. 700

Silicon Zener Diodes

- OAZ200 to OAZ207 Voltage range
4.7-9.1 V ±5%
- OAZ208 to OAZ213 Voltage range
4.2-12.2 V ±15%

Silicon Junction Diodes

- OA200 P.I.V. 50 V, I max. 50 mA
- OA202 P.I.V. 100 V, I max. 30 mA

Germanium Junction Diode

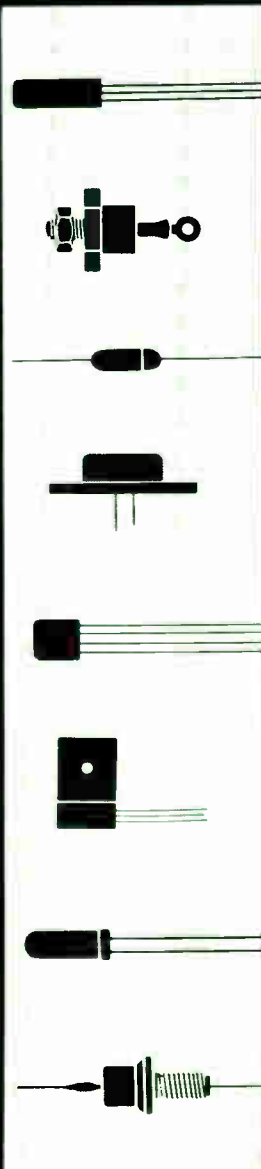
- OA10 Low hole storage computer diode

Germanium Gold Bonded Diodes

- OA5 P.I.V. 100 V, General purpose switching.
- OA7 P.I.V. 25 V, High speed switching.
- OA47 P.I.V. 25 V, High speed switching.
- 1N281 P.I.V. 75 V, High conductance diode.
- 1N760 P.I.V. 60 V, Extremely fast recovery diode.
- 1N788 P.I.V. 60 V, Extremely fast recovery diode.

Germanium Point-Contact Diodes

- OA70 1N87 Video detector.
- OA72 High frequency diode.
- OA73 1N616 Industrial diode.
- OA79 1N541 a.m. and f.m. detector.
- 2-OA79 1N542 Matched pair OA79 1N541.
- OAS1 1N476 High voltage general purpose.
- OAS1C 1N477 Clip-in version of OAS1 1N476.
- OA85 1N478 High voltage general purpose.
- OAS5C 1N479 Clip-in version of OAS5 1N478.
- OA86 1N480 Low hole storage computer diode.
- OAS6C 1N119 Clip-in version of OAS6 1N480.
- OA90 1N87A Subminiature video detector.
- OA91 1N617 Subminiature OAS1 1N476.
- OA95 1N618 Subminiature OAS5 1N478.
- 1N126 Subminiature JAN diode.
- 1N198 Subminiature JAN diode.

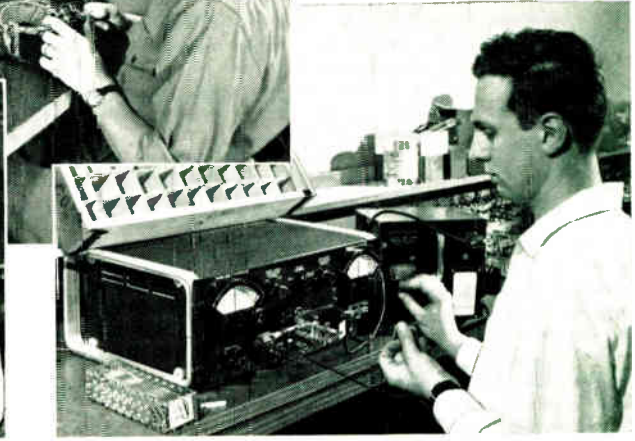
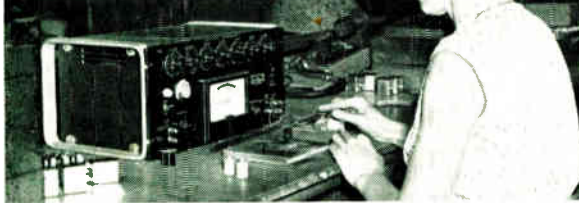
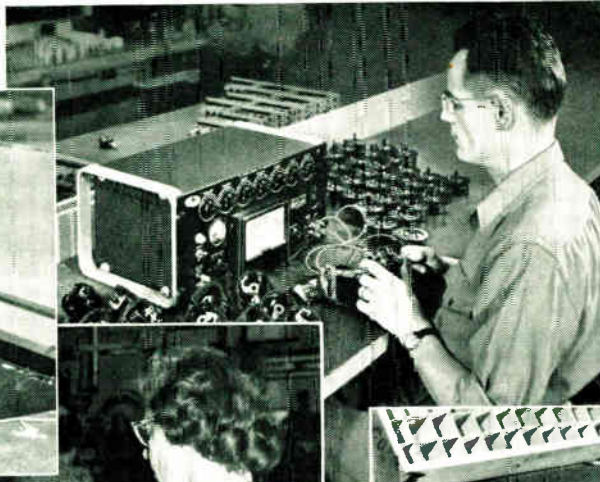


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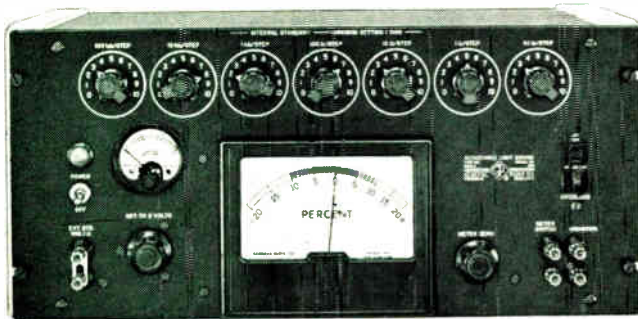
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- ★ Fast . . . Self Balancing . . . Measurements are made as rapidly as components can be connected.
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- ★ Easy to operate . . . Once set up, no further adjustments are necessary; measuring procedure reduces to simply connecting unknown to Bridge and reading meters.
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Type 1652-A Resistance Limit Bridge . . . \$520

Large, easily-read meter indicates directly component resistance as a percentage of value of internal standards. No computations, minimum possibility of mistake, saves valuable testing time.

Range: 1 to 1,111,111 ohms with internal resistance standard. 1 ohm to 2 megohms using external standards.

Meter Range: Meter reads from -20% to $+20\%$. $\pm 5\%$ and $\pm 10\%$ scales clearly indicated with color coding.

Accuracy: As a limit bridge, 0.5% or better. For matching resistances, $\pm 0.2\%$.

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Type 1605-A Impedance Comparator . . . \$800

Indicate directly on two panel meters the differences in magnitude and phase angle between an unknown and an external standard. Measures impedance differences as small as 0.01% and phase angle differences of ± 0.0001 radian.

Ranges: Impedance and resistance, 2 to 20 M Ω . Capacitance, 40 μf to 800 μf . Inductance, 20 μh to 10,000h.

Meter Ranges: Impedance Magnitude Difference; $\pm 0.3\%$, $\pm 1\%$, $\pm 3\%$, $\pm 10\%$ full scale. Phase-Angle Difference (in radians): ± 0.003 , ± 0.01 , ± 0.03 , ± 0.1 full scale.

Accuracy: 3% of full scale; i.e., for the $\pm 0.3\%$ range, accuracy is $\pm 0.009\%$ of the impedance magnitude being measured.

Internal Oscillator Frequencies: 100c, 1 kc, 10 kc, 100 kc.

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For complete details check No. 18 on handy card, page 47