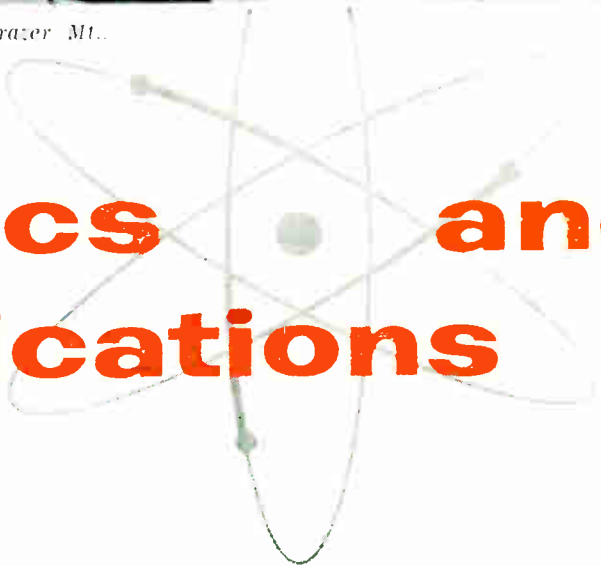


Antenna array of microwave repeater station at Frazer Mt., Nova Scotia (see story on page 20).

electronics and communications



an age publication

JANUARY 1959

12110
987
080
888

World Radio History

MR. F. W. PRESTON
B. EASTVALE CROSS
BROADBROUGH ONE

AROUND THE WORLD *again and again!*

A fair idea of the extent to which Stackpole fixed composition resistors are used may be gained from this illustration.

Laid end to end, the total number of these tiny components produced to date by Stackpole would extend many times around the world.

Such acceptance is a tribute, both to the high quality of the resistors and to the dependable, personalized service, that Stackpole puts behind each resistor order.

CANADIAN STACKPOLE LTD.

550 Evans Ave., Etobicoke
Toronto 14, Ontario

Type CM-1/32
($\frac{1}{2}$ watt)

Made in Canada . . . By
Canadians . . . In this modern
21,000 square-foot building.



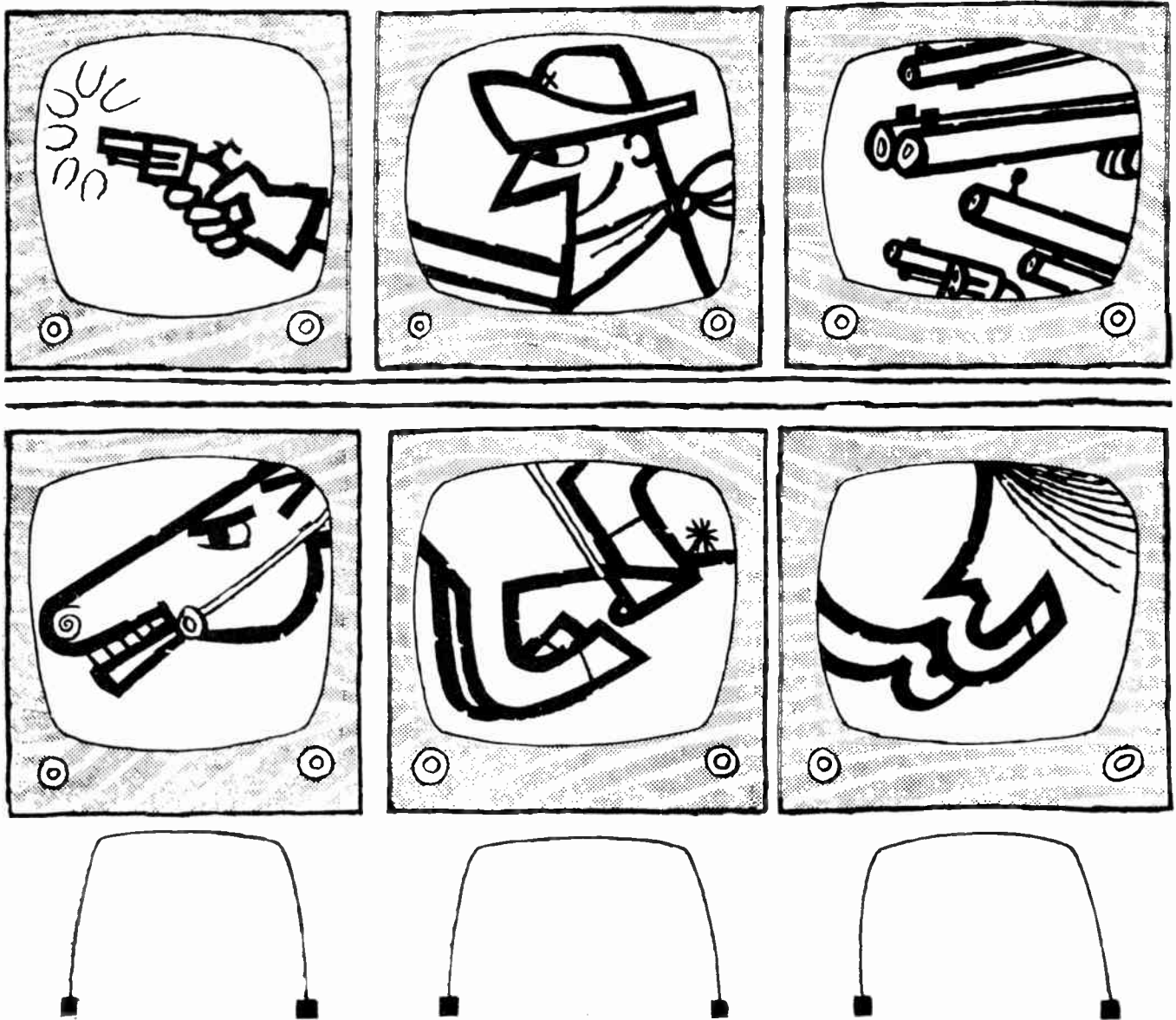
Type CM-2
(2 watts)

Type CM-1
(1 watt)



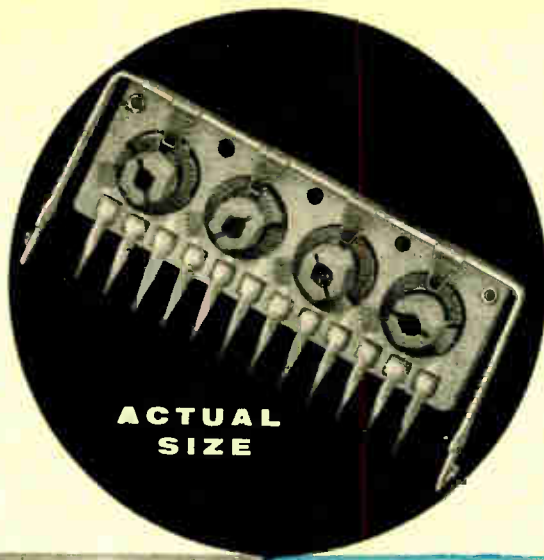
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Available for your convenience through leading parts distributors.

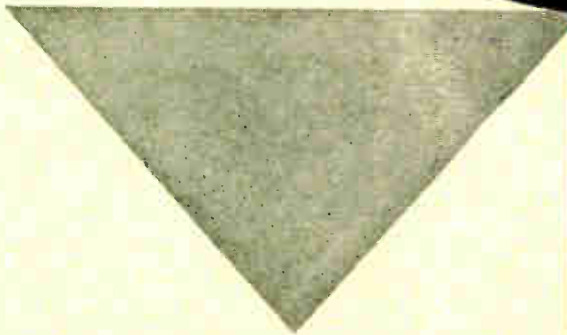


More bad guys bite the dust on **Marconi** TV Picture Tubes

Once again in 1958, more new television sets were equipped with Canadian Marconi TV Picture Tubes than any other brand. Again indeed! Since the beginning of TV set production in Canada, more Marconi TV picture tubes have been used than any other brand. ■ This consistent acceptance by Canada's leading TV set manufacturers is proof of the dependable quality and performance of Marconi Picture Tubes. ■ For complete customer satisfaction specify MARCONI RVC PICTURE TUBES.



Cost Savings
Higher Reliability
 your job ...
 and **Centralab's**



Model 5 Radiohm®
 1/4 watt multiple miniature
 variable resistor

(Component Density = 16.2 per cu. in.)*

* Cubic inch, rather than cubic foot, is used to provide a more realistic and more readily visualized standard of comparison.

TYPICAL MODEL 5

up to 4 variable and 9 fixed resistors on a single steatite plate measuring 2 1/4" x 3/4" x 15/32", including knobs . . . proportionally smaller when fewer variable resistors are required.

ECONOMY: Installed cost is considerably lower than larger variable resistors and separate fixed resistors. Substantial savings result from reduced production assembly costs.

RELIABILITY: Steatite bonded resistance elements assure high stability and noise-free operation. Conservative ratings provide an extra margin of safety under maximum load or severe environmental conditions.

VERSATILITY: The Model 5 Radiohm® is available with one to four variable resistors, with horizontal or vertical mounting brackets, plug-in terminals for printed circuit boards or wire leads for metal chassis.

SUPERIOR KNOB CONSTRUCTION: Unusual design permits adjustment with internal or external hexagon wrench, screwdriver, or by fingertip.

SPECIFICATIONS:
 Resistance Range: 1000 ohms to 5 megohms, linear taper.
 Wattage Rating: 1/4 watt at 70° C. ambient.
 Breakdown Voltage: 1250 Volts RMS, between adjacent sections and to bracket.
 End Resistance: Less than 1% of total.
 Rotational Life: Less than 5% resistance change after 250 rotations.
 Initial Torque: 2 inch ounces average.

Write for Centralab Bulletin EP-539 giving full specifications on the Model 5 Radiohm® series.



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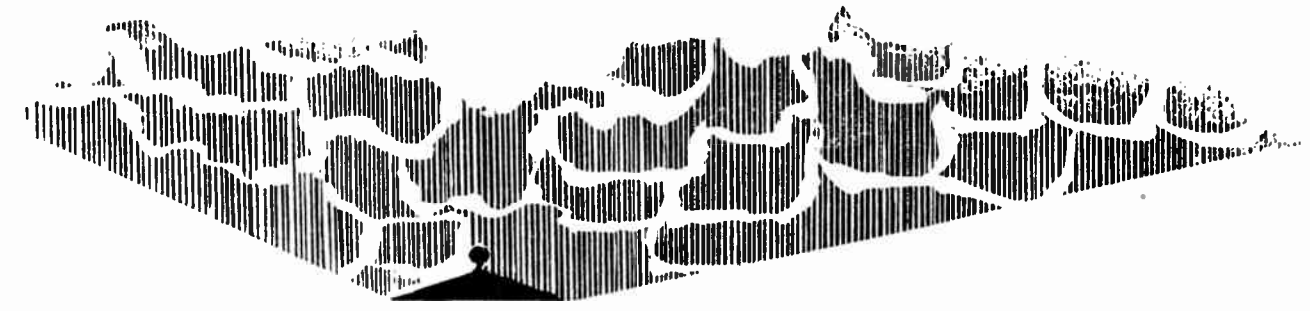
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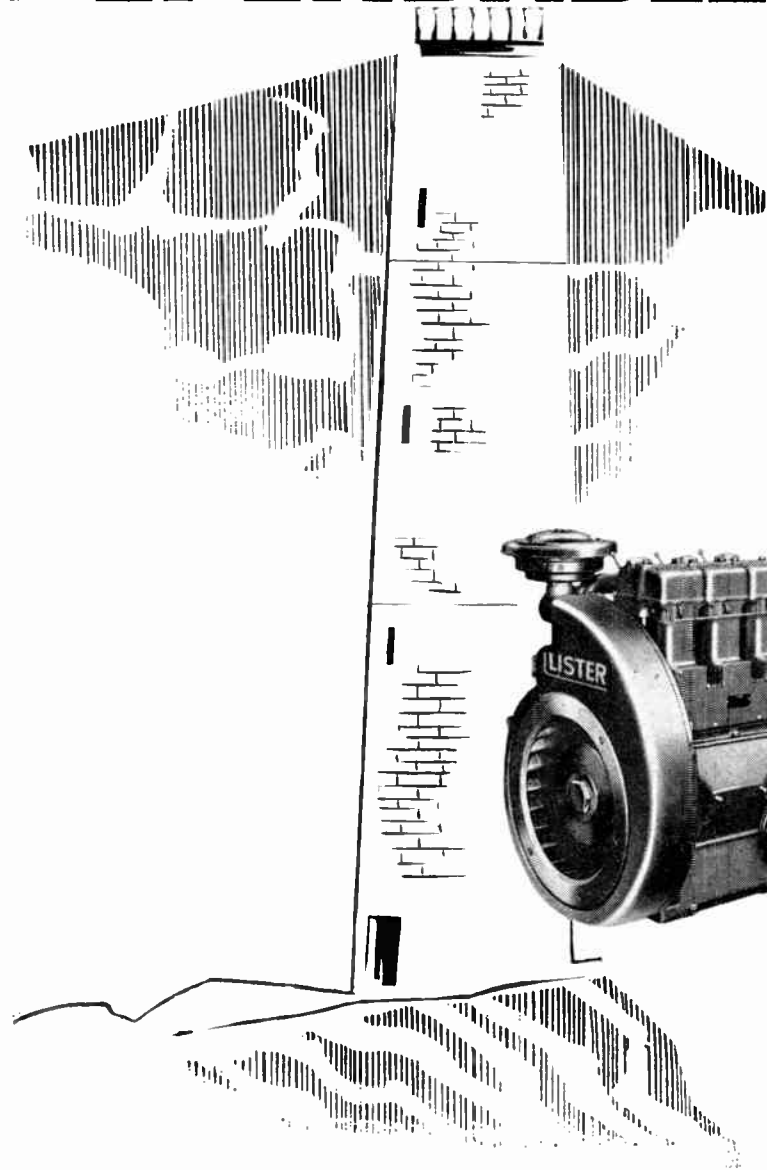
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LISTER AIR COOLED DIESEL ENGINES

In every field, Lister engines have proven themselves—setting a high standard of reliability and economy for industry and utilities. They are particularly suited to use in generating assemblies—for continuous running without attention.

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World Radio History

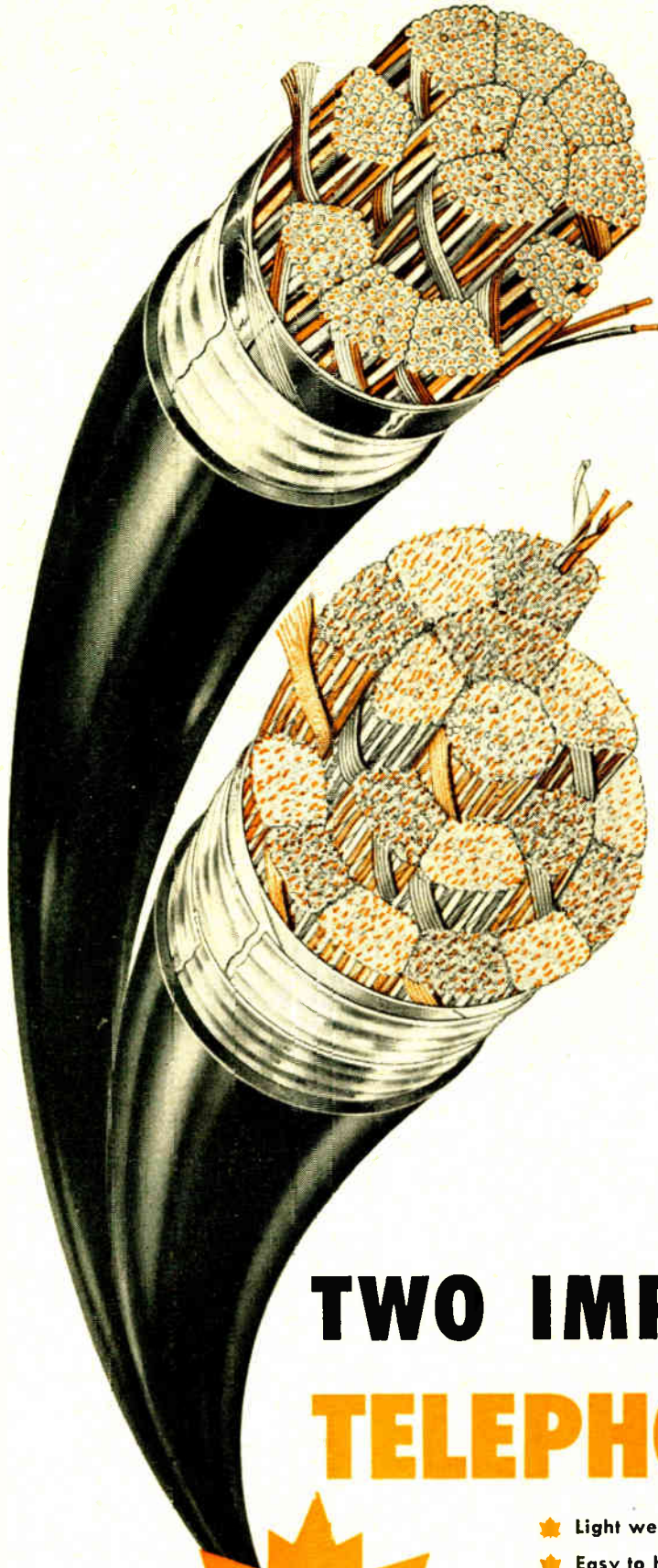
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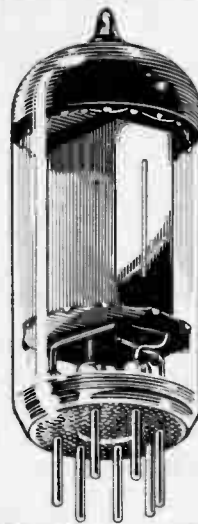
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5809

The 5727 miniature Thyatron is one of a line of Rogers Special Quality* Tubes designed to give reliable performance in all relay or grid controlled rectifier applications.

This ruggedized tube has an improved heated cathode construction and is recommended as a replacement for the 2D21 and 2D21W where reliability is of the utmost importance. The 5727 Thyatron has an inverse voltage of 1300. Its average cathode current is 100 mA.

**Rogers Special Quality tubes are finding more and more applications in all types of professional equipment. The greater reliability and lower maintenance cost of the apparatus in which they are used more than compensates for the higher initial cost.*



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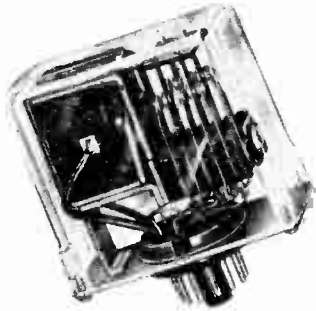
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Ideal for use in machine and process controls for the accumulation of data to provide automatic operation. Manufactured in Canada Struthers Dunn 219 Frames have a variety of contact arrangements and standard AC or DC coil voltages. Plastic cover assures good mechanical protection.

Long life — 20 million operations
Contact Rating 10 amps
Minimum 1500 volts AC dielectric test
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For further information
Write to Department 46 for Bulletin 2219.

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type HFR

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Power Rating 1/4 watt
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Available from 5 to
125 megohms.

Tolerances ± 20%
standard. ± 10% and
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Manufactured in Canada
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For further information write to Department 43
for Bulletin F-1b.

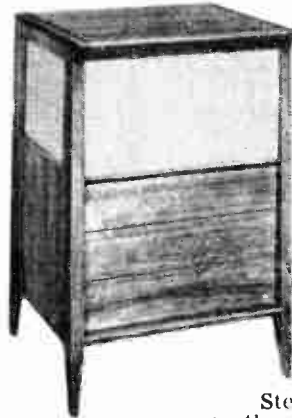
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to engineering advances in this critically
important field.

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EIA Report

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

Busy Engineering Committees

The Receiver Engineering Committee and the Receiver Sub-Committee on Safety and CSA met in Toronto during January. Important discussions took place regarding receiver engineering and design while reports from chairmen-observers to the EIA of United States technical committees were given. The Components Engineering Committee also met at the end of the month.

The re-activated Microwave, Radio Relay and Multiplexing Committee under its new chairman D. F. Wright of Canadian Westinghouse Company met in Montreal on January 23, while the Transformer Engineering Sub-Committee of the Components Engineering Committee met in Toronto on January 29, for the first time under its new chairman, B. H. Geary, of Canadian General Electric Company.

EIA to Participate in OARAD Conferences

The Electronic Industries Association will participate in the series of sales conferences planned by the Ontario Association of Radio and Television Dealers. These meetings will be held in Toronto, Ottawa, Kingston, Chatham, Kitchener, Niagara Falls and Sudbury over the next four months and EIA will supply a number of qualified speakers. Some of the subjects to be dealt with concern the impact of transistors in future sales of radio and television sets, the merchandising of high-fidelity and stereophonic sound equipment, quality selling, and the importance of selling Canadian-made products. The treasurer of RCA Victor Company, R. C. Ludlow, will be guest dinner speaker at the Ottawa and Toronto meetings and will talk on business management.

Radio Importation Still Increasing

Imports of small radio receivers, mainly from Japan, are still increasing in numbers and are seriously affecting the Canadian electronics industry. With Japanese plans to increase production and export sales still further, Canadian radio manufacturers are very much concerned with the situation.

Television production in Japan has entered the era of mass production. For the first time, production of TV sets has surpassed the rate of 100,000 a month, according to figures released by the Electronic Machinery Industry Association. The Association said the country's 40 television manufacturers are concentrating on production of 14-inch sets, which now account for 95 per cent of total production.

Inauguration of new TV networks throughout Japan this year and early next year is expected to result in even greater production. The Association said there is now one TV set for every four households in Tokyo.

Talk About Transistors

About 2,000 scientists and technologists from many countries — among them Canada, the United States and the Soviet Union — will gather in London next May to attend an international convention and exhibition concerning transistors, the first event of this kind.

The transistor, invented only ten years ago, has already revolutionized the world of electronics; Mr. G. Millington, chairman of the radio and telecommunications section of Britain's Institute of Electrical Engineers, which is organizing the event, said at a London press conference last week that now was the time for an "international exchange of information" on the subject.

Opening lectures at the convention will be given by the American co-inventors of the transistor — Dr. W. B. Shockley, Dr. W. H. Brattain and Professor J. Bardeen — who received the 1956 Nobel Prize in Physics for work in this field.

Sir Willis Jackson, vice-president of the I.E.E.C. said at the press conference that Britain was making every effort to keep in the forefront of transistor research and development. At present there are 12 companies in the U.K. manufacturing transistors or about to start such production.

Among the products is an automatic lifeboat transmitter which sends a continuous signal — thus simplifying the task of air-sea rescue teams. This small transmitter can also be used in inflatable rafts and can be adapted to Morse or voice transmission. Combined car-portable radio receivers no larger than a cigar box, and transistor-operated, are also being produced.

Newsletter

Canadian Radio Technical Planning Board

WHO'S WHO IN THE PLANNING BOARD

No. 10 — Canadian Overseas Telecommunication Corporation

The Canadian Overseas Telecommunication Corporation is a Crown Company formed in 1950 to own and operate the cable stations in Canada previously forming part of the global telegraph system owned by Cable and Wireless Limited of London, England, and also the overseas radiotelegraph and radiotelephone facilities which had been built up by the Canadian Marconi Company.

The Corporation owns and operates cable stations at St. John's, Newfoundland, and Halifax, providing direct telegraph communications with the United Kingdom, the West Indies. Cable stations are also on Vancouver Island for Australia and New Zealand, and, these connect with the Commonwealth System serving all parts of the world. Direct radio services to a number of European countries as well as other points in the Western Hemisphere are handled by stations in the Montreal area, while similar facilities on the West Coast serve the Antipodes and Japan.

In addition, the Corporation is a joint owner of the first Transatlantic Telephone Cable system which provides Canada with first class telephone and telegraph service to Europe free from the interruptions associated with HF radio services.

Overseas services provided by the Corporation and available to the general public include telephone and telegraph communication, phototelegraphy and telex, the latter service being introduced to Canada by the Corporation in 1956 upon opening of the Transatlantic Telephone Cable. Leased channels in this cable, both telephone and telegraph, are provided for private use.

CRTPB MEETINGS

Committee Chairmen Meet with DOT

Recent meetings of CRTPB included a gathering of all committee chairmen in Ottawa on January 28. Arranged by the General Co-ordinator, R. A. Hackbusch, those at this special meeting included representatives from the Department of Transport. Under discussion were the broad principles contained in DOT Radio Standards Specification 103, Issue 2 entitled, "Technical Data Required in Support of an Application for a Radio License Proposing the Use of Radio Equipment for which Type Approval Is Not Required".

Also under discussion was the CRTPB participation in the forthcoming meetings of the International Telecommunications Union and of the Consultative Committees on International Radio, and problems concerning the allocation of frequencies.

Executive Committee

The Executive Committee met at the CRTPB Office in Toronto on January 15 to re-assess that part of the new proposed constitution and by-laws that was not approved at the 14th annual meeting in December. The results of the Executive Committee's thoughts on this matter will be reported to the membership in due course.

Also discussed was a revised issue of the CRTPB Organization Chart, a progress report by the Director of Public Relations, R. C. Poulter, on the plans for the proposed publicity brochure outlining the purposes and activities of the CRTPB, and other matters arising from the 14th annual meeting.

Microwave Task Force On Communication System Parameters

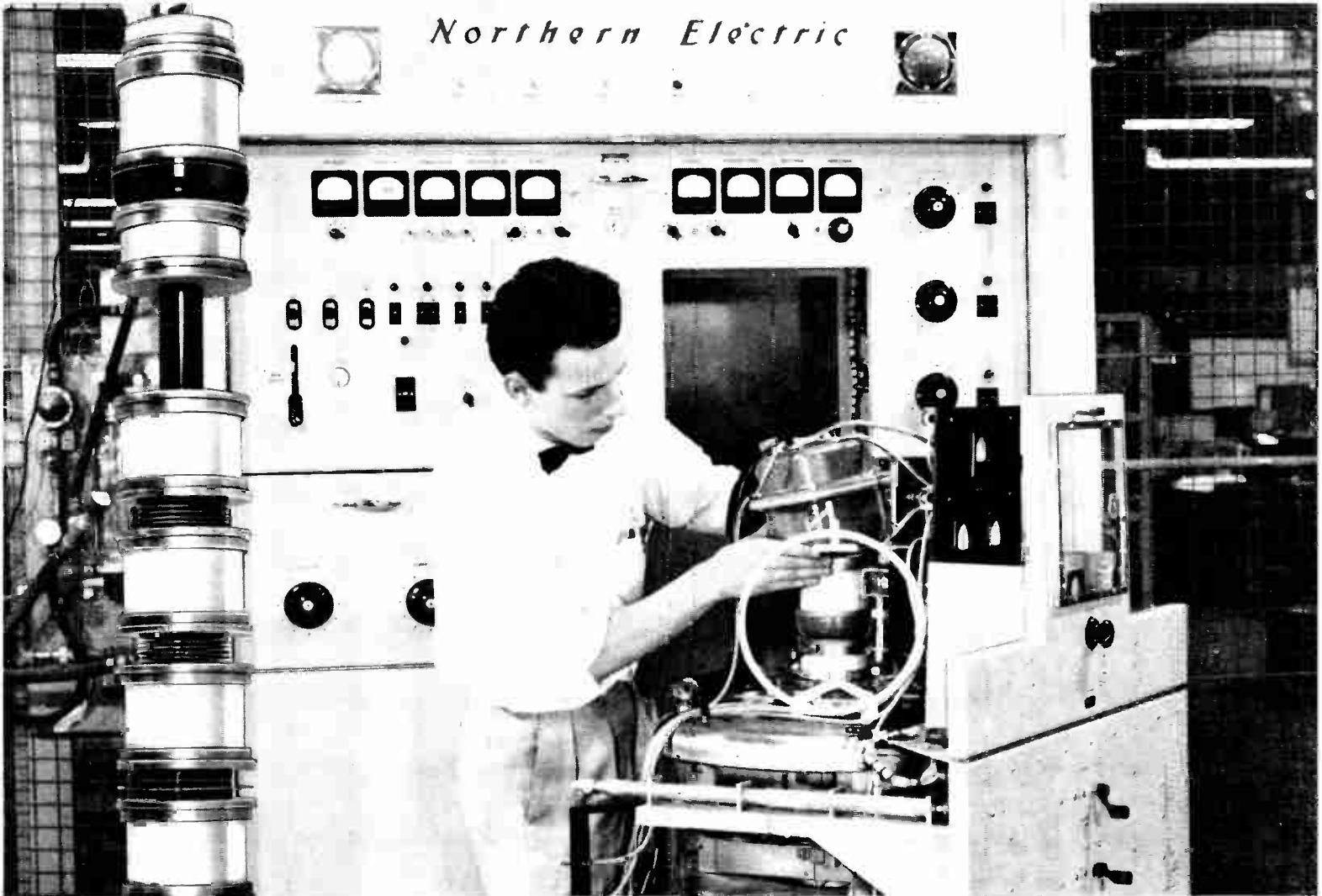
The eighth meeting of the Microwave Task Force On Communication System Parameters met in Montreal on December 12 to discuss modification procedure on TR 141 (an EIA Engineering Standard) and basic parameters for broadcast lines and for television video lines.

New Defense Radio Installation

In December Defense Minister George Pearkes opened the new communications wing of the Defense Research Telecommunications Establishment at Shirley Bay, near Ottawa. It was built to facilitate research activities in radio propagation for defense radar communication problems. Far northern reaches of Canadian territory are greatly affected by the auroral zone and by the earth's magnetic field close to the North Pole. Ionization in the aurora borealis causes clutter in long range radar equipment that can possibly mask small targets, especially where highpower radar is used. The new DRTE installation will carry out research of this problem in particular.

Canadian Radio Technical Planning Board
200 St. Clair Avenue West, Toronto 7, Ontario

F. H. R. POUNSETT, President; C. J. BRIDGLAND, Vice-President; R. A. HACKBUSCH, General Co-ordinator;
R. C. POULTER, Director of Public Relations; F. W. RADCLIFFE, Secretary-Treasurer



A Technical Assistant in Northern Electric's Product Engineering Department installs the air system socket on an Eimac 4KM3000LQ klystron in one of the new Northern Electric "TELORIZON" transmitters.

LINKING LABRADOR WITH THE WORLD

The 2 kilowatt tropo-scatter transmitter shown here is part of the new microwave and tropospheric scatter system linking Goose Bay, Labrador with Quebec City. One of several 2 and 10 kilowatt transmitters built by Northern Electric for the Bell Telephone Company of Canada, it is equipped with an Eimac high power amplifier klystron that provides bandwidth and linearity for 200 voice channels—with telephone toll quality. The klystron, an Eimac 4KM3000LQ, is of a special four cavity type not previously used. It operates in the frequency range of 720 to 985

megacycles, with an efficiency of 42% and a 7MC. bandwidth.

The 4KM3000LQ features the unique Eimac depressed collector providing high efficiency at wide bandwidths. The Klystrons used with the system's 10 kilowatt transmitters are Eimac type 4K5000LQ.

The design, quality and performance of Eimac tubes have made them first choice with manufacturers across Canada—in a variety of fields, and for many different applications.

When you want quality tubes—of transmitting types—it will pay you to investigate Eimac first.

Eimac 4KM3000LQ, modulating anode, depressed collector, 2KW klystron.

Eimac

Eimac First for high power amplifier klystrons.

EITEL-McCULLOUGH, INC.
SAN CARLOS CALIFORNIA

CANADIAN REPRESENTATIVE

R. D. B. SHEPPARD

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EIMAC 4KM3000LQ AND 4K50,000LQ KLYSTRONS
FREQUENCY RANGE
POWER OUTPUT
BEAM VOLTAGE
COLLECTOR DISSIPATION
COOLING

4KM3000LQ
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2 KW
10 KV
3 KW
AIR

4K50,000LQ
720-985 MC
10 KW
17 KV
50 KW
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SUB MINIATURE SELENIUM DIODES

Ratings: 20 to 160 volts • 100µa to 11 ma.

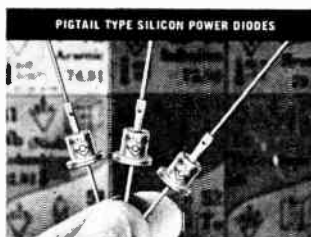
Ideal components for bias supplies, sensitive relays, computers etc. High resistance, (10 megohms and higher at -10 volts). Excellent linear forward characteristics. Extremely small, low in cost. Encapsulated to resist adverse environmental extremes. Specify Bulletin SD-18.



MINIATURE SILICON POWER DIODES

Ratings: 100 to 600 PIV, Up to 500 ma.

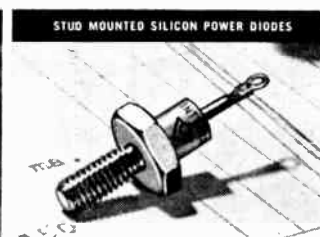
Specifically designed for missile and airborne equipment applications where miniaturization and reliability are prime factors. Hermetically sealed, all-welded, pigtail lead construction. Manufactured to meet the most rigid military requirements. Request Bulletin SR-203



PIGTAIL TYPE SILICON POWER DIODES

Ratings: 50 to 600 volts PIV • 250 to 750 ma.

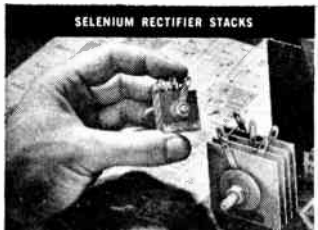
An extensive line of silicon power diodes for military and industrial applications featuring all-welded, hermetically sealed construction. All designed and manufactured to meet the most rigid military requirements. For information on types for your application Contact Factory



STUD MOUNTED SILICON POWER DIODES

Ratings: 50 to 600 volts PIV • 400 ma. to 1 amp.

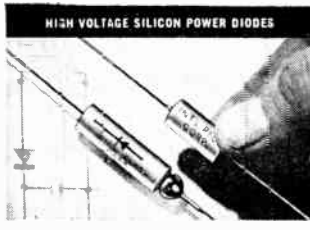
Industrial and military types including the 1N253, 1N254 and 1N255. Stud mounted, hermetically sealed, all-welded construction. Operating temperature range: -55°C to +150°C. Designed and manufactured to meet most rigid military specifications. Bulletin SR-133C



SELENIUM RECTIFIER STACKS

Ratings: From 100 ma. to 50 Amps.

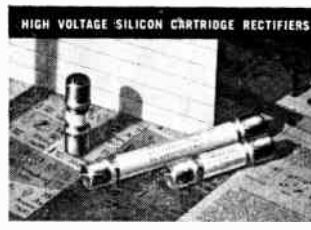
Low forward voltage drop and low leakage characteristics make this series ideal for a wide variety of power applications. For details request Bulletin C-439, (26 volt cells); Bulletin SR-160, (45 to 52 volts per cell) and Bulletin SR-152, on high current density cells.



HIGH VOLTAGE SILICON POWER DIODES

Rating: 600 to 2400 volts PIV • 100 to 125 ma.

Three types available. Hermetically sealed, pigtail construction. Style J rated at 600 to 1000 volts PIV at 125 ma. Bulletin SR-138E. Styles K and L with PIV ratings from 600 to 2400 volts at 100 ma. dc output current are described in technical detail—Bulletin SR-157.



HIGH VOLTAGE SILICON CARTRIDGE RECTIFIERS

Ratings: 1500 to 16,000 volts PIV @ 45 to 440 ma.

Especially suited for miniaturized military equipment where optimum reliability is a prime factor. Standard types for normal convection cooling and high current types for forced air or oil cooling. Hermetically sealed, metallized ceramic housing. Request Bulletin SR-225



SELENIUM HIGH VOLTAGE CARTRIDGE RECTIFIERS

Ratings: 20 to 20,000 volts • 0.2 to 195 ma.

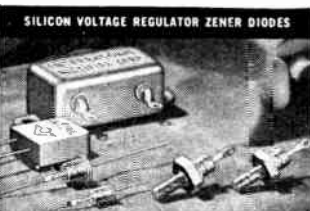
Designed for long life and reliability in half-wave, voltage doubler, bridge, center-tap circuits, and 3-phase circuit types. Phenolic cartridges and hermetically sealed types available. Operating temperature range: -65°C to +100°C. For details specify Bulletin M-2.



SELENIUM CONTACT PROTECTORS

Complete series of AC and DC types.

Designed to eliminate arcing and erosion across the contacts of relays, switches, etc. A complete series in each of three basic types: diode type, cartridge type and hermetically sealed types for industrial application. For complete data: Bulletin SR-150-A



SILICON VOLTAGE REGULATOR ZENER DIODES

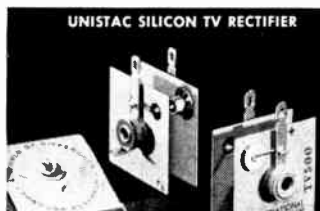
Ratings: From 600 milliwatts to 10 watts

A complete series in 6 types. Miniature single junction types, multiple junction types, and double anode units. 750 milliwatt and 1 watt types: Bulletin SR-251, 3.5 and 10 watt types: Bulletin SR-252, Multiple junction 5 watt types: SR-253, Double anode types: SR-254



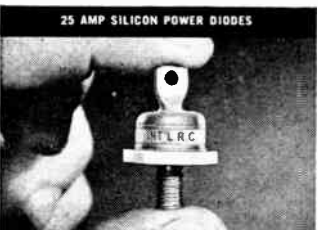
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Rating: 50 to 500 volts PIV • 25 to 45 Amps.

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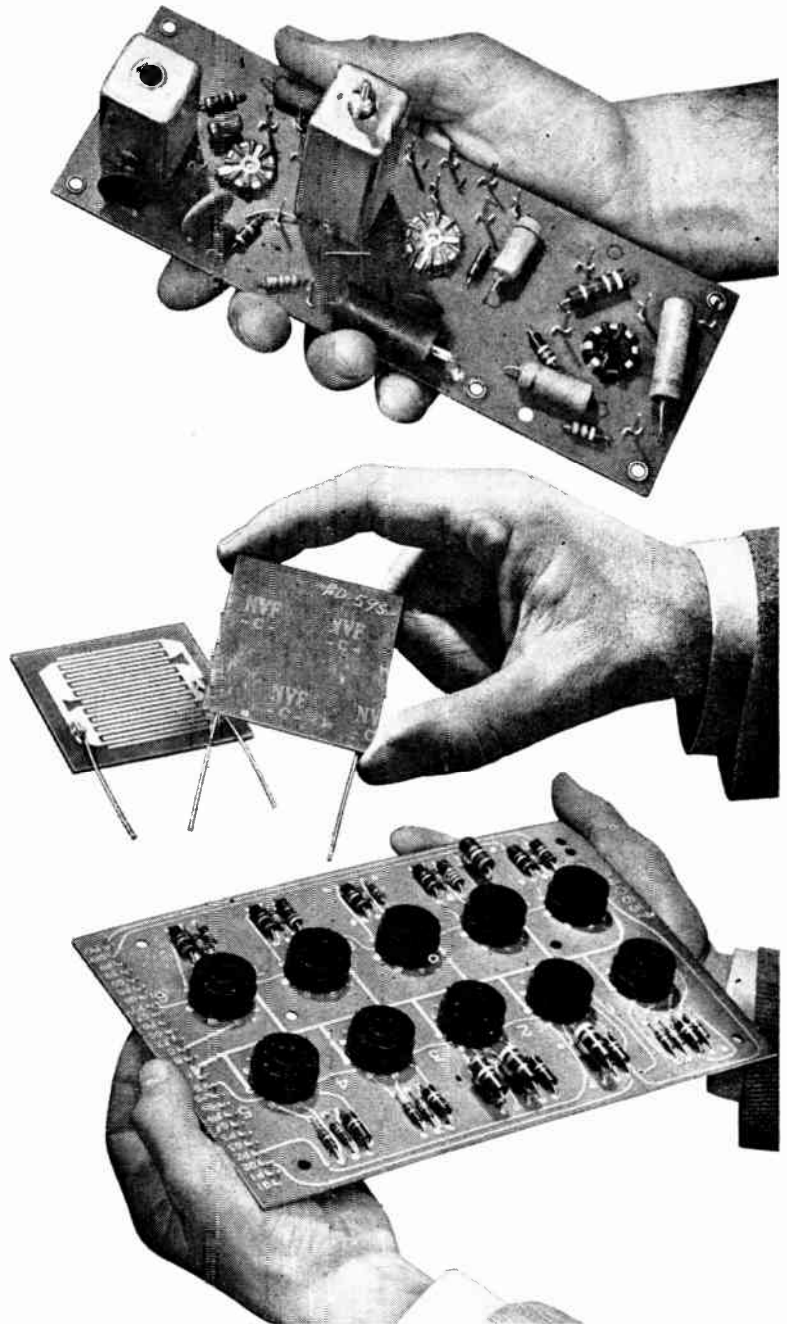
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GRADE	PROPERTIES OF BASE MATERIAL					COPPER CLAD PROPERTIES			RELATIVE COST Based on XXXP on Arbitrary Scale of 1	
	Dielectric Constant	Dissipation Factor	Moisture Absorption	Flexural Strength	Maximum Operating Temperature	Copper Bond Strength		Hwt Solder Resistance		Surf. Ice Resistance
	10 ⁴ Cycles	10 ⁴ Cycles	% 24 Hrs	Psi	Degree F	Pounds to Pull 1" Strip		Secs to Blister 1" Square > Greater Than		Megohms, Etched Retma Comb Pattern, 96 Hrs, 35°C/90% RH
P-214-B-1	5.3	.040	2.20	18,000	250	8	11	> 10 @ 475°F	100,000	.81
XXP-209-G-1	4.6	.037	1.30	17,000	250	8	11	> 10 @ 475°F	200,000	.92
XXP-239-1 PHENOCLAD	4.2	.035	0.67	15,500	250	8	11	> 10 @ 475°F	200,000	.92
XXXP-219-C-1	4.5	.030	0.70	15,500	250	8	11	> 10 @ 475°F	500,000-1,000,000	1.00
XXXP-455-1	4.0	.026	0.55	23,500	250	8	11	> 10 @ 475°F	1,000,000-1,500,000	1.00
XXXP-470-1	3.7	.027	0.48	14,000	250	8	11	> 10 @ 475°F	300,000-500,000	1.00
N-1-852-1	3.3	.030	0.20	16,000	165	8	11	> 10 @ 450°F	2,000,000	2.69
G-5-813-1	6.8	.018	1.00	55,000	300	8	11	—	—	2.98
G-10-865-1	5.2	.012	0.13	60,000	250	10	15	> 30 @ 500°F	1,500,000-2,000,000	3.49
G-11-861-1	4.9	.015	0.17	60,000	300	10	15	> 30 @ 500°F	2,000,000	3.55

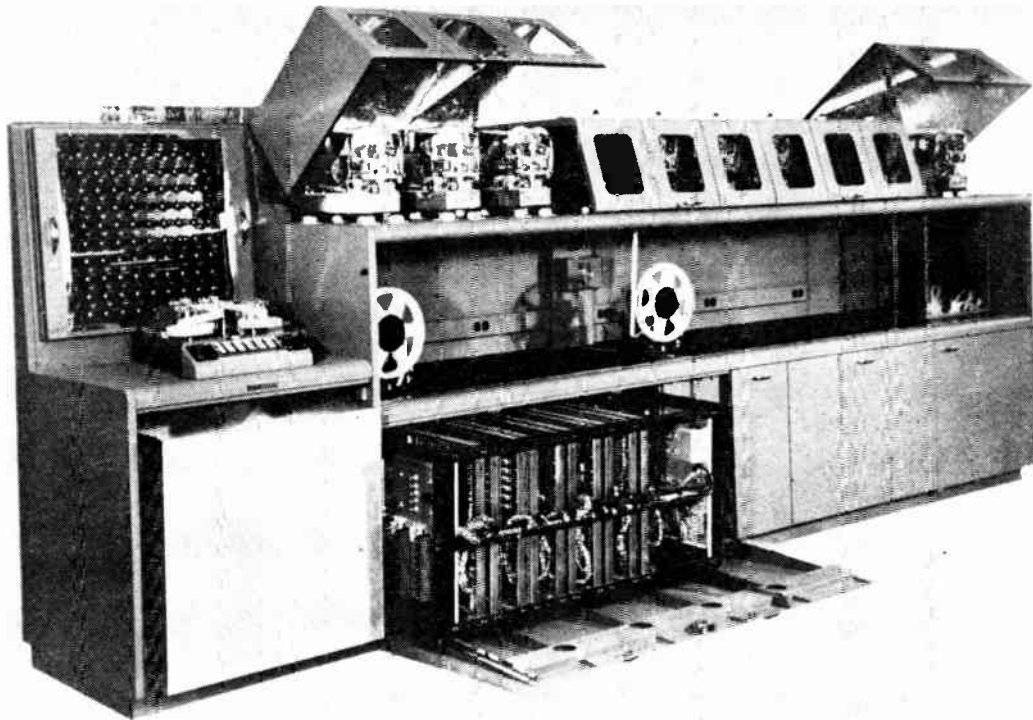


Figure 1. General view of the Message Sorter, showing tape reader and code assignment switches (left) electronic circuit framework (lower center) and reperfors (top).

The versatility and efficiency of modern transistor circuitry is demonstrated by the equipment described in this article which, although specifically designed for reading, sorting and reproducing punched paper tape, embodies principles and practices which are capable of far wider use.

A tape message sorter

by John Rywak*

A somewhat unusual manifestation of the potential of modern transistor circuitry went into operation recently in the Ontario Hydro's new Computation Center in Toronto. The Tape Message Sorter, which was designed by Northern Electric for the Bell Telephone Company of Canada, acts as an intermediary between the teletype communications network feeding in data to the headquarters from a number of regional offices and the Univac computer in which the data is processed. Incoming messages from one region will deal in succession with a great number of different categories of information, and it is the function of the Sorter to assemble all messages dealing with the same (or related) categories on the same tape, which can then be used by the computer.

Messages arrive at headquarters at 75 words a minute, and the tapes are fed manually into the duplex tape reader which forms the input unit of the Sorter, operating at 600 words per minute. The electronic circuitry identifies each message by means of a code address which heads it, and directs it to the reperfors which has been assigned to accept this category. Each reperfors, or punch, can be assigned to accept one or more categories of data, and if there are more varieties of messages to be sorted than there are punches available, any punch can be assigned to accept the surplus, and the tape thus produced can then be re-sorted. Since the message identification code is

* Northern Electric Research & Development Laboratories
Belleville Branch.

always reproduced on the new tape, any number of re-sorts is possible. Complete flexibility of punch assignment is provided by means of the control panel to the rear of the input reader. The units installed at Hydro headquarters are equipped for up to 10 punches and will sort 50 different categories, but both these figures may readily be increased if required.

General problem considerations

While the basic problem of handling the pulses received from the reader, and of feeding them to the punches by means of transistor circuitry, was comparatively simple, it was complicated by the fact that the reader and the selected punch are not working in synchronism, in fact the punch is deliberately made to operate faster than the reader, and use is made of an interrogation system which allows temporarily stored information to be "read out" at the correct instant for punch operation. Further complication arises from the fact that since all punch motors are running continuously, they will be random in phase with respect to one another, and an auxiliary storage of one character duration is necessary coming into effect only during message switching. This circuit allows for the time taken for the selecting relays to operate.

Because the six-character code address by which a message is identified has to be reproduced by the selected reperforator (to allow further sorting), it is necessary to direct the message through a form of delay, for a six character duration, so that the appropriate punch can be selected during this delay period prior to read-out.

The read-out and all selecting and switching functions have to be performed while the input tape is being read-in at a constant speed. That is to say, the tape is not required to stop during route selection and switching.

Description of circuitry

While the detailed performance of the switching circuits is far too complex to describe in an article of this length, the general operation may be understood by reference to the simplified block schematic of Fig. 2. The electrical impulses from the tape reader, which correspond to the characters punched on the tape, are fed in parallel form to the first position of the Shift Register, which consists of transistor flip-flop circuits. At the same time, the control pulse from the reader triggers the shift pulse generator, the output of which causes all the stored characters to step along from one shift register position to the next. Thus, after six characters have been read, all the positions are full and the thyatron grids are conditioned by the character in Position 6. At the correct instant (as determined by the phasing of the punch to which the output is connected), anode voltage is applied to the thyratrons which fire and actuate the punch magnets, producing the correct character on the output tape. As they do so, the information read out of position 6 is erased, leaving the shift register ready for the next transfer to take place.

The foregoing description covers merely the direct transfer of information from reader to punch with a 6-character delay, on the assumption that one of the

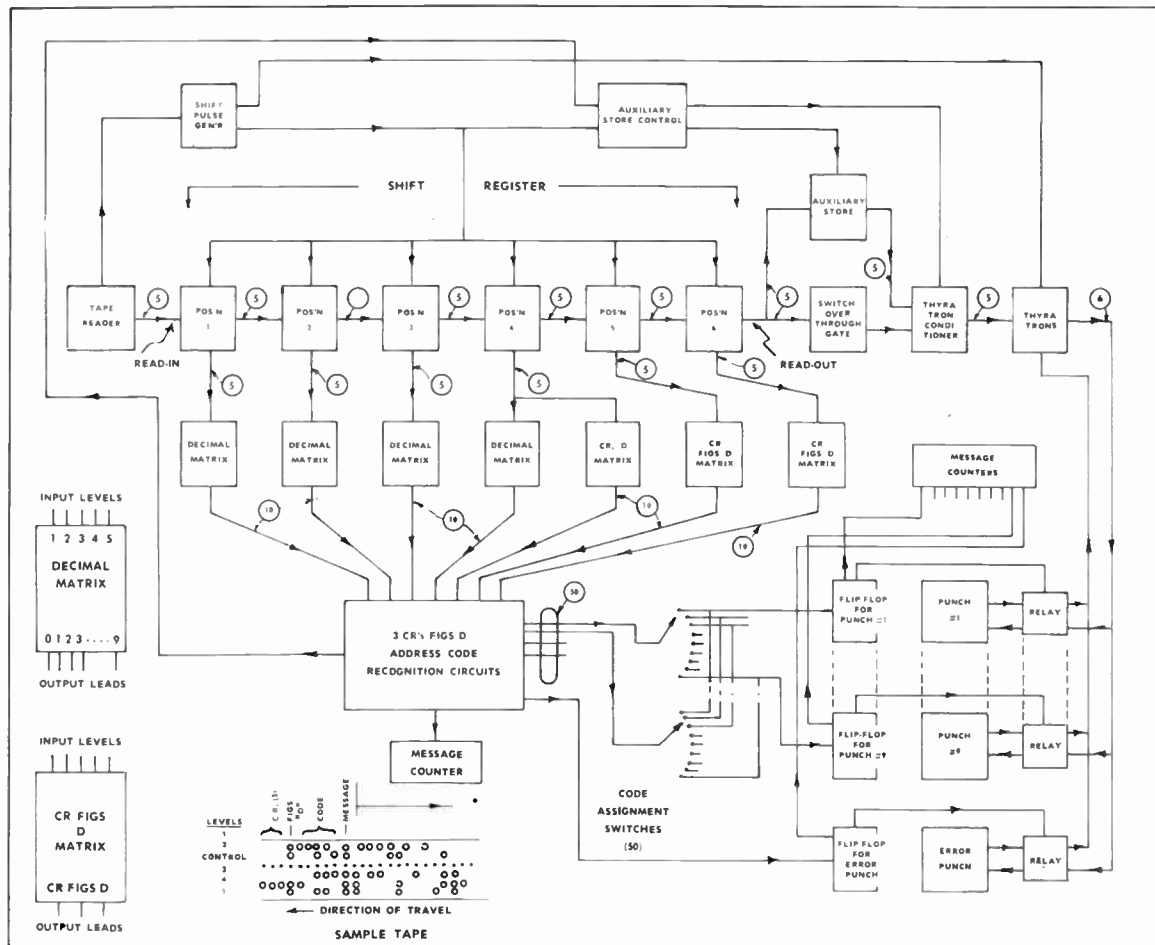


Figure 2

punch relays is closed. However, at the beginning of a message, a much more complicated train of events is initiated. In order to make the system work, every message must end with at least three "carriage return" (CR) characters; and the new message must begin with the "Figures" symbol, followed by "D" and a four figure code indicating the category of the succeeding information.

It will be seen from the block diagram that the outputs of the various shift register positions are fed to a number of matrices, four of which convert from tape code to decimals, while the other three recognize "CR", "Figs" and "D" symbols. The outputs of these matrices are fed into the recognition circuits which operate in the following manner. When positions 4, 5 & 6 are occupied by carriage returns, the corresponding matrix outputs operate a three-input "AND" gate, and throw over a setting flip-flop. (For the benefit of readers not too familiar with computer terminology, an n-input "AND" gate is a device which gives no output until correct signals are fed to *all* inputs. In contrast an "OR" gate will give an output when any input is energized.) The appearance of "Figs" and "D" in positions 4 and 5, together with an output from this flip-flop, actuate a turn-off mechanism, opening the circuit of the relay connecting the punch currently in use. On the next shift, "Figs" and "D" will move to positions 5 and 6, while the remaining positions will be occupied by the numerical code. At this point, the outputs of the "Figs" and "D" matrices and the setting flip-flop operate another three-input "AND" gate, which in turn applies a pulse to one input of 50 five-input "AND"

gates, the other inputs of which are fed from the outputs of the decimal matrices in such a way that a correct code will cause one gate, and one only, to operate. The resulting output is fed through the code assignment switches and operates, via a flip-flop, the relay associated with the required punch, and the new selection has been made.

In the event that the four figures do not correspond with any of the valid codes, no output is produced by any of the five-input "AND" gates and an "error" punch is automatically connected to receive the message which is then printed out for examination by the operator.

Recognition of an approaching change of category (as indicated by the appearance of three "CR's", "Figs" and "D") also causes the recognition circuits to initiate the operation of the Auxiliary Store Control. Under normal circumstances, the Auxiliary Store is by-passed by the Switchover Through-Gate, but at the beginning of a new message, this is closed, so that information is no longer read-out directly from Position 6 to the thyatron conditioner. Instead, it is passed into the Auxiliary Store, thus adding an extra delay of one character. As soon as the switchover is complete, and at a time decided by the phasing of the new punch, the Through-gate opens again, and operation returns to normal.

It should be realized that all this takes place at the comparatively high speed of 3,600 characters per second, and the switchover from punch to punch takes place accurately between two designated characters, so that all the carriage returns appear on the former punch,

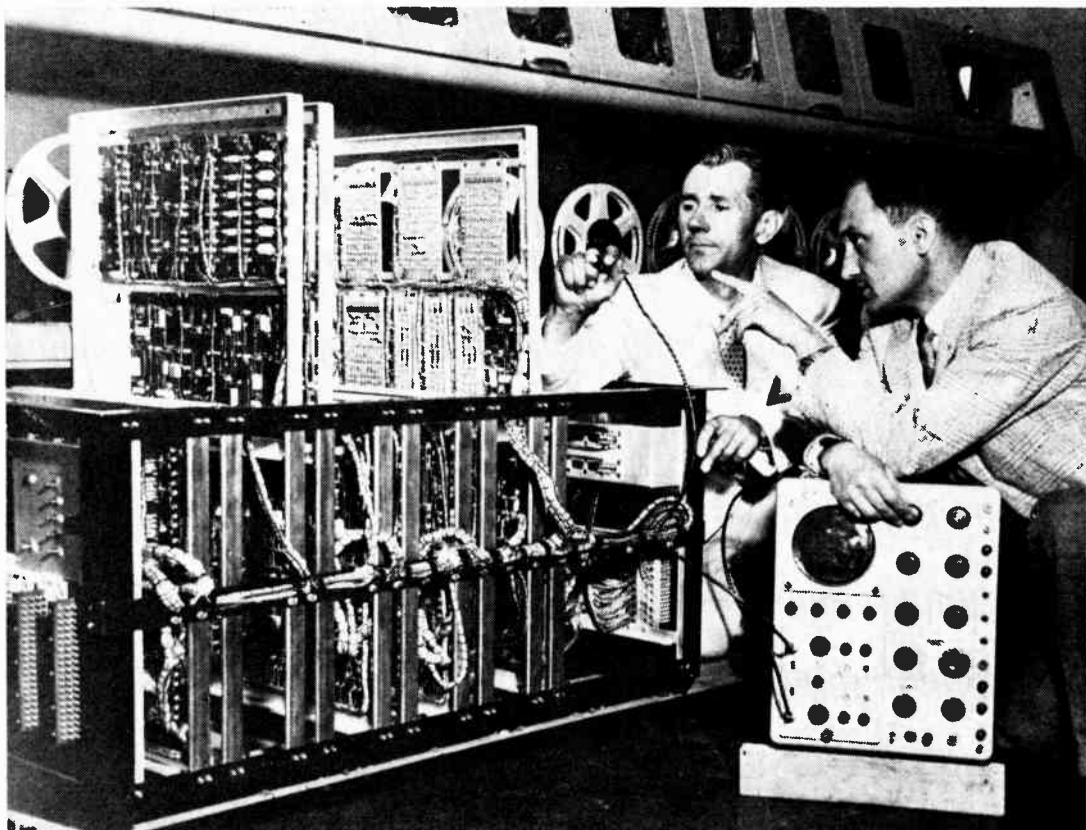


Figure 3. Two men who played an important part in the development of what is believed to be the world's fastest electronic paper-tape sorter are Peter Fatovic, a wiring specialist (left) and John Rywak, P.Eng., electronic expert. Both are with the electronics section of the Northern Electric Company, and guided the production of the sorter, part of which is shown here. The machine, forming part of Ontario Hydro's data processing system, is being installed by Bell Telephone.

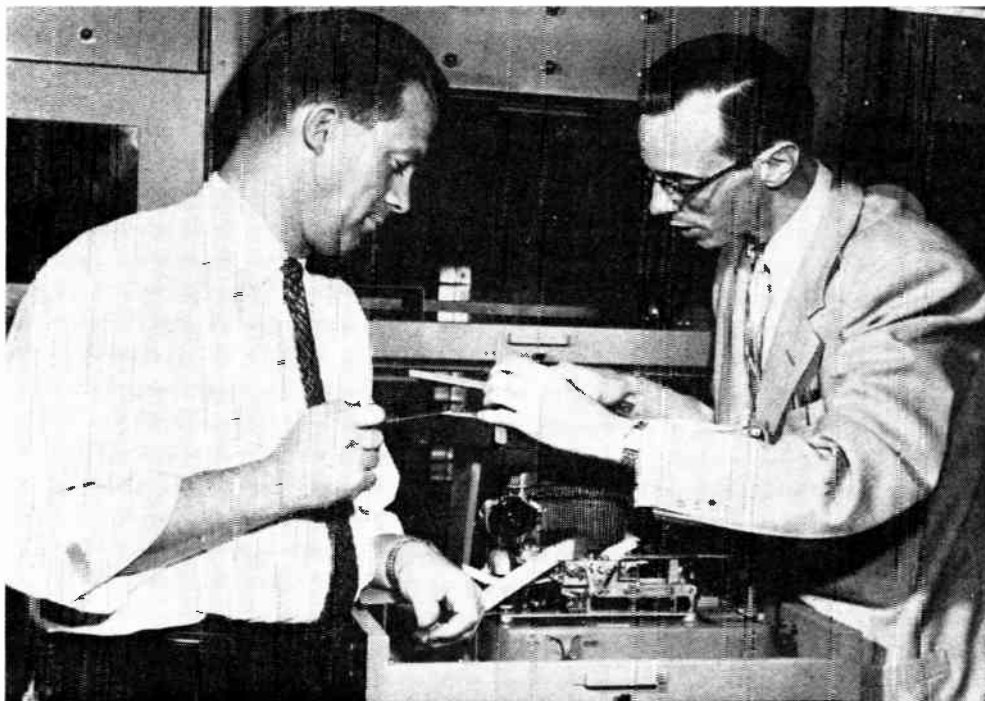


Figure 4. Bell Telephone technicians work at the installation of one of the specially designed typing reperforators which are part of the data processing system being installed at Ontario Hydro's head office. These machines receive great quantities of information from regional offices, and produce punched paper tape, which in turn is fed into a unique Canadian-designed paper-tape electronic sorter. Later in the process this mountain of data goes to the giant UNivac II digital computer.

and the "Figs", "D" and numerical code are the first characters produced on the newly selected punch.

Mechanical layout

Each tape sorter is housed in a cabinet approximately 15 feet in length, an overall view of which is shown in Fig. 1. At a convenient height at the left hand side is the duplex tape-reader. This is arranged so that a second tape may be loaded while the first is running through, with automatic switchover as soon as the first is finished, giving the possibility of continuous operation. Behind the reader are mounted one hundred code assignment switches, of which only fifty are at present in use. The panel is protected by a locked glass-fronted cover to prevent unauthorized meddling with the knob settings. Beneath the reader is a large bin to receive the tape. This is normally enclosed by a door which has been removed for the purposes of the photograph.

The entire electronic circuitry is mounted in the framework immediately to the right of the bin, and shown partly withdrawn. A closer view of this is shown in Fig. 3, where three of the individual equipment frames have been raised for servicing. From this it will be seen that most of the components are mounted on bakelite cards, and that considerable use is made of printed circuits. All interconnecting cables are flexible, so that no equipment need be unplugged for inspection. Approximately 250 transistors and 1,000 diodes are used. The entire electronic circuitry, apart from the thyatrons consumes less than 30 watts. The thyatrons and punch magnets dissipate another 37 watts. The remainder of the lower portion of the equipment is taken up with power supplies, control panels and a second tape storage bin used in connection with the error punch.

On the top level, beneath sound absorbing covers, are the high speed punches, with the error punch on the extreme right. The latter is associated with a Transmitter-Distributor, mounted alongside, working at 75 words per minute and feeding a standard teleprinter. In view of the difference in speeds between the punch and the transmitter-distributor, a glass-fronted temporary store is provided. This may be seen immediately below the error punch.

Tape from the other punches is collected on take-up reels (of which only two are shown in Fig. 2) from which it may be removed either for resorting or for use by the computer.

Acknowledgments:

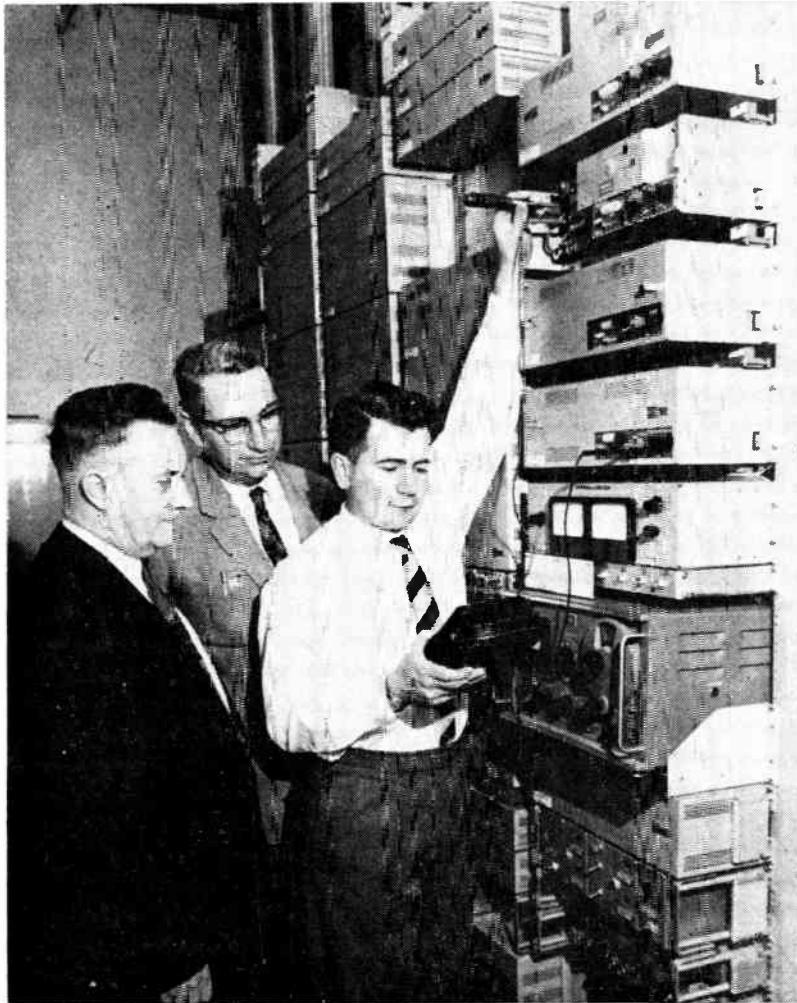
Because of customer commitments the sorter circuits were developed on an extremely rush basis. Under these circumstances the success or failure to meet the deadline was strongly dependent on the assistance and co-operation of the people concerned with the work.

The author is very grateful for the extremely attentive assistance received from Mr. P. Fatovic throughout the entire project. Also, appreciative acknowledgment is accorded Mr. W. T. Simpson, without whose close attention, guidance, and assistance it would have been difficult, if not impossible, to meet the completion schedule.

During the early design considerations the author was fortunate to have a profitable technical discussion with Messrs. C. D. Florida and P. M. Thompson of the Defense Research Board, Ottawa.

The cabinet for the sorter was designed by Mr. K. D. H. Wilcocks.

The author is grateful to the Northern Electric Company and the Bell Telephone Company of Canada for permission to publish.



Bob Acorn, Radio Maintenance Department, tests Collins' microwave system at Charlottetown central office as D. C. Johnson, Maritime Telephone and Telegraph Company Radio Equipment Engineer (left) and E. G. Cameron, District 5 Plant Superintendent for the Island Company, look on.

Microwave replaces long haul open wire lines of Island and Maritime Telegraph and Telephone Companies to form a system of

Weather-proof communications

Collins Radio Company, Cedar Rapids, Iowa

On January 6, 1956, one of the worst sleet storms in the history of Prince Edward Island hit, snapping wire lines and hundreds of telephone poles and causing complete communication isolation for thousands of Island Telephone Company, Ltd., subscribers.

According to W. A. Logan, Chief Engineer at Maritime Telegraph and Telephone Company, Ltd., Halifax, Nova Scotia, an affiliated company, on the evening of January 6, 1956, heavy sleet built up on outside wire leads until the ice reached a diameter of from two to three inches. In addition, eight-inch icicles formed beneath the wire, placing a strain on poles, cables and wires far beyond anything previously experienced by the telephone companies.

As a result, wire, cable and pole lines fell in fantastic tangles. On January 7, 8 and 9, the situation was further

aggravated by flood waters which blocked many highways and hindered maintenance crews in repair work.

With over 3,100 poles broken and more than 2,740 miles of toll wire lines damaged, the phone companies had a major emergency on their hands. Within a minimum amount of time, using their complete resources and aided by many private citizens as well as by neighboring telephone companies and amateur radio operators in the area, temporary service was restored.

The sudden and devastating storm, which constituted a drastic financial loss to the telephone companies, pointedly indicated that some method other than open wire lines had to be used in the permanent replacement of long haul toll circuits. After careful consideration from an economic standpoint, bearing in mind that the

replacement communication system must have the utmost in reliability and be able to withstand severe storms, these Canadian telephone companies installed a Collins Radio Company Microwave Communication System.

In comparing costs, Island and Maritime discovered that the cost of replacing the storm damaged open wire line would be almost as much as the cost of a highly reliable microwave system. Sleet storms can bring wires and poles down, but have no effect on a microwave radio beam.

The microwave system supplied by Collins was more or less a complete package. Besides the microwave equipment, the contractors provided antennas, most of the towers, reflectors, batteries, chargers, rotary inverters and special protective de-icing domes for the antennas.

Installation of the system was carried out by Maritime Telegraph and Telephone Company engineers together with Island Telephone Company personnel under the direct supervision of Collins field engineers.

Many special considerations were taken into account for the Island/Maritime microwave system due to geographical location, weather conditions and spectrum difficulties. One hop in the system had to be over 37 miles of water; this condition coupled with spectrum allocation considerations dictated the use of space diversity over this link. The across-the-water path, operating on a dual space diversity basis, has provided continuous and uninterrupted service since its installation. Many detailed recordings have been made of the propagation over this path, and the diversity arrangements have turned out to be highly successful.

The severe weather experienced in the area made necessary the use of standby float charged batteries in the event of a failure from the main ac power supply. Weather conditions also made necessary the provision for special protective de-icing domes for the microwave antennas.

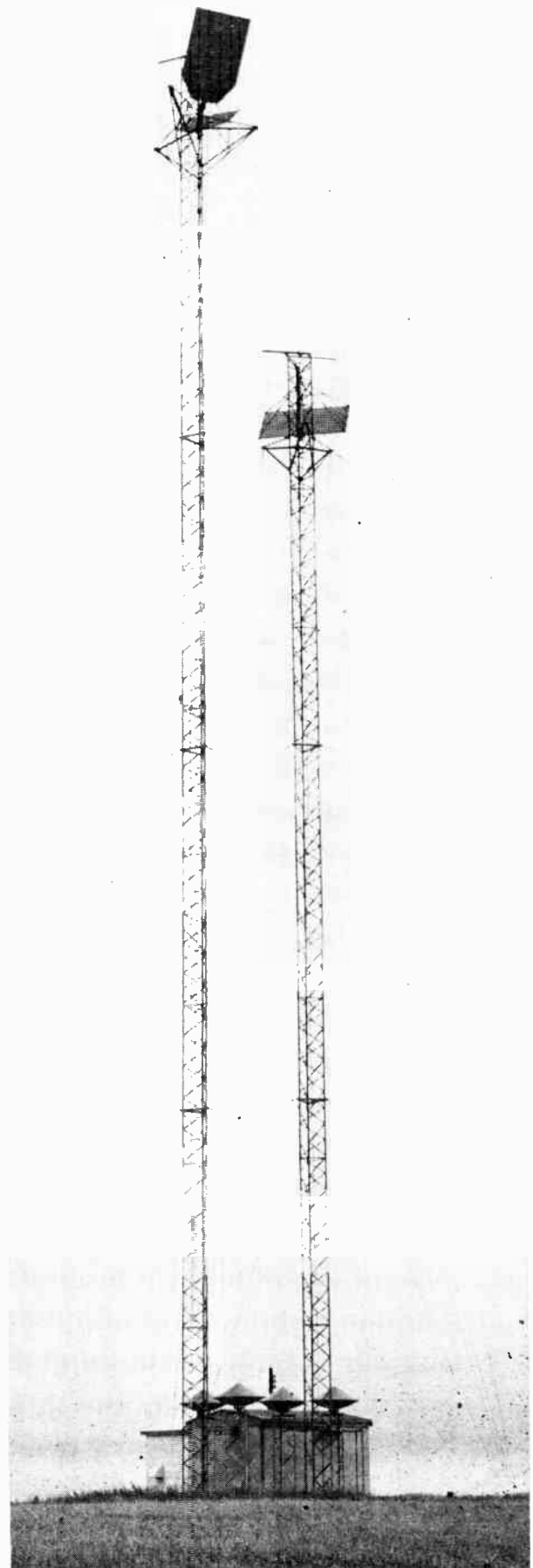
In addition, every consideration had to be given in providing adequate and expandable microwave equipment. Special carrier equipment was supplied by the contractors to transmit the audio portion of the CBC television network signal from the Nova Scotia mainland to Prince Edward Island. The video signal is transmitted over a separate TD-2 microwave system.

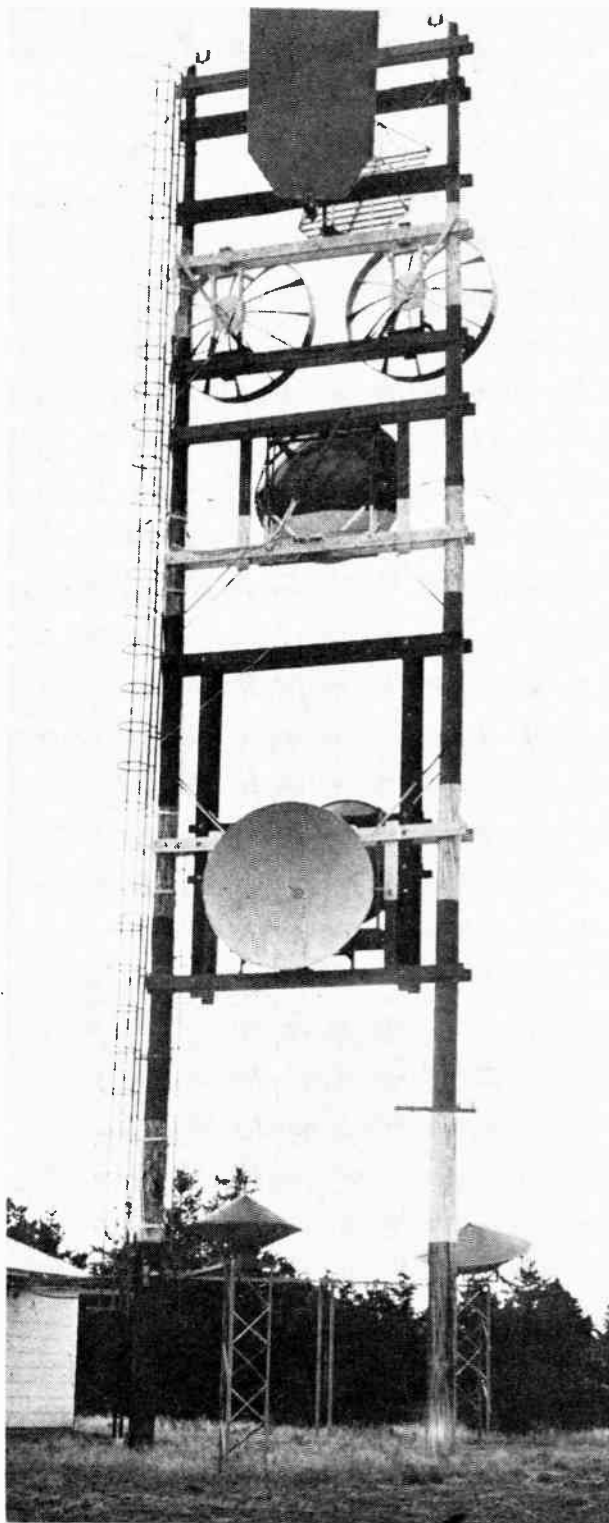
Two section system

The Collins system installed consists of two sections tied together at Charlottetown on Prince Edward Island. The first section goes from Fraser's Mt., near New Glasgow, on the Nova Scotia mainland across a 37-mile path over Northumberland Strait to Mt. Buchanan, P.E.I. From the Mt. Buchanan repeater station, the signal is beamed 30 miles to Hazel Grove, a three-way branching repeater, and then on to Charlottetown, 16 miles away. The second section goes from Egmont, which is tied to the New Brunswick mainland by VHF radio, to Summerside (13 miles) to Hazel Grove (18 miles) and on to Charlottetown.

The initial microwave installation provides for 28 channels from Fraser's Mt. to Charlottetown. This link replaced an old PTM system, which carried 15 channels, and a VHF radio system, which carried four channels from Fraser's Mt. to Charlottetown.

Hazel Grove is a three-way branch repeater station, which utilizes four 6-foot antennas, a 12 x 12 foot reflector mounted on a 150 foot tower and two 8 x 12 foot reflectors mounted on a 200 foot tower.





Mt. Buchanan microwave site utilizes three antennas and two reflectors for this link, which features space diversity. Other antennas on the poles were used in an old system by the Island Company.

Under the old system, 20 channels were carried on open wire line from Egmont to Charlottetown. Microwave now connects Egmont and Summerside with 12 channels, and only eight are carried by open wire.

Twenty-two channels are provided between Summerside and Hazel Grove. The 22 channels from Summerside are combined with 28 channels from Mt. Buchanan at Hazel Grove to form a total of 50 channels from Hazel Grove to Charlottetown.

Hot standby equipment is employed in the microwave system at the Charlottetown dual terminal, Hazel Grove repeater, Egmont terminal and at the Summerside drop repeater. Space diversity is used on the Mt. Buchanan to Fraser's Mt. link, and the Mt. Buchanan repeater has hot standby going in the other direction. Fraser's Mt. is a space diversity terminal and is also equipped with hot standby equipment. Both main and standby equipment are fault sensed.

A standby receiver is provided at the Mt. Buchanan site. This receiver is connected to the lower antenna making a total of five receivers at the station. Fraser's Mt. utilizes a main and standby transmitter and a single receiver connected to each antenna in a conventional space diversity arrangement.

Each station in the system is operated by a 130 volt float-charged battery bank which is capable of operating the station without primary power for a four-hour period. The small amount of ac power necessary for operation of the klystrons, in the RF transmitter and receiver, is derived from a rotary inverter. The rotary inverter, which operates continuously to facilitate instantaneous switchover, also supplies ac power from batteries in the event of a primary power outage.

Remote fault alarm equipment is provided at all stations, with master control stations at Summerside, Charlottetown and New Glasgow. The fault alarm equipment from the two sections is bridged on the service channel at Charlottetown, therefore fault alarm interrogation of the entire system is possible from any of the master control stations. Eleven trouble indications including RF switchover, power failure, low battery voltage, tower light outage, illegal entry, diversity path A, emergency engine start, rack, off-frequency, standby RF failure and diversity path B are provided in the fault sensing system at each of the stations in the system. A service channel for maintenance ease is provided at each station.

System characteristics

Frequencies used and a physical description of the antennas at each station follows:

Fraser's Mt. to Mt. Buchanan link operates on 6155 mc transmit and 6245 mc receive frequencies. The Fraser's Mt. site has a space diversity terminal for the Mt. Buchanan path and utilizes cable facilities from the New Glasgow office, which is a master fault alarm station with a service channel provision. TV program channels from New Glasgow are introduced at Fraser's Mt. through the coupling equipment by FM sub-carrier modulators. Provision for transmitting three program channels and receiving two program channels are provided. The antenna system is comprised of two 8-foot dishes mounted on coated wooden poles.

Mt. Buchanan to Hazel Grove link operates on 6325 mc transmit and 6415 mc receive frequencies. There are three antennas and two reflectors at Mt. Buchanan. A 6-foot antenna and an 8 x 12-foot reflector are utilized for the Hazel Grove path, and two 8-foot antennas and a 10 x 12 reflector are used for the Fraser's Mt. path.

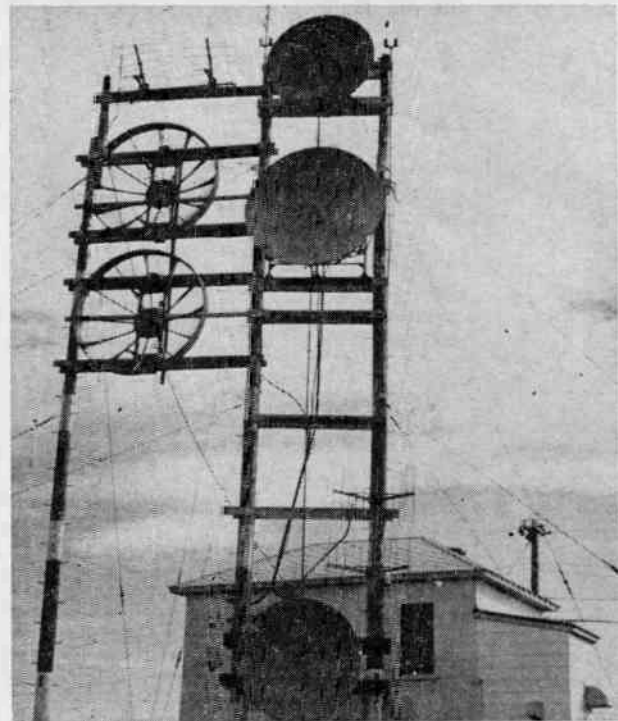
Hazel Grove to Charlottetown link operates on 6025 mc transmit and 5975 mc receive frequencies. The branch repeater at Hazel Grove utilizes four 6-foot



(Upper left): Russ MacDonald, Maritime Telephone and Telegraph Company's New Glasgow Central Office Foreman, uses service channel on the Collins' microwave equipment located at the Fraser's Mt. station.

(Upper right): Earl Smith, Central Office Foreman of the Island Telephone and Telegraph Company, checks out the service channel at the Summerside terminal.

(Lower right): Fraser's Mt. site uses two 8-foot antennas (top right) and (bottom right) for linking the mainland to Mt. Buchanan on Prince Edward Island through space diversity microwave. Other mounted antennas belong to an old system and are scheduled for removal.



antennas, a 12 x 12-foot reflector mounted on a 150-foot tower for the Charlottetown path, and two 8 x 12-foot reflectors mounted on a 200-foot tower for the Mt. Buchanan and Summerside paths.

Charlottetown to Hazel Grove link operates on 6115 mc transmit and 6055 mc receive frequencies. The Charlottetown station is a dual terminal with the two sections of the system terminating here. The service channel is bridged between the two sections of the overall system at Charlottetown to provide service channel and fault alarm facilities for all stations. Two separate paths to Hazel Grove are provided by two 6-foot antennas mounted on the roof of the telephone building. FM sub-carrier equipment for TV program channels from both Summerside and Fraser's Mt. is used at this station.

Summerside to Hazel Grove link operates on 6155 mc transmit and 6245 mc receive frequencies. The Summerside station is a drop repeater with coupling and isolation equipment for the insertion and dropping of channels. Both remote and master fault alarm equipment is provided, and one two-way TV program channel is provided from Summerside to Hazel Grove. The antenna system consists of two 6-foot dishes and two 6 x 8-foot reflectors mounted on a tower, located on the roof of the telephone building.

Egmont to Summerside link operates on 6325 mc transmit and 6415 mc receive frequencies. The Egmont station is the end terminal of the system on Prince Edward Island. Coupling equipment is provided at this site as well as remote fault alarm and service channel equipment. A 6-foot antenna mounted on a coated

wooden pole is utilized. The Egmont end terminal is connected to Lutz Mt., near Moncton, New Brunswick, by VHF radio.

Maritime, fifth largest telephone company in Canada, is one of the first Canadian independent firms to utilize VHF and Microwave Radio. A progressive company, Maritime has many firsts to its credit: 1941 — Installation of a VHF Radio System to carry Toll Circuits and 1948 — Installation of a commercial PTM system. Also, its leadership can be attested to by the fact that it had Operator Toll Dialing in 1951.

With the installation of Collins' high quality microwave equipment, both the officials at Maritime and Island Telephone Companies feel that the hazards of weather upon telephone communication can be held to the lowest level possible.

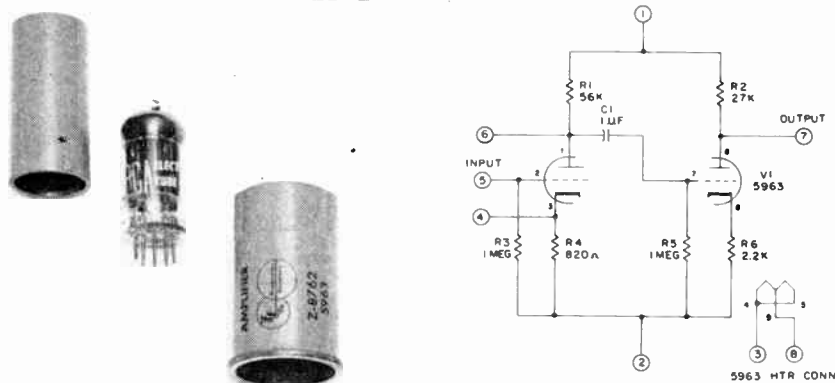


Figure 1. Construction of a typical plug-in amplifier stage.

The elimination of time consuming calculations is one of the principal features of these versatile building block units.

Standard plug-in units reduce engineering design time

by J. R. Simpson *

One of the major trends in the design and construction of electronic equipment in recent years has been the development and application of plug-in components. A number of types of "plug-ins" have been used for many years, notably single elements which have a relatively limited life, such as thermal relays, or which may have to be changed during normal operation, such as crystals and other frequency-determining components. The increasing complexity of equipment, and the gradual standardization of individual circuits, have extended the field to complete stages, and in some cases to entire sub-assemblies.

The impetus toward plug-in construction has been greater in some fields than in others; probably the most significant advances have been made in the computer and data processing equipment fields, where identical stages are employed many times in the same piece of equipment. In many cases entire design and production procedures have been converted to one or another type of plug-in.

Plug-in units may be divided for purposes of discussion into two broad groups. The first group is one in

* Electronic Associates Limited, Willowdale, Ontario.

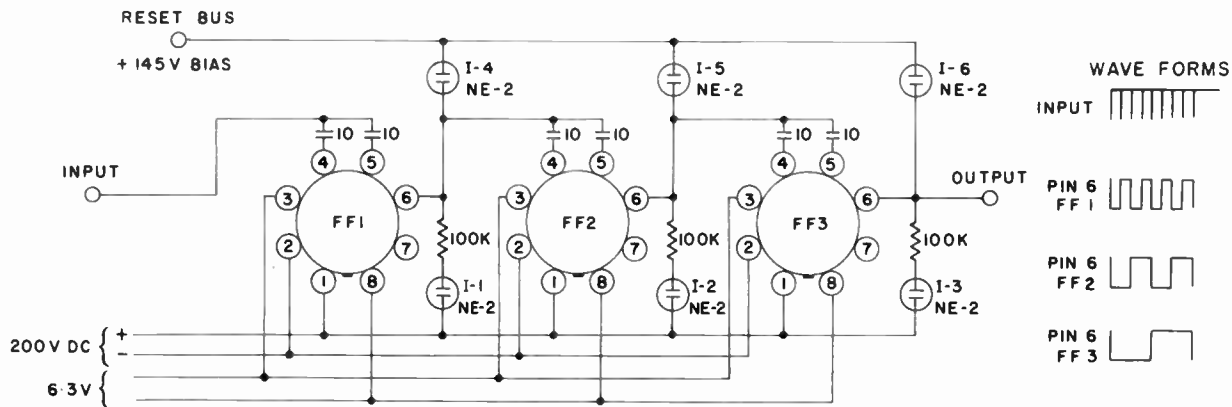


Figure 2. Digital counting chain requires only 12 external components for operation.

which not only the construction of individual stages is altered, but the overall make-up of the equipment is changed to accommodate these stages. The second group involves units which have been developed for general use by equipment designers and manufacturers, and which require very little in the way of special mountings or interconnection facilities. The examples with which this article is concerned fall into the latter category, and require no special facilities whatever.

The advantages offered by plug-in units accrue in several areas; we are concerned here principally with design and development, but a few of the advantages in other fields are worth mentioning. The use of plug-ins simplifies servicing considerably; faulty stages can be located and replaced quickly and with the ease of replacing vacuum tubes. Analysis of the faulty stage can then be done on the bench, and repairs made without danger to other stages in the equipment. The repairability aspect must be qualified to some extent, since some types of plug-ins involve specialized techniques, printed circuits for example, and in the case of some military equipment the need for miniaturization has consigned the units to the throw-away class. From the point of view of stock-keeping, plug-ins reduce the number of items held in parts inventories, both by

the manufacturer and the eventual customer. They can be stocked and called up on a bill of materials or spare part lists in the same way as resistors and capacitors.

Chief advantages

General-use plug-in units present their chief advantages in the design and development fields. In cases where the characteristics of the required circuits are known, design may be approached from the system viewpoint and the calculation of individual stage values becomes unnecessary. Effectively, the design engineer becomes a block-diagram man, and the units can be used as building blocks; presently available plug-ins can be combined to provide an almost endless variety of circuit functions. The current shortage of engineers makes the elimination of time-consuming calculation particularly important; plug-in units are engineer multipliers.

When a certain amount of development work must be done to evolve a good design, plug-ins save time by permitting rapid circuit changes. Major circuit modifications can be made by replacing stages; often the required characteristics can be obtained by simple external component changes.

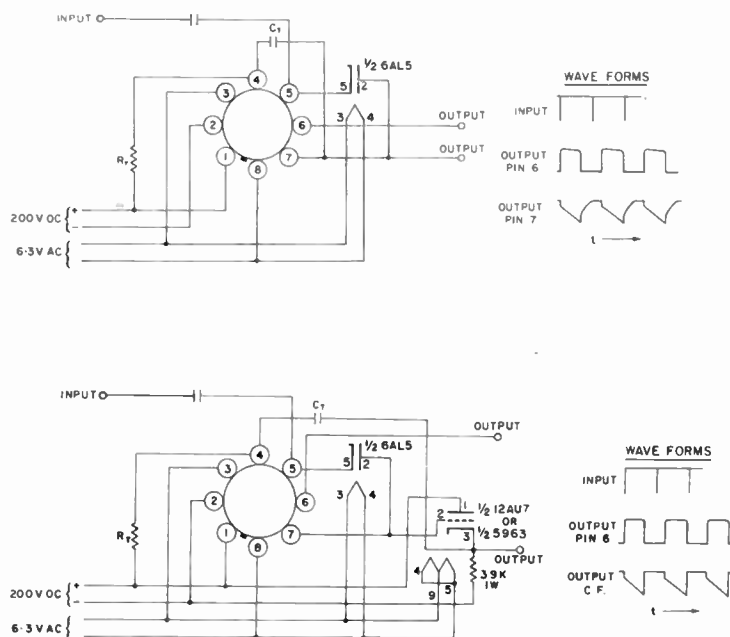


Figure 3. Plug-in phantatron sweep generator connected for normal output (top) and for shortened recovery time (bottom).

The units used as examples here are designed and manufactured by the Electronic Engineering Company of California. One type, a linear amplifier, is shown in Figure 1. Mechanically, it consists of a die-cast aluminum container which houses the tube and all associated components. The noval or seven-pin tube base is supported by a nylon sleeve which also provides insulation, and the components are wired to a standard octal base. The tube shield is removable to permit easy replacement of the vacuum tube, and the component sub-assembly is protected with a fungus- and moisture-proof spray. The unit has a seated height of 3½ inches and a diameter of 1½ inches.

The linear amplifier shown in Figure 1, which is of the general-purpose resistance-capacity-coupled type, has a voltage gain of about 40 db and a frequency response from 9 to 200,000 cycles \pm 1 db. The uses of such a stage in development work are legion; it is particularly useful in applications requiring amplification of low-level (up to 300 millivolts) sinusoidal, complex and transient signals — from data pick-up units, for example. Additional pin connections are provided for the use of external frequency response compensating networks if required. The schematic diagram gives some indication of the time which would be required to wire the complete stage; the use of a plug-in requires only the supply of plate and filament voltages to an octal socket.

The advantage of using such units becomes even more evident when more than one stage is required to perform a desired function. One example of this, digital counting, is shown in Figure 2. The chain includes three medium speed bistable multivibrators which operate in the range from 0 to 100 kc. There are 49 components which would have to be assembled if this circuit were wired during development, versus 12 components, including the sockets, if the plug-ins were used. The circuit could, of course, be extended to provide further counting functions simply by providing additional sockets and plugging in more stages.

Reduced engineering time

The phantastron sweep circuits of Figure 3 illustrate the combination of a plug-in unit with external circuitry to provide given characteristics. In both cases a vacuum diode is shown between input and output, although a

high back-resistance crystal with a high inverse-voltage rating could be used. The circuit is controlled by an external resistor and capacitor which are chosen to provide the required design characteristics. The basic circuit provides a sweep waveform of the order shown in (a). By using a cathode follower to couple the timing capacitor from plate to grid, shortened recovery time of the external RC circuit may be obtained as shown in (b). The components of the plug-in would be used in any standard phantastron, and the unit can be externally adapted to almost any application. These stages can be cascaded in driver applications without the use of amplifiers.

Another commonly used circuit which lends itself to the use of a plug-in is the squarer of Figure 4. The information to be applied to timing, counting or sweep circuits often has a poor rise time and must be squared before it can be used to trigger a one-shot or flip-flop. The circuit shown will handle frequencies from 0 to 100 kc; units are available for use up to 1 mc. The input section of the squarer is biased to the desired value by adding an external resistor from plate to grid. The series combination of the external resistor and the grid leak is chosen to set the input grid at between 50 and 75 volts positive with respect to the cathode. For positive pulse squaring, the bias should be about 50 volts, and for negative pulses a bias of the order of 75 volts is required. In any case, the input sensitivity and output wave shape symmetry may be adjusted for the specific application.

The audio power amplifier shown in Figure 5 is another example of plug-in unit application, on a somewhat more plebeian level than the foregoing examples, but one which seems to be of widespread current interest. The circuit involves a direct-coupled amplifier-phase inverter and a push-pull voltage amplifier which drives the output stages. The underchassis view shows the extremely simple wiring which results from the use of these units, and points up the advantage of low hum and noise pick-up. The tubes themselves are well shielded.

The possible applications for plug-ins are endless; available circuits include several types of flip-flops, gates, linear and pulse amplifiers, phantastrons, thyatron ring counters, squarers, cathode followers, voltage regulators, and one shots. Blocking oscillators which require only the addition of an external resistance

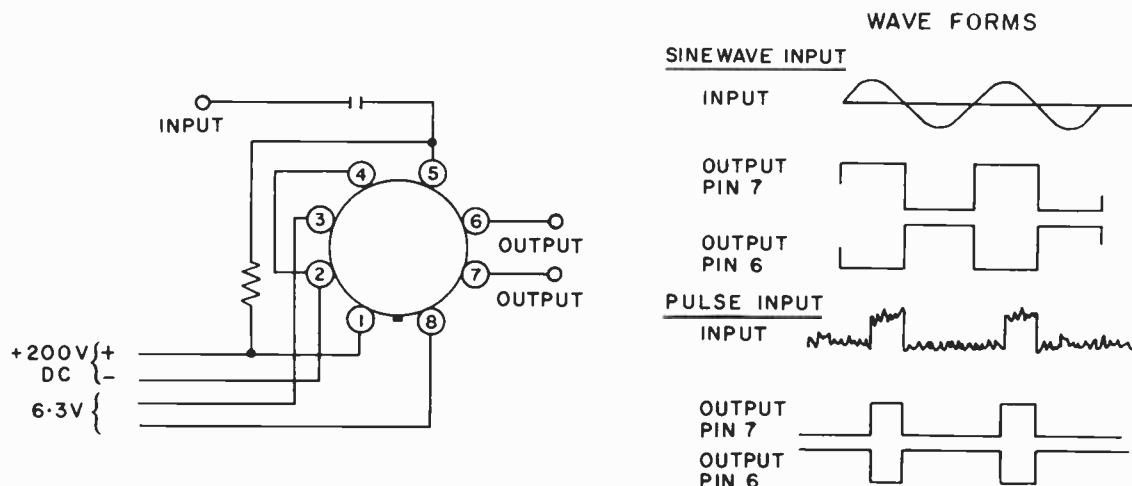


Figure 4. Squarer circuit may be adapted to specific applications by changing the external bias resistor value.

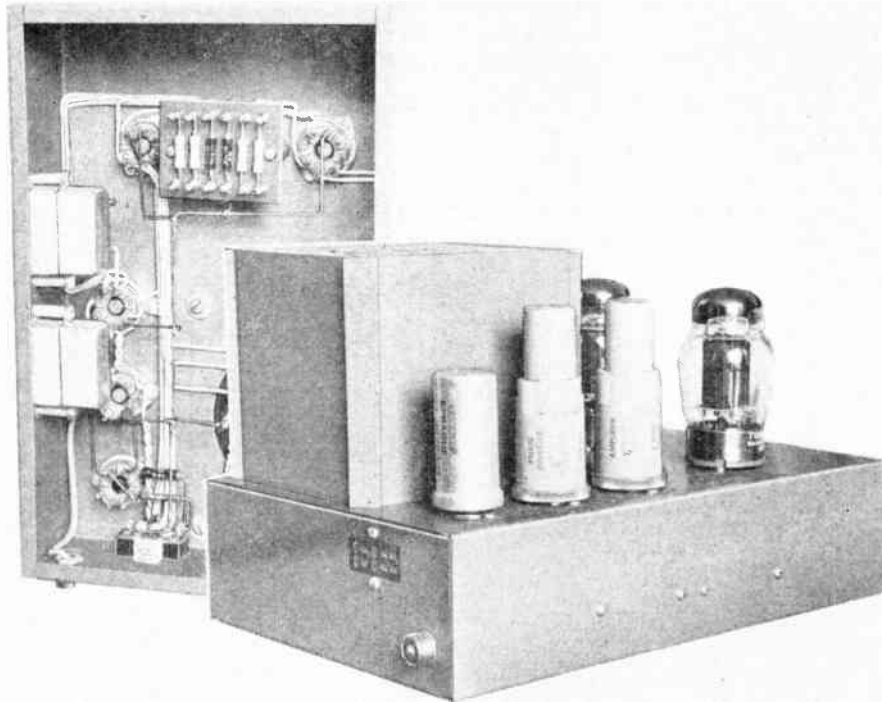


Figure 5. Use of plug-in stages in 60 watt audio amplifier eliminates major portion of under-chassis wiring.

to control pulse width, and a crystal oscillator which requires only a crystal, are also available. Plug-in diode banks incorporating eight, twelve or sixteen crystal diodes, or even complete decimal counters for use from 0 to 100 kc can be obtained. In every case the units are designed to plug into standard octal or Amphenol sockets.

One last point in connection with these units; the manufacturer provides drawings of each type which can be filed, and the equipment schematic can be reduced to a diagram of the sort shown in Figures 3 and 4. This not only saves the engineer's time during the design stage, but can result in a substantial reduction in space occupied by drawings.

Most versatile TV camera ever developed

An E.M.I. color television camera exhibited for the first time at a private exhibition is said to be the most versatile and compact color camera ever developed.

Utilizing three vidicon tubes and a novel optical system, it has the advantage of being cheaper and much easier to operate than the more elaborate three Image Orthicon Camera previously produced.

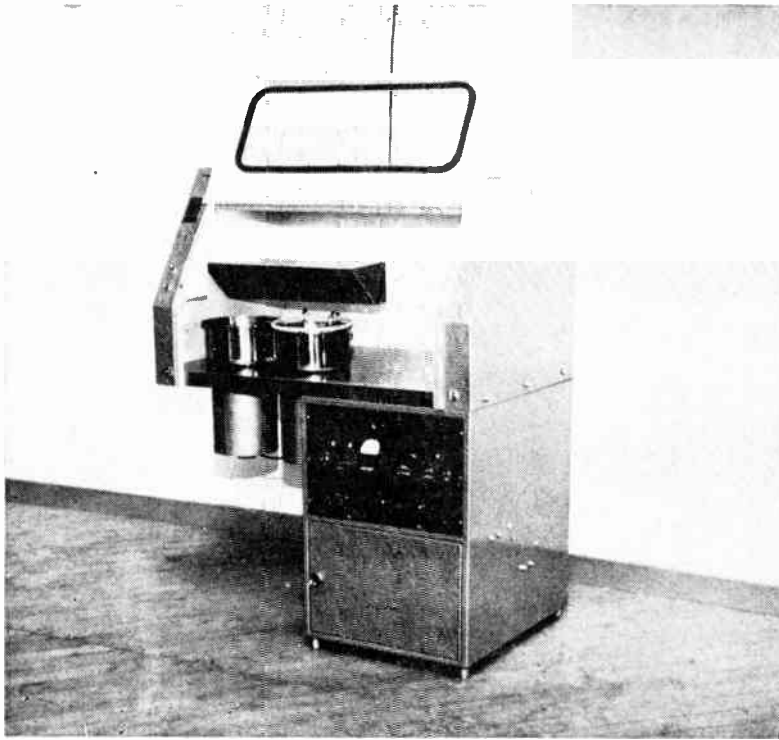
The color rendering is claimed to be more accurate, and simplicity of operation makes the equipment specially attractive for industrial, medical, and scientific uses. The lower cost of the equipment, when compared with more conventional units, makes it most attractive to operators wishing to obtain experience of color studio work, but who have been deterred in the past by the large capital outlay involved.

Main features of the E.M.I. equipment are the originality and efficiency of its optical system, improved quality of color reproduction and the suitability of the design to meet such applications as broadcasting, telecine transmission, industrial, merchandising and medicine.

Its large contrast range enables first-class outside broadcasting in color, and good picture quality even under poor lighting conditions. It is considerably lighter and more compact than anything previously produced either in England, Europe or the United States. The camera has been designed to operate on 405, 525, and 625 line standards.

The general style of construction of the equipment follows the new E.M.I. practice, and takes the form of a series of standard cases which are fitted with handles for portability, and fit into standard 19 inch cubicles or consoles. The units are mounted on runners so as to give easy access to the internal assemblies.

The efficiency of the camera's novel optical system is several times that of relay lens types. It has been designed so as to enable the maximum amount of light to fall on the photo-conductive surfaces of the vidicons. To achieve this each pick-up is provided with its own objective lens. Located in front of these lenses are the dichroic and front-surface mirrors necessary for splitting the incident light into its color components.



Component or assembly operations including cleaning — spraying — winding — welding and tooling operations can be completed within confines of pressurized cabinet shown.

Total elimination of foreign particles 1 micron in diameter and 99.5 per cent of particles .3 micron in diameter represents new technique in

Dust-free component assembly

IN this modern "Explorer" age the stringent requirement for total reliability of complex mechanisms demands that each component be totally reliable. For example, the failure of a gyroscope, or a piece of electronic gear in a guided missile is a well advertised loss of time and dollars.

To control the reject rate at assembly and inspection of component parts, and to build a greater confidence factor into the complex, close tolerance equipment of today, a new "tool" is necessary, a tool that will provide a dust-free atmosphere.

The words "dust free", as applied to work areas, no longer means dust that can be seen with the human eye. Many pieces of equipment, gyros, miniature bearings, cathode ray tubes, complex aircraft carburetors, instruments, etc. can fail in their purpose because of an accumulation of dust particles no larger than bacteria, or the particles which comprise cigarette smoke.

The state of the precision machining and assembly art has progressed to the point where the old fashioned pressurized room is not adequate as an assembly tool.

Dust, from wear of moving parts, from clothing, cosmetics, dandruff, soot, fumes and other aerosols must be removed from suspension in the air and prevented from accumulating on surfaces in areas where precision assemblies are made.

It is necessary, of course, to choose the most economical, adequate piece of equipment for the job to be accomplished. To define the particular limit required for a specific job, there must be a correlation between particle concentration and component performance; however, it may be said, in general, that particles .3 microns diameter and over present problems in most component assemblies, and that particle diameter rather than particle mass should

be the control factor. A component assembly may operate satisfactorily even though it contains a number of one micron diameter particles, and fail completely with the introduction of one 10 micron particle.

Baker Sterilshield cabinets and prefabricated rooms provide the means to carefully control the atmosphere in work areas.

Designed for utility and comfort, the Sterilshield workspace has an open front which allows the operator complete freedom of movement. "A shield" of cleaned air across this opening of the pressurized cabinet prevents the introduction of airborne particles into the work area. Only the operators' hands and tools need enter the area where delicate assemblies are being made.

To maintain the confidence factor, the design of this equipment allows the installation of a complete assembly line within the dust controlled cabinets. Ultrasonic washing equipment, spray heads, sinks, coil winders, welding stations and tools for other operations can be installed within the pressurized cabinets. A component or an assembly can be completed without ever leaving the controlled atmosphere of these enclosures. Parts or assemblies can be transferred, by hand or conveyor, from one cabinet to another through electrostatic precipitators or through absolute mechanical filters. It is possible, by the method used, to remove all particles one micron diameter and over, and 99.5 per cent of the particles .3 micron diameter and over, from the air which is delivered to the workspace.

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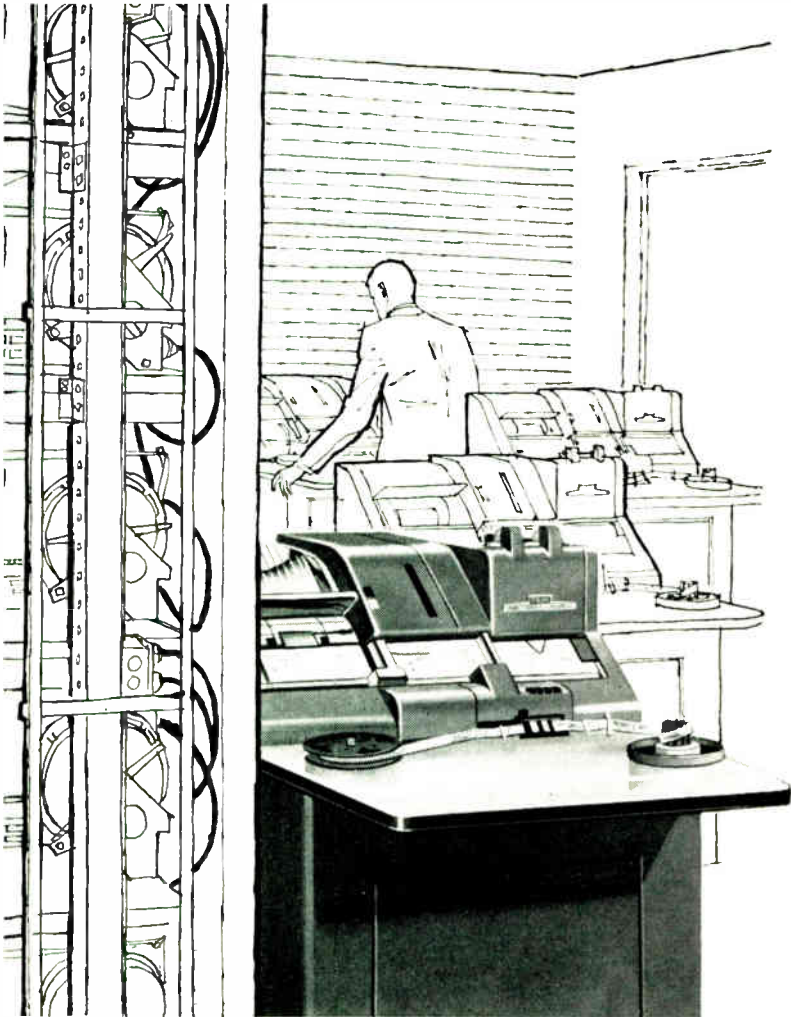
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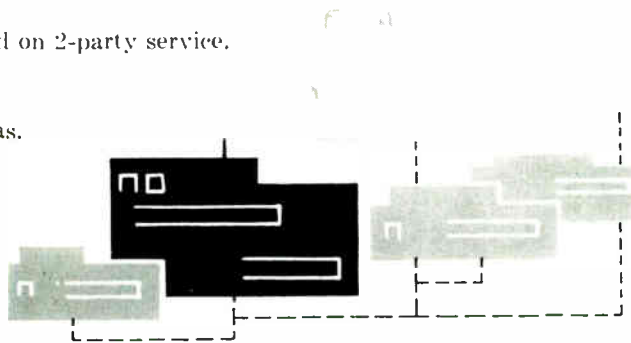
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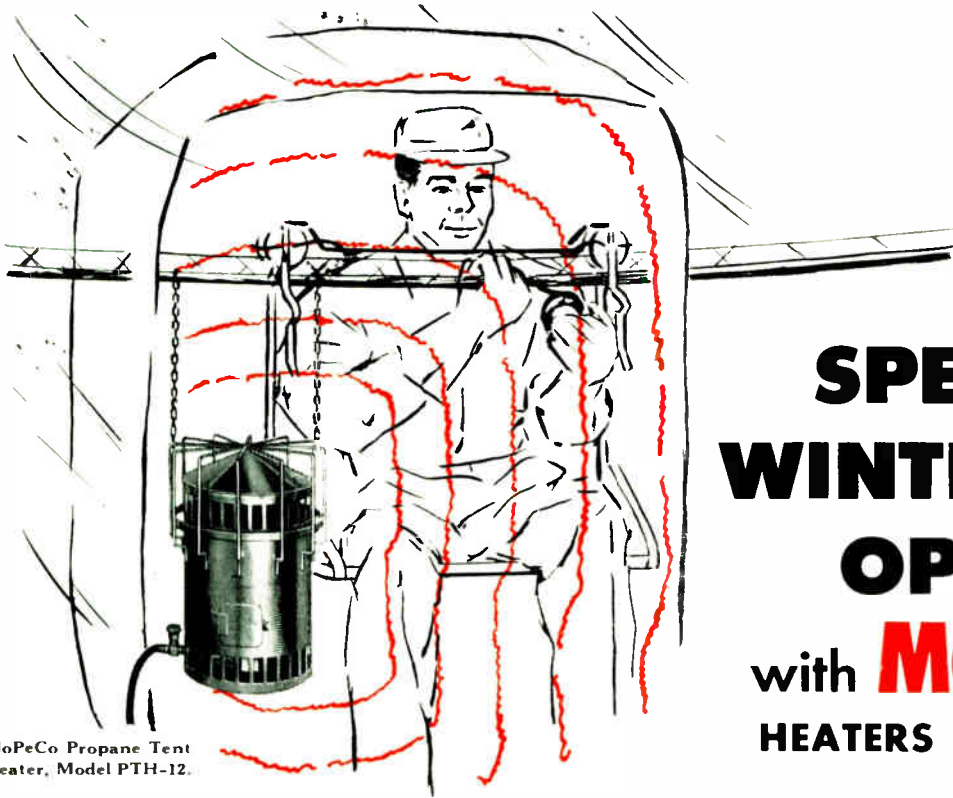
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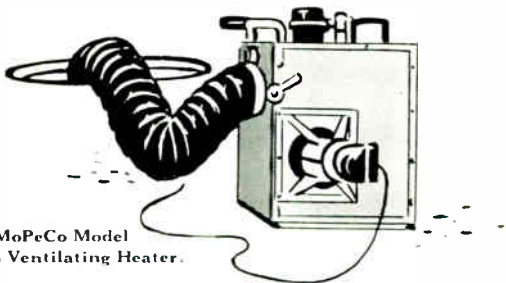
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5-04

business briefs and trends

★ Contracts for more than \$302 million dollars were placed with the General Electric Company by the U.S. Department of Defense for research and development for the fiscal year ending last June 30. This placed the General Electric Company as the top researcher for defense purposes in terms of dollars for the twelve month period preceding June 30 last.

* * *

★ Government sources in Ottawa have indicated that an exodus of Canadian engineers to the United States has started with close to 200 electronic engineers and engineers in associated fields leaving the works of Canadair in Montreal to take up employment with Boeing Aircraft in Seattle, Washington. This mass migration of engineers from the Canadian scene is believed due to the cancellation of defense contracts by the Canadian government.

* * *

★ A National Aeronautical Establishment has been created within the framework of the National Research Council in Ottawa. The new Establishment will work in close cooperation with the Defense Research Board and will also carry out engineering investigations on behalf of the Canadian aircraft industry.

* * *

★ The Hayes-Coffin mission to Canada from the United States Foreign Affairs Committee has recommended that the Canadian electronics industry be afforded more opportunity to bid on United States orders for defense electronic equipment. The reasoning behind the suggestion is that if Canada is to become a purchaser of American built equipment in the form of missiles and other like armament then it should be permitted a part in the manufacture of such equipment.

* * *

★ A National Stereo Radio Standards Committee has been formed by EIA in the United States for the purpose of carrying out engineering tests and to subsequently recommend standards to the FCC for the governing of stereo broadcasting in the United States. Prior to bringing in any recommendations an overall study of stereo broadcasting systems will be carried out by the newly established body. Head of the NSRC is Dr. W. G. R. Baker, president of Syracuse University Research Corporation.

* * *

★ Prognostications concerning the welfare of the electronics industry in the United States claim in the majority that 1959 will be the best year ever and review of the industry for the past year leaves the impression that no one is quite sure how good or how bad the past year has been.

* * *

★ J. Herbert Smith, president of the Canadian General Electric Company, in summarizing conditions in the electrical industry says that there now appears to be little doubt that the low point of business recession was passed in mid-1958 and while the rate of recovery is not constant the prospects for 1959 are for increasing strength in the general economy.

* * *

★ AT&T in the United States are planning on approaching the FCC to seek approval for a new mobile phone band the approval of which would encourage the use of telephones in private automobiles.

* * *

★ According to John E. Hayes, chief engineer of the CBC, color television may be started in Canada within the year. In addressing the Electric Club of Toronto Mr. Hayes pointed out that the Fowler commission had recommended that the CBC commence color telecasting in 1959 with the proviso that color proved successful in the United States. Two major CBC studios, it is understood, could be converted to telecast in color without any great delay or inconvenience.

business briefs and trends

★ "Future Developments In Space" will be one of the lead attractions on the symposium agenda of the IRE National Convention to be held in the New York Coliseum and the Waldorf Astoria Hotel this March 23 - 26.

* * *

★ More than 40,000 people from 41 countries visited the Electronic Computer Exhibition and Business Computer Symposium, which closed at Olympia, London, England, on December 4, after a six-day run. Forty-three manufacturers of computers and ancillary equipment showed products worth £8 million in the most comprehensive exhibition of electronic computers ever held and the first of its kind in Europe.

* * *

★ Members of a recent Japanese Trade Mission to Canada found Canadians interested in quality goods, according to Mr. Eihiro Fujise, executive director of the Japan Trade Center in Toronto. "From Japan we have learned the mission found that while Canadians were price-conscious, they were not interested in low prices without quality," Mr. Fujise said.

* * *

★ Canadian National Railways is forging westward in the Atlantic region with its program of centralized traffic control, automatic and unerring signalling system which expedites train movements. Up to \$3 million may be spent by the end of 1961 on a three-stage project, with a \$2 million expenditure earmarked for the next two years to extend CTC from Napadogan, N.B., to Monk, Que. The intricate, complex equipment already is being installed on the stretch between Napadogan and Edmundston, N.B.

* * *

★ A closed-circuit television camera that can "see" in almost total darkness — below the level of human sight — has been developed by the General Electric Company. R. Peter de Karwin, specialist for Canadian General Electric Company Limited's closed-circuit television operation in Toronto, said the glow from a cigarette lighter in a completely dark room produces more than enough light for the camera to transmit a clear picture of the entire room.

* * *

★ D. G. Fink, president of the Institute of Radio Engineers, recently commented that the Northeast Electronics Research and Engineering Meeting, known as NEREM is the fastest growing electronics meeting. Mr. Fink was speaking at a luncheon meeting held in Boston during November in conjunction with 1958 - NEREM, at which the registration was 6,100, technical papers 43, and exhibits 207.

* * *

★ A sale of half the outstanding stock of Zenith Electric Supply Ltd., Toronto, and its affiliated companies located in St. Catharines, Brantford and Cornwall, has been made to a group headed by G. R. Gardiner, president of Gardiner, Watson Ltd. of Toronto. B. R. Steen has been appointed as president, with G. R. Gardiner as vice-president; A. Basen, secretary; and M. Goldhar, treasurer.

* * *

★ Price reductions ranging from 11 per cent to 18 per cent on the Dow Corning fluorocarbon silicone rubber have been announced by this producer of silicones. The new prices became effective December 15, 1958, and range from \$18.90 per pound in 1,000 pound quantities to \$25.20 per pound in less than 10 pound quantities.

New Products

New Product specifications published in **Electronics and Communications** have been briefed for your convenience. If you require further information on any of the items published you may readily obtain such by using our **Readers' Service, Page 49**. Just mark the products you are interested in on the coupon on Page 49 and the information will be in your hands within a few days.

Quick Setting Silicone Rubber

Item 2208

To meet the demand of designers in many industries, Dow Corning has developed a faster setting silicone rubber. Identified as Silastic RTV 502, this new material is an easy-to-apply liquid which vulcanizes to a rubber in only 30 minutes . . . or about 20 times faster than conventional RTV silicone rubbers.

Relatively new to many industries, RTV silicone rubbers . . . the RTV signifying "room temperature vulcanizing" . . . have gained acceptance as versatile, basic engineering materials because they offer a fast, simple, low cost method of obtaining rubber-like properties. Silastic RTV 502, for example, retains flexibility from -70 to 500 F, has good electrical insulating properties. Like regular heat-cured silicone rubber, Silastic RTV 502 also resists weathering, moisture, ozone and corona.

Silastic RTV 502 is suitable for sealing and caulking metal-to-metal and metal-to-rubber joints; potting and encapsulating electrical and electronic parts; as a mold or impression material for making prototype parts; as a shock and vibration absorber for delicate components.

Complete information is available from **Dow Corning Silicones Ltd., 1 Tippet Rd., Downsview, Ontario, Canada.**

Andrew Antenna Systems Catalog

Item 2209

Andrew Catalog 22C, a 96-page product and facility book, will be a welcome addition to the reference library of antenna system planners and engineers. It fully



covers the antennas, antenna systems, and transmission line products that are produced by this Canadian concern.

Included in the Andrew catalog are new product developments in 21-inch waveguide, high power transmission lines, ground-to-air and telemetry antennas, microwave and two-way communication antennas, and the introduction of two new sizes of Helix (flexible coaxial line).

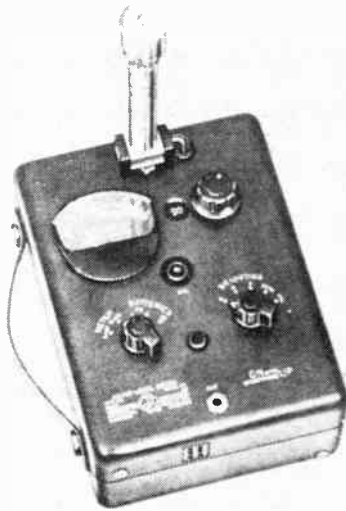
In addition to complete engineering data on Andrew products, the catalog includes a special 16-page section of general antenna systems engineering information.

The catalog is available on request by addressing **Andrew Antenna Corporation, Ltd., 606 Beech Street, Whitby, Ontario, Canada, on your letterhead.**

Sound-Level Meter

Item 2210

Smaller, lighter, and easier to hold than its predecessor, the new Type 1551-B Sound-Level Meter developed by General Radio Company also has many worthwhile new



technical features and improvements. Among these are:

A new microphone for better all-round performance.

A new meter circuit, which more closely approximates rms response.

A new calibration circuit for amplifier gain standardization, which does not require a power-line connection.

A new adjustment for microphone sensitivity, which facilitates the use of special-purpose microphones.

Improved signal-to-noise ratio and dynamic range.

Improved frequency response.

Improved performance at high sound levels.

Improved stability, requiring less frequent calibration adjustments.

General Radio Company, 275 Massachusetts Ave., Cambridge 39, Mass., U.S.A.

Silver and Copper Compounds

Item 2211

Two new Walsco products are now available to facilitate printed circuit repairs by technicians, experimenters, engineers, and laboratories. Walsco Silver Print and Walsco Copper Print can easily be used to touch up circuits around eyelets, parts, etc.

According to Mr. Robert Fleming, manager of Walsco's New Products Department, the same silver and copper compounds are used here as are used in original printed circuit design.

Walsco Silver Print is available in two sizes, 1/2 Troy ounce (Walsco catalog No. 36) or a full Troy ounce (Walsco catalog No. 36-1).

The Copper Print, Walsco catalog No. 37-02, is available in a 2-ounce bottle.

Detailed information about Walsco Silver Print and Copper Print and their applications is available from Walsco distributors or direct from the manufacturer, **Walsco Electronic Manufacturing Company, 100 West Green Street, Rockford, Illinois, or from the Canadian Factory Representatives, Atlas Radio Corporation Ltd., 50 Wingoid Avenue, Toronto 19, Ontario.**

12 1/2 Watt Rheostat

Item 2212

The Ohmite Manufacturing Company announces its Model "E" Rheostat — a unit smaller than many 1 or 2-watt, film or composition potentiometers, yet capable of 12 1/2 watts dissipation at 40°C.

Featuring famous Ohmite construction, this ceramic and metal unit is only 7/8" in diameter, and extends 1/4" behind the mounting panel. Actually, it is a miniaturized version of the time-proven Ohmite rheostat design, featuring ceramic hub, independent contact arm pressure, vitreous enamel coating and other Ohmite features.

Capable of operation in high ambient temperatures (with proper derating), this unit lends itself to military and aircraft applications. With its small size and power handling capability, it opens new vistas in miniaturization to apparatus designers. Ohmite is now stocking 23 different resistance values with linear winding. Rheostats with non-linear taper, tandem rheostats, or other features can be provided.

For complete information, write for Bulletin 157 to **Ohmite Manufacturing Company, 3698 Howard Street, Skokie, Illinois, U.S.A.**

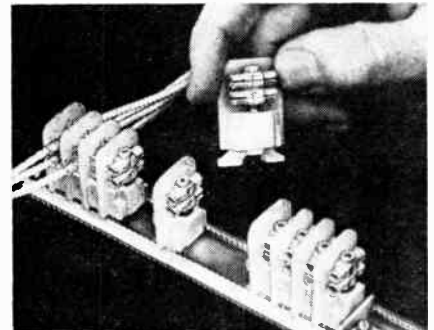
Terminal Block

Item 2213

Based on the modular principle, MODULOK, a new, extremely versatile and reliable terminal block accommodating wire sizes Nos. 22-12, is now available from **Burdny Canada Ltd., Toronto.**

Versatility is achieved through modular construction which allows individual modules to be snapped together or apart and then inserted onto a steel track and locked by end locks. The modules are made of Zytel 31, a nylon compound having extremely low water absorption characteristics. The tracks are available in any lengths up to 32 inches and 30 modules may be mounted per foot of track.

Modules have either 2 or 4-tier spring-loaded plated sockets which may be set for quick-disconnect for rapid ring-out, bussing, or circuit changes. A twist of a screwdriver transforms the quick-disconnect into a permanent connection. These unique spring-loaded sockets exert continuous and uniform pressure in either position. Solderless crimp-type contact tips installed on wire ends are inserted into the sockets and provide high reliability and speed of assembly as contrasted to the high rejection rate and slow assembly characteristic of solder operations.



Although a new product, MODULOCK has already found numerous applications in early warning electronic systems, missile ground control systems, and similar equipment.

Burdny Canada Ltd., 1530 Birchmount Rd., Scarborough, Ontario.

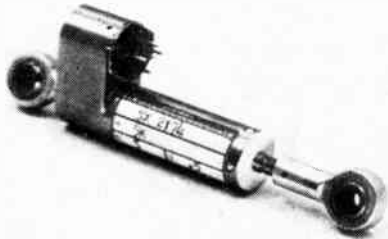
New Products

Rectilinear Potentiometer

Item 2214

Precision wire-wound rectilinear potentiometers for applications such as measuring variations in position of control surfaces on missiles or aircraft, gaging liquid levels, sensing strain, are now offered by Helipot of Toronto, a division of Beckman Instruments, Inc.

Transducers of this type measure linear motion directly, bypassing gear trains and other devices necessary for translating linear motion directly to rotary motion. In addition, they eliminate backlash and misalignment.



Helipot's standard model is a high-temperature unit for operation at ambients from -55°C to 125°C .

Linearity, resistance range and power dissipation ($\frac{1}{2}$ watt per inch) are dependent on length of resistance element, which is set by system requirements.

Application for computer control or telemetering circuits is simplified since no signal amplification is required.

A rugged unit, the HELIPOT® rectilinear potentiometer exceeds environmental specifications demanded by builders of one of Canada's newest military aircraft . . . vibration to 10G's at 10 to 500 cps, shock to 15G's, humidity to 95 percent.

Housing and shaft are stainless steel, bearings of Teflon to minimize operating force. The standard housing diameter of 0.625" can be increased for particular applications.

The standard model has three Teflon leads from the rear bushing although terminals or plug-in attachments are easily provided. Method of mounting and shaft attachment can be supplied to suit customer requirements.

For further information contact: R-O-R Associates Ltd., 1470 Don Mills Road, Don Mills, Ontario.

Custom Manufactured Patch Panels

Item 2215

Cambridge Thermionic Corporation, manufacturer of electronic components, has developed a patch panel that will be custom manufactured for control instruments and for use in switching computer circuits.

Dubbed the "256", the patch panel mounts on an aluminum panel 6" x 6" x $\frac{1}{8}$ ". It inserts easily by means of a 5" lever. The Cambion-designed 2378 jack and 2379-1 plug assure positive contact at each of 256 points. Individual contacts have a minimum current capacity of one ampere. A D key in the jack's floating spring maintains a solid front at all times. All pins are heavily gold plated, .045" in diameter, and spaced on .200" centers. Cambridge Thermionic will custom manufacture other configurations of this sure contact patch panel to meet special design requirements.

Like all other Cambion components, the "256" patch panel is carefully processed from quality materials, and its reliable performance is guaranteed.

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

Firewall Connectors Item 2216

A major problem in the airframe industry — moisture accumulation in firewall electrical connectors, the principal cause for reduction in voltage ratings — has been relieved by the new "KE" series of connectors manufactured by Cannon Electric (Canada) Limited.

The "KE" series, an improved version of the military MS-K type, is designed to meet the severe environmental conditions encountered by modern high-altitude aircraft. The "KE" is the first connector to satisfy both the high-temperature requirements for a fireproof, Class MS-K connector, and the vibration-proof, moisture-proof requirements of the MSE Class of connector. In addition to meeting the 2000°F flame test specified in the MIL-C-5015, this new connector will stand up under continuous operation at 400°F. Moisture proofing is achieved with seals made of a fluorinated silicone which has improved the resistance to oil and skydrol hydraulic fluid.

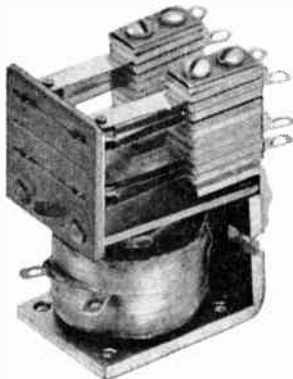
Cannon "KE" connectors are produced in two basic shell styles, for conduit use and for wire bundles. A variety of shell sizes and insert arrangements are currently available, and most sizes are furnished in both long and short versions.

For further information write to Cannon Electric (Canada) Limited, 160 Bartley Dr., Toronto 16, Ontario.

Custom Built Relays

Item 2217

Complete Canadian-made relays, wholly engineered, fabricated and thoroughly tested on the premises of Osborne Electric Company Limited, Toronto, have recently been announced by that organization.



Osborne Electric is prepared to supply, on short notice, any combination of contacts and ratings in the general purpose relays, motor starting relays, short and long telephone types, and co-axial relays.

Osborne Electric will pay special attention to any requirements for small quantities, and will custom build to specifications.

Osborne Electric Company, Limited, 95 Wesley St., Etobicoke, Toronto 18, Ontario, Canada.

Output Pentode For Radar And TV Studio Equipment

Item 2218

The EL360, a new output pentode introduced by Mullard, is rated for three distinct applications in radar equipment: as a pulse modulator, scanning valve or series regulator. As a scanning valve or regulator it is also suitable for television studio equipment. Its versatility, especially in radar, will assist designers to reduce the number of different valve types used in a particular equipment.

As a pulse modulator, the EL360 can be operated at 5.0kV with a duty factor of 0.001 and a peak cathode current of 4A. Maximum pulse duration is 1 microsecond.

For scanning applications the maximum anode supply voltage, $V_a(b)$, is 1kV and the permissible anode dissipation 15W. Peak positive anode voltage is 7kV maximum. The high voltage rating achieved for this application is due largely to the use of ceramic insulators in the valve.

For series regulator use, triode-connected,

and with anode voltages of up to 400V the maximum anode dissipation is 18W. Under typical operating conditions, with anode voltage 100 volts and anode current 128mA, the a.c. resistance is 340 ohms.

The EL360 is octal based, with top-cap anode, and has a 6.3V, 1.27A heater. Its physical dimensions are: overall height 110 mm maximum, overall diameter 33 mm maximum.

Mullard Ltd., Mullard House, Torrington Place, London, W.C. 1, England.

Power Oscillator Model 150

Item 2219

The Industrial Test Equipment Company, 55 East 11th Street, New York is in production on its new Model 150 Power Oscillator. This instrument supplies 160 VA of power at either a fixed frequency of 400 C.P.S. $\pm 25\%$ or a variable frequency with a range of 350-450 C.P.S. An input jack is also provided for output frequencies from 50-4,000 C.P.S. Output voltage is continuously variable from 0-120 volts.

Special features of the instrument include; less than 1% output distortion, better than 1% regulation from no load to full load, and the ability to be used with loads of any power factor. The use of silicon diodes in the plate supply circuit reduces the heat dissipated, and enables the unit to be supplied in a relatively small enclosure. The size of the panel is 19" x 8 $\frac{3}{4}$ " and the depth is 13 $\frac{1}{2}$ ". A unique cabinet design provides either a handsome desk top console, or a rack mounting type instrument.

Two or more of these units may be wired together for polyphase operation. Two and three units are available from the factory.

For further information contact: The Industrial Test Equipment Company, 55 East 11th Street, New York.

Pilot Light With Built-In Resistor

Item 2220

This series of Dialco Pilot Lights is especially designed to utilize fully the advantages of the new high-brightness Neon Glow Lamp NE-51H. This lamp may be operated at about three times the level of current that may be applied to other lamps of this type, and it will produce eight times as much light — with long life. The lamp itself is very rugged, vibration-resistant and compact (approx. 1 $\frac{1}{2}$ " x 3 $\frac{3}{4}$ " overall). Very low power is required — less than 1 watt on 250 volt circuit. The low operating temperature permits the use of attractive plastic lenses. The lamp may also be used on D.C. circuits over 160 volts.

Since neon lamps require a current-limiting (ballast) resistor, the required resistor is built in . . . an integral part of Dialco assemblies in this series. The resistor itself is completely insulated in molded bakelite and sealed in metal — an exclusive Dialco feature (U.S. Patent No. 2,421,321).



The resistance value for bright light on 105-125 volt circuits is 18,000 ohms ($\frac{1}{2}$ watt). Other resistance values can be built in for direct connection of the pilot light to commercial circuits up to 250 volts.

Dialco Pilot Lights in this "high brightness" series are available in two sizes — for mounting in $\frac{1}{8}$ " or $\frac{3}{8}$ " dia. panel clearance holes.

Address inquiries to Diallight Corporation, 60 Stewart Avenue, Brooklyn 37, N.Y.

New Products

High-Sensitivity Accelerometers

Item 2221

Development of two series of self-generating, high-sensitivity accelerometers, is announced by Abraham I. Dranetz, vice-president, Gulon Industries, Inc.

Produced by the company's Glennite Instrumentation Division, the new A-380 and A-395 Series of accelerometers are credited with bringing a new dimension to the measurement of shock and vibration, particularly in the aircraft and missile field.

Featuring high sensitivity without sacrifice of resonant frequency or capacitance, the new units provide a flat response over temperatures ranging from -70°F to $+250^{\circ}\text{F}$, with an accuracy of ± 5 per cent. In order to eliminate the problems of circulating ground currents, both series of Glennite accelerometers are also available in grounded or integrally ungrounded designs. All eight units in the two series feature the advantages of case isolated bender construction that affords excellent acoustic isolation characteristics.

The Glennite A-380 Series, self-generating units, have an acceleration range of 0.05 to 500 g, and a useful frequency range of 3 to 2,500 cps, resonant frequency is 10,000 cps, with sensitivity and capacitance (with cables) of 40MV/G minimum and 1,200 uuf minimum respectively. The Glennite A-395 Series has an acceleration range of 0.1 to 800 g, a useful frequency range of 3 to 9,000 cps and a resonant frequency of 30,000 cps. Capacitance and sensitivity, both with cables, are identical to the previous series.

Available in either titanium or aluminum housings, these new instruments utilize a new piezoelectric ceramic for flat response and can be calibrated at higher frequencies on special order.

Gulon Industries, Inc., 212 Durham Ave., Metuchen, N.J., U.S.A.

Transistor Tester

Item 2222

A new Transistor Tester, Triplett Model 890-A, provides positive leakage and gain tests for PNP and NPN type transistors.

It measures DC Beta (which is the current gain from the collector to base with grounded emitter) from 5 to infinity. A better indication of the degree of quality is made possible by the long good portion of the scale. The tester also affords an exact test for shorts and leakage; and checks forward and reverse leakage of diodes.



Separate "Calibrate" and "Gain Buttons" eliminate the possibility of errors in usage. Single switch selection of transistor types for operation simplicity.

The Triplett Electrical Instrument Co., Bluffton, Ohio.

Carrier System Filters and Transformers

Item 2223

The Budelman Electronics Corp. now has available a complete range of voice pass, low pass, high pass, band pass and band stop filters for use with Budelman and other carrier systems operating at frequencies up to 150 kc. All filters are encased in a universal housing for indoor or outdoor mounting.

In addition to the above, two new line matching transformers have just been introduced. Type 211A offers ratios of 600:600 and 600:150 ohms, frequency response of 6 to 150 kc., and precision balancing in accordance with REA requirements. It can be used to match carrier terminals to entrance cable impedances.

Type 212A is a pole-mounting transformer designed to match the different impedances encountered at junctions between cable and open wire. Its ratio is 600:150 ohms, and frequency response is 24 cycles to 320 kc. at 3 db points, provided DC is not flowing in the windings. Dial pulses are passed without distortion.

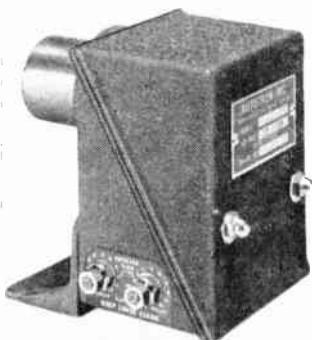
Represented by Tele-Radio Systems Ltd., 3534 Dundas St. West, Toronto 9, Ont.

Photoelectric Timing Control

Item 2224

Sharp time delay adjustment over a range of 1 to 10 seconds is featured in an improved photoelectric timing control announced by Autotron, Inc., Box 722CJ, Danville, Illinois.

The control relay energizes when the light beam is interrupted and the time delay period has expired. Dual potentiometers in series give unusually sharp adjustment of time delay. Shaft locks are provided to hold the exact setting desired. Repeat accuracy: plus or minus 4 per cent.



Minimum phototube light time varies with the distance between the light source and the phototube as follows: .5 second at 5 feet; .3 second at 4 feet; .1 second at 3 feet; and .05 second at 2 feet. Minimum light required on the phototube is 40 foot-candles.

The control relay contacts are SPDT, rated 8 amperes at 115 VAC, non-inductive load. Contacts pull in when the light beam is interrupted and the time delay period has expired.

The case is gasket-sealed cast aluminum, tapped for $\frac{1}{2}$ " conduit. The mounting bracket is adjustable. Lens diameter is $1\frac{1}{2}$ ". Power consumption is approximately 10 watts. Available with built-in safety relay when specified. Approximate dimensions, less lens tube: $5\frac{1}{4}$ " high, $3\frac{1}{8}$ " wide and $3\frac{1}{4}$ " deep.

Literature on request to Autotron, Inc., Box 722CJ, Danville, Illinois, U.S.A.

Round-Nose Connector

Item 2225

A new 83 Series UHF Round-Nose Connector is now available allowing the use of dip-soldering on the center contact. This simplifies the soldering technique and reduces soldering time.

Features: Voltage rating — 500 volts peak; dielectric material — mica-filled bakelite; mates with all UHF receptacles; uses standard UHF reducing adapters.

For further information write to: Amphenol Canada Limited, 300 Campbell Avenue, Toronto 9, Ontario.

Silicon Rectifiers

Item 2226

A line of eight silicon rectifiers ranging from peak inverse voltage of 50 to 500 volts for radio and television set use has been developed by Tung-Sol Electric Inc. The new semi-conductors have been assigned type numbers 1N2072 thru 1N2079 by the Joint Electronic Devices Engineering Council.

The new units are diffused junction silicon rectifiers enclosed in epoxy resin cases with flexible pigtail leads. In configuration they closely resemble small capacitors.

The 1N2078, with a peak inverse voltage of 400 volts, has wide application for radio and TV replacement. It provides the low forward voltage drop and low leakage current characteristics of silicon. The resulting higher output voltage, coupled with the ability to withstand heavy current surges, assures superior operation of equipment.



The 1N2078 eases installation three-ways: 1) overall size is considerably smaller than most silicon rectifiers; 2) epoxy resin case effectively insulates the silicon junction so that only the flexible leads are "hot"; and 3) flexible leads may be soldered into any piece of equipment, no additional hardware required.

The line:	Type	Peak Inverse Voltage
	1N2072	50
	1N2073	100
	1N2074	150
	1N2075	200
	1N2076	250
	1N2077	300
	1N2078	400
	1N2079	500

Tung-Sol Electric Inc., 95 Eighth Avenue, Newark 4, N.J., U.S.A.

Microwave and UHF Test Equipment Catalog

Item 2227

An 84-page catalog describing the company's greatly expanded line of microwave and UHF test equipment and components has been published by The Narda Microwave Corporation, Mineola, N.Y.

The new 1959 edition of the Narda catalog includes all of the recent additions to the Narda line, in particular the company's new millimeter waveguide instruments for the K to E band, standard gain horns for the 40,000 to 90,000 mc. range, broad band bolometers and thermistors, tuneable waveguide detectors, high directivity directional couplers, coaxial hybrids, tuned pre-amplifiers and transistorized VSWR amplifiers, and laboratory and classroom training sets.

Newcomers to the field may find helpful the illustrations of typical component setups for the measurement of impedance, attenuation, and other properties of waveguide and coaxial systems.

Besides its standard products, Narda is also prepared now to custom-engineer microwave and UHF components for radar and communications systems. Details of this new service as well as a number of typical problems and recommended solutions are given in the new catalog.

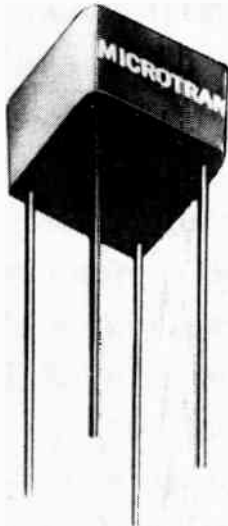
For free copy of the new 1959 Narda catalog, write The Narda Microwave Corporation, 118-160 Herricks Road, Mineola, N.Y., U.S.A.

New Products

Veri-Miniature Transformers

Item 2228

Microtran Company, Inc., L.I., N.Y., announces the availability of its line of Veri-Miniature size transformers in epoxy, molded, plug-in construction. There are 13 transformers in this line consisting of inputs, outputs, interstage and chokes. These transformers are built to MIL T-27A class R and S, Grade 2 or 4. Frequency response is ± 2 DB. 200 to 10,000 cycles. Reliable life is 10,000 hours minimum. High temperature epoxy is used in the molding of these units to provide protection against extremes of ambient.



Mounting is by means of tabs or solid buss leads as these units are designed for plug-in printed circuit application. Weight of these units is $\frac{1}{4}$ of an ounce.

Literature of catalogued items available on request. Canadian representatives, Hudson Randall International, 123 Manville Road, Scarborough, Ontario.

Ultrasonic Primary Phase Standard

Item 2229

Acton Laboratories, Inc., a subsidiary of Technology Instrument Corp., of Acton, Mass., offers Type 706-A Ultrasonic Primary Phase Standard. This instrument generates two sinusoidal voltage signals whose phase difference can be varied smoothly from 0° to 360° with an accuracy of $\pm 1^\circ$. Units are built for any single frequency from 20 kc to 200 kc. The instrument can be used for calibrating high frequency phase meters and phase detectors, and phase shifting devices in general.

Operation of Type 706-A is based on the interpretation of a multiple-frequency Lissajous pattern. The output signal frequency is applied to the horizontal deflection plates of a cathode-ray oscilloscope. A signal whose frequency is exactly 36 times the output frequency is applied to the vertical plates. The resultant Lissajous pattern will rotate as the phase of the low frequency signal is varied. With a frequency ratio of 36, the pattern will repeat itself 2n times for every 360° shift of the low frequency voltage. Thus, the pattern is the same at every 5° phase interval ($360^\circ/2n = 5^\circ$). Calibration of the phase shifter section of the instrument removes the ambiguity caused by every 5° phase shift point presenting the same pattern on the scope. Between 5° points, a vernier phase shift dial is used to set incremental angles within $\pm 0.1^\circ$. Note that accuracy is not dependent on the dial calibration, but results directly from the precision with which the Lissajous pattern is read.

For further details write to Acton Laboratories, Inc., 533 Main Street, Acton, Massachusetts, U.S.A.

High Temperature Tantalum Capacitors

Item 2230

T.C.C. (Canada) Limited announce the production of a new series of high temperature tantalum foil capacitors capable of operating over the range of -50°C to $+125^\circ\text{C}$. Ratings are from 6 VDC to 150 VDC for both polar and non-polar types. A wide range of standard capacitance values is available in each voltage group and intermediate values of voltage and capacitance can be made to order. A special double seal construction assures reliable operation over the extended temperature range.

The capacitors, which are wholly manufactured in the T.C.C. (Canada) plant in Toronto, will meet the requirements of the proposed amendment No. 1 to MIL-C-3965B.

The Telegraph Condenser Co. (Canada) Ltd., 50 Berta Road, Toronto 15, Ontario.

Radio Frequency Duplexer

Item 2231

The Budelman type 149 is an extremely compact tuned cavity network designed to enable a transmitter and receiver to be coupled to the same antenna and transmission line with negligible interaction and loss of efficiency. Model 149A covers the range 440 to 480 mc. and model 149B 880 to 970 mc. Occupying only $3\frac{1}{2}$ " of rack space, the model 149A permits a minimum frequency spacing of 7 mc. At 10 mc. the transmitter branch bandwidth is 25 db, receiver branch 60 db. Minimum spacing in the case of the 149B is 15 mc., and at 20 mc. the transmitter branch bandwidth is 25 db, receiver branch 60 db. Midband insertion loss (transmitter branch) is less than 1 db and less than 2 db for the receiver branch.

In addition to effecting economies in regard to the cost of antennas, transmission line and towers, the 149 provides a substantial reduction in both spurious radiation and spurious responses.

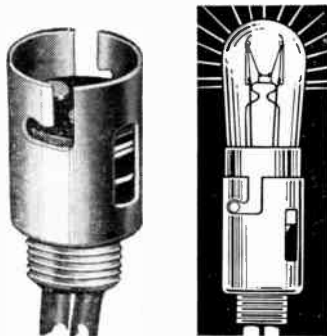
For further information contact, Tele-Radio Systems, 3534 Dundas Street West, Toronto 9, Ontario.

Candelabra Bayonet Base Lampholder

Item 2232

This Lampholder is designed to provide a simple means of attaching to any bracket, panel, or threaded pipe. It can be made to accommodate single or double contact candelabra bayonet base lamps (unit illustrated is double contact type).

The Lampholder has a standard $\frac{1}{8} \times 27$ American National Pipe thread which can be screwed directly to any corresponding female panel or, by means of hardware, through a $\frac{1}{8}$ " clearance hole. The double contact unit illustrated (our part No. 12-230) is rated 75 watts, 125 volts. It is Underwriters' Laboratories listed, and approved by Canadian Standards Association.



Single contact units of this type have one lead (No. 11-230, not illustrated) and the threaded portion is grounded to the shell. All metal parts are heavily plated for corrosion resistance. These assemblies can also be made to conform to all applicable military specifications. Engineering design samples will be furnished, no charge, on request made on company letterhead.

Please address inquiries to Leecraft Mfg. Co., Inc., 60 Greene St., New York 12, N.Y.

Clip-On DC Milliammeter

Item 2233

A clip-on dc milliammeter which provides an entirely new and time-saving method of measuring dc current is now available from the Hewlett-Packard Company.

The instrument, Model 428A, employs a pen-sized probe which clips around a wire without interrupting the circuit. Current is then read directly on the milliammeter. Model 428A thus eliminates the necessity of breaking and resoldering leads, and does not load the circuit under test.

The milliammeter, which measures by sensing the magnetic field around a conductor, has full scale current ranges from 3 milliamperes to 1 ampere in 6 steps. Accuracy is ± 3 per cent ± 0.1 ma. The accuracy is unaffected by line voltage changes, instrument aging, or effects of the earth's magnetic field.

The instrument measures dc currents in the presence of ac. For extremely low current level measurements, dc sensitivity can be increased by making one or more loops of the conductor through the "jaws" of the probe.

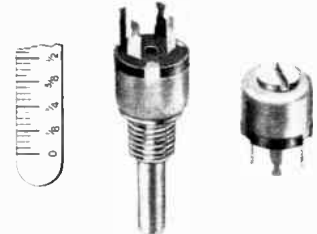
Model 428A is particularly useful in transistor work, in low impedance circuits such as emitter circuits, and in computer work where a large number of dc current determinations are normally necessary.

Hewlett-Packard Company, 275 Page Mill Rd., Palo Alto, California, U.S.A.

Variable Composition Resistor

Item 2234

Precision Electronic Components (1956) Limited have designed a new variable composition resistor with only $\frac{3}{16}$ " O.D. Type "T" with bushing mount and Type "V" for standard .100 printed circuit outlay (lugs distance .200"). It is the smallest control



on the market which can be used under extreme environmental conditions as outlined in the MIL-R-94B specifications.

Precision Electronic Components (1956) Ltd., 50 Wingold Avenue, Toronto 19, Ont., Canada.

Telephone Type Relay

Item 2235

Greater sensitivity, a wider range of contact combinations, increased range of time delay, longer service life and increased stability of adjustment are featured in a new telephone type relay, designated Class 66, announced by Magnecraft Electric Company, 3354RC West Grand Avenue, Chicago 51, Illinois.

Contributing to the unusually great life expectancy and the exceptional versatility of this new relay is a full yoke type armature hinge with over size bearing surfaces and precision fitted stainless steel hinge pin.

Available with standard contact combinations to 10 PDT; with bifurcated contacts for reliable switching of low voltage and low current; with heavy duty power contacts and with combinations of different types of contacts to serve widely varied switching requirements with a single relay.

Literature, including operating and dimensional data with descriptions of the many variations, including plug-in mounting and hermetically sealed enclosures, mailed promptly on request to Magnecraft Electric Company, 3354RC West Grand Avenue, Chicago 51, Illinois, U.S.A.

New Products

Economy Power Package

Item 2236

A revolutionary add-on 250/330 watt economy power package which promises substantial savings to two-way radio owners who need greater communications range has been announced as available by the Canadian General Electric Company Ltd.

The package, to be known as the General Electric Power-Mate, enables users of transmitters in the lower power ranges to upgrade their present systems to as high as 330 watts at half the cost they normally would pay for a complete 330 watt station.

G. F. Ward, communications specialist for the Canadian General Electric Electronic Equipment and Tube Dept., says the new product fills a substantial market need because it is the first package available to permit long-time users of two-way radio to obtain advantages of latest high power designs without scrapping existing equipment.

The General Electric Power-Mate combines a newly-engineered 250/330 watt power amplifier and a new 250/330 watt power supply in a compact, convenient office-style cabinet.

The equipment is named Power-Mate because it matches the height of standard office desks and because it may be mated easily to existing communications systems. It may be added to any existing AC FM communications system licensed for higher power, regardless of manufacturer. The lower-powered transmitting equipment already at the user's location becomes the driver stage for the add-on feature. If the old transmitter is capable of delivering 10 watts excitation in 25-54 mc or 144-174 mc, the new unit will make up to 330 watts output possible. Systems providing 15 watts input in UHF frequencies can be upgraded to an output of 250 watts.

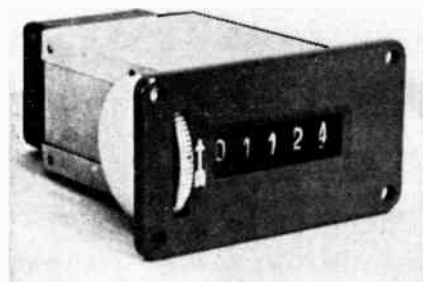
Further information on the General Electric Power-Mate may be obtained from Canadian General Electric, Electronic Equipment and Tube Department, 830 Lansdowne Avenue, Toronto 4, Ontario.

Multi-Purpose Counters

Item 2237

I/O mechanical and electrical counters are newly available in Canada.

The model illustrated is the F 106 Electro Magnetic counter giving speeds up to 20 imp. per sec. for DC and 15 imp. per sec. for AC. The manufacturers claim a life of 60 to 70 million operations. The F 106 is available with solder or screw terminals and can be supplied with Zero reset or non reset as required.



These counters are used in a wide variety of industries for such applications as piece counting on machines, assembly line and conveyor belt counting and control, man hour records and measuring control in flat goods industries. For permanent records, I/O printing counters are available in various models.

Full information and literature is available from Aeromotive Engineering Products Ltd., 147 Hymus Blvd., Pointe Claire, Quebec.

Professional Movie Camera In 8 mm.

Item 2238

For firms unwilling to meet the expense of 16 mm. motion pictures of plant operations, time study, and sales promotion, the world renowned Emel 8mm. camera, made in France, affords all the professional features of most 16 mm. equipment. The Emel, available in Canada through their representative, Canadian Research Institute, or high grade photographic dealers, is equipped with a triple lens turret or the 1959 Pan-Ciner reflex zoom lens. Features such as wide speed range from 8 to 64 frames per second, single frame counter, film wind for lap dissolves and special double exposure effects, parallax correction to 10" for extreme close up work, zoom view-finder, cable release, continuous run lock (30 seconds on one winding), permit extreme flexibility in industrial filming.



The precision Angenieux and SOM Berthiot lenses give definition better than that obtained on some 16 mm. cameras. These instruments are available from Toronto stock.

Canadian Research Institute, 46 St. George St., Toronto 5, Ont.

Unique System 'Beefs Up' Tiny Radar Pictures

Item 2239

A unique electronic system which makes miniature target drones look like giant intercontinental bombers was announced recently by the Sperry Gyroscope Company of Canada, Ltd.

The new system — called SEE, for Sperry Echo Enhancer — was employed in a series of successful flight tests at Cape Canaveral, Fla., to help check the nation's SAGE air defense network.

By enlarging the pips — or electronic "pictures" — which denote approaching aircraft on radarscopes, SEE makes possible use of small, relatively inexpensive target missiles and drone aircraft to simulate attacks by large enemy bombers. These miniature drones are intercepted and "killed" by fighter aircraft or guided missiles in tests of the nation's defense system.

The SEE equipment is designed for broad use with either surveillance, air-intercept or tracking radars. It can be applied, also, to enable ground controllers to locate and identify aircraft with much greater certainty and at greater distances. This additional air traffic control capability has been demonstrated in tests conducted in the New York area, Sperry's aeronautical equipment division said.

The system is both inexpensive and light in weight. It consists of a Sperry traveling wave tube, miniaturized power "package" and antenna, weighing in total less than 20 pounds. Mounted within an aircraft or target drone, the equipment detects pulses

from ground radars and sends back signals of greater intensity to create pips of any desired size on the ground radarscopes.

SEE already has been flight tested successfully at speeds greater than Mach 2 (twice the speed of sound) and altitudes above 50,000 feet. It even has proved effective with specialized Moving Target Indicator (MTI) equipment which "erases" ground objects on radarscopes and concentrates its attention on aerial targets in motion.

Sperry Gyroscope Company of Canada, Ltd., 6011 Cote de Liesse Rd., Montreal, Que.

Precision Decade Resistors

Item 2240

IRC Decade Resistors consist of 4 individual resistors solidly encapsulated in a specially designed block. They mount on the tie-rods of standard Wafer switches. By using 1, 2, 3 or 4 in each decade any value from 1 to 10 may be obtained. By using 2, 3 or 4 of the decades any resistance value to 10 megohms can be obtained plus or minus .1% tolerance.

Mountings are made with short leads to the chassis of the equipment being tested and adjusted while in position. The value of the resistance can be changed as needed without stray capacitance and pick up associated with conventional decade boxes and leads.

This new decade is desirable where experimental units or small lots are being manufactured and are economical enough to remain as a permanent part of the equipment.

Operating temperature 125° ambient. Solder coated lugs are securely fastened to the resistive elements and provide rugged easily solderable termination.

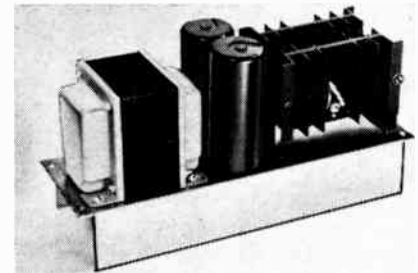
The resistors used are designed to meet the environmental requirements of MIL-R-93 and MIL-R-9444.

For further information write to: International Resistance Co. Ltd., 349 Carlaw Avenue, Toronto 8, Ont.

Fully Transistorized Modular Power Supplies

Item 2241

Dressen-Barnes Corp., Pasadena, California announces a line of fully transistorized power supplies designed for use as components in original equipment. These sub-chassis units can be built into deliverable equipment, saving design time and production expense.



Seven voltage ranges are provided — from 5-7 volts at 3.0 amps., up to 27-32 volts at 1 amp. With this wide choice available, it is anticipated that designers will be able to fill many special requirements using shelf items.

Regulation for these units, line and load combined, is 0.5 per cent; maximum transient NL to FL is 200 MV. Units are short-circuit proof. Ripple: 2 MV RMS. Maximum operating temperature: 50°C. Units can be operated in series to supply higher voltages. Or they can be mounted on panels for standard rack mounting if required. Size: 4" wide x 12" long; approximately 4½" above chassis, and 1¼" below chassis.

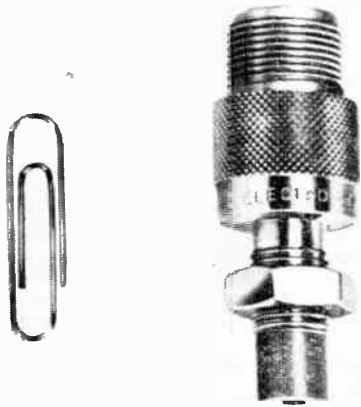
These units are designated as Models 22-111 through 22-117. Complete specifications, price and delivery data supplied on request. Manufacturer: Dressen-Barnes Corp., 250 N. Vinado Ave., Pasadena, Calif. Represented in Canada by E. E. Whitaker, Box 3255, Arrnprior, Ont.; and 12 Glenmorris Drive, Dundas, Ont.

New Products

Miniature Proximity Pickup

Item 2242

A new Miniature Proximity Pickup — Model 4912-AN — has been announced by Electro Products Laboratories, Chicago, Ill. The sensing face is $\frac{3}{8}$ " in diameter. Overall length is $2\frac{1}{8}$ ". Mounting thread is $\frac{1}{8}$ "-20.



This probe-type pickup is a very small sensing unit for Proximity Control Systems. It detects both ferrous and non-ferrous metal parts having a diameter of less than $\frac{1}{16}$ inch, and can be excited by gear teeth of 10 diametral pitch.

The new Miniature Proximity Pickup is mounted at the point of work. It is connected with a shielded connecting cable to a Proximity Control Unit. Metallic work pieces in close proximity to the pickup cause the connected control unit to provide an electrical pulse that governs associated mechanical or production operations.

Model 4912-AN can be used with the entire line of Electro Proximity Control Units for detecting stationary metal objects, as well as moving metal pieces passing the pickup at a rate up to 60,000 per minute. Operating clearances up to $\frac{1}{4}$ inch can be achieved for metal pieces over $\frac{3}{8}$ inch in diameter.

The pickup's high temperature range is up to 200°F. Its low temperature range is apparently unlimited.

For additional information on Proximity Transducer Systems, write the Canadian Representatives — Atlas Instrument Corporation, 50 Wingold Avenue, Toronto 19, Ontario.

Oil-Filled Potentiometers

Item 2243

Three liquid-filled potentiometers now produced by Helipot Division of Beckman Instruments, Inc., supply subject matter for Data Sheet 1482, a seven-page technical summary issued by the Toronto, Ontario, electronics firm.

All working parts of the new potentiometers are sealed in a bath of oil which effectively cushions the unit against shock and vibration, protects it against environmental changes, increases dielectric strength, and flushes away wear particles that can reduce life and cause noise.

Fully described in the data sheet are a ten-turn $1\frac{1}{8}$ " diameter model and three-turn and ten-turn 2" diameter models.

Photographs, power input charts, dimensional drawings, electrical and mechanical specifications, standard coil data and a list of readily available modifications tell the complete product story.

Copies of Data Sheet 1482 may be obtained from R-O-R Associates, Ltd., 1470 Don Mills Road, Don Mills, Ontario, sales representative for Helipot Division.

Jack for Tight Patch Work

Item 2244

The Cambridge Thermionic Corporation announces a new jack, designated 2515, for quick, tight patch work.

The new jack assures perfect electrical connections because permanent gripping power is maintained by a specially designed compression spring used with a floating key. It is provided with a solder terminal for convenient wiring. The jack may be obtained in shank lengths for panels varying from $\frac{1}{8}$ " to $\frac{3}{8}$ ". It takes a plug with a pin diameter of .062".

For additional information, write Cambridge Thermionic Corporation, 445 Concord Ave., Cambridge 38, Massachusetts, U.S.A.

Wide-Range Volt-Ohm Meter

Item 2245

The Siemen's MULTITRON, a new wide-range multiple Volt-Ohm meter, is now available in Canada from The Ahearn & Soper Company Limited.

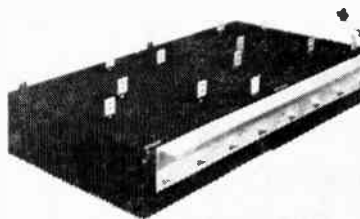
The new Multitron has a measuring range for DC voltage from 1.5 v to 1,500 v, and for AC voltage from 30 cps to the highest frequencies of 250 mc/s. It will also measure resistance from 10 to 10⁷ Ohms. Nine clearly-marked scales permit fast, easy reading of these measurements. The Multitron's shock-proof measuring device has an angle of deflection of 100 degrees.

For complete information, contact The Ahearn and Soper Company Limited, 384 Bank St., Ottawa, Ont.

(HCD) Selenium Rectifier Stacks

Item 2246

Canadian designed High Current Density (HCD) Selenium Rectifier Plates in a complete size range have been announced by Canadian Line Materials Limited.



The new selenium plates are manufactured by CLM using new techniques including vacuum deposition of the selenium. The company states that the (HCD) stacks can be continuously operated at twice NEMA ratings, with only a slight temperature rise of 15 to 20 degrees centigrade, which allows many years life expectancy. The physical sizes of High Current Density Selenium Stacks are just half of those previously offered at NEMA ratings. A reverse voltage of 26 volts RMS is standard but 33 volt plates are available.

Bulletins are being prepared. Technical information is available upon request to Canadian Line Materials Limited, Toronto 13, Ontario.

Small Panel Instruments

Item 2247

The "Big Look" is the term used by design engineers to describe a completely new line of small panel instruments available from Canadian General Electric.

Available for switchboard or panel use, the line includes $2\frac{1}{2}$ " and $3\frac{1}{2}$ " sizes for both AC and DC measurements. Design engineers say that all types have longer scales yet, will fit into the same panel space as conventional equipment. They are actually easier to read than many larger-sized instruments, they said.

The "Big Look", it was explained, is a way of describing the high degree of readability featured in the new panel instruments. To achieve this readability, the

engineers simplified scale graduations, used a tapered pointer and specified big upper case numerals which are positioned above the graduations, so the pointer can't obscure them.

All DC instruments are self-shielded, allowing mounting on magnetic or non-magnetic panels without special calibration. This also allows cluster mounting—bezel to bezel—without interaction and minimizes the effects of stray flux.

An exclusive moving-magnet mechanism is used in all DC ratings, except ammeters below 5 milliamperes. Milliammeters below 5 MA and all microammeters use the widely accepted coremagnet movement that General Electric patented in 1933.

The new moving magnet design eliminates zero set. Conventional control springs are replaced by a control magnet. In de-energized condition the moving magnet, with attached pointer, aligns with the control-magnet, locating the pointer at zero.

Ratings for measuring AC current and voltage employ a variation of the conventional moving iron principle.

All instruments are accurate to within two percent of full scale value. Mounting is interchangeable in accordance with JAN, MIL and ASA (round) specifications.

Appearance design features include a border-to-border scale framed in aluminum for less reflectance, and a new cover design that admits more light from all sides.

A distinctive color area channels the eye for quick reading, the engineers said. Standard colors are readily available and any color choice is offered in quantity orders.

To protect jewels, pivots and internal components against dust, dirt and water all cases are completely sealed with Neoprene gaskets.

For further information contact Canadian General Electric, 214 King Street West, Toronto.

SSB Communication Transceiver

Item 2248

Collins Radio Company is marketing a new HF single sideband communication transceiver, the 32RS-1 in two configurations, the cabinet version (32RS-1C) shown in the illustration and a rack mounted version (32R-1H).

The 32RS-1 has an output of 100 watts PEP on any one of four pretuned channels in the 1.6 to 12 mc frequency range. The new transceiver features high stability,



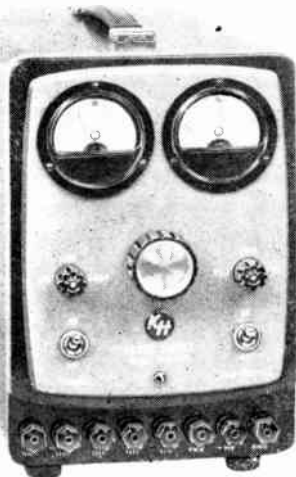
simplified controls for non-technical operators, voice actuation of transmitter function, automatic load control, compact station packaging and superior communication and spectrum conservation through the utilization of Collins SSB. Accessories available for the 32RS-1 include directional wattmeter, phone patch, antenna coupler and a number of antenna kits.

Collins Radio Company, Cedar Rapids, Iowa, U.S.A.

Ultra High Regulation Power Supply

Item 2249

The new Model UHR-216 Ultra-High Regulation Power Supply is now available from Krohn-Hite Corporation. An addition to the famous UHR Series Power Supplies, designed to suit the most exacting requirements, this instrument provides Ultra-High Regulation from 160 to 600 volts for loads from zero to 100 ma. It has 0.002 per cent regulation and 100 microvolts ripple over the entire operating range (160-600 volts and 0-100 ma). For line voltages between 105 and 125 volts, full rated current can be drawn continuously with a substantial margin of safety. The internal impedance is less than 0.1 ohm for frequencies as high as 100 kc. Transient response is 0.001 millisecond. Typical ten-hour drift is 500 ppm. In addition to the dc output, there are two independent 6.3V ac outputs, each rated at 5 amps. This instrument is compact (7½" wide x 10" high x 15" deep) for bench use. Available for relay rack mounting.



The Model UHR-236R which consists of two UHR-216's rack mounted on a single panel, has an output voltage range up to 1,200 volts for applications requiring higher voltages, superior regulation and extremely low ripple.

For further details write Krohn-Hite Corporation, 580 Massachusetts Avenue, Cambridge, Mass., U.S.A.

Wide Range Oscillator

Item 2250

A general purpose resistance-capacitance tuned oscillator, continuously tunable over the frequency range of 5 c/s to 600 Kc/s in five decades. One instrument now provides complete coverage from sub-audio to low radio frequencies. This feature, together with the low distortion and constant output associated with the resistance-capacitance tuned oscillators, will prove of particular value in vibration investigations, testing wide-band amplifiers, transducers, medical equipment and carrier communication systems as well as for most routine audio frequency measurements.

The instrument comprises a frequency controlling Wien bridge, feeding into a balanced push-pull amplifier coupled to a transformer output given up to 3 V into a 600 ohm load. Low distortion (of the order of 0.25%) low hum (less than 0.1%) and constant output are achieved over the whole frequency band.

The complete instrument measures only 6½" x 9½" x 10" and weighs 17 lbs.

For further information contact Cossor (Canada) Ltd., 72 Grenville St., Toronto 5, Ontario.

Topics In Electromagnetic Theory by Dean A. Watkins, Professor of Electrical Engineering, Stanford University.

This volume brings together new material which, for the most part, has never before been available in book form. It provides a logical, unified treatment of topics of interest to students and workers in the field of electromagnetic theory and microwave electron tubes.

The first chapter is devoted to periodic transmission systems. It lays the groundwork for the material which follows and shatters some of the false notions that students get about microwave transmission systems from having studied only smooth systems. Both the field approach and the equivalent circuit approach are employed.

Chapter two deals with propagation on a wire helix, and the third chapter discusses concepts concerning coupling of modes of propagation. The fourth and last chapter gives a quick view of the world of anisotropic media and the waves that propagate therein.

Topics In Electromagnetic Theory is published by John Wiley & Sons, Inc., 440 Fourth Avenue, New York 16, N.Y., contains 118 pages, hard cover bound, price \$6.50.

Guide To The Literature Of Mathematics And Physics Including Related Works On Engineering Science by Nathan Grier Parke III.

For the first time available in a handy, inexpensive edition, this unique up-to-date guide puts a comprehensive library catalog at one's finger tips.

It includes an up-to-date listing of agencies and individuals who are engaged in Russian translation programs. This is only one of the many features of this unusual work which was written by Nathan Grier Parke III, head of Parke Mathematical Laboratories, as an aid for people embarking on research in physics, mathematics, and related engineering sciences.

The Guide lists more than 5,500 key works under 120 subject headings such as Projective Geometry, Geometric Optics, and Cosmic Rays. Titles are carefully cross-referenced and the subject classifications are based on those used by Mathematical Reviews. Whenever a foreign language title appears, any translations are also listed. If there is no English translation of a Russian work, for example, the Guide indicates whether there is one in German.

Guide To The Literature Of Mathematics And Physics is published by Dover Publications, Inc., 920 Broadway, New York 10, N.Y., and is available in Canada through McClelland & Stewart, 25 Hollinger Rd., Toronto 16. It contains 436 pages, paper cover bound, price \$2.75.

Mathematical Foundations Of Information Theory by A. I. Khinchin, translated by R. A. Silverman and M. D. Friedman.

The first comprehensive introduction to information theory, this book places the work begun by Shannon and continued by McMillan, Feinstein and Khinchin on a rigorous mathematical basis. For the first time, mathematicians, statisticians, physicists, cyberneticists and communications engineers are offered a lucid, comprehensive introduction to this rapidly growing field.

In his first paper, Dr. Khinchin develops the concept of entropy in probability theory as a measure of uncertainty of a finite 'scheme', and discusses a simple application to coding theory. The second paper investigates the restrictions previously placed on the study of sources, channels and codes and attempts, "to give a complete, detailed proof of both . . . Shannon theorems, assuming any ergodic source and any stationary channel with a finite memory".

Mathematical Foundations Of Information Theory is published by McClelland & Stewart Limited, 25 Hollinger Rd., Toronto 16, contains 120 pages, paperbound, price \$1.50.

Fundamentals of Radio and Electronics (Second Edition) edited by William L. Everitt, Dean, College of Engineering, University of Illinois.

This volume is especially valuable to those in charge of the proper care and manipulation of complicated radio and industrial electronic apparatus. The book offers definite, practical help to radio operators, radio and electronic technicians and repair men, engineers — anyone interested in radio and electronics.

Thorough and easy-to-use, the book was prepared by six experts — each a specialist in his field. Putting their extensive knowledge to work, the reader will find authoritative, up-to-the-minute information on all phases of radio and electronics — from broadcasting transmitters and receivers, to radar and navigation; from transistors, vacuum tube principles and circuits, to electronic instrumentation and industrial electronics.

In order to make the text as self-contained as possible, two features of the first edition have been retained: a short resume of the most important topics in mathematics needed for an adequate discussion of electronics, and a brief discussion of the electric-circuit fundamentals required.

Fundamentals of Radio and Electronics (Second Edition) is published by Prentice-Hall, Inc., 70 Fifth Avenue, New York 11, N.Y., contains 805 pages, hard cover bound, price \$11.00.

The Algebra of Electronics by Chester H. Page.

In his book Dr. Page discusses basic laws and fundamental principles starting with graphs of networks and relating Kirchhoff's law to Ohm's law clearly. From loop-branch relations in tabular form into nodal analysis determinants and through Laplace's expansion of determinants by cofactors, the book progresses clearly and helpfully.

The author covers practical methods of solving simultaneous equations, develops elementary Fourier waveform analysis, and shows the effects of frequency selectivity, modulation, and distortion. Tubes, transistors, and power supplies are analyzed.

Only high school algebra and simple differential calculus is necessary for a thorough understanding of these mathematical techniques that help to solve circuit problems.

The Algebra of Electronics is published by D. Van Nostrand Company (Canada) Ltd., 25 Hollinger Road, Toronto 16, Ontario, contains 258 pages, hard cover bound, price \$9.50.

Handbook Of Automation Computation And Control — Volume I, Control Fundamentals, edited by Eugene M. Grabbe, Simon Ramo, Dean E. Wooldridge, all of The Ramo-Wooldridge Corporation, with sections contributed by a staff of 104 specialists.

Written and edited with an emphasis on systems engineering, the handbook covers material of direct use to all levels of technical personnel in the associated fields of automatic control and computers.

The major objective is to provide practical design data for research, development and design in feedback control, computers, data processing, control components, and control systems. The stress throughout is on new techniques and components for designing, and developing control systems.

This Volume I covers aspects of mathematics not usually available in engineering handbooks, for example, sets and relations, Boolean algebra, probability and statistics. It includes a compilation of numerical analysis methods — and the latest techniques and comparisons of different methods of digital computation. It presents self-contained treatments of feedback control theory and of operations research, and gives essential material on information theory and transmission.

Handbook Of Automation Computation And Control is published by John Wiley & Sons, Inc., 440 Fourth Avenue, New York 16, N.Y., contains 994 pages, hard cover bound, price \$17.00.

News Report

A monthly roundup of news and personnel changes in the Canadian electronics industry

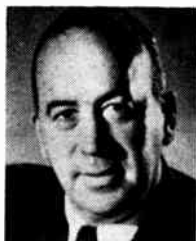
RCA Victor Appoints Sales Executives

B. R. Machum, manager, Commercial Marketing, Technical Products Division, RCA Victor Company, Ltd., has recently announced the appointments of W. T. Roloff as manager, Head Office Sales and K. G. Chisholm as manager, Field Sales.

Mr. Roloff has had wide experience in all phases of marketing of telecommunication products in Canada and overseas. He joined RCA Victor in 1955 and was engaged in organizing the marketing of Microwave Radio Relay Equipment and Systems. Prior to his present appointment, he was manager, Radio Communications Products Sales.



W. T. Roloff



K. G. Chisholm

Mr. Chisholm is well known to the industry, having been actively engaged in the electronic field for over 29 years. In 1929-31 he was associated with the creation of Montreal Radio Station CFCF. For the next six years he worked with the Department of National Defense on various communications systems and engineered the first five aviation radio range stations in Canada. He is also credited with the pioneering development of the use of radio communications in forestry and mining for the Saskatchewan Government. Mr. Chisholm came to RCA Victor in 1941 as sales engineering representative for Western Canada, and, subsequently moved to the company's Ontario office. In 1950 he was appointed area marketing manager for Ontario and Manitoba. He is a senior member of the IRE.

Westinghouse International Promotes R. C. Hall

The appointment of R. C. Hall as sales manager of the Canadian Westinghouse International Company Ltd., has been announced by W. S. Beck, vice president and general manager.

Mr. Hall was supervisor of apparatus sales for Westinghouse International.

E.M.I. and Cossor Form Partnership

Simultaneously in London, England, and Halifax, Nova Scotia, announcement was made at the close of 1958 of the formation of a new partnership by the director of Electric & Musical Industries Limited, a giant British industrial corporation, with a \$200 million yearly operation, and the directors of A. C. Cossor Limited, the parent organization of Cossor (Canada) Limited.

The announcement came after both companies had decided on a policy of co-operation in the development of the Canadian market in the field of electronic engineering. The combination of interests will be known as E.M.I.-Cossor Electronics Limited.

Henry Chisholm, joint managing director of A. C. Cossor Limited, will continue as chairman of the Canadian company; Clifford Metcalfe, C.B.E., a managing director of E.M.I., and managing director of E.M.I. Electronics Limited, will become president. A. C. Carter, D.F.C., as executive vice-president, will continue in charge of operations in Canada, with the company engineering continuing as the responsibility of Arthur Levin, M.I.E.E. the technical director.

R. Addie, commercial director of E.M.I. Electronics Ltd., will join the Board with particular responsibility for commercial development.

J. C. MacKeen will continue as vice-president, and G. F. MacLaren, Q.C., of Ottawa will continue to serve on the Board.

Bell Telephone Engineers Train At Belleville

The city of Belleville, Ontario, has been selected as the location for a permanent training school for Bell Telephone engineers.

A former manual exchange building is being converted and adapted for the new project, and it is planned to have the premises ready for pilot courses during the spring and for full operation of the school in the fall of this year.

The school, which will be under the direction of Eric C. Brake, of Montreal, the Bell Telephone Company's staff engineer in charge of training programs, is expected to contribute greatly to the efficiency of the company's engineering operations.

Toronto IRE Section Upgradings Announced

Upgradings in section membership have recently been announced by H. F. Shoemaker, chairman of the Toronto Section of the Institute of Radio Engineers.

Designated as members are: John H. Campbell, Spruce Falls Power & Paper Co.; Richard R. Carley, Avro Aircraft; Leonard Casciato, K.C.S. Data Control, Ltd.; Rene Goldberger, RETS of Canada Ltd.; Francis W. G. Pelzer, Benco Television Associates Ltd.; Olav Poldne, Canadian General Electric Co. Ltd. Frederick J. Low has become an associate member.

Other names fall into the following classifications:

Senior member — Arthur Kingsnorth. Member — Robert J. Brembecom, Warren B. Duffy, Donald S. Ellenwood, Wm. R. Loughren, Roy W. LePage, Stanley B. Pattison, John R. Richardson, Edmund Richter, Peter Sawalzy, Barry F. Smith, Silvano L. Stocco, Thomas Sullivan, Alexander Yuchimenko.

Associate — David S. Andrews, Walter K. Boerner, John E. Lockyer, James N. Matthews, Gordon C. Park.

The Toronto Section now has a total membership of over 590, excluding students.

Two Executive Appointments Made By 3M

The appointments of A. H. DeMille and H. B. Underhill as division manager and national sales manager respectively have been announced by Minnesota Mining and Manufacturing of Canada Limited.

A. H. DeMille, former national sales manager for the Abrasives product group, assumes the responsibilities of manager for 3M's Abrasives, Adhesives and Coatings Division. In his new position Mr. DeMille will direct the marketing and production of the company's abrasive, adhesive and coating products. He has been with 3M and associated companies since 1945.

H. B. Underhill, former marketing manager for the Abrasives product group, replaces Mr. DeMille as national sales manager for abrasives and related products. In his new position Mr. Underhill will be responsible for the sales of 3M Abrasives across Canada. He has been with 3M and associated companies since 1948.

APEO Elects 1959 President

The 18,000-member Association of Professional Engineers of Ontario on Dec. 31 elected Andrew W. F. McQueen, P.Eng., of Niagara Falls, Ont., as its 1959 president. He succeeds C. T. Carson, P.Eng., as head of the largest professional organization of its kind in Canada.

In business life, Mr. McQueen is president of H. G. Acres & Co. Ltd., Canada's largest firm of consulting engineers. At present the firm is undertaking two large hydro-electric projects in West Pakistan. A member of the A.P.E.O. since 1938, he has served on the Executive Council during the last two years, and last year was the Association's 1st vice president. He is a graduate (1923) in civil engineering from the University of Toronto, and received the professional degree C.E. from his alma mater in 1932.



A. W. F. McQueen

Elected 1st vice president for 1959 is Dwight S. Simmons, general manager of manufacturing, Imperial Oil Ltd., Toronto. The 2nd vice president is John W. Holmes, design engineer, Canadian General Electric Co. Ltd., Peterborough.

Also elected were councillors, two for each of the five engineering branches, in addition to one from each

branch being appointed by the Lieutenant-Governor-in-Council.

The new Executive Council will convene at the Association's annual meeting to be held Saturday, Jan. 24, at the Royal York Hotel, Toronto.

The Association's permanent staff includes: T. M. Medland, executive director; J. M. Muir, secretary-registrar; T. C. Keefer, field secretary, and B. H. Goodings, field representative.

Electro Sonic Supply Co. Now Cambion Distributor

Cambridge Thermionic Corporation, manufacturer of guaranteed electronic components, announces the appointment of Electro Sonic Supply Co., Ltd., 543 Yonge St., Toronto, Canada, as an authorized Cambion distributor.

Electro Sonic's appointment is part of Cambridge Thermionic's newly-established program to develop a network of Cambion (R) distributors across the country, thus making Cambion components available from local stocks as well as from the Cambridge plant.

Pointon Represents Don Bosco Electronics

Charles W. Pointon Ltd., 6 Alcina Avenue, Toronto 10, Ontario, recently announced their appointment as Canadian sales agents for Don Bosco Electronics, manufacturers of the mosquito transistorized signal injector, a battery-operated unit of small size and light weight which contains a complete electronics circuit.

Atomic Accessories, Inc. Represented by Radionics

Announcement is made that Radionics Limited, 8230 Mayrand Street, Montreal 9, Que., has been appointed Canadian sales representative for Atomic Accessories Inc., 244-02 Jamaica Avenue, Bellerose 26, N.Y.

Radionics Ltd. Establishes Toronto Branch Office

Radionics Limited of Montreal, Que., electronic manufacturers' engineering sales representative, announces the appointment of William A. (Bill) Wood to direct the marketing for Central and Western Ontario of the company's broad range of electronic, microwave, high vacuum and nuclear instrumentation.

Mr. Wood is a graduate of the University of Toronto and has broad experience in the electronic instruments field. Since 1950 he had been associated with Ontario Hydro as an electrical applications engineer. Previous to this he served in responsible quality control, production and test equipment engineering capacities with Canadian Arsenals Ltd. and Research Enterprises. Mr. Wood's unusually broad background should enable him to be of special service to customers of the range of products being handled by Radionics Limited.

Correspondence and telephone calls for this area may be routed to Mr. Wood at the newly established Toronto branch office of Radionics at 65 Brimbor Blvd., Scarborough, Ontario, Telephone: AMherst 1-0936.

CANADIAN RADIO TECHNICAL PLANNING BOARD 14th ANNUAL MEETING



Shown above are the assembled members of the Canadian Radio Technical Planning Board, which held its 14th Annual Meeting in Ottawa on December 11th, 1958. Back Row (standing — left to right): W. A. Caton — Controller, Radio Regulations Division, Dept. of Transport; E. L. Palin — Canadian Education Assn.; W. J. Wilson — Department of Transport; Staff Sgt. W. J. Hugel and Major J. C. Gornall — Royal Canadian Mounted Police; W. J. W. McNaughton and T. S. Dutton — Canadian Electrical Assn.; F. A. Smith — Canadian Overseas Telecommunications Corp.; G. H. Stewart — DOT; S. Bonneville — Telephone Association of Canada; W. B. Smith — Telecommunications Branch, DOT; J. H. Fletcher — Chairman, Tropospheric Scatter Committee, CRTPB; G. H. Long — Canadian Assn. of Chiefs of Police; N. Redsell — Assn. of Municipal Electrical Utilities; J. C. Cline — Hydro-Electric Power Commission of Ontario; J. E. Hayes — Chairman, Television Committee, CRTPB; A. Reid — American Radio Relay League (Canadian Section); Front Row (seated — left to right): H. S. Dawson — Canadian Electrical Manufacturers Assn.; W. OrNSTEIN — Chairman, Fixed Land and Maritime Mobile Committee, CRTPB; C. M. Brant — Chief, Technical Co-ordination Division, Telecommunications Branch, DOT; R. A. Hackbusch — General Co-ordinator, CRTPB; C. J. Bridgland — Vice-President, CRTPB; F. H. R. Pounsett — President, CRTPB; R. C. Poulter — Director of Public Relations, Canadian Radio Technical Planning Board; F. W. Radcliffe — Secretary-Treasurer, CRTPB; G. A. Muir — Chairman, Amortization Committee, CRTPB; D. J. McDonald — Telephone Association of Canada.

IRE Toronto Section Meets With AIEE & Students

The annual student papers competition will be held at the next meeting of the Institute of Radio Engineers on Thursday evening, February 12, at 8:15 p.m. in Room 102 of the Mechanical Building, University of Toronto. This will be a joint meeting with the Toronto Section of the American Institute of Electrical Engineers, the Joint Student Branch of the IRE and AIEE at the University of Toronto and the Student Associate Branch of the IRE at Ryerson Institute of Technology.

A senior test pilot of Avro Aircraft Co. will speak at the 6:00 p.m. supper meeting at Hart House. He will hold an informal discussion on some of the more interesting aspects of his day-to-day work.

Members and friends are invited to attend both meetings. For supper meeting reservations please telephone Mrs. Quigley at PLymouth 5-4856 before noon, Tuesday, February 10.

Disston Branch Managers Hold Sales Conference

The Canadian Disston Division of H. K. Porter Company (Canada) Limited held its first sales conference

towards the close of 1958 in its new plant at Acton, Ontario.

H. F. Nunn, the Porter Company's vice-president and general manager in Canada, addressed the two-day gathering of Disston branch managers from Moncton, Montreal, Winnipeg and Vancouver and hardware and industrial representatives for the provinces of Ontario and Quebec.

Other speakers included G. F. Corben, Disston sales manager, and C. W. Walker, personnel manager of Porter-Canada.

Methods to improve efficiency plus good salesmanship in order to sell better products and provide better service were the main topics for discussion.

R-O-R Associates Canadian Rep For Hughes Aircraft

Hughes Aircraft Company has named R-O-R Associates, Ltd., of Toronto, Ontario as exclusive distributor of Hughes commercial products in Canada, it was announced recently by Rollin M. Russell, vice-president of sales and manager of the company's international division.

The Canadian firm will distribute the complete line of Hughes semi-conductors, cathode ray storage tubes, microwave tubes and test instrumentation, including the Memo-Scope

oscilloscope containing the Hughes memory tube.

R-O-R Associates, headed by John S. Root, is located in the Don Mills industrial area on the outskirts of Toronto, and has a branch office in Montreal.

TMC Canada Appoints Vice-President (Sales)

D. V. Carroll, president and managing director of T.M.C. (Canada) Limited of Ottawa, is pleased to announce the appointment of Group



G/C H. C. Ashdown

Captain H. C. Ashdown, recently retired from the Royal Canadian Air Force, as vice-president (sales). Group Captain Ashdown has had many years' experience in the telecommunications

field and has held many important posts in the Royal Canadian Air Force which dealt with the communications field, among which included Commanding Officer of the Royal Canadian Air Force Radio Training Establishment at Clinton, Ontario, and until his retirement, Director of Radio Warfare at RCAF Headquarters, Ottawa, Ontario.

DEPENDABLE COMMUNICATIONS OVER HIGH LOSS VHF PATHS



Shown here is a bay of PYLON auxiliary equipment assembled recently for a 4-channel receiving terminal. Electronic diversity switches, Model DS-2, automatically select the optimum combination of the outputs of dual diversity receivers, even under rapid fading conditions. At the same time instantaneous protection is provided against receiving equipment failure.

Eight pre-amplifiers, Model BP-1, feed antenna signals to the individual receivers. A transmission planning figure of 7 db is used for the S/N improvement obtained with the BP-1 connected ahead of a standard VHF receiver.

Pylon

PYLON ELECTRONIC DEVELOPMENT company, Ltd.

Communications Systems and Equipment

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A.P.H. Barclay Directs IRE Canadian Region

At its meeting on November 18, 1958, the Board of Directors of the Institute of Radio Engineers announced the election of A. P. H. Barclay of Philips Electronics Industries Ltd., Toronto, Ontario, as director of its Canadian Region. The international society has a membership of over 68,000 radio engineers and scientists, there being in excess of 2,400 in the Canadian Region.

Mr. Barclay who was born in Glasgow, Scotland, received a B.A. degree in chemistry and physics from McMaster University in 1935, and a M.Sc. degree from Cornell University in 1936.



A. P. H. Barclay

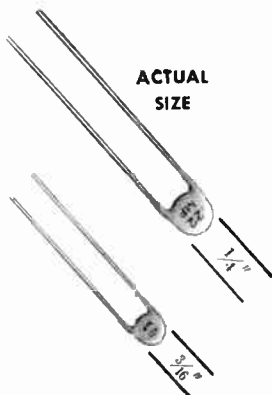
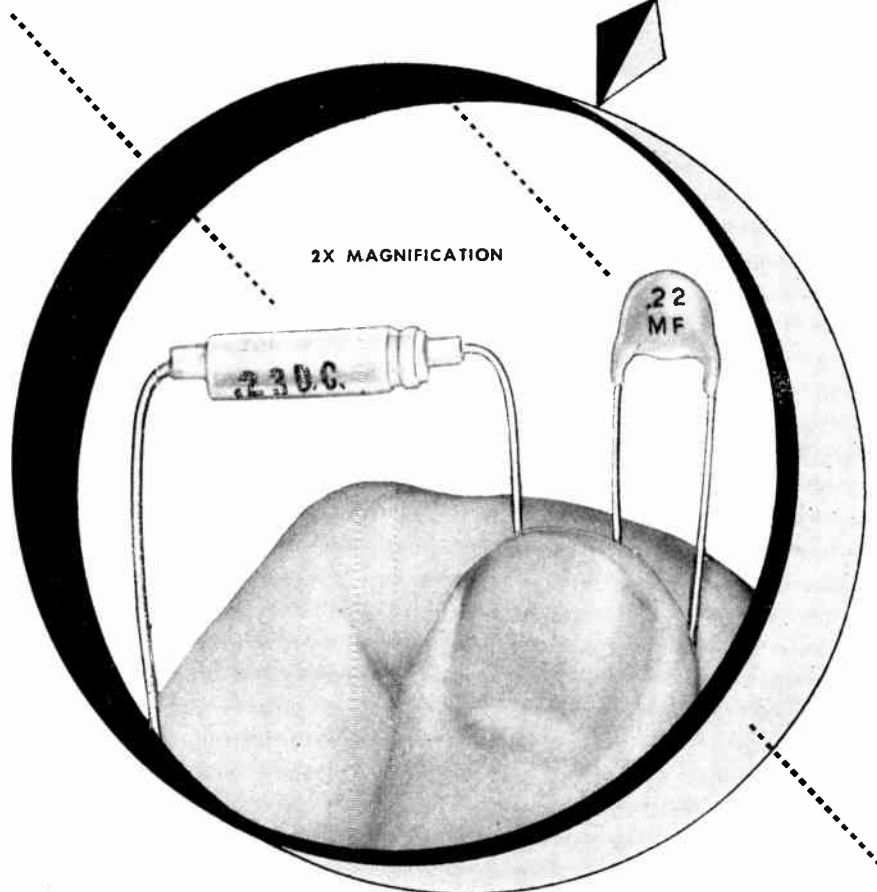
Joining the Philips enterprises in Canada after the war, Mr. Barclay has served successively as chief engineer of the Electronic Tube Division, government projects officer, director of engineering, Professional Equipment Division and general manager, engineering and manufacturing of this Division, the position he currently occupies.

Mr. Barclay is a registered professional engineer and a senior member of the Institute of Radio Engineers. He served as chairman of the Toronto Section in 1956, as a member of the Institute of Radio Engineers Canadian Convention Committee in 1956-1958 and as chairman of its Papers Committee in 1958. He is associated with the work of the Canadian Radio Technical Planning Board, being chairman of its Microwave Committee. As a member of the Electronics Division Committee, he also takes an active part in the Electronics Industries Association.

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Technical Meetings Held By Toronto Groups

The Institute of Radio Engineers' Toronto Section and the Canadian Astronautical Society will be linking hands for a series of two technical meetings to be held in Toronto in March and April of this year.

These meetings, sponsored by the IRE, will present: "Rockets and Space Travel" on March 16, by David C. Wallis, Senior Weapons Systems Analyst, The Avro Aircraft Company; and "The Elements of Guided Missiles" on April 27, by Dr. Philip A. Lapp, Senior Project Engineer, Guided Missile Division, The De Havilland Aircraft of Canada Ltd.

Founded in 1957, in Toronto, The Canadian Astronautical Society has for its primary objective the advancement in Canada of all the sciences and technologies embraced by the concept of manned space travel. Closely associated with other Commonwealth astronautical societies and represented at the Amsterdam Congress as an official delegate, the C.A.S. has high hopes that Canada will soon engage directly in important astronautical ventures. The society's first president, Dr. Philip A. Lapp, will present the second of the technical papers mentioned above.

Electric Auto-Lite Appoints Canadian Rep

Anthony Foster & Sons Ltd. of Toronto announce their appointment as exclusive Canadian representatives and stocking distributors of aircraft and electronic wire for the Electric Auto-Lite Company of Port Huron, Michigan and Hazelton, Pennsylvania.

Enquiries should be addressed to E. Stewart Weir, manager, Aircraft Division, Anthony Foster & Sons Ltd., 302 Church St., Toronto.

Ampex Opens Sales Office In Ottawa

Ampex American Corporation, wholly owned Canadian subsidiary of Ampex Corporation, has recently opened a new instrumentation sales office in Ottawa, Ontario.

The new office is manned by Barry Simpson, professional engineer, Canadian Div. Manager, Instrumentation Products, who transfers from the company's Toronto office. He will provide sales and service of magnetic tape recorders and tape products for industrial, scientific, and military customers through Canada's Eastern Provinces.

The address of the new office is Room 607A, Commonwealth Building, 77 Metcalfe Street, Ottawa 4, Ont.

J. B. McBride PR Manager For Dominion Electrohome

The recent appointment of John B. McBride as public relations manager of Dominion Electrohome Industries Limited, Kitchener, Ontario, has been announced by Norman J. Long, director of industrial and public relations. The appointment is an addition to Electrohome's industrial and public relations staff.

Before joining Dominion Electrohome, Mr. McBride was with the public relations department of The Bell Telephone Company of Canada in Toronto and Montreal.

Adams Engineering Represents Hunts Capacitors

Announcement was recently made by A. H. Hunt (Capacitors) Ltd., of London, England, that as from January 1, 1959, their company would be represented in Canada by Adams Engineering Ltd., who maintain offices at 1500 St. Catherine St. West, Montreal, Que., 77 Metcalfe St., Ottawa, Ontario, and 1999 Avenue Rd., Toronto, Ontario.

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G-V Sensing Relays operate contacts when current or voltage to their heaters exceeds or drops below the operating point. They can be selected with a response rate paralleling the action of the equipment. These relays operate quickly on heavy changes but tolerate slight changes until they become dangerous.

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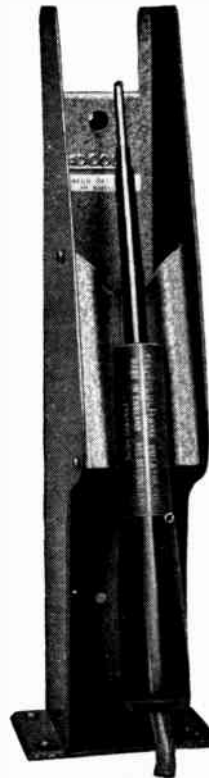
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Westinghouse Appoint Division Managers

Division management appointments involving Canadian Westinghouse apparatus and electronics operations have been announced recently.

W. J. Cheesman, manager of the Westinghouse electronics division at Hamilton since 1954, has been appointed assistant general manager, apparatus products. In the newly-created post he assumes responsibility for the company's industrial control, switchgear, meter, relay and instrument, and distribution apparatus divisions.

Appointed to succeed Mr. Cheesman as electronics division manager is G. P. Adamson. He joined Westinghouse in 1956 as defense contracts manager and has been manager of the electronics division engineering department since June, 1957.

RCA BOARD MEMBER



Right Hon. C. D. Howe

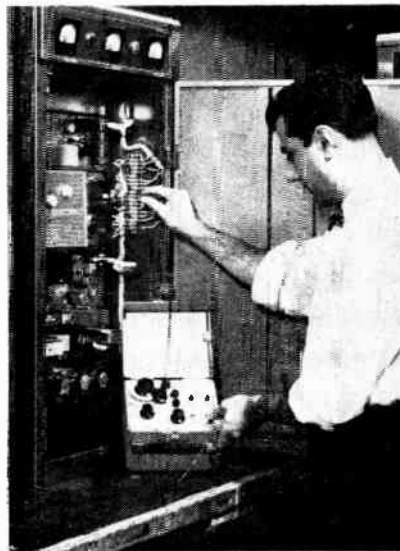
P. J. Casella, president, RCA Victor Company, Ltd., announces that the board of directors at its meeting held at the head office in Montreal on December 18 elected The Right Honorable C. D. Howe, P.C., as a member of its board. Mr. Howe is also chairman and director of Price Brothers & Company, Ltd., director of a Canadian Chartered Bank, Aluminum Limited, Canadian Investment Fund, Ltd., Atlas Steels Limited, and others.

Electrolabs Canadian Reps. For Venner Limited

Venner Limited, of New Malden, Surrey, England, announce the appointment of Electrolabs, 7385 St. Lawrence Boulevard, Montreal, as their exclusive Canadian representatives.

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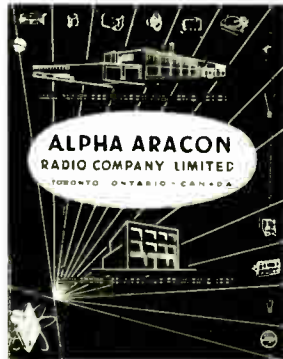


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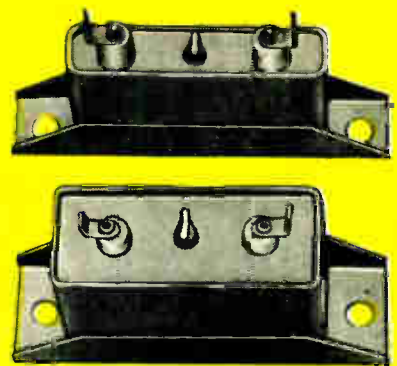
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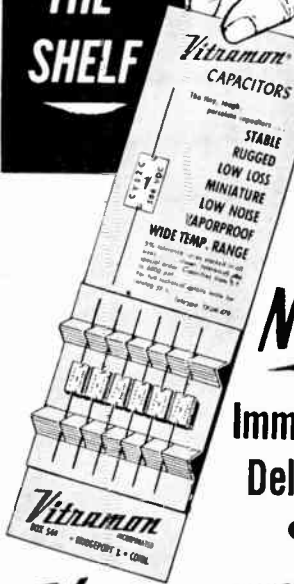


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Toronto IRE Section To Hold March Stag Party

The Institute of Radio Engineers, Toronto Section, will hold its annual Stag Party on Monday evening, March 2, at 8.00 p.m. at the Four Winds Dining Room, Steeles Avenue West.

The speaker on that occasion will be Professor L. Joslyn Rogers, whose subject will be "Technical Evidence In Court". Professor Rogers has devoted his life to the detection of crime.

Refreshments will be served during the evening. Members and friends are invited to attend.

APPOINTMENT



T. C. Drees

Spaulding Fibre of Canada Ltd., 70 Coronet Road, Toronto 18, Ontario, announces the appointment of Thomas C. Drees as vice-president and general manager. He formerly held the position of sales manager. Mr. Drees has also been elected to the board of directors.

Spaulding Fibre of Canada Ltd. are manufacturers and fabricators of industrial plastics, laminates, press-board, vulcanized fibre, insulating papers and material handling equipment.

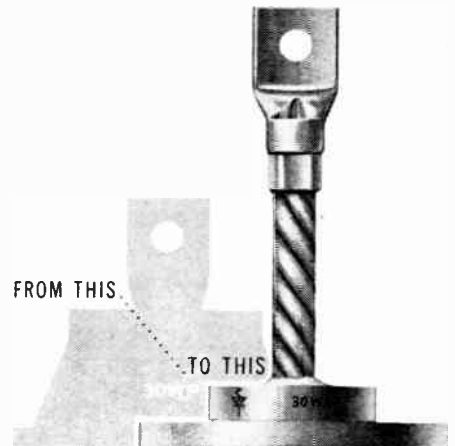
Staver Company, Inc. Appoints Atlas Radio As Canadian Rep

Among new manufacturer sales representatives appointed to handle the products of the Staver Company, Inc., Bay Shore, Long Island, New York, is Atlas Radio Corporation, Ltd., 50 Wingold Avenue, Toronto, Ontario, who represents the Staver Company in Canada.

The Staver Company manufactures metal tube shields for vacuum tubes, tube guards and tube holding springs, specialty gaskets, washers, lead and lead alloy parts and "Micro-Shim" laminated brass and aluminum shims. In addition, the company is a specialist in precious metal stampings.

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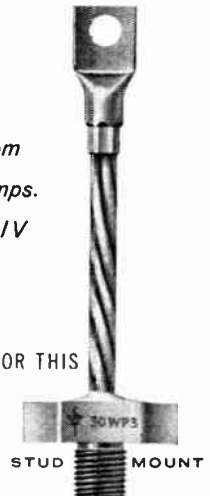
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Caldwell A/V Equipment Represents Kodak Co.

Audio-visual equipment of the Canadian Kodak Company Limited will now be available through Caldwell A/V Equipment Co. Ltd. in Montreal, Toronto, Ottawa, Winnipeg and Vancouver, according to an announcement by the Caldwell Company.

Kodak designs audio-visual equipment for all phases of industry, science, education, television, sales and advertising, and professional photography.

CBC Buys RCA Equipment For Seaway Opening

B. R. Machum, manager, Commercial Marketing, Technical Products Division, RCA Victor Company Ltd., has announced that the Canadian Broadcasting Corporation has purchased three TVM-1A portable microwave systems and twelve synchronizing generators.

This equipment is required by the Canadian Broadcasting Corporation for the telecast of the Seaway Opening in 1959.

1959 Electronic Parts Distributors Show

The 1959 Electronic Parts Distributors Show will be held in the Conrad Hilton Hotel, Chicago, from May 18 to 20 inclusive.

The Show is a non-profit venture operated by the Electronic Industry Show Corporation, whose headquarters are at Suite 1500, 11 So. La Salle St., Chicago 3, Illinois.

An intensive workshop conference program has been announced by the chairman of the Educational and Program Committee. "Better Business Management for Today and Tomorrow" is the theme of the recommended program, covered in a detailed visual outline.

Admiral Conducts Sales Contest

A six-day vacation for two in New Orleans during the Mardi Gras was the award for the top Canadian Admiral salesman in the month of December.

According to E. Whittaker, vice-president and general sales manager, the grand prize was to be awarded to the Admiral salesman who topped his quota by the greatest percentage during Mardi Gras Month.

Salesmen from nine company branches from Halifax to Vancouver competed for the Mardi Gras trip and weekly cash prizes.

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For the full T-Pot Story, whistle for data file E 12.

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The T takes 50G's meeting MIL-R-19; exceeding NAS 710 proc. III

The T takes 500 cps at 30G's, meeting NAS 710 proc. III

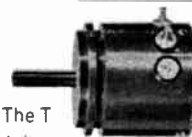
ACCELERATION



The T takes 100G's, exceeding MIL-R-19

The T takes -55° to $+125^{\circ}\text{C}$, with 1.2 watts at 40°C

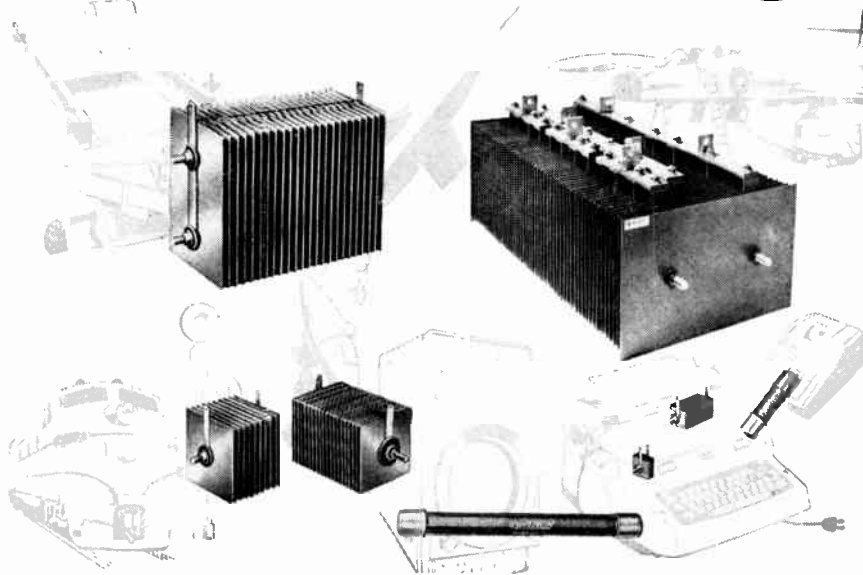
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San Jose Scientific Co. Appoints E. E. Whittaker

Announcement was made recently of the appointment of E. E. Whittaker of Arnprior, Ontario, as Canadian Representative for the San Jose Scientific Co., San Jose, California.

San Jose Scientific Co. are electronic design engineers and, among other equipment, manufacture "miniature" potentiometric recorders.

Mr. Whittaker's address is P.O. Box 3255, Arnprior, Ontario; his telephone number is 1318.

MANUFACTURING MANAGER



Fred Shuh

General Instrument — F. W. Sickles of Canada Ltd. of Waterloo, Ontario, announces the appointment of Fred Shuh as Manager of Manufacturing for the Waterloo plant, engaged in the manufacture of an extensive range of electronic components. Mr. Shuh has been associated with General Instrument for three years, and prior to this time was a production manager with Canadian Westinghouse.

International Transistor Exhibition

The first international convention and exhibition featuring transistors and associated semi-conductor devices will be held in England in May and is expected to attract scientists and technologists from many countries, including Canada.

The event is being organized by the radio and tele-communications section of the Institution of Electrical Engineers and will be held at Earls Court, London, from May 21 to 27.

The American co-inventors of the transistor — Dr. W. B. Shockley, Dr. W. H. H. Brattain and Professor J. Bardeen — are scheduled to deliver the opening lectures.



Simply slide together and lock with thumbscrew on back.

New Triplet Unimeters

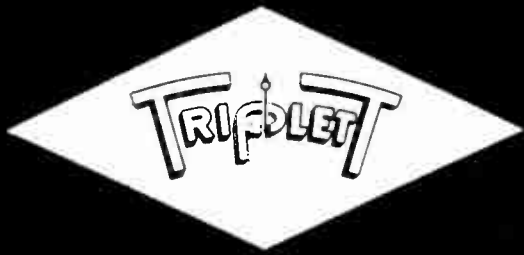
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With the New Select-Your-Range Triplet Unimeters two basic meter movements can be combined with any number of Dial-Component units for a wide variety of panel meter ranges—you can even create your own ranges with available dial blanks by following simple instructions furnished.

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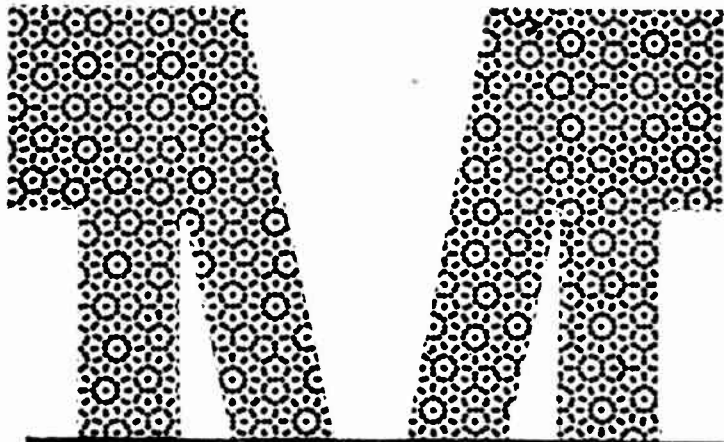
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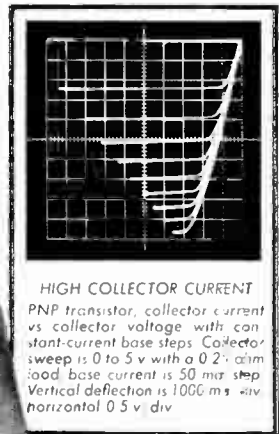
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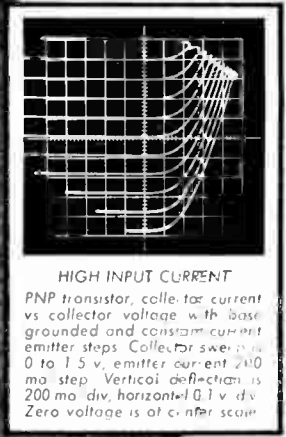
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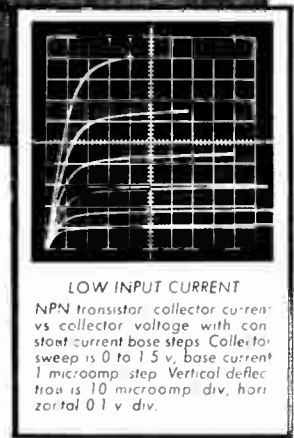
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PNP transistor, collector current vs collector voltage with constant-current base steps. Collector sweep is 0 to 5 v with a 0.2-ohm load; base current is 50 ma/step. Vertical deflection is 1000 ma/div, horizontal 0.5 v/div.



HIGH INPUT CURRENT
PNP transistor, collector current vs collector voltage with base grounded and constant-current emitter steps. Collector sweep is 0 to 1.5 v, emitter current 200 ma/step. Vertical deflection is 200 ma/div, horizontal 0.1 v/div. Zero voltage is at center scale.



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NPN transistor, collector current vs collector voltage with constant-current base steps. Collector sweep is 0 to 1.5 v, base current 1 microamp/step. Vertical deflection is 10 microamp/div, horizontal 0.1 v/div.

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TYPE 575 CHARACTERISTICS

Positive or Negative Collector Sweep

Collector supply—0 to 20 v, 10 amperes.
—0 to 200 v, 1 ampere.

Dispipation limiting resistors—0 to 100-kilohms in 17 steps.

Positive or Negative Base Stepping

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17 current-per-step positions, 1 μ a/step to 200 ma/step.

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Base current, 17 steps from 0.001 ma/div to 200 ma/div.

Base source volts, 5 steps from 0.01 v/div to 0.2 v/div.

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editorial

Electronics for Canadian nuclear subs

There have been reports that Canadian naval officials are looking forward to the not-too-distant future when the main units of an anti-submarine convoy fleet — a role which is the traditional job of the Canadian navy — will be comprised of underseas craft. Indeed, it has been intimated that active study is now being given to the construction or purchase of an atomic powered submarine for the Canadian naval service as a first step in the transition from surface to underseas vessels.

In view of this development it is interesting to note the part that electronic equipment will play in such future Canadian naval vessels, a part already being played by electronic gadgetry in United States atomic powered subs as outlined in a recent issue of the Industrial Bulletin of Arthur D. Little, Inc.

The Bulletin points out that: "Submarine navigation is a complex art in which sound is of major importance. Now that submarines have demonstrated their ability to remain submerged for long periods, running on nuclear fuel, they require sonar equipment and guidance systems that far surpass in complexity any devices available in World War II. And as complete weapons systems, they use new underwater listening and echo-ranging gear that permits sound to play an essential role in target detection, fire control and navigation.

"In World War II, radar — which depends on the transmission of electromagnetic waves through the air — was the principal means of detecting targets and, in conjunction with visual observations by periscope, provided nearly all the information necessary for a successful attack against an enemy surface fleet. Sonar — which relies on sound waves — was used merely to detect other ships at relatively close range, for mine detection and to sound the ocean depth as a navigational aid. But the potential use of submarines to fight other submarines, together with advances in radar-countermeasure equipment, have forced the submarine to rely heavily on sonar.

"Sonar is less reliable than radar for certain purposes. Radar provides accurate information primarily because the high-frequency impulses travel in a straight line and are only slightly attenuated by the atmosphere. Sound waves, however, are easily bent, depending on water temperature or salinity, and high frequency impulses are attenuated by water. These characteristics limit the range of 'active' or echo-ranging sonar and occasionally cause peculiar effects with 'passive' or listening sonar — ships are detected many miles away but targets close by may pass unnoticed. And there is further confusion due to the noise generated by sea life and by the submarine itself.

"Present weapons make surface operations and even use of the periscope very dangerous; consequently, the submarine is almost solely dependent on 'passive' sonar to obtain intelligence of the activities of nearby ships. Fortunately, low-frequency sound waves are attenuated relatively little by the sea and detection ranges equal to or greater than those achieved by radar are possible. But then, within attack range, 'active' sonar can be used for fire control. Active sonar has the disadvantage that the searching submarine reveals its own location to the target, but the speed and manoeuvrability of the newer subs may be sufficient to overcome the risk.

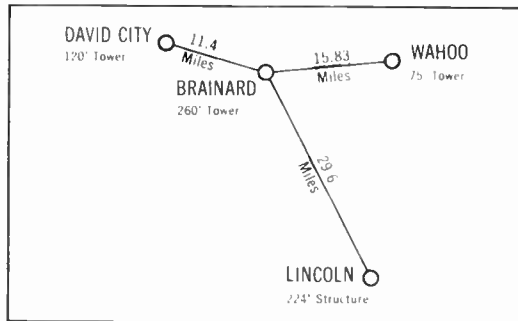
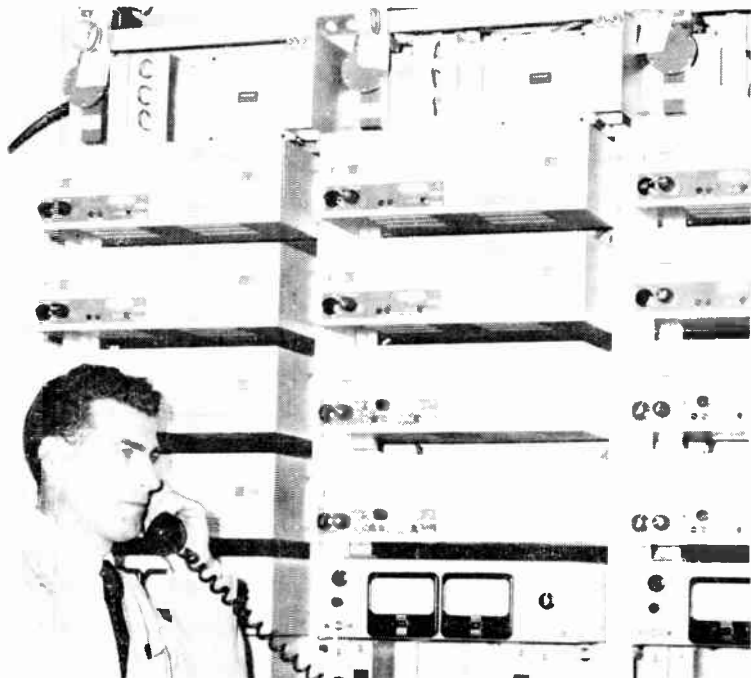
"Sonar equipment used on the latest submarines (actually an improved version of a system first used on German surface ships) can amplify sound waves to a much greater extent than earlier models, allowing different sounds to be distinguished more easily. Electronic techniques make it possible to recognize signals lower in amplitude than the surrounding noise by taking advantage of the fact that the sound of a propeller has a definite pattern, whereas mere noise is random. Another device to overcome the noise problem is an ultrasensitive 'hydrophone', lowered several hundred feet below the submarine; a hydrophone detection system has the maximum range."

In the Canadian submarine navy of the future, a navy that may come into being earlier than many think, there will be inherent a challenge to the technical ability of Canadian industry to produce much of the specialized equipment that such vessels will require and it is reasonable to presume that no small amount of this equipment will be the products of the Canadian electronics industry.

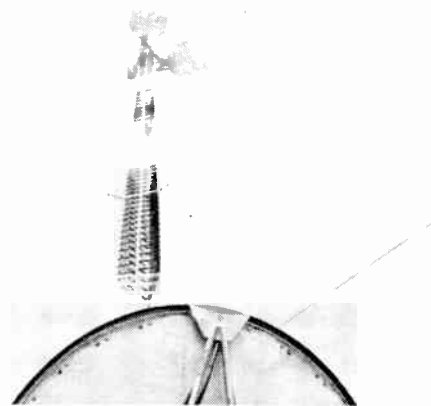
Charles E. Connors, Lincoln Tel & Tel transmission and Protection Engineer, uses service channel at Brainard station. The service

channel gives order wire service between stations of the microwave system on a party line basis.

System map of Lincoln Tel & Tel microwave installation gives tower heights and mileage between stations. The installation of Collins Microwave for Lincoln Tel & Tel paves the way for economical future expansion.



The backside of the Collins parabolic offset feed antenna (foreground) utilized at all stations in the Lincoln Tel & Tel system features a de-icing assembly, which keeps the reflector free of ice during sleet and snow storms.



COLLINS MICROWAVE doubles Lincoln Tel & Tel toll circuits

In expanding their toll circuits, Lincoln Tel & Tel had a requirement for a reliable communication system for all-weather service. A Collins Microwave System provided the economical answer.

Contributing to Lincoln Tel & Tel's selection of Collins Microwave were such service and maintenance features as complete assembly and pretest of

stations in the factory; exceptional frequency stability; built-in metering and test facilities and fixed tuned IF amplifier requiring no field alignment when tubes are changed.

For complete information about Collins Microwave write or call COLLINS RADIO COMPANY OF CANADA LTD., 11 Bermondsey Road, Toronto 16, Ontario.

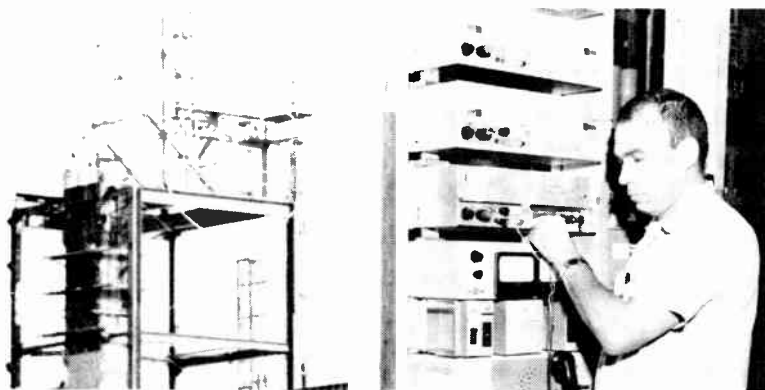
Paul Henson, Chief Engineer at Lincoln Tel & Tel, recommended expansion with microwave to provide higher quality and more dependable circuits for customers. "Microwave," said Mr. Henson, "has proved to be more economical than expansion by any other type of facility."



The three-way branch microwave repeater station at Brainard utilizes three Collins offset feed antennas for the path to David City, to Wahoo and to Lincoln.



COLLINS RADIO COMPANY OF CANADA, LTD
11 BERMONDSEY ROAD, TORONTO 16, ONTARIO



Collins Microwave was installed in the equipment hut (circled portion) before the completion of the new Lincoln Tel & Tel central office and administration building at Lincoln.

All Collins Microwave equipment is racked and pretested under simulated operating conditions before shipment to the customer. Routine maintenance testing is simplified in Collins equipment.



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