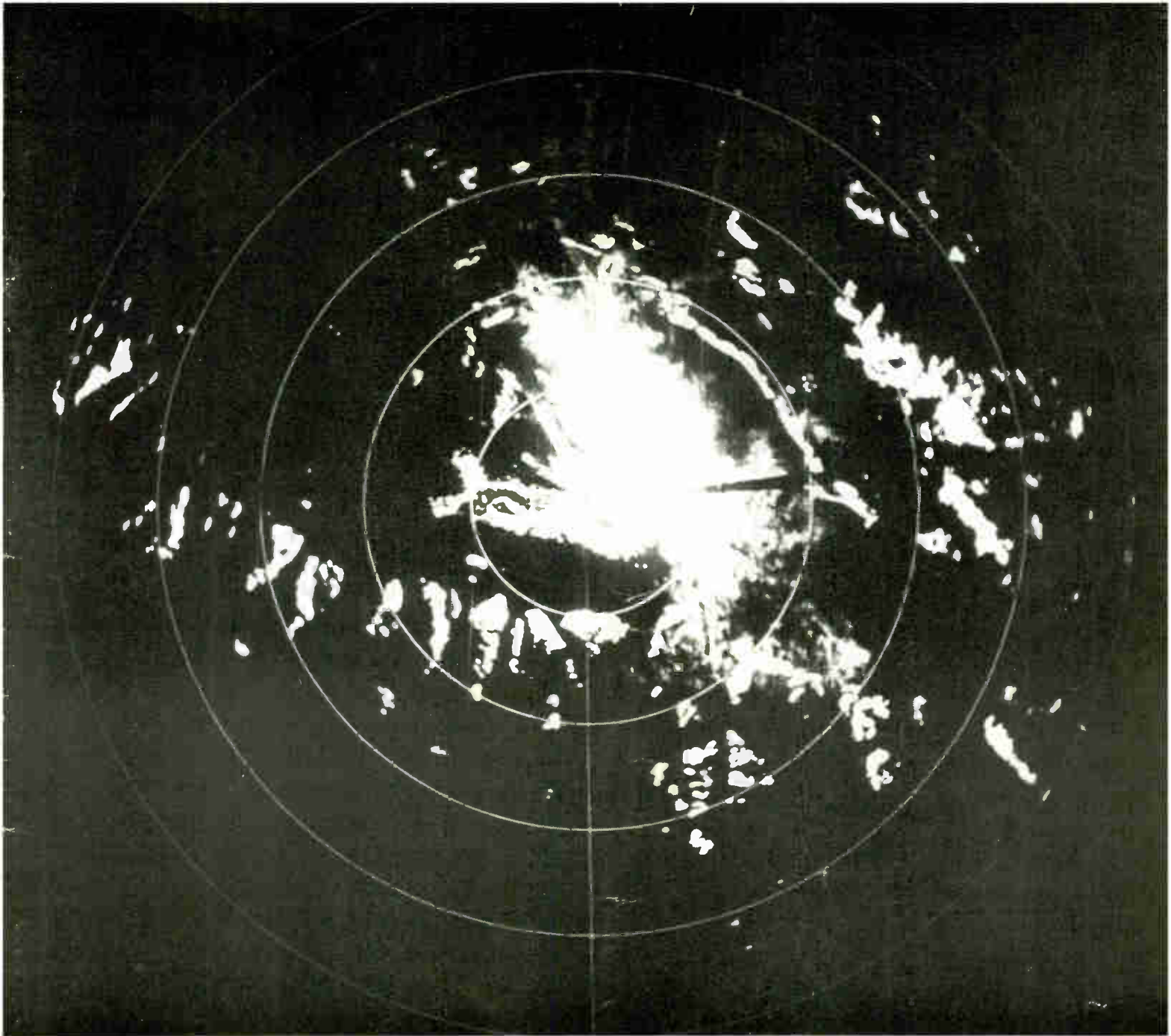
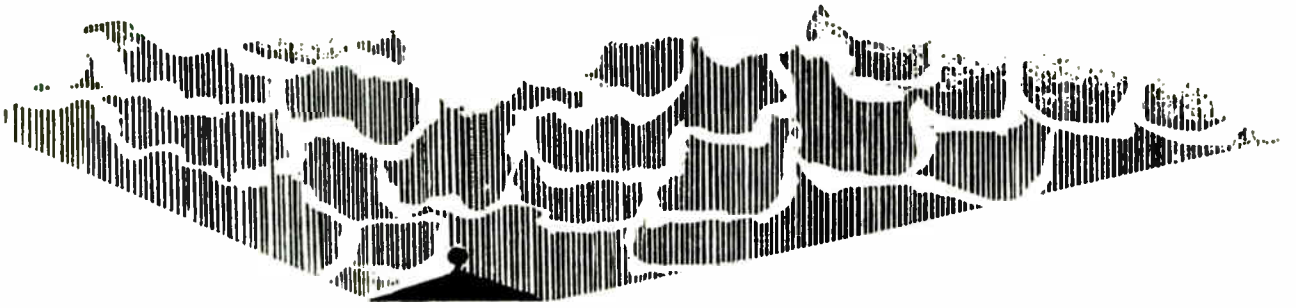


Courtesy Department of Transport and Decca Radar (Canada) Ltd. (description page 5)

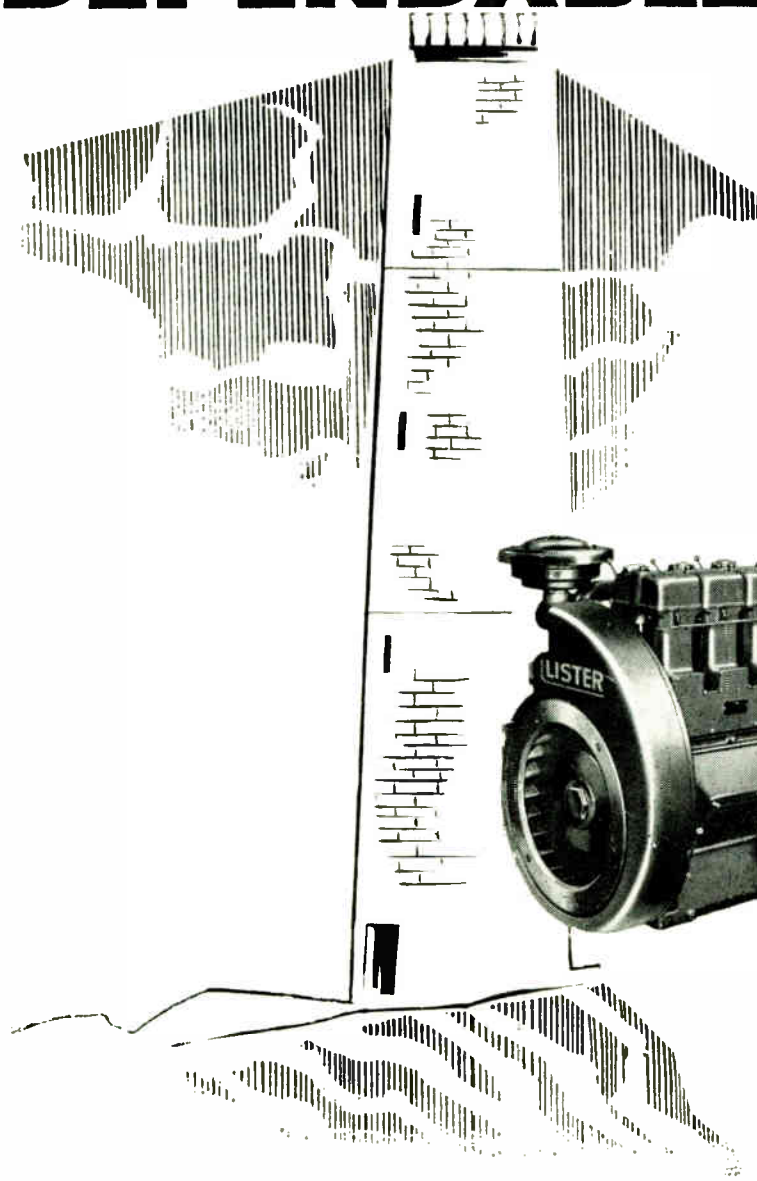
electronics and communications

an age publication

JULY 1959



DEPENDABLE POWER



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.

Among their varied uses, Lister engines are in use for pumping and construction machinery, generating sets and marine propulsion. Parts and service are available throughout Canada.

Lister HA air cooled range. Direct injection for cold starting and greater economy. 10 BHP per cylinder continuous rating. 1800 RPM. Designed for working under the most varied conditions.

Write us for your free copy of Bulletins LD, SL and HA which describe, in detail, the Lister air-cooled range of Diesel engines 3½—30 BHP. Indicate application.

Lister-Blackstone engines 3½—1400 BHP.

CANADIAN LISTER-BLACKSTONE

1921 Eglinton Ave. E., Scarborough, Toronto 13, Ont. LIMITED

VANCOUVER
3135 West Broadway

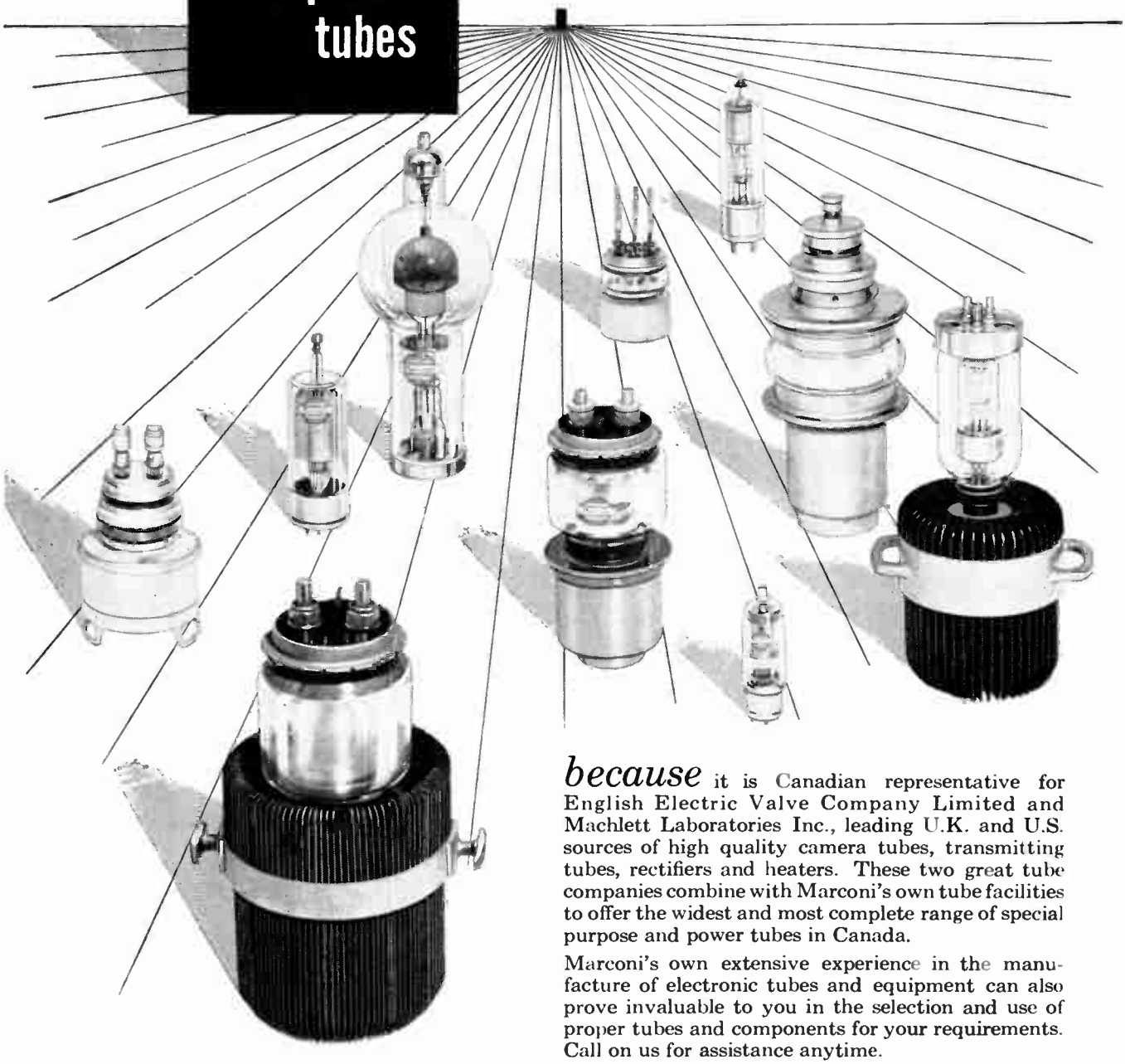
MONTREAL
25 St. James St., Ville St. Pierre

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

For complete details check No. 19 on handy card, page 35

special purpose and power tubes

Why has Canadian Marconi the widest range?



because it is Canadian representative for English Electric Valve Company Limited and Machlett Laboratories Inc., leading U.K. and U.S. sources of high quality camera tubes, transmitting tubes, rectifiers and heaters. These two great tube companies combine with Marconi's own tube facilities to offer the widest and most complete range of special purpose and power tubes in Canada.

Marconi's own extensive experience in the manufacture of electronic tubes and equipment can also prove invaluable to you in the selection and use of proper tubes and components for your requirements. Call on us for assistance anytime.

ELECTRONIC TUBE AND COMPONENTS DIVISION

CANADIAN Marconi COMPANY

830 BAYVIEW AVENUE, TORONTO, ONTARIO

Branches: Vancouver · Winnipeg · Montreal · Ottawa · Halifax · St. John's, Nfld.

For complete details check No. 20 on handy card, page 35

HEATHKIT

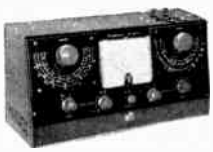
CANADA'S FINEST ELECTRONIC TEST EQUIPMENT!

in kit form at budget prices

VTVM KIT MODEL V-7A
$36.95

- Quickly and easily assembled.
- Large, easy-to-read 4½" 200 ua meter.
- 1% precision resistors for high accuracy.
- Etched circuit board assures extreme circuit stability.

"Q" METER KIT
MODEL QM-1



$54.95

Tests components at normal operating frequencies — 150 kc to 18 mc. Wide range of inductance, capacitance, and Q, covers all values likely to be encountered. All indications read directly on meter. Full frequency range on four bands. Voltage regulated and transformer - operated power supply. Special test coil provided for calibration purposes.

LABORATORY GENERATOR KIT MODEL LG-1

Designed for laboratory and development work as well as for general service. Accurately calibrated 200 microampere panel meter reads output voltage in microvolts or percent modulation. Frequency range from 100 kc to 30 mc, on fundamentals, divided into five calibrated bands. Maximum output in excess of 100,000 microvolts. Modulation variable from 0 to 50%, at frequency of 400 cycles internally. Can be modulated externally with an audio frequency of 60 to 10,000 CPS.

$67.95

"EXTRA DUTY" 5" OSCILLOSCOPE
MODEL 0-12
$80.95

- Laboratory quality, at much lower than usual price.
- Sweep range 10 — 500,000 CPS, push-pull output.
- Printed circuit boards for faster, easier assembly and assured stability.
- Automatic sync circuit with self-limiting cathode follower.

IMPEDANCE BRIDGE KIT
MODEL 1B-2A

$72.95

Gives rapid and accurate measurement of resistance, capacitance and inductance, as well as dissipation factors of condensers and storage factors of inductors. A center scale one hundred ua meter provides for null indications. Features a built-in power supply, 1,000 cycle phase shift generator, and a vacuum tube detector. Can be connected to external generator for measurements at frequencies other than 1 kc.

PROFESSIONAL OSCILLOSCOPE KIT
MODEL OP-1
$219.95

Features DC coupled amplifiers and DC coupled CR tube un-blanking. Triggered sweep circuit operates on either internal or external signals and may be either AC or DC coupled. Polarity of triggering signal may also be selected, and any point on waveform for start of sweep. Prewired terminal boards provided for all critical circuits. Power supply is transformer-operated using silicon diode rectifiers. Write for complete specifications.

DAYSTROM LIMITED

Distributors of Heathkits in Canada

2 RAITHERM ROAD **TORONTO 19, ONTARIO**

5842

For complete details check No. 23 on handy card, page 35

Electronics and Communications

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

an age publication

Published by
AGE PUBLICATIONS LIMITED
450 Alliance Avenue, Toronto 9, Ontario
Telephone ROger 2-7225

publishers of
Wine/Beer/Spirits
Restaurants and Institutions
Automatic Heating/Plumbing/Air Conditioning
Air Age
Food Service Equipment Supplier

WEST COAST
Dillenbeck-Galavan, Inc.
226 S. Alexandria Ave.
Los Angeles 4, Calif.

U.K. AND EUROPEAN REPRESENTATIVE
Norman F. Keenan
47 Manchester Street
London, W. 1, England

Subscription Rates:
Canada, U.S.A. and U.K. Possessions $5.00 a year
Foreign $10.00 a year

Member Canadian Circulations Audit Board

Authorized as second class mail
by Post Office Dept., Ottawa

CCAB

PRINTED IN CANADA
60

contents

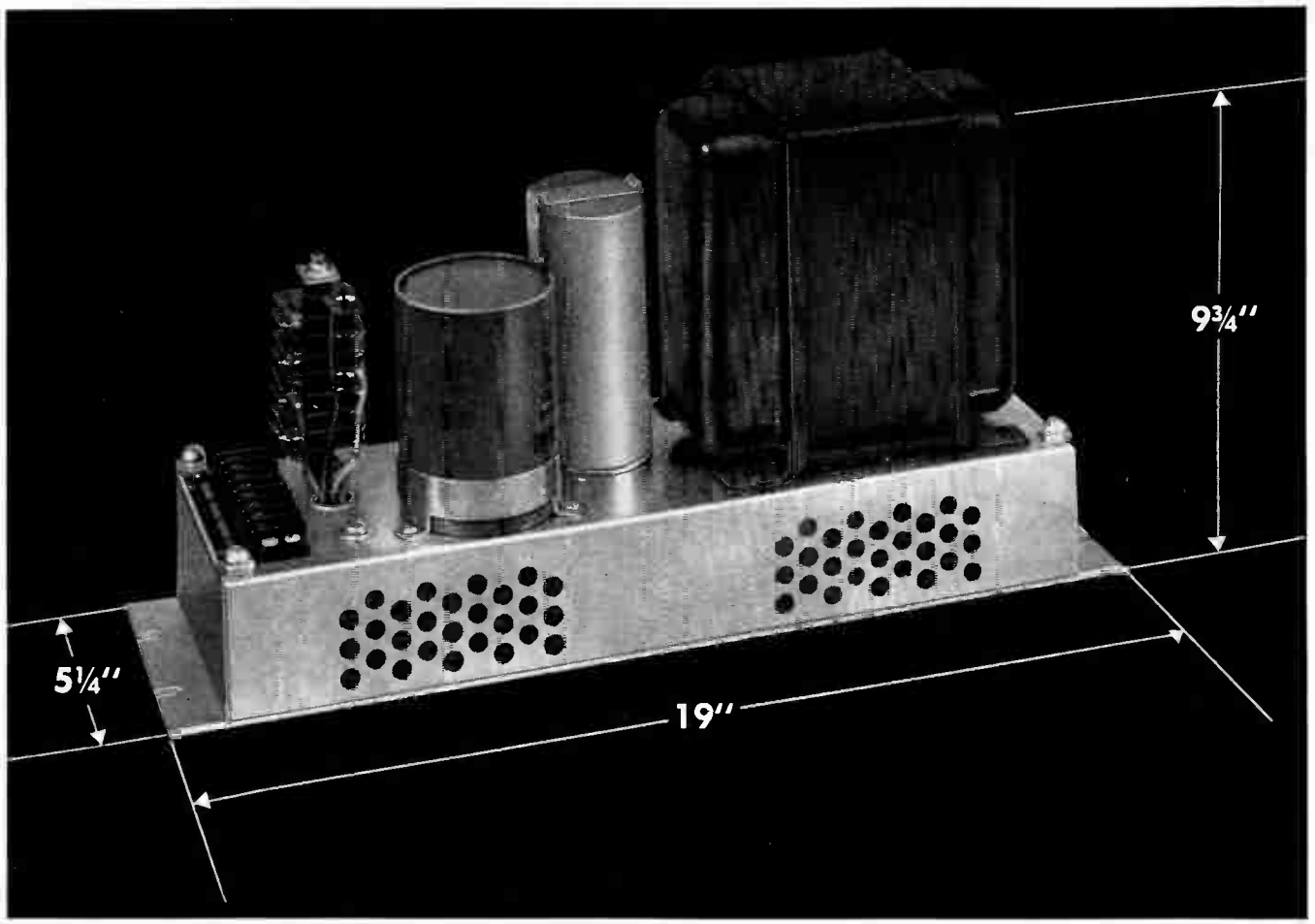
JULY 1959 Vol. 7, No. 7

departments

COVER STORY

The unusual picture on our cover illustration shows a rain storm over the Strait of Georgia photographed from the display of a Decca 3 CM. Meteorological Radar at Vancouver Airport.

Photograph provided by the courtesy of Department of Transport Information Service.



Sola Constant Voltage DC Power Supplies are designed for intermittent, variable, pulse or high-amperage loads.

Sola packs 6 amps of 300-watt regulated dc power into 5¼ inches of relay-rack space

Looking for a source of regulated dc power that fits into a small space? You'll probably find that the Sola Constant Voltage DC Power Supply offers what you want.

This compact unit has exceptional performance characteristics, too — it delivers current in the "ampere range," regulates within ±1% even under a ±10% variation in line voltage, has less than 1% rms ripple, and even tolerates dead shorts. It is 80% efficient and has a very low static output impedance.

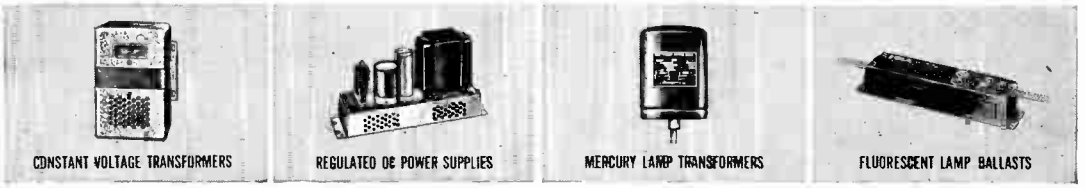
How's it done? Sola managed it through a balanced assembly of three complementary components . . . a special Sola Constant Voltage Transformer is teamed up with a semiconductor rectifier and a high-capacitance filter. Electrical characteristics of the transformer maximize most of the advantages of the rectifier and filter, while virtually eliminating all their disadvantages. The resulting regulated dc power supply is simple, highly reliable, compact and moderately priced.

These benefits are exhibited by the entire line of Sola dc power supplies. Sola has designed and produced hundreds of ratings to meet requirements of equipment manufacturers. The company is set up to handle specific needs for custom-designed units in production quantities. A Sola sales engineer can supply all the facts. In addition to this custom service, Sola currently stocks six models ranging from 24 volts at six amps to 250 volts at one amp.

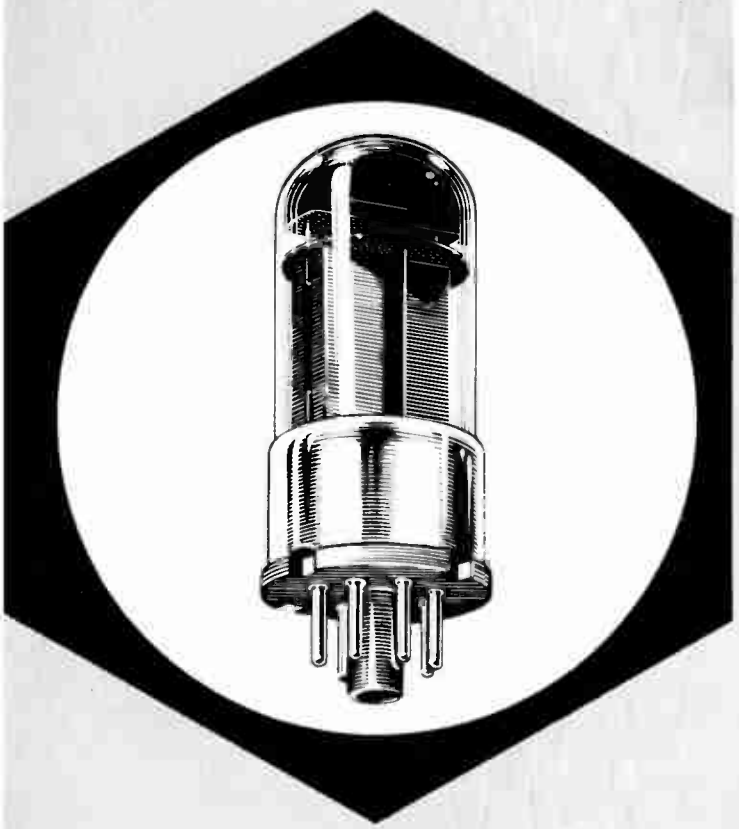
For complete data write for Bulletin 32G-CV-235.

SOLA ELECTRIC (CANADA) LTD., 24 Canmotor Avenue • Toronto 18, Ontario • Phone: CLifford 1-1147
In The United States, Sola Electric Co., Chicago 50, Illinois, A Division of Basic Products Corporation

SOLA



For complete details check No. 39 on handy card, page 35



The Mullard EN33 Thyratron is an improved plug-in replacement for the 2050 thyratron. One of a line of Rogers Special Quality* tubes, the EN33 has greater electrical ratings than the 2050 and consequently, when operated under similar conditions, offers a longer-life performance. It is smaller in size and has a higher permissible average and peak cathode current. The EN33 has many applications in industrial control circuits, motor and lighting controls, and AC and DC switching.

**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.*

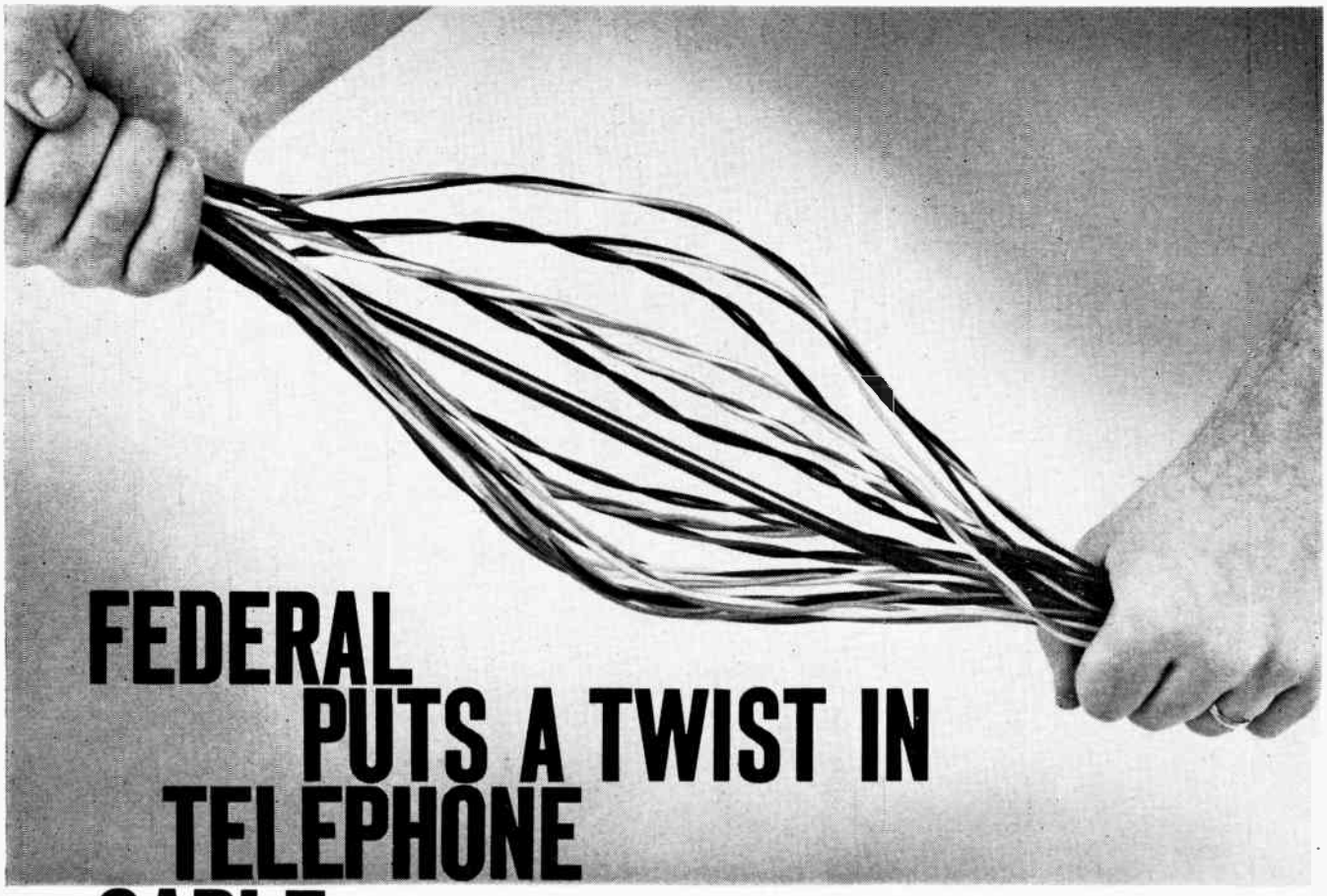
ROGERS

electronic tubes & components

A DIVISION OF PHILIPS ELECTRONICS INDUSTRIES LTD.

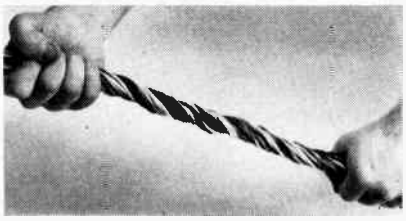
116 VANDERHOOF AVENUE, TORONTO, ONTARIO / BRANCHES: MONTREAL, WINNIPEG, VANCOUVER

★ Rogers Electronic Tubes are sold through Canada's Independent Electronic Parts Distributors



FEDERAL PUTS A TWIST IN TELEPHONE CABLE

Special 'Unilay' Construction



Twist it's open . . . twist it's closed! Just as simple as that, this one-direction cabling technique gives easy access to inner conductors . . . makes possible faster, more efficient mid-span taps.

A feature in . . .
FEDERAL TYPE B RURAL DISTRIBUTION WIRE

Because of its high tensile strength, it is ideal where longer spans are required. Its rugged construction gives excellent service life and permits re-use after emergency operation. Thus, considerable time and expense are saved in new construction. Engineered for maximum dielectric strength, low transmission loss and cross talk, Federal Rural Distribution Wire provides the best in subscriber service at minimum cost.

Another fine product . . .
FEDERAL TYPE NC TELEPHONE DROP WIRE

is specially built for life-long resistance to severe wind and ice-loading conditions. Its high dielectric rubber insulation is securely bonded to No. 18 copperweld conductors. The tough, reinforced neoprene sheath is ribbed for quick polarity identification by touch. It comes in solidly taped 1,000 foot "Tangle-proof" coils for fast, efficient installation. Buy Federal quality for dependable service.

FEDERAL WIRE PORTER ***& CABLE DIVISION***

H.K. PORTER COMPANY (CANADA) LTD.

PORTER SERVES INDUSTRY: with Rubber and Friction Products - THERMOID DIVISION; Electrical Equipment - DELTA-STAR ELECTRIC DIVISION, NATIONAL ELECTRIC DIVISION; Copper and Alloys - RIVERSIDE-ALLOY METAL DIVISION; Refractories - REFRACTORIES DIVISION; Electric Furnace Steel - CONNORS STEEL DIVISION, VULCAN-KIDD STEEL DIVISION; Fabricated Products - DISSTON DIVISION, FORGE AND FITTINGS DIVISION, LESCHEN WIRE ROPE DIVISION, MOULDINGS DIVISION; and in Canada, Refractories, "Disston Tools," "Federal" Wires and Cables, "Nepcoduct" Systems

H. K. PORTER COMPANY (CANADA) LTD.

For complete details check No. 35 on handy card, page 35

15,000 WATTS P. E. P.
New Ceramic Tetrode for SSB

Eimac's new, high-power 4CW10,000A is ideal for use in Class AB_1 single sideband service. This new tetrode is a water-cooled version of the widely-used Eimac 4CX5000A, with plate dissipation capability increased to 10,000 watts and a peak envelope power of 15,000 watts. Water-cooling makes the 4CW10,000A excellent for heavy duty applications where reserve plate dissipation is required.

Eimac offers the most complete line of tetrodes with the high-power gain, low distortion and excellent stability required in Class AB_1 operation. Each has proved reserve ability to handle the high peak powers encountered in single sideband service. Efficient integral-finned anode coolers on the air-cooled types keep blower requirements to a minimum, allowing compact equipment design.

Ceramic-metal design means compactness, ruggedness, high performance, and reliability. These proved advantages of Eimac ceramic tetrodes make possible more compact, efficient single sideband equipment.

Eimac

Eimac First for high power amplifier klystrons.

EITEL-McCULLOUGH, INC.

SAN CARLOS CALIFORNIA

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

CLASS AB, SSB OPERATION

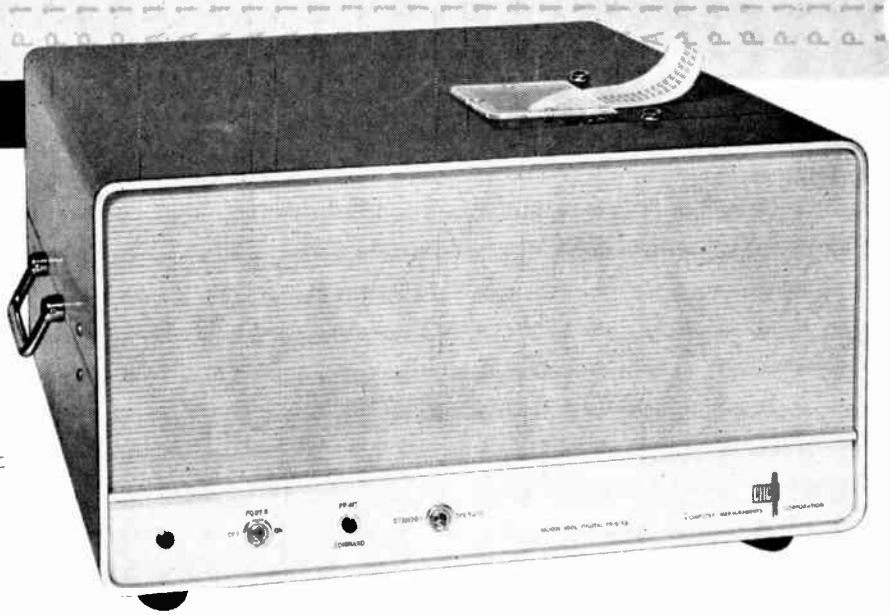
	4CX250B	4CX300A	4CX1000A	4CX5000A	4CW10,000A
Plate Voltage	2000 v	2500 v	3000 v	7500 v	7500 v
Driving Power	0 w	0 w	0 w	0 w	0 w
Peak Envelope Power	325 w	400 w	1680 w	10,000 w	15,000 w

For complete details check No. 24 on handy card, page 35

5901

Announcing CMC's New Model 400C

The most versatile DIGITAL PRINTER ever made!



MODEL 400C

ALL NEW, the CMC Model 400C is a reliable, economical instrument for permanently recording digital data from counting, timing, frequency measuring, and data handling systems.

EIGHT OPTIONS OFFERED

Optional features which broaden the area of application for the CMC digital printer:

• *10 line output for operating punches and electric typewriters* • *analog output for driving strip chart and other pen type recorders* • *built-in inline readout for visual monitoring at a distance* • *accumulator for totalizing* • *code converter to accept any digital code. Model 400C is compatible with any make of counting equipment* • *transistorized drive which accepts low voltage input* • *an add-subtract solenoid which prints plus and minus numbers* • *print-line identification for coding printout.*

New Standard Features

Standard features designed to improve reliability and flexibility include elimination of stepping switches, 4 line per second printout, parallel entry, and rugged unitized construction.

Key Specifications

Print-out capacity 6 digits standard, up to 12 on special order • Accuracy determined by basic counting instrument • Display time 0.2 seconds minimum, maximum controlled by the counter • Weight 64 lbs. • Price $950. Add $10 for rack mount.

CMC engineering representatives are located in principal cities. For more information on this versatile instrument, phone your nearby representative or write directly to Dept. 307

9 8 7 6 5 4 3 2 1 0

CMC | Computer-Measurements Company *A Division of Pacific Industries, Inc.*

ELECTROMECHANICAL PRODUCTS

AGINCOURT, ONTARIO
Telephone AXminster 3-7011

[illegible] Michel Sarrazin
MONTREAL, QUEBEC
Telephone R14-1932

For complete details check No. 22 on handy card, page 35

Electronic Industries Association Report

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

EIA President on "Buy In Canada"

At the Chicago Electronic Parts Show in May the EIA President at that time, R. M. Robinson, addressed Canadian purchasing agents and urged them to buy their components in Canada. Mr. Robinson told the Canadian delegates of the grave effects of radio importation on the Canadian electronics industry saying that some 30 per cent of all radios sold in Canada in 1958 were imported sets. Said Mr. Robinson, "I don't think we need to take a back-seat to any other nation when it comes to engineering and manufacturing skills, but if our electronics industry — or any other industry in Canada — is to survive in these days of heavy foreign competition, then we as Canadians will have to make sure our industries are not destroyed one by one."

He pointed out that since the peak year of 1955, some 2,000,000 square feet of factory space formerly used for electronics manufacturing, was now vacant, and 2,000 workers had lost their jobs, adding that the "very serious import conditions are cutting into Canadian electronic production and employment".

Service Committee Plan Nation-Wide Course on Servicing

The Service Committee met recently in Toronto to draw up plans for the spreading of the highly successful television servicing course across Canada beginning in the fall of this year. The pilot course, run at the Ryerson Institute of Technology in Toronto last fall and winter, was a means of upgrading the technical education of twenty practicing service technicians in the Toronto area. The course syllabus covers advanced servicing techniques for the latest types of television receivers and is an intensive course of training.

Television Resolution Charts Available

The EIA office is the Canadian source of supply for the EIA Resolution Chart which is used to help measure the resolving power of the television system, or a part of it, such as a television camera chain. The chart is televised by the studio facility under test, and reproduced under suitable picture monitor. Horizontal and vertical resolution wedges cover the range from 200 to 800 lines. The chart was recently revised and the present printing is on high quality heavy map paper which has an extremely "white" characteristic. Grey scale overlay strips are available for the Resolution Chart. These highly accurate scales provide the correct logarithmic reflectance relationship for the scales on the chart.

Other test charts for television broadcasting purposes are available. Full particulars may be obtained from the EIA Office.

Recent EIA Meetings

The Transformer Engineering Sub-Committee of the Components Engineering Committee met recently at the EIA Office to discuss the question of the compilation of a power transformer specification. The specification for audio transformers for radio and television receivers will be issued in the near future.

The Public Relations and Publicity Committee also met recently in Toronto to discuss publicity on the radio importation problem and other matters.

U.S. Electronic Industries Growth to Continue

At the 35th Annual Convention of EIA of United States the re-elected president, D. R. Hull, predicted that the recent upgrade in the electronics business would continue through 1959, and probably for several years ahead. He estimated that the total electronics sales at the factory level would rise to $9 billion this year for a new record, and that military procurement of electronic equipment and components would continue to rise.

He noted that the military market for electronics now absorbed 52 per cent of the industry's sales and 30 per cent of the Department of Defense's major procurement dollars. This expenditure would approach $5 billion this coming year. Part of this increase, Mr. Hull explained, was due to the fact that the electronics portion of missiles was increasing, and would total about $2 billion in 1959.

"Whatever our problems as an industry or an organization," said Mr. Hull, "I am confident that we can and will solve them. No industry today has greater assurance of continuing growth, and broadening service to our country and mankind."

business briefs and trends

★ The first ocean link in a Commonwealth 30,000 mile round-the-world telephone cable, estimated to cost $246,400,000, is to be laid by Cable and Wireless Ltd. of London between Scotland and Newfoundland in the summer of 1961. Orders have been placed with Submarine Cables Ltd. of Greenwich, England, for 552 miles of armored cable for the shallow water sections, costing $2,086,322, to be followed shortly by 1,600 miles of lightweight cable for the deep-sea section, costing $4,490,672 (specially developed for use with rigid, two-way submerged repeaters of British design, about 92 of which will be needed). The transatlantic section, estimated to cost $25,000,000 is being jointly financed by Cable and Wireless Ltd. and the Canadian Telecommunication Corporation.

* * *

★ Dominion Electrohome Industries Limited six-year-old employee profit sharing retirement fund has topped the one million dollar mark, the company announced. The fund now stands at $1,238,711 as a result of the company's contribution based on 1958's record operations. This is the largest annual company contribution since the plan became operative and is equivalent to 25 per cent of profits before taxes and after an allotment of five per cent on invested capital to reserves. More than 800 employees or 93 per cent of those eligible are members of the plan and contribute from three per cent to five per cent of annual earnings.

* * *

★ 574,490 radios were sold in Canada last year. This amounted to $40,000,000 sales at retail. The potential for additional radio set sales is staggering. Why? Because there are nearly 3,000,000 homes in Canada that only have one radio.

* * *

★ The first transistorized electronic digital computers designed to provide fully automatic control of many industrial processes are now being manufactured by Ferranti Ltd., parent company of Ferranti-Packard Electric Limited, Toronto, and the first production model will be installed within the next twelve months.

* * *

★ Canadian manufacturers will be afforded the opportunity of bidding on equipment to be used in the construction of nine TACAN bases to be built in Canada for the United States Air Force. Agreement between the Canadian and United States governments allows for all material required to be purchased in the United States to enter Canada duty free and for the cancellation of Canadian sales and excise taxes on all materials purchased in Canada to be used in the installations and which will become the property of the United States government.

* * *

★ British firms are now advertising in Canada in competition with American companies for the hiring of Canadian engineers many of whom at the present time are among the ranks of the unemployed due to the cancellation of major government defense contracts. Latest among the British firms to indicate their interest in Canadian engineers is EMI of Hayes, Middlesex, one of Britain's largest manufacturers of electronic equipment.

* * *

★ A bright star on the Canadian electronics scene lies in the future of electronic mail handling equipment for the Canadian post office. Domestic market for this type of equipment has been estimated to be in the neighborhood of $40,000,000. Equipment to be manufactured would be based on designs of apparatus developed by Canadian post office engineers. Canadian designed equipment could break into the export market by reason of certain refinements in Canadian designed equipment but the margin of difference between British and American equipment is slight and Canadian post office engineers or private companies will have to fight hard to keep Canadian equipment in the forefront if export markets are to be won.

CANADA'S MOST COMPLETE LINE OF WIRES AND CABLES

BUILDING WIRES and CABLES
Flameseal—Type TW
Flexible Armoured Cable—Type AC & ACL
Philex Cable—Type NMD-3, NMW-10
Rubber and Braid—Type R, RH, RW
Rubber Neoprene Cables
Service Entrance Cables

FLEXIBLE WIRES, CABLES and CORDS
Annunciator
Aircraft Cable
Automobile Wire
Bell Cord
Car Wiring Cable
Fixture Wire
Flexible Cords
Locomotive Cables
Military Wire
Motor Lead Cable
Neon Sign Cable
Oil Burner Cable
Office Wire
Portable Cords—Type SV, SJ, S, SJO, SO
Portable Cables—Type SW, SWO, G, SH
Radio Wire
Transformer Lead Cable
Welding Cable

MAGNET WIRES
Enamel, Formel
Cotton, Silk
Asbestos, Glass
Paper, Nylon
Round, Square, Rectangular

POWER CABLES
Armoured—DSTA, SWA
Neoprene Jacket
Rubber Insulated
Paper Insulated
Varnished Cambric Insulated
Shipboard Cables
Parkway Cables
Submarine Cables
Mining Cables
Lead Sheathed Cables
Power Cables (69 KV. and Higher)

CONTROL CABLES
Station Control
Traffic Control
Signal Cable
Railway Control
Elevator Cable
Thermostat Control Cable

RODS, BAR and LINE CONDUCTORS
Bus Bar Copper
Electrolytic Copper Rods
Aluminium and ACSR
Brass and Bronze Wire
CCSR Conductor
Copper Wire & Cable
Copperweld Wire & Cable
Copperweld Copper Conductors
Trolley Wire
Neoprene Line Wires
Weatherproof Wire & Cable

COMMUNICATION WIRES and CABLES
Coaxial Cables
Fire Alarm Cables
Interphone Cables
Paper Telephone Cables
Police Signal Cables
Signal Cables
Telegraph Cables
Telephone Cables
Telephone Switchboard Cables
Telephone Wires
Telephone Cords
Terminating Cables

ROCKBESTOS WIRES, CABLES and CORD
Boiler Room Wires
Fixture Wire—Type AF
Flexible Cords
Power Cables
Switchboard Wires
Range Wires
Stove Wires
Appliance Lead Wires
Rheostat Wire
Special High Temperature Wire
Soil Heating Cable

MISCELLANEOUS
Cable Terminals
Capacitors
Junction Boxes
Potheads
Splicing Materials

Phillips Electrical Co. Ltd., Head Office—Brockville. Branches: Montreal, Ottawa, Toronto, Hamilton, Winnipeg, Regina, Edmonton and Vancouver.

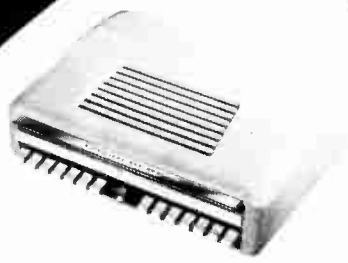
5603

PHILLIPS ELECTRICAL COMPANY LIMITED

THE MOST COMPLETE RANGE OF COMMUNICATION SYSTEMS

Hackbusch Electronics Limited offer you a complete range of high quality Stromberg-Carlson communication and intercommunication systems. Each system represents the most outstanding development within its field—Pagemaster, Key-Municator, Dial-X and conventional sound systems. Complete equipment, replacement and parts facilities are maintained to provide the ultimate in coast to coast service.

PAGEMASTER provides direct, instantaneous, personal paging for key personnel within plants, hospitals, large offices, hotels and many others. Receivers have D.O.T. approval P1.



KEY-MUNICATOR a new concept in intercommunication—compact, has audio and visual signaling, can be expanded in multiples of 14 stations.

CONVENTIONAL SOUND amplifiers, speakers, microphones and record playing equipment. Also completely engineered systems for public address, paging, music distribution systems in schools, hospitals and music therapy systems.

DIAL-X solves communication problems by giving two systems, two phones —one for 100% service and one for 100% outside service. Dial-X reduces telephone costs.

A trained technical representative will gladly furnish further details.

There is nothing finer than a Stromberg-Carlson.

STROMBERG-CARLSON
A DIVISION OF GENERAL DYNAMICS CORP.

HACKBUSCH ELECTRONICS
LIMITED
23 PRIMROSE AVENUE, TORONTO 4, LEnnox 1-2453

For complete details check No. 28 on handy card, page 35

Simpson WIDE BAND LABORATORY OSCILLOSCOPE

Model 2610

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

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

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

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

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

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

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

Bach-Simpson LIMITED

1255 BRYDGES ST. LONDON, ONT.

IN U.S.A.: SIMPSON ELECTRIC COMPANY, 5200 W. KINZIE STREET, CHICAGO 44, ILLINOIS

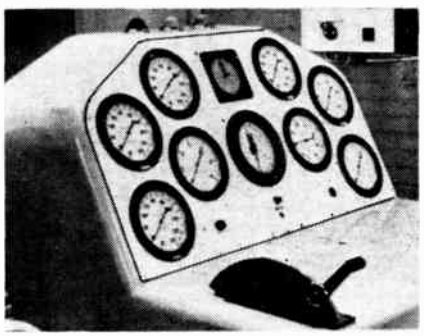
For complete details check No. 14 on handy card, page 35

Accuracy of recording consumption of small volumes of fuel can now be achieved by . . .

Electronic fuel consumption measuring equipment

In the laboratory or engine test house, electronics can be enrolled to assist the automobile engineer to measure fuel consumption accurately and rapidly. This has been successfully done by Farnell Instruments, Ltd., of Wetherby, Yorkshire, whose electronic fuel consumption testers are used by Leyland Motors Ltd.

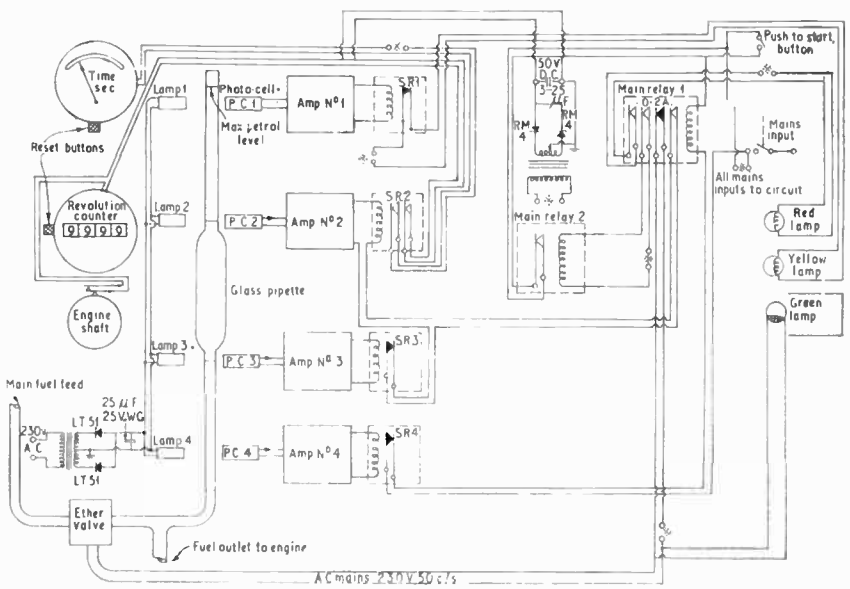
This equipment occupies a metal cabinet measuring 36 in. x 20 in. x 10 in., suitable for wall mounting. There are three basic measuring devices: a burette, which can be 157.8 cm^3 or 1,578 cm^3, to choice; a Dowty engine-revolution counter reading up to 999,999 and a Synclock time interval meter, counting from 0 to 30 minutes in seconds and fractions of seconds. The external connections comprise AC mains leads, 200 to 250 volts, single-phase 50 c/sec; fuel feed pipes; and a jack, to connect the contactor unit to the engine under test and so to operate the revolution counter. Three indicator lamps show stages in the operation of the apparatus, and automatic resetting has been incorporated. To avoid tabulating errors, however, the engine revolution and time indicator dials are manually reset. The apparatus can be used to measure the consumption of any liquid that is opaque or colored.



A view of an engine test department, where three electronic fuel testers are mounted on the wall in the background.

Electronically, the circuit consists of four lamps and their associated photo-electric cells, with the necessary amplifiers and energizing relays to control the operation. About ten seconds are required initially for the amplifiers to warm up; after this, the tests are controlled by the start button just under the nameplate on the instrument panel.

When the mains switch is closed, the Ether valve, which is named after its inventor, is energized; this is a straight-forward solenoid-operated valve, which opens the main fuel feed and permits fuel to flow to the engine under test and to fill the burette. A green indicator lamp, in parallel with the valve, is illuminated, showing that the valve is open. The fuel in the burette rises until it refracts the light from lamp (1); this causes a relay to close and illuminates the yellow indicator lamp to signify that tests can begin. Meanwhile the engine under scrutiny has been started, and is run on the fuel passing from the storage tank through the Ether valve.



The sequence of operations of the engine fuel consumption tester are as follows: (1) all mains on, Ether valve opens and green light comes on; (2) when the amplifier is ready and the fuel level normal, the yellow lamp is illuminated; (3) operation of the press-to-start switch illuminates the red lamp, closes the Ether valve and switches off the green lamp — if the system is functioning correctly the yellow lamp goes out within a few seconds, indicating that fuel is being used; (4) when the yellow lamp is illuminated again, the test can be repeated by pressing the start switch.

When the start button is pressed, the Ether valve is closed and the green lamp extinguished; then the engine draws its fuel solely from the burette. At the same time the red lamp is lit, indicating that a test is under way, and various relays are operated: SR3 closes to complete the circuit through the relay coil of amplifier No. 2, and main relay (2) closes to connect the mains supply directly across main relay (1), which is necessary to maintain the status quo of relay (1) after the start button has been released.

The level of the fuel in the burette then starts to fall, a fact which will be indicated by the extinguishing of the yellow lamp as the level drops below lamp (1) again. As it drops below lamp (2), photo-cell (2) responds and its amplifier closes the contacts in relay SR2, which sets in operation the time interval recorder and the revolution counter. Between lamps (2) and (3), therefore, is the portion of the burette containing the critical volume of fuel, the consumption of which is measured on a time/engine-revolution basis.

As the liquid level passes lamp (3), amplifier (3) opens SR3 relay. This opens SR2 relay and stops the time interval recorder and the revolution counter. The fuel level continues to fall until it passes lamp (4), whereupon the impulse from photo-cell (4) causes its associated amplifier to open relay SR4. The opening of SR4 breaks the circuit to main relay (1), and main relay (1) de-energizes main relay (2). The cycle thus concludes with the opening of the Ether valve, the extinguishing of the red lamp and the re-lighting of the green.

Subsequently the engine continues to run, taking its fuel from the storage tank through the Ether valve, and the burette is refilled. As the fuel level rises past the photo-cells, SR4 relay closes; similarly SR3 closes in its turn, followed by SR2. However, since the mains supply is interrupted and main relay (1) is open, nothing will happen. When the fuel rises past photo-cell (1), relay SR1 closes, lighting the yellow indicator lamp and permitting another test to begin as soon as the time recorder and revolution counter dials have been reset to zero.

The basic circuit of the amplifiers embodies a trigger tube operating from transformer-rectifier-supplied direct current at 150 volts. When the grid of the valve is energized by an impulse from the photo-electric cell the trigger tube strikes, operating the relay incorporated in the anode circuit. Similarly rectified and transformed current at 50 volts operates the revolution counter, while the photo-electric cell lamps are served by 6.3 volts alternating current.

With higher speeds of commercial aircraft strict adherence to E.T.A.'s is becoming increasingly important as a factor in aircraft traffic control.

An airborne flight progress indicator

by E. B. Moss *

There is an obvious and growing need for more effective air traffic control, particularly in U.S.A., and vast programs of research and development set up by the Airways Modernization Board are being pursued by the Federal Aeronautics Authority in an effort to provide effective systems for exercising these controls under the changing pattern of civil and military flying in future years.

An important function of Airway Traffic Control is to ensure that flight plans are adhered to accurately. Radar surveillance equipment is installed largely for this purpose, and a major proportion of the load now carried by radio telephone channels relates to aircraft position. This load is increasing, consequently any assistance to navigation is worthwhile, particularly if it makes no demands on radio communications.

The bewildering variety of pilot's instrument displays now available for flight control, and the ingenuity expended in competitive diversity, coupled with the generous provision of navaids seem to forestall any excuse for an aircraft not following a prescribed flight plan, or for not being within the prescribed volume of airspace at any particular time. The processed information displayed by the more advanced of these integrated systems facilitates "smooth" operation by providing tangential approaches to changed headings or radio beams, as is highly desirable for the new generation of aircraft. But little has been done to help accuracy of time keeping which increases in importance as speeds rise and separations become more critical. Yet "smooth" operation with respect to time is just as vital as for any other parameter. The speed range of jet aircraft, and the space required for their manoeuvres makes the adjustment or correction of E.T.A.'s, even by only a few moments, far more difficult than with the piston-engined variety. A straight fly-in is obviously the ultimate objective, but it may be an unattainable ideal. However, it is worth striving for, and among other things requires accurate time keeping.

This aspect of the A.T.C. problem is not being neglected. The FAA's plans envisage a form of data link providing an automatic system of two-way communication for position control under the title of A.G.A.G.S., and instrument manufacturers have not been idle, but it is felt that the various proposals do not give enough attention to the time factor, and this paper considers what instrumental help towards more

* *Vice-President Engineering, Canadian Applied Research Limited*

Figure 1. Typical of the activity at large airports is the photo at right showing control tower at London Airport. Ground-to-air radio, one of the devices shown in the photograph, is used for directing pilots to the correct runway.

accurate time keeping might result from relatively simple developments of the R-Theta Dead Reckoning Navigation System, which is one of the very few computers of this kind whose capabilities have been proved by operational service.

The standard form of the R-Theta Computer requires automatic inputs of magnetic heading and true airspeed, and manual inputs of wind direction and speed, and magnetic variation. It is capable of being monitored by Doppler. This takes care of the wind factor, so the system is capable of fully automatic operation when the necessary inputs can be provided. In operation the range and bearing of a selected objective, or check point, from base are set up and fed into the computer, the changing values being continuously displayed as the flight proceeds. The computer employs analog methods, and various quantities are evaluated as steps in the calculations of range and bearing, and are accessible if required. These include ground speed as a D.C. analog voltage, distance along track, and distance off track as shaft positions.

Instrument duplication avoided

The proposed instrument is not intended to duplicate the function of other instruments, so its essential display relates to time, ground speed, and distance to go, and can be arranged as shown in Fig. 2 representing a standard 3.250" x 3.250" instrument. However, information as to distance off track can be obtained from the range and bearing computer if needed, and the instrument illustrated in Fig. 3 suggests a way of showing it, although to avoid ambiguity this is associated with the larger 5" x 5¼" size. Undoubtedly it could be crammed into the smaller face, but not without seriously affecting legibility.

Referring to Fig. 2, it is seen that two four-figure counters show present time, and estimated time of arrival. Both have setting knobs. The first to allow normal synchronization, the second for setting up E.T.A. Below these is an arcuate dial with an index and a pointer, calibrated in ground speed. The index can be set by hand if required, for the purpose to be explained later; but normally it functions as a "director" indicating the ground speed necessary to achieve the E.T.A. The pointer shows actual ground speed, and coincidence is readily seen because of the ring sight and bead configuration. Finally, the third counter shows miles to destination or way point.

The instrument works as follows, taking advantage of recent developments of the present R-Theta system whereby the displays are divorced from the computers, a simple servo link, using potentiometers replacing the mechanical coupling. In this instance the distance potentiometer in the range and bearing computer serves a double purpose, and is represented by P_1 in Fig. 4. The complete potentiometric system is made up of P_1, P_2 and P_3 to which the voltage V is applied.

P_1 and P_2 in conjunction with amplifier A_1 and motor M_1 forms the servo loop for positioning the

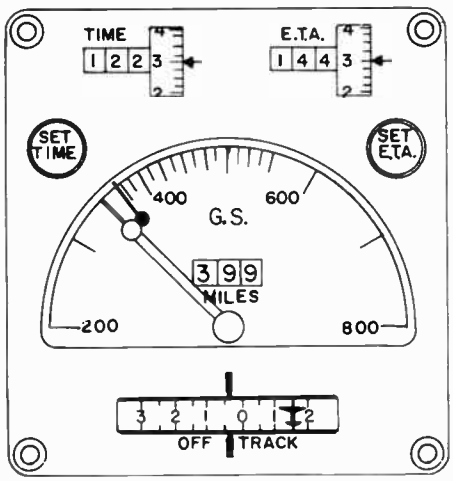


Figure 2

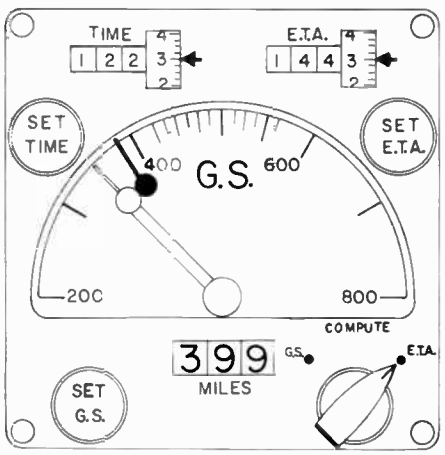


Figure 3

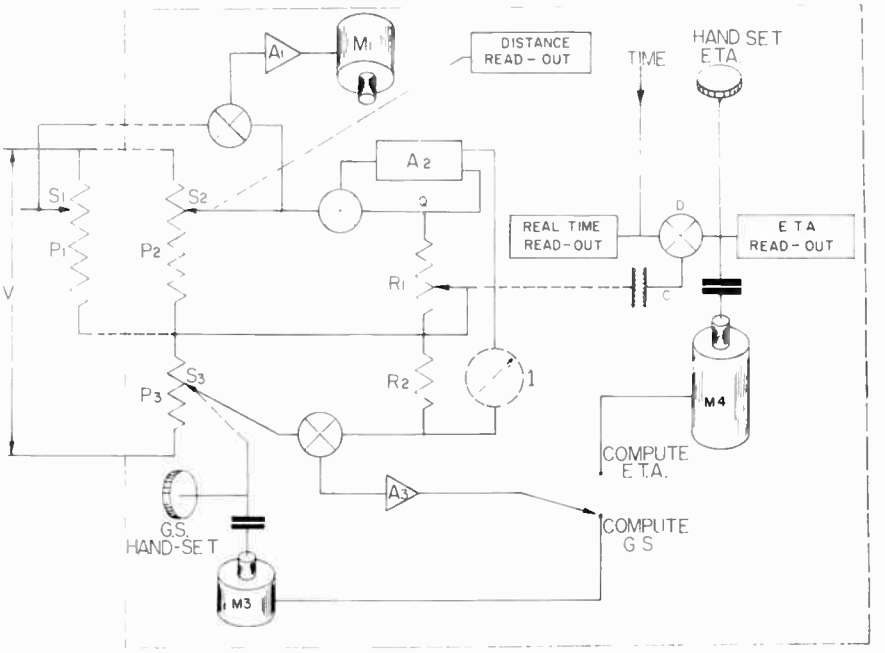


Figure 4

distance readout counter in the PNI (Pilot's Navigation Indicator). Thus the voltage on S_2 is proportional to distance. If this voltage is applied to a circuit of resistance r, such that $r = kt$, then the current in the circuit will be proportional to ground speed. Any appreciable load on potentiometer P_2 would introduce errors. Therefore, a feed-back amplifier A_2 is introduced to energize the circuit $R_1 + R_2$ so that the potential at Q is equal to that at S_2 whatever its position or the value of R_1, within expected limits.

The current in this circuit could, for example, be measured by a meter I. This would mean V being accurately stabilized, and defined in absolute terms, a need to be avoided if possible. Also, it is doubtful if such an instrument would give the required precision of better than 1 per cent. Accordingly, the current in R_2 is measured by comparison with the potentiometer P_3 through the servo link A_3 and M_3. Thus the position of S_3 on P_3 which is independent of voltage, is a function of the ground speed necessary to meet an E.T.A., and positions the director index on the ground speed scale. The diagram does not show the circuit associated with the actual ground speed pointer. In this instance the potentiometer providing the ground speed analog voltage, which also controls the ground miles integrator, is in the ground speed and drift computer; otherwise the arrangements are very similar to the P_1 P_2 A_1 and M_1 circuit in Fig. 4.

Timing by conventional clock

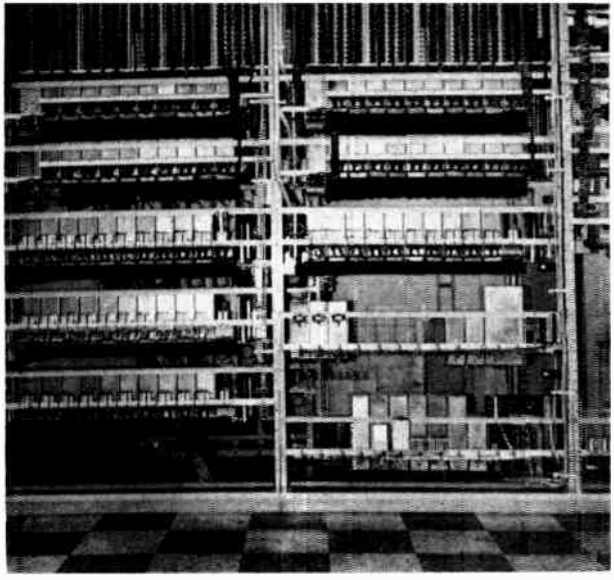
The foregoing requires that R_1 shall be adjusted continuously with respect to time, and to do this the slider is driven through the mechanical differential D whose inputs are present time and E.T.A. Thus the position of the slider is proportional to estimated time of flight, and R_1 will become zero when present time and E.T.A. coincide. It is not proposed to study in detail how time information is introduced, as this would depend on apparatus in the aircraft.

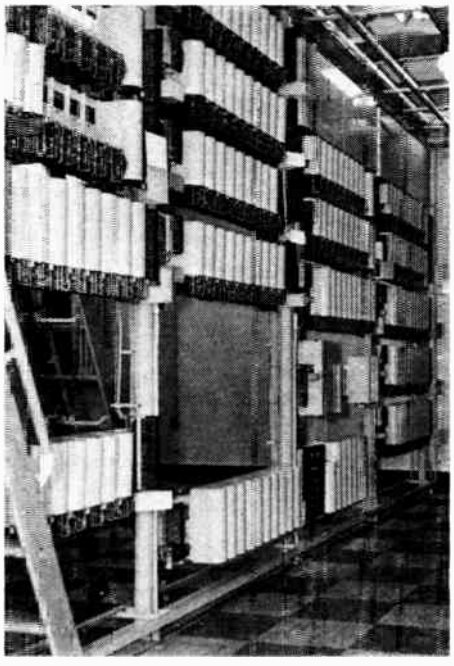
A conventional clock could give timed impulses to operate a ratchet mechanism at not more than 15 second intervals, or a synchronous motor drive can be employed, energized from a time stabilized 400 cycle supply. The electromagnetic clutch C in conjunction with limit switches (not shown) is used to prevent overtravel of the slider at either end of R_1 as would otherwise occur frequently in use. Similar switches may be needed on P_3.

The facility of computing E.T.A. requires only the addition of a switch and a motor drive to take the place of the manual setting. To use this function the switch is moved to "Compute E.T.A.", and the slider S_3 is moved by the knob marked "Set GS" to the intended ground speed, as shown on the dial, or can be left at some value at which the aircraft is actually flying. The setting knob can over-ride the friction clutch of the drive from M_3 which cannot now be driven as the output of A_3 is now switched to M_4. This zeros the system by moving R_1, as shown on the E.T.A. readout. Such a calculation of E.T.A. may appear a trivial arithmetrical problem for a computer, but under adverse flying conditions re-planning may have to be done hurriedly, yet accurately, and this could make the facility worthwhile.

Some reference has to be made to the distance off-course display illustrated in Fig. 3. This information is shown by rotation of a torque receiver carrying a 2" diameter drum calibrated in miles left or right of track, with a midway zero. Such an open scale is desirable, but a cylindrical scale rotating in this way is capable of misinterpretation, so an additional index is added in the shape of simulated aeroplane. This is moved by the drum to one side or the other according to the deviation of the aircraft, and shows the direction unmistakably. Its excursion is limited to a little more than one mile but the actual distance off course can be read on the moving scale.

The foregoing shows one way in which, what is believed to be vital information as to time keeping during flight, can be displayed in the interest of improved A.T.C. The diversity of opinion among aviation people as to how any such instrument should be arranged is proverbial, so it is not expected that the suggested arrangement will be accepted without criticism. That does not matter for many alternative layouts are possible, and the purpose of this paper is to show what information is already available from existing and proved computing equipment.





Above: View showing close-up of the private exchange (PAX) installation. Right: An overall view of the exchange installation.

Major re-location of telephone equipment can be accomplished without interrupting service.

About moving telephone equipment

The Aluminum Company of Canada Ltd. (Alcan), recently found it necessary to expand their 220 linefinder P-A-X system to 480 lines and, in addition, move their present equipment to a new building half a mile from the building in which it was currently installed. It was desirable to maintain P-A-X service throughout the changeover.

In March 1954, a 220 linefinder P-A-X was installed in the power control building of the Aluminum Company of Canada's Kitimat plant in British Columbia. The original system consisted of two units — one a 200 line unit for the plant and the other a 20 line unit for the office. Both units had a common combined distributing frame, power shelf, battery and charging equipment.

In April 1958, it was decided to move the automatic telephone equipment to a new control building about half a mile away. In addition, 260 lines were to be added to the board.

All this was accomplished without interrupting service.

To accomplish this, new ironwork and a new combined distributing frame were first installed in the new building. The rack-end cables were pulled in and hooked to protectors. These cables fed through duets back to the cable pit in the old building. As soon as the cables were hooked to the protectors, the cable splicer commenced half-tapping the cables in the cable pit.

New linefinder shelf equipment with 80-line relays, a selector and connector shelf were mounted to serve as the new office unit. Then a power shelf, less the ringing interrupter relays, was mounted. A spare unit from the old board was used for the ringing interrupter. New batteries and charging equipment were installed next.

When the 80-line section was tested and jumpered to the protectors, the lines of the old office unit were cut to the new board. This unit has a four-digit numbering plan, the first digit being absorbed.

The 20-line linefinder shelf was disconnected, moved to the new building and mounted. Relays and switches were provided to make this shelf a complete 200-line unit.

The old 20-line unit connector shelf was next to be moved and with the new selector and connector shelves a 200 line board was completed. This equipment was tested, the jumpers run to the protector and the line relays blocked.

On the night of the cutover, the heat coils were pulled on the combined distributing frame in the old building, the blocking tools removed from the line relays and the plant lines were working in the new equipment.

The following day the splicer removed the cable half-taps and the installers moved the linefinder selector and connector shelves of the old 200-line unit to the new building, completing the installation as a 400-line plant unit and an 80-line office unit.

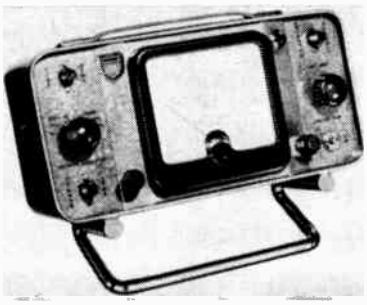
New Products

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 35. Just mark the products you are interested in on the coupon on Page 35 and the information will be in your hands within a few days.

Transistorized DC voltmeter

Item 2387

Model 140 DC Voltmeter, a product of Amos of Exeter, England, is similar in function to a valve-voltmeter but with the advantages of full portability, no valve replacements, no dependence on mains supply and a more robust construction. It has self contained battery power, low current drain, high impedance input, high accuracy and voltage readings from 1 volt full scale deflection to 20,000 volts full scale deflection. The advantage of being self powered is that mains variations can have no effect on the accuracy of the reading.



It is claimed by the manufacturer to be the only meter available which covers all DC voltages present in modern television and radar equipment.

Model 141 Transistorized DC Voltmeter, in order to meet certain requirements of experimental departments, is available with nine ranges up to 1000v. but excluding the higher ranges of Model 140. In all other respects it is similar to Model 140.

Further information on these models may be obtained from the Canadian distributor — **Mechron Engineering Products Ltd., 2437 Kaladar Avenue, Ottawa 1, Ontario.**

Multi-turn precision potentiometer

Item 2388

Douglas Randall (Canada) Limited announces the availability of a new high power high temperature multi-turn precision potentiometer manufactured by The Gamewell Company, Newton, Mass.

These potentiometers have a resistance range of 300 ohms to 1 meg ohm, coil length 50" approximately over a winding angle of 3600 +5 —0°. They are available with a linearity of 0.025 per cent.

These potentiometers are quality products having all metal housings; ball bearings used are class 7 stainless steel. These potentiometers meet applicable sections of NAS-710, MIL-R-19, JAN-R-19 and MIL-R-19518 specifications.

For further information please contact **Douglas Randall (Canada) Limited, 126 Manville Road, Scarborough, Ontario.**

Electrical locking relays

Item 2389

New Struthers-Dunn close differential electrical locking relays have been developed and are being manufactured in Canada. Designated part numbers are 149XAX-1001 for AC operation and 49XAX1001 for DC operation.

These popular relays, which combine a 149 or 49 close differential relay and a standard B1 frame relay on a common base, eliminate contact chatter at the pick-up and drop-out voltages. Positive contact action at the pick-up and drop-out voltages is accomplished by the B1 frame which acts as a "locking" relay. Relays may be adjusted to drop out at 5 per cent minimum below specified pick-up voltages.

Operating voltages are available up to 230 volts AC and 115 volts DC; Series coils to 10 amps AC or DC. Contact ratings available up to 6 amps at 115 volts AC and 6 amps at 24 volts DC.

Relays are available in 1 pole normally open or 1 pole normally closed, and are supplied front connected, back connected, with or without glass cover. Special mountings and contact arrangements available upon request.

For further information write to **Renfrew Electric Co. Limited, 349 Carlaw Avenue, Toronto 8, Ontario — manufacturers of Struthers-Dunn Relays in Canada.**

Capacitance checker

Item 2390

The Jackson Electrical Instrument Company has produced a new wide range capacitance checker which is being distributed in Canada by the Electronic Tube and Components Division of Canadian Marconi Company.

This new Model — 591 — tests capacity from 10 uuf to 1,000 uf in four ranges, and provides color-coded range push buttons which match scale colors to facilitate selection.

The new model has graduated leakage tests for both polarized and unpolarized capacitors and low voltage leakage tests for transistor-circuit capacitors. There is a graduated power factor test for electrolytics from 0 to 60 per cent and an electron ray indicator tube for all tests.

Model 591 comes complete with test leads and has been factory wired and calibrated for guaranteed accuracy.

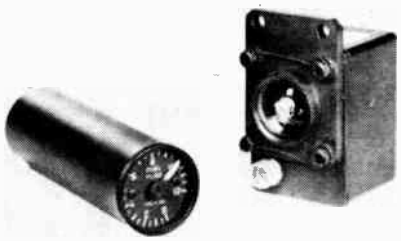
For further particulars write **Electronic Tube and Components Division, Canadian Marconi Company, 830 Bayview Avenue, Toronto, Ontario.**

Miniaturized mass flowmeter system

Item 2391

Higher accuracy in measuring fuel flow up to 1200 pounds per hour in reciprocating aircraft engines as well as small turboprop and small jet engines is now possible using a new miniaturized mass flowmeter system, according to F. T. Dayment, manager, Aviation Equipment Sales for Canadian General Electric Company Limited.

The system measures the actual mass of fuel passing into the engine rather than its volume, which may vary with changes in temperature, pressure, and variations in such fuel properties as density and viscosity. This precise, continuous fuel measurement contributes to improved operating economies by permitting the pilot to control the rate of fuel flow for maximum engine efficiency.



Developed for the U.S. Army through Wright Air Development Center under a U.S. Air Force contract by General Electric's Instrument Department, the small, lightweight system has only two basic components — a type TJ-64 flowmeter transmitter and a type DJ-99 remote indicator.

System weight is under 4 pounds, and the transmitter is about the size of two packages of cigarettes. The system operates on 115 volt, 400 cycle power. However, direct indication of true mass flow rate is obtained without need of an aircraft constant frequency power source.

The miniaturized system represents one of the latest advances in General Electric's development work — begun nine years ago — on methods for direct measurement of fluid mass.

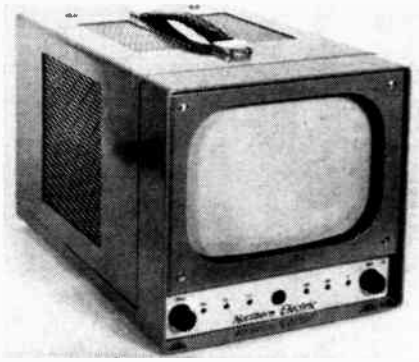
Additional information is available from the **Electronic Equipment & Tube Department, Canadian General Electric Company Limited, 830 Lansdowne Ave., Toronto.**

R20500A Video Monitor

Item 2392

The Model R20500A Video Monitor is a semi-portable unit measuring only 8½" wide by 8¾" high by 14" long. The small compact size permits these units to be employed in clusters for operators to observe several scenes at a glance, while two units can be shelf-mounted side by side in a standard 19" rack.

Features include frequency response within 3 db, 50 cps to 6 mc, electro-static focussing by control, DC restoration, composite or non-composite input with remote control facilities, 8" rectangular CRT and easy access to all controls. The safety glass can easily be removed.



Further information may be obtained from the nearest **Northern Electric Company's office.**

Vernier variable resistor

Item 2393

A new compact vernier variable resistor with ball bearing rotation designed for fine tuning applications has been developed by C. C. Meredith & Company, Ltd., Streetsville, Ontario.

The contact arm rotates only 1° for each 13.5° shaft rotation. Total contact arm rotation is 300° ±5° and total shaft rotation approximately 4,000°.

Type VA-45 is a $1\frac{1}{8}$" diameter ¼ to ½ watt variable composition resistor with only $\frac{5}{32}$" more depth than standard non-vernier Type 45. Resistance range is 250 ohms through 10 megohms (linear taper) with standard tolerance ±30% for 250 ohms through 5 megohms and ±40% for 5 to 10 megohms. Voltage rating across end terminals is 500 volts DC and voltage rating bushing to terminals 1,000 volts AC for 1 minute high pot test with 750 volts DC operating maximum.

Available in a wide variety of resistance tapers and shaft specifications.

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

New Products

Sequence timer for air-to-air missiles

Item 2394

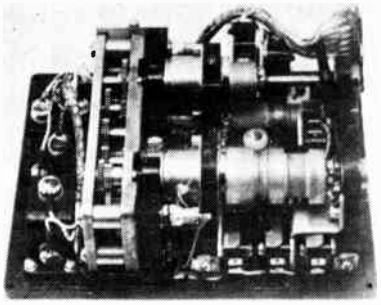
Designing and building this firing circuit sequence timer for air-to-air missiles requires that the Avionic Division, John Oster Manufacturing Co., Racine, Wisconsin, provide a unit meeting all the usual aircraft system requirements including compactness, light weight, simple operation, and easy maintenance. In addition, this unit has to be capable of repeated engagement through a clutching mechanism requiring a high torque-to-weight ratio.

To meet these requirements, the timer is designed using a 12,000 rpm direct-current motor rated at 0.1 ounce inch to turn three separate timing cams at different rates of speed. The three input shafts for the timing cams turn at 5, 12, and 20 rpm, respectively, being linked to the motor through a speed-reduction gear train.

Since the motor runs continually, the input shafts are constantly rotating. The electric clutches provide a simple, foolproof method of coupling the right clutch to its input shaft at the proper time. Three SF-80 clutches, specially designed for this application by Warner Electric Brake & Clutch Co., Beloit, Wisconsin, are used to couple the cams to their input shafts. Although these Warner clutches can be fully engaged in four milliseconds, speed of engagement is not as important as are compactness and durability.

To meet the physical requirements of the installation, Oster engineers developed a special backing plate to take care of the Warner design that insures extra strength for repeated application while holding weight to an absolute minimum.

Specifications call for the clutch to be able to operate from −55°C to 135°C. Particularly at the upper limit of the temperature range, the small amount of current required for actuation of Warner clutches is advantageous. The lower current requirements also contribute to the compactness of the design and to the fact that special provisions need not be made for dissipation of heat generated by clutch actuation.



Inherent simplicity of electric motion control is a major factor in reliability of operation. Because clutch engagement is fast and positive, it minimizes parts wear, resulting in a system that is virtually maintenance-free.

Additional information available from the **Avionic Division, John Oster Manufacturing Co., Racine, Wisconsin, U.S.A.**

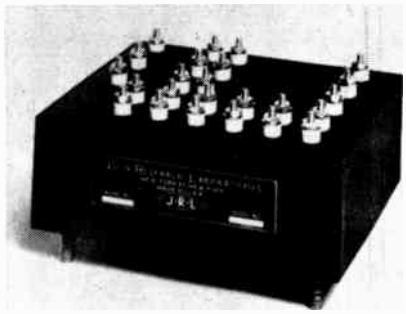
High accuracy resistance sets

Item 2395

Julie Research Laboratories, Inc., announce the latest addition to their line of high accuracy resistance sets designed for precision digital-analog conversion, analog resistance synthesis, and general laboratory standardization.

The Model BDR-105 resistance set consists of 21 ultra-precise, ultra-stable resistors scaled in a modified binary-decimal sequence of 1, 2, 3, 4 by decades with an extra units digit, permitting synthesis of any resistance from zero to 100,000 ohms in one-ohm steps, with accuracies and stabilities of 0.0015% (15 parts per million) of the maximum value.

By appropriate relay (or diode) switching, this set, in combination with an appropriate external reference standard, permits digital-to-analog conversion to considerably better than 0.01%.



An oil-bath construction is used to minimize thermal and self-heating effects. The total effect of all transient thermal influences, including self-heating, Seebeck, and Peltier effects, is less than .0005% of full scale.

The assembly is housed in a hermetically sealed metal case which shields the components electrostatically, and isolates them from environmental influences other than temperature. The complete unit is 5 inches wide, 4¼ inches deep, and has a height of 1⅞ inches plus ½ inch of terminal extension. Four threaded studs are provided on the bottom of the case for mounting purposes.

Complete details are available from the manufacturer, **Julie Research Laboratories, Inc., 556 W. 168th St., New York 32, N.Y., U.S.A.**

Precision data processive components

Item 2396

To meet the needs of its own Computing Division, as well as those of others requiring electronic components and ancillary data processing equipment, E.M.I. Electronics Ltd. is manufacturing a new series of Emidata components. Included amongst these is a Fast Start/Stop Digital Tape Deck, the Emidata 1" tape deck, in which engineers of E.M.I. have combined very high speed and fast start, stop and reverse times with first class electrical and mechanical reliability. Bi-directional tape speeds of 200 inches/sec. with start and stop times of 4 milliseconds, are achieved by an advanced design of vacuum capstan.

Located below each main drive capstan is a tape bin which provides buffer storage between the tape spools and the capstans. These bins are electrically sensed to measure the amount of tape in them and the tape in each bin is maintained at a pre-determined level by the servo controlled main tape spools and vacuum binning capstans.

The equipment has the following special features: 1. Out of contact operation with no wearing of oxide surface of tape; 2. 1" tape 2,400 ft. spools and up to 24 channels; 3. Bi-directional tape speed of 200 inches/second; 4. Easy tape threading and fully automatic operation.

A new instrumentation tape deck specially designed to meet the requirements of the data processing engineer is also available. Four of its speeds within the range ½ to 120 inches/sec. can be selected instantaneously, and up to 24 channels on 1 inch tape provided. Tapes made on one machine may be replayed on another of the same type with complete reliability. The equipment, which has been designed to give utmost flexibility to meet the diverse needs of modern data processing systems, provides 4 or 6 tape speeds on any deck.

E.M.I. has also developed an outstanding range of magnetic drum stores. These drum stores are high capacity units of superior reliability and performance, they are available with capacities of 8,000 or 16,000 words. Printed circuits head switching units form an integral part of the drum assembly and have first rate accessibility.

The Emidata Type "B" range of magnetic heads have been developed to meet the need for an inexpensive but reliable unit for digital work. They are designed for "out of contact" operation on magnetic drum and tape stores. Both the type "A" and "B" designs afford the highest standards in precision manufacture and mechanical stability, resulting in a high performance of the standard required for modern digital data processing.

E.M.I. Electronics Ltd., Hayes, Middlesex, England.

Electrical connectors

Item 2397

Connector Seals Corporation, a new factor in the electrical connector industry, has announced the development and production for marketing of a series of MS-E type electrical connectors.

This Rosemead, California concern offers its new Seal-E connector as a long step forward in the field of electronics. Here, they state, is a connector in either pin or socket type, in sizes up to and through Size 0, which offers the combined advantages of internal connector moisture-proofing by interfacial sealings of mated MS-E type connectors, plus partative hermetic sealing of application units as created by glass seals.

Connector Seals Corporation, Rosemead, California, U.S.A.

Phase generator

Item 2398

A new model of the Theta Phase Generator will operate into loads which vary between open circuit and zero ohms without affecting its phase accuracy. This has been accomplished with purely passive

components. The device produces a constant output voltage which is phase variable through 360°. With load, the output voltage is reduced in level, but operation is otherwise normal.

Specifications: range, 360°; overall accuracy, 30 minutes-of-arc; input, 115 volts at 400 cps; output, 40 volts at 400 cps; dial diameter, 5 in.; housing diameter, 2½ in.

Manufactured by: **Theta Instrument Corp., 48 Pine Street, East Paterson, New Jersey, U.S.A.**

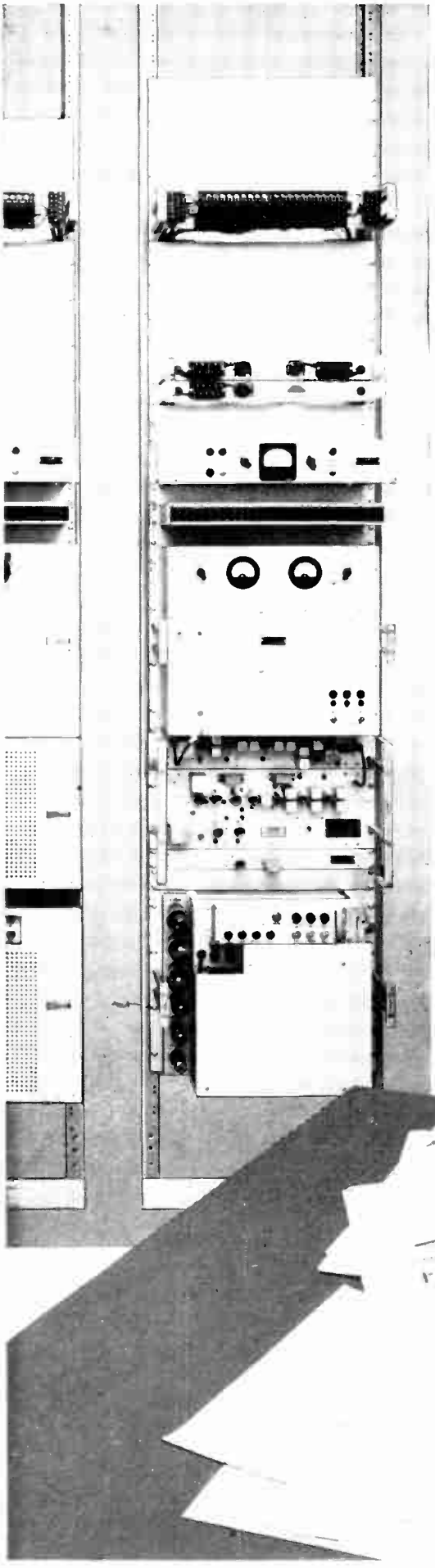
Small hole driller

Item 2399

A "brand new" precision tool which makes small hole drilling simpler, faster and more economical is now ready for the market, according to Hunter Tool, Santa Fe Springs, Calif. For use on milling machines, jig borers, lathes and drill presses. You simply lock into position and control the drilling pressure with your finger tips.

Hunter claims the Small Hole Driller pays for itself quickly because it practically stops drill breakage, and drills stay sharp up to 400% longer because you "feel" the correct cutting pressure. Precision made, each Hunter Small Hole Driller comes individually packaged in a plastic kit complete with adapter shank.

Complete information plus fully illustrated catalog is yours for the asking by writing **Hunter Tool, P.O. Box 564, Whittier, Calif., U.S.A.**



with your carrier and radio equipment—

Lenkurt

provides complete instruction and maintenance information

The wise choice is made. Your Lenkurt equipment is installed. Now you have to get to know it.

To make this easy, Lenkurt provides complete, detailed information about the equipment. Questions about wiring, lining-up, operation, tests and maintenance are quickly answered. Detailed drawings and schematics leave nothing in doubt.

Here is a service that can *really* save time, money and worry. Your nearest branch of Automatic Electric will be delighted to show you such information.

Lenkurt

AUTOMATIC ELECTRIC

For complete details check No. 9 on handy card, page 35

AN OUTSTANDING CANA

Wond

FOR YOUR

The new type 90-B-20 Private Automatic Branch Exchange by Automatic Electric was designed in Canada to give business telephone subscribers a more modern, efficient and flexible branch exchange system than ever before. From the pushbutton operated attendant's cabinet and easily expandable switchboard to the individual standard desk sets, the completely "packaged" 90-B-20 system offers the latest developments in telephone technology plus several brand-new operating features!

Type 90-B-20 P-A-B-X offers greater line and trunk capacity than previous "packaged" equipment. The "packaged" feature ensures ease and economy in both installation and maintenance. Its fresh approach in concept and design should make it a top seller to your business subscribers.

For complete details check No. 10 on handy card, page 35

IAN DESIGN ACHIEVEMENT

THE AUTOMATIC ELECTRIC 90-B-20 P-A-B-X IS

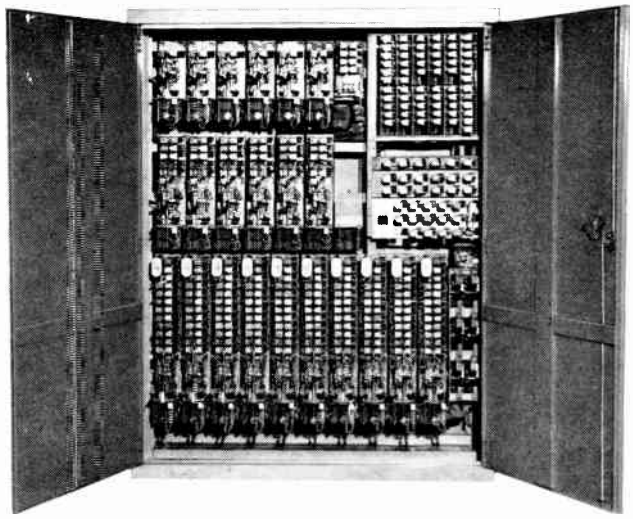
erful News

BUS NESS SUBSCRIBERS

90 LINES — 20 TRUNKS

Two switchboard units are used to provide for the full capacity of the Type 90-B-20 P-A-B-X. The first unit provides complete service for an initial installation and avoids a large investment in unused equipment. Addition of the second unit provides rapid and economical expansion to the ultimate capacity. Packaged components permit intermediate circuit quantities to meet actual requirements.

Circuits	One Unit Initial	One Unit Ultimate	Two Units Ultimate
Local Lines	30	50	90
Local Links	4	6	12
Central Office Trunks	7	10	20



SERVICES AND FEATURES AVAILABLE

Standard equipment includes: Automatic Local Service ● Trunk Service from Manual or Automatic Central Office ● Direct Dialing of Outgoing Trunk Calls from all or part of Local Stations ● Local Stations Transfer Trunk Calls by Dialing (no pushbuttons) ● Attendant Cabinet Pushbutton Operated ● Keymarker for Local Calls by Attendant ● Night Answer and Transfer of Trunk Calls by Local Stations

Optional services include: Automatic Code Call Service ● Automatic Night Service ● Conference Service ● Right-of-Way Service ● Secretarial Answering Service ● Tie Lines (to distant P-A-B-X) ● Direct Trunks to Local Lines ● Group Hunting (over Local Lines) ● and others

Automatic Electric Sales (Canada) Limited, 185 Bartley Drive, Toronto 16, Ont. Branches in Montreal, Ottawa, Brockville, Hamilton, Winnipeg, Regina, Edmonton, Vancouver.

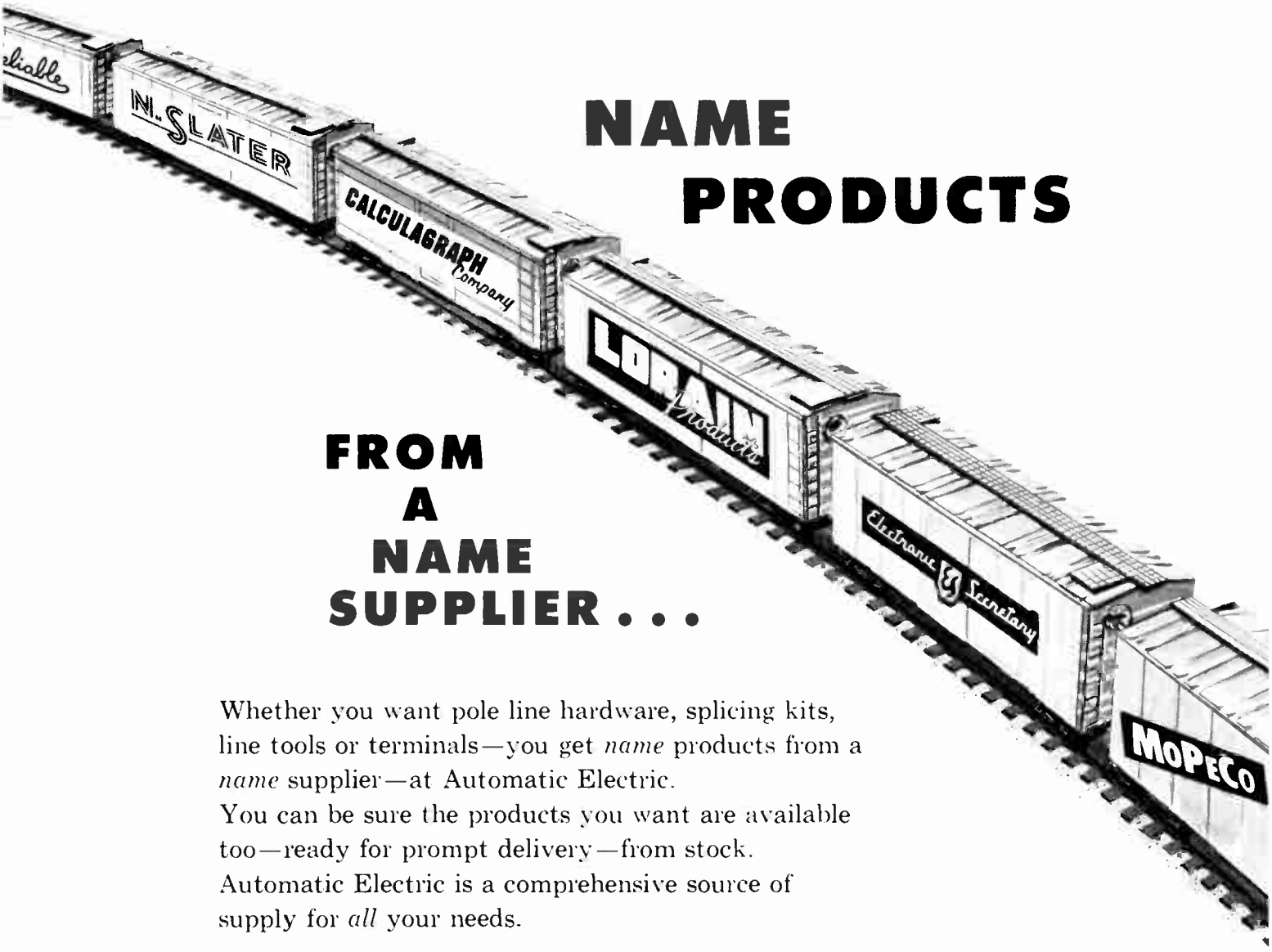
P-A-B-X speeds inside and outside communications

AUTOMATIC ELECTRIC

ORIGINATORS OF THE DIAL TELEPHONE

GENERAL SYSTEM

5945



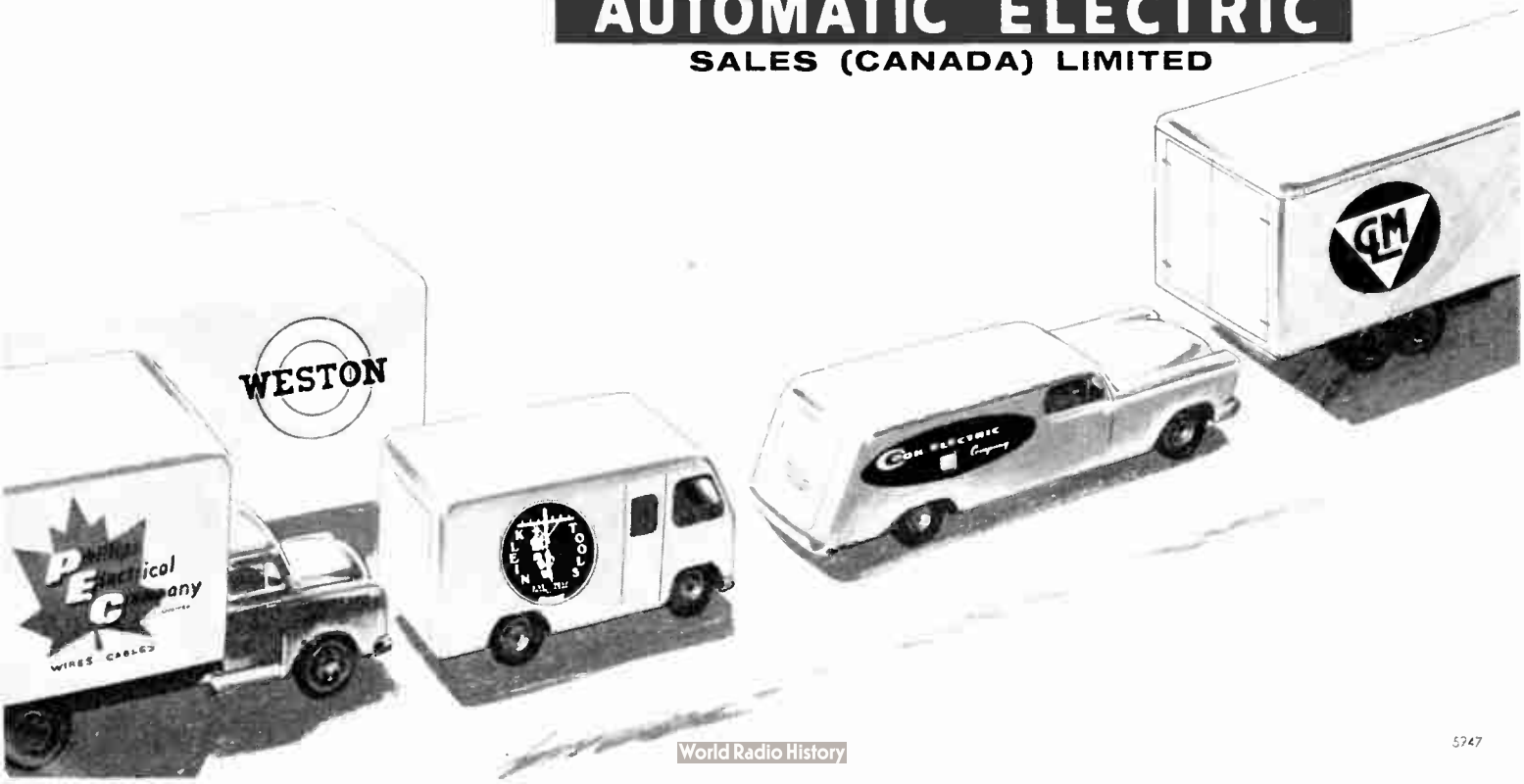
NAME PRODUCTS

FROM A NAME SUPPLIER . . .

Whether you want pole line hardware, splicing kits, line tools or terminals—you get *name* products from a *name* supplier—at Automatic Electric.
You can be sure the products you want are available too—ready for prompt delivery—from stock.
Automatic Electric is a comprehensive source of supply for *all* your needs.

Automatic Electric Sales (Canada) Limited, 185 Bartley Drive, Toronto 16, Ontario. Branches in Montreal, Ottawa, Brockville, Hamilton, Winnipeg, Regina, Edmonton, Vancouver.

AUTOMATIC ELECTRIC
SALES (CANADA) LIMITED



5747

News Report

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

Senior appointments by Croven Limited

J. R. Wolter, president of Croven Limited (formerly W. Gary Wright Electronics of Canada Ltd.), Whitby, Ont., recently announced two senior appointments made by his organization.

Robert B. Corbin has been appointed chief engineer and will direct engineering activities in the design, development and manufacture of quartz crystals and crystal ovens. Mr. Corbin brings to Croven Limited a vast knowledge of the frequency stability field, gained largely through his association for the past ten years with Motorola Inc., Communications and Electronics Division, Chicago, with whom he held the position of senior design engineer.

R. B. Corbin

D. Rambo

Doyle Rambo has been appointed as senior design engineer, Crystal Division. Mr. Rambo has had a vast experience in quartz crystal design and development obtained through his association with the James K. Knight Co., and with Motorola Inc., Chicago, Ill., Advance Circuit Section, Research Dept., with whom he was associated for the past eight years. With Croven Limited Mr. Rambo will continue to specialize in extensive research and development programs, covering all phases of quartz crystal design and manufacture.

Canadian Electronic Sales Reps elect officers

The Canadian Electronic Sales Representatives, at their annual breakfast meeting held in the Palmer House, Chicago, during the Electronic Parts Distributors Show recently held in that city, elected E. G. Hill, of Antiference (Canada) Limited, Toronto, as their chairman for the next two years.

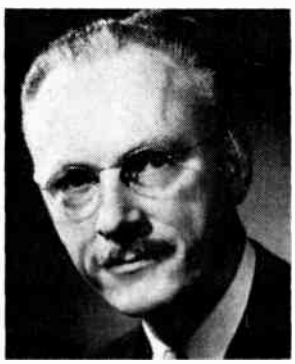
Mr. Hill was formerly secretary-treasurer of the organization and succeeds C. G. Pointon, the former chairman. Supporting Mr. Hill will be K. J. Davis, of J. R. Longstaffe Limited, Toronto, as vice-chairman, Bruce Lord, of Radio Vision Sales Limited, Calgary, as Western vice-chairman, and J. J. MacQuarrie, of Toronto, as secretary-treasurer.

A new record of attendance by Canadians was set at this year's Electronic Parts Distributors Show. The number of Canadian registrations passing through Canadian Headquarters in Room 19 of the Conrad Hilton totalled 175. This headquarters is hosted by the Canadian Electronic Sales Representatives each year, who also sponsor the annual Canadian Luncheon at which 150 were in attendance. The guest speaker on this occasion was Ron M. Robinson, Vice-President and General Manager of the Electronic Equipment & Tube Department of the Canadian General Electric Company Limited, Toronto. The luncheon was under the chairmanship of C. G. Pointon.

EXECUTIVE APPOINTMENTS BY PHILIPS

T. van Dyk

D. H. Prentice



F. H. Pounsett

D. H. Prentice has been elected vice-president, Philips Industries Limited. The appointment was announced by O. W. Rodomar, O.B.E., president, Philips Industries Limited, a division of Philips Electronics Industries Ltd. T. van Dyk has been elected executive vice-president, and F. H. Pounsett, vice-president, engineering and manufacturing (Radio and Television Division), Philips Electronics Industries Ltd. The appointment of van Dyk and Pounsett were announced by D. C. F. van Eendenburg, president.

Bakelite Company announcement

The appointment of Allan E. Scott as a technical representative for Bakelite Company, Division of Union Carbide Canada Limited, is announced by W. S. Berry, sales manager.

A. E. Scott

Mr. Scott, graduated in chemistry from McGill University in 1948. In his new position he will be located in the Montreal office of Bakelite Company and will be primarily engaged in the sale of Union Carbide Silicone products.

Executive of Collins Radio to Texas

Edwin N. Lent has been named director of manufacturing for the Texas Division of Collins Radio Company, according to a recent announcement by Max W. Burrell, vice-president and general manager of the Division.

For the past two years Mr. Lent has been director of Collins' Latin American aviation sales program. Prior to that he was director of manufacturing of Collins Radio Company of Canada, Ltd.

SALES APPOINTMENT

D. C. Ralph

J. Cartwright, sales manager for Aerovox Canada Limited, has announced the appointment of D. C. (Don) Ralph to the travelling sales staff. Don will be servicing the capacitor accounts in Southern Ontario.

CDC appoints U.S. aviation rep.

B. C. J. (Bud) Sinclair has been appointed U.S. aviation sales engineer for Computing Devices of Canada Limited, according to a recent announcement by CDC marketing director, W. S. Kendall.

Mr. Sinclair's primary sales responsibility will be the position and homing indicator.

Mr. Sinclair, a member of the CDC sales staff for the past year, has had extensive sales and engineering experience. He has held a commercial pilot's license since 1953, and is a Member of the Association of Professional Engineers of Ontario.

Canadian Westinghouse adds to directorate

The election of J. D. Campbell to the board of directors of the Canadian Westinghouse Company Limited, Hamilton, has recently been announced by G. L. Wilcox, president of the company.

Mr. Campbell is executive vice-president of the organization.

Companies conclude agreement

General Theatre Supply Company Limited and Dominion Sound Equipments Limited announce that they have concluded an agreement under the terms of which the theatre and sound system departments of the respective companies will operate, in the future, under the name of General Sound and Theatre Equipment Limited.

L. C. Pearson

The agreement between General Theatre Supply Company Limited, Dominion Sound Equipments Limited, Famous Players Canadian Corporation Limited, and Northern Electric Company Limited was completed in Toronto on May 4 and became effective on May 30.

Lloyd C. Pearson, who has been general sales manager of Dominion Sound Equipments Limited and who originally joined the Northern Electric Company Limited in 1928, has been named president and general manager of the new organization. Andrew G. Rouse will be executive vice-president. A. D. Turnbull, chief engineer and manager of theatre sales and service department for Dominion Sound, will undertake the same duties in General Sound and Theatre Equipment Limited.

International Resistance Co. agent for C. C. Meredith

The International Resistance Company Limited has been appointed exclusive sales agent for the C. C. Meredith line of military and industrial controls and replacement TV and radio controls marketed through distributors.

C. C. Meredith and International Resistance Company have been manufacturing in Canada for over 25 years and operate manufacturing plants at Streetsville, Ontario, and Toronto, Ontario, respectively. Both rank among the largest manufacturers in their particular lines of products.

This appointment in no way affects the manufacture and sale of products by either firm to manufacturers of original equipment.

Canadian firm establishes U.S. subsidiary

A significant reversal in trend in Canadian-U.S. business in the formation of a U.S. subsidiary of a parent Canadian company has been announced by Croven Limited of Whitby, Ontario.

The U.S. subsidiary, Ovenaire Inc., to be located in Charlottesville, Virginia, has been established as a manufacturing and sales outlet for the parent company's complete quartz crystal and crystal oven product lines.

J. R. Wolter, president of Croven, in a recent announcement stated that the heavy export volume to the United States prompted the formation of the new company. U.S. defense contracts, formerly not available, may now be tendered from both sources of supply. A second source of supply is also a requisite of Canadian defense and commercial contracts. All Canadian contracts will continue to be supplied from the Whitby, Ontario, palnt.

James Male, Aviation Service Manager for CDC

James Male has been appointed Aviation Service Manager for Computing Devices of Canada Limited, it was recently announced by CDC sales manager, N. C. Wilson. He will be responsible for ensuring that the growing number of customers for Bendix aviation radio and radar receive prompt efficient service when needed.

James Male

Born and educated in Scotland, Mr. Male served for 19 years as an electronics and radar technician in the RAF. He came to Canada in 1952, and until joining CDC was an Airborne Communications Project Officer with the Department of National Defense (RCAF).

U.S. electronics subsidiary locates in Toronto

A new Canadian company, Fanon Electronics of Canada Limited, has set up operations in Toronto, manufacturing a wide range of consumer and commercial electronics equipment, which was previously imported from the parent company, Fanon Electronics Industries Inc., of New York.

Initially the majority of components will be brought from the United States, but as soon as the company is underway it intends to procure materials and components locally.

Fanon is headed by Canadian-born Harold Rosen, treasurer, with president Sallo Nachtigall of the parent company also as president but in a non-active capacity.

The Toronto company is located at 431 King St. West.

Active Radio & TV Limited of Toronto remain as exclusive sales agents for Fanon.

Continued on page 32

CGE appoints specialist, distributor sales

The appointment of William J. Stead as specialist — distributor sales has been announced by Robert S. Thompson, manager — replacement sales, Electronic Tube Section, Canadian General Electric Company Limited.

W. J. Stead

Mr. Stead has held important sales responsibilities with the wholesale department of CGE in Ottawa for ten years. For the past several years he has been electronic tube specialist for the Ottawa District Office.

A native of Biggar, Saskatchewan, Mr. Stead joined CGE following wartime service with the Royal Canadian Navy.

Electron Products Co. appoint Canadian rep

Electron Products Co., 430 N. Halstead Avenue, Pasadena, California. have recently announced the appointment of Electromechanical Products, Markham Road, Agincourt, Ontario, as their Canadian representatives.

Electron Products Co. manufacture capacitors and interference filters.

PRESIDENT RETIRES

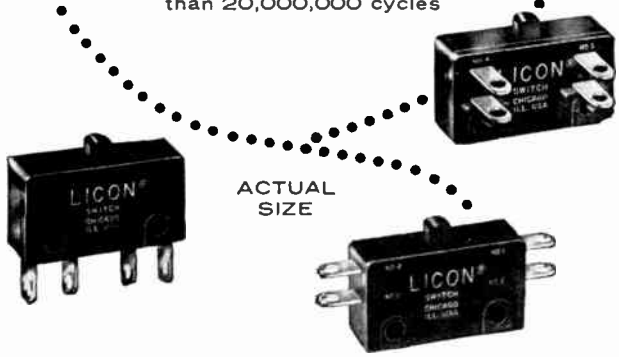
W. E. Davison

W. E. Davison recently retired as the president of Radio Valve Company Limited is shown in the above picture addressing the large number of friends and business associates on the occasion of a testimonial dinner held in his honor at the Granite Club in Toronto. Mr. Davison's retirement marked the end of a 47-year career in the electronics industry, 37 years of which were in direct association with the Radio Valve Company Limited.

You've never seen a SUB-MINIATURE switch as mighty as this

BIG switch performance in sub-miniature size

Rated 10 amps 30 V.d-c. inductive (L/R- .026). Consistently more than 20,000,000 cycles



NEW LICON® TYPE 16 SWITCH measures only 25/32" long and ¼" thick but packs quality and dependability never before achieved in sub-miniatures. With characteristics found only in much larger precision switches, the Licon Type 16 is ideal for aircraft safety applications, has performance and size vital to guided missiles. Passes Navy 1300 G shock test . . . exceptionally shock and vibration resistant even near the trip point. Its new switch mechanism with stainless steel springs avoids early fatigue and provides the advantages of double break contacts with wiping action in a wide range of movement differentials and operating forces.

WRITE FOR FREE LICON TYPE 16 SWITCH BULLETIN

Engineering data, characteristics, modifications . . . write for complete information on the new Licon Type 16 Sub-miniature Switch today.

NOW MADE IN CANADA

LICON

SWITCHES AND CONTROLS

DIVISION OF

CANADA ILLINOIS TOOLS LTD.

67 Scarsdale Road

Don Mills, Ontario

Exclusive Sales Agents

CONSTELLATION COMPONENTS LTD.

136 Tower Drive, Toronto

17041 Omega Place

St. Genevieve, Montreal

LI-A

For complete details check No. 18 on handy card, page 35

ADCOLA

(Regd. Trade Mark)

QUALITY SOLDERING EQUIPMENT

DESIGNED FOR BENCH LINE PRODUCTION AND CONTINUAL USE

•

Canadian, British & Foreign Pats., Reg. Designs

•

Instrument List No. 64 3/16" Bit. Also available in 1/8" and 1/4" tip.

Adcola Instruments operate at correct soldering temperatures which ensures permanent and quality joints.

•

ALL VOLTAGES SUPPLIED

•

SALES AND SERVICE

L. J. LAMB

Box 103

Weston, Ont.

CH. 1-5830

For complete details check No. 1 on handy card, page 35

BOWMAR

PRECISION COUNTING DEVICES

MINIATURE DECIMAL COUNTER 2416

Decimol indicotions from 000 to 999 with return to 000. Reversible and continuous rotation. Speed: 1500 rpm max. int., 500 rpm cont. Torque: .2 in.-oz. at 20°C. Wgt.: .5 oz. Specifications are typicol, and may be changed to suit requirements.

Bowmar designs and produces precision counting devices of all types and in all quantities to customer specifications. Miniature size, unusual configurations, light weight and high speed operation are features most often designed into Bowmar counters. Applications, although unlimited, generally include navigational, fire control, missile tracking and computing systems.

SEND FOR NEWEST HANDBOOK PAGES AND NAME OF NEAREST BOWMAR REPRESENTATIVE

Precision Miniature Speed Reducers and Gearheads

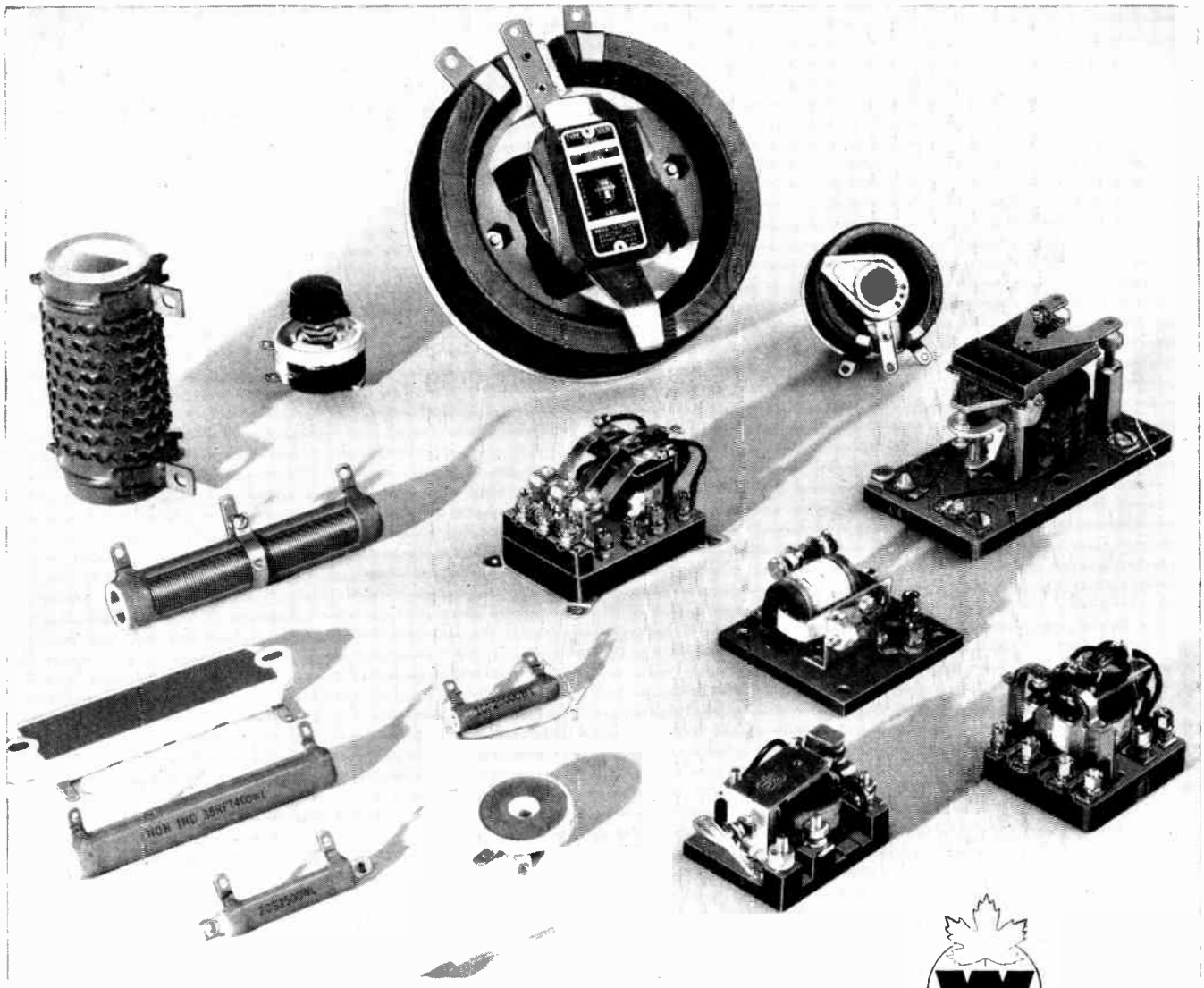
Precision Servo Packages

AEROMOTIVE ENGINEERING PRODUCTS LTD.

Montreal: 147 Hymus Blvd., Pointe Claire, Que. OX. 7-0810

Toronto: 1912A Avenue Road • RU 3-4288

For complete details check No. 2 on handy card, page 35



Design made easy with reliable *stock*

RESISTORS, RELAYS, RHEOSTATS

Want to know how? These data-packed bulletins and catalogs will show you.

RESISTORS — you'll find the widest selection of stock power resistors ever offered by any manufacturer in Ward Leonard Catalogue 215.

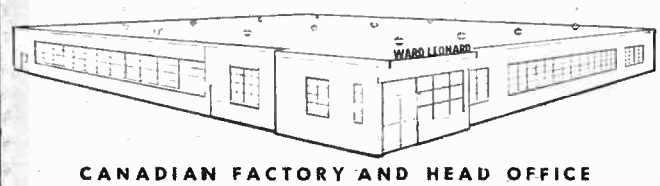
RELAYS — long, trouble-free life under the most adverse conditions is the big plus the system designer gets with the a-c and the d-c relays described in Ward Leonard's relay catalogue.

RHEOSTATS — complete application data on smooth-acting 25- to 300-watt Vitrom ring rheostats is contained in Ward Leonard Bulletin 60RR.

Write for this helpful literature. Order the reliable Ward Leonard RESISTORS, RELAYS and RHEOSTATS for immediate shipment — or pickup!

5906

WARD LEONARD
OF CANADA LIMITED
1070 BIRCHMOUNT ROAD TORONTO 16



CANADIAN FACTORY AND HEAD OFFICE

Resistors • Rheostats • Relays • Motor Controls • Dimmers • Loadbanks • SAFT Batteries • Barkelew Switches • Kenco Pumps

For complete details check No. 42 on handy card, page 35

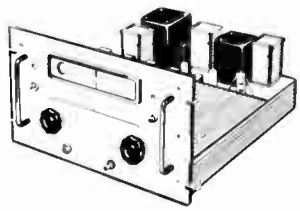
A.W.A ELECTRONICS

New concepts in electronics have been developed at AWA, as a result of experience with missile systems. Now they have a wider application. Here are some of the new AWA devices now available to industry.

U.H.F. RECEIVER

Designed as a Wide Band Low Noise Receiver for the 420-470 Mc/s Frequency Band. Available as either a 19" rack mounted unit c/w Stabilised Power Unit, or in an 8" Case with separate Power Unit. Basic arrangement consists of R.F. Amplifier, Mixer, Local Oscillator I.F. Amplifier (A.G.C. Controlled) Cathode Follower Output Stage. Wide variations of this Receiver can be supplied to customers' own requirements.

Standard Specification: Frequency Range: 420-470 Mc/s; Bandwidth: 4.5 Mc/s; Noise Factor: 10db (approx.); Intermediate Frequency: 45 Mc/s; Sensitivity: 25 MicroV. for a 12 db signal to noise ratio; R.F. Gain: 12 db; I.F. Gain: 80 db; Image Rejection: 40 db; Input Impedance: 75 ohms (approx.) Unbalanced; Output Impedance: 80 ohms (approx.); Outputs: (a) 0.5v from Crystal Detector, (b) 300 mV at 45 Mc/s.

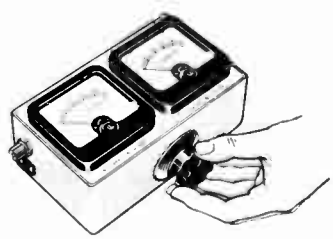


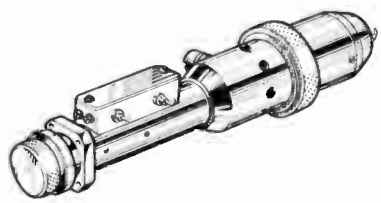
DIRECTIONAL COUPLER

Of the "Loop" type, suitable for measurements of R.F. power and Standing Wave Ratio in coaxial cables. Directional properties are largely unaffected by frequency changes, so coupler may be used to help obtain optimum termination for a 52 ohm coaxial system up to 600 Mc/s.

72 ohm version of this instrument is also available.

Standard Specification: Case Size: 7" x 4" x 2½"; Weight: 4 lbs. 3 ozs.; Power Measurement: low range 1w c/w max., high range 5w c/w max.; Accuracy (at frequency of calibration): low range 0.1 dbs, high range 0.2 dbs; Directivity: 26 dbs (approx.); Coupling Coefficient: 30 dbs (approx.).





PRECISION OSCILLATOR

The Oscillator has been designed round a disc sealed triode and particular attention has been paid to ensure good frequency stability. This has been achieved by the use of selected materials and concentric sleeve tuning. The latter in conjunction with Micrometer head tuning giving very good resolution. In order to reduce R.F. losses all cavities and lines are silver plated, polished, and rhodium flashed.

The Oscillator can be supplied in the form illustrated for installation in the customers' own equipment, or as a unit complete with its own stabilised power supply mounted on a 19" panel.

Standard Specification: Frequency: Adjustable to operate in the 450-550 Mc/s band. Actual Tuning Range in this band is approx. 30 Mc/s; Frequency Stability: Better than 1 part in 10^4 (long term); Input: 300v at 30 mA, 6.3v at 0.4A; Power Output: Max. output 1.25w at 470 Mc/s.

All devices are adaptable to suit customers' own requirements. For further information consult:

COMMERCIAL ELECTRONICS DEPT.

SIR W. G. ARMSTRONG WHITWORTH AIRCRAFT LTD., Bagington, Coventry, England.

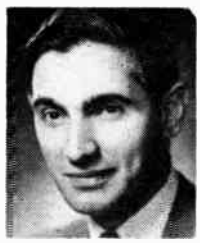
MEMBER OF THE HAWKER SIDDELEY GROUP

For complete details check No. 7 on handy card, page 55

New Collins Canada appointments

J. P. Giacoletto, vice-president and general manager of Collins Radio Company of Canada Ltd. has announced the appointment of Frederick W. Preziosi as chief engineer, Robert W. Hipwell as director of materiel and Lorne O. Lawler, as purchasing agent.

Mr. Preziosi joined Collins Canada in June 1955. He has been engaged since that time as senior project engineer on the ARC-552 UHF Airborne Transceiver being produced for the RCAF. After graduating from McGill University, he joined Standard Telephones and Cables (Canada) where he was employed in development of Communications equipment. He is a member of the Institute of Radio Engineers and of the Association of Professional Engineers of Ontario.



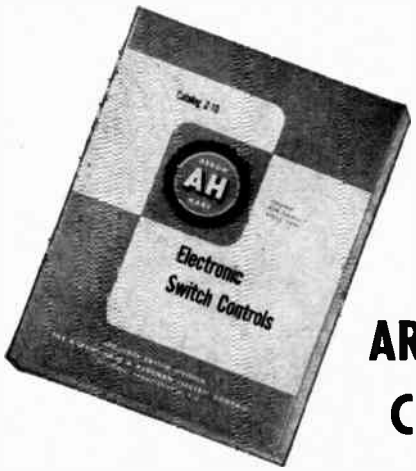
F. W. Preziosi

L. O. Lawler

R. W. Hipwell

Mr. Hipwell joined Collins Canada in January 1956. Since 1956 he has worked in the Industrial Relations and Tariff departments, and more recently as purchasing agent. In 1944 he was graduated from the University of Toronto and was commissioned in the Royal Corps of Signals. Following the war he was employed as industrial engineer with J. D. Woods and Gordon, Galt Metal Industries and the Toronto Industrial Commission. He is a member of the Association of Professional Engineers of Ontario.

Mr. Lawler joined Collins Canada in July 1955 and has held various appointments in the purchasing department. He was graduated in 1937 from the Radio College of Canada and, prior to joining Collins, was employed from 1949 by Canadian General Electric as a buyer in the electronic department. During the war he was active in the engineering department of Research Enterprises Limited and in the National Research Council in Ottawa where he was assigned to Radar Projects.



NEW ARROW-HART CATALOGUE

of Electronic Switch Controls (No. Z-10)

for electronic, radio, appliance, motor and military applications.

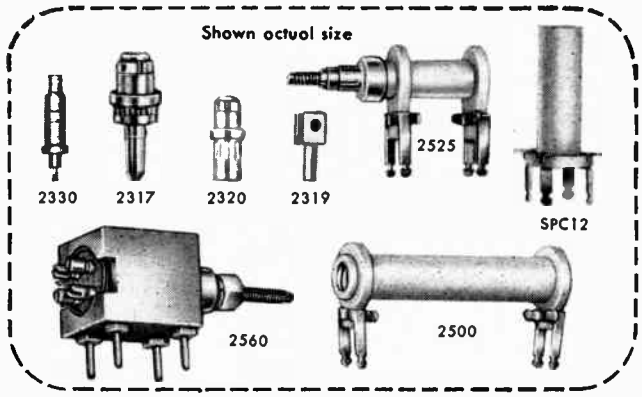
SEND FOR *YOUR* FREE COPY NOW!

ARROW-HART & HEGEMAN (CANADA) LIMITED
Industry Street, Toronto 15, Ontario. Phone RO. 2-1101
7365 Mountain Sights, Montreal, Quebec.

Representatives: Cochrane Stephenson (Western) Ltd., Winnipeg, Calgary, Edmonton, Vancouver • George C. Robinson, Saint John, N.B.

QUALITY MOTOR CONTROLS • WIRING DEVICES • APPLIANCE SWITCHES
5905

For complete details check No. 8 on handy card, page 35

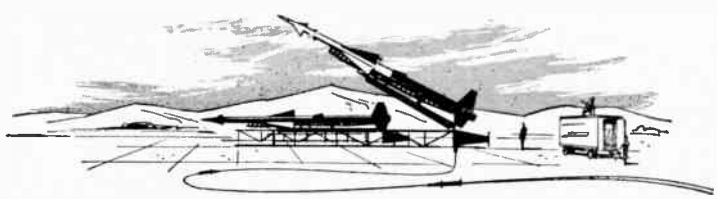


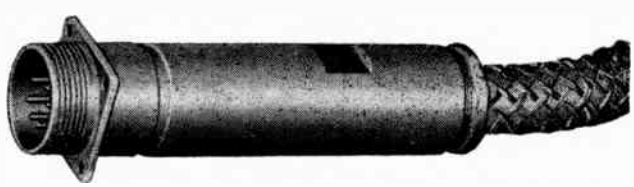
Printed Circuits take a beating!

But CAMBION® Printed Circuit Components are built to withstand the constant shock and vibration so common in today's electronic equipments. From printed circuit connectors to shielded coil forms, they're made from finest quality materials . . . processed and tested under thorough quality control methods . . . *unconditionally quality guaranteed.*

Available in a wide range of coil forms (shielded, ceramic, phenolic), solder and insulated terminals, plugs and jacks, diode clips, and other components. Use them to build stamina into your product. CAMBION Tools speed assembly and mounting. For details, write Cambridge Thermionic of Canada Limited, 2425 Grand Boulevard, Montreal 28, P.Q.

For complete details check No. 17 on handy card, page 35





Why it pays you to specify

Bendix QWL Electrical Connectors for use with Multi-conductor Cable

For use with multi-conductor cable on missile launching, ground radar, and other equipment, the Bendix* QWL Electrical Connector meets the highest standards of design and performance.

A heavy-duty waterproof power and control connector, the QWL Series provides outstanding features: • The strength of machined bar stock aluminum with shock resistance and pressurization of resilient inserts. • The fast mating and disconnecting of a modified double stub thread. • The resistance to loosening under vibration provided by special tapered cross-section thread design. (Easily hand cleaned when contaminated with mud or sand.) • The outstanding resistance to corrosion and abrasion of an aluminum surface with the case hardening effect of Alumilite 225 anodic finish. • The firm anchoring of cable and effective waterproofing provided by the cable-compressing gland used within the cable accessory. • The watertight connector assembly assured by neoprene sealing gaskets. • The additional cable locking produced by a cable accessory designed to accommodate a Kellems stainless steel wire strain relief grip. • Prevention of inadvertent loosening insured by a left-hand accessory thread. • The high current capacity and low voltage drop of high-grade copper alloy contacts. Contact sizes 16 and 12 are closed entry design.

These are a few of the reasons it will pay you to specify the Bendix QWL electrical connector for the job that requires exceptional performance over long periods of time. *TRADEMARK

Canadian Affiliate: Aviation Electric Ltd., 200 Laurentien Blvd., Montreal 9, Quebec.

Scintilla Division
Sidney, New York

Bendix AVIATION CORPORATION

For complete details check No. 15 on handy card, page 35

CALMAG represented in B.C. by James J. Backer Co.

The CALMAG division of California Magnetic Control Corporation, North Hollywood, has appointed the James J. Backer Company of Seattle, Washington, as its field representative organization in the Pacific Northwest area. Included in this territory is British Columbia.

Northern Electric Co. host to London visitors

A group of leading citizens from London, Ontario, visited Montreal on May 27 and 28 as guests of Northern Electric Company Limited. Those participating in the tour included Hon. J. P. Robarts, Minister without portfolio in the Ontario Legislature, G. Ernest Jackson, M.L.A., G. E. Halpenny, M.P., the Mayor of London, J. Allan Johnston, a number of the city aldermen, the dean of the School of Business Administration of the University of Western Ontario, and representatives of all sections of professional and business life in the London area.

Shown above is the Mayor of London, J. Allan Johnston, watching the manufacture of telephone sets at Northern Electric's Shearer Street plant in Montreal.

General Radio equipment exhibitions

The General Radio Company of West Concord, Massachusetts, whose Canadian office is situated at 99 Floral Parkway, Toronto 15, Ontario, recently despatched a traveling exhibit of newest instruments and equipment to Toronto and Montreal. The Toronto show was held at the Seaway Hotel on Saturday, May 16, and the Montreal exhibit was staged in the Capri Hotel on Sunday, May 24.

OPPORTUNITIES

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

There is absolutely **no charge** for "positions desired" advts.

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

POSITIONS WANTED

ELECTRONICS SALES ENGINEER

or Physicist with broad technical background in electronic instrumentation. Sales personality important. Unusual advancement opportunities. Reply in strict confidence.

Box 5013
Electronics and Communications
450 Alliance Avenue, Toronto 9, Ont.

ELECTRONICS TEACHER

Desires position with Canadian concern. Twenty years' experience. City and Guilds of London Institute Certificates etc. Experienced in programming and planning technical instruction in Basic Electronics, Pulse Techniques, Microwave, Radar Systems, Computors, Communication Systems, Maths, Physics, etc. Also experienced in industrial design and development work. Prepared to travel if necessary.

Box 5014
Electronics and Communications
450 Alliance Avenue, Toronto 9, Ont.

ELECTRONICS TECHNICIAN

seeks employment in the communications field. Experience includes seven years teaching communications and radar principles. One year recently spent in multi-channel microwave communications.

Box 5016
Electronics and Communications
450 Alliance Avenue, Toronto 9, Ont.

ITEMS FOR SALE

TELETYPE EQUIPMENT

Models 14, 15, 19, etc., prompt delivery ex stock at lowest prices. List on request.

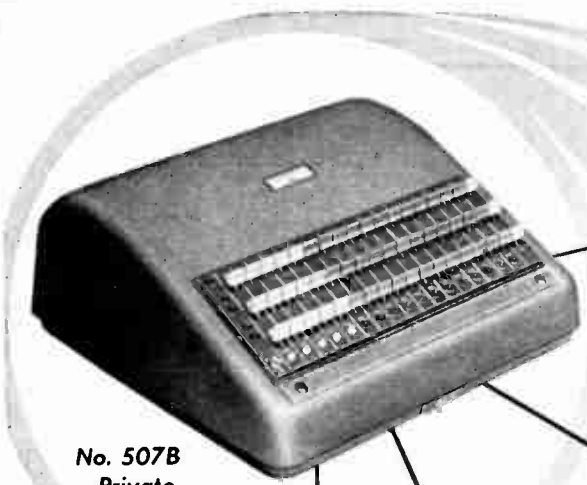
Suplex Lamps Ltd.
239 High Holborn
London, W.C. 1, England

OPPORTUNITIES

SALES REPRESENTATIVE

in Toronto and district wanted for established company. Must be familiar with all phases of electronic instrumentation. Late model car necessary. Remuneration includes salary, expenses, commission, fringe benefits as well as opportunity to invest in growing company. Reply in first letter, giving all details of qualifications and salary expected. All replies held strictly confidential.

Box 5012
Electronics and Communications
450 Alliance Avenue, Toronto 9, Ont.



No. 507B
Private
Branch Exchange

modern compact efficient

Photo—courtesy of
The T. Eaton Co.

Photo—courtesy of
National Life Assurance Co. Ltd.

Photo—courtesy of
Jaeger Co. Ltd.

Photo—courtesy of
Hyde & Ahearn.

finished in neutral beige-gray colour with a fine wrinkle texture, the No. 507B P.B.X. will blend with the most modern office equipment. It is particularly adapted to operation by those who have other duties to perform in addition to switchboard attendance. The specially contoured keyhandles and smoothly working keys make this board a pleasure to operate.

Provides terminating equipment for 12 Station Lines and 5 Central Office Trunks and permits 5 Simultaneous Conversations.

Operation is from 24 or 48 volt battery with manual or dial telephone.

Northern Electric

COMPANY LIMITED

44 BRANCHES THROUGHOUT CANADA

2054-2

For complete details check No. 33 on handy card, page 35

editorial

For whom the tax (15%) tolls

R. M. Robinson, vice-president and general manager of the Electronic Equipment and Tube Department of the Canadian General Electric Company Limited, told a recent gathering of Canadians on the occasion of the Electronics Parts Show held in Chicago that the Canadian electronics industry had slumped over $60 million annually during each of the past two years from the peak of $560 million reached in 1955.

The effect of this slackening in the industry is reflected in two million square feet of factory space hitherto occupied by some type of electronic manufacturing, but which now stands vacant, and some two thousand workers formerly occupied in the electronics industry who are now on the labor market.

Mr. Robinson pointed out that while these conditions obtain in the domestic industry, approximately 30 per cent of all radios sold in Canada in 1958 were made in Japan, and estimated that for 1959 close to 50 per cent of all radios sold in Canada will be of Japanese origin.

While the manufacture of radios does not by any means constitute the entire activity of the Canadian electronics industry, it does nevertheless represent a sizable portion of it. Based on figures issued by the Canadian Electronic Industries Association, there were 574,490 radios sold in Canada in 1958 with a retail value of $40 million. If, as pointed out by Mr. Robinson, Japanese manufacturers have captured 30 per cent of this market, it means that they have managed to take a bite of no less than $12 million out of Canadian manufacturers' pockets. If Mr. Robinson's prediction for 1959 comes true, it means that this bite will have increased to $20 million.

Although $20 million represents only 4 per cent of the total annual sales volume of the Canadian electronics industry, it looms as a more significant amount when it is considered that it is being sliced from one section of the industry alone — the radio manufacturing segment of the industry.

Despite these statistics, no one in the Canadian electronics industry has so far commenced to shout excitedly for unreasonable protectionist legislation. As Mr. Robinson pointed out:

> ". . . The Canadian government should not be expected to solve the situation alone. Industry must also accept its share of responsibility in selling its goods in foreign markets, but Canadian industry should have the assistance of long-term financing for expansion with low interest rates, income tax relief for export shipments, a favorable attitude toward mergers for increased production economies, a strong Buy-Canadian policy in foreign loan arrangements and much harder bargaining at international conferences."

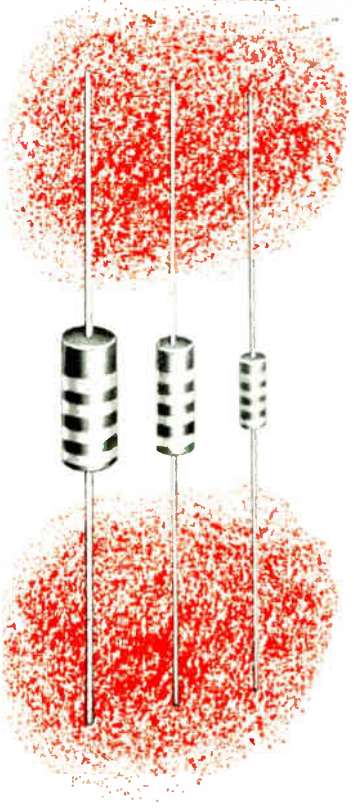
It is interesting to note further from Mr. Robinson's remarks that "despite the general agreement on tariff and trade, other nations are taking firm action to promote their industry both at home and abroad. Exchange controls, quotas, preferential taxation on exports, interest-free loans and so on are all tools being used to protect and build up industry in almost every country but ours."

In the matter of the increasing sales of foreign made radios on the Canadian market, it is obvious that one of the most aggravating factors militating against domestic producers is the cheap labor conditions which prevail in the Japanese and European economies, an end price determining factor that is never likely to be matched by Canadian radio manufacturers. In view of this seemingly unbeatable obstacle it is surely reasonable to expect that Canadian government authorities, if at all interested in preserving a vital segment of the Canadian electronics industry, would do all in their power to compensate for this condition and thereby place the Canadian radio industry in a more favorable competitive position with foreign exporters.

A first step in this direction could be a good long, soul-searching analysis on the part of federal taxation authorities in Ottawa with respect to the fairness of a 15 per cent excise tax on Canadian-made radios, levied, we understand, as means of subsidizing the CBC — mainly we presume CBC-TV.

If, in the interest of maintaining Canadian purism in our television fare the government finds it necessary to operate our television system largely as a public service, rather than by private endeavor, then it seems ironical that the Canadian radio industry should be burdened with a 15 per cent excise tax in order to pay the piper on behalf of Canadian culture, especially at a time when the lower end price of imported merchandise on the Canadian market is cutting deeply into the welfare of those engaged in the Canadian radio manufacturing industry.

While most Canadians would undoubtedly agree with the principle of preserving a healthy content of Canadianism in our television programs, even to the extent of having our television system operated as a public service, it is doubtful that they would agree with a taxation principle that is helping to bring this Canadianism to them via an increasing number of radios made in Berlin, Tokyo and points east.



how many Resistors have you soldered recently?

It's no trick today to obtain resistors that give everything you need in the way of conventional characteristics such as load life, resistance-temperature, temperature cycling, and so on.

But what a whale of a difference when it comes to "solderability"! Try the different makes for yourself and see. Whether you solder by hand or by automatic dipping, you'll find that Stackpole Coldite 70+ resistors solder lots better, lots faster and lots more surely.

Just hit 'em with solder and they stay soldered—because they're the only resistors whose leads get an extra final solder dip *in addition* to the usual tin-lead coating. You get faster production, fewer rejected assemblies. And there's less chance of trouble developing after your products reach the field.

COMPARE THESE "SPECS"! — Write for Stackpole Resistor Bulletin giving complete scorecard for Coldite 70+ (cold-molded) resistors in relation to MIL as well as commercial specifications. And remember that they give you unmatched solderability in the bargain—at no extra cost!

CANADIAN STACKPOLE LTD., *550 Evans Ave., Toronto 14, Ont.*

Ceramag® ferromagnetic cores • Slide and Snap switches • Variable composition resistors Ceramagnet® ceramic magnets • Fixed composition capacitors • Electrical contacts Brushes for all rotating electrical equipment Hundred of related carbon, graphite, and metal powder products.

STACKPOLE
Coldite 70+®
fixed composition resistors

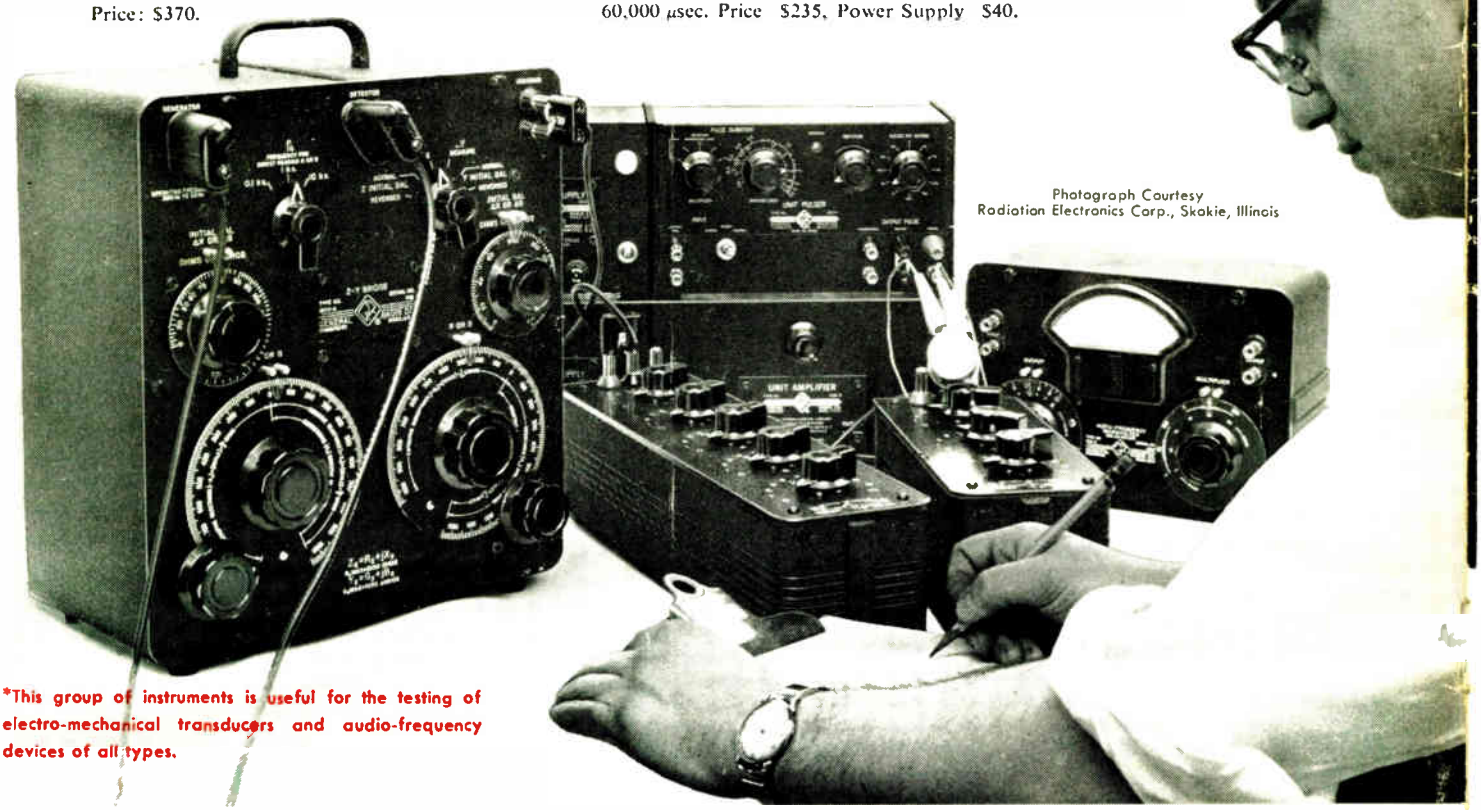
For complete details check No. 21 on handy card, page 35

The Team Approach*

Infrared systems and other modern-day electronic equipment use many special-purpose transformers having unusual electrical requirements. For example, the small cylindrical transformer shown connected to the decade box was designed by Radiation Electronics Corporation to operate at a primary signal level of 10^{-8} volts. Its primary and secondary impedances are 5 and 50,000 ohms respectively (dc resistance of primary only 0.6 ohm). Bandpass is from 12 cps to 45 kc. To measure these transformer characteristics, a test setup composed of the following G-R instruments is used:

1603-A Z-Y BRIDGE (at left) measures transformer impedances in terms of quadrature components at various frequencies and signal levels (transformer input voltage is varied by simply changing the bridge input). This Bridge can be balanced for *any* impedance from short circuit to open circuit, real or imaginary, positive or negative, over the entire audio-frequency range. Basic accuracy is 1%. Price: $370.

1217-A UNIT PULSER (upper center) provides a means for measuring low-frequency response to better than 0.3 cps — well below the range of conventional audio oscillators. Long-duration pulses are fed to the transformer under test, and low-frequency cutoff is determined by the measurement of the resulting pulse droop. Unit Pulser repetition rate 15c to 100 kc; pulse duration 0.2 μsec to 60,000 μsec. Price $235. Power Supply $40.



Photograph Courtesy
Radiation Electronics Corp., Skokie, Illinois

*This group of instruments is useful for the testing of electro-mechanical transducers and audio-frequency devices of all types.

1206-B UNIT AMPLIFIER (beneath Pulser) an ideal general-purpose amplifier — 3-watt output from 20c to 50 kc, 1.5 watts from 10c to 100 kc — less than 1% harmonic distortion. Price $85; Power Supply $40.

1432 DECADE RESISTANCE BOXES provide primary and secondary loads for the transformer under test. Decade Boxes are available in 10 different models in 0.1-Ω steps to 1000-Ω steps, total resistances from 111Ω to 1,111,100Ω. Prices range from $68 to $143.

546-C MICROVOLTER (extreme right) measures transformer gain and usefulness at very low signal levels. Used with an oscillator, the Microvolter supplies small, accurately-known voltages from 0.5 μv to 1.0v open circuit. Basic accuracy is 3%. Price: $140.

Write For Complete Information

GENERAL RADIO COMPANY

Canadian Engineering Office in TORONTO

99 Floral Parkway, Toronto 15, Ontario
Arthur Kingsnorth • Richard J. Provan
Tel.: CHerry 6-2171

Repair Service: Bayley Engineering Ltd., Ajax, Ontario

For complete details check No. 27 on handy card, page 35