New Ideas
For Modern Management

Addenda To Electronics And Communications 1955 Directory . . . 3

Automation Moves Into The Electronics Industry — Cuts Costs — Speeds Production . . . . . 29

Radio Aids To Air Navigation In Canada Holds Promise Of Orders For Canadian Manufacturers . . . 36

New Manufacturing Technique Lowers Cost Of Producing Long-Playing Records . . . . . . 38

Single-Chamber Roll Vacuum Metallizer Speeds Component Manufacture . . . . . . 38

Close-up view of one of the microwave antenna in the Buffalo-Toronto link of the Bell Telephone Company's microwave transmission system. The antenna weighs nearly one and one-half tons and is ten feet square.

Circulation Of This Issue
Over 10,200 Copies

Nov.-Dec. 1955 ★ $5.00 a year
An AGE Publication, Toronto, Canada
THE PROBLEM

1. Termination of the concentric within a diameter of .24 inches.
2. POLARIZED orientation of terminals.
3. Terminations to withstand Voltages ranging from 15 to 550 volts A.C. and an insulation resistance of over 10,000 Megohms between pin to pin and pin to ground.
4. Terminals to be tubulations for No. 25 wire.
5. Header to be VACUUM TIGHT.

THE SOLUTION

Connector for vacuum tight enclosure.

Double size.

THE CONCLUSION

This HEADER challenged each of the various processes in the manufacture of HERMETIC SEALS, i.e: glass making, controlled atmosphere and temperature and timing equipment. Our engineers were presented this problem and within a few weeks this Header was delivered.

This HEADER is the first of its kind in Canada — the first of its kind anywhere in the world.

THE CUSTOMER     RCA VICTOR CO., LTD.

Write us today telling us of your problems and you can be assured of an immediate reply and solution.

45 Hollinger Road
East York, Toronto, Ontario

For further data on advertised products use page 99.
Due to the flexible and active state of the Canadian electronics industry, the publishers of Electronics and Communications have found it necessary to compile this addenda to the 1955 Directory issue in order to bring this reference issue fully up to date.

Buyers’ Guide Of Electronic And Communications Equipment

☆ Addenda To 1955 Directory ☆

AMMETERS
Measurement Engineering Ltd.
John Herring & Co. Ltd.
Aviation Electric Ltd.
Associated Electronic Components

AMPLIFIERS (Audio Frequency)
Measurement Engineering Ltd.
Aviation Electric Ltd.
Canadian Aviation Electronics Ltd.
Canadian General Electric Co. Ltd.
(Electronic Equipment & Tube Dept.)
Radio Engineering Products Ltd.
(Canada) Ltd.

AMPLIFIERS (Decade)
Measurement Engineering Ltd.

AMPLIFIERS (Magnetic)
Measurement Engineering Ltd.
Magnet Inc.
The Glendon Co. Ltd.
Aviation Electric Ltd.
Data Processing Association Ltd.

AMPLIFIERS (Musical)
(Canada) Ltd.

AMPLIFIERS (Power)
Measurement Engineering Ltd.
Aviation Electric Ltd.
Canadian Aviation Electronics Ltd.
(Canada) Ltd.

AMPLIFIERS (Television)
Canadian Aviation Electric Co. Ltd.
(Electronic Equipment & Tube Dept.)
(Canada) Ltd.

AMPLIFIERS (Wideband)
Measurement Engineering Ltd.
Canadian Aviation Electronics Ltd.
(Canada) Ltd.

ANALYZERS (Audio)
Canadian Aviation Electric Co. Ltd.
(Electronic Equipment & Tube Dept.)

ANALYZERS (Frequency)
Canadian General Electric Co. Ltd.
Canadian Marconi Co.

ANALYZERS (Magnetic)
Measurement Engineering Ltd.

ANALYZERS (Video)
Measurement Engineering Ltd.

ANTENNA SYSTMS
Measurement Engineering Ltd.
Aviation Electric Ltd.
Canadian Aviation Electronics Ltd.
Canadian General Electric Co. Ltd.
(Electronic Equipment & Tube Dept.)
Canadian Marconi Co.
Standard Telephones & Cables Co.
(Canada) Ltd.
Sinclair Radio Labs. Inc.
Andrew Antenna Corp. Ltd.

ANTENNAS PEDESTALS
(Canada) Ltd.

ANTENNA REFLECTORS
Aviation Electric Ltd.
Canadian Aviation Electronics Ltd.
Canadian General Electric Co. Ltd.
(Electronic Equipment & Tube Dept.)
Sinclair Radio Labs. Inc.
Andrew Antenna Corp. Ltd.

ANTENNA ROTATORS
Aviation Electric Ltd.
Canadian Aviation Electronics Ltd.

ANTENNA TOWERS
Aviation Electric Ltd.
Canadian General Electric Co. Ltd.
(Electronic Equipment & Tube Dept.)
Sinclair Radio Labs. Inc.

ANTENNAS AIRBORNE
Measurement Engineering Ltd.
Aviation Electric Ltd.
Canadian Aviation Electronics Ltd.
Canadian Marconi Company
(Canada) Ltd.
Andrew Antenna Corporation Ltd.

ANTENNAS (Broadcast)
Canadian Aviation Electronics Ltd.
Canadian General Electric Co. Ltd.
(Electronic Equipment & Tube Dept.)
Sinclair Radio Labs. Inc.
Andrew Antenna Corp. Ltd.

ANTENNAS (Directional)
Measurement Engineering Ltd.
Canadian Aviation Electronics Ltd.
Canadian General Electric Co. Ltd.
(Electronic Equipment & Tube Dept.)
Sinclair Radio Labs. Inc.
Andrew Antenna Corp. Ltd.

ANTENNAS (Marine)
Measurement Engineering Ltd.
Aviation Electric Ltd.
Canadian General Electric Co. Ltd.
Canadian Marconi Co.
(Canada) Ltd.
Andrew Antenna Corp. Ltd.

ANTENNAS (Railroad)
Aviation Electric Ltd.
Andrew Antenna Corporation Ltd.

ANTENNAS (Television)
Canadian Aviation Electronics Ltd.
Canadian General Electric Co. Ltd.
(Electronic Equipment & Tube Dept.)
Canadian Marconi Company
(Canada) Ltd.

BAMFLEES (Speaker)
Measurement Engineering Ltd.
Associated Electronic Components

BAMFLEES (Speaker) (Theater)
Ampex Corporation.

BATTERIES (Storage)
Canadian Aviation Electronics Ltd.

BEACONS
Measurement Engineering Ltd.
Aviation Electric Ltd.
Canadian Aviation Electronics Ltd.
Canadian Marconi Company
(Canada) Ltd.

BEARING (Jewel)
John Herring & Company Limited

BLOWERS
John Herring & Company Limited

BOOMS (Microphone)
Canadian General Electric Co. Ltd.
(Electronic Equipment & Tube Dept.)
Canadian Marconi Company

BRIDGES (Capacitance)
Measurement Engineering Ltd.
Canadian Marconi Company
John Herring & Company Limited
(Canada) Ltd.

BRIDGES (Electrical)
Measurement Engineering Ltd.
Canadian Marconi Company
John Herring & Company Limited
(Canada) Ltd.

BRIDGES (Inductance)
Measurement Engineering Ltd.
Canadian Marconi Company
John Herring & Company Limited

BROADCAST EQUIPMENT
Measurement Engineering Ltd.
Canadian Aviation Electronics Ltd.
Canadian General Electric Co. Ltd.
(Electronic Equipment & Tube Dept.)
Canadian Marconi Company
(Canada) Ltd.

CABINETS
Measurement Engineering Ltd.
Canadian Aviation Electronics Ltd.
Canadian General Electric Co. Ltd.
(Electronic Equipment & Tube Dept.)

CABLE
The Glendon Co. Ltd.
Canadian General Electric Co. Ltd.
Canadian Marconi Company
(Canada) Ltd.

CABLE CLAMPS
Aviation Electric Ltd.
Canadian General Electric Co. Ltd.
(Electronic Equipment & Tube Dept.)
| Capacitance | Measurement Engineering Ltd. | Canadian Marconi Company |
| Resistance | Measurement Engineering Ltd. | Canadian Marconi Company |
| Capacitance | Measurement Engineering Ltd. | Canadian Marconi Company |
| Germanium | Measurement Engineering Ltd. | Canadian Marconi Company |
| Memory, Magnetic, Recording | Measurement Engineering Ltd. | Canadian Marconi Company |
| | Canadian General Electric Co. Ltd. | Electronic Equipment & Tube Dept. |
| | Electrical Components | Aviation Electric Limited |
| | (Electronic Equipment & Tube Dept.) | Canadian General Electric Co. Ltd. |
| | (Electronic Equipment & Tube Dept.) | Canadian Marconi Company |
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| | (Electronic Equipment & Tube Dept.) | Canadian Marconi Company |
Addenda To 1955 Directory Issue Of
Canadian Electronic And Communication Equipment Suppliers
With Listing Of American and Foreign Principals

Aviation Electric Ltd., 200 Laurentian Blvd.
Bendix Avionics Ltd., 3000 Henry St., New York, N.Y.
Bendix Aviation Corp., 1250 3rd Ave., New York, N.Y.
Bendix Aviation Ltd., 700 Trans Canada Hwy., Toronto, Ont.

Bendix Avionics Ltd., 3000 Henry St., New York, N.Y.
Bendix Aviation Corp., 1250 3rd Ave., New York, N.Y.
Bendix Aviation Ltd., 700 Trans Canada Hwy., Toronto, Ont.

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Bendix Aviation Ltd., 700 Trans Canada Hwy., Toronto, Ont.

Bendix Avionics Ltd., 3000 Henry St., New York, N.Y.
Bendix Aviation Corp., 1250 3rd Ave., New York, N.Y.
Bendix Aviation Ltd., 700 Trans Canada Hwy., Toronto, Ont.
Texas Instruments Marks Full Year As Lone Silicon Transistor Manufacturer, Ups Line From 5 to 7 Types

Marking a full year as the exclusive commercial producer of transistors made from silicon, Texas Instruments Incorporated has announced further expansion of its line from five to seven types of n-p-n grown junction silicon transistors. During the year, TI has voluntarily reduced prices twice — once by 25 per cent — to encourage the application of silicon transistors.

Texas Instruments silicon transistors have found wide application in airborne military and complex commercial electronic equipment. Since commercial introduction in May of 1954, steadily increasing production has allowed TI to broaden its line three times.

Many manufacturers — including Texas Instruments, which is the largest producer of germanium radio frequency units — make transistors from germanium, which operates satisfactorily to 65°C. (149°F.). Silicon transistors will operate satisfactorily to 150°C. (302°F.).

The new Types 951, 952, 953 are medium power silicon transistors and are improvements on the superseded Type X-15. They can produce a power gain of 30 db, supply up to 1 watt of Class B power, and be operated up to 150°C.

The other four silicon transistor types (903, 904, 904A, 905) in the exclusive Texas Instruments line are classified as small signal units. Three current amplification ranges are available. The minimum alpha in each range is 0.90, 0.95, and 0.975. One type has a minimum alpha frequency cut-off of 8 mc.

Texas Instruments has been able to repeatedly add new models and make substantial price reductions as a result of improved manufacturing techniques — aided by a recently completed plant expansion just for semiconductors — enables silicon transistors to be delivered in unlimited quantity.

For detailed information on the three new type of silicon transistors, write for the new Texas Instruments bulletin. Series 900 bulletin on small signal types also available.

Texas Instruments represented in Canada by:
Computing Devices of Canada Limited,
P.O. Box 508, Ottawa 4, Ont.

Datatron Electronic Data Processing Machine

Science, industry, and business are faced with enormous and expensive operations in the handling and processing of data. DATATRON electronic data processing machines are helping to bring about revolutionary improvements in such operations. On any type of data processing problem, DATATRON systems are fast, efficient, and offer practical dollar savings.

Available through lease or purchase at a fraction of the cost of the very large-scale data processing systems, DATATRON is within the reach of virtually all business, research, and engineering organization. Substantial company-wide savings are made possible by the DATATRON computer in such functions as statistical analysis, maintenance of office systems, storage of records, accounting operations, design, development and testing, and manufacturing control. Reduced operating costs may be far more significant than the initial low purchase price of DATATRON machines.

DATATRON machines are designed so that all components function at levels far below their engineered specifications, thus assuring maximum reliability of operation.

A two-week course in programming and coding is scheduled regularly at ElectroData's computing center in Pasadena, and training in maintenance is available to customer personnel.

The DATATRON digital computer system is manufactured by ELECTRONIC DATA Corporation, Pasadena, California, an affiliate of Consolidated Engineering Corporation. All phases of customer application and service, sales and maintenance in Canada are handled by:
Data Processing Associates Limited,
1313 Wellington Street, Ottawa, Ont.
Telex TV Listener

A new listening device that attaches to the audio system of television sets and permits children to hear their favorite programs without disturbing others is being marketed by Telex, Inc., St. Paul, Minn., manufacturers of headsets and electronic components.

Known as the "TV Listener", the device consists of a control unit, with volume controls and on-off switch, and is connected to the TV set's output circuit by a 15-foot cord, two jacks and a Telex Earset receiver which plugs into the jacks.

Earset volume may be adjusted by controls on the chairside. "Listener" control on the unit does not affect volume of TV speaker itself. Earset receiver is lightweight and slips over one ear, leaving the other ear free for conversation while producing full-tones personal hearing, the manufacturer states, and the 4-foot Earset cord allows for the usual shifting of position while helping to confine the children to one general area.

Another useful application for the Listener is in institutions where individual listening controls are desirable. The manufacturer reports the unit to be ideal for persons with hearing loss.

As the unit does not alter the basic operation of the TV set, it is simple and safe to use. The case is 3½" in diameter, 1" thick and extremely light in weight.

For additional information and prices, write:
Dept. KP, Telex, Inc., Telex Park, St. Paul 1, Minnesota. Mention this publication.

Tally Register Digital Point Plotter

Operating directly from electronic digital computers, punch card machines, keyboards and punched tapes, the TALLY REGISTER high speed digital point plotter provides a continuous feed two direction grid printing facility. Tpe 8113 — Model 3 Plotter features numeric abscissa printing. This provides for numeric printed identification of reference points along the lower edge of the plot. Characters may be printed at a rate of ten per second and may be programmed to print at any abscissa point desired. Speed of 20 points per second with four symbols and sequenced programming can be accomplished. The TALLY REGISTER Corporation, Seattle, Washington. Full technical information may be obtained from their Canadian representatives:

Data Processing Associates Limited,
1313 Wellington Street, Ottawa, Ont.

Tension Gauge

These are precision measuring instruments for determining the tension of any spring up to 500 grammes with micrometer accuracy, and are the most advanced gauges of their kind in the world. This design eliminates approximation and the user pre-sets the gauge to the required tension (in grammes) by means of the knurled pre-setting screw. The operating strip is then applied to the tip of the spring under test; deflection of the operating strip to either side, simultaneously with movement of the spring under test, indicates that the spring tension is equal to the gauge setting. The user can concentrate attention simply on the movement of the spring under test without having to try to observe a gauge scale at the same time.

Distributed in Ontario by Prince and Roberts, 61 Charles St. W., Toronto.

10 Kw Television Transmitter

A new concept in T.V. Transmitters is presented in the Standard Electronics 10 k.w. Transmitter featuring lower initial cost — lower installation cost, all units self-contained — lower operation costs. Only 30 k.w. at 90 per cent power factor — black level and lowest prices with longest life amplifier tubes.

Address enquiries to:
Canadian Westinghouse Co. Ltd., Electronics Division, Hamilton, Ont.

Note...

The Editors of Electronics and Communications have endeavored to compile as complete a directory of the Canadian electronics and communications industries as possible including listings of Canadian manufacturers, sales representatives and the firms they represent.

Due to the extensive ramifications of these industries and the many categories of related components and types of equipment which could be numbered in the thousands it has been necessary to compile this addenda to the September - October 1955 Directory Issue of Electronics and Communications.

Readers are requested to remove pages three to ten of this issue and insert them in the September - October 1955 Directory Issue in order to bring the Directory Issue completely up-to-date.
DESIGNED AND BUILT TO MEET CRITICAL OPERATING CONDITIONS

Rigid inspection at every step maintains the high quality engineered into Marconi tubes ... assures complete satisfaction under the most critical operating conditions. Perfection in every unit is the traditional Marconi standard that means greater power, better tone and longer life to please your every customer.

MARCONI RADIOTRONS
ELECTRONIC TUBE AND COMPONENTS DIVISION

CANADIAN Marconi COMPANY
830 BAYVIEW AVENUE, TORONTO, ONTARIO

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

For further data on advertised products use page 99.
## LENKURT CARRIER TELEPHONE SYSTEMS

- **For open-wire lines**
  - **type 33A**: A low frequency, one-to-three channel, stackable carrier system. Primarily for short or medium haul circuits.
  - **type 45A**: A miniaturized, 12-channel, high frequency carrier. Economical enough for short haul, efficient for long haul circuits.

## LENKURT CARRIER TELEGRAPH SYSTEMS

- **type 22A**: An FM carrier telegraph system using frequency shift keying. Minimizes "cross-fire", noise and static.
- **type 24C**: An economical AM carrier using on-off keying. Provides 18 high quality channels.

## LENKURT TELEMETERING & REMOTE CONTROL SYSTEMS

- **type 440/444**: Carrier signalling equipment for telemetering, dial signalling, remote control, supervision or alarm functions.
- **type 51B**: Remote control, supervision and alarm system for handling large numbers of functions over very few signalling circuits.
- **type 5090B**: Boosts signal-to-noise ratio as much as 22DB. Saves circuits otherwise unsuitable because of excessive line noise or cross-talk.

## RADIO SYSTEMS

- **type 72B/C**: Wide-band FM radio systems capable of handling up to either 216 or 360 channels.

---

Consult our nearest office for full details.

For further data on advertised products use page 99.
Three New Double Beam D. C. Oscilloscopes

With Outstanding Performances

MODEL DE 103 Wide band D.C. 10 Mc/s in each channel with identical amplifiers. Versatile time base with calibrated sweep times from 0.2 second to 2.0 µsecs per 10 cm.

MODEL DT 103 High Sensitivity of 250 µV/cm pk-pk over frequency band D.C. 100 Kc/s, in two channels. Wide range time base 20 secs-200 µsecs per 10 cm calibrated sweep times. Sweep expansion on either one or two beams. Independent X shifts.

MODEL DS 103. A medium sensitivity version giving 8 mV/cm over D.C. 200 Kc/s with similar time base facilities to the DT 103.

Cossor are the exclusive distributors in Canada for Nagard-Ltd., who are now producing this equipment in quantity for: ALL Research establishments - - for Aircraft, Guided Missiles, Hospitals, Universities, Physicists, Biologists, Neurologists, etc.

For further information write:

COSSOR (CANADA) LIMITED

For further data on advertised products use page 99.
Having enjoyed the privilege of working in close cooperation with Canada's Armed Services, Department of Defence Production, National Research Council and Defence Research Board in providing and developing through electronics new methods of automatic information processing, Computing Devices of Canada is now making available the special techniques evolved, for the ever increasing demands of business and industry. While continuing to do everything possible to make Canada stronger, we will also endeavour to assist in the many complex business and engineering problems so important to the industrial growth of Canada.
EDITORIAL CONTENTS

FEATURES

Addenda to 1955 Directory Issue ............................................. 3

Microfusion Processes For Long Playing Records .......................... 28
     A Revolutionary Technique of Manufacturing.

Automation — Printed Circuits to Mechanized Assembly ................. 29
     An Electronic Application For The Electronics Industry.

Microwave Engineering Application of The Ferromagnetic Faraday Effect .................................................. 30
     By W. W. H. Clarke, B.Sc., Ph.D.

Radio Aids To Air Navigation In Canada ..................................... 36
     Canadian Airports Equipped With Latest Aids.

Single-Chamber Continuous Roll Vacuum Metallizer ......................... 38
     New Equipment Speeds Component Manufacture.

Background Music ...................................................................... 80
     Toronto Store Boasts Largest Canadian Installation.

DEPARTMENTS

Business Briefs And Trends ...................................................... 19

Editorial .................................................................................... 21

Editor's Page .............................................................................. 25

News ............................................................................................ 44

New Products .............................................................................. 56

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United States of America $7.50 per year
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Write for catalogues and other literature.

... in any requirement for electronic instruments is to Radiometer — a well-established name in Canada, backed by Canadian service.

Before investing in any instrument, you owe it to yourself to try Radiometer — quality instruments in every sense of the word, at most attractive prices.

RADIOMETER
ELECTRONIC INSTRUMENTS
SOLD AND SERVICED
IN CANADA BY

Bach-Simpson LIMITED
1255 Brydges St.
London, Ontario

For further data on advertised products use page 99.
ALREADY big enough
to tackle any job...

STILL young enough
to give every job our best

CENTRAL BRIDGE Company Limited
Freton, Ontario
An important member of every Smart Set!

Westinghouse ELECTRONIC TUBES

In Television, high voltages put extra strain on set components. Tubes must be able to take it! That's just one of the reasons why forward-looking manufacturers use Westinghouse as original equipment.

Tonal quality is the vital factor in High Fidelity Amplifiers. All units must be perfectly matched for maximum response. Westinghouse quality control makes Westinghouse Electronic Tubes top choice for the finest Hi Fi sets.

Just look around! You'll find that more and more of Canada's Radio and Television Manufacturers are using Westinghouse Electronic Tubes in their sets. Westinghouse Electronic Tubes are engineered and manufactured to the rigid specifications that today's Electronics Industry demands... they're right for every job!

And in order to supply this increased demand by Manufacturers and Service Men, Westinghouse Plant facilities are being expanded and production schedules set at an all time high. Specify Westinghouse Electronic Tubes when you order from your jobber.

Enjoy Television's Finest Hour.
"STUDIO ONE" Monday Nights 10 P.M.

CANADIAN WESTINGHOUSE COMPANY LIMITED • Electronic Tube Division • HAMILTON, CANADA

For further data on advertised products use page 99.
The first meeting of the special RETMA Policy Committee on the Royal Commission, recently formed to compile information to assist the recently-appointed Royal Commission on Canada's Economic Prospects, was established as a policy and steering group to direct a Task Group of market research and other industry specialists in compiling information to assist the recently-appointed Royal Commission on Canada's Economic Prospects.

Total value of orders for electronic and communications equipment placed by the Department of Defense Production in the period of September 1st, to September 30th, amounted to $1,413,592. This figure includes only those contracts in excess of $10,000 and does not include the value of contracts placed for classified equipment.

The Radio-Electronic Television Manufacturers Association of Canada reports that: "For the first time since sales of television receivers started in Canada, in 1949, the monthly sales have exceeded 100,000 units. During September 119,724 television sets were sold, a 45 per cent increase over September, 1954. Previous highest monthly sales was in November, 1954 when 93,649 units were sold. The September figures show a 68 per cent increase over the 71,108 television sets sold in August of this year."

Dr. W. R. G. Baker, General Electric Co., Vice-President told the Boston, Mass., Conference on Distribution that the rapid development and application of electronics to the field of industrial communications together with the use of closed circuit television and the use of electronic computers is already having a pronounced effect on marketing and distribution. Dr. Baker said that two-way radio and other developments will help management "achieve new precision in eliminating costly product development errors".

Robot thinkers — devices to replace human brains in industry — will not result in widespread unemployment as many have feared, a noted automation authority has declared. Addressing dinner meeting of the Los Angeles section of the Institute of Radio Engineers, Dr. Dean E. Wooldridge, president of the Ramo-Wooldridge Corporation, said: "Ultimately, a major portion of the processing data that now occupies the routine attention of thousands of people will be accomplished automatically. A large fraction of the repetitive activities of factory workers will be done by the use of new automation techniques." But the direct results of this spreading industrial revolution, Dr. Wooldridge predicted, will be a large increase in national productivity and a better life for all. "Hundreds of thousands of people will be employed by companies engaged in the various branches of automation," he said, "with annual sales reckoned in billions of dollars." The electronics expert said that automation will also result in the appearance of new products, whose design and production will be for the first time economical.

Admiral's 5,000,000th television receiver will come off the production line at the end of this month, according to Vincent Barreca, president of Canadian Admiral Corporation. Company plants in Canada and the U.S., Mr. Barreca announced, have consumed over 10,000,000 miles of wire of all types in producing television sets. For the operation of these five million receivers, more than 100,000,000 picture and receiving tubes were required. Admiral TV sets placed side by side would reach from Halifax to Windsor — about 1,500 miles.

The first section of the transatlantic cable is reported to have been completed in the last week of September. The Scotland-Newfoundland section of cable is scheduled to be laid next summer with anticipated commencement of service some time toward the end of 1956.

It is expected that by the end of the summer of 1956 a VOR airway will be commissioned between Montreal and Windsor. Equipment is on hand and is being installed between Toronto and Windsor and consideration is being given to placing shortly a further large order for equipment for most of the Prairie stations and those in eastern Canada.

It has been realized for some time that, with the increasing speed of modern aircraft, coupled with the increased volume, more precise control of their movements must be exercised over greater distances. This involves knowing more accurately the position of the aircraft being controlled. To accomplish this, consideration is being given to ordering surveillance radar equipment for 15 of the major airports, including Toronto, which will enable traffic controllers to see aircraft as small as military jets at a distance of 90 miles and at elevations up to 60,000 feet.

A new type of hands-free telephone by which a telephone user can carry on a conversation from as far as 20 feet away from the instrument, or by which a large group can participate in a telephone conference without passing a bulky instrument from one to another, has been announced by the Stromberg-Carlson Company, a division of General Dynamics Corporation. This new instrument, offering several advantages over other types of hands-free, or loud-speaking telephones, was introduced at the USITA convention last month.

Employment of "synthetic intelligences" in future automation systems and the responsibility of university training in meeting the challenge, was discussed recently by Dr. Simon Ramo, executive vice-president of The Ramo-Wooldridge Corporation, in a symposium at the Statler Hotel honoring Dr. Gordon Sproul's twenty-fifth anniversary as president of the University of California. "Anyone brave enough to challenge the idea that in a few years the replacement of man's brains will be the top industry of the nation is in danger of having his brains amongst the first to be replaced," the scientist said. "Because of major changes now being made in electronics, this industry is riding high, if not at the top, in influencing university training in the future and it rapidly is becoming the greatest industry user of university graduates."
the most complete range of wires and cables in Canada...
Automation - No Threat To Jobs...

Automation is no threat to jobs, but, on the contrary, our American economy “desperately needs automation to maintain our standard of living with the onrush of our population increase.”

This conviction was expressed recently by Robert C. Tait, president of Stromberg-Carlson Company, a division of General Dynamics Corporation, in testifying before the Subcommittee on Economic Stabilization of the Joint Congressional Committee on the Economic Report. Mr. Tait’s remarks, we believe, are equally applicable to the Canadian economy.

Citing the telephone industry, as an example, Mr. Tait pointed out that “the introduction of the dial telephone displaced large numbers of telephone operators”. Yet, he continued, “despite the terrific pace with which telephone companies have been modernizing their plants and installing dial phones and automatic equipment, including now completely automatic toll ticketing systems, there are more people employed by the telephone companies today than ever before”.

Actually, Mr. Tait declared, automation “may be a lifesaver at this particular time in our history when we are facing a more rapid relative increase in total population over the next decade than in the work force”. That is, he explained, the big increase in population is taking place in the very young, and in the over-65 groups, rather than in the work force age.

To produce the goods that will be required by this rapidly growing population, one large industry has estimated that by 1964 it will have to produce twice the volume of goods produced last year, with only 11 per cent more people on its payroll,” Mr. Tait related. Adjusted for a probable decrease in working hours during this period, this means that ten years hence that company’s employees must produce about twice as much for every hour of work as they did last year, he pointed out.

“Automation in every conceivable direction, from blueprint to the shipping dock, is the only answer to this situation,” Mr. Tait declared.

He also called attention of the Congressional Committee to the fact that “automation is being directed largely toward manufacturing processes, and manufacturing provides only about 30 per cent of total employment”. In view of these facts, he continued, “even if we applied all that we know about automatic controls, regardless of costs, only a small segment of the labor force would be affected.

“Rather than mass unemployment as a result of automation,” Mr. Tait declared, “we face a labor shortage over the next ten to twenty years.”

“What should be of greater concern than the impact of automation,” Mr. Tait told the committee, is “the availability of human engineering talent.”

“We are really getting into a serious situation in this respect, for we are graduating far fewer engineers than our industry needs now, let alone in the future,” he declared. “Even if we persuaded twice as many qualified students to take up engineering in the future as are now entering these fields, it would take years before we could catch up with the shortage.”
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CANADIAN DIVISION—1654 Bank Street, Ottawa, Ontario
new, revolutionary development  
in the handling and dispensing of FEDERAL magnet wire

PAYOFFPAK

a boon to users of FEDERAL magnet wire

Fabricators simply open this amazing new container and thread the machine. The wire pays off like a fisherman's line from a spinning reel. There are no backlash, overrun or inertia problems and—most important—no stops.

Saves Time—Saves Work—Saves Money.
One Payoffpak container holds 600 lbs. of magnet wire—replaces 8 reels.
Two standard-size Payoffpak containers eliminate down time and need for a wide range of reel sizes.
Set up time on the winding machines is cut to the very minimum.
Interlocking tops and bottoms allow storage in a minimum amount of space.
Made of tough, reinforced fibre—standard-size container weighs only 22 lbs.

Speed up your production with Payoffpak—improve your product with Federal Magnet Wire!

FEDERAL Wire and Cable Company Limited
GUELPH, ONTARIO
A LETTER FROM STATION CFAC,
CALGARY, ALBERTA

E. C. CONNOR
Technical Director
Broadcast Station CFAC
Calgary, Alberta

AN AMPEX FALLS
AND PROVES ITSELF!

An accidental fall really proved the ruggedness of one of our Ampex 600's. It had had to be located on a narrow shelf four feet above a cement floor in an industrial building. Despite precautions someone pulled on the microphone cable at precisely the wrong moment and the recorder landed on one corner on the floor. The Ampex continued to record, and to the surprise of all concerned, it was impossible to detect the spot on the tape where the machine had fallen off the shelf. The only damage to the recorder was a displaced hold-back tension spring.

At present we have in service two Ampex 401's, two 403's, two 350's and two 600's. Required servicing has been much less than anticipated, and all are within specifications. To say that we are enthusiastic about the performance of our Ampex recorders could be considered an understatement.

Sincerely,

BROADCAST STATION CFAC

E. C. Connor
Technical Director

THE AMPEX 600 WAS
DESIGNED BOTH FOR USE AND ABUSE

When the 600 was first developed, Ampex engineers performed a test similar to CFAC's accidental drop—not by accident, but quite intentionally. Also, the Ampex 600 was given running tests equivalent to an estimated 10 years of service. These are reasons why the price you pay for an Ampex buys both the finest performance available and the most hours of service per dollar.

For descriptive literature, write Dept. SS-2304
SIGNATURE OF PERFECTION IN SOUND

70 Grenville Street • Toronto, Ontario

For further data on advertised products use page 99.
The following correspondence has been received in answer to a commentary made last month in The Editor’s Space with regard to an address delivered by His Eminence the Cardinal Archbishop of Montreal, which dealt in some respects with automation and labor. Since the commentary was based on press reports the following broader concept of the Cardinal’s remarks are published below.

Dear Sir:

The attention of His Eminence the Cardinal Archbishop of Montreal has been called to an article written in your publication, under the title of “The Editor’s Space”. It dealt largely with a commentary on certain observations made by His Eminence in a sermon delivered to the workers at St. Joseph’s Oratory on Labor Day this year. The remarks in your article did not show understanding of the sermon which Cardinal Leger gave on that day. This is not too surprising when you consider that they were based upon a few excerpts taken completely out of context and, I may add, not too exact in every instance. To clear up any misunderstanding in this matter, I have undertaken on the instructions of His Eminence to summarize the remarks which he made on that occasion.

In his sermon of Labor Day His Eminence was discussing the present condition of the worker. He commented on the double revolution, technical and philosophical, which the world has witnessed during the last century. The Cardinal did not decry the technical revolution as such. Indeed he mentioned a happy consequence, namely, the increase of efficiency of human work. The unhappy consequence of which he spoke was in no way a lamenting of improved technical procedures. He merely described the dangers inherent in our present economy, due to the fact that the social change and social thinking did not develop in equal proportion to the technical. He gave as an instance the concept of the absolute and unlimited right of private property and showed the dangers of this concept when applied to a small number who, due to their large productive holdings, could influence and control the subsistence of a large number of workers. In pointing out the possible injustice which would result from the belief that a person has a right to use, abuse or destroy his own property regardless of the welfare of the workers, His Eminence was merely applying a fundamental of Christian social teaching.

The second point made by His Eminence was the philosophical revolution. He spoke of the time when men realized their own inherent weakness. They sought to safeguard themselves by the forming of guilds which guaranteed certain basic points of justice. This was in contrast to economic liberalism which would sacrifice man to the law of supply and demand and which at one point risked to dehumanize him with assembly line methods.

Now we come to the point which seems to have caused all the furor. His Eminence, continuing his line of thought as applied to both technical and philosophical development, pointed out that with increased automation: first, the power of production could be left in the hands of a few; second, if humanity adheres to Marxist ideology “the mass of people cut away from God will be nothing more than a pile of flesh debased by pleasure and degraded by surrounding weakness”. We would like to point out that this latter part was applied to the results of Marxist thinking and not to the fact of the forthcoming automation. This is easily seen in the context by His Eminence’s subsequent remarks. He refers to the 16-hour day as a nightmare of the past. He states it is not the mission of the Church to interfere in the affairs of the world with a view of changing the technical structure of society. He pleads with employers for human working conditions and home conditions for the workers favorable to the development of man’s dignity and the fulfillment of his divine vocation. Finally he calls on both employers and workers to restore man’s dignity, especially as increased leisure will play a large role in human development and human culture. He comments that it would be a great pity to lose this chance to increase personal dignity and to allow themselves, as a result of the Marxist philosophy to be submerged in a collective mass.

(Turn to page 59)
NEW VARIAN KLYSTRONS

ADD SEVEN LEAGUE BOOTS
to microwave transmission...

Meet Varian's newest klystrons... a related group of 1 Kw and 10 Kw cw amplifier tubes that extend microwave propagation far beyond conventional line-of-sight limits. Designed to exacting Varian quality and performance standards, applications for these versatile klystrons include long range communication and cw radar or illuminator service... available in the following types and frequency ranges:

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Built for long, trouble-free service...

Varian 1 Kw amplifier klystrons offer many advantages for commercial transmitter operation. Rugged, integral-cavity design, air-cooled operation, wide range tuners and conservatively rated, thoriated tungsten buttons provide a life expectancy in excess of 10,000 hours. One power supply design can be used for the entire frequency range... no special r.f. equipment is needed. Other outstanding features include:

- Low noise, negligible microphonics
- High gain — over 50 db... no intermediate amplifiers required
- Standard waveguide output — permits direct coupling
- High efficiency and simplicity of installation

For further data on advertised products use page 99.
now... capacitors for printed circuits designed and made in Canada to meet Canadian requirements

Hunt plug-in PW Series Capacitors are speeding production and cutting assembly costs for major Canadian TV and radio manufacturers. Their outstanding success and rapid acceptance is due to their reliable high quality, rugged, long-life construction. Hunt PW Series Capacitors are enclosed in a rigid, high-strength tube of molded bakelite and sealed with an epoxy resin of great adhesive power and noted ability to resist moisture. The tinned copper leads, cut to the customer's specified length, are extended from the same end of the tube and held in place to close tolerance to assure ease of use in printed circuit boards. Hunt plug-in PW Series Capacitors meet and exceed Canadian demands for automation programs within the electronic industry.

Hunt PW Series Capacitors can be made to your specifications.

HUNT CAPACITORS (CANADA) LIMITED
830 BAYVIEW AVENUE, TORONTO, ONT.
Microfusion Process For Long-Playing Records

By GARETH ROLLAND

A new and revolutionary method for processing long-playing records known as the “microfusion process” has recently been announced by officials of Cook Laboratories Inc. Basically a new idea it is anticipated that the development will have a startling and dramatic effect on the ears and pocketbooks of all hi-fi fans and it has been termed by those concerned with its development as the greatest advance in records since the LP ousted the 78 shellac.

The problem of noise confronts both manufacturer and customer at every turn. Vinyl seemed to be the answer to a major part of this problem. In most plants additives are used to make a quiet surfaced recording. However the “soft” and pliable record that results just won’t stay quiet! As the grooves are pliable the stylus pushes them around or is in turn pushed by them. Obviously the correct tracking of all the high frequencies is impossible. The original lacquer master is as quiet as the grave but getting thousands of duplicates in the hands of the music lovers is not an easy matter. After all, the original lacquer master doesn’t have to stand repeated playings whereas the commercial copy gets the full treatment, sometimes played every day. Dust and perspiration from eager hands also take a heavy toll.

In the “Microfusion” process, records are manufactured from the purest vinyl: No additives are used. Pure powdered vinyl is the best record material known. It behaves however like a pie crust. The more you work it the worse it gets. With vinyl, “the first time you mold it, is the last good time”. The current method entails pre-heating the vinyl until it becomes a gelatinous mass of solid plastic. In this form it is fed to the press. With “Microfusion” the pure vinyl powder becomes the record in a single step. There is no working. The resultant record is a quiet and faithful replica of the original lacquer. And what’s more it stays that way.

No Bogies Employed

Until “Microfusion”, it would have been extremely difficult to mold pure unadulterated vinyl. Cost alone would have rendered the project prohibitive. “Microfusion” makes this possible and the ensuing record has harder grooves with much better and more complete tracking of the highs. This means brighter highs with less progressive distortion of actual high frequency content.

Ever buy your favorite soprano only to find that she had the “wavers”? You darkly suspected turntable trouble only to discover that you’d bought a record with the “wow” built in. This means a stretched “stamper” distorted by steam, pressure and continued use!

“Microfusion” doesn’t employ either of these “bogies”. Molding is gentle.

(Turn to page 71)
Automation From Printed Circuits To Mechanized Assembly

By PAUL MAXIMOFF
Malco Tool And Mfg. Co.

Introduction of printed circuitry, while a milestone in electronic progress, was not in itself the impetus for the great strides that industry has taken toward automation. However, it was the development which opened the door to new and faster techniques, highly improved production methods and the reduction of human error.

As always the case with progress such as this, it created the need for skilled operations and precision machinery.*

An entirely new form of electronic circuitry, the printed circuit board was readily adaptable to mass production assembly and soldering techniques. Developments in this respect were rapid. Soldering operations and devices quickly conformed and special printed hardware to facilitate terminal connections was introduced.

Among the first developments in printed circuitry hardware was the Malco miniature self-retaining tubular pin terminal. This terminal is designed so that two beads on the lower part of the pin terminal depress and snap out when inserted in the printed circuit board, thus locking them in. Not only does this eliminate rollover operations, but it permits insertion of pigtails into the receiving holes of the terminals at either the top or bottom of the board. Flanging the bottom hole of the terminals allows additional wrap-around connections.

Companion to these was the development of a female contact which fits to the top of the tubular pin for quick connect and disconnect applications. Wire wrap terminals for use with wire wrapping machines have also been developed.

Obviously, manual insertion of these terminals would be both tedious and time consuming. However, by producing them in chain form and on reels and by using automatic insertion equipment the operation becomes fast, accurate and completely automatic.

This was accomplished in the development of the Malco Automatic Pin and Contact Inserting Machine, along with equally automatic crimping equipment and also staking equipment for the wire wrap type terminals. Perhaps the most important of these is the inserting machine which inserts up to 40 or more terminals in three seconds, turning out 1200 complete printed circuit boards per hour.

Tubular pin type terminals in continuous chain form are fed from two reels, threaded through rollers, and passed through a die where they are automatically formed and severed from the carrying strip when the punches descend. They are then deposited into individual plastic tubes, which in turn are directed into any symmetrical or non-symmetrical pattern the printed circuit board may call for. The tubes and individual jig bored bushing are enclosed in a plastic and aluminum box which can be quickly removed from the machine and replaced with new box when the circuit pattern is changed.

After the pins have fallen into their respective bushings, a vibrator is actuated, thus facilitating the nesting of the pins into the board. This portion of the cycle is reached when the printed circuit board is raised by a platen to register against the master pattern box by pilots under the first station head.

When the platen recedes to transfer position, the strip with pins attached is automatically advanced for the repeat cycle.

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Microwave Engineering
Applications of the Ferromagnetic Faraday Effect


The Faraday effect is the change of polarisation of a plane electromagnetic wave as it passes through a magnetised ferromagnetic medium. This paper is concerned with the Faraday effect at microwave frequencies, with its explanation, and with its application through the medium of high resistivity ferrites, which provide reasonably low attenuation of electromagnetic waves.

In simple terms, the bound electrons in a ferrite precess about the magnetisation vector at a frequency proportional to the magnetic field; hence the "precessional vector" lies along the magnetisation vector. A plane electromagnetic wave may be regarded as the sum of two contra-rotating circularly polarised components, whose propagation constants are differentially affected by the precession. This difference is a maximum when the precessional and Poynting's vectors are aligned. Owing to the differential phase delays of the circular components, their resultant is a plane wave with polarisation changing throughout its path in the medium.

A number of recent engineering developments have been concerned with the Faraday effect at microwave frequencies. This had been predicted but was not realised until ferromagnetic materials were developed with sufficiently high resistivity to be transparent to microwaves. High resistivity reduces eddy current losses in the new ferromagnetic materials, which are known as ferrites, permitting microwaves to be passed through them with small attenuation. The Faraday rotation is then apparent and can be employed in microwave engineering applications.

It is apparent that many applications of non-reciprocal transmission properties of ferrites, caused in particular by the Faraday effect, are being developed. Behind the Faraday effect and its development for microwave applications there are also a number of theoretical papers, concerning the Faraday effect itself and ferromagnetic resonance, which occurs when the precession frequency becomes equal to the microwave frequency, and general propagation in gyromagnetic media. In most practical cases, gyromagnetic transmission lines with longitudinal magnetisation behave in a manner which may be almost entirely explained by a simple non-reciprocal rotation of the plane of polarisation. The uses of the Faraday effect are more developed than the uses of non-reciprocal behavior introduced by magnetic fields perpendicular to the direction of propagation.

Ferrite devices for microwave isolation, duplexing, modulation and switching are becoming well known and this paper discusses some examples of these, and their behavior. Other possible applications of ferrites at microwaves are mentioned.

The Faraday Effect

All electrons possess a gyroscopic moment, \( J \), and a magnetic moment, \( M \), which causes them to precess in a magnetic field. When in a normal orbital position, these gyromagnetic properties are almost cancelled by the nucleus and other electrons, leaving only the usual small para- or dia-magnetic behavior.
However, the outer electrons of certain atoms are, in a crystal lattice, held at some distance from the nuclei by interatomic forces, and exhibit their full gyromagnetic property. This is known as ferromagnetism.

The precession frequency of an electron in a field H is given by:

\[ f = \frac{M \cdot H}{2\pi J} \]  

(1)

For a field of 3000 gauss this gives a frequency of the order of 10,000 Mc/s. Hence an incident wave of that frequency will have a circular component rotating with the same frequency and sense as the precession, which is the phenomenon of ferromagnetic resonance.

Ferromagnetic resonance introduces a dividing line in that the Faraday effect has the opposite sense for frequencies above the resonance to that effect has the opposite sense for frequencies below the resonance. This is implied by the behavior of the permeability near resonance shown in Fig. 1 for a circularly polarized wave. The complex permeability is \( \mu \) where:

\[ \mu = \mu_{1} + i\mu_{11} \]  

(2)

According to the classical interpretation, the precession rate of the electron spins is an effective addition to, or subtraction from, the frequency of the incident wave, depending on the (circular) sense of the polarisation insofar as the propagation constants are concerned.

Hence, (with constant permittivity) the velocities for the two polarisations are proportional to the values of \( (\mu)_{1}^{-1} \)

at frequencies \( f + M \) and \( f - M \) where \( f \) is the actual microwave frequency and \( M \) is the precession rate. This leads directly to the change of sense of the Faraday effect at resonance. Though not rigorous, these considerations lead to an appreciation of phenomena, which Polder and Hogan have explained with rigorous mathematics for the case of an infinite plane wave in material with assumed damping characteristics typical of the shape of the ferromagnetic resonance curve. Figure 2 shows the difference between polarised waves at different frequencies with constant magnetisation. Predictable application of the Faraday effect is easier at magnetic fields below resonance, and from its engineering point of view requires lower driving currents for the fields.

In most engineering applications it is not desirable to operate too close to resonance owing to the differential attenuation of the two wave components, to the general high loss region near the maximum of the zero difference of velocities occurring in the resonance transition. Control of the Faraday effect in this region necessitates control of small changes in, or deviations of, a field which is large.

Simple Gyrator Operation

The foregoing description of fundamental processes implies that plane polarised waves with any orientation of polarisation are transmitted as well as circularly polarised waves. Hence in applications of ferrites circular guide is commonly used, and selection of particular planes of polarisation is accomplished by junctions of circular guide to rectangular guide of substantially the same impedance. Simple gyrator operation is now described in detail with respect to circular guides, and the ideas developed are then extended to include plane polarisation filters (rectangular guides) at input and output of a gyratory circular guide.

With reference to Figure 3 a plane polarised wave incident from the left in the transmission line will cross the boundary into the magnetised ferromagnetic material and will suffer a small instantaneous rotation, and there will be a reflected wave of rotated polarisation. These rotations are usually small and are due to the Kerr effect; equal and opposite (Kerr) effects occur on leaving the gyromagnetic medium. Hence the net rotation of the transmitted wave is only that due to the Faraday effect. All the rotations described can only occur when there is magnetisation along the direction of propagation, and they depend on the existence of different propagation constants for LH and RH circularly polarised components, whose equivalence to one plane polarised wave is indicated in Figure 4(a).

The difference in propagation constants is manifest as two differences — in phase constant and in attenuation constant; the former producing Faraday rotation, and the latter generally producing a transmitted wave comprising two unequal circular components (LH and RH), equivalent to one elliptically polarised wave. Figure 4(b) illustrates the equivalence of two plane polarised waves with polarisations at right angles and also 90° out of phase, to one circularly polarised wave. Thus the general case of an elliptically polarised wave transmitted resolves into two unequal circular components and thence into four plane polarised components which add vectorially in pairs. If \( A_{L} \) and \( A_{R} \) and the amplitudes of the LH and RH circular components respectively, they resolve into one plane component of amplitude \( A_{L} + A_{R} \) and another of amplitude \( A_{L} - A_{R} \) polarised at 90° in the direction in which the circular components subtract. These conditions are illustrated in Figure 5. Unequal circular components cannot add to form a plane polarised wave, but are representable by two circular waves at right angles to one another. Therefore, when the emergent wave is elliptically polarised and is fed to rectangular waveguide, there is a further loss of power, by reflection, and by the excitation of evanescent modes in the rectangular waveguide.

The useful gyrator is one in which the attenuations of LH and RH circularly polarised waves are both low. Then a rectangular waveguide, accepting only one component of plane polarized wave, may be used beyond the gyrator, with its "acceptance polarisation" at any orientation with respect to the input polarisation. Where the angle between the input and output polarisations is \( \Theta \) as in Figure 6, \( M \) is the magnetic penetration (positive in the direction which rotates towards the output polarisation), \( l \) is the length of the gyrator, and \( K \) is a constant, then

\[ \phi_{1} = KM_{1} - \Theta \]  

(3)

where \( \phi_{1} \) is the angle which determines the transmission. The energy transmitted is given by:

\[ W_{o1} = \cos^{2}\phi_{1} \]  

(4)

This neglects multiple reflections on the assumption that they are absorbed for polarisations at 90° to the input polarisation at the junction of input guide and gyrator, and at 90° to the output polarisation at the junction of the output guide and gyrator.
Without absorbers, the energies in the successive reflected waves will be
\[ W_n = \begin{cases} \frac{1 - \cos \phi_1}{2} \text{ reflected from second boundary.} \\ W_n \sin \phi, \cos \phi, \text{ reflected wave transmitted across first boundary.} \end{cases} \]
assuming absorption of wave components polarised at right angles to the accepted polarisations, is achieved in the case \( \Theta = \frac{\pi}{4} \), when the magnetisation is adjusted to make \( K_M = \frac{\pi}{4} \).

Their relative phases will determine how they add, and the impedance mismatch reflections at the boundaries of the gyror will complicate the situation beyond the possibility of useful analysis. With an absorber to remove the component of the output wave polarised at 90° to the output plane of polarisation the situation is relatively simple and relation (3) is obeyed.

With two absorbers at 90° to the input and output polarisations the two directions of through transmission give energies transmitted:
\[ W_n - \phi = W_0 \cos \phi (K_M - \Theta) \quad (5) \]
\[ W_n - \phi = W_0 \cos \phi (K_M + \Theta) \quad (6) \]

From this it is seen that the operation is generally non-reciprocal, but the special case \( \Theta = \frac{\pi}{2} \) gives reciprocal operation when \( K_M \Theta \) as far as energy transmission is concerned. When \( n \) is an even integer the operation is entirely reciprocal for phase, which fact is utilised in a "ring duplexer incorporating a ferrite component in this condition". In many applications it is undesirable to dissipate energy in the gyror. The choice of \( \Theta = 0 \) in the direction of main energy flow is then imperative, and is achieved by adjustment of magnetic field and length of ferrite.

The applications fall into two classes, the first of which involves only the non-reciprocal behavior with \( \Theta \) and \( M \) fixed in value, while the second involves the variation of \( M \), the magnetisation.

Static Gyrators

4.1 The maximum difference between transmission in two directions,

\[ \text{where } \phi_2 = K_M - \frac{\pi}{2} + \Theta \]
\[ W_n \sin \phi, \cos \phi, \text{ doubly reflected wave transmitted across second boundary etc.} \]

4.2 The case \( \Theta = \frac{\pi}{2} \) and \( \phi = 0 \) is reciprocal with regard to power, but there is a difference of \( \pi \) between the phase shifts for the two directions of transmission. Since \( K_M = \frac{\pi}{2} \),

there are no multiple reflections (except due to impedance mismatch), and the conditions are very simple. Such a component provides a low loss wave guide device, non-reciprocal in phase, which, when used in a circulator as indicated in the schematic Figure 8, adds the wave passed by the gyrator arm to that passed by the other arm so that input 1 feeds output 2, input 2 feeds output 5, input 3 feeds output 4 and input 4 feeds output 1. With power fed to any one of the four feeds, there is an output at one of the two feeds in the other magic tee, and there is cancellation at the other two points provided the path lengths in the two arms of the circulator are arranged correctly with a phase difference \( m \pi \) (\( m \) assumes different integer values for the two directions through the circulator). A unit of this type may be used as a duplexer; with transmitter feeding 1, and the antenna fed from 2, the receiver is connected to 3. In this application the receiver isolation is limited by the input v.s.w.r. which may be achieved for the antenna. It is of course possible to back up the isolation by waveguide switches of the ferrite or conventional type, open during the transmitter pulse. The practical limit of a gyratory circulator is in the neighborhood of 40 db isolation of a narrow frequency band (say 20 mc/s at 10,000 mc/s), and considerably less isolation for larger bandwidths. By special adjustment of tuning studs in a practical circulator at one frequency, it is possible to achieve about 55 db isolation in the laboratory.

(Turn to page 34)
Now...record the whole performance... without a break!

Got a favorite concert or opera program you'd like to preserve on tape? Symphony or dramatic production? Now, record it all using new “Scotch” Brand Extra Play Magnetic Tape. With 50% more tape wound on each reel, Extra Play Tape gives you as much recording time as 1¼ reels of standard tape, plus strength to spare. This means annoying interruptions for reel change are sharply reduced to offer more perfect recording results.

You'll notice a crisper tone and higher fidelity, too—the result of “Scotch” Brand’s exclusive oxide dispersion process. By packing minute, fine-grain oxide particles into a neater, thinner pattern, “Scotch” Brand has been able to produce a super-sensitive, high-potency magnetic recording surface. Hear the difference yourself. Try new “Scotch” Brand Extra Play Tape on your own machine.
This is extremely critical and not significant for engineering applications. Figure 9 is a photograph of a circulator employing a coil energised gyrator.

4.3 There are other possible, more complicated devices which come in the category of static gyrators, but mostly they have significance in connection with dynamic gyrators or other devices, and they represent generalisations of the basic components already described. For example it is possible in an isolating gyrator

\[ \Theta = \frac{\pi}{4}, \quad K_M = \frac{\pi}{4} \]

to feed reflected energy into a side arm. Then, if a gyratory switch is employed beyond the isolator, reflections from the switch appear in the side arm. The behaviour is similar to that of the circulator of Figure 9, but the design is more compact.

**Dynamic Gyrator Applications**

5.1 In this context the word "dynamic" implies variation of the magnetisation of a ferrite unit, and more specifically, with regard to the Faraday effect, variation of the magnetisation in the direction of propagation. It is evident that the incident microwaves may be entirely transmitted through, or partly reflected by and partly absorbed in a ferrite component, in the general case of an angle \( \Theta \) between the input and output planes of polarisation. The magnetisation can have two values which define these two conditions. Practical applications of this

switching condition generally employ \( \Theta = 0^\circ \) or \( \Theta = 90^\circ \), and are complicated by the effects of hysteresis which make it difficult to achieve the two values of magnetisation repetitively with the required accuracy. Rapid change from open to closed or closed to open depends on the build-up time of the field and is limited by the design of the energising coil and the associated short-circuited turn effect*.

The hysteresis effect is illustrated in Figure 10 which shows the transmitted power as a function of coil current for the case \( \Theta = \pi/2 \). The current should be made to vary between the value giving maximum attenuation and a less critical value giving minimum attenuation, in order to provide the greatest switching depth. Hysteresis loops of attenuation against magnetising field as in Figure 11 may be followed. Figure 11(a) indicates the optimum, and Figures 11(b) and (c) indicate cycles on either side of the optimum. These cycles may be used for switching or modulation provided the magnetising field can be driven in the required manner. It is evident that the waveform imposed on the microwave signal shall be distorted by the gyrator in the manner indicated by the graph of attenuation against magnetising field, Figure 10. The theoretical distortion is simply that of part of a cosine curve, and in practice hysteresis adds to this. The last rise and fall times obtainable with square wave switching functions indicate that gyrators may also modulate at relatively high frequencies. Sine waves may be impressed at frequencies up to 1 Mc/s for large modulation percentages and at higher frequencies with decreasing amplitude (or increasing heat dissipation) owing to increasing hysteresis losses and increasing power drive requirements for the same amplitude.

5.2 The foregoing has indicated the critical nature of the maximum attenuation position which is one limitation in applications to switching. The other limitation is switching speed which reduces to a problem in inductance and current pulse driving circuit design. Figure 12 is a photograph of a gyrator designed for switching square waves at a pulse repetition frequency of 100 kc/s. With a power of 20 watts dissipated in the driving circuit, the transmitted waveform of Figure 13 has been obtained by the author, using this gyrator.

The reliable performance of these components is properly defined without any daily adjustments of bias or other circuit controls, and it is possible to obtain a reliable 1.0 db to 20 db switching function with rise times 0.7 \( \mu \)s and fall times 0.8 \( \mu \)s for the above power dissipation (20 watts). There are hysteresis heating of the ferrite and microwave power dissipation, and there is a secondary effect of resistive heating in the coil windings. This is of limiting design factors. About 5 watts of microwave power can be handled at 100 Kc/s switching rate by the gyrator in Figure 12. Driving circuit dissipation may be increased to reduce the switching time, without affecting the dissipation in the gyrator except in the coil windings, but increase of switching frequency produces more hysteresis heating.

Incorrect adjustment of the standing current bias in the gyrator coil results in a decrease in depth of the square wave or in a waveform with two spikes of maximum attenuation at the bottom of the square wave; these correspond with cyclic operation, in accordance with Figures 11(b) and 11(c) respectively. The transmission part of the square wave is not at all critical with respect to bias.

5.3 For purposes of modulation, the gyrator is in most respects excellent, though it is not capable of producing a waveform or in a waveform with two spikes of maximum attenuation at the bottom of the square wave; these correspond with cyclic operation, in accordance with Figures 11(b) and 11(c) respectively. The transmission part of the square wave is not at all critical with respect to bias.

Materials

The type of ferrite material involved in applications at microwave frequencies is the product of a highly specialised high grade developed technology. Ferromagnetic materials of spinel structure, in which the cubic lattice is
In this ultra-modern Trans Horizon laboratory are the scatter propagation communication field's most extensive and complete facilities for research and development. Cuts at right show Cedar Rapids-Lamar, Missouri terminals of Collins 350-mile test circuit for long haul UHF studies. Collins' progress in pioneering techniques used in UHF and VHF scatter propagation is supported by development of a whole new line of equipment and components. Many of these developments have already achieved singular contributions to the radio field, but all are a part of an integrated Trans Horizon program begun at Collins over ten years ago.
Radio Aids To Air Navigation In Canada

In opening the new $600,000 terminal building at Saskatoon Airport last September 29th, Transport Minister George C. Marler said that it was one of the largest terminal buildings to be constructed under the Department of Transport’s present program of improving ground facilities at Canadian airports and that it was one of the large number now in the planning or construction phase throughout the country.

In the matter of equipping Canadian airports with the communication apparatus and aids to navigation the following statement prepared for Electronics and Communications by the Deputy Minister’s office, Department of Transport, outlines the Department’s plans for maintaining high efficiency at Canadian airports through the use of modern equipment.

It is the practice of the Canadian Government to install the latest developments in aids to air navigation on the Canadian airways. In some instances Canada has been behind similar installations in the United States, but this has worked to our advantage, since we are able to profit by the experience obtained by the American authorities, who are very generous in keeping their Canadian counterparts advised.

Low frequency four course radio ranges have now been operating in Canada for some fifteen years. An active program to replace these ranges with VHF Omni Ranges was started in 1954 and will be continued until all Canadian airways are equipped with these new facilities.

It is expected that by the end of the summer of 1955 a VOR airway will be commissioned between Montreal and Windsor. Equipment is on hand and is being installed for the airway between Toronto and Winnipeg. Consideration is being given to placing shortly a further large order for equipment for most of the Prairie stations and those in eastern Canada.

All the principal Canadian airports are equipped with instrument landing facilities. Several of them, as is the case at Toronto, have two runways so equipped. These aids have very materially increased the regularity and safety of scheduled flights by the Canadian airlines.

A complete modern G.C.A. installation is being installed at Gander airport this fall and, barring unforeseen difficulties, should be in commission some time next spring.

It has been realized for some time that, with the increasing speed of modern aircraft, coupled with the increased volume, more precise control of their movements must be exercised over greater distances. This involves knowing more accurately the position of the aircraft being controlled. To accomplish this consideration is being given to ordering surveillance radar equipment for fifteen of the major airports, including Toronto, which will enable traffic controllers to see aircraft as small as military jets at a distance of ninety miles and at elevations of up to 60,000 ft.

Long distance aids to navigation, mainly over the oceans, are provided by Loran stations on the East and West coasts.

The above paragraphs outline various aids by which aircraft may fly from point to point or land safely at airports.

Communications between aircraft and the ground also may be classified as an aid to navigation. Canada has also been keeping up-to-date in this respect, as the use of high frequencies for this purpose is gradually being replaced by VHF type of communication.

Since Malton Airport, serving Toronto, is one of the busiest in Canada, it is fully equipped with up-to-date aids and communication facilities. Remote transmitting and receiving stations permit transmissions to take place without interference to reception. The traffic control center is connected with all airports in its control area, and adjacent centers in Canada and the U.S., by voice. Weather maps, prepared in Montreal, are received in the Met. office by facsimile for use in forecasting weather conditions. An efficient public address system is in use. When a decision is made to use any newly developed aid, Malton Airport is one of the first to receive an installation.

Nerve center of Department of Transport’s Saskatoon Airport is the radio control room, located in ample size headquarters in the new terminal building. Shown left to right, are Sid Young, O.I.C. of the station, formerly of Victoria, B.C.; Elmer Walsh of Winnipeg, and Charles Fisher recently of Yellowknife; and Walter Thiet, who hails from Millet, Alberta.
PERFORMANCE - GUARANTEED

Magnetic Shields

COST NO MORE -

WHY TAKE LESS?

You're time and money ahead with Performance-Guaranteed Magnetic Shields, for our shields are guaranteed to meet the requirements of your circuit to mutually agreed upon shielding specifications. Dry hydrogen annealed, as required . . . of MuMetal, A.E.M. 4750, or whatever commercially available material is most suitable . . . fabricated or drawn . . . painted or lacquered to match any shade, or unfinished. Write for the industry's most complete catalog, MS-104, today.
Single-Chamber Continuous Roll Vacuum Metallizer

A faster technique for metallizing offers the electronics industry faster production in metallizing condenser papers for the manufacture of capacitors — metallizing printed circuit boards and illuminizing television picture tubes.

FASTER metallic coating of plastic film and sheeting, such as Mylar, acetate, cellophane, and butyrate, as well as of condenser paper, textile fabrics, and even thin sheet steel is possible with a new type of vacuum equipment for continuous roll metallizing.

The new metallizing equipment represents a completely new approach to the problem of continuous deposition of metal on a moving web of material. Previously, continuous roll metallizing of plastics, paper, or textiles has been done in a dual-chamber set-up, with the base material being out-gassed in one vacuum chamber and then transferred to a second chamber to receive the thin coating of metal deposited by evaporation.

The new Stokes units have only a single vacuum chamber and thus need only a single vacuum pumping system. This makes them more compact, taking up much less floor space, and saves considerably on capital investment. And the new continuous metallizers coat the base material faster than previously available equipment.

The new continuous roll metallizing units can coat material in widths of 6, 24, 36, 48, 54 or 60 inches, at speeds up to 500 feet per minute. Rolls up to 24 inches in diameter can be accommodated in the units, and material ranging in thickness from .0005 in. up to .0020 in. can be successfully coated on a continuous basis. (A 24-inch diameter roll of thin gauge plastic film, for example, might contain as much as 40,000 feet of material, depending on the size of the core of the roll.)

The Stokes metallizing units are designed to deposit a brilliant, uniform coating of metal over the entire width of the material with no dark or "burned" areas. They incorporate an ingenious device for continuously supplying the pure metal to be deposited. An observation port set into the cover of the unit, plus a fluorescent light source placed behind the coated film, allows the operator to check the uniformity and quality of the coating continuously, during the deposition process, and to adjust the speed of travel of the material through the evaporation chamber so as to obtain the desired thickness of metal deposit. Air-actuated poppet valves, push-button controlled from the front panel, simplify the operation of the units.

Recent Development

Vacuum metallizing, a fairly recent arrival on the industrial scene, is now a well-established procedure for low-cost finishing of molded plastics, metal die-castings and stampings, and paper. Its widespread application for decorative purposes led to the development of continuous roll metallizing.

Metallized plastic film is already in fairly wide use for the interior trim of automobiles—door panels, scuff plates, dashboards, and upholstery welting. The number of these applications is expected to increase steadily in the next few years.

Vacuum metallized Mylar, for example, can be bonded to rigid vinyl or steel sheet, and then embossed or stamped to provide a durable, brilliant decorative effect. Such material is usually bonded to the base sheet metallized side down (in), and the tough Mylar film thus acts as a rugged, scuff-proof protection for the shiny coating.

The new Stokes single-chamber continuous roll metallizers can coat plastic film and other base materials in widths from six inches (model shown here) up to 60 inches at speeds up to 500 feet per minute. Other uses for the process include continuous roll metallizing of condenser paper for the production of capacitors, production of printed circuit boards and the illuminizing of television picture tubes.

(Turn to page 71)
The Automatic Electric Type 88 Loud Speaking Telephone opens a new era in telephone convenience! The built-in microphone (5) picks up the normal voice, while the other party is heard, clearly and naturally, through the separate speaker (6). Others may join in the conversation by gathering around the desk! For privacy, raise the handset and talk in the usual way; to use the loud speaker again merely replace the handset.

A regular telephone, a loud-speaking telephone and a conference telephone are combined in one instrument. Busy executives, bankers, editors, accountants and other business and professional people enthusiastically welcome this "hand-free" convenience. Available with or without dial for use on any telephone line.

Circular 1857 gives full details.
Television
And
Dentistry

MAKING a noteworthy advance in the field of audio-visual instruction, a built-in industrial television system has been incorporated in the new dental school of the University of Texas at Houston.

By means of this installation, fewer instructors are required for a substantially larger number of students than formerly.

There will be 50 unit labs, each accommodating four students. Each lab will have its own 17-inch television monitor on which the students can follow the instructor at close range.

When a student wishes to interrogate, he uses a microphone, instead of raising his hand as has been traditional classroom practice. A cue lamp indicates to the instructor that a query has been made. All students in the different labs hear the question and answer clearly.

The instructor, also, can make use of any teaching aids which regardless of size are reproduced distinctly on the screen.

Assisting the instructor is an operator in an adjacent room, who completely controls the camera for positioning, image size, lens and focus. Instructors may originate lecture material from a desk, or from any one of the special purpose laboratories located in the building.

The specially designed television system is equipped with slide and motion picture projectors, by means of which the control room operator can fade in any desired instruction material. Special x-ray viewing equipment is included.

Program information originating in the University's nearby Cancer Research Lab or at local TV broadcast studios can also be displayed. In addition, conference rooms and lecture halls are equipped with television outlets for remote viewing of operations taking place in laboratories elsewhere in the dental school building.

- This master console designed by Kay Lab is part of the audio-visual television system installed recently in the University of Texas Dental Branch, Houston.

For Proven Performance... FREED

TYPE 1020B
MEGOHMETER

USES
A self-contained and A.C.-operated instrument for laboratory or production testing of leakage resistance of insulation materials, condensers, cables, motors and transformer windings.

FEATURES
Resistance values indicated directly on a four-inch meter protected against over-load. Rapid and safe to use, test voltage removed from terminals, and capacitive component discharged to ground in all positions of multiplier switch. Maximum short circuit-current limited to 6 milliamperes for optimum safety of operating personnel. Low resistance in series with component under test provides very short charging time for even the very largest capacitors. Calibration position provided to check accuracy of 500 volts D.C. potential.

SPECIFICATIONS
Range: 1 megohm to 2,000,000 megohms in six overlapping ranges selected by a multiplier switch. Accuracy: Plus or minus 3% on resistance values up to 100,000 megohms; plus or minus 5% from 100,000 to 2,000,000 megohms. Voltages on Unknown: The voltage applied to the unknown terminals is 500 volts D.C. and is independent (less than 1%) of the value of the unknown. Power Supply: 105-125 volts A.C. 50-60 cycles 30 watts. Dimensions: 9½ x 10½ x 8 inches.

SEND FOR COMPLETE TRANSFORMER & INSTRUMENT CATALOGS

FREED TRANSFORMER CO., INC.
1716 Weirfield Street, Brooklyn (Ridgewood) 27, N. Y.
Take the trouble out of winter

with 'Jeep' 4Wheel-drive VEHICLES

solve your toughest transportation problems too!

You're always sure and safe with 4 wheel-drive

'Jeep' vehicles are internationally recognized as the most dependable means of transportation today! The ability of these modern workhorses to go through snow, sand, mud, over icy roads, up and down steep grades, across open country, make 'Jeep' 4 wheel-drive vehicles Canada's first choice for the really tough jobs!

TRACTION. Four wheel-drive gets you through snow, ice, mud.

SNOW PLOWS. Angle, V or Blower types.

TRUCK WRECKER. Gives sure service in any weather.

CAB. Ideal for winter working comfort. WINCH increases uses of vehicle.

COMPRESSOR. Power take-off-driven. One-man operation.

WELDER. Service on the spot in any weather.

DUMP-O-MATIC. Saves time, cuts costs.

JEEP-A-TRENCH. Even trenches in frozen ground.

For the toughest "impossible" jobs the world automatically thinks of 'Jeep'

KAISER-WILLYS OF CANADA LTD.

WINDSOR • ONTARIO

Canada's most useful vehicles
Television Flight Information

The first airline use of closed circuit television is underway at the Portland Airport, Portland, Oregon, where United Air Lines is testing TV as a fast, efficient way to disseminate flight information.

The experimental telecasts originate in United's dispatch office — central source of flight information — where arrival and departure times are posted on a large plexiglass panel. A TV camera, focused on the panel, transmits pictures via coaxial cable to four receivers in the terminal building. One receiver is in United's telephone sales office, another in the ramp chief's office, and two are in the lobby for public viewing.

Flight information ordinarily is reported to various departments by telephone and telemeter. As compared with this method, closed circuit TV thus far has been found to have these advantages:

1. Faster reporting of arrival and departure times to the public;
2. Simultaneous reporting to all departments;
3. Elimination of error through transcribing or transmitting flight information;
4. Elimination of duplicate effort, since agents no longer have to post changes on Flight Information boards in the lobby and telephone sales office.

The Portland installation is the result of tests begun 18 months ago by United and Kay-Lab Corporation of San Diego, makers of industrial electronic equipment. Portland was chosen for a full-scale test because all of United's offices there, except a downtown ticket office, are under one roof.

United and Kay-Lab are exploring inter-city use of closed circuit TV and transmission to receivers at remote locations. If the Portland tests prove satisfactory on all counts, similar installations may be made at major stations on the airline's 13,250-mile system.

first with hermetically sealed receptacles

... and still the leader for true hermetically sealed plugs and receptacles... pin or socket insert assemblies... in a variety of "AN" (Air Force-Navy) and Cannon K and KK shell sizes. Square, circular, or hex flanges with locknuts for panel mounting. Many insert arrangements available. Standard shell finish now combines copper flash, heavy cadmium plate and tin plate. Steel shells and contacts. Vitreous insulators fuse contacts to the shell to provide perfect hermetic seal.

IN PIN AND SOCKET INSERT ASSEMBLIES
Write for Hermetically Sealed Connector Bulletins.
CANNON ELECTRIC CANADA LIMITED
160 BARTLEY DRIVE, TORONTO 16, ONT.
CANNON ELECTRIC
Since 1915
BUDELMAN TELEPHONE CARRIER EQUIPMENT

The Only Low Cost Telephone Carrier Equipment Immediately Available

- E & M Trunk signalling 2 frequency crystal controlled
- Ringdown trunk signalling
- C. B. subscriber with bridged and divided ringing
- Magneto subscriber carrier with revertive call features
- Single party C. B. subscriber private line carrier

PLUS: A complete range of FM-VHF and Microwave Radio Systems, available in a number of versions to suit any requirement and easily integrated with Budelman Telephone carrier equipment.

We welcome inquiries which will enable us to engineer custom-built systems to your specifications.

Exclusive representatives in Canada

COMMUNICATIONS DIVISION

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HALIFAX

Plant: AJAX, Ontario

Typical subscriber carrier terminal showing 3 channels of bridged ringing carrier in outdoor pole-mounting cabinet.

Type 16A — Central Office carrier, Selective (Divided) ringing.

Type 16A Subscriber Carrier Terminal. Selected (Divided) ringing.

Type 16A Carrier E & M Auxiliary signalling chassis.

Engineers and consultants on mobile fixed to mobile, point to point, and multi-channel radio communication systems; suppliers of telephonic apparatus of all kinds; manufacturer and supplier of scientific instruments, industrial and commercial television cameras, radios, high-fidelity reproducers and television receivers.

For further data on advertised products use page 99.
Varian Associates Establish First Canadian Klystron Manufacturing Plant

Canada's first klystron manufacturing and research plant went into operation October 21, with the dedication of the new Varian Associates of Canada Ltd. facility in Georgetown, Ontario. The opening ceremonies were attended by representatives of government and industry, with the dedication address given by Dr. Russell H. Varian.

Organized last October, the new firm will be engaged in the manufacture of Varian klystron tubes for both Canadian and U.S. customers and will also be available for the development of advanced tube types and related microwave devices. The Varian klystron tube manufacturing and development facility is the first of its kind to be established in Canada and marks an important step in the growth of Canada's vigorous electronic industry.

At a recent directors' meeting, Mr. C. W. Carnahan, Manager of the new plant, was appointed Vice-President and General Manager of the firm. Mr. Carnahan was previously engaged in engineering management work in the Varian headquarters in California and before that served five years as manager of electronics research at Sandia Corporation, Albuquerque, New Mexico. Mr. B. H. Breckenridge, Assistant Treasurer, was appointed Business Manager and Assistant Secretary.

Mr. P. J. Corbell is Sales Manager and other key technical positions are filled by personnel on loan from the parent company until Canadian replacements are trained in the highly specialized field of klystron development and manufacture.

It is planned that management and operating positions of Varian Associates of Canada Ltd. will be assumed by an all-Canadian staff after the completion of the necessary training program.

Located on a ten-acre site at 45 River Drive in Georgetown, the new 10,000-square foot plant has provision for expansion to several times this area.

The new company is a subsidiary of Varian Associates of Palo Alto, California. Only seven years old, the parent company is now one of the world's largest and most diversified manufacturers. Those eligible to qualify for the scheme will be under no obligation to work for either firm following the year's work. In making the announcement Lindsay said the employees of other firms in Canada who can secure leave of absence are also eligible for the trip.

Successful applicants for the scheme will be paid $3,900 for the year in addition to travelling expenses to England and return. Unmarried applicants who qualify for the scheme will be paid one-half this amount in sterling while in England, and the remaining paid in dollars on their return to this country. Married engineers will be paid their entire salary while in England but will have to defray travelling expenses for their families.

C.G.E. Awarded Contract For Charlottetown TV Installation

Canadian General Electric Co. Ltd. has announced the signing of a contract with Island Broadcasting Company, headed by Mrs. Keith S. Rogers and Mr. R. F. Large, Manager, for a complete television transmitter and studio installation at Charlottetown, Prince Edward Island.

Planning a Spring 1956 “On Air”, CFCY-TV has been allocated Channel 13. The combined transmitter-studio operation is situated eight miles outside Charlottetown.

CFCY-TV, Charlottetown, is Canadian General Electric's 57th broadcasting station, and the equipment supplied includes C.G.E.'s Ultra-Power television antenna. Used on Channels 7 through 13, the Ultra-Power antenna represents a new development in simplified design and flexibility, allowing block building to the maximum allocated power of 325 Kw E.R.P.
British Radio Shows In 1956

The 23rd annual (British) National Radio Show will be held at Earls Court, London, from Wednesday, August 22, to Saturday, September 1, 1956, with a preview for overseas visitors and other special guests on Tuesday, August 21.

The exhibition, as previously, will be primarily concerned with broadcasting and all the equipment for it. It will include demonstrations of the latest television techniques, from every stage from camera to screen. There will also be exhibits of components and valves, electronic equipment for industry, service equipment and training methods.


The 13th annual Radio Component Show will be held at Grosvenor House, Park Lane, London, W.1, from Tuesday, April 10, to Thursday, April 12. An innovation will be a preview on the afternoon of Monday, April 9, for overseas visitors, the press and other specially invited guests.

Exhibits by about 150 manufacturers—a record number—will cover the whole range of components for the radio, television, electronic and gramophone industries and test equipment.

Organizers are the Radio and Electronic Component Manufacturers Federation, 21 Tothill Street, London, W.C. 1.

Musimart of Canada Limited, Montreal, have announced their recent appointment as the Canadian agents for Dynamu Magnetronics Corporation, a division of the Minco Company of Minneapolis.

As agents for Dynamu Magnetronics Corporation, Musimart will handle Dynamu Heads, which have been heralded as one of the most revolutionary developments in the field of tape recording and reproduction technology.

J. M. Bridgman, Managing Director, PSC Applied Research Limited

Announcement of the appointment of J. M. (Monty) Bridgman to Managing Director of PSC Applied Research Limited has been made by officials of the company. Mr. Bridgman joined PSC in 1947 to set up a Technical Division. Under his direction these grew into two self-sustaining companies, PSC Applied Research Limited (AIL) and Aeromagnetic Surveys Limited. He became Managing Director of AIL in 1951.

Mr. Bridgman previously was in charge of electronic development for the RFC in Ottawa. He served with the RFC and RCAF as a radar expert from 1941 to 1947; in 1945 he was in charge of airborne radar for the Middle East Command of the RCAF, with the rank of Squadron Leader. After the war, at RFC HQ in Ottawa, he promoted the use of Shoran for aerial survey.

Eitel-McCullough, Inc. To Add 17,000 Square Feet For Super Klystron Production

A new 17,000 square foot building, which will include facilities for the production of super-klystron amplifier tubes up to 20 feet long, will be added to the main San Bruno, California, plant of Eitel-McCullough Inc., manufacturer of Eimac electron-power tubes. Present plans call for completion of the building in early spring.

The need for additional klystron facilities arises from the demand for Eimac high power klystrons in an increasing number of electronic applications, including forward-scatter.

One section of the building will include a two-ton crane to handle the giant klystrons.

The new extension will bring the total square feet at the main Eimac plant in San Bruno to approximately 170,000 sq. ft. Eimac has office and research facilities at two other San Bruno locations and a major plant in Salt Lake City, Utah.

C.D.C. Appointed Agents

Computing Devices Of Canada Limited have recently announced their appointment as the Canadian representatives for Byron Jackson Co., P.O. Box 2017, Terminal Annex, Los Angeles, California; the Donner Scientific Company of 2801 Seventh Street, Berkeley 10, California and Lavoie Laboratories Inc., Morganville, N.Y.

Canadian Admiral's Vincent Barreca Elected To Newly Created Post

Vincent Barreca, President of Canadian Admiral Corporation, has been elected to the newly-created post of vice-president-operations of the parent company, Admiral Corporation, with headquarters in Chicago. John B. Huarisa, Executive Vice-President, also announced Barreca's election to the Board of Directors, and said he will retain his Canadian affiliation.

Barreca, 38, is a native of Chicago. He joined Admiral in 1934 when the company was founded, and worked in all phases of production and purchasing. In 1946 he was assigned to Canada to establish Canadian Admiral Corporation, the first firm to manufacture TV receivers in the Dominion.

The Canadian subsidiary manufactures television and radio receivers in a new 130,000 sq. ft. plant in Port Credit, Ontario, a suburb of Toronto. According to industry statistics, the company's receivers are in over one-fourth of Canada's TV homes.

Dominion Sound Equipments Appoints R. T. Manuel To Newfoundland Post

The appointment of R. T. Manuel as sales and service representative in St. John's, Newfoundland, has been announced by J. McEwan, Halifax district manager for Dominion Sound Equipments Limited.

For the time being Mr. Manuel will make his headquarters in the Northern Electric office at 32 Adelaide Street, St. John's, Newfoundland.

(Turn to page 46)
Electronic Engineers
Co-Operate For Public Good

The most far-reaching example of co-operation by many top-ranking professional engineers for the benefit of industry and the public was held in Ottawa recently. The results of this giant co-operative effort, which affects the technical and economic utilization of the radio air-waves, were examined in detail at the 11th annual meeting of the Canadian Radio Technical Planning Board.

Without parallel in the history of engineering development in this country, many electronic specialists met at this Board meeting, on an entirely voluntary basis, to consider recommendations made by engineers meeting during the past year, at their own expense, to make certain that the radio air-waves, which are in the public domain, will provide for the rapidly increasing number of radio and allied services. The results of these deliberations will undoubtedly reflect in clearer television reception and better radio listening in the homes of Canadians.

The Canadian Radio Technical Planning Board was formed to make recommendations to the Government and to industry for the conservation and efficient use of the radio spectrum, or the channels of communication for the public service.

(Turn to page 48)
Vision first lights the way. Then progress follows. Today intricate electronic devices like the new OSCILLOSCOPE, recently developed by CAE research experts, are “blazing the trail” into tomorrow’s “push-button” world.

Basic to all electronics, the CAE Oscilloscope shines deeper into the secrets of the natural world than man has ever seen before. It “sees” into the structure and action of the heart, permitting accurate diagnosis. It “sees” into the heart of aeroplane engines, actually picturing the efficiency of metals and parts. It “sees” into fog and darkness in the form of radar.

Into business, industry, home and national defense shines this new light, seeing and reporting data with such fantastic speed and accuracy that revolutionary methods become possible.

With these new electronic tools and many more which will be discovered in CAE’s research laboratories ... Canada will develop a new and powerful economy ... with greater productivity, higher quality, less waste, greater national security ... bringing a higher standard of living for all.

Through research, design, development and engineering, the skilled personnel of CAE are proud of their electronic contributions that are destined to play a major role in our country’s most ambitious projects.

At CAE there are unlimited opportunities for those who plan their future in the exciting world of electronics. CAE is an ultra-modern and progressive company that offers unexcelled working conditions and unparalleled benefits.
**Collins Radio Company Takes Over Communications Accessories Co.**

Collins Radio Company, Cedar Rapids, Iowa, a major developer and manufacturer of communication and navigation equipment, has acquired one hundred per cent ownership of Communication Accessories Company, an electronics component manufacturer, through an exchange of stock.

Communication Accessories Company currently employs 400 in its Hickman Mills, Missouri, operations. It specializes in the design, development and manufacture of toroids, audio band-pass filters, pulse transformers and magnetic amplifiers. Its products are used extensively in communication equipment and in guided missiles.

Collins’ officials state that the new subsidiary will continue to operate as an independent unit in the components field with distribution through its established representatives. Edward J. King, Jr., founder and president of Communication Accessories Company, and other key personnel will continue with the organization.

**Sensitive Research Instrument Moves To New Premises**

Marvin I. Steinberg has announced the relocation of Sensitive Research Instrument Corporation in their new production and engineering laboratories at 510 Main Street, New Rochelle, N.Y.

Sensitive Research Instrument Corporation is represented in Canada by Measurement Engineering Limited of Arnprior, Ontario.

The new building is completely vibration proof, dust free and air conditioned and provides the company with about three times the production and engineering facilities previously available.

**Varian Associates Enter High-Energy Radiation Business**

Varian Associates has entered the high-energy radiation business, according to an announcement this week by Dr. Russell H. Varian, President of the Palo Alto electronics firm. The company is planning construction of its own linear electron accelerator, under license recently obtained from Stanford University, where such accelerators were pioneered, and has undertaken development of special accelerator parts for the University of Chicago. Other contracts in this field are now being negotiated, Dr. Varian said.

**W. H. Heflin Elected To Top Post By Lenkurt Electric**

William H. Heflin has been elected Vice-President and General Manager of Lenkurt Electric Co. of Canada Ltd. at Vancouver, British Columbia.

The company, an affiliate of Lenkurt Electric Co. in San Carlos, California, produces carrier telephone and telegraph systems and other electronic equipment for use throughout Canada.

**J. H. Cornell Elected PSC Director**

J. H. (Bert) Cornell, Commercial Manager of The Photographic Survey Corporation, of Toronto, has been elected to the air survey organization’s board of directors, D. N. Kendall, PSC President, announces.

Mr. Cornell joined PSC’s aircraft operating company, Kenting Aviation, as a navigator in 1946. In that year he flew on PSC’s first South American operation, an oil concession survey in Venezuela. In 1950 he transferred to PSC’s Sales Division as Western Representative, with headquarters in Calgary. He returned to Toronto in 1951 to become PSC’s Sales Manager, a post later designated as Commercial Manager when Mr. Cornell took over supervision of all the company’s client relations.

**Marsland Engineering To Manufacture TV Tuners**

Marsland Engineering Limited of Kitchener, Ontario, and Sarkes Tarzian Inc. of Bloomington, Indiana, have announced an exclusive licensing agreement between the two corporations for the manufacture of Sarkes Tarzian television tuners in Canada. The agreement became effective last October last.

**Sensitive Research Instrument**

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(Continued from page 46)
EIMAC KLYSTRONS are used in Texas Towers forward-scatter communications system

High power UHF/microwave forward-scatter transmitters by National Company are an example of reliable National equipment designed to meet the most exacting requirements. From the first National Company forward-scatter development link to the advanced Texas Tower communication net, Eimac klystrons have been used exclusively as high power final amplifier tubes. Eimac amplifier klystrons provide the power necessary to make long distance communication through forward-scatter techniques practical at microwave frequencies.

- Second in a series of advertisements emphasizing the extensive application of Eimac amplifier klystrons and circuit components by the leading manufacturers of forward-scatter UHF/microwave transmitters.
NEWS
(Continued from page 48)

New President And Directors Named By Canadian Westinghouse

The Board of Directors of Canadian Westinghouse Company Limited announce the election of George L. Wilcox, former Executive Vice-President of the Westinghouse Electric International Company, New York, as President and Director of Canadian Westinghouse.

G. L. WILCOX

The Board also announce the election of two new directors, W. E. Phillips of Toronto, President of Duplate Canada Ltd., and L. E. Osborne, Vice-Chairman of Westinghouse Electric Corporation. The intention of the company is to elect, in addition to Mr. Phillips, other Canadian directors to its Board so that not only the independent shareholders but also the Canadian economy will be substantially represented.

Mr. Wilcox brings to his new position a thorough background in industrial management, combined with a broad knowledge in all phases of the electrical industry.

Mr. Phillips, in addition to serving Duplate Canada Ltd. as President, is Chairman of the Board of Canadian Pittsburgh Industries Ltd. He is a director of The Royal Bank of Canada, Massey-Harris-Ferguson Ltd., the Brazilian Traction, Light & Power Co. Ltd., the St. Lawrence Corporation Ltd. and several other Canadian companies. He is Chairman of the Board of Governors of the University of Toronto. His home is in Toronto.

Mr. Osborne, Vice-Chairman of the Board of Westinghouse Electric Corporation, has been with that company for 44 years.

Entron Incorporated Appoint Eastern Canadian Representative

Entron Incorporated, Bladensburg, Maryland, announces the recent appointment of Maurice Olfman, Montreal, as Entron factory representative for Eastern Canada.

The JFD Manufacturing Co., Inc., Brooklyn, N.Y., recently announced the opening of a Canadian manufacturing and sales division. Called JFD Canada, Ltd., it is located at 51 McCormack Street, Toronto 14, Ontario; contains the latest, most modern stamping and assembling machinery.

In a statement, Mr. Julius Finkel, JFD President and founder, said, "Today's rapidly-expanding television markets demand that the antenna manufacturer provide the fastest possible service at the lowest possible prices." Mr. Finkel went on to say that this expansion move will give Canadian distributors and dealers on-the-spot service, faster delivery, savings in shipping and duty charges, and in product costs.

Perkin Appoints Electromechanical Products As Representative

The Electromechanical Products Company, Warden Avenue, Agincourt, Ontario, Canada, was recently appointed the exclusive manufacturer's representative in Canada for the Perkin line of DC power supplies, according to an announcement made by Philip Diamond, President of Perkin Engineering Corporation, 345 Kansas St., El Segundo, California.

(No text continues on this page.)

LAKESHORE

WE ARE PROUD TO ANNOUNCE

that the list of our Distinguished Clients now includes the internationally famous makers of Klystrons —

VARIAN ASSOCIATES OF CANADA LIMITED
GEOGETOWN, ONTARIO

who now join as our client, such recognized leaders in Aviation Electronics as —

AVRO Aircraft Ltd.
Canadian Pratt & Whitney Aircraft
Sperry Gyroscope of Canada
The Federal Government
Canadian Arsenals Ltd.
Frigidaire Products of Canada Ltd.

AND PROUD TO OFFER OUR UNIQUE SERVICE

to the Aviation Electronics Industry with parts made to the most exacting standards of precision, accuracy and tolerance. We have complete facilities for manufacturing

DIES — FIXTURES — TOOLS & GAUGES

"Be Precise — Go Precision" — Bring your problems to us.

LAKESHORE PRECISION GAUGE WORKS LIMITED
100 NIAGARA AT TECUMSEH STREETS
TORONTO, ONTARIO

For further data on advertised products use page 99.
time on our hands

Here's a handful of microtime... doled out in hundredths of a millimicrosecond. It's our new HELIDEL* delay line.

It's precise... wide-band... continuously variable. This is not an adwriter's pipedream... it's an engineer's, come true.

Which means that definitions are in order.

Precise = delay increments of only $2 \times 10^{-11}$ sec; resolution 0.01% and better; linearity "better than $\pm 1\%"... actually, so fine it can't be measured.

Wide-band = transmission of pulse signals up to 20 mc with negligible phase-distortion, overshoot, or distortion of waveshape.

Continuously variable = a distributed-constant, electromagnetic type... dreamed up in 1946... developed in helical form since 1951, by Helipot and DuMont.

The HELIDEL is already used successfully in color-tv broadcasting and oscilloscopes... and as a trimmer in transmission systems.

What can you dream up?

---

To help you dream, there's a 10-page technical paper on the HELIDEL, presented at the 1954 WESCON... and a new data sheet, with complete specs. For your copies, write for Data File 1207.
NEWS
(Continued from page 50)

W. S. Kendall Announces Collins Radio Appointments

W. L. "Murray" Binions has been promoted to the position of Assistant Director of Sales. His broad experience and wide acquaintance in the Canadian radio and electronics industry over the past ten years will be most effectively utilized in this new capacity.

J. H. McLeod, who came to Collins from the Department of Transport, will have the responsibility for setting up the Collins Field Service Organization in Canada. McLeod has just returned from Collins, Dallas, where he had several months' indoctrination on the latest equipments, including SSB transmitters, weather radar, the Collins Integrated Flight System, the Military ARC-27 UHF transceivers, etc.

Phillip Wharton will head up the Amateur and Industrial Component Sales. Mr. Wharton has a wide background of experience in electronics and has travelled extensively in this field. Wherever he has been he has set up and operated with enthusiasm.

His most recent experience has been in that ham's paradise, Ethiopia, where his call letters were ET3S. His responsibility in Ethiopia was as a radio instructor for the United Nations' Technical Assistance Mission to Ethiopia. It is interesting to note that Phil Wharton was instrumental in persuading the Ethiopian Government to restore amateur radio again after the war.

CAE Opens Maintenance Laboratory At Dorval Airport

Canadian Aviation Electronics have established a repair and maintenance laboratory at the Timmins Business Aviation Hangar at Dorval Airport in Montreal.

This facility permits immediate and complete adjustment, repair or overhaul of any type of airborne electronic equipment. Should a visiting aircraft develop trouble in its communication, radio navigation or any other electronic equipment on board, it can be attended to without delay. If new equipment is needed, it can be installed and the necessary cable harness and mounting brackets produced with the absolute minimum of delay.

CAE's Montreal plant is located six minutes drive from the Timmins Aviation Hangar, and the complete facilities of this plant are always available in support.

Douglas N. Kendall
Vice-President
Hunting Associates Limited

As Vice-President of Hunting Associates Limited, of Toronto, Mr. Douglas N. Kendall is executive head of all Hunting Group companies in Canada. He is President of The Photographic Survey Corporation, PSC Applied Research Limited; Field Aviation Company Limited and Kenting Aviation Limited and Vice-President of Aeromagnetic Surveys Limited.

In 1946 Mr. Kendall came to Canada to set up PSC, which has since grown to be the largest civilian aerial survey organization in the British Commonwealth, and in conjunction with other Hunting companies, the largest in the world. PSC Applied Research and Aeromagnetic Surveys, from being technical divisions of PSC, have grown to be separate companies with growing interests in the instrumentation and geophysics fields, respectively.

Community Television For Quebec Centers

New community television systems under construction in Magog, Quebec; Victoriaville, Quebec, and Shawinigan Falls, Quebec, are installing equipment manufactured by Entron Incorporated of Bladensburg, Maryland.

(Turn to page 64)

PRECISION ELECTRONIC COMPONENTS LTD.

Announce their NEW TYPE 'VG'

VARIABLE COMPOSITION RESISTORS

for 3 Watt rating at room temperature and 2 Watt 75°C. ambient temperature.

This new Type "VG" has a resistance element which is homogeneous, solid, and not only surface-coated. It has a very low noise level and is stable. The mechanical construction is very sturdy and the corrosion resistance is very high and will pass a 200 hour salt-spray test. The change after a humidity-cycling test is less than 5%.

Fast delivery. Any special type, as for instance double or triple Controls; sealed shafts; locking devices; as well as tapers and resistance values from 100 ohms to 5 megohms, can be made to order.

PRECISION ELECTRONIC COMPONENTS LTD.
50 WINGOLD
TORONTO, ONT.
RU. 1-6174

For further data on advertised products use page 99.
here is the easy, economical way to gain toll quality transmission!

Automatic Electric's new type AT-2 TRANSISTORISED Voice Frequency Repeater provides many striking advantages economically. Its small size and small (one watt) power drain, large (up to 10 db) gain and ease of installation, provides the answer to your transmission problems.

Saves space—Using transistors as small as a pencil eraser, instead of bulky tubes, Type AT-2 measures only 5 1/4" high, 2" wide, and 7 1/2" long.

Saves maintenance—Transistors last many times longer than vacuum tubes, and are almost free from aging and dissipation. You can forget tube failures, forget frequent checks of output levels.

Saves power—Type AT-2 is fully self-contained; it needs no power supply other than your exchange battery. Draws only about 1/10th the power required for comparable vacuum tube units. (Special fins on transistors eliminate need for cooling fans, regardless of number of repeaters in installation.)

Offers simple installation—No electronic training necessary to install the Type AT-2 Voice Frequency Repeater. It can be removed at any time without interrupting conversations. A specially-designed Installer's Set is available for quick matching of network to line.

Has many applications—Maximum gain is about 10 db on non-loaded cable or open wire, and from 6 to 8 db on loaded cable or wire. You can use Type AT-2 to raise transmission to toll grade, or to permit use of smaller-gauge cable on inter-office trunks, long subscriber lines, foreign exchange lines, P-B-X tie trunks, tandem and tributary trunks, centralized intercept and information trunks, loaded and non-loaded cable, and other applications.

Write today for Circular 1844. It gives full details.
steel spider

Replace with guaranteed

ROGERS ELECTRONIC TUBES

RECEIVING TUBES - PICTURE TUBES - TRANSMITTING TUBES - FERROXCUBE

For further data on advertised products use page 99.
at work

Fashioning grids from wire that is not much thicker than a spider's silken thread is one of the many precision operations necessary to produce the components for ROGERS electronic tubes.

Designed and built by ROGERS engineers, these strong yet wonderfully sensitive grid winding machines draw out a pair of parallel wires called side rods, cut notches in them, feed winding wire around the rods and into the notches and then peen it fast in a solid mechanical bond. For a tube the size of a 6CB6 the side rods are less than 1/32" in diameter and are spaced about 5/32" apart.

High standards of engineering, rigid inspection and the thorough testing of every completed tube ensure the high quality and long-life performance of ROGERS electronic tubes.

A section of the finished grid as the inspector sees it under a microscope.

This enlargement shows the way in which the grid wire is notched into the side rods.
NEW PRODUCTS

New Product specifications published in Electronics and Communications have been briefly 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 99. Just mark the products you are interested in on the coupon on Page 99 and the information will be in your hands within a few days.

- **18-Ounce Torque Motor**  
  **Item 937**  
  A new and powerful torque motor designed to drive hydraulic servovalves or other mechanisms which demand fast response at high output force proportional to input current has recently been announced.

  The torque motor is conservatively rated at nine pounds of force for 40 ma differential current. It may be driven from two miniature output tubes in push pull, or from magnetic amplifiers. When magnetic amplifiers drive the motor, low impedance, high current coils are available which dissipate the same power.

  The stroke of the motor is \( \frac{0.015 \text{ inch}}{40 \text{ ma}} \) proportional to input differential current. The displacement sensitivity is \( \frac{4 \text{ inch per amperes}}{9 \text{ lbs}} \) for full stroke.

  This rugged little 18-ounce motor is assembled with steel dowels and will withstand severe vibration without damage. The armature is of balanced construction so that large lateral accelerations have virtually no effect on armature position.

  The torque motor is designed to operate from \(-65^\circ\) to \(400^\circ\) F.

- **New Delay Line For Color TV**  
  **Item 938**  
  An inexpensive, distributed-constant delay line designed for use as a compensating delay in the luminance channel of color television receivers, has been announced.

  The new Shallcross Type T 30036 Delay Line has an unusually high impedance of 4300 ohms and uniform response to 4 megacycles. Phase characteristics also are linear within 5 per cent to 4 mc. Total delay of the T 30036 is 0.8 microseconds. Rise time is only 0.1 microseconds.

  The unit is enclosed in an aluminum can only 14 sq cm. square by 3\( \frac{1}{2} \) cm. high, exclusive of terminals. Modifications of the basic electrical and physical characteristics of the T 30036 can be made for quantity users.

  Full details on this, and other Shallcross Delay Lines are available on request.

- **Self-Locking Micro Nuts**  
  **Item 939**  
  A line of remarkably tiny Flexloc micro nuts — miniature self-locking fasteners for precision instrument and electronic fastening applications have been introduced to the market.

  The new Flexlocs meet the increasing demands of miniaturization for smaller and precision fasteners, range in size from 0-80 up to 4-48. The 0-80 micro nut, smallest in the line, measures less than one-eighth inch across itslargest dimension.

  It would take 281 of these miniature fasteners to fill a standard thimble.

  Though much smaller than a standard Flexloc of the same nominal diameter, each micro nut provides all the mechanical advantages of its larger counterpart. The Flexloc is a one-piece, all-metal fastener that functions as a stop nut as well as a locknut.

  Its slotted, locking collar, whose segments are turned in slightly during manufacture, is expanded as the nut is tightened down on a threaded member. Spring-like pressure of the resilient, collar segments holds the Flexloc securely in place, whether seated or not — even under severe vibration. The Flexloc locks anywhere on a threaded member as soon as its locking threads are fully engaged.

  Flexloc design permits repeated re-use. Because of all-metal, one-piece construction, heat, moisture, dryness of oil does not impair effectiveness.

- **Sensitive Relay Catalog**  
  **Item 940**  
  A comprehensive catalog on high speed and sensitive relays is available.

  The 13-page catalog describes relays especially designed for precision aircraft electronic equipment conforming to highest standards of inspection with excellent military ratings in quality control.

  Operational charts and instructions for their use are included. The charts provide a means of predicting the behavior of special values of coil resistance and other operating characteristics. Dimensional and wiring diagrams are also shown in the relay catalog.

- **Snap-Around Volt-Ammeters Now Available**  
  **Item 941**  
  With the addition of three high voltage Amprobe Junior models, there is now an Amprobe model available for every job and every budget. This complete line assures the correct model being available for all types of electrical servicing and installations.

  The Amprobe Junior line of economy models are designed to fill a specific job at low cost. This tool now makes it possible for every man who formerly carried an ordinary voltage tester to work with greater accuracy and with the added convenience of a real snap-around ammeter. Amprobe Juniors are available in 0-250, 250 volt models in current ranges of either 0-10, 0-25, 0-50 and 0-100 amperes ac and in 0-150, 600 volt models in current ranges of either 0-25, 0-50 or 0-100 amperes ac.

  The model 300 is the ideal Amprobe for general all around work. It covers 6 amperes range up to 300 amperes ac and 3 volt meter ranges up to 600 volts. The tapered probe jaws are perfect for hard-to-get-at wires in crowded switch boxes.

  The model 600, and 1200 are the same models without the low range. The model 300 but designed to handle extra heavy loads up to 600 and 1200 amperes ac.

- **High-Fidelity FM Tuner Kit**  
  **Item 942**  
  The new Heathkit Model FM-3 features tremendous circuit improvements and brand new physical design. Sensitivity is better than 10 uv for 20 db of quieting, and it employs a completely modern tube line-up for highgain and stable operation. Incorporates its own power supply, and has provision for low-level or high-level output at low impedance.

  The attractive Model FM-3 matches the WA-P2 Preamp in color, styling, and physical size.

  Incorporates automatic gain control, a highly stabilized oscillator, and illuminated tuning dial. Educational treatment of construction manual simplifies assembly for the newcomer to electronics. IF and ratio transformers are prealigned, and the front-end tuning unit is pre-assembled and aligned.

  Uses 6BF7A as a cascade (type RF stage, 6UB oscillator-mixer, two 6G6's as IF amplifiers, a 6AL5 ratio detector, a 6C4 audio amplifier, and 6X4 rectifier.
VU And DB Panel Instruments

These new, completely self-contained precision panel instruments are ruggedized and conform to MIL-M-10304 and MIL-M-3023 specifications. They are accepted and used by the armed services, and in commercial applications where audio level monitoring is necessary.

Vulcanized Fiber Containers For Electronic Components Described In Bulletin

Lightweight vulcanized fiber materials handling containers that can be used to speed the intra- and inter-plant transport of delicate radio and electronic components are described and illustrated in a recently released catalog.

Radio Field Strength Meter

This extremely rugged equipment is designed to make field strength measurements in the range of 10 to 125 megacycles and will accurately measure field intensities ranging from 2 microvolts to 25 million microvolts per meter. Model 728 can be used to measure the field intensities of both AM and FM transmitting stations.

Provisions for linear or logarithmic output indications for recording meter use are included. Readings in decibels above 1 microvolt per meter are made by the simple addition of three values. Measurement of noise intensities can be made by means of auxiliary probes.

RURAL COMMUNICATIONS

a vital link

TMC MAGNETO TELEPHONE AND SWITCHBOARD EQUIPMENT GIVES TWO-WAY SATISFACTION

Our Magneto Telephone Equipment is designed and built to operate at high efficiency in all climatic conditions for long periods without attention.

Maintenance is simple because all parts are easily accessible. Smart as well as rugged, the telephones have polished black moulded bakelite cases and combination handsets, with anti-side-tone circuits.

Magnet Switchboards, strongly constructed of seasoned hardwoods, having attractive modern designed cabinets are also available.

A full range of equipment is kept at our showrooms. We invite you to call or write for full details and technical data.

For further data on advertised products use page 99.

World Radio History
NEW PRODUCTS
(Continued from page 57)

• Automatic Hysteresis Loop Recorder

Item 947
An entirely new automatic hysteresis loop recorder is now being distributed through the Commercial Products Division of Canadian Marconi Company. Designed to facilitate the testing of magnetic materials usually done by ballistic methods. It records the hysteresis loop on a chart 30 x 20 cms. in a few minutes, the time being controlled according to the material under test. The sensitivity of the record is controlled by the dial setting of the integrator amplifier. This covers a range of from $6 \times 10^{-1}$ to $8 \times 10^{1}$ line turns per cm. on the recording chart. In practice this means that with a specimen of 1 sq. cm. section with a winding of 100 turns, 1 mm. corresponds to 60 lines (gauss).

The magnetizing current is automatically controlled and can be set to any maximum value up to 400 mA. This gives ample magnetization for saturation on normal ring samples without an undue number of turns. The control of the exciting current is such that it automatically reverses at each end of the loop, so that magnetization can be followed over any desired number of cycles. In addition minor loops at any point on the cycle can be plotted, by pressing a button which reverses the current.

Such alloys as H.C.R. can be plotted without any particular difficulty as well as silicon iron. One feature is the ease with which this flux measurement can be calibrated. This is done by simply applying a known e.m.f. for a definite length of time and noting the reading. No mutual inductance is involved. The reading is simply the integral of the fundamental equation:

$$e = -N \frac{d\phi}{dt}$$

where \(N\) = number of turns
and \(\phi\) = flux in lines per sq. cm.

• New 4-Channel Open-Wire Carrier System

Item 948
Development of a new miniaturized 4-channel carrier telephone system for open-wire lines has been announced and is now being placed in regular production at the company's plant in Vancouver, B.C. A prototype was given extensive tests under field operating conditions in the southwest part of the United States this summer.

The new system uses single-sideband suppressed carrier operating in the frequency range of 40 to 76 kc and co-ordinates with Western Electric 4B carrier. The 45CB is designed to permit operation on the same open-wire pair with 3-channel Lenkurt 33A systems or other carrier systems using frequencies below about 35 kc.

Three of the common equipment units in the 45CB have been transistorized. In addition to transistors, the new system has the latest proven electrical and mechanical design techniques such as unitized plug-in construction. All four channels are encompassed.

Type 45CB is the fourth system to be developed for the Lenkurt 45-class carrier family. Other 45-class systems include a 12-channel open-wire, 24-channel cable, and 240 channel radio carrier. These are designed so that channel groups can be transferred between different systems at carrier frequencies.

• Booklet On Magnetic Tape Manufacture

Item 949
Owners and operators of tape recorders, students, and others interested in magnetic recording will find a great deal of useful and interesting information about the manufacture and quality control of magnetic recording tape in a new illustrated folder recently published.

This new folder, "How Magnetic Tape is Made", completely describes and illustrates in six photos every step in the manufacture of magnetic recording tape, from start to finish. The publishers of the booklet, are the manufacturers of a line of well known tapes, and they are offering copies of the booklet free on request.

(Please turn to page 60)
This was the tenor of His Eminence’s remarks. The few lines which seem to have aroused some criticism was therefore isolated from the context of this message. They were not even correctly translated. For instance, His Eminence has been quoted as saying “the diffusion of a belief tending to substitute man for God by exalting his (man’s) bounty and glorifying his egotism”. This is not what His Eminence said at all. He was merely comparing the Christian concept of man weakened by original sin and the doctrine which strives now to substitute man for God by exalting man’s natural goodness and making light of his tendency toward pride and egotism. Quite a difference!

May I point out that these words are vastly different from the ones which led you to apply His Eminence’s statement to the starving millions in the world. I assure you that the concern of His Eminence for all of humanity is too well known to need any defense.

I think that anyone who reads the sermon of His Eminence in its entire context would not interpret it as a condemnation of technical progress. Far from begrudging the worker greater hours of leisure, he is only concerned to see this leisure used for human and cultural purposes. We might mention in passing that on this point Robert M. Hutchins in a recent visit to our city spoke on much the same terms. It would be a pity then if the important and timely message which the Cardinal delivered to the workers should be misunderstood and misinterpreted by critics based on a few lines taken out of context, and some of them not even true to the original.

Yours sincerely,

(Rev.) Alex Carter.

A firm of television manufacturers have recently released figures to show that they have consumed over 10,000,000 miles of wire of all types in the production of their television receivers. At first glance this would appear to be something of a record but compared to the linear measure of red tape imposed upon the public by the Ontario Liquor Commission in the matter of filling out forms as a prerequisite to the purchase of a few ounces, it’s hardly enough to tie one’s sock up with.

Speaking of developments in the field of electronics perhaps one of the more startling to be made known is the music synthesizer, a device which can generate any tone produced by any musical instrument or by the music synthesizer, a device which can generate any form of a belief tending to substitute man for God by exalting his (man’s) bounty and glorifying his egotism. Quite a difference!

The heart of any electrical connector is the socket contact. This is why the Bendix-Scinflex® socket contacts have always been machined from bar stock. Stampings, with their required thin sections, can be easily overstressed.

Even with the machined sockets, industry has been plagued with overstressed spring leaves due principally to the misuse of test probes and lax tolerances on pin contacts. Bendix engineers have now provided the only socket contact that completely eliminates intermittent circuit problems resulting from socket contact malfunction.

The “Clip-Type” socket will not accept any oversize probe or pin nor can one be forced into it. Also, no amount of wrenching or twisting of an acceptable pin or probe can possibly distort the spring clip. This new socket is now standard in all Scinflex connectors including those using solderless, high-temperature and thermocouple contacts.

Our sales department will be glad to furnish complete information on request.

SCINFINX
ELECTRICAL
CONNECTORS

The “Clip-Type” closed entry socket contact now standard in

BENDIX
SCINFINX
ELECTRICAL
CONNECTORS

Cannot be overstressed — eliminates intermittent circuit problems resulting from socket contact malfunction.

The heart of any electrical connector is the socket contact. This is why the Bendix-Scinflex® socket contacts have always been machined from bar stock. Stampings, with their required thin sections, can be easily overstressed.

Even with the machined sockets, industry has been plagued with overstressed spring leaves due principally to the misuse of test probes and lax tolerances on pin contacts. Bendix engineers have now provided the only socket contact on the market today which completely eliminates all these problems.

The “Clip-Type” socket will not accept any oversize probe or pin nor can one be forced into it. Also, no amount of wrenching or twisting of an acceptable pin or probe can possibly distort the spring clip. This new socket is now standard in all Scinflex connectors including those using solderless, high-temperature and thermocouple contacts.

Our sales department will be glad to furnish complete information on request.
NEW PRODUCTS
(Continued from page 58)

- Miniature Vacuum Fixed Capacitors

Item 950

The smallest vacuum capacitors on the market, measure only 1\% inches in length by 1\% inches in diameter. They are available in capacities of 25, 40, 80, 120 and 150 mfd at voltages of 71x, 10, and 15 kv peak. Their all-copper construction makes possible current ratings of 30 amperes rms which can be doubled with the use of forced air cooling. Their small size, low inductance, and negligible dissipation factor make them extremely useful for operation at the higher frequencies. Like all vacuum capacitors they are not damaged by internal arcing due to moderate over-voltages. For ease of mounting 8-32 tapped holes are provided on both ends.

Hi-Fi Replacement Stylus

Item 951

A fundamental change in the design of G-E high fidelity replacement stylus has been announced. The new design will be marketed under the name "Clip-In Tip" and will permit changing individual stylus tips by a simple "slide-in" method. In the new stylus models, the positionizing knob, shaft and stylus holder have been made a permanent part of the variable reluctance cartridge. Only the diamond or sapphire tip and its baton need be replaced.

The present G-E stylus, requiring replacement of the entire assembly, has been completely abandoned. All future production will have the "Clip-In" feature. The change in design does not affect the performance characteristics of the stylus or cartridge.

The new stylus will permit users of the G-E single stylus cartridge to adapt their equipment to the three popular record speeds without changing the cartridge. With the dual cartridge, the user is now offered complete freedom in selecting and maintaining the combination of stylus best suited to his record collection.

It is further noted that the new stylus design offers a solution to the problem of dual stylus service which, with current models, involves the loss of both tips for the time it takes to service one. Using the "Clip-In Tip" models, the old stylus tips can quickly be removed while the companion tip is in use.

Six "Clip-In Tip" stylus are available.

- Microwave Frequency Standard For Accurate Measurements In 2400 To 40,000 mc Range

Item 952

A new Microwave Frequency Standard for the accurate (1.001 per cent) measurement of frequency from 2400 to 40,000 mc has been announced. It consists of a temperature stabilized crystal oscillator followed by a multiplier-amplifier chain, with outputs at 100,500, and 1500 mc. The Standard is supplied complete with sweep circuits for use with reflex klystron local oscillators to obtain beats with harmonics of the Standard output.

Complete waveguide set-ups are supplied for the frequency ranges specified by the customer. These set-ups include a harmonic mixer for multiplying the Standard signal and mixing with the klystron output, frequency meter, directional coupler, two variable pads, termination, detector, and co-axial adapter when required. The harmonic mixer is the only mixer specifically designed for multiplying a standard crystal controlled signal for frequency measurement. The waveguide components are all available individually if the customer wishes to make use of equipment now in his possession.

Besides the basic package and the waveguide components, the customer will require a video amplifier, a shortwave receiver, and an oscilloscope.

The purpose of the improved design is to incorporate advances in the present state of the art not available in present equipment.

- Precise Rotary Accelerator

Item 953

A new, compact acceleration testing machine that tests and calibrates small assemblies while at the same time subjecting them to multiples of the acceleration of gravity has recently been developed. The machine, Model CK9X, is capable of subjecting objects as large as a 5" cube weighing a maximum of three pounds to accelerations up to 250 G's. The rotating table is tapped with groups of holes allowing objects as large as a 5" cube weighing a maximum of three pounds to accelerations up to 250 G's. The rotating table is tapped with groups of holes allowing objects as large as a 5" cube weighing a maximum of three pounds to be placed in any desired position. The waveguide components are all available individually if the customer wishes to make use of equipment now in his possession.

SOLD IN KIT FORM ONLY

THE WELLINGTON SEVEN

Write for ILLUSTRATED BROCHURE ON THIS TRULY HI-FIDELITY AMPLIFIER

The Wellington Seven is a truly High Fidelity Phono Amplifier, Combining pre-amplifier, equalizer and power amplifier. It has low hum and noise, low distortion, compactness, a full seven watts output and modern attractive design.

DISTRIBUTED BY CANADA'S LEADING JOBBERS FROM COAST TO COAST

HAMDON MANUFACTURING COMPANY LIMITED

GUELPH • ONTARIO • CANADA

For further data on advertised products use page 99.
are provided for electrical connection between rotating test objects, stationary instruments and power sources. All rings have shielded leads and are rated at 5 amps at 220 v and 10 amps at 110 v. The column assembly, motor mount, motor, rotating table, tachometer generator and rpm pickup are in a compact group, installed in a fabricated steel test stand with an integral 1/4" thick steel plate safety guard enclosing the rotating table. The lid over the rotating table has a transparent window of 1/4" thick plexiglas which permits observation of the table top while providing protection for the operator. All controls are centralized in a console which may be placed on a table or desk remote from the machine. A tachometer generator and meter provide continuous speed measurement accurate to 2 per cent. In addition, a Stroh°, conn frequenCy meter may be used to provide rpm readings accurate to ±.1 per cent. Dynamic braking is provided to bring the rotating table to a rapid stop. Single and four line pressure and vacuum systems are available if desired.

● Toroid Coil

A new addition to the "Postage Stamp" Toroid Coil Series is announced by Hycor Company, Inc. This new configuration was designed specifically for use in printed circuitry. The tinned No. 20 AWG wire leads are spaced in accordance with the standards recently proposed by the RETMA Automation Committee. The unit consists of a sub-miniature molybdenum permalloy toroid core with a winding having a residual hole as small as 1/4" diameter. Windings are impregnated with a special compound and the finished coil is encased in a tough epoxy plastic. Overall dimensions are: 1/8" x 1/8" x 1/8" thick. It is available in any inductance up to 1 hy. The useful frequency range covers 1500 cps to 150 kc, dependent upon the inductance value. The unit is capable of withstanding temperatures from -55°C to +125°C, plus extreme environmental conditions. Bulletin ST-6, showing complete technical data, is available upon request. (Turn to page 62)

**TEMPERATURE CABINETS**

**Two Types**

"F" Series — Front Opening

"C" Series — Top Opening

**Range:**

-150°F. to +100°F.

**Size:**

4 cu. ft. to 72 cu. ft.

**HUMIDITY AND TEMPERATURE CABINETS**

"F" Series — Front Opening

"C" Series — Top Opening

**Range:**

-150°F. to +100°F.

**Humidity:**

10% to 97%

**Controlable above a 35°F. D.P.**

**Size:**

4 cu. ft. to 64 cu. ft.

**ALTITUDE AND TEMPERATURE CABINETS**

"F" Series — Front Opening

**Range:**

Temperature: -150°F. to +100°F.

Altitude: Up to 125,000 ft.

**Size:**

4 cu. ft. to 64 cu. ft.
NEW PRODUCTS
(Continued from page 61)

• First Sliding Coaxial Termination Item 955

Two important developments in microwave test equipment, the first coaxial terminations with a low VSWR and the first sliding coaxial termination ever available, have been announced by The Narda Corporation, Mineola, Long Island, New York.

The basic Narda coaxial termination consists of a molded "Narda-Iron" terminating element mounted in a coaxial line and having a VSWR less than 1.05 over the entire frequency range of the S to X band, 2400 to 12,400 megacycles.

"Narda-Iron" is a new termination material developed by Narda engineers. It consists of powdered iron dispersed in plastic, and is cast to shape.

The Narda fixed coaxial terminations are useful for terminating directional couplers and other devices in actual operation or for test purposes. The low VSWR for the terminating element increases the effective directivity of directional couplers and facilitates more accurate VSWR measurement of all types of coaxial components.

The Narda sliding coaxial terminations provide the most accurate and convenient method for evaluating the residual VSWR of coaxial slotted lines and standardizing all types of impedance measuring equipment for coaxial line components. These terminations are particularly valuable for determining the VSWR of RF cables, connectors and adapters.

Both fixed and sliding terminations are available with type N or C connectors, either male or female. Power ratings are 5 watts average, 5 kw peak.

• 25 Per Cent Weight Savings With New Magnesium Mounting Bases Item 956

Magnesium mounting bases weighing 25 per cent less than comparable aluminum bases with no sacrifice in strength and shock performance have been developed.

The bases are available in all Jan-C-172A and MIl-C-172B standard sizes and are also supplied in special sizes to meet unusual loading and dimensional requirements. The 25 per cent savings in weight per base times the number of such bases aboard an aircraft can mean as much as five to seven pounds saved.

Although the virtue of lightweight magnesium has long been recognized, its application to mounting bases has been difficult because of the special problems of welding, and in the control of galvanic action between the magnesium and stainless hardware. The galvanic effect is defeated by "padding" the hardware with nylon and thereby isolating it from the magnesium.

These magnesium mounting bases can be equipped with the Finnflex all-metal vibration mounts which meet all requirements of MIL-C-172B.

• Ultrasonic Solder Gun Item 957

A new soldering iron operated ultrasonically and having an internal source of heat for melting solders has been announced.

Designed for fluxless soldering and tinning of aluminum, germanium, silicon, and other hard-to-solder metals, the Alcar Solder Gun W/Heated Tip (Model 1152) corrects a basic fault of conventional ultrasonic soldering irons which require external sources of heat. A special heating coil within the transducer delivers heat to the working tip via a second power line contained in the one cord set. This eliminates the need for cumbersome heating devices to flow the solder.

Unit is resonant at 20 kilocycles and may be operated from either of Alcar's 30 or 100 watt generators.

• Lightweight, Miniature Continental Connector For Airborne Electronics Item 958

Two-page illustrated color bulletin describing features of the new, 37 contact Continental Connector suitable for airborne electronics. Bulletin includes electrical and mechanical ratings, mounting and clearance dimensions and diagrams.

(Turn to page 65)
To withstand high heat, shock, and continuous off-on cycling...

Centralab ceramic insulator
used as igniter in new, instant car heater

A newly designed, gasoline-burning, instant heater for passenger automobiles uses the principle of reliable aircraft heaters.

The new heater is an injection-type system which is complete in itself. Ignition is accomplished by a spark plug of Centralab Electrical Porcelain, energized by a separate ignition system.

The spark is cycled off and on with the fuel — usually several times per minute, as the off-on cycling modulates heater output. Ignition is instantaneous.

This calls for complete reliability and perfect timing — accomplished with Centralab Electrical Porcelain made for specific heat-range and heat-shock requirements. Like all Centralab ceramics, it has high heat resistance, high dielectric strength, and dimensional stability.


More proof that if it’s a job for electronic components, it’s a job for Centralab

Centralab’s advanced engineering continues to create the prototypes of the components industry

Centralab Sweepstakes
28 Big Prizes!
Nothing to buy! Nothing to answer!

1st PRIZE — $100.00 Gift Certificate for a Hart-Schaffner & Marx Suit.
2nd PRIZE — Four (4) Arrow Shirts.
3rd PRIZE — Two (2) Arrow Shirts.
Twenty-five (25) 4th PRIZES — One (1) Arrow Tie each.
To be eligible for the grand drawing, simply send us your name and address on your letterhead. Or ask your Centralab rep for an entry blank. Entries must be postmarked no later than midnight, December 31, 1955. Contest not open in states where prohibited.
Get a GOOD Charger!

CHARGING VOLTAGE AUTOMATICALLY REGULATED

The proper charging rate at 2.15 volts per cell provided at all times prolongs battery life. Increased voltage settings for older batteries by simple adjustment.

Equalizing Charges Without Violent Changes In Charging Rate

To equalize cell voltages, a "Hi/Lo" switch in "Hi" position increases to correct over-voltage value by a gradual process, returning slowly to regular floating voltage upon switching to "Lo" position.

Protection From Line and Load Irregularities

Thermostat control automatically reduces charging rate if overheating occurs. Circuit breakers provide overload protection on both AC and DC lines. Inherent characteristics of selenium rectifiers ensure that the battery cannot discharge through the charger in the event of AC power failure.

Benefit by Nichols' Engineering Service

There is a Nichols Rectifier Unit for practically every purpose. Consult with us, or write for information to Dept. EC 11.

MAGNETIC RELAYS

B.P.O. Types 3000 and 600 to your specification. Coils up to 100,000 ohms. Tropical Baking or Vacuum Impregnating also available. Speedy deliveries... Enquiries invited.

Full details and prices from our Canadian Agents: Electronic Research Co., 292 Glebeount Ave., Toronto.

KAYE ELECTRICAL MANUFACTURING CO.
Havelock Works, Havelock Place,
HARROW, MIDDX., ENGLAND

MECHANICAL DESIGN ENGINEERS

The Research Division of Ferranti Electric Limited requires Engineers experienced in the design and development of precise mechanisms, equipment mountings and enclosures as related to electronic computers and similar devices.

Applicants should be capable of supervising a development group, and should be qualified engineers or holders of British Higher National Certificates.

For appointment call Mr. Mann, RO. 2-3861 or write to:

FERRANTI ELECTRIC LIMITED
Industry Street,
Toronto 15, Ontario

WATCH

for the January Issue of ELECTRONICS and COMMUNICATIONS

For News of the 1956 CANADIAN ROOM

Hotel Commodore - New York
March 18th to March 23rd

For further data on advertised products use page 99.
To withstand high heat, shock, and continuous off-on cycling...

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A DIVISION OF GLOBE-UNION INC.

964 E. Keefe Avenue • Milwaukee 1, Wisconsin

In Canada: 804 Mt. Pleasant Road, Toronto, Ontario

SINCE 1922, INDUSTRY'S GREATEST SOURCE OF STANDARD AND SPECIAL ELECTRONIC COMPONENTS

Electronics & Communications, November - December, 1955

For further data on advertised products use page 99.
Bogue Electric Of Canada Limited
Open New Plant

Bogue Electric of Canada, Ltd., have formally opened their production and administrative headquarters in a modern plant recently completed at Gloucester, near Ottawa, Ontario, it has been announced by Edward P. Schinman, president.

An address by The Honorable C. D. Howe, Minister of Trade and Commerce and an Open House highlighted the inauguration ceremonies at which some 500 guests including important industrial and military leaders from the United States and Canada were present.

The new plant will give the Canadian firm important new facilities for the production of motors and generators, power supplies, control systems and electronic components for a wide range of industrial and military applications.

Mr. Schinman stated that the new plant will help to supply Canada's growing needs for these industrial power supplies and control systems as well as supply her Air Force and Navy with vital control and communications apparatus.

"With the Royal Canadian Air Force now engaged in the greatest peacetime build-up in its history, Bogue equipment specially designed to serve its needs — from tiny components for guided rockets and missiles to unique aircraft testing, servicing and starting equipment — will make important contributions to Canadian air power," Mr. Schinman said.

Other products to be manufactured at the new plant will include water conditioning equipment, magnetic amplifiers, rectifiers, servo-systems, sonic tank gauging equipment and bearing temperature monitors.

Designed for a maximum of efficiency and ease of materials handling, the ultra-modern industrial structure covers approximately 80,000 square feet under one roof. When the plant is in full production it will employ approximately 350 persons under the supervision of Mr. Thomas Trumbour, factory manager.

CAE To Handle Raytheon Communications Equipment

A variety of communications systems will now be distributed in Canada by Canadian Aviation Electronics of Montreal, according to an agreement with the Raytheon Manufacturing Company of Waltham, Mass. Among the Raytheon equipment to be handled by CAE will be the Raytheon color telecast equipment, which provides simultaneous video and high fidelity voice signals facilities. This equipment is provided in two variations for long range (1 Watt) and medium range (1.1 Watt).

(Turn to page 76)
NEW PRODUCTS
(Continued from page 61)

• Flexible Printed Circuit Cables

Item 959

Flexible printed circuit cables — made by an exclusive process of laminating the versatile plastic Kel-F with copper in thin sheets — are now being introduced. This unique development introduces an entirely new concept in the fabrication of multi-conductor cables or wiring harnesses.

The new cables have excellent electrical and mechanical properties for operation over a wide range of environmental conditions. Complete encapsulation of the conductors in Kel-F ensures maximum protection against moisture. Glass cloth can also be included in the laminations for increased strength and high temperature stability.

These new cables are lighter and thinner than many conventional cables. They are adaptable to many types of connectors or terminations and are easily secured by clamps, rivets or cement. The manufacturing technique eliminates wiring errors. Additional conducting and insulating layers can be added to the basic cable to provide a greater number of separate conductors. As many as three conducting layers are possible, depending on the flexibility required. Each layer is made slightly shorter than the layer below to expose all the conductor ends for solder connection. Stacked circuits have been built up to five layers and may go higher depending on the application.

• New AC Voltage Regulator

Item 960

A new ac regulator designed and manufactured in Canada is now available for early delivery.

The Stedivolt will supply up to 7 kw on a 115 v line to a regulation of 1/4 per cent, for input variations between 103 v and 125 v — even wider range and faster response is obtained with loads 3.5 kw and under.

Supplied complete with heavy steel box as illustrated, the Stedivolt can be mounted easily in any location. A readily accessible front control permits setting output voltage to any desired level within control limits. (Voltmeter can be supplied as optional extra.)

Stedivolt advantages include: Zero waveform distortion — Independent of power factor — Quiet operation — Simplicity and reliability — All components are standard proven industrial types — Fuse protection included — Accurate high speed regulation.

The Stedivolt should be used wherever line regulation is critical — in laboratories, standards rooms, instrument departments, electric furnaces, heat treating, critical lighting installations — for all applications where accurate fully-automatic regulation is required.

• Blast-Proof Water-Proof Loudspeaker

Item 961

The availability of a new blast-proof and water-proof four-inch loudspeaker for radio and intercom service has been announced.

The P4-SB is designed to meet the requirements for a small, highly efficient loudspeaker which must operate reliably after exposure to heavy gun blasts, extreme shock and vibration, immersion in water and extremely high humidity. Reliability is a must in armed forces field equipment and inclusion of these speakers in such equipment currently supplied is indicative of their performance under the above conditions.

This loudspeaker is available in two models — P4-SB-1 for mounting on front panel and Model P4-SB-2 for mounting on rear panel.

Here are the electrolytic capacitors that are outselling all other makes. In Canada, the largest TV and Radio set manufacturer imports more DUBILIER capacitors than all other makes combined.

Made in England by
DUBILIER CONDENSER CO. (1925) LTD.
Maker of the World’s Finest Capacitors

Canadian Sales Office:
ASTRAL ELECTRIC CO. LIMITED

44 Danforth Road
Toronto, Ontario

For further data on advertised products use page 99.
Get a GOOD Charger!

CHARGING VOLTAGE AUTOMATICALLY REGULATED

The proper charging rate at 2.15 volts per cell provided at all times prolongs battery life. Increased voltage settings for older batteries by simple adjustment.

Equalizing Charges Without Violent Changes In Charging Rate

To equalize cell voltages, a “Hi Lo” switch in “Hi” position increases to correct over-voltage value by a gradual process, returning slowly to regular floating voltage upon switching to “Lo” position.

Protection From Line and Load Irregularities

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Benefit by Nichols’ Engineering Service

There is a Nichols Rectifier Unit for practically every purpose. Consult with us, or write for information to Dept. EC 11.

MAGNETIC RELAYS

B.P.O. Types 3000 and 600 to your specification. Coils up to 100,000 ohms. Tropical Baking or Vacuum Impregnating also available. Speedy deliveries . . . Enquiries invited. Full details and prices from our Canadian Agents: Electronic Research Co., 292 Glebemount Ave., Toronto.

KAYE ELECTRICAL MANUFACTURING CO.
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The Research Division of Ferranti Electric Limited requires Engineers experienced in the design and development of precise mechanisms, equipment mountings and enclosures as related to electronic computers and similar devices.

Applicants should be capable of supervising a development group, and should be qualified engineers or holders of British Higher National Certificates.

For appointment call Mr. Mann, RO. 2-3661 or write to:

FERRANTI ELECTRIC LIMITED
Industry Street, Toronto 15, Ontario

WATCH for the January Issue of ELECTRONICS and COMMUNICATIONS

For News of the 1956 CANADIAN ROOM Hotel Commodore - New York March 18th to March 23rd

For further data on advertised products use page 99.
When it comes to TELEPHONE STANDS

whether you want them ...

... wall mounted
... or island

... small
... or large

with legs ...
... or without legs

DESIGN CRAFT have the award-winning answer!

It's easy to understand why Design Craft won the citation of merit from the Association of Canadian Industrial Designers for distinctive appearance and planned efficiency. The wide variety of modern designs ... the wide choice of durable finishes that blend with any interior, make Design Craft your choice when it comes to Pay Telephone Stands. Details of the complete range are available from Automatic Electric.
AUTOMATION

(Continued from page 39)

This feed portion of the machine is pneumatically operated and designed for quick replacement in the event of malfunction. It's construction is based on a gear and rack principle. The rack carries two feed pawls which are cammed individually to feed any desired number of pins by registering and locking the cam bar in line with the graduations on the plastic face plate. The chain scrap is also cut up in this section of the machine for efficient handling.

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

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

Transfer and handling of boards through the Malco machine can be accomplished either by rails or pallets normally used in automatic component assembly machines or they can be engineered to meet individual applications.

One leading radio-television manufacturer, using the Malco inserting machine in conjunction with other automatic assembly equipment, has eliminated over 400 hand soldered connections. Over 70 per cent of the components are automatically inserted. Adoption of methods similar to these will be industry-wide within the next few years.

The transfer mechanism then carries the board to the second stage of the operation where the platen ascends against a specially constructed plate with bushing inserts. This snaps the terminals into the board to retain them during subsequent operations prior to soldering.

The construction of the bushings in this station are of a funnel shape and highly polished, thus facilitating positioning and straightening of the pins during the snap-in process.

*Note: Equally important are the "human" or economic factors it has created. While an article of this nature is not concerned with these, they must be briefly mentioned. First, skilled operations and machinery has opened new fields for trained technicians. Second, since the manufacturer can produce "more" for "less" and is passing it on to the consumer as such, employment is increasing — not decreasing — as production strives to meet greater consumer demand.

For further data on advertised products use page 99.
NEW PRODUCTS
(Continued from page 65)

• "Fluxvalve"
  Item 962
The "Fluxvalve", a radically new wide-
range magnetic pickup with easily re-
placeable styli has been introduced accord-
ing to a recent announcement.

The unique design of the Fluxvalve meets
the demands of all presently envisioned
recording developments, including those
utilizing less than 1 mil styli.

With this revolutionary new pickup tracking
distortion, record and stylus wear are
reduced to new low levels.

The Fluxvalve is a turnover design fea-
turing easily replaceable styli. A new kind
of stylus. it has extremely high compliance
for low tracking force (2-5 grams). The
vibratory mass has been reduced to an
amount so low that pickup response is
flat at 30 kc on ordinary vinyl. A vital factor
for smooth high frequency and transient
response.

Electrical characteristics of the Flux-
valve include: frequency response abso-
lutely flat to well beyond 20 kc; negligible
intermodulation distortion; output of 25
millivolts at a normal recording level; and
medium impedance, requiring a termination
of 47,000 ohms.

The entire magnetic circuit, including the
magnetic gap, is completely encapsulated
in a tough plastic; dirt cannot enter the
magnetic gap and the inside of the entire
pickup is preserved indefinitely. The pickup
is supplied with a mounting clip which
adapts it to all standard arms, and also acts
as the bearing for the turnover action.

• Subminiatures Featured In
  New Neomatic Relay
  Brochure
  Item 963
A new brochure illustrating rugged sub-
miniature relays designed for a wide variety
of high-precision applications has been is-
sued by the manufacturer.

Built to watch precision for today's elec-
tronic "tight spots", these relays feature
high performance and shock qualities
unique in subminiatures.

The brochure includes the world's smal-
lest precision relay, the first built in a stan-
dard transistor case for transistorized cir-
cuity.

Many packaged power variations are possible, depending on requirements. Prac-
tical combinations can include any of the following instruments.

<table>
<thead>
<tr>
<th>AC Regulators</th>
<th>High-Current DC</th>
<th>High-Voltage DC</th>
</tr>
</thead>
<tbody>
<tr>
<td>670VA</td>
<td>5-15 amps</td>
<td>0-325 v, 0-125 ma</td>
</tr>
<tr>
<td>1200VA</td>
<td>15 amps</td>
<td>0-500 v, 0-200 ma</td>
</tr>
<tr>
<td>2000VA</td>
<td>15 amps</td>
<td>0-1000 v, 0-500 ma</td>
</tr>
<tr>
<td>5000VA</td>
<td>10000mA</td>
<td>Dual 500 v to 100 ma</td>
</tr>
</tbody>
</table>

In addition, ±0.01% frequency control in an auxiliary unit: 400 cycles at
220VA or 10000VA, 60 cycles at 10000VA.

Consult our engineers for other power packages, comprising such instruments as
Rangers, AC meter calibrators, DC voltage reference standards, inverters, higher
capacity regulators and power supplies than those indicated above. Sorensen & Co.,
Inc., Stamford, Conn. In Europe, Sorensen A.G., Gartenstrasse 22, Zurich 2,
Switzerland.

Write on your business or professional letterhead for further
information and for your copy of the latest Sorensen catalog.

THREE PRECISION POWER SUPPLIES IN ONE CABINET, TO
HANDLE ALL OF YOUR LABORATORY POWER REQUIREMENTS

This newest Sorensen concept—Power in a Package—is designed to
give the research man, technician, or designer a wide range of
power outputs, all from one compact cabinet.

The unit illustrated will provide regulated power, simultaneously, as follows:
0 - 600 volts DC at 0 - 500 milliamps, regulated ±0.25%; 6 or 7 volts DC at
1.5 - 15 amps, regulated ±0.2%; 10 - 120 volts AC, 0 - 1000VA load range,
regulated ±0.1%.

SORENSEN
Sorensen & Co., Inc., 375 Fairfield Ave., Stamford, Conn.
NEW PRODUCTS

(Continued from page 69)

“Extra Eyes” For Industry

Item 964

The world’s smallest self-contained television camera for circuit applications in industry is now available in Canada.

Weighing only 8½ lbs, and measuring a mere 4½” x 6½” x 10” the Dage 60 series camera is suitable for many industrial applications including plant security, plant inspection and supervision and remote observation of dangerous operations and materials. Because it is compact, light weight, portable and sturdy the Dage unit can be easily installed out of sight, making hard-to-reach locations instantly visible.

A full range of accessories including a remote control panel is available. Any one of four lenses can be remotely selected and focused for a choice of wide angle, normal and telephoto close-ups of the operation under study. The low cost unit provides extreme simplicity of operation, installation and maintenance.

100 KC GT Crystal Unit

Item 965

The model GA-100 is one of a line of high stability crystal units. The GA-100 Crystal Unit contains a 100KC GT High Precision Quartz element in an evacuated glass bulb fitted with a standard octal base. The overall dimensions are 4½” x 2”. The unit exhibits a frequency shift of less than one-half cycle over a temperature range of 25°C to 70°C. Aging characteristics average less than one part in 10⁶ per week. Qs in the order of one million are readily attainable.

(Continued on page 74)
with electric heat and low pressure. Stampers stay put. Your future “wow” trouble will unfortunately or fortunately (as you wish) mean a new turntable because wow in records will be a thing of the past.

A powerful microscope is sometimes needed to show up the minute inaccuracies in the hair-breath grooves of the molding. However these inaccuracies can cause extremely annoying disturbances on the finished record. Clicks, pops, and hisses reach monumental proportion in quiet passages often completely destroying the entire musical mood. The virgin powder fusion technique of “Microfusion” however creates a micro-accuracy in molding. A disc slightly larger than the finished record is formed from the vinyl powder. As this is carried to the press it is briefly and slightly heated to form a spongy cake. This is the sintering process and it produces a light porous “biscuit” about three times as thick as the finished record. The powder adheres together just enough to allow the biscuit to be handled. When the master is put in a special low pressure press, each minute particle of the biscuit is free to drift its way into the groove profile independently.

“Microfusion”. And this is really good news to all music lovers — and record manufacturers.

It is an exact process and the record is formed without the slam bang brute force employed in ordinary methods. The result: a surface silence hitherto unapproachable. The average L.P. record has almost half a mile of groove, fifteen thousandths of an inch deep and twice as wide. This is a fine low line into which are etched corners and curves capable of pushing the stylus back and forth up to 15,000 times per second. The material in which the groove is molded must stand a needle pressure of ten tons per square inch. Microfusion provides that groove and gives less surface noise than the original tapes. As a bonus, it costs less to make records by
formulated of the oxide of a bivalent metal ion and FeO₃, exhibit high permeability and low hysteresis, and have a dielectric loss which is quite low at high frequencies. Sintered blocks of these materials are now produced by repeatable processes giving a consistent end product. Microwave applications involving anisotropic propagation have been found to require the admixture of the oxides of two bivalent metals with Fe. Albers Schoenberg describes the properties of ferrites, composed of MgO, MnO, and FeO₃, which vary with the properties of the ingredients. The optimum proportions for microwave applications appear to be in the region 60-65% MgO, 5-10% MnO, 30% FeO₃. A ferrite of this type (MF-1331) has the following properties:

- Initial permeability at 1 Mc/s: 50
- Dielectric constant: 13
- Loss angle at 10⁶ °c/s (tanδ): 0.003
- Resistivity Ohm-cm: 10⁶

It is presumable that other spinels will be found in due course to have desirable microwave properties, but at the present time one formulation is pre-eminent.

Applications of Related Ferromagnetic Effects

In the microwave region ferrites exhibit doubly refractive properties similar to the phenomena associated with the Faraday effect. Transverse magnetisation produces different velocities for plane waves polarised parallel to the magnetisation and for plane waves polarised perpendicular to the magnetisation. This has been shown by Polder. In each case the velocity varies with magnetisation which produces a variable permeability and hence an associated variable impedance. Such a variable impedance could be used as a modulator providing variable reflection coefficient.

Applications of ferrites in rectangular guide with both fixed and variable magnetic fields, both longitudinally and transversely applied are foreshadowed by promising experimental work.

The gyromagnetic phenomena which have been discussed are contributing much to microwave techniques and there is no doubt that they will be employed increasingly in microwave engineering.

ACKNOWLEDGMENT

The author is indebted to the Defense Research Board for permission to publish this article. He also wishes to thank Mr. P. M. Thompson and Mr. E. A. Walker for their assistance.

An interesting application of double refraction has been described by Cacheris. He has used a rotatory transverse magnetic field to obtain continuous phase change of the micro-waves passing through a ferrite mounted in the rotatory field. This generates a single frequency greater than the input microwave frequency by twice the rotation frequency. Such single side band generation is a novelty in microwave engineering.

References


Reggio and Beatty, "Characteristics of the Microwave Circuit Component for High Speed Switching or Modulation", Electronics, May, 1955.


C. Kittel, "Ferromagnetic Resonance" Le Journal de Physique et le Radium 12, p. 291, 1951.


"Price is right! Delivery is right!

ECLIPSE-PIONEER AUTOSYN* SYNCHROS

AY-200 SERIES
in 5 standard types** including CORROSION-RESISTANT models

AY-500 SERIES (PYGMY)
in 5 standard types** including CORROSION-RESISTANT models

AY-190 SERIES
in 5 standard types** all CORROSION-RESISTANT models

And there's a Bendix autosyn to meet every need!

Eclipse-Pioneer’s experience, facilities, and production techniques make possible the following important advantages:

- Significant price reductions
- Delivery of standard types from stock
- A complete range of standard and special types

Whatever your synchro requirements, it will benefit you to request further information from AVIATION ELECTRIC, 200 Laurentian Boulevard, Montreal.

*REGISTERED TRADEMARK RADIUS AVIATION CORPORATION

OTHER STANDARD AND SPECIAL ECLIPSE-PIONEER AUTOSYN SYNCHROS INCLUDE MODELS 1, 11, 15, 18, 23 and 2R as well as high temperature, high frequency, linear, and other types for special needs.

SALES • SERVICE • OVERHAUL • MANUFACTURE OF AIRCRAFT INSTRUMENTS & ACCESSORIES
How much would a failure here cost you?

—FOR DEPENDABILITY . . . INSIST ON
TEN THOUSAND HOUR RCA "SPECIAL REDS"!

Large, complex production facilities may now be easily controlled directly from a centralized panel . . . and the electron tubes behind these controls have become vital to successful modern production facilities.

Industrial plant owners have invested and are currently investing millions of dollars in automatic and electronically controlled devices. Their confidence in electronics warrants the finest industrial receiving tubes—RCA "Special Reds." Be sure—specify RCA Special Reds in new designs and as replacements for prototypes currently used in your industrial equipment where operating conditions are within the ratings of RCA "Special Reds."

RCA "Special Reds"—and only RCA "Special Reds"—offer all these features:

• exceptional stability throughout life
• extra long life (10,000 hours, minimum)
• rigid construction for resistance to shock and vibration
• finest quality materials and workmanship

Your local RCA Tube Distributor can supply you with "Special Reds" and other RCA Tubes you need for replacement. For fast, friendly service, call him today.

NEW PRODUCTS
(Continued from page 70)

• Dynamic Pickup For Measurement of Low Pressures

Item 966

A versatile new low-range pressure transducer smaller and lighter than many existing types of low-pressure pickups, the new DYNSCO unit measures either gauge or differential pressure in the ranges 0.00-0.05 and 0.00 to 1.00 psi. High accuracy and high resolution characteristics make the new pickup particularly suitable for sensitive air-flow measurements, vacuum equipment studies, precision altimeters, and medical research equipment. Special construction minimizes acceleration sensitivity and facilitates use in aircraft and missiles.

The new dynamic pickup consists of a 1" diameter, beryllium-copper bellows fastened to the rigid pickup case and connected to a special, strain-sensitive resistance bridge. Separate input pressures are brought to bear on either side of the bellows through threaded connection holes in the pickup case. Movement of the bellows produces an electrical output signal proportional to the difference between the two pressures. The design can withstand overloads up to 15 psi. High acceleration effects are minimized by a specially-designed support which protects the entire resistance-bridge assembly. Acceleration sensitivity is held to 0.001 psi/g with the effect of lateral accelerations being negligible.

• Fan For Cooling Aircraft Electronic Units

Item 967

This compact vane axial fan is being installed in planes of the U.S. Air Force to cool airborne electronic installations. Overall dimensions are less than 7" long x 4" wide x 5 1/2" high. The fan delivers 60 cfm at 5" pressure water guage and 112 cfm at 1" pressure water guage. It is designed and built especially to meet the
Actual size

CURTISS-WRIGHT now offers

THE “SNAPPER” THERMAL TIME DELAY RELAY

Relied on for positive action and long life in scores of applications involving time delay in electrical circuits, the “SNAPPER,” formerly produced by Elly Electronics Corp., is now a Curtiss-Wright product.

Single pole, double throw contact action eliminates chatter. These unique relays feature snap action, double throw, reliability, small size. They are adaptable to military and commercial applications. Time delay periods: preset from 3 seconds up. Envelope: metal, miniature (7 and 9 pin) or octal (8 pin). Glass, 9 pin only.

High-Low Differential Thermostat

The “SNAPPER” Thermostat is a single pole, double throw snap action temperature sensitive switch. Its snap action principle has been extended to provide a low differential thermostat with precision characteristics, at low cost.

Canadian Representative:
Consolidated Electronics Equipment Company, Ltd.
1156 Yonge St., Toronto, Ont.

NEW PRODUCTS
(Continued from page 74)

service requirements of aircraft installation, oil proof and explosion proof, and operates in either pressurized or non-pressurized aircraft. In the exploded view photograph of the unit, the major elements are left to right: vanes, wheel, housing, and motor. The radio interference filter is directly above the housing.

• Magnetic ADF Antenna
Item 968

This new antenna’s primary feature is its improved anti-noise characteristics, higher sensitivity, lower weight, and zero drag. Of flat construction it is designed for flush mounting in a shallow cavity in the skin of the aircraft being faired over with a plastic cover so that the aircraft lines remain unchanged.

At the center of the antenna is a small electrostatically shielded loop coil wound on an iron core. The position of the loop is controlled by a small motor and autosyn. Four ferrite collector bars extend radially from the center of the antenna at intervals of 90°. These collector bars are sensitive only to electromagnetic energy and since the loop coil is extremely small the reception of electrostatic interference by the loop itself is minimized. The minimized pick up of electrostatic energy affords a more sensitive null point and further increases the usable sensitivity of the radio compass system.

It may be substituted for the MN36, MN-60, AS313, or AT269 Radio Compass Loop Antennas and its performance is equal to or better than these antennas.

• New Molded Tipco Distribution Block Cuts Wiring Time
Item 969

A new line of distribution blocks designed to simplify wiring of panelboards and switch-gear, cutting both wiring time and cost is now available. These new blocks are available with either 2, 4, 6, 8 or 10 taps, each tap numbered for easy identification. Blocks are rated at 600 volts for either 70, 125 or 225 amperes service.

Underwriter-approved pressure connectors allow multiple connections, in a wide range of wire sizes, to be made in one tap. Vibration cannot be transmitted through the connector, since the distribution block is designed with the brass insert floating free in the block. When wired, the block offers protection from live power.

Under the distribution blocks eliminate bending and soldering leads, require no covers, special tools or extra parts.

(To turn to page 77)
Beckman Instruments
Appointments

Appointment of Donald C. Duncan as General Manager of the Berkeley Division of Beckman Instruments Inc. has been announced by Corporation President, Dr. Arnold O. Beckman.

At the same time, Dr. Beckman announced the appointment of Thomas Allinson as Manager of the Berkeley Division, located in Richmond, Calif. Allinson will report to Duncan, who will continue to serve as general manager of Beckman’s Helipot and Argus divisions in South Pasadena.

D.C. DUNCAN T. ALLINSON

Duncan, 37, received degrees in electrical and mechanical engineering from Pennsylvania State University. He was an industrial control test engineer for General Electric, Schenectady, N.Y., in 1940, and from 1941 to 1945 served with the Navy’s Bureau of Ships in Washington, D.C., as an electrical engineer.

Allinson, 34, joined Berkeley in 1951 as plant manager. In 1954 he was named marketing manager directing advertising and sales promotion, market research and sales activities of Berkeley’s nuclear instruments, analogue computers, counters, timers, recorders and high frequency measuring instruments.

Beckman’s Helipot Division is represented in Canada by R.O.R. Associates of Toronto.

C.P.R. Combine
Communications And Computers

Facilities of Canadian Pacific Communications will, it is announced, be used to telegraph information from principal points of the Canadian Pacific Railways Canada-wide system to supply the data for the company’s electronic data processing machines. These machines will be used to process the 5,000,000 waybills, 9,000,000 passenger tickets, and 1,800,000 requisitions on stores which are part of the yearly transactions of the Canadian Pacific. The electronic calculators — manufactured by International Business Machines — are housed in a new seven-storey, air-conditioned Canadian Pacific headquarters building situated at the back of Windsor Station, Montreal.

(Turn to page 79)
NEW PRODUCTS  
(Continued from page 75)

• "Q" Multiplier Kit  
Item 970

Here is the Heathkit Q Multiplier you hams have been asking for. A tremendous help on the phone and CW bands when the QRM is heavy. Provides an effective Q of approximately 4,000 for extremely sharp "peak" or "null". Use it to "peak" the desired signal or to "null" an undesired signal or heterodyne. Tunes to any signal within the IF band-pass of your receiver. Also provides "broad peak" for conditions where extreme selectivity is not required.

Operates with any receiver having an IF frequency between 450 and 460 kc. Will not function with ac-dc type receiver. Requires 6.3 volts ac at 300 ma. and 150 to 250 vdc at 2 ma. Derives operating power from your receiver. Uses 12AX7 tube, and special High-Q shielded coils. Simple to connect with the cable and plugs supplied. Measures only 4 1/2" h. x 7 3/4" w. x 4 3/4" d. A really valuable addition to the receiving equipment in your ham shack.

• Graphic Recorder  
Item 971

A portable, modestly-priced graphic recorder, capable of widespread applications in the recording of data, has been introduced to the market.

The lightweight, compact Model G-10 Graphic Recorder has dimensions of 10" x 7 3/4" x 8". It may be used directly as a recording millivoltmeter or, with appropriate transducers, as a means for recording pressure, light intensity, temperature and many other physical quantities. Designed to conform to rigid electrical and mechanical specifications.

According to the manufacturer, the new, 15-pound model G-10 is the first instrument of its kind which combines practical low-cost with the operating characteristics necessary for dependable recording of scientific phenomena. The instrument is of the self-balancing potentiometer type, and features a standard full-scale response time of 2.5 seconds and a standard sensitivity of 100 millivolts full-scale. Accuracy is 1 per cent and maximum allowable signal source resistance is 0.5 megohms.

POLYPENCO® TEFлон® SHAPES

Get All These Important Advantages of Teflon—Plus Low-Cost Fabrication

No other material is proving so versatile in the electronics and electrical field as Teflon. It is now widely used for insulating bushings, terminal connectors, stand-off insulators and many other parts as its applications continue to expand.

TEFлон'S OUTSTANDING PROPERTIES

<table>
<thead>
<tr>
<th>Property</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dielectric Constant</td>
<td>2.0</td>
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<tr>
<td>Power Factor</td>
<td>0.0005</td>
</tr>
<tr>
<td>Dielectric Strength, volts/mil.</td>
<td>400-500</td>
</tr>
<tr>
<td>Surface Resistivity (100% R.H.) meghohms</td>
<td>3.6 x 10^9</td>
</tr>
<tr>
<td>Temperature Range</td>
<td>-110°F. to +500°F.</td>
</tr>
<tr>
<td>Water Absorption</td>
<td>nil</td>
</tr>
<tr>
<td>Chemical Resistance</td>
<td>excellent</td>
</tr>
</tbody>
</table>

FABRICATION FROM STANDARD SHAPES

POLYPENCO Teflon Shapes are available in rod, tubular bar, tape, slab and flexible tubing—in a wide range of sizes—for fast, easy machining to close tolerances on standard metalworking tools or automatic equipment.

POLYPENCO TEFлон MEANS QUALITY

In order after order, POLYPENCO Teflon comes to you with uniform, controlled density and maximum dimensional stability. Stock sizes available for immediate delivery from distribution locations throughout the country.

Take this first step toward a more efficient, economical solution to your design problems. Write today for latest technical data.

POLYPENCO, INC.
2052 St. Catherine Street West, Montreal, Quebec

For further data on advertised products use page 99.
The future in electronics is "tremendous", with television sets more than doubling in the next ten years in Canada. Ronald Robinson, vice-president and general manager of Canadian General Electric told 140 graduating electronics students November 19th. Mr. Robinson was addressing the first graduating class of the Radio Electronic Television Schools at a special convocation in the King Edward Hotel, Toronto.

There are now 1.5 million television sets in the whole of Canada, Mr. Robinson told the grads, "but by 1964 there will be more than four million sets. There will also be more television stations, and then there will be color television too. It will be a billion dollar business, and a bright future for qualified technicians is assured. If you are good enough, you will get your share of that future."

He estimated Canada would need some 20,000 qualified technicians per year. This graduating class, the first from R.E.T.S. in Canada, has completed a one-year course, under the supervision of expert instructors. Some of them qualified engineers.

Radio Electronic Television Schools of Canada, Ltd., is associated with an international training organization with schools throughout the U.S. Canadian headquarters was established in Toronto a year ago. This graduating class is the first turned out by the school, which has a current enrollment of 3,600 in branches across the country, as well as at its two Toronto locations. Branches have been established in the first year at Montreal, Hamilton, London, Winnipeg and Vancouver.

In their course students work with and repair various power supplies, super heterodyne radio receivers and modern television receivers. Full instruction is given in test equipment such as the multi-tester, vacuum tube voltmeter, tube tester, capacity tester, signal generator, square wave generator, sweep generator and oscilloscope.
Plans Well Under Way For 1956 Canadian IRE Convention

Keen interest is being shown throughout the electronic industry in the Canadian I.R.E. Convention and Exposition which will be held in Toronto on October 1, 2 and 3, 1956.

The event will be held in the Automobile Building, Canadian National Exhibition Park, Toronto. This magnificent building has been described as one of the most beautiful exhibition buildings on the continent. It is completely equipped with all facilities for convention and exhibition purposes and is ideally located with unlimited parking space.

The Convention Committee's plans are now well under way. A brochure giving complete details, including floor plans and space rates, will be mailed to prospective exhibitors. Copies are available from the Convention manager, Grant Smedmor, at 745 Mt. Pleasant Road, Toronto.

The exhibition will include a wide variety of products of the industry and of allied fields such as instrumentation, laboratory apparatus, materials, packaging and so on. There will be displays of electronic equipment as used by all branches of the Canadian Armed Forces, and it is also expected that equipment relating to the industrial applications of atomic energy will be shown.

Dr. George Sinclair of the Department of Electrical Engineering, University of Toronto, Chairman of the Technical Papers Committee, has invited authors to submit titles and abstracts of 100 to 200 words on papers offered for presentation. The deadline for receiving titles and abstract is May 31, 1956. The papers may be on any subject pertaining to radio or any allied field of interest to members of the I.R.E.

A complete program of technical papers and symposia is planned for the convention.

M. J. Martin Sales Manager
3-M Company of Canada

The appointment of M. J. Martin to the position of sales manager, administration of Minnesota Mining & Manufacturing of Canada Limited, London, Ontario, has been announced by Roy W. Keeley, director of sales.

Mr. Martin will assume his new duties immediately.

As sales manager, administration, Mr. Martin will act as liaison between various product managers and supervisors assisting them, through the director of sales, in formulating merchandising and sales plans. In addition, he will continue as administrator of the advertising and sales promotion departments.

CESCO Distributes
PRI Geiger Counters

Canadian Electrical Supply Co. Ltd., Montreal, has been appointed as distributor of precision radiation instruments, geiger counters and scintillators for Eastern Canada. This distribution covers all the Maritimes, Quebec and Ontario.

In this new arrangement CESCO will carry in stock the complete line of precision radiation instruments.

Lake Engineering Appointed
Canadian Reps For
Gulton Industries

Lake Engineering Co. Ltd. announce their appointment as Canadian Representative for Gulton Industries Inc. of Metuchen, New Jersey. Associated with Gulton Industries Inc. are Gulton Mfg. Corp., Glenco Corp., Greibach Instruments Inc., Thermister Corp. of America and Vibro-Ceramics Corp., all of Metuchen, New Jersey.

Many of the products of these firms will be manufactured in Canada by their Canadian Associate, Titania Electric Corporation of Canada Ltd., at the company's new plant which is nearing completion at Gananouke, Ontario.

Automatic Electric Develops
New Telephone Switch Unit

A new telephone switch for use in railroad communications systems has been developed by the Automatic Electric Company. The unit is a small desk type unit and has a capacity of two to 11 pairs and includes all the equipment required for connecting a telephone to any one of the pairs for which it is wired.

The company designed the new switch to improve on an earlier model which employed the jack-box-and-dummy-plug method for switching one telephone among a number of telephone lines.

(Turn to page 82)

Ungar pencil soldering irons and interchangeable tips for every soldering job! Featherlight, less than 5 inches long, the Ungar iron has been designed to speed soldering production and reach hard to get at soldering points. Cool and comfortable, the new heat deflector head reflects heat AWAY from the handle.

The 400 Super HI-HEAT series tips are engineered especially for production line soldering and extra heavy duty service. A searing 650° to 1000° of actual tip temperature is at your command, yet only 47½ watts! Special processing eliminates maintenance chores. Change from one tip to another in less than 5 seconds!
Background Music

Considered to be the largest installation of its kind in Canada, the background music system fitted in the new Toronto store of Henry Morgan & Company Ltd. boasts 101 loudspeakers.

WHAT is believed to be the largest Canadian installation for the express purpose of providing background music has been fitted in the new Henry Morgan and Company Limited store in Toronto. The installation was carried out by Instantaneous Recording Service of Toronto. The system provides background music through the medium of eight-hour playing tapes which originate in the studios of Instantaneous Recording Services in downtown Toronto and is delivered through the medium of 101 loudspeakers installed in the Henry Morgan store.

The originating source consists of a battery of Presto eight-hour continuous long-playing tape reproducers with associated pre-amplifiers and power amplifiers. These units, which are continuous in operation, will repeat an eight-hour tape which consists of approximately 175 different musical selections automatically if the tape is not changed. However, in the library of I.R.S. are sufficient long-playing tapes to provide musical reproduction for 25 days without repetition.

The installation at I.R.S. incorporates several unique features. Since it is unattended after normal business hours, it has been designed to assure against breakdown or failure of service to subscribers. This has been achieved by the design of control equipment that automatically cuts in a second or third complete reproducing system in the event of breakdown of the primary service.

Unique Tape Injector

The most recent innovation designed and being used in the I.R.S. system of background musical transmission is a unique tape injection system. Every two months I.R.S. produce a new two hour tape that contains hit musical numbers featured in current New York shows — musical selections that are destined to become “Standard” numbers. One of these injection tapes is placed on an auxiliary long-playing tape reproducer. Through the use of inaudible notes, recorded on the primary 8 hour tape, the injection unit is controlled automatically. After any pre-determined numbers have been reproduced from the primary tape, the injection unit is cut in and any pre-determined number of new up-to-date numbers from the injection tape are reproduced over the network.

A further inaudible note on the primary tape cuts out the injection unit and the reproduction reverts to the primary unit and this cycle is automatically repeated. This unique injection system makes possible the automatic injection of seasonal music such as Christmas and Easter selections.

Write for complete catalog.
In the I.R.S. system automatic voltage regulators control the output signal at a constant level—an important requirement in downtown Toronto where line voltages vary throughout the day and night. The taped music is fed to a 100 terminal Bell Telephone set-up located in the studio and maintained at a constant DB level. The music is then carried by special equalized lines to the Bell Telephone's Empire exchange from whence it goes out on similar equalized lines to the Orchard exchange in the north west section of the city, a distance of approximately eight miles. There it terminates in a ten channel bridging amplifier. A further Bell line carries the music from one of the output channels of the bridging amplifier to the Morgan store. Here it is fed into an elaborate hi-fidelity power amplifier set-up. Duplicate amplifiers are installed so that at the flip of a switch the second amplifier can be cut in, in the event of a tube—capacitor or resistor breakdown in the primary amplifier. In addition to the main volume control on the power amplifiers, due to the varying acoustical conditions, on each of the three floors a separate and concealed volume control has been installed. As a further assurance of maintaining proper background level in specific areas where the number of patrons vary, further separate controls have been installed.

To provide an added service to the Henry Morgan store, special wiring to the central telephone switchboard enables the switchboard operator to lift a hand microphone from a convenient hook, which automatically cuts off the background music and makes possible the use of the entire installation as a highly efficient public address system.

Hewlett-Packard offers eight precision signal generators providing, collectively, direct-reading test signals between 10 and 21,000 MC. Whether you are measuring gain, selectivity, sensitivity, image rejection; driving bridges, slotted lines, antennas, filter networks; determining signal-noise ratio, SWR or transmission line characteristics, there is one of these wide range, high power instruments to answer the need. All have broadest usefulness, simple operation, wide modulating, pulsing and other output choices. Direct output calibration; no charts or tedious interpolation.

Only Hewlett-Packard offers this broad selection of direct-reading signal generators:

<table>
<thead>
<tr>
<th>Instrument</th>
<th>Frequency Range</th>
<th>Characteristics</th>
<th>Price</th>
</tr>
</thead>
<tbody>
<tr>
<td>-hp- 608C</td>
<td>10-480 MC</td>
<td>Output 0.1 µV to 1 v into 50 ohm load. Pulse or CW modulation. Direct calibration.</td>
<td>$ 950.00</td>
</tr>
<tr>
<td>-hp- 608D</td>
<td>10-420 MC</td>
<td>Output 0.5 µV to 0.5 v into 50 ohm load. Pulse or CW modulation. Direct calibration.</td>
<td>$ 1,050.00</td>
</tr>
<tr>
<td>-hp- 612A</td>
<td>450 to 1,200 MC</td>
<td>Output 0.1 µV to 0.5 v into 50 ohm load. Pulse, CW or FM modulation. Direct calibration.</td>
<td>$ 1,200.00</td>
</tr>
<tr>
<td>-hp- 614A</td>
<td>800 to 2,100 MC</td>
<td>Output 0.1 µV to 0.223 v into 50 ohm load. Pulse, CW or FM modulation. Direct calibration.</td>
<td>$ 1,950.00</td>
</tr>
<tr>
<td>-hp- 616A</td>
<td>1,800 to 4,000 MC</td>
<td>Output 0.1 µV to 0.223 v into 50 ohm load. Pulse, CW, FM, square wave mod. Direct calibration.</td>
<td>$ 1,950.00</td>
</tr>
<tr>
<td>-hp- 618A</td>
<td>2,800 to 7,600 MC</td>
<td>Output 0.1 µV to 0.223 v into 50 ohm load. Pulse, CW, FM, square wave mod. Direct calibration.</td>
<td>$ 2,250.00</td>
</tr>
<tr>
<td>-hp- 620A</td>
<td>7,000 to 11,000 MC</td>
<td>Output 0.1 µV to 0.097 v into 50 ohm load. Pulse, CW, FM, square wave mod. Direct calibration.</td>
<td>$ 2,250.00</td>
</tr>
<tr>
<td>-hp- 628A</td>
<td>15,000 to 21,000 MC</td>
<td>Output 1 µWatt to 10 mw. Internal or external pulse, FM, or square wave mod. Direct calibration.</td>
<td>$ 3,000.00</td>
</tr>
</tbody>
</table>

Data subject to change without notice.
Continued from page 79)

Canadian Made Electronic Equipment For H.M.C.S. Bonaventure

Electrical and electronic equipment valued at $2,834,000 has been ordered from Canadian firms for the Royal Canadian Navy's new aircraft carrier, Bonaventure. In addition, some $200,000 worth of orders for such equipment have still to be let by the Department of Defense Production, which places all contracts for the Navy.

Among the major Canadian equipments to be installed in the carrier are several electronic fire control and radar units, worth some $2,181,000, which make up part of the ship's internal communications and fire control system. Radio transmitters and receivers, along with other items of radio equipment, have also been ordered in Canada to the value of about $264,000. In addition, there has been ordered $313,000 worth of electrical fittings and fixtures, such as transformers, distribution panels, lighting units, etc.

Mobile Radio Aids Seaway Construction

Duties of the engineering staff of the St. Lawrence Seaway Authority is being facilitated by the use of a private mobile radio system which consists of a base station and 14 mobile units which have been supplied by the Bell Telephone Co. of Canada.

The equipment is being used by hydrographic engineers who are carrying out surveys between Montreal and Cardinal, Ontario. Disposition of the equipment is divided between three groups, two of which are working on both sides of the river, and the third group, who are working on board ship.

Further use of mobile radio equipment is planned by the Ontario Hydro-Electric Power Commission, who plan the installation of mobile radio apparatus in eight station wagons for use in co-ordinating the relocation of communities which will be submerged during the building of the seaway.

I.R.E. Members Tour Marconi Plant

More than two hundred members of the Institute of Radio Engineers, the American Institute of Electrical Engineers and the Engineering Institute of Canada were given a conducted night-time tour of the Canadian Marconi Company head office and factory on Trenton Avenue, Montreal, recently. In addition, the guests were shown the company's research laboratories and facilities, as well as the aviation department and radio relay department on McEachran Avenue, Outremont.

The visitors were welcomed by Mr. S. M. Finlayson, Canadian Marconi president, who gave a brief summary of the company's history and outlined the type of work Marconi was presently engaged in with particular emphasis on electronic products and equipment for the home, for defense purposes and for industrial use.

Ontario Hydro Awards Large Order To Enfield Cables

Enfield Cables Limited of Brimsdown, Middlesex, England, have announced that they have been awarded a contract to the value of approximately $500,000 by the Hydro-Electric Power Commission of Ontario, Canada. The cables will be laid in Ottawa, and they will cross the well-known Rideau Canal in the capital city.
It's better, quicker, cheaper, to specify CLAROSTAT for those carbon control requirements, because:

**For usual needs, there's an adequate choice of standard Clarostat types such as:**

**SERIES 37:** 1-1/8" d. 0.5 watt. Linear or tapers. One to three taps. Available with switch. Choice of shafts. Singles or duals. 500 ohms to 5 megarohms. Approved for Type RV3, characteristic U, MIL-R-94 specification.

**SERIES 47:** 15/16" d. 0.5 watt. Linear or tapers. One tap, choice of three positions. Available with switch. Choice of shafts. Singles or duals. 500 ohms to 5 megarohms.

**SERIES 48:** For miniaturization. 5/8" d. 0.2 watt. 500 ohms to 5 megarohms, linear, or 2,500 ohms to 2.5 megarohms, tapers. Singles or duals. Available with switch.

**SERIES 51:** For high-voltage high-resistance electronic circuitry. 1-17/32" d. phenolic case. 1 watt. 5,000 ohms to 50 megarohms. 10,000 V.D.C. breakdown test between terminals and mounting bushing. Maximum operating voltage, 4,000. Tapers available.

And for unusual needs, Clarostat can design and put into production those special types—quickly, satisfactorily, economically—often based on ingenious adaptation of standard features and available tooling.

**SEND FOR LITERATURE.** Engineering collaboration, quotations and prompt delivery cycles, available on request!
C.G.E. Gets Contract For Installation Of Horn Antennas

Canadian General Electric Company has announced the signing of a contract with the Bell Telephone Company of Canada for the installation of microwave horn antennas and waveguides at 29 relay points between Uxbridge, a few miles north of Toronto, and Lake of Two Mountains on the Manitoba border.

These relay stations are being constructed by the Bell Telephone Company of Canada and will form part of the transcontinental microwave radio relay system which will provide for coast-to-coast television programs and additional telephone circuits.

The overall network is being constructed in stages by the telephone companies which comprise the Trans-Canada Telephone System, and is scheduled for completion early in 1958.

G. C. W. Browne Honored On Retirement

Believed to have been the first occasion in which Federal civil servants of the United States thus honored a civil servant of Canada, a unique ceremony took place in Ottawa recently when Transport's Department's retired Controller of Telecommunications, G. C. W. Browne was presented with a scroll and a wrist watch from his many friends and acquaintances in Washington. The presentation was made by Philip S. Bogart, Transport and Communications Attache of the United States Embassy in Ottawa on behalf of United States officials in the communications field of the State Department, Military Services, Coast Guard, Civil Aeronautics Administration, as well as Federal Communications Commission, the Department of Agriculture and the Department of the Interior.

George Cecil Watson Browne is a native of Ireland and a graduate in civil engineering from Trinity College, Dublin. He was engaged in radio development activities in the United States for a number of years and later in marine radio work in Great Britain. He entered the Canadian Government radio service in 1914. During World War I, he served with the Royal Canadian Navy and was placed in control of a group of Direction Finding Stations on the East Coast. In 1936, with the formation of the Department of Transport, he was placed in control of one of the coast-to-coast television programs and a meeting with ICAO's Secretary General, Mr. Carl Ljungberg.

In Canada's capital, Ottawa, Col. O'spina had an opportunity to inspect Department of Transport facilities, among them the C.G.E. manufactured OMNI-RANGE at Uplands Airport.

- G. C. W. Browne, recently retired from the Department of Transport in which department he held the position of director of telecommunications is shown left being presented with a scroll by Philip S. Bogart, Transport and Communications Attaché of the United States Embassy in Ottawa.
indispensable for measurement and reception

with these special features:
- HIGH SENSITIVITY & SELECTIVITY
  Automatic tracking, double-tuned cavity pre-selector.
- EXCELLENT GAIN STABILITY
  Equipped with AGC, "signal-lock" AFC.
- SELF-CONTAINED
  Electronically regulated low and high voltage power supplies.
- UNI-DIAL CONTROL
  tracks automatically, direct reading linear dial.

MICROWAVE FIELD INTENSITY RECEIVER

Broadband 950 to 11,260 mc

One of the most complete and versatile measurement instruments ever designed for reception and quantitative analysis of microwave signals in the range 950-11,260 mc.

The Polarad Model R Microwave Receiver is ideal for the reception and monitoring of all types of radio and radar communications within its range. It permits comparative power and frequency measurements, by means of its panel mounted meters, of virtually every type of signal encountered in microwave work.

It is compact and functional, featuring four integrally designed plug-in, interchangeable RF microwave tuning units to cover 950-11,260 mc, non-contacting chokes in pre-selector and microwave oscillator to ensure long life and reliability, and large scale indicating meter for fine tuning control.

Call any Polarad representative or direct to the factory for detailed specifications.

AVAILABLE ON EQUIPMENT LEASE PLAN

FIELD MAINTENANCE: SERVICE AVAILABLE THROUGHOUT THE COUNTRY

Polarad ELECTRONICS CORPORATION
43-20 34th STREET, LONG ISLAND 1, N. Y.

For further data on advertised products use page 99.
eliminates RADIO and TV noise and improves reception

Each Aerovox Filter is individually tested and is guaranteed to end radio and TV annoyance caused by H.P. motors, oil burners, refrigerators, electric shavers and other appliances.

DOMINION FASTENERS APPOINTMENTS

Following a recent directors' meeting, Mr. George A. Tinnerman, president, Dominion Fasteners Limited, exclusive Canadian manufacturer and licensee of Tinnerman Speed Nuts, announces the appointment of Mr. E. G. (Ernie) Bradner as vice-president and general sales manager, and Mr. L. (Bus) Wills as vice-president and secretary-treasurer.

Quebec Hydro To Have Longest Private Commercial Microwave System In Canada

The longest private commercial microwave communications system in Canada will link Hydro-Quebec's giant new power development on the Bersimis River to Montreal.

Hydro-Quebec's Bersimis No. 1 plant, now under construction in Northeastern Quebec on the North Shore of the Gulf of St. Lawrence, some 400 miles northeast of Montreal, will have an ultimate capacity of 1.2 million h.p. Timed with the scheduled operation of its generators, the system will be completed by September 1st, 1956. The Bersimis No. 2 plant, 18 miles down river from Bersimis No. 1, with a scheduled capacity of 600,000 h.p., will also be linked to this microwave system upon completion.

The system will cost approximately 1 million dollars. It will include 30 telephone circuits as well as teletype, telemetering and load frequency control circuits, all utilizing microwaves as means of transmission. The electric power produced at, and transmitted from Bersimis will be remotely indicated at the Hydro-Quebec Building from where power consumption will be controlled by means of the load frequency control circuits. Hydro-Quebec's engineers will be in a position to make fast and vital decisions on the control of power from the new plant. The combination of control and telephone circuits will enable them to initiate any necessary changes with the utmost speed and accuracy.

MARCONI APPOINTMENTS

T. C. Adams, comptroller of Canadian Marconi Company, has announced two new appointments in the Finance Division of the Company. Charles S. Stephens, C.A., has been appointed assistant to the comptroller, and John S. Ogilvy, C.A., has been named internal auditor for the Company. Mr. Stephens and Mr. Ogilvy will both make their headquarters in the head office of Canadian Marconi Company in Montreal.
Canadian Aviation Electronics Expand West Coast Operations

Work has started on the new 16,000 sq. ft. Vancouver plant of Canadian Aviation Electronics Limited, with headquarters in Montreal. The building on Fraser Street is scheduled for completion by late Spring, 1956. Plans allow for a further 24,000 sq. ft. expansion.

The plant will house the engineering, manufacturing, repair and overhaul and consumer products division of CAE’s West Coast branch. The lay-out of the new Vancouver plant follows closely the principle of visual control, as applied in CAE’s modern electronics headquarters in Montreal — considered as one of the finest examples of up-to-date factory planning in North America. Unobstructed areas can be adjusted to particular work projects. At present, the following areas are planned for: office, machine shop, repair and overhaul, service, maintenance, warehousing, maintenance stores. The same flexibility is maintained in internal power distribution.

CAE’s West Coast operations are under the management of Mr. Dave Manders, OBE, a Science Graduate of the University of British Columbia and former B.C. representative of the National Research Council, Ottawa. Mr. Manders was awarded the OBE in recognition of his war-time services to the University of British Columbia.

Pye Mobile Radio Equipment
For Seaway Contractor

The St. Lawrence Seaway, now becoming a modern reality, is a century-old idea. Several contracts have already been awarded by the Seaway Authority to different companies and already work is well under way in the Montreal area. McNamara Construction Company Ltd., of Toronto, which is taking part in this multi-million dollar operation, has been supplied with a Pye V.H.F. radio communications system. The dredges “Charlie M.”, “John Holden” and “George M. Jr.”, together with the tug “Marry M.” and the houseboat “Tanti II” have been equipped with Pye model PTC 117 “Reporter” mobile radiotelephones, all using PTC 3GP ground-plane antennas for maximum coverage. Installed at the McNamara office on the Department of Transport wharf, Coteau Landing, Quebec, is a Pye model PTC 704 15-watt fixed station, also using a PTC 3GP ground-plane antenna.
From All of Us
To All of You...

Serving you during 1955 has been a lasting pleasure... we hope our efforts on your behalf have been worthwhile. We hope, too, that your Christmas and New Year will be happy and peaceful and that everything you wish for in 1956 will be yours. In the meantime we'll continue to work even harder for you. From all of us to all of you... Season's Greetings and all our Best Wishes.

The Staff of
AGE PUBLICATIONS LIMITED
The Heathkit Oscilloscope Kit introduces a versatile, portable oscilloscope designed for both professional and hobbyist use. It is built on a printed circuit board and includes a variety of components and features, making it an excellent choice for those interested in electronics and communication measurements.

**Heathkit Oscilloscope Kit**

- **Model V-7**
  - Price: $24.50
  - Shpg. Wt.: 7 lbs.

- **Model MM-1**
  - Price: $29.50
  - Shpg. Wt.: 6 lbs.

- **Model AV-2**
  - Price: $29.50
  - Shpg. Wt.: 5 lbs.

**Calibrator Kit**

- **Model VC-2**
  - Price: $11.50
  - Shpg. Wt.: 4 lbs.

**Capacitance Meter Kit**

- **Model CM-1**
  - Price: $29.50
  - Shpg. Wt.: 7 lbs.

**Electronic Switch Kit**

- **Model S-2**
  - Price: $23.50
  - Shpg. Wt.: 11 lbs.

These kits are part of the Heathkit brand, which is a subsidiary of Daystrom Inc., located in Benton Harbor, Michigan. Heathkit products are designed to provide exceptional quality and reliability, with many outstanding features. They are suitable for both educational and professional use, offering a comprehensive range of capabilities that cater to the needs of enthusiasts and professionals alike.

For further data on advertised products, please refer to page 99. Verisys calibrator provides a voltage range of 0.01 to 100 volts peak-to-peak and features a wide range of controls and scales, making it a versatile tool for various applications. The Electronically Switch Kit permits the observation of 2 signals simultaneously, providing switching rates from 10 cps to 500 cps.

As an essential instrument for professional laboratories, or for servicing monochrome, color television, or even for service calls, the Oscilloscope Kit is a valuable addition to any enthusiast's collection. It is easy to assemble and offers high-quality components, ensuring accuracy and reliability in kit form.
HEATHKIT TV ALIGNMENT GENERATOR KIT

Here is the complete R.F. signal source for FM and TV alignment, (both monochrome and color). Provides output on fundamentals from 3.6 Mc to 220 Mc in four bands, with harmonic output usable up through the UHF channels. Electronic sweep circuit eliminates mechanical gadgets and accompanying noise, hum, and vibration. Continuously variable sweep up to 0—42 Mc, depending on base frequency.

Variable marker (19—60 Mc on fundamentals) and crystal marker (4.5 Mc and multiples thereof) generators built-in. Crystal included with kit. Provision for external marker if desired.

Packed with outstanding features, 50 ohm output impedance—exceptionally good linearity—effective AGC action—plenty of R.F. output. An essential instrument for the up-to-date service shop.

HEATHKIT SIGNAL GENERATOR KIT

This is one of our most popular kits, and is "serviceman engineered" to fulfill the signal source requirements of the radio serviceman and experimenter.

Covers 100 Kc to 110 Mc on fundamentals (5 bands), with output in excess of 100,000 microvolts. Calibrated harmonics extend usefulness up to 220 Mc. Choice of unmodulated R.F. output, 400 cps modulated R.F. output, or 400 cps audio output. Step-type and continuously variable output attenuation controls.

Cables are prewound, and construction manual is complete. Calibration unnecessary for service applications.

HEATHKIT CONDENSER CHECKER KIT

Model C-3
Measures capacity in four ranges from 0.0001 to 100 microfarads. Power factor control is provided for indication of electrolytic condenser efficiency. Tests capacitors under actual load conditions. Checks resistance from 100 ohms to 10 megohms. Direct reading scales for all tests. No calculation necessary.

Shpg. Wt. 7 lbs.
$19.50

HEATHKIT DECADE RESISTANCE KIT

Model DC-1
Provides capacity values from 100 microfarads. Silver-mica condensers used. High quality ceramic washer switches for reduced leakage.

Shpg. Wt. 3 lbs.
$16.50

HEATHKIT DECADE RESISTANCE BOX KIT

Model D-2-1
Provides switch selection of 36 RTMA 1 watt standard 10% resistors, ranging from 15 ohms to 10 megohms. Numerous applications in radio and TV work.

Model CS-1
Shpg. Wt. 2 lbs.
$5.50

HEATHKIT VISIBLE-AURAL SIGNAL TRACER KIT

Model T-3
This signal tracer features a high-gain R.F. channel and probe to permit signal tracing from the receiver antenna input through the R.F. and I.F. stages. Separate low gain channel for audio circuits. Both visual and aural indication by means of speaker and electron beam "eye" tube. Also noise locator circuit, wattmeter, and terminals for "patching" output transformer or speaker into external circuit.

Shpg. Wt. 9 lbs.
$23.50

HEATHKIT SIGNAL GENERATOR KIT

Model LG-1
Here is a signal generator for use where high accuracy and metered performance are essential. Covers 1 Mc to 30 Mc on fundamentals in 5 bands, 400 cps modulation variable from 0 to 59%. E.F. output at 30 Mc from 100,000 to 1 watt. Meter reads H.F. output in uv. or modulation percent. Step-type and variable output attenuation. Cables are prewound, and construction manual is complete. Calibration unnecessary for service applications.

Shpg. Wt. 16 lbs.
$39.50

HEATHKIT VISUAL-AURAL SIGNAL TRACER KIT

Model M-1
The M-1 is literally pocket size to fit in your coat pocket, tool box, glove compartment, or desk drawer. Measures A.F. or D.C. in 5 steps from a full scale minimum of 0—10 v. to a maximum of 0—5000 v. Measures direct current at 10 Ma and 0—100 Ma, and provides ohmmeter ranges of 0—399 ohms and 0—399,999 ohms. Sensitivity of 1,000 ohms/v. 1% precision divider resistors employed.

Shpg. Wt. 3 lbs.
$14.50

HEATHKIT DECADE RESISTANCE BOX KIT

Model DC-1
Provides switch selection of 36 RTMA 1 watt standard 10% resistors, ranging from 15 ohms to 10 megohms. Numerous applications in radio and TV work.

Model CS-1
Shpg. Wt. 2 lbs.
$5.50

HEATHKIT DECADE CONDENSER KIT

Model DC-1
Provides capacity values from 100 microfarads. Silver-mica condensers used. High quality ceramic washer switches for reduced leakage.

Shpg. Wt. 3 lbs.
$16.50

HEATHKIT CONDENSER CHECKER SUBSTITUTION BOX KIT

Model C-1
Measures capacity in four ranges from 0.0001 to 100 microfarads. Power factor control is provided for indication of electrolytic condenser efficiency. Tests capacitors under actual load conditions. Checks resistance from 100 ohms to 10 megohms. Direct reading scales for all tests. No calculation necessary.

Shpg. Wt. 2 lbs.
$5.50

HEATHKIT LABORATORY GENERATOR KIT

Model C-3
Here is a signal generator for use where high accuracy and metered performance are essential. Covers 100 Kc to 110 Mc on fundamentals (5 bands), with output in excess of 100,000 microvolts. Calibrated harmonics extend usefulness up to 220 Mc. Choice of unmodulated R.F. output, 400 cps modulated R.F. output, or 400 cps audio output. Step-type and continuously variable output attenuation controls.

Cables are prewound, and construction manual is complete. Calibration unnecessary for service applications.

Shpg. Wt. 7 lbs.
$19.50

HEATHKIT DECADE RESISTANCE KIT

Model DC-1
Twenty 1% precision resistors provide resistance from 1—99,999 ohms in 1 ohm steps. Indispensable around service shop, laboratory, or home workshop.

Shpg. Wt. 4 lbs.
$19.50

HEATHKIT CONDENSER CHECKER KIT

Model C-3
Measures capacity in four ranges from 0.0001 to 100 microfarads. Power factor control is provided for indication of electrolytic condenser efficiency. Tests capacitors under actual load conditions. Checks resistance from 100 ohms to 10 megohms. Direct reading scales for all tests. No calculation necessary.

Shpg. Wt. 7 lbs.
$19.50

HEATHKIT DECADE RESISTANCE BOX KIT

Model D-2-1
Provides switch selection of 36 RTMA 1 watt standard 10% resistors, ranging from 15 ohms to 10 megohms. Numerous applications in radio and TV work.

Model CS-1
Shpg. Wt. 2 lbs.
$5.50

HEATHKIT DECADE RESISTANCE BOX KIT

Model D-2-1
Provides switch selection of 36 RTMA 1 watt standard 10% resistors, ranging from 15 ohms to 10 megohms. Numerous applications in radio and TV work.

Model CS-1
Shpg. Wt. 2 lbs.
$5.50

HEATHKIT DECADE RESISTANCE KIT

Model DC-1
Twenty 1% precision resistors provide resistance from 1—99,999 ohms in 1 ohm steps. Indispensable around service shop, laboratory, or home workshop.

Shpg. Wt. 4 lbs.
$19.50

HEATHKIT DECADE CONDENSER KIT

Model DC-1
Provides capacity values from 100 microfarads. Silver-mica condensers used. High quality ceramic washer switches for reduced leakage.

Shpg. Wt. 3 lbs.
$16.50

HEATHKIT TV ALIGNMENT GENERATOR KIT

Here is the complete R.F. signal source for FM and TV alignment, (both monochrome and color). Provides output on fundamentals from 3.6 Mc to 220 Mc in four bands, with harmonic output usable up through the UHF channels. Electronic sweep circuit eliminates mechanical gadgets and accompanying noise, hum, and vibration. Continuously variable sweep up to 0—42 Mc, depending on base frequency.

Variable marker (19—60 Mc on fundamentals) and crystal marker (4.5 Mc and multiples thereof) generators built-in. Crystal included with kit. Provision for external marker if desired.

Packed with outstanding features, 50 ohm output impedance—exceptionally good linearity—effective AGC action—plenty of R.F. output. An essential instrument for the up-to-date service shop.

HEATHKIT TUBE CHECKER KIT

Because of its low price this fine tube tester is available, not only to the service shop and laboratory, but to part-time servicemen, experimenters, and radio amateurs, as well. Will test tubes commonly encountered in radio and all tubes commonly encountered in radio and TV service work. Simple "A.C." test on the 4¼" meter. Tests for open, short, and quality on the 12th of total emission. Includes illuminated roll chart. Fourteen different diode voltage values available. Separate lever switch for each tube element.

Model TC-2
The same electrically as TC-2, except that it is housed in a beautiful two-toned aluminum panel, bakelite case, and .0001 mid to .22 mid. 2 lps.

Portable carrying case available separately for $4.45. Shpg. Wt. 15 lbs.

Model TC-2
$29.50

$49.50

MODEL TS-4
Shpg. Wt. 16 lbs.
These High Quality Instruments

Heathkit Harmonic Distortion Meter Kit

Performs the functions of more elaborate and much more expensive audio distortion testing devices and yet is simple to operate and inexpensive to own. Used with a sine wave generator, it will check the harmonic distortion output of audio amplifiers under a variety of conditions. Essential in audio design work.

The HD-1 reads harmonic distortion directly on the meter as a percentage of the original signal input. It operates from 20 to 20,000 cps in 3 ranges, and incorporates a VTVM circuit for initial reference settings and final harmonic distortion readings. VTVM ranges are 0-1, 3, 10, and 30 volts full scale. 1% precision voltage divider resistor used. Distortion meter scales are 0-1, 3, 10, 30 and 100% full scale. Having a high input impedance the HD-1 requires only 0.1 volt input for distortion tests.

HD-1 Kit
Price $49.50
Ship. Wt. 13 lbs.

Heathkit Audio Generator Kit

This basic audio reference generator deserves a place in your Laboratory. Complete frequency coverage is afforded from 20 cps to 1 Mc in 5 ranges, and output is constant within ±1 db from 20 cps to 400 Kc down only 3 db at 600 Kc, and 8 db at 1 Mc. An extremely good sine wave is produced, with a distortion percentage below 0.4% from 100 cps through the audible range.

Plenty of audio output for all applications; up to 10 v. under no load conditions. Output controllable with a continuously variable or step-type attenuator with settings under no load conditions. Output controllable with a constant current output.

PS-3 Kit
Price $35.50
Ship. Wt. 17 lbs.

These High Quality Instruments

Heathkit Audio Analyzer Kit

The AA-1 consists of an audio wattmeter, an AC VTM, and a complete IM analyzer, all in one compact unit. It offers a tremendous saving over the price of these instruments purchased separately.

Use the VTM to measure noise, frequency response, output gain, etc. Use the wattmeter for measurement of power output. Internal loads provided for 4, 10, or 600 ohms. VTM also calibrated for use with DMM units at 0.1% gain or loss can be noted quickly.

High or low millivolt IM measurements can be made. High (6 Kc) and low (60 cps) frequency generators built-in. Only 4 meters are employed, and one of these is in scale. Full scale VTM ranges are 0-200, 100-0-100 microamps. IM analyzer scales are 0, 1, 10, 30 and 100%.

AA-1 Kit
Price $59.50
Ship. Wt. 13 lbs.

Heathkit Audio Oscillator Kit

Features sine or square wave coverage from 20 to 20,000 cps in 3 ranges. An instrument specifically designed to completely fulfill the needs of the serviceman and high fidelity enthusiast. Offers high-level output across the entire frequency range, low distortion and low input output. Uses a thermistor in the second amplifier stage to maintain essentially flat output through the entire frequency range. Produces good, clean square waves with a rise time of only 2 microseconds.

AO-1 Kit
Price $24.50
Ship. Wt. 10 lbs.

Sine Wave - Square Wave

Build your own receiver with confidence. Complete instruction book anticipates your every question. Features transformer-type power supply, high gain miniature tubes, built-in antenna, planetary tuning from 550 Kc. to 1600 Kc, 5/2 inch speaker. Also adaptable for use as AM tuner or phono amplifier.

BR-2 KIT
Price $17.50
Ship. Wt. 10 lbs.
This one compact package contains complete transmitter, with built-in VFO, modulator, and power supplies. Provides phone or CW operation—VFO or crystal excitation—and band-switching from 160 meters through 10 meters. R.F. power output 100—155 watts phone, 120—130 CW. Parallel 6L6s modulated by push-pull 6L6's. B network interference and output coupling for reduced harmonic output. Will match non-reactive antennas between 50 ohms and 600 ohms. TVI suppressed with extensive shielding and filtering. Rugged metal cabinet and dependable performance. Overall dimensions 20 1/4 wide x 13 1/2 high x 16 deep.

Supplied complete with all components, tubes, cabinet and detailed construction Manual. (Less crystals.) Don't be deceived by the low price! This is a top-quality transmitter designed to give you years of reliable service and dependable performance.

Enjoy the trouble-free operation of commercially designed equipment while still benefiting from the economies and personal satisfaction of "building it yourself."

This CW Transmitter is complete with its own power supply, and covers 80, 40, 20, 15, 11 and 10 meters. Single knob band-switching eliminates coil changing, or can be excited by external VFO. Crystal not included in kit. Incorporates features one would not expect in this price range, such as key-click filter, line filter, copper plated chassis, prewound coils, 52 ohm coaxial output, and high quality components throughout. Instruction book simplifies assembly. Uses 6AG7 oscillator, 616 final and 5134G rectifier. Up to 35 watts plate power input.

Weigh the cost of this kit against the cost of crystals—and consider the convenience and flexibility of VFO operation. This is one of the most outstanding kits we have ever offered for the radio amateur.

Covers 160—40—40—20—15—11 and 10 meters with three basic oscillator frequencies. Illuminated and precalibrated dial scale clearly indicates frequency on all bands and provides more than two feet of dial calibration. Reflects quality design in the use of ceramic coil forms and tuning capacitor insulation, and copper plated chassis. Simply plugs into crystal socket of any modern transmitter to provide coverage of the bands from 160 meters through 10 meters. Uses 6AU6 Clapp oscillator, and OA2 voltage regulator for stability. May be powered from plug on Heathkit Model AT-1 Transmitter, or supplied with power from most transmitters.

For further data on advertised products use page 99.

MAIL YOUR ORDER TODAY TO THE HEATH COMPANY
A SUBSIDIARY OF DAYTON HUB INC.
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For further data on advertised products use page 99
"Get prices down! Keep quality up! BUT HOW?"

With the many materials now available, and new ones coming on the scene, how can a designer be sure he's got the right answer?

Here's one way. Work with a company that has an exceptionally broad line of basic engineering materials, plus the research facilities and production experience you need to support your decision.

NVF materials—Vulcanized Fibre, Phenolite Laminated Plastic, Metal-Clad Phenolite and Fibre, Peerless Insulation—are surprisingly adaptable. Each is manufactured in many forms, grades, and combinations, with various degrees of hardness, resilience, flexibility, insulating ability, dielectric strength, moisture resistance, and ease of fabrication. What they can do—to reduce costs and preserve product quality—has raised many a manufacturer's eyebrows and profits!

NVF design assistance is complete. Our technical people can work with you while your project is in the head-scratching stage—make sure that you get exactly the right material or product for the specific job. But even more important, they stick with the project until it's completed to your satisfaction.

NVF maintains complete facilities for machining and forming ready-to-use parts. This saves you operating steps and gives you 100% usable parts. Working with a single integrated supplier often turns red figures into black ones.

If you have a design problem, call on National. It's the job of our engineering staff to discover ways and means of applying NVF materials to your difficult applications. Full details of our materials and services are yours without obligation.

Write for sixteen-page General Catalog, attention Dept. AD-12.

Also Manufacturers of Peerless Insulation, Materials Handling Receptacles, Val-Cot Wastebaskets and Textile Bobbins.

For further data on advertised products use page 99.
The STRAIGHT WAY Home

The R Theta D-R Navigation Computer, produced for the RCAF, is the first of its type in the world. Completely electro-mechanical in operation, no ground or airborne transmitted information is needed. Now under evaluation by the USAF and the RAF, the R Theta, will guide the pilot the straight way home no matter where he flies.

This new milestone in aviation was invented by Wing Commander J. G. Wright, RCAF. He was awarded the McKee Trans-Canada Trophy for 1954 for this contribution to Canadian aviation. The R Theta was developed and is being produced for the RCAF by PSC Applied Research Ltd.

PSC APPLIED RESEARCH LTD.
1500 O'CONNOR DRIVE
PLYMOUTH 5-3371
TORONTO 16, ONTARIO, CANADA
MUST YOUR EQUIPMENT BE RADIO INTERFERENCE FREE?

IF YOURS IS A TOUGH RF INTERFERENCE PROBLEM — LET FILTRON SOLVE IT....

FILTRON'S engineering department, cooperating with engineers of leading companies, has solved RF Interference Suppression problems throughout the country.

If your equipment must meet the RF Interference limits set by the military specifications, consult with FILTRON'S engineers in the earliest stages of design. FILTRON can furnish RF Interference Suppression Filters whose size, weight and overall configuration will fit into your equipment.

FILTRON has custom designed over 1000 different types of RF Interference Suppression Filters for equipment that meets military RF Interference Suppression limits and specifications.

FILTRON'S completely equipped screen rooms are always available for the RF Interference testing of your units and equipment.

An inquiry on your company letterhead will receive prompt attention.

FILTRON can best solve your RF Interference problems because:

- FILTRON'S engineering, research and design divisions are staffed by experienced RF Interference Suppression filter engineers.
- FILTRON'S modern shielded laboratories are equipped to measure RF Interference from 14 KC to 1000 MC in accordance with military specifications.
- FILTRON'S production facilities, comprising a capacitor manufacturing division, coil winding division, metal fabrication shop, metal stamping and tool and die shops, are exclusively producing the highest quality components for FILTRON'S RF Interference Suppression Filters.
- FILTRON'S extensive production facilities permit us to meet your delivery requirements. NOW!

Send for your copy of our NEW CATALOG on your company letterhead.
Expands useful portion of conventional scale...eliminates the rest. Expansion is accomplished by exclusive, non-linear bridge in balance at only one value of input voltage. Any deviation results in bridge unbalance which is demodulated and applied to a standard milliammeter movement. Ideal for power supply, generating units, test equipment, line monitoring, etc. Available from stock in many standard sizes and types with 115 volt base. Write for data file 1205.
ONLY 6 MONTHS ON THE MARKET YET ACCEPTED AND APPROVED BY THE ENTIRE ELECTRONICS INDUSTRY!

DOES MORE JOBS • IN LESS SPACE • AT LOWER COST • BETTER!

1. The new “Dur-Mica” is a silvered mica capacitor coated with a specially developed plastic coating for extra durability.
2. Operating temperature range — 55° C. to 125° C.
3. Improved moisture resistance particularly in the higher temperature range.
4. New reduced size makes “Dur-Mica” the smallest mica capacitors.
5. Temperature coefficient approaching the “NPO” range.
7. A versatile capacitor that gives precision performance with substantial savings in cost.
8. The “Dur-Mica” meets or exceeds all applicable MIL and RETMA standards for mica capacitors.

CAPACITY RANGES and DIMENSIONS

<table>
<thead>
<tr>
<th>Capacitor</th>
<th>Range</th>
<th>Dimensions</th>
</tr>
</thead>
<tbody>
<tr>
<td>DM15</td>
<td>1 to 400 µF at 500 VDCW; to 820 µF at 300 VDCW</td>
<td>7/16 x 9/32 x 5/32 to 7/32 thick</td>
</tr>
<tr>
<td>DM19</td>
<td>2 to 2200 µF at 500 VDCW; to 3900 µF at 300 VDCW</td>
<td>5/8 x 13/32 x 5/32 to 7/32 thick</td>
</tr>
<tr>
<td>DM20</td>
<td>2 to 3900 µF at 500 VDCW; to 5100 µF at 300 VDCW</td>
<td>13/32 x 13/32 x 5/32 to 7/32 thick</td>
</tr>
<tr>
<td>DM30</td>
<td>5 to 10,000 µF at 500 VDCW; to 20,000 µF at 300 VDCW</td>
<td>13/16 x 3/4 x 7/32 to 9/32 thick</td>
</tr>
</tbody>
</table>

STANDARD TOLERANCE: ±10% TOLERANCES AS LOW AS ±0.5%

For further data on advertised products use page 99.
**INDEX TO ADVERTISERS**

Page number is on the right
Key number for use with READER SERVICE CARDS is on the left

<table>
<thead>
<tr>
<th>Key No.</th>
<th>Name</th>
<th>Page No.</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Aerovox (Canada) Ltd.</td>
<td>86</td>
</tr>
<tr>
<td>2</td>
<td>Alpha Wire Corp.</td>
<td>46</td>
</tr>
<tr>
<td>3</td>
<td>American Research Corp.</td>
<td>80</td>
</tr>
<tr>
<td>4</td>
<td>Ampex Corp.</td>
<td>24</td>
</tr>
<tr>
<td>5</td>
<td>Andrew Antenna Corp.</td>
<td>71</td>
</tr>
<tr>
<td>6</td>
<td>Arco Electronics Inc.</td>
<td>98</td>
</tr>
<tr>
<td>7</td>
<td>Astral Electric Co. Ltd.</td>
<td>65</td>
</tr>
<tr>
<td>8</td>
<td>Automatic Electric (Canada) Ltd.</td>
<td>12</td>
</tr>
<tr>
<td>9</td>
<td>Automatic Electric (Canada) Ltd.</td>
<td>39</td>
</tr>
<tr>
<td>10</td>
<td>Automatic Electric (Canada) Ltd.</td>
<td>53</td>
</tr>
<tr>
<td>11</td>
<td>Automatic Electric (Canada) Ltd.</td>
<td>67</td>
</tr>
<tr>
<td>12</td>
<td>Automatic Electric Sales (Canada) Ltd.</td>
<td>67</td>
</tr>
<tr>
<td>13</td>
<td>Aviation Electric Ltd.</td>
<td>73</td>
</tr>
<tr>
<td>14</td>
<td>Aviation Electric Ltd.</td>
<td>87</td>
</tr>
<tr>
<td>15</td>
<td>Bach-Simpson Ltd.</td>
<td>16</td>
</tr>
<tr>
<td>16</td>
<td>Beckman Instruments Inc. (Ariga Division)</td>
<td>97</td>
</tr>
<tr>
<td>17</td>
<td>Bendix Aviation Corp.</td>
<td>59</td>
</tr>
<tr>
<td>18</td>
<td>Bohne Industries Ltd.</td>
<td>62</td>
</tr>
<tr>
<td>19</td>
<td>Bomac Laboratories Inc.</td>
<td>101</td>
</tr>
<tr>
<td>20</td>
<td>Calvert Electronics Inc.</td>
<td>84</td>
</tr>
<tr>
<td>21</td>
<td>Canadian Aviation Electronics Ltd.</td>
<td>47</td>
</tr>
<tr>
<td>22</td>
<td>Canadian Electrical Supply Co. Ltd.</td>
<td>46</td>
</tr>
<tr>
<td>23</td>
<td>Canadian Marconi Co.</td>
<td>11</td>
</tr>
<tr>
<td>24</td>
<td>Canadian Marconi Co.</td>
<td>83</td>
</tr>
<tr>
<td>25</td>
<td>Canadian Stackpole Ltd.</td>
<td>102</td>
</tr>
<tr>
<td>26</td>
<td>Canadian Westinghouse Co. Ltd.</td>
<td>18</td>
</tr>
<tr>
<td>27</td>
<td>Cannon Electric (Canada) Ltd.</td>
<td>42</td>
</tr>
<tr>
<td>28</td>
<td>Centralab Div.</td>
<td>63</td>
</tr>
<tr>
<td>29</td>
<td>Central Bridge Co. Ltd.</td>
<td>17</td>
</tr>
<tr>
<td>30</td>
<td>Coil Winding Equipment Co.</td>
<td>40</td>
</tr>
<tr>
<td>31</td>
<td>Collins Radio Co.</td>
<td>35</td>
</tr>
<tr>
<td>32</td>
<td>Computing Devices of Canada Ltd.</td>
<td>14</td>
</tr>
<tr>
<td>33</td>
<td>Conrad Inc.</td>
<td>61</td>
</tr>
<tr>
<td>34</td>
<td>Cossor (Canada) Ltd.</td>
<td>13</td>
</tr>
<tr>
<td>35</td>
<td>Curtis-Wright Corp.</td>
<td>72</td>
</tr>
<tr>
<td>36</td>
<td>Dawe Instruments Ltd.</td>
<td>22</td>
</tr>
<tr>
<td>37</td>
<td>Eitel-McCullough Inc.</td>
<td>49</td>
</tr>
<tr>
<td></td>
<td>Electro Sonic Supply Co. Ltd.</td>
<td>42</td>
</tr>
</tbody>
</table>

**PLEASE SEND FURTHER INFORMATION ON THE FOLLOWING NEW PRODUCT ITEMS AS NUMBERED BELOW — USE PRODUCT ITEM NUMBERS**

**PLEASE SEND FURTHER INFORMATION ON THE FOLLOWING ADVERTISEMENTS AS NUMBERED BELOW — USE KEY NUMBER**

<table>
<thead>
<tr>
<th>Name</th>
<th>Position</th>
</tr>
</thead>
<tbody>
<tr>
<td>Company</td>
<td></td>
</tr>
<tr>
<td>Street</td>
<td>City</td>
</tr>
</tbody>
</table>

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<table>
<thead>
<tr>
<th>Name</th>
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</tr>
</thead>
<tbody>
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<td>Company</td>
<td></td>
</tr>
<tr>
<td>Street</td>
<td>City</td>
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</tbody>
</table>
### ELECTRONICS AND COMMUNICATIONS

**31 - 35 Willcocks Street**

**Toronto 5, Ontario**

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<table>
<thead>
<tr>
<th>Key No.</th>
<th>Name</th>
<th>Page No.</th>
</tr>
</thead>
<tbody>
<tr>
<td>38</td>
<td>Federal Wire &amp; Cable Co. Ltd.</td>
<td>23</td>
</tr>
<tr>
<td>39</td>
<td>Ferranti Electric Ltd.</td>
<td>66</td>
</tr>
<tr>
<td>40</td>
<td>Filtron Co. Inc.</td>
<td>96</td>
</tr>
<tr>
<td>41</td>
<td>Fraser Ltd., D. M.</td>
<td>68</td>
</tr>
<tr>
<td>42</td>
<td>Freed Transformer Co. Inc.</td>
<td>40</td>
</tr>
<tr>
<td>43</td>
<td>Hackbusch Electronics Ltd.</td>
<td>45</td>
</tr>
<tr>
<td>44</td>
<td>Hammond Mfg. Co. Ltd.</td>
<td>60</td>
</tr>
<tr>
<td>45</td>
<td>Heath Co.</td>
<td>89-93</td>
</tr>
<tr>
<td>46</td>
<td>Helipot Corp.</td>
<td>51</td>
</tr>
<tr>
<td>47</td>
<td>Hellerman Canada Ltd.</td>
<td>82</td>
</tr>
<tr>
<td>48</td>
<td>Hewlett-Packard Co.</td>
<td>81</td>
</tr>
<tr>
<td>49</td>
<td>Hunt Capacitors (Canada) Ltd.</td>
<td>27</td>
</tr>
<tr>
<td>50</td>
<td>Hycor Co. Inc.</td>
<td>76</td>
</tr>
<tr>
<td>51</td>
<td>Kaiser-Willys of Canada Ltd.</td>
<td>41</td>
</tr>
<tr>
<td>52</td>
<td>Kaye Electrical &amp; Mfg. Co.</td>
<td>66</td>
</tr>
<tr>
<td>53</td>
<td>Kester Solder Co.</td>
<td>48</td>
</tr>
<tr>
<td>54</td>
<td>Lakeshore Precision Gauge Works Ltd.</td>
<td>50</td>
</tr>
<tr>
<td>55</td>
<td>Magnetics Inc.</td>
<td>37</td>
</tr>
<tr>
<td>56</td>
<td>Marsland Engineering Ltd.</td>
<td>75</td>
</tr>
<tr>
<td>57</td>
<td>Minnesota Mining &amp; Mfg. of Canada Ltd.</td>
<td>33</td>
</tr>
<tr>
<td>58</td>
<td>National Fibre Co. of Canada Ltd.</td>
<td>94</td>
</tr>
<tr>
<td>59</td>
<td>Nichols Ltd., R. H.</td>
<td>66</td>
</tr>
<tr>
<td>60</td>
<td>P.S.C. Applied Research Ltd.</td>
<td>95</td>
</tr>
<tr>
<td>61</td>
<td>Phillips Electrical Co. Ltd.</td>
<td>20</td>
</tr>
<tr>
<td>62</td>
<td>Polerad Electronics Corp.</td>
<td>85</td>
</tr>
<tr>
<td>63</td>
<td>Polypenco Inc.</td>
<td>77</td>
</tr>
<tr>
<td>64</td>
<td>Precision Electronic Components Ltd.</td>
<td>52</td>
</tr>
<tr>
<td>65</td>
<td>Prodelin Inc.</td>
<td>78</td>
</tr>
<tr>
<td>66</td>
<td>Pye (Canada) Ltd.</td>
<td>43</td>
</tr>
<tr>
<td>67</td>
<td>Quality Hermetics Ltd.</td>
<td>2</td>
</tr>
<tr>
<td>68</td>
<td>R.C.A. Victor Co. Ltd.</td>
<td>74</td>
</tr>
<tr>
<td>69</td>
<td>Radio Engineering Products Ltd.</td>
<td>61</td>
</tr>
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<td>70</td>
<td>Radio Engineering Products Ltd.</td>
<td>64</td>
</tr>
<tr>
<td>71</td>
<td>Rogers Majestic Electronics Ltd.</td>
<td>54-55</td>
</tr>
<tr>
<td>72</td>
<td>Sanborn Co.</td>
<td>70</td>
</tr>
<tr>
<td>73</td>
<td>Snelgrove Co. Ltd., C. R.</td>
<td>58</td>
</tr>
<tr>
<td>74</td>
<td>Sorensen &amp; Co. Inc.</td>
<td>69</td>
</tr>
<tr>
<td>75</td>
<td>Stark Electronic Instruments Ltd.</td>
<td>98</td>
</tr>
<tr>
<td>76</td>
<td>Telephone Mfg. Co. Ltd.</td>
<td>57</td>
</tr>
<tr>
<td>77</td>
<td>Ungar Electric Tool Co. of Canada</td>
<td>79</td>
</tr>
<tr>
<td>78</td>
<td>Varian Associates</td>
<td>26</td>
</tr>
</tbody>
</table>
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