ELECTRONICS *and* COMMUNICATIONS

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RUGGED, LONG LIFE EIMAC 4X5000A CERAMIC TETRODE DELIVERS 10kw FOR SINGLE SIDEBAND

4X5000A RADIAL-BEAM POWER TETRODE
TYPICAL OPERATION
FREQUENCIES BELOW 30 mc.

	Class C CW	Class AB* R-F Linear Amplifier
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D-C Screen Voltage	500 v	1250 v
D-C Grid Voltage	−350 v	−300 v
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Driving Power	150 w	0 w
Plate Dissipation	5 kw	4.2 kw
Plate Power Output	16 kw	10 kw

*Class AB figures shown are under Peak Envelope or Modulation Crest Conditions.

Top Single Sideband performance plus the advantages of great immunity to damage by thermal or physical shock are combined in the metal and ceramic Eimac 4X5000A radial-beam power tetrode.

Developed especially for Single Sideband communication systems the 4X5000A delivers 10kw power output and has a maximum plate dissipation rating of 6000 watts. High output is easily developed without going into the positive grid region.

A unique integral-finned anode permits the 4X5000A to be cooled with low air pressures. Simple coaxial construction provides low inductance multiple terminals.

Now available for optimum socketing and cooling of the 4X5000A is the Eimac SK300 air-system socket.

Visit Eimac klystron, negative-grid tube and ceramic receiving tube display at Booth 153 during the Canadian I.R.E. Convention. Also see "Tubes That Can Take It", a new motion picture on revolutionary Eimac receiving tubes.

For further information about the 4X5000A and its companion socket write our Application Engineering Department.

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The World's Largest Manufacturer of Transmitting Tubes

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THE **AHEARN AND SOPER** COMPANY LIMITED P.O. Box 715, Ottawa, Ontario

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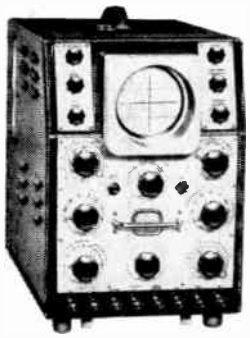
EVOLUTION IN PRECISION INSTRUMENTS



MODEL 1049 Double Beam meets industrial and laboratory requirements, recording frequencies from zero to 400 Kc/s (A1) and 800 Kcs. (A2).
4-inch flat-screen double beam tube operates at 2KV and provides for operation at 4KV when recording of fast transients is undertaken. 2 independent channels with gains 900 and 25.

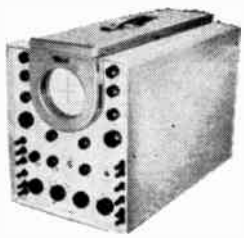
The complete range of Cossor oscilloscopes provide instruments that are desinged to meet plant and laboratory requirements and are an evolution in precision.

Write for complete specifications and details to Cossor (Canada) Ltd.

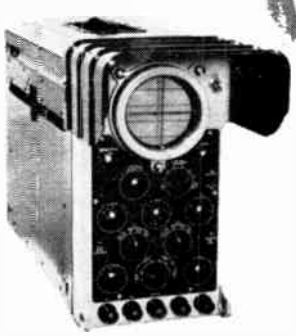
MODEL 1037C provides the basic facilities required for radio, television, radar and industrial electronics servicing and testing. Its small dimensions and universal power supply operation make it of universal application.

MODEL 1058 is fitted with a 4-inch diameter P.O.A. tube and provides a display of 6 cm. amplitude from zero frequency to 6 Mc/s. It has a direct-coupled Y amplifier with a sensitivity of 0.25V./cm. and accurate calibrating facilities and a symmetrical X amplifier. The time base is free-running or triggered and has a wide range of scanning velocity.

MODEL 1035 incorporates a 4" flat screen Double Beam Tube and independent amplifiers providing high and low gain channels with a frequency range of 20 c/s to 7 Mc/s and 20 c/s to 100 Kc/s respectively. Voltages of applied signals can be measured directly on calibrated front panel dials.



MODEL 1052 has a 4-inch diameter flat-screen tube providing two amplifier channels of approximate gain 2,000 each and an upper frequency response of better than 5 megacycles. The repetitive or triggered time-base has a sweep duration from 200 milliseconds to 5 microseconds with constant full screen deflection.



MODEL 7514C Oscilloscope is a versatile high gain wide band instrument for general laboratory and industrial applications. The Amplifier handles signals from 5 cycles to 10 Mc.

COSSOR (CANADA) LIMITED

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complete money-saving service

for all your rural distribution wire and supplies

You can save enormously on time, materials and labour, with rural distribution wire and supplies from Automatic Electric. The wire is insulated, colour coded and formed like cable. It is put up fast and economically. All that's needed is a single bracket at each pole for proper attachment. Here is a typical installation:

PROTECTED TERMINAL Can be supplied for either cable or station protection. Weather-tight and designed for either pole or crossarm mounting. Available for 6, 11 and 16 pair wire.

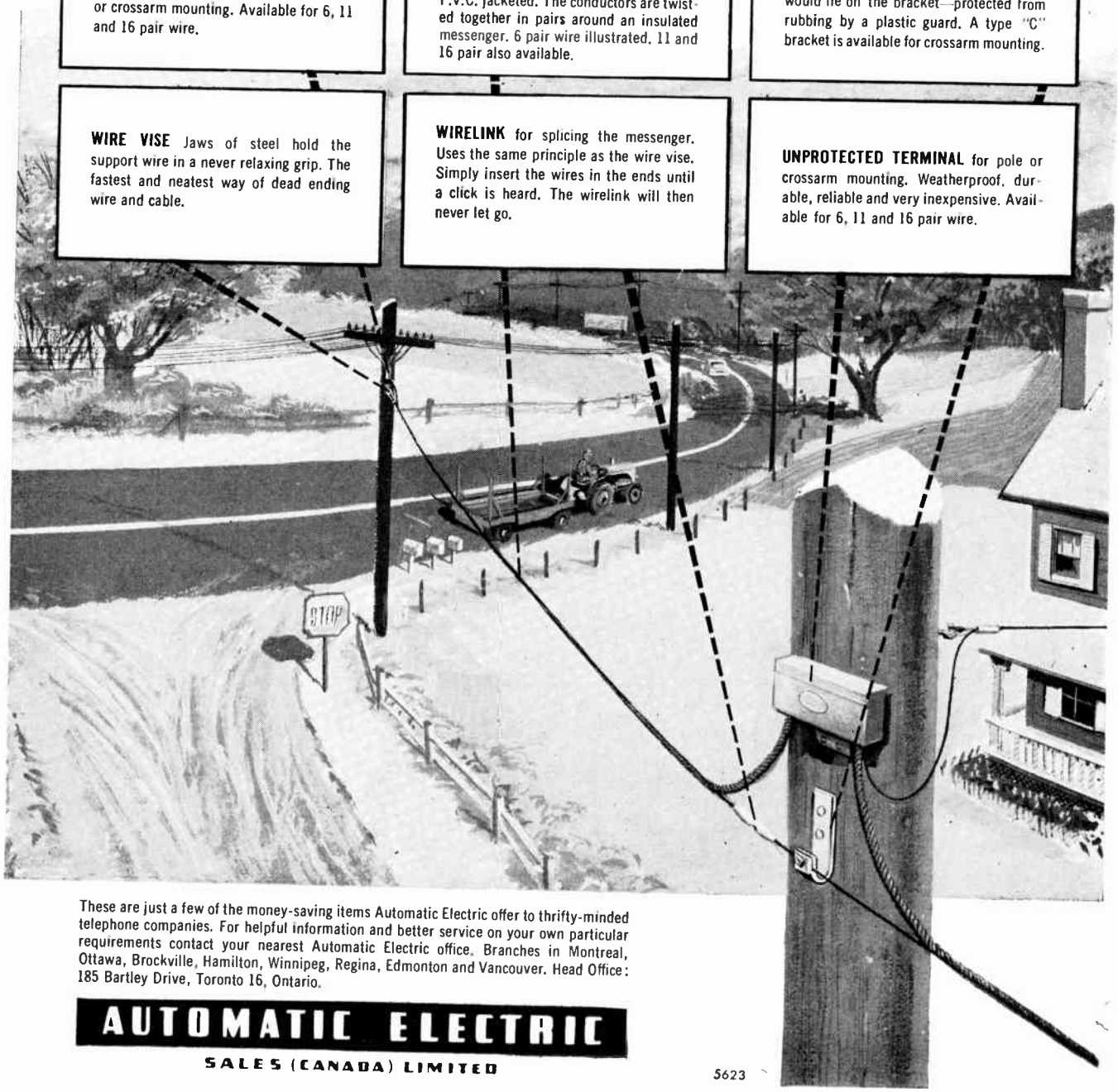
DISTRIBUTION WIRE The economical solution for expanding rural and suburban telephone facilities. 19 gauge solid copper conductors are polyethylene insulated and P.V.C. jacketed. The conductors are twisted together in pairs around an insulated messenger. 6 pair wire illustrated. 11 and 16 pair also available.

TYPE "B" BRACKET attaches the messenger directly to the pole as shown. If there were no terminal box, the wire would lie on the bracket—protected from rubbing by a plastic guard. A type "C" bracket is available for crossarm mounting.

WIRE VISE Jaws of steel hold the support wire in a never relaxing grip. The fastest and neatest way of dead ending wire and cable.

WIRELINK for splicing the messenger. Uses the same principle as the wire vise. Simply insert the wires in the ends until a click is heard. The wirelink will then never let go.

UNPROTECTED TERMINAL for pole or crossarm mounting. Weatherproof, durable, reliable and very inexpensive. Available for 6, 11 and 16 pair wire.



These are just a few of the money-saving items Automatic Electric offer to thrifty-minded telephone companies. For helpful information and better service on your own particular requirements contact your nearest Automatic Electric office. Branches in Montreal, Ottawa, Brockville, Hamilton, Winnipeg, Regina, Edmonton and Vancouver. Head Office: 185 Bartley Drive, Toronto 16, Ontario.

AUTOMATIC ELECTRIC

SALES (CANADA) LIMITED

5623

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connect with CANNON PLUGS for better aircraft and electronic equipment

For Aircraft, Electronics, Instruments

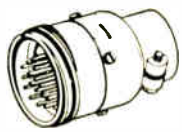
AN

AN Series . . . conforming to Specification MIL-C-5015B. 15 diameters and 260 insert layouts. 6 shell styles, AN3100 to AN3108.

For Aircraft Vibration Resisting—Moisture Proof

AN-E

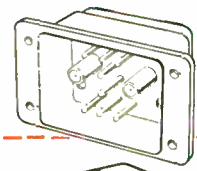
AN-E Series . . . environment resisting. Meets Specification MIL-C-5015B. Completely sealed from cable to cable. Integral cable clamp. New grounding lugs. Improved sealing grommet and new grommet follower. Resilient inserts.



For General Circuitry in More Rugged Applications

K, RK

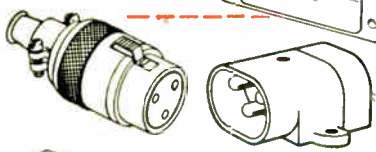
K, RK Series . . . *Special Acme thread.* Rugged. 8 basic shell shapes, 8 diameters, and 204 catalogued insert layouts. The all-purpose line.



For Rack-and-Panel Applications

DP

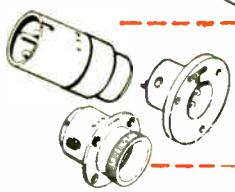
DP, DPB, DPD, DPD2, DPD2R, DPR, DPA (miniature), and DPM Series . . . rectangular in shape with many insert layouts in DPB and DPD.



For Audio

P, O

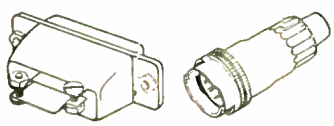
P and O Series, the original microphone series . . . 22 shell styles and 7 insert layouts.



For Low Level Circuits

X, XK, XL

X, XK and XL Series . . . 23 basic shell styles and 8 insert layouts for cord-end or wall mounting.



For Portable Radio and Other Audio Circuitry

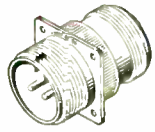
D, U

Sub-Miniature Connectors . . . The D and U Series for cord-end, rack-and-panel, or wall-mounted applications. The D Series has 3 basic shapes, up to 50 contacts. The hermetically-sealed U Series, cylindrical with 4 basic shell sizes, accommodates up to 12 contacts in 12 insert layouts. DH Types used for hermetically-sealed miniature components.

For High Pressure Applications

GS

Hermetically-Sealed Connectors . . . with steel shells and contacts to withstand high pressures. Available in the GS, KH, DH, and U Series. Insulation is a vitreous material, fused under high temperature to shell and contacts, thus forming a true hermetic seal.



For Open Flame Protection

STEEL SHELL FIREWALL

AN-K and Cannon K Firewall or High Temperature Connectors . . . offer you the greatest variety of this type of connector. Cannon made the first firewall connector and is still the leader in the field. Wall- or box-mounting receptacle. Straight or angle 90° plugs. Crimp-on contacts . . . no solder to melt. Inserts of asbestos-filled or glass-filled material.

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Since 1915

Send for a copy of the Cannon Plug Guide. Be sure to see Cannon's informative 16mm technical film "Contact."

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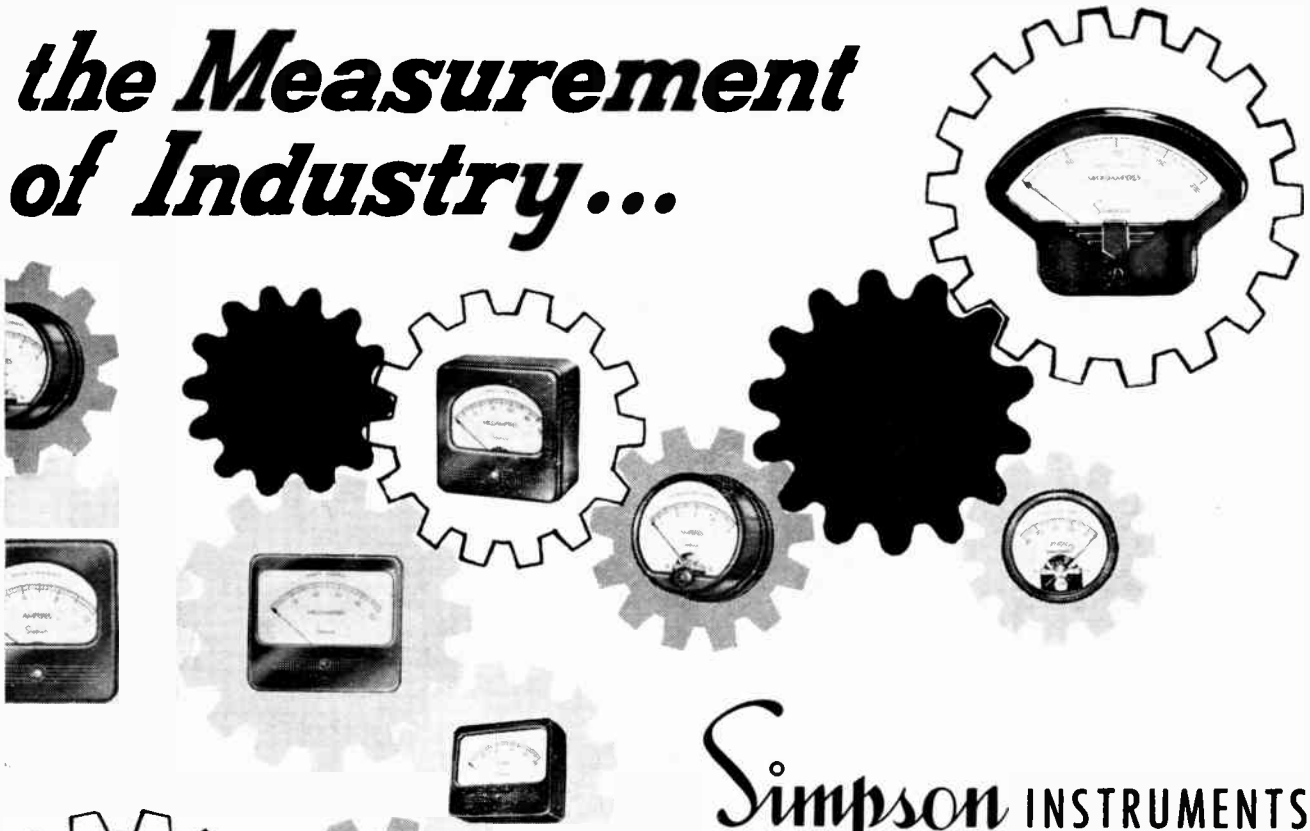
the Measurement of Industry...



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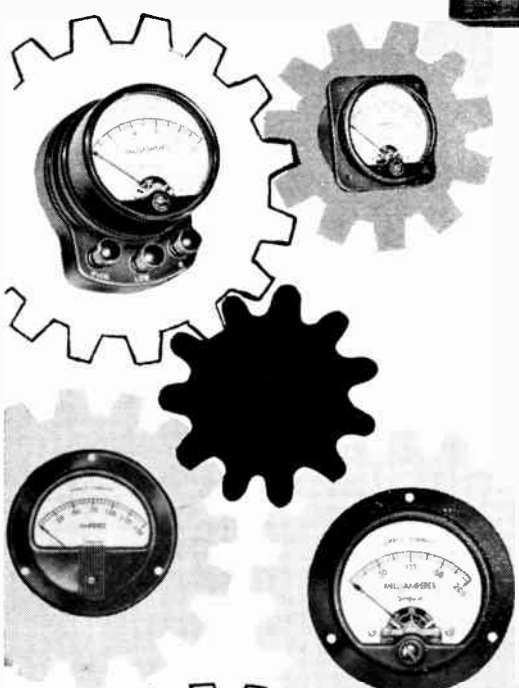
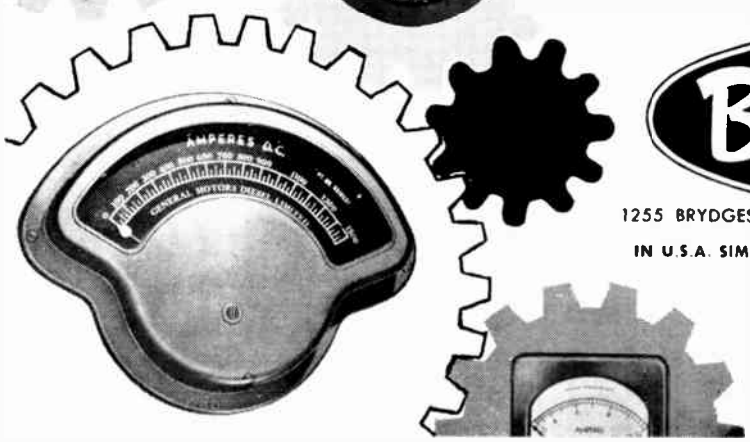
With measurement an increasingly important function in industry — and Simpson instruments a major factor in the instrumentation field — then Canadian industry and Canadian made Simpson instruments have much in common.

Instrumentation is a complex field and requires, for solutions to industry's problems, the attention and facilities of specialists. That's just what we at Bach-Simpson feel we are — specialists, backed by complete Canadian facilities for manufacture, design and engineering of panel instruments.

If you have a problem in this field, let us have a look at it, regardless of how insurmountable it may appear. Others have—and found in Canadian made Simpson instruments the answers to their problems.





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LIMITED

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IN U.S.A. SIMPSON ELECTRIC COMPANY, 5200 W. KINZIE ST., CHICAGO 44, ILL

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For further data on advertised products use page 85.

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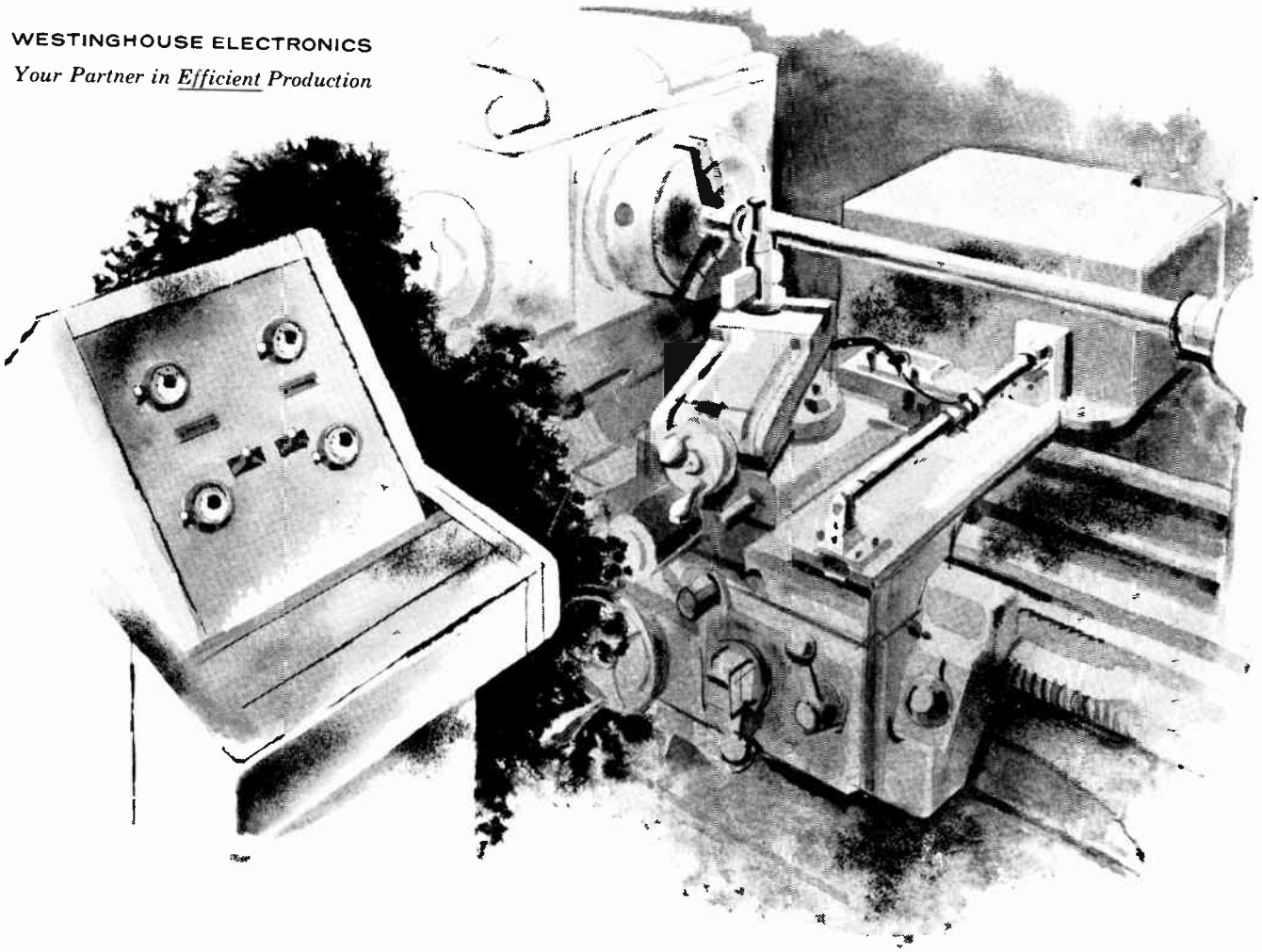
WESTINGHOUSE ELECTRONICS

Your Partner in Efficient Production



10 times more accurate than ordinary tool setting!

Ordinary manual tool settings can't possibly give you the close tolerances you need today. Rejects pile up . . . time's wasted in making allowances for wear. But with the new Canadian Westinghouse Electronic Micro-Spacer, you get accuracy to 1/10,000″ . . . with never a worry about wear.

Invented by Canadian Westinghouse, this new Micro-Spacer is ten times more accurate than the best manual setting. And this is lifetime accuracy . . . because the setting is done by electro-magnetics, not by metal parts.

Remotely operated, simple in design, the new Westinghouse Electronic Micro-Spacer is an excellent example of how Canadian Westinghouse Electronics serves Canadian industry . . . one of the hundreds of ways Westinghouse can help you operate more efficiently. Backed by the Westinghouse team of 400 engineers, physicists and scientists, it illustrates why Westinghouse is Canada's leader in military and commercial electronics.

We will gladly have an electronics specialist review your entire operation, and submit detailed recommendations on putting Westinghouse Electronics creative experience to work for you. Contact any branch of Canadian Westinghouse . . . unsurpassed in electronics.

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ELECTRONICS DIVISION
CANADIAN WESTINGHOUSE COMPANY
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ELECTRONICS and COMMUNICATIONS

THE ONLY CANADIAN JOURNAL DEVOTED SPECIFICALLY TO THE APPLICATIONS OF COMMUNICATIONS AND ELECTRONICS

SEPTEMBER • 1956
Vol. 4 No. 8

EDITORIAL CONTENTS

FEATURES

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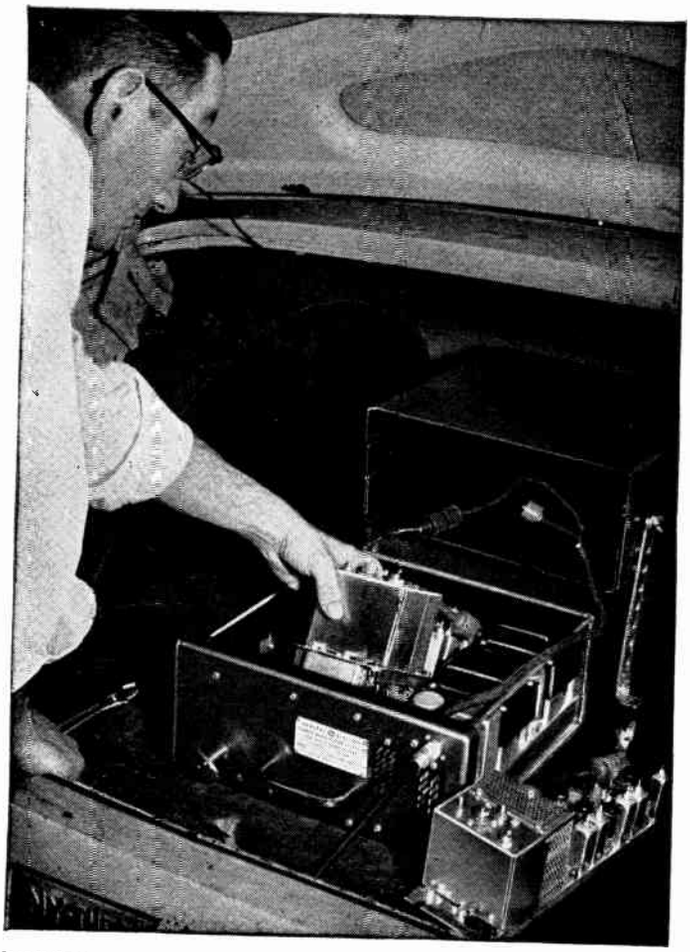
G.E. DEVELOPS NEW PLUG-IN CHASSIS FOR 2-WAY RADIO

NEW PROGRESS LINE saves money on maintenance through faster servicing—protects from obsolescence because chassis are quickly interchangeable.

IN the new Progress Line, transmitter, receiver, power supply and optional chassis are individually rack-mounted in a triple-rigid mobile case. Rapid interchangeability is provided by this rack construction and true plug-in chassis. This plug-in design permits changes in frequency, power, type of reception (narrow or wide band) quickly *at minimum cost, at any time.* You're free of any obsolescence risk!

You may switch Progress Line mobile units—whether front or trunk mount, between vehicles with 6 or 12 volt DC systems. No electrical alterations are needed. And any mobile combination can be converted quickly to a low-cost, 117 volt AC intermittent duty base station by changing only the power supply chassis!

Let a G-E Communications Specialist analyze your radio needs and develop an installation or conversion program planned for long-run savings. Write or call today for full specifications on the new PROGRESS LINE. *Write: Mobile Equipment Sales, Canadian General Electric Co. Limited, 830 Lansdowne Ave., Toronto.*



INDIVIDUAL PLUG-IN CHASSIS minimize capital investment in spares and reduce radio maintenance time! Your vehicles will be back "in service" faster. For instance, you can replace either a transmitter or receiver plug-in chassis right in the vehicle in 5 minutes—using only a screwdriver. Individual plug-in chassis of the new General Electric Progress Line units also provide complete interchangeability between mobile and station transmitters and receivers.

EASY FRONT MOUNTING under the dash. The new G-E Progress Line case is less than 15" deep. For the first time you can have a 90-watt front mount mobile unit in the 25-54 MC band and a 50-watt front mount mobile unit in the 144-174 MC band. In the 25-54 MC band you can now have simultaneous monitoring of 2 channels, in the same case, without additional equipment.

2-WAY MOBILE RADIO

SEE THIS EQUIPMENT AT THE CANADIAN I.R.E. SHOW

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CANADIAN GENERAL ELECTRIC COMPANY LIMITED

MR-956

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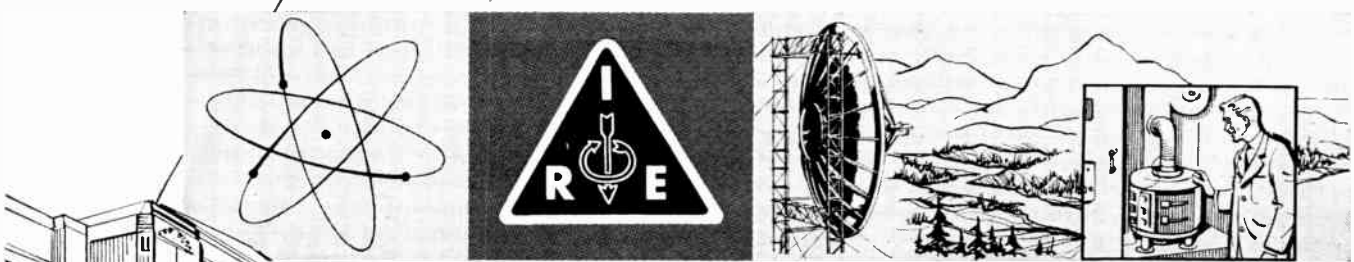
TORONTO, CANADA
OCTOBER 1ST, 2ND and 3RD, 1956



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30th Anniversary in Canada
The Institute of Radio Engineers

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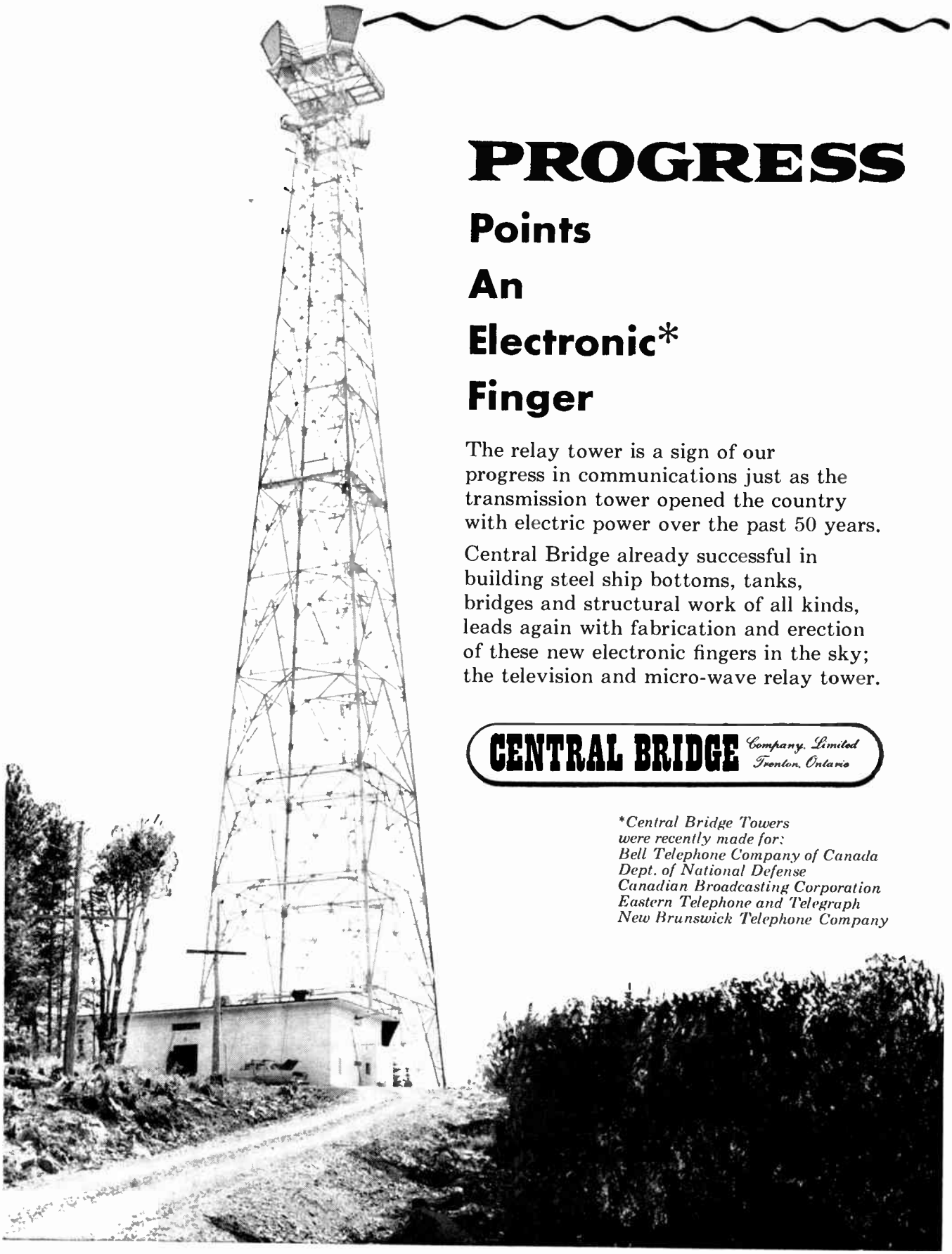

PROGRESS

Points An Electronic* Finger

The relay tower is a sign of our progress in communications just as the transmission tower opened the country with electric power over the past 50 years.

Central Bridge already successful in building steel ship bottoms, tanks, bridges and structural work of all kinds, leads again with fabrication and erection of these new electronic fingers in the sky; the television and micro-wave relay tower.

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Dept. of National Defense
Canadian Broadcasting Corporation
Eastern Telephone and Telegraph
New Brunswick Telephone Company

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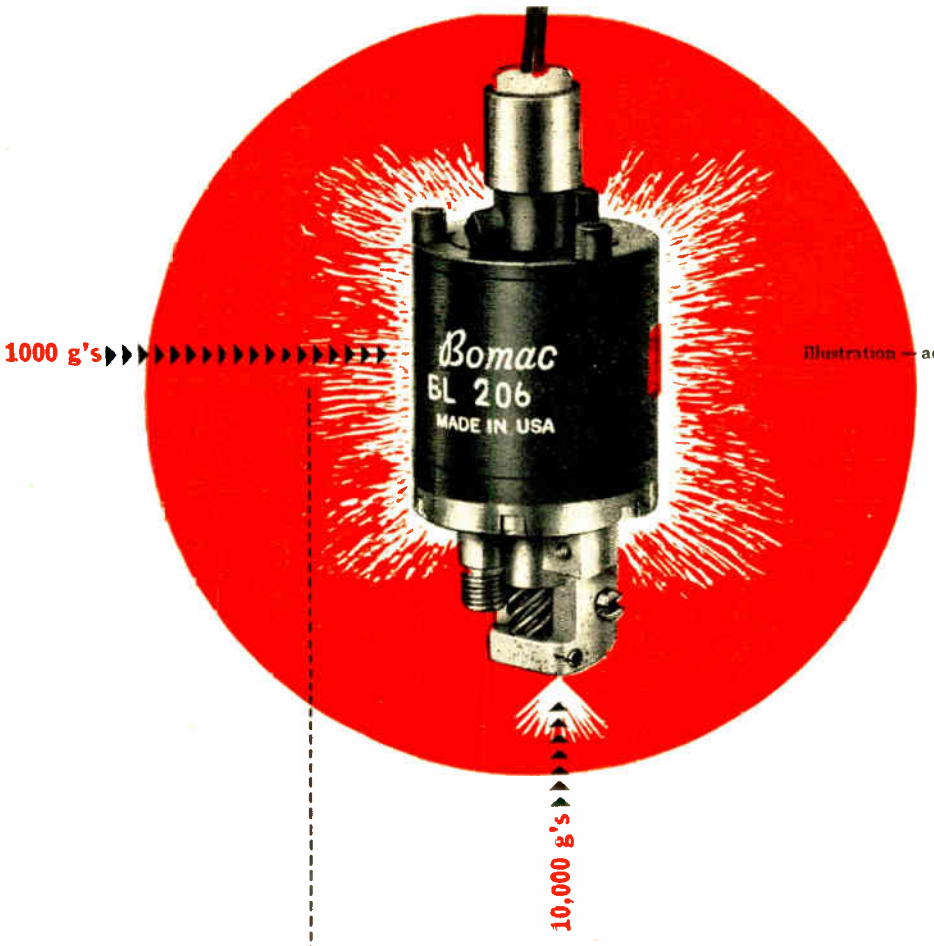

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miniature C band magnetron . . .

UNERRING RELIABILITY *in performance under severe stress — 10,000 g's longitudinally, 1,000 g's laterally . . .* **HIGH PRECISION, ADJUSTABLE TUNING** *from 5400 to 5900 mc. by worm drive with set screw lock on tuner . . .* **FREQUENCY DRIFT** *— less than 0.05 mc/° C . . .* **COMPLETE PACKAGE UNIT** *— no accessory equipment or accessory fittings are required . . .* **WARM-UP TIME** *— 7 seconds . . .* **WEIGHT** *— 6.5 oz. . . .* **DIMENSIONS** *— 5⅛" high, 1 15/16" diameter*

For complete specifications, write (on your company letterhead) to Dept. EC-9

Bomac Laboratories, Inc.

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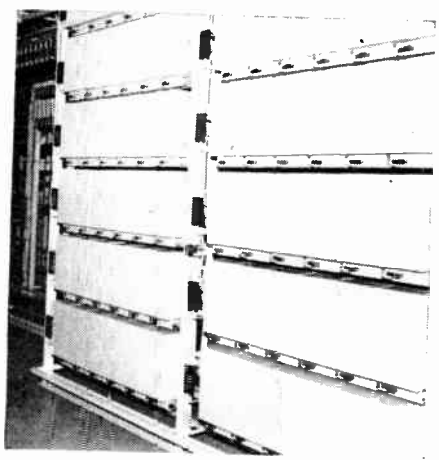
Chief operator's control console. The control and supervision of traffic is centralized. Automatic signals adjust themselves to the prevailing conditions during overload. Service information and intercept boards are also provided.

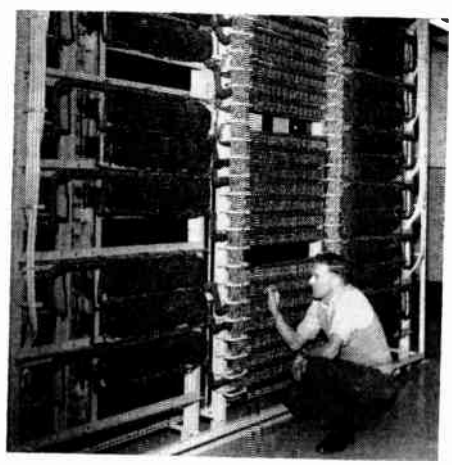
UNIQUE TELEPHONE FACILITIES AT NEW WESTMINSTER, B.C. FEATURES AUTOMATIC ELECTRIC EQUIPMENT

On January 29th, 1956 in New Westminster, the B.C. Telephone Company made the largest cut-over in its history to meet the phenomenal growth of the city. By means of two and one-third 10,000 line units of Strowger Step-by-step Equipment, the Company now provides local and extended area service to more than 21,000 subscribers between New Westminster and neighboring Vancouver.



A unique feature of this ultra-modern exchange is the complete provision for handling toll traffic. With the inter-toll dial trunks illustrated, an operator may dial direct to some 40 toll centres. Automatic alternate routing is provided where advantageous.

A bay of inter-toll selectors shown in the toll switchroom. Here toll switching, both terminating and through, are handled by Automatic Electric's Type FW-1 Intertoll switching system, which incorporates many new features for the switching of toll traffic.



Using a new high speed method of call distribution, incoming traffic is received by any available operator. Calls are served through a "gate" system practically in the order of their arrival, with preference being given automatically to certain classes of calls. The illustration shows primary distribution bay.

The facilities at New Westminster represent another large installation of Strowger Step-by-step equipment in Canada . . . proving once again that Strowger is your safest investment in telephone equipment. Contact our engineers for their recommendations on your specific problems.

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Automatic Electric Sales (Canada) Limited,
Head Office: 185 Bartley Drive, Toronto 16.
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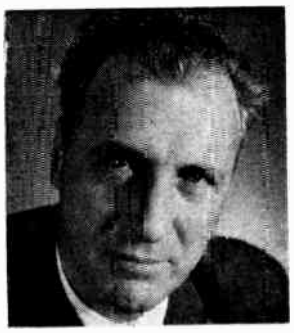
5618

AUTOMATIC ELECTRIC (CANADA) LIMITED

For further data on advertised products use page 85.



The EDITOR'S PAGE

More About Engineers

At the annual meeting of the Canadian Manufacturers' Association recently held in Toronto, announcement was made by Crawford Gordon Jr., president of the A. V. Roe Canada Ltd., of a national conference to be held September 10th-11th on scientific and engineering manpower aimed at finding a solution to the "existing extreme shortage of scientists, professional engineers and skilled technicians". Leading Canadians in the fields of education, government, the professional societies, labor and industry are expected to attend this conference.

It is extremely unlikely that a two-day conference will find the ultimate solution to the "existing extreme shortage of scientists, professional engineers and skilled technicians", but there is every reason to believe that an earnest analysis of the situation by leaders of industry, government and members of the professional societies et al could find ways and means of plugging one leak that is draining off the most highly experienced engineers that industry possesses, a leak that is permitted to remain open with the full sanction and knowledge of those who are in such dire need of engineering personnel, namely, the policy of retiring engineers to pension or otherwise when they are fully capable of further years of useful service.

Despite the reasoning underlying company retirement schemes, there is little justification why a man with twenty-five or thirty years of experience should be compelled to retire from active participation in engineering, especially in face of the extreme shortage of such personnel. Surely company policy on this matter could be revised to prevent what literally amounts to throwing years of engineering experience out the window. If it is essential that engineering personnel must be retired to fulfil company retirement policy, a policy which under the circumstances would appear untenable, then it would seem logical that further company policy be laid down to provide for the part-time employment of retired engineers or their retention in a consulting capacity in order that the years of their accumulated knowledge may not be entirely lost.

In view of the extreme shortage of skilled technical men, it seems a little ridiculous that an engineer or scientist who is still capable and desirous of remaining in employment should be denied the privilege of so doing because he is 65 years old and the pension policy of his firm stipulates that he must, therefore, be retired.

* * *

The Patent Waiver

In a recent report issued by the Ontario Association of Professional Engineers addressed to professional engineers and management and dealing with the subject of professional recognition for engineers, it is pointed out on behalf of the engineer that "the use of the Patent Waiver, all too prevalent in this country, is not an inducement to creative thinking. If such a document is necessary because of the need to protect systems or formulae, then the company's solicitor should be required to give an equal amount of thought to the protection of employer and to the protection of inventor."

This is an old issue and one that has been bandied about for some considerable time. There are definitely two schools of thought on the matter which would appear to be irreconcilable, and though we are definitely of the belief that every consideration should be given to the employee whose creative ability devises some way or means of further enriching his employer, an employee, nevertheless, in the commonly accepted interpretation of the word, is by no means in a position to regard any financial gain from his invention as a right, but should regard it rather as a reward.

It is indeed unfortunate that there should have to be such a document as a patent waiver, but then, as the poet said, "life is real, life is earnest", and no one knows this better than the business manager who pays thousands of dollars annually in engineering salaries for the express purpose of buying the creative ability of engineers to devise new and better ways of conducting his business. This, of course, is but one of the many arguments that can be presented both pro and con on the matter but it is, we think, fundamentally irrefutable.

* * *

Color Television

Canadian Westinghouse talked color when it introduced the 1957 TV line to its dealers in July, but predicted that only one family in one thousand able to receive color programs, will buy color in 1956-57.

Ricardo Muniz, manager of the TV-Radio Division of Canadian Westinghouse, blamed the slow progress of color television on the lack of sufficient programming plus the fact that Channel 2 in Buffalo would soon end its affiliation with the major color broadcaster in the United States and also the current apathy of the Canadian Broadcasting Corporation to color television.

Mr. Muniz said that color presents many problems to a manufacturer. Problems of service and selling lead to high cost and possible dissatisfaction. Mr. Muniz said that his company would bring color television sets in a dozen at a time as prestige items in order that dealers and the public may know that they have the sets available even though the people who ask dealers about color TV generally have no intention of buying at this time.

Mr. Muniz told dealers that the relatively high price of the set and the predictable reception of Channel 17 gives buyers poor value for the money they spend. He said that it would be "unfair" to push color with the outcome so much in doubt.

"When the CBC moves into color," Mr. Muniz said, "then we will produce sets in Canada as the market grows. Right now the move would be highly impractical."

This then is the situation with color television as far as one manufacturer is concerned, and it may be reasonably taken for granted that the thinking on the part of other manufacturers is fairly parallel.

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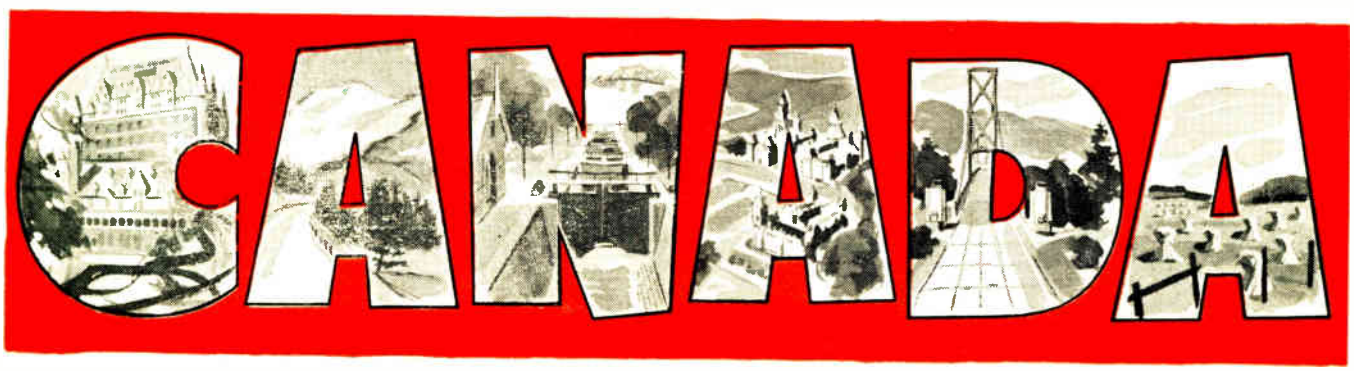

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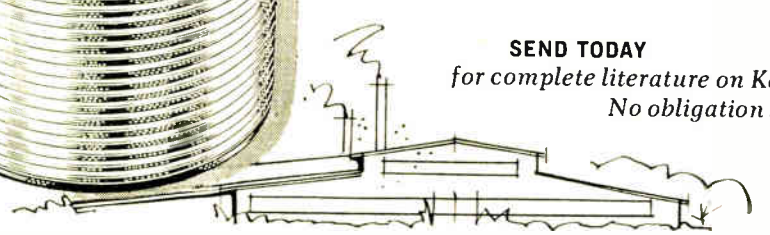


KESTER SOLDER COMPANY of Canada LTD.

BRANTFORD, ONTARIO

For further data on advertised products use page 85.

VOLUME 4, NUMBER 8 • SEPTEMBER 1956

ELECTRONICS & COMMUNICATIONS

First Region 8 Conference For IRE

In realms electronic there has been a long standing need in Canada for a national forum where engineers and scientists could present significant developments for critical discussion. The technical program for the Canadian Convention and Exposition, which has already appeared in the July pages of this journal, is sufficient evidence of this need and of the diversity of objectives of electronic engineers.

Because electronic devices are not confined to the radio communications field but affect many branches of science and engineering it is appropriate and significant that this forum should be provided by IRE. It is appropriate because the topics fall within the interests of IRE members who are found from sea to sea, in sections from St. John's to Vancouver. In the past IRE has sponsored Regional Conferences in its seven regions in the USA and it is now holding its first Region 8 conference. The boundaries of Region 8 are simply those of Canada so this Convention and Exposition has peculiar significance as it is the first to be held under IRE auspices of a national character outside the United States of America. It represents a phase in the growth of IRE just as much as it marks a milestone in the industrial and technological development of the country.

The broad interests of IRE members are strikingly attested by the names of its Professional Groups; Electronic Computers, Antennas and Propagation, Medical Electronics, Nuclear Science, Broadcast and Television Receivers, just to pick a few at random. In fact the whole Professional Group System is a unique feature whereby specialists can concentrate on one or more subjects within the framework of the IRE organization for the common advantage of all members. This wide variety of subjects is reflected and catered to in the present convention program. To augment and complement the technical papers the Exposition has been arranged to furnish maximum technical information and to focus attention on the ever increasing engineering and manufacturing facilities available here at home.

That the IRE, through its publications, standards, and in other ways is of value to citizens of many lands is demonstrated by the increasing number of sections that are being formed in other countries at the request of local members. In the rapidly expanding radio electrical field this influence is growing, carrying with it promotion of international goodwill and understanding. Geographical proximity and a common language combine to make it natural that the first national convention outside the USA should be in Canada but we look forward to the time when we can benefit from similar conferences in other countries.

We are privileged in Region 8 to provide an opportunity for technical discussions between members and their friends and are indebted to the far sighted Executive Committee of the Canadian Convention which initiated the proposals, to its specialized committees which have prepared the detailed plans and to the Convention Manager for his excellent organization.

Dr. J. T. Henderson,
Regional Director,
Institute of Radio Engineers.

business briefs & trends

★ A schedule of salaries for Canadian engineers, recommended by the combined associations of professional engineers of Canada, ranges from $4,200 annually for a Grade I engineer to $16,000 annually for a Grade VII engineer. The salary for a Grade VIII engineer should be arrived at by agreement. A definitive breakdown of the qualifications and experience for the various grades of engineers is contained in the presentation which is to be used in interpreting the recommended schedule of salaries.

* * *

★ The Radio Electronic Television Manufacturers Association of Canada reports that up to the end of May 1956 the total television sales in Canada amounted to 2,175,234 sets.

* * *

★ British exports of Hi-Fi equipment are making substantial inroads into many overseas markets including the United States, it has been reported. In 1955 British manufacturers of this equipment exported nearly $16,000,000 worth of goods and up to the present time this year it is estimated that sales have increased by 17 per cent.

* * *

★ Developed under contract for the United States Air Force, Eitel-McCullough of San Bruno, California have produced a new stacked ceramic receiving tube in order to provide a small electronic tube capable of withstanding airborne and missile applications. Design of the tube eliminates the necessity of sockets since the tube is wired directly into the circuitry of the system.

* * *

★ In the past eight years the use of electronic control apparatus in industry has just about doubled in the United States according to the Department of Commerce. It is estimated that the sale of electronic control equipment in 1956 will reach nearly $20 million.

* * *

★ American authorities are becoming increasingly alarmed over the growing volume of imported portable radio sets. In the first three months of 1956, 89.000 units were exported to the United States. As a means of forestalling American complaints, Japanese industrialists are reported to be considering the application of a self imposed quota.

* * *

★ Edmund Allen, Director of Apprenticeship and Tradesmen's Qualifications for the British Columbia Department of Labor, has stated that television and electronic technicians in British Columbia are to come under certification of the government. An Order in Council approving the granting of certification was passed by the B.C. legislature in July last.

* * *

★ The increasing use of tape recording equipment has boosted the requirement of magnetic tape in the United States to the point where it is estimated that nearly seven billion feet of magnetic tape will be produced in 1956. Dollar-wise this will mean about $9 million for the tape industry.

* * *

★ The sale of replacement parts for television and radio sets to the American public reached $200 million dollars in 1955 and indications are that this volume will be bettered by $90 million dollars by 1957 rising to $480 million dollars by 1958.

* * *

★ The first pictures to be televised from a submerged submarine were telecast from the United States submarine "Albacore". The underwater camera used for the event was a product of Pye Canada Limited of Ajax, Ontario.

* * *

★ The National Coal Board of Great Britain is turning to electronics for the improvement of safety measures. Instruments developed to this end include a portable carbon-monoxide detector and alarm, a photoelectric densitometer for speedy evaluation of long-running thermal precipitator samples and an automatic particle counter for the measurement of dust samples.

* * *

★ In order to make the purchase of computing machines more feasible for small business concerns manufacturers are now working on the production of smaller, less expensive machines. The cost range of computers to Canadian business firms has now been brought down to between $20,000 and $35,000. Insofar as the larger computers are concerned a few have been in operation for some years and reports indicate that orders have been placed for about ten large installations ranging in cost from $100,000 to $200,000.

* * *

★ In 1955 American business firms spent $36 million on electronic replacement parts and defense authorities spent $105 million. Forecasts indicate that these levels will rise at the rate of about 10 per cent through 1957 and 1958.

* * *

★ Roughly twenty two tons of radio and television equipment was used by CBS to cover the Chicago Democratic convention.

* * *

★ Drugstores, hardware stores and supermarkets in the United States have installed tube testers for the convenience of customers who may now test their old radio and TV tubes and purchase new ones from the shelves of such establishments. Nearly 12,000 tube testers have been installed since 1953 at a total value of $3 million.

* * *

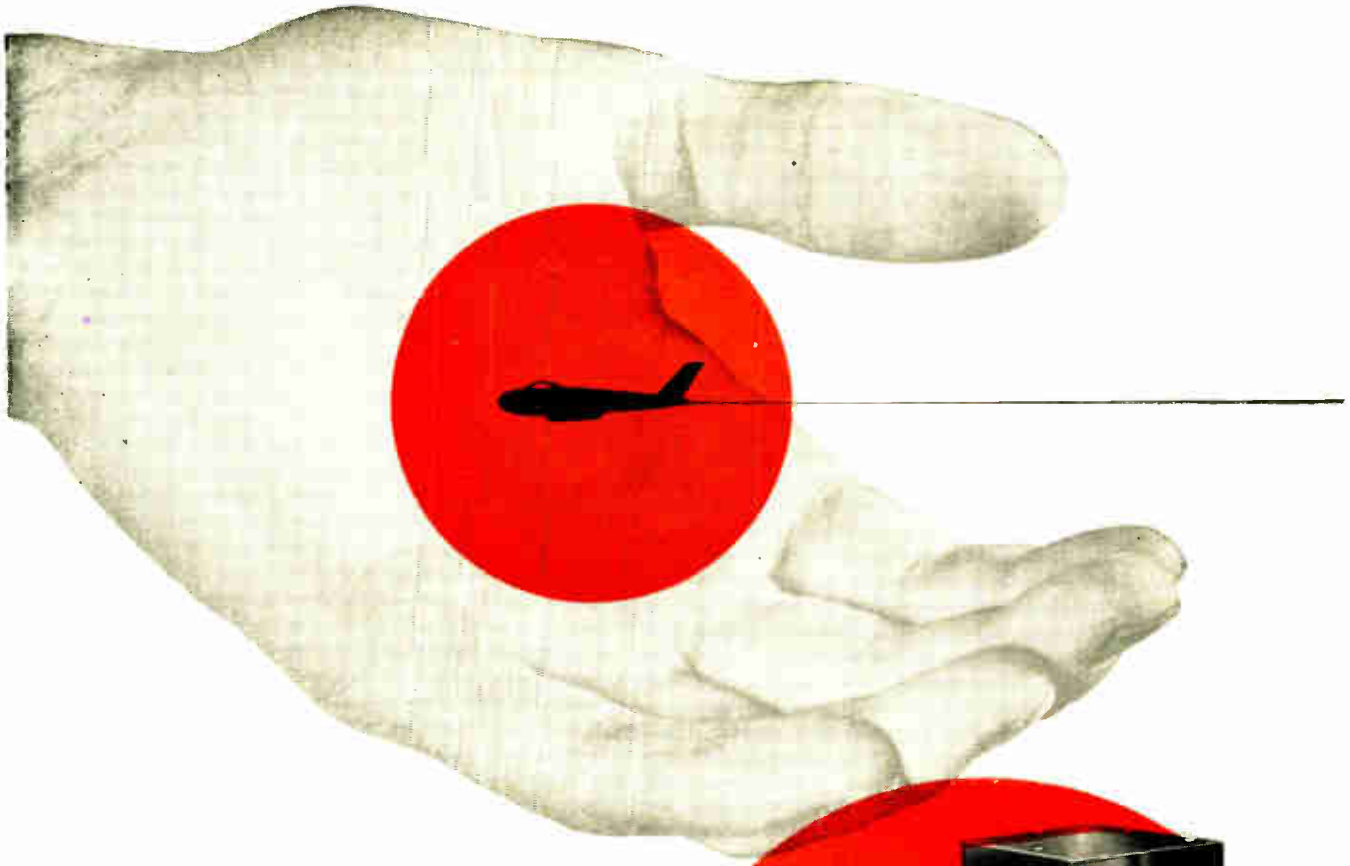
★ Industry throughout the world is turning to the electron microscope to further advance their research projects. According to recent reports there are about 1,200 such microscopes in use today ranging in cost from $9,000 to $50,000.

* * *

★ At the present time transistors are being produced at the rate of 10 million units annually and according to reports future requirements will increase production to 300 million units annually by 1956. It is estimated that of the 300 million figure about 25 million of the transistors will be of the medium and large power variety.

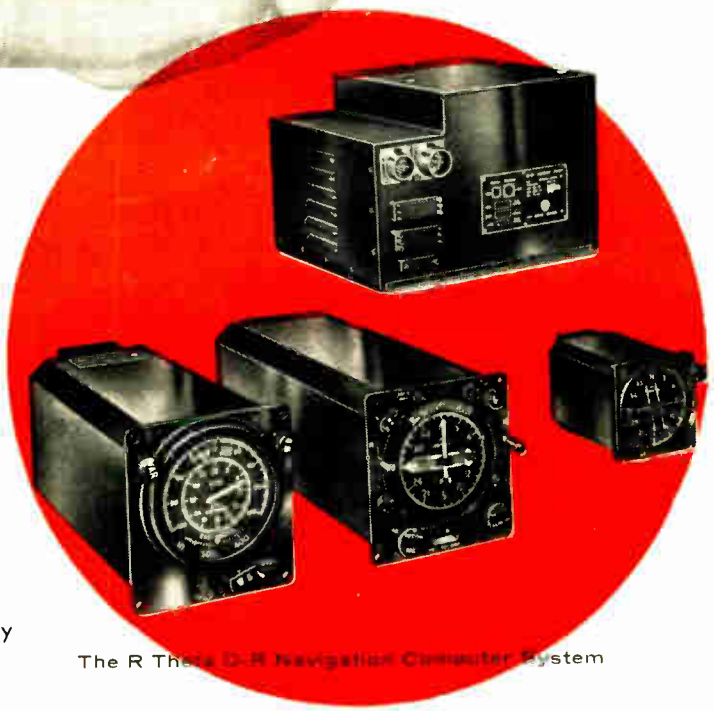
* * *

★ Sylvania Electric Products Inc., of New York City are using an 18,000 mile private communications network and data processing system to link their 19 laboratories. Center of the system is in Camillus near Syracuse, New York.



The STRAIGHT WAY Home

The R Theta D-R Navigation Computer System, produced for the RCAF, is the first of its type in the world. Completely electromechanical in operation, no ground or airborne transmitted information is needed. Now under evaluation by the armed services of the U.S.A. and U.K., the R Theta will guide the pilot the straight way home no matter where he flies.



The R Theta D-R Navigation Computer System

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.

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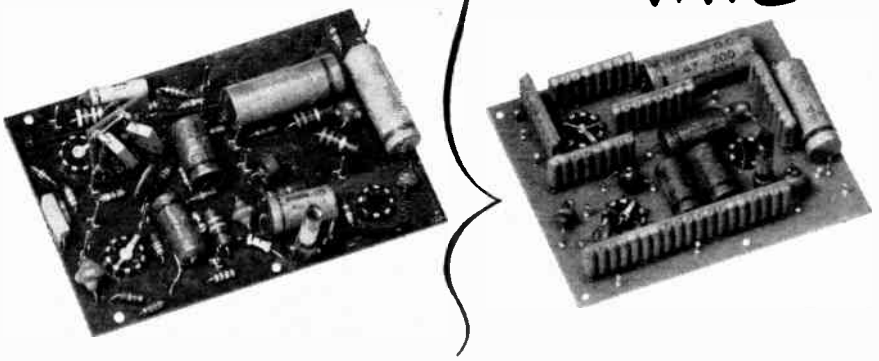

*PACKAGED ASSEMBLY CIRCUIT

PAC-Facts

REDUCED COSTS
PAC requires fewer insertions. Simplified equipment. Smaller chassis area. Reduced inspections. Fewer items purchased. Fewer chassis holes. Simplified chassis wiring.

UNIQUE TERMINAL DESIGN
The Erie PAC terminal provides a "U"shaped cross section and tapers in both planes to assure easy insertion, self-adjusting — rigid fit, and large contact area.

FLEXIBILITY
All Resistance values between 5 ohms and 50 megohms. Wide range of capacitor temperature characteristics. Parallel and series arrangements readily obtained. Excellent circuit flexibility thru use of printed wiring type base.

REDUCED CHASSIS AREA
Chassis area is reduced by use of the vertical plane design feature. 15 components per square inch.

See us at the Canadian IRE Booth No. 358

Erie's new Packaged Assembly Circuit is able to reduce assembly and labor costs for electronic component users by simplifying automation. By employing standard size resistor and capacitor pins, a PAC module can be assembled simply, automatically, and economically.

PAC will drastically reduce the number of component insertions in TV, radio, computers, and other electronic equipments by combining up to 90 components into one PAC module. The illustration above clearly exemplifies how Erie's Packaged Assembly Circuit will clean up and simplify nearly any printed circuit board. The original conventional design, at left, contains 44 individual components. The electrically equivalent Erie PAC design, at right, contains but 16 individual units — *a savings of 64% in the number of insertions.*

Experimental PAC Design Kits have been prepared and are available at a moderate cost. The 5% PAC Kit includes 195 different resistance and capacitance values, strips, wiring boards, clips, eyelets, and other material essential for building complete PAC circuits. The 10% PAC Kit contains 105 values along with the other items, and the 20% PAC Kit has 54 values plus equipment. This Design Kit is your key to cost savings.

Write for Erie Engineering Bulletin No. 450-1

ERIE electronics

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a.c. & d.c. current ranges

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Model 8

Universal AvoMeter

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The multi-range instrument with automatic cut-out protection on virtually any overload.

Minimizes costly instrument repairs and delays. If overload occurs, select correct range, reset cut-out button and take the reading.

OTHER FEATURES:

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

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3 Resistance Ranges: 0-2,000 Ohms, 200,000 Ohms & 20 Megohms. Ranges may be extended by means of external "AVO" accessories. A movement reversing button changes meter polarity without reversing leads — simplifies discriminator alignment.

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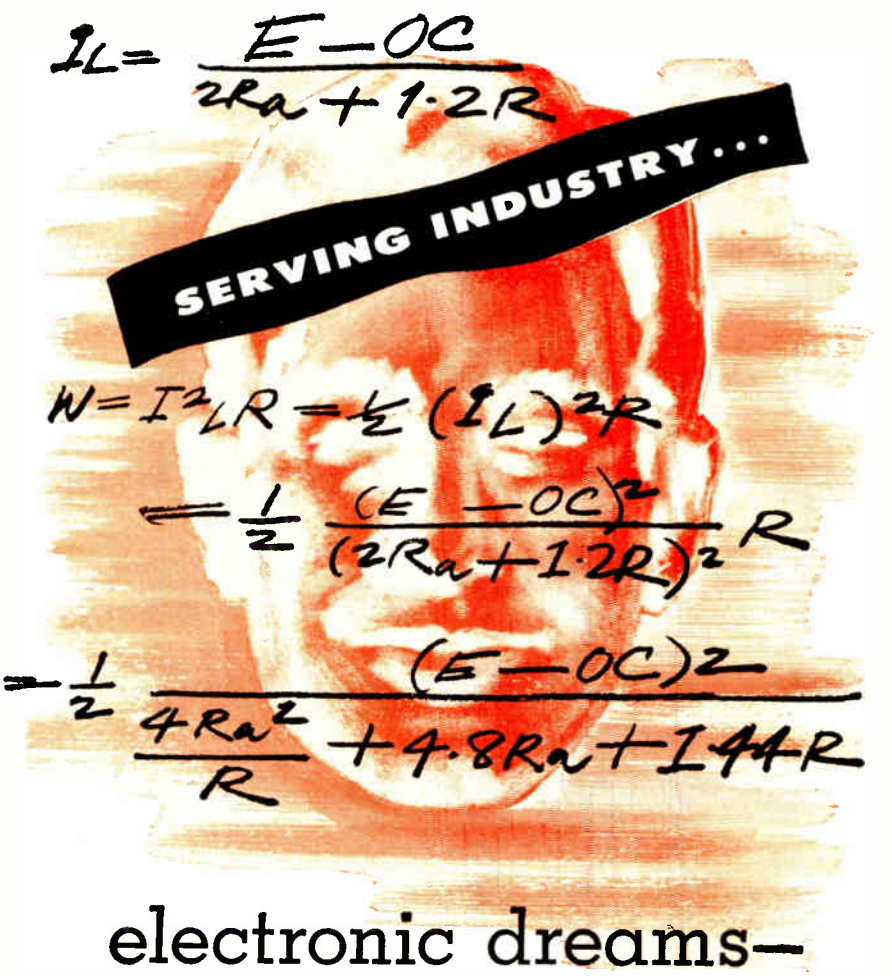

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CWC-5523

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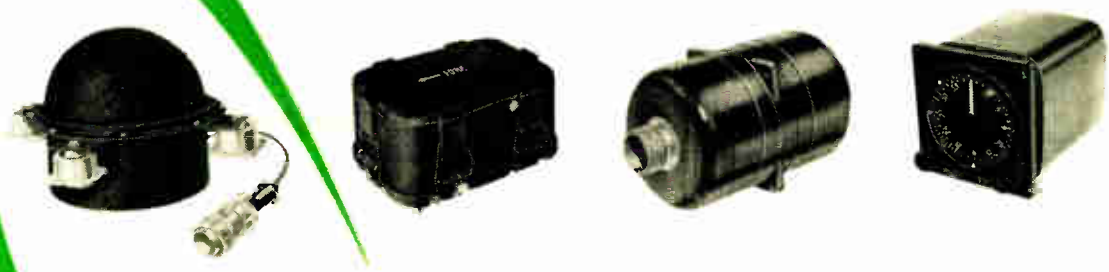

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THE LATEST NEWS ON SIMPLIFYING DESIGN

John Macadam, one of National's staff of applications engineers, displays example of the forming versatility of vulcanized fibre.

Versatile Vulcanized Fibre by National reduces cost of dies and molds and simplifies parts for fast assembly.

Today's big news in product design is *simplification* through the use of molded plastic parts. But molding may not be your best answer. *Formed fibre* is often a cheaper—and better—solution!

Look to National Vulcanized Fibre as an engineering material with these advantages:

Lower die or mold costs

Excellent forming qualities

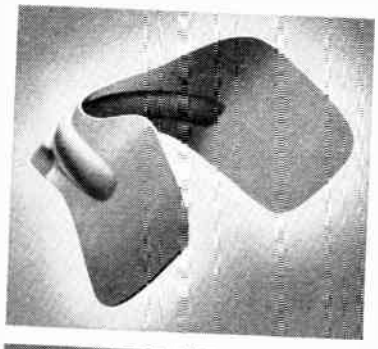
Greater durability—toughness plus resilience

Good heat resistance and dimensional stability

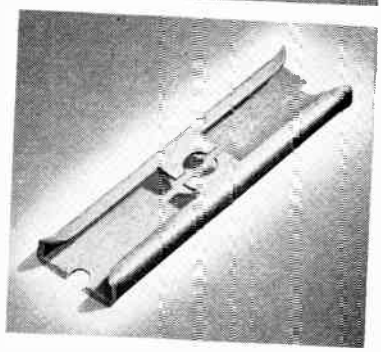
Low material cost

National Vulcanized Fibre and its unique combination of mechanical and electrical properties suit this lightweight, low-cost material to hundreds of difficult applications. And National's generations of experience can always be tapped for answers to your problems.

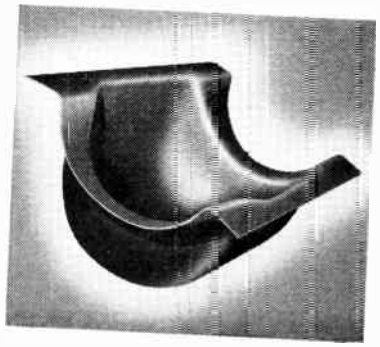
The typical examples on this page show what can result when our skilled technicians apply versatile vulcanized fibre to your particular job. Consult your nearest National representative about your current materials problem—or write Wilmington, Delaware, Dept. O-9.



Drawn and formed in one operation, the hip guard shown here possesses the resilience, toughness and shape retention that make vulcanized fibre the most used material for protective athletic equipment. Channel draw strengthens structure yet retains necessary spring. The piece is dipped, then baked with synthetic enamel for moisture protection and good appearance.



Punched, formed, scived and flared, this insulator component shows the successful solution of a difficult problem—boxing a channel on all four sides. In fabricating, the blank of vulcanized fibre was first cut to contour, after which the ends were scived, then formed into a box section and flared. This combination of operations makes the piece unusual.



Formed and deep drawn to a depth of 7 inches, this welder's helmet demonstrates the extreme workability of vulcanized fibre. Fabrication was by a single draw with an open bottom die—i.e., fibre was pulled in four different directions. Drawing depth and radii curve are about the maximum limit.

NATIONAL

FIBRE COMPANY OF CANADA, LTD.

ATLANTIC & HANNA AVENUES, TORONTO

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VULCANIZED FIBRE • PHENOLITE LAMINATED PLASTIC • PEERLESS INSULATION
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CDC maintains a team of specialists to assist you in any phase of these activities. Familiar with the latest techniques in these fields, this group of engineers is backed by the extensive experience of the company in instrumentation, systems design and computation. This combination of talents permits CDC to offer complete services to agencies engaged in development activities . . . helping them make major contributions in these fields.

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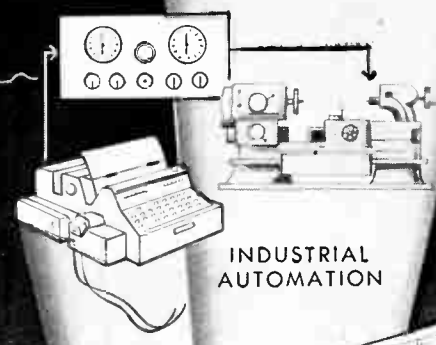
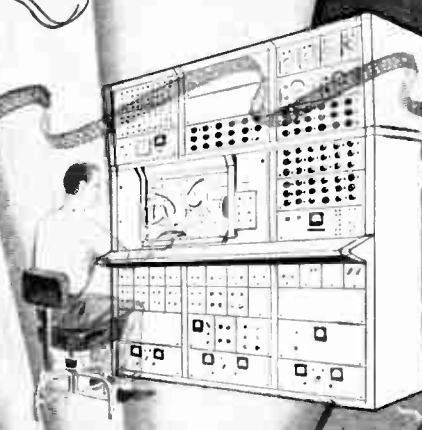
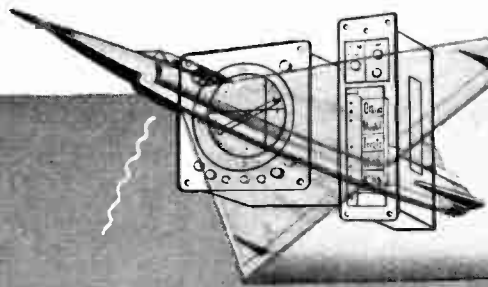
SIMULATION



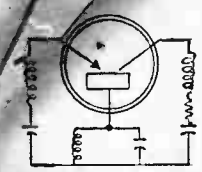
INDUSTRIAL AUTOMATION



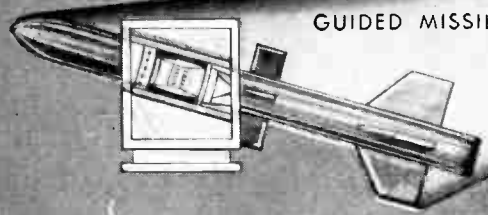
COMPUTERS



AIRCRAFT INSTRUMENTATION



SEMICONDUCTOR APPLICATIONS



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The technical knowledge and manufacturing facilities of Sperry are readily available for the solution of problems involving methods of automatic operation and monitoring in all types of industry; and the development of new mechanisms to meet new conditions.

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Defense Chiefs Salute IRE

Owing to the limitations of human senses and the need to extend their capabilities, it is now essential for our armed forces to be equipped with many electronic devices to solve the problems encountered in modern warfare. Thus the fighting efficiency of our armed forces is now related to the efficiency of our electronic industry. The electronic equipment required is necessarily complex, yet it must not fail under the severest of conditions, it must be simple to operate and easy to maintain.

The design, development and production of such equipment is a challenging problem and its solution requires close co-operation between the armed forces and industry. The forthcoming Exposition sponsored by the Institute of Radio Engineers will assist greatly in the exchange of information which is so important in this field of endeavour. I am pleased indeed that the IRE is able to stage this Exposition and wish the members every success in their endeavour.

Ralph Campney,
Minister of National Defense

The role of electronics in the Royal Canadian Navy is vital, and one of which the Service itself is increasingly conscious.

Modern warships and aircraft are dependent to a great and increasing extent upon complex electronic systems. To ensure that these systems are at the highest level of operating efficiency when needed requires not only the skill of service operating and maintenance personnel, but also those of the designer, manufacturer and constructor. Each has an important part in the creation and application of the new electronic devices. Each can make vital contributions to the ultimate and essential operational efficiency.

The operating environment for equipment, even in a modern warship, is severe. It is hoped and believed that the continued efforts of both service and civilian electronic engineers will produce, in Canada, equipment second to none in both performance and reliability.

Vice Admiral H. G. DeWolf,
Chief of The Naval Staff.

Convention & Exposition

The Canadian Army is today dependent for its effectiveness in battle to a great extent upon the quality of the electronic equipment which it employs for communications and the control of weapons. In future, with the increased threat of nuclear warfare and the resulting dispersion of forces over much greater distances, this will be even more true. It will then be necessary for the army commander to detect enemy activity at a considerable distance, provide reliable communications to enable information to be transmitted rapidly from widely separated points, and direct the fire of complicated weapons over increased ranges. He will also need to carry out operations involving the intimate use of aircraft which will give the battle a distinctly tri-dimensional character, and will require the closest integration of air and ground elements. To meet all these requirements he will constantly need new and better electronic equipment and devices.

Accordingly, the capability and inventiveness of the electronics industry is of direct interest to the Canadian Army, and I am glad to see the rapid progress of that industry in Canada marked by the first Exposition and Engineering Symposium of the Institute of Radio Engineers. I hope that the occasion will stimulate thought which will help to bring about even further Canadian achievement in this field.

Lieutenant General H. D. Graham,
Chief of The General Staff,
Canadian Army.

On behalf of the Royal Canadian Air Force I extend good wishes to all those connected with organizing the first Exposition and Engineering Symposium of the Institute of Radio Engineers of Canada. I trust that the occasion may serve to focus public attention to good effect upon this highly important branch of the scientific and engineering professions and of the associated industry which is so vital to our national defense today and in the future. Few technical fields have increased as rapidly and significantly in importance to Air Forces as have electronics and communications.

Without the civilian members of the electronics and communications professions, however, and without the Canadian firms that have sprung up in these fields we could not exist as a meaningful operational Service. This degree of dependence seems bound to increase rather than diminish; and it is in the interests of us all to stimulate in our peoples even more than in the past the acquisition of high scientific engineering and technical skills in these fields.

My best wishes for a fruitful meeting.

Air Marshal C. R. Slemon,
Chief of The Air Staff.

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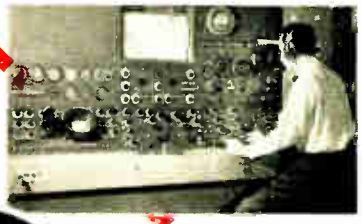

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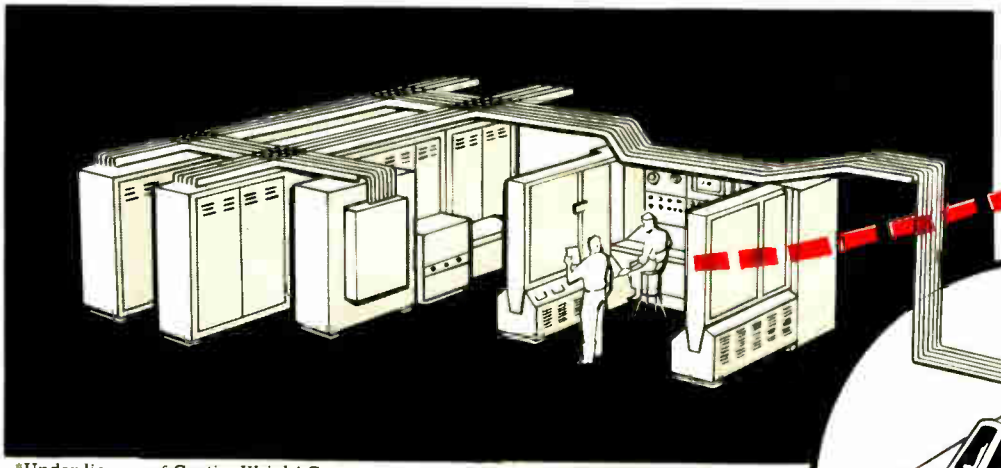
RCAF Pilot Flying CF 100/4 Flight Simulator



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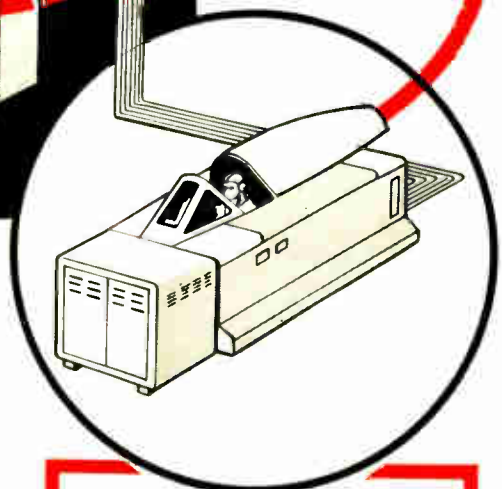

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Since the 1880's temperature in large office and commercial buildings has been controlled by air operated dampers, motors, valves and thermostats. The B.C. Electric building is a departure from this practice.

Temperature Control For Large Buildings

● The B.C. Electric Company building shown above is one of the most modern buildings in Vancouver and in keeping with its modern style incorporates one of the latest systems of temperature control.

OFFICE building comfort and efficiency will come of age — electronic age — in Canada when the B.C. Electric Co. Ltd. office building in Vancouver is completed.

Described as perhaps the most modern structure in the nation, it will be equipped with a master control panel that applies the principles of electronic automation to the control of comfort for the first time in any Canadian building.

In a control room, adjacent to the equipment room of the building, will be located the heart of the electronic master control system. It is a single control panel which extends from floor to ceiling and across the full width of the control room. By means of it the building's engineer will single-handedly monitor and control the heating and air conditioning system throughout the building.

Ninety-two electronic thermostats —each 100 times more sensitive to temperature than the human body — are strategically located throughout the building and linked to the master control panel. Integrated with the electronic controls are pneumatic thermostats for use in the six smaller zones on each of the tower floors.

The whole air conditioning system is designed to provide continuous supply of fresh air to all the major zones in the tower section and the balance of the system in the lower four floors.

The temperature information obtained from the master control panel enables the operator quickly and easily to determine what the conditions are in all the major zones. With this information he can remotely reset the temperature of any given zone by use of the reset controller on the colorgraphic panel.

This panel is so unique in operation and so impressive in appearance that it will be located off a main corridor behind a glass panel so that the public can watch it in operation.

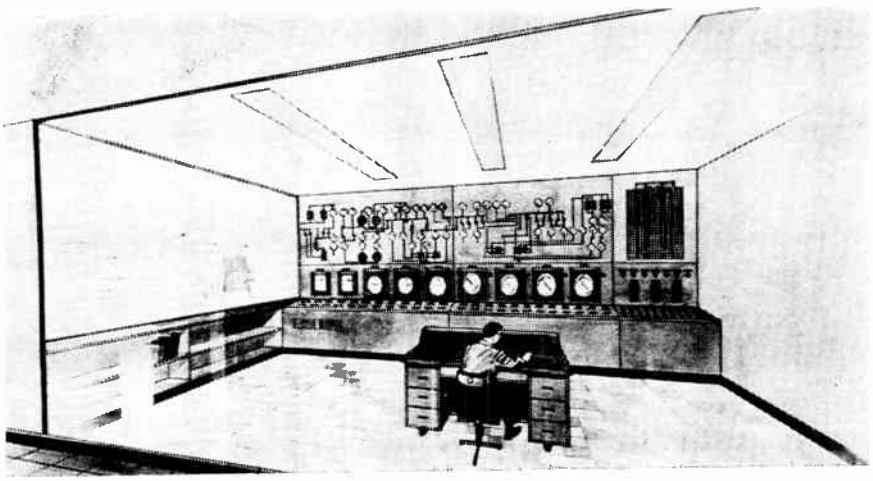
Engineers of the Minneapolis-Honeywell Regulator Co. Ltd., who designed the control centre, said the system was engineered specifically to meet the special needs of the building.

To provide the flexibility and accuracy that was needed for this building engineers blended the old, long-established principles of pneumatic control, using compressed air, with the most advanced electronic knowledge, and thereby made use of a new concept of temperature regulation.

Since the 1880's, temperature in large office and commercial buildings has been controlled with air operated dampers, motors, valves and thermostats. The B.C. Electric Co. building is a major departure from this practice.

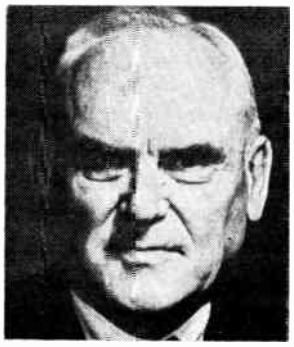
The master control panel is patterned after giant control centres which are the "nerve centres" of modern chemical refining and other automatic processing industries. It automatically adjusts for the different heating or cooling needs posed by varying outdoor conditions and interior loads.

From the control center, the building engineer can check and adjust the temperature at ninety-two locations throughout the building and by a flick of a switch, shift the building's huge year-round air conditioning plant from day to night operation or to either a summer or winter schedule.



● A drawing of the master control panel which will extend from floor to ceiling and across the full width of the control room in the B.C. Electric Co. Ltd. building in Vancouver, B.C. By means of it, the building's engineer will single-handedly monitor and control the heating and air conditioning system throughout the building. Ninety-two electronic thermostats are linked to the panel.

Government Leaders Commend



I would like to take this opportunity to congratulate the Institute of Radio Engineers of Canada on holding its first Exposition and Engineering Symposium and to wish its members every success in their new venture.

This co-operative effort is an acknowledgment of the growth of the Canadian electronics industry in recent years; it is also an acknowledgment of the growing importance of this professional organization. Through its activities in the scientific and engineering fields, the Institute of Radio Engineers has already done much toward the establishment of sound engineering practices and will, no doubt, do more in the future.

Canada's electronics industry, which will be on view in October, is one of the key industries in our rapidly developing country. It is making a major contribution towards our defense effort and it provides, in the communications field, an important means of economic and cultural integration of our widely-spread population. It is generally acknowledged that periods of international tension provide the need and the great effort necessary for technological break-through, and that in normal times the pace slackens, when the defense stimulus inevitably decreases. Today, Canada's expansion and growing needs, particularly in your field, provide a more desirable stimulus, and one which, in the long run, will be more beneficial. It does, however, require initiative and imagination to seize the opportunities as they arise. These qualities, I am sure, will not be wanting among members of the Canadian IRE nor in the Canadian electronics industry itself.

Through close association of industry with its professional institutions, true progress can best be assured and transitions, such as that which will attend the introduction of automation, can be wisely handled to the lasting benefit of the industry and the general economy of the country.

C. D. Howe,
Minister of Trade and Commerce

Co-operation between the Instiute of Radio Engineers and Electronics Industries in a joint Exposition and Engineering Symposium is a most important step forward.

During the past decade Canadian electronics industry has come of age and a parallel growth has occurred in Canadian electronics and other engineering laboratories concerned primarily with research. Among these are laboratories of the Defense Research Board which will be represented in both the symposium and the exposition. This indicates the extent of defense interest in electronics development in Canada. I hope the number of formal as well as informal contacts between eleetronics industries and the professional organizations of engineers and physicists in Canada will continue to increase. The support of such industry linked with research and development laboratories is one of the major needs of Canadian defense.

Dr. George S. Field,
Acting Chairman,
Defense Research Board.

IRE Convention & Exposition

I welcome this opportunity to congratulate those responsible for initiating and organizing the Canadian IRE Convention and Exposition.

While we can expect the future of our Canadian electronics industry to be even more significant than its past, we can be justly proud of the tremendous contributions it has already made to the development of our country. The Canadian IRE Convention will do great service in bringing into focus the role played by our electronic engineers in the growth of Canada.

Since the invention of the vacuum tube and its use in communications — the first practical use of electronics — the industry has experienced a phenomenal expansion. The manufacture of radios and radio-phonographs, and recently television receivers, has provided for the universal use of electronic devices on an extremely large scale. In this field particularly, there should be greater opportunities than in the past for Canadian applied research. Already, many Canadian research engineers and scientists are acquiring an enviable reputation for their achievements in various branches of electronics. The papers to be presented at the forthcoming Convention will, I know, confirm this. But I feel sure it would be in the general interest if Canadian engineers could assume still greater responsibility in the field of applied research and and development. It is to be hoped that the Canadian IRE Convention and Exposition will help to promote this essential step in the continued rise of Canadian engineering.

J. A. Ouimet, P. Eng.,
General Manager,
Canadian Broadcasting Corporation.

The Department of Transport, as the agency of the Canadian Government responsible for the administration of the Radio Act, the radio sections of the Canada Shipping Act and international treaties and agreements pertaining to radio and also as the operator of radio aids to air and marine navigation, has a very vital interest in the development of the radio engineer in Canada and in his well being.

The radio frequency spectrum is one of Canada's important national resources and the expansion of is use for the greatest benefit to the largest number of our citizens is dependent upon the radio engineer and his growing technical knowledge. He makes possible the design of new equipment and re-design of old equipment to carry more and more intelligence with a minimum occupation of the spectrum.

The Institute of Radio Engineers in Canada has been an excellent forum for the interchange of ideas, the broadening of knowledge and the development of high standards of professional competence. Its continued growth and well being are an essential part of Canada's future.

As the Minister of Transport, I consider it a privilege and an honour to express my greetings and best wishes on the occasion of the Toronto Engineering Symposium of the Institute of Radio Engineers.

George C. Marler,
Minister of Transport.

"Janet" Canadian Scientist Evolves New Communication Technique

A DEFENSE Research Board team has developed a promising new communications technique which uses the trails of single meteors to transmit messages over long distances. Called "Janet" on its inception four years ago, the project's principles have just been declassified by the Department of National Defense.

DRB authorities credit physicist Dr. P. A. Forsyth, formerly of Saskatoon, of the Radio Physics Laboratory (RPL) at Shirley Bay near Ottawa, with visualizing the practical possibilities of using individual meteor trails from the ionosphere as a communications aid.

Hundreds of meteors enter the earth's atmosphere every hour. They leave behind, at a height of about 60 miles, trails of charged particles which can reflect radio waves. Dr. Forsyth and his associates discovered that these trails can be used for communicating between distant points on the earth's surface. Experiments have proven that the signals can be transmitted by the "Janet" method for distances up to 1,000 miles.

Although large meteors occasionally flash through the atmosphere, those used in the "Janet" system are tiny particles about the size of a pin head which leave a trail of electrons.

The equipment required for the transmission of messages by this new technique is relatively simple. Because the method is reliable and uses low-power equipment, efficient and economical long-range communication systems for all-season use are a definite possibility.

The system employs frequencies previously used only for short distance transmissions such as television broadcasts. Because these frequencies are considerably less crowded than those now being used for long distance communications, this in effect opens a new band for long distance use.

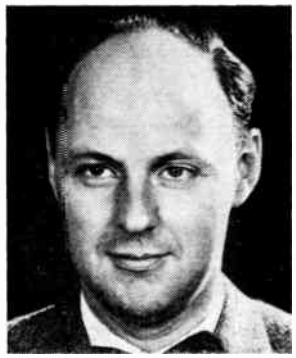
The equipment at each of the two widely-separated ground stations employs many of the recently developed computor or "electronic brain" techniques. When the circuit detects a suitably located meteor trail in the upper atmosphere, the message previously stored at one station is transmitted automatically and rapidly to the other end of the circuit.

Because each meteor can be used only for about a second, transmission must take place in short bursts at very high speeds. The actual transmission speed is much too high to be received by standard teletype equipment. The incoming information therefore, is held in storage and printed at normal speeds during the intervals between transmission bursts.

This high speed "burst" transmission technique, and the frequent presence of meteors in the upper atmosphere, permits the passage of lengthy messages between stations in a relatively short space of time.

Because the signals reflected from the trails are largely independent of ionospheric conditions such as disturbances caused by the aurora borealis (northern lights), meteor trail transmissions will be particularly valuable for Canada with its vast distances in the aurora belt.

Dr. Forsyth and his team have proven the scientific feasibility of the technique as well as its practical applications. Further trials, between far distant points in Canada, will continue for some time.



● DR. P. A. FORSYTH

The project stemmed from upper atmosphere studies at RPL late in 1952 which included meteor investigations. The first two-way transmission employing the new technique took place between the laboratory's Shirley Bay site and Port Arthur early the following year. The first teletype message was transmitted successfully between Shirley Bay and Halifax in 1954.

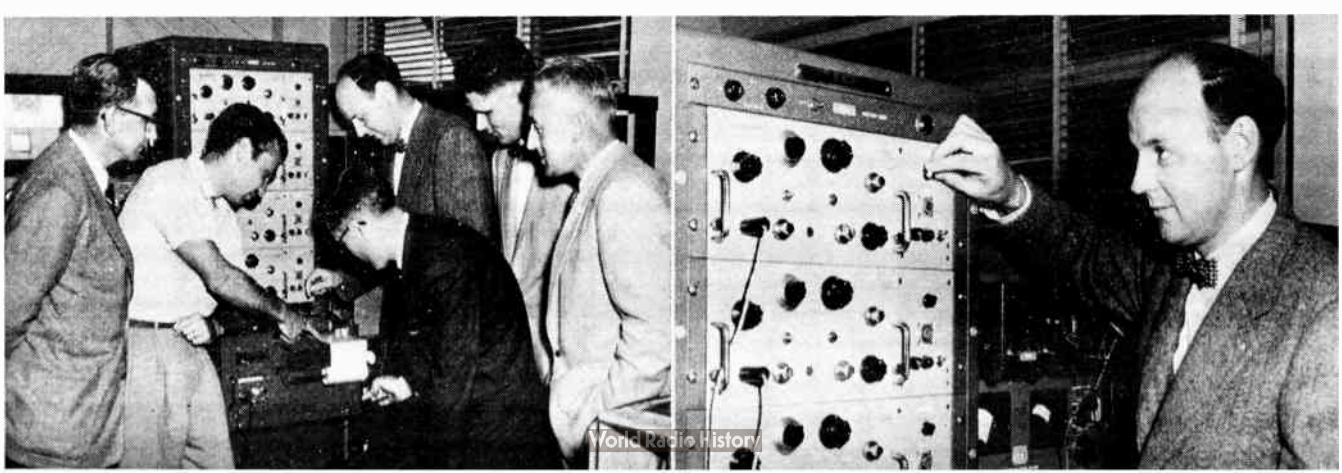
A team of development engineers at Ferranti Electric Limited, Toronto, is engaged in further development of the transmission equipment.

Members of the RPL group associated with Dr. Forsyth on the project were Dr. E. L. Vogan, formerly of London, Ontario; W. C. Collins, formerly of Toronto; D. R. Hansen, formerly of Viscount, Sask.; Dr. C. O. Hines, formerly of Toronto; Dr. L. L. Campbell, formerly of Winnipeg, and J. K. Grierson, formerly of Wombwell, Yorks, England.

Successful development of the principle will provide Canada's armed services, and possibly civilian users in the future, with a highly reliable low-power form of communications.

Defense authorities in the United Kingdom and in the United States have been kept fully informed throughout the development program and have encouraged the Canadian effort in this field. In addition, a continuing interest in the technique has been exhibited by other Commonwealth countries.

● *Left:* — Members of the scientific team at the Radio Physics Laboratory (RPL), of the Defense Research Board near Ottawa, demonstrate some of the scientific equipment used in developing a dramatic new long-distance communications system which reflects radio signals from meteor trails. From *left to right,* are J. K. Grierson, formerly of Wombwell, Yorks, England; Dr. C. O. Hines, formerly of Toronto; Dr. P. A. Forsyth, formerly of Saskatoon, leader of the upper atmosphere group; Dr. L. L. Campbell, formerly of Winnipeg, and W. C. Collins, formerly of Toronto. In the *foreground* is Dr. E. L. Vogan, formerly of London, Ont. Absent is D. R. Hansen, formerly of Viscount, Sask. *Right:* Dr. P. A. Forsyth, formerly of Saskatoon, of the Defense Research Board's Radio Physics Laboratory (RPL), near Ottawa, adjusts a panel on the research equipment which played a major role in the development of the "Janet" long-distance communications technique developed at RPL. Dr. Forsyth and a team of six scientists developed the new communications system.



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For further data on advertised products use page 85.

Although electronic computation and data processing is a relatively new technique, it has already proved its worth in business, engineering and science. Computers are extremely versatile, reliable, accurate and speedy and are not mere scientific curiosities which one can safely ignore for the time being while the other fellow burns his fingers with them. Those Canadian organizations who are installing computers this year have already spent one, two or more years in exploratory investigation and preparatory work and are therefore that much ahead of their competitors in the highly important field of . . . .

Electronic Computation And Data Processing

By LAWRENCE SANDFORD, A.I.M.T.A., D.P.A.
Business Applications Consultant
KCS Data Control Limited
Toronto, Canada.

ELECTRONIC computation is catching on at a tremendous pace. In the fall of 1954 only one computer — Ferut at the University of Toronto — was in operation in Canada. By August 1956 there were thirteen. Over twenty will be installed by the end of 1956 and very likely more than fifty by December 1957. In addition a number of companies are making use of computing and data processing services provided by consultants or computation centers.

In the United States, where a score or so computers were operating in 1952, there are today some 400 to 500 medium and large size machines installed. There will be 800 to 900 by the end of 1956 and probably 1,500 by December 1957.

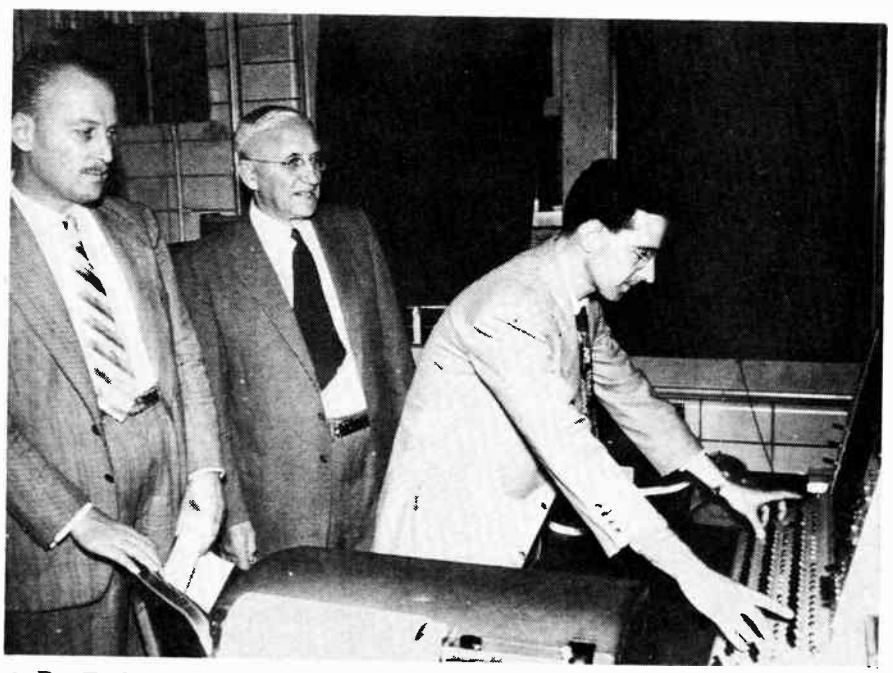
The steadily growing cost and complexity of modern office work underlines the need for the new electronic approach to the problem of streamlining office systems and procedures, and because Canada is entering the electronic era — an age of vigorous competition — there is no time like the present to get in on the ground floor and take advantage of the opportunities for greater efficiency which electronic computation and data processing can provide.

Business managements, both large and small, are now beginning to appreciate that computers can be of inestimable value through their ability to perform burdensome accounting and clerical routines many times faster than by any other means. Computers can supply answers at very high speed to the most complex scientific, engineering and statistical problems, and can enable management for the first time to receive information from tabulations and reports in easily digestible form as quickly as required — up-to-date facts and figures for management control and timely action — not ancient history for the filing cabinet.

With the aid of computers it is now possible for executives to call for reports which, valuable though they are, could not have been presented at all by manual or partly mechanized methods because of the excessive time, labor and expense involved.

Increased efficiency, accelerated output, reduced costs and the elimination of the need for continuous recruitment of extra clerical staff can be accomplished without reversing any desired trend towards decentralization of responsibility. Indeed, with the aid of electronic computation, branch managers can be given more useful, more succinct and more up-to-the-minute information than ever before. Computers can cope with scores of different types of work, anything, in short, involving long and complex calculations or large masses of fairly simple but time-taking figurework ranging from scientific, engineering and statistical problems to all types of business routines.

(Continued on page 62)



● Dr. T. O. Lazarides of Lazarides, Lount & Partners, and the Hon. James Noble Allan, Ontario Minister of Highways, watch while Dr. Josef Kates of KCS Data Control Limited works at the console of FERUT, Toronto University's giant six-ton Ferranti computer. Computing machines such as this are opening new horizons of computation for mathematicians to probe new problems of space and matter, as yet unknown and unsolved, and for business concerns to speed the ever increasing volume of time and labor-consuming paper work. The installation shown above is one of the machines used by KCS Data Control Limited, a Toronto firm of consulting engineers who specialize in electronic computation and data processing for business and industrial concerns.

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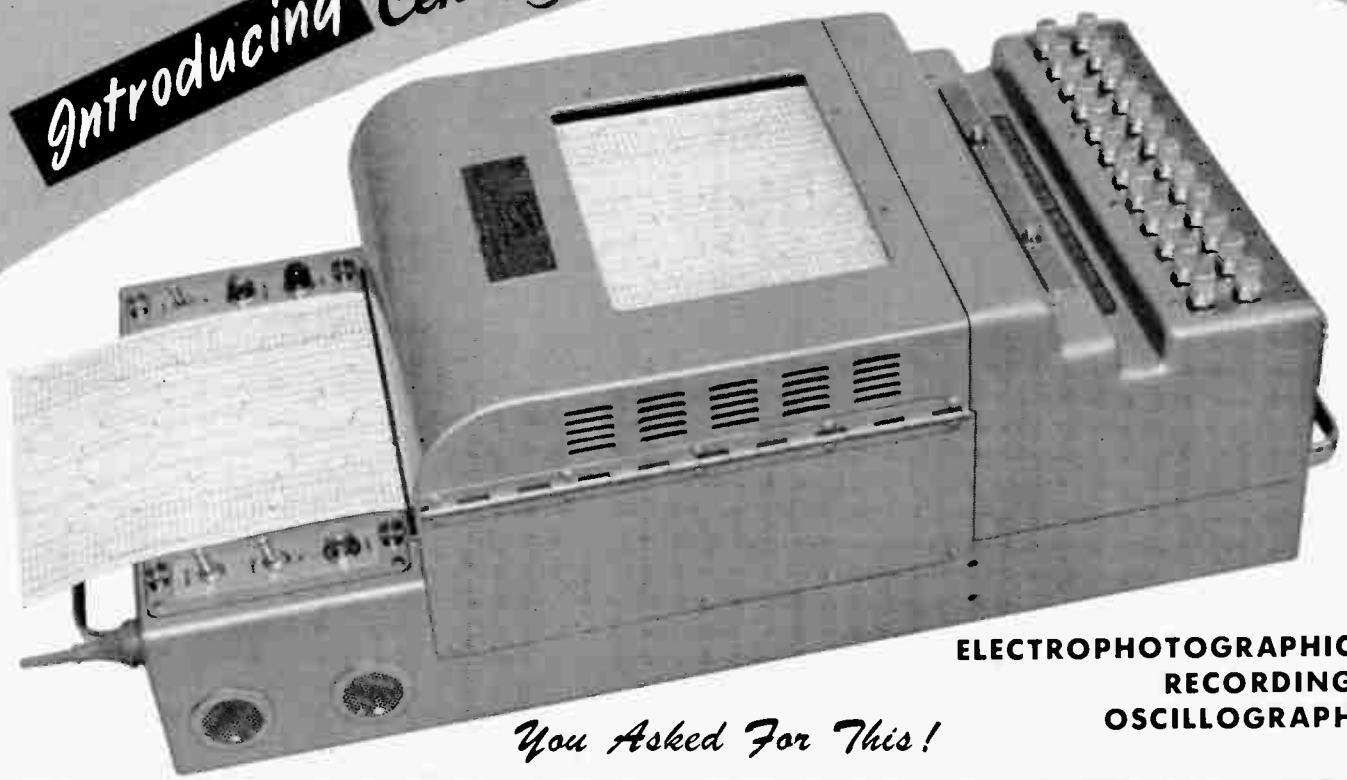

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FACTS AND FIGURES

● *Complexity and Cost:* A World War II bomber had eight electronic communication systems, a basic weight of 37,672 pounds, and a flyaway cost of $220,249. A modern bomber has 14 electronic-communications systems, a basic weight of 167,685 pounds and a flyaway cost of $6,429,259. A World War II fighter had three electronics-communication systems, a basic weight of 7,198 pounds, and a flyaway cost of $53,635. A modern fighter has nine electronic-communication systems, a basic weight of 10,536 pounds, and a flyaway cost of $384,225.

● *Helicopters:* Helicopter Council member companies of the Aircraft Industries Association report total sales of $141, 703,000 for the first six months of 1956. Military sales amounted to $119,732,000 and civilian, $21,971,000. Civilian sales increased to $14,079,000 in the second quarter from $7,892,000 in the first quarter. As of June 30th, 1956, the backlog of the helicopter companies was $472,060,000, of which $422,294,000 was in military business.

● *Propellers:* Nine companies shipped aircraft propellers and parts valued at $57.4 million during the first half of 1956. Military shipments were 17 per cent below those of the similar period in 1955, but civilian shipments showed a 40 per cent increase over those of the similar period in 1955. Civil aircraft shipments for the first half of 1956 totaled 3,861 compared with 2,675 for the first six months of 1955.

● *Aircraft Employment and Earnings:* Aircraft Industry employment totaled 789,800 in June compared to 726,000 in June a year ago. Earnings of employees in aircraft and parts plants averaged $94.66 for one week in June 1956, compared to $88.15 for one week in June 1955.

● *Exports:* The Federal Republic of Germany has established a 20 per cent duty rate on aircraft, aircraft parts, and equipment, replacing the temporary rate of 30 per cent which existed in 1955. However, aviation material was actually admitted duty-free in 1955 and for the first eight months of 1956. Although this status is expected to continue until December 31st, 1957, Germany may impose her legal 20 per cent rate at any time.

Col. Max Heyna, Deputy Chief of Staff (Materiel) German Air Force, stated at a July luncheon meeting of the AIA Export Committee that the rebuilding of the German Air Force was definitely underway. He said that although he could not speak for the German manufacturers, he felt that the sales approach to the German Air Force procurement program would be through licensed German aircraft manufacturers in preference to direct sales.

Although the following article is based upon conditions in the United States and points out the complexity of present day aircraft and the electronic equipment required for their operation it emphasizes a parallel situation which confronts the Canadian manufacturer of aircraft and airborne electronic equipment.

Complexity And In Present Day

ELECTRONICS has become a full partner in the modern aeronautical engineering field. Prior to World War II, electronics associated with aircraft, whether airborne or ground, pertained primarily to the instrumentation field. During the war, the need for automatic and electronic aids for the pilot in handling his complex airplane was seen. Radar, remote controlled gun turrets and electrically operated bomb sights were a few of the important developments during the war. Aircraft today with greatly increased performance characteristics are far more complex than their World War II counterparts. Electronics provide the eyes, the brain, and controlling muscles for modern military airplanes. Intricately precise electronic equipment installed in today's fighters and bombers permit more accurate fire power or bombing performance, more maneuverability, and both day and night capabilities.

Major factors in the cost of today's aircraft are the complexity of electronic equipments and their ever increasing use. These high-speed, high-altitude weapons require equipment capable of rapid reactions and high traffic handling capacity. Since most of these capabilities are beyond human capacity, greater reliance is placed on electronic equipment. This capability is a major element in the adequate defense and retaliatory air power.

A medium bomber today requires 40 miles of wiring compared to 10 miles for the World War II model. Today's bomber contains over 1,500 electronic tubes. A World War II fighter required 515 wires totaling 1,545 feet compared to 5,500 wires totaling nearly 23,000 feet for a jet fighter today. The modern allweather fighter has almost $80,000 worth of radar and rocket firing-control and navigation equipment which was not used at all on the World War II plane. The Norden bombsight used in World War II cost $8,000 per unit—a small fraction of the $250,000 cost of the K-1 used in one of today's bombers. The K-1 is a far more complex piece of equipment, capable of making calculations automatically and operating in bad weather. It weighs about a ton, compared with the 50-pound weight of the Norden, which was primarily manually operated. *The cost of electronics alone, on three medium bombers today would buy a complete World War II bomber.*

The increasing rise in the use of electronics is reflected in the United States Air Force budget. In the USAF aircraft and related procurement program alone, which includes the production installation and initial spares of electronics equipment in aircraft and guided missiles, the trend has been steadily upward. In fiscal year 1951, electronics represented only 6.1 per cent of the aircraft and related procurement program. In FY 1952, approximately $883.3 million out of $9.2 billion, or 9.6 per cent of the USAF aircraft and related procurement program was programmed for the procurement of electronic equipment. Comparing this with the FY 1957, $1.4 billion out of $8.4 billion, or 17.3 per cent, is allocated for electronics. While over-all procurement of aircraft and related equipment is expected to be maintained at approximately the current level for the next few years, continued growth in the electronics segment of the aircraft and related procurement program is inevitable. The Air Force attributes this growth to the anticipated increase in guided missile production. Although the percentage of electronics in guided missiles varies with the mission of the missile, it is

Electronics Aircraft

considerably greater than in the piloted vehicle.

The growth which has taken place in the Air Force usage of electronic equipment is also seen in other programs.

Electronics Paces Aircraft Development

Communication and electronic equipment constitutes over 70 per cent of current USAF procurement other than aircraft program, for which $1.14 billion was appropriated this year. Included in the communication and electronic program are modernization of in-service aircraft, electronic countermeasures, air defense electronic equipment, and communications equipment. The requirements for the airborne radio equipment project have increased from $33,684,872 in fiscal 1955 to $150,903,000 in fiscal 1957. This project provides for the procurement of the retrofit requirement of airborne radio communications equipment, airborne direction finding and landing systems, homing devices, the airborne terminal for ground data link equipment of the air defense Semi-Automatic Ground Environment System (SAGE), and other airborne communications systems. The requirements for the airborne radar equipment project have increased from $11,482,656 in fiscal 1955 to $35,683,000 in fiscal 1957. This project provides for the procurement of the retrofit requirements of airborne radar equipment such as Identification Friend or Foe (IFF) equipment and search, navigation and weather radar. In both of these projects, equipment installed in production aircraft and airborne equipment peculiar to the electronics countermeasure program are excluded.

(Continued on page 101)

Official Thoughts

Gen. Nathan F. Twining, Chief of Staff, United States Air Force, in testifying before the Senate Committee on Armed Services, July 19, 1956, stated that as a result of his visit to Moscow he felt that the United States Air Force was technically ahead of Russian Air Force. He declared that we were not only ahead in quality but also in striking ability. When queried about the status on July 1, 1959, Gen. Twining pointed out that many factors had to be taken into consideration but "based on current intelligence, I feel that the programs I have recommended, if successfully carried out, will enable the USAF to carry out its overall mission and the Strategic Air Command to carry out its specific portion of the overall mission."

* * *

Lt. Gen. Donald L. Putt, USAF Deputy Chief of Staff for Development, August 4, 1956.

"The combination of the airplane and missile into a weapon system suggests a design concept in which the aircraft is considered a weapon carrier rather than a fighter designed for combat acrobatics as in the past.

"The electronics and aircraft industry have done a great job in the past as well as the present, but we and they must continue to seek greater simplicity, reliability, and economy. We must have smaller, lightweight equipment. We must all constantly strive to solve this problem."

* * *

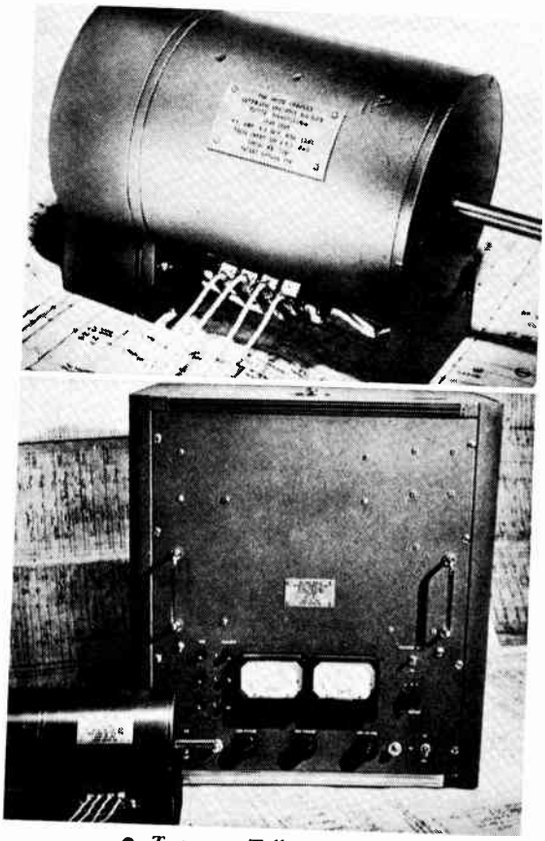
Honorable Donald A. Quarles, Secretary of the Air Force, August 4, 1956.

"Within the Air Force one of the most difficult basic problems we have to face is that of apportioning our materiel resources between procurement of equipment for the inventory on the one hand, and development of equipment for future use, on the other. In other words: How much shall we spend for inventory production and how much for research, development and test of better equipment for the future?

While there are no categoric answers to such questions, success depends on wise judgment in arriving at answers. Currently, our expenditures for development of future equipment are about 25 per cent and for inventory equipment about 75 per cent of our total materiel expenditures, not including military personnel costs. Most businesses would consider 25 per cent a very large fraction to devote to development. In our business the criterion must be the sufficiency of the force today and continuously in the future."

A system for the completely automatic operation of milling machines, lathes, grinders, drills and other machine tools with adaptability to the fields of telemetering, computers, synchronizing drives, valve controls and other areas involving power amplification constitutes this new - - - -

Automatic Control System



● *Top:* — Teller step motor which is heart of new automatic control system. Ultra-fast acceleration and deceleration mean direction and magnitude of welding rod movement are followed precisely despite radical shifts in chassis contour. With hunting eliminated, previously unattainable degrees of precision can now be reached, a feature which makes the step motor of particular value for machine tool control.

● *Bottom:* — Teller automatic control device to be used by a midwestern manufacturer for welder positioning control in the manufacture of chassis frames. The Teller step motor controls position of the welding rod so that it follows the contour of the chassis exactly, regardless of variations in construction of the frame. A sensing device rides the chassis, giving exact contour information to the special amplifier (in the cabinet). The amplifier, in turn, directs the step motor which positions the welding rod.

A REVOLUTIONARY basic control device which will open new avenues for vastly simplified automation and other industrial control applications will be of interest to engineers and management.

As announced by Arthur L. Fitch, Teller Company President, this device consists of a new motor incorporated in an automatic control system which permits a multiple series of operations to be programmed on tape or punched cards for the completely automatic operation of milling machines, lathes, grinders, drills, and other machine tools.

The special motor developed for the system provides such a high degree of precision and rapid operation that it is fully applicable for instrumentation uses as well.

While several other automatic control systems for such uses have been developed, they are complicated in the extreme, and have suffered from faults which to some degree have limited their usefulness. Teller's unique motor together with its special amplifier permits elimination of a host of complex equipment, reducing the number of vacuum tubes required from 400 to 20, and eliminates many of these faults.

Actually, for the first time, a unit is now available for industrial applications with the combined ability to control displacement precisely and produce the power to do so. This is claimed to be the first system which provides a simple means for eliminating hunting, a major deterrent to the use of previous systems because of the inaccuracy which hunting introduces.

The motor which is the heart of this system is basically a step motor with patented refinements which permit a most precise measure of high speed control. As the system operates, a tape or punched card is the control medium, with one mark or other characterization on the tape corresponding to one step motion of the motor, thus providing an electrical gear system. The individual steps can be made so fine and the motor operated at such a high speed that the work output of the motor is very smooth.

These Teller step motors can be built so that each step represents a very small angular displacement of the rotor. Standard sizes will cover outputs ranging from inch-ounces of torque to thousands of inch-pounds.

Because several motors can be coordinated on a single tape, three or more units can be tandemed for the multiple operations required by machine tools. Thus, on a milling machine, one step motor would cause the table to travel lengthwise, a second cause the saddle to carry the table at right angles, and a third cause the knee to lift or lower the workpiece. It is obvious that other step motors can be added for additional functions, and despite the fact that they might vary in operating speed, the co-ordinating tape would provide perfect accuracy of the piece being shaped.

Among other characteristics which make this step motor particularly suitable for machine tool operation are its high starting torque, accuracy in indexing, and the fact that, when stopped, the motor is locked magnetically. The motor's ultra-fast acceleration and deceleration provide the required high degree of sensitivity.

So reliable are these units that it is generally not necessary to incorporate feedback, nor need provision be made to eliminate hunting. Regardless of changes in ambient conditions, circuit components, or in tape speed, the final co-ordinated output will remain exactly the same.

Manufacturers of the equipment plan to extend applications into telemetering, computers, synchronizing drives, valve controls, and other areas involving power amplification. Because the anticipated demand for these units is tremendous, particularly in the machine tool, instrumentation, and aircraft industries, the manufacturer's engineering staff is being expanded rapidly, and special training courses for engineering personnel have been established.

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  For further data on advertised products use page 85.

The Importance Of Carrier In

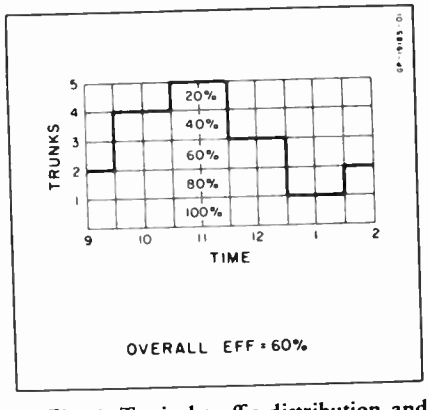
Nationwide Toll-Dialing

The achievement of nationwide toll-dialing will require careful planning and close co-operation of all segments of the telephone industry for the next several years. The new concepts in toll routing and design and the increased importance of carrier are significant aspects of the overall plan.

This article discusses the basic plan as it exists today and describes the important role that carrier will play in its achievements.

Courtesy Lenkurt Demodulator

THE ultimate objective of the nationwide toll-dialing plan is a system of communications throughout the United States and Canada which will enable any telephone customer



● *Fig. 1.* **Typical traffic distribution and trunk efficiencies over a period of several daytime hours.**

to call any other customer merely by dialing his number. The accomplishment of the plan involves some new techniques and equipment. These in turn demand a high standard of transmission performance which will depend to a large extent on the use of carrier and microwave radio.

The basic structure of the plan has been set and the philosophy underlying it has been accepted by the major segments of the communications industry. However, telephony cannot afford the luxury of being a static art. As new developments occur, minor details of the plan may require revision; but the trend of any changes will remain directed toward an improved and more economical telephone service.

The Plan

The general plan is based on a principle called automatic alternate routing. By means of alternate routing, a call between any two points in the United States-Canada network may have many possible paths to its destination. These paths may vary in complexity from a direct connection to a connection containing as many as seven or eight intertoll links in tandem.

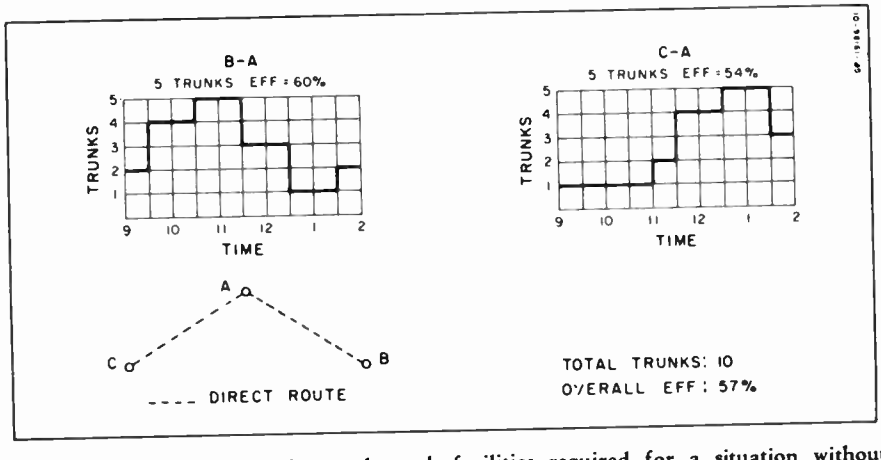
A call will be offered first to paths made up of the most direct routes between its two end points. These will be tried in logical order until either a through route is found or until it is determined that all trunks on these direct routes are busy. Since they are always the first choice, the trunks on such a route carry a heavy average traffic load and comprise what is termed a high-usage group.

If all high-usage groups are busy, the call will then be offered to a final group. A final group consists of trunks which have no alternate route. Such groups will have low-usage and be capable of handling the overflow of many high-usage groups with a small probability of lost calls.

The advantages of alternate routing stem from two fundamental facts associated with long-distance traffic: irregularity of flow, and diminished returns from additional trunks. Both of these are illustrated in Fig. 1 which shows a typical average variation of daytime traffic for a number of trunks between two points.

The curve consists of a peak of heavy traffic and valleys of light traffic. If this traffic is handled by directing the flow so that the trunks are used in ascending numerical order, the efficiency decreases with each succeeding trunk. At one extreme, trunk 1 is used to capacity throughout the entire time and operates at 100 per cent efficiency. At the other extreme, trunk 5 is idle most of the time and operates at only 20 per cent efficiency.

The over-all efficiency could be considerably improved by eliminating one or two trunks. However, this would mean that the calls represented by the top of the peak would be "lost" or at least delayed.



● *Fig. 2.* **Traffic distribution and trunk facilities required for a situation without alternate routing.**

Long-distance traffic destined to one point in the country will differ in the positions of peaks and valleys due to time zone differences at the points of origin and for other reasons. If the peak traffic for several direct routes is allowed to overflow to a combined alternate route, the trunks on this alternate route may be operated at high efficiency as the peaks and valleys will tend to counteract each other and the curve will level out somewhat.

The trunks handling this peak traffic can then be eliminated from the direct routes. The net result is fewer trunks required and a higher operating efficiency for all trunks involved.

A hypothetical situation with and without alternate routing is shown in Figs. 2 and 3. Figure 2 shows the trunk requirements and traffic distribution between B and A and between C and A without alternate routing. Figure 3 shows how the same volume of traffic is handled by allowing the shaded portions of traffic to overflow to an alternate route between D and A.

Of course, the shaded portion of curve B-A must find available trunks between B and D and the shaded portion of curve C-A must find available trunks between C and D. These are provided either by direct high-usage groups or by final groups which are alternate routes for the combined traffic from several other points destined for D. Considerations of cost and existing traffic will determine the routing designation to preserve the efficiency and economy described for the initial situation above.

The example cited is a simple one involving one intertoll switching point (at D). Under the present general toll switching plan, as many as seven or eight intertoll links may be connected in tandem on some calls. The increased switching requirements are being handled by machines which automatically determine the destination of a call, search for an idle trunk, and build up a through circuit in the proper direction.

A large body of traffic theory and mathematical analysis underlies the techniques used in automatic switching. The final result, however, is simply that calls can be switched so quickly and so economically that switching is not a limiting factor in the achievement of the over-all plan.

Transmission Requirements

Alternate routing means that the path which any particular call may take will depend on the trunks available at the time. Thus successive calls between the same two points may vary widely in the number and types of links which make up the total path. For this reason it becomes important that the losses of each link be kept as low as practicable in order to prevent large differences in transmission levels among calls between the same two points.

Differences in transmission levels could be entirely eliminated if all links could be operated at zero loss. However, there is a practical limit to the minimum loss at which a circuit can be operated. This limit is a value of loss below which the factors of echo, singing, noise and crosstalk become objectionable. Of these factors, echo is usually the most critical and, in most cases, a circuit designed to hold echo within tolerance will meet the transmission requirements for singing, noise and crosstalk.

The minimum loss of a circuit depends on the type of facility and the makeup of the total connection of which the circuit is a link. Since the makeup of the connection may vary from call to call, the minimum loss for a link will also vary. To maintain this minimum loss for each link for each possible makeup is far too cumbersome to be practicable. Therefore, a compromise is adopted which, with some approximation, gives a much simpler method of determining the lowest practicable loss for any link.

This method uses a figure called Via Net Loss (VNL) to define the loss which a particular circuit must maintain when it is used as an intermediate link, regardless of the total number of links in the connection. When the circuit is used as a terminal link rather than as an intermediate link, additional loss must be inserted. In either case, however, the VNL determines the lowest practicable loss at which a trunk can be operated without incurring objectionable effects of echo, singing, noise and crosstalk.

The VNL of a circuit is obtained by multiplying the circuit length by a value called Via Net Loss Factor (VNLF) and then adding 0.4 db to allow for individual variations. The VNLF is computed from the transmission characteristics of the circuit and a statistical analysis of customers' tolerance to echo. The relationship of tolerance to echo and VNLF is such that decreasing the objectionable nature of echo decreases the VNLF.

Tolerance to echo depends on the loudness of the echo and the time required for the talker's voice to make the round trip of the circuit and return to him. If this time delay is short, the effect of a given amount of echo is not too objectionable. As the time delay increases, however, the effect of the same amount of echo becomes more and more objectionable.

The primary transmission requirement of the toll-dialing plan—minimum loss on each intertoll link—becomes therefore a matter of achieving minimum VNLF for each link. This, in turn, means reducing the amount of echo in the circuit, the time delay of the echo, or both.

The computations of VNL and VNLF are based on the performance of four-wire circuits. For two-wire circuits, no simple solution exists and minimum loss must be determined from evaluations based in part on past experience.

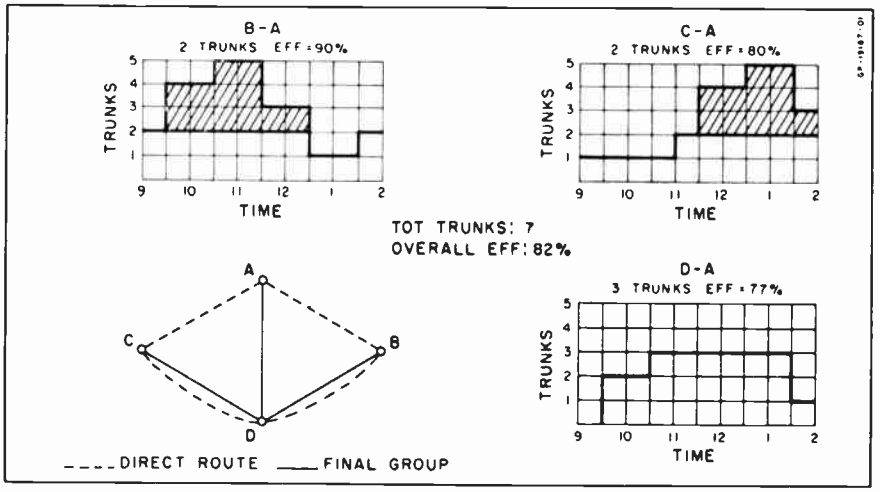
Role of Carrier

Carrier has long since proved its worth over long-distance circuits by reason of the economies it affords. In addition, the inherent low noise level and high stability of carrier systems have continued to provide the quality of transmission required for toll use. As the nationwide toll-dialing plan progresses toward its goal, these contributions will be enhanced necessary to the plan. Among these are low tendency to echo and high velocity of propagation.

The major share of echo stems from impedance mismatches at the hybrid junctions which must be used whenever a circuit is converted from two-wire to four-wire or from four-wire to two-wire. In two-wire circuits, these points of mismatch will occur at intermediate repeaters, terminal repeaters and switching connections.

Four-wire circuits with four-wire switching have much less tendency to echo since these points of impedance mismatch exist only at the terminal drops. In this respect, carrier circuits,

(Continued on page 70)



● *Fig. 3.* Traffic distribution and trunk facilities required for same situation as in *Fig. 2*, but with alternate routing through D.

● Bolted to the underside of a test car's front bumper is a closed-circuit TV camera developed by General Precision Laboratory, which "observes" action of the car's suspension system. The picture from the camera, now used by General Motors Engineering Staff at GM Technical Center, appears on a monitor screen in the back of the car, where an engineer can observe it. Used for the first time in this type of testing, the TV camera gives engineers quick answers that ordinarily would take longer with motion pictures.

With the use of closed circuit television automotive engineers now observe the operation of underbody chassis assemblies and engine appendages of test cars under actual running conditions.

TV Camera Aids Automotive Research

A SMALL, rugged, bomb-shaped television camera gives engineers a picture of what goes on underneath an automobile when it's cornering sharply or bouncing over a rough test road. The picture is transmitted through a closed TV circuit to a 14-inch monitoring screen in the rear of the test car.

This mobile TV system, used for the first time in automotive research, was developed at General Motors Technical Center in co-operation with the TV camera manufacturer, General Precision Laboratory of Pleasantville, N.Y.

Engineers believe it is the best system for quick answers in test work. Ordinarily they would use motion picture cameras for such visual aid in testing — and they still do — but working with films is slower and less flexible than live TV.

For watching the action of a car's suspension system, the TV camera is attached to the underside of a car's front or rear bumper and focussed on the portion of the suspension engineers wish to observe. When the test is underway, an engineer observer sits in the back seat of the car and watches the remote action going on beneath him.

It is likewise possible to use such a system with the picture flashed to a large screen in an office or laboratory where a group of engineers can sit and watch the action on a car cruising along a test road miles away.

In addition to testing suspension systems in action, the mobile TV unit is used for observing tire roll when a car is going around a corner. In other tests the little camera is mounted beneath a car's hood. This helps to observe engine "rock," fan blade "bending" or action of throttle and choke controls. With this technique the TV camera is teamed with a strobe light that "stops" action of the engine fan blades as they whirl.

Other automotive tests are being studied with use of the remote TV "eye" in mind not only with moving cars but also in test cells or laboratories where high speed rotating parts would be hazardous to observe firsthand.

Magnetic Switch Eyes Assembly-Line Operations

ASSEMBLY-LINE automation appeared to have moved a step closer to actuality recently with the development of a new switch, operating on the "proximity" principle, to keep tab on moving metal parts. Electronic research engineers who designed it say the new switch works like a "magnetic detective" to locate objects containing iron on assembly lines, in liquids and even the moving parts of automatic machine tools. The switch has no moving parts. There is no physical contact with the work piece required; detection is accomplished by the object's passing through a magnetic field set up directly in front of the switch's sensing end. A signal flows through the magnetic circuitry of the switch and operates a remotely located electrical control relay. This relay can be triggered up to 10 times per second.

Company officials believe the proximity switch represents the first major improvement in switch technology since the advent of snap action switches.

The first application of the new switches will be on 1958 engine block manufacturing lines for the Ford Motor Company. Ford has purchased 2000 of the switches for its plants in Cleveland, Lima and Dearborn.

The proximity switch is believed to be literally "wear-out proof." Its magnetic design eliminates both internal electrical contacts and linkages (both subject to wear) and the need for physical contact with the object to be detected.

The new switch is about flashlight size (6" long and 1⅝" square) and is sheathed in a thin steel housing. The magnetic circuitry is embedded in a solid plastic solution. The sensing poles in the switch are designed to detect metal objects within one-eighth of an inch of its face. In the case of machine tool operation, the new switch cannot be set off by falling metal chips. It operates on 115 volt, 60-cycle current.

Because of the switch's adaptability to any industrial automation process requiring detection of an iron-based object or moving part it has aroused interest among many of the larger machine tool manufacturers.

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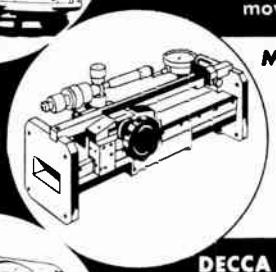
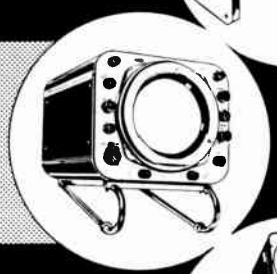
DECCA AIRFIELD RADAR

Decca Type 424 Airfield Control Radar offers an economical solution to the problem of providing an efficient and reliable approach aid under conditions of poor visibility at air terminals. Decca Airfield Surface Indicator is a revolutionary "Q" Band radar for control of all ground movement on airfields.



MICRO WAVE TEST GEAR

The Decca Radar Laboratories have developed a range of precision "S" Band and "X" Band microwave test gear. This range includes Standing Wave Meters, Attenuators, Oscillators, Matched Loads, Noise Sources and complete Test Benches, all built to the highest engineering standards.



DECCA MARINE RADAR

In the past 6 years Decca Marine Radar has been installed aboard over 5000 vessels of the worlds Navies and Mercantile Fleets. This fact itself testifies to the performance and reliability of Decca Radar which leads the world in advanced design.

DECCA STORM WARNING RADAR

Decca Type 41 with a useful range beyond 200 miles provides the meteorologist with an essential aid, giving information on storm build up and movement in many cases virtually impossible to acquire by other means.

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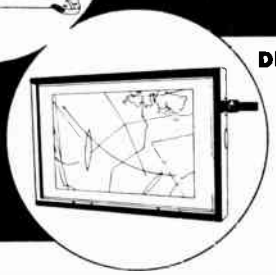
Over 3500 ships of all classes, including those of many navies testify to the high accuracy, reliability and simplicity in use of the Decca Navigator System.



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The Decca Navigator System provides complete flexibility in flight planning, continuous fixing of position and the facility of map presentation using the Decca Flight Log. It is ideally suited for Helicopter operation having no "line of sight" limitation and being capable of pilot operation.

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For further data on advertised products use page 85.

Small parts and assemblies succumb to electrosonic cleaning and net one firm a saving of $50,000 in a three month period.

Electrosonic Cleaning For Small Parts & Assemblies

THE difficulties of efficiently cleaning small parts and delicate assemblies has been a problem in many industries for some considerable time. While the use of such solutions as strong acids, alkalis and various types of detergents has been an almost standard practice, the results of such methods, even when followed by manual scrubbing has not always been wholely satisfactory.

A new solution of this problem, however, has now been found and has already shown considerable saving in actual dollars and cents where used. One user goes so far as to state that $50,000 worth of rejected parts that had defied the usual cleaning methods were reclaimed within three months of the installation of the new system.

The key unit in this case was a new Electrosonic Generator. This consists of two parts, a driver-amplifier that fits conveniently under any ordinary work bench, and a compact transducer measuring 14" x 11" x 17", with attached cleaning tank which is placed on the work bench top. The entire unit can be easily moved from department to department as occasion requires.

The principle of the electrosonic cleaning system is very simple. Energy from the driver-amplifier is applied to a nickel alloy magnetostrictive element in the transducer which creates high-energy acoustic agitation in the cleaning solution. The resulting extremely high and extremely low pressure waves, uniformly permeating the liquid, having a scrubbing action on the parts placed in the container. Any of the usually employed cleaning solutions can be used.

While standard models have up to a four quart capacity, installation of larger units and even line assembly jobs can be designed to fit special needs.

Control of the electrosonic generator is by conveniently placed tuning and power output controls. Different applications call for different power output. To assure uniformity of results for each process, an output power meter is provided. No special training is required to operate the generator. Action is extremely rapid.

Successful application of this system has been extended to such things as small assemblies of ball bearings in their races, computer-servo components and other mechanical assemblies and the removal of mill scale and corrosion. Pre-cleaning before plating or other finish is another successful form of application.

The system is also applicable in the manufacture of fine jewellery and miniature precision parts. Clocks and watches can also be efficiently and quickly cleaned providing that hair springs and similar parts sensitive to the effect of heat are first removed.

A new field has also been found in emulsification. Many stable emulsions not previously possible to attain can now be made through the use of the electrosonic generator. This phase opens up wide possibilities for use in the cosmetic and pharmaceutical industries.

● This electrosonic cleaning equipment consists of two parts, a driver amplifier and a transducer with attached cleaning tank. The equipment is fully portable and can be easily moved from one section of a plant to another without trouble.

Safeguarding Atomic Workers

AN automatic radioassay systems has set a new record for speed, capacity and convenience in counting and recording data on large numbers of radioactive samples to guard atomic workers from radiation hazard.

Unattended, this two-detector sample changer rapidly measures and prints out radioactivity present in up to 250 samples obtained from strategically located air filters, benchtops and floors.

These samples are placed in special medical discs and fed into the system for measurement. Inspectors need only check the printed record to pinpoint sources of dangerous radioactivity.

Periodic tests of workers' blood samples also can be run through the sample changer as a double check on plant safety.

Systems engineers at Berkeley built the system by combining a Scaler and a Digital Printer from stock, tying the project together with a specially designed sample changing mechanism.

The sample changer counts samples in separate counting channels, enabling it to measure separately alpha and beta radiation, alpha (and/or beta) and gamma, or two different gamma energies.

Total operating time can be scheduled in advance through the preset time basis. Counts per unit time read directly, and the printer records sample number and count for each sample. If preferred, output can be fed to a card punch for automatic data processing.

Besides safeguarding employee health in atomic plants, the new system will help fuel power reactors for the aircraft industry, analyzing the distribution of neutrons inside a reactor.

Long, narrow strips of gold or iridium foil are passed through the reactor core, where they are bombarded with neutrons. The strips are cut up and fed into the sample changer which counts the neutrons absorbed.

The automatic radioassay systems have been designed in a variety of forms to suit any specific need. Application fields include health-physics, agricultural research, aviation, biology, organic chemistry, metallurgy and other fields in which large numbers of samples must be handled.

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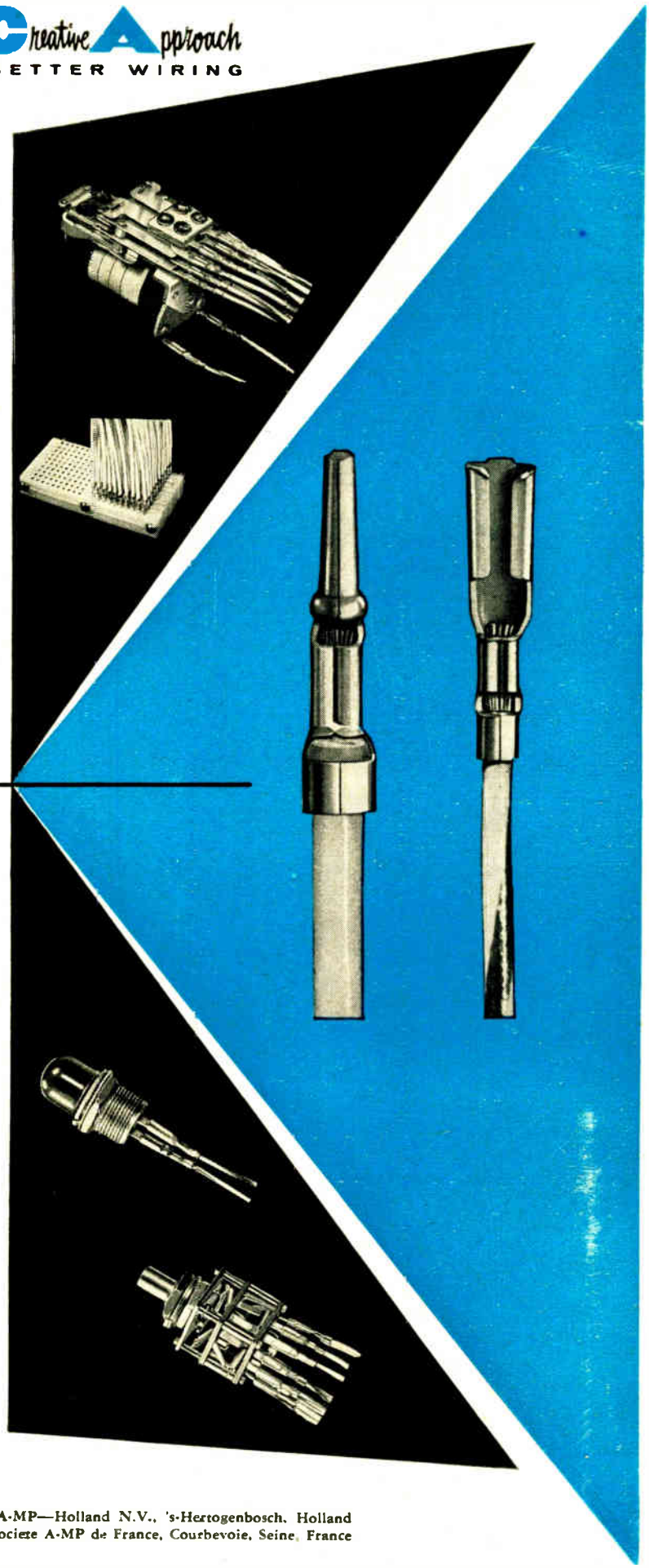

AMP

Aircraft-Marine Products of Canada, Ltd.
1764 Avenue Road
Toronto 12, Ontario, Canada

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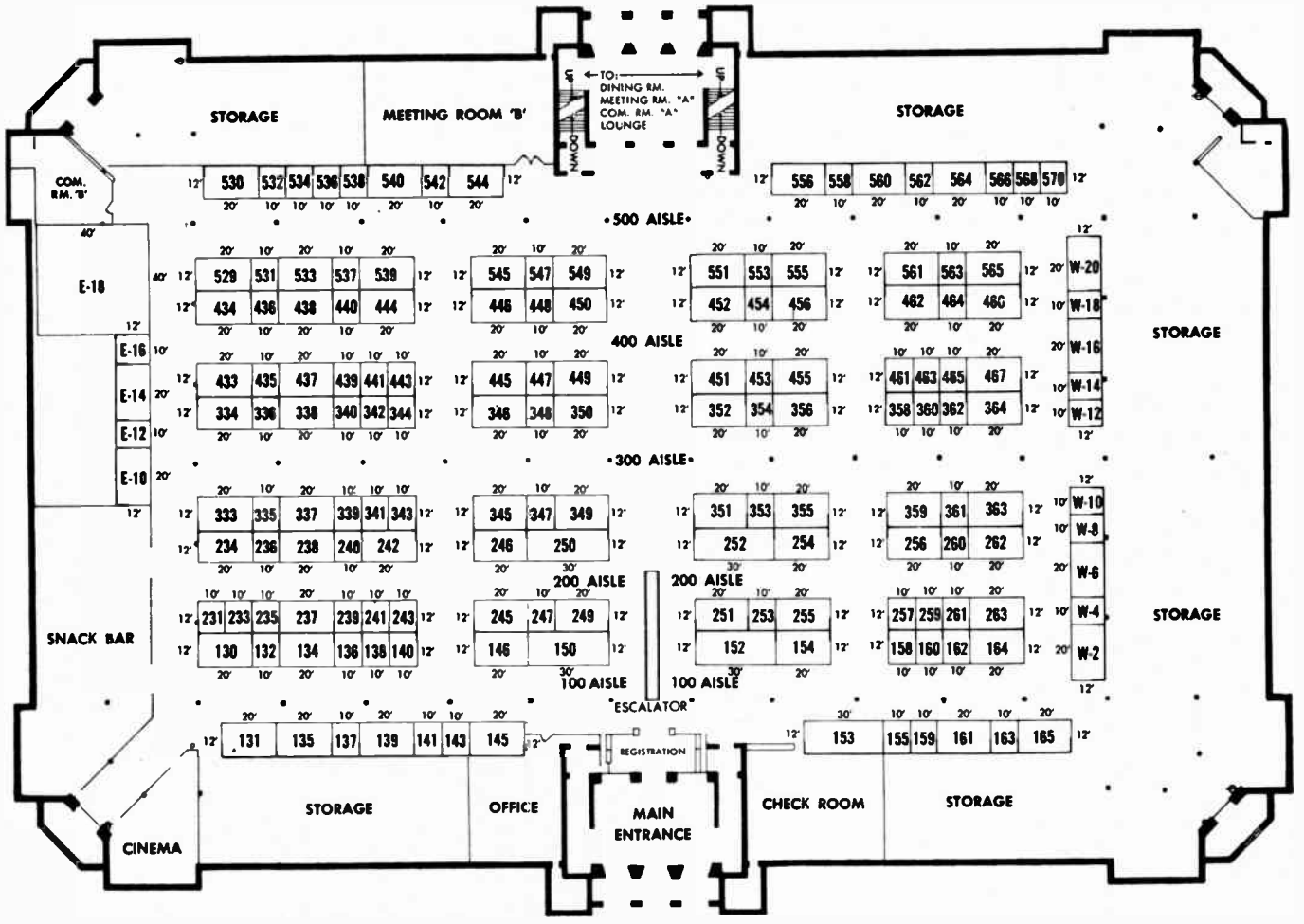
Aircraft-Marine Products (G.B.) Ltd., London, England • Societe A-MP de France, Courbevoie, Seine, France

For further data on advertised products use page 85.

Your Guide To The...

CANADIAN IRE CONVENTION AND EXPOSITION

Automotive Bldg., Exhibition Park, Toronto,
October 1st, 2nd and 3rd, 1956



— FLOOR PLAN —

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AT THE CANADIAN I R E SHOW

BOOTH No. W-8

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TEST EQUIPMENT
VACUUM TUBES

—— Working Display of Our Microwave, Backward Wave Oscillator and Ferrite Circulator;

—— Ferrite Devices: Load Isolators, Uniplexers, Modulators, etc.

RFL

Radio Frequency Laboratories, Inc.
Boonton, New Jersey, U.S.A.

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—— A.F. 2-Way Terminal and Assemblies;

—— An Application Engineer from the Development Laboratory will be present at our Booth.

Microwave Systems

891 O'CONNOR DRIVE, TORONTO, ONTARIO, PLYMOUTH 5-0763

For further data on advertised products use page 85.

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Visit our exhibit
at the Canadian IRE Show
Booth 364

Your inquiries are cordially invited

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For further data on advertised products use page 85.

When long-haul communication requirements exceed the practical limits of conventional equipment, the most effective propagation technique is likely to be . . .

TRANSHO

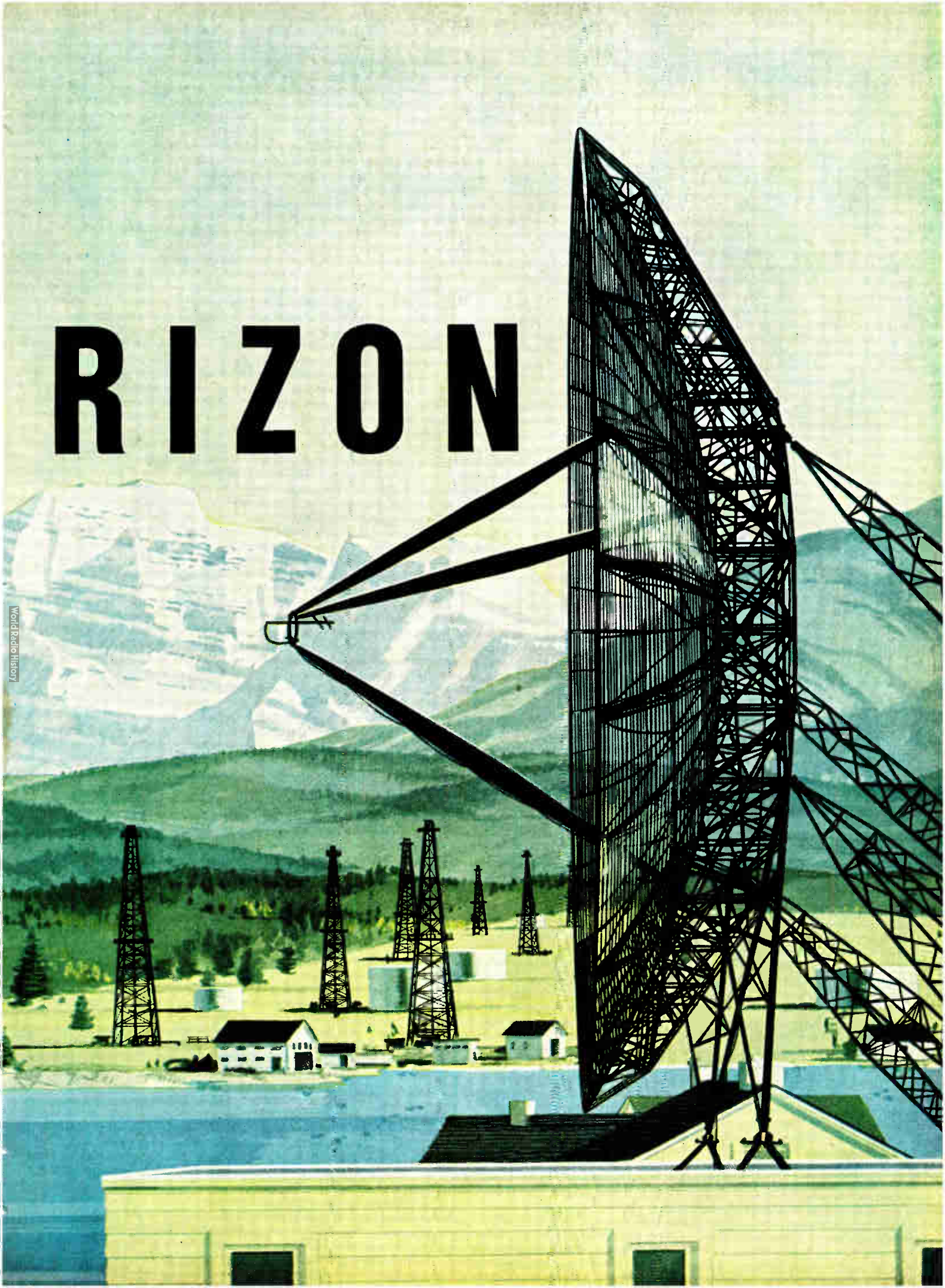
Topography, climate and maintenance difficulties rule out economical installation of wire line or conventional radio facilities in many areas of Canada. Transhorizon "scatter" systems are ideally suited for long-haul all-weather communication over difficult terrain. Links of 100 to 1,200 miles without intermediate relay stations can tie together widely separated operations with voice, data and telegraph channels.

Collins engineering services are available for evaluating, planning and installing your integrated communication system.

Collins CREATIVE LEADER IN COMMUNICATION

COLLINS RADIO COMPANY OF CANADA, LTD.
11 Bermondsey Road — Toronto 16, Ontario

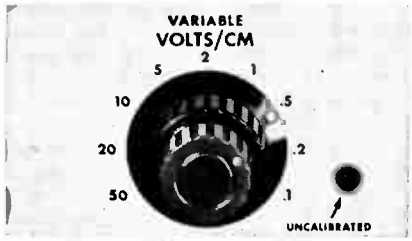
See Collins new Transhorizon Equipment on display at the Canadian IRE Convention, Booths 434-436, in Toronto, October 1-2-3.



TEKTRONIX®

DC-to-15 MC PASSBAND

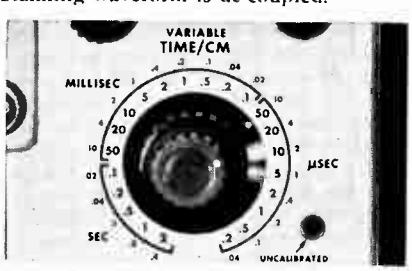
High in performance, but low in size, weight, and cost, the Type 515 fits a relatively new requirement area. Besides its extra capabilities in applications requiring vertical response out to 15 megacycles, it occupies less space and is easier to handle than most other general-purpose laboratory oscilloscopes.



Risetime of the dc-coupled vertical amplifier is less than 23 millimicroseconds. Sensitivity is accurately calibrated, 0.1 v/cm to 50 v/cm in nine steps. A variable control adjusts the sensitivity between calibrated steps and out to 125 v/cm. To help avoid accidental inaccurate readings, a warning light indicates an uncalibrated condition when the variable control is in use. A balanced network delays the signal 0.25 μsec to permit observation of the leading edge of the waveform that triggers the sweep. Direct input capacitance of approximately 36 μμf is reduced to approximately 10 μμf by use of the 10x attenuator probe supplied with the instrument.

SIMPLIFIED SWEEP CONTROL

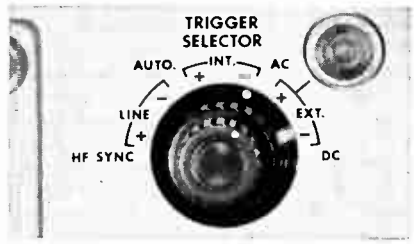
All 22 of the Type 515's accurately calibrated sweeps are selected by the same control knob. This knob also indicates the sweep time-per-centimeter when the 5x magnifier is in use, making mental calculation of time intervals unnecessary. The normal sweep is expanded to 50 centimeters by the magnifier, and the horizontal-position control has sufficient range to display any 10 centimeters of the magnified sweep. To maintain uniform bias on the control grid of the cathode-ray tube for all sweep speeds and repetition rates, the unblanking waveform is dc-coupled.



Calibrated fixed sweeps extend from 0.2 μsec/cm to 2 sec/cm. A variable control makes the sweep range continuous from 0.2 μsec/cm to 6 sec/cm. Here again a warning light indicates an uncalibrated condition when variable control is in use.

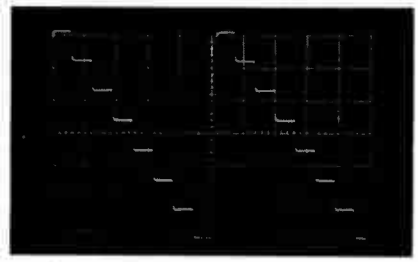
AUTOMATIC TRIGGERING

Automatic triggering is a real convenience in a great many oscilloscope applications. This one position, without further adjustment of the triggering controls, permits signals of widely differing frequencies and amplitudes to initiate the sweep, and provides a reference trace on the screen in the absence of an input signal. The automatic circuit operates at a natural rate of about 50 cycles, but synchronizes readily with incoming signals from 60 cycles to 2 megacycles.



Triggering versatility is one of the many highly-useful qualities of the Type 515. You can trigger the sweep from either the positive or negative slope of an internal, external, or line-voltage signal. On any of these signals, you can trigger the sweep at a selected amplitude level. You select either ac or dc-coupling through the trigger circuitry. You can synchronize the sweep with sine-wave signals up to and beyond 20 megacycles. You can block out the low-frequency component of a composite signal, permitting the high-frequency component to trigger the sweep. These complete triggering facilities make possible a steady display of just about any signal you are likely to encounter.

LARGE DISPLAY AREA



A full 6-centimeter by 10-centimeter linear display can be presented on the screen of the new Tektronix cathode-ray tube, Type T55P, developed especially for this instrument. Characteristics of this new tube help make possible the wide signal-handling range and excellent transient response of the Type 515. Accelerating potential is 4000 volts. A T55P2 is normally supplied, but a P1, P7, or P11 screen is available on request at no extra cost.

PORTABILITY

It's a bit unusual for higher performance to come in an oscilloscope that's smaller and lighter than previous models. But this combination of compactness and performance makes the Type 515 most convenient for those more-exacting field applications. Handling ease and simplified controls are characteristics also desirable in the increasing number of production-line test stations where high performance is a new requirement. The Type 515 weighs only 40 pounds and measures 9¾" wide, 13½" high, 21½" deep.

OTHER CHARACTERISTICS

Many of the other features you'd expect to find in any Tektronix Oscilloscope are part of the Type 515. Square-wave amplitude calibrator, sweep sawtooth and gate available at front panel, illuminated graticule, and electronically-regulated power supply are some of the "standard equipment". New style cabinet with removable sides speeds any maintenance that may be necessary.

TYPE 515 . . . $750

f.o.b. Portland (Beaverton), Oregon

If, from the above description, the Type 515 looks good to you, get in touch with your Tektronix Field Engineer or Representative and let him know you are interested. He'll see that you receive any further information you may need to make your decision.

See and try the Type 515 at the Canadian IRE Convention in Toronto, Booth 241.

Tektronix, Inc.

P. O. Box 831, Portland 7, Oregon
Phone: CYpress 2-2611
TWX-PD 265 • Cable: TEKTRONIX

ENGINEERS—interested in furthering the advancement of the oscilloscope? We have openings for men with creative design ability. Please write to Richard Roplequet, Vice President, Engineering.

For further data on advertised products use page 85.

JOHN HERRING & COMPANY LTD.

EXTENDS CORDIAL GREETINGS TO ALL DELEGATES and FRIENDS ATTENDING the

CANADIAN CONVENTION

TORONTO — **OCTOBER 1, 2, 3**

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Our service to our customers is backed by no less than 50 years of specialized service. We actually do jobs which nobody else would even attempt, providing effective solutions for the most complicated problems. You are cordially invited to visit us and learn how helpfully we combine our experienced service with our contact with varied and established manufacturers of electronic component parts.

FORTIPHONE LIMITED

Sub-miniature Audio-frequency components. Complete range miniature transformers covering microphone input, driver, single ended and push pull coupling and output transformers for transistor amplifiers.

AEMCO INC.

Canadian made relays to Military specifications and commercial requirements. Timers, Interval Timers and Flashers.

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Sub-miniature capacitors: VSR Voltage sensitive ceramic . . . and UHF Ultra High Frequency ceramic capacitors.

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Relays — frequency sensitive, ultra high speed, polarized. D.C., A.C. Choppers 0 to 500 cycles to Military and commercial specifications.

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Ball and Roller Bearings: Sub-miniature bearings from .043" OD Ball Bearings to 1.0236" Roller Bearings.

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Motors — Miniature types, from .0012 HP to .05 HP in unidirectional, synchronous, reversible, geared head and shaded pole types.

SHALLCROSS MFG. CO.

Miniature type ceramic power resistors, switches, attenuators, resistance, capacitance and magnetic flux measuring instruments.

RIPLEY CO. INC.

Miniature Blowers, and electronics control equipment.

JOHN HERRING and COMPANY LTD.

3468 DUNDAS STREET WEST — TORONTO, ONTARIO

For further data on advertised products use page 85.

DATA PROCESSING

(Continued from page 40)

Small Firms Can Benefit

It is not only the giant corporations that can afford electronic computation and data processing. To begin with, computers vary considerably in price and rental. The larger computers cost from one million dollars upwards and rent for $20,000 to $30,000 a month. Medium size machines sell for $75,000 to $500,000 and rent for $3,000 to $10,000 a month. The smaller machines, which usually cannot perform a long programmed chain of calculations in one operation, sell for $20,000 to $50,000 and rent for $650 to $1,500 a month.

It has been stated that most organizations having 500 or more employees and an annual turnover upwards of 2½ million dollars could probably use a medium or large data processing machine to advantage. However, no rule-of-thumb criterion can be laid down in this respect. Everything depends on two considerations, the type and volume of work being performed by manual or partly mechanized means and the scope for putting a computer to work on duties which could not previously be carried out at all with sufficient speed or economy. The only reliable test of the feasibility of acquiring a computer is, therefore, a survey of potential computer applications in an organization coupled with a comparison of costs. Moreover, while it may be considered that an organization is too small to justify the purchase or rental of its own data processing system, there may be problems or routine work which could with advantage be assigned to a computing service.

By using a programming and computing service, a company can open up new possibilities of improving its work and gain the invaluable long-term advantage of becoming familiar with the practical uses of electronic computers and data processing machines. If a firm has a computing or calculating task which, in aggregate, is costing more than $500 a year to perform by manual or partly mechanized methods, it has been estimated that it would be worth its while to consider the use of a computing service.

Consultants Important

Consulting services cost money. If an organization already has, and can spare, sufficient people on its staff with years of experience of electronic computation, with a thorough knowledge of the capabilities and applications of the various types of computer on the market, and with speedy, far-sighted answers to all the questions which inevitably arise when a computer installation is being considered or prepared for, then it can get on fine without consultants. But businesses which are not in that happy position might do well to take another look at computer prices and rentals and ask themselves whether they can risk the hit-or-miss approach to the problem.

There is no doubt that electronic computing systems and data processing methods can save time and labor, improve efficiency and increase profits. People, however, are still more important than machines and no one imagines that one has merely to read a few manufacturers' brochures, order a computer, engage an operator or two, and then sit back and reap the benefits of electronic computation. There is, as will readily be appreciated, a lot more to it than that and in particular there is a great deal of preliminary enquiry, exploratory investigation and preparatory work to be done before a computer is installed. Indeed, a considerable amount of work is necessary before a computer is ordered. Without that work a computer will not cut costs or give an organization added efficiency. It is much more likely to have the opposite effect.

Experience has shown that there must of necessity be a time lag, usually of a year, two years or more between (1) the initial decision to look broadly into the possibilities of electronic computation and (2) the actual installation of a computer. This interval is far from being a mere waiting period. It is, in fact, a time of intense activity when all the work and planning must be done on which the ultimate success of an installation will depend. It is during this period that the employment of consultants — working as a team with selected members of a business's staff — can be a first-class investment in know-how.

Consultants are ready to give specialized assistance and advice in such matters as:

(a) A preliminary investigation and an overall survey to determine the broad areas of potential computer application.

(b) Estimating costs and savings which should result from using a computer, and the possibilities of obtaining reports and information for management which were previously unobtainable.

(c) Advising on the capabilities and merits of various computers and the selection of equipment most suited to specific needs.

(d) Assisting with a feasibility study, laying out the detailed procedures involved, arranging for training of staff, planing the organization of the work and preparing for the smooth transition from existing methods to integrated high-speed computation and data processing.

(Turn to page 101)

For further data on advertised products use page 85.

ENVIRONMENTAL TEST EQUIPMENT

Trop-Artic
INC.
MUNCIE, IND.

- **TEMPERATURE CABINETS**
  Front Opening and Chest Type
- **TEMPERATURE & HUMIDITY CABINETS** Front Opening
  16 Stock Models available ranging from 2 cu. ft. to 48 cu. ft.
- **SPECIAL DESIGNS**
  Temperature or Temperature and Humidity; Cabinets or Walk-In Rooms manufactured to your specific requirements.

  Range: + 500° F to — 200° F.

  Humidity: From 20% to 95% measured by 35° D. P.

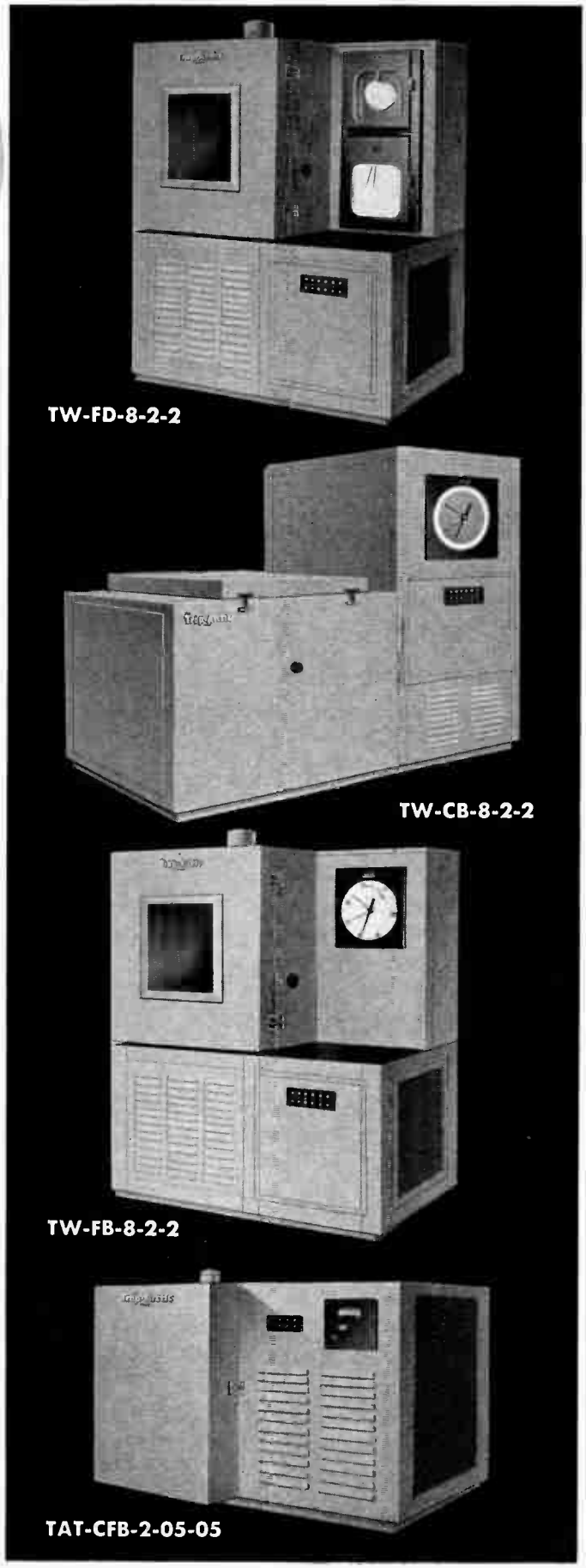
Better Performance through Better Engineering

Write for Bulletin #201 or ask to have a Sales Engineer call.

Trop-Artic
INC.

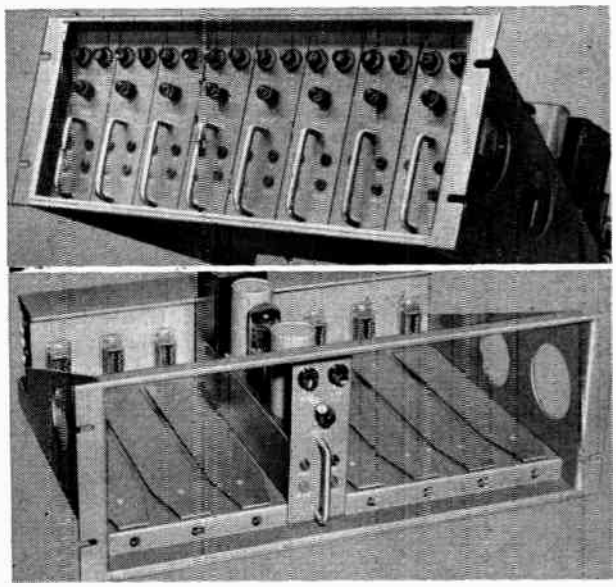
Sales Office
P. O. Box 334 Mishawaka, Indiana

See Us At the CANADIAN I. R. E. Show
October 1, 2, 3 Space 439



For further data on advertised products use page 85.

Video Distribution Amplifiers and Regulated Power Supplies *for the RADIO and TELEVISION Industry*

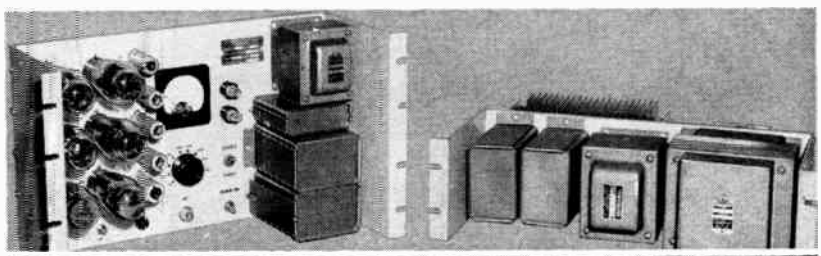


McCURDY RADIO INDUSTRIES LTD. handle a complete range of electronic equipment for radio and television purposes. With a staff of highly trained technicians, we are equipped to offer the finest in service and maintenance. Consult our Engineering Department. They will be pleased to discuss your specific equipment needs.

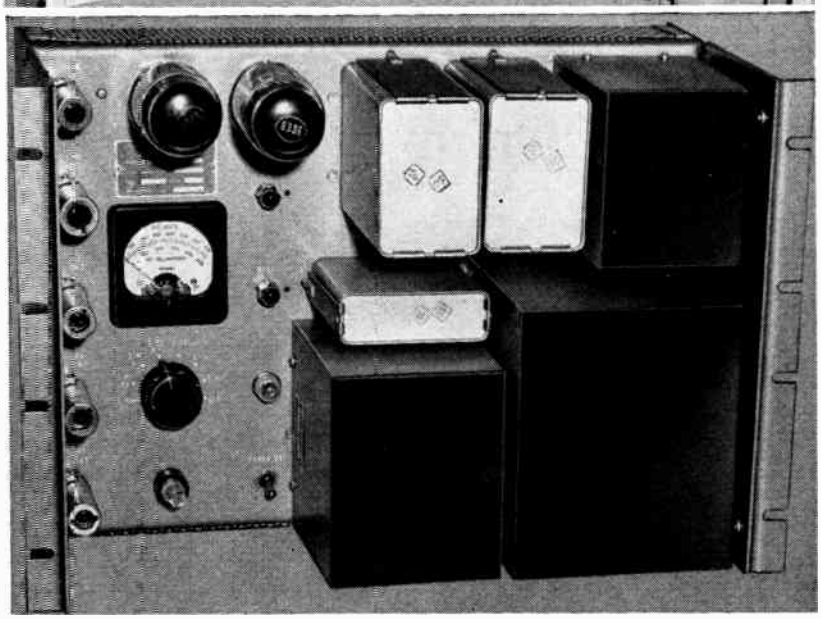
Top Left: AV510 Plug-in Video Distribution Amplifiers in Frame.

Lower Left: Mounting Frame, SA 10.012 for 8 Type AV510 Amplifier Units.

Regulated Power Supply PS-842. 1 amp., 270-325 volts.



Regulated Power Supply PS-843. .5 amps., 270-325 volts.



We invite you to see our display at the I.R.E. Convention and Exposition, Booth No. 247, Automotive Building, C.N.E., October 1, 2 and 3.

McCURDY RADIO INDUSTRIES LIMITED

mccurdy radio industries *limited*

22 FRONT ST. WEST, TORONTO 1, ONT. PHONE EM. 6-6531

For further data on advertised products use page 85.

A Seal FOR EVERY PURPOSE

PRESSURE - TEMPERATURE - EXTREME CLIMATIC CONDITIONS

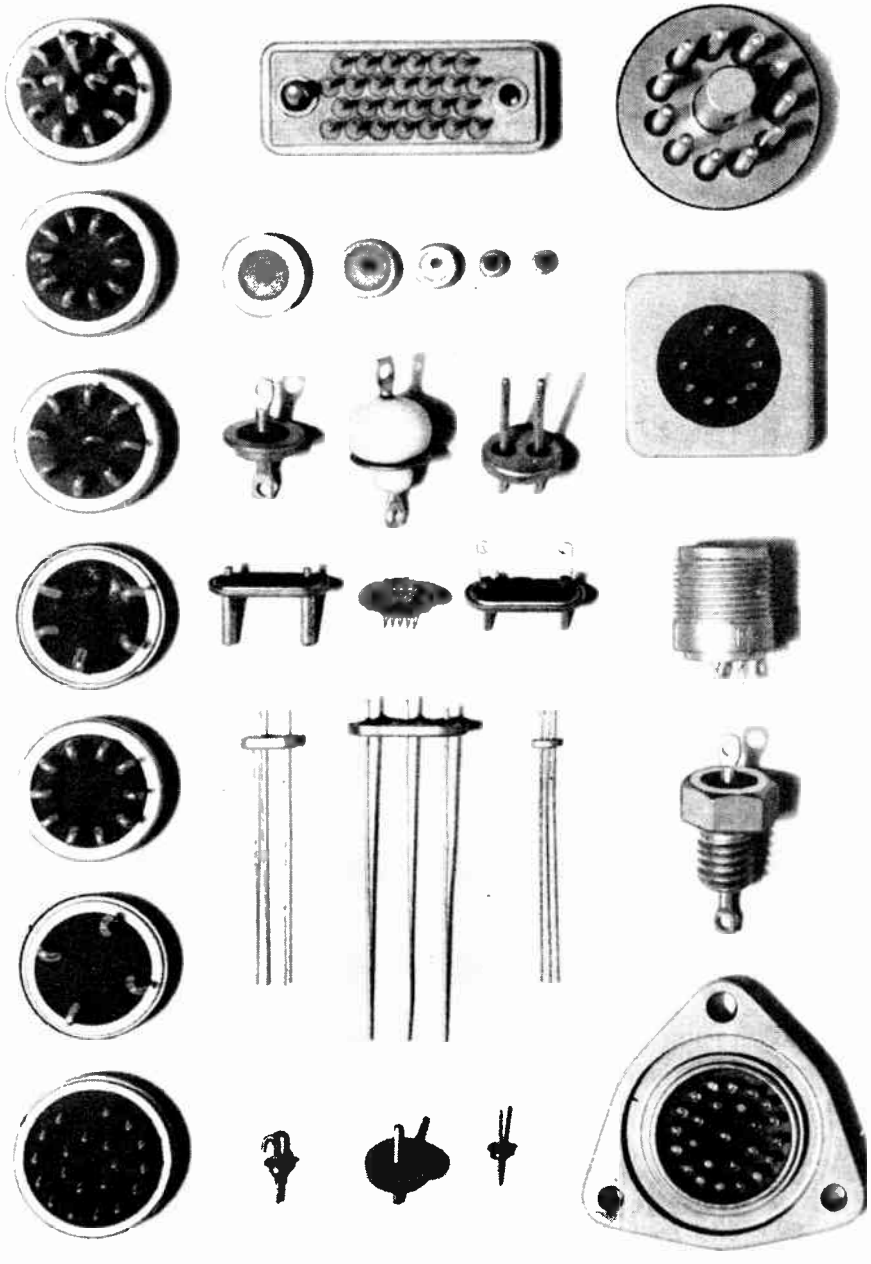
Safeguard your equipment design by contacting Quality Hermetics Limited for the hermetic seal to meet your particular application.

NOW, completely engineered and manufactured in **CANADA**, a complete line of:

- **Multi-Terminal Headers**
- **Multi-Terminal Plug-Ins**
- **Individual Terminals**
- **Hi-Voltage Terminals**
- **Condenser Seals**
- **Crystal Holders & Bases**
- **Transistor Holders & Bases**
- **Special Headers & Terminals**

Join the growing list of Canadian companies served with Quality Hermetic Seals, tested and proven to meet your rigid requirements.

Visit us at the Canadian I.R.E. Convention, October 1, 2, 3 - Booth No. 233.



A sampling of some of the products available from

Quality **HERMETICS LTD.**

45 Hollinger Road
East York, Toronto, Ontario

For further data on advertised products use page 85.

RETMA REPORT

A Monthly Bulletin Of Association Activities
Prepared For Electronics And Communications
By
BASIL JACKSON

RETMA'S Participation In Canadian IRE Convention

There is no doubt that the Canadian IRE Convention to take place in Toronto on October 1, 2 and 3 will be a most significant event.

Coming at the time of the 30th anniversary of the Institute of Radio Engineers in Canada, the convention emphasizes the growing self-sufficiency of the Canadian electronics industry. The Canadian electronics industry, from its early beginnings in 1919, has grown at a rate in excess of three times the rate of growth of the gross national product, and is showing every indication that this steady consolidated expansion will continue.

The extent of the Canadian electronics industry is widening, a process which seems to increase in proportion to the square of the effort directed into research and development. Long-term research programs are essential for the development of this expansion process, and the industry is now receiving the benefits of the research work undertaken many years ago. Similarly, research undertaken today will produce results in practical form in future years.

The Canadian electronics industry is supplying primary and secondary industries in Canada with electronic equipment to control and facilitate extraction and production processes. This application of electronics to industrial and commercial use will expand the general economy of Canada. It will make new jobs, increase buying power and create new allied industries.

Those who believe in the cyclical theory of history will agree that research leading to invention and industrial application has led to continued progress in our civilization. When James Watt developed the steam engine over one hundred and fifty years ago no one could foresee, at that time, the part that steam power would play in opening up vast continents and countries, or how it would transport millions of tons of freight and millions of passengers overland, would drive ocean liners and cargo ships, and would cause an industrial revolution destined to affect the whole world, sociologically and politically.

Similarly, when Thomas Edison succeeded in applying electric power for the illumination of cities at the turn of the century, very few realized, at the time, that electricity would soon be used to power factories, to refrigerate food, to air-condition buildings, to cook food, to actuate cranes, to drive trains, and to perform thousands of jobs now taken for granted.

Now, with electronics, another chapter of industrial history is being written. The effect of electronics on Canadian life has already become evident. Its results will be far-reaching and will be felt in many, as yet, untouched quarters. Already electronics has made it possible for men to talk to each other, and to see each other, over great distances, and the wonders of the universe are being explored by the radio telescope which has enabled men to hear today the mysterious noises made by stars disintegrating many millions of years ago. Electronics can cook man's food, increase the productivity of his factories, map the bottom of the deepest ocean, unlock the secrets of nuclear power, and raise the material standard of living of millions of people.

The Radio-Electronics-Television Manufacturers Association of Canada wholeheartedly endorses the Canadian IRE Convention. Many of the personnel of its member-companies are in the vanguard of its organizing committees and activities. Over 33 per cent of RETMA members are exhibiting, and over 50 per cent of the engineers who will be delivering the 130 technical papers are from RETMA member-companies.

The Joint Service Committee of the Department of National Defense is participating in the convention. One of the main features of this exhibit will show the emphasis placed on the importance of reliability and component parts standardization.

Radio Fall Meeting Program

Hotel Syracuse - - Syracuse N.Y. - - October 15, 16, 17, 1956

Sponsored By RETMA Engineering Department

MONDAY, OCTOBER 15th

9:30 a.m. — Automation Session.
(Arranged by the RETMA Committee on Automation)
F. C. Collings, Presiding
High Production Method of Etching Printed Wiring Boards.
E. F. Altens,
Philco Corporation.
Basic Considerations in Foil Transformer Production.
W. A. Brackman, R. Levinsohn, and D. McCarthy,
American Machine and Foundry Company.
Automatic Manufacture of a Small Choke Coil.
D. H. Esperson,
General Electric Company.
Effect of Printed Circuits on the Television Industry.
J. Toyzer,
Radio Corporation of America.

2:00 p.m. — Semiconductor Applications and Reliability Session.
(Arranged by the IRE Professional Group on Reliability and Quality Control)
J. R. Steen, Presiding.
Review of Applications Status for Semiconductors.
D. B. Krett,
Radio Corporation of America.
Naval Material Laboratory Transistor Reliability Study.
R. E. Martin,
Naval Material Laboratory.
Factors Determining Reliability of a Germanium Power Transistor.
A. B. Jacobsen,
Motorola Inc.
Success Story — Transistor Reliability — 1956.
C. M. Zierdt, Jr.
General Electric Company.

8:00 p.m. — Session with Syracuse IRE Section.
Management of Military Engineering Programs.
J. M. Bridges,
Director of Electronics — O.A. S. D.

8:30 p.m. — Stag Party.
Courtesy of American Lava Corporation.

TUESDAY, OCTOBER 16th

9:00 a.m. — Television Receiver Session I.
(Arranged by the IRE Professional Group on Broadcast and Television Receivers).
L. R. Fink, Presiding.
An Ultrasonic Remote Control for Home Receiver.
Robert Adler, Peter Desmares, and John G. Stracklen,
Zenith Radio Corporation.
Portable TV Design Considerations.
F. R. Wellner and M. E. Jones,
General Electric Company.
Determination of Transistor Performance Characteristics at VHF.
G. E. Theriault and H. M. Mason,
Radio Corporation of America.
Transistorized Television Vertical Deflection Systems.
W. F. Palmer and George Schiess,
Sylvania Electric Products Inc.
Transistor Feedback Preamplifiers.
R. Page Burr,
Burr-Brown Research Corporation.

2:00 p.m. — Television Receiver Session II.
(Arranged by the IRE Professional Group on Broadcast and Television Receivers).
W. E. Good, Presiding.
A New Noise-Gate A.G.C. and Sync System for TV Receivers.
George C. Wood,
General Electric Company.
John G. Spracklen and Walter Stroh,
Zenith Radio Corporation.
The Measurement of C. R. T. Beam Apertures.
Edward J. Quinlan,
Philco Corporation.
Color-Hold Considerations in Color Receivers.
J. R. Banker,
Westinghouse Electric Corporation.
A One-Tube Crystal Filter Reference Generator for Color TV Receivers.
R. H. Rausch and T. T. True,
General Electric Company.
Techniques of Color Purity Adjustment in a Receiver Employing the "Apple C.R.T."
R. C. Moore, A Hopengarten, P. G. Wolfe, and W. F. Simon,
Philco Corporation.

6:15 p.m. — Cocktail Party.
Courtesy of Stackpole Carbon Company.

6:45 p.m. — Radio Fall Meeting Dinner.
Toastmaster, A. V. Loughren;
Speaker, W. R. G. Baker;
Subject, To be announced.

WEDNESDAY, OCTOBER 17th

9.00 a.m. — Electron Devices Session.
(Arranged by the IRE Professional Group on Electron Devices).
T. M. Liimatainen, Presiding.
Receiving Tubes Operating at 12 Volts Anode Potential.
C. E. Atkins,
Tung-Sol Electric Inc.
Tube Design Considerations for Low Voltage Operation in Hybrid Circuitry.
R. J. Bisso,
Sylvania Electric Products.
Electron Tube and Circuit Considerations for Series-String Applications.
R. G. Rauth,
Radio Corporation of America.
Effects of the Earth's Magnetic Field on Color Purity in the Shadow-Mask Color Kinescope.
H. N. Hillegass and J. L. Hudson,
Radio Corporation of America.
A Horizontal Deflection Circuit with Miniature Tubes.
R. E. Schwab,
Sylvania Electric Products.
Voltage Tuneable Magnetrons and their Applications.
G. C. Griffiin,
General Electric Company.

2:00 p.m. — Semiconductor Devices Session.
(Arranged by the IRE Professional Group on Electron Devices.)
W. H. Forster, Presiding.
High Frequency Germanium NPN Tetrode.
D. W. Baker,
General Electric Company.
PNP Transistors with High Current Amplification — Forward and Reverse — at High Collector Current.
A. P. Kordalewski,
General Electric Company.
High Frequency Silicon Transistors.
C. Thornton, J. Roschen, and T. Miles,
Philco Corporation.
Application of Power Transistors to Audio Output Stages.
R. Minton,
Radio Corporation of America.
A New Device for Transistor Stabilization.
C. F. Wheatley and R. E. Klepinger,
Radio Corporation of America.
Transistor Symbology.
C. D. Todd and L. F. Leinweber,
General Electric Company.

For further data on advertised products use page 85,

The Importance Of Carrier In Nationwide Toll-Dialing

(Continued from page 47)

which are electrically equivalent to four-wire circuit, serve the over-all plan by eliminating intermediate sources of echo and allowing circuits to be operated at low losses.

The high velocity of propagation of carrier circuits, on the other hand, acts to bring echo within tolerable limits by reducing the objectionable effect of whatever echo is present in the circuit. A higher velocity means a shorter time delay as the signals will require less time to make the round trip of the circuit.

Carrier and microwave circuits have a velocity above 100,000 miles per second. This assures a short time delay over even the longest inter-toll circuits. Thus a higher echo level can be tolerated, or, in terms of transmission requirements, the circuit can be operated at a lower loss than it could if the delay were longer.

The transmission advantages of carrier and microwave are universally accepted throughout the industry. The vast majority of toll routes existing today make use of carrier and microwave circuits and as the plan progresses, more and more will be called into play. Also of importance, however, are the advantages carrier offers in providing some of the new short- to medium-haul facilities the intertoll-dialing plan will require.

One such application will come about when many small manual tributary offices are converted to automatic with the consequent transfer of operators to a toll center serving the area. Functions such as directory, information, complaints, and other services will require additional circuits. Since only a few extra channels are required and the distances are usually short, a carrier system such as the Lenkurt Type 33A or 45C, providing up to four channels and designed to prove-in over short distances, may result in greater savings than the alternate method of stringing extra wires or constructing extra facilities of other types.

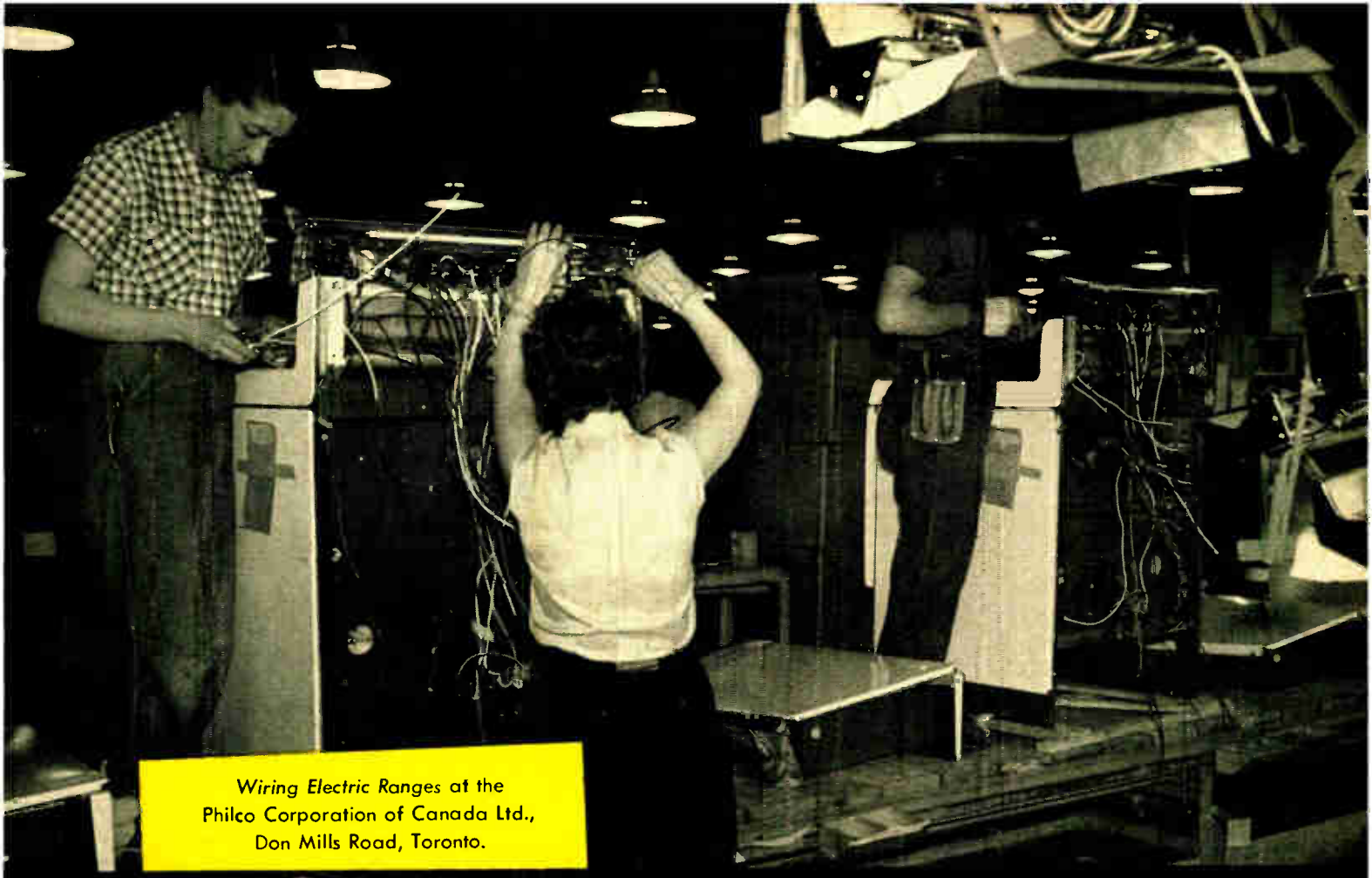
Conclusion

Achievement of the nationwide toll-dialing plan will involve the careful and gradual integration of existing telephone plant into a complex long-distance network based on alternate routing and automatic toll switching. The new techniques necessary to accomplish this impose severe transmission requirements.

Probably the most important single role in the over-all transmission scheme is being played by carrier, not only in meeting these requirements but also in meeting the public's demands for more and better toll service resulting from a growing awareness of what constitutes good transmission and an increasing willingness to make use of long-distance facilities.

When the goal is reached, the plan will provide a continent-wide long-distance facility that is economical, convenient, fast, and reliable—a facility that will more than repay the effort and expense involved in its achievement.

For further data on advertised products use page 85.



Wiring Electric Ranges at the Philco Corporation of Canada Ltd., Don Mills Road, Toronto.

...and again the choice is FEDERAL STOVE WIRES

Whenever, wherever quality wires and cables are needed, the choice is Federal—again and again. All Federal products are built to rigidly high standards and are carefully tested before shipment.

Federal Stove Wires (Types A-15 and A-17) have solid or stranded, annealed copper conductors, insulated with vinyl plastic. The outer coverings are of asbestos—saturated in a moisture-resisting, flame-retarding compound.

No matter what the electrical requirements of your job, specify quality wire and cable . . . make your choice Federal.

FEDERAL Wire and Cable Company Limited

Head Office and Factory: GUELPH, ONTARIO
Sales Offices and Warehouse Stocks: St. John's, Nfld., Truro, Montreal, Winnipeg, Regina, Saskatoon, Calgary, Edmonton, Vancouver.

5624

NEWS ☆ ☆ ☆

Kester Solder Holds Silver Anniversary In Canada

September 16th (1956) marks the 25th year of continuous operation of Kester Solder Company of Canada, Ltd. at Brantford, Ontario.

According to Frank C. Engelhart, Kester's president, "Previous to 1931 or September of that year, we had been supplying the Dominion through the U.S. plants at Chicago and Newark, New Jersey. However, it seemed expedient that we establish a manufacturing unit in Canada, using Canadian labor, materials and supplies. This is what we did, and we're proud to say that the original decision has been justified again and again. Consistent and loyal support by all Kester users has resulted in a very successful operation. Our only hope is that the next 25 years will be as productive of good-will as the last!"

F. C. ENGELHART

Supervising the manufacturing facilities of the Brantford plant is J. A. T. Butler, while Tom Fleming, the general sales manager, is responsible for the marketing of the many Kester products.

Marty Howard Regional Rep For Consolidated Electronic Equipment Co.

Announcement has been made of the appointment of Mr. J. (Marty) Howard as representative for eastern Ontario and the province of Quebec for Consolidated Electronic Equipment Company Limited of Toronto.

Mr. Howard has had wide experience in the electronics sales field and prior to establishing his own firm, Electronic Sales Associates of Ottawa, he was employed by J. R. Longstaffe Company Limited in their Montreal office and by the Department of Defense Production where he was engaged on development work in connection with the creation of Canadian sources of supply of electronic components.

"Operation Overthrust" World's Largest Survey

The world's most extensive mining library and geophysical model test laboratory in Toronto are but two of the many far-reaching results seen of the new gigantic co-operative geological study of some 357,000 square miles of aerial photography of the rich mining areas of the Precambrian Shield in Canada and the United States.

Already the leading North American mining companies which started the project co-operatively are planning 400,000 square mile extensions which will extend its scope to Labrador and far beyond the Manitoba border. Exploration of the richest mineral area in the world is expected to be advanced by at least a generation in the relatively short period of two and a half years which should complete the project. Multi-million dollar geological and geophysical field work will follow the over-all study. A listing of the possible locations of the economic minerals in the area will be compiled, especially the lesser known minerals such as lithium, colombine, tantalium, titanium and chromite.

The Photographic Survey Corporation, of Toronto, who worked on the complete natural resources inventories of Pakistan and Ceylon under the Canadian Colombo Plan and of Alberta for the Provincial Government have been assigned to this project. "Operation Overthrust" as it is called, is the largest survey of its type in the world. It will far overshadow the Pakistan, Ceylon and Alberta projects also carried out by the Photographic Survey Corporation.

Committee Members Of Canada's First IRE Convention & Exposition

● Members of the committee responsible for the Canadian IRE Convention and Exposition which will be held in the Automotive Building at the Canadian National Exhibition Park, Toronto, on October 1, 2 and 3, 1956. Shown above are: *Sitting*, left to right: Clive Eastwood, recording secretary; R. C. Poulter, chairman, advertising, publicity and program; E. O. Swan, chairman, exhibits and registrations; C. A. Norris, general convention chairman; Dr. George Sinclair, chairman, technical program; A. P. H. Barclay, chairman, Toronto section IRE; Claude Simmonds, corresponding secretary. *Standing*, left to right: F. H. R. Pounsett, IRE Region 8; C. H. Hathaway, chairman, finances; Grant Smedmor, convention manager; E. L. Palin, chairman, social activities. The three-day event is expected to attract engineers from all over Canada and from neighboring states.

National Fibre Co. Will Feature Copper-Clad Phenolite At Canadian IRE Show

National Fibre Company of Canada, Ltd. will occupy Booth 251 at the Canadian IRE Show to be held in Toronto, October 1st through 3rd.

The company will feature its latest line of copper-clad Phenolite laminates for printed circuitry. Also on display will be a wide range of materials for electrical and electronic applications, including the company's electrical grades of Phenolite laminated plastics and National vulcanized fiber.

Booth 251 will be manned by the following National Fibre Co. personnel: H. A. Frankel, vice-president and general manager, R. J. Halfnight, C. W. Abbott and N. E. Jepson.

G. Robt. Mezger Vice-President Measurements Corporation

Mr. Harry W. Houck, president of Measurements Corporation has recently announced the appointment of G. Robt. Mezger as a vice-president of the Corporation. Administration and expansion of sales of the Corporation's line of precise electronic laboratory equipment will be Mr. Mezger's primary responsibilities.

G. R. MEZGER

In making his announcement, Mr. Houck stated his belief that the extraordinary growth of the electronic's industry demanded that Measurements Corporation extend and improve its services to its customers throughout the world with the aid of a seasoned sales executive and experienced electronic engineer.

Measurements Corporation are represented in Canada by H. Roy Gray Limited, Toronto.

Complete System Of Radio Despatching For P.G.E.

Opening of the Pacific Great Eastern Railway's new line from Vancouver to Squamish will remove a major bottleneck in the shipment of the wealth of British Columbia's northland to the industrial areas in the south of the province. And the entire operation will be directed by radio.

For the first time in the history of Canadian railroading, dispatching of traffic along a major line is to be completely dependent upon radio. Builders of the line found that installation of conventional telegraph or telephone lines would be both costly and impractical. Overhead wiring would also be under constant threat of damage from snowslides and rockfalls all along the 41-mile route through the most rugged mountain terrain in Canada.

Pacific Great Eastern's communications superintendent, R. N. Doble, and engineers of Rogers Majestic Electronics Ltd., Leaside, Ont., designed and supervised installation of the radio setup. It will provide voice circuits and teletype from Squamish to Vancouver, dispatch circuits from Squamish to all way stations, direct communication to all trains in motion, a two-way radio link between engineers and conductors aboard the trains themselves and connections with maintenance crews along the right of way. Repeater stations have been established at Watt's Point, Bowen Island, and Point Grey. All are self operating, requiring no staff to man them.

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NEWS

(Continued from page 73)

G. E. To Sponsor Course On Spectrophotometry

A scientific color measurements course will be sponsored by General Electric's Instrument Department, September 24-28 at Portsmouth, N.H.

Featuring a full curriculum of spectrophotometry and colorimetry industrial applications, the course will be instructed by representatives of such companies as American Cyanamid, Pacific Mills, Inter-Chemical Corp., E. I. DuPont, as well as the National Bureau of Standards, private consulting laboratories, and educational institutions.

Instruction will feature the seminar approach as technical specialists lecture, followed by laboratory sessions utilizing the most modern equipment.

Instrument department engineers say a basic familiarity with such recognized textbooks as "The Handbook of Colorimetry," by A. C. Hardy, and "Color in Business, Science and Industry," by Deanne B. Judd, will be helpful to prospective students.

Tuition for the entire course will be $110.00. The sessions will be held at the Wentworth-by-the-Sea, Portsmouth's well-known resort hotel. Accommodations will be at off-season convention rates; rooms range from $4.75 European Plan to $15.00 under the American Plan.

Department engineers advise early registration due to limitations on space and facilities. Complete information on the course and the hotel accommodations may be obtained by writing to Ronald Doyle, Meter and Instrument Section, Canadian General Electric Co. Ltd., 1130 Blvd. Charest, Quebec 8, P.Q.

Muirhead Instruments Appointed Sole Canadian Agent

A. J. Muirhead, vice-president and general manager of Muirhead Instruments Limited, Stratford, Ontario, has announced the appointment of the company as sole Canadian agent for Muirhead and Company Limited of Beckenham, Kent, England, manufacturers of wave analysers, impedance angle meters, decade oscillators, servo motors, magslips and other types of electronic equipment and instrumentation.

Servicing and manufacturing facilities are being developed in the Stratford plant of Muirhead Instruments Limited where the manufacture of magslips and synchrons is already in production.

According to the announcement Muirhead sales engineers will tour eastern Canada this fall with a selected range of instruments and components including equipment as mentioned above.

New President

The Board of Directors of Age Publications Limited, Toronto, announce the election of Norman G. McHardy as president of the company, succeeding Norton W. Kingsland, who

N. G. McHARDY

passed away recently. Mr. McHardy was formerly vice-president in charge of advertising. He has had a long and successful career in the periodical press business in Canada with leading publishing houses. At one time Mr. McHardy was director of advertising for *Saturday Night* and the Business Newspaper Division of Consolidated Press Ltd. For many years he was director of advertising for Hugh C. MacLean Publications Ltd.

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For further data on advertised products use page 85.

● Paul Dixon, C. E. Smiley, A. K. Tateishi, with Sea Breeze Stereophonic Recording System at the recent demonstration held in the King Edward Hotel, Toronto

Seabreeze Appointed Canadian Rep By Livingston Electronic Corp.

Seabreeze Manufacturing Ltd. of Toronto, Canada, largest supplier of record playing and tape recording equipment in Canada, and Livingston Electronic Corporation of Livingston, N.J., have jointly announced the appointment of Seabreeze as exclusive Canadian outlet for a new line of stereophonic tape recordings to be issued under the newly created "Seabreeze Stereo" label.

Recognizing the imminence of a large scale demand for stereophonic sound in the home, Seabreeze and Livingston are programming a substantial library of stereophonic tape recordings, and consider this new arrangement a more efficient way to service the increasing requirements of the Canadian market. Consequently, Livingston will no longer service Canadian accounts, but will confine its activities in that market to the joint participation with Seabreeze in an accelerated expansion of the present stereo tape library.

Mr. Paul Dixon, vice-president in charge of marketing for Seabreeze, has indicated that stereophonic sound equipment for the home is one of the major factors in the production and merchandising plan by Seabreeze for the fall market, and expects to announce more than twenty outstanding stereophonic tape releases within the next six weeks.

It is significant that after five years of pioneering in the field of stereophonic sound, this is the first occasion when Livingston has become openly and actively identified with any related operation. Ched Smiley, president of Livingston, admitted to being so highly impressed by the maturity of planning and scope of the proposed Seabreeze operation that he immediately discarded all other plans for Canadian merchandising.

RMS Appoints Sol Budd & Associates For Canadian Warehouse

Edward E. Wineblatt, general manager of RMS Export Sales Corporation, 2016 Bronxdale Avenue, New York 62, N.Y., announced the appointment of Sol Budd & Associates, Ontario Rep to handle all Canadian stock including service and repairs.

For further data on advertised products use page 85.

Harold A. Cohen Appointed General Manager Of Quality Hermetics Limited

Harold A. Cohen, P. Eng., has been appointed general manager and vice-president of Quality Hermetics Limited, 45 Hollinger Road, Toronto, Ont.

H. A. COHEN

Mr. Cohen was, for many years, chief engineer of Stark Electronics Instruments Limited, and has also served on the staff of Electrical Engineering Department, University of Toronto.

A member of the Association of Professional Engineers of Ontario and the Institute of Radio Engineers, Mr. Cohen brings to Quality Hermetics Limited, manufacturers of glass-to-metal hermetic seals and components, extensive experience in engineering management and in application engineering in this comparatively new and growing field. All details relative to engineering sales for the manufactured products of Quality Hermetics Limited, are embraced in this new appointment.

Collins Radio Appoints A. Davies Director Of Sales

Collins Radio Company of Canada Ltd. announces the appointment of Anthony Davies as director of sales.

Mr. Davies recently arrived in Canada from Britain, where he terminated 10 years' service with Smiths Aircraft Instruments Limited, where he was technical sales manager. Prior to this, he served for 7 years with Sperry Gyroscope Company Limited, London, handling the sale and service of the U.S.A. parent company's Aviation products. Mr. Davies graduated from the College of Aeronautical Engineering, London, England.

A.C. Petrasek Named Sales Manager By Collins Radio

Collins Radio Company of Canada Ltd. announces the appointment of Albert C. Petrasek as sales manager of ground communications equipment.

Mr. Petrasek came to Collins Canada from the Texas Division of Collins, U.S.A. where he specialized in Microwave sales.

Previous to his association with Collins, he spent 7 years with the General Electric Company at Syracuse and New York City. His 17 years' experience in the electronics and communications field have contributed to radio projects throughout the world.

He is a senior member of the Institute of Radio Engineers.

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For further data on advertised products use page 85.

For further data on advertised products use page 85.

NEWS

(Continued from page 77)

W. F. Mayer Vice-President Of Measurements Corporation

Administration of plant and production of Measurements Corporation will be handled by William F. Mayer, who was elected, as of August 1st, to the office of Vice-President of Measurements Corporation by the Board of Directors of the Corporation.

Mr. Mayer will supervise the company's plant at Boonton, N.J. where they specialize in the manufacture of precise, measuring equipment for the electronic laboratory that is used for the development of radio, radar, television, communications, and military electronic equipment.

W. F. MAYER

Immediately prior to his appointment, Mr. Mayer served as production manager. Mr. Houck stated, however, that, with the general increase in the company's volume of business and with the introduction of a variety of improved and different products, the responsibilities of the office of production manager required an increase in administrative authority.

Microwave System To Link Victoria To Mainland

Victoria will be linked to the Mainland by a microwave radio relay system, designed to carry television programs, according to an announcement in Vancouver by W. S. Pipes, vice-president and general manager of B.C. Telephone Company.

The system, equipment for which is now on order, will consist of two links, from the telephone company's head office building in downtown Vancouver, to a point on Salt Spring Island, and thence to the company's Victoria headquarters building on Blanshard Street.

Mr. Pipes points out the new microwave path will be so arranged that it can be tied in with the 3800-mile system now being built across Canada, from Sydney, Nova Scotia, to Vancouver, scheduled for completion in 1958.

Although this Trans-Canada microwave system will be used to transmit television programs, it is being constructed primarily to provide additional long distance telephone circuits. On the other hand, the Victoria-Vancouver link will be used solely for television transmission.

Mr. Pipes said that the Victoria-Vancouver link will be completed well in advance of the overall Trans-Canada system, probably before the end of this year.

(Turn to page 80)

For further data on advertised products use page 85.

● Exchanging congratulations after receiving their diplomas from Western Radio Electronic Television Schools in Vancouver are 14 year old Larry Steed and 63 year old Bill Meyers, youngest and oldest of the 80 graduates. John Turner, Educational Director of W.R.E.T.S. noted that the duo were among the highest students in the courses. Larry had completed Grade 9 only one month previous. Bill is a veteran motion picture projectionist.

Digital Computer To Be In Operation At IRE Show

Computing Devices of Canada, pioneer in the field of electronic data processing in Canada, will have a digital computer set up and operating at the forthcoming IRE show in Toronto.

The computer is to be a Bendix G-15, a small, low-cost, general purpose digital computer. During the show it will be used to demonstrate the capabilities of digital computers in solving engineering problems.

Also at the CDC booth will be a Reeve analogue computer. The REAC 301, is a small brother of the REAC 400 soon to be installed at the CDC Data Processing Center in Ottawa. Though small and portable, it will do almost everything that the large model will do, lacking only in flexibility and range.

Landmark for the CDC exhibit will be a wing tip tank from a CF-100, supported from the ceiling over the top of the booth. It is one of several fitted out by CDC for the RCAF as a "Universal Instrumentation Package". The inside of the tank is completely rebuilt to carry two high speed motion cameras, a recorder, a radio receiver, and instruments to accurately measure the aircraft's altitude, airspeed, and course. Fitted to the wing tip of CF-100, it is equipped to record all of the pertinent details of airborne trials of aircraft and armament.

E. H. Edge Appointed By Collins Radio

Collins Radio Company of Canada Ltd. announces the appointment of E. H. (Ted) Edge, P. Eng. to the general communications sales department, specializing in microwave and scatter systems.

Mr. Edge graduated from the university of Toronto in 1950. Following graduation, he has worked as a design engineer with Canadian General Electric, and as a systems planning and sales engineer with Rogers Majestic Electronics Ltd. Mr. Edge is a member of the Ontario Association of Professional Engineers.

TV Technicians To Be Certified In British Columbia

Edmund Allen, Director of Apprenticeship and Tradesmen's Qualifications, B.C. Dept of Labor, stated in an interview following the graduation ceremonies for the first groups of technicians to complete the Western Radio Electronics Television School course, that radio, TV and electronic technicians in B.C. are to come under certification by the government. An Order in Council approving the granting of certification was approved recently by the B.C. government.

The certification will provide a standard of competence which should bring about the elimination of half trained technicians who do more damage than good when servicing the public's radio and TV sets. In addition to the better service it should provide, Mr. Allen expressed the hope that the certification would become a requirement of employers when hiring personnel.

Mr. Allen noted that the electronics industry in Canada is practically stalled, through a shortage of properly trained electronics technicians. When schools are able to turn out sufficient numbers of technicians with the proper training then design engineers will be able to make new developments available on a larger scale than at present. Today it is almost impossible to service what we already have, he said.

(Turn to page 82)

AMF Atomics (Canada) Limited Awarded Fuel Element Contract

Canada's peaceful atomic energy program will take a major step forward as a result of a long-term contract to fabricate fuel elements awarded to AMF Atomics (Canada) Limited by Atomic Energy of Canada Limited.

A new 30,000 square foot plant and nuclear laboratory will be built on a 30-acre site at Port Hope, Ontario, to carry out the contract, Denton Massey, general manager of AMF Atomics (Canada) Limited has announced. This will be the first unit of a large nuclear facility and will be staffed by Canadians. AMF Atomics (Canada) is one of the first private companies in Canada to be organized solely for nuclear research and development engineering.

It is expected to start construction of the new plant shortly, and to have it operating at full capacity early in 1957. The fuel fabrication plant will be the first unit of the nuclear engineering and manufacturing facility to be located in Port Hope by AMF Atomics (Canada). In time, it is hoped to develop in this Canadian nuclear laboratory, and supply from the plant, equipment for nearly every phase of

● G. Ernest Robertson, President of Leland Electric Canada Limited and senior executive of the American Machine and Foundry Company in Canada.

Canada's peaceful atomic energy program.

The plant will be on a site owned by AMF Atomics (Canada) in the new industrial area in the eastern part of the city on highway No. 2. In addition to fabricating fuel elements, the new plant will have a nuclear laboratory to conduct engineering, research and development on research and power reactors and their components and auxiliaries. The laboratory will also

For further data on advertised products use page 85.

provide engineering services to outside organizations.

The fuel elements manufactured by AMF Atomics (Canada) will be used in Atomic Energy of Canada Limited's large Chalk River facilities. These

● Denton Massey, General Manager of AMF Atomics (Canada) Limited. Mr. Massey was a Member of Parliament for Toronto, Greenwood, for fourteen years. During the past two years he has become one of North America's outstanding spokesmen on the peaceful uses of atomic energy.

elements form the "heart" of an atomic reactor. The Chalk River nuclear center includes the NRX nuclear research reactor, which has been in operation since 1947, and the NRU reactor which is scheduled to go critical this year.

"With the development of this new nuclear facility and the steady growth of other American Machine & Foundry Company operations in Canada, AMF is exploring actively fiscal and other processes necessary to expand and consolidate it's interests in Canada. This will provide for equity participation in the company by Canadians," said Mr. G. Ernest Robertson, another senior executive of AMF.

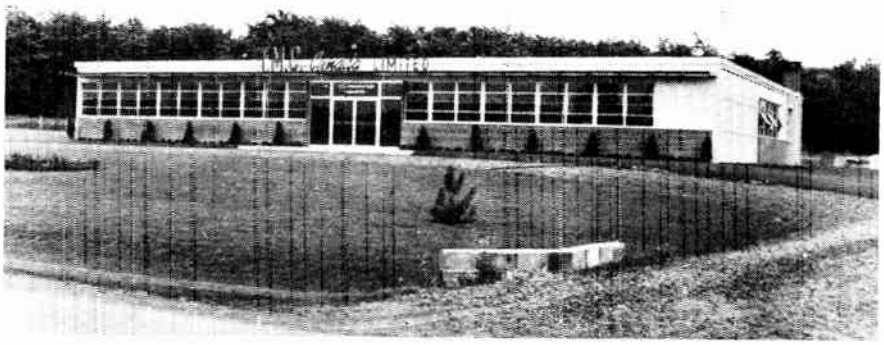
D. B. Mundy Electronics Director For D.D.P.

Announcement has been made by the Right Honorable C. D. Howe, of the appointment of D. B. Mundy to the position of director of the Electronics Branch of the Department of Defense Production. The appointment became effective August 1st.

Mr. Mundy has been Acting Director of the Electronic Branch of the department for the past several months.

Mr. Mundy has been with the Department of Defense Production since 1951 and from 1952 to 1954 served in Paris on the staff of the Canadian delegation to the North Atlantic Treaty Organization. On his return to Canada he became Director of the Ammunition Branch and took over the duties of Associate Director of the Electronics Branch in April 1954.

For further data on advertised products use page 85.



● Offices and plant of TMC Canada Limited operated entirely by Canadian personnel, a portion of it being owned by Canadians. During the 6 years that the company has been in business it has extended its facilities from a one-man operation to where it now employs some 40 people, including engineers, technicians, draughtsmen, factory personnel and office staff.

TMC Canada Limited Report Progress

Officers of TMC Canada Limited, have expressed their intention to add to their plant facilities, equipment and personnel to keep step with the general growth of the electronics and communications industry in Canada.

TMC (Canada) Limited was founded, organised and letters patent issued in September, 1950. Since then TMC (Canada) Limited has continued to provide the communications services and equipment required in industry and in the defense of Canada. It has enjoyed a steady growth to such a point that in 1952 it was necessary for the firm to move out of rented space in the heart of Ottawa and build a plant on the outskirts of that city. The company acquired several acres of land near the Uplands Airport on the River Road and constructed a modern factory of some fifteen thousand square feet to manufacture and sell the communications equipment already developed and manufactured by the parent company. Additionally, new developments and engineering of products and systems for the Canadian market are constantly being carried out.

The company is managed by Mr. D. V. Carroll, formerly in charge of Communications Engineering Division at Naval Headquarters and Mr. G. A. Worth, formerly director of Naval Communications, Royal Canadian Navy. Its chief engineer, Mr. W. A. Acton is an ex-Group Captain of the Royal Canadian Air Force, who was in charge of the Royal Canadian Air Force Communications Engineering Division at Headquarters during World War II. The company is enjoying steady progress and intends to add to its facilities in buildings, equipment and personnel to keep step with the general growth of the Electronics and Communications Industry in Canada.

TMC (Canada) Limited will be displaying its equipment at Booth 341, Canadian IRE Convention, Toronto, October 1st, 2nd, and 3rd, 1956.

Radionics Limited Appointed Exclusive Canadian Reps.

Radionics Limited of Montreal have been appointed exclusive Canadian representatives for Higgins Laboratories for their line of traveling-wave tubes and backward-wave oscillators it has been announced. In the same announcement S. H. Ungar, of Radionics Limited announces his company's appointment as exclusive Canadian agents for the Vacuum-Electronic Engineering Company, manufacturers of high vacuum equipment, including helium mass spectrometer leak detectors, valves, pumps, gages and systems.

INDEX TO ADVERTISERS

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INDEX — Continued

NEWS

(Continued from page 84)

ACME Electric Realigns Executives In Canadian And Cuba, New York Plants

William F. Koubek, becomes president and a member of the board of directors of Acme Electric Corporation, Ltd. of Toronto (an affiliate company) it has been announced. He succeeds E. A. Miller, who will continue as a member of the board of directors of the Canadian company.

W. F. KOUBEK

Mr. Koubek joined Acme Electric in 1932 when the firm was located in Cleveland, Ohio. When the Cuba, New York plant was opened in 1937, Koubek supervised the installation of production facilities and was in charge of the initial production of luminous tube transformers and radio transformers.

Karl Crease who has been with Acme Electric since 1951, steps up from assistant to general plant manager. Crease was born and educated in Australia, coming to the States in 1948. He became a naturalized citizen in 1954.

Ed Miller, who started with the company in 1930, will now again be able to concentrate his efforts on the work associated with his office as vice-president in charge of engineering.

N. Y. Transformer & Essex Electronics Join Forces

J. B. Schaefer, president of New York Transformer Company, Alpha, New Jersey. and B. M. Goldsmith, president of Essex Electronics, Berkeley Heights, New Jersey, have announced the recent acquisition of a substantial amount of Essex Electronics stock by New York Transformer Company for the purpose of expanding its product line.

At the present time, Essex Electronics maintains three manufacturing plants: one in Berkeley Heights, New Jersey, another in North Hollywood, California, and a third in Trenton, Ontario, Canada.

The pooling of this wealth of specialized development and manufacturing experience in the electronics field will greatly expand and improve the operations of both firms, and will bring together many decades of skilled transformer, inductor and coil design and manufacturing experience.

The new close association enables both companies to render services in

(Continued on page 89)

For further data on advertised products use page 85,

For further data on advertised products use page 85.

NEWS

(Continued from page 87)

design and production of both low and high frequency inductors and transformers which heretofore have not been available to the trade from any single source.

According to L. W. Elliott, general manager of Essex Electronics of Canada Limited, Trenton, Ontario, the recent acquisition of Essex Electronics by the New York Transformer Company will not mean any change to the Canadian operation in the immediate future. The Trenton company will continue as before to supply RF coils and transformers to the radio and television industry together with such special products as delay lines and pulse transformers.

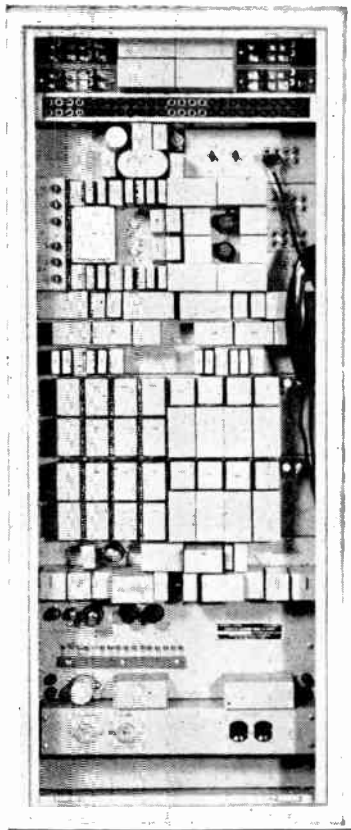
General Instrument Adds New Canadian Division

In a move which makes it "the largest manufacturer of television, radio and electronic components in Canada," General Instrument Corporation has acquired — through its Canadian subsidiary, General Instrument — F. W. Sickles Company of Canada, Ltd. — all the outstanding stock of T. S. Farley, Ltd., of Hamilton, Ont., the Dominion's oldest and largest producer of radio and television coils, it has been announced by M. H. Benedek, general instrument board chairman. General Instrument — F. W. Sickles of Canada, with headquarters and plant at Waterloo, Ont., is the major producer of TV tuners, yokes, flybacks and other components for most of Canada's leading television set makers, and the acquisition gives it the "broadest line of TV parts made by any Canadian firm," it was stated.

The Farley company, Mr. Benedek said, will retain its identity and will be operated as a separate division with present personnel retained. Theodore S. Farley, former president, continues with the company as a consultant and Lloyd R. Harris remains as vice-president and general manager.

It is planned that the engineering know-how of both General Instrument's Canadian divisions will now be shared in the development of electronic components especially for the Canadian market. Both Canadian divisions, it was stated, will have the benefit of the research and development work of the parent company, General Instrument Corporation, which is one of the largest producers of radio, television and electronic components in the United States.

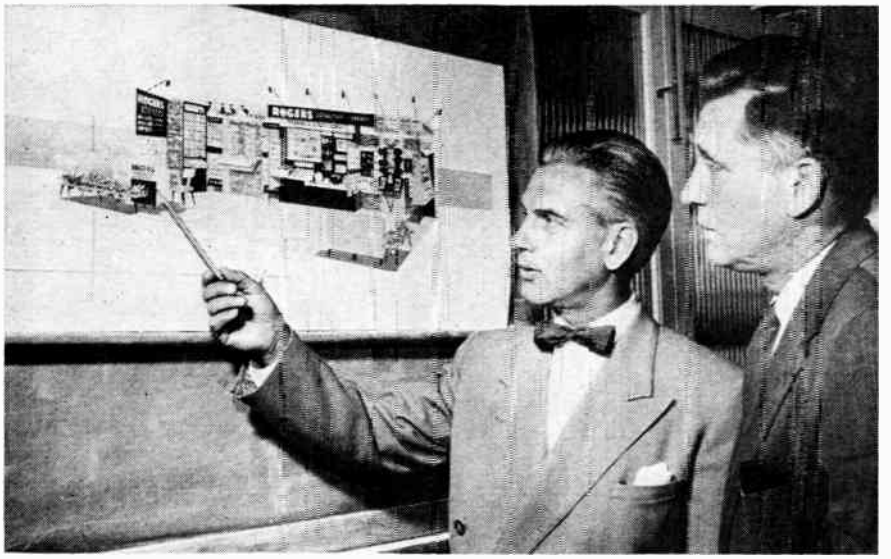
For additional information on advertisements, use coupon page 85.



TELEPHONE REPEATER TYPE TA-289/FCC

This is a packaged voice-frequency repeater adapted for use on almost any type of two-wire or four-wire line facility. The principal components are amplifiers, hybrid circuits and balancing networks. It also includes line protectors, monitoring telephone set, d-c telegraph composite sets, adjustable line equalizers, v-f signal converter type CV-339/FCC, and rectifier for a-c operation. It has a maximum net gain of 24 db on 2-wire circuits and of 30 db on 4-wire circuits, between nominal 600 ohm impedances.

Type TA-289/FCC Repeater, Telephone, manufactured for the U.S. Army Signal Corps. This is a recent redesign of the type OA-7/FC Repeater, Telephone, and is moisture- and fungus-proofed. It meets all applicable MIL specifications.



● Recent world advances in broadcasting, industrial and special purpose tubes will be featured by Rogers Electronic Tube & Components at the I.R.E. Convention Show in the CNE's Automotive Building. Photo shows Morley C. Patterson, the organization's General Manager, and G. G. Armitage, Sales Manager, Special Products, examining final designs for handsome green and gold booth.

Rogers Majestic Electronics Ltd. Plan Interesting Exhibit

Audience participation shows dramatizing uses of industrial television, radio paging devices and other electronic equipment will be among the highlights of a Rogers Majestic Electronics Limited exhibit at the Institute of Radio Engineers' Fall Convention, October 1st to 3rd.

The Rogers Majestic exhibit is designed to reflect recent world progress in the electronic equipment industry. In addition to electronic communication products it will feature the newest Philips electron microscope, sound systems, impulse generators and a broad array of other scientific and industrial equipment marketed by the Leaside, Ontario, company. The specially constructed booth, executed in a modern design involving a dynamic use of lighting and color will occupy a 50 foot frontage in the CNE's Automotive Building.

A second exhibit, now being constructed by Rogers Electronic Tube & Components, will also be on view at the Convention. It will feature recent advances in broadcasting, industrial and special purpose tubes, developed by Rogers and leading electronic manufacturers and laboratories in Britain, Europe and the United States.

R. W. Keeley Vice-President Of 3M's International Division

Roy W. Keeley, former director of sales of Minnesota Mining and Manufacturing of Canada Limited, has been appointed vice-president and general sales manager of 3M's International Division, St. Paul, Minnesota. He will be leaving the Canadian company to assume his new position early this fall.

R. W. KEELEY

Mr. Keeley has been with 3M and associated companies in Canada since 1932 and for the past two years he was director of sales for Canadian 3M. In this position he was responsible for the sales of "3M" Tapes, Abrasives, Adhesives, Reflective Materials, Graphic Products and Electrical Insulation Products across Canada.

For further data on advertised products use page 85.

Alex L. Clark Appointments Announced

Mrs. Alex. L. Clark, President of Alex. L. Clark Limited, has announced the promotion of W. G. Farrow to Vice-President and Manager, and the appointment of R. B. Mackenzie to Vice-President, Sales, September 1st, 1956.

W. G. FARROW

R. B. MACKENZIE

Mr. Farrow has been with Alex. L. Clark Limited for four years as Sales Manager. Mr. Mackenzie, a graduate in electrical engineering, University of Alberta, joins the company with ten years in sales management.

CLASSIFIED

ENGINEER

AN OUTSTANDING OPPORTUNITY exists for a senior experienced electronics engineer who wishes to join a fast-growing Canadian Electronics Company.

The person chosen will be responsible to the Directors for guiding and developing Company policy in the field of commercial engineering products. His duties will range from preparing quotations against open tenders for Government Departments to investigating the possibilities and then directing and assisting in the development of new proprietary lines of equipment. He will also be responsible for ensuring that the Sales Division has adequate advanced engineering support. He will be supported as necessary by the Project and Works engineers.

The post is not in this area and the person concerned must be willing to relocate.

The salary paid will be commensurate with the important responsibilities involved. Replies will be treated in the strictest confidence and should be sent to Maclaren, Laidlaw, Corlett and Sherwood, Barristers, 48 Sparks Street, Ottawa, Ontario. Any person not wishing his reply to be forwarded to a particular Company, can ensure this by writing the name of that Company on the back of the envelope.

FOR SALE

General Radio 804B signal generator — $100.00.

Box 73
Electronics & Communications
31 Willcocks St. - Toronto 5, Ont.

For further data on advertised products use page 85.

For further data on advertised products use page 85.

NEW PRODUCTS

New Product specifications published in Electronics and Communications have been briefed for your convenience. If you require further information on any of the items published you may readily obtain such by using our Readers' Service, Page 85. Just mark the products you are interested in on the coupon on Page 85 and the information will be in your hands within a few days.

● *Model 1000 Dyna-Scan Video - Generator*

Item 1211

Complete, self-contained Flying Spot Scanner. Produces a composite video and sync signal that operates any standard VHF black and white or color TV receiver. Merely by placing a slide film transparency in front of the scanning tube, any picture or pattern is completely reproduced with high definition on the TV set. Can be used with a single monitor or any number of standard TV sets, or fed into a master antenna system. Resolution capability is well in excess of 400 lines.

Simplifies and speeds servicing. Makes it easy to reproduce the standard INDIAN HEAD test pattern, or any other pattern, anytime, anywhere — in home, shop or store — for proper TV set alignment. Enables you to make all color TV static and dynamic convergence adjustments with stable WHITE DOT and WHITE LINE patterns.

Provides closed-circuit TV systems with unlimited range of original subject material for merchandising, advertising and industrial use. Enables anyone to transmit and reproduce pictorial or graphic material in stores, schools, plants, offices, hotels and institutions. May also be used as a video paging system to project typed or written messages.

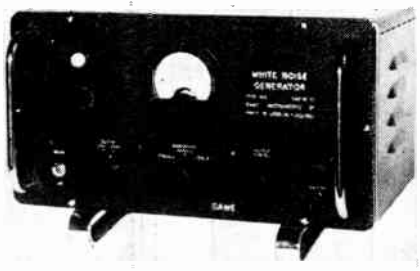
RF carrier output is continuously variable from 50,000 microvolts to below 100 microvolts for testing fringe area TV receiver sensitivity. Built-in synchronized bars make the Model 1000 self calibrating, and insure perfect vertical and horizontal linearity. Can also be used as a square wave generator for video amplifier trouble-shooting.

Simple to use. Just attach RF output cable of DYNA-SCAN to antenna terminals of TV receiver. Compact, portable. Rugged steel hammertone finished case with etched 1 5-inch flying spot scanner tube; 8 other aluminum front panel. Has special 5BKPV-tubes and 2 rectifiers. Front panel controls: Off-On calibrating bars switch; RF tuning; video gain; horizontal hold; and RF attenuator. Fully fused. Power: 150 watts. Operates on 110-120 volt 60 cycle A.C. Supplied with transparencies of Indian Head, White Dot and White Line patterns, and 6 ft. RF cable. Size: 16½-inches long, 10⅜-inches high, 9½-inches wide. Net weight 28 lbs.

● *White Noise Generator*

Item 1212

The White Noise Generator provides electrical noise uniform in level over wide frequency bands. Three bandwidth ranges are provided, covering 30 c/s to 20 Kc/s, 30 c/s to 500 Kc/s and 30 c/s to 5 Mc/s respectively. The 20 Kc/s audio frequency band can be used for testing the acoustical



properties of rooms, loudspeakers and microphones tests and the frequency response and the dynamic range of audio amplifiers. The 500 Kc/s and 5 Mc/s bands can be used for receiver interference tests, cross-talk investigations on multi-channel carrier telephony, determination of resonances in complex networks and for filter tests. The instrument can also be used to demonstrate some concepts of statistical theory such as various degrees of correlation and possible errors of random sampling. Coarse and fine output level controls are provided and an output meter is incorporated to read directly the R.M.S. noise level applied to the load. The maximum output voltage is 1 volt R.M.S. The average spectrum level for one cycle band at 1 volt R.M.S. is 6 mV. on range 1, 1 mV. on range 2 and 0.5 mV. on range 3. The output impedance is approximately 1,000 ohms.

● *1,000 Volt Silicon Diode*

Item 1213

This 1,000 volt diode is one of a series of high voltage silicon diodes now available in production quantities. The diode is especially designed for power applications where high ambient temperature, reliability, high efficiency and miniaturization are prime factors.

These high voltage diodes are available in peak inverse voltage classifications of 600 v, 800 v and 1,000 v, with half wave d.c. output currents of 125 ma at 75°C. ambient temperature. The operating temperature range is from minus 55°C. to plus 150°C. ambient. The diodes occupy a volume of only $\frac{1}{10}$ cubic inch ($\frac{3}{8}$ inch dia. x $\frac{5}{8}$ inch long) and are provided with pigtail leads to facilitate easy wiring into crowded chassis.

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For further data on advertised products use page 85.

For further data on advertised products use page 85.

NEW PRODUCTS

(Continued from page 93)

• *Thermal Conductivity Gage*

Item 1214

A new type of Thermal Conductivity measuring instrument is announced. This instrument is a major improvement over the resistance type units widely in use for determining the thermal conductivity of gases in that this new instrument, based on the patented Hastings compensated thermopile principle, allows more accurate measurements to be made without the instability and temperature effects of the older resistance type instruments.

The Hastings Thermal Conductivity Cell incorporates 6 noble metal thermocouples, arranged in such a manner as to not only compensate for temperature changes in the gas, but also for rate of change of temperature effects. These thermal conductivity elements are made entirely out of noble metals, are directly heated with A.C. and have an electrical output directly in terms of millivolts. The instrument is ideal for use in chemical analysis of gases and in detection of explosive gases and vapors. When used with gases of high thermal conductivity, such as helium, this thermal conductivity measuring instrument can be used as a tracer.

• *Model 750 Test Equipment Calibrator*

Item 1215

New, low-cost, laboratory-type Calibrator with accurancy of 1 per cent or better in all of its sections. Quickly, easily checks the accuracy of test instruments and helps make correct adjustments. Prevents wrong decisions and costly recalls caused by instrument errors, in receiver servicing. Convenient and economical, too, for laboratory and industrial calibration.

Calibrates volt-ohm milliameters, vacuum-tube voltmeters or any individual meter, signal generators, sweep generators, marker generators, and oscilloscopes. Remarkably trouble-free — requires no internal adjustments in the field.

Supplies 2, 5, 25, 100 and 300 volts D.C., and 5, 25, 100 and 300 volts A.C. to check voltage ranges. Provides 10, 100, 1000, 10,000, 100,000 ohms and 10 megohms to check resistance ranges. Provides a crystal oscillator capable of generating harmonic frequencies of the crystal well over 300 mc, with accuracy of 1/10th of 1 per cent. By plugging in the proper crystal, you can use it as a marker generator in radio and television receivers, or help check the calibration of your AM signal generator, or check and align the audio I.F. system of TV receivers.

Crystal oscillator and pentode amplifier of the Calibrator can be converted into an audio oscillator to signal-trace trouble in audio amplifiers in AM, FM and TV receivers, and high fidelity equipment.

Serves as a voltage Calibrator for oscilloscopes in the measurement of peak-to-peak voltages of any unknown waveforms such as are found in TV receivers.

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For further data on advertised products use page 85.

NEW PRODUCTS

(Continued from page 95)

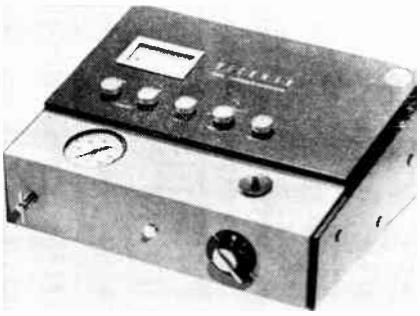
• *Gas Chromatograph*

Item 1216

A new instrument employing the rapid technique of gas chromatography has been announced.

Called the Gas Chromatograph, the instrument is small, compact and low-priced, and designed especially for the analysis of gases and low-boiling liquids. Despite its small size, the Gas Chromatograph is a precision unit, giving accuracies equalling even the highest priced gas chromatography instruments for materials boiling to 80°C. or below.

The chromatographic columns are copper tubing with standard fittings, and are easily removed. Columns of any length can be used in either absorption or partition type.



Samples are admitted through a standard serum cap or by a unique sampling valve available as an accessory. A stream of helium "carrier" gas passing through the column sweeps the sample components out at different times depending upon their affinity for the absorbing material in the column.

The volume of each component gas coming from the column is measured by a diffusion type thermal conductivity cell which combines fast response with excellent stability.

A one millivolt potentiometer recorder with 1 second response can be connected to the Gas Chromatograph for permanent recordings of sample volume.

• *Electromechanical Switches*

Item 1217

Several types of electromechanical switches, originally designed and built for service in telephone systems, now are being made available for industrial applications, according to an announcement.

The switches include two general types — automatic stepping switches, and key switches for manual operation.

Principal among the stepping switches is the famous XY Universal Switch, used in thousands of dial telephone exchanges in this country and abroad. The XY Universal Switch is a two-motion, 100-point step-by-step switch deriving its name from the fact that it operates over 10 points in a primary direction, and 10 points in a secondary direction. It can be used for searching through 100 four-wire circuits to find a particular circuit, for selecting a particular circuit from among 100 circuits, or for performing consecutive operations in 100 separate circuits.

Similar but smaller is the XY Deca Switch, providing 10-point selection among 10 four-wire circuits.

Among the key switches are a wide variety of cam key, indicating, plunger, push and twist button types, with locking and interlocking features if desired. Suitable mountings for single or multiple key arrangements of any type also are available.

All of these products have been proved for reliability and long, trouble-free operation through many years of service in telephone systems.

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For further data on advertised products use page 85.

For further data on advertised products use page 85.

NEW PRODUCTS

(Continued from page 97)

● *High And Low Temperature Test Chamber With Vibration Facility*

Item 1218

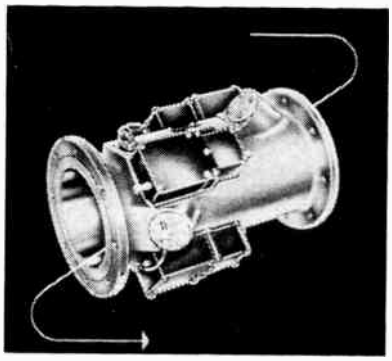
The Model FBV-8-3-3 Temperature-Vibration Chamber is designed with a flexible diaphragm in the bottom. This allows an M-B Manufacturing Company, or Calidyne and other similar types of vibration exciters, to be installed below the cabinet with the shaker head connected directly to the product inside of the cabinet. This eliminates the need for extension rods and, also, eliminates the need for having the vibration machine inside of the environmental chamber.

The cabinet is portable and can easily be moved to position above the vibration machine. The temperature range is plus 480°F. to minus 100°F. The equipment has a Conrad Cascade Freon 13 — Freon 22 system. The equipment is a standard production model, and available with custom designed accessories for specific applications.

● *Ultrasonic Flowmeter*

Item 1219

Simultaneous readout of mass flow rate, mass totalization, volumetric flow rate, volumetric totalization, and fluid density can now be obtained in a simple, direct-reading instrument especially designed to measure fluid flow accurately, at high transfer rates, as in fuel gaging for aircraft and missiles.



This new instrument utilizes ultrasonic energy to determine the volume or the mass of fluid passing through a smooth-bore sensor that interposes no obstruction to free flow of the fluid and therefore causes no additional pressure drop. The instrument illustrated will handle up to 720,000 pounds or 90,000 gallons of jet fuel per hour at an accuracy of 1 per cent. Accuracy is independent of changes in fluid density. The unit operates equally well for either direction of flow and over wide temperature ranges. No moving parts are employed.

The sensor for a four-inch line is only ten inches long and weighs only ten pounds. The unit is designed to operate from the aircraft electrical supply, with modest power demands. Linear readouts of any desired quantity or combination of quantities can be made on any convenient type of indicator or recorder, remote from the sensor; information can be telemetered with suitable coupling circuitry.

● *Precision Needle File Kit*

Item 1220

Made in Switzerland, these high grade carbon steel files are 5½ inches long. There are seven individual shapes: round, half-round, flat, square, oval, triangular, and knife edge, and all have No. O cutting surface. Separated for easy selection these files are packaged in an attractive, sturdy plastic tube and are a great aid to servicemen, hams and the do-it-yourself hobbyist.

(Turn to page 100)

For further data on advertised products use page 85.

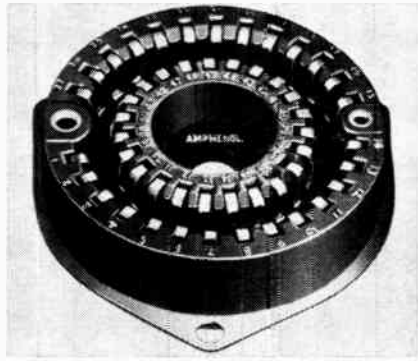
NEW PRODUCTS

(Continued from page 100)

• *Fifty Contact Circular Connectors*

Item 1224

These 50 contact circular connectors were originally developed for a special avionic application where the unique ribbon contact features were desired but space limitation prevented the use of standard rectangular connectors. They have since been used in countless other applications where the quick, easy making and breaking of 50 circuits is required. Available in the line are plug, receptacle and hermetic compression sealed plug.



The most striking design feature of these connectors is the large number of contacts obtained in the relatively small size. The diameter is just under 3 inches.

Polarization is achieved by means of a pin and socket arrangement plus a center guide pin and bushing.

The 26-167-50 hermetic seal plug has an individual glass bead for each contact. The glass is bonded to the seal plate under compression, the most efficient sealing method. Connectors are completely inspected and tested before shipment.

Bodies are molded of diallyl phthalate and contacts are goldplated.

Voltage rating is 5 amps, 750 volts DC at Sea Level and 300 volts DC at 60,000' altitude.

• *High Temperature Accelerometer System*

Item 1225

The development of a new high temperature accelerometer system that will open new avenues in the field of environmental testing is announced. The system, designated GLENNITE KAHT-310 is comprised of an accelerometer and external cathode follower, will measure shock and vibration phenomena at temperature up to 300°F. without external cooling.

This subminiature system has a frequency response from 10 to 2000 c.p.s. and acceleration range up to 300 g's. Sensitivity is 20 microvolts per g, output impedance 200 ohms, while accuracy is 5 per cent.

• *Relay Catalog*

Item 1226

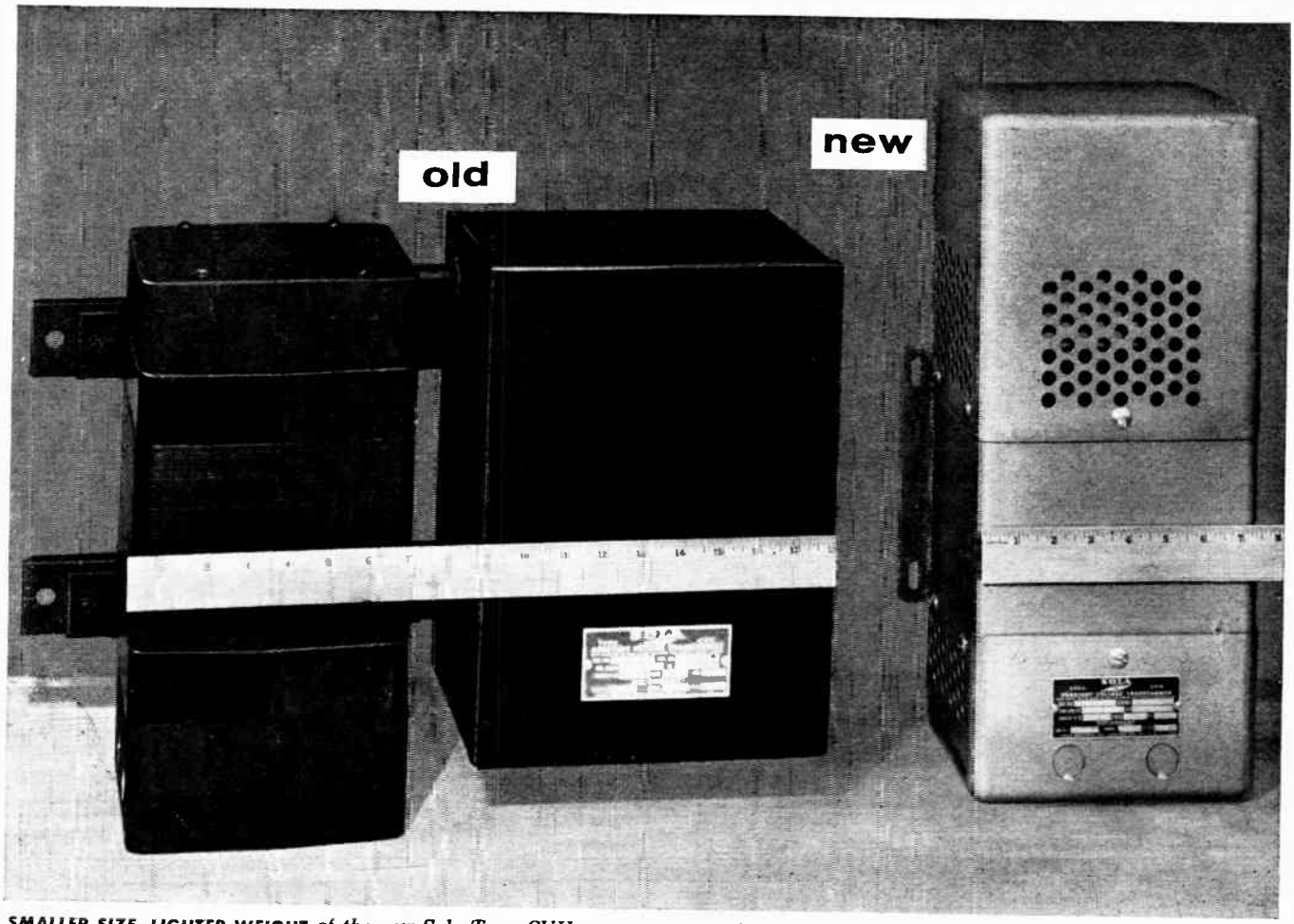
The Relay Division of a large company are pleased to announce the availability of their new 32 page catalog J.

This catalog is the most complete relay catalog available in Canada and covers 5,348 relay types. Besides the standard types such as Power, Small, Sensitive, Large Sequence, Instrument Control, Special Purpose and Timers, the Relay Division of this company are prepared to manufacture any type of relay requirement.

For Canadian industrial companies with relay requirements, the catalog is invaluable in that it not only gives a general description but complete information in regard to contact arrangements, contact ratings, insulation, operating coils, terminals, mounting, size, etc. together with many illustrations.

(Turn to page 104)

For further data on advertised products use page 85.



SMALLER SIZE, LIGHTER WEIGHT *of the new Sola Type CVH regulating transformer design is shown by the comparison of 1000va units shown above. The new unit shown at the right utilizes a single. rectangular housing that replaces the core-and-coil-assembly and separate neutralizer component. Also available in the new design are 250 and 500va capacities. Finish is gray hammerloid.*

New Sola Harmonic-Neutralized Constant Voltage Transformers greatly reduced in size and weight

Now the valuable performance features of the Sola Harmonic-Neutralized Constant Voltage Transformer (Type CVH) are offered in a new unit design that provides up to 60% reduced size and 54% lighter weight. In addition to significant size and weight reductions, the new Sola Type CVH regulator design provides the lowest external field of any stock static-magnetic stabilizer available.

Essentially, electrical characteristics of the new Type CVH regulator are unchanged. Stabilization is ±1% regardless of primary voltage swings over a newly-expanded range of 95-130 volts. Sinusoidal output is delivered with less than 3% harmonic distortion at rated load. The nominal output rating has been raised to 118 volts to correspond with similar input reratings of electronic and other equipment.

Sola harmonic-neutralized regulators may be used for the most exacting applications with equipment having elements which are sensitive to power frequencies harmonically related to the fundamental. They are especially suitable for input to a rectifier when close regulation of the dc output is required.

New design Sola Type CVH regulators are available in three capacities — 250, 500, and 1000va. For specific advice on your particular application, consult your Sola representative listed below.

SOLA *Constant Voltage* **TRANSFORMERS**

Request Explanatory Circular

SOLA ELECTRIC CO.
4633 W. 16th Street
Chicago 50, Illinois

CONSTANT VOLTAGE TRANSFORMERS • FLUORESCENT LIGHTING BALLASTS • MERCURY VAPOR LIGHTING TRANSFORMERS
SOLA ELECTRIC CO., 4633 West 16th Street, Chicago 50, Illinois, Bishop 2-1414 • NEW YORK 35: 103 E. 125th St., TRafalgar 6-6464
PHILADELPHIA: Commercial Trust Bldg., RIttenhouse 6-4988 • BOSTON: 272 Centre Street, Newton 58, Mass., Bigelow 4-3354 • CLEVELAND 15:
1836 Euclid Ave., PRospect 1-6400 • KANSAS CITY 2, MO.: 406 W. 34th St., Jefferson 4382 • LOS ANGELES 23: 3138 E. Olympic Blvd., ANgelus
9-9431 • SOLA ELECTRIC (CANADA) LTD., TORONTO 17, ONTARIO: 102 Laird Drive, Mayfair 4554 • Representatives in Other Principal Cities

For further data on advertised products use page 85.

NEW PRODUCTS

(Continued from page 102)

● *New Power Meter Available*

Item 1227

A new power meter designated the Type HB UHF Variload Power Meter has been announced. It has a terminating resistance adjustable to any value between 40 and 100 ohms, and a direct reading 0-60 watts at either 50 ohms or 75 ohms terminating resistance (93 ohms on request).

It is ruggedly made (no fragile metal film) and has an easily replaceable ferrite dissipating element. The power monitoring element is a Type 21B silicon crystal and Type N connectors (50 ohms and 75 ohms) are normally supplied. In addition, 93 ohm connectors are available on request.

The frequency range of the meter runs from 200 to 500 Mc/s., and the VSWR at any resistance setting is 1.2. The power range 0-60 watts is single scale with lower value on an expanded scale. For example, 4W gives 25 per cent deflection. Power reading accuracy is plus or minus 6 per cent.

● *X-521 Backward Wave Oscillator*

Item 1228

The X-521 Backward Wave Oscillator is the first of a series of microwave vacuum tubes to be announced by this Corporation. This new line of tubes represents a significant advancement in construction technique and production methods and makes it possible to achieve improved performance characteristics. This Corporation has already demonstrated its engineering ability in the field of ferrite containing microwave devices including the Uniline Load Isolator, the Gyraline Amplitude Modulator and special purpose equipment. The same engineering ingenuity is demonstrated in the design of this radically different microwave oscillator. This tube is new from concept to completion and involves precision punch press techniques, modern ceramic techniques, special advanced soldering and evacuating methods. Tube assembly is accomplished in special clean areas which incorporate the latest ideas in clean room design.

The principal features of this tube are:

(1) The frequency of oscillation is variable over the entire X-band by the adjustment of the second anode voltage. No mechanical tuning is necessary.

(2) The power output of 1 watt makes it ideally suited for microwave measurements, for test purposes and for microwave relay applications.

(3) Frequency of oscillation is relatively unaffected by the load.

(4) It operates at a nominal 6 per cent efficiency which is better power utilization than can be obtained with most low power oscillators.

(5) The tube is of extremely rugged mechanical construction. It is made entirely of ceramic and metal parts. It has no fragile glass parts or precision wound helicies.

Specifications

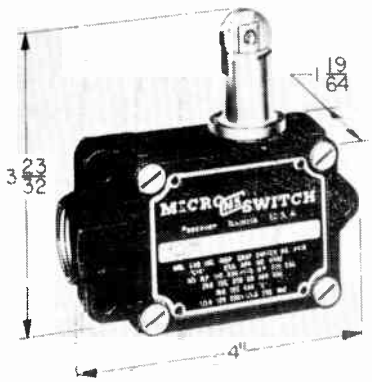
Frequency, 8-13 kmc; Power Output, 1 Watt minimum; First Anode Voltage (to cathode), 1500 Volts; Second Anode Voltage (to cathode), 500 - 1500 volts; Beam Current, 30 milliamperes; Focusing field, 1100 Gauss; Heater Voltage, 6.3 volts; Heater Current, 0.6 Amperes; Eestimated Tube Weight (including magnet), 15 lbs.

For further data on advertised products use page 85.

● *Sealed Roller Plunger High Capacity Switch*

Item 1229

The micro switch division of a large regulator company announces a new completely sealed, roller plunger, high capacity switch. Catalogued BAF1-2RON8, this switch will handle inrush currents as high as 75 amperes.



Special integral O-ring seals around the bushing and plunger, and a ring type seal between the cover and housing, make this switch entirely oil tight. The actuator is field adjustable through 360° to allow operation from any direction. The rugged corrosion-resistant, long-wearing steel roller and heavy plunger bushing are built to withstand the severe abuse of rapid cam operation. Although the enclosure is compact, ample wiring space and side facing screw terminals allow easy and fast installation.

The switching unit is protected from physical damage by a sturdy aluminum enclosure, which provides a means for mounting and for conduit connection. The switch is available with the actuator positioned either to the right, or to the left.

Underwriters' Laboratories list the BAF1-2RON8 at: 20 amperes 125, 250 or 460 volts a-c; ½ ampere 125 volts d-c 2 h.p. 230 volts a-c; 10 amperes 125 volts when controlling tungsten filament lamp loads on a-c circuits.

Contact arrangement is single-pole double-throw.

● *Temperature And Level Control*

Item 1230

This instrument operates on the principle of electrical capacitance, or measuring changes in the invisible electrical field located between the specimen and the electrode of the instrument. The electrical field is set up in the air by the instrument, which then accurately measures any changes in it.

Used in situations demanding a high degree of accuracy, some capacitance-type instruments can determine variations as small as one millionth of an inch, or temperature changes of one thousandth of one degree.

One electronic device is designed to control the temperature in as many as 100 different steps of a manufacturing process. Should trouble develop in the process, the device will stop the production line, signal an attendant and locate the difficulty. It can also be set up to bring about self correcting action automatically.

Another of the instruments called a multipoint recorder is capable of putting down on a twelve-inch circular chart, electronic impulses received from ninety-six remote sources.

There are eight controls in this series, mounted on a portable display set up to operate. This traveling exhibit has appeared in fifty cities in the U.S. and the company estimates more than 1,000 controls experts have seen it.

(Turn to page 106)

For further data on advertised products use page 85,

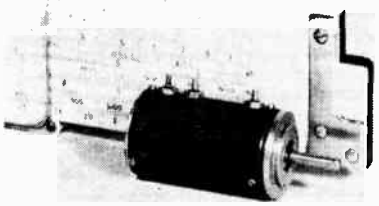
NEW PRODUCTS

(Continued from page 105)

● 7/8" Diameter 1-Turn Potentiometer

Item 1231

This new Model LA09 10-turn potentiometer is especially designed to meet critical demands for reliability in military electronics equipment.



The 7/8 inch diameter potentiometer is built with a rugged all-metal external construction . . . sturdy metal-to-metal stops . . . precision stainless steel ball bearings . . . and glass-sealed terminals positively seated to the metal housing to provide mechanical reliability and a low leakage path. Terminals are gold-plated for excellent solderability.

Resolution as close as .008 per cent is the result of winding a large number of turns of resistance wire on a mandrel 17 per cent longer than in previously available potentiometers. Linearity is held as close as .05 per cent. All connections are welded. Taps are welded to a single turn of resistance wire.

● High Vacuum Equipment Catalog

Item 1232

A large manufacturer of nuclear test equipment announces the availability of a 75 page bound catalog describing the wide range of equipment produced by the company. The catalog which is available on request will be of paramount interest to engineers engaged in the field of nucleonics. The catalog sets forth specifications for such equipment as leak detectors, leak test manifolds, vacuum process systems, high vacuum valves, solenoid vacuum valves, non-burnout ionization gages, diffusion pumps and many other types of relative equipment.

● New Paper Base Laminate Resists Arcing And Flame

Item 1233

A new paper base laminate featuring superior arc and flame resistance is available in production quantities. Identified as Phenolite Y-2500, it is bonded with a modified phenolic resin that gives fire resistant qualities for superior service in electrical and electronic applications.

While its general properties correspond to NEMA Grade XX, National's new Phenolite Y-2500 also provides arc resistance up to 100 seconds. The new material punches and shaves better than any melamine paper base laminates presently used for arc-resistant applications. As a self-extinguishing laminate, it passes the standard Underwriters Laboratory flame test.

Recommended for use where arc and flame resistance are of primary importance and where economy is a factor, Phenolite Y-2500 laminate is particularly suited for such applications as: arc deflectors, circuit breaker components, electrical switches and other interrupting devices.

Phenolite Y-2500 is available in sheet sizes of 39 by 47 and 39 by 39 inches and in thickness from .015 to 1.0 inch. It comes in a standard semi-gloss and a special dull finish in either natural (light brown) or red.

(Turn to page 112)

For further data on advertised products use page 85.

For further data on advertised products use page 85.

Heathkit HARMONIC DISTORTION METER KIT

MODEL HD-1

$49.50

Shpg. Wt. 13 lbs.

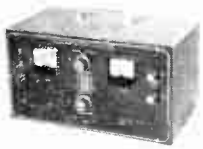
Use with low-distortion audio generator to measure harmonic distortion of audio amplifiers. Reads distortion on meter as percentage of input signal. Operates between 20 and 20,000 cps. High impedance VTVM built in for initial reference settings and final distortion readings. VTVM ranges are 0-1, 3, 10, and 30 volts full scale. 1% precision resistors employed. Distortion scales are 0-1, 3, 10, 30, and 100% full scale.

Heathkit 6-12 VOLT BATTERY ELIMINATOR KIT

MODEL BE-4

$31.50

Shpg. Wt. 17 lbs.



Will supply either 6 or 12 volt output to take care of auto radios on even the most modern cars. Output voltage is variable from zero to 8 volts DC or 0 to 16 volts DC. Will deliver up to 15 amperes at 6 volts or up to 7 amperes at 12 volts. Two 10,000 microfarad output filter capacitors insure smooth DC output. Panel meters monitor output current and voltage. Will double as a battery charger.

HEATHKIT AUDIO TEST EQUIPMENT

You can equip your shop for complete analysis and test of high fidelity audio equipment by employing Heathkit instruments. Professional equipment you can afford!

AUDIO OSCILLATOR KIT (SINE-WAVE – SQUARE WAVE)

MODEL AO-1

$24.50

Shpg. Wt. 10 lbs.

Produces sine wave or square wave signals from 20 to 20,000 cps in three ranges. Designed for use in service shop, or home workshop. Employs thermister for output regulation. Features high level output, low distortion, and low impedance output. Produces sine waves for audio testing, or will produce good, clean square waves with a rise time of only 2 microseconds. Very simple to build from complete instructions supplied.

Heathkit HANDITESTER KIT

This compact model easily slips into tool box, glove compartment, or coat pocket. Valuable as "extra" instrument in service shop, and ideal for the home experimenter. Very popular with appliance repairmen and electricians. Measures AC or DC voltage at 0-10, 30, 300, 1000, 5000 volts full scale. Direct current ranges are 0-10 ma and 0-100 ma. Attractive black bakelite case. Ohmmeter ranges are 0-3000 and 0-300,000 ohms.

MODEL M-1

$14.50

Shpg. Wt. 3 lbs.

Heathkit VARIABLE VOLTAGE REGULATED POWER SUPPLY KIT

MODEL PS-3

$35.50

Shpg. Wt. 17 lbs.

Supplies regulated DC output that can be manually controlled from 0 to 500 volts. It will supply up to 130 ma at 200 VDC, and up to 10 ma at 450 VDC. Large panel meter monitors output voltage or current. Also provides filament voltage at 6.3 volts AC, up to 4 amperes. Filament and B+ circuits are isolated from ground. Ideal lab power supply.

AUDIO GENERATOR

MODEL AG-9

$34.50

Shpg. Wt. 8 lbs.

This generator features low distortion (less than .1%). Ideal for use with Model HD-1, or in other applications requiring low signal distortion. Frequency accuracy within ±5%. Features step-type tuning from 10 cps to 100 kc, with three rotary switches to provide two significant figures and a multiplier. Output monitored on a large 4½" meter. Meter calibrated for output voltage or db. Output ranges are—.003, .01, .03, .1, .3, 1, 3, and 10 volts.

Heathkit "Q" METER KIT

The Model QM-1 measures the Q of inductances and RF resistance and distributed capacity of coils. Employs a 4½" 50 microampere meter for direct indication. Features built-in signal source for tests at frequencies of 150 kc to 18 mc in 4 ranges. Measures capacity from 40 mmf to 450 mmf within ±3 mmf. Indispensable for coil winding, and for determining unknown capacitor values.

MODEL QM-1

$44.50

Shpg. Wt. 14 lbs.

Heathkit IMPEDANCE BRIDGE KIT

MODEL IB-2

$59.50

Shpg. Wt. 12 lbs.

Features a built-in oscillator and amplifier. Measures resistance, capacitance, inductance, dissipation factors of condensers, and storage factor of inductance. D, Q, and DQ functions combined in one control. Employs ½% resistors and ½% silvermica capacitors. 100-0-100 ua. meter indicates null. Two section CRL dial provides ten separate units with accuracy of .5%. Fractions of units read on variable control.

AUDIO ANALYZER KIT

MODEL AA-1

$59.50

Shpg. Wt. 13 lbs.

This combination instrument provides the functions of an AC VTVM, audio wattmeter, and intermodulation analyzer. Includes built-in high and low frequency oscillators for intermodulation distortion tests. VTVM ranges are .01, .03, .1, .3, 1, 3, 10, 30, 100, and 300 volts rms. Wattmeter ranges are .15 mw, 1.5 mw, 15 mw, 150 mw, 1.5 w, 15 w, and 150 w. IM scales are 1%, 3%, 10%, 30%, and 100%. Provides internal loads of 4, 8, 16, or 600 ohms. An extremely valuable instrument for the audio engineer, or serious audiophile.

Heathkit CRYSTAL RECEIVER KIT

MODEL CR-1

$7.95

Shpg. Wt. 3 lbs.

This crystal radio covers the standard broadcast band from 540 to 1600 kc. It employs two high Q tank circuits that are tuned separately for the desired station. A sealed germanium diode is featured for detection. No critical "cat's whisker" to adjust. Kit includes a pair of high impedance head sets, and is easy to build, even for a beginner. Construction manual takes "educational" approach and explains theory of signal reception. Requires no external power for operation. Ideal standby unit for emergency reception of civil defense signals in case of power failure.

Heathkit BROADCAST BAND RECEIVER KIT

You can build your own radio receiver with confidence, even if you are a beginner. Complete step-by-step instructions insure success. Features transformer-type power supply, high gain miniature tubes, built-in antenna, 5½" speaker, and planetary tuning from 550 kc to 1600 kc.

CABINET: Fabric covered plywood cabinet with aluminum panel as shown. Part #91-9A, shipping weight 5 lbs. $4.50.

MODEL BR-2

$17.50

(less cabinet)

Shpg. Wt. 10 lbs.

HEATH COMPANY *A Subsidiary of Daystrom, Inc.* **BENTON HARBOR 3, MICH.**

For further data on advertised products use page 85.

HEATHKIT HIGH FIDELITY

AMPLIFIER KITS

Proven circuit designs and step-by-step instructions insure successful construction, even if you have never built a kit before.

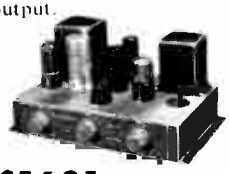
KIT COMBINATIONS:

W-5M Amplifier Kit: Consists of main amplifier and power supply, all on one chassis. Complete with all necessary parts, tubes, and comprehensive manual. Shpg. Wt. 31 lbs. **$59.75** Express only.....

W-5 Combination Amplifier Kit: Consists of W-5M amplifier kit listed above *plus* Heathkit Model WA-P2 Preamplifier kit. Complete with all necessary parts, tubes, and construction manuals. Shpg. Wt. 38 lbs. Express only.... **$79.50**

Heathkit 25-WATT ADVANCED-DESIGN

This 25 watt amplifier incorporates the "extra" features required for really outstanding performance. Employs KT66 output tubes in push-pull, and features a Peerless output transformer. Response is within ±1 db from 5 cps to 160 kc at 1 watt. Harmonic distortion only 1% at 25 watts, 20 to 20,000 cps. IM distortion only 1% at 20 watts. Output impedance is 4, 8, or 16 ohms. Hum and noise are 99 db below rated output.



$16.95 MODEL A-7D

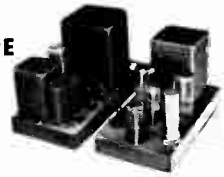
Shpg. Wt. 10 Lbs.

Heathkit 7-WATT

Using a tapped-screen output transformer of new design, frequency response of this unit is ±1½ db from 20 to 20,000 cps. It provides good sensitivity, with surprisingly low distortion. Transformer tapped at 4, 8, and 16 ohms. Push-pull output. Separate bass and treble tone controls.

MODEL A-7E: Same as Model A-7D, but with stage of preamplification. Extra gain for low-level cartridges. RIAA compensation. Shipping weight 10 lbs..... **$18.50**

Heathkit 20-WATT DUAL-CHASSIS WILLIAMSON TYPE



Features the famous Acrosound TO-300 "ultra linear" output transformer. Uses 5881 tubes and has a frequency response within ±1 db from 6 cps to 150 kc at 1 watt. Harmonic distortion only 1% at 21 watts. IM distortion at 20 watts only 1.3%. Output impedance is 4, 8, or 16 ohms. Hum and noise is 88 db below 20 watts.

KIT COMBINATIONS

W-3M: Consists of main amplifier and power supply for separate chassis construction. Includes all tubes and components necessary for assembly. Shpg. Wt. 29 Lbs. **$49.75** Express only.....

W-3: Consists of W-3M kit listed above *plus* Heathkit Model WA-P2 Preamplifier described on this page. Shpg. Wt. 37 Lbs. **$69.50** Express only.....

Heathkit 20-WATT SINGLE-CHASSIS WILLIAMSON TYPE

The original low-priced Williamson Amplifier kit. A Chicago output transformer and 5881 output tubes are featured. Frequency response is ±1 db from 10 cps to 100 kc at 1 watt. Harmonic distortion only 1.5% at 20 watts. IM distortion only 2.7%. Output at 4, 8, or 16 ohms. Hum and noise 95 db below 20 watts.

KIT COMBINATIONS

W-4AM: Consists of main amplifier and power supply for single chassis construction. Includes all tubes and components necessary for assembly. Shpg. Wt. 28 Lbs. **$39.75** Express only.....

W-4A: Consists of W-4AM Kit listed above *plus* Heathkit Model WA-P2 Preamplifier described on this page. Shpg. Wt. 35 Lbs. **$59.50** Express only.....

Heathkit 20-WATT

This amplifier can provide you with high fidelity at a surprisingly low price. Preamplifier built into same chassis as main amplifier. Four switch selected, compensated inputs are available, as are bass and treble controls. Features full 20-watt output using push-pull 6L6 tubes. Frequency response is ±1 db from 20 to 20,000 cps. Harmonic distortion only 1% at full output.

MODEL A-9B **$35.50** *Shpg. Wt. 23 Lbs.*

Heathkit HIGH FIDELITY PREAMPLIFIER KIT

MODEL WA-P2

$19.75 *(with cabinet)*

Shpg. Wt. 7 Lbs.

Designed for use with Heathkit main amplifiers. Features five separate switch-selected input channels, each with its own input level control. Four-position turnover and roll-off controls for record equalization. Separate bass and treble tone controls. Special hum control to insure minimum hum level. Will do justice to finest program sources. Beautiful satin-gold finish.

Heathkit ELECTRONIC CROSS-OVER KIT

MODEL XO-1

$18.95

Shpg. Wt. 6 Lbs.

The XO-1 separates high and low frequencies at selectable crossover points, to feed two separate power amplifiers, one for high frequencies and one for low frequencies. Speakers are then connected to the amplifiers directly, without the usual LC crossover. Separate level controls provided for both outputs. The XO-1 consumes no audio power. Crossover frequencies are 100, 200, 400, 700, 1200, 2000, and 3500 cps. Attenuation is 12 db per octave.

Heathkit TUNER KITS

These tuners measure only 12 9/16" long x 3 5/8" high x 5 7/8" deep, and are finished in beautiful satin-gold enamel. Easily stack one over another to form compact control unit.

FM HIGH FIDELITY

MODEL FM-3

$24.50 *(With cabinet)*

Shpg. Wt. 7 Lbs.

This FM tuner offers sensitivity, selectivity, and stability, not expected at this price level. Efficient 7-tube circuit is entirely new, and incorporates AGC, cascode front end, temperature-compensated oscillator, built-in power supply, and other outstanding design features. Pre-aligned IF and ratio transformers. Sensitivity is better than 10 microvolts for 20 db of quieting. Covers 88 to 108 mc.

AM BROAD BANDWIDTH

MODEL BC-1

$24.50 *(With cabinet)*

Shpg. Wt. 8 Lbs.

Designed for use with high fidelity systems. Low distortion voltage-doubler detector. Covers 550 to 1600 kc. 20 kc IF bandwidth. Audio response ±1 db from 20 cps to 2 kc. 6 db signal-to-noise ratio at 2.5 microvolts. RF and IF coils pre-aligned. Power supply built-in. Efficient, modern circuit. Matches WA-P2 and FM-3 in color and style.

Heathkit SPEAKER SYSTEM KITS

The models SS-1 and SS-1B are matched so that when the smaller unit is placed on top of the larger unit, the appearance of a single piece of furniture is achieved.

SS-1 HIGH FIDELITY

MODEL SS-1 **$39.95**

Shpg. Wt. 30 Lbs.

Employs two Jensen speakers to cover from 50 to 12,000 cps. Response is within ±5db. Built-in crossover functions at 1600 cps. System rated at 25 watts, with nominal impedance of 16 ohms. Enclosure is ducted-port bass reflex type. Merely assemble the cabinet, wire the speakers and crossover network, and finish to your taste.

SS-1B HIGH FIDELITY RANGE EXTENDING

Employs woofer and super tweeter to cover 35 to 600 cps, and 4000 to 16,000 cps. Extends frequency range of SS-1 at both ends of the spectrum, for total of ±5 db from 35 to 16,000 cps. The kit includes necessary crossover circuits and balance control. Power rating is 35 watts for speech and music. Impedance is 16 ohms.

MODEL SS-1B **$99.95**

Shpg. Wt. 80 Lbs.

HEATH COMPANY A Subsidiary of Daystrom, Inc. **BENTON HARBOR 3, MICH.**

For further data on advertised products use page 85.

NEW *Heathkit* PROFESSIONAL RADIATION COUNTER KIT

MODEL RC-1

$79.95 Shpg. Wt. 8 Lbs.

- *Completely modern design for maximum sensitivity and reliability.*
- *Both visual (4½" meter) and aural (panel-mounted speaker) indicators for radiation level.*
- *Meter calibrated in CPM and mR/hr. Four measuring ranges.*
- *Employs 900-volt Bismuth tube in beta/gamma sensitive probe.*

This radiation counter provides design advantages found only in units costing several times its low kit price. It incorporates features essential to the serious prospector. High sensitivity is provided, with ranges of 0-100, 600, 6,000, and 60,000 counts per minute, and 0.02, .1, 1, and 10 milliroentgens per hour. A type 6306 Bismuth tube is employed in the probe, and the probe and a radiation sample are included in the kit price. The circuit employs 5 tubes (plus a transistor) to assure stable and reliable operation. High quality, 4½" 200 microampere meter eliminates "guess work" and indicates radiation level directly in cpm, or mR/hr. In addition, transistor oscillator provides aural signal from panel-mounted speaker. High voltage power supply is "packaged" pre-built unit with reserve capacity above 900 volt level at which it is regulated. Merely changing regulator tube would allow use of scintillation probe if desired.

Fulfills requirements of those who want a prospecting instrument that can be relied upon. Has selectable time constant, to allow for different rates of travel over the area being investigated. Measures only 9½" high x 6½" wide x 5¼" deep, and weighs only 6½ lbs. Not to be confused with novelty radiation detection devices on the market. A top-quality instrument, yet simple to build.

Heathkit TUBE CHECKER KIT

MODEL TC-2

$29.50

Shpg. Wt. 12 Lbs.

You can afford your own tube tester, even if you only do part-time service work. Uses a 4½" meter with 3-color meter face for simple "good-bad" indications of tube quality, on the basis of emission. Tests all tubes commonly encountered in radio and TV service work. 14 different filament voltages—built-in roll chart—ten 3-position lever switches for open or short tests on each tube element.

Heathkit CATHODE RAY TUBE CHECKER KIT

Indicatescondition of CRT on large "good-bad" scale. Spring-loaded switches protect operator. Checks all electromagnetic deflection picture tubes normally encountered in TV servicing. Supplies all operating potentials and tests for shorts, leakage, and emission on the work bench, in the carton, or in the set. Features shadowgraph test to indicate tube condition.

MODEL CC-1

$22.50

Shpg. Wt. 10 Lbs.

Heathkit VISUAL-AURAL SIGNAL TRACER KIT

MODEL T-3 **$23.50**

Shpg. Wt. 9 Lbs.

Features a high-gain RF input channel for signal tracing and troubleshooting from the receiver antenna input clear through all RF and IF stages. Separate low-gain channel for audio circuit exploration. Built-in loudspeaker provides audio response, while electron beam "eye" tube gives visual indication. Ideal for signal tracing in AM, FM, and TV receivers.

Heathkit TV ALIGNMENT SWEEP GENERATOR KIT

All-electronic sweep eliminates mechanical hum or vibration. Features improved linearity—effective AGC—flat output—0 to 40 mc sweep. Covers all frequencies in FM, monochrome TV and color TV. Plenty of RF output for alignment of tuners, IF strips, boosters, etc. Fundamental output from 4 to 220 mc in four bands. Incorporates crystal oscillator (4.5 mc and multiples thereof), and variable marker covering 19 to 60 mc on fundamentals —up to 180 mc on harmonics. Effective two-way blanking.

MODEL TS-4

$49.50

Shpg. Wt. 16 Lbs.

Heathkit SIGNAL GENERATOR KIT

MODEL SG-8

$19.50

Shpg. Wt. 8 Lbs.

This tried and proven generator covers 160 kc to 110 mc on fundamentals in five bands, and calibrated harmonics extend to 220 mc. Very popular in service shops, laboratories, and home workshops. RF output is in excess of 100,000 microvolts, controlled by a variable and a fixed-step attenuator. Output is pure RF, RF modulated at 400 cps, or 400 cps audio for amplifier testing.

Heathkit CONDENSER CHECKER KIT

Measures paper, mica, ceramic, and electrolytic capacitors in 4 ranges from .00001 to 1,000 microfarads. It indicates condenser value and quality. Also measures resistance from 100 ohms to 5 megohms. All values indicated directly on panel scale, after adjusting for null on electron beam "eye" tube. No calculations necessary. A valuable instrument in service or laboratory applications.

MODEL C-3

$19.50

Shpg. Wt. 7 Lbs.

Heathkit LINEARITY PATTERN GENERATOR KIT

MODEL LP-2

$22.50 Shpg. Wt. 7 Lbs.

Supplies information for white dots, crosshatch pattern, horizontal bar pattern, or vertical bar pattern. Use for adjustment of vertical and horizontal linearity, picture size, aspect ratio and focus. Dot pattern is a *must* for color convergence adjustments. Clip merely connects to antenna terminals of TV set. Panel provision for external sync if desired. Covers channels 2 to 13. 5 to 6 vert. bars and 4 to 5 hor. bars.

Heathkit LABORATORY GENERATOR KIT

MODEL LG-1

$39.50

Shpg. Wt. 16 Lbs.

This signal generator covers from 100 kc to 30 mc on fundamentals in 5 bands. 400 cycle modulation variable from 0 to 50% RF output up to 100,000 microvolts. Meter reads RF output or percentage of modulation. Fixed step and variable output attenuation. Voltage regulation, double copper-plated shielding for stability, and other "extras." Provision for external modulation. Output impedance 50 ohms.

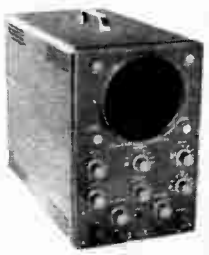
HEATH COMPANY *A Subsidiary of Daystrom, Inc.* **BENTON HARBOR 3, MICH.**

For further data on advertised products use page 85.

HEATHKIT ETCHED CIRCUIT
OSCILLOSCOPE KITS

You may choose from three different oscilloscope models when you purchase a Heathkit scope. All three units employ printed circuit boards for increased circuit efficiency and simplified assembly. Construction time cut almost in half. Outstanding dollar values for you!

5" COLOR TV



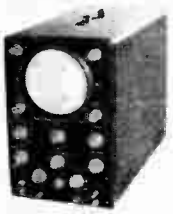
MODEL O-10

$69.50

Shpg. Wt. 21 Lbs.

Amplifier response essentially flat from plus 2 db -5 db from 5 mc down to 2 cps without extra switching. Extended sweep oscillator range allows single-cycle observation of signals up to 500,000 cps, and will sync signals even higher. Uses etched metal circuit boards. Push-pull vertical and horizontal amplifiers—built in peak-to-peak calibrating source—step attenuated input—preformed and cabled wiring harness. A professional oscilloscope, ideal for color TV work in the lab or service shop. The 11-tube circuit features 5UP1 CRT.

FULL SIZE 5"



The Model OM-1 with a 5", 5BP1 cathode ray tube has many big scope features—yet it is priced reasonably. Features etched-metal circuit boards. Incorporates 3-step input attenuator—phasing control—built-in peak-to-peak voltage calibrator—and push-pull vertical and horizontal amplifiers. Vertical amplifier flat within ±3 db from 2 cps to 200 kc. Sweep circuit functions from 20 cps to 100,000 cps.

MODEL OM-1

$49.50

Shpg. Wt. 21 Lbs.

3" PORTABLE

Has many of the features of the Model OM-1, yet is smaller in physical size. Employs etched-metal circuit boards. Features vertical frequency response within ±3 db from 2 cps to 200 kc. Sweep generator operates from 20 to 100,000 cps. The 8-tube circuit features a type 3GP1 CRT.

MODEL OL-1

$29.50

Shpg. Wt. 14 Lbs.

Heathkit AC VACUUM TUBE VOLTMETER KIT

MODEL AV-2

$29.50

Shpg. Wt. 5 Lbs.

This VTVM combines high impedance, wide frequency range, and high sensitivity. It is designed especially for audio work. Frequency response is substantially flat from 10 cps to 50 kc. Sensitivity allows measurements as low as 1 mv at high impedance. Ranges are .01, .03, .1, .3, 1, 3, 10, 30, 100, and 300 volts rms. Total db range is −52 to +52 db. 1 megohm input impedance at 1 kc. An outstanding instrument for your laboratory, service shop, or home workshop.

Heathkit ETCHED CIRCUIT VACUUM TUBE VOLTMETER KIT

MODEL V-7A

$24.50

Shpg. Wt. 7 Lbs.

The Heathkit Model V-7A features a 200 ua meter, 1% precision resistors, and an etched metal circuit board. Very simple to build. Measures DC voltage, ACV (rms) ACV (peak-to-peak), and resistance. AC (rms) and DC voltage ranges are 0-1.5, 5, 15, 50, 150, 500, and 1500 volts. Peak-to-peak ranges are 4, 14, 40, 140, 400, 1400, 4000 volts. Ohmmeter ranges provide multipliers of X1, X10, X100, X1000, X10K, X100K, and X1 megohm. DB scale also provided. 11-megohm input impedance.

Heathkit 20,000 OHMS/VOLT VOM KIT

MODEL MM-1

$29.50

Shpg. Wt. 6 Lbs.

This instrument is especially valuable for portable applications where AC power is not available. Sensitivity is 20,000 ohms-per-volt DC and 5,000 ohms-per-volt AC. Black bakelite case -4½" 50 ua. meter-1% precision resistors. AC and DC ranges are 0-1.5, 5, 50, 150, 500, 1500, and 5000 volts. Direct current ranges are 0-150 ua., 15 ma., 150 ma, 500 ma, and 15 a. Resistance multipliers are X1, X100, and X10,000. DB range from -10 db to +65 db.

Heathkit DIRECT-READING CAPACITY METER KIT

MODEL CM-1

$29.50

Shpg. Wt. 7 Lbs.

This unique measuring instrument indicates capacitor values in mmf, or mfd, directly on a large 4½" 50 ua meter. It provides ranges of 0-100 mmf, 0-1,000 mmf, 0-.01 mfd, and 0-.1 mfd. Residual capacity less than 1 mmf. Scales are linear. Merely connect the capacitor to the instrument and read its value directly on the scale. Instrument not susceptible to hand capacity effects. Will measure even small value trimmers or variable air capacitors.

Heathkit ELECTRONIC SWITCH KIT

MODEL S-3

$21.95

Shpg. Wt. 8 Lbs.

This new instrument design allows simultaneous oscilloscope observation of two input signals by producing both signals, alternately, at its output. The all-electronic circuit provides 4 switching rates, selected by a panel switch. Provides actual gain for input signals, and features frequency response of ±1 db from 0 to 100 kc. Employs 7 miniature tubes, Sync output provided to control scope sweep. Functions at signal levels as low as 0.1 volt. Ideal for observing amplifier input and output simultaneously for comparison purposes.

ORDER BLANK

NOTE: All prices subject to change without notice.

Enclosed find ( ) check ( ) money order for_____.

Please ship C.O.D. ( ) postage enclosed for_____pounds.

On Express orders do not include transportation charges — they will be collected by the express agency at time of delivery.

ON PARCEL POST ORDERS include postage for weight shown. ORDERS FROM CANADA and APO's must include full remittance.

Name_____

Address_____

City & Zone_____ State_____

(PLEASE PRINT)

SHIP VIA

- ☐ Parcel Post
- ☐ Express
- ☐ Freight
- ☐ Best Way

QUANTITY	ITEM	MODEL NO.	PRICE

HEATH COMPANY *A Subsidiary of Daystrom, Inc.* **BENTON HARBOR 3, MICH.**

For further data on advertised products use page 85.

NEW PRODUCTS

(Continued from page 106)

• *A Natural For Control Systems*

Item 1234

REGOHM is a compact, universal, electric-circuit controller used to regulate voltage, current or speed and to perform important control functions in many types

of servo systems. It can be used for power amplifying, impedance matching, zero-error controlling, and system stabilizing. In circuit design, REGOHM offers these advantages: low operating power, fast acting, lasts for years, performance is mathematically known, continuous control, versatile control characteristics, sturdy and temperature-stable — all the factors desirable for precise, efficient circuit regulation.

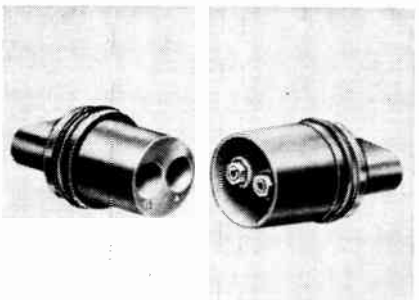
REGOHM-controlled equipment is widely used in airborne and shipborne radio, radar and other electronic devices, telephone systems, industrial power systems, locomotives, gun turrets, battery charging equipment, guided missiles, signal and alarm systems. It may be used as a replacement for or as an auxiliary to vacuum tubes in high performance regulator systems; an element in positioning and other types of servo-mechanisms; as a sensing element in close differential relays.

• *High Voltage Pressurized Connectors*

Item 1235

A new group of precision high voltage pressurized connectors in two and three contacts designed for AN 24 shell has been announced.

These connectors were developed for altitude applications where leads are required for pressure-tight instrumentation.



Maximum air leakage between contacts and insert, and insert and shells, is less than 1 cubic inch of air per hour at an ambient temperature of 25 degrees centigrade when the plug is subject to a pressure differential of 30 p.s.i.

Sealing is accomplished by the use of individual "O" rings. Nonrotating contacts are removable for wiring. Inserts are mineral filled Melamine (MIL-P-14D, Type MME).

(Turn to page 114)

For further data on advertised products use page 85.

NEW PRODUCTS

(Continued from page 112)

● *Model 210 Standard FM Signal Generator*

Item 1236

Measurements Corporation announces that the first model of the new series of Model 210 Standard FM Signal Generators has just been released from production. These FM signal generators are available for the following frequency ranges:

Carrier Frequency, Mc.	Model No.
30 - 37	210 - C
36 - 44	210 - D
42 - 52	210 - E
86 - 108	210 - A
148 - 174	210 - B

Equipped with mechanical and electronic vernier tuning, the Model 210 is designed for broadcast FM receiver measurements as well as railroad and mobile radio systems. An accurate bolometer bridge measures the output voltage which is continuously variable from 0.1 to 100,000 microvolts. Internal modulating frequencies of 400 and 1000 c.p.s. or external modulating frequencies up to 70 Ks., produce a deviation directly calibrated in two ranges: 0 to 30 Kc., and 0 to 300 Kc., with less than 1 per cent distortion for 75 Kc. deviation.

Because of its high accuracy and excellent fidelity, this compact and moderate-priced instrument will also be useful in research and development of multiplexing and telemetering FM equipment.

● *New Transistors*

Item 1237

Ten new inexpensive transistors, designed for application in either high fidelity amplifiers or broadcast receivers, are now available.

The new transistors, all PNP types made of germanium and produced by the alloy junction process, include six different types for the output stage of an audio amplifier and four types for the driver stage.

The wide selection of gain and output characteristics offered among the new audio transistors allows the design engineer a broad variety of possible equipment designs.

Current gain of the six new audio amplifier output transistors is maintained at an essentially constant value for collector currents from 1-milliampere to 200 milliamperes. This linearity of current gain insures low distortion in push-pull circuits and permits the use of any two transistors from a particular type without matching.

Three of the new audio output transistors, the 2N186A, 2N187A, and 2N188A, are rated at a 180 milliwatt power collector dissipation at 25°C. Thus it is possible to use any one of these transistors in a class "A" output stage in radios that formerly required two low power dissipation units in a push-pull circuit. In addition, they may be used in push-pull circuits to obtain a power output of 750 milliwatts with less than 5 per cent distortion.

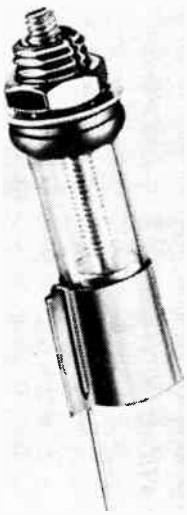
For further data on advertised products use page 85.

The other three new audio output transistors, the 2N186, 2N187 and 2N188, are rated at a maximum power collector dissipation of 75 milliwatts at 25°C. In a class "B" push-pull circuit, a pair of the transistors from one type, without matching, may be used to obtain a power output of 300 milliwatts with distortion of less than 5 per cent.

• *Ultra Low-Loss Quartz Trimmer Capacitor*

Item 1238

Production of the Model VC11A Fused Quartz Piston Capacitor for use in capacitor networks requiring low-loss and high leakage resistance for 400 cycle operation is announced. It is also recommended for ultra stable oscillator circuits and as a tuning element in high frequency, low power tank circuits.



The coaxial construction utilizes an invar tuning slug and adjustment screw, that is individually fitted to the precision bore cylinder. A silver clad invar band serves as the fixed electrode. Special quality control procedures give the VC11A a dissipation factor of less than 0.0002 at 400 cycles to +125°C. The high insulation resistance of the VC11A remains constant making it highly suitable for low frequency network applications. Other outstanding characteristics include:

1 mmf. maximum at minimum setting at 1 Kc., 10 mmf. minimum at maximum setting at 1 Kc.; dielectric strength that withstands 2000 volts DC between leads for 5 seconds within full range of capacity; approximately zero temperature co-efficient at 0.1 Mc.; Q factor of 2000 minimum at 50 Mc.; insulation resistance greater than 1,000,000 megohms after 30 days exposure to MIL-STD 170 moisture test; 1-4 inch ounces adjustment torque; approximately 8 grams unit weight, fused quartz dielectric; precision invar tuning slug; 1 mmf. C per turn of adjustment.

To obtain further information on New Product items, use coupons on page 85.

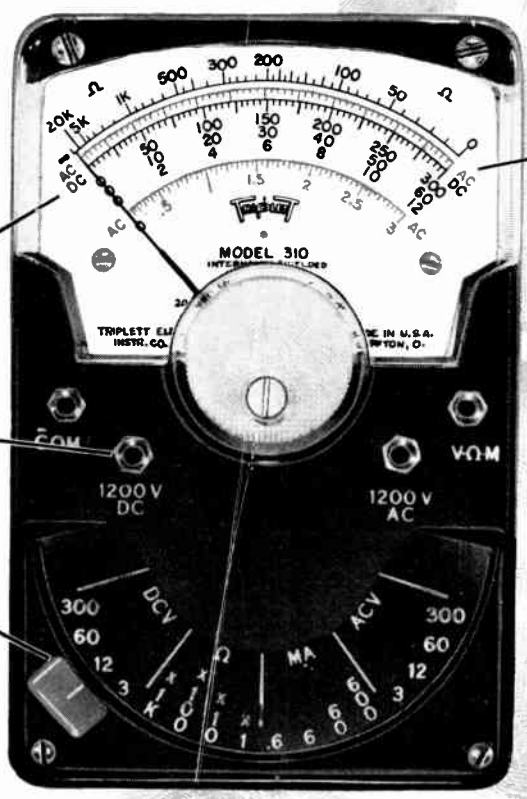
For further data on advertised products use page 85.

ACTUAL SIZE

complete with selector switch...

TRIPLETT

ELECTRICAL INSTRUMENT CO.
Bluffton, Ohio



- 5,000 ohms per volt. A.C.
- 20,000 ohms per volt. D.C.
- BANANA-TYPE JACKS—positive connection and long life.
- EXCLUSIVE SELECTOR SWITCH speeds circuit and range settings. The first and only miniature VOM with this exclusive feature for quick, fool-proof selection of all ranges.

CARRYING CASE

Handsome leather carrying case with adequate space for Model 310 tester and accessories. Trouser belt slips through loop on back of the case for out-of-the-way carrying. MODEL 369 CASE — Suggested Canadian Dealer Net..... **$4.10**

Model 310 MIGHTY MITE

the only complete miniature V-O-M (AC-DC)

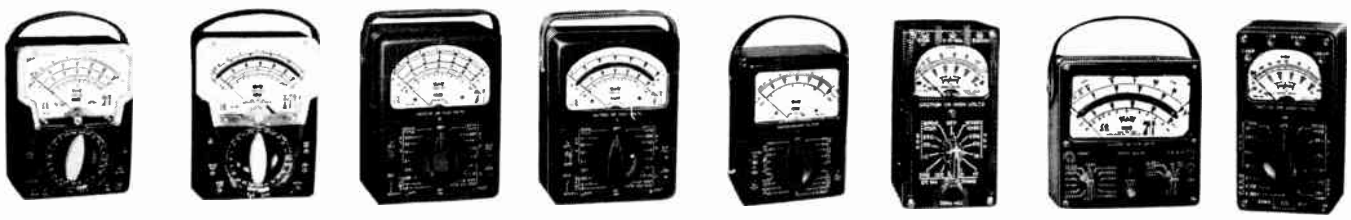
LOOK AT ALL THESE RANGES

DC VOLTS: 0-3-12-60-300-1200 at 20,000 Ohms/Volt.
AC VOLTS: 0-3-12-60-300-1200 at 5,000 Ohms/Volt.
DC MICROAMPERES: 0-600 at 250 Millivolts.
DC MILLIAMPERES: 0-6-60-600 at 250 Millivolts.
OHMS: 0-20,000-200,000 (200-2000 at center scale).
MEGOHMS: 0-2-20 (20,000-200,000 Ohms at center scale).
OUTPUT: Convenient chart in instruction book.

SEE IT AT YOUR JOBBER
AND IT'S ONLY ONE OF TRIPLETT'S MIGHTY NINE VOM LINE!

ONLY $39.95 Suggested Canadian Dealer Net

BURTON BROWNE ADVERTISING



631 Combination V-O-M—VTVM

630-NA For Best Testing Around The Lab, Production Line or Bench

630 The Papular All-Purpose V-O-M

630-A A Good Lab and Production Line V-O-M

630-T For Telephone Service

666-HH Medium Size For Field Testing

625-NA The First V-O-M With 10,000 Ohms/Volt AC

666-R Medium Size With 630 Features

LEN FINKLER
1505 Park Royale Blvd., Port Credit, Ontario

C. M. ROBINSON COMPANY
189 Market Street, Winnipeg
325 10th Avenue, Calgary
550 Beatty Street, Vancouver

NEW PRODUCTS

(Continued from page 115)

● *Model 7340A Frequency Indicator And Counter*

Item 1239

The model 7340A Frequency Indicator And Counter is typical of counting equipment developed specifically for industrial applications.

The unit provides an economical solution to a wide range of industrial problems in the field of counting and recurrence rate measurement of mechanical and electrical events. The instrument is ideal for such applications as r.p.m. measurement, oscillator calibration, direct counting, and flow measurement.

Counting and indication with automatic decimal point location is easily read from glow transfer tubes directly in events per second ranging from 1 to 9,999 events. Recently developed, the tubes provide a simplified, reliable circuitry that virtually eliminates component aging malfunctions.

A precision synchronous motor establishes the gate time (from 1 to 10 seconds) during which input events are counted. For gate times longer than 10 seconds or for cases where a straight counter is desired a manual gate switch is provided. For applications requiring a permanent record of readings, the instrument can be delivered as the Model 7341A, shown above, with outputs for driving a serial type print-out.

● *Angular Accelerometer Calibrator*

Item 1240

Production of the Model AA C-2 Angular Accelerometer Calibrator has been announced.

This equipment is designed for calibrating angular accelerometers within the range of 0.5 radians per second squared to 140 radians per seconds squared, when typical instruments are mounted on the oscillating table.

The new unit is a torsional pendulum device which operates with low decrement sinusoidal oscillations. Both the period of oscillation and the amplitude of the oscillation may be set to obtain the desired test conditions.

Several pairs of arms and weights are provided to vary the period of the torsional pendulum to suit individual test requirements. The 12" oscillating table may be set to an accurate initial displacement and released by a simple trigger mechanism.

The Statham Model AA C-2 Angular Accelerometer Calibrator features simplicity in design and versatility in the size and range of instruments that may be calibrated. The unit is used in conjunction with a multiple channel recording oscillograph and an accurate timing signal function generator.

Maximum angular acceleration is 140 radians/sec.^{2} (typical with 180° displacement); minimum angular acceleration is 0.5 radians/sec.^{2} (typical with 45° displacement).

For further data on advertised products use page 85.

NEW PRODUCTS

(Continued from page 117)

• *Tape Reel With 32 Sq. In. Of Indexing Area*

Item 1241

All Irish Recording Tapes are being delivered with a new improved 7" reel featuring 32 square inches of indexing area. One of the most annoying problems to the tape recorder user is indexing the material on the reel. The new Irish reel solves this problem by offering four large flat areas for indexing with china crayon or adhesive labels.

The manufacturers have dessigned the new reel as a result of recommendations by many radio station and recording studio engineers. Threading is made easy with two greatly enlarged side openings.

Laboratory tests show the new reel to be 28 per cent more rigid than the former standard reel, and it is designed to operate with equal efficiency on all tape recorders on the market.

• *New X-Band Reference Cavities*

Item 1242

The new MA-318 series of temperature compensated reference cavities have recently been announced for use in automatic frequency control applications and as fixed frequency stabilizers in radar beacons and other microwave systems. Because of improved form factor packaging (practically half the size of 1Q22-1Q24 series) and extra rugged construction, these new reference cavities are ideally suited for airborne radar beacon applications where weight, space, pressure extremes, and vibration considerations are of paramount concern. The cavities require no matching and are available from 9250-9350 mc/s.

• *Catalog No. 67 Describes Hammond Transformers*

Item 1243

Hammond Manufacturing Co. Ltd. announces its new Catalog No. 67, which describes the company's line of transformers of all types, reactors, cabinets, chassis, panels, racks, etc. for the electronic industry. This catalog comprises twenty pages and covers, and lists and describes over 500 stock types.

• *Microwave Silicon Mixer Diodes*

Item 1244

Four new high sensitivity point contact microwave silicon mixer diodes have recently been developed for low noise mixer performance in L, S, C, and X band radar receiver circuitry.

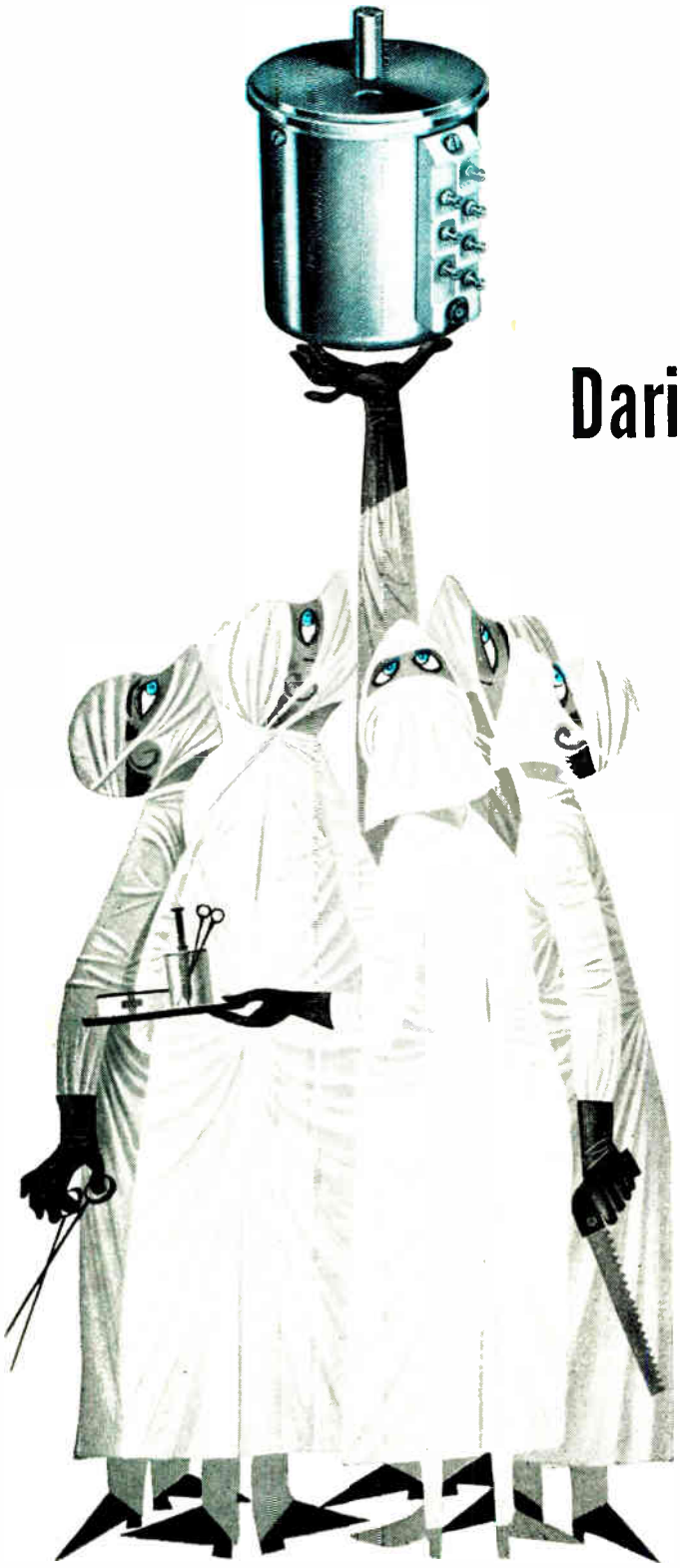
The new 1N23E fixed forward polarity and 1N415E reversible polarity diodes achieve minimum performance of 7.5 db overall systems noise figure at their X band design center frequency when used with a 1.5 db IF strip. Radar systems manufacturers report overall systems noise figures as low as 6.45 db and receiver noise figures of 5.5 db measured at mixer terminals in X band equipment.

In S band equipments use of the 1N21E or 1N416E reversible mixer diode will result in a maximum overall system noise figure of 7.0 db given a 1.5 IF noise level. radar overall systems noise figures as low as 6.0 db in L and S band radars using the new 1N21E or 1N416E reversible diode.

Users report a 2 db reduction in noise figure when the 1N23E or 1N415E are directly substituted for limit 1N23C crystals. Similar results are obtained with the 1N21E and 1N416E diodes when substituted for limit 1N21C crystals.

Existing L, S, C and X band radar systems designed for 1N21 or 1N23 series design centers can invariably be improved by direct substition of the new types.

For further data on advertised products use page 85.



Another product surprise from Helipot!

Daring operation

Delicate design surgery by the Helipot staff removed the mandrel from our new ten-turn series 7700 . . . and left nothing but fresh air inside the turns of resistance wire!

Startling . . . but so advantageous.

The post-operative picture shows temperature, pulse and pressure normal. Prognosis *excellent* . . . because with air-core winding† linearity approaches the resolution of the unit and phase-shift is less than 0.1° in AC circuitry.

The splendid 7700 . . . 1-13/16" in diameter, with all-metal housing . . . is available for servo or three-hole pilot mounting. Eleven mechanical coil turns provide 180° overtravel at each end. Mechanical stops are standard, with stop-load strength of 50 inch-pounds. Incidentally, air-core winding is used for units with total resistance of 200 to 5,000 ohms . . . copper-mandrel winding, from 5,000 to 200,000 ohms.

The complete clinical records of this fascinating case are presented in data file 907. A copy has been set aside for you.

† *The air-core winding system was developed by Vestal Laboratories of I. B. M.*

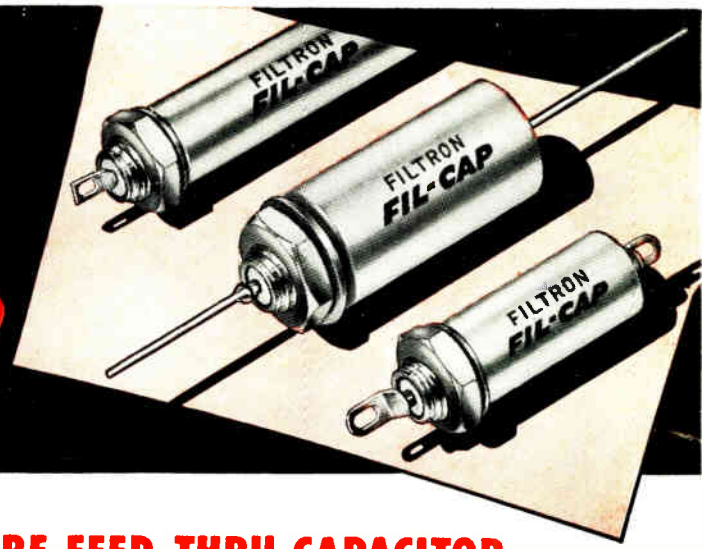
Helipot makes precision potentiometers . . . linear and non-linear . . . in the widest choice of sizes, mounting styles and resistances. Many models are stocked for immediate shipment. Our engineers will gladly adapt standard models to your requirements, or design entirely new HELIPOT* precision potentiometers for you.

Helipot®

first in precision potentiometers
Canadian Factory: No. 3 Six Points Rd., Toronto 18, Ont.
Sales Representative: R·O·R Associates, Ltd.
290 Lawrence Ave. West, Toronto 12, Ont.
a division of Beckman Instruments, Inc.

See Beckman Automation . . . for Production Control . . . for Business and Research . . . at the I. S. A. Show, New York Coliseum, Sept. 17-21

the Difference is INSIDE the FIL-CAP®



FILTRON'S NEWEST SUBMINIATURE FEED-THRU CAPACITOR SETS A NEW STANDARD OF RF ATTENUATION PERFORMANCE

1 For the first time—a complete line, ratings for 5 AMPS & 10 AMPS, continuous duty

2 Advanced internal circuit design . . . specially processed impregnant

3 Meets Spec MIL-C-11693 (proposed) for suppression capacitors

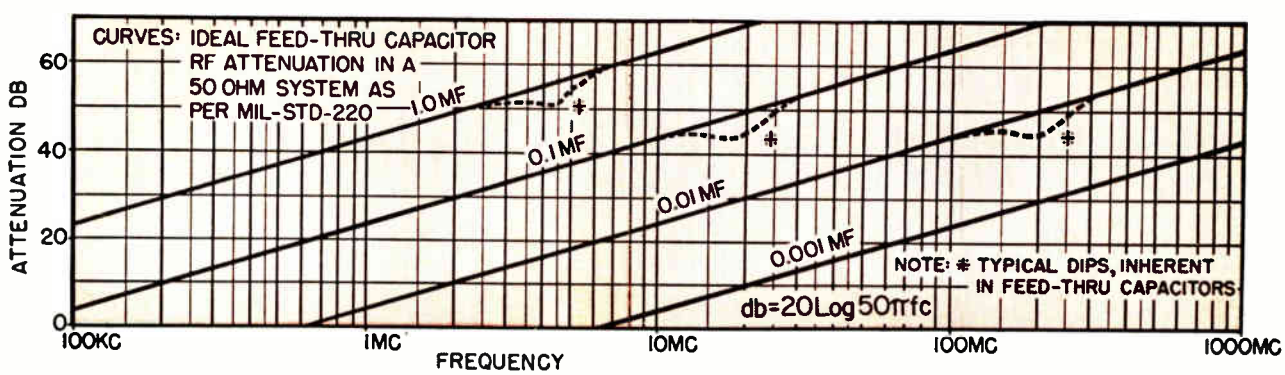
4 Closely matches theoretically ideal attenuation characteristics

An unusual internal circuit arrangement, precision mechanical components, and a specially processed silicone impregnant combine to afford outstanding electrical characteristics and stability—unobtainable in conventional feed-thru capacitors ordinarily used for interference suppression in electronic equipment.

Basically, FIL-CAPS are a four-terminal network inserted in the current-carrying line. The power line to be filtered must be broken, and each end connected to an insulated terminal of the capacitor. The feed-thru ground-plane mounting prevents mutual impedances between input and output terminals. The FIL-CAP design includes compression glass insulated terminals, and milled flats on the threaded mounting neck, to prevent rotation during installation and under service conditions.

Type FV is rated for 5 amps AC-DC continuous operation, and Type FX is for 10 amps AC-DC continuous operation. Both types are available in operating voltages of 100, 200, 300, 400 and 600 volts DC; 125 and 250 volts AC; 0 to 400 cycles.

All FIL-CAP subminiature feed-thru capacitors are 100% tested and inspected before shipment.



If your requirements call for greater attenuation than is obtainable with feed-thru capacitors, Filtron also manufactures a complete line of RF interference filters. More than 5000 filter types are offered for military, industrial, nuclear and commercial applications. Filtron is the world's largest manufacturer of RF interference filters. Details and literature furnished on request.

For complete engineering data and installation diagram, ask for Filtron Catalog FV, and FV Supplement for FIL-CAP equivalents to MIL-C-11693 military designations.

Main Plant, Flushing, New York

FILTRON CO., INC., FLUSHING, LONG ISLAND, NEW YORK
PLANTS IN FLUSHING, NEW YORK, AND CULVER CITY, CALIFORNIA

Canadian Representative: Aircraft Appliances & Equipment Ltd., 585 Dixon Side Road, Toronto 15, Ontario.

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