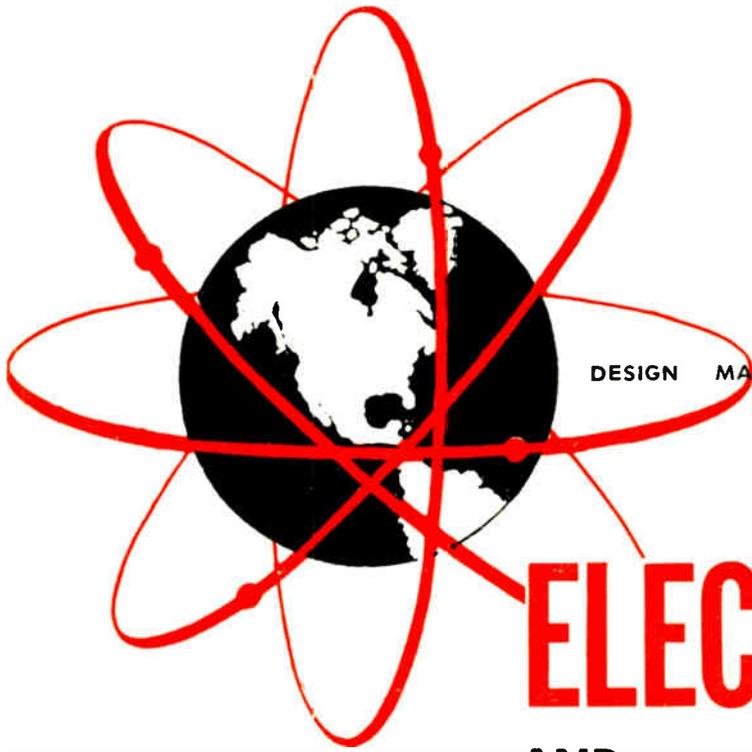


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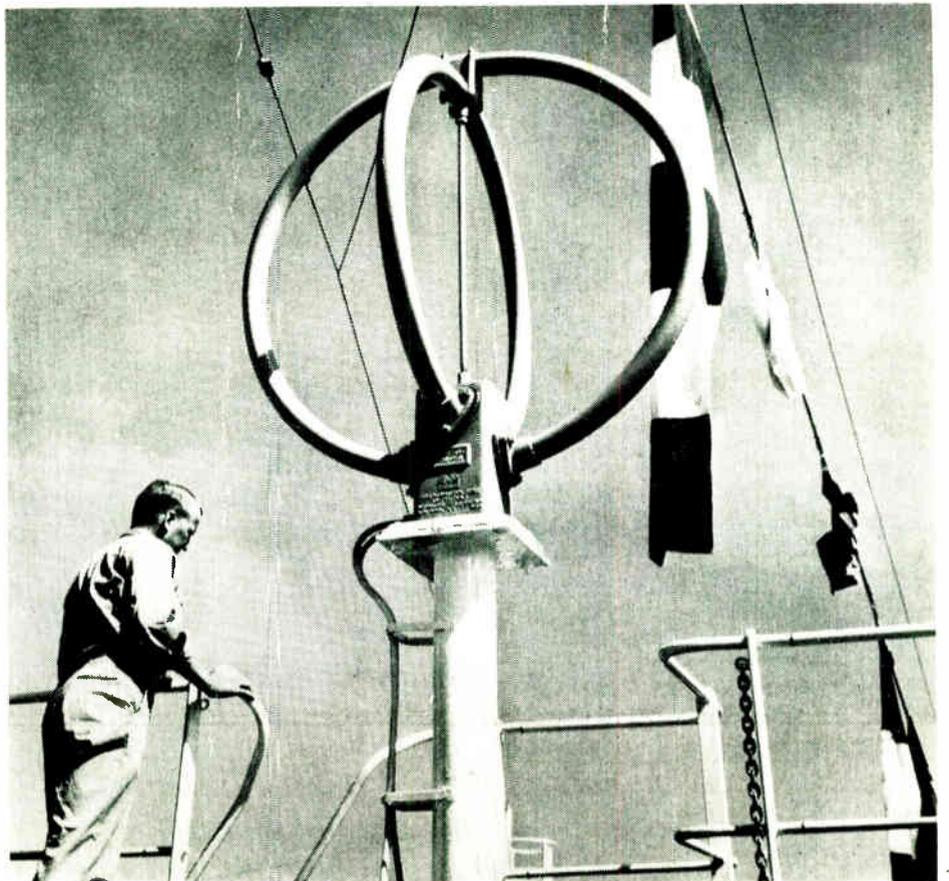
# ELECTRONICS AND COMMUNICATIONS

APRIL, 1957



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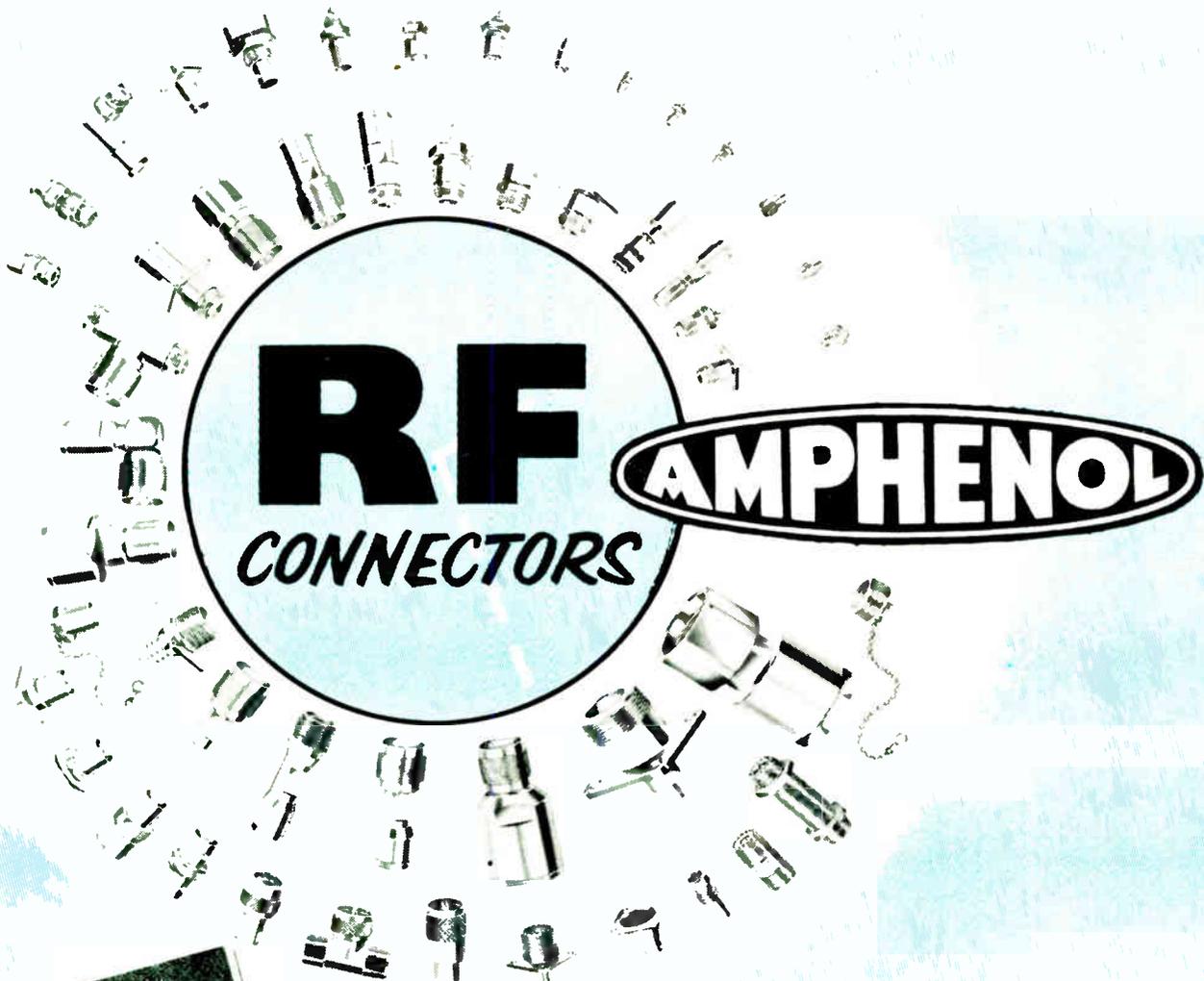
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From atop the mast of a Cities Service supertanker, nearly 80 feet above the waterline, this radar antenna scans a wide area with unfailing vigilance

*Cities Service Photo*

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If you are working with RF connectors you will find the new AMPHENOL catalog D3 an invaluable aid. Complete information is given on each RF series manufactured by AMPHENOL.

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For further data on advertised products use page 87.

World Radio History

# MAGNETRONS

## FROM CANADIAN MARCONI

### Vital electronic components now produced in this country

A million dollar production plant, complete with micro-wave tube development laboratories, now assures Canada of a domestic supply of magnetrons for vital defence and navigation equipment.

These same laboratories are being staffed and equipped to deal with advanced work on magnetrons and other micro-wave devices. We would welcome the opportunity to help you with any of your micro-wave tube problems.



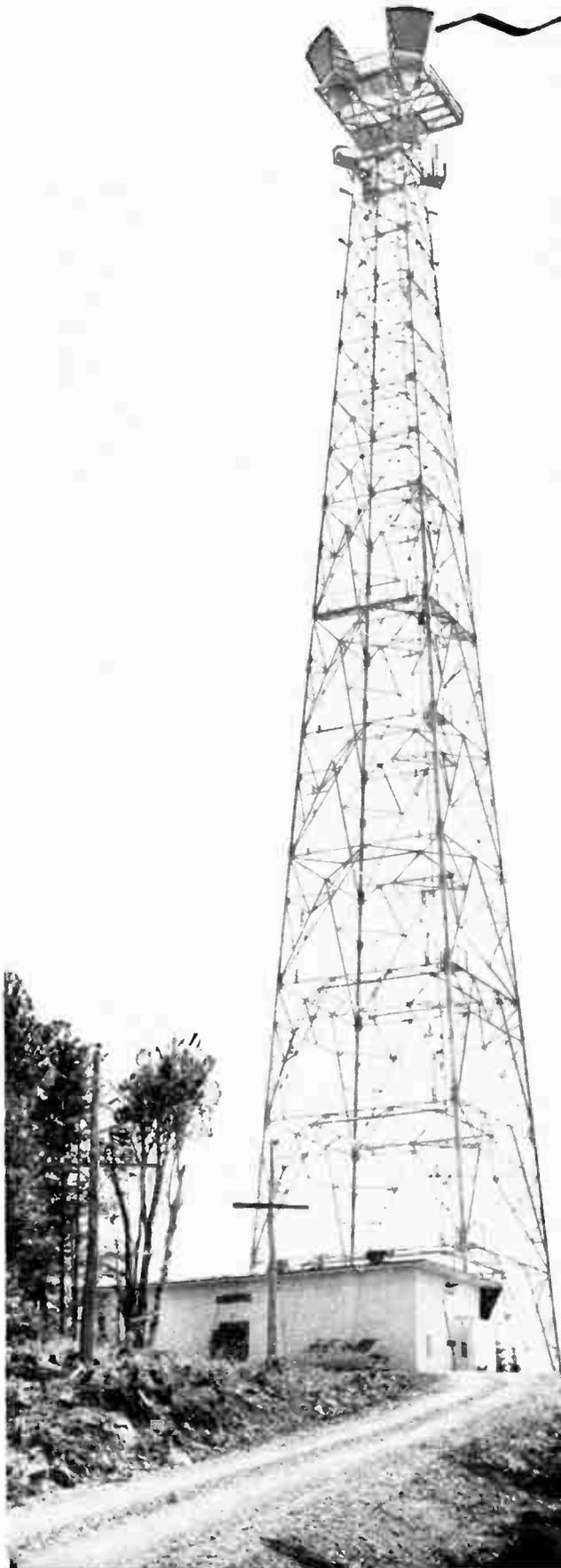
Canadian Marconi's new Electronic Tube plant in the town of Mount Royal, Quebec.

Electronic Tube and Components Division

**CANADIAN Marconi COMPANY**

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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.

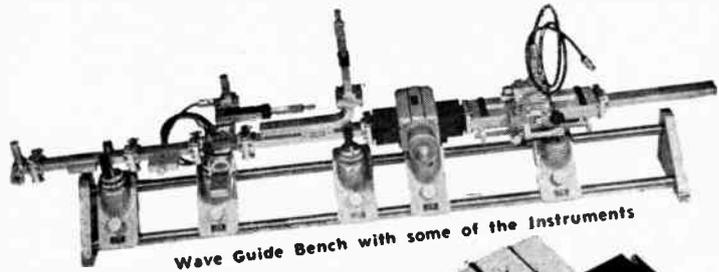
**CENTRAL BRIDGE** *Company, Limited*  
*Fresno, Ontario*

*\*Central Bridge Towers  
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Eastern Telephone and Telegraph  
New Brunswick Telephone Company*

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## PRECISION MICROWAVE TEST EQUIPMENT

Designed expressly for precision measurements to the most exacting specifications. All 3-centimeter parts in stock and all standard couplings, bends and twists available.



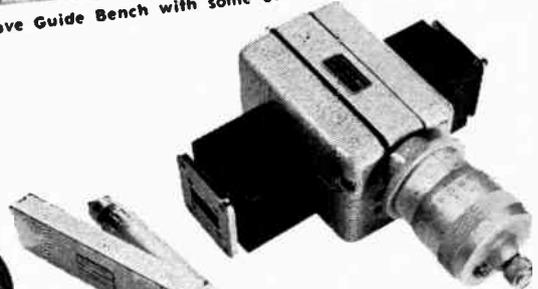
Wave Guide Bench with some of the Instruments

### 3-Centimeter Stock List

Directional Couplings 10 to 40 dB  
 Crystal Mixer Mount  
 Crystal Detector Mount  
 Coaxial Crystal Detector Mount  
 Wavemeter  
 Calibrated Attenuator  
 Matched Termination  
 Matched Load  
 Preset Attenuator  
 Variable Attenuator  
 High Sensitivity Coaxial Detector  
 Crystals  
 Wave Guide Support Bench and Carriages  
 Adjustable Short Circuit  
 Standing Wave Meter  
 Klystron Mount Assemblies  
 Matched Terminations  
 Centimetric Noise Source Unit  
 Klystron Power Unit  
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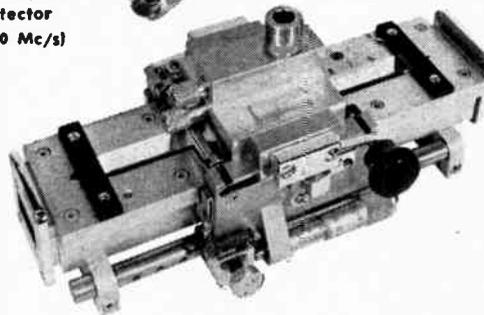


Wide Band Coaxial  
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 (200 to 15000 Mc/s)



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Illustrating method of packing



Multi - Purpose  
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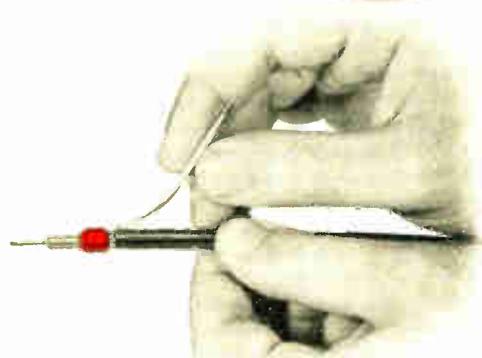
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coaxial and shielded cable grounding  
completed in 90 seconds with  
**HYRINGS**

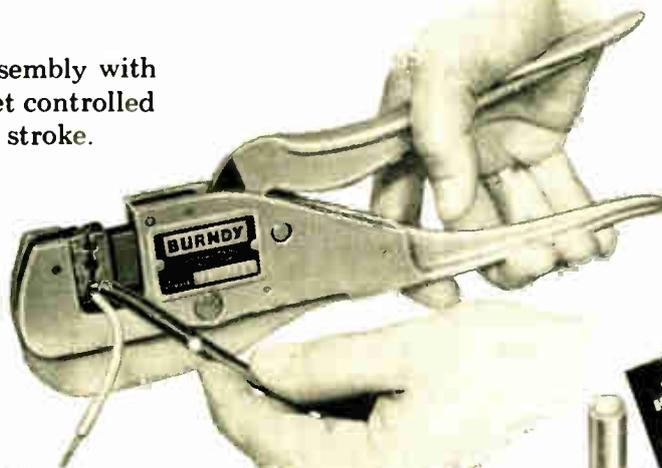
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**INSERT** ground lead under outer Hyring and line up over the inner Hyring.



**INDENT**, assembly with single ratchet controlled compression stroke.



**COMPLETED** assembly, with Burndy Hylug attached to free end of ground lead.



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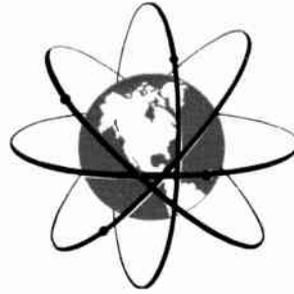
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PUBLISHER'S  
VIEWPOINT



ELECTRONICS  
AND  
COMMUNICATIONS

Letters We Like

Among the great volume of mail that passes over a publisher's desk there is nothing more pleasing to the eye than requests from readers, manufacturers and government agencies seeking permission to use or reprint articles and information which have been published in the pages of a magazine.

In this respect Electronics and Communications has, we believe, established something of a record. Requests from as far away as India and South Africa have been addressed to us seeking permission for the further use of articles carried in the columns of Electronics and Communications. While such requests are flattering to us and confirm that we are providing the information that industry needs, it is even more flattering when such requests emanate from the highest source of scientific knowledge in our country. In this latter instance, of course, we refer to the National Research Council of Canada, from which agency we have had several requests for permission to pass articles carried in Electronics and Communications on to the European Productivity Agency in Paris. Needless to say we are always pleased to grant such requests and look upon them as readership approval of the type of material being published.

Sixty Million Pages

As previously mentioned in the columns of Electronics and Communications, there is a growing realization among the publishers of trade and industrial publications that the ability of the engineer to absorb any more information of a purely technical character is rapidly reaching the point of saturation. The truth of this observation has recently been confirmed by a report of the Association of Technical Writers and the Society of Technical Writers in the United States to the effect that there are approximately 60,000,000 pages of scientific information being published every year. Of this vast amount of technical information it has been estimated that only 1/10,000th of it is usable because of a lack of common bases of understanding. It seems evident, therefore, that to attempt to add to this deluge of technical information, publishers of trade and industrial journals would be doing little more than increasing an already existing surfeit of information of this character.

April, 1957

Vol. 5, No. 4

EDITORIAL CONTENTS

FEATURES

	Page
Quality Is No Accident . . . . .	24
<i>by E. N. Lent.</i>	
Aluminizing Equipment For TV Tubes . . . . .	26
Damp-Proofing Electronic Equipment . . . . .	28
<i>by Allen M. Foote.</i>	
Infra-Red Detection of Hot-Boxes . . . . .	30
Electronic Press Control . . . . .	30
Sulphide Minerals Located With Ronka EM Unit . . . . .	33
A Survey Of Shock Test Procedures — One Phase of Laboratory Simulation . . . . .	34
<i>by C. A. Mills.</i>	
Selection Of Non-Metallic Materials . . . . .	38
<i>by J. Harry DuBois.</i>	
Missile Speed Measurement . . . . .	44

DEPARTMENTS

Editor's Page . . . . .	9
RETMA Report . . . . .	11
Editorial . . . . .	17
Electronics In Business And Industry . . . . .	21
News . . . . .	48
New Products . . . . .	74
Business Briefs And Trends . . . . .	77

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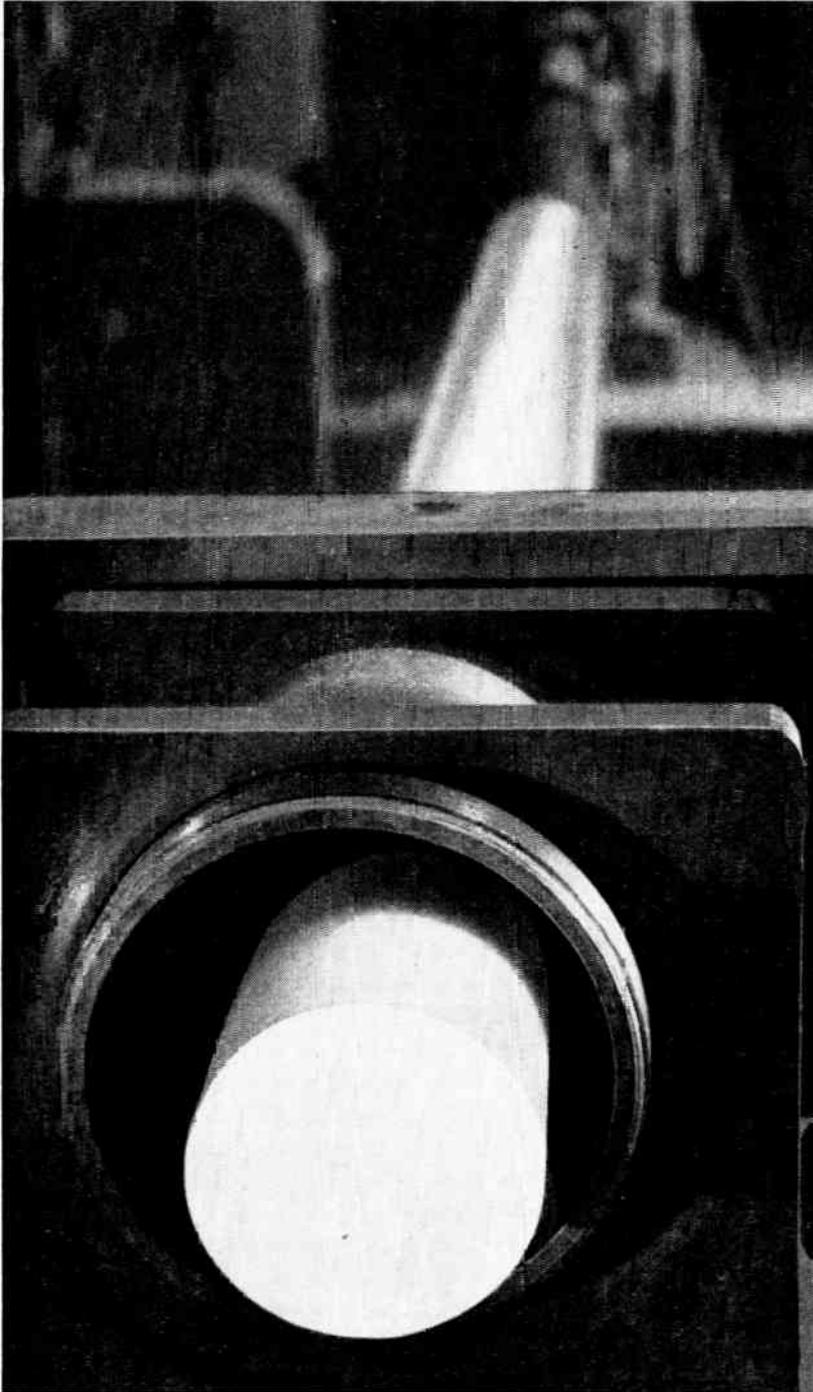
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## **THE NATIONAL SCENE**



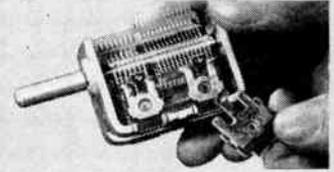
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You benefit by calling National first. Check telephone directory yellow pages or write Toronto—Dept. ( ),

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For further data on advertised products use page 87.

# the editor's page

*A commentary on affairs  
pertinent to the electronics  
and communications industries.*

## How Much Bigger!

It is perhaps a little late to be recording observations on the Institute of Radio Engineers' Convention and Show held in New York last March 18 to 21, but deadline dates prevented including any remarks in our March issue. It has already been said many hundreds of times that the 1957 show again broke previous records for attendance and, despite the spaciousness of the new Coliseum and the fact that the show was spread over four floors, visitors jammed the aisles to the point where it was impossible to proceed at more than a snail's pace. To reach an exhibitor's booth required, to say the least, the adoption of a determined anti-social attitude in the matter of forcing one's way through the crowds, all of which is indicative, in a roundabout way, of the tremendous success of the IRE Show.

If one can believe reports, the IRE Show is about the biggest attraction that hits New York City during the course of the year and while there is little likelihood that this distinction will be taken away from it, judging by its annual growth, one is led to wonder just how much bigger this show can grow before it becomes top-heavy. As a move to accommodate buyers, show management this year grouped the exhibits into various categories — instrumentation, components, etc., and while this move did to some extent alleviate conditions for the person interested in examining one class of merchandise, it could in no way diminish the hurly-burly, distracting atmosphere that cannot help but pervade an event the size of the IRE Show.

In many respects the IRE Show is similar to a colossal Woolworth's store. Fundamentally the two operations are similar in nature by reason of the fact that their stock-in-trade is made up of a thousand and one items. Literally there must be many thousands of items which go to make up the ever-increasing complexity and variety of electronic equipment, and, with the increasing demand for component quality and specification requirements, more and more manufacturers of components are becoming anxious to exhibit their particular bits and pieces at the various electronic shows, on which occasions they are afforded the opportunity of pointing out to potential buyers the quality standards and specification levels of their products. The growth in the number of components and sub-assemblies in the electronics industry has reached terrific proportions and would appear to be still snowballing. The effect of this condition on electronic shows would surely mean that the time will come when these shows will burst asunder and disintegrate into many small shows specializing in sharply defined classes of components and equipment. From a standpoint of potential sales, we believe that smaller shows would result in a greater volume of business for exhibitors. Certainly exhibitors would at least be afforded a more appropriate atmosphere in which to conduct their business during show hours without having to resort to the use of hotel rooms for the conclusion of interrupted business discussions.

## Let's Avoid This

It is reported that strong criticism has been directed to firms in the United States who use the occasion of the IRE Convention and Show for the recruitment of engineers. This is a situation, we believe, that can only be measured on the basis of business ethics which the industry is prepared to set down for itself. Certainly at the present time there is no such code and, in view of the acute shortage of engineers, industry is not likely to impose upon itself any moral rules that would deprive itself of the opportunity of recruiting engineering help

from among the concentrated gathering of engineers who attend the IRE Convention.

Since all companies dependent upon engineering talent to carry out their business regard their technical personnel with extreme jealousy at this time, it can be reasoned that any loss of skilled personnel resulting from visits to the IRE Convention is not taken kindly by personnel officers. As already stated, there is little possibility that firms will rule out this practice themselves, in view of which situation it is considered that IRE Show officials would be doing the industry a service by prohibiting this practice at future shows. It is sincerely hoped that, insofar as the IRE Canadian Exposition and Show is concerned, this practice will not be permitted to gain a foothold.

## Shopping By Electronics

The latest item to be deemed expendable by the scientists is none other than the housewife's shopping basket, according to an R.C.A. news release.

A large association of thousands of independent grocers in the United States and Canada are now reported to be testing several versions of an automatic food store that is electronically operated.

In one of these, the housewife shops by inserting a key into a series of slots in display cases. Food items are behind glass. As the buyer inserts the key under each item she wants, the total is tabulated electronically inside her key. Then she simply presents the key at the checkout counter, and her order is brought on a conveyor belt in a carton.

Elsewhere, some king-size supermarkets are today using electronic "answer-men" — panels equipped with buttons which housewives can press to find out where a particular item is in the store. Moreover, the drive-in principle is no longer confined to restaurants. Some drug stores are using it, and have even equipped their carhop order-takers with radios for communicating with clerks inside.

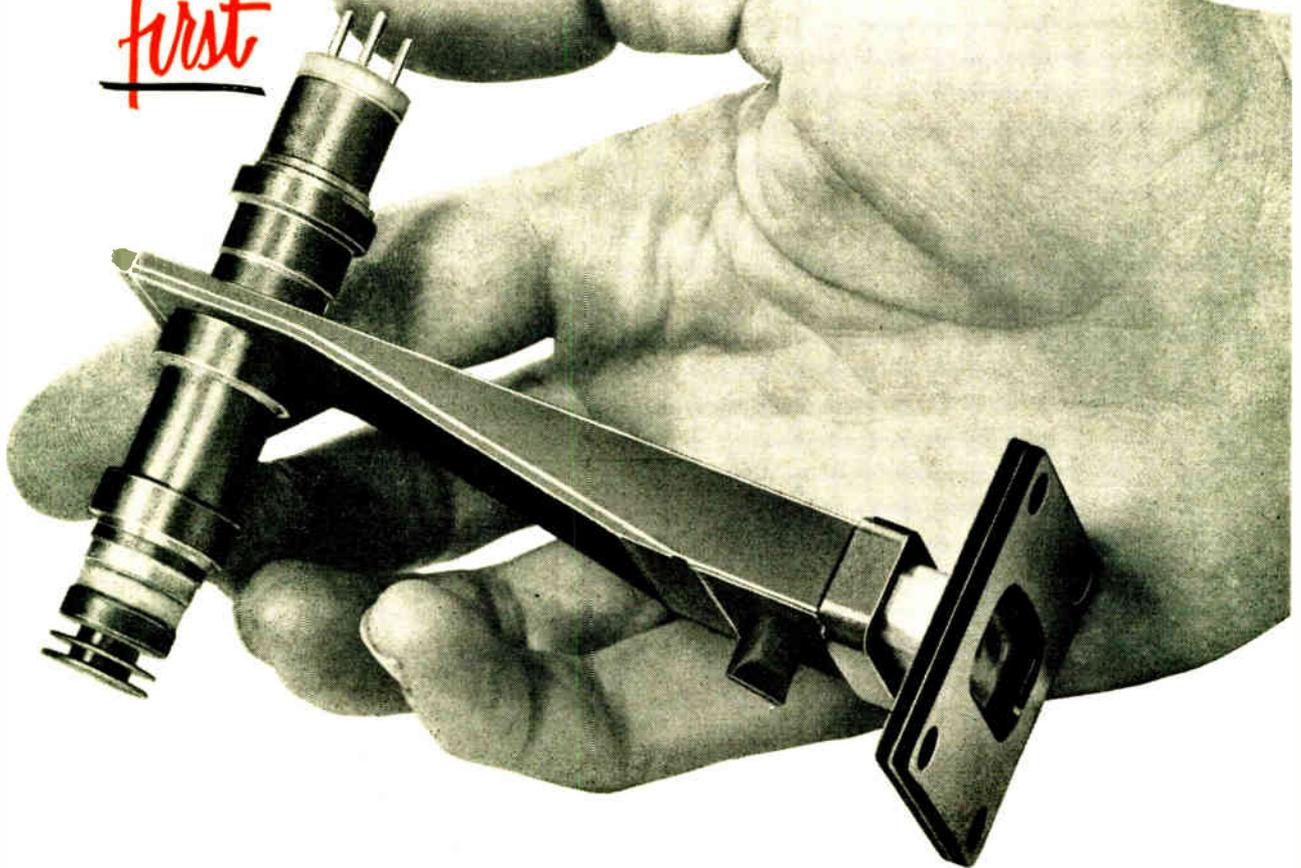
Behind the retail counters electronics is also taking over. RCA's Bizmac electronic computer, for example, is already being tested by one large retailing organization as a possible helper in answering such vital questions as what to buy, how much, when, and at what prices. It will also apply electronic speed to tabulating sales, recording charge accounts, determining customer preferences, and forecasting future business conditions.

Insofar as the elimination of the housewife's shopping basket is concerned it is the best bit of news we've heard in some time. Anything that science can do to alleviate those week-end supermarket melees in which it is necessary to push a rubber tired parrot cage up and down crowded aisles of week-end shoppers should be heartily recommended for consideration as a possible Nobel prize winner in the field of science.

It may be of course that this new method of shopping electronically will be a little frustrating to Milady at first, depriving her as it will of the opportunity of probing meat cuts to determine their fat and bone content and generally man-handling the merchandise to appraise its quality, but this is something that housewives will have to sacrifice for the sake of progress. Until such times then that housewives accept this electronic incursion upon their traditional shopping techniques it will be interesting to observe their deliberations as they stand and ponder whether to insert their key in favor of an electronically controlled string of sausages or a couple of pounds of electronically imprisoned hamburger.

## ANOTHER VARIAN

*first*



## A MINIATURE *backward wave oscillator*

This Varian Model VA-161 is the *only* rugged, system-tailored, voltage-tuned Backward Wave Oscillator now available for radars, signal generators, search receivers and related microwave equipment. Here are some of its important advantages:

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- ✓ Low voltage requirements... operates over a frequency range of 8.2 to 12.4 kMc on less than 600 volts.
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- ✓ Designed for modern miniaturized equipment... small, compact... body measures approximately 4" x 3/4".

- ✓ Withstands shock and vibration... rugged metal and ceramic construction.
- ✓ Permanent magnet weighs less than 5 pounds... eliminates need for electromagnet *and* its power supply.
- ✓ Power output is smooth across entire tuning range... fluctuations are small.
- ✓ Low thermal drift.

Additional tubes covering other frequencies are being developed to help solve your microwave system problems.

**SYSTEM DESIGNERS**... Why not get the full story on this important new Backward Wave Oscillator? For complete technical data, write Applications Engineering Dept.

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For further data on advertised products use page 87.

# RETMA Report

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



## RETMA'S Participation in Dealerama

The Radio-Electronics-Television Manufacturers Association of Canada participated in the "Dealerama" held under the auspices of the Ontario Association of Radio, Television, and Appliance Dealers on April 15th at the Royal York Hotel, Toronto.

RETMA provided luncheon and dinner speakers and an authoritative panel of experienced merchandising personnel. The luncheon speaker, Charles Bevis Jr., Vice-President and General Manager of WBUF-TV, Buffalo, N.Y. announced that UHF Channel 17 will double its power to one million watts on or about August 1st.

Mr. Bevis said the power increase to 1,000,000 watts would mean an even brighter, clearer picture for television viewers and a much larger area.

"All communities beyond Metropolitan Buffalo in our present coverage area are expected to receive a much-improved signal, and what is now our outer area will be extended a greater distance," he said. In Toronto, Hamilton and Oshawa viewers should benefit greatly.

Mr. Bevis said every Canadian manufacturer, distributor, retailer and serviceman with a stake in television stood to gain from the power boost. WBUF officials, he said, had made the following estimates based on their first-hand knowledge of events and conditions in the Buffalo market and reports from reliable Canadian sources:

There were about 45,000 homes in the city of Toronto and the six counties of the Ontario Peninsula which were now equipped to receive Channel 17 - approximately 17 per cent of the total television homes in this area.

With the stronger signal, the demand for UHF conversion was expected to add more than 23,000 homes to WBUF's audience between August 1st and the end of this year. More than one-fourth of these should be in Toronto alone.

Estimated retail sales of all-channel sets and converters in the Ontario Peninsula area between August 1st and January 1st, 1958, should total about \$3,900,000.

Such estimated sales could exceed \$35,000,000 by the time 100 per cent conversion was eventually achieved.

The power increase will be accomplished by replacing the existing antenna with a new antenna about double the size. The new antenna will increase the height of WBUF's tower at the rear of the \$1,500,000 Color Television Center from 670 feet to 740 feet.

The dinner speaker, Mort Farr, Past-President, National Association of Television and Appliance Dealers, Upper Darby, Pa., spoke on successful television selling in today's market.

A top-flight panel organized by RETMA, under the chairmanship of Fred W. Radcliffe, RETMA General Manager, was well received. The panel was led by Lloyd Kiely, General Sales Manager of the Philco Corporation of Canada, who gave pointers on selling to the approximately 700,000 wired Canadian homes who have not yet acquired television receivers. The way to such sales was by a personal approach and, in view of the expense of making personal calls, telephone solicitations should be made. This type of approach, if accomplished methodically and diplomatically, could lead to increased sales.

K. C. Hartwell, Manager of Radio and Television Sales, Canadian General Electric Company, spoke on the sales approach for portable television receivers and for second sets.

(Continued overpage)

# RETMA Report

---

He stressed the need for planning, ingenuity, and salesmanship and presented some interesting facts on surveys made on the second set market in the U.S.A. The locations of the second sets were given as follows:

Living room .....	11.2 per cent
Den or Study .....	17.7 per cent
Adult's Bedroom .....	30.5 per cent
Children's Bedroom .....	21.6 per cent
All others (Patio, Recreation Room etc.) ..	19.0 per cent

Further statistics showed the age groups for these purchasers:

	Per Cent Purchased	Per Cent Population	Per Cent Saturation
18-34 years .....	27.4	22.0	74.5
35-44 years .....	23.6	21.1	81.0
45-54 years .....	18.2	18.5	66.8
55 and over .....	21.5	24.8	65.7

By income groups, the following figures were given by this survey:

Under \$3,000 .....	1 per cent
3,000-4,000 .....	2 per cent
4,000-5,000 .....	4 per cent
5,000-7,000 .....	6 per cent
7,000 and over .....	13 per cent

The speaker also mentioned the potential sales of second sets for summer cottages and holiday resorts within range of television signals.

Howard Main, Sales Manager, Dealer Promotion Department, Dominion Electrohome Industries Limited, dealt with the advantages of making the sales approach on "quality" rather than on low prices. He presented sales mark-up figures which indicated how the net profit increased as better quality merchandise was sold approximately for the same amount of time and expense as selling lower quality goods.

He emphasized that goods of quality gave customers "pride of ownership" and this attribute should be made a selling point. "Suggestive" selling methods should be utilized to establish contact between customer and seller.

Jacques Wolff, Merchandising Manager of Consumer Products, RCA Victor Company, spoke on the home market for tape recorders. He mentioned the advantages of tape as a recording medium, citing the ability to erase previously recorded sounds and re-using the tape many times. Tape recordings could also be cut and spliced so that it gave flexibility of recording.

He explained the characteristics of stereophonic sound as three-dimensional and mentioned the availability of stereophonic sound tapes for the home phonograph.

Mr. Wolff mentioned the future possibilities of tape recordings. It would soon be possible for the home user to record his favorite television program on tape and play it back through his television receiver -- both audio and video would be recorded.

Jim Sands, General Service Manager of Philips Industries Limited, spoke on the Town Meetings for television service technicians for 1957. These meetings have been held since 1948 and have been well attended from Halifax to Vancouver.

Mr. Sands said that Town Meetings were intended to keep the technician abreast of the latest developments of the industry. He urged all dealers to make sure that their service technicians were given the opportunity to attend the meetings

(Continued on page 78)

build reliability  
into your product  
with

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**COMPONENTS**

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All-ceramic and metal, close-control rheostats for unsurpassed dependability and smoothness of operation. Ten stock sizes, 25 to 1,000 watts.

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A wide range of dependable, fixed, adjustable, tapped, and noninductive power wire-wound resistors. Also a wide range of precision resistors.

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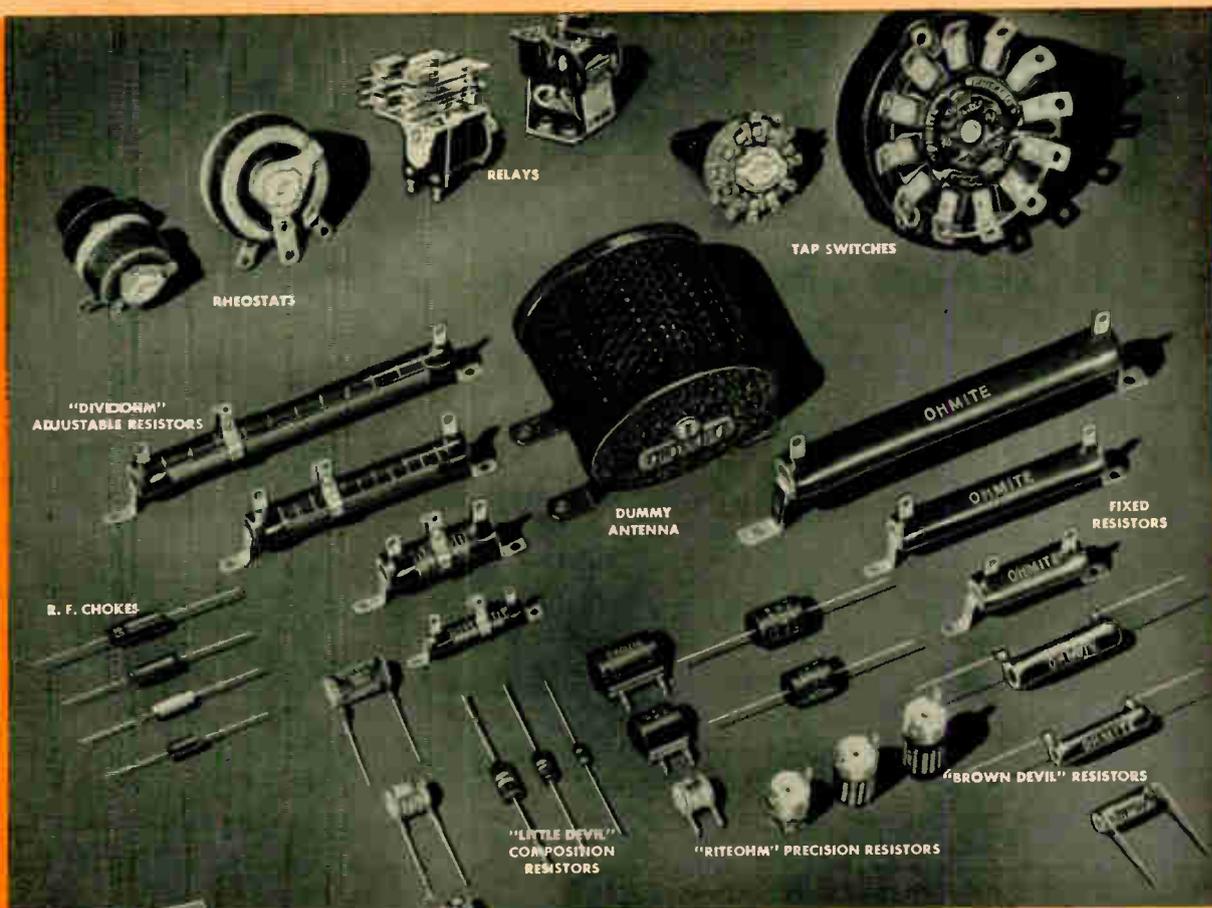
65 Types in four stock models. Good delivery on made-to-order relays. Contact current ratings up to 25 amps, AC or DC. Wide variety of contact arrangements. Hermetically sealed or dust-protective enclosures available.

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Five compact models, up to 100 amperes, AC, up to 12 taps. All-ceramic and metal construction. Silver-to-silver contacts, with self-cleaning rotor contact.

*radio-frequency* **CHOKES**

Single layer R.F. plate chokes and power line chokes on steatite or plastic cores. Protected by a special moisture-resistant coating.



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World Radio History

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We have prepared a 30 page Booklet — listing the last 1000 of the many thousands of reader post card enquiries received during 1956.

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For Your Copy use a Reader Service Card — Page 87



*a comprehensive*  
**Telecommunication  
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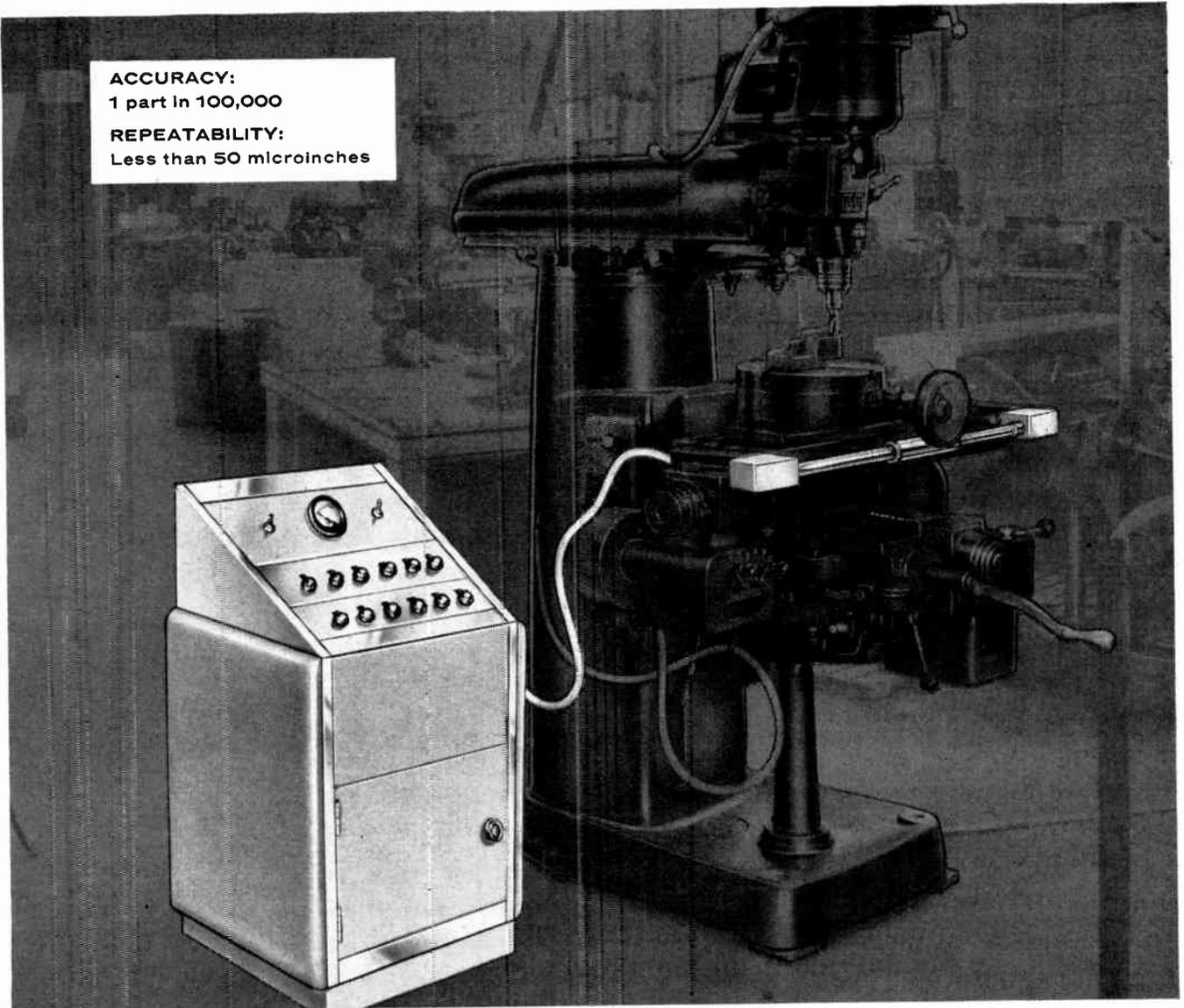


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- Measuring systems feature a counter read out providing the operator with a constant visual indication of tool position.
- Positioning systems are completely automatic—setting dials to correspond with required dimensions results in accurate tool positioning. Programmed versions using punched tape or cards are also available.
- Adaptable to both new and existing machines these systems make not only long but short production runs attractive by reducing set up time to a minimum. Use of plug-in packaged components facilitates maintenance.
- Machine tools are but one application for Nultrax. From simple gauging to complex wind tunnel throat control systems, Nultrax offers a new standard of performance.
- For more information on Nultrax, contact your nearest Westinghouse Sales Office, or write Canadian Westinghouse Company Limited, Electronics Division, Hamilton, Canada.
- **WATCH WESTINGHOUSE ELECTRONICS**
- ...WHERE BIG THINGS HAPPEN FIRST

Enjoy Television's Top Dramatic Show, *Westinghouse STUDIO ONE*, every Monday at 10:00 o'clock.

## Labor's Future In Automation

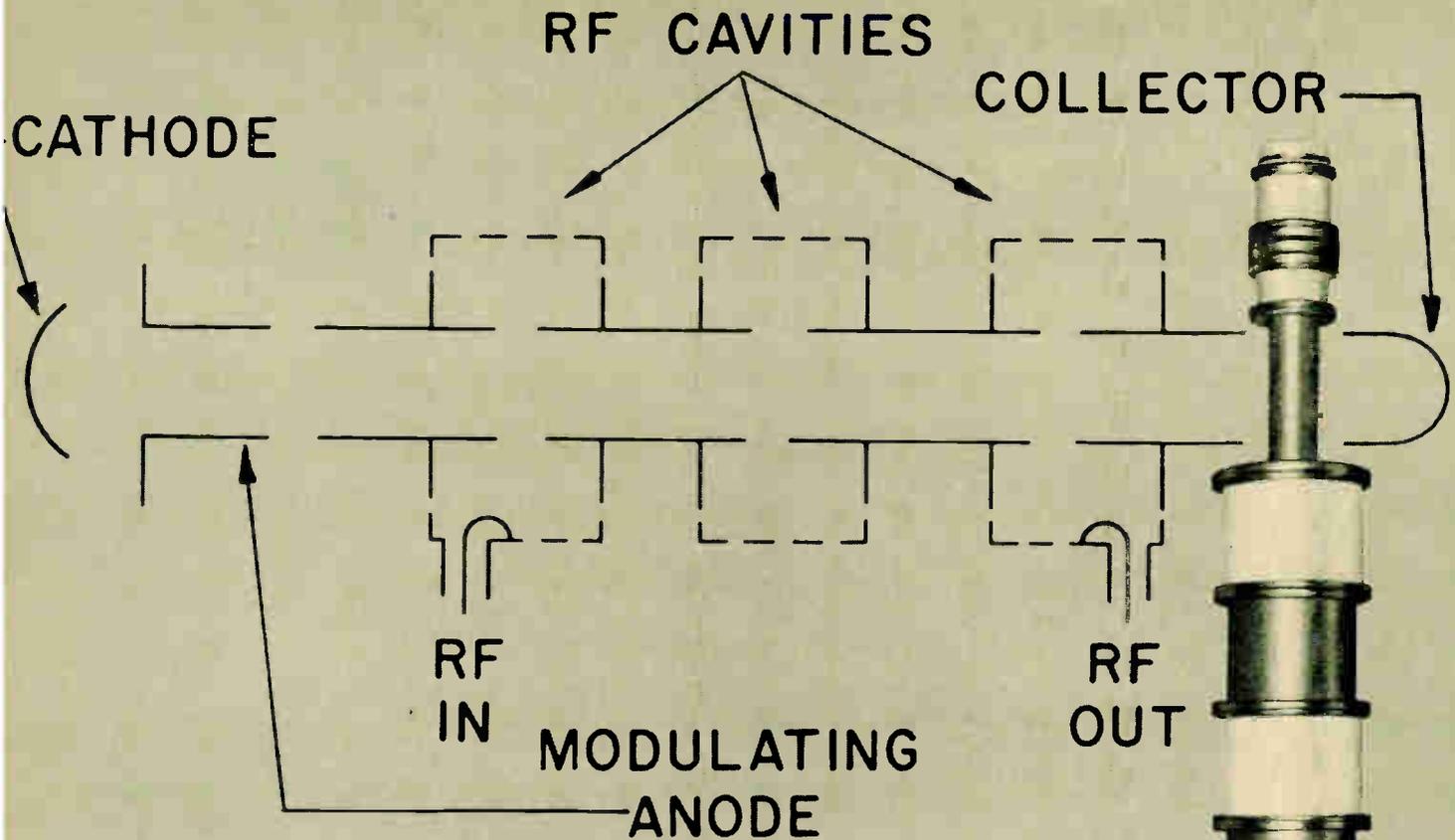
*It is encouraging to note that there is less pessimistic gloom being written into reports concerning automation and its possible effect on society. It is not too long ago that such reports dwelt primarily with the grim conditions that it was claimed would surely ensue once automation got a foothold in industry and business. It is quite natural and legitimate that labor authorities should have raised their voice in protest against any influence that would have wrought injury to the labor force, but it would now appear that the brighter prospects that may conceivably result from automation are being recognized by labor authorities.*

★ *This change of attitude toward automation on the part of labor authorities is to be welcomed because there is little doubt that the expressed attitude and opinion of labor leaders is most certainly reflected in the mental attitude of the labor force. It follows, therefore, that a labor force, provided with the factual information regarding both the pitfalls and the advantages that will be inherent in this product of present day technology, will surely be in a healthier frame of mind to face the situation than would otherwise be the case if provided only with the gloomy side of the story.*

★ *Evidence of this change of attitude on the part of labor officials is contained in that portion of the Report of the Royal Commission on Canada's Economic Prospects which deals with automation. While there is still a trace of the old gloom, it would appear to be diminished in quantity and what does remain is certainly modified by the considered inclusion of the brighter possibilities that may result from automation.*

★ *Insofar as labor is concerned, one of the most reassuring observations made in the report — an observation presumably submitted by labor authorities — was that, with automation, there might be substantially more jobs by 1961 than there would be workers to fill them.*

★ *While the year 1961 may be a little early for this condition to obtain, there is, we believe, every likelihood that such a situation will eventually come to pass. At that time, whenever it may be, there is little doubt that Canada will have a numerical labor force sufficient to fill the demands, but whether this labor force will be qualified in the trades and skills that will be necessary to fill the type of job that will be born of automation is another question. It is in this matter, then, the matter of training our labor force in the necessary skills to perform these future jobs, that the problem of labor lies. Not only is this the problem of labor insofar as automation is concerned, it is indeed a responsibility, and labor authorities could do no better than encourage those of their ranks who will likely be called upon to fill these future jobs to use the intervening years in which to qualify themselves for the types of employment that will be available in Canada's next decade.*



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**Eimac high power klystron**  
**for 225-400 mc range**

Eimac has spanned another frequency range... 225-400 mc with its new 3KM50, 000PA ceramic klystron. This tube, designed for the VHF/UHF border junction, will deliver 20KW CW power output with as low as one watt drive and an efficiency of 45%. This high efficiency and power gain of 20,000 times is typical of the incomparable performance of Eimac Klystrons.

Eimac has also incorporated the modulating anode which gives the 3KM50, 000PA 100 percent modulation ability to peak power outputs of 40 KW. It can easily be pulse modulated with low pulsing power.

Wide range tuning and an easy economical approach to high power UHF transmitters is made possible by the Eimac feature of completing RF circuitry outside the vacuum system. These permanent components, available at Eimac, make for ease of tube change plus economy since costly RF circuitry is not repurchased with each tube replacement.

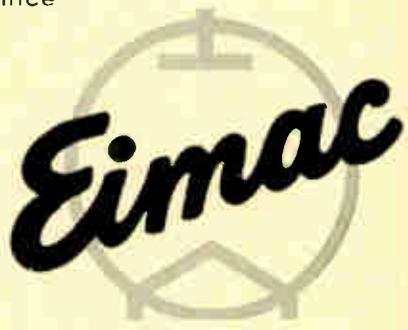
For further information on the 3KM50, 000PA, as well as other Eimac firsts, please consult our Application Engineering Department.

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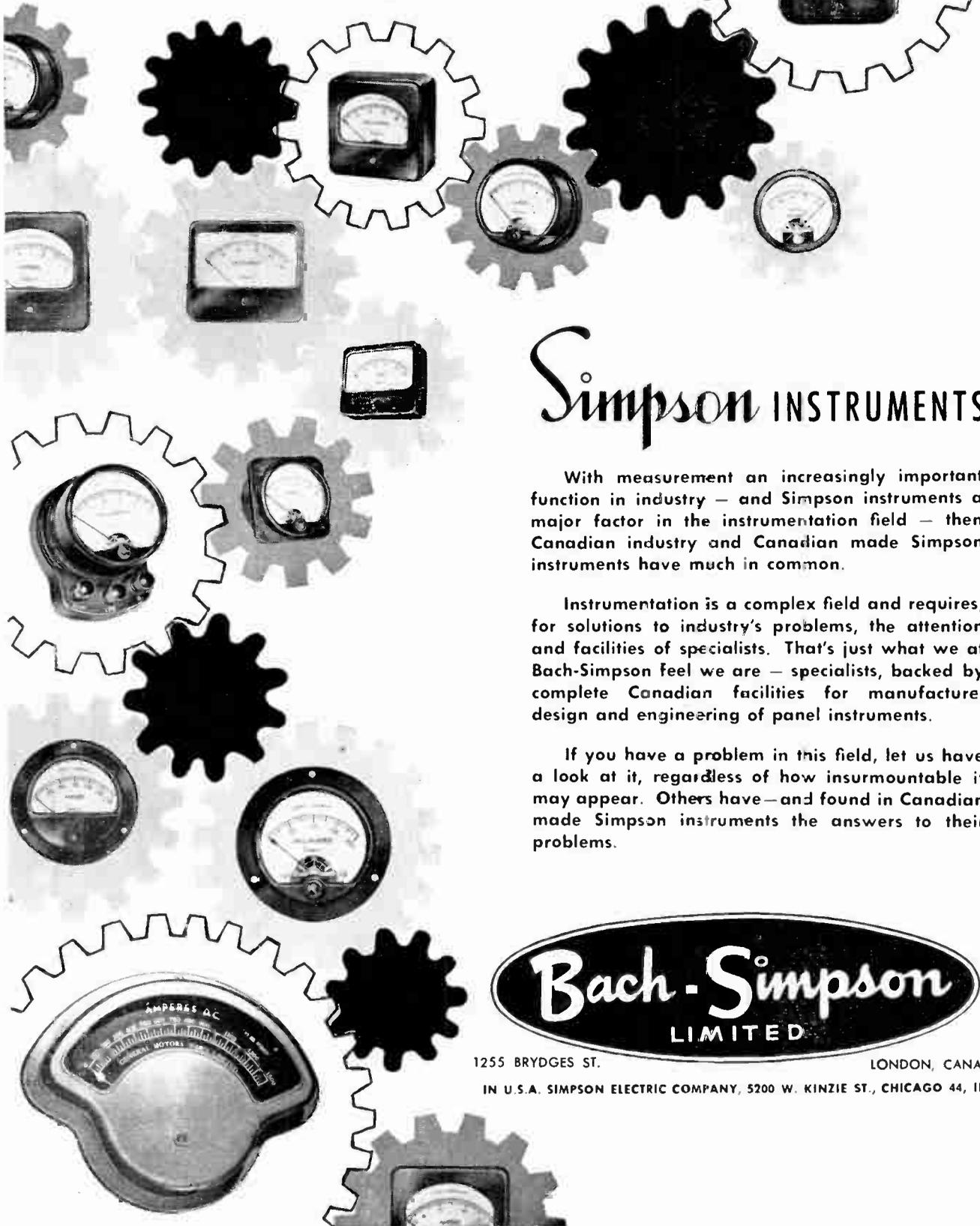
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**Typical Operation of the 3KM50, 000PA**

D-C Beam Voltage . . . . .	20kv	Driving power . . . . .	1w
D-C Beam Current . . . . .	2.2 amps	Efficiency . . . . .	45%
Power input . . . . .	44kw	Power Gain . . . . .	43db
Power output . . . . .	20kw		

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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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LONDON, CANADA

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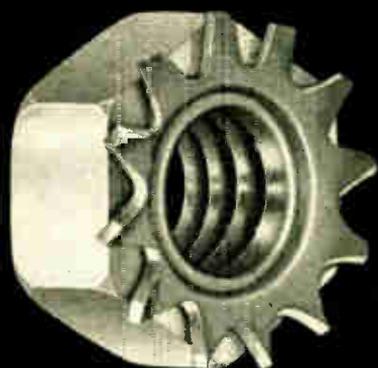
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# electronics

## in business & industry

### business machines

An input-output typewriter for data processing work has been developed by International Business Machines Corporation. Used as output equipment, signals from the computer automatically control the keyboard functions of the typewriter. Used as an input device, electrical impulses are conveyed from the typewriter simply by depressing a key.

• • •

### biology

Greater efficiency in conducting pyrogen tests of intravenous preparations is now possible. To eliminate the manual labor involved in making these tests, new electronic equipment developed by the Fielden Instrument Division of Robertshaw-Fulton Controls Company provides automatic and continual recording of the body temperatures of as many as 24 rabbits at one time. Rabbits are customarily used in such tests.

\* \* \*

### metallurgy

An easily operated portable equipment for sorting and identifying non-ferrous metals and alloys has been developed in the United Kingdom. The instrument can be operated by personnel with little or no electrical or electronic knowledge. The instrument works on dry batteries and will identify metals and alloys, measure electrical resistivity, detect flaws, variations and foreign matter and will measure variations in thickness from one side of the material.

\* \* •

### materials handling

Two types of electronic checkweighers known as "Solarchecks" have been developed by a British firm. One model weighs instantaneously and accurately rigid or packaged goods and enables the operator to handle them at a rate of 60 items a minute in semi-automatic production lines. The principle employed is a force balance whereby an article placed on the weighing head is counterbalanced by means of a highly stabilized electronic servo system. The second model, designed for incorporation into existing production lines, is capable of weighing up to 120 items a minute with a high degree of accuracy.

\* • •

### copying machines

A labor-saving piece of office equipment known as the "Secretary" Copying Machine, which uses an exclusive electronic principle to reproduce letters, reports, charts, meeting proceedings, production or sales data, can copy 2,000 words in less than one minute. This equipment operates without the use of liquids, negatives or master copies.

\* \* •

### life-saving

An electronic lifesaver consisting of a glass wand containing argon gas has been developed for resuscitation purposes in cases of drowning, mine disaster and electrocution.

\* • •

### telephony

A lightweight telephone amplifier, weighing only three ounces, and termed the Scottie Phone Aid, has been devised for attachment to any style of telephone receiver. Its purpose is primarily to help the hard of hearing by increasing the sound output and to eliminate surrounding noises that tend to disturb the listener. The device has further possible applications as an aid in improving long distance and rural telephone connections.

\* \* •

### navigation aid

A new type of daylight switch using transistors and sensitive relays for controlling battery operated buoys and shore lights has been developed by the Radio and Electrical Engineering Division of the National Research Council of Canada, and approved by the Department of Transport. It is hoped that, through the use of this type of switch, buoys will be able to operate through a whole season without replacing the batteries.

# electronics

## in business & industry

### instrumentation

A computing device that can be used in pneumatic measurement or control circuits for a variety of purposes has been developed by Honeywell's Industrial Division. Known as a Sorteberg Force Bridge, the device can convert a transmitted signal from a square root flow transmitter into a linear signal permitting the use of a flow receiver with an evenly graduated chart.

\* \* \*

### radiation monitor

A compact, multi-channel radiation monitor system for personnel safety in hospitals, laboratories, reactor installations, or wherever radio-isotopes are used, is now available. The unit, Model UAC 450, is a five channel master console type remote monitor located at a central control station, and can be used to monitor radiation up to several thousand feet away in each of five different locations. It is ideal for area and background monitoring for personnel protection, exposure and health monitoring, film expose determination in industrial radiography, water supplies, water sewerage, stack monitoring, etc.

\* \* \*

### pharmaceutical

A powerful new ultra violet sterilizer, capable of producing completely safe, high-potency vaccines for immunization against polio and other diseases, has been invented by two scientists of the Michael Reese Foundation in Chicago, and is in course of production. Basic components of the sterilizer are a precision-balanced metal container 15 inches in height and an ultra violet element which fits inside. When the container is spun at 1800 revolutions per minute, the virus fluid works its way up the polished sides in a film one-twentieth the thickness of a human hair. Rays from the ultra violet element bombard each particle of the vaccine as it moves towards the container top. Precise control of the rays enables operators of the sterilizer to inactivate all virus organisms and at the same time retain highest potency of the vaccine.

\* \* \*

### marine engineering

The National Bureau of Standards, using a metal inductance micrometer probe as a detecting element, have developed an electronic instrument which continuously measures the clearance between the rotating and stationary blades of a steam turbine. It is expected that the device will assist in solving the problem of assuring safe axial clearance between rotating and stationary blades in turbines.

\* \* \*

### fruit inspection

An electronic fruit inspector, known as a Rephobiospect, is being used by the American Government to take the guesswork out of judging and appraising fruits and vegetables. This equipment seeks out hidden defects such as rotten cores and determines off-colors by the use of colored beams of light.

\* \* \*

### atomic flashlight

The Nuclear Corporation of New England has developed an atomic flashlight that will produce light for many years without the use of batteries or other external power. The illumination diminishes at such a slow rate that at the end of twelve years it has only lost half its brilliance.

\* \* \*

### prospecting

A new Ronka Ground EM unit is a portable tool for the prospector. The unit, called an electromagnetometer, eliminates the need for tedious land travel over difficult terrain and for pick and shovel work. This device is capable of locating lead, zinc or copper from an aeroplane. It operates by setting up a magnetic field. When any conductor enters this field, it creates a secondary field which is shown up on the instruments connected with the device.

\* \* \*

### railroad inspection

The New York subway is utilizing television as a labor-saving safety measure. An ultrasonic camera, installed in the train, detects hidden flaws in the rails and displays them on a 12-inch screen in the driver's cab. It is claimed that it took 267 track-walking men to find 67 breaks in one year, whereas the TV camera discovered 39 flaws in only 12 days.

# ALRIGHT!

## PYE NOW HAS THE F.M. 2-way radio

### You've been waiting for

Pye F.M. Ranger  
8-10 watt mobile  
radiotelephone  
available now.



Pye F.M. 20-watt fixed station.  
Available soon.

After years of intensive research Pye has now produced the *ultimate* in radiotelephone communications—the F.M. Ranger. What's more, this addition makes PYE the most complete radio communications supplier in Canada — the *only* company with both A.M. and F.M. VHF equipment.

Meeting the latest D.O.T. standards, the PYE F.M. Ranger is fully capable of being modified to meet future requirements imposed by channel splitting. Your investment is protected for the life of the set.

*As a completely new approach to frequency modulation the F.M. Ranger features:*

- Fewer tubes
- Many circuit refinements for top performance
- Minimum battery drain
- Low initial cost — low maintenance cost
- Highly efficient noise limiting
- Transmitter standby switch
- Fully compatible with existing F.M. systems

Special versions of the F.M. Ranger are also available for duplex and trunk mounting. Complete details and delivery information will be gladly supplied by any one of our sales offices located across Canada.

P.S. Demand is heavy — order now for early delivery.



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Manufacturers and engineers of H.F., V.H.F., U.H.F. radio systems, telephone apparatus of all kinds, scientific instruments, industrial and commercial television cameras, marine radiotelephones, fish finders and depth sounders.



● Critical electro-mechanical tuning demands accurate gears. Receiving Inspection uses a Vari-Roll Gear Checker to determine tooth to tooth composite error, total composite error, and backlash.

# Quality Is No Accident

By E. N. LENT

*Collins Radio Co., of Canada*

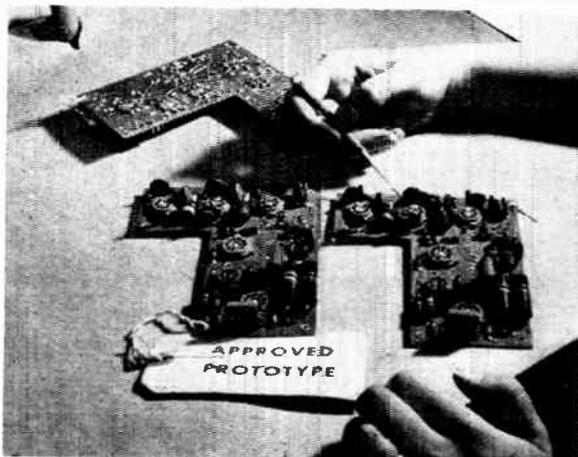
A QUALITY Control system should be designed to set up necessary checks and balances throughout a production program. Selection of materials and components, appraisal of vendors and cognizance of their manufacturing problems, inspection of all purchased material, step by step inspection of assembly and fabrication operations, production testing procedures and final test, shipping materials and methods must all be monitored by members of the Quality Control Dept.

It should not be necessary to engage in a long struggle to install suitable controls to meet the present day high quality standards of commercial and government customers.

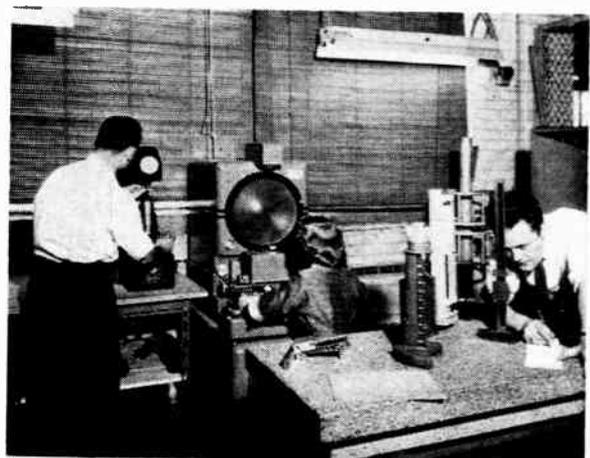
Defined levels of quality and reliability and the availability of tools to achieve the required levels are important factors in achieving a rapid acceleration to a significant volume of production.

Every department must participate in and will derive benefits from a

Quality Control system. The system should be designed to provide a continuous feedback of information to the Purchasing Department, Receiving Inspection, Assembly Inspection, Test and Engineering. Simple but comprehensive reports of factory performance should be provided to management on a weekly basis and visual charts should portray the quality level of any assembly line daily. By this method the occasional discrepancy is illuminated for all to see.



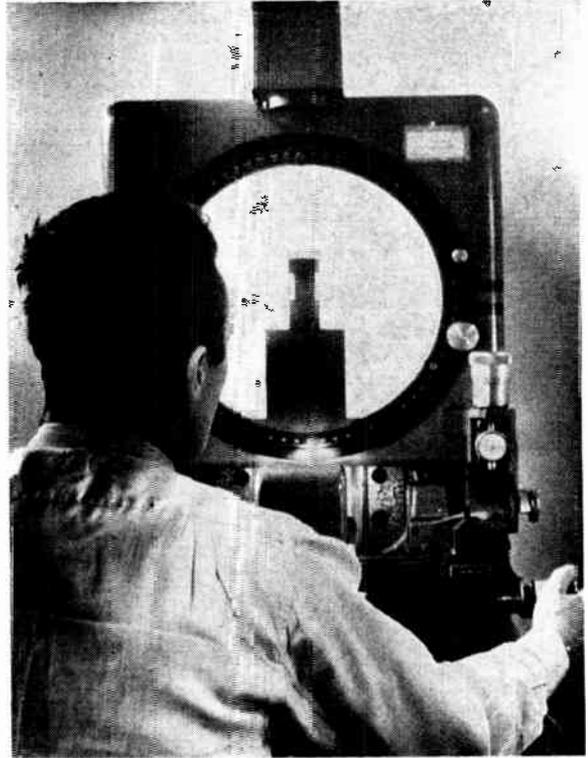
● If acceptable components are assembled in exact accordance with the approved prototype, the resulting sub-assembly will meet acceptable quality level.



● Mechanical dimensions of a UHF Scatter chassis are determined by using standard height and Cadillac gages.

- Mechanical inspection of a guide pin, used on the ARC-38 airborne HF Transceiver, utilizing a Kodak Projector at 50 diameters.

Rigid Statistical Techniques Of Quality Control Are Of Paramount Importance If Quality And Reliability Are To Be Manufactured Into Electronic Equipment. The Following Article Describes A System Of Quality Control Which Has Been Adopted As A Model System By Government Agencies And Prime Contractors.



The Purchasing Department plays an important part in any approach to Quality Control. In addition to acting as the buying agency, it also affords liaison with the Quality Control Department, the Engineering Division and the Vendor. In one successful Quality Control operation it is the policy of the Purchasing Department to buy the best quality product from a Canadian manufacturer at the most economical price. The specifications covering components give a complete description of pertinent

points of the component and methods of inspection and test. Drawings of mechanical parts show all dimensions pictorially and, in addition, are accompanied by another drawing which shows the degree of importance of all dimensions, their acceptable quality levels, and the methods of inspection. It has been found that this procedure lends a significant aid in Quality Control and acceptance of this system by the vendors has been enthusiastic. In effect this system of control is based on the old truism that it is more

economical to prevent mistakes before they occur than it is to correct them after they have been made.

#### *Cooperation With Vendors*

In any good system of Quality Control it is wise to invite new vendors to the plant and discuss methods of manufacture and inspection in order that any misunderstandings can be cleared up. This is one of the most important responsibilities of a Quality Control Department and it has helped to avoid many troubles.

(Continued on page 26)



- Test technicians carry out exacting tests on a sub-assembly prior to incorporation in final assembly of the ARC-27 UHF Transceiver.



- The number of errors found at the inspection station is compiled on the lower chart and the error average plotted. The Process Average is determined by dividing the error average by the total possible errors. The mean of the process averages for assembly lines under each foreman is plotted on the Chart.

# Quality Is No Accident

(Continued from page 25)

Contrary to general belief, it has been found that, with careful application, statistical methods can be as reliable for short runs as for large quantities and a good system can be applied to maintain a consistent approach for any lot size. In Receiving Inspection one large manufacturer relies on a double sampling plan in accordance with a modified version of the MIL-STD-105A Sampling Table. Following the selection of the proper sample size to be inspected, reference is made to the incoming quality record of the part itself as well as the vendor. The case history of the part and the quality history of the vendor may then allow either tightening or loosening of the inspection. If a more rigid inspection is indicated it might be applicable on only one attribute which has caused trouble in the past. Permanent records of vendor performance are an important factor in evaluation of quotations. Purchasing Departments know that the cheapest price is not always the best price and make regular use of Inspection records.

Occasionally it may be found that a part in short supply is usable but that certain dimensions exceed the specifications. In this instance a Material Review Board will screen such parts and ascertain that they may be used without affecting reliability or performance of the end equipment. A waiver of specifications is initiated by the Quality Control Department and after signature by the Project Engineer, the Quality Control Engineer and the Resident Government Inspector, the part is accepted into stock.

Inspection in the Fabrication Shop is essentially the same as that carried on in Receiving Inspection. When a machine has been set up, a part is produced and approved by a roving inspector before production is authorized. Through the use of periodic checks the quality may be controlled throughout the run of the part and final inspection of the lot is unnecessary. Here again case histories by part number and machine provide the benefit of experience in establishing

inspection techniques. Process charts are maintained from the individual machine records and make it possible for the foreman to know the general quality level of the Fabrication shop and detect significant trends.

## Small Quantity Inspection

In a plant where most of the assembly inspection involves small quantities of end equipments usually from ten to two hundred and fifty, a uniform approach to assembly inspection has been adopted. Before production has started one of the most skilled operators assembles a model under the close supervision of a representative of Quality Control. Particular attention is paid to quality of workmanship in order that a perfect example of standard practices may be obtained. After completion of this model it is tagged as a production sample and often mounted in plexiglas in order to protect it from handling damage and dust. It is then approved by Quality Control, Final Test, and, for a Government job, by the Government Inspector. All equipments are inspected using this model as a guide and all errors are logged and charged to that assembly group. Process charts are made daily and posted at the end of each line showing the average number of errors per equipment on a daily basis.

(Continued on page 33)

## Aluminizing Equipment For TV Tubes

A high-production unit for aluminizing color-TV plates or the screens of black-and-white picture tubes, inter-

changeably, is a versatile self-contained unit, with its own vacuum pumping system, which can handle

two color plates or two black-and-white tubes at the same time. For color plates, a removable metal cone supports the plates. To switch to black and-white tubes, all that is required is to remove the cones and insert the necks of the tubes into the openings of the evacuation chamber.

The filament holders, from which are hung the small staples of aluminum that is vaporized in the aluminizing process, are slightly different for each type of tube, but they can be quickly and easily interchanged.

The new dual-tube units will aluminize 20 color plates or black-and-white tubes per hour. The units can be used singly or mounted on dollies that travel around a circular or oval track to provide a continuous aluminizing system.



● The new aluminizing equipment can process two black-and-white picture tubes at a time, and can be quickly converted for processing color-TV plates.



#### MASS SPECTROMETER SEPARATES ELECTRON PARTICLES

This mass spectrometer for basic research in the petroleum industry required an extremely stable, high-intensity field which could be varied.

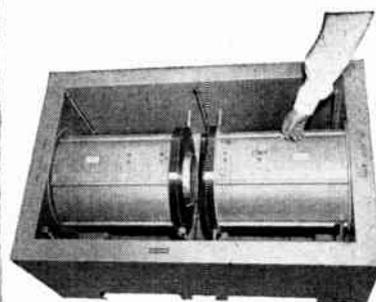
This assembly, which incorporates a massive 1,300-pound Indiana Alnico permanent magnet, provided the answer. It has a maximum field strength of 6,000 gauss, and stability is maintained without the use of complex control equipment normally associated with electromagnets.



#### ELECTRONIC "BRAIN" SENSITIVITY DEPENDS ON ALNICO

This electronic computer manufacturer required a permanent magnet housing for the magnetic tape reader and recorder unit of the processing machine in order to improve sensitivity.

Using Alnico for this housing brought on immediate improvement in signal strength . . . and better sensitivity because of the magnet's high efficiency.



#### NUCLEAR RESONANCE RESEARCH UNIT USES 1,000-LB. MAGNET

The University of Chicago, renowned in the field of basic research, required a high intensity magnetic field to extend their research in nuclear resonance.

This huge permanent magnet assembly, containing over 1,000 pounds of Indiana Alnico, produces a field of 6,750 gauss. The stability — an inherent quality of permanent magnets — is maintained without the use of costly controls.

## How three unusual products use Alnico permanent magnets plus creative design ... by Indiana

These dramatic examples of the use of Alnico permanent magnets illustrate how the creative engineering and manufacturing skill of The Indiana Steel Products Company have combined to meet the critical requirements of three unusual products.

This same experience can be put to work for you, too . . . regardless of application. Indiana offers the larg-

est staff of magnet engineers and the most complete research and production facilities in the world to assist in the development of permanent magnets for use in your products.

Be sure your new designs incorporate the most efficient and economical magnet! Contact Indiana, today, for engineering assistance and recommendations—without cost or obligation, of course!

#### **You can expect from Indiana:**

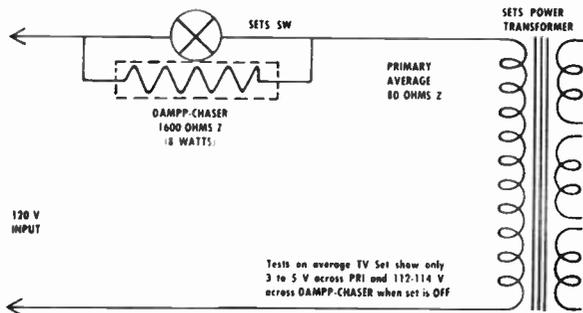
- Uniform, high energy magnets
- 24-hour service on "stocked" Alnico V magnets for your product development work
- Engineering assistance with new magnet designs—no cost or obligation
- World's most complete magnet production and research facilities

*For your product development work, Indiana stocks a wide variety of standard Alnico V magnets—available immediately in experimental quantities. Write for Catalog 11-A4.*

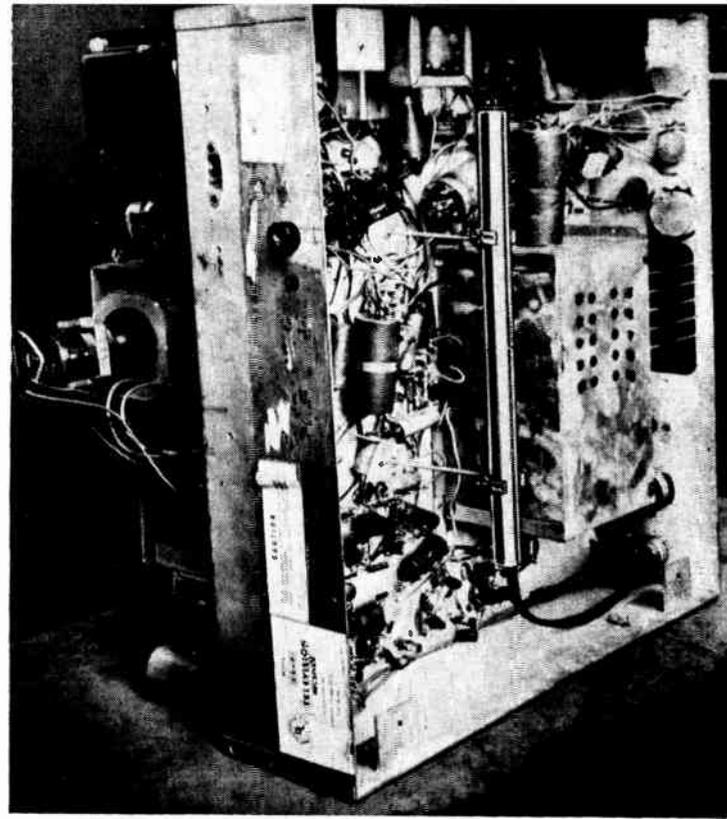
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Costly Repairs And Break-downs In Electronic Equipment Caused By Corrosion And Condensation Can Now Be Overcome By - - -



● Damp-Chaser, the slim aluminum tube shown installed underneath TV set. Invented by Allen M. Foote, electronic engineer and president of Damp-Chaser Inc., North Carolina, the tube protects the entire set by setting forth all-reaching convection currents. This insulating process is continuous owing to the tube's unique design which allows it to run both economically ( $\frac{1}{2}$ c a day of electricity) and continuously, never requiring attention.

# Damp-Proofing Electronic Equipment

By Allen M. Foote

**E**LECTRONIC equipment is seriously affected by excessive dampness not only in warm, humid climates but by condensation due to temperature changes in practically all climates. Therefore, while danger from dampness is acute in the tropics, it is present almost everywhere.

The danger from the use of highly concentrated sources of heat to correct dampness and condensation conditions is recognized by every electronics engineer and for some there has been a need for a special device which would meet the following exacting requirements: (1) the heating element must be long enough to distribute the heat evenly throughout the equipment to be protected, thus avoiding the danger of overheating some parts and underheating others; (2) it must be able to withstand voltage surges to which all electrical equipment is subjected when it must operate 24 hours every day, especially during lightning storms; (3) its wattage must be 4 to 6 watts per cubic foot due to equipment being vented; (4) the heater must not be a personal hazard, even when it is in direct contact with components or wiring, and it must be

tamper proof. After years of experiment there has been developed a unit that meets the exacting requirements outlined above.

Many engineers have not fully realized that by keeping equipment only 2 or 3 degrees warmer than the room temperature at all times, condensation due to daily temperature changes can be completely eliminated. This can be easily and efficiently accomplished by using continuous, gentle, well-distributed electric heat. A 25-watt unit consumes only 18 KWH per month which averages a penny a day.

Moisture cannot condense on surfaces unless they are at least a fraction of a degree cooler than the air around them. Condensed moisture causes rust and corrosion on metal objects and is absorbed by porous insulating materials such as wood, paper, bakelite, glass, porcelain, etc. causing leakage, arc-overs and break-downs.

By using a  $\frac{3}{4}$ " diameter, 25-watt, 36" long heater, the full benefit of the convection currents set up, due to heat's natural rise, is quickly and

continuously carried equally to all parts of the equipment without hot spots. By circulation, the entire equipment is insulated from the ruinous effects of excessive dampness and condensation by a blanket of gentle, warm, dry air in which the equipment is continuously bathed.

In electronic equipment such as TV, Radio, HiFi and Electronic Organs, the new heater has been successful in eliminating troubles from high voltage arc-overs, leaky condensers and insulation, corroded transformer wire and poor tone from damp paper diaphragms in HiFi loud speakers.

Other methods of removing excessive humidity such as dessicants are impractical unless the equipment is sealed up air-tight. Even then condensation can occur if the temperature change is sufficient. Since air-tight sealing is not possible when equipment is in use, there is only one answer — electric heat — properly applied.

A novel method of connecting the heater across the equipment's main power switch for automatic operation is shown in the schematic diagram.

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It's rather sensible, the emphasis our customers put on this "Performance-Guarantee." They know it's a guarantee based upon our *higher* quality hydrogen annealing, vital for high permeability laminations.

You see, small percentages of impurities, particularly carbon, oxygen and sulphur, have a deleterious effect on magnetic properties—and they are present in every alloy at the beginning despite the most rigid control of the metallurgy of the heats. In this as-rolled state, *the steel will develop as little as 5% of its ultimate permeability.*

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the water vapor which is produced by the reduction of hydrogen. Carbon reduces to methane, sulphur to sulphur dioxide, and both are removed by the continuous flow of dry hydrogen during the 24-hour cycle.

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CABLE: MAGNETICS

Damage And Possible Derailment Caused By Overheated Journals A Problem Long Paramount In The Minds Of Railway Operators Is Now Nearing Solution By The Use Of . . .

## Infra-Red Detection Of Hot-Boxes

**T**HE Chesapeake and Ohio Railway has set an infra-red "Hot Box Detective" to sleuthing out one of the oldest railroad villains.

The C&O was the first railroad to put in use an electronic detector developed to spot overheated journal boxes on railroad cars. "Hot boxes" can cause an accident if not detected.

T. L. Carlson, C&O superintendent of signals at Richmond, Va., has been working closely with Servo Corporation engineers in installing and testing the device on the C&O's eastbound track at Norge, Va.

Detector units are located outside and parallel to the rails with infra-red lenses angled up at 45 degrees at the axle journals of moving railroad cars. The equipment records on tape the temperature of every journal box regardless of the train's speed.

When a detector finds a journal box above a certain temperature, it flashes a warning to a signal mecha-

nism and the train is stopped. The equipment also notes the location of the car in the train and just where the defective journal is.

Since test installation on the C&O, the "Detective" has spotted one hot box that might have caused a derailment.

The detector head contains an infra-red pyrometer with a lens aimed at the bottom and side of a passing journal. A magnetic gate opens and closes a shutter that protects the lens and keeps it clean. This gating unit requires no external power source since the wheel flange passing over it generates a voltage pulse that operates the shutter.

The gating unit is located so the amplifier operates only when the journal is viewed by the detector. Because of this, heat from other sources, such as hot brake shoes, wheel rims and steam lines, does not affect the detector.

Signal processing amplifiers and

power equipment are mounted in a metal box inside the station building. A paper tape recorder makes a visual record of the relative heat of each journal passing over the detector. A pen deflection of about four times a normal heat impulse is considered to indicate a hot box. The telegraph operator acts on this warning and stops the train just east of Norge.

At present, this "Detective" is still in the testing stage on C&O. The railroad intends to replace the graphic recorder with an alarm-operating mechanism and journal counters also developed by Servo Corporation of America, that will instantly report the location of a hot box in a train. This information will either be used locally or forwarded to the dispatcher to have the train checked for a hot box.

The "Detective" is the latest of a large number of infra-red systems developed by Servo Corporation of America for the military and industry.

Tool And Die Distortion And Blunting Caused By Mechanical Overload Prevented With The Use Of . . .

## Electronic Press Control

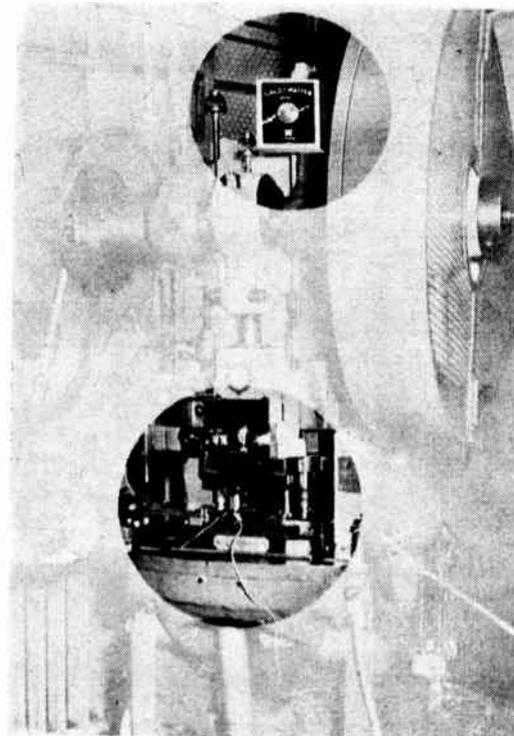
**T**HE introduction of a revolutionary electronic-mechanical press control to prevent tool and die damage caused by mechanical overload has resulted from some years of research and production-line testing in the manufacturer's own plant, Wintriss, Inc., of New York.

The Circuit Master, Mark II, as the device has been named, was especially designed for use on automatic equipment such as presses and molding machines equipped with a solenoid or clutch-type release. The new control is composed of a sensing assembly consisting of a compensating contactor mounted on the stationary part of the machine and a bumper mounted on the movable part. The contactor is connected by a single lead to a small and compact control unit containing a visual indicator and a switch, if

desired.

This amazing mechanism automatically senses the slightest mechanical overload, from practically any malfunction: faulty stock, tool dullness or misalignment, misfeeds, jams, non-ejection, freezing, etc. Stops any automatic machines, on contact, precluding expensive tool and die damage and replacement. The device is automatically self-adjusting and wear-compensating, and is unaffected by normal factory temperature changes.

Manufacturers of the device point out that the initial cost of the attachment is such that manufacturers, requiring the use of many presses, a requirement in many types of present-day industrial activity, may equip all presses with the control, a device that is simple to install, requires no attendance and negligible supervision.



● The electronic press control shown above automatically senses the slightest mechanical overload from malfunctions caused by faulty stock, tool dullness, misalignment and a variety of other causes.

# MONSANTO IS AT WORK



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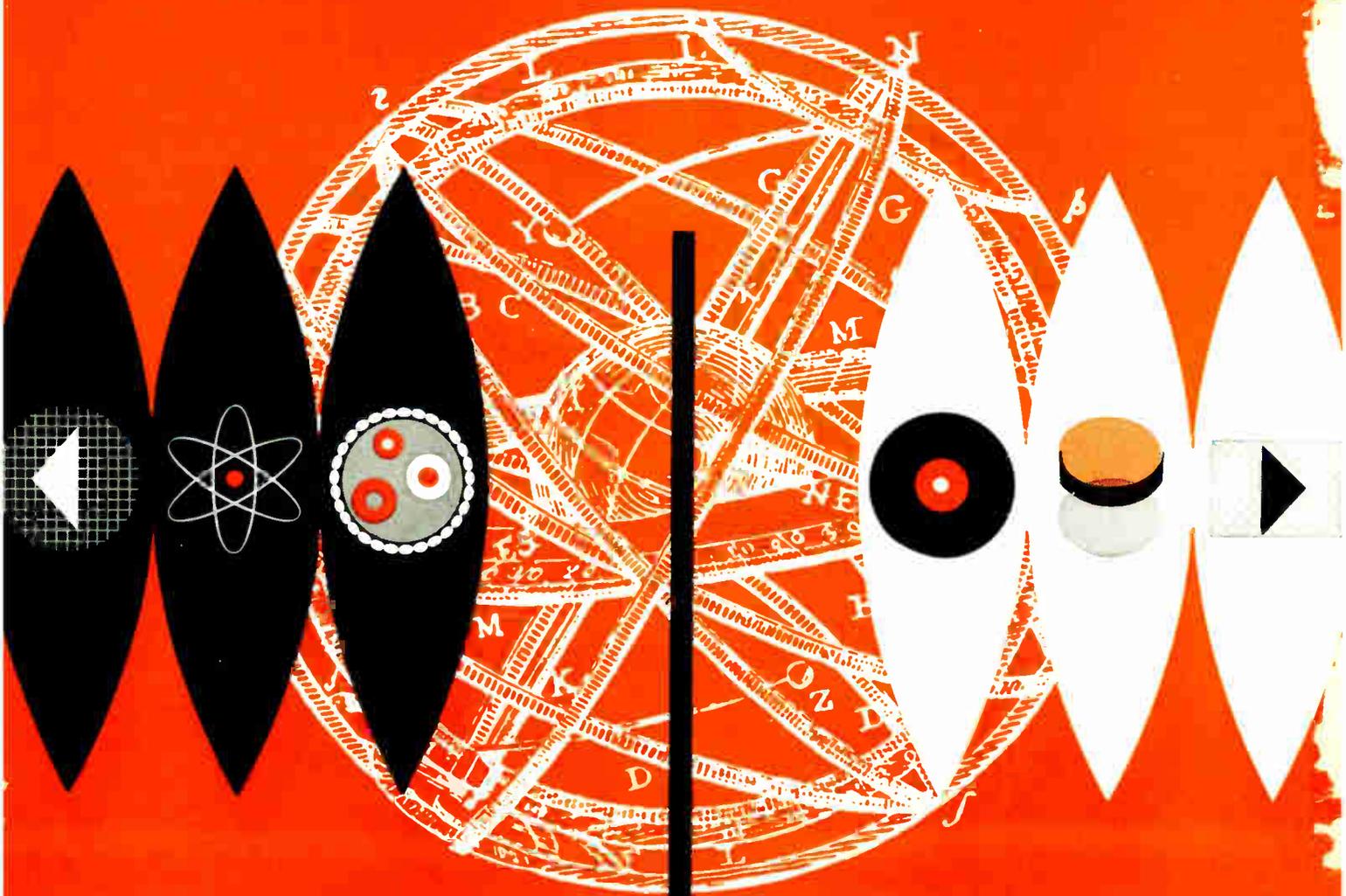
The colorful face of a juke box, the smart new cabinets of radio and television sets are molded of Lustrex, Monsanto's polystyrene plastic. The cables that carry broadcasts over distant networks are reinforced and protected by Ultron, Monsanto's vinyl plastic, which also forms the discs for new Hi-Fi recordings. Component parts in giant telecommunication systems, too, are intricately molded plastics.

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This Recently Developed EM Ground Unit Has Already Achieved World-Wide Reputation Through The Discovery Of Ore Bodies Valued At Millions Of Dollars.

## Sulphide Minerals Located With Ronka EM Unit

A NEW portable electronic tool for the prospector which combines modern electronic techniques with proven prospecting methods has been developed by Vaino Ronka, an electronics engineer with Aeromagnetic Surveys Limited of Toronto.

The lightweight Ronka Ground EM can be easily carried and operated by two men. It will be of most service in accurately locating and detailing sulphide bodies detected in the first instance by airborne EM methods. Materials other than sulphide bodies can show up as an anomaly on the airborne EM equipment. The ground EM survey will assist in distinguishing these materials from commercial sulphides. The use of the diamond drill while conclusive is an expensive method of confirming the presence of such sulphides.

The Ronka Ground EM unit makes use of two horizontal electromagnetic loops rather than a vertical loop. The manufacturer claims that the horizontal loop equipment is more portable, is cheaper to operate and is

much faster than the vertical loop equipment. Powered by flashlight batteries it can survey up to five miles of picket line in a day. The equipment is simple to operate and no special skills are required to plan and carry out a survey.

The equipment consists of two coils or "loops" which are suspended around the waists of the operators by shoulder harnesses. The prospector carrying the receiver coil also carries the receiver compensator console and is equipped with earphones. His companion wearing the transmitter coil operates the equipment with a switch. He is connected to the receiver by a cable 200 feet long which is stretched taut in operation.

An electromagnetic field is set up between the coils which induces voltage in a conductor if there happens to be one beneath the area they are surveying. The principle of operation is much the same as that used so successfully with airborne EM equipment and indeed with the familiar wartime mine detector. An alternating current



● Robert Parker, Toronto engineer, operates the new Ronka Ground EM unit, used in conjunction with another similarly equipped prospector to detect scarce lead, zinc and copper deposits. Although only recently introduced publicly to the mining world, the electromagnetic device has been proved in over a year's operational and experimental service by various companies.

passed through a coil of wire sets up a magnetic field about the coil complete with North and South poles and lines of force. Any metallic, electrically-conductive body within this alternating magnetic field will have "eddy currents" induced within it. These currents in turn set up a secondary magnetic field about the body. By detecting the presence of this secondary field, the operators establish the presence of the metallic conducting body.

---

## Quality Is No Accident (Continued from page 26)

### *Final Tests*

Experience has shown that assembly personnel take great pride in maintaining an acceptable quality level. Recurring mistakes are very obvious and may be traced to the operator and constructive help given in order to minimize such errors. At the end of each week all charts for each foreman are tabulated and a report is published showing the quality of work performed under the jurisdiction of each foreman. In addition to determining errors in assembly it has been found that errors chargeable to Receiving Inspection and Fabrication Inspection may be fed back to those departments by means of daily reports of such occurrences. This information on a current basis is of great help in establishing consistent inspection in both of these areas. By the same

token, mistakes in Assembly Inspection are brought out in Final Test and their procedures include an immediate feedback of information to assembly inspectors.

Each unit or sub-unit carries an identification tag throughout the assembly and test cycles. All errors are recorded on this tag and repairs and acceptances are stamped by the operator and by the inspector. All findings of the Final Test Department as well as any necessary repairs are recorded and the tag becomes a permanent record of that assembly. Studies of reliability have shown a definite correlation between Final Test troubles and troubles experienced in the field, and it has been found possible to insure dependable operation by proper test procedures. In addition, it has been established that most field

troubles occur in the first few hours of operation and usually involve a minor defect such as a defective tube. In order that the customer may be assured of dependable operation from the start, operation of the equipment for a prescribed number of hours should be carried out in the Test Department. This is a good investment in customer satisfaction and has resulted in a high order of reliability statistics in the field.

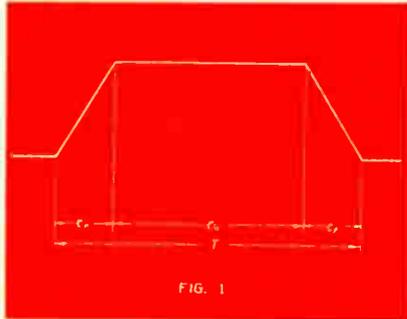
After Final Test the units are delivered to the Shipping Department where they receive a final inspection for handling damage before being boxed or crated. Shipping materials and methods should be carefully monitored and the final preparations for shipment must be approved by the Shipping Inspector.

# A Survey Of Shock Test Procedures

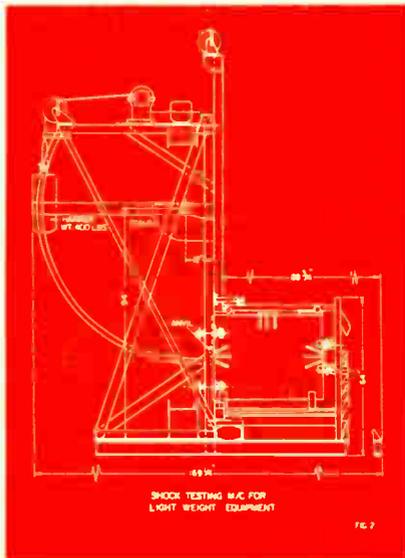
## — One Phase Of Laboratory Simulation —

By C. A. Mills

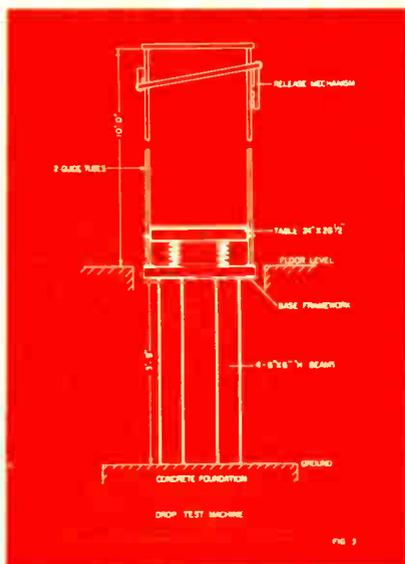
Section Engineer, Air Armament Engineering Electronics Division  
Canadian Westinghouse Company Limited.



● Fig. 1. — Reference Waveform.



● Fig. 2. — Naval Impact Machine.



● Fig. 3. — Spring Type Drop Tester.

**S**HOCK test machines were among the first instruments used as an attempt to produce laboratory conditions that simulate those met in the field. The need to simulate near-misses by torpedoes, mines, etc., resulted in the development of the Naval Impact machines. At the time this need was recognized, accelerometers capable of measuring the conditions were not available and hence empirical design methods were used. It was found that certain items of equipment survived the high shocks produced by near-misses. These items were then mounted on test machines and the force of the impacts increased until failure resulted. The test condition was then stated to be slightly less stringent than this point. This method of machine design made correlation of tests from laboratory to laboratory very difficult and the philosophy of specifying a particular machine was adopted. As instrumentation improved, attempts were made to define the test condition but the variation from test machine to test machine precluded this possibility. The High, Medium and Low Impact Machines are developments of this period.

During the Second World War the need for shock machines capable of simulating lower accelerations became apparent. These were to simulate conditions such as handling shocks, transportation shocks, rough landings, etc. In the interests of rapid design and manufacture, many varieties of test methods came into use — e.g. dropping from windows and gantries on to sand, spring, rubber, etc. The U.S. Military Authorities later standardized their test conditions. This resulted in the "Medium Impact Machine" called up in specifications for testing both equipment and components. The spring type unit was also standardized for some components.

As the specifications called for particular test machines and detailed test methods, the development of new types of test machines was discouraged. These machines had very wide tolerances on the deceleration produced for a given height and

number of blocks in the case of the sand test machines. Thus the specifications gave approximate "G" figures and duration whilst stating definite test methods. With these empirical test conditions the tendency on engineering was to work to large safety factors if a test waiver could not be arranged.

With the advent of high performance airborne machines, both manned and unmanned, the weight factors became more serious. This meant that the philosophy of beefing-up a piece of equipment to withstand shock had to be stopped to remove unnecessary materials. However, before safety factors could be reduced two major questions had to be answered:

1. What is the actual airborne environment?
2. What are the test conditions produced in the laboratory?

Once these problems were faced, instrumentation made great steps with the result that the actual conditions in piston aircraft became comparatively well known while those in the jets are still under consideration. When these conditions had been measured, steps were taken to develop test machines capable of simulating these conditions.

In attempting to meet these defined test conditions several new types of shock machines were developed: e.g.

- a) Lead Block Decelerators
- b) Hydraulic Machines
- c) Pneumatic Machines

As is to be expected, in the development of test machines to meet these conditions, several variants of each type resulted. However, these variants are less serious than formerly, providing the shock wave form can be measured and is similar from machine to machine. It is also a prime requisite of any test apparatus that test conditions are reproducible within reasonable tolerances.

### Purpose of Shock Testing

An examination of these new requirements showed that shock machines could simulate the following factors:

1. Normal operating accelerations, e.g. J.A.T.O., landings, manoeuvring.
2. Emergency Landings where equipment must not come loose and injure personnel.
3. High acceleration bursts of vibration, i.e. Transient conditions produced by rough engine operation, manoeuvres, etc.

**Definitive Test Conditions**

Before discussing the various methods of carrying out shock tests, the method of specifying the test conditions should be defined.

A true definition of a shock wave can only be given by one of three records.

- a) Acceleration/time
- b) Velocity/time
- c) Displacement/time

This record is necessary in order to completely analyze the test requirements and compare these with the simulated test conditions. In all three cases it is also necessary to define the bandwidth of the measurement system.

**Interpretation of Shock Waves**

In order to fully interpret a shock wave the following factors must be considered:

- a) Rise and decay times
- b) Duration of pulse at mean acceleration
- c) Mean acceleration
- d) Peak acceleration

In the case of an idealized shock wave (See Fig. 1) the acceleration is applied infinitely fast and maintained as a flat topped pulse for a given duration and then removed infinitely fast. In this condition  $t_r = t_f = 0$ . If this pulse is then analyzed it will be found that frequencies are present between the limits of infinity and  $\frac{\lambda}{4} = t_r$ . If this wave was applied

to a mechanical structure all resonances would be excited within these limits and these vibrations would last for a period longer than  $T$ , this period being dependent on the damping in the system. There would also occur a uni-directional deflection resulting from the acceleration. This deflection would initially be that produced by twice the acceleration and it would then return to a deflection produced by the acceleration proper providing the acceleration is still being maintained. This apparent amplification is present as the acceleration is instantaneously applied.

In practice however, these ideal conditions are not encountered and the state where  $t_r$  and  $t_f$  are both finite periods may be considered. In this case analysis will show that the whole spectrum from  $\lambda/4 = t_r$  to infinity is not excited but only a limited band of frequencies. The greater portion of the energy available will be expended in exciting resonances in the band between  $\lambda/4 = t_r$  and  $\lambda/4 = t_f$ . Since  $t_r$  is now a finite value the apparent amplification of 2 will not be present. However, the factor "infinitely fast" is a relative term between  $t_r$  and  $t_n$  where  $t_n$  is the period of the resonant frequency under consideration. If  $t_n \gg t_r$  then the acceleration is applied infinitely fast and the amplification becomes 2.

If this ratio is varied then the following table results

$t_r/t_n$	Amplification
0	2
0.2	2
1	1.8
2	1.2
3	1.1

If one reaches the condition where  $t_r \gg t_n$  then shock tests and sustained acceleration tests become synonymous. A centrifuge can then be used to produce the uni-directional movement produced by a shock test in the case of a system with only one major

resonance. In practice, systems normally have more than one major resonance and also one is interested in examining the effects of the transient vibrations produced on various parts of the system in addition to the uni-directional movement. From this it can be seen that the sustained accelerator or centrifuge cannot be used in lieu of shock test equipment but rather the two tests are complementary.

From these comments on the interpretation of shock waveform it can readily be seen that shock tests can also be used to simulate high acceleration transient vibration conditions providing the shock test method is one where the rise time, and duration are controllable. Many transient conditions are such that vibration testing equipment cannot effectively simulate conditions and hence this application becomes important.

It should be noted that the rise time  $t_r$  on a histogram is effected by the bandwidth of the instrumentation used and care must be taken to ensure that the definition of the test condition is not affected by this factor. This implies the bandwidth of the instrumentation system must have a wide enough pass band to pass all frequencies present.

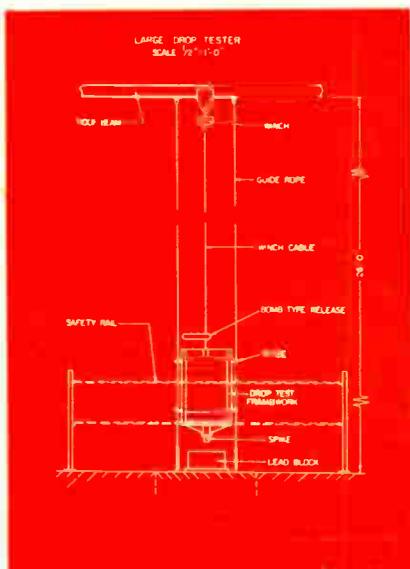
**Specifying The Test**

Bearing in mind the preceding comments on waveform interpretation an attempt can now be made to specify a shock test that would satisfy most testing requirements. The chief requirements of the specified waveform are as follows:

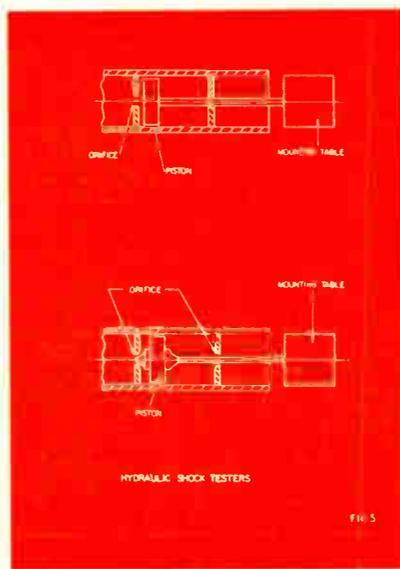
1. Repeatability of Waveshape.
2. Use of a waveshape that can be analyzed and test results compared with the actual conditions.
3. Accelerations must be compatible with those met in practice.

These factors can be achieved by using a waveform that approximates

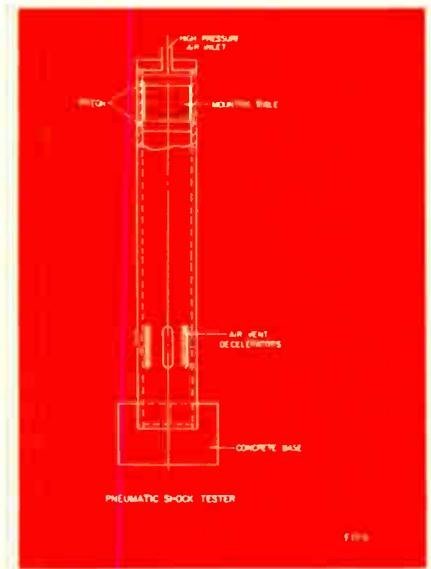
(Continued on page 36)



● Fig. 4. Large Lead Block Decelerator.



● Fig. 5. Hydraulic Shock Tester.



● Fig. 6. Pneumatic High "G" Shock Tester.

# Shock Test Procedure

(Continued from page 35)

an ideal shock, i.e. a trapezoidal wave with a finite time of rise and a relatively constant acceleration during the pulse. In practice a pulse with a rise time of approximately 500 microseconds and a duration of 8 to 10 milli-seconds will excite all frequencies in the band of 25 to 500 c.p.s. which in most structures will cover all serious resonances.

## Measurement Techniques

Virtually all types of acceleration, velocity and displacement transducers have been used at one time or another to determine the shape of the shock wave present either in practice or in laboratory simulation.

Three main methods are in use in the general field at the moment with other methods being developed in the various research laboratories. These methods are as follows:

1. Crystal Accelerometers
2. Strain Gages
3. Indent Accelerometers

The first two methods are in many cases complementary owing to the frequency spectrum covered by the two instruments. The Crystal Accelerometer with its very high resonance (10 to 30 Kc/s) will follow the most rapid rise in acceleration liable to be encountered in general practice. This instrument however will not follow a sustained acceleration even for a few milliseconds since the electrical signal generated is dependent on changes in crystal compression produced by the effects of acceleration on the accelerometer lead. Thus the output signal falls exponentially during any maintained acceleration. The Strain Gage Accelerometer however relies on the mechanical strain to produce an unbalance in the bridge circuit normally used and hence sustained accelerations can be measured from milliseconds upwards. These instruments have the disadvantage of having a resonant frequency usually less than 800 c.p.s. with the result that very fast times of rise can not be followed.

In many cases in practice however one is only interested in frequencies up to 50 c.p.s. and under these conditions either instrument will give satisfactory results. Experiments have shown though that for accuracy the complete measuring system should be calibrated as an entity rather than by its separate components. If an upper limit of 500 c.p.s. is required then the filter limiting this in the measurement system should be included in the calibration.

With extremely high accelerations (over 1000 G) normal accelerometer reliability tends to fall off owing to

normally minor faults being magnified. On tests of this nature one is normally only interested in the peak "G" present. This can readily be measured by using the Indent Accelerometer. This instrument uses the penetration of a steel ball into a piece of material as the indication of the force exerted. This indentation can be easily calibrated by use of compression machines and normal hardness testers. This type of instrument has repeatable accuracy within the limits of Brinell Hardness tolerances.

## Mounting Jigs

Great care must be taken in the design of mounting jigs to ensure that the resonant frequencies excited in

these do not color the results of the test. Since the whole spectrum is excited simultaneously the interaction of the various resonances must be carefully examined. Ideally no resonant frequency should be present in the jig over the frequency band to be excited during the test. In this consideration the effects of the test sample on the jig should not be neglected. In practice one of the great boons to jig design is that weight is not usually a problem as in vibration testing where the power available may be limited and hence jigs can be very sturdily constructed. The effect of the mounting table resonances will normally have been borne in mind during the design of this part of the machine.

## Types Of Test Machines

### High Impact Machine

The Lightweight Impact Machine is shown in Fig. 2. The heavier units operate on a similar principle. The test sample is mounted on a metal mounting plate and the hammer raised to the height called for in the specification. On release the hammer swings down and strikes the table a blow. This blow can usually be applied normal to the plate or upward through the plate. The hammer is manufactured of steel as is the mounting table hence the shock wave is produced by a blow of steel on steel. This results in an impact with a very high acceleration but with a very short duration. The accelerations are frequently up to levels of several hundred G but with a duration of only a millisecond or so. The impact normally produces a very high acceleration vibration, the damping of which is very largely effected by the sample mounted on the machine. The vibration frequency produced is usually fairly high on these types of machines and hence the loading effects produced on the test sample are virtually those due to repetitive ideal shocks. As a result of this factor this cannot be used to simulate a known acceleration versus time histogram. Since the test samples affect the results so greatly it has been found that the results from different machines are very difficult to correlate. This has resulted in the empirical method of specifying test, i.e. different heights for different weights of test samples.

This type of machine is highly effective in determining the effects of high acceleration shocks on the performance of the test assembly. This high acceleration can be produced by such

things as naval broadsides, near misses with mines, shells, etc. In these cases considerable vibration would be induced as in the test sample.

### Spring Type Machines

Several types of shock machines have been utilized using coil springs as the decelerating agent. Some of these have been recognized by specifications as standard test machines, e.g. JAN-S-44 (Relays).

The simplest method is the table shown in Fig. 3, where coil springs are mounted on the under surface. When the table is released by means of a "bomb release mechanism" the table will fall and the springs will strike the solid foundation of the machine. The springs will then be compressed, the stiffness of the spring producing the resisting force and the resulting deceleration. With this method it will be found that the following equation gives the acceleration (a) in "g" units where h is the height of the drop and X is spring compression.

$$a = 2 \lambda / X$$

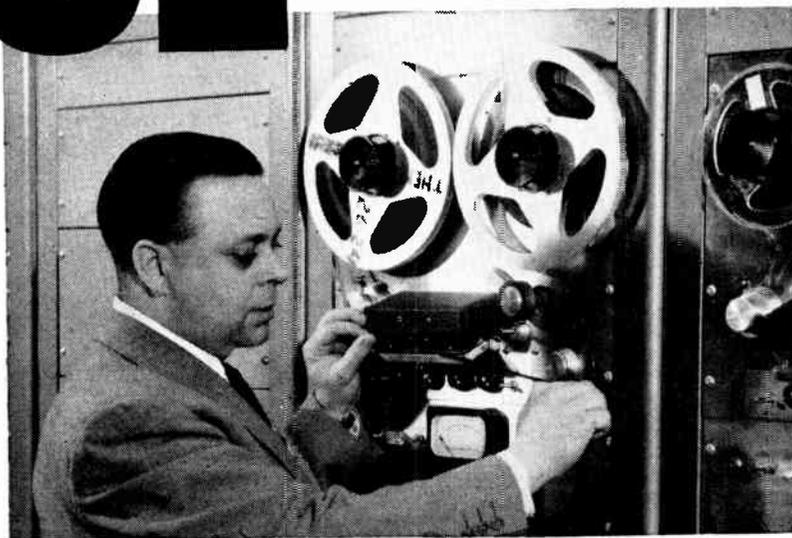
With this type of tester the rise time can be fairly fast followed by a pulse of appreciable duration. In order to prevent additional accelerations and deceleration, however, some form of a cathing device must be used to prevent rebound. This may produce fairly high level short duration shocks which could be undesirable.

### Sand Type Machine

The unit shown in Fig. 7 consists of a flat steel table mounted on a steel structure to which varying numbers of wooden blocks can be attached. The whole assembly is then dropped

(Continued on page 42)

# CKSL *proved it!*



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*twice each day for nine months!*



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*Ron Turnpenny, Director of Engineering, CKSL, London, Ontario.*

On battery-operated portable tape recorders, the technicians of this same station have also found that "SCOTCH" Brand Magnetic Tape 120A provides higher output and reduces noise and overload problems.



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# Selection Of Non-Metallic Materials

In Product Design It Pays To Know The Materials To Use

By J. Harry Du Bois

*Mycalex Corporation Of America*

AN over-simplified statement of the problems of the product designer with respect to materials boils down to the selection of the one material which will produce the most satisfactory results at the lowest cost. Such a basis for selection must be further tempered by decisions as to the relative importance of the opposing factors — is cost more important than performance, or does the product have to perform to specification, regardless of cost? There are many other considerations, some of which prove to be irrelevant, but others may well provide the basis for decision. The combination of properties applicable to the job at hand is vastly more important than any single feature of any one material.

As insulating materials for electrical and electronics applications, ceramics, glass, glass-bonded mica and ceramoplastics, organic and inorganic plastics, all have clearly defined characteristics which are rarely, if ever, completely interchangeable. Selection of the one material which imparts the maximum essential or desirable properties is most advantageous to the designer, and the most economical in the long run.

## *Ceramics*

The conventional ceramics are used for applications in which the end products require high temperature

resistance, complete dimensional stability, low electrical loss, minimum moisture absorption, low thermal expansion coefficient, arc resistance, radiation resistance, high thermal expansion conductivity, transparency (glass) and, in some cases, low cost.

Generally, the use of ceramic materials is limited by manufacturing considerations, since ceramics are formed to shape by molding or extrusion and then fired to achieve their final vitreous form. During the firing operation, a certain amount of distortion occurs, which limits the degree of dimensional control obtainable. Fired ceramics are totally stable dimensionally and, in some instances it is possible to form and fire a ceramic part and then machine for final close dimensional control. Machining ceramics is expensive; but when they can be used in the "as fired" state without any additional work, they offer an economical solution to many problems. Inserts cannot be included during molding.

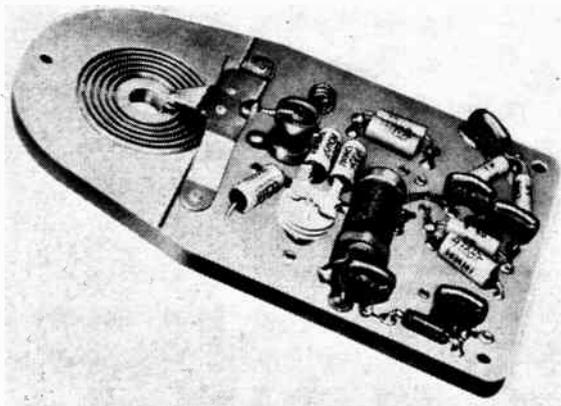
## *Ceramoplastics And Glass-Bonded Mica*

The ceramoplastic materials and glass-bonded mica offer the multiple properties of the ceramics and, in addition, may be molded with precise dimensional control and within tolerance limits that are not possible with the ceramics or organic plastics. The

thermal expansion rate of glass-bonded mica and of the ceramoplastic materials closely matches that of steel, and many kinds and shapes of metal inserts may be included during the molding operation to produce highly functional components. A major advantage resulting from the matching thermal expansion is the possibility of molding-in-place reinforcing steel sections to achieve functional strength characteristics which are not attainable with any other material.

Glass-bonded mica applications are limited to temperatures of approximately 650°-700° Fahrenheit; the ceramoplastic materials, which are made with high quality ceramic binders and pure "Synthamica" synthetic mica, may be used for applications up to 1000° Fahrenheit. Glass-bonded mica and the ceramoplastics combine more "plus" properties than may be found in any other single basic material. These special properties include:

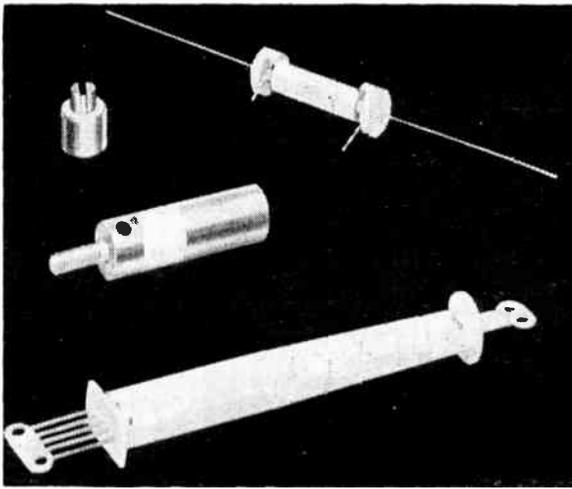
1. Total permanent dimensional stability.
2. Imperviousness to moisture and vapors.
3. Thermal expansion coefficient equal to that of metals — no distortion or insert loosening due to differential expansion and no corona in electrical applications as the result of expansion differ-



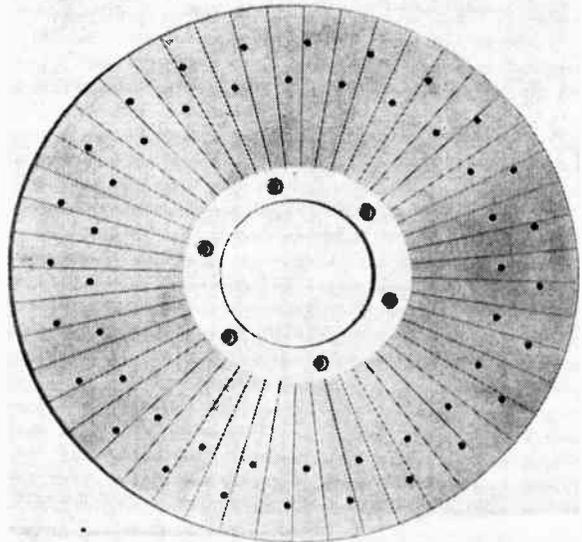
● Base plate of the new stable tuner assembly developed by Crosley Division of Avco Manufacturers Company uses silver ribbon precision molded in ceramoplastic to create a continuously tunable oscillator circuit which has greater stability than crystal controlled circuits.



● Massive parts with good physical strength like this tube mounting bracket for guided missile use can be molded from ceramoplastic. The bracket shown measures about six inches across, and weighs several pounds.



● These examples of precision molded ceramoplastic illustrate the possibilities of molding with insert metals. Because the thermal expansion co-efficient of Supramica 555 is very close to that of steel, inserts cannot loosen under thermal cycling, nor create coron gaps to cause arcing. Fragile gold-plated wire (coil form, top right) is molded in without damage.



● This capacity commutator plate is machined to extremely close tolerances from ceramoplastic sheet. 14 inches in diameter, the plate is silvercoated on one side, and ground to optical flatness within 2 light bands. Holes are drilled and counter-bored.

ential air gaps between insert and insulator.

4. Ability to withstand unlimited soldering and re-soldering of leads to insert contacts without loosening.
5. Radiation resistance.
6. Excellent resistance to power arcs.
7. Dimensional reproducibility.
8. Inclusion of fragile and complex insert assemblies.
9. Ceramoplastic parts may be used as inserts in organic plastic molded products and in metal die castings.
10. May be molded complete, or fabricated by machining.
11. High dielectric strength.
12. Low electrical loss.

#### Cold Molded Plastics

The cold molded plastics are formed to shape in the mold and then are hardened by a curing operation after removal. They are generally divided into two classes, namely non-refractory and refractory materials. The non-refractory cold molded plastics use fillers of asbestos, glass fibers, ground mica, diatomaceous earth and binders of pitch, asphalt, linseed oil and some of the synthetic resins. They are generally low in cost, poor in strength, appearance electrical properties and general properties.

Refractory cold mold materials are commonly used because of their good arc resistance and high thermal endurance. The refractory cold mold materials may be molded to shape

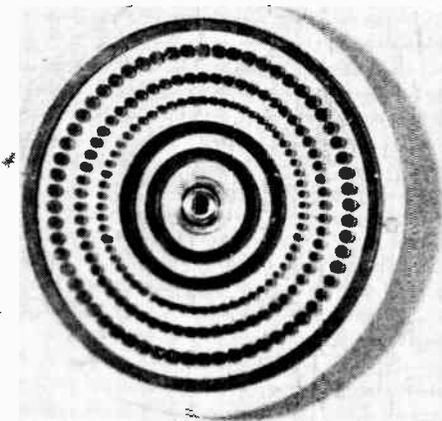
and are usually composed of cement, asbestos fibers, colloidal or kaolin clay, and are hardened by curing in a post-molding operation. However, it is not possible to control dimensions of cold molded products closely, and they show substantial moisture absorption. Temperatures up to 1300° Fahrenheit may be handled satisfactorily. They are poor in electrical properties.

#### Organic Plastics

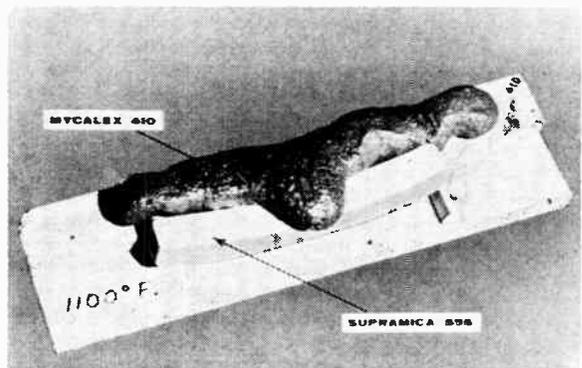
Organic plastics are the most widely used and familiar plastics materials. Interesting and valuable properties that may be derived from the correct use of the proper organic plastic material include the following:

1. Organic plastic materials for elec-

(Continued on page 40)



● 180 coin silver contacts are precision molded into this commutator plate of ceramoplastic. Commutation switches for telemetering, manufactured by Mycalex Electronics Corporation, and employing plates of this type, have established records of thousands of hours of service under extreme conditions. Dimensional and age stability of the material are of major importance, as .0002" distortion in the plate would produce noise greater than the strength of the signal.



● This photograph illustrates the gain resulting from the use of Synthamica synthetic mica in the Supramica ceramoplastic formulations. Mycalex 410 made with natural mica is limited in its thermal endurance range to 650°F. Supramica 555 is rated at 950°F. The bloating and distortion noted above are characteristic of the natural mica products when exposed to elevated temperatures. It will be noted that distortion of the synthetic mica product is limited to the flow of the glass binder.

## MATERIALS

(Continued from page 39)

- trical applications are available for each type of problem such as for high voltage, low loss, high frequency, low current arcs, semi-conductors, permeability cores, anti-static, capacitors, medium and low temperatures, and for corona insulation stability.
2. Many of the organic plastics offer unusual chemical resistance so that products may be designed to meet almost any corrosion problem by the proper material selection.
  3. Organic plastics have attractive tactile characteristics resulting from their low thermal conductivity and their smooth and attractive surfaces.
  4. Most organic plastics are available in a wide selection of colors and textures. The product stylist can gain appearance advantages by suitable styling since desirable contours and shapes which must be avoided in other materials and processes may be produced economically by some of the many plastics processing methods. (This is true of all molded products.)
  5. Certain organic plastics materials, when used as integral structural sections of the product, may be used to advantage for thermal insulating properties, to simplify product design, and to minimize assembly costs; others have high thermal conductivity and assist in the transfer of heat.
  6. Noise may be reduced and vibration minimized by the use of certain plastics. Some of these materials are mechanically non-resonant and will dampen vibrations in any assembly. Many of the organic plastics have elastic properties that will absorb undesirable vibration and sound. The elastomeric organic plastics are better than natural rubbers for many applications.
  7. Most of the organic plastics have greater strength per unit of weight than metals and the weight of many products may be reduced by the use of a proper plastic material. Weight is a large factor in the selection of plastics which are subject to rotation and inertia forces. Plastic products in the "as-molded" state are most perfectly balanced because of their lower weight and more uniform density.
  8. For cams, gears, bearings and other rubbing surfaces, certain plastics exhibit wear resisting characteristics that indicate their use at any price.

Organic plastics are available in a very large variety of forms and are produced by all conventional manufacturing processes; they may be machined, cast, molded, blown, ex-

truded, calendered, sprayed, spun, foamed, vulcanized, welded and alloyed with all types of extenders and fillers.

Numerous limitations are evident in the selection of materials because it is not always possible to get the full desirable *balance of properties* in a single material. Each material type is significant because it exhibits certain special properties — at a price. No single material possesses the entire range of properties, and compromises are inevitable. For example, it may be necessary to attach a handle to an electric iron; the general purpose phenolics have fairly low thermal conductivity but cannot be used above 250°F; a high temperature phenolic compound that would withstand the temperature has greater thermal conductivity and gets too hot to touch. In every case, the designer must evaluate the limitations of each material to make sure that the balance of properties will be satisfactory. In many applications, very desirable properties of a material are offset by weaknesses which prevent its use or necessitate basic design changes.

### Cost

One important limitation is the production cost factor. Tool cost must be considered carefully prior to designing custom molded plastics into small-volume items. Simple shapes may be fabricated by conventional machining processes; more complex shapes must be molded. Wood, concrete and special composition molds may permit low pressure molding of some materials for small-volume products. Cast plastics may be used for certain products with low tool investment. Blow molding may be a satisfactory and low cost method of producing re-entrant shapes. Extruded shapes offer a most economical means of producing continuous sections.

### Operating Conditions

Most of the material failures in product design result from incomplete knowledge of the operating conditions, or lack of consideration of the functional limitations of the materials selected. All known operating conditions and requirements must be passed along to the engineer responsible for the materials selection. In critical applications a handmade or sample molded part should be tested to destruction. Numerous failures result from inadequate loss factor, impact strength, arc and radiation resistance, chemical properties, moisture, dimensional, thermal and age stability, too close tolerance requirements, or excessive differential expansion.

Many designs fail because designers are unwilling to recognize that certain of the organic plastics are not dimensionally precise materials like the metals and that their higher coefficients of expansion introduce dimensional and differential expansion prob-

lems that must be given careful consideration. Large-volume products require greater dimensional latitude than small-volume products because of the thermal and dimensional variables in the multiple cavity molds used for large-volume production. Products to be made in very small-volume or those that may be designed for simple processes such as stamping, punching, turning, or sawing should be made from thermoplastic extrusions, sheets, laminated plastics, glass-bonded mica, ceramoplastics, or from vulcanized fiber. Selection of the proper fabricating material is relatively simple because properties are well defined and the choice is limited. Certain of the casting resins may be used for casting low volume products in very simple molds.

Selection of the proper material for molded parts requires the study of numerous considerations to make sure that the most economical material with a suitable balance of properties is selected. The starting point in material selection is an analysis of the good points and the weak points of each material that may be suitable for the job. No one material will have all the plus qualities with no minus considerations, and the negative qualities must be compensated for in the product design.

### Selection Guides

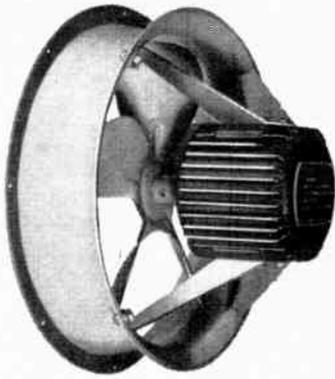
A workable sequence of material selection activity might be as follows: If an elastic plastic is required, the choice is limited to polyethylene, vinyl, polytetrafluoroethylene, or a synthetic rubber compound. Nylon may be suitable in cases where the elastic rebound requirement is small. Polyethylene and vinyl-chloride-acetate are both limited to low temperature (185°-212°F.) applications and if the temperature requirement goes above this limit, synthetic rubber and silicone rubber compounds must be considered. Temperature requirements indicate another broad division since higher temperature applications (over 450°F.) require the use of cold molded compounds, ceramics, glass-bonded mica or the ceramoplastics.

Medium temperature jobs (250°F. to 400°F.) may be served well by glass or mineral-filled phenolics, silicone, melamine, alkyd, or polytrifluoro-chloroethylene plastics.

The organic plastics materials vary widely in impact strength and this is a fundamental material selection consideration that may eliminate certain high modulus materials. Metal reinforcement cannot be used generally because of the large expansion differentials in the organic plastics. Steel reinforcement can be molded in the ceramoplastics and glass-bonded mica to gain very high strength sections.

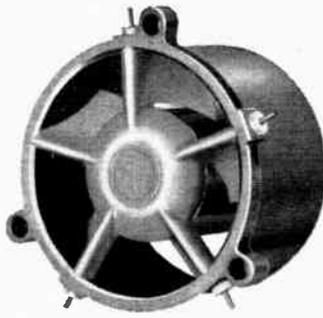
Products requiring superior arc resistance are limited to the alkyd, cold molded, melamine, or glass-bonded mica and ceramoplastic materials.

(Continued on page 46)



PROPELLER FANS

$N_s = 150,000$



VANEAXIAL FANS

$N_s = 65,000$



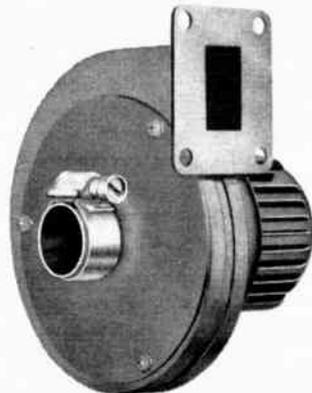
CENTRIF. BLOWERS—LOOSE SCROLL

$N_s = 40,000$



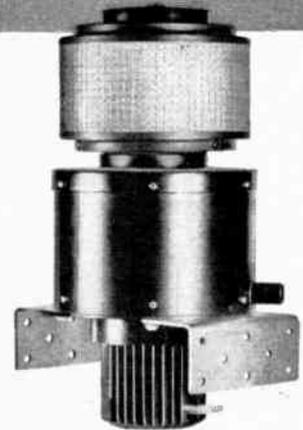
CENTRIF. BLOWERS—TIGHT SCROLL

$N_s = 15,000$



RADIAL WHEEL BLOWERS

$N_s = 13,500$



MULTISTAGE BLOWERS

$N_s = 2,000$

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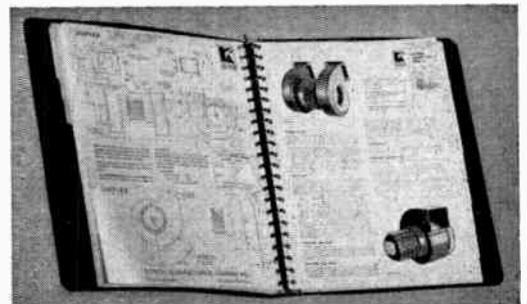
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For further data on advertised products use page 87.

# Shock Test Procedure (Continued from page 36)

from a pre-determined height. During the fall the potential energy of the raised platform is converted to kinetic energy which in turn is dissipated on striking the sand in the box. This dissipation results in a deceleration being applied to the test sample. By varying the number of blocks under the table the deceleration may be varied. This factor may also be varied by adjusting the height of free-fall. The relatively large platform (3 ft. square) enables large test samples to be handled.

With this machine the sand must be loosened and levelled carefully after each test. The loosening may be done either by raking or by the use of bellows. When the loosening is done by means of a rake it has been found that a discontinuity occurs in the calibration caused by energy still remaining in the table once the loosened sand has been packed. This residue must then be dissipated in the packed lower layers of sand. The point of this discontinuity is a function of the energy to be dissipated, i.e. weight of test sample and the drop height. Unless the bellows used are such that the sand is raised at several points over the area of the sand box it will be found that the mass of sand is simply raised and then deposited back in its original position with very little loosening.

Over a large number of tests it has been found that the wave form shown in Fig. 8 is a typical one although there is considerable variance in the detail shape and deceleration levels. It has been found that repeatability is virtually non-existent unless the operator is well trained and has participated in the calibration. It has been found that the balancing of the table is very critical as also is the levelling of the sand as either will cause the

table to strike unevenly resulting in a double pulse where the pulses may reach an extremely high factor.

An examination of the waveform (Fig. 8) will show that this machine produces a relatively slow time of rise. The duration of the pulse is usually the order of 5 to 8 milliseconds. It will be noted that considerable ringing is present owing to the deceleration being transferred to the test table at several points over a considerable area. The deceleration tends to vary during the period largely owing to variations in sand density and the lack of flow in the sand. This means that the band of frequencies excited is limited on both extremes.

Calibration tests on this machine have shown that decelerations over the range of 15 to 100 G can be produced with durations of from 3 to 8 milliseconds with a repeatability on deceleration of about  $\pm 20$  per cent.

### Lead Block Decelerator

The unit shown in Fig. 9 is a small drop tester used for the calibration of transducers. In this case the transducer system is taken to include the basic transducer plus cathode followers, filter and recorder. Although only a small unit is illustrated similar units have been built capable of coping with loads up to several thousand pounds. The larger unit shown in Fig. 4 is one undergoing construction at this time in the Environmental & Appraisal Laboratory.

The units consist basically of a table well ribbed to ensure a high resonant frequency. The spike in the center of the test table strikes the lead and the deceleration is spread to the table by the stiffening webs. The test table is released from a predetermined height and allowed to fall freely to strike the lead. The free falling factor

has a major effect on the waveform by eliminating bearing chatter owing to unbalances and mis-alignments and thus removing unwanted lateral vibrations. The energy dissipated in these unwanted effects would make it impossible to carry out an absolute calibration of the drop tester using a track.

This type of machine utilized a property of commercially pure lead seldom used in other applications of the material. If lead is struck at a relatively high impact velocity it flows as a liquid. As with liquid the penetration of the spike into the lead is resisted by the viscosity of the lead. This resistance is used to dissipate the energy present in the falling mass and hence produce a deceleration. It will be found that the decelerating force varies as diameter to the approx. 1.4 to 1.6 power.

The resistance produced by the viscosity of the lead acts only on the face of the spike in the case of a cylindrical spike. This means that the deceleration produced by a given spike is constant regardless of the height and can be given as so many pounds of force. As the height is varied the energy to be dissipated is varied and hence the decelerating force must be present for varying periods of time resulting in different penetrations. Thus both the level of deceleration and the duration of the pulse are controllable. In the case of a cylindrical spike the deceleration is applied very fast and the rise time of typical shock wave such as shown in Fig. 10 will be found to be the order of 250 to 500 microseconds. Once the calibration of the system has been completed it will in general be found that conditions are repeatable to approx.  $\pm 5$  per cent.

This type of shock tester can be calibrated from basic principles pro-

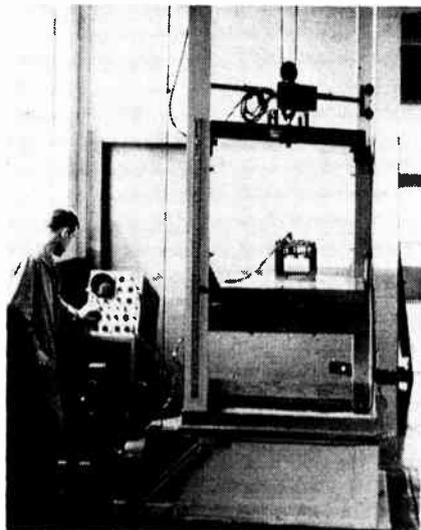


Fig. 7

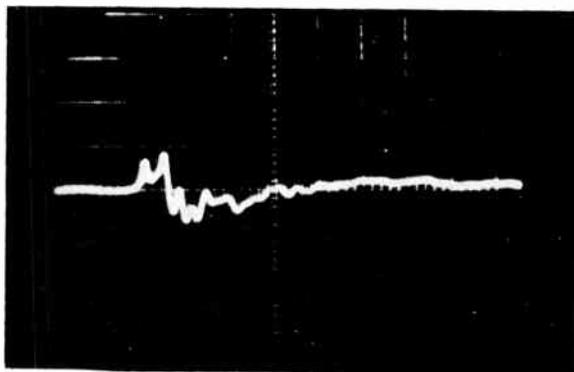


Fig. 8

- Fig. 7. Medium Impact Shock Machine
- Fig. 8. Typical Waveform On Medium Impact Shock Machine

viding the height of drop is very much greater than the depth of penetration. With this proviso the deceleration in G's is the ratio of the height over penetration. Ideally if the calibration is carried out in a manner such that the table bounces to the level of the surface of the lead then the above proviso does not apply and height/penetration gives the actual G. In practice, however, the friction of the lead on the sides of the spikes will prevent this bounce and will also serve to damp out any vibrations present in the spike.

The unit shown in Fig. 9 has been used to produce shock waves over the range of 20G to 200G on small test samples.

Once the constants of the lead being used are known, the shapes of spikes can be calculated to produce various waveforms. In this case the decelerating force against the projected area would be used to establish the various diameters required. The longitudinal position of the reference diameters would be governed by the time requirements of the waveform. The duration of the pulse can be controlled by the height of drop and the mass. In this way shock tests with specific bandwidths can be carried out

and used to simulate transient vibration conditions.

The free fall type of lead block decelerator has two major disadvantages in practice:

1. The test sample must be located such that the center of Gravity is in line with the point of support and the point of impact, i.e. the spike. This is essential to ensure the spike strikes the lead normal to the surface.
2. The test sample falls a considerable distance to ensure sufficient energy is present to give the correct deceleration when it is dissipated. This means that electrical power and monitoring leads must be long, with the result noise may be developed and great care must be taken to ensure leads are not broken.

Drop towers have been built up to heights of 250 ft. and it can readily be seen that these problems would be very serious during a fall of this nature.

Some lead block machines have been built where the test sample only moves a short distance. One of these is illustrated in Fig. 11. In this case the hammer is released from a specific height. It then swings down and

strikes the test table via a hard rubber block. The table then accelerates until a spike on the front of the table strikes a lead block and the sample is then decelerated. In this case the test sample is subjected to a double shock, one of deceleration and one of acceleration, with the resulting problem of deciding which pulse caused the failure.

Other variants have the sample swung as a pendulum and striking a lead block. Others have a lead block swung as a pendulum, striking the test sample and producing an acceleration which is then dissipated at a much lower "G" in a separate retarding assembly.

In all these variants the advantage of being able to calibrate from basic principles is lost with a resulting dependency on a calibrated measurement system. The losses in the moving parts are considerably greater than those present in a falling device using bearings and guide rails and hence a less efficient machine results. In many cases, however, where a small movement either linear or angular is a prime requisite these difficulties are overcome and such a machine becomes a useful tool.

(Continued on page 44)

- Fig. 9. Lead Block Decelerator — Calibrator
- Fig. 10. Typical Waveform on Lead Block Decelerator
- Fig. 11. Pendulum Type Lead Block Decelerator

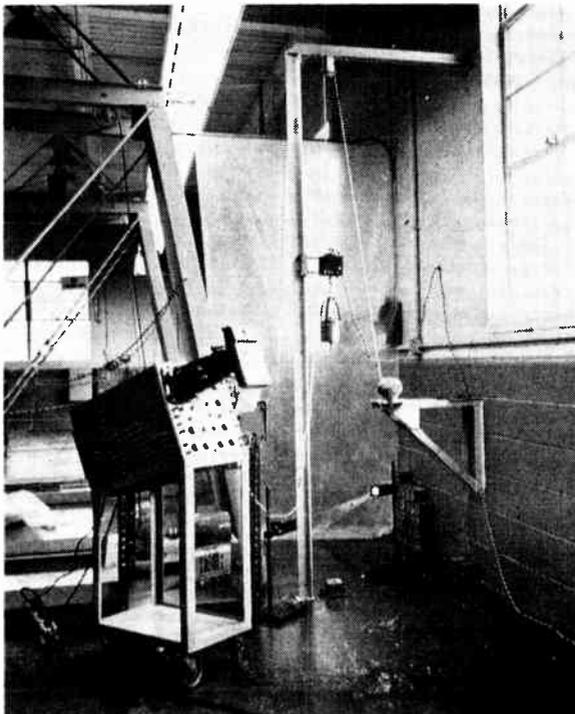


Fig. 9

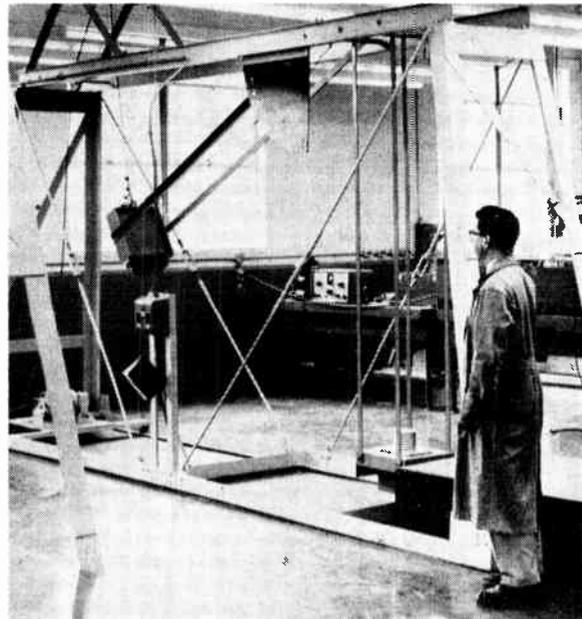


Fig. 11

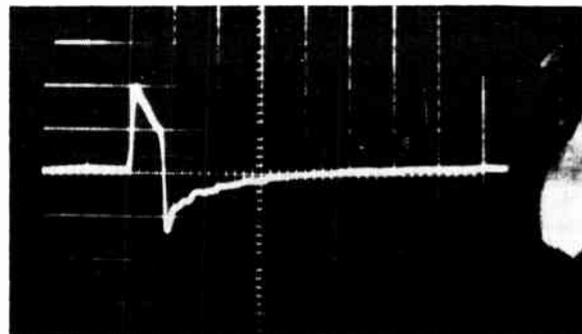


Fig. 10

# Shock Test Procedure *(Continued from page 43)*

## *Hydraulic Machines*

Hydraulic Shock Machines have come into their own as limitations of the lead block decelerator become known, particularly with respect to pulses with longer duration than 8 to 10 milliseconds. In long duration pulses the height of tower required to build up sufficient energy with lead block decelerators is such that costs become exorbitant. In order to achieve sufficient energy drop towers have been built up to height of 250 ft., thus making electrical monitoring very difficult. The difficulty in handling large objects in a lead block decelerator also indicated a need for a means of producing shock waves with a horizontal movement.

If pulses with a sharp time of rise are required a piston and orifice arrangement such as is shown in Fig. 5 is required. In this case the hydraulic pressure is built up in the top of the cylinder. This pressure acts on the surface of the piston exposed through the orifice. When this pressure has been built up to the point where it exceeds the force necessary to move the test sample the piston will move. When this happens the oil pressure will act over the whole area of the piston and a sudden increase of the force acting on the test sample results. Since this large force is operating on the test sample a high acceleration results and as the change from balance to full force is very rapid a wave front approximating an ideal shock results. The test sample is brought to rest by similar use of an orifice at the limit of travel. With this mode of operation the sample may be moved several inches with machines being in operation with movements up to 24 inches for special applications. By variations in the pressure different loadings are accommodated. Similarly, variations in pressure will give different accelerations for a given mass.

In cases where a specific waveshape is required the use of a metering pin in the orifice is required. Where a shaped metering pin is used in lieu of a flat ended piston the hydraulic pressure acts on the projected area of the pin. As the area of the pin is increased the force effecting the test sample is increased and hence the acceleration is increased. Thus, by calculating the shape of the pin the rise time of the shock wave can be made to conform to a specialized requirement. The following acceleration can similarly be made to conform to the specific wave duration. By a similar metering pin the sample may be brought to rest with a symmetrical waveform.

As can be seen this machine lends itself to horizontal movement with only a limited length of movement and hence can be used readily with units

where complex electrical monitoring is required. This horizontal movement also lends itself to simpler methods of rigging the test sample.

For large pieces of equipment this type of unit is preferable to the lead-block decelerator for the reasons stated above. For small items such as components the economics on the use of hydraulics becomes rather debatable. For larger units it must be borne in mind that high pressure fluid is used and personnel must be thoroughly trained in its handling.

With suitably fitted control valves this same type of machine could readily be adapted to supply high force, large displacement, low frequency vibrations to the test sample. By suitably energizing these valves the oil flow can be modulated to produce the actual waveshape required.

## *Pneumatic Machines*

Pneumatic machines used in shock testing are fundamentally the same as the hydraulic types. Pneumatic machines, however, came into common usage in the production of very high decelerations (10,000 G upwards) long before hydraulic units.

A very common method of producing these very high "G" decelerations is to have a long air gun with several short slots near its base, as shown in Fig. 6. The test sample is mounted on a projectile at the top end of the barrel. The projectile is a tight fitting piston such that air pressure built up behind it will cause the projectile to accelerate. The longer this acceleration functions the higher will be the velocity of the projectile and hence the high potential energy in the moving object.

As the sample moves along the barrel the air moving in front of it escapes from the slots around the periphery of the gun barrel. As the projectile passes the slots the flow of air is restricted and a back pressure starts to build up retarding the projectile slightly. As soon as the slots are covered, however, the action is accelerated and the forward movement of the projectile is rapidly halted. This type of unit is a compressed free fall type of unit where the energizing acceleration is considerably greater than unity. The decelerating force is not constant as with a lead block, however, but increases as the air pressure is increased, thus a deceleration approximating a sawtooth results. The duration however is normally very short and peak accelerations up to 80,000 G have been achieved with instruments at present in use.

As with hydraulic units the level of the "G" factor in the shock wave can be controlled by the pressure of air used to accelerate the projectile in the barrel.

# Missile Speed Measurement

**A** NEW technique for measuring a vital flight test data, that is reportedly more accurate than any previous method, is being utilized in the testing of Convair F102A all-weather supersonic jet interceptors at Edwards Air Force Base, California.

The heart of the unique test data measuring system is a miniature, two-ounce electronic sensing device which is capable of measuring altitude and airspeed through changes in the tension exerted upon a 2½-inch wire about the thickness of a human hair. Tension variations on the fine wire are sensed as extremely precise frequency changes which are directly readable as numerical indications at ground level.

According to Convair engineers who supervise the F102A flight testing program, the absolute pressure transducers provide accurate measurements of altitude and air-speed to ground level observers.

The transducer is mounted immediately behind the nose boom of an F102A during flight testing.

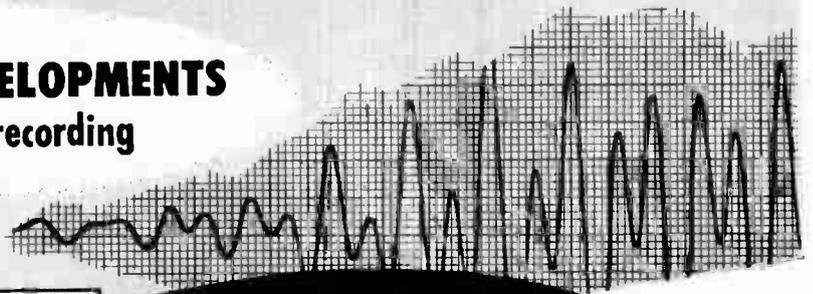
Basically, the new type transducer consists of a fine wire stretched between a diaphragm and an anchor point within a magnetic field. The length of the wire and the tension exerted upon it determine the frequency at which it vibrates. When pressure changes resulting from variations in altitude or airspeed expand the diaphragm, the latter in turn reduces the tension on the wire and this tension change is then detected as a frequency change.

In actual operation during flight testing, two of the transducers are utilized, one which senses total pressure and a second which senses static or barometric pressure. When these pressure signals are amplified and transmitted to ground level stations by way of an FM/FM telemetering system, the static pressure signal indicates altitude. Then by mechanical methods, the static pressure indication is subtracted from the total pressure indication to establish a plane's airspeed.

According to BJ Electronics engineers who developed the transducer, it is ideally suited for use in modern high-performance aircraft and missiles as an extremely accurate, remote sensing device with rapid response characteristics and exceptional accuracy under the most difficult environmental conditions.

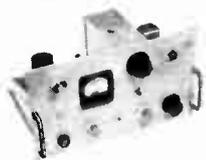
In laboratory tests, according to the company, the transducer has demonstrated sensitivities to pressure changes of the order of one one-thousandth pound per square inch.

## TECHNIQUES and DEVELOPMENTS in oscillographic recording



**PHASE SENSITIVE DEMODULATOR PRE-AMPLIFIER PROVIDES A DC VOLTAGE PROPORTIONAL TO AN INPHASE COMPONENT OF AN AC VOLTAGE WITH RESPECT TO A REFERENCE.**

**T**HE measurement of the amplitude of an AC voltage component is often necessary in performance studies of servo systems or of suppressed carrier signals over the carrier frequency range from 60 to 10,000 cps. In such cases the demodulator responds to inphase signals and rejects quadrature signals.



A circuit with these characteristics for use in an oscillographic recording system can be seen in the Model 150-1200 Servo Monitor (Demodulator) Preamplifier. It was developed by Sanborn as one of twelve interchangeable, plug-in front ends for "150" Series equipment, to be used with the appropriate Driver Amplifier-Power unit in any channel of a "150" system. Elements comprising the circuit from input to output, include: compensated stepped attenuator and cathode follower input circuit, phase inverter, push-pull mixer and demodulator stages, differential DC output amplifier and low pass filter. In addition, the chassis contains a VTVM to facilitate accurate adjustment of the reference voltage, and an overload indicator which lights a warning lamp when excessive quadrature voltages exist.

Adaptability to a fairly wide variety of applications is accomplished through broad input voltage, reference voltage and frequency ranges. In order, these are 50 mv to 50 v (for full scale 5 cm deflection), 10 v to 125 v; 60 cps to 10kc. Rise time with low frequency plug-in demodulation filter is 0.1 seconds; with high frequency filter, 0.01 seconds. Quadrature rejection is better than 100:1; for carrier frequencies up to 5000 cycles.

Two representative uses of the Servo Monitor Preamplifier are in the design and adjustment of servo systems, and with instruments used in the design, development or adjustment of other apparatus. The first is illustrated by use of the Preamplifier and associated equipment in the recording of the output shaft amplitude and driving frequency of an AC positional servo; the second by recordings made with a similar setup of the difference between output signals from a gyroscopically-controlled stabilizing device and the "pitch" and "roll" signals generated by a "Scorsby Table" used for testing the device under dynamic conditions.

For a detailed discussion of the principles and design considerations involved in the Servo Monitor Preamplifier, refer to the February, 1955 issue of the Sanborn RIGHT ANGLE, for Dr. Arthur Miller's article on "Measurements with the Servo Monitor Preamplifier."

Technical literature and engineering assistance on specific problems are always available from our engineering department.

FROM  
**SANBORN**



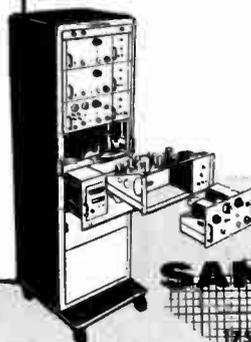
**BASIC  
FACTORS  
IN SELECTING  
OSCILLOGRAPHIC  
RECORDING  
EQUIPMENT**

**W**HEN considering any oscillographic system or equipment for your application, three useful "yardsticks" to apply are (1) the recording method, (2) equipment adaptability, and (3) variety of equipment available. Here are the answers to the three, as they apply to Sanborn systems. In the record, rectangular coordinates accurately correlate multiple traces, simplify interpretation and eliminate errors. Permanent traces, produced by a hot ribbon stylus without ink, provide sharp peaks and notches, and clearly reveal all signal changes. One percent linearity results from current feedback driver amplifiers and high torque galvanometers of new design; maximum error is 1/4 mm in middle 4 cm of chart, 1/2 mm across entire chart. From the standpoints of "adaptability" and "variety", Sanborn "150" equipment offers the versatility of 13 different plug-in front ends for any basic system . . . the choice of one- to eight-channel systems . . . the variety of nine chart speeds, timing and coding controls, console or individual unit packaging . . . availability of equipment as either complete systems or individual amplifier or recorder units.

Canadian Representative:

**ROR ASSOCIATES**

290 Lawrence Avenue West  
Toronto 12, Ontario, Canada



**SANBORN COMPANY**

200 WEST 11TH AVENUE  
MINNEAPOLIS, MINN. 55402  
175 WYMAN STREET, WALTHAM 24, MASS.

## MATERIALS

(Continued from page 40)

High current, high thermal shock applications need the ceramoplastics and glass-bonded mica. Radiation resistance requires ceramoplastic or ceramic components, as organic plastics deteriorate very rapidly under radiation in most cases.

At this point the material search may be limited by color requirements. Urea, nylon and melamine compounds offer good colors in the 180°-250°F. temperature range. Nylon is not dimensionally stable under elevated temperatures and loads and must be tested for each application. The phenolic plastics are suitable in this temperature range but their colors are not fast in the light shades. Dark red, brown, walnut, mahogany and black are the stable phenolic colors. The thermoplastic materials such as polyethylene, the acetates, styrenes, acrylics, and their copolymers offer a wide color selection in the temperature range below 175°F. The ceramoplastics are pure white and a limited range of dark colors.

Bearings, cams, gears and rubbing surfaces may be made from the laminates, special phenolic molding compounds or from nylon. Certain types of slow-speed, high-temperature bearings may be made from the ceramoplastics and the ceramics. Bearing and similar applications must give

adequate consideration to the high rate of thermal expansion when clearances are calculated. Many organic plastics bearings are water lubricated and require additional study to determine the effect of swelling from the water.

When maximum transparency is desired, for such applications as lenses, acrylic materials are the best choice; polystyrene provides good clarity and better surface hardness. Various special glasses and synthetic mica offer maximum transparency in the high temperature range.

Rain erosion is an important consideration in selecting materials for missiles and aircraft. At very high speeds, the hardest materials give best results; elastic materials may withstand erosion best at low speeds. The ceramoplastics and certain special glasses have exhibited unusual rain erosion resistance.

Moisture, acid, solvent, caustic, and other chemical problems indicate another broad search classification that further limits the field to those few which will do the job under consideration. Plasticizer migration is an angle that must be evaluated. Many of the thermoplastics are loaded with plasticizer that will pass to adjacent lacquered surfaces or plastics and cause damage.

Permeability to gases and liquids is a most important factor in selecting a housing material. Some organic plas-

tics films will pass certain ingredients and hold others, changing the basic formulation of the product. Packaging materials should be selected only after adequate "shelf life" tests have been completed.

Electrical requirements are clean cut and some materials carry rather broad coverage in this field. The most difficult electrical problem is the high frequency — high temperature insulator and there are a few special purpose materials for these applications. Glass-bonded mica and the ceramoplastics are very desirable in the high frequency — high temperature electrical field. Electrical circuits which must maintain dimensional and property stability throughout humidity changes require polystyrene, polyethylene, glass-bonded mica, ceramoplastics, ceramics, or the fluorocarbon products. Tetrafluoroethylene and styrene are best for products requiring minimum loss factor provided they will withstand other forces.

Dimensional stability is often an important factor and the field is limited when really tight control is a requirement. The only materials that may be considered for maximum dimensional stability requirements are glass-bonded mica, ceramoplastics and the ceramics. The mineral filled phenolics — with an after-bake subsequent to molding, are second choice; the alkyd compounds are also to be considered. Of the thermoplastics,

(Continued on page 65)

### Why is **ELECTRONICS & COMMUNICATIONS** a member of CCAB?

To have a circulation statement that is *believed* by Advertisers and their Advertising Agencies.

Advertisers, by nature, are doubting Thomases, and may not believe that you have received this copy of E&C. We know you have, of course, but that is not good enough.

Therefore, along with 214 other Canadian publications, we have joined CCAB. Advertisers, and Advertising Agencies, have also joined, and we give to them a majority position on the Board of Directors.

Once every year, the CCAB auditor visits our Circulation Department. He checks our records thoroughly, demanding proof that you are in the electronics, communications or allied industry, that you are where we say you are, and that you are being sent E&C regularly.

It is this auditor's report that is believed. We are proud of it, and shall be glad to send you a copy if you wish.

## **ELECTRONICS & COMMUNICATIONS**

a member of Canadian Circulations Audit Board Inc.

### \* ITEM OF THE MONTH . . .

#### TACO ANTENNAS

Specifically engineered line of high quality antennas for Domestic — Special Military, and Communication antennas.

Domestic VHF — UHF Antennas good for either Colour, or Black and White.

Be sure to ask for information about the outstanding performance of the TACO "Trapper and Topliner" series, and FM Antennas for High Fidelity equipment.

Available at

### **HACKBUSCH ELECTRONICS LTD.**

Call or Write:—

23 Primrose Avenue

TORONTO, ONTARIO

LENNOX 1-2453

• STROMBERG-CARLSON PRODUCTS • SYLVANIA ELECTRIC PRODUCTS (ELECTRONICS DIVISION) • TECHNICAL APPLIANCE CORP. (TACO ANTENNAS) • CALEDONIA ELECTRONICS AND TRANSFORMER CORP. •

For further data on advertised products use page 87.

*Management is doing something  
about the shortage of*

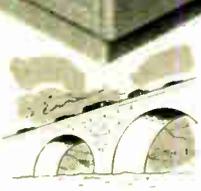
# HIGHWAY ENGINEERS



Progressive government and private builders are making preparations for the new Federal program.

For example, by using electronic computers, they are lifting the burden of mathematical work from the engineers they have. Now they can complete more mileage... without added engineering manpower. In the applications shown (at right), the Bendix G-15 is performing computations as much as 30 times faster than by traditional methods. It is assuring the *best* solution too, because computation can be carried to the ultimate in a reasonable time.

Improved designs, simpler operating techniques and factory training for the user have made computers practical for almost any overloaded highway engineering team. And whether you rent or buy, the long run economies will surprise you. The coupon (at right) will bring more detailed information on the many ways that Bendix Computers can do something about *your* shortage of engineers.

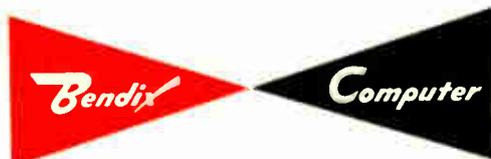
 <p><b>ROUTE SURVEYS</b> Computing error of closures; balancing traverses.</p>	 <p><b>BRIDGES</b> Calculating stresses; location and type of new bridges.</p>	 <p><b>ROAD RATINGS</b> Determining adjusted or weighted sufficiency ratings of roads.</p>
 <p><b>EARTHWORK COMPUTATIONS</b> Solution of problems involving location, design and construction of earth movement; closing traverses; computing alternate line locations; combining electronic computation with photogrammetry.</p>	 <p><b>FINAL ESTIMATES</b> Computing pay quantities, particularly earth moving.</p>	 <p><b>TRAFFIC</b> Determining traffic patterns; signal types and timing; future traffic loads; improvement of existing facilities vs. construction of new facilities based on safety, benefits to users, land service benefits, costs.</p>

**COMPUTING DEVICES OF CANADA LIMITED**  
P.O. BOX 508, OTTAWA, CANADA

*Please send me more information on Bendix G-15 computers and how they are helping to solve the shortage of engineers.*

NAME \_\_\_\_\_ TITLE \_\_\_\_\_

COMPANY \_\_\_\_\_ ADDRESS \_\_\_\_\_



5708

# news of the industry

## RETMA Endorses Canadian Radio Week, May 5-11

The Radio-Electronics-Television Manufacturers Association of Canada is participating wholeheartedly in Canadian Radio Week to be held across Canada during the week of May 5-11.

John D. Campbell, president of RETMA of Canada, said at a press conference held in Toronto that RETMA, with over one hundred members manufacturing radio, television, and electronic equipment, fully endorsed the aids and aspirations of Canadian Radio Week, and was happy to co-operate with the Canadian Association of Radio and Television Broadcasters to promote the venture.

Canadian Radio Week will serve to emphasize the importance of radio in the daily lives of Canadians.

The members of the Receiver Division of RETMA will donate three hundred radio receivers to radio stations as prizes for public contests held by these stations. RETMA member-companies were also tying in their advertising of Canadian Radio Week with distributors and dealers.

Canadian Radio Week during May 5-11 will underline the forward steps made by the Canadian electronics industry since regular broadcasting began in Canada in 1920, and will indicate the importance of radio communication from coast-to-coast in Canada.

## Marconi Instruments Exhibit At IRE

The latest designs of leading British manufacturers of precision instruments and tubes were shown on the stand of Marconi Instruments Ltd. at the I.R.E. National Show, which was held in New York from the 18th to the 21st of March.

Marconi Instruments Ltd. featured a number of their telecommunications test equipments, including signal generators, bridges and deviation meters.

● The Lenkurt Demodulator, a magazine introduced by Lenkurt Electric Co. in 1952 to present information about the use of carrier, and since expanded to include microwave, telegraph and data transmission subjects, recently completed five years of useful service to readers ranging from corporation presidents to college engineering students. Shown celebrating the occasion are *left to right*: J. A. Dippel, associate editor; A. Milton Seymour, technical services manager for Lenkurt Electric and editor of The Demodulator; Harry J. Lewenstein, past editor and now assistant export manager; and Paul C. DeMuth, past editor and now chief consulting engineer in Lenkurt's commercial relations department.

The stand also contained displays of apparatus by the English Electric Valve Co. Ltd., Canadian Marconi Company, Stratton and Co. Ltd., the Wayne Kerr Laboratories Ltd., and Cinema-Television Ltd.

## R. H. Nichols Ltd. Adds To Directorate

In an announcement made by H. J. Davie, president and general manager, S. A. Turnpenny was recently elected to the board of directors of R. H. Nichols Limited, manufacturers of electrical equipment. Mr. Turnpenny continues as plant manager, a function for which he is well qualified. He was executive assistant for some time in a British manufacturing concern, and at the outbreak of World War II, he was general manager of a radio company in England. He served for a time with an anti-aircraft radar unit, transferred to the Royal Electrical and Mechanical Engineers, and within a short time was teaching radar theory and practice at the Royal Military College of Science.



S. A. TURNPENNY

In 1942, Mr. Turnpenny joined the British Army staff in Washington, D.C. as technical liaison officer for radar equipment and was closely associated with several U.S. manufacturers, the U.S. Signal Corps, and with the Canadian Army Office. Eventually, his work brought him to Canada, particularly Research Enterprises Limited. Working in conjunction with the Canadian Army, he wrote several books on radar technical and maintenance proce-

dures. He joined the R. H. Nichols group following his discharge from the army in 1945.

## Fourth Annual Canadian Room At New York's Hotel Commodore

The fourth annual Canadian Room held in the Hotel Commodore, New York, during the Institute of Radio Engineers, annual convention and exhibition attracted a large number of Canadian representatives of the electronics and communications industries and officials of many American firms who maintain Canadian representation. In addition to industry personnel who made use of the Canadian Room facilities government personnel from the following bureau, were also guests at the Canadian headquarters: National Research Council of Canada, Directorate of Armament Development, Royal Canadian Electrical and Mechanical Engineers, Defense Research Board, Department of Defense Production, Air Force Headquarters, and the Canadian Army Signals Experimental Establishment.

The Canadian Room is held annually during the Institute of Radio Engineers, convention and exhibition as a meeting place for Canadian visitors to the convention and exhibition and their American business associates.

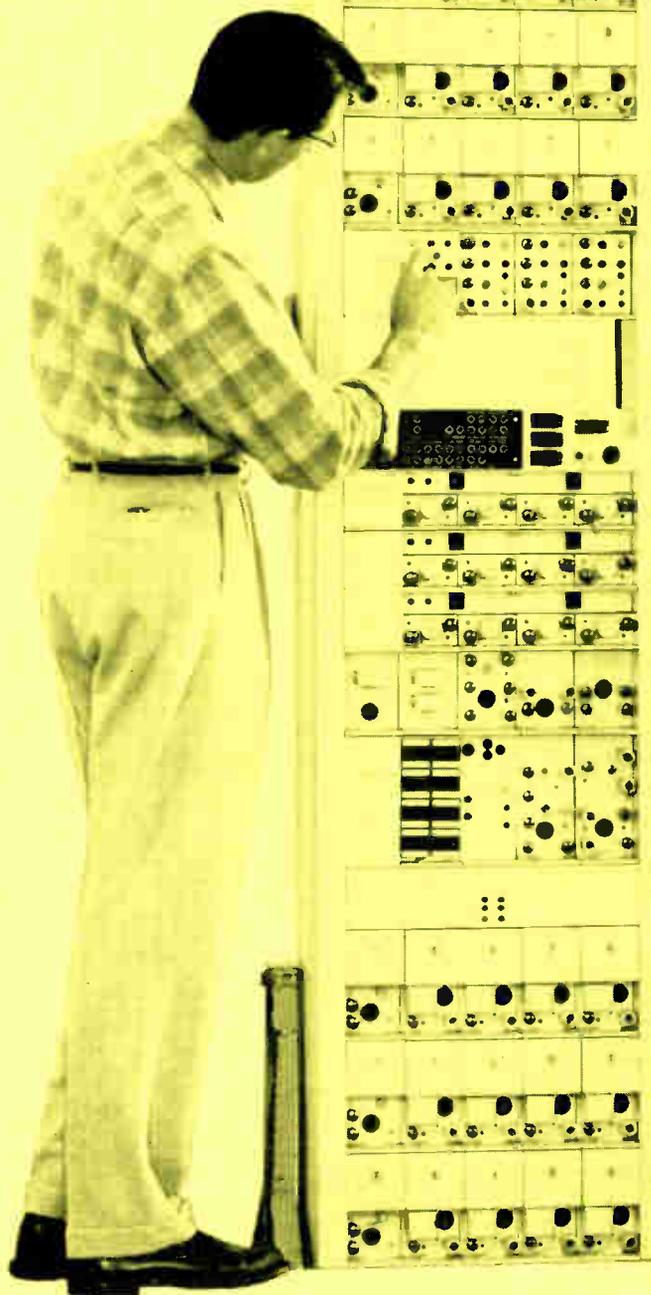
## Inter-Comm Supply Co. Expands Operations

Inter-Comm Supply Company of 1315 Victoria Avenue, Fort William, Ontario, has recently opened an electronic wholesale branch at 211 Pearl Street in Port Arthur.

This expansion program is intended to give increased service to dealers in and around Port Arthur.



Type 45NB1 24 channel  
Terminal Assembly



whether it's open wire...  
cable... or radio  
communication

*Lenkurt* CARRIER SYSTEMS  
meet every need

## CARRIER TELEPHONE SYSTEMS

### For open-wire lines

**Type 32E**—Low frequency, four channel, for medium and long haul circuits.

**Type 33A**—Low frequency, one-to-three channel, stackable. Primarily for short or medium haul.

**Type 45A\***—Miniaturized, 12-channel, high frequency. Economical for short haul, efficient for long haul.

**Type 45C\***—Provides up to 16 additional channels in 4 channel groups.

### For radio

**Type 33B/C**—1 to 24 channels. For low capacity radio systems.

**Type 45BX2\***—Miniaturized. Provides up to 240 channels for radio transmission. Provision for growth to 360 channels and beyond.

### For cable

**Type 45BN1\***—Miniaturized, 24 Channel.

## CARRIER TELEGRAPH SYSTEMS

**Type 22A**—F M system. Uses frequency shift keying. Minimizes "cross-fire", noise and static.

**Type 24C**—A M system. Uses on-off keying. 19 high quality channels.

## TELEMETERING AND REMOTE CONTROL SYSTEMS

**Type 440/444**—for telemetering, dial signalling, remote control, etc.

**Type 51B**—handles supervision, alarm, etc.—will operate over the facilities it supervises.

## COMPANDOR

**Type 5090B**—Boosts signal-to-noise ratio. Saves circuits unsuitable due to cross-talk, etc.

## RADIO SYSTEMS

**Type 72B/C**—Wide band, F M. Handles up to 216 or 360 channels.

\* All Lenkurt's famous 45-Class carrier systems are designed for direct interconnection at carrier frequencies. This eliminates expensive back-to-back arrangements, reduces distortion and simplifies maintenance.

Lenkurt Carrier Systems can help solve your communications problems—economically.

For further details, call or write—

5739

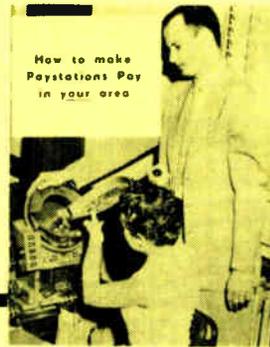
**AUTOMATIC**  **ELECTRIC**

ORIGINATORS OF THE DIAL TELEPHONE



# It's the "EXTRAS" that increase *these aids from Automatic Electric*

Telephone people everywhere now realize that added income comes from more sales of convenience items. It is no longer enough to be content with single station and toll revenue. Subscribers are becoming increasingly interested in extensions, coloured telephones, secretarial answering devices, dial P-B-X service and the host of other auxiliary items now available. The big problem for the operating company is this: What are the best ways to sell such services? We hope you can find a few answers right on this page.



## PAYSTATIONS

—How to make them *pay!* This highly informative booklet thoroughly covers every aspect of profitable paystation operation—Choosing the location, selecting the equipment, informing the public, collections, maintenance and costing. This concise booklet will prove invaluable to any telephone company that wants the utmost revenue from each and every paystation on their books.

## NEW BUSINESS KITS

Sales-stimulating ideas, sales training suggestions, and sales-aid literature—neatly packaged and ready for your use in Automatic's New-Business Kit! Here is one sales-aid you cannot afford to be without. The kit includes our booklet "Ideas for Building Business"; a veritable storehouse of sound merchandising ideas. Don't miss getting this kit—write for yours today!

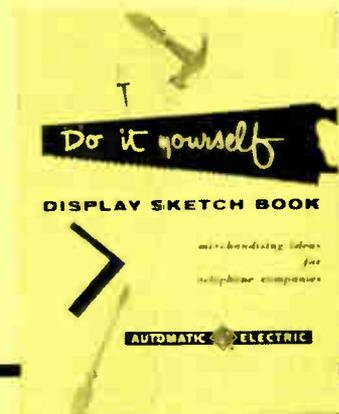
# telephone service and revenues

*will help you sell them!*



## P-A-B-X PROMOTION KIT

Many telephone companies are discovering that the promoting of P-A-B-X Services can be a very rewarding experience—provided you have the right plan, and the right tools. Automatic's P-A-B-X Sales Kit gives you, in one complete package, all the information you need.



## DISPLAY IDEAS

Automatic's "Do It Yourself" Display Sketch Book shows you how to build a variety of displays that incorporate sound merchandising ideas and colorful eye appeal.

## THIEF-PROOF COIN RETURN



How many times have customers complained to you that one of your paystations had failed to return a coin due them? What probably happened is some dishonest person stuffed a wad of cloth or paper up into the coin return chute. Naturally, returned coins are prevented from falling all the way down the chute and your paying customers are bilked. Later, the thief returns, removes the stuffing and walks away with an ill-gotten "jack-pot".

With Automatic's new Anti-Stuffing Coin Return, such illegal practices are impossible.

The Anti-Stuffing Coin Return features a movable pocket beneath the coin return chute. Coins being returned slide into this pocket and, by tilting forward the pocket, the customer is able to pick up his money. In either position, forward or back, the pocket closes off access to the coin chute—thereby providing absolute protection.

Write or phone for these revenue-producing sales-aids today.

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

**AUTOMATIC  ELECTRIC**

ORIGINATORS OF THE DIAL TELEPHONE



5740

# NEW ACCESSORIES FOR AN OLD FAVOURITE

## THE *Electronic Secretary*

During the past year the Electronic Secretary has become one of the most popular items of telephone equipment for both telephone companies and subscribers.

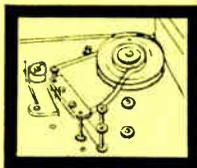
Subscribers are delighted by the convenience. The Electronic Secretary answers telephone calls when the office is empty, with a pre-recorded message. It also records the message the caller wishes to leave. Subscribers save time and increase business efficiency.

Telephone companies are delighted by the extra revenue and goodwill the Electronic Secretary brings.

Here are the new accessories to increase the versatility and popularity of the Electronic Secretary.

### TAPE ADAPTER ATTACHMENT:

Instead of using a pre-cut record of his opening message, the subscriber may change this message whenever he chooses, merely by dictating the new message on to the tape.



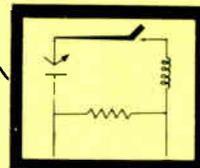
### REMOTE CONTROL CALL BACK SET:

Now, the subscriber need not return to his office to play back his messages. By dialing his number and using the remote call back set, an activating signal trips a switch, and plays back all his calls — *on the telephone!*



### VOICE CONTROL ADAPTER:

Normally the caller has a minute or so to record his message. Some offices require longer periods for in-coming calls. The Voice Control Adapter records as long as the caller is speaking. A 20 second break would cut him off.



### ALSO AVAILABLE:

TR Answering Unit — answers the phone with a (pre-recorded) message but does not record incoming messages.

TT Answering Unit — same as the TR model, except that the outgoing message may be changed as frequently as desired.

Both the TR and TT Answering Unit are available at approximately ½ price of the standard Electronic Secretary.

*The ELECTRONIC SECRETARY in no way interferes with normal telephone use. It is distributed to telephone companies in Canada by*

### AUTOMATIC SALES AND SERVICE (CANADA) LIMITED

185 Bartley Drive, Toronto 16, Ontario

Branches in: Montreal  
Ottawa  
Brockville  
Hamilton  
Winnipeg  
Regina  
Edmonton  
Vancouver

5741

## AUTOMATIC ELECTRIC

SALES (CANADA) LIMITED

For further data on advertised products use page 87.

## NEWS

### 3M Electrical Division On Expansion Program

The establishment of a new electrical products division and the promotion or appointments of approximately 35 personnel have been announced by Kenneth J. Shea, vice-president and general manager of Minnesota Mining and Manufacturing of Canada Limited, who describes the move as a "major expansion in breadth and depth in company personnel".

The company is spending \$1,500,000 on a new office building and an addition to the plant in London, the second major expenditure for buildings within two years.



R. T. TODD

The electrical products division will be responsible for the quality, manufacturing and sales of all 3M electrical products, including electrical and magnetic tapes, Irvington insulations, varnishes and micanite products and for all American Lava products.

The manager of the new division is Robert T. Todd who has headed the 3M electrical products sales since 1954. For 16 years prior to that he was general sales manager for Irvington Varnish and Insulator Company before it became associated with the 3M organization.

In January, a Thermo-Fax sales organization was formed with sales and service stores in principal Canadian cities to market Thermo-Fax copying machines.

Throughout the whole 3M organization many individuals are being promoted to more responsible positions.

### Magnetics, Inc. Forms "Control" Division

In a major move to spur use of high permeability magnetic devices for industrial control, Magnetics, Inc. of Butler, Pa. has announced formation of its new division, "Control", and the division's initial line of 22 standard reactor assemblies.

"Control" was introduced by company president, Arthur O. Black, as the division responsible for design, manufacture and sales of the new standard units from which electronic equipment designers can choose quickly and accurately the required assembly.

With "Control" assemblies the engineer will be able to design around a standard line of saturable reactors

with stated physical and operating characteristics. Magnetics will manufacture with a "Control" nameplate both 240-volt and 120-volt 60-cycle reactors, with eleven standard sizes in each range.

Establishment of "Control" by Magnetics, Inc. means that high permeability devices now pass from the custom-order to the mass production stage. The move will result in greater convenience and dependability for designers.

To spur use of these catalogued reactors, "Control" will stock assembled core units with power windings and connections ready for finished as-

sembly. Customers will specify control windings required for their particular applications, and stock units will be finished and sent out on short delivery, beginning May 1st, 1957.

### Electrodesign Handles Siemens Rectifiers

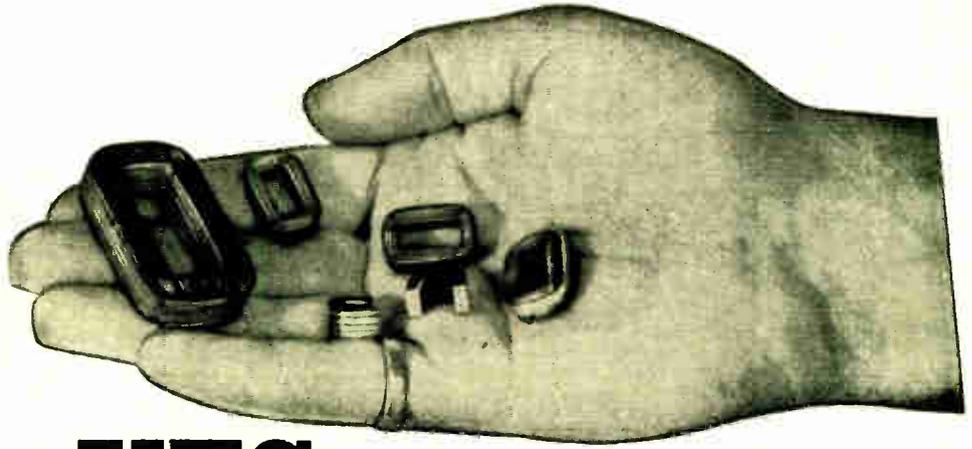
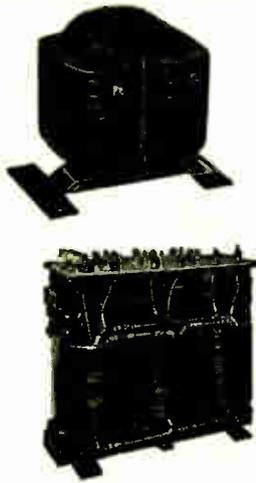
Electrodesign, of 736 Notre Dame Street West, Montreal and 109 Eglinton Avenue East, Toronto, have been appointed exclusive Canadian agents for Siemens Flat and Block Selenium Rectifiers as used in the manufacture of radio and television sets.

(Turn to page 56)

*When you buy*  
**SPRINGS**  
**QUALITY**  
**COUNTS**

You can count on quality when you buy from Bohne because they are specialists in the field of precision spring making. Industry is constantly calling on Bohne "know-how" for economical spring production. Send your sample, blueprint or specifications for quotation.

**BOHNE INDUSTRIES LIMITED**  
1153 QUEEN ST. W. • TORONTO 3



**YES...**

**No core too small—No transformer too large!**



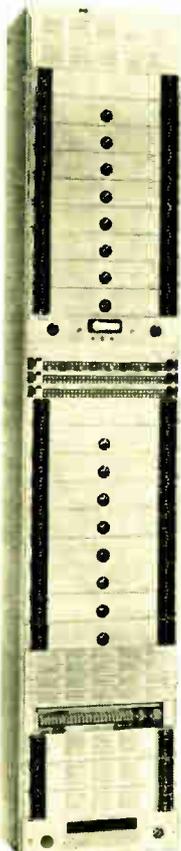
Illustrated above and reading counter-clockwise: HyperCores, Chokes, Power, Pulse, Filament, and Plate Transformers.

**MOLONEY ELECTRIC COMPANY OF CANADA LIMITED**

Factory and Head Office: 213-219 Sterling Road, Toronto 3, Ont., Regional Offices: Montreal, Calgary

565

**... for use on RADIO LINKS**  
**TMC 40-CHANNEL CARRIER TELEPHONE SYSTEM R40A.**



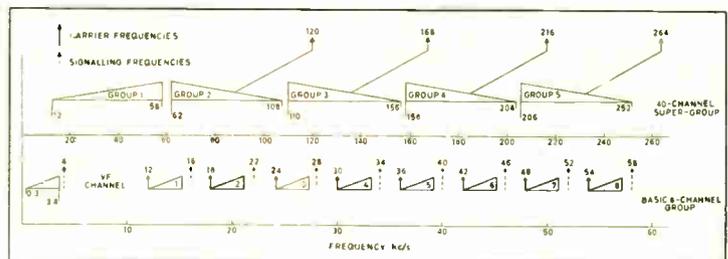
THE TMC R40A system provides up to 40 high quality wideband telephone channels (300-3400 c/s) with inbuilt outband ringdown signalling and 2 or 4 wire strapping options. The use of 6 kc/s channel spacing and other design features results in a compact and low cost system.

A fully equipped terminal comprises three baysides mounting channels, 1-16, 17-32 and 33-40 respectively, each measuring 9 ft. x 20½ in. x 6½ in. A pair of baysides (32 channels) can be mounted back to back to occupy no more floor space

than a double sided standard 20¼ in. apparatus bay.

Each bayside is self-contained with carrier supplies, power pack, alarm and metering facilities. Any number of channels can be installed initially and easily extended to meet traffic growth by plugging in channel panels or adding a bayside.

The radio connections are 75 ohm (unbalanced). The transmit level is -37 dbm and receive level -8 dbm.



Bayside equipped with 16 channels.

For full technical data apply Dept. EC.

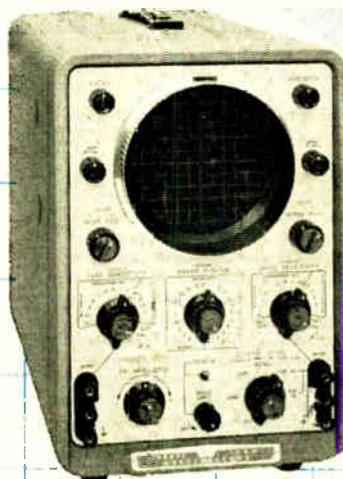
**TELEPHONE MANUFACTURING CO. LTD.**

SAXONY BUILDING: 26 DUNCAN STREET, TORONTO. Telephone EM. 6-5314.



For further data on advertised products use page 87.

not just "new"  
but  
a new  
**KIND** of  
**OSCILLOSCOPE**



-hp- 130A Low Frequency Oscilloscope

High sensitivity, dc to 300 KC  
21 direct reading sweep times  
Sweeps 1  $\mu$ sec/cm to 15 sec/cm  
Easy to use  
"Universal" automatic triggering  
5% voltmeter, millivoltmeter

This totally new production and laboratory instrument obsoletes previous concepts of oscilloscope convenience, usefulness and reliability.

Horizontal and vertical amplifiers are similar. Sensitivity is 1 mv/cm or 10 mv full scale deflection. Amplifiers have wide pass bands, dc to 300 KC. Input circuits are balanced on 5 most sensitive ranges. Single-ended input may be dc or ac coupled. Amplifiers are stable; gain may be standardized by an internal 1,000 cycle square wave. Sweep times are highly linear, may be set and read directly. In most cases -hp- 130A needs no preamplification to present transducer signals as a brilliant, high resolution trace.

A special feature is the "universal" automatic triggering system where one preset condition provides optimum triggering on almost all input signals.

### Brief Specifications

**Input Amplifiers:** (Similar Vert. and Horiz. Amps.). Sensitivity 1 mv/cm to 50 v/cm; 14 calibrated ranges, 1-2-5-10 sequence plus continuous vernier. Pass band dc to 300 KC; ac or dc coupling. Balanced input on 1, 2, 5, 10 and 20 mv/cm ranges.

**Sweep Range:** 1  $\mu$ sec/cm to 15 sec/cm. 21 sweeps: 1-2-5-10 sequence, 5% accuracy.

**Triggering:** Internal, line voltage or external 0.5 v or more. Pos. or neg. slope, +30 to -30 v trigger range.

**Preset Trigger:** Optimum setting for automatic stable triggering.

**Amplitude Calibration:** 1 KC square wave. 5% accuracy.  
Price: \$650.00

For the complete story on a really new oscilloscope,  
call your -hp- representative, or write direct.

## HEWLETT-PACKARD COMPANY

4054D Page Mill Road • Palo Alto, California, U.S.A.  
Cable "HEWPACK" • Davenport 5-4451

Represented in Canada by  
**ATLAS RADIO CORPORATION, LTD.**  
50 Wingold Avenue, Toronto 10, Ontario  
505 McIntyre Bldg., Winnipeg, Manitoba



also offers -hp- 150A High Frequency Oscilloscope, dc to 10 MC,  
sweeps 0.02  $\mu$ sec/cm to 15 sec/cm. Rise time 0.035  $\mu$ sec.

## NEWS

### Canadian Westinghouse Appointment

The appointment of F. Robert Aitken, as manager marketing services, Electronics Division, has been announced by D. D. McLean, manager sales department, Electronics Division, Canadian Westinghouse.



F. R. AITKEN

In this capacity, Mr. Aitken will now be responsible for sales services, advertising and sales promotion and the sale of facility services of the division, including the environmental laboratory and the analog computer.

Mr. Aitken has been with the sales department of the Electronics Division since 1953 and has served as planning administrator of the Electronics Division.

### Instronics Limited Widens Representation

Since its inception nearly a year ago, Instronics Limited, of 11 Spruce Street, Stittsville, Ontario (P.O. Box 51), has added to the list of U.S. firms it represents in Canada. These now include: BJ Electronics, Borg-Warner Corp., Santa Ana, California; Donner Scientific Company, Concord, California; Empire Devices Products Corp., Bayside, New York, N.Y.; Lavoie Laboratories, Inc., Morganville, N.J.; Potter Instrument Company, Inc., Great Neck, N.Y.; Millivac Instrument Corporation, Schenectady, N.Y.; Radio Frequency Laboratories, Inc., Test and Service Equipments Division, Boonton,

N.J.; Telerad Manufacturing Corp., New York, N.Y.; Texas Instruments Incorporated, Industrial Instrumentation Division, (formerly Houston Technical Laboratories), Houston, Texas.

Instronics Limited also represents Racial Engineering Limited, Bracknell, Berkshire, England.

### Canadian Distributor For 'dag' Dispersions

Acheson Colloids Company, Port Huron, Michigan, has appointed Apco Industries Limited, 10 Industrial St., Leaside (Toronto), Ontario, as distributor for the Provinces of Ontario and Quebec, of 'dag' dispersions of colloidal graphite, molybdenum disulfide and other solids, according to an announcement by Alden Crankshaw, sales manager.

Apco Industries Limited will distribute a complete line of controlled, high quality, ready-to-use industrial lubricants. These products, diluted blends of Acheson concentrated dispersions, serve a wide range of manufacturing industries — from automobiles to jet engines, and from electric toasters to giant machine tools. There are about 50 'dag' dispersions now available for use as maintenance and operational lubricants, as parting and anti-seize compounds, as built-in lubrication for machinery and other uses.

### C.G.E. Plans To Aid Universities

A new plan to provide financial assistance for Canadian colleges and universities through direct grants of funds was announced recently by Canadian General Electric Company Ltd.

The new plan, known as the Corporate Alumnus Program, provides that the company will match dollar-for-dollar contributions made by CGE-employed alumni during 1957.

In announcing the plan, James H. Goss, company president, said the plan "provides for joint participation in the giving program by individual employees and by the company."

Mr. Goss estimated that Canadian General Electric employs over 1000 alumni of the various Canadian colleges and universities. He said contributions of up to \$1000 within the year of any such alumni will be matched by the company.

The plan provides that contributing employees must have at least a year's service with the company; the contribution must be an actual gift and not merely a pledge; and it must be made to a Canadian college or university attended by the employee as a full-time day or evening student for at least one academic year.

He said that he is convinced that one of the greatest untapped sources of continuing support for higher education lies in the regular contributions by alumni.

### Servomechanisms Inc. Component Division

A new component division for Servomechanisms, Inc., specializing in vacuum film products, has been announced by Harold R. Larsen, vice-president and general manager of the Components Group.

The new division, known as the Vacuum Film Products Division, is located in El Segundo, California, and occupies 5500 square feet.

Division Manager will be David W. Moore. The new division will be responsible for the development and manufacture of electronic components utilizing vacuum film deposition techniques.

Servomechanisms, Inc. has plants in the Los Angeles, California area and Long Island, New York, and Toronto, Canada.



J. SMITH

H. R. STEWART

M. B. TROTTER

F. A. BURNETT

S. THOM, Q.C.

● The following appointments are announced by Ray Jameson, president and general manager of Allanson Armature Manufacturing Co. Ltd., Toronto: J. Smith, vice-president — Sales, Transformer Division; H. R. Stewart, vice-president — Engineering and Development; M. B. Trotter, vice-president — Manufacturing; F. A. Burnett, secretary-treasurer; S. Thom, Q.C., assistant secretary. All five men have been elected to the Board of Directors.

Allanson Armature is an all-Canadian company with complete engineering, tooling, and manufacturing facilities for their two divisions consolidated in a 70,000 square foot plant in Toronto's famous "Golden Mile" district. The Specialty Transformer Division is the largest of its kind in Canada, manufacturing ignition transformers for oil burners, neon transformers, fluorescent lighting transformers, television and radio transformers and distribution and power transformers.

# Another Essco First!



For the first time anywhere—a Radio Parts Catalogue devoted solely to the specialized electronic components and devices used in the Industrial, Military, Laboratory and Engineering fields. Ensure getting your FREE copy of this unique and informative book—write us today!

**free!**

Industrial Catalogue No. 561

**ELECTRO SONIC**  
SUPPLY CO. LTD.  
543 YONGE ST., TORONTO 5  
WA. 4-9301



## how large is small?

DAVEN'S NEW  
MINIATURE WIRE  
WOUND RESISTORS  
PROVIDE AS MUCH  
AS 400K  
RESISTANCE IN  
1/4" x 5/16" SPACE

Types and Specifications

Type	Dia.	Length	Max. Ohms	Max. Watts
1274	3/16	3/8	100K	0.25
1273	1/4	5/16	400K	0.25
1283	1/4	5/16	400K	0.25
1284	1/4	27/64	.5 Meg.	0.25
1250	1/4	1/2	900K	0.33
1170A	7/16	1/2	1.2 Meg.	0.50
1170	1/2	1/2	1.8 Meg.	0.50

Write for our new resistor catalog.

THE **DAVEN** CO.

534 West Mt. Pleasant Ave.  
Route 10, Livingston, N. J.

Special temperature coefficients  
can be supplied on request.

IN CANADA:  
Adams Engineering Ltd.  
Montreal and Toronto



## FREED MAGNETIC AMPLIFIERS FOR IMMEDIATE DELIVERY.

### FAST RESPONSE MAGNETIC AMPLIFIERS

2 response Phase reversible

Cat. No.	Supply Freq. C.P.S.	Power Out. Watts	Volt. Out. V. AC	AC or DC signal voltage req'd for full output.	
MAF-1	60	13	110	1.0	—
MAF-6	400	5	57.5	1.2	0.4
	400	10	57.5	1.6	0.6
MAF-7	400	15	57.5	2.5	1.0

### SINGLE ENDED MAGNETIC AMPLIFIERS

Cat. No.	Supply Freq. C.P.S.	Power Out. Watts	Sig. req'd for full outp. MA-DC	Total res. Contr. wdg. K Ω	Load res. ohms
MAO-1	60	4.5	3.0	1.2	3800
MAO-2	60	20	1.8	1.3	700
MAO-4	60	400	9.0	10.0	25
MAO-5	60	575	6.0	10.0	25

### PUSH-PULL MAGNETIC AMPLIFIERS

Phase reversible

Cat. No.	Supply Freq. C.P.S.	Power Out. Watts	Volt. Out. V. AC	Sig. req'd for full outp. MA-DC	Total res. contr. wdg. K Ω
MAP-1	60	5	115	1.2	1.2
MAP-2	60	15	115	1.6	2.4
MAP-3	60	50	115	2.0	0.5
MAP-3A	60	50	115	7.0	2.9
MAP-4	60	175	115	8.0	6.0
MAP-7	400	15	115	0.6	2.8
MAP-8	400	50	110	1.75	0.6

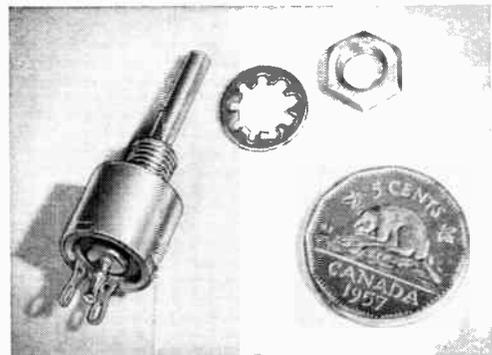
For detailed information about Freed Transformers and Laboratory Test Instruments send for Catalog.

**FREED TRANSFORMER CO., INC.**  
1716 WEIRFIELD ST., BROOKLYN (RIDGEWOOD) 27, N.Y.

## MEET A NEW MEMBER

### OF OUR FAMILY

The 1/2" diam. 1/3 Watt Variable Composition Resistor, designed and produced to Military Specifications.



Manufactured entirely in Canada

by

**PRECISION ELECTRONIC COMPONENTS**  
(1956) **LIMITED**

50 Wingold Ave.

Toronto 10, Ont.

Write for further information

FORWARD WITH CANADA

## Blueprinting the Future...

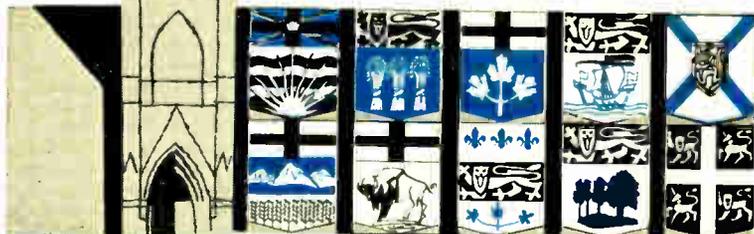
Today, more than ever before,  
Canada's future is being shaped  
by the slide rule  
and the drawing board.

In every construction project,  
in communications, power development  
and in public utilities,  
innumerable items of electrical equipment  
are required.

Ordering these units  
calls for a high degree  
of planning and co-ordination.

Purchasing from Northern Electric  
gives you immediate access  
to over 100,000 items  
which are the dependable products  
of more than 1,000 manufacturers.

With Northern Electric offices  
and warehouses throughout Canada,  
electrical supplies and equipment  
are always available to you  
at short notice.



***Northern Electric***  
SERVES YOU BEST

6657-4

For further data on advertised products use page 87.

# Engineering Achievements



There are opportunities at MEL for -  
 \* Engineers with Industrial Electronics or  
 Nuclear Design experience. \* Sales  
 Engineers.

Development work on transistorized circuits at MEL has resulted in these two achievements — above — **Transistorized Communications Receiver** undergoes engineering approval tests. High sensitivity and selectivity combined with greater reliability, ruggedness and extremely low battery drain. Left — **A Transistorized Megaphone** features higher power, lower distortion, longer life and greater economy than earlier vacuum tube models.



## MEASUREMENT ENGINEERING LIMITED

Head Office and Plant - ARNPRIOR, ONT. - Phone 400

Central Ontario Branch Sales Office — P.O. Box 50, Don Mills — Hickory 4-8172

A complete service as Consultants, Field Research Engineers and Equipment Specialists in every phase of Electronics and Communications.

# NEW

## SAFE SOLVENTS

### by DU PONT

"FREON" - MF

"FREON" - BF

"FREON" - TF

### Assure utmost safety for men and equipment

In normal use "Freon" Solvents are:

- NONCORROSIVE** — cannot damage equipment.
- NONFLAMMABLE** — will not burn or explode.
- NONTOXIC** — harmless to operators.

For facts about  
**"FREON" SOLVENTS**  
 Send this coupon to  
**DU PONT COMPANY**  
 OF CANADA (1956) LIMITED  
 P. O. BOX 660  
 MONTREAL, CANADA



"Freon"\* Solvents offer many unique solvent properties. These properties include selective solvency for greases and oils — adaptability to hand cleaning, batch or continuous degreasing operations — ready solvent-vapor recovery — a wide range of industrial uses. These solvents are a new and outstanding addition to Du Pont's family of fluorinated hydrocarbons.

Under normal conditions, some of the many uses for "Freon" Solvents include: Cleaning mechanical and electrical controls, cleaning precision instruments and gauges, vapor-degreasing hermetically sealed motors, cleaning motion picture and TV film, solvent for silicone greases, cleaning lithographic plates, cleaning plastic materials and parts, cleaning oxygen-breathing equipment, cleaning magnetic recording tape.

\*"Freon" is Du Pont's trade name for its fluorinated hydrocarbon compounds.

Firm Name . . . . . EC-4

Name (Mr.) . . . . . Position . . . . .

Address . . . . .

I am interested in "Freon" Solvents for the following applications:  
 . . . . .

## K. J. Farthing Promoted By Canadian Westinghouse

K. J. Farthing was recently appointed general advertising manager for the Canadian Westinghouse Company, to administer general advertising and public relations activity through all company divisions and subsidiaries. He also assumes responsibility for advertising and promotional services to the Apparatus, Industrial, Air-brake and Project Development Groups at Westinghouse.



K. J. FARTHING

Joining the company as an apprentice in 1914, Mr. Farthing held various sales posts in Western Canada and Hamilton before being named manager of the advertising and sales promotion division in 1944. He became consumer products advertising manager in 1955, with responsibility for activity in the appliance, television, radio, lamp and tube markets.

Nationally-known as a speaker, Mr. Farthing is a director of the Association of Canadian Advertisers and a member of the National Industrial Advertisers Association.

## Electronic Parts Distributors' Show May 20-23

The interest shown by Canadian manufacturers and distributors of electronic equipment in the Electronic Parts Distributors Show which is held in the Conrad Hilton Hotel, Chicago, in May of each year is evidenced by the large number from Canada who journey to Chicago for this event.

The show this year will be held May 20th to 23rd, 1957, and already considerable interest is being shown by members of the Canadian electronic industry who are planning to



● The above photograph, taken on the occasion of the annual convention of The Institute of Radio Engineers Inc. in New York City, shows A. V. Loughren handing over the gavel of office to Dr. J. T. Henderson, newly elected president of the IRE for the year 1957. Dr. Henderson is the first Canadian to hold this office. He is Director of the Department of Electrical Engineering, National Research Council of Canada, Ottawa.

*Photograph courtesy of Electronic Week.*

take it in.

Canadian activity centers around Canadian headquarters which will be set up in room 13 on the fourth floor of the Conrad Hilton opening at nine o'clock Monday morning, May 20th. These headquarters are sponsored by the Canadian Electronic Sales Representatives, an association of electronic manufacturers and manufacturers' representatives which this year is headed by C. G. Pointon, of Toronto, as chairman. All Canadian visitors to Chicago are welcome to make the Canadian Room their headquarters and meeting place.

In addition to providing the Canadian Headquarters conveniences, Canadian Electronic Sales Representatives sponsor each year the annual Canadian luncheon which this year will be held Tuesday noon, May 21st, in the Beverly Room of the Conrad Hilton Hotel. For further

information and tickets for the luncheon contact may be made with Mr. Rochford at 25 Taylor Drive, Toronto 6, Ontario, telephone number OXford 1-5304.

The Canadian Electronic Sales Representatives will hold their annual breakfast meeting in Chicago on Wednesday, May 22nd, and all members of the Association are invited and urged to attend this meeting.

## Measurement Engineering Provides New Service

Measurement Engineering Limited of Arnprior, Ontario, announces that its manufacturing facility is prepared to supply custom-built terminal boards on short order. Stocks of laminates and turret lugs are maintained at its plant at Arnprior, Ontario, Canada.

Here's what the  
**HAMMOND**  
TRANSFORMER SERVICE  
offers you

Your enquiries are invited for small or large quantities.

A most complete line designed to meet the needs of the Radio, Electronic, and Communication Industries.

Transformers, and reactors; cabinets, racks, panels, chassis, and other sheet metal items.

Specials can be designed and built to meet your requirements.

**HAMMOND MANUFACTURING COMPANY LIMITED, GUELPH, CANADA**

For further data on advertised products use page 87.

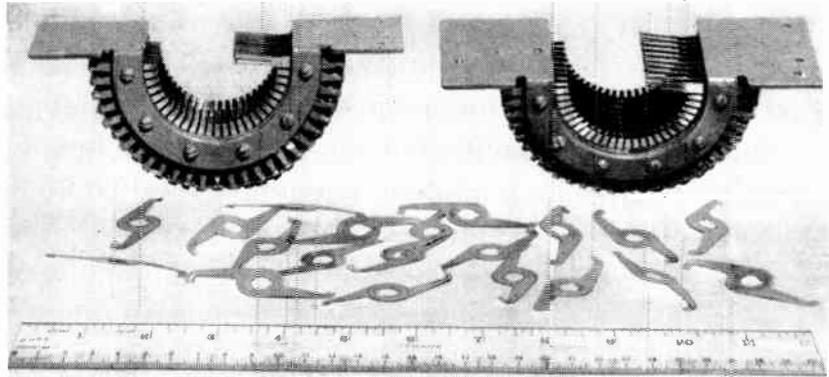
## CDC To Handle Canadian Sales Of Bendix Aviation Electronic Equipment

C. I. Rice, manager, Aviation Electronic Products, Bendix Radio announced recently that a direct sales and licensee agreement has been concluded with Computing Devices of Canada Limited. Under the new agreement CDC will handle the Canadian sales of Bendix Radio's aviation electronic products.

Commenting on the new agreement with CDC, Rice said, "The transfer of these electronic products from Aviation Electric Ltd. — which has been handling them in Canada for a number of years — to CDC was occasioned by our desire to make the best use of the facilities of both firms. Aviation Electric, which has concentrated on mechanical and electro-mechanical products, will continue to handle products from other Bendix Divisions — as it has for many years past. CDC, primarily an electronics firm, is in an excellent position to handle the electronics equipment manufactured here at Bendix Radio. We feel that the new arrangement will work to the benefit of all concerned."

During the past eight years, CDC has been engaged in the development, manufacture, and sale of airborne navigation and flight control equipment, digital and analog computers.

## ● Remarkable Results Achieved with SEL-REX Bright Gold Precision Plating on Stepping Switch and Wiper Contacts



This unusually complex piece of electrical equipment, consisting of a combination of beryllium copper contactors, with a framing of steel and fibre, provides one of the most convincing examples, yet to be shown, of the exceptional features of SEL-REX Bright Gold Precision Plating.

In this particular instance no less than 260 parts are involved — all insulated. The fact that it was possible to carry out all plating work after assembly is another testimony to the high value of this remarkable process.

SEL-REX Bright Gold Precision Plating is making rapid advances in the electronics and electrical fields because of its complete adaptability for this type of work and its proven ability to resist tarnish and corrosion. It is becoming more and more the first choice among leading manufacturers in Canada and the United States.

Wherever electronics and electrical parts, requiring plating, are being made an investigation of the SEL-REX Bright Gold Process is of undoubted importance.

For further information, write or phone:—

The Electric Chain Company of Canada Limited, 86 Bathurst Street, Toronto 2B, EM. 3-8881.

**Bendix**  
SCINTILLA  
CONNECTORS



- ▶ DELIVERY IS RIGHT
- ▶ PRICE IS COMPETITIVE
- ▶ QUALITY IS TOPS

BENDIX-SCINTILLA connectors are now available in Canada. Profit from the dependable performance of these famous connectors.

Fast delivery of AN Types A, C and E from Montreal stock.

**AVIATION ELECTRIC**  
LIMITED

CANADIAN AFFILIATE OF BENDIX AVIATION CORPORATION

## MECHRON ENGINEERING PRODUCTS LTD.



50 Way Static Strain Recorder. This instrument provides a means of selecting up to 50 selected points where strain gauges have been installed and measures by means of a Wheatstone bridge the resistive unbalance which is caused by the applied loads to the structure.

Made by:  
**SAVAGE & PARSONS LTD.**  
Watford, England.

Other Savage & Parsons products include:

Strain gauge equipment; Communication equipment; Precision gear trains; Servo mechanisms; Airborne radar; Naval radar; Fire Control equipment; Scanners, Wave guides; Lead shielding; Remote Manipulators; Equipment handling devices.

**MECHRON ENGINEERING PRODUCTS**

LIMITED

KALADAR AVE.

OTTAWA

# Direct Reading Spectrum Analyzer

- for • Visual frequency calibration — high resolution
- Leakage and interference measurements
  - Standing wave measurements
  - Pulse modulation analysis
  - Sensitive receiver

## The BASIC SCOPE for VISUAL MICROWAVE



### SPECIFICATIONS

Model No.	Equipment
Model Du.....	Spectrum Display and Power Unit
Model STU-1...	RF Tuning Unit 10-1,000 mc.
Model STU-2A...	RF Tuning Unit 910-4, 560 mc.
Model STU-3A...	RF Tuning Unit 4,370-22,000 mc.
Model STU-4...	RF Tuning Unit 21,000-33,000 mc.
Model STU-5...	RF Tuning Unit 33,000-44,000 mc.
Frequency Range: 10 mc to 44,000 mc.	
Frequency Accuracy: $\pm 1\%$	
Resolution: 25 kc.	
Frequency Dispersion: Electronically controlled, continually adjustable from 400 kc to 25 mc per one screen diameter (horizontal expansion to 20 kc per inch)	

Frequency differences as small as 40 kc measurable by means of variable frequency marker with adjustable amplitude. Portable and completely self-contained.

Input Impedance: 50 ohms—nominal  
Overall Gain: 120 db

Input Power: 400 Watts

Sensitivity: (minimum discernible signal)

STU-1: 10-400 mcs	—85 to —95 dbm
350-1,000 mcs	—80 to —90 dbm
STU-2A: 910-2,200 mcs	—85 to —95 dbm
1,980-4,560 mcs	—75 to —87 dbm
STU-3A: 4,370-11,000 mcs	—77 to —90 dbm
8,900-22,000 mcs	—65 to —85 dbm
STU-4: 21,000-33,000 mcs	—57 to —75 dbm
STU-5: 33,000-44,000 mcs	—50 to —65 dbm
RF internal 100 db continuously variable (STU-1, STU-2A, STU-3A)	
IF 60 db continuously variable	

For further data on advertised products use page 87.

World Radio History

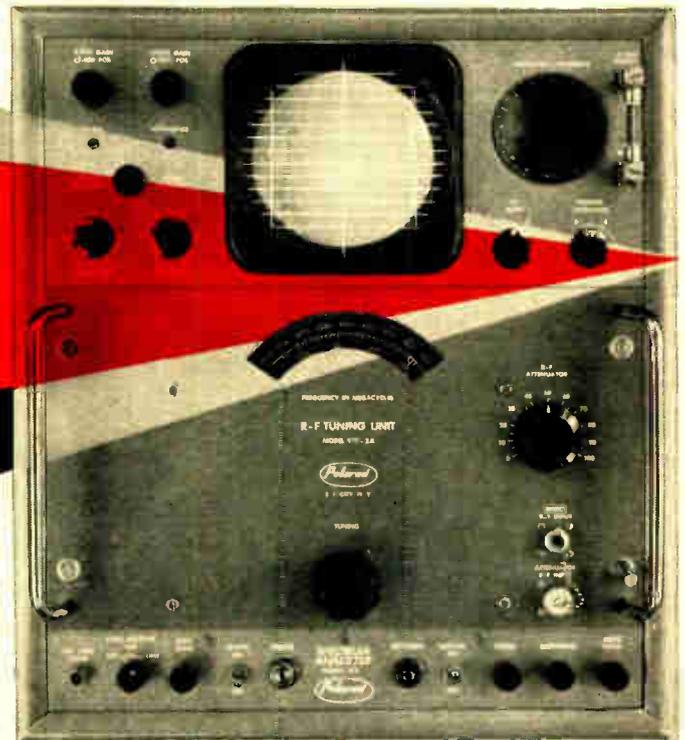
# Broadband 10-44,000 mc

Now, the Polarad Model TSA Spectrum Analyzer provides the same visual advantages for microwave testing as the standard oscilloscope accomplishes for low frequency signals. This is a "must" instrument for microwave work! It displays with high sensitivity on a bright easily defined CRT, pulse modulation components, frequency differences, attenuation and band width characteristics, leakage detection, radiation and interference signals, and VSWR information.

This is visual instrumentation—it provides immediate and complete information because of the high resolution obtainable.

Frequencies are read directly on the linear dial with 1% accuracy as the set is tuned. Maximum reliability and long life are assured through use of non-contacting oscillator plungers. A variable frequency marker with both frequency and amplitude adjustable is provided.

## ANALYSIS



Write today—directly to Polarad, or your nearest Polarad representative—to find out how the Model TSA Spectrum Analyzer can speed your research and solve your microwave measurement and testing problems.

Write for your copy of the Polarad "Handbook of Spectrum Analyzer Techniques". 50c per copy. Includes discussion of Spectrum Analyzer operation, applications and formulae for analysis techniques.

**AVAILABLE ON EQUIPMENT LEASE PLAN**

**FIELD MAINTENANCE SERVICE AVAILABLE THROUGHOUT THE COUNTRY**

*For private demonstration  
without obligation  
ask for the*



*to stop  
at your plant*



**ELECTRONICS CORPORATION**  
43-20 34th Street, Long Island City 1, N. Y.

REPRESENTATIVES: Albany, Albuquerque, Atlanta, Baltimore, Boston, Chicago, Cleveland, Dayton, Denver, Englewood, Fort Worth, Kansas City, Los Angeles, New York, Philadelphia, Portland, Rochester, St. Louis, San Francisco, Schenectady, Stamford, Syracuse, Washington, D. C., Winston-Salem, Canada: Arnprior, Ontario.  
Resident Representatives in Principal Foreign Cities



# SSB?

## Yes...

We now manufacture a complete line of SSB equipment from Antenna to Antenna.

### The Chain:

- • • SBE-1 Exciter (195)
- GPT-750 Xmtr. (174B)
- TRC-Xmtr. coupler (178)
- DAC-Recr. coupler (158)
- GPR-90 Receiver (179C)
- GSB-1 Slicer (194A)
- • •

Write for these bulletins (shown in brackets)

\* \* \*



The only tunable SSB adapter for any 455 kc IF Receiver

Model GSB-1

A companion unit for our Model GPR-90 Receiver

\* \* \*

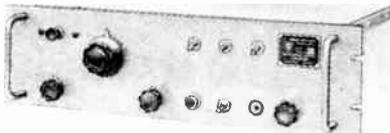


**SINGLE SIDEBAND EXCITER  
MODE SELECTOR TRANSMITTING**

Model SBE-1 AN/URA-23

A companion unit for our Model GPT-750 Transmitter

\* \* \*



**SINGLE SIDEBAND ADAPTER  
MODE SELECTOR RECEIVING**

Model MSR-1 CU/591/URR

A companion unit for our AN/FRR-502 Receiver (TMC Model FFR)

\* \* \*

Watch for our new table top linear power amplifier bulletin to be released shortly. Used in conjunction with the SBE-1, it provides a complete and versatile table top SSB transmitting system.



**T.M.C.  
(CANADA) LTD.**

In U.S.A. ...  
TECHNICAL MATERIEL  
CORPORATION  
MAMARONECK, N.Y.

P.O. BOX 1004  
BILLINGS BRIDGE  
OTTAWA, ONT.

### Toronto Section, IRE Holds March Meeting

On March 18th the Toronto Section of The Institute of Radio Engineers convened to hear John E. Raftis, of Rogers Majestic Electronics Limited, give a talk on "An integrated Radio Relay and Railway Communications System".

Mr. Raftis described the communications facilities recently installed by his company for the Pacific Great Eastern Railway Company, linking the North Vancouver Station and the Dispatch Office at Squamish.

### Canadian Marconi Promotes J. A. Howlett

Jack A. Howlett has been appointed assistant industrial relations manager for Canadian Marconi Co., according to an announcement by Ralph



J. A. HOWLETT

Letts, manager of the company's industrial relations division.

Mr. Howlett joined Canadian Marconi in 1948 in a programming capacity with the company's Radio Station CFCF. He later became promotion director

for the station, and later was named program manager for the separately operated Station CFCF-FM. In turn he was appointed production supervisor for CFCF, and then program manager.

### CDC Marketing Division Makes Appointment

Lt./Cdr. A. J. McCulloch, RN (ret.) has recently been appointed Contracts Officer - Navigation for Computing Devices of Canada Limited.

Cdr. McCulloch will be responsible for the sale of the Decca Navigator to



CDR. McCULLOCH

marine users in Canada. Decca is new to Canada, though extensively used in Great Britain and Europe. The recent decision of the Department of Transport to evaluate the Decca system in Canada is hailed by W. S. Kendall, Marketing Director of CDC, as a "significant step forward in providing reliable and accurate navigation facilities in the Atlantic coast regions of Canada".

Cdr. McCulloch joined the Royal Navy in 1928 as a boy seaman. Since that time, his duties have almost continuously involved him in air and surface navigation and communications. In 1934 he took up naval aviation as a specialist. Some of his more

interesting appointments have been Executive Officer of a Destroyer, Group Signal Officer of a number of naval airfields, and Operations Officer of fleet and escort carriers. In this latter capacity, he was more recently involved in the Korean incident.

Cdr. McCulloch is a founder member of the Institute of Navigation, and a member of The Royal Geographic Society, Kensington.

### CESCO Opens Quebec City Branch

It has been announced by M. I. Rosenthal, president of Canadian Electrical Supply Co. Ltd., that a new branch has recently been opened in Quebec City at 110 Ouest Rue St. Vallier.

The opening of this branch in CESCO's 45th year of operation enables customers to receive direct and fast service with on-the-spot information from highly trained radio technicians. By means of a teletype service, this Quebec City branch will be in direct contact with the company's head office in Montreal.

The new branch office, coupled with the Montreal head office and the branches at Toronto and Ottawa, becomes part of an organization serving the radio-television and appliance dealers, services and the electronics industry.

(Turn to page 66)

## ECLIPSE-PIONEER SYNCHROS



**FOR SERVO MECHANISMS  
AND COMPUTING DEVICES**

A complete line of high accuracy transmitters, receivers, resolvers, differential and linear synchros is available in sizes 10, 11, 15 and 22 — standard or corrosion resistant models.

Fast delivery on small quantities for your engineering prototypes.

**AVIATION ELECTRIC  
LIMITED**

CANADIAN AFFILIATE OF BENDIX AVIATION CORPORATION

## MATERIALS

(Continued from page 46)

styrene, ethylcellulose, and the vinyls may be satisfactory when the dimensional stability requirements are not too severe. Highly plasticized compounds such as the acetates must be avoided because age loss of the plasticizer may cause serious dimensional change. The dimensional stability of the various materials is affected by moisture and temperature; most of the organic plastics have high thermal expansion. The thermoplastic compounds change dimension rapidly under stress (cold flow) at temperatures near their softening point.

Most plastic products cannot be used for critical parts of machines or instruments where the performance of the device depends on the dimensional stability of the molded piece, unless allowances are made for differential expansion and variation. In business machines, large housings, etc., the design will be satisfactory if the inner mechanism is not supported by the plastics housing. All interior mechanism must be an integral assembly with the plastics enclosure serving only as a housing. Moisture absorption, age shrinkage, warping or distortion may cause the mechanism to bind if it is tied firmly to a plastic material with poor dimensional stability and high thermal expansion. Organic plastics cannot be used for products which must maintain precision dimensions over long periods of time. Glass-bonded mica and the ceramoplastics are the only materials with total dimensional stability suitable for precision products.

Weather resistance is a major weakness in many of the plastics. Shellac, glass-bonded mica, ceramoplastics, ceramics, and alkyd resins are the best selections for outdoor service. Acrylics and polyethylene plastics are suitable for some outdoor applications and some of the styrene copolymers may perform satisfactorily under certain conditions.

Odor and taste requirements will limit the choice of some applications, particularly in packaging and food processing since many of the plastics have a strong odor and may impart a taste to food. Melamine, urea, ceramoplastics, glass-bonded mica, polystyrene and polyethylene are particularly good in freedom from odor. There are some minimum odor phenolic molding compounds and laminates.

The unusual production processes such as reinforced plastics, extrusion blowing, and vacuum forming of sheets, must be evaluated carefully since they offer many production advantages and will indicate their own materials.

# MORE ACTIVE! EFFECTIVE!



THE BEST FOR TV-RADIO WORK...

**EVERYTHING ELECTRICAL**—Kester "Resin-Five"

Core Solder is better and faster than any solder ever developed. It has an activated flux-core that does a perfect job on all metals including zinc and nickel-plate. The flux residue is absolutely non-corrosive and non-conductive.

Available in all practical Tin-Lead Alloys; 40/60, 50/50 and 60/40 in diameters of  $\frac{3}{32}$ ",  $\frac{1}{16}$ ",  $\frac{3}{64}$ ",  $\frac{1}{32}$ " and others.

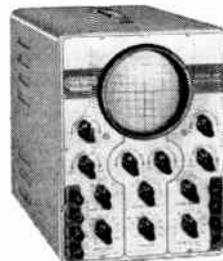
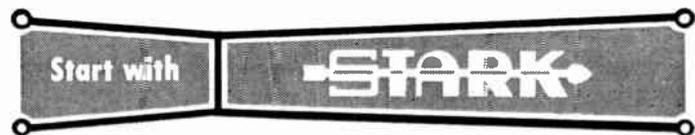


**Printed Circuit Soldering**  
On Copper-etched boards use 60% Tin - 40% Lead Alloy... for those that are Silver-surfaced use 3% Silver-61½% Tin-35½% Lead

## KESTER SOLDER COMPANY

OF CANADA, LTD. Dept. U

Brantford, Canada



### MODEL No. 115 CATHODE RAY OSCILLOSCOPE

5" CR. Tube.  
Complete visual alignment.  
High Sensitivity .025V (25MV) per inch.  
Wide band vertical amplifier — to 1 megacycle.  
Excellent square wave response.  
Unitized physical construction.

### MODEL No. VT-9 LABORATORY SIZE ELECTRONIC VOLT-OHM-CAPACITY MILLIAMMETER

Measures A.F., I.F., and R.F. voltages from 20 cycles to 300 megacycles. Capacity measurements as low as 1 mmf., as high as 1,000 mf. Resistance range: 1 ohm to 10,000 megohms. Current (D.C.) 5 micro-amperes to 1,200 milliamperes.  
A.C.-D.C. Voltage measurements: 0-3, 12, 30, 120, 300, 1200 RMS or Peak to Peak measurements.  
Greater visibility with extra large laboratory size 9" meter. High voltage D.C. probe available — extends range to 30,000 volts.



### STARK ELECTRONIC INSTRUMENTS LTD.

Factories and Sales Office: Ajax, Ont.  
Foreign Division: 276 West 43rd Street  
New York 36, N.Y., U.S.A.

# SANDERS Model 2 Phase Comparator



...can be used as a  
modulator,  
demodulator  
or switch

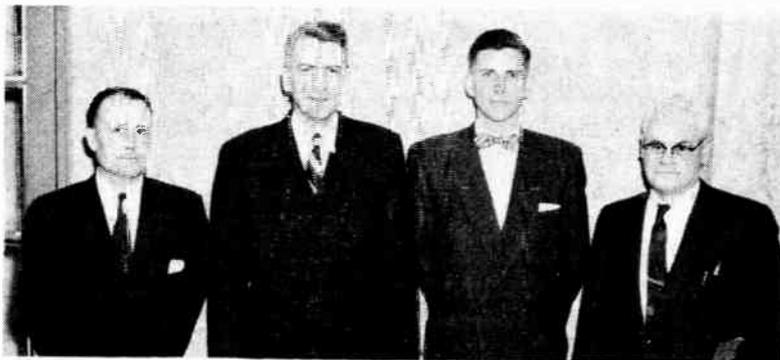
This compact, rugged comparator is hermetically sealed in an inert gas and packaged for mounting in a standard octal socket. Two full-wave bridge rectifiers are used to obtain a high degree of stability and balance.

As phase sensitive comparators, these units can be used to measure the amplitude or phase of an input signal with respect to a reference signal. As demodulators, DC output can be obtained either single-ended or push-pull with respect to ground. Suitable for all military applications.

#### SPECIFICATIONS

**Frequency Response:** 0 to 5000 CPS;  
**Max. Reference Voltage:** 120V. RMS;  
**Max. Output Voltage:**  $\pm 50V$ . DC;  
**Dynamic Range:** 46 db; **Load:** Max. 200K ohms, — Min. 20K ohms; **Input Impedance:** Approx. 200K ohms with 200K ohms load and 1:1 transformer.  
**Size:** 1" dia. x 3"; **Weight:** 2 ozs.

Write for data sheets to Dept. EC-4



● The above photograph taken at the April meeting of the Toronto Section IRE shows the incoming executive for 1957-58. They are: Chairman, H. Jackson; Vice Chairman, H. F. Shoemaker and Secretary Treasurer, R. Turner. Second from left is Mr. Fred Heath, retiring Chairman of the Toronto Section IRE.

## A. V. Roe Canada Acquires PSC Applied Research

PSC Applied Research Limited, one of Canada's leading designers and manufacturers of electro-mechanic instrument systems has been acquired by A. V. Roe Canada Limited from the Hunting group of Canadian aviation companies. PSC Applied Research Limited employs an expanding staff of over 300 and operates two plants in Toronto's east end.

The announcement was made simultaneously by Crawford Gordon, Jr., president and general manager of A. V. Roe Canada Limited of Malton, Ontario and D. N. Kendall, founder and operating head of the Hunting aviation group in Canada.

PSC Applied Research Limited becomes the sixth operating company in the A. V. Roe Canada group. The others are: Avro Aircraft Limited; Canadian Car and Foundry Company Limited; Canadian Steel Foundries (1956) Limited; Canadian Steel Improvement Limited; Orenda Engines Limited. In addition, through CanCar, the group has controlling interest in Canadian General Transit Company Limited which is engaged in the leasing of railway tank cars.

## Logistics Research Changes Name

Logistics Research, manufacturer of Alwac electronic data processing systems, has recently changed its name to Alwac Corporation. A. Y. Baker, executive vice-president and general manager, states that "the new title will provide better identification with the company's products and services which all bear the Alwac name."

Concurrent with the name change is a change in location to Hawthorne, California, which will provide for larger manufacturing facilities and a new computing service and training center.

Alwac computing and training centers are now located through the United States, Canada and Europe

## Eitel-McCullough Promotes J. R. Welch

James R. Welch has been named manager of application engineering for Eitel-McCullough, Inc., San Bruno, California, manufacturer of Eimac electron power tubes.

Welch joined Eimac in 1950 as a research engineer in the firm's laboratory, transferring to the application engineering in 1955. A registered engineer in the State of California and a member of the Institute of Radio Engineers, he has a long background of experience in electronics. Prior to joining Eitel-McCullough, he spent two years as a maritime radio operator, worked seven years as transmitting engineer for Press Wireless and Globe Wireless in San Francisco, was a specialist in radio direction finding during three years' Coast Guard Service and was employed for five years in the radio broadcasting field.

Eitel-McCullough is represented in Canada by Ahearn and Soper of Ottawa.

## A. C. Wickman Limited Appoints Sales Engineer

Mr. L. B. Manning, vice-president in charge of sales for A. C. Wickman Limited, announces the appointment



B. H. MCGREGOR

of B. H. McGregor, P. Eng., as sales engineer in their Electronics Division. Mr. McGregor brings to the Wickman organization a broad background of experience in the field of electronics, communications and meter-

ing. A graduate from the University of Toronto in 1947, Mr. McGregor has worked in the Electronics Division of the Northern Electric Co., with Rogers Majestic Electronics Ltd., and most recently with R. H. Nichols Ltd. In his new position, he will specialize in the application of Brush direct writing recording systems and allied products.

(Turn to page 68)

# Power where it's Needed!



This new ANDREW 450 MC base station antenna has been designed for the many base stations that are not in the center of their desired coverage area. Such stations, placed to take advantage of mountain tops, or located at operations headquarters, can now concentrate their highest gain in the direction where the need is greatest.

In planning a new radio system or improving an existing system, consider the advantages of an integrated ANDREW antenna system. The following example shows how an ANDREW system, using the Type 201, can give improvement over ordinary equipment in all directions and more than 9 db improvement in the best direction.

Typical Existing System	Relative Gain, db		
	Front	Side	Back
Base Station Antenna (Typical)	5.0	5.0	5.0
Station Cable Loss, 100 feet RG-17/U	(2.5)	(2.5)	(2.5)
Mobile Antenna, $\frac{1}{4}$ $\lambda$ Whip (RG-58)	0*	0*	0*
<b>Combined Antenna System</b>	<b>2.5</b>	<b>2.5</b>	<b>2.5</b>
<b>ANDREW Type 201 System</b>			
Base Station, Type 201	10.8	6.1	3.3
Base Station Cable Loss, 100 feet Type HO HELIAX	(1.0)	(1.0)	(1.0)
Mobile Antenna, Type 233 (RG-8)	1.8*	1.8*	1.8*
<b>Combined Antenna System</b>	<b>11.6</b>	<b>6.9</b>	<b>4.1</b>
<b>IMPROVEMENT, db</b>	<b>9.1</b>	<b>4.4</b>	<b>1.6</b>

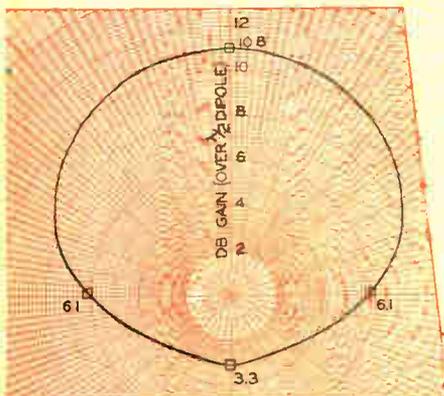
\*Gain of Type 233 is relative to assumed 0 db gain of  $\frac{1}{4}$   $\lambda$  whip with RG-58/U, and includes allowance for lower loss of RG-8/U feed cable.

Write for Bulletin 8417 giving complete information on Type 201. Also, be sure your library contains ANDREW Catalog 21, a complete, 100-page guide to antenna and transmission line systems.

## Andrew

A N T E N N A  
C O R P O R A T I O N L T D .  
606 BEECH ST., WHITBY, ONTARIO

Offices: Chicago, New York, Boston, Los Angeles



Gain Pattern, Type 201

ANTENNAS • ANTENNA SYSTEMS • TRANSMISSION LINES

**TELEVISION TUNERS**

Switch Type  
Licencees of Sarkes-Tarzian Inc.

**LOUDSPEAKERS**

Domestic and Military Types

**WIRE WOUND RESISTORS**

Cement and Vitreous Enamelled  
Coatings - MIL Approved

**VARIABLE TUNING  
CAPACITORS**

Radio Tuning Types - Special  
Units For Military Application

**TRIMMER CAPACITORS**

Conventional Air Dielectric  
Glass and Ceramic  
**LEDEX ROTARY  
SOLENOIDS AND  
SELECTOR SWITCHES**

**PERMEABILITY TUNERS  
PRECISION GEARS AND  
GEAR TRAIN ASSEMBLIES  
SERVO-LOOP SYSTEMS  
MICROWAVE  
COMPONENTS**

Filters, Antennas

ALL SYSTEMS  
AND  
COMPONENTS  
ENGINEERED

TOOLED AND  
MANUFACTURED IN  
OUR KITCHENER  
PLANT



**marsland  
ENGINEERING  
LIMITED**

KITCHENER, ONT., CANADA

**NEWS (Continued)****Canadian Firm Exhibits At  
New York IRE Show**

The Constanta Co. of Canada Ltd. was the sole Canadian individual exhibitor at the IRE Exhibition in New



York City. The Constanta booth, in charge of Walter J. Bastanier, attracted a large number of visitors to view its line of high stability precision resistors.

**Toronto Training Center  
For Electronics Students**

DeVry Technical Institute, one of North America's largest in the field of electronics, recently announced the opening of its Toronto Training Center, at 580 Roselawn Avenue. Both day and evening classes are now available for resident students, in addition to a well-planned spare time home training program for those unable to attend resident school.

For over 25 years the high standards of training at DeVry in Chicago have produced technicians for careers in the expanding field of electronics, which includes television, nucleonics, industrial electronics, automation electronics, radar, etc.

The same effective training method will be followed in the Toronto Laboratory, using modern types of commercial test equipment to provide practical knowledge in electronics.

With the expansion of all phases of electronics in Canada, DeVry Technical Institute will provide a welcome and necessary source of acquiring trained technicians to serve industry and commerce in this highly specialized field.

**Westinghouse Supplies  
World's First Parallel  
Generator AC System**

The first aircraft electrical system in the world wired for automatic parallel operation of four engine driven generators supplying high voltage AC power has been supplied to Canadair Ltd., by the Canadian Westinghouse Company.

The system will supply the power for radar, electronic and electrical equipment aboard the huge Canadair "Argus" being built by the Montreal aircraft firm for the RCAF maritime command. The four generators supply enough power to meet the requirements of 60 six-room homes completely equipped for electrical living.

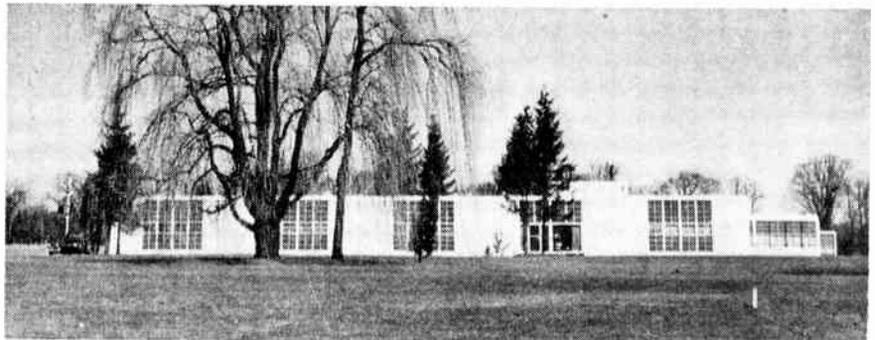
Unique in the aviation field, the parallel generating system has 40-KVA alternators driven at 6,000 r.p.m. by constant speed hydraulic transmissions from each of the craft's four engines.

**Electronic Service Supply  
Opens Branch At Regina**

In keeping with the growth of industrial and oil development in the province of Saskatchewan, Electronic Service Supply Co. Ltd. has recently announced the opening of a branch operation located at Regina. The new branch will be located at 2810 - Dewdney Avenue and will be under the direction of George E. Ferguson, branch sales manager.

Electronic Service Supply Co. Ltd. is an all western company with offices at Calgary and Edmonton, Alberta. A complete electronic service is available covering such fields as Mobile Radio-Telephone, Extended Range Fixed Radio-Telephone, UHF and VHF Radio, Paging and Sound Systems through to elaborate Micro-Wave Multi-Channel Communications. A design and engineering staff is readily available.

Facilities of the new branch will be available for servicing of equipment presently in use.



● Shown above is a view of the building which R-O-R Associates Ltd. will occupy early in May as its new head office. Situated at 1470 Don Mills Road, Don Mills, Ontario, the new facilities will include service department, display room and conference room. Effective March 11 last, R-O-R Associates Ltd. became Canadian representative for Berkeley Division and the newly formed Systems Division of Beckman Instruments Inc.

For further data on advertised products use page 87.

## C. C. B. A. Engineering Conference

The Central Canada Broadcasters Association has set the date of its 1957 Engineering Conference for October 7 and 8 in the Seaway Hotel, Lakeshore Boulevard, Toronto.

The C.C.B.A. Engineering Committee personnel for 1957 is: Chairman—Bill Nunn, CFPL-TV, London, Ontario; Past Chairman—Sandy Day, CKCO-TV, Kitchener, Ontario; Secretary—Don McEachern, CFRB, Toronto; Treasurer—Jack Mattenley, CKVR-TV, Barrie, Ontario.

## Canada Wire Plant Managed By A. V. Armstrong

A plant for the production of magnet wire in Canada is now under construction by Canada Wire and Cable Company Limited at Simcoe, Ontario.

A. V. Armstrong, former senior Canadian executive for Amalgamated Electric Corp. Limited has been appointed manager of the magnet wire division of which the Simcoe plant will be the major unit.



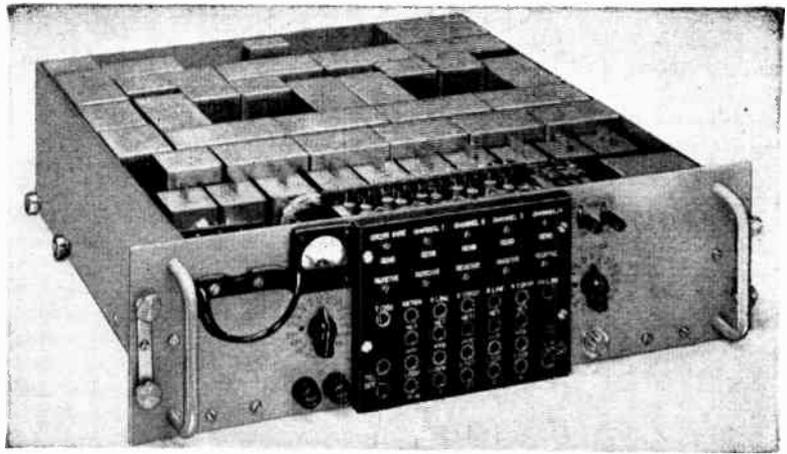
A. V. ARMSTRONG

In making the announcement of Mr. Armstrong's appointment, O. W. Titus, vice-president and general manager of the company, said the new plant will employ some 100 to 150 people and will be in production by the end of 1957 to provide for the continuing expansion of demand for electrical equipment in this country.

The new plant situated on the outskirts of Simcoe, Ontario, and adjacent to railroad siding and the highway will have 110,000 square feet of modern manufacturing space.

Mr. Armstrong, as manager, brings to his new position, a lifetime of service to the Canadian electrical industry.

(Turn to page 70)



## FOUR-CHANNEL CARRIER-TELEPHONE TERMINAL FOR RADIO LINKS

This is a miniaturized unit of advanced design which provides four voice channels on a frequency-division basis above a voice-frequency order-wire channel. Each of these five channels is provided with a 4-wire 2-wire termination and a voice-frequency ringing circuit for d-c or 20-cycle signals. Adjustable attenuators are provided in the 4-wire side of all channels, and a built-in test oscillator and meter permit complete line-up, maintenance and trouble-shooting checks to be made. Channel levels are from -9 to 0 dbm and line levels from -30 to 0 dbm. Channel width is 300 to 3500 cycles within 1 db.

This unit is only 5 1/4" high by 19" wide by 14" deep. It mounts on a standard rack and operates from 115 volts 50-60 cycles a.c.

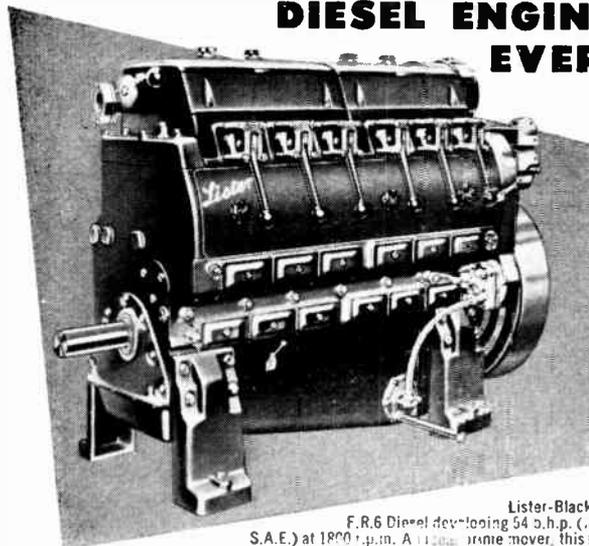
## RADIO ENGINEERING PRODUCTS

1080 UNIVERSITY ST., MONTREAL 3, CANADA

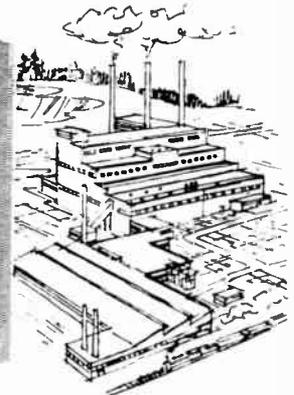
TELEPHONE  
UNiversity 6-6887

CABLES  
RADENPRO, MONTREAL

## DIESEL ENGINES FOR EVERY PURPOSE



Lister-Blackstone  
F.R.6 Diesel developing 54 b.h.p. (8 n.p.  
S.A.E.) at 1800 r.p.m. A 1000 lb. prime mover, this series  
ranges from 9 to 54 b.h.p. (15 h.p. to 78 h.p. S.A.E.) at 1800 r.p.m.



Built in a tradition of reliability. Lister-Blackstone engines incorporate the very latest improvements in Diesel design. The full line includes engines from 3 1/2 to 600 h.p. and there are models for every purpose. Ease of maintenance and economical operation are assured when you specify Lister-Blackstone. Service and spare parts are available from coast to coast. Write for Bulletin F.R.1-6.

## CANADIAN LISTER-BLACKSTONE

LIMITED

1921 EGLINTON AVE. E., TORONTO 13 • 3135 WEST BROADWAY, VANCOUVER  
25 ST. JAMES ST., VILLE ST. PIERRE, MONTREAL

Distributors: B.C. Equipment Co. Ltd., 551 Howe Street, Vancouver • Bruce Robinson Electric (Edm.) Ltd., 10056-109th Street, Edmonton • Medland Machinery Limited, 576 Wall Street, Winnipeg • Russel-Hipwell Engines Ltd., Owen Sound • Consolidated Engines & Machinery Co. Ltd., 5645 Pare Street, Town of Mount Royal, P.Q. • Russel-Hipwell Engines Ltd., 1298 Barrington Street, Halifax • Clayton Construction Co., Ltd., P.O. Box 118, Muir Bldg., St. John's, Nfld.

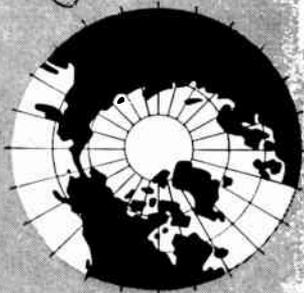
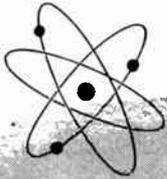
Announcing the second annual:

# IRE CANADIAN CONVENTION AND EXPOSITION

Automotive Building, Exhibition Park, Toronto, Canada,

October 16, 17, 18, 1957

## ELECTRONICS & NUCLEONICS



RESERVE YOUR EXHIBIT SPACE NOW!

Enlarged by 25 per cent to meet the demand for more exhibit space! The 1957 IRE Canadian Convention promises to draw an even larger attendance than last year's 10,038. Plan your company's exhibit participation now. Write today for illustrated brochure.



### IRE CANADIAN CONVENTION

Sponsored by the Canadian Sections of the Institute of Radio Engineers

Office: 745 Mount Pleasant Road, Toronto 7, Canada  
Telephone: HUdson 8-7768

**CANADA'S LARGEST SCIENTIFIC CONVENTION AND EXPOSITION**



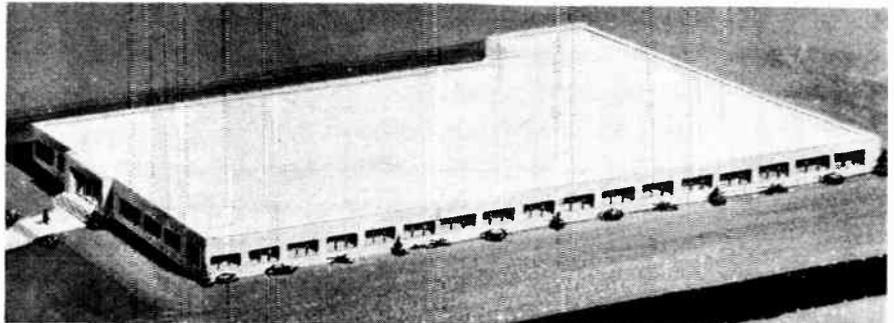
● International Sales Conference: Cannon Electric Co., manufacturers of plugs for aviation, electronics, and broadcasting industries, holds three-day conference in Boston, March 13, 14, 15, 1957. *Left to right at seminar table:* William Bradley, Cannon Electric, Canada, Ltd., Toronto; F. A. Round, Cannon Electric, Great Britain; Don Forrester, Cannon Electric, Great Britain; Floyd Cate, international sales manager, Cannon Electric Co.; Paul J. Souriau, Souriau et Cie., Paris; D. E. Bookless, Cannon Electric, Great Britain; Minoru Numoto, vice-president, Japan Aviation Electronics Industry.

### Cannon Electric Company Hold Sales Conference

Cannon Electric Co., world's largest manufacturer of plugs and connectors for the aviation, electronics, and broadcasting industries, will feature five new products during the coming year, according to an announcement by Floyd Cate, acting sales manager, at the company's international sales con-

ference in Boston, March 13th, 14th, 15th.

These new products are (1) electronic wiring devices, (2) special rack and panel connectors for high altitude application, (3) Quick disconnect plugs, part of the company's Q series, (4) Electrical quick disconnects for the Hustler B58 and the F 102 aircraft, (5) Commercial-type new plugs for jet transportation aircraft.



● The new million dollar plant of Bomac Laboratories, Inc., Beverly, Massachusetts, will virtually double the company's present engineering and manufacturing facilities. To be finished some time in May, the new building will house complete manufacturing and assembly facilities, engineering offices, and a modern cafeteria. The plant will be used principally for magnetron production.

## WANTED

Going Business need not be profitable. Manufacturer desires to purchase small or medium size relay, transformer, instrument coil winding, small motor or allied plant within fifty miles of Toronto.

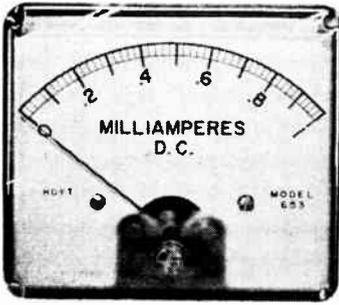
Box 319 DR

**ELECTRONICS & COMMUNICATIONS**  
31 Willcocks St. • Toronto 5, Ont.

For further data on advertised products use page 87.

# SPECIFY *Hoyt* METERS

FOR  
**EVERY**  
**APPLICATION**



No. 653 illustrated

NEW! 2½, 3½, 4, 4½ inch, anti-static treated, AC or DC meters with clear polystyrene cases for modern installations. Feature standard or matched colors on lower frosted panel for appearance and functional identification.

Be sure of the highest accuracy, dependability, and readability PLUS *economy* with HOYT precision AC and DC instruments — the *complete* line of Panel Meters. Moving coil, rectifier, and repulsion types available in a wide variety of sizes, ranges, cases, and colors. Also, custom-designed to meet your most rigid specifications for a *quality* instrument.

Write for *NEW* literature containing descriptions, engineering data, and prices.



**ELECTRICAL INSTRUMENTS**  
Sales Div., BURTON-ROGERS COMPANY  
42 Carleton Street, Cambridge 42, Mass., U.S.A.

**WRITE FOR YOUR FREE COPY!**  
**CESCO'S LATEST**  
**ELECTRONICS**  
**BUYING GUIDE**



A GUIDE FOR INDUSTRY

Today's latest and most comprehensive Electronics Buying Guide with more information and new lines in this valuable catalogue for Industry. See amongst the many new listings these lines:

- Guardian Relays
- Industrial Tubes
- Industrial Timers
- Sola Transformers
- Atlas E-E

These and many other interesting feature items are shown. Write for your FREE copy today.

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MONTREAL 275 Craig St. W. UN. 1-2411	QUEBEC o. St. Vallier LA. 4-3518	OTTAWA 836 Somerset W. CE. 2-2696	TORONTO 877 Yonge St. WA. 1-5111
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# Get a GOOD Charger!

**CHARGING VOLTAGE**  
**AUTOMATICALLY REGULATED**

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

**Equalizing Charges Without**  
**Violent Changes In Charging Rate**

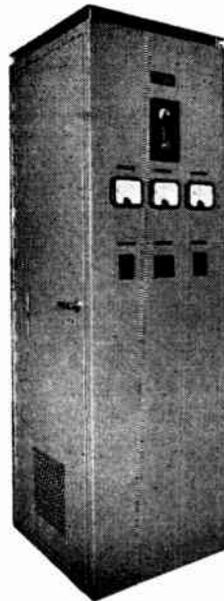
To equalize cell voltages, a "Hi/Lo" switch in "Hi" position increases to correct over-voltage value by a gradual process, returning slowly to regular floating voltage upon switching to "Lo" position.

**Protection From Line and**  
**Load Irregularities**

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

**Benefit by**  
**Nichols' Engineering Service**

There is a Nichols Rectifier Unit for practically every purpose. Consult with us, or write for information to Dept. EC 4.



**R.H. Nichols LIMITED**  
2781 DUFFERIN STREET • TORONTO

## Canadian Reps For Bulova

Recent negotiations have resulted in an agreement between Bulova Watch Company, Inc. and Beechey Enterprises of 20 Nash Drive, Downsview, Ontario, for the latter to market (in Canada) the products of Bulova's Electronics Division.

Bulova Watch Company, Inc., Electronics Division, is located at 40-06 62nd St., Woodside 77, New York. This division is engaged in the manufacture of component ovens, quartz crystals, packaged oscillators, crystal filters etc.

## Automatic Electric Appointment

C. R. Hughes, President of Automatic Electric Sales (Canada) Ltd., announces the recent appointment of Bruce B. Shier as Marketing Manager of that firm.

Mr. Shier graduated in electrical engineering at McGill University in



**B. B. SHIER**

1923. After several years of experience in the inspection engineering and field surveys of automatic telephone equipment, he joined the Automatic Electric organization in 1935 as sales engineer. Since 1947 he has been in charge of the sales promotion of all products handled by the company. In his new position he will be responsible for market research, sales statistics, methods and procedures.



● Stuart M. Finlayson left, president of Canadian Marconi Company, and Douglas F. Bowie right, president of Canadian Overseas Telecommunication Corporation, are interviewed on the occasion of the official opening of the Corporation's new eight-storey building in Montreal. The opening blue ribbon was cut by the Hon. George C. Marler, Minister of Transport, who has jurisdiction over C.O.T.C.

## Budd Co. Changes Name of Division

A change in the official name of the Continental-Diamond Fibre Division of The Budd Company, Inc. was announced recently by Harry K. Collins, vice-president and general manager of the division. The new corporate name is "Continental-Diamond Fibre Corporation."

Plants of the Continental-Diamond Fibre Corp. are located at Newark, Delaware; Valparaiso, Indiana; Spartanburg, South Carolina; and Toronto, Canada.

## Exide Appointments

J. E. Eells, executive vice-president of the Electric Storage Battery Company (Canada) Limited, has announced the following appointments: G. E. Lindsay, P. Eng., sales manager, Exide Industrial Division and W. A. Gray, manager, Montreal branch, Exide Industrial Division.

For many years Mr. Lindsay and Mr. Gray have specialized in the industrial field in a division currently supplying those batteries which have come to be known as standard equipment in mine, mill, railroad, and communications.

The Exide Industrial Division will continue to manufacture in its present location on Warden Ave., Scarborough, with general offices at 153 Dufferin Street, Toronto and Montreal Branch

Office at 1010 St. Catherine Street, West.

## 1,500 Scientists Convene In Toronto, September 3 - 14

More than 1,500 experts in the earth sciences will gather at Toronto, September 3-14, 1957, to hold the XIth General Assembly of the International Union of Geodesy and Geophysics (IUGG). Their main topic will be the International Geophysical Year (IGY), to be launched previously in July. Delegates will come from 50 countries in all parts of the world to review the IGY opening and lay final plans for the vast joint enterprise.

The International Geophysical Year, an 18-month concerted effort by more than 50 nations and 5,000 scientists, is expected to cost well over \$300 million. From July 1957 to January 1959, experts in 14 fields of research will investigate the earth from pole to pole, from ocean floor to outer space. All over the world simultaneous measurements will be taken on such phenomena as the aurora, cosmic rays, meteors, the upper atmosphere, glaciers, oceans, gravity, magnetism, earth tremors, solar flares and sunspots.

Canadian scientists are playing a creditable role in the IGY, with programs operating in nearly all departments, omitting only the rocketry and satellite studies.

**LEADERS IN QUALITY,  
AVAILABILITY**

.....

For a complete line of  
**RECEIVING AND PICTURE TUBES**

●

**POWER AND TRANSMITTING TUBES**

●

**TRANSISTOR, DIODES AND RECTIFIERS**



Electronic

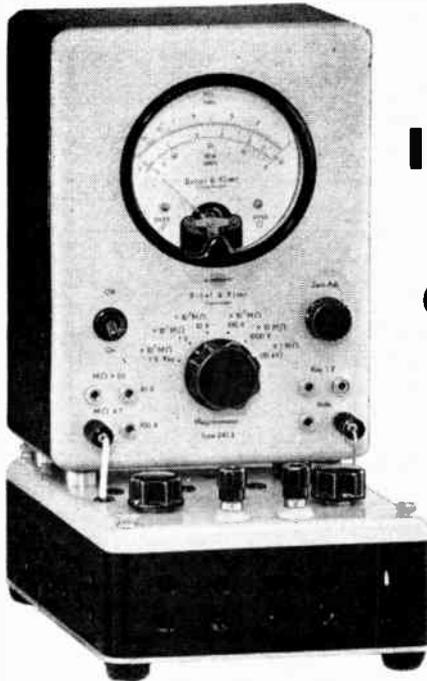
TUBES

CANADIAN GENERAL ELECTRIC COMPANY LIMITED

For further data on advertised products use page 87.

## Wide Range, Accurate Measurement

- RESISTANCE from 100 K to 10 million megohms
- D. C. VOLTAGE from 0.01 to 2000 volts
- CURRENT from 10 micro-microamps upward



### With One Compact Instrument

Only  
**\$163.00**

F.O.B. TORONTO

**Size:**  
Only 10" x 7" x 6"  
**Weight:**  
9 lbs.

This Bruel & Kjaer Megohmmeter, Model 2423 will increase efficiency of production, inspection and research and greatly assist service engineers in measurements of high resistances, and D. C. voltages and currents.

#### UNIQUE FEATURES INCLUDE:

- Constant zero adjustment on all ranges
- Stabilized for wide variation of line voltage
- Low (10V) test potential for transistor circuits
- Illuminated scale for quick, accurate readings

**Used as a Megohmmeter**, accuracy is 3%. Test potentials of 10 or 100 volts are stabilized to 0.03%. Semi-logarithmic scale spreads values for easy reading. A "Key" position is provided permitting instantaneous charging of capacitors.

**Used as a D. C. Voltmeter**, accuracy is 2%—input impedance is 1000 megohms on 1 volt range and 100 megohms on other ranges.

**Used as a Microammeter**, entire range is covered with only 1 volt drop for full scale deflection.

High voltage accessory Model 3423 extends range to 100 million megohms with 1000 V potential. Any test voltage from 10 to 1000 volts can be selected.



**R-O-R ASSOCIATES LIMITED**  
270 LAWRENCE AVE. W. TORONTO 12

## for greater design freedom

### MICRO SWITCH

*offers a complete line  
of precision switches*



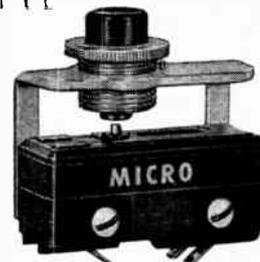
#### NEW ILLUMINATED PUSH BUTTON SWITCH

Unusually precise, accurate and dependable for operation on computers and other similar devices. Power for the light is obtained from a circuit other than that to which the switching units are wired.



#### PUSH BUTTON ACTUATORS

These switches combine long life, reliable operation, smart appearance and good feel. For industrial devices which require reliable panel-mounted, manually-operated switches.



#### PANEL MOUNTING PUSH BUTTON SWITCH

This subminiature switch provides almost simultaneous switching with a snap-acting mechanism that gives a positive feel. One of a complete line of panel mounting Push Button Switches designed for any application.



For name of nearest distributor and/or Micro Switch Catalogue 75B, write Honeywell, Dept. 502, Toronto 17, Ont.



### MICRO SWITCH

A DIVISION OF HONEYWELL CONTROLS LIMITED, TORONTO 17, ONTARIO

# new products

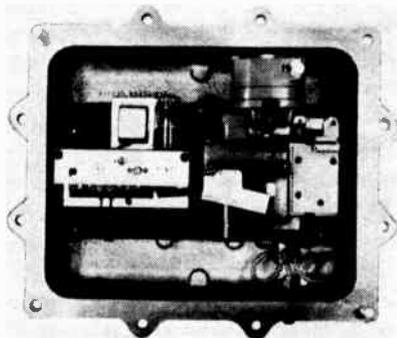
New Product specifications published in *Electronics and Communications* have been briefed for your convenience. If you require further information on any of the items published you may readily obtain such by using our Readers' Service, Page 87. Just mark the products you are interested in on the coupon on Page 87 and the information will be in your hands within a few days.

## ● Explosion-Proof Level Control System

Item 1505

The combination pneumatic-electronic level controller recently developed by Fielden Instrument Division of Robertshaw-Fulton Controls Company, is now available in a new explosion-proof model.

According to the company, the explosion-proof "Pneutronic" controller is intended for use in Class I, Group C and D and Class II, Group E, F and G hazardous locations.



The Pneu-tronic controller was designed to utilize the best advantages of electronics and pneumatics. It is capacitance-actuated and will convert the smallest change in level into a proportional air output. It is being used to control the level of liquids (including water, acids, alkalis, oils and aqueous solutions). Installed with specially designed probes, the level controller has been used also with granular solids.

Company engineers say probes are usually of rigid rod-shaped structure, having no moving parts. These are supplied in standard sizes and models suited to most applications.

The Pneu-tronic level controller systems are available with either of two types of pneumatic action: Model 111 produces an increase in air output with an increase in measured level. Model 112 produces a decrease in air output with an increase in measured level. The Division offers the services of applications engineers for consultation in selecting the system to use in a given installation.

Further information about the new explosion-proof pneutronic level control systems is available without obligation from Fielden Instrument Division, Robertshaw-Fulton Controls Company, 2920 North 4th Street, Philadelphia 33, Pennsylvania, U.S.A.

## ● Model GN LX Nitro-neal Generator

Item 1506

A nitrogen generator with a wide controlled-hydrogen-content range has been developed by Baker & Co., Inc., one of the Engelhard Industries.

Metal, electrical, chemical, food, synthetic-fiber and petroleum-products manufacturers can use this "Nitro-neal" generator to produce oxygen-free nitrogen from ammonia in their own plants at a cost many times less than that of nitrogen purchased in cylinders, according to Baker.

It is much safer than the conventional ammonia dissociators now used by the metalworking industry, which can produce

only a highly explosive mixture of 75 per cent hydrogen and 25 per cent nitrogen. It also is cheaper to operate than the older devices. It draws nitrogen from both air and the ammonia, rather than from the ammonia alone. Because the reaction is exothermic, no external heat is necessary, eliminating the expense of replacing burnt-out heating elements periodically. Its platinum catalyst has an indefinite life, unlike the nickel catalysts used in conventional dissociators.

Fully automatic, it requires no maintenance and can be operated by a single unskilled worker attending the apparatus only one-half hour per day.

Baker's generators range in size from 50 standard cubic feet per hour to 10,000 s.c.f.h. They are shipped as a single unit and are completely portable. The only connections required are a 110-volt electrical receptacle, a drain, and single lines for water, air, and ammonia.

A brochure on Nitro-neal generators will be sent free of charge to persons requesting it on company letterhead from Baker of Canada, Ltd., 512 King St. E., Toronto, Ontario, Canada.

## ● Electronic Metal Film Gage

Item 1507

Boonton Radio Corporation, Boonton, N.J., has announced a new Film Gage, Type 255-A, an electronic instrument for measuring quickly and precisely the plating and film thickness on conductive materials.

The instrument features, for example, interesting applications in measuring the protective coating thickness of anodic films on anodized aluminum, magnesium, and other non-magnetic basis metals — including such insulating films as organic paints, porcelain, enamel, and other non-conductive coatings.



The new instrument also aids in sorting metals in accordance with their electrical conductivity and in matching metals in accordance with their magnetic properties.

The Film Gage, too, is useful for making these different types of measurements: for measuring the film thickness of non-magnetic platings such as silver, gold, cadmium, chromium, rhodium, etc., on such non-magnetic basis metals as copper, brass, aluminum, etc.; and for measuring the thickness of conductive, non-magnetic materials such as copper on insulating basis materials such as glass, phenolic sheet material, ceramic, etc.

Boonton Radio Corporation, Boonton, N.J., U.S.A.

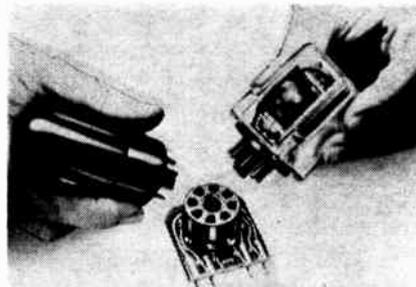
## ● Right Angle Octal Socket

Item 1508

A new right angle octal socket, suitable for GT type octal tubes and octal base relays and coils, is being manufactured by the Cleveland Metal Specialties Company, Cleveland, Ohio.

The socket is mounted on a laminate base with a printed circuit supplying the circuitry to the socket and the component. Designed to be incorporated into printed circuits, the octal socket is held rigidly through the unique supplementary buttress ribs in the same manner as the company's previously designed 7 PC and 9 PC single and multiple sockets.

Manufactured in accordance with the company's Underwriters' Laboratory approved processes, the socket is suitable for use on such products or components where Underwriters' Laboratory approval is required.



Base material is  $\frac{3}{32}$ " XXXP Phenolic (Nema Grade) and the copper pattern is .0027 on two sides offering a current carrying capacity of 15 amperes per connection. Both the base material and the copper pattern of the standard sockets can be altered in size and dimension to meet the purchasers' specifications.

The supplementary buttress ribs provide structural and mechanical rigidity which results in vibration resistant construction eliminating any electrical discontinuity through the weakening of the basic electrical connections of the mounting proper.

Detailed literature and prices may be obtained by writing to Cleveland Metal Specialties Company, 1783 East 21st Street, Cleveland 14, Ohio, U.S.A.

## ● Superior Red Iron Oxides For Ferrite Electronic Components

Item 1509

Mapico Red Iron Oxides provide the maker of top-quality Ferrite components with high purity raw materials of reagent quality. Their carefully controlled particle size and shape contribute to effective control of packing and shrinking. Successfully used for many years in commercial production.

Highly modern manufacturing processes under rigid laboratory control assure uniformity and dependability. Ask us for full technical information. Our Technical Service Department is ready to give you the full benefit of its experience and will gladly co-operate in the solution of any problem.

Columbian Carbon Co. (Canada) Ltd., Mapico Color Unit, 33 Edward Street, Toronto, Canadian Distributor.

(Turn to page 76)



**Do you have an unsolved  
"X" spot in your design?**

**...A place where you would  
put the "ideal" relay—  
if you had it?**

CLARE Type J Relays have been filling difficult "X" spots in industrial designs for more than a decade.

Possessed of the most positive of all twin-contact designs, the CLARE Type J Relay has all the desirable features of a telephone type relay—yet greatly reduced in bulk.

Many basic design ideas have been improved by this relay—a CLARE original—whose wide acclaim has provoked a lot of imitators but never an equal—whose many distinctive features have provided an eminently satisfactory solution to many perplexing problems involving efficient, long-life relay operation.

Let us work with you to pick the best relay for YOUR important relay requirement. Address: C. P. Clare & Co., 3101 Pratt Blvd., Chicago 45, Illinois. In Canada: C. P. Clare & Co., 659 Bayview Ave., Toronto 17. Cable address: CLARELAY.

#### TYPE J DESIGNS TO MEET WIDE DESIGN REQUIREMENTS

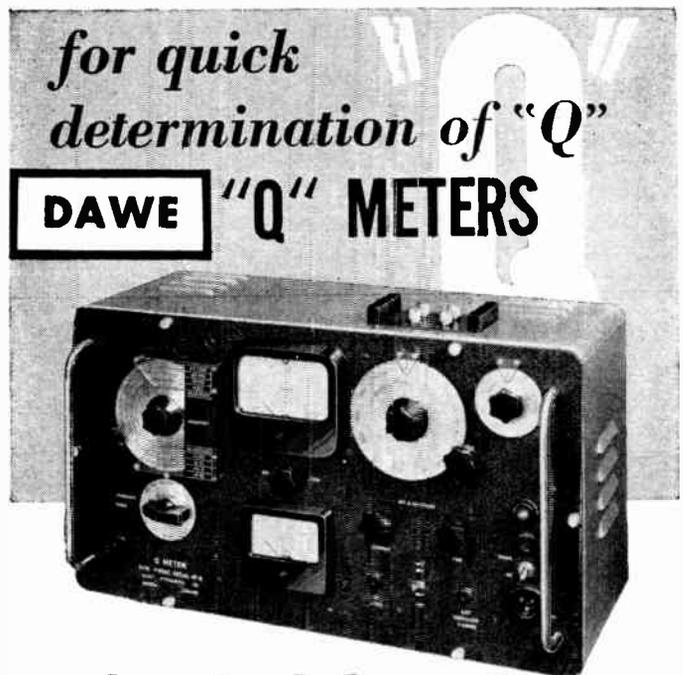
**Standard Type J Relays.** Twin contacts (Palladium standard). Rated current-carrying capacity: 4 amperes, 150 watts.

**Power Type J Relays.** Heavy-duty contacts riveted to springs. Code 18 (Silver). Rated current-carrying capacity: 10 amperes, 27½ volts d-c.

**Type J Video Relays.** For switching video and other high-frequency currents.

Write for Engineering Data Book  
and Bulletin 119

**CLARE RELAYS**  
FIRST in the industrial field



*for the laboratory  
and the factory...*

- Simple to Operate
- Direct Reading
- Mains Operated

The DAWE "Q" Meters are designed to add speed, efficiency and accuracy to your factory or laboratory.

Type 622 is designed for the determination of "Q" and related R.F. measurements by resonance methods in the range of 50 kc/s to 75 Mc/s. The instrument is completely self contained, totally enclosed, extremely robust, and can be plugged into any A.C. supply.



Type 620—  
*Specially Suited  
For Mass Production  
Testing.*

The Type 623 supplements the Type 622 model by extending the range of the measurement to 200 Mc/s. Its wide frequency range covers television channels.

*Write for further information on DAWE "Q"  
Meters and other DAWE Electronic Instruments.*

5406

**DAWE**

**INSTRUMENTS LIMITED**

CANADIAN DIVISION — 1654 Bank Street, Ottawa, Ontario

**This is  
your answer  
where quality  
and size are  
prime factors**

## **Centralab's Model 3 Radiohm®**

The Centralab Model 3 Radiohm, with its exclusive Interfused Composition Element, provides unbelievable wattage dissipation, yet is smaller than a dime.

This miniature rotary potentiometer, with its rugged element, is ideally suited for high-temperature operations in both commercial and military applications.

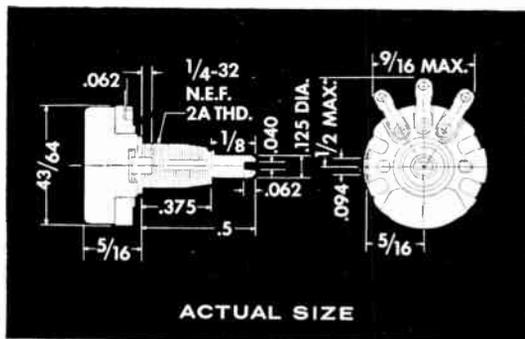
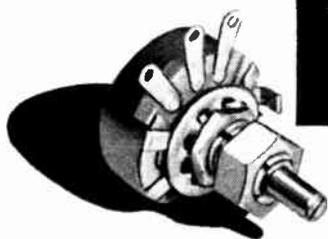
Advanced design features offer you both standard and locking-type bushings. Each is available with sealed construction to meet today's demand for a unit that can be potted.

For immediate delivery in ratings from 1,000 ohms to 2.5 megohms, ask your local Centralab distributor for the JP and JL Series.

typical  
watt-hour  
rating

Only 10% maximum resistance change, when used at . . .

- 1 watt for 1-1/2 hours
- 3/4 watt for 35 hours
- 1/2 watt for 80 hours
- 1/3 watt for 300 hours
- 1/4 watt, continuous rating



Write today for  
Technical Bulletin EP-63,  
for complete engineering data.

**Centralab Canada Ltd.**

804 Mt. Pleasant Rd. Toronto 12, Ontario

A DIVISION OF  
**GLOBE-UNION INC.**

964D E. Keeffe Ave.  
Milwaukee 1, Wis.

In Canada:

804 Mt. Pleasant Road  
Toronto, Ontario

## **NEW PRODUCTS**

### ● **Quick-Disconnect Strip Terminals**

*Item 1510*

A complete line of production-installed Fingrip quick-disconnect strip terminals is described in a new four-page bulletin available from Burndy (Canada) Limited. Male, female, and right angle terminals are described for wiring applications in stoves, oil burners, switches, fans, timers, harnesses, and a variety of major and smaller electrical appliances. The bulletin contains complete test data including pull-out, pull-off, and heat tests, and dimensional and installation information. The Termatic automatic installation machine for production installation of Fingrips is also described.

**Burndy (Canada) Limited, 381 Greenwood Ave., Toronto 8, Ontario, Canada.**

### ● **Decade Capacitors With Polystyrene Dielectric**

*Item 1511*

Nearly ideal characteristics make polystyrene a desirable dielectric material for capacitors. Measurements on polystyrene from dc to several hundred megacycles show substantially constant values of dielectric constant and low dissipation factor. A program of development and field use of polystyrene capacitors over a period of years has demonstrated their excellent performance and reliability, and they are now offered in the form of decade units.

The individual capacitor units are non-inductively wound with purified high molecular-weight polystyrene tape and carefully heat treated. Units are hermetically sealed in brass cans with Teflon insulators. Polystyrene and Teflon are used as dielectrics in the decade switches. The decade assembly has an insulation resistance of greater than  $10^{12}$  ohms at 100 volts. Dissipation factor is specified to be less than 0.0002 in the audio range and is usually about half that amount.



Individual General Radio Type 980 Decade Capacitor Units in steps of 0.001, 0.01 and 0.1  $\mu\text{f}$  are available as well as a 3-dial General Radio Type 1419-A Decade Capacitor with a range to 1.11  $\mu\text{f}$  in steps of 0.001  $\mu\text{f}$ . The low dielectric absorption of these units makes them particularly useful in research and development work on computer and integrator circuits, and on low-level d-c amplifiers. Because of their constancy of capacitance and dissipation factor with frequency, they make excellent components for measuring circuits, filters, and tuned circuits. They are nearly ideal capacitors for d-c work, because of their high insulation resistance and low dielectric absorption.

Further information and literature on the Decade Capacitors can be obtained from **Commercial Products Division, Canadian Marconi Company, 2442 Trenton Ave., Montreal, P.Q.**

(Turn to page 79)

For further data on advertised products use page 87.

# business briefs & trends

★ The Bell Telephone Company of Canada has purchased from Western Electric Company 272,000 shares of Northern Electric Co. Ltd., Montreal, manufacturer of electronic equipment, cables and TV receivers. The transaction was valued at \$19.7 million and represents 34 per cent of the stock of Northern Electric. Western Electric's holdings in Northern Electric are now reduced from 44 per cent to about 10 per cent and have increased Bell's holding to 56 per cent. American Telephone & Telegraph Company, which controls Western Electric, now holds only about 5 per cent of the Canadian Bell stock.

★ According to F. B. Hobbs, vice-president of the Radio College of Canada, the Canadian electronics industry may become one of the most important industries in Canada within the next five years. Mr. Hobbs stated that the shortage of trained technicians for the Canadian electronics industry is so serious that major companies send out teams to find qualified immigrants to do the work.

★ The Western Division of Canadian Aviation Electronics Ltd. have been awarded a contract to maintain eight of the U.S. Air Force Pinetree radar sites. The company will allocate a five-man group to each station, including four technicians and one engineer.

★ E. G. Perry, Toronto, chief engineer of Pye Canada Limited, in a recent statement to the Western Association of Broadcasters, said that there are at least thirty points across Canada which could make use of satellite TV stations to receive television programs which, under existing conditions, they would have to do without. Mr. Perry outlined three methods of satellite operations which would increase and improve TV coverage and reception now being enjoyed by 80 per cent of Canadians.

★ Air Commodore J. G. Stephenson, chief of personnel services at R.C.A.F. headquarters, believes that the CF-105 fighter aircraft now being produced in Canada will be one of the last human piloted planes we will have. Air Commodore Stephenson trusts that guided missiles and rockets will be perfected within ten years to such an extent that pilots will not be necessary.

★ J. W. Kerr, vice-president of the apparatus products division, Canadian Westinghouse Company Ltd., says that the electrical industry must interpret, defend and promote automation to prevent a serious manpower shortage in Canada. Mr. Kerr claims that automation is just another step toward higher productivity needed to ship more products per man day, not only to compete with other countries, but to satisfy our own Canadian requirements.

★ David F. Manders, British Columbia manager of Canadian Aviation Electronics Ltd., has stressed the danger of foreign control of Canada's \$275 million electronics industry. Mr. Manders said that there must be a sizeable part of the industry relatively free of foreign control if Canada is to retain her engineers and increase exports of electronic devices. He predicted that in ten years Canadian production of electronic equipment, which means devices controlling the electron, would total \$750 million and more than \$1,000 million by 1972.

★ The Canadian General Electric Company has recently announced the first two-way mobile radio price increase since the entry of the firm into this field in 1946. A price increase of 5 per cent will apply immediately to all models and accessories of the C.G.E. line of mobile radio equipment. Increasing costs of materials and labor were given as the primary reasons for this price adjustment.

★ American manufacturers of electronic equipment for office automation have achieved the position in the office equipment market where their annual sales have reached a total of \$4 billion. Inroads into the office equipment market are credited to new equipment capable of performing new tasks by electronics and the modification of old products enabling some offices to make use of electronic equipment.

★ Approximately 25 per cent of the total American production of plastics is used by the electronic and electrical industries. The total production of plastics in 1956 amounted to 4,112,900,000 pounds.

★ Addressing the United States RETMA Conference on Industrial Relations, Congressman James C. Davis, scored the mass hysteria engineering recruiting methods in use today. He stated that hiring skilled manpower from other plants or industries caused greater disruption of the situation.

★ The Canadian Pacific Railway has commenced operation of its new transceiver network linking stations from New Brunswick to British Columbia to an IBM 705 computer located in Montreal.

★ The Canadian Government has agreed to build a \$650,000 "forward scatter" station near Gander Airport in Newfoundland. The station will form part of a new-type chain of radio stations which will improve communications for air traffic control and other aviation purposes across the North Atlantic.

★ The United States atomic industry is planning on spending \$38 million this year for electronic and other control instruments and for industrial research.

★ Closed-circuit television — particularly in the industrial field — has many possible applications in the years that lie ahead. From a volume of \$6 million in 1956, manufacturers of closed-circuit TV equipment visualize a possible \$75 million by 1966.

★ The Canadian Westinghouse Company booked and shipped more orders in 1956 than in any previous year, with a vast backlog of unfilled orders at the year-end. Although net earnings indicated progress over the two previous years, they did not reflect a substantial increase in business volume for the year. Earnings for 1956 were impaired by the prolonged strike of the Westinghouse Electric Corporation in the United States, from whom component parts that are not economical to produce in limited quantities in Canada are obtained. Efforts to manufacture these components or to obtain them from other sources in order to complete customers' orders had added to the cost of production.

## business briefs & trends

★ K. R. Patrick, president and managing director of Canadian Aviation Electronics Limited, predicts that Canadians, in five to ten years, will be watching TV programs from Great Britain and from the Continent. TV sets of the distant future, he contends, will be the size of small radios, with a projector throwing the picture on a wall screen. In this way the pictures would be larger and sharper in detail.

★ Four specially-equipped aircraft and over thirty resources experts from Toronto and Oshawa are working in Venezuela in co-operation with its government and various exploration companies to develop the South American country's rich oil and hydro-electric power potential. These aircraft and experts are engaged on more than half a dozen separate survey projects in Venezuela being carried out by The Photographic Survey Corporation and its associate, Aero-

magnetic Surveys Limited. The work involved will run to over half a million dollars.

★ Although all line divisions of the Canadian Marconi Company showed a profit on their normal operations, the company's annual report for 1956 shows a loss, after tax recovery, of \$176,991 for the year compared to a profit, after taxes, of over \$1 million in 1955. This situation, however, is explained by the fact that the company incurred a substantial outlay in bringing its new electronic tube plant into operation and also incurred a heavy expenditure in Marconi's proportion of expense in a new, large and modern plant for Radio Valve Company Ltd. In addition, with a view to the future, a heavy investment was made in engineering in many fields to ensure the orderly and profitable expansion of the business by broadening the company's operations and adding new products.

## RETMA Report (Continued from page 12)

in their locality. It was essential, he said, for service technicians to keep abreast of the latest industry developments in order to provide the best service to dealers' customers.

S. P. Burden, Sales Manager, Radio and Television Division, Canadian Westinghouse Company, spoke on high-fidelity equipment sales opportunities. He indicated that all wired homes were potential buyers of such equipment, especially when it was considered that 90 per cent of the 800,000 radio phonographs sold in Canada during the past ten years were obsolete. He reminded his audience that recorded music sales were higher today than they were fifty years ago, in spite of the advances of motion pictures, radio, and television.

He urged dealers to take advantage of the potentialities of high-fidelity and then gave a comparative outline of high-fidelity equipment. To sell this equipment, it was necessary to fit up a demonstration room in the store to take advantage of the consumer demand for proper demonstrations

### RETMA Co-sponsors Canadian Radio Week

During May 5th and May 11th Canadian Radio Week will be in progress. Under the slogan - "Be In The Know - Buy Another Radio", Canadians from coast to coast will be reminded of the great strides radio communications have made since broadcasting first began in Canada thirty-seven years ago. Canadian Radio Week is being sponsored by RETMA and by the Canadian Association of Radio and Television Broadcasters. The members of RETMA's Receiver Division who manufacture radio receivers are donating three hundred sets to radio stations as prizes to be given to winners of public contests organized by the stations; additionally, Canadian Radio Week is being advertised by nation-wide tie-ins with distributors and dealers.

### Technical Training Sessions Now Arranged

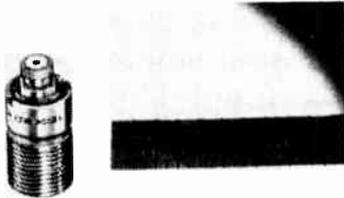
The schedule for the 1957 series of Town Meetings for service technicians, sponsored by RETMA and the National Advisory Council of Town Meetings, has now been finalized. The first series will take place at the Ryerson Institute of Technology in Toronto, Ont. on May 28th, 29th and 30th.

Following the Toronto Town Meeting, the next meetings will take place in Winnipeg on June 4th, 5th and 6th; Regina on June 11th, 12th and 13th; Calgary on June 18th, 19th and 20th, and in Vancouver on June 25th, 26th and 27th.

## NEW PRODUCTS

### ● Subminiature Accelerometer Item 1512

Endevco Corporation have announced a new Model 2216 accelerometer which mounts completely within a  $\frac{3}{8}$  inch hole. Accurate vibration measurements to 10,000 c.p.s. are claimed for the accelerometer by mounting it right in the device being tested, in addition to the usual surface mounting.



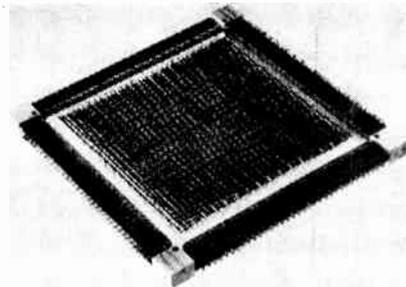
This subminiature model, 0.635 inches high, provides 5 millivolt per G sensitivity with a natural frequency of 50,000 c.p.s. Temperature characteristics are flat  $\pm 10$  per cent from 30°F to 230°F. These wide range specifications, plus small size and weight (only 8 grams) are claimed by the manufacturer to resolve many problems in accurate measurement of vibration and shock phenomena even under very limited space conditions.

The accelerometer is supplied with adapters for surface mounting on vibration tables or devices being tested, and a matching  $\frac{3}{8}$  inch tap for mounting within a device under test.

Computing Devices of Canada Limited,  
P.O. Box 508, Ottawa 4, Ontario, Canada.

### ● Magnetic Memory Frames Item 1513

General Ceramics Corporation, Keasbey, N.J., announces the availability of a new line of magnetic memory planes built in any frame size up to and including 10" by 10". Newly designed frames are assembled individually in stacks which eliminate the need for molds, as was the case with old style frames of glass reinforced epoxy resin. The elimination of molds not only assures more rapid delivery on any size plane but obviates the need for tool charges on production items and prototypes.



Improved design features planes with greater frame strength and rigidity. In addition, spacers are no longer required for the vertical assembly of planes, since the four corners have a greater cross-sectional height than the remainder of the frame.

All General Ceramics' magnetic memory cores are fully inspected prior to assembly in the matrix. After wiring, frames are electrically inspected and tested to insure the fact that the memory matrix meets rigid specifications.

General Ceramics Corporation, Keasbey, N.J., U.S.A.

### ● Low Frequency Phasemeter

Item 1514

The requirements of the rapidly expanding field of servo engineering and the subsequent interest in frequencies below 10 c/s are met by the D-729-B Low Frequency Phasemeter which has a lower frequency limit of 0.5 c/s. The design is very similar to the D-729-A Phasemeter, the only marked difference being the change in frequency range. Measurements of the phase change and gain of passive and active networks and the input output characteristics of servo systems may be made with the D-729-B Low Frequency Phasemeter without imposing any appreciable load on their sources. Direct indication of the phase angle and the difference in level, between two substantially sinusoidal voltages, is made possible by arranging that

the two voltages are adjusted to the same predetermined level — the vector sum then becoming a function of phase angle only. Both voltages may be measured and, for distorted wave-forms, socks are provided between which a frequency selective device may be connected. With this arrangement, the fundamental (or other specific frequency) may be selected and phase, level and voltage measurements may be made using the phasemeter indicator in the normal manner.

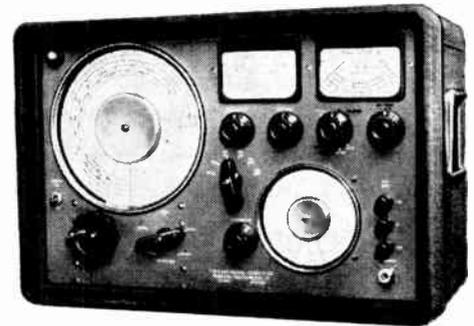
The D-729-BS Power Supply Unit is mounted in a separate case and connected to the D-729-BM Phasemeter by a flexible multi-core cable, which enables the power unit to be stowed beneath the bench, thereby reducing the amount of working space required by the instrument.

Muirhead Instruments Ltd., Stratford,  
Ontario, Canada.

(Turn to page 80)

## CW, FM and AM Signals "All the Way Up" (10-470 mc/s)

### with a MARCONI TF 1066 FM/AM SIGNAL GENERATOR



Sturdy light-grey cellulose finish  
Dark-grey moulded plastic control knobs  
Dimensions: 14½" x 23½" x 10½"

- Outstandingly high frequency stability — less than 0.005% drift, after reaching thermal equilibrium
- Continuous coverage from 10 - 470 mc/s in FM and AM
- Incremental tuning directly calibrated in Kc/s regardless of carrier frequency permitting small and precise changes in carrier frequency
- Frequency modulation accurately indicated on easy-to-read 0 - 20 Kc/s and 0 - 100 Kc/s meter scales
- Amplitude modulation up to 80% — indicated in the same manner
- Accessories available include 6 db pad, 20 db pad, 50 ohm unbalanced to 300 ohm balanced matching unit, and d-c isolating unit

Also available is the "premium" TF1066/1 similar to the above, but having 0.0025% drift and a switched incremental frequency control.

The above are only a few of the advanced electronic engineering features incorporated in these new Marconi Signal Generators. For complete specifications, write or wire today.

# Marconi



CANADIAN MARCONI

COMPANY — MONTREAL 16, QUEBEC

Canada's Largest Electronic Specialists

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**PROFESSIONAL ENGINEER**, experienced in setting up merchandising operations and sales of new engineering products in Canada, is shortly available for new project. Reply to Box 502, Electronics and Communications.

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**ENGINEER** — Secondary education in London, England, followed by professional education with degree from London Electrical Training College, Manor Gardens, London N7. Also certificate proficiency wireless telegraph and telephony as signed by Postmaster General, London, England. Reply to Box 505, Electronics and Communications.

**ENGINEER** — Manager - Consultant: broad experience in technical personnel development; management assignments at top decision level; electrical and electronic engineering (holds several patents); economic analyses and engineering studies. Interest lies in management work requiring technical background. Sen. Mem. I.R.E., Mem. A.I.E.E., Assoc. Mem. O.R.S.A. and P.Eng. Reply to Box 506 Electronics and Communications.

**ELECTRONIC & COMMUNICATION ENGINEER** Member IRE with more than 15 years' experience in electronics, acoustics, ultrasound and telephone equipment, Excellent fundamental background in electrical and electronic engineering, able to do responsible design and development work. Speaking and writing fluently French, German and Italian. Expected to be Canadian citizen 1958. Good organizer, able to undertake new methods, is looking for a situation where his qualities may be utilized full. Reply to Box 507, Electronics and Communications.

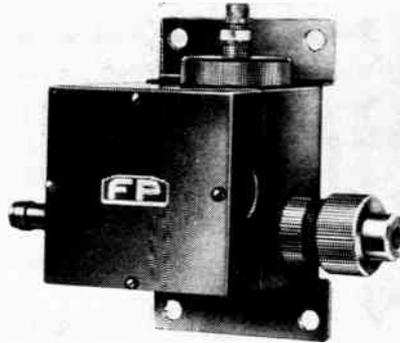
**ELECTRICAL ENGINEER, B.S.M.S.E.E.** 41 years old, bilingual, married, holds pilot license, familiar with all types of industrial electrical problems, good knowledge of electronics, presently employed with large Canadian company, seeks responsible position as assistant plant manager or similar. Would consider assignment abroad. Reply to Box 508, Electronics and Communications.

## NEW PRODUCTS

### ● Control For Oxidation — Reduction Processes

Item 1515

Fischer & Porter Company, designers and manufacturers of complete process instrumentation, offer an accurate, convenient means for controlling oxidation-reduction processes. The company's new O-R-P Cell is sensitive to changes in the relative concentration of specific chemical ingredients in liquid vehicles. Such changes affect the electrical potential between the inert-metal electrode and a reference electrode.



The new cell operates at pressures up to 35 p.s.i. and may be obtained alone or in combination with an F&P self-balancing potentiometer. Cell and potentiometer, in conjunction with electric, electronic or pneumatic controlling devices, can regulate either batch or continuous-flow processes.

A feature of the new cell is its straight-bore design which gives an unrestricted flow stream — eliminating deposits and plugging. Large electrodes minimize polarization effects. Contamination of the reference electrode is prevented by a reservoir pressure of from 2 to 5 p.s.i. greater than that of the static pressure in the cell itself. The F&P O-R-P Cell can be easily disassembled for inspection and cleaning. The manufacturer offers a choice of materials for both cell body and electrodes to satisfy demands of a particular process.

The F&P self-balancing potentiometer offers unitized construction, continuous re-balancing to a null balance, single or multi-point recording and continuous standardization by comparison with a standard cell. Values are recorded on a round chart.

Further information and literature are obtainable from Fischer & Porter Company, 2000 Jacksonville Road, Hatboro, Pa., U.S.A.

### ● Subminiature High Temperature Unit

Item 1516

Gulton Industries, Inc., Metuchen, New Jersey, has announced the development of a subminiature high temperature accelerometer that will measure three mutually perpendicular accelerations simultaneously. The new instrument, designated Glennite Model AHT-30T, will operate accurately in temperatures from -65°F. to +350°F. and features an acceleration range up to 500 g, frequency response from 25 to 20,000 CPS, and sensitivity of 0.8 mv/g.

Excellent linearity and stability characterize the AHT-30T which can replace three separate accelerometers formerly required to measure one longitudinal and two lateral accelerations at the same time. The unit weighs less than one ounce and is less than one cubic inch in volume.

Canadian representative: Lake Engineering Co. Ltd., 767 Warden Avenue, Scarborough, Ontario, Canada.

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MAGNETIC AMPLIFIERS • INDUSTRIAL CONTROLS

## ● Miniature Ku Band Ferrite Isolator

Item 1517

A new 100 Kw resonant absorption miniature Ku band ferrite isolator, which insures optimum magnetron spectrum and power output by furnishing isolation between magnetron and RF energy reflected from line mismatches, has been announced by Airtron, Inc.'s Cambridge Division — leading ferrite component designer and pioneer in the development of ferrite materials for microwave devices.

The uni-directional isolator based on the principle of resonant absorption of RF energy has the ferrite material mounted directly on the waveguide wall, which, in conjunction with the full waveguide opening, permits the rapid conduction of heat away from the waveguide; thus allowing this miniature isolator to operate at high power levels in a small amount of space, without forced air cooling. Not only that, the ferrite material used in this new uni-directional isolator to provide a high order of isolation with a small transmission loss in an extremely small configuration was especially developed by Airtron, Inc.



Because of its inherent, small, compact design, this new miniature isolator permits easy retrofitting of existing radar and microwave systems. The many plus factors which are realized by incorporating ferrite isolators into microwave systems are: minimized long line effects, improved AFC performance, optimum magnetron operation, increased systems reliability, improved operation plus the elimination of complex mechanically adjusted phase shifters.

This unit operates over a frequency range of 16,000 to 17,000 Mcs with a minimum isolation of 15 db and a maximum insertion loss of 0.4 db. It will safely handle 100 Kw of peak power and 100 watts of average power into a 2 to 1 mismatch load. When it is terminated with a matched load, it presents an inherent VSWR to the magnetron of the order of 1.10. Operating characteristics are guaranteed under vibration specification MIL-E-5272A and over temperatures that range from -55° to plus 100°C.

Further information on this Ku miniature ferrite isolator and other ferrite components developed by the Cambridge Division may be obtained by writing to Airtron, Inc., 1103 West Elizabeth Avenue, Linden, New Jersey, U.S.A.

## ● Low Cost Verifax Matrix Paper

Item 1518

A new, lower-cost matrix paper, Verifax Matrix Paper CS, which reduces the cost for one Verifax Copy to less than 8 cents, has been introduced by Canadian Kodak Co., Limited.

Expressly designed as an aid for the large volume user with many calls for single photocopies, the new product will provide

a valuable supplement for those business photocopying operations which do not require the multiple copy feature of regular Verifax Matrix Paper.

Major uses foreseen for the new single-copy matrix are in the preparation of Verifax Copy Replies, translucent masters for diazo-type print production, and Verifax offset masters for use with office duplicators.

As with regular Verifax Matrix, copies from the new Matrix CS have archival permanence and can be made one-sided or two-sided on regular copy paper, card stock, or pre-printed forms. In addition, all colors and types of ink originals, as well as spirit copies may be photocopied in full room light with the new Verifax Matrix Paper CS.

Verifax Matrix Paper CS is available in 750-sheet packages in both letter size and legal size.

Additional information on Verifax Matrix Paper CS may be obtained from Verifax dealers or by writing Canadian Kodak Sales Limited, Toronto 9, Ontario.

## ● Electric Connector Driver

Item 1519

Ideal Industries Inc., Sycamore, Ill., has developed a small, low-cost torque tool designed to apply Ideal's Wire Connectors quickly, firmly and with just the proper twist and tension to ensure good, permanent electrical connections.

Ideal's Electric Connector Driver is a durable, electrically-powered, compact unit with squeeze grip control easily handled by women operators. Splined Driver Sockets connect to motor shaft and fit the particular wire connector used.

It is easy to operate. The Driver Socket is placed on the connector. A light squeeze of the hand control gives a perfect connection instantly. The motor stalls when connection reaches proper tension. There is no guesswork, no clutch to adjust . . . nothing to get out of order.

Ideal Industries Inc., 5092 Park Avenue, Sycamore, Illinois, U.S.A.

(Turn to page 82)

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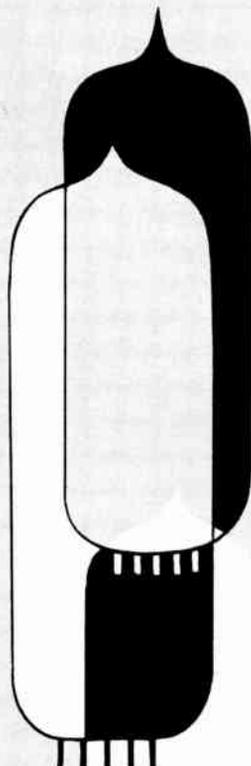
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## NEW PRODUCTS

### ● *Catalog Of Electric Impulse Counters* Item 1520

For many years past the Sodeco technical literature has dealt exclusively with the small panel mounting electric impulse counters of the TCe . . . series. An 8-page folder (212/213 19e. 0157) is the first complete catalog ever published dealing with the standard size impulse counters of Sodeco Ti series.

For the first time full technical data has been published in section 1.6. and for the first time dimensional drawings of all Ti counters are given on the last page of

the catalog. The little booklet contains many other novelties: in section 1.1. there has been an addition in the special counting ratios. Apart from the ratios from 6-25 impulses per ten units, ratios from 2-9 units per impulse have become available. Other novelties in that section are the armature contact and the set periodical changeover contact. In section 1.2. the impulse counter with two registers type Ti726 is a new model altogether. In section 1.3. "Pre-Selection Counters" the most important addition is the differential predetermined counter TiZ4RP1. In section 1.4. "Impulse Counters With Two Driving Systems", 5 digit models have been added to the 4 digit models available so far in all three types without zero reset, with manual and with electrical zero reset, but the most notable addition is the optional accessory of the changeover contact operating at zero position.

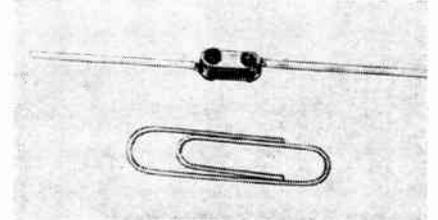
The section 1.5. "Impulse Counters with Pointer and Circular Dial" presents for

the first time 12 new models, three each for counters without reset, for counters with single impulse electrical reset and for differential counters with pointer and dial. Among the impulse transmitters driven by synchronous motors section 2.4. model Tk2Wrl is listed for the first time.

The J. W. Ellis Industries, 42 Lombard Street, Toronto, Ontario, Canada.

### ● *Dwarf Selenium Rectifier* Item 1521

One of the tiniest selenium rectifiers of them all for the current and voltage they handle is now being sold by Radio Receptor Co., Inc. It is the Siemens dwarf, a 5 milli-ampere DC half-wave rectifier which will handle up to 125 volts AC with a resistive load.



The dwarf rectifier, about a fourth as long as an ordinary paper clip, weighs .015 ounces. Assembled in a black plastic body with flat pigtail leads, it is inexpensive and extremely rugged in withstanding vibration and shock. List prices range from 51c to 60c, depending on type.

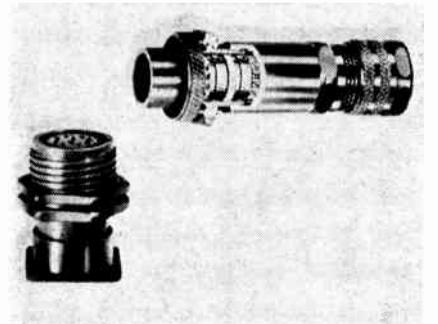
Siemens dwarfs are available only in half-waves, but several units may be connected for other circuits, such as bridge, center tap and doubler. They can be used for test instruments, small power supplies, computers, control circuits, bias supplies, relays and applications like transistor power supplies where a light current is required.

Details on the dwarf rectifier are given in Bulletin No. 242, obtainable from the Semiconductor Division, Radio Receptor Co., Inc., 240 Wythe Ave., Brooklyn 11, New York, U.S.A.

### ● *Environment-Resistant Electrical Connectors* Item 1522

A new line of compact, lightweight electrical connectors for military and industrial applications has been introduced by The Pyle-National Company, of Chicago.

Known as the Pyle-Star-Line, these new plugs and receptacles are said by the maker to be impervious to water, moisture, oil, gas, dust, pressure, vibration and shock. The connectors meet and exceed performance requirements of class A, B, C, and E of military specifications MIL-C5015B as well as NEMA requirements for power, lighting, control and coaxial circuits.



A bulletin, No. 637, illustrating and describing the new line, with environmental data and electrical capacities, may be obtained from The Pyle-National Company, 1334 North Kostner Avenue, Chicago 51, Illinois, U.S.A.

(Turn to page 84)



## CLM RECTIFIERS nurse your batteries

You'll protect your investment in station-type batteries when you install CLM Electronic Regulated Selenium Rectifiers.

**CONSTANT OUTPUT VOLTAGE.** In a CLM rectifier the output voltage is kept constant from no load to full load which increases battery life.

**SELF-PROTECTING.** CLM rectifiers are self-protecting on overload as the voltage curve drops off rapidly after 115 percent load is reached. CLM electronic regulated rectifiers are convection cooled, noiseless and require a minimum of maintenance.

**FREE BULLETIN.** For your free copy of Bulletin SR-14 which describes in detail, the performance characteristics of CLM rectifiers for station-type batteries write: Jack West, Sales Manager, Rectronic Division, Canadian Line Materials Limited, Toronto 13, Canada.



## SELENIUM RECTIFIERS

For further data on advertised products use page 87.

# Bendix-Pacific ELECTRO-SPAN

## GIVES YOU THE MOST VERSATILE TANK GAUGING SYSTEM

Programmer



Prints time and date prior to each liquid level gauging.

Calendar / Clock



Automatic digital read-out of minute, hour, day, month and year.

Card Punch



Permanent record of selected gauging for automatic data processing equipment.

Remote Tank Selector

Single Wire Pair



Indicating Receiver / Control

Auto Sequential Scanner



All or selected tanks are read in sequence automatically.

Cycle Timer



Orders the read-out of tanks at pre-set time or time intervals.

Electric Typewriter



Provides easily read, permanent log of all (or selected) gaugings.

With Electro-Span Gauging Systems you can secure *any* arrangement of a basic system — together with a unique selection of input and readout equipment — to meet virtually every requirement.

The Electro-Span System is an inexpensive digital pulse-code system for the measurement and control of any number of tanks.

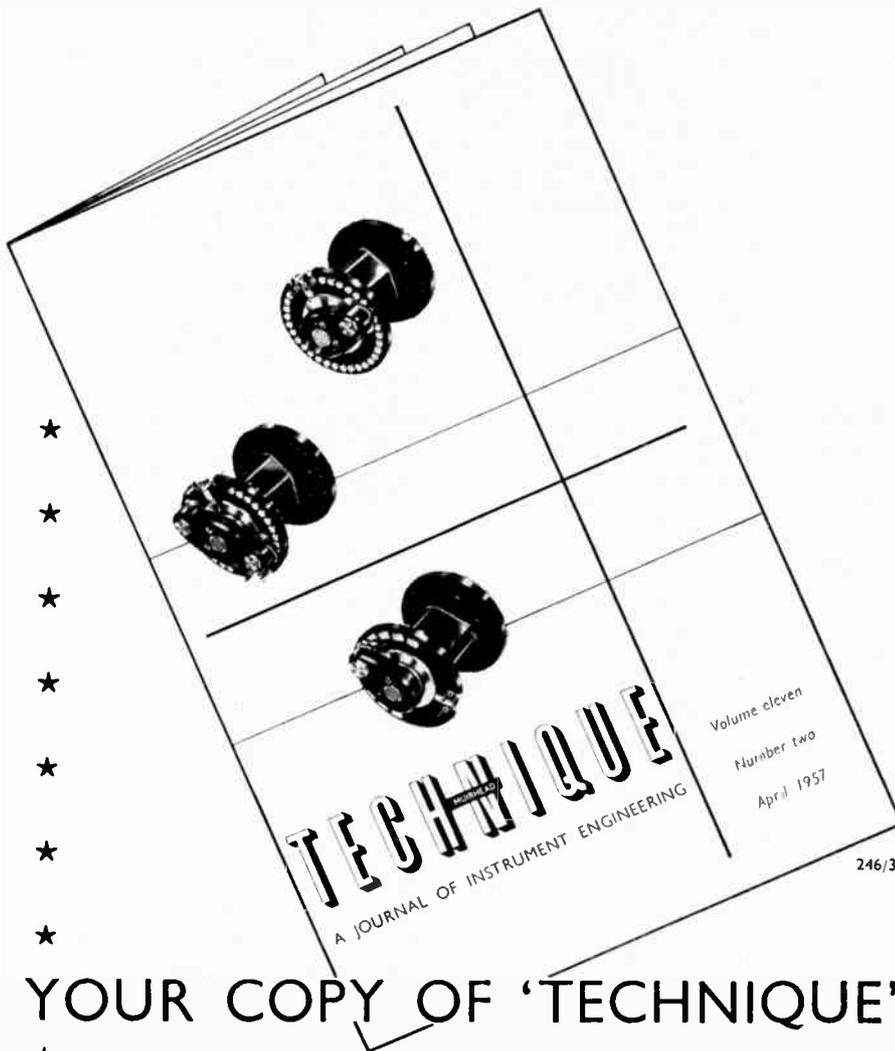
Tank levels to  $\frac{1}{8}$ " , and averaging temperatures if desired, are displayed on lamp registers.

In addition, all of the important accessories shown above can be provided to give you the most complete tank gauging system available today.



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## NEW PRODUCTS

### ● Ruggedized Broadband Klystron

*Item 1523*

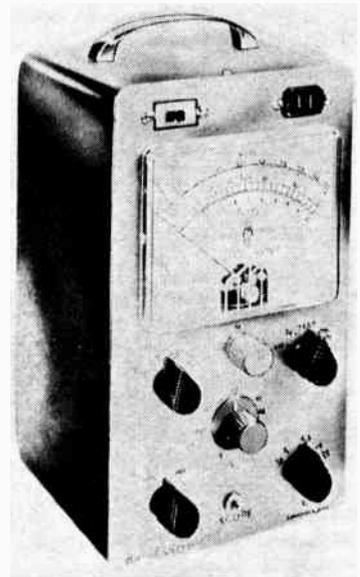
A new addition to Polarad's Velocitron line of Microwave tubes is the ZV1009. It is an external cavity, pulseable, broadband ceramic klystron. This tube was designed as an improvement of and replacement for the type 5836 klystron and can be used in any appropriate cavity, such as one designed for a type 5836 tube. The ZV1009 has a continuously variable output frequency from 1,500 to 6,000 mc. Due to its rugged internal construction, the tube is virtually non-microphonic. A ceramic envelope permits operation at elevated cavity temperatures much higher than equivalent glass tubes, thus obviating the need for blower cooling. Although the tube can also be operated at increased ratings, it is directly applicable in circuits designed for the 5836 glass klystron.

Represented in Canada by **Measurement Engineering Limited, Arnprior, Ontario.**

### ● Instrument Measures Transistor Parameters

*Item 1524*

New portable transistorized instrument for measurement of transistor parameters in quality control testing, circuit design, incoming inspection and general trouble shooting has just been announced by Baird-Atomic, Inc., Cambridge, Massachusetts, through their Canadian distributors, Canadian Marconi Company, Montreal.



Compact MODEL KT-1 has been designed specifically for measurement of Beta,  $I_{B1}$  and  $I_{C0}$ . Instrument is completely self-contained with its own 1 kc oscillator and mercury cell power supply. Battery life of the mercury cell is about 1000 hours. Printed circuitry has been used throughout, increasing the portability and ease of maintenance of the unit.

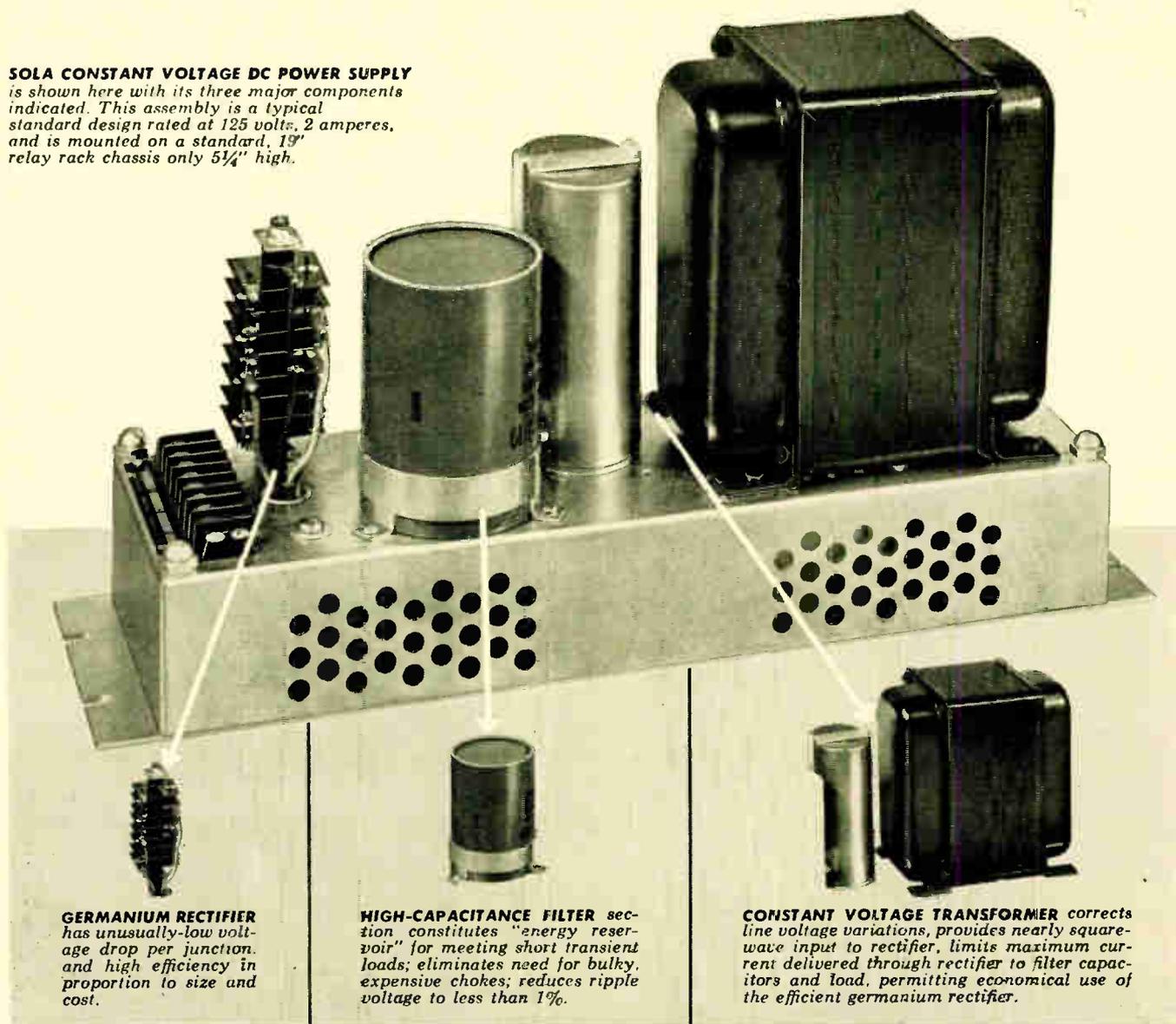
An external jacket permits collector waveform observation. Positive meter overload protection has also been built into the instrument, together with an adjustment for temperature variation.

Unit measures 5-11/16 inches wide, 5 1/2 inches deep and 10 inches high; weight is 3 lbs.

For further information, write Commercial Products Division, Canadian Marconi Company, 2442 Trenton Avenue, Montreal 16, Quebec, Canada.

(Turn to page 90)

**SOLA CONSTANT VOLTAGE DC POWER SUPPLY** is shown here with its three major components indicated. This assembly is a typical standard design rated at 125 volts, 2 amperes, and is mounted on a standard, 19" relay rack chassis only 5¼" high.



**GERMANIUM RECTIFIER** has unusually-low voltage drop per junction, and high efficiency in proportion to size and cost.

**HIGH-CAPACITANCE FILTER** section constitutes "energy reservoir" for meeting short transient loads; eliminates need for bulky, expensive chokes; reduces ripple voltage to less than 1%.

**CONSTANT VOLTAGE TRANSFORMER** corrects line voltage variations, provides nearly square-wave input to rectifier, limits maximum current delivered through rectifier to filter capacitors and load, permitting economical use of the efficient germanium rectifier.

## 2 amps of 125v regulated dc power in only 5¼" of relay-rack height

Exceptional performance under intermittent, variable, pulse, or high-amperage loads is a prime advantage of the new static-magnetic, Sola Constant Voltage DC Power Supply. Its design simplicity — possible because of the mutual support and protection provided by the combination of its three basic components — provides compact size, low weight, and moderate price in proportion to power output and performance.

Output of these power supplies is regulated within  $\pm 1\%$  for line voltage variations of up to  $\pm 10\%$ . They

are available in six stock models, in ratings ranging from 24 volts at six amperes to 250 volts at one ampere. Also, design-and-assembly service for special ratings is offered to meet the specific requirements of equipment manufacturers.

Your area representative, listed below, is part of a nationwide organization maintained to provide you with prompt service. He'll be happy to supply further information on stock or special Sola Constant Voltage DC Power Supplies.

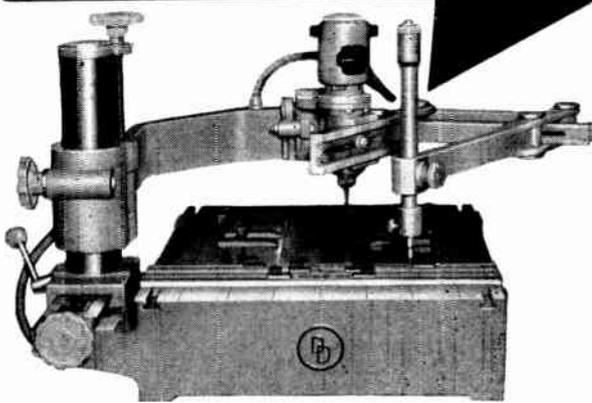
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**DC POWER SUPPLIES**



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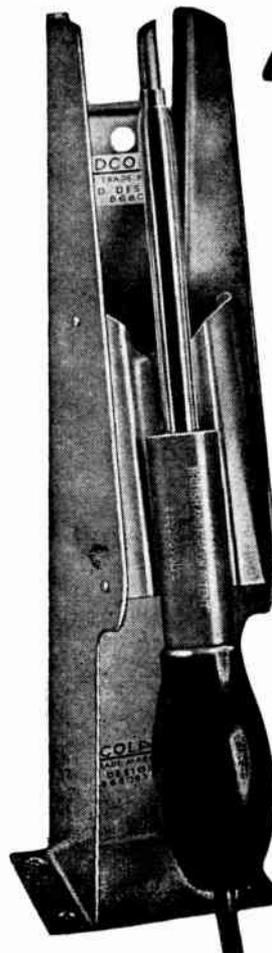
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For further data on advertised products use page 87.



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# INDEX TO ADVERTISERS

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

Key No.	Name	Page No.
1.	Adcola Products Ltd.	86
2.	Ahearn & Soper Co. Ltd., The	18
3.	Amphenol Canada Ltd.	2
4.	Andrew Antenna Corp. Ltd.	67
5.	Arrow-Hart & Heggeman (Canada) Ltd.	86
6.	Automatic Electric Sales (Canada) Ltd.	49
7.	Automatic Electric Sales (Canada) Ltd.	50
8.	Automatic Electric Sales (Canada) Ltd.	51
9.	Automatic Electric Sales (Canada) Ltd.	52
10.	Aviation Electric Ltd.	61
11.	Aviation Electric Ltd.	64
12.	Aviation Electric Ltd.	92
13.	Bach-Simpson Ltd.	19
14.	Baker Platinum of Canada Ltd.	91
15.	Benco T.V. Associates Ltd.	80
16.	Bohne Industries Ltd.	53
17.	Burndy Canada Ltd.	6
18.	Burton-Rogers Co.	71
19.	Canada Illinois Tools Ltd., (Shakeproof - Fastex Div.)	20
20.	Canadian Electrical Supply Co. Ltd.	71
21.	Canadian General Electric Co. Ltd.	72
22.	Canadian I.R.E. Convention	70
23.	Canadian Line Materials Ltd.	82
24.	Canadian Lister-Blackstone Ltd.	69
25.	Canadian Marconi Co.	3
26.	Canadian Marconi Co.	79
27.	Canadian Stackpole Ltd.	98
28.	Canadian Westinghouse Co. Ltd.	16
29.	Cannon Electric (Canada) Ltd.	89
30.	Central Bridge Co. Ltd.	4
31.	Centralab (Div. Globe Union Inc.)	76
32.	Clare & Co., C. P.	75
33.	Computing Devices of Canada Ltd.	47
34.	Computing Devices of Canada Ltd.	83
35.	Cossor (Canada) Ltd.	5
36.	Daven Co., The	57
37.	Dawe Instruments Ltd.	75
38.	Du Pont Co. of Canada (1956) Ltd.	59
39.	Eitel-McCullough, Inc.	18
40.	Electric Chain Co. of Canada Ltd., The	61
41.	Electro Sonic Supply Co. Ltd.	57
42.	Electronic Tube Co.	95
43.	Empire Engineering	86
44.	Ericsson Telephone Sales of Canada Ltd.	81

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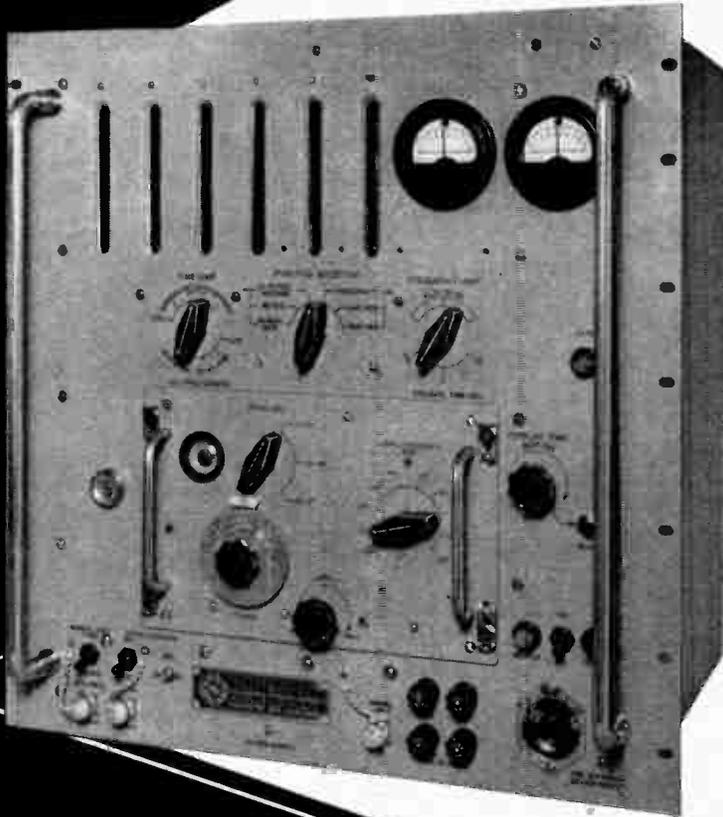
**INDEX — Continued**

Key No.	Name	Page No.
45.	Freed Transformer Co.	57
46.	Hackbusch Electronics Ltd.	46
47.	Hammond Mfg. Co. Ltd.	60
48.	Helipot Corp.	96
49.	Helipot Corp.	97
50.	Hewlett-Packard Co.	55
51.	Honeywell Controls Ltd.	73
52.	Honeywell Controls Ltd.	94
53.	Indiana Steel Products Co. of Canada Ltd., The	27
54.	Kester Solder Co.	65
55.	Magnetics Inc.	29
56.	Marsland Engineering Ltd.	68
57.	Measurement Engineering Ltd.	59
58.	Mechron Engineering Products Ltd.	61
59.	Minnesota Mining & Mfg. Co. of Canada Ltd.	37
60.	Moloney Electric Co. of Canada Ltd.	54
61.	Monsanto Canada Ltd.	31-32
62.	Muirhead & Co. Ltd.	84
63.	National Fibre Co. of Canada Ltd.	8
64.	Ney Co., The J. M.	86
65.	Nichols Ltd., R. H.	71
66.	Northeastern Engineering Inc.	90
67.	Northern Electric Co. Ltd.	58
68.	Ohmite Mfg. Co.	13
69.	Polarad Electronics Corp.	62-63
70.	Precision Electronic Components Ltd.	57
71.	Pye Canada Ltd.	23
72.	R.O.R. Associates Ltd.	73
73.	Radio Communications Equipment & Engineering Ltd.	93
74.	Radio Engineering Products Ltd.	69
75.	Rotron Mfg. Co. Inc.	41
76.	Sanborn Co.	45
77.	Sanders Associates Inc.	66
78.	Sola Electric Co.	85
79.	Standard Telephone & Cables Mfg Co. (Canada) Ltd.	15
80.	Stark Electronic Instruments Ltd.	65
81.	T.M.C. (Canada) Ltd.	64
82.	Telephone Mfg. Co. Ltd.	54
83.	Varian Associates of Canada Ltd.	10

Your request for further information on New Product items or additional information concerning advertisements in Electronics and Communications will be promptly acknowledged.



# electronic counter



CAT. NO. — NE — 14-20 FM

ACCURATE • SIMPLE  
DIRECT READING  
INSTANTANEOUS  
RELIABLE

FREQUENCY MEASUREMENTS  
10 CPS to 220 MC; TIME  
INTERVAL 1 MS to 100 DAYS;  
PULSE LENGTH, REP, RATES,  
FREQUENCY DRIFT

**northeastern**

Manchester



**engineering**

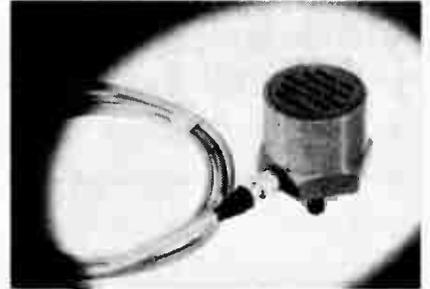
New Hampshire

## NEW PRODUCTS

### • Low G Accelerometer

Item 1525

Acceleration values down to 0.03 G can now be accurately measured with the new Model 2218 Accelerometer. Minimum sensitivity of 40 millivolts per G is assured by the Plezite I ceramic element. A natural frequency of 20 KC, minimum, gives a response from 2 c.p.s. to over 4,000 c.p.s. with a linearity of  $\pm 5$  per cent. Moisture



proof construction assures accurate operation under wide environmental conditions. Response to high level audio noise fields is virtually eliminated by clamped crystal design and internal acoustic shielding. Temperature characteristics are linear ( $\pm 10$  per cent) from  $-65^{\circ}\text{F}$  to  $+230^{\circ}\text{F}$ .

The accelerometer weighs only 2 ounces and is 1 inch hex in size. It is supplied with a special noise treated cable.

Endevco Corporation, 161 East California St., Pasadena, California, U.S.A.

### • Electrolytic Capacitors

Item 1526

Astron Corporation, East Newark, New Jersey, manufacturer of quality capacitors and RF noise suppression filters, has announced two new high reliability electrolytic capacitors.

Style EX and EZ feature superior quality materials, specially anodized, 99.99% pure aluminum foil, and scientifically compounded electrolytic formulas.

The new Astron electrolytics have been specially designed to meet exacting requirements of small size, extremely low leakage



STANDARD TWIST PRONG MOUNTING  
STYLE - EX



PRINTED CIRCUIT MOUNTING  
STYLE - EZ

and long idling or shelf life. Ideal for miniaturized, printed and transistorized circuitry. These rugged, hermetically sealed capacitors supply dependable performance over wide temperature ranges. Also featuring safety margin construction, these electrolytics will withstand shock and vibration, surge voltage and momentary overloads without permanent damage.

Type EX has a standard twist prong mounting and Type EZ is designed for printed circuit mounting.

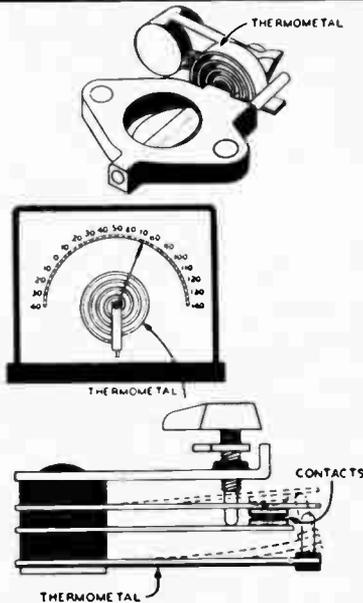
For additional information write Canadian agent: Charles W. Pointon Ltd., 6 Alcina Avenue, Toronto 10, Ontario, Canada.

(Turn to page 92)

For further data on advertised products use page 87.

**THERMOMETAL...**

for use in electrical appliances, thermal cutouts, heating controls... in any application involving the indication and accurate control of temperatures, electrical currents, voltages, etc. Supplied in strip form, rolled and slit to close tolerances and tempered to meet specifications. Also supplied as elements and sub-assemblies, with or without contacts attached, fabricated in accordance with specifications.

**FINE WIRE...**

of ductile and non-ductile materials for every application requirement. BAKER research has developed processes for bare drawing wire as fine as .0004". Where smaller fine wire is required, the Wollaston process, for ductile metals, and the Taylor and Extrusion methods, for non-ductile materials, are employed.

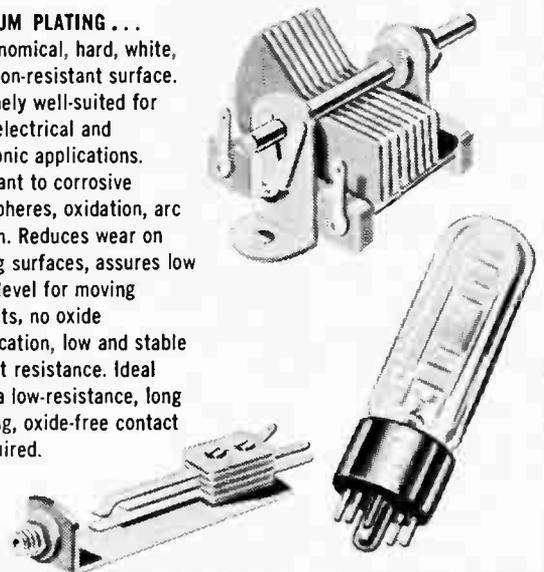


- ▶ for controlling temperature...
- ▶ for fine wire...
- ▶ for precious metal contacts...
- ▶ for corrosion-resistant surfaces...

**PRECIOUS METAL CONTACTS** for long operating life and unvarying performance. Available in pure or alloyed forms of Silver, Platinum, Palladium, and Gold. These contacts provide extremely high resistance to atmospheric corrosion, deformation, arc erosion, sticking and metal transfer. They are supplied as wire, rod, sheet, and as fabricated forms.

**RHODIUM PLATING...**

an economical, hard, white, corrosion-resistant surface. Extremely well-suited for many electrical and electronic applications. Resistant to corrosive atmospheres, oxidation, arc erosion. Reduces wear on moving surfaces, assures low noise level for moving contacts, no oxide rectification, low and stable contact resistance. Ideal when a low-resistance, long wearing, oxide-free contact is required.



Write for complete catalog material and details.

**BAKER** PRECIOUS METALS

**BAKER PLATINUM OF CANADA, LTD.**

512 King Street East, Toronto, Ontario, Canada

SALES OFFICE: BAKER PLATINUM QUEBEC, LTD., MONTREAL

ENGELHARD INDUSTRIES

RESEARCH MAINTAINS BAKER'S LEADERSHIP IN PRECIOUS METALS

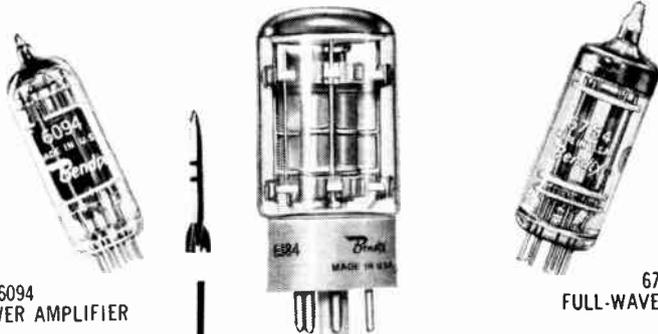
ELECTRONICS & COMMUNICATIONS, APRIL, 1957

For further data on advertised products use page 87.

SPECIALLY BUILT TO WITHSTAND  
SEVERE OPERATING CONDITIONS

**Bendix**  
Red Bank

## HARD GLASS TUBES



6094  
BEAM POWER AMPLIFIER

6384  
BEAM POWER AMPLIFIER

6754  
FULL-WAVE RECTIFIER

- Ideal for modern high-performance aircraft and missiles.

- Processing at higher vacuum and under the higher heat permitted by the hard glass reduces gas and contamination and provides greater operating stability at higher temperatures.

- Ceramic element separators prevent emission loss from high heat and vibration.

- Solid aluminum oxide heater-cathode insulator eliminates shorts, reduces leakage.

For further information, write AVIATION ELECTRIC LIMITED, 200 LAURENTIEN BLVD., MONTREAL, P.Q.

ELECTRICAL RATINGS*	6094 Beam Power Amplifier	6384 Beam Power Amplifier	6754 Full Wave Rectifier
Heater Voltage (AC or DC)**	6.3 volts	6.3 volts	6.3 volts
Heater Current	0.6 amp.	1.2 amp.	1.0 amp.
Plate Voltage (Maximum DC)	300 volts	750 volts	350 volts
Screen Voltage (Maximum DC)	275 volts	325 volts	—
Peak Plate Voltage (Max. Instantaneous)	550 volts	750 volts	—
Plate Dissipation (Absolute Max.)	14.0 watts	30 watts	—
Screen Dissipation (Absolute Max.)	2.0 watts	3.5 watts	—
Heater-Cathode Voltage (Max.)	≈ 450 volts	≈ 450 volts	≈ 500 volts
Grid Resistance (Maximum)	0.1 Megohm	.1 Megohm	—
Grid Voltage (Maximum)	5.0 volts	0 volts	—
(Minimum)	-200 volts	-200 volts	—
Cathode Warm-up Time	45 sec.	45 sec.	45 sec.

\*For greatest life expectancy, avoid designs which apply all maximums simultaneously.

\*\*Voltage should not fluctuate more than ± 5%.

MECHANICAL DATA	6094	6384	6754
Base	Miniature 9-Pin	Octal T-11	Miniature 9-Pin
Bulb	T-6½	T-11	T-6½
Maximum Over-all Length	2 ½"	3 1/8"	2 ¾"
Maximum Seated Height	2 ½"	2 1/8"	2 ½"
Maximum Diameter	¾"	1 1/8"	¾"
Mounting Position	Any	Any	Any
Maximum Altitude	80,000 ft.	80,000 ft.	80,000 ft.
Maximum Bulb Temperature	300°C	300°C	300°C
Maximum Impact Shock	500G	500G	500G
Maximum Vibrational Acceleration	50G	50G	50G

**AVIATION ELECTRIC**  
LIMITED

HALIFAX • TORONTO • MONTREAL • CALGARY • VANCOUVER

For further data on advertised products use page 87.

World Radio History

## NEW PRODUCTS

### Carrier And Radio Developments Data

Item 1527

Automatic Electric Sales (Canada) Limited, 185 Bartley Drive, Toronto, offers three new bulletins featuring carrier and radio developments. The bulletins are:

1. Form 72-ENG: Engineering principles of both 72B and 72C Radio equipment. Supersedes 72B-ENG., issue #1 October 1954.
2. Form 45BNI-ORD: Latest information on Lenkurt's cable carrier and the first description of the new 45BN Repeater. Supersedes same form number issued January 1956.
3. Form 45BX-P4: Supersedes issue #3 and contains revised level information on this type of radio channelizing equipment.

For further information apply to Automatic Electric Sales (Canada) Limited, 185 Bartley Drive, Toronto 16, Ontario, Canada.

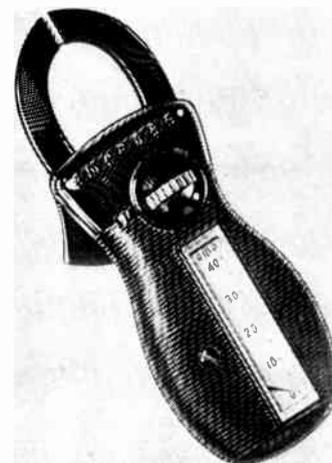
### Rotary Scale Multi-Range Amprobe

Item 1528

A completely new snap-around type Volt-Ammeter, the RS-1 Amprobe, has been introduced by the Pyramid Instrument Corporation of Lynbrook, New York.

This new Amprobe with its built-in recessed range-selector permits selection of any one of 4 ampere and 2 voltage ranges by just a flick of the thumb. Since only one current scale or voltage scale is visible at any time, speed of reading is increased and chance of error is minimized.

The RS-1 model Amprobe has many other new features—including: a magnifying-glass covered dial; a longer needle sweep; a Pointer-Lock to lock the needle in place when taking a reading in a difficult location, simple bayonet voltage leads that lock-in at bottom for quick connecting, impact-proof case that won't chip or crack with non-slip ribbing that gives it a firm pistol-grip, advanced printed circuit construction and shielded core magnet movement that mean trouble-free operation and longer service life.



The Amprobe RS-1 can be used for current measurement without cutting conductors. It is a convenient instrument for balancing circuits, tracing faults and grounds, an aid in estimating new or revised distribution circuits, diagnosing operating troubles without shutting down equipment or premises, etc.

The model RS-1 Amprobe, a pocket-size snap-around volt-ammeter, comes equipped with a fitted leather case that can be hooked on the belt, sells for \$49.85 complete.

Canadian factory representatives: Atlas Radio Corporation Ltd., 50 Wingold Ave., Toronto 10, Ontario, Canada.

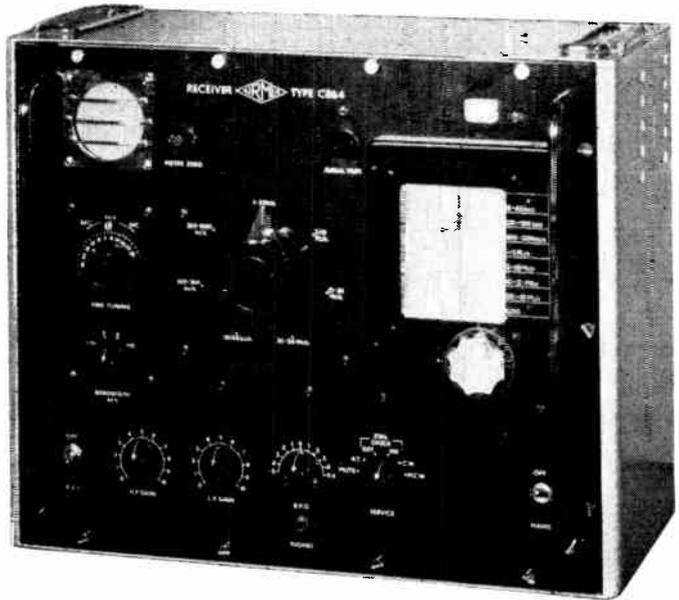
(Turn to page 94)



# COMMUNICATION RECEIVER

**type C.864**

**a very high grade general purpose communications receiver operating over frequency range 15 kc/s to 30 mc/s.**



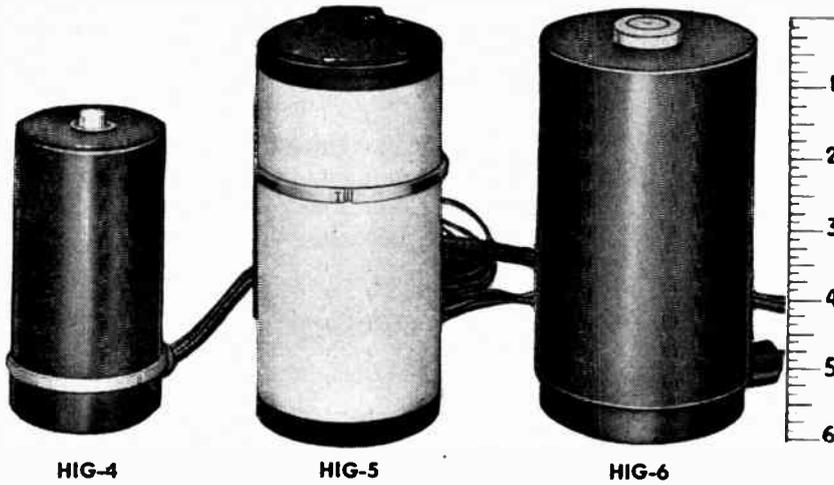
**Frequency Coverage from 15-45 kc/s and 100 kc/s — 30 Mc/s.**  
**Film Scale giving actual Scale length of 4 ft. on each frequency range.**  
**90 : 1 Slow Motion Drive with logging scale.**  
**Crystal Calibrator incorporated.**  
**Frequency setting accuracy better than 1 kc/s.**  
**Separate Incremental tuning control for use with Crystal Calibrator.**  
**Double frequency changer circuit.**  
**Stabilised Local Oscillator H.T. Voltages.**  
**Image rejection over 100 db.**  
**Exceptionally high sensitivity and signal/noise ratio.**  
**Variable Selectivity - S Meter incorporated.**  
**Very stable B.F.O. - Muting facilities provided.**  
**Built in Loudspeaker - 2 Watts Output - Turret band switching.**

*Send for illustrated literature*

# RCE

**RADIO COMMUNICATIONS  
EQUIPMENT & ENGINEERING  
LTD.**

475 Metropolitan Blvd.  
Lachine, Montreal 32



**HONEYWELL HIG GYRO FAMILY**

**Small, Rugged  
WORLD'S MOST SENSITIVE**

To meet your floated gyro needs, Honeywell has developed a complete line of Hermetic Integrating Gyros—the newer HIG-4 and the HIG-6, which together with the already famous HIG-5, make up the Honeywell HIG “family”!

This is a versatile line-up, as indicated by the specifications below. It gives you a wide range of performance characteristics

in a variety of weights and sizes. Honeywell HIG's can be used as rate gyros, platform gyros, directional gyros, free gyros, or precessible gyros. Other models are available as pendulous gyro accelerometers.

For full details on the HIG “family” and on our full gyro line, write Honeywell Aero Division, Dept. 600, Toronto 17, Ontario.

**Specifications of New Honeywell HIG “family”**

	HIG-4	HIG-5	HIG-6
Angular Momentum	10 <sup>4</sup>	10 <sup>5</sup>	0 <sup>6</sup>
Threshold	1° per hr	.2° per hr	.01° per hr
Trimmed Drift Rate	5° per hr	1° per hr	.05° per hr
Maximum Precession Rate	5 radians/sec	1 radian/sec	.1 radian/sec
Characteristic Time Constant	3.5 millisecc	2.8 millisecc	3.1 millisecc
Damping Ratio — Output Axis/Input Axis	1 to 1	1 to 1	2.1 to 1
Torque Generator Scale Factor	1 or 10 dyne-cm/ma <sup>2</sup>	2.5 or 35 dyne-cm/ma <sup>2</sup>	.025 or 1 dyne-cm/ma <sup>2</sup>
Signal Generator Scale Factor	25 volts/radian at 100 ma 400 cps	34 volts/radian at 100 ma 400 cps	25 volts/radian at 50 ms 400 cps
Spin Motor Excitation	10 volts, 2 phase	10 volts, 3 phase	115 volts, 3 phase
Weight	1.5 lbs.	2.75 lbs.	4.5 lbs.

**Honeywell**  
Aeronautical Division



AIRCRAFT · ORDNANCE ·  
CONTROLS AND INSTRUMENTATION

For further data on advertised products use page 87.

**NEW PRODUCTS**

● **Flow Rate Measurement  
By Ultrasonics**

*Item 1529*

A new straight-through flowmeter, that achieves accurate flow rate measurements by the modification of an ultrasonic beam, has been announced by the Vibro-Ceramics Division of Gulton Industries, Inc. Because this new instrument offers no obstructions to the fluid flow, pressure drop is eliminated, maintenance is simplified and greater accuracy is consistently attained. Its many features are especially adapted to the measurement of such difficult liquids as kerosene, liquid oxygen, water and similar low viscosity liquids.

This unit designated as GLENNITER Model UF-100, will measure flow rates in the range of 1000 - 4000 gallons per minute with an accuracy of better than 1 per cent, and provides 5 volts full scale output to feed into standard telemetering and recording systems.

Special instruments for the measurement of volumetric flow, and complete control systems designed around the flowmeter, can also be provided.

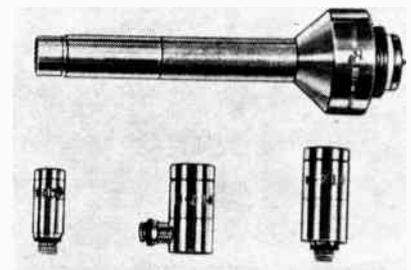
For further information write Canadian representative: Lake Engineering Co. Ltd., 767 Warden Ave., Scarborough, Ont.

● **Sound Pressure  
Measurement Equipment**

*Item 1530*

This new line of sound pressure measurement equipment makes available a number of precision instruments which incorporate all the improvements in standard microphone construction developed at Massa Laboratories, Inc. during the past decade. Acoustic measurements over both audible and ultrasonic ranges can be made to levels exceeding 200 db versus .0002 microbars.

The microphones are stiffness controlled over the specified frequency ranges of operation and therefore introduce no phase shift errors, making the new units ideal for the accurate reproduction of acoustic transients. The high acoustic impedance also results in linear response to extremely high magnitudes, so that the microphones are suitable for the measurement of not only conventional sound pressure levels, but also blast pressures and shock waves such as are generated by gunfire or explosions. These units also are well suited for measuring high-frequency sound pressure such as occurs in exhausts from jets or missiles.



Specifications: Model M-125 (5½" long) — Frequency Range 20-35,000 c.p.s., crystal sensitivity 23½ μV/μbar; M-214 (1½" long), M-215 (¾" long) — Frequency Range 20-90,000 c.p.s., crystal sensitivity 12½ μV/μbar; M-213 (½" long)—Frequency Range 20-120,000 c.p.s., crystal sensitivity 8 μV/μbar. Operating temperature -40°F. to 160°F.

Massa Laboratories, Inc. provide accessory equipment including power supplies, pre-amplifiers and adapters for a complete sound pressure measurement system. For free literature write to Massa Laboratories, Inc., 5 Foffler Road, Hingham, Mass., U.S.A.

(Turn to page 96)



GA3 ..... \$19.95



GA4 ..... \$16.95

**IMPORTED HI-FIDELITY PICK UP ARMS.**

These Arms are superb copies of well known American types. The GA 3 (12") at \$19.95 and GA6 (16") at \$39.00 are viscous damped and come complete with adaptors for G. E. Pickering and other standard cartridges. The GA4 utilizes dynamic damping in order to achieve virtually no resonance in the audio range.

**SUBMINIATURE TRANSISTORS COMPONENTS**

as nationally advertised — in USA

1½" Speaker 8 ohms .....	\$2.95
2" Speaker 3.2 ohms .....	2.49
Crystal Earphone .....	1.49
6 OHM Dynamic Earphone .....	2.70
3000 ohm Dynamic Earphone .....	2.75
2 Gang Superhet Capacitor .....	2.29
Midget plug and Jack .....	.30
5 Terminal Transistor Socket .....	.30
SubMiniature Transformers from .....	1.79 up
SubMiniature Volume Controls from .....	.98 up
Transistor Loop Antenna .....	1.38
Ultra Miniature IFS .....	1.95

**POCKET**

**MULTIMETER**

\$8.75



Leather Case \$1.20 Extra

200 microampere full scale movement provides 2000 ohm per volt sensitivity. Ranges:

AC & DC Volts 0-6, 60, 120, 600.
DC milliamperes 0-120
ohms 0-100,000

Complete assortment of imported multi-meters in stock — WRITE

**IMPORTED 300 POWER MICROSCOPE**

\$7.95



Triple revolving turret has 100, 200 and 300 power objective lenses. The quality and price of this laboratory instrument are truly astounding. Complete with polished wood storage chest and slides. Makes a superb gift.

**HAM GEAR**

Elmac AF67 .....	\$198.90
Elmac PMR-7 .....	\$196.80
Morrow MB560 .....	\$249.60
Morrow MBR-5 .....	\$249.50
Morrow 5BR-2 .....	\$ 88.50
Gonset G66 .....	\$244.50
Central Electronics 600L .....	\$589.00
Central Electronics 20 A (Kit) .....	\$239.95

Marv VE2ANN will give you a top deal on standard brand HAM gear. Get our prices before you buy. Visit our store when in town for used equipment values.

When in Montreal visit our store. Surplus inventories purchased. Write today listing your available inventory.

Write for latest catalog.



**ELECTRONIC TUBE COMPANY**

464 MCGILL ST.

AV. 8-6218

MONTREAL, P.Q.

**BUY THESE SUPER QUALITY ITEMS**

**at the LOWEST PRICE EVER OFFERED!**

When in Montreal visit our store. Mail orders 20% deposit with order balance C.O.D. Shipments, F.O.B. Montreal. All material fully guaranteed and sold with a 10-day money back guarantee. Write for latest catalog.

**GOVERNMENT SURPLUS EQUIPMENT**

1154 transmitters  
BC611 handie talkies  
MN26C compass receivers  
RA10DB receivers  
AT1 transmitters  
SCR522 Transceivers  
#19 MKII transceivers  
TA12C transmitters  
MKIII IFF sets

and many others  
prices on request

**RADIOSONDES**

**GOVERNMENT SURPLUS AN/AMT - 2 \$3.95**

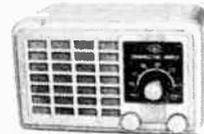
Designed to be attached to a balloon and released by government weather stations for descent by parachute, this electronic wonder records temperature barometric pressure and humidity in the high altitude and relays the findings via radio. Contains miniature 400 MC (approx.) Transmitter, temperature sensitive resistance element, humidity sensitive strip and barometer. Complete with subminiature tubes 5703 and CK5875, sensitive relay, thermistor, aneroid movement and pressure chart. Brand new and complete less balloon.



**VHF FM & AM RECEIVERS**

Police, Fire, Aircraft  
Mobile-Telephone  
Roads, Taxis

all models \$79.50



Complete ready to operate, have built in speakers, self-contained AC/DC power supplies. Eight tube plus selenium rectifier.

30 - 50 megacycles FM .....	Model 3045FM
112 - 132 megacycles AM .....	Model 3055AM
132 - 152 megacycles AM .....	Model 3085AM
152 - 174 megacycles FM .....	Model 3056FM

**BROADCAST TYPE MICROPHONE**

High impedance crystal microphone with essentially flat response from 40 to 8000 c.p.s. — output level 50 DB. Double crystal cartridge for full non directional response. Chrome plated case bakelite trim. Standard 5/8" — 27 bushing. Will fit any mike stand.

only \$9.95

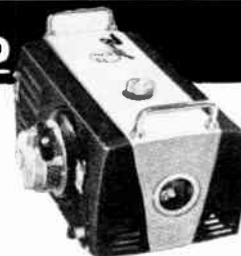


**PORTABLE ELECTRIC GENERATOR \$295.00**

Specifications: Size 19" x 11½" x 13"

**WEIGHT: 43 LBS.**

Output: 800 - 1000 Watts  
Engine: 2 h.p., 3600 r.p.m., 2 cycle air cooled  
Generator: 110V, A.C., 60 Cycle  
Fuel Consumption: Full Tank (¾ gallon) will run generator for 1 to 3 hours — depending on load.  
—equipped with rewind starter.



Descriptive literature on request.

**TUBE SPECIALS**

OB2 .....	1.15	5BP1 .....	6.95
OD3 .....	.99	6AK5 .....	1.75
IR5 .....	1.19	6J6W .....	1.95
2E24 .....	4.50	6BQ6GT .....	1.99
2E30 .....	2.56	6W4 .....	.96
5U4G .....	.83	12A6 .....	.99

35W4 .....	.71	813 .....	17.95
304TH .....	19.95	872A .....	6.80
807 .....	1.95	1625 .....	.69

Thousands of receiving, transmitting special purpose, cathode ray and subminiature tubes in stock at sensible prices. Full warranty and top quality only. Quotations on request.

**IMPORTED CERAMIC TUBE OIL FILLED CONDENSERS**



600 W .V .DC - 1500 Test V, DC.

Fabulous quality approaching JAN military specifications at the price of normal capacitors.

.001 - 600 V .....	13
.002 - 600 V .....	13
.005 - 600 V .....	13
.01 - 600 V .....	16
.02 - 600 V .....	19
.05 - 600 V .....	25
.1 - 600 V .....	29

Special quantity prices on request.

**DUAL DYNAMIC PENCIL MICROPHONES**



\$16.50

This is a high quality imported dynamic microphone suitable for public address, recording and other general audio applications. The big feature of this microphone is its dual impedance. 50 ohms or 30,000 ohms at the flick of its built-in switch. Complete with lavaliere, adjustable microphone bracket and 9 feet of flexible cable. Chrome and baked grey enamel finish.

**PLAN NOW****TO ATTEND THE  
IRE  
CONVENTION**

Toronto —  
October 16-17-18

**DRAFTSMEN  
SENIOR and JUNIOR**

Experience in sheet metal layout, foundry practice, and mechanical detailing is desirable.

This is an opportunity to work creatively and independently in a small mechanical group.

Employees enjoy a 5 day, 40 hour week and comprehensive group insurance. Our firm is a medium-sized company located in a friendly, progressive community on the banks of the Ottawa River.

Reply in writing, stating details of education, experience, age, marital status, salary expected, and when available Contact —

Mr. C. W. Hawkins at —  
**Measurement Engineering  
Limited**  
Arnprior, Ontario.

**TECHNICAL SALES  
REPRESENTATIVES**

with an interest in one or more of the following fields:

Communications  
Electronics  
Radar  
Instrumentation  
Industrial Electronics,  
Measurement and Control

Territories: Toronto, Ottawa Valley, Montreal.

Please forward an outline of your technical history to

**E. E. Whittaker,**  
**M.E.L. SALES**  
a Division of Measurement  
Engineering Limited,  
Arnprior, Ontario.

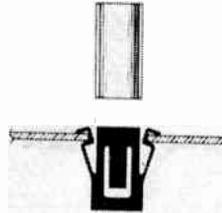
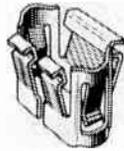
**NEW PRODUCTS**

- **Speed Clip For  
Crystal Canisters**

Item 1531

A new, simplified technique of assembling or replacing crystal canisters in electronic equipment is now being offered by Dominion Fasteners Limited, Canadian manufacturer of Tinnerman Speed Nut brand spring tension fasteners.

Formerly, crystal-containing canisters were either riveted or screwed to the chassis. When service was required these components were often inaccessible, involving excessive time and effort to remove. The new Tinnerman Speed Clip, however, completely eliminates this problem, for once it is snapped into place on the chassis crystal cans can be assembled or changed as easily as replacing a radio tube.



Assembly is extremely simple. The new Speed Clip is merely pressed into place by hand on the chassis where it retains itself in canister-receiving position. As the crystal canister is inserted, spring fingers formed in the Tinnerman clip bear against its sides and secure it firmly under live spring tension.

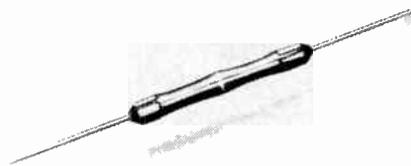
Changing of the crystal can simply requires slipping the spent canister out of the Speed Clip and replacing it with a fresh one. The Tinnerman Speed Clip remains intact on the chassis and can be used indefinitely.

Dominion Fasteners Limited, Box 492,  
Hamilton, Ontario, Canada.

- **"Toothpick" Type  
Resistors**

Item 1532

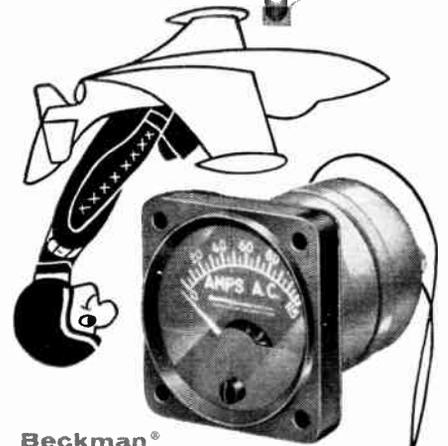
The Daven Company, Livingston, N.J., announces the availability of two new "toothpick" type, wire wound resistors, specially designed for use in applications where minimum space is a prime factor, such as in guided missiles and airborne radar and communications equipment.



Standard tolerance of both of these resistors is  $\pm 1\%$ ; however, certain values can be obtained as close as  $\pm 0.1\%$ . The smaller resistor, known as type 1288, measures 1" long x  $\frac{1}{8}$ " diameter; its maximum resistance is 100K, and it dissipates .15 watt. The type 1289, slightly larger, measures 2" in length x  $\frac{1}{8}$ " diameter. Its maximum resistance is 200K, and it dissipates .20 watt. Both are non-inductive. These units will pass all environmental requirements of MIL-R-93-A, Amendment 3.

Additional data on Daven's new "toothpick" resistors may be obtained from The Daven Co., 530 West Mt. Pleasant Avenue, Livingston, N.J., U.S.A.

another product surprise from Helipot!

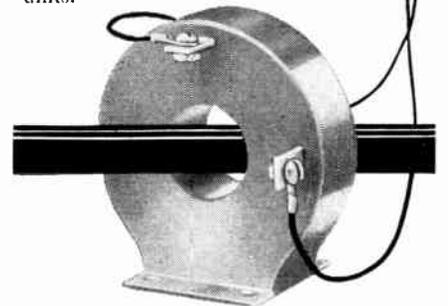


**Beckman®**  
**Linear Scale AC Ammeter**

There's no peek-a-boo with our new BECKMAN Linear Scale AC Ammeter. designed for rapid, accurate monitoring of generator load. We'll fly upside down to prove you can get quick readings from any angle. And no bunched-up graduations... the needle deflection is always directly proportional to amperage.

It's plain to see that the Helipot engineers responsible for our 22-ounce meter-transformer unit know their onions as well as their ohms. They gave it intestinal fortitude (that's right—guts!)... to withstand extreme vibration, shock, moisture, salt spray and fungus. They gave it airworthy performance... anywhere from sea level to 50,000 feet and from  $-55^{\circ}$  to  $+71^{\circ}$ C. And they gave it flexibility... the compact meter can be installed on your instrument panel, the potted transformer as far away as 150 feet (with negligible effect on accuracy).

In your next free moment (like right now), write for data file 447, which has complete information on our standard units.



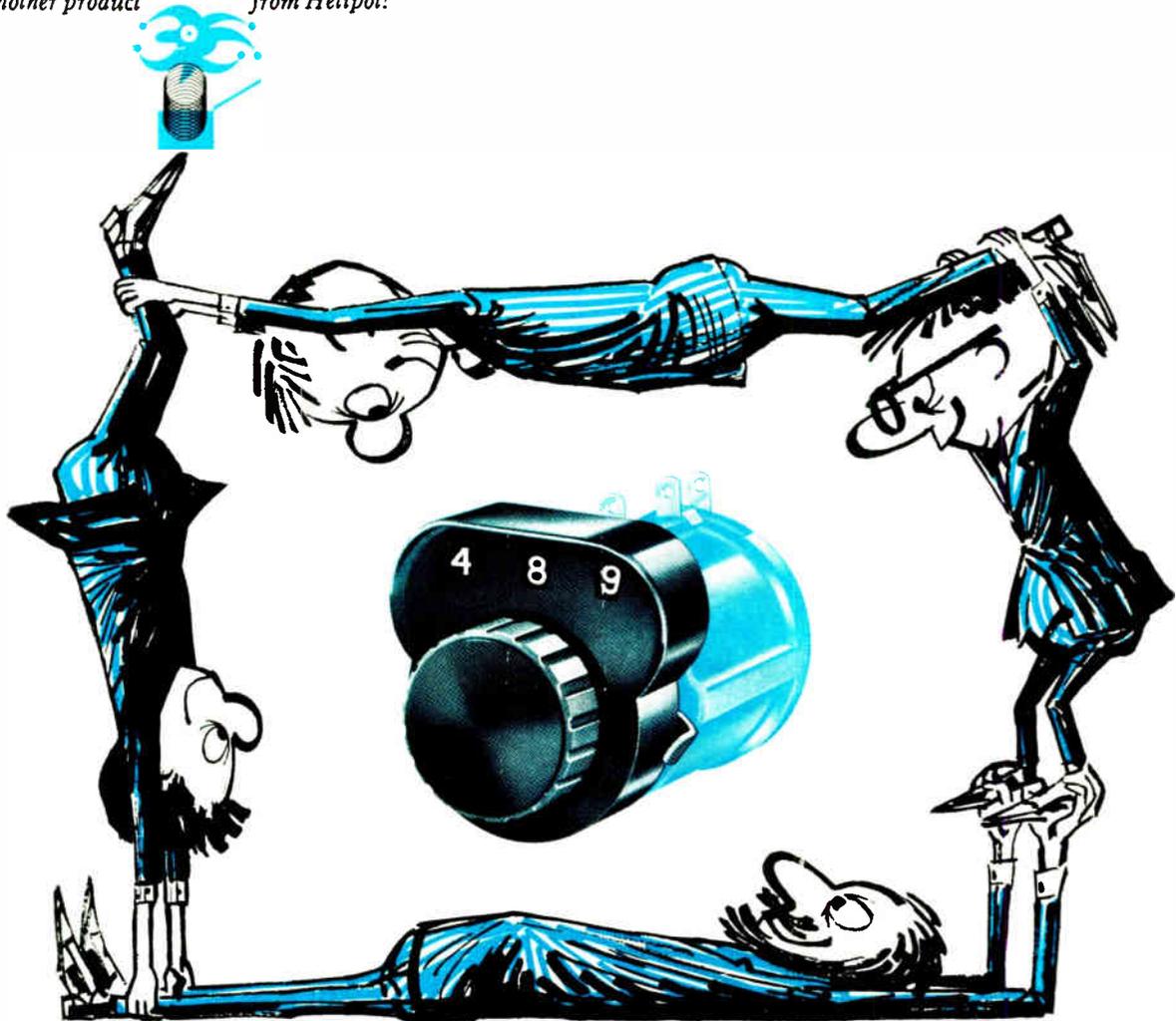
**Beckman® Helipot**  
Corporation  
a division of Beckman Instruments, Inc.

Canadian Factory:  
No. 3 Six Points Rd., Toronto 18, Ont.  
Sales Representative: R-O-R Associates, Ltd.,  
290 Lawrence Ave. West, Toronto 12, Ont.

988

For further data on advertised products use page 87.

Another product *surprise* from Helipot!



## A Dial to reckon with

When position is everything, you can count on the new DIGIDIAL\* ten-turn decimal-counting dial . . . for indicating shaft position from  $0^\circ$  to  $3,600^\circ$  . . . with reading resolution of 0.05% of full scale or better.

The DIGIDIAL reads by the numbers. This means farewell to interpolations and operator errors . . . hail and hello to fast, accurate reading from as far as six feet away . . . from just about any angle except behind the panel. You'll welcome its compact construction, light weight, simple installation and smooth operation. You'll utter gleeful greetings to the positive, non-distorting locking mechanism.

If position is important to you, you'll want to know more about the DIGIDIAL . . . to get the whole story, write for data file 427.

**Helipot** Corporation a division of Beckman Instruments, Inc.

Canadian Factory: No. 3 Six Points Rd., Toronto 18, Ont.

Sales Representative: R-O-R Associates, Ltd., 290 Lawrence Ave. West, Toronto 12, Ont.

# AROUND THE WORLD *again and again!*

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

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

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

## CANADIAN STACKPOLE LTD.

550 Evans Ave., Etobicoke  
Toronto 14, Ontario

Type CM-1/32  
(1/2 watt)

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



Type CM-2  
(2 watts)

Type CM-1  
(1 watt)



# STACKPOLE FIXED COMPOSITION RESISTORS

Available for your convenience through leading parts distributors.