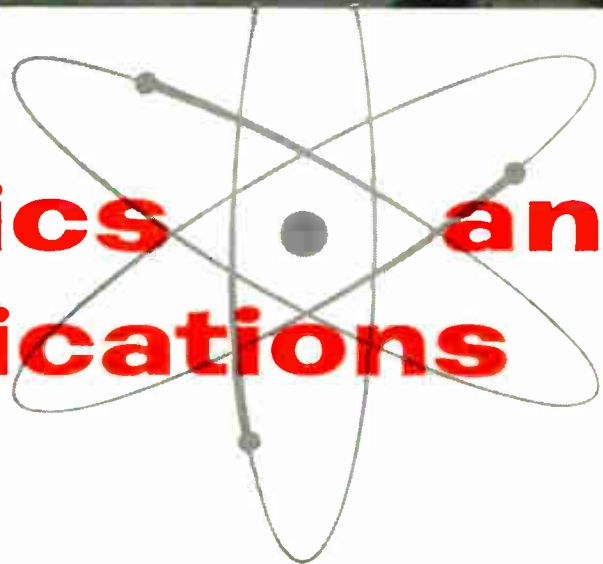




An "atomic clock" that neither gains nor loses one second in 1000 years. (Story, page 5)

electronics and communications



an age publication

AUGUST 1959

1211C
DEL
CRC
EPM

MR F W PREZIOSI
8 EASTGATE CRES
SCARBOROUGH ONT



DEPENDABLE POWER



LISTER AIR COOLED DIESEL ENGINES

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

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

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

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

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For complete details check No. 13 on handy card, page 51

→
at →
Canadian
Marconi
→

the only complete
Image Orthicon
testing lab
in Canada

ELECTRONIC TUBE AND COMPONENTS DIVISION

CANADIAN **Marconi** COMPANY

830 BAYVIEW AVENUE • TORONTO, ONTARIO

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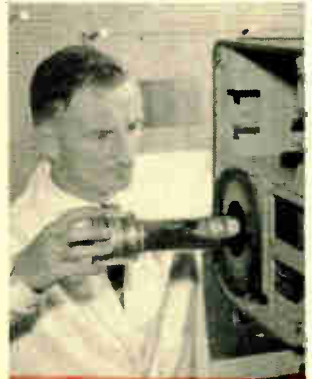
*factory tested
and sealed*

Before they leave the factory, all Marconi Image Orthicons undergo extremely critical testing.



*studio conditions
duplicated*

Acceptance tests are conducted when the tubes arrive in Canada. Marconi has built a special lab where the image orthicons are tested under Canadian studio conditions.



fast warranty

This special testing lab enables Marconi to offer immediate warranty adjustment when required.



"total" testing

An extensive series of tests check every detail. Once it has passed these tests, the camera tube is shipped to the studio, sealed and protected by the Marconi guarantee.



*visiting
studio personnel*

Studio engineers and technicians are invited to inspect and make use of these facilities.

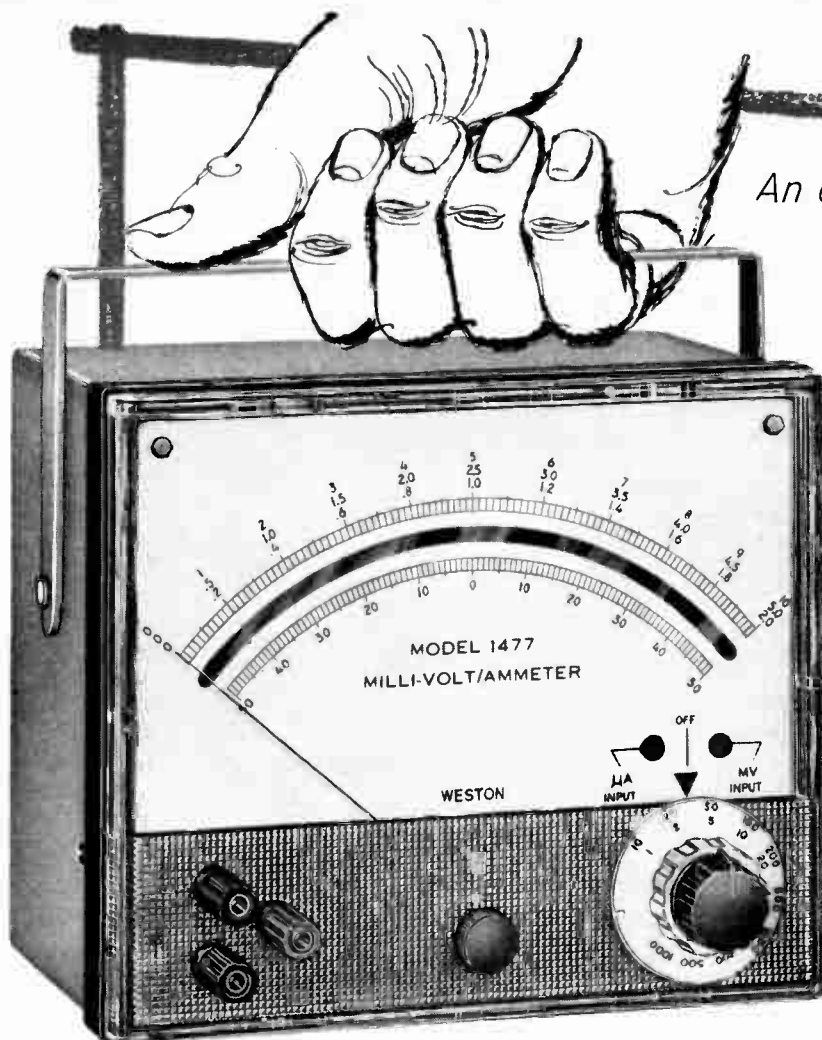


tests vary

Each of the six types of image orthicons undergoes its own special tests. To test each tube thoroughly takes 30 to 50 minutes.

For complete details check No. 14 on handy card, page 51

ELECTRONICS AND COMMUNICATIONS, August, 1959



*An exceptional new tool
for lab or industry!*

WESTON

*Zero
Load*

**ELECTRONIC
MILLI-VOLT/
AMMETER**

Check these outstanding features and exclusives:

- ✓ Measurement, amplification and transduction of a wide span of D-C current and voltage ranges — 10 to 1000 microamps and 1 to 1000 millivolts full scale — in a single 5½-pound unit.
- ✓ Unique INDUCTRONIC® servo-amplifier provides extreme high gain and full feedback — for accuracy and stability unaffected by variations in line voltage or frequency, condition of tubes, or other variables.
- ✓ Model 1477 is a true D-C meter with zero-drift comparable to a permanent magnet moving coil instrument. No mechanical switches or choppers are used.
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- ✓ Knife-edge pointer and 7.2-inch mirror scale provide unmatched readability.
- ✓ Gain stability and output linearity are both within 0.1% at ranges above 1 millivolt or 200 microamps.
- ✓ Resolution capability is within 2 microvolts or .02 microamps.
- ✓ Power requirements: 115 volts A-C, 50 to 1600 cycles, 35 watts.
- ✓ Less expensive than competing instruments offering lower stability.

For full information, call *Daystrom Ltd., 840 Caledonia Rd., Toronto 19, Ontario; 5430 Ferrier Street, Montreal 9, Quebec. A subsidiary of Daystrom, Incorporated. Or any office of Northern Electric Co. Ltd.*

5923

WESTON

Instruments

WORLD LEADER IN MEASUREMENT AND CONTROL





an age publication

Electronics and Communications

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

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60

contents

AUGUST 1959 Vol. 7, No. 8

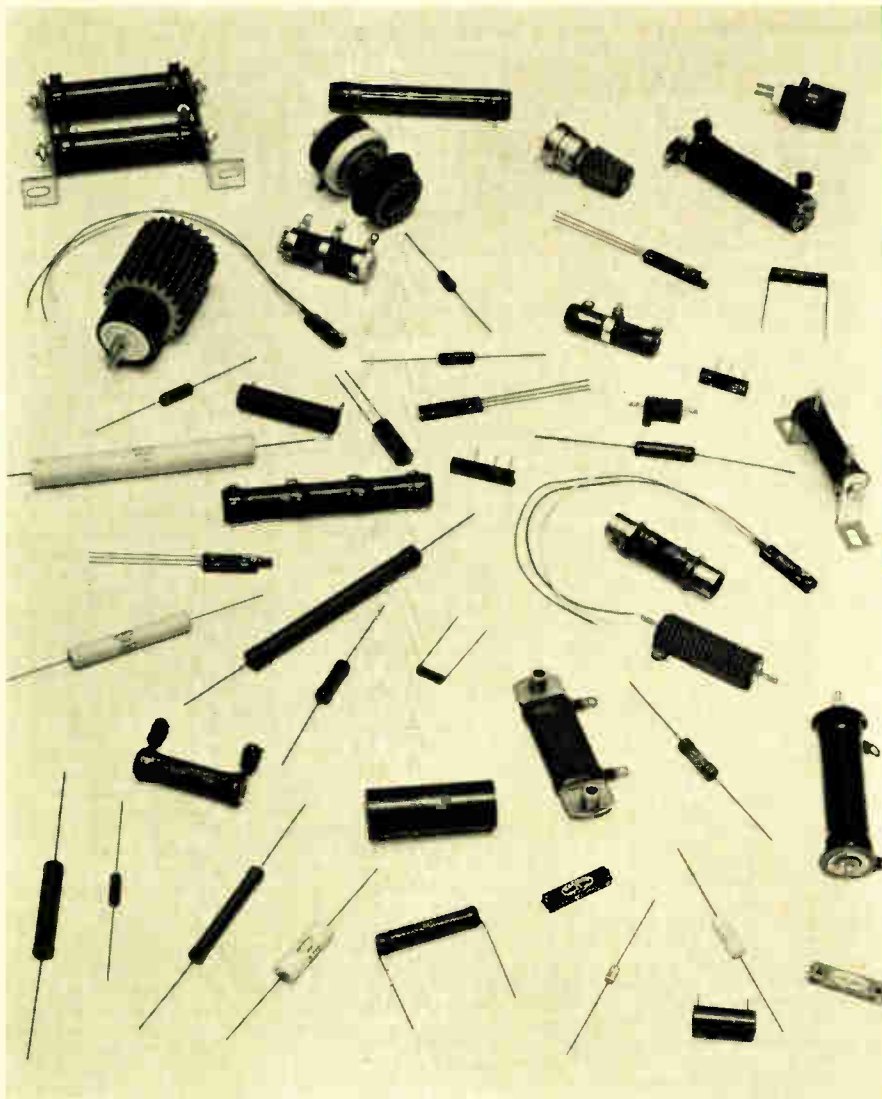
- 22 Closed circuit television for nuclear applications
by W. Jones
- 25 Behavior of open-wire lines and cables
at frequencies above 150 kc
Courtesy — Lenkurt Electric Co. of Canada Ltd., Vancouver, B.C.
- 29 Custom built tube tester
With capability of testing 2000 tubes per hour
- 30 Ultrasonic cleansing of precision parts
Meets demands for cleanliness of missile components

departments

- 11 Electronic Industries Association Report
- 12 Business Briefs and Trends
- 35 New Products
- 38 News Report
- 60 Editorial

COVER STORY

This 30-pound "atomic clock" ticks 24 billion times a second and is being developed by Hughes Aircraft Company for the National Aeronautics and Space Administration. Dr. Harold Lyons, Hughes' scientist, is shown examining the tubular heart of the clock which will house stream of ammonia molecules that generates a highly stable current.



The NEW CERL-DALE, Limited

now serving
Canada with
the FINEST of
RESISTORS

Canadian electronic manufacturers now have a superb source for the finest of precision resistance products.

Formation of CERL-DALE, Limited (formerly Canadian Electrical Resistors, Limited), makes available through a Canadian company the dependable DALOHM line of resistors and trimmer potentiometers.

CERL-DALE, Limited, is a single source for wire wound, deposited carbon, vitreous enamel and metal film precision resistors. Inherent stability is achieved by advanced component design and manufacturing techniques. Both wire wound and carbon trimmer potentiometers in numerous sizes and styles can now be ordered.

In addition to the DALOHM line, all of the famous CERL and BERCO products will continue to be available.

Write for Catalog Information Now!



CERL-DALE, Limited

Curity Avenue
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For complete details check No. 16 on handy card, page 51

The Rogers 6360 twin tetrode. is a Special Quality* miniature transmitting tube designed to give reliable, efficient and long life performance at V.H.F. up to 225 Mc/s at maximum ratings.

Typical plate output power is 14.0 watts at 200 Mc/s with a plate supply voltage of only 300 volts. As a tripler with an output of 175 Mc/s, 5.5 watts is obtained with a plate supply voltage of 300 volts.

The 6360 is particularly suitable for push-pull operation in either fixed or mobile transmitters and may also be used as an amplifier, oscillator, multiplier, modulator or audio amplifier. In new equipment or for replacement purposes, this Special Quality tube provides high output at very low initial cost.

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



ROGERS

electronic tubes & components

A DIVISION OF PHILIPS ELECTRONICS INDUSTRIES LTD.

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

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

Three Faces of A·E·L



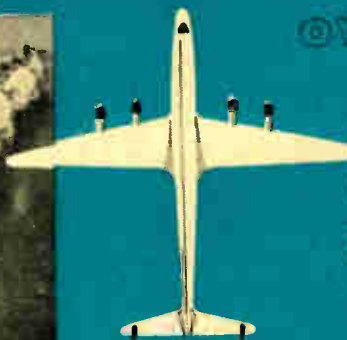
DESIGN

AEL's "backroom boys" form one of the finest design teams in the aviation business. A closely-integrated group of specialists have an outstanding record of designing products to meet new requirements and modifying units to fit new applications. Products are developed by environmental testing. Fully-equipped physical metallurgical and chemical laboratories having RCAF approval.



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AEL's manufacturing division contains a complete line of departments staffed by specialists and equipped with the most modern machines and test tools available. Aircraft and industrial products are fabricated, some to a tolerance of one-millionth of an inch.



OVERHAUL

Recently expanded overhaul facilities permits AEL to offer overhaul of aircraft instruments, accessories and electronic equipment with an absolute minimum turnaround time — at no increase in cost. The high standard of AEL's precision workmanship in overhaul is due to the combination of trained technicians, modern tools and test equipment and ideal new plant conditions.

For the finest in aviation design, manufacturing and overhaul — talk to AEL.

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LIMITED

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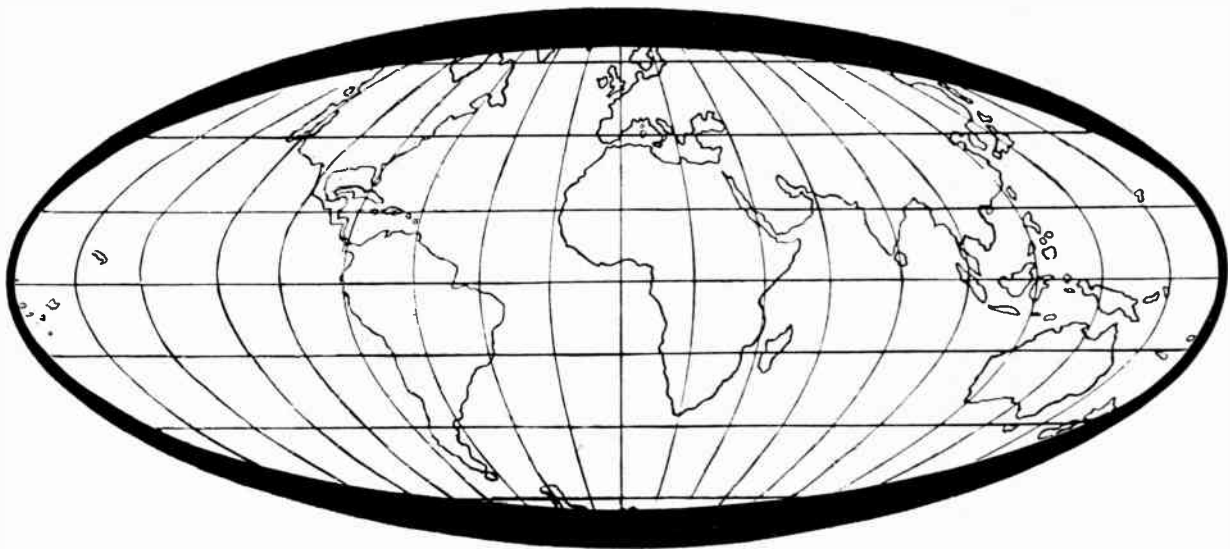
AVIATION ELECTRIC PACIFIC LIMITED, VANCOUVER AIRPORT, VANCOUVER, B.C.

INTRODUCING



ASSOCIATED ELECTRICAL INDUSTRIES (CANADA) LTD.

A NEW 'CANADIAN'



. . . A WORLD - FAMOUS GROUP OF ELECTRICAL COMPANIES

Associated Electrical Industries, is Britain's largest electrical manufacturing company with factories and offices around the world. A.E.I. companies manufacture all types of electrical equipment ranging from small motors, to the 150,000 kw steam turbine generators being supplied for two major Canadian power companies.

Employing more than 100,000 people, sales of electrical equipment in world markets by this fifty nine year old company exceeded \$490,000,000.00 in 1958.

A.E.I. business in Canada has been handled by a

number of organizations including The British Thomson-Houston Co. (Canada) Ltd., and Metropolitan-Vickers Electrical Export Co. Ltd. (both A.E.I. companies). On July 2nd, 1959, the staffs of these organizations were combined under the name of Associated Electrical Industries (Canada) Ltd., which will be responsible for selling and servicing the products manufactured by the many A.E.I. divisions in the United Kingdom and the A.E.I. Switchgear factory in Montreal. Siemens Edison Swan (Canada) Limited, another A.E.I. company, will continue to operate without change of name.



Associated Electrical Industries (Canada) Ltd.

766 King Street West, Toronto 28
EMpire 4-9281

562 Montée de Liesse, Montreal
Riverside 7-0677

908 Burrard Bldg., 1030 West Georgia St., Vancouver
MUtual 3-8108

For complete details check No. 4 on handy card, page 51

ELECTRONICS AND COMMUNICATIONS, August, 1959

World Radio History



MODEL 362
Low-Ohmmeter



MODEL 370
AC Ammeter



MODEL 371
AV Voltmeter



MODEL 372
Ohmmeter



MODEL 373
DC Milliammeter



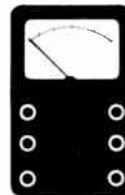
MODEL 374
DC
Microammeter



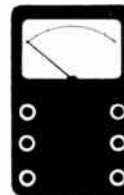
MODEL 375
DC Ammeter



MODEL 376
AC Voltmeter



MODEL 378
AC Milliammeter



MODEL 387
Millivoltmeter



MODEL 377
DC Voltmeter

The complete line of

Simpson MICROTESTERS

Model	Ranges
362	5/25 Ohms
370	1/2.5/5/10/25 A.C. Amperes
371	150/300/600 A.C. Volts
372	0-500 ohms to 0-50 Meg ohms in 6 ranges
373	1/5/10/25/50/100/250/1000 D.C. Milliamperes
374	50/100/250/500/1000 D.C. Microamperes
375	1/2.5/5/10/25 D.C. Amperes
376	5/10/25/50/100/250/500/1000 A.C. Volts at 1000 ohms per volt
377	1/2.5/5/10/25/50/100/250/500/1000 D.C. Volts at 1000 ohms per volt
378	5/25/100/250/1000 A.C. Milliamperes
387	10/30/100/300/1000 D.C. Millivolts

The line of Simpson Microtesters features low cost, and convenience in application and size. Low cost because ranges that may not be required are not included; convenience — for single purpose applications; service and industrial testing, receiving room inspection or laboratory and school room experimentation. Simpson Microtesters are small and compact in size and are surprisingly low in cost. Write for further details.



1255 BRYDGES ST.

LONDON, CANADA

J9550

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

For complete details check No. 10 on handy card, page 51

Electronic Industries Association Report

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

"Electronics An Expanding Field", Says EIA Guest Speaker

"You are fortunate to be in an expanding rather than a contracting field", said J. H. Warren, Assistant Deputy Minister of Trade and Commerce, when he addressed delegates at the 30th Annual Meeting of EIA recently. Under the title "Current Problems In International Trade", Mr. Warren reviewed the import/export problems of the Canadian electronics industry. A summary of his address follows:

" . . . Several industries, including your own, have brought to the Government's attention the problems of very low cost imports of certain products. I can assure you that these representations are being given careful consideration. The Government, as you know, has passed anti-dumping legislation designed to defend Canadian producers against unfair foreign trade practices, and has taken various other measures to help Canadian industry. You are aware that the Government has referred to the Tariff Board for consideration that section of the tariff concerned with radio, television and related equipment. You know also that provision has been included in the 1959-60 supplementary estimates for substantial sums to sustain technological capability in Canadian industry by supporting selected defense development programs.

" . . . After a period of rapid expansion, following on the introduction of television in Canada, your industry has in this field at least experienced some levelling off in demand. You have also been affected by changes in the pattern of defense spending in the last couple of years, and by the upsurge of imports of radios from Japan and European sources. I think it would be a mistake to draw unduly pessimistic conclusions from these factors. In the past your industry has lived through many variations in the volume of output, and you have adapted successfully to constant changes in the size and nature of demand. It is clear that electronic equipment is becoming more and more important to industry and that it is essential to modern defense equipment. Over the longer run, you are fortunate to be in an expanding rather than a contracting field.

" . . . The Department of Trade and Commerce stands ready to assist you in your efforts to develop export markets, and I do not believe your endeavors in this direction should be discouraged because of the present sharp impact of import competition in certain lines. Much of the special electronic equipment now being manufactured or developed here should prove of interest to other countries, and there is obviously a sales job to be done. Some of your companies are already achieving considerable success in selling Canadian designed products in world markets.

Both as regards defense and normal commercial business, much will depend on the initiative and efficiency of your companies in producing what is required and in finding the market for your product. Quality design and design standards will be very important. Publicity and public relations will also merit your attention. The recent slackness in sales of television sets promises to be of limited duration, as the time approaches for replacement and the eventual introduction of color TV should provide an important stimulus to sales. Background influences affecting the market for consumer goods are becoming increasingly favorable. The consumer has experienced a substantial rise in real income, and consumer spending has been increasing since last Fall. This strength in consumer demand is having its effect on the electronics industry. I understand that factory shipments of radios are running 20 per cent ahead of last year's level, and that even in this in-between-period television sales are down only slightly.

I have confidence that the electronics industry of Canada will overcome current difficulties, and that the future holds great promise for you. I said earlier that no one could forecast accurately the precise things that you would be making 20 years hence. I am confident, however, that electronic devices and controls of all kinds will have a much wider application than at present, and that the Canadian electronics industry will be very much in business."

business briefs and trends

★ Ferranti-Packard Electric Limited of Toronto has recently been awarded a contract to design and manufacture an electronic cheque sorting machine for the Federal Reserve Bank in New York City. This device is to be based on techniques employed in the manufacture of a mail sorting computer for the Canadian Post Office Department which Ferranti-Packard installed in 1954.

* * *

★ The first new size change in picture tubes in several years is being introduced to the market by the Admiral Corporation and Sylvania Electric Products, who are featuring 23-inch picture tubes with safety panel bonded to face plate in their 1960 models of television sets.

* * *

★ A contract has been awarded by the Department of Defense Production to Titania Electric Corporation of Canada Limited, Gananoque, Ontario, for a study of present and future requirements for precision electronic ceramics in Canada.

* * *

★ The Canadian Government is prepared to subsidize Canadian defense industries to the extent of \$5 million in order to support them in their efforts to participate in U.S. defense production contracts.

* * *

★ It was recently revealed that Canadian Aviation Electronics Limited of Montreal enjoyed a 200 per cent net income for the year ending March 31, 1959. The net amount is \$469,993 for the period 1958-1959 as against \$155,170 for the preceding twelve month period.

* * *

★ The Canadian Department of Defense Production has placed an order worth \$200,000 with Marconi Instruments Limited for telecommunication measurement equipment. Nearly 200 instruments are to be provided, including signal generators, portable frequency meters, oscilloscopes, wave analyzers and transmission test sets. The Canadian counterpart of Marconi Instruments Ltd. is Canadian Marconi Co., 2442 Trenton Ave., Montreal, Que.

* * *

★ Speaking at the second annual Marketing Seminar held by the major appliance division of the Canadian Electrical Manufacturers' Association, F. W. Mansfield, director of marketing research for Sylvania Electric Products Inc., New York, said that both Canada and the United States had reached the stage where only 10 to 12 per cent of the people did not own TV sets. Marketing research, he said, had not yet been able to see when a cycle of replacement of TV sets might occur and said the average life of the set might be anywhere from seven to thirteen years.

* * *

★ A Missiles and Systems Division has been formed by Canadiar Limited to serve as a self-contained unit under which will be consolidated all research studies made by the company in connection with guided missiles, automatic control equipment and other products not concerned with aircraft. The new division will equip itself to provide forceful competition to U.S. firms in its bid for a share in defense requirement business.

* * *

★ "Unemployment in the Canadian electronics industry is being caused by the rapidly rising rate of importation of foreign radio sets, particularly from the low-wage areas like Japan," said R. M. Robinson, retiring president of the Electronic Industries Association of Canada. In a brief to the Federal Government, the E.I.A. has pointed out that "it is vitally necessary that the 'made in Canada' program be so impressed on all Canadians that they automatically ask the question at the time of every purchase — Was this Made in Canada? — and if not, decline to purchase.

THINK OF MAGNET WIRE ... THINK OF PHILLIPS

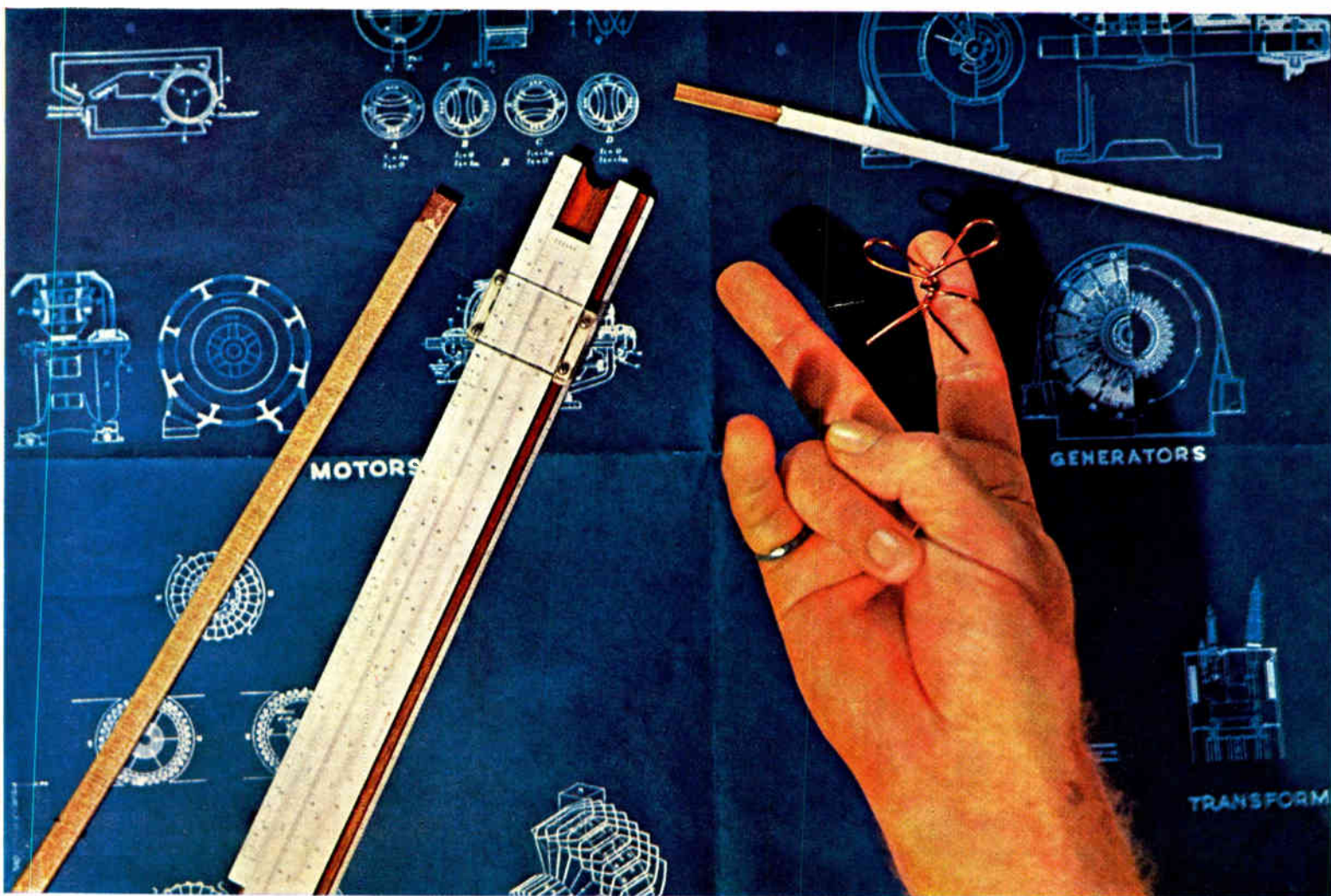
Significant changes are taking place in the Magnet wire field. Changes that may mark the beginning of a new era for magnet wire users. The successful development of Formel provided a reliable satisfactory wire for general winding purposes. Now, to meet the needs of industrial applications, the increase in Home Appliances, and the expansion in Electronics, a number of new and promising wires are being actively developed. These new types employ recently produced synthetics for their insulation, and are the result of months, even years, of painstaking research, selection, and testing.

Tests in which some of you may have participated. As a result, Daglas, Philsol, and Fuzel are now on the market, and others are coming.

You may be assured, that when new and improved magnet wires are needed—Phillips will have them.

Phillips Electrical Company Limited. Head Office—Brockville. Sales Offices—Montreal, Ottawa, Toronto, Hamilton, Winnipeg, Regina, Edmonton, Vancouver. The Canadian affiliate of the British Insulated Callender's Cables Group.

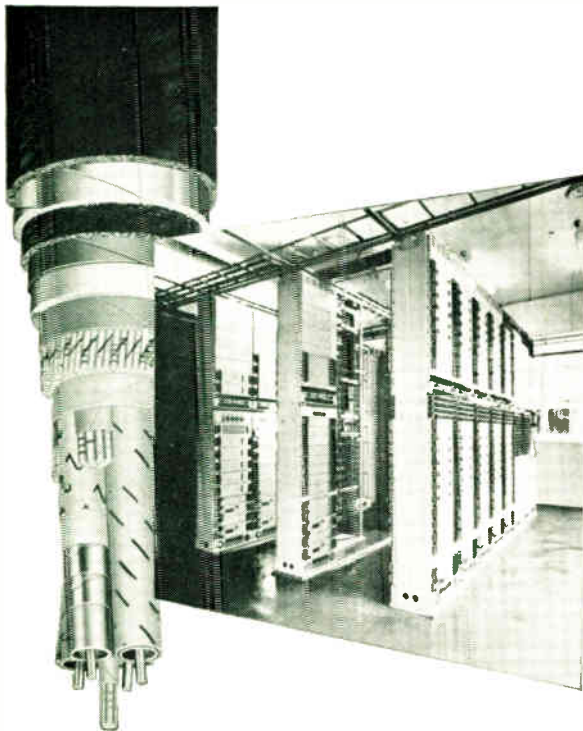
5718



PHILLIPS ELECTRICAL



COMPANY LIMITED



FIRST CO-AXIAL CABLE SYSTEM IN NEW ZEALAND

The first section of the new trunk telephone link in the North Island of New Zealand is now in service with the commissioning of the multi-channel carrier telephone system operating over co-axial cable between Auckland and Hamilton. On this section 240 circuits are to be provided initially; the system is extensible to 960 circuits. A.T. & E. Co. Ltd., were entrusted by the New Zealand Post Office with the supply of all the line transmission and terminal channelling equipment. BICC were responsible for the design, manufacture and installation of the co-axial cable in conjunction with the New Zealand Post Office. This is another example of a joint enterprise by two specialist organisations who undertake complete communication systems anywhere in the World.



**AUTOMATIC TELEPHONE &
ELECTRIC CO. LTD.**

STROWGER HOUSE, ARINDAL ST., LONDON, ENGLAND

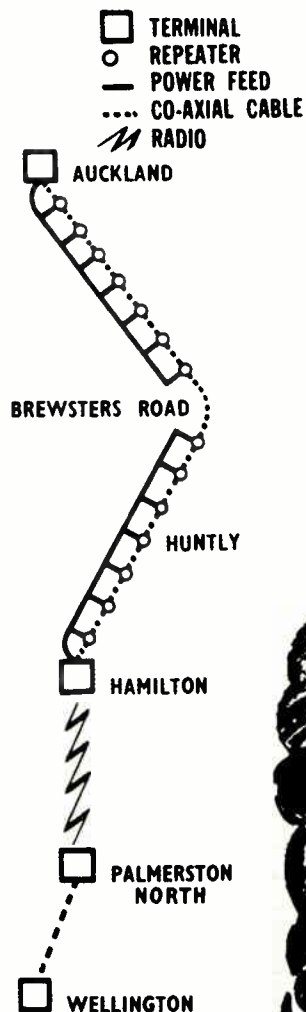
REPRESENTED IN CANADA BY AUTOMATIC ELECTRIC SALES (CANADA) LTD., 185 BARTLEY DRIVE, TORONTO 16



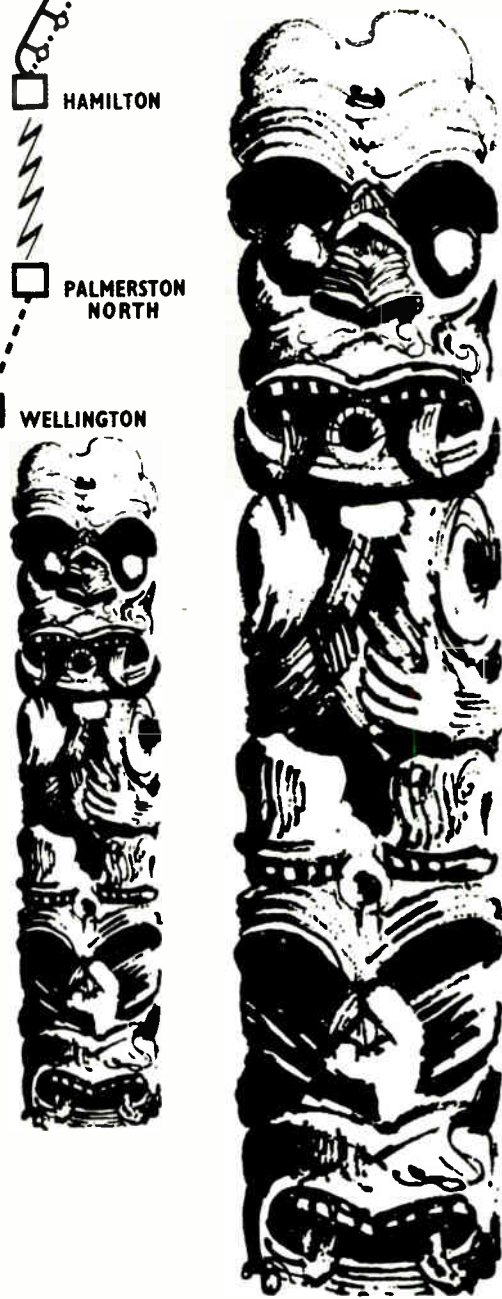
**BRITISH INSULATED CALLENDER'S
CABLES LTD.**

21 BLOOMSBURY STREET, LONDON, ENGLAND

For complete details check No. 8 on handy card, page 51



On the second cable link between Wellington and Palmerston North BICC have supplied the Co-axial Cable and ATE are supplying the Transmission equipment.

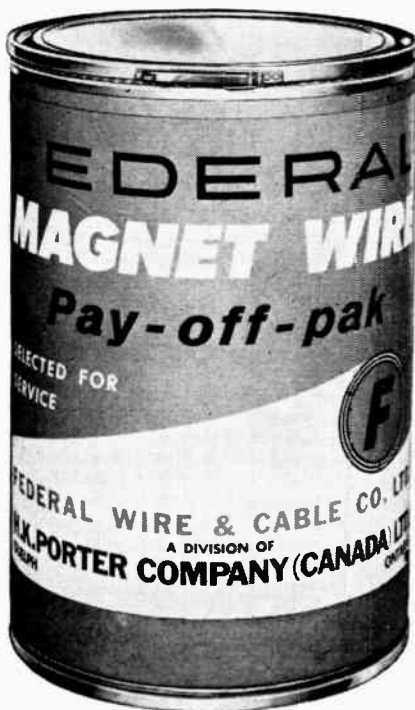
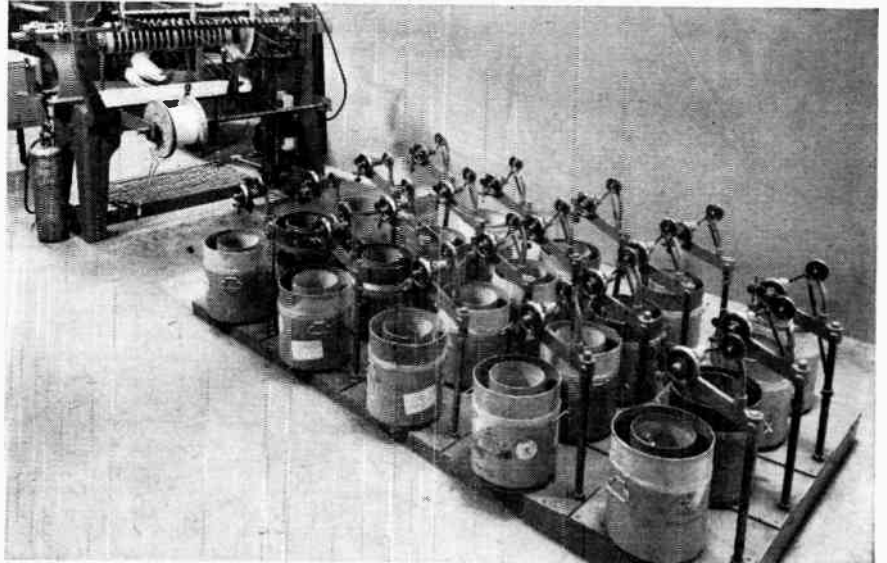


AT 14913

FEDERAL "Pay-Off-Paks"

pay off in *speed* and *profits*

This cost-reducing method of magnet wire packaging and handling, pioneered by Federal Wire in 1956, has been paying off in speed and extra profits on every installation. Simply open the container and thread. The wire pays off like a fisherman's line from a spinning reel. There are no backlash, over-run or inertia problems and most important—no stopping to solder during winding.



- One "Pay-Off-Pak" holds approximately 500 lbs. of size 12-23 magnet wire—replaces 10 reels—reduces soldering and downtime.
- "Pay-Off-Paks" eliminate need for a wide range of reel sizes.
- Reduced investment in returnable reels.
- Set-up time on the winding machines is cut to a minimum.
- Interlocking tops and bottoms allow storage in a minimum amount of space.
- Made of tough, reinforced fibre—standard-size container weighs only 22 lbs.
- Also sizes 21-29 available in 100 lb. "Pay-Off-Pak" and sizes 12-23 AWG in 250 lb. "Pay-Off-Pak."

**Speed up production with a Federal "Pay-Off-Pak".
You can depend on the quality of Federal Magnet Wire.**

5900

FEDERAL WIRE



& CABLE DIVISION

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PORTER SERVES INDUSTRY: with Rubber and Friction Products—THERMOID DIVISION; Electrical Equipment—DELTA-STAR ELECTRIC DIVISION, NATIONAL ELECTRIC DIVISION; Copper and Alloys—RIVERSIDE-ALLOY METAL DIVISION; Refractories—REFRATORIES DIVISION; Electric Furnace Steel—CONNORS STEEL DIVISION, VULCAN-KIDD STEEL DIVISION; Fabricated Products—DISSTON DIVISION, FORGE AND FITTINGS DIVISION, LESCHEN WIRE ROPE DIVISION, MOULDINGS DIVISION, H. K. PORTER COMPANY de MEXICO, S.A., and in Canada, Refractories, "Disston Tools," "Federal" Wire and Cable, "Nepconduct" systems
H. K. PORTER COMPANY (CANADA) LTD.

For complete details check No. 34 on handy card, page 51

LOW LEVEL INPUT AMPLIFICATION

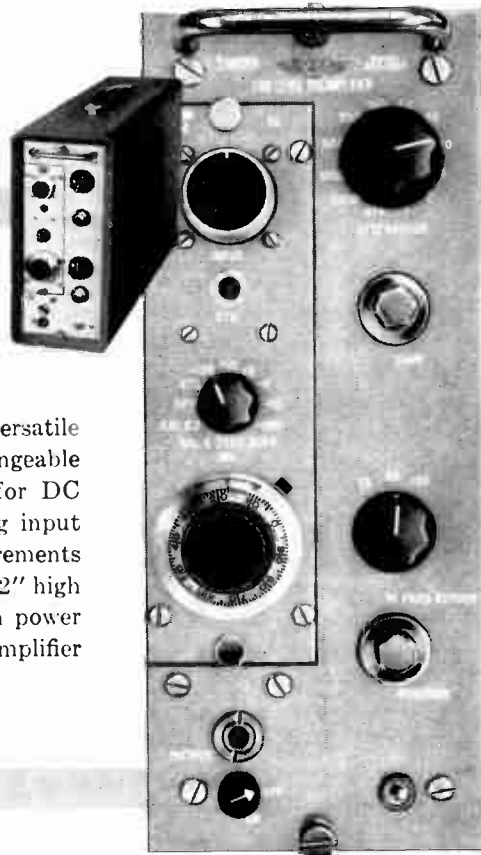
- 1,000,000:1 rejection ratio at 60 cps
- floating input
- isolated output

IN 2 NEW SANBORN CHOPPER AMPLIFIERS

INDIVIDUAL SET-UPS

portable, self-contained unit amplifier

The Model 350-1500 Low Level Amplifier provides extremely versatile measurement of low level signals through use of two interchangeable plug-in circuits — one for thermocouple applications, another for DC strain gage work (other plug-ins now in development). Floating input and isolated output make the 350-1500 useful when signal measurements are made in the presence of large ground loop voltages. The 10-1/2" high x 4-3 16" wide 350-1500 may be used individually with its own power supply to drive a 'scope, meter, optical element, etc. or as a preamplifier in 6- or 8-channel 350 series recording systems.



MULTI-CHANNEL INSTALLATIONS

8-unit 7" high modules for
"850" series direct writers

Compact Model 850-1500A Low Level Preamplifiers are economical, space-saving units for large installations such as aircraft and missile development and test facilities where many recording channels are used to monitor strain gage and thermocouple outputs. Required 440 cps chopper drive voltages can be supplied for up to 16 channels with the Model 850-1900 MOPA.

SPECIFICATIONS

	350-1500	850-1500A
Sensitivity	20 uv input for 1 volt output, or 10 chart div. with Sanborn recorder; X1 to X2000 attenuator	100 uv input for 1 volt output, or 10 chart div. with Sanborn recorder; X1 to X200 attenuator
Input	Floating, can be grounded	
Input Impedance	100,000 ohms	200,000 ohms
Output	Floating or grounded (independent of input)	
Output Impedance	350 ohms	
Output Capabilities	±2.5 volts across 1000 ohm load	
Bandwidth	DC - 100 cps (3db)	
Linearity	±0.1% of full scale	
Common Mode Performance	120 db for 60 cps and 160 db for DC with 5000 ohms unbalance in source	
Noise	2 uv peak-to-peak over a 0 to 100 cps bandwidth	
Drift	±2 uv for 24 hours	
Gain Stability	±0.1% for 24 hours (specifications subject to change without notice)	

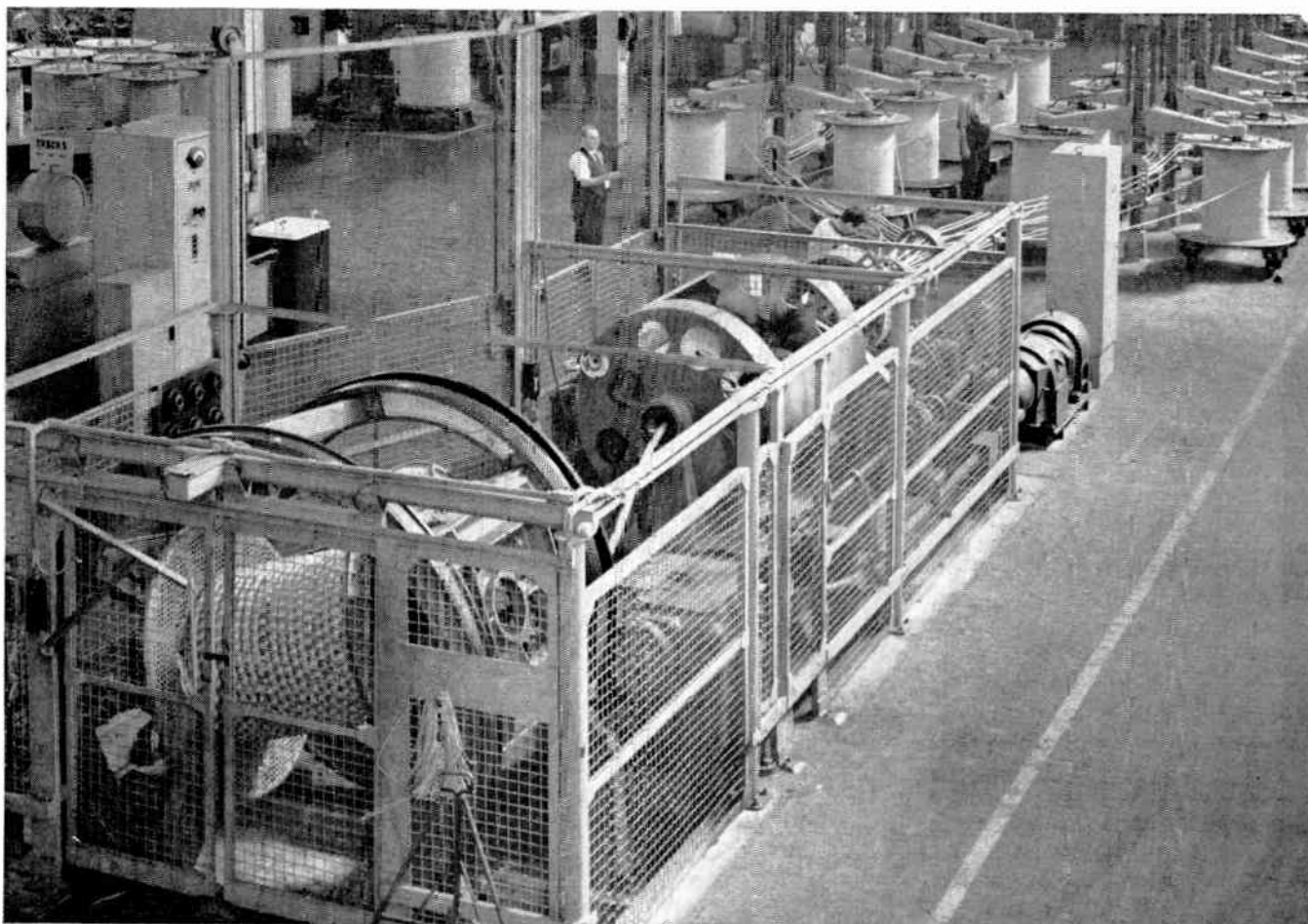
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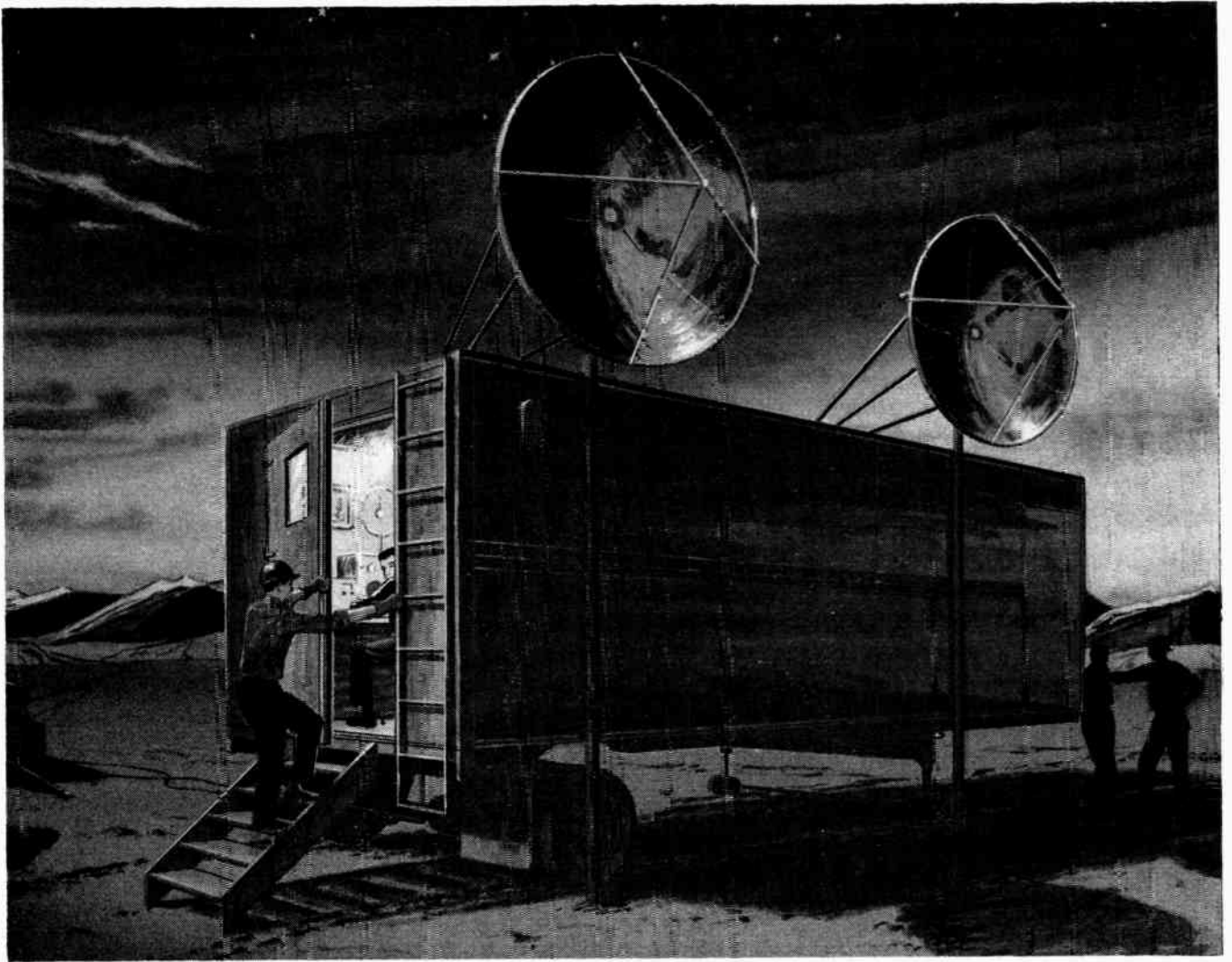
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Its name is MICROSCATTER—the most *compact* system ever developed for low-cost, long range tropospheric scatter communications.

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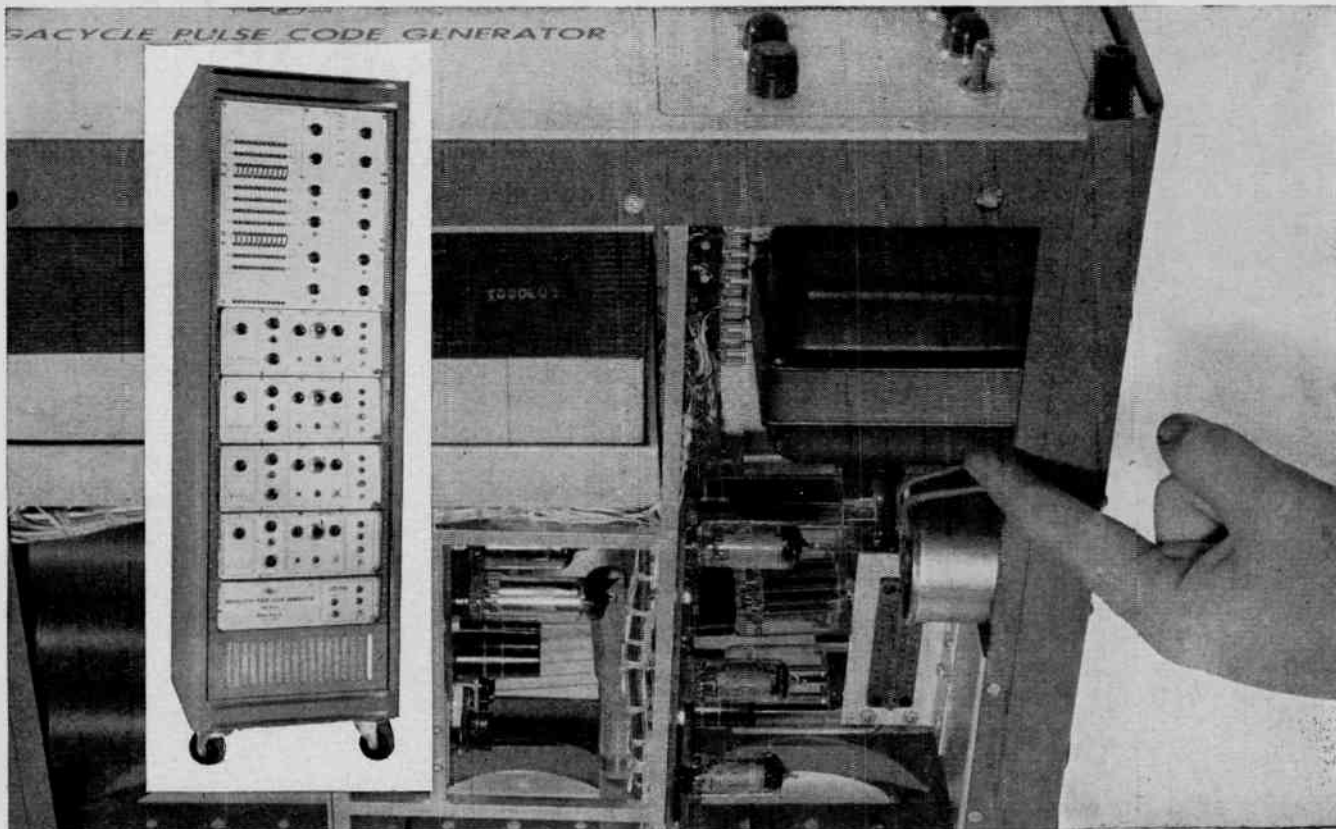
MICROSCATTER APPLICATIONS			
COMMERCIAL		MILITARY	
Fixed Station—120 telephone channels	—television and sound	Wide Band	—radar
			—data
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			—teletype
			—data
FEATURES			
• Frequency—4400-5000 mc		• Power—2 KW	
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A Westinghouse communications specialist will gladly furnish complete information on MICROSCATTER radio. Phone your nearest Westinghouse office, or write to Canadian Westinghouse Company Limited, Electronics Division, Hamilton, Canada.

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59A745



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Sola transformer regulates filament voltage within $\pm 1\%$ —protects tubes from inrush currents and line transients

Fluctuations in supply voltage for electron tube filaments can be costly . . . in shortened tube life . . . in substandard performance . . . in equipment downtime. Electro-Pulse, Inc. solved its filament voltage problems through this straightforward approach: the company's Megacycle Pulse Code Generator includes a Sola Constant Voltage Filament Transformer built-in as part of its power supply.

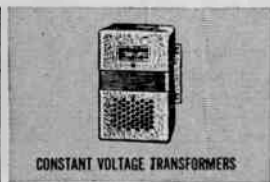
This versatile unit does the step-down job of a conventional transformer and it also regulates the filament supply — a task that ordinary filament transformers don't pretend to do. Filament voltages are stabilized to within $\pm 1\%$ even with line voltage variations as great as $\pm 15\%$. Its current-limiting characteristic protects tubes from cold inrush currents upon starting—as well as from line transients. It is a simple, reliable static-

magnetic regulator with automatic and virtually instantaneous action. Variations in input voltage are usually corrected within 1.5 cycles. There are no tubes or moving parts, and no manual adjustment or maintenance is necessary.

The filament voltage regulator illustrated is only one of a complete line of Sola Constant Voltage Transformers having wide application in electrical and electronic devices. They include such special types as harmonic-free, plate-filament, and adjustable output units—all provide the benefits of regulated input voltage. More than 40 ratings of these compact, economical regulators are available from stock, and Sola manufactures custom-designed units (in production quantities) to meet special needs.

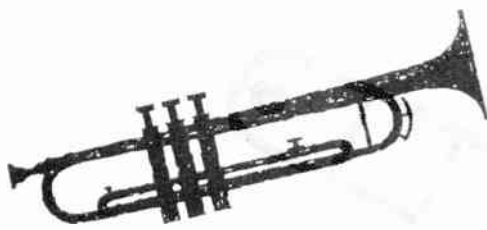
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Output is constant within ± 1 db over the full frequency range, and is adjustable from +20 dbm (3 volts rms) to -110 dbm (0.1 μ v rms). No level adjustments are required during operation.

SPECIFICATIONS

Frequency Range: 50 kc to 65 MC in 6 bands.

Frequency Accuracy: Within $\pm 1\%$.

Frequency Calibrator: Crystal oscillator provides check points at 100 kc and 1 MC intervals accurate within 0.01% from 0° to 50° C.

RF Output Level: Continuously adjustable from 0.1 μ v to 3 volts into a 50 ohm resistive load. Calibration is in volts and dbm (0 dbm is 1 milliwatt).

Output Accuracy: Within ± 1 db into 50 ohm resistive load.

Frequency Response: Within ± 1 db into 50 ohm resistive load over entire frequency range at any output level setting.

Output Impedance: 50 ohms, SWR less than 1.1:1 at 0.3 v and below.

Spurious Harmonic Output: Less than 3%.

Leakage: Negligible; permits sensitivity measurements to 0.1 μ v.

Amplitude Modulation: Continuously adjustable from 0 to 100%.

Internal Modulation: 0 to 100% sinusoidal modulation at 400 cps $\pm 5\%$ or 1000 cps $\pm 5\%$.

Modulation Bandwidth: Dc to 20 kc maximum.

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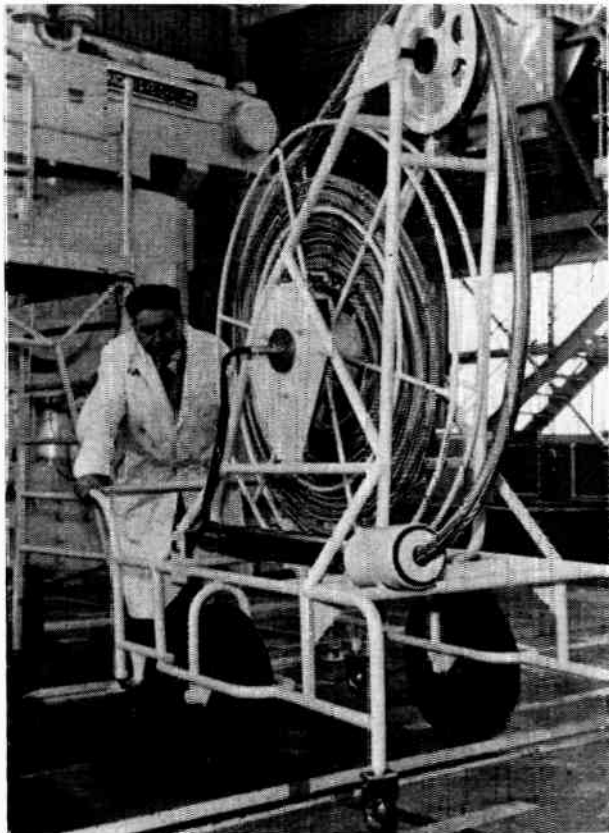


Figure 1. Gas cooled camera complete with transporter mechanism.

In the age of nuclear power the faculties of man have fortunately been extended by

Closed circuit television for nuclear applications

by W. Jones*

Successful controlled release of atomic energy, on an economic basis has been made possible by every branch of engineering contributing its particular basic principles and techniques; in some instances, problems have been solved which would formerly have been considered insoluble. Tasks which are simple when performed with the aid of hands and eyes must now be carried out in regions which are inaccessible to man. To accomplish this, the normal faculties of man require extension by mechanical and electronic means so that, for instance, machines which are completely enclosed by lead and concrete function correctly without any direct sensory control between the machine and the

operator.

This need for the remote location of equipment is a major factor in the complexity of the engineering required in atomic energy installations.

Closed circuit television is the obvious substitute for human sight and when properly applied, adequately extends the human sense into the complex machinery which man is able to devise.

The United Kingdom Atomic Energy Authority were the first to use television wherein cameras are inserted into the gas cooled moderated reactors at Calder Hall.

*General Manager, Transmission Division of Pye Canada Limited.

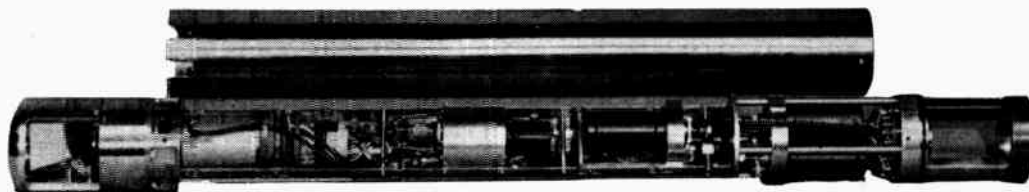


Figure 2. Gas cooled camera head showing internal construction.

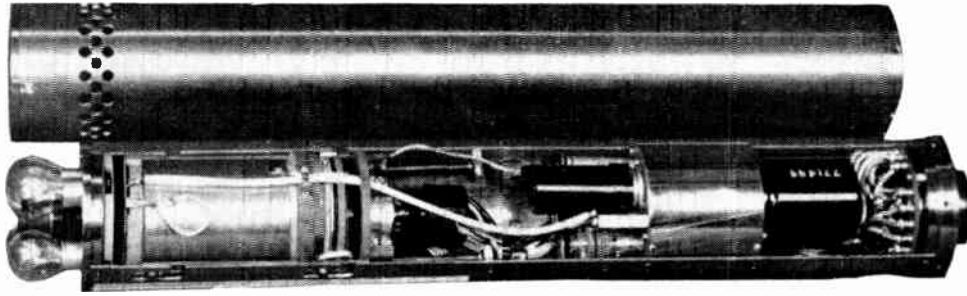


Figure 3. Escape gas cooled camera head.

These reactors were the first nuclear power plant in the world to feed electrical power into a national power distribution network. By the end of 1958 approximately 750 million kilowatts had been fed into the national system by two reactors. At the present time four reactors are working at Calder Hall.

The type of camera used at Calder Hall is shown in Figure 1, complete with transporter mechanism.

Design of the television camera for gas cooled reactor inspection

The camera is designed to operate within the fuel or control rod channels of a reactor under shut down conditions. It is 3.5 inches in diameter and approximately 48 inches in length. The assembly is lowered into the reactor supported on a flexible stainless steel covered cable. The camera can be operated at an ambient temperature of 200°C, the interior of the camera being maintained at a much lower temperature of approximately 50-60°C, by means of cooling by carbon dioxide gas supplied through the stainless steel supporting cable from an external supply. The cooling gas passes through the camera and escapes into the reactor.

The camera itself is contained within a stainless steel cylinder, with remote optical focussing accomplished by moving the pick up tube relative to the fixed lens. The pick up tube carriage assembly is motor driven and counter balanced to ensure even focussing action, regardless of the inclination of the camera. (See Figure 2.)

The optical system consists of a 1 inch f1.9 lens with a horizontal viewing angle of 28°. Built in lighting is provided by four 25 volt incandescent lights grouped around the lens, giving sufficient illumination to observe objects at distances of up to three feet when operating in a black graphite fuel channel. (See Figure 3.)

All components in the camera have been designed for the maximum resistance to radiation damage.

Camera attachments

To achieve all round viewing a plane mirror is mounted in front of the lens, lying along the optical axis of the camera. The mirror can be tilted by a motor drive controlled remotely, enabling inspection at right angles to the optical axis. A second motor within the camera controls the rotation of the mirror about the optical axis giving 360° viewing in a plane normal to the camera axis.

Manipulator attachments are provided which are capable of grasping small objects located in front of the camera. The manipulator motions are controlled by an electric motor contained within the camera. The

manipulator is so designed that it does not obstruct forward viewing of the camera. (See Figure 4.)

With further attachments, the camera and manipulator are capable of lifting heavy loads such as the fuel elements.

Cable and coolant hose

A standard type of television camera cable connects the camera to the control equipment. For the reactor inspection application, the cable is contained within a stainless steel hose which carries the cooling gas into the camera and supports the weight of the camera when lowered into the reactor.

To facilitate handling on the reactor charge floor, the complete equipment is split into two sections, each mounted on a four wheeled tubular steel carriage.

The camera itself is transported on the hose and

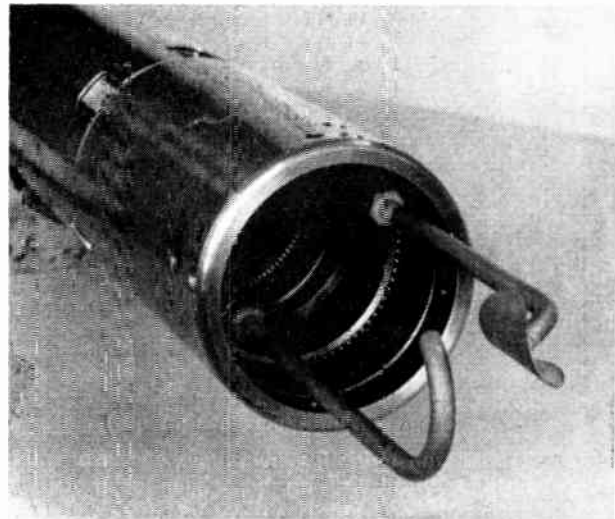


Figure 4. One type of manipulator head.

winding carriage, equipped with a drum from which the camera supported by the stainless steel hose is lowered through one of the stand pipes on the charge floor into the reactor.

The raising and lowering function is power operated by means of a variable speed drive. A depth indicator is provided.

The second and smaller carriage houses the camera control equipment, consisting of the camera control panel, the camera control unit and the picture monitor. The camera control panel mounts all the controls for the system, including those for the mirror or grab attachment operation. (See Figure 5.)

The camera control unit provides all the necessary pulse generation, waveforms, and video amplification required for operation of the camera.



Figure 6. Water cooled camera head.



Figure 5 (left). Control equipment transporter.

The picture monitor displays the resulting video signal from the camera.

Operating conditions — gamma radiation

A useful operating life is obtained with 1 Mev gamma photons in the range 10^6 to 10^8 R/hour. The operating life is defined at the time interval between the replacement of those components susceptible to radiation and corresponds to a total dose in the range of 10^7 to 10^8 rads.

Neutron radiation

The camera is intended for operation in a reactor shut down condition, i.e. the neutron flux should be less than 10^6 neutrons $\text{cm}^{-2}\text{sec}^{-1}$.

Temperature

The design of the camera cooling system permits the use of the camera in a reactor at a temperature of 200°C without the camera internal temperature exceeding 50°C .

Pressure

The camera is designed to be inserted into a reactor under depressurized conditions, when the internal pressure is roughly atmospheric.

Coolant

Since the camera is designed for use in graphite-moderated carbon dioxide cooled reactors, the coolant used is carbon dioxide at a pressure of 150 psi.

Inspection camera for watercooled reactors

The water cooled camera is primarily intended for close observation of the core and control mechanism of a water cooled reactor of the swimming pool type. The equipment, however, lends itself to applications in connection with pressurized water and similar reactors.

The totally sealed camera is 3 inches in diameter and approximately 48 inches long, resembling the gas cooled reactor camera, but may be immersed in light or heavy water. There are no grab facilities. Remote control allows forward or right angle viewing with the camera being physically rotated to view through 360° . The camera is self illuminating and made of stainless steel or pure aluminum. (See Figure 6.)

The camera terminates in a socket which is plugged into the watertight connector on the end of a tubular extension shaft. The opposite end of the tubular extension terminates in a socket and a number of these stainless steel or pure aluminum 10 foot rigid extension shafts can be connected in series to obtain the required length. The flexible television camera cable can be connected to the end distant from the camera.

Similar control equipment is provided as with the the gas cooled camera.

Specification

The closed circuit camera operates on the standard broadcast system, namely 525 line, 60 field interlace for the North American continent. Resolution is of the order of 600 lines utilizing vidicon type pick up tubes.

In this article the characteristics of open-wire lines and cables in the 150 kc to 350 kc region are discussed.

Behavior of open-wire lines and cables at frequencies above 150 kc

Courtesy — Lenkurt Electric Co. of Canada Ltd., Vancouver, B.C.

In the development of carrier systems for toll transmission, the channel capacity of an open-wire lead or a multi-pair cable was increased by using higher and higher frequencies. For a number of reasons, the maximum frequency commonly used for medium- and long-haul toll circuits in the United States is about 156 kc for open-wire lines, and 264 kc for multi-pair cable. However, higher frequencies are used for carrier channels applied to coaxial cable.

Recently, carrier systems for subscriber service have been developed to operate at frequencies up to about 350 kc. In this article, the characteristics of open-wire lines and cables in the 150-kc to 350-kc region are discussed.

Unprecedented demand for telephone service has been felt strongly in rural areas as well as in the urban and suburban areas. This demand has occurred at a time when telephone service is being "up-graded" in anticipation of Direct Distance Dialing; so that in addition to increasing the service in rural areas it is also necessary to improve this service.

The extension and improvement of rural service is being met in a number of ways. For example, multi-pair 19-gauge voice-frequency loaded cable is being installed in some areas. The cable provides the backbone of the rural service line, and open-wire drops extend from the main cable to the subscriber location.

Another method which has been gaining in popularity in the last few years is in the use of carrier that is designed for rural subscriber service. In this application,

the subscriber end of the carrier channel and its associated equipment effectively provide the central-office facilities (talking battery and ringing current) as well as the communication channel — but at a location remote from the office. A number of subscribers may obtain service from one carrier channel.

In many cases, the toll-lead route will be followed by the rural lead from the central office to the outlying areas. Where carrier is used on the toll lead, coordination is necessary between the subscriber carrier and the toll carrier. The number of channels of subscriber carrier which may be used will depend upon the frequency spectrum occupied by the toll circuit. For this is well as other reasons, the frequency spectrum for some of the subscriber-carrier channels is above that used for toll applications.

A number of different types of wire and cable are used for rural subscriber circuits. Before carrier can be applied to a rural line the characteristics of the wire or cable should be known. Among the characteristics which should be considered are: (1) wire type and size, (2) line transposition, (3) attenuation, (4) crosstalk and (5) noise.

Effects of wire types and sizes

Various types and sizes of wire are used in open-wire line construction. While copper is the better conductor, iron and steel wire are sometimes used because of their greater mechanical strength. However, iron wire or

Channel Number	Line Frequencies in Kilocycles							
	"A" Allocation		"B" Allocation		"C" Allocation		"D" Allocation	
	West	East	West	East	West	East	West	East
1	50	65	57.5	72.5	50	335	57.5	342.5
2	80	95	87.5	102.5	65	320	72.5	327.5
3	110	125	117.5	132.5	80	305	87.5	312.5
4	140	155	147.5	162.5	95	290	102.5	297.5
5	170	185	177.5	192.5	110	275	117.5	282.5
6	200	215	207.5	222.5	125	260	132.5	267.5
7	230	245	237.5	252.5	140	245	147.5	252.5
8	260	275	267.5	282.5	155	230	162.5	237.5
9	290	305	297.5	312.5	170	215	177.5	222.5
10	320	335	327.5	342.5	185	200	192.5	207.5

Figure 1. Frequency allocation chart of an FM subscriber-carrier system.

ungalvanized steel wire are rarely used in new construction. Copper-clad steel wire is becoming increasingly popular because it combines the strength of steel and the superior conductivity of copper.

The kind of wire as well as the size used in open-wire construction has a bearing on the attenuation. Over the frequency range from 1 kc to 360 kc, 102-mil copper-clad wire with a 30 per cent copper content is more efficient than 80-mil copper-clad wire with either a 30 or 40 per cent copper content; and above 220 kc a 102-mil, 30 per cent copper-clad wire pair is more efficient than a 104-mil, 40 per cent copper-clad wire pair. The attenuation of a 102-mil, 30 per cent copper-clad open-wire pair with 12-inch spacing is only 0.56 db per mile at 360 kc, when using 25.5 pairs of #17 insulators per mile. Solid 104-mil copper-wire pairs, using the same wire spacing, but supported by 53 pairs of CS insulators per mile, have an attenuation loss of 0.65 db per mile at 360 kc, and when using 53 pairs of DP insulators per mile, the attenuation increases to 0.84 db per mile.

The attenuation in steel and iron wire is considerably greater than in copper or copper-clad steel wire. The attenuation of a 109-mil high-strength, zinc-galvanized steel wire pair, when new, is 5.16 db at 360 kc. The attenuation increases as the zinc coating thickness decreases from weathering. When the zinc coating is reduced in half, the attenuation at 360 kc increases to 6.63 db per mile and when the coating has completely eroded, the attenuation increases to 7.76 db per mile. The loss becomes even higher when the wire rusts or becomes pitted.

Insulated wire is sometimes used in carrier system applications. The insulation protects the conducting surface from the elements, thus reducing corrosion. In addition, a sturdy insulating jacket can reduce the effects caused when the wire rubs against trees and other objects. Depending upon the kind of insulation, however, an insulating jacket can introduce increased attenuation if it becomes saturated with moisture. This effect increases with higher frequencies since the portion of current that will flow in the damp insulating medium becomes greater because of skin effect which increases with frequency. This undesirable effect is minimized in new types of insulated wire, specifically designed for carrier applications, which employ modern insulating materials.

There is a considerable variance in attenuation among different kinds of cable. The highest losses occur in paper insulated cable with small size conductors. In cable with 26-gauge conductors, the attenuation at 360 kc is 26 db per mile compared to 12 db per mile for paper-insulated cable with 19-gauge conductors. Polyethylene-insulated cable is somewhat more efficient at these frequencies; the attenuation in cable with 19-gauge conductors being 11.8 db or 0.2 db better than paper-insulated cable.

Attenuation of the relatively new multi-pair plastic rural-distribution cable, under dry weather conditions, is very close to that of paper-insulated DNB exchange-area cable with 19-gauge conductors. Rural-distribution cable is currently used primarily for voice frequency distribution, although it has also been used for

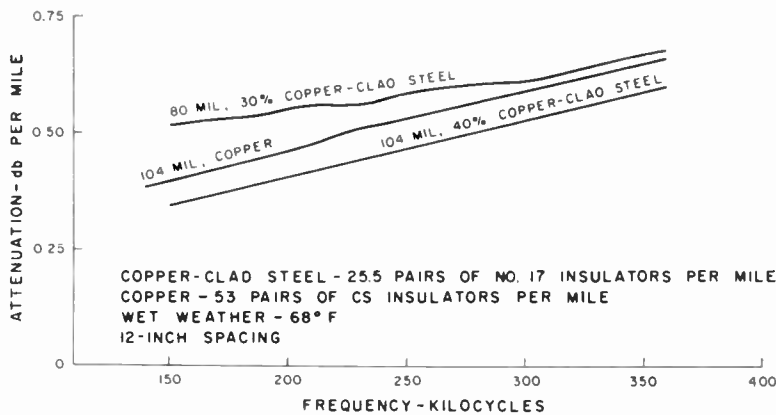
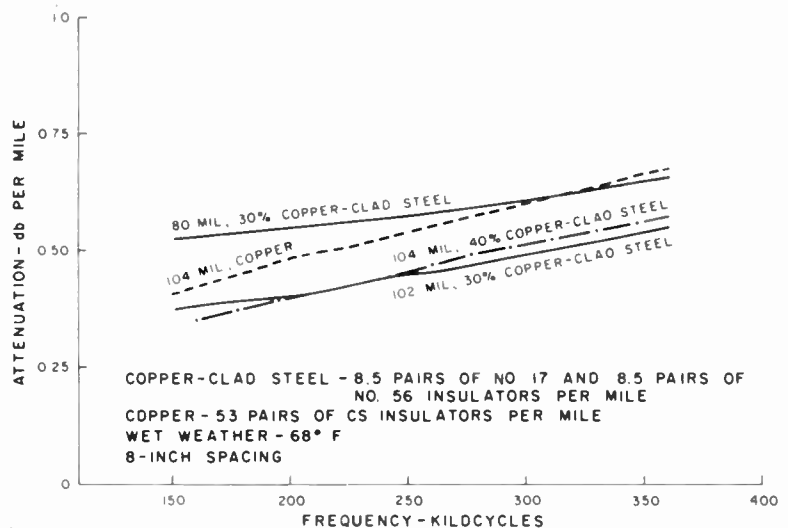


Figure 2 (Left). Frequency-attenuation characteristics of copper-clad steel and hard-drawn copper open-wire pairs spaced 12 inches apart.

Figure 3 (Right). Frequency-attenuation characteristics of copper-clad steel and hard-drawn copper open-wire pairs spaced 8 inches apart.



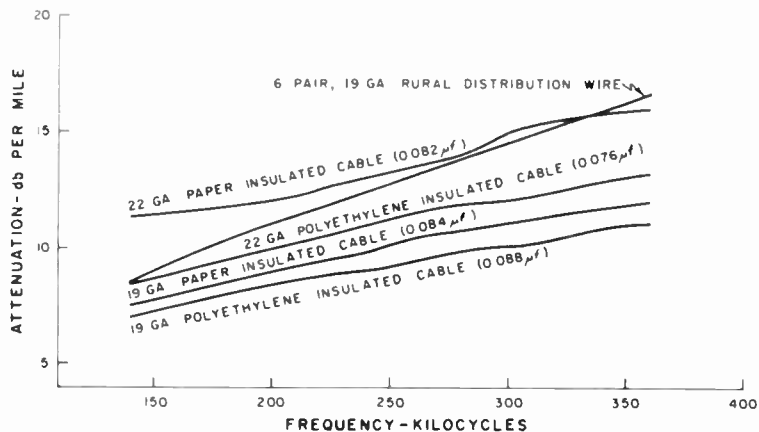
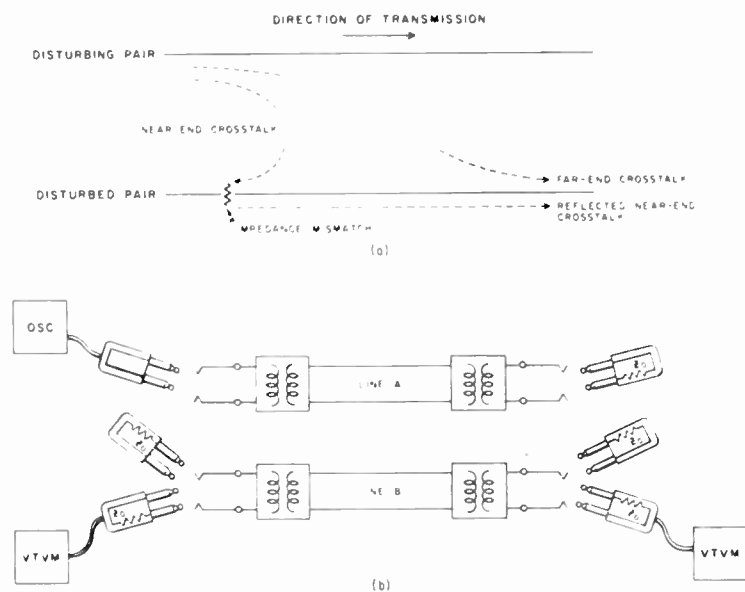


Figure 4 (Left). Frequency-attenuation characteristics of multipair cable and rural distribution wire.

Figure 5 (Right). Crosstalk — (a) An illustration of a way in which near-end and far-end crosstalk may occur. (b) A test set up for measuring crosstalk coupling losses.



subscriber-carrier applications. In a 6-pair rural-distribution cable the attenuation when wet is 16.6 db per mile at 320 kc, and 10.2 db per mile at 180 kc. When dry, the attenuation is about one-half as great. The wet weather conductance (leakage) of this cable is about ten times as great as when dry.

Rural-distribution cable has much to offer in the way of convenience in installation and its life is estimated at about 15 years. However, because of the relatively high attenuation at high carrier frequencies, the distances over which it can be effectively used is limited.

Effect of wire spacing

Whether the conductors are spaced eight inches or 12 inches apart has little effect on the frequency-attenuation characteristics of an open-wire pair. At 180 kc the attenuation per mile is 0.43 db for 12-inch spacing and 0.45 db for eight-inch spacing. When the wires are spaced 12 inches, the attenuation at 360 kc is 0.65 db per mile compared to 0.67 db per mile for eight-inch spacing.

However, where high carrier frequencies are used, it becomes increasingly difficult as the frequency increases to adequately reduce the crosstalk coupling effects between paralleling pairs. To overcome this difficulty, it is necessary, in addition to employing suitable transposition patterns, to employ wire spacings

that will materially reduce the coupling coefficients between the various wires on the line. This has quite generally led to the use of eight-inch, and to some extent six-inch, spacing of wire pairs, and a corresponding increase in the spacing between pairs.

In addition to reducing the crosstalk coupling, closer-spaced wires are also effective in limiting the noise due to induction, static, long-wave radio or other external sources of interference.

Line transpositions

Absorption effects, caused by induction into surrounding circuits and producing drastic attenuation at certain frequencies, can be eliminated by using an appropriate transposition plan. Crosstalk and the pickup of radio and other interference can also be reduced by proper transposition of open-wire pairs, particularly where more than one carrier system is to be applied to the same open-wire lead.

Absorption effects, which cause transmission distortion, can be eliminated automatically by transposing lines to avoid crosstalk between like carrier systems. This may not be true, however, when all of the pairs on a line are not correctly transposed. A continuous succession of identical transposition sections will increase the likelihood and prevalence of absorption peaks while on the other hand a random succession of transposition sections of different lengths will reduce absorption effects.

Different transpositions are required at frequencies above 150 kc than for lower frequencies. For example, a pair transposed for a carrier system operating at up to 140 kc might have severe absorption peaks at frequencies above 200 kc.

Measurement of line attenuation

Transmission measurements may be made by applying a signal at one end of the line through a suitable matching transformer and measuring the signal level at the other end of the line with a frequency-selective voltmeter, suitably terminated and also connected through a matching transformer.

The signal source may be an oscillator with an output of at least +20 dbm and tunable over a frequency range of 5 to 350 kc. The frequency-selective voltmeter should be capable of measuring levels down to about -70 or -80 dbm over the same frequency range. The matching transformers must be capable of passing the frequencies involved.

Laterals, drops and spur lines should be disconnected from the main pair or treated with appropriate way-station filters when making initial transmission tests.

Crosstalk

When several carrier channels are applied to an open-wire lead crosstalk may occur. Crosstalk can be reduced by avoiding duplication of the same carrier frequencies on the same lead (different pairs), and by staggering the frequencies of the various channels.

Construction irregularities, such as difference in the sag of the various wires in each span, particularly between the two wires of each pair, will cause crosstalk. Variation in spacings of the wires may also contribute to crosstalk.

While like carrier systems can be used on the same pole line, when pairs are properly transposed, the use of two carrier channels, operating on the same frequency, should be avoided.

When several carrier channels are applied to various pairs on a lead, proper transposition is normally required. In some instances, it may not be possible to make use of all available channels due to excessive crosstalk interference from radio stations, or absorption at certain frequencies.

Measuring crosstalk

Crosstalk can be measured using the same instruments as were used for measuring attenuation. To measure "far-end" crosstalk from line A to line B, as shown in Figure 5 for example, the signal generator is connected through a suitable matching transformer to one end of line A, the other end of line A is terminated. The frequency-selective voltmeter is connected to the far end of line B, suitably terminated through a matching transformer, while the near end of line B is terminated, usually through a matching transformer. If the attenuator characteristics of line A are identical to line B, the far-end crosstalk coupling in db is the difference between the levels of the received

signals at the far end of A and B.

"Near-end" crosstalk may be measured by connecting the frequency-selective voltmeter to the near end of line B, while continuing to apply a signal at the near end of line A. The far end of each line is terminated.

Noise

Noise is caused by static, dust storms, radio storms, power-line carrier systems, electrical-power transmission lines and electrical equipment which may be operating near telephone lines and drops. In some areas, power-line carrier systems employing both AM and FM sub-carriers, may be operating near telephone lines and may introduce noise into the carrier channels. Some of these power-line carrier systems employ transmitters of considerable power and, when not in good order, may radiate spurious signals of the same frequency as some subscriber carrier channels.

Noise can sometimes be alleviated by transposition of lines and otherwise eliminating line unbalance. In some cases it may be necessary to avoid the use of certain carrier channels on a specific line, if the trouble cannot be corrected by improving the line or stopping the cause of the noise at its source.

Effects of splices

Improper splices can cause problems, including the introduction of noise. A bad splice may act as a rectifier or detector, demodulating two or more radio signals picked up by the line and interjecting the sums, differences and other combinations of these signals into the line as noise. Splices can cause vastly different effects at the higher carrier frequencies than at voice frequencies.

Twisted splices, if used, should be well soldered. Splices of copper-clad steel or copper wire to steel should be made with special splicing sleeves designed for this specific purpose. When splicing copper to copper or steel to steel, standard compression sleeves may be satisfactory.

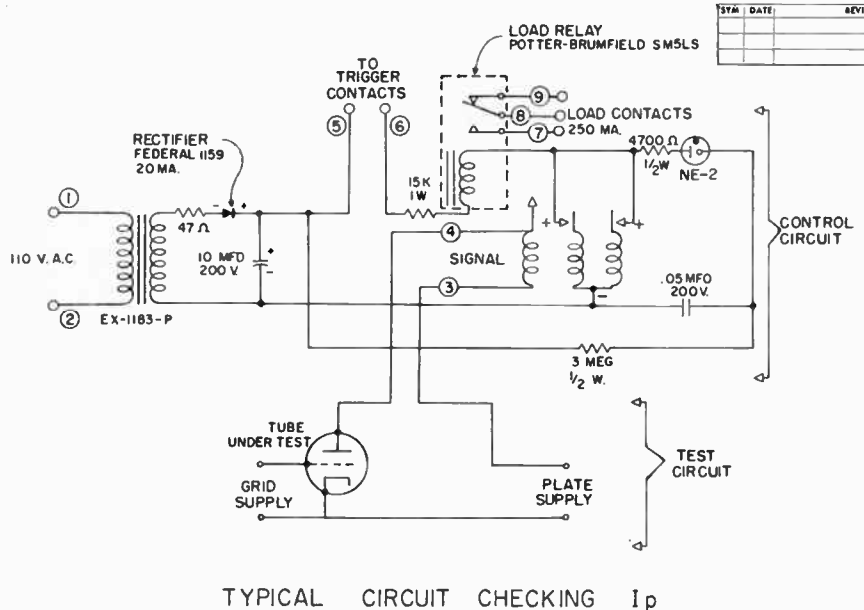
Effects of weathering

Weathering of lines also causes adverse effects. The attenuation of a steel wire from which the zinc coating is partially or fully eroded is considerably greater than in new galvanized wire. Pitting, rusting and corrosion also increase attenuation and cause line unbalance. Dirty and broken insulators may cause excessive leakage. In the case of insulated wire, weathered insulation may permit the accumulation of moisture along the surface of the conductor, introducing attenuation which increases sharply with frequency.

Conclusion

Although a number of factors must be considered before high-frequency carrier is used to extend subscriber loops, the improvement of service and the ease with which additional subscribers may be added make the use of subscriber carrier attractive for many rural applications.

★ Engineers were told at a recent meeting of the American Society of Mechanical Engineers that they are frequently not considered for management positions because their view of industrial operation is too narrow. They were allowed consolation, however, in the statement that many other professions are similarly myopic, including accountants, marketing experts, labor relations men and purchasing personnel.



Circuit diagram of equipment for checking 20 characteristics per tube at 2000 tubes per hour, shown at left, is built around 60 meter relays.

Vacuum tube testing at the rate of 2000 tubes per hour is the performance of

Versatile Custom built tube tester

Electrical characteristics are being automatically tested four times faster than formerly by two giant machines recently installed on its production lines by Tung-Sol Electric, Inc.

Built by their own engineers around versatile instruments called meter-relays, the machines also improve product quality by eliminating human error and by checking product characteristics more thoroughly than human beings can. Operators are needed only to load and unload the machines.

Currently operating in Tung-Sol plants at Washington, N.J., and Weatherly, Pa., each machine tests approximately 1200 vacuum tubes per hour — and has a theoretical capacity of 2000 tubes per hour.

Moving on a belt conveyor with 80 test sockets, each tube is tested for up to 20 separate characteristics and is automatically rejected and sorted if found deficient in any characteristic. With easy adjustments, the machines will test practically all of the approximately 1000 present types of vacuum tubes.

The design principles used in the machines could be adapted to test similar characteristics of other electrical and electronic components. Among the characteristics being tested are filament currents, short circuits, plate and screen current, gas current, mutual conductance, heater cathode leakage, cathode emission, voltage gain and cut-off currents.

Sixty meter-relays are incorporated in each machine. The meter-relays, each assigned a different task, indicate and control all conditions of all circuits at all times. Besides testing tube characteristics, the meter-relays also monitor all voltages used and will automatically shut the conveyor down if any improper test conditions develop.

Adjustable pointers of the meter-relays are set at high and low limits, marking the "satisfactory" range of the electrical characteristics being tested. The meter-relays used range from low microammeters, with

full-scale ranges of 0 to 5 microamperes, to high milliammeters, which have full-scale ranges of 0 to 500 milliamperes.

In an average of approximately one-third of a second, each meter-relay (1) measures an electrical property and indicates its magnitude on a dial; (2) causes a tube to be rejected if it is faulty; and (3) resets its circuit so that it is ready to test another tube.

Technically, the reject operation proceeds as follows. A moving pointer on the meter-relay, indicating the minute electrical current through a portion of the tube, meets either the high or low fixed pointer. Contacts on the pointers touch and lock electro-magnetically, closing a circuit through them. This circuit closure actuates a load relay that in turn closes the contacts of a heavy duty power relay. The latter actuates a counter that keeps track of the number of tubes rejected for that particular characteristic. The power relay also breaks the circuit to a reject solenoid coil. A plunger is released which pushes the defective tube from its testing socket at the proper time so that it falls down a chute with other tubes rejected for the same test.

The testing machines were built around meter-relays because they are reliable and easier to work with.

The meter-relays read signals direct from the tubes being tested and rarely need calibration. All factors considered, use of meter-relays also simplifies maintenance, according to company engineers.

Operational experience has proved that only an "amazingly small" amount of maintenance and adjustment is required to keep the system functioning. Meter-relays have been in service with a satisfactory record of operating millions of times with contacts closing several hundred thousand times.

From 15 to 30 minutes is required to change over a machine for testing a different type of tube. Resetting the limit pointers of the meter-relays accounts for most of this time.



Figure 1

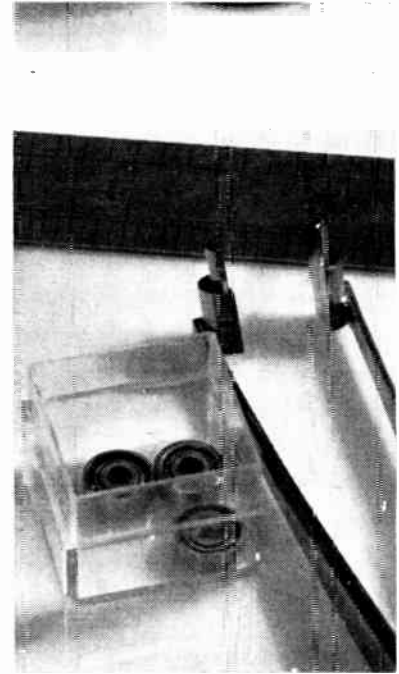


Figure 2

**Stringent demands for cleanliness
in missile component assembly
lean heavily on the use of**

Ultrasonic cleansing of precision parts

Clearances measured in microinches are now common for components for the advanced instrumentation used in the latest aircraft and guided missiles. Even the smallest speck of dust may interfere with the functioning of such parts, while a particle of metallic dust can result in disastrous galvanic corrosion. To achieve the necessary degree of cleanliness, very stringent precautions are necessary.

Figure 1 shows the ultraclean room of a firm responsible for the assembly of classified instrumentation. This room, which is air conditioned to give a relatively low humidity, is lightly pressurized so that dust cannot be carried in by drafts. Before entering the room, overalls and caps of a long-staple rayon material — slightly hygroscopic and non-“static” in character — must be donned. Even the camera, although clean by normal photographic standards, had to be specially processed before permission was given to take the accompanying illustrations. Admittance to the room is gained through an airlock, any attempt to open both doors simultaneously being signalled by a loud alarm bell. The room itself is paved with special polyvinyl chloride, while all furniture is of corrosion-resistant aluminium or stove-enamelled steel with stainless steel working surfaces. Suction tubes are provided throughout to remove the slightest trace of particulate matter instantly it is sighted and before it has any chance to find its way into a component.

Such cleanliness precludes the use of normal cleaning methods. Instead the last traces of dirt and contamination are removed from all components by a Dawe Type 1150 Ultrasonic Cleaner. The transducers of this unit, powered by the main oscillator, feed an

average power output of 125 watts into the cleaning tank at a frequency of 40 kc/s, which is sufficiently far above the audio range not to be heard. The ultrasonic signal, converted into mechanical vibration by the transducer, gives rise to “cavitation” as succeeding waves of compression and rarefaction cause millions of microscopic vapor bubbles to form and collapse almost immediately. The effect is equivalent to a brush with very small and finely spaced bristles being passed vigorously over the surface many thousands of times each second. The ultrasonic energy can even be beamed down holes, bores, and slots less than 0.001 in. wide, so that bearings like those in Figure 2 are thoroughly cleaned in the fully assembled condition.

The cleaning fluid used in this case is white spirit, which combines a wide solvent action with a fairly low evaporation rate, so that, during drying, there is little risk of the component falling below the dew point and attracting condensation. The component is suspended in the fluid on the end of a hook looped over the side of the beaker, an evaporation dish being placed over the top to prevent the entry of any foreign matter which may have escaped the precautions described above. The white spirit is changed after washing each component and is then distilled and filtered through 1-micron paper before re-use.

After cleaning for a time, which experience has shown to be sufficient to remove any trace of soil, the components are dried in a fume cupboard. Before placing in the small, transparent plastic boxes used for storage (see Figure 2), each component is individually inspected for cleanliness under a microscope.

TOLL MAINTENANCE ISN'T EASY

Communication equipment has become increasingly intricate to cope with the requirements of modern communications. Consequently Toll Maintenance has become more and more specialized and complicated. The Toll Maintenance man is now a key figure in the modern communication picture. He requires qualities of knowledge, judgment, efficiency and endurance. But even then he has difficulties.

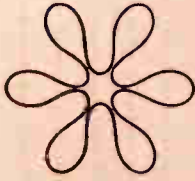
One of several ways in which Lenkurt helps to overcome these difficulties is by means of a comprehensive program of Maintenance Training Courses. In addition to the intensive factory training which has become a Lenkurt trademark, in-plant training is now being provided upon request. A skilled field instructor will conduct classes at convenient locations, using either installed equipment or, if you prefer, Lenkurt-supplied terminals.

Both factory and field training are available on the majority of Lenkurt carrier and radio equipments. You are invited to utilize this free-of-charge service in the way most suited to your particular requirements. Your local Automatic Electric Sales office would be pleased to discuss it with you and make the appropriate arrangements.

5761-R

For complete details check No. 5 on handy card, page 51

STROWG



When you're equipped with Strowger from Automatic Electric, you can be certain a highly trained sales representative is always with you. It's his job to learn all he can about your communications problem—to be ready with information, practical advice, and details of suitable equipment—the minute you need it. So however urgent or complicated your requirements, you can just relax and hand your worries to us.

This service is based on our firm belief that the best way to grow is to work with *and for* our customers.



PLUS THESE FIVE VITAL EXTRAS

I Up-to-the-minute design

With its simple circuits and unitized construction, Strowger meets all today's demands, and it's designed for ready adaptation to future requirements. Here are some of the up-to-the-minute features Strowger equipment can provide:

- Intertoll dialing, with the latest supervisory standards.
- Easy adaptation to Direct Distance Dialing.
- Economical expansion with simple jack-in equipment.
- Easy adaptation to automatic toll ticketing—working directly into accounting machines without converters.
- Direct dial control—no delays for common equipment.
- Banks and wipers in plain view, easy to see and reach.
- Low maintenance, fast call tracing.
- Simplified checking—each switch and its control relays mounted as a unit.
- Trunk repeaters for carrier, microwave, physical or composite circuits.
- Automatic time announcing and weather reporting.
- Quick, easy testing of lines.
- "Four-wire" toll switching.

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2 Quality construction

Only the finest materials go into Strowger equipment, and quality control is maintained at every stage right through to final testing.

3 Proven performance

Strowger is the only switching equipment in the world that has over 65 years of continuous performance in the field. Because it is uniquely adaptable, Strowger has met every requirement of changing conditions—completely without obsolescence.

4 Minimum maintenance

The simple, step-by-step construction of Strowger equipment assures an absolute minimum of adjustment and maintenance—even under continuous-operation conditions.

5 Easy, low cost expansion

Strowger is assembled in compact, self-contained units, so, with the least possible effort and expense, you can keep up with every new requirement in your community.

If you would like further information, call or write any Automatic Electric office.

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

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AUTOMATIC

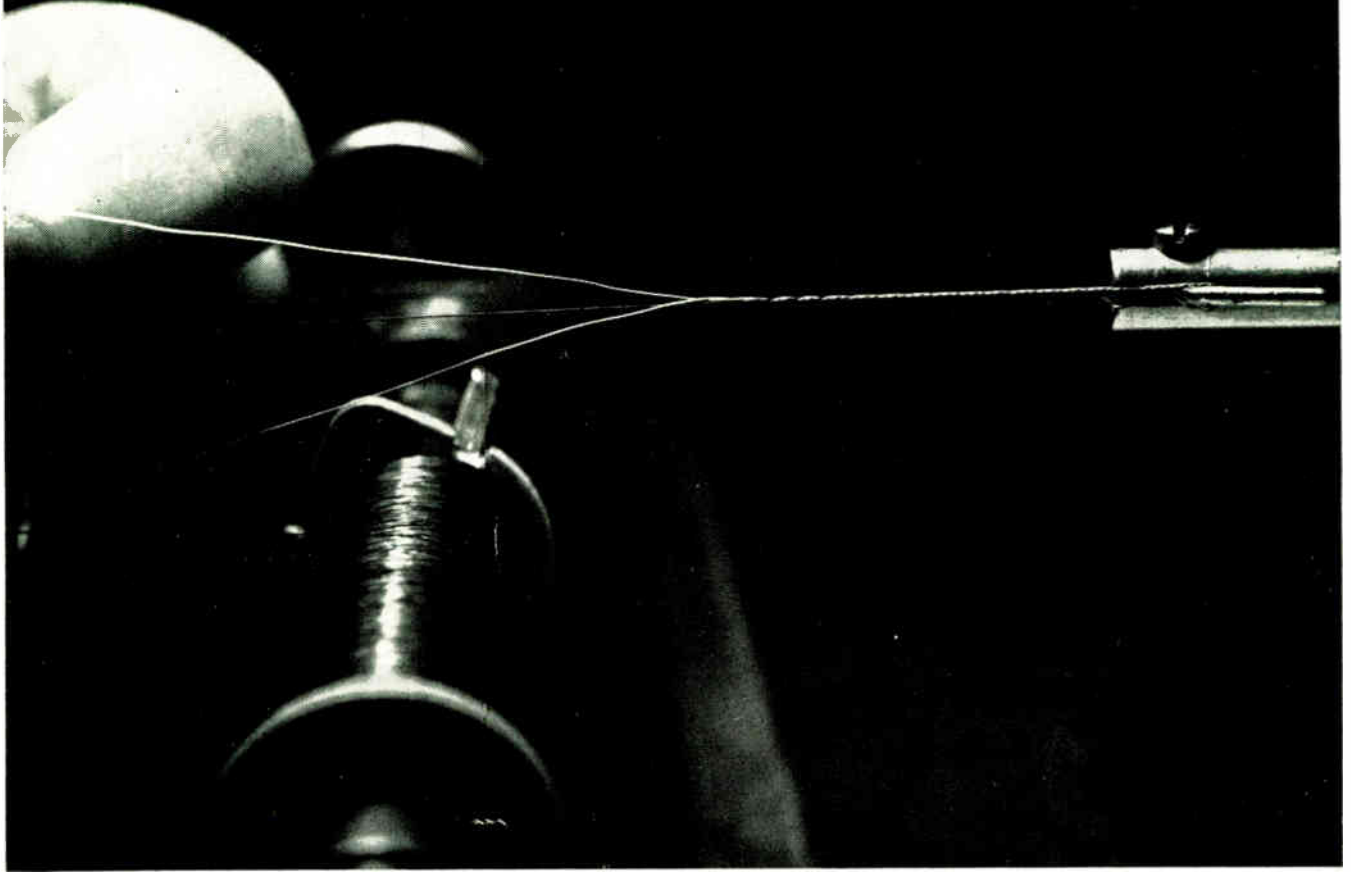


ELECTRIC

ORIGINATORS OF THE DIAL TELEPHONE



STANDARDS THAT DETERMINE
RELAY QUALITY . . . No. 1



Solderless splice solves problem of open coil windings

trouble-free coil windings

Solderless splice ends failures two ways

The two chief causes of relay coil windings going open in service are: (1) electrolysis, and (2) breaking at the terminal. Automatic Electric prevents these difficulties with a winding termination technique that is vitally different.

The coil endings of fine wire are not attached directly to the terminals. Instead, we carefully strip the insulating enamel from several inches of the coil endings and

tightly twist this length of wire with strands of bare tinned copper wire. This strong solderless splice is then insulated with a special film sheet.

Because the terminal connections are made over a long section of stranded wire, electrolysis has no single point to attack. And this flexible connection will never snap under temperature extremes or other stress-producing factors.

In every step of relay design and manufacture, Automatic Electric take extra pains to prevent trouble before it starts.



Class "A" Relay—for use when low first cost is important. Write today for information. Automatic Electric Sales (Canada) Ltd., 185 Bartley Drive, Toronto 16, Ontario. Branches across Canada.

AUTOMATIC  **ELECTRIC**

PIONEERS IN AUTOMATIC CONTROL



AN ORGANIZATION SERVING CANADIAN INDUSTRIES WITH COMMUNICATION, TIME AND CONTROL SYSTEMS

5923

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 51. Just mark the products you are interested in on the coupon on Page 51 and the information will be in your hands within a few days.

Vacuum tube electrometers

Item 2402

A new line of vacuum tube electrometers for measuring low currents is announced by The Victoreen Instrument Company, Cleveland, Ohio.

Designed by the Tullamore Electronics subsidiary of Victoreen, the units are suitable for rack, panel or console-mounting. High and low level trip circuits can be supplied on special order for reactor control applications.

Three types are available. Model VTE-O is an economy low-current measuring instrument covering a current range from 10^{-3} to 10^{-11} amperes; Model VTE-1 is identical to the VTE-O except that it has a built-in bucking current supply; Model VTE-2 is a wide range and stable measuring device covering the current range of 10^{-3} through 2×10^{-10} amperes full scale.

Models VTE-1 and VTE-0 are particularly suitable for measurement of currents from most scintillation counters and ionization chambers. The instruments use a CK 5886 electrometer tube which operates in such a manner that input grid current is less than 2×10^{-10} amperes. The 5886 filament is dc-operated from a regulated voltage supply which results in zero drift of less than 10 mv per day after warmup of approximately 30 minutes.

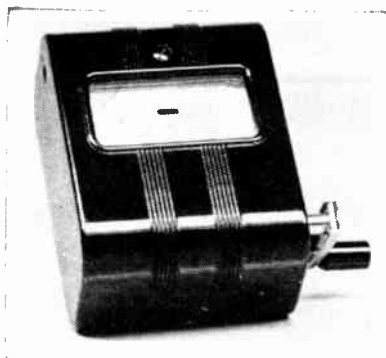
Full specification details, technical and performance data on Victoreen vacuum tube electrometers are available on request to the Canadian representative — Radionics Limited, 8230 Mayrand St., Montreal 9, Que.

Insulation resistance test set

Item 2403

An ultra-compact crank type Insulation Resistance Test Set has just been announced by Canadian Research Institute, 46 St. George Street, Toronto 5, Canada.

This new instrument, termed Isognom, is housed in impact-resistant phenolic plastic housing, with collapsible hand crank. Despite its tiny size (only 3" x 4" x 2") the built-in stabilized generator delivers a test potential of 500 volts and reads on a full size 2" scale 0 to 50 megohms. Five foot test leads are supplied. Including test leads, the Isognom weighs less than half a pound.



This handy portable Insulation Resistance Test Set is most widely used by electrical line men. Requiring no batteries, or external power supply, they are very convenient for field use. Carried in stock, the Isognom is available at low cost.

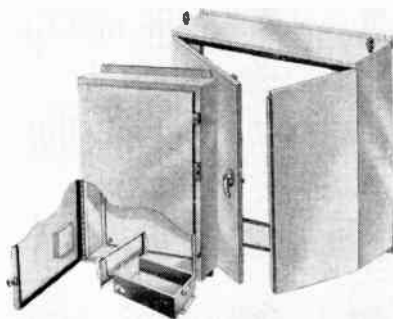
Canadian Research Institute, 46 St. George St., Toronto 5, Ontario.

Heavy duty panel boxes, enclosures

Item 2404

Built to N.E.M.A. and J.I.C. standards, these new lines of single and double door, quality enclosures are designed around the "most wanted" dimensions in a complete range of sizes.

Standard models are equipped with removable interior panels and finished in hard, durable, oven-baked enamels, machine grey on the outside and white inside.



Floor mounting feet and dry ledge are available as separate items at a slight extra cost.

Complete information, price lists and shop prints available from Hammond Manufacturing Company Limited, Guelph, Ont., Canada.

Extrusions and fabricated parts

Item 2405

Extrusions and fabricated parts made from DuPont's new thermoplastic, "Delrin", are now offered by National Fibre Co. of Canada, Ltd., Toronto, Ontario.

National can supply "Delrin" extrusions in the form of strip, rod, tubing, or special shapes. Strip comes in widths up to seven inches and thicknesses from 0.020 to 0.093 inch. Rod diameters range from 1/2 inch to 2 inches. Tubing and special shapes are made to order. From these basic extruded forms, the company can produce a variety of precision parts, employing conventional machining operations.

With its unique properties, extruded "Delrin" further extends National's services in thermoplastic materials, complementing an established business in extruded nylon and fabricated parts. It also further rounds out the company's line of some 100 grades and types of engineering materials which include vulcanized fiber, copper-clad laminates, and polyester glass or laminated plastics. Extruded "Delrin" promises a broad range of applications in the electrical and electronic fields, and the mechanical design field.

Further information about extrusions and fabricated parts from "Delrin" can be obtained from National Fibre Co. of Canada, Ltd., 107 Atlantic Ave., Toronto, Ontario.

Transistorized subcarrier

Item 2406

Fully transistorized multiplex equipment designed for high speed, highly reliable and secure protective relaying over a microwave base band medium has been introduced by Motorola. The new MC-22 equipment provides quality, noise immune and drift-free performance in an unusually compact package.

The Motorola MC-22 base band relaying multiplex operates in the 40-200 kc frequency band with 4 kc channel spacing. Up

to 41 channels can be applied to a 6,000 Mc. microwave base band channel without any intervening equipment or using any of the available voice channel capacity. While the MC-22 is designed for application to Motorola MR-20 microwave equipment, it can be applied to any microwave base band having adequate frequency space.

The MC-22 transmitter translates tripping information into a one kc frequency shift. This is reverted to a contact closure by the receiver at the remote station.

Crystal controlled oscillators are used in both the transmitter and receiver to provide frequency drift protection. The transmitter and receiver with self contained power supplies are but 1 3/4 inches high, enabling the mounting of up to 44 units on a standard seven foot, 19 inch wide rack.

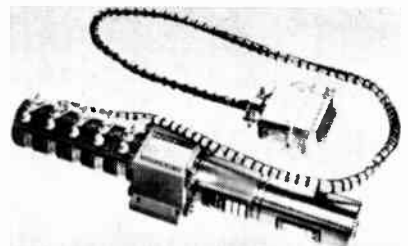
The new multiplex provides positive protection against false trip due to noise, loss of signal, loss of power, component failure, or other reasons through special "decision" circuitry that provides both alarm and protection functions.

For further information contact the Microwave and Industrial Products Department of Canadian Motorola Electronics Limited, 105 Bartley Drive, Toronto 16, Ontario.

In-line servopackages

Item 2407

Systems engineers in need of servo position indicators, integrators and other servo-system assemblies can have quick delivery of in-line servopackages, according to Helipot Division of Beckman Instruments, Inc., Toronto, Ontario. These compact, space-saving modules free the designer from



positioning, testing, matching and aligning individual components.

Typical of Beckman servopackages, developed by Helipot, is a size 11 system module consisting of a 115-volt, 400-cycle servomotor-rate generator; gearhead; mounting pad; five ganged Helipot Model 5203 single-turn potentiometers; and AN connector. The entire unit measures only 7 3/4" x 1 3/4" x 1 1/2".

Stall torque of the servomotor-rate generator unit is 0.6 oz. in.; rotor inertia 1.1 gm.cm.²; acceleration at stall 38,500 rad/sec²; and power input 3.9 watts.

The all-metal Helipot Model 5203s in the ganged section are available with any resistance range from 250 to 100,000 ohms, linearity tolerance up to ±0.15 per cent, and power rating of 3 watts at 100°C, derating to zero at 150°C.

Beckman servopackages are available with size 8, 11, 15 and 18 servomotors; servomotor-rate generators; and inertia and velocity damped servomotors . . . instant availability of a wide variety of matched potentiometers and other components makes it possible for Helipot to furnish specification servopackages quickly and economically.

Units are available for delivery from R-O-R Associates, Ltd., 1470 Don Mills Rd., Don Mills, Ontario, sales representatives for Helipot Division of Beckman Instruments, Inc.

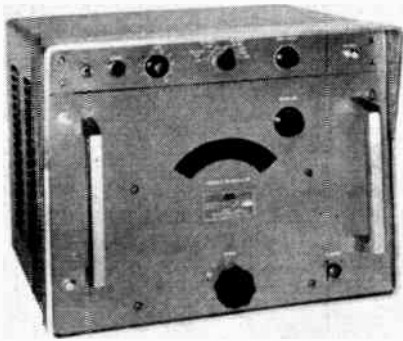
New Products

Microwave signal source

Item 2408

A new microwave signal source — Model KSS, 1,050 to 11,000 mc — in a single compact cabinet with interchangeable plug-in microwave tuning units has been developed by Polarad Electronics Corporation, 43-20 34th Street, Long Island City 1, N.Y.

The instrument consists of a basic power supply and modulator unit and four interchangeable plug-in tuning units to cover the frequency range.



The Model KSS is recommended as a stable, reliable source of microwave energy at relatively high output levels: 80 to 400 mw in the lowest range, 14 to 40 in the highest. This high power output particularly adapts the instrument for measurements of antenna characteristics, for slotted line measurements, for testing radar sets, microwave systems, filters and transmission line components.

Model KSS generates internal square wave signals variable 10, to 10,000 pps, internal cw signals — and may be externally modulated. Pulse rise and decay time on external modulation is 0.15 microseconds minimum. The instrument utilizes single knob UNI-DIAL Control for frequency settings of better than 1 per cent accuracy.

Polarad Electronics Corporation, 43-20 34th St., Long Island City 1, N.Y., U.S.A.

Power supply with direct "read-out" control

Item 2409

The John Fluke Model 301E Power Supply combines excellent stability and accuracy with direct "read-out" controls.

Features include chopper stabilization and built-in standard cell reference. Output voltage is 1.02 to 512 V DC at 0 to 300 milli-amp. Polarity is selective. Regulation against line or load is better than 0.005 per cent. With a resolution better than 1/2 mv at any output voltage, the unit has a calibration accuracy better than 0.1 per cent.

Applications: computer reference source, transistors, high power feedback amplifiers, strain gauges, AC amplifiers.

Write The Glendon Company Ltd., 44 Wellington St. East, Toronto 1, Ontario, for further particulars.

Relays with terminals on .2" x .2" co-ordinates

Item 2410

Relays with terminals located on .2" x .2" co-ordinates to permit mounting on printed circuit boards by automatic assembly techniques have been added to the micro-miniature relay line of Potter & Brumfield Canada Ltd. The new terminal layouts are available on both dual coil magnetic latching and on single coil action relays.

Both relays operate under 100g shocks and 30g vibrations to 2000cps with no contact openings in either armature position. Relays with single coil action pull-in at 260 milliwatts at 25°C; dual coil latching relays at 230 milliwatts. All coil connections are

polarized to take advantage of permanent magnet forces in the relay.

Single coil action SCG relays have eight pins located in two rows of four. Magnetic latching SLG relays have ten pins, two located midway between rows. Both units have dpdt contacts rated at 2 amperes, 28 volts DC, resistive.

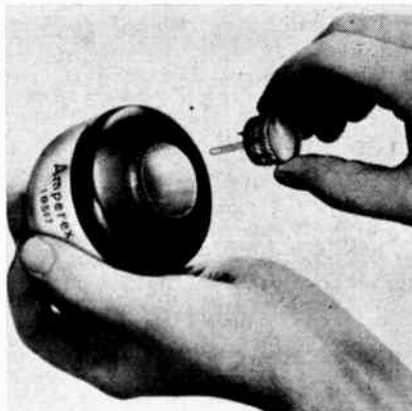
Relays are .890" high x .795" wide x .370" thick and weigh less than 20 grams. For additional information, write the Technical Information Department, Potter & Brumfield Canada Ltd., Guelph, Ontario.

Low level beta detection system

Item 2411

Philips have contributed another advanced detector system for the field of radioactive contamination investigations. The Philips 18515 thin end window geiger tube is ideally suited for the detection of Strontium 90 contamination in wastes and in foodstuffs such as milk and water, etc. Since the Philips scientists announced their unique system incorporating a specially designed geiger tube in a hemispherical guard counter tube considerable work has been done indicating the high efficiency for beta radiation from Strontium 90 in conjunction with a background of less than 1 count/minute. This low background enables the Philips low level B counter to quickly and accurately check for trace amounts of radioactive contamination.

The Philips low level beta detection system consists of: (1) Philips PW 4127 universal Anticoincidence lead castle assembly complete with the 18515 Geiger tube and 18517 guard counter tube; (2) Philips 4092 Universal Anticoincidence Unit; (3) Philips PW 4035 Predetermined Count Scaler; (4) Philips PW 4022 H. V. Supply.



For preliminary radiation monitoring a simple set-up of the PW 4035 Predetermined Count Scaler and a PW 4106/01 Geiger probe may be obtained first and later expanded to the anticoincidence set-up. By adding the Philips pulse height analyzer assembly the individual radio-active contaminate may be positively identified.

The Philips low level beta assembly is also ideally suited for use with C¹⁴, S³⁵ and P³² since it allows lower concentrations of radio-active isotopes to be introduced as a tracer due to its great sensitivity for these isotopes.

Additional data available from Philips Electronics Industries Ltd., Research and Control Instruments Group, 116 Vanderhoof Ave., Toronto 17, Ontario, Canada.

Rack/panel environmental-resistant connector

Item 2412

Cannon Electric Canada Limited announces production of a new ultra-light-weight rack/panel environmental-resistant connector, the DPSM series.

Use of magnesium for the shell of the DPSM affords a 26 per cent reduction in weight. The connector is fully environmental resistant. It is designed to operate under high-vibration conditions, through a temperature range of -65° to +300°F.

To maintain electrical characteristics at

high altitudes, the DPSM has a special sliding seal of resilient "Silcan 63" material, lubricated for ease of separation. This permits a 1/8" axial tolerance while still effecting a seal.

The DPSM, originally designed for the requirements of the U.S. Air Force's B-58 "Hustler", is primarily intended for modular rack/panel aircraft and missile applications, in keeping with the new trend toward modular design in electronic equipment. Special adaptors also permit use of the DPSM as a cable connector.

Cannon Electric Canada Limited, 160 Bartley Drive, Toronto 16, Ontario.

Transistorized wave analyzer

Item 2413

A new, completely transistorized wave analyzer operating from 20 cps to 50 kc is now available from the Hewlett-Packard Company.

The instrument, Model 302A, separates an input signal into its individual components so that the fundamental, harmonics and intermodulation products may be separately measured and evaluated. It may also be used as a narrow-band tuned voltmeter which will read absolute or relative levels.

The new wave analyzer is particularly useful in investigating and measuring individual distortion products in amplifiers, transducers and other active devices, as well as determining transmission characteristics and measuring filter characteristics rapidly.

Model 302A provides increased versatility, low power consumption, elimination of warm-up time and portable operation from an external dc source as well as 115/230 volt power lines. It has an automatic frequency control which maintains the difference frequency between the input signal and the local oscillator constant at 100 kc even though the input signal drifts. This assures precise, rapid measurements.

Model 302A, a compact instrument weighing only 43 pounds, is manufactured by Hewlett-Packard Company, distributed by Atlas Instrument Corp. Ltd., 50 Wingold Ave., Toronto 19, Ont.

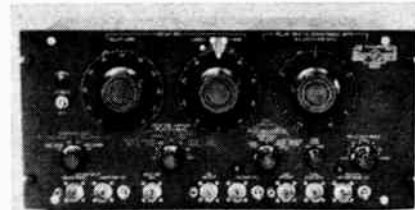
Time-delay generator

Item 2414

The Type 1392-A is an analog generator which produces accurately known and continuously adjustable time delays for measurement, testing, and calibration of electronic equipment and systems.

An external signal voltage of almost any waveshape will set the PRF. Two delay circuits provide delays relative to the 0.1 sec direct synchronizing reference pulse of from 0 to 1.1 seconds and from 0.5 microsecond to 0.5 second.

Delay No. 1 is initiated by the direct synchronizing pulse. Delay No. 2 can be initiated by either the direct synchronizing pulse or the Delay No. 1 synchronizing pulses. Thus the two pulses can be operated adding in delay times or producing two independent delays.



Because this is an analog generator, the delay can be produced from a start command pulse without any gating transient or quantization error. It is also possible to establish delays in any time-dependent unit, and so this generator is an excellent range calibrator for radar, sonar, and radio navigation systems. The delay can be varied by an external control voltage.

Requests for additional information should be addressed to General Radio Company, 275 Massachusetts Ave., Cambridge 39, Mass., U.S.A.

New Products

Oscillograph recorder amplifiers

Item 2415

Edin, a Division of Epsco, Incorporated, announces the availability of the first two models of a new B-Series line of Amplifiers intended for a wide variety of both rack-panel and portable oscillograph recording needs. These highly stable units drift less than .5 mv. equivalent input per hour and will operate from 115 v. \pm 5 v. power lines without additional regulation. An input impedance of two megohms, plus optional zero suppression, allows the unit to be used with a wide variety of transducers. Unique features include plug-in frequency compensation to extend the range of the Edin galvanometer to 200 cycles, and also automatic signal overload protection to prevent galvanometer burnout.

For maximum operational simplicity, and an uncluttered work area, output connections are located at the rear of each amplifier, while inputs are at both front and rear. Models are available with or without steel cabinet for portable applications.

The low gain amplifier, Model 8106B, has a gain of 150. The high gain amplifier, Model 8105B, has a gain of 150 in the LO position, and a gain of 5,000 in the HI position. Both amplifiers feature built-in calibration circuits, and precision step attenuators.

Further information on these amplifiers, or the other components in the Edin line may be obtained from A. C. Wickman Limited, P.O. Box 9, Station "N", Toronto 14, Ontario, Canada.

Transistor tester

Item 2416

The Reflectone Model TT-1 Transistor Tester is a compact, dependable instrument for testing semi-conductor devices. Both PNP and NPN transistor types of low, medium and high power can be tested quickly and easily. In addition, this instrument tests all semi-conductor diodes.

Weighing approximately three pounds, this handsome tester is built into a strong shock resistant case.



Conveniently located on the instrument panel is a universal receptacle to accommodate the many transistor types. For special configurations, test leads are provided and each clip lead is lettered to correspond to the proper transistor terminal designation. A sensitive, 50-microamp ammeter, connected to the circuit only when the Push-to-Test button is pressed, permits accurate quantitative measurements of transistors for matching purposes. Each transistor tester is built with heavy duty switches for reliable operation.

For further information contact Mel Sales Limited, Arnprior, Ontario, Canada.

Sub-miniature diodes

Item 2417

Minifiers, new sub-miniature selenium diodes, specifically designed for high reliability and long operating life have been announced by International Resistance Company Limited.

Minifiers are used in a broad range of electronic applications such as computers, electrical measuring instruments, radio and television, transistorized equipment, etc. Among the specific circuits where these diodes are applicable are detectors, gating, logic circuitry, phase comparators, bias supplies, clamping, clipping, AFC, AGC, and sensitive DC relays.

IRC's sub-miniature diodes are assembled in a drawn brass housing to provide high efficiency heat dissipation and better mechanical protection. The units are then coated with a thermosetting material for environmental protection. The complete assembly is only 3/32" in diameter and is fully insulated to permit use where space is a limiting factor. They have a useful life expectancy greater than 20,000 hours when operated within ratings.

For further information write to International Resistance Company Ltd., 349 Carlaw Avenue, Toronto 8, Ontario for catalog data bulletin M-1.

Portable audio console

Item 2418

The R5460B Audio Console is an AC or battery operated single channel transistorized unit, designed for remote broadcast operations. The AC power supply employs semi-conductors as rectifiers, and a unique fail-safe feature, should AC power fail, automatically switches over to battery.



The unit contains four separate printed wiring pre-amplifiers, with high level mixing and balanced inputs. As the amplifiers are plug-in cards, they can be removed for servicing ease.

The weight of the console is 30 lbs. and dimensions are 15 1/2" x 18" x 5".

The console comes well within TR105B specifications for frequency response, and distortion with full rated output of + 18 dbm (after line pad).

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

Mass flow transducer without moving parts

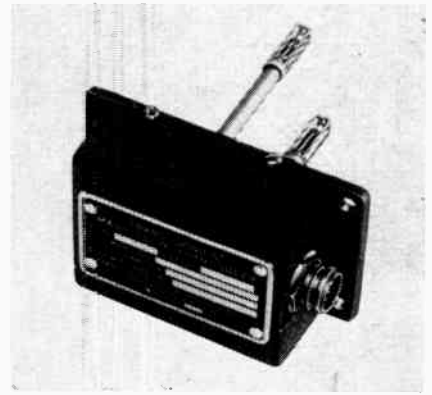
Item 2419

A new Mass Flow Transducer with a range from 20 to 180 lbs. of air/minute in a 6-inch duct is now in production at Trans-Sonics, Inc., Burlington, Mass. The instrument, which has no moving parts, utilizes platinum resistance elements to give a direct measurement of true mass flow independent of the temperature or pressure of the gas. The transducer provides a 100 microampere output signal as a function of the mass flow of air or other gas over operating temperatures from 40 to 150F.

The Trans-Sonics* Mass Flow Transducer has been qualified for service in passenger-carrying commercial jet aircraft. Because of its complete reliability and usefulness with gases other than air, it is also used

to protect an expensive catalyst bed in a chemical process which requires uninterrupted gas flow. Other applications include service in heating, ventilating, and air conditioning equipment.

The transducer consists of two platinum resistance probes which form the active elements in opposite arms of a DC resistance bridge. These probes extend into the flow stream from a case which houses the passive bridge elements and a zener diode voltage regulator circuit. The longer probe is heated by a relatively high steady-state current, and makes the fundamental density-velocity measurement as it is cooled by the mass flow in the duct. The shorter



probe is unheated, and provides compensation for changes in the output of the heated probe as a function of the gas temperature. Transducer specifications include: input of 28 volts DC; weight less than 1 pound.

A D'Arsonval Meter type of indicator is also available from Trans-Sonics, Inc., for visual readout of the Mass Flow Transducer. Tolerances on the transducer and meter are held so that individual units can be replaced without the necessity of adjustment or calibration.

Write for Technical Bulletin on Mass Flow Transducer to Trans-Sonics, Inc., Burlington, Mass., U.S.A.

Nylon extruded profile shapes

Item 2420

Continuously extruded profile shapes of Nylatron GS, a molybdenum disulphide filled nylon, are now available from Polypenco, Inc., Reading, Penna, U.S.A. The extrusions are used for runners, conveyor or channel tracks, sash linings and general sliding contact or protective wear surfaces in the machinery, automotive, aviation or architectural fields.

The filled nylon profiles reduce wear and friction on sliding surfaces. The nylon does not gall or erode metals or other materials in the absence of lubrication. Smooth, noise-free action is readily obtained.

Nylatron GS is utilized for the profiles as the homogeneously dispersed molybdenum disulphide provides lower surface friction and imparts increased rigidity and dimensional stability to the end product.

Custom shapes can be presently designed with total cross-sectional areas of .003 to .150 square inches. Since special tooling is required, flat strip or shapes formed from flat strip are normally recommended for requirements under 5,000 feet unless a previously engineered profile can be applied. The resilient shapes can be force fit in or around connecting members. When desired, they are fastened by other conventional or special techniques. The profiles are used in continuous lengths or cut into segments.

Additional information obtainable from the Canadian reps: Peckover's Limited, Toronto, Ont. and Montreal, Que.; and C. M. Lovsted & Co. (Canada) Ltd., Vancouver, B.C. and Calgary and Edmonton, Alberta.

News Report

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

Automatic Electric to build in the West

Automatic Electric (Canada) Limited will shortly build a new plant in Western Canada to provide additional manufacturing, assembly and warehouse facilities, according to a statement released recently by C. R. Hughes, president.

"For a numbers of years," Mr. Hughes said, "we have studied the merits of such an undertaking. A large number of our customers for communication equipment are in the western provinces. We wish to give these customers the best service possible. To accomplish this objective and to give positive indication of our faith in the future of Western Canada, we will carry out this plan as quickly as possible. Included in this program are plans to provide space to permit assembly of some of our present products and, in addition, the manufacture and assembly of products we are not at present making in Canada.

"Our plant in Brockville and its operations have expanded more rapidly than anticipated. We nearly doubled our floor area in the addition made in 1957. The rate of expansion has somewhat limited the production of new products we wish to consider for the future. This condition has, in some respects, accelerated the decision to establish a new branch manufacturing plant.

"A number of locations in the west have been studied. The most favorable choice under present facts and circumstances shows it to be Lethbridge, Alberta.

"Plans for the building and layout of manufacturing space are now underway. It is hoped construction will be completed by the end of this year and be ready for gradual occupancy at the year-end. Some initial training on proposed operations will be necessary which will start in the early fall. This will form a nucleus of trained people to go into the new plant when ready."

Mr. Hughes continued, "This move will permit us to expand the production of our main line of switchgear equipment at Brockville, and at the same time introduce more 'Canadian

made' products to the Canadian market."

CDC appoints Western Canada reps for Bendix equipment

Appointment of the Winnipeg Division of Bristol Aero-Industries Limited as exclusive sales representatives in Manitoba, Saskatchewan, and Alberta for Bendix Airborne electronic equipment has been announced by N. C. Wilson, sales manager of Computing Devices of Canada Limited.

CDC are exclusive representatives in Canada of the Radio Division of the Bendix Aviation Corporation. More than two million dollars worth of Bendix radio equipment is installed on order for the RCAF, Trans Canada Airlines, and other major Canadian customers.

Canadian Westinghouse announces expansion plans

The Canadian Westinghouse Company recently announced the formation of a new manufacturing and repair division and an expansion of production and service facilities at Halifax, Moncton, Montreal, Toronto, Winnipeg, Calgary, Edmonton and Vancouver.

Named to executive posts in the new organization are H. H. Lang of Hamilton as division manager and W. A. Eskil of Toronto as commercial manager.

Eight key plant at the major cities,

links in a twelve-unit coast-to-coast chain of apparatus service centers, will be geared for production or assembly of electrical equipment for power utilities, industry and commercial customers, Westinghouse president George L. Wilcox stated. They will continue to provide repair and maintenance services for a wide range of electrical apparatus.

Union Carbide expansion

A major expansion project, designed to increase the company's polyethylene production capacity a further 60 per cent, was announced recently by Carbide Chemicals Company, Division of Union Carbide Canada Limited.

The augmented facilities will provide Carbide's Montreal East Plant with an annual polyethylene capacity of over 65 million pounds. Particularly significant is the fact that upon completion of this latest addition, it will be possible for Carbide to further substantially increase capacity with relatively little additional investment.

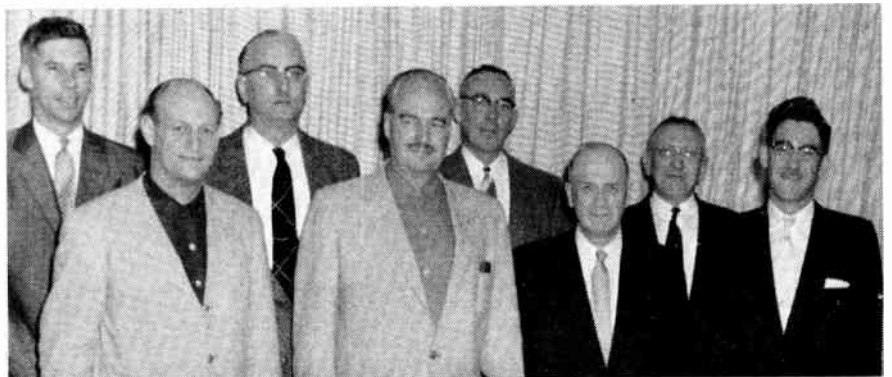
Desser E-E Ltd. appointed Canadian rep.

Announcement of a new Canadian representative, Desser E-E Ltd., 441 St. Francois Xavier, Montreal, Canada has been released by Vis-U-All Products Co., 640 Eastern Avenue SE, Grand Rapids, Michigan, manufacturers of a line of tube testing equipment.



C. R. Hughes

1959 - 1960 EXECUTIVE OF EIA



The 1959-1960 executive of the Electronic Industries Association of Canada, elected at the Association's recent annual meeting held at Bigwin Inn, are shown in the above photograph. They are (back row from left to right): John Houlding, Vice-President and Chairman of the Electronics Division; W. F. Wansbrough, Vice-President and Chairman of the Receiver Division; Stan Kendall, Vice-Chairman of the Electronics Division; Ralph Hackbusch, Director of Engineering. (Front row, left to right): Ron Robinson, Immediate Past President; Stuart D. Brownlee, President and Chairman of the Board; S. W. Radcliffe, General Manager and Secretary of EIA; and James Key, First Vice-President and Chairman of the Components Division.

Spaulding Fibre of Canada forms new division

Spaulding Fibre of Canada Limited, 70 Coronet Road, Toronto 18, Ontario have formed a new Material Handling Division to manufacture and market a broad range of strong light-weight vulcanized fibre containers. This includes trucks, tote boxes, cans, barrels, partitioned boxes and many other types of fibre and fibreboard containers for industry. This type of equipment is already in use in such fields as the electrical and electronics industry, and aircraft manufacturers.

D. I. Kearney, P.Eng., is responsible for the design and marketing of this division.

Union Carbide Canada executive appointment

The appointment of H. L. Reichart, Jr., as vice-president and general manager of Carbide Chemicals Company, Division of Union Carbide Canada Limited is announced by A. A. Cumming, president, Union Carbide Canada Limited.



H. L. Reichart, Jr.

Mr. Reichart, previously vice-president — production and engineering, has been associated with Carbide's Montreal East Plant since its inception and with the expansion programs completed and at present under way.

Mr. Reichart is a member of the Chemical Institute of Canada, American Chemical Society and American Association for the Advancement of Science.

Carbide Chemicals Company is one of the rapidly growing divisions of Union Carbide Canada Limited. Its products are polyethylene and a growing list of synthetic organic chemicals, many of which are being made for the first time in Canada.

Croven Ltd. appoints West Coast rep.

Pacific Electronics, 1641 West 2nd Ave., Vancouver, B.C., have been appointed as exclusive representatives for Croven Limited in the British Columbia, Seattle-Tacoma areas.

The appointment, made by Paul A. MacPhee, vice-president, sales, further adds to the expansion program of the company.

Pacific Electronics will represent Croven's complete quartz crystal and crystal oven product lines.

U.S. Army to exhibit at IRE show

Space research projects of the United States Army will have a prominent place in the Institute of Radio Engineers' 1959 Canadian Convention and Exposition to be held in Toronto October 7, 8 and 9.

The U.S. Army's equipment will form part of the Canadian Astronautical Society's exhibit of space equipment. It will include duplicates of the "talking" and cloud cover satellites launched early this year, solar cell assemblies and other electronic equipment used in space exploration.

Discussions between A. E. Main, Secretary of the CAS and Lieutenant-General G. Trudeau, Chief of Research and Development, United States Army, resulted in the decision to send the exhibits to Toronto. An earlier U.S. Army space project, the Explorer III satellite, was the subject of a CAS exhibit at the IRE's 1958 Canadian Convention.

According to George Armitage, Chairman of the IRE's Exhibits Committee, demand for Exposition space indicates that the number of participating firms and institutions may exceed last year's 152. Seventy-five per cent of the available space in the Automotive Building, Exhibition Park, has now been booked, Mr. Armitage said. Space has also been reserved for a number of overseas scientific agencies who have been invited to exhibit equipment used in headline electronic and nucleonic projects.

More than 10,000 scientists, engineers, businessmen and technicians are expected to attend the Convention which is Canada's largest scientific event.

Honeywell creates new division

Creation of a new Honeywell division called Military Products and Systems Engineering Division has been announced by L. F. Wills, vice-president, Honeywell Controls Limited.

The new division incorporates the scope and skills of the former Aeronautical Division. Product range of the new division extends from ordnance products through inertial navigation to missile equipment. It also incorporates the company's systems engineering group.

General manager of the new division is J. H. Baldwin, who held the same post in the Aero Division. T. C. Agnew is the assistant manager and O. M. Cepella is manager of Service Engineering for Military

Products.

Mr. Cepella will continue to supervise liaison and services on all military products and military systems of the company.

CDC announces two executive appointments

Robert G. Salusbury has been appointed contracts manager of Computing Devices of Canada Limited, it was recently announced by CDC marketing director W. S. Kendall.



R. G. Salusbury

J. J. Shepherd

Salusbury succeeds K. G. Thorne, now CDC chief engineer.

For the past year, Salusbury has been manager of the CDC Decca Department.

In a further move to strengthen the CDC Contracts Department in keeping with the increasing scope of the company's activities, Kendall also announced the appointment of John J. Shepherd as assistant contracts manager. He joined CDC in 1958 as a Contracts Officer.

Sales appointment by Beckman Instruments concerns Canada

The appointment of David C. Nelson as field sales engineer, Scientific Instruments, for the Seattle, Washington, office of the Scientific and Process Instruments Division, Beckman Instruments, Inc., was recently announced by Mark Howlett, marketing manager.

Mr. Nelson's territory will include western Canada. His address is 10609 N.E. 18th St., Bellevue, Washington.

Mr. Nelson will be responsible for the sales of all laboratory instruments marketed by the Scientific and Process Instruments Division.

Fiberglas Canada builds in Western Canada

Fiberglas Canada Limited will build a \$2 to \$3 million plant near Edmonton, Alberta, according to a recent announcement by T. J. Bell, president. The new plant will provide fiberglas insulating wool products and serve markets from Winnipeg west to the coast.

OUR THANKS

To those readers who have returned E&C circulation verification post-cards.

A REMINDER

To those readers who have not, as yet, received or returned verification cards.

PLEASE COMPLETE CARD IN FULL

Our mailing list auditors insist that we have the following information from you:

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A PROPERLY COMPLETED CARD FROM YOU IS YOUR GUARANTEE THAT YOU WILL RECEIVE ALL FORTHCOMING ISSUES OF

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LAMPKIN 205-A FM MODULATION METER

- Indicates instantaneous peak modulation, plus or minus, on 0-12.5 or 0-25.0 KC scales.
 - Accuracy 10% of full scale.
 - Tunable 25 to 500 MC in one band, with fast and slow controls.
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 - Speaker for aural monitoring, oscilloscope output for visual monitoring.
 - Meets Department of Transport specs for mobile-radio maintenance.
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 - Price \$240.00 net (does not include duty). Satisfaction guaranteed or money refunded.
- To measure transmitter center frequencies, from 0.1 to 175 MC (to 3,000 MC by checking multipliers), with an accuracy better than 0.0025%, use the LAMPKIN 105-B MICROMETER FREQUENCY METER.

Write today for technical data on both instruments.

LAMPKIN LABORATORIES, INC.
Dept. 707, Bradenton, Florida, U.S.A.

For complete details check No. 29

IRE forms S.W. Ontario subsection

The first meeting of the South Western Ontario Subsection of the Institute of Radio Engineers was held on Tuesday, June 2, 1959 at Windsor, Ontario.

The officers of the Subsection were elected at the meeting. Chairman is W. Ruse of the Windsor Bell Telephone Company; Vice-Chairman is R. A. Clark of the Canadian Broadcasting Corporation; Secretary-Treasurer is G. L. Virtue of CKLW-TV.

The new organization was granted a charter as a Subsection of the London Section of the IRE in January of this year. There are about 50 members in the group representing Essex, Kent and Lambton Counties.

A. C. Wickman reps for Houston Instrument Corp.

A. C. Wickman Limited, Electronics Division, announce their appointment as Canadian representative for the products of Houston Instrument Corporation.

Specializing in electromechanical instruments for research laboratories and for the petroleum and chemical industries, Houston Instrument Corporation offers a series of X-Y recorders and also chopper stabilized

low gain DC amplifiers.

Further information on these products, or assistance in the application of these units, may be obtained from A. C. Wickman Ltd., P.O. Box 9, Station "N", Toronto 14, Ontario.

Sales manager for Lake Engineering

Lake Engineering Co. Limited, Scarborough, Ontario, announces the



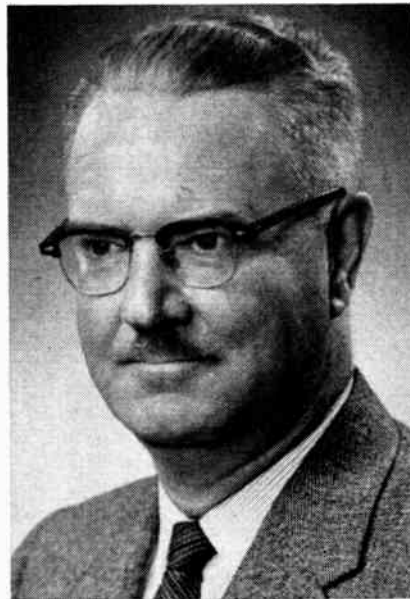
Frank P. Taylor

promotion of Frank P. Taylor to the position of sales manager. In this new position he will continue to personally serve the radio and TV manufacturers but will have a broad responsibility for

the firm's component sales to all equipment manufacturers.

Frank Taylor joined Lake Engineering Co. Limited, in September 1956, and brings to this new position a broad experience in the Canadian electronics industry in both the sales and purchasing fields. He previously held positions with Northern Electric Co. Limited, and National Fibre Co. Ltd.

AUTOMATIC ELECTRIC APPOINTMENTS



G. R. Morrow



G. H. K. Begg

C. R. Hughes, president of Automatic Electric Sales (Canada) Limited, announces two staff appointments to Vancouver. G. R. Morrow is appointed District Manager, responsible for all company operations in the Pacific District, covering British Columbia and the Yukon. G. H. K. Begg is appointed Pacific District Sales Manager, responsible for all sales activities in that territory. Both Mr. Morrow and Mr. Begg have had several years of experience with Automatic Electric Sales and associated companies.

Engineering appointments at C. R. Snelgrove Co. Ltd.

C. R. Snelgrove, president of C. R. Snelgrove Co. Limited, Don Mills, Ontario, announces the appointment of three new members to his staff.

Robt. B. Corbin assumes the position of chief development engineer of the special "Perma-Stable" crystal department. This department develops and manufactures crystals of extreme stability and excellent aging characteristics — which are becoming increasingly important in single side

band, split channel VHF, etc. Mr. Corbin has gained extensive experience in the field of crystal aging and stabilization while with Motorola Inc., Chicago, for the past ten years.



G. Feltmate

Clive Lamprell, B.Sc., will assist Mr. Corbin on various current development projects aimed at a general improvement in the art. Mr. Lamprell comes from the U.K. where he held positions in the electronic and nucleonic engineering departments of Metropolitan-Vickers Electrical Co. Ltd., and A.E.I.-John Thompson Nuclear Engineering Co. Ltd.



C. Lamprell



R. B. Corbin

Gordon Feltmate has been appointed production co-ordinator, a similar position he held for the past eight years with Canadian Applied Research Ltd., on precision aircraft instruments and specialized electronic equipment.

These additions to the staff have been made necessary by both an extensive program covering new development projects and a considerable increase in business over past years in the domestic and export market.

CGE wins Australian defense contract

Canadian General Electric Company has been awarded an Australian defense contract valued at more than \$250,000 for the production of height-finding radar equipment. The equipment to be used for Australia's radar defense lines is similar to that used on Canada's Pinetree Line.

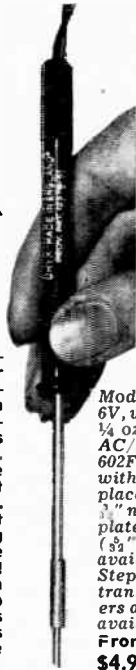
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- Transistors & Diodes
- Sub-Micro Miniaturization

ORYX

MINIATURE SOLDERING INSTRUMENTS

Pencil-thin . . . feather-light . . . but built for production line operation! Oryx precision soldering irons cut production costs four ways — low initial cost . . . long-life low voltage operation . . . low-cost replaceable tips . . . plus really efficient close-quarter soldering with no hand fatigue and no handle heat! There's an Oryx Iron for every precision job . . . 7 different models stocked by distributors everywhere, or write direct.



Model 6A
6V, weighs
1/4 oz.,
AC/DC.
602F max.
with re-
placeable
nickel-
plated tip
(3/32" tip
available)
Step down
transform-
ers are
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From
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For complete details check No. 22

DESIGN ENGINEERS

Select the Right Choke INSTANTLY!



ESSEX ELECTRONICS

R.F. Choke Kits

Epoxy-encapsulated, High-Reliability R.F. Chokes available in 4 handy kits for design engineers:

RFC - WEE	0.1 μ H to 1,000 μ H	0.150 Dia. x 0.375 L
RFC - S	0.1 μ H to 100 μ H	0.188 Dia. x 0.44 L
RFC - M	1.0 μ H to 1,000 μ H	0.25 Dia. x 0.60 L
RFC - L	1.0 μ H to 10,000 μ H	0.31 Dia. x 0.90 L

Data sheets available on request both for the Choke Kits and for the Essex Electronics Standard Line of Chokes. Both the kits and production quantities of chokes are available from stock.



Chokes • Delay Lines • Coils • Pulse Transformers

ESSEX ELECTRONICS

A MEMBER OF THE *NYTRONICS* GROUP

99 Wragge St., Trenton, Ontario, Canada

For complete details check No. 21



a new WELWYN

MOLDED

DEPOSITED CARBON RESISTOR

Welwyn Series N molded resistors employ a thermoplastic insulating material, combining economy with endurance and long term stability.

They meet the requirements specified by MIL-R-10509B and show negligible changes in resistance when subject to several one hour cycles of immersion in boiling water, along with D.C. polarization. Continuous operation at 150°C causes no damage.

The transparent molded insulation has an effective resistance in the order of 10^{13} ohms, and with a thermal conductivity 10 times that of air, vastly improves the load life under conditions of excessive dissipation.

Available in 4 physical sizes and in values of 10 ohms to 10 megohms.

For complete data and specifications write

WELWYN CANADA LIMITED

1255 BRYDGES STREET

LONDON, CANADA

H-8349

For complete details check No. 48 on handy card, page 51

Group of companies provides engineering services

A complete industrial marketing service believed to be unique in Canada, which provides engineering sales and services across Canada, has been formed by a group of 12 companies. Known as Canmark Services Limited, it has been established to accommodate the needs of industrial products manufacturers who are seeking a complete "package" in engineering sales, warehousing, installation and servicing of their products. It will embrace the electrical, mechanical and electro-

mechanical fields.

Headquarters for the new enterprise is in Toronto (at 131 Bermondsey Road). The member companies are mainly engaged in installations, maintenance, servicing and sales of electrical and mechanical equipment for industry.

Purpose of the new company is to acquire agencies for allied lines of industrial equipment for distribution and sale across Canada.

Charter members include Ainsworth Electric Co. Ltd., Toronto; Blenkhorn and Sawle Ltd., St. Catharines; Sutherland-Schultz Electric Co., Kitchener,

and Montreal Armature Works Ltd., Montreal. Other member companies are located in Halifax, Quebec City, Fort William, Winnipeg, Regina, Calgary, New Westminster and Vancouver. Additional firms providing supplementary coverage will be brought into association with Canmark Services Limited as necessary.

TV signals between Newfoundland and mainland

Television signals on a test basis have recently been transmitted from Newfoundland to the Nova Scotia mainland, thus opening up a new era of communications in Newfoundland and Canada.

J. S. Ford, chief engineer of the Canadian National Telegraphs, said in Toronto that "satisfactory" signals were being received at Sydney, N.S., from St. John's over the microwave network built by CNT for the Canadian Broadcasting Corporation. The project is under the overall direction of John R. White of Toronto, CNT's general manager.

Mr. Ford said construction of the network, incorporating what is believed to be the longest microwave water hop in the world, was the largest and most difficult job ever tackled by CNT engineers. Spanning the 69 miles of Cabot Strait between Nova Scotia and Newfoundland is considered a major achievement in electronic engineering.

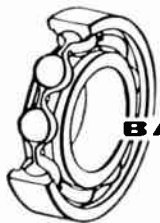
VICE-PRESIDENT — SALES



L. B. Kiely

The Board of Directors of Philips Industries Limited has named Lloyd B. Kiely Vice-President in charge of sales of Philips Television, High Fidelity and Radio products. The appointment was announced by O. W. Rodomar, O.B.E., President, Philips Industries Limited, a division of Philips Electronics Industries Limited.

NEW DEPARTURE



BALL BEARINGS

for

High capacity high speed applications

or miniature instrumentation

From high capacity, ultra precision N. D. bearings of special steels, finish and tolerances, to tiny instrument bearings of exquisite accuracy, your Canadian source of supply is R&M Bearings Canada Ltd. Experienced salesmen and engineers are available to discuss standard or specialized applications. Call your nearest R&M office for prompt service.

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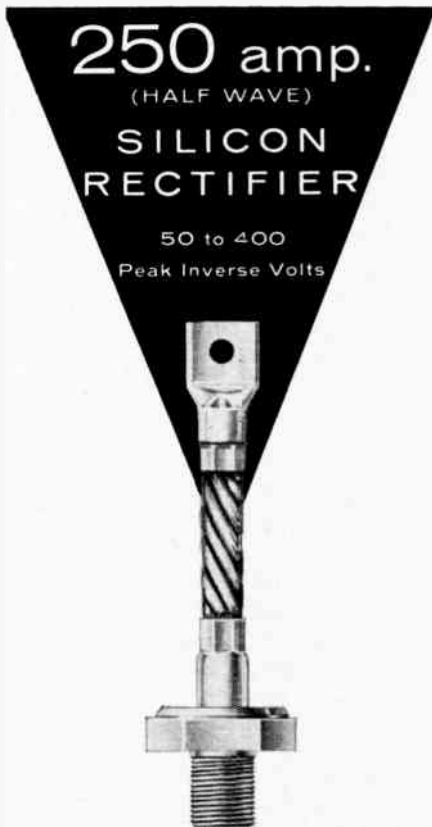


For catalogues write **R&M** at
1006 Mountain Street, Montreal, P.Q.
Catalogue ABC for high capacity bearings.
Catalogue PIB for miniature bearings.



R&M 6-

For complete details check No. 37 on handy card, page 51



by
Tarzian

Low thermal drop (less than 10°C junction to base) and low junction temperature rise (approximately 60°C) are built-in features in the Tarzian Y series rated at 250 amperes d.c. This combination minimizes "thermal-aging" problems and extends life expectancy. Ideally designed for use in welding, electroplating and electrolysis application, this series is also useful in any application that requires 1000 or more d.c. amperes.

Write for complete information.

SARKES TARZIAN, INC.
Rectifier Division

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BLOOMINGTON, INDIANA

IN CANADA: 700 WESTON RD., TORONTO 9
TEL. ROGER 2-7535
EXPORT: AD AURIEMA, INC., NEW YORK CITY

For complete details check No. 41
ELECTRONICS AND COMMUNICATIONS. August, 1959

Radionics Limited represents Julie Research Labs.

Announcement was made recently of the appointment of Radionics Limited as exclusive Canadian representative for Julie Research Laboratories, Inc. of New York, N.Y.

Catalog literature on JRL units as well as a free subscription to JRL "Precision" are available upon request to Radionics Limited, 8230 Mayrand Street, Montreal 9, Que.

Zenith Radio supervisory appointment

Sydney L. Capell will supervise the activities of the radio-TV-electronics division of Zenith Radio Corporation of Canada, Ltd., according to a recent announcement by L. C. Truesdell, vice-president of the Canadian corporation.



S. L. Capell

As a consultant with Zenith since December 1957, Mr. Capell has been active in the formation of the division, and the establishment of the Canadian corporation's operations in Toronto and Montreal in 1958. He will now assume more active supervision of these operations, Mr. Truesdell said.

Mr. Capell is well known in the radio and TV appliance sales field in Canada. From 1936 to 1953, he was vice-president and general manager of Philco Corporation of Canada, Ltd. From 1953 to 1957, when his association with Zenith began, he was president of the Philco International Corporation. Mr. Capell was also president of the Radio Manufacturers Association of Canada for two successive terms after World War II.

Eutectic Welding holds "open house"

Close to 200 welders, welding foremen and plant supervisory personnel attended "Open House" ceremonies at a new welding service center and warehouse, formally opened on June 24 on Torbarrie Road by Eutectic Welding Alloys Co. of Canada, Ltd.

R. D. Wasserman, president of the company, made the following remarks. "With the opening of this new welding service center and warehouse in Toronto, we have completed a coast-to-coast network that can provide prompt service to all parts of Canada. We are proud to have the opportunity to share in Canada's industrial growth, which has made our own rapid expansion possible."

New ROHN SELF SUPPORTING COMMUNICATION TOWER



- ★ 120 ft. in height, fully self-supporting!
- ★ Roted a true HEAVY-DUTY steel tower, suitable for communication purposes, such as radio, telephone, broodcasting, etc.
- ★ Complete hot-dipped galvanizing after fabrication.
- ★ Low in cost—does your job with BIG savings—yet has excellent construction and unexcelled design! Easily shipped and quickly installed.

FREE details gladly sent on request.
Representatives coast-to-coast.

ROHN Manufacturing Co.

116 Limestone, Bellevue,
Peoria, Illinois

"Pioneer Manufacturers of
Towers of All Kinds"

For complete details check No. 39

Canadian computer to Switzerland

On a recent KLM Flying Dutchman flight to Switzerland, a Super H Constellation freighter was re-routed from New York to Toronto to fly an electronic computer to Switzerland in a cargo which also included live animals ranging from white mice to sea lions. The computer was destined for Aufina in Zurich.

Manufactured in the Canadian IBM plant on Don Mills Road, Toronto, the computer — the first of this type to be exported from Canada — is known

as a RAMAC which denotes Random Access Method of Accounting and Control.

IBM's RAMAC is claimed to be the forerunner of accounting to come, the modern answer to better business control. Through the random access method of accounting and control, sorting and collating often are completely eliminated. There is no waiting, no lost time to be regained, because transactions are processed as they occur.

RAMAC's advanced concepts can be applied to almost every phase of business accounting and recording keeping.

CNT installation at Gander airport

At the international airport of Gander, Newfoundland, Queen Elizabeth officially opened in June the new terminal building recently completed by the Department of Transport in which the elaborate communications system was installed by Canadian National Telegraphs. The facilities provide Gander with one of the most extensive and modern airport communications systems in Canada.

Transfer of the equipment to the new terminal was carefully planned by Canadian National engineers and technicians weeks in advance, and the actual cut-over was accomplished without interruption to the flow of vital weather and flight plan information which makes safe flying possible.

Into the new building have gone some 26,000 feet of cables, a thousand feet of wiring, 80 teletype machines, over 100 telephones and scores of other items of complex communications equipment essential to aviation. Cost of this equipment and its installation is well in excess of \$200,000.

Operations of CNT at Gander are under the supervision of Manager E. J. Milley.

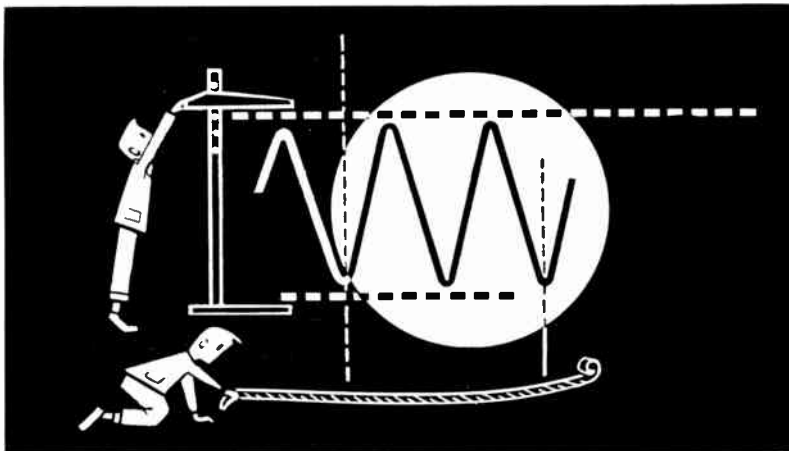
Canadian navigation system ordered by German Air Force

The Canadian designed Position and Homing Indicator has been specified for the advanced design Starfighter aircraft ordered by the West German Air Force, it was revealed recently by C. F. Hembry, president of Computing Devices of Canada Limited. The PHI is an advanced automatic dead reckoning navigation system for single seat fighter aircraft. The instruments will be manufactured in Canada and supplied to Lockheed Aircraft Corporation, builders of the aircraft, before they are delivered to Germany.

Selection of the Canadian navigation equipment follows extensive evaluation of the PHI and competing equipment from other countries by the West German Air Force.

The significance of the German decision to use Canadian navigation equipment was pointed out by Hembry "Naturally we are pleased and proud that our PHI was selected by the German Government", he said "The PHI is entirely a Canadian concept and achievement, and came into being as a result of the foresight of the RCAF and Department of Defense Production in sponsoring the advanced development of dead-reckoning navigation equipment in Canada."

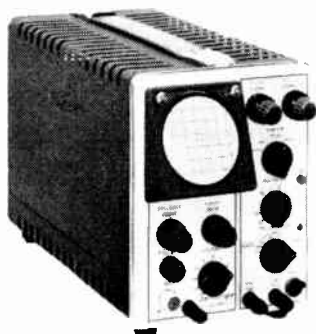
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For complete details check No. 11 on handy card, page 51

S. A. Brownlee elected president of EIA

At their 30th annual meeting held at Bigwin Inn, Muskoka, Ontario, on June 19, the Electronic Industries Association of Canada elected Stuart D. Brownlee their president for the ensuing year. Mr. Brownlee, who is president of the Canadian Admiral Corporation Limited of Port Credit, Ontario, is no stranger to the EIA.



S. D. Brownlee

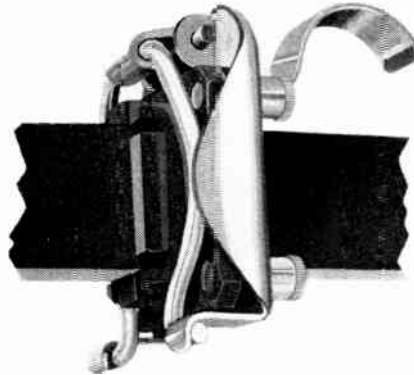
In September 1945, "Stu" Brownlee became secretary, later general manager, of EIA. His interest in patents and great ability in this field were responsible for his appointment, concurrently with his EIA post, as general manager of Canadian Radio Patents Limited in 1945. He was later elected a director of CRPL in 1952 and became president of that company in 1954. During the ten years 1945-1954 Mr. Brownlee was also secretary-treasurer of the Canadian Radio Technical Planning Board.

In February 1956, Mr. Brownlee was appointed executive vice-president of the Canadian Admiral Corporation, becoming responsible for Admiral's operations in Canada. In March of this year he was appointed president of Canadian Admiral Corporation.

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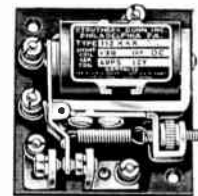
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The Sixth Annual
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with its wealth of information on Parts,
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Services is now in preparation

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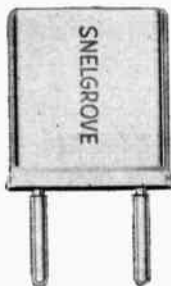
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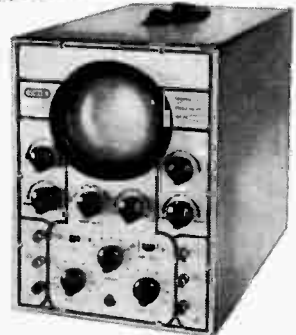
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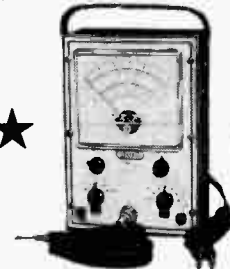


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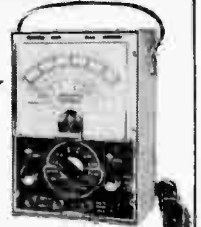
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MK-2



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MK-1

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10,000 Ohms per Volt DC; 5,000 Ohms per Volt AC. Measures Volts DC to 5,000; Volts AC to 1,000 V.; Milliampers to 500 ma; Ohms to 4 megohms; and Decibels from -20 to 62 dbs. Supplied with 1% deposited carbon resistors, special nylon switch, molded bakelite panel, test leads, assembly & operating instructions. Kit only.

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Assures unusual accuracy in checking high impedance circuits. 7 AC & 7 DC Ranges: 1.5 to 1200. 7 Peak to Peak Ranges: 4 to 3200. 7 Resistance Ranges: 0.2 ohms to 100 megohms. Frequency: AC to approx. 5 megacycles. Input Impedance: AC & DC to approx. 10 megohms. FRENCH-ENGLISH assembly and operating instructions included. Available in kit form — or — wired and calibrated.

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First prairie station to go to 50 KW

With the signing of a contract with Canadian General Electric Company Limited, the first Prairie station to go to full AM power since the Department of Transport lifted the power ceiling for regional channels from 5 KW to 50 KW will be CKY-580 k/s — Winnipeg.

The great areas of Manitoba and the Prairies requiring radio service from a Canadian source was one of the factors taken into consideration by the owners in their application for maximum power.

The transmitter purchased by CKY to supply their increase to full power is the G-E BTC-50-A designed, developed, and produced by Canadian General Electric at the Toronto Royce Works of the Electronic Equipment and Tube Department. It is similar to the transmitter installed by CKAC — Montreal in early 1958, which has operated satisfactorily since that time.

Professional engineers elect president

A 54-year-old consulting engineer, who has twice served as president of the New Brunswick Association of Professional Engineers has been elected president of the Canadian Council of Professional Engineers at its annual meeting in Winnipeg.

Donald Orton Turnbull, P.Eng., a native of Rothesay, N.B., succeeds Professor W. O. Richmond, P.Eng., of Vancouver, as president of the national advisory body for Canada's 11 provincial and territorial professional engineering organizations.

Sales rep for Abbey Electronics

Abbey Electronics Ltd. of 555 Wilson Avenue, Toronto, announces the appointment of L. McNabb as industrial sales representative.



L. McNabb

Larry McNabb, who was born and educated in Toronto, served overseas with the Canadian Army for four years. He has had more than ten years' experience in all levels of electronic sales, and was with Aerovox of Canada for four years prior to his appointment with Abbey Electronics.

Mr. McNabb will be responsible for Tung-Sol semi-conductors, and industrial and receiving type tubes.

For complete details check No. 26 on handy card, page 51

THE CASE OF THE FOURTH FOOT*



EVIDENCE

- A. Drop sensitive multimeter four feet onto cement floor. Sweep up pieces before proceeding with next step.
- B. Place identical meter in Pylon transit case, Type TC-4.
- C. Drop case four feet onto cement floor.
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PRECEDENT

The TC-4 has been upheld in trials by major electronic equipment users from coast to coast in Canada.

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Pylon presents a very solid case — one that continues to win support from many learned experts.

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The Pylon TC-4 offers unsurpassed protection for electronic equipment.

* Four feet is the mean distance your favorite shipper drops electronic equipment, according to a recent government survey. Airlines average slightly more.



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ELECTRONICS AND COMMUNICATIONS, August, 1959



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HUNT R.C.E. for PRINTED CIRCUIT BOARDS

(Rapid Circuit Etch)

Hunt R. C. E. is a proprietary etchant, formulated to etch printed circuits fast and to speed up production. It offers these 6 big advantages:

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(Solder Circuit Etch)

This ready-prepared product is designed to etch solder-plated circuit boards more easily, more effectively than it has ever been done before. You'll find that Hunt S. C. E.

- Etches rapidly at room temperatures
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- Has guaranteed uniformity, and is of the highest quality because of rigid laboratory control

Hunt S. C. E. is essentially an oxidizing solution with the capacity to keep the oxidized copper permanently in solution. Although many acids will etch copper, S. C. E. solution has the peculiar property of not attacking the solder . . . but giving fast, odorless etching of the copper.

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Revised Issue of the

MUIRHEAD SYNCHRO BROADSHEET



This revised issue of the Muirhead Synchro Broadsheet is available to all those interested in servo engineering. Prepared in tabular form for easy reference, it presents the brief specifications of Muirhead Control Transmitters and Receivers; Motor Tachometers and Tachometer Generators; Two-Phase Servomotors and Resolvers and Linvars in Standard Synchro frame sizes. It is available without charge and will be sent upon request.

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E and C editor tours British electronics industry

The electronics industry of the United Kingdom which is exceeded in size only by that of the United States ranks as one of the most rapidly expanding industrial complexes in present day Britain.

This observation was noted by Thomas W. Lazenby, editor of *Electronics and Communications* magazine who, together with three other editors of Canadian technical and business publications, recently returned from a tour of United Kingdom as guests of the British Government Commonwealth Relations Office. The itinerary of the tour which was arranged by the British Central Office of Information permitted the four Canadian newspapermen a close insight into British industry. Insofar as the British electronics industry is concerned, reports the editor of *Electronics and Communications*, it is running close to peak capacity. Latest figures available which are for 1957 indicate that the annual value of the industry's output including telecommunications equipment amounted to \$952,000,000 and there is every reason to believe that this figure has increased during the past two years. The value of export orders for British built electronic equipment in 1957 was in the order of \$121,800,000 the largest customer being the United States followed by Australia, South Africa and India.

The quality of British built products, according to Mr. Lazenby, is without doubt second to none and in many cases is noticeably superior to American products. Research in the British industry, upon which large amounts of money are being spent annually is keeping Britain in the forefront as a producer of new equipment.

While producers of electronic equipment are anxious to break into the Canadian market it has been expressed on more than one occasion that they have no desire to push the export of equipment into Canada that will militate against the Canadian industry. In view of the wide range of components and end equipment produced in Great Britain and which is not manufactured in this country this leaves a wide market potential for British products in Canada.

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INDEX TO ADVERTISERS

Page number is on the right.
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Key No.	Page No.
1. Adcola Products Ltd.	46
2. Airtron Canada Ltd.	45
3. Amphenol Canada Ltd.	58
4. Associated Electrical Industries (Canada) Ltd.	9
5. Automatic Electric Sales (Canada) Ltd.	31
6. Automatic Electric Sales (Canada) Ltd.	32-33
7. Automatic Electric Sales (Canada) Ltd.	34
8. Automatic Telephone & Electric Co. Ltd.	14
9. Aviation Electric Ltd.	8
10. Bach-Simpson Ltd.	10
11. Canadian Electronics Ltd.	44
12. Canadian General Electric Co. Ltd.	20
13. Canadian Lister-Blackstone Ltd.	2
14. Canadian Marconi Co.	3
15. Canadian Westinghouse Co. Ltd.	6
16. Cerl-Dale Ltd.	6
17. Daystrom Ltd. (Western Div.)	4
18. Edo (Canada) Ltd.	54
19. Eitel-McCullough Inc.	59
20. Electronic Associates Inc.	55
21. Essex Electronics of Canada Ltd.	41
22. Finkler Ltd., Len	41
23. General Radio Co.	62
24. Hewlett-Packard Co.	21
25. Hunt Co. (Canada) Ltd., Philip A.	49
26. I.R.E. Canadian Convention	48
27. International Resistance Co. Ltd.	58
28. Kester Solder Co.	54
29. Lampkin Laboratories Inc.	40
30. Muirhead Instruments Ltd.	50

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INDEX TO ADVERTISERS

(Continued)

Key No.	Page No.
31. National Fibre Co. of Canada Ltd.	56-57
32. Northern Electric Co. Ltd.	17
33. Phillips Electrical Co. Ltd.	13
34. Porter Co. (Canada) Ltd., H. K.	15
35. Pylon Electronic Development Co. Ltd.	49
36. R.O.R. Associates Ltd.	47
37. R. & M. Bearings Canada Ltd.	42
38. Rogers Electronic Tubes & Components (A Division of Philips Electronics Industries Ltd.)	7
39. Rohn Mfg. Co.	43
40. Sanborn Co.	16
41. Sarkes Tarzian Inc.	43
42. Snelgrove & Co. Ltd., C. R.	46
43. Sola Electric (Canada) Ltd.	19
44. Stark Electronic Instruments Ltd.	47
45. Struthers-Dunn Relays	45
46. Tektronix Inc.	53
47. Tung-Sol Electric Inc.	61
48. Welwyn Canada Ltd.	41

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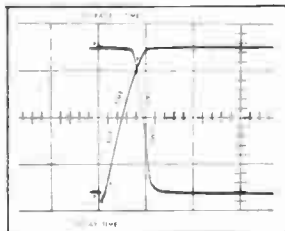
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characteristics by the
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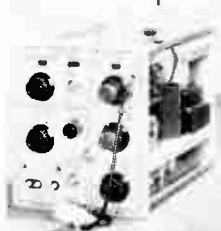


TYPE R TRANSISTOR-RISETIME PLUG-IN UNIT CHARACTERISTICS

- Collector Supply** 1 to 15 v continuously adjustable, positive or negative. Current capability—400 ma.
- Mercury-Switch Pulse Generator** Risetime less than 5 μ sec, amplitude 0.02 v to 10 v across 50 ohms, positive or negative. Overall risetime with Type 541A: 12 μ sec. Overall risetimes with other Tektronix Oscilloscopes—Types 543, 545A, 555: 12 μ sec—Type 551: 14 μ sec—Types 531A, 533, 535A: 23 μ sec.
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- Type R Transistor-Risetime Unit** \$300



The Type R Unit can trigger the Oscilloscope sweep either on the start of the test pulse only, or on both the start and finish to display delay, rise, storage, and fall times simultaneously.



The Type R Transistor-Risetime Unit, when plugged into a Tektronix Oscilloscope, supplies a fast-rising pulse and the required supply and bias voltages for measurement of transistor rise, fall, delay, and storage times. The Type R Unit can be used with all Tektronix Type 530 Series, Type 540 Series, and Type 550 Series Oscilloscopes.

When the Type R Unit is used with the Tektronix Type 541A Oscilloscope, risetime of the combination is 12 μ sec. The Type 541A is a fast-rise general-purpose oscilloscope that adapts to many specialized applications through its plug-in preamplifier feature. Nine plug-in preamplifiers are presently available, others will be announced in the near future.

Please call your Tektronix Field Engineer for complete details. If desired, he can arrange a demonstration in your own application.

TYPE 541A CHARACTERISTICS

- Vertical Response** DC-to-30 MC passband, 12- μ sec risetime, 50-mv/cm deflection factor with Type K Plug-In Preamplifier.
 - Signal-Delay** Permits observation of leading edge of signal that triggers the sweep.
 - Versatility**—Other Plug-In Preamplifiers available for many specialized applications.
 - Sweep Range** 0.1 μ sec/cm to 5 sec/cm in 24 direct-reading steps. 5-x magnifier increases calibrated range to 0.02 μ sec/cm. Continuously adjustable from 0.02 μ sec/cm to 12 sec/cm.
 - Triggering** Fully automatic, or amplitude-level selection with preset or manual stability control.
 - Accelerating Potential** 10 kv for bright display with fast sweeps and low repetition rates.
 - Amplitude Calibrator** 0.2 mv to 100 v in 18 steps. Square wave, frequency approximately 1 kc.
 - Regulation** Electronically-regulated power supply.
 - Type 541A**, without plug-in units \$1200
 - Type K Plug-In Preamplifier** \$135
- Prices f.o.b. factory.

ENGINEERS—interested in furthering the advancement of the oscilloscope? We have openings for men with creative ability in circuit and instrument design, cathode-ray tube design, and semiconductor research. Please write Richard Ropiequet, V.P., Eng.

Tektronix, Inc.

P. O. Box 831 • Portland 7, Oregon
Phone CYpress 2-2611 • TWX-PD 311 • Cable: TEKTRONIX

CANADIAN FIELD OFFICE:
3 Finch Avenue East, Willowdale, Ontario
Phone: Toronto, BAldwin 5-1138

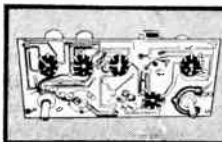
For complete details check No. 46 on handy card, page 51

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 3/32", 1/16", 3/64", 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-61 1/2% Tin-35 1/2% Lead

KESTER SOLDER COMPANY OF CANADA, LTD., Dept. U Brantford, Canada

For complete details check No. 28 on handy card, page 51

THE AIRLINES OF THE WORLD* HAVE MORE EDO LORAN NAVIGATION SYSTEMS COMBINED THAN ALL OTHER LONG RANGE NAVIGATION SYSTEMS

- *15, to date—Aerolineas Argentinas
• Air France • BOAC • Cubana
• Irish Air Lines • Japan Air Lines
• KLM • Lufthansa • Northwest
• Pan American • Qantas
• Sabena • SAS • Swissair
• Varig—also in use by MATS



For complete data on Edo Model 345 Loran, send for Technical Manual to Dept. 8-E.

Edo (CANADA) Ltd.

CORNWALL, ONTARIO

For complete details check No. 18 on handy card, page 51

Pye Limited supplies TV cameras for nuclear plant

The Transmission Division of Pye Canada Limited recently announced that their parent company, Pye Limited, has been awarded a large contract for closed circuit television equipment to be supplied to Hunterston Nuclear Power Station, Scotland. This TV equipment is being used for visual observation inside the reactor and for monitoring various other services. Special nuclear TV cameras, capable of withstanding high temperatures and high level radiation, are features of these unique cameras.

The contract calls for the supply of 30 of these special purpose TV cameras.

BRANCH MANAGER



Stanley Elkins

D. C. Brazier, Central Regional Manager of Phillips Electrical Company Limited, Brockville, Ont., announces the appointment of Stanley Elkins as manager of the company's Hamilton branch. Mr. Elkins was formerly manager of Phillips' Vancouver sales, and is a member of the company's Quarter Century Club. He brings a wide and diversified experience of electrical wire and cable requirements to his new post.

Navy anti-sub craft get Sperry analyzers

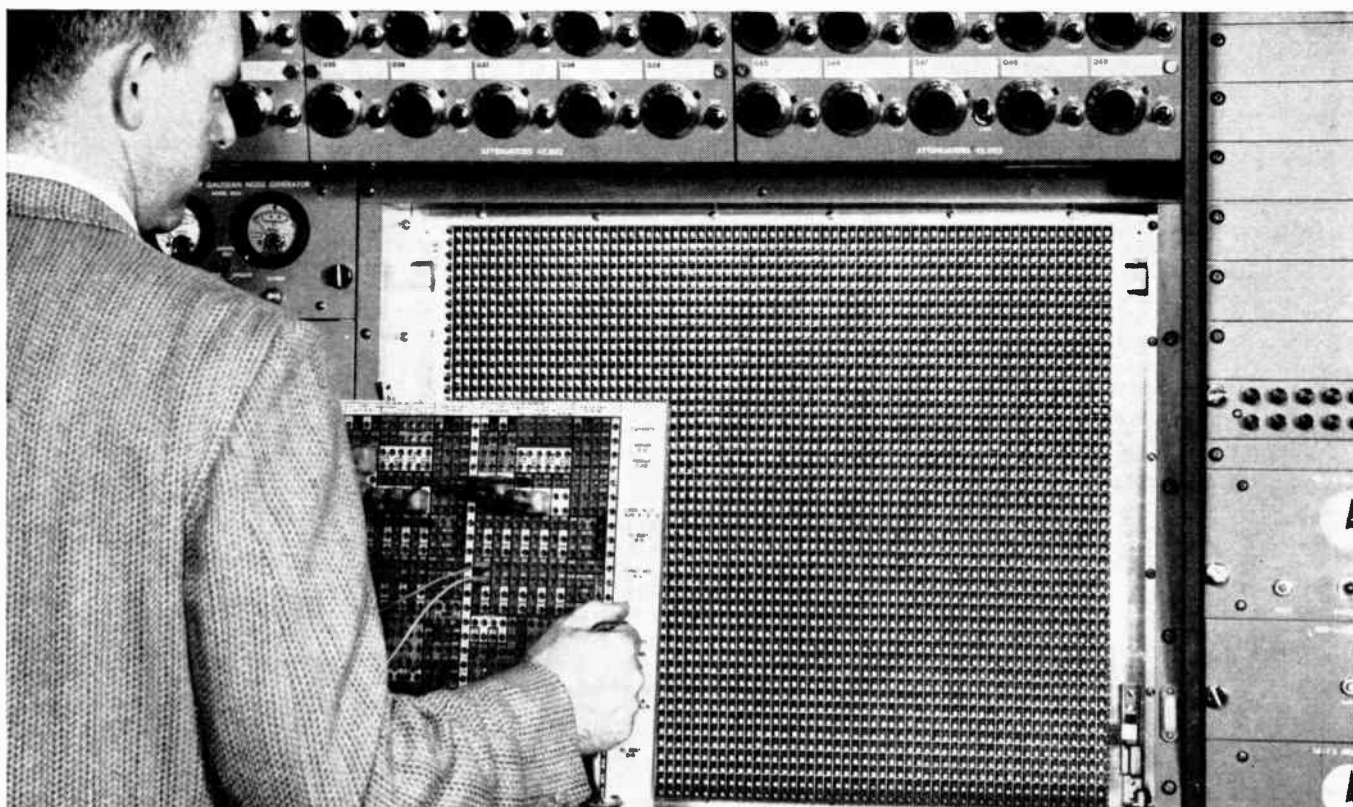
Maximum mission readiness and reliability in flight for the Navy's entire fleet of P2V Neptune patrol bombers are being assured by a program to equip the anti-submarine craft with airborne engine analysis systems, the Sperry Gyroscope Company announced recently.

The Neptunes are the latest in a series of naval aircraft to be equipped with Sperry analyzers, WV-2, R6D, R4Q-2 and P5M aircraft having been equipped under previous contracts. Similar Sperry systems are employed widely by the Air Force and in commercial and corporate aviation.

You can see and feel
the quality in EAI's
PACE
analog computer

There's a certain feel and appearance that goes hand-in-hand with quality and reliability. This is nowhere more evident than when you pull out the pre-patch panel in the PACE 231-R Computer. Feel the solid construction of the panel itself — notice the thousands of contacts in the patch bay, all plated with 24 carat gold. This reflects the quality built into every part of the PACE Computer.

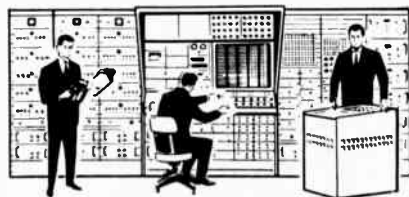
- Solid aluminum pre-patch panel is light and easy to handle. Its 3450 holes are precision drilled to .001 of an inch. It will not warp, bend or crack.
- The rack and console are of welded, heavy gage steel construction for added protection to precision components.
- 3450 contacts in the patch bay are plated with 24 carat gold. This provides unusually good electrical contact... important for accuracy at low voltages and currents.
- Contacts are isolated from each other by cells to shield against pick-up and cross talk.



Contacts in patch bay are plated with 24 carat gold for maximum accuracy at low voltages and currents.

- Coaxial leads and individually shielded amplifiers are part of a complete shielding system that extends throughout the computer.
- Bus bar power distribution provides an added measure of reliability and simplifies inspection and maintenance.
- Over 100 inspectors are engaged full-time in checking quality and performance of parts, circuits and systems.
- Components and sub-assemblies must pass seven separate tests—one test requiring 4 to 6 weeks to complete.

Outstanding career opportunities for engineers with proven ability — résumés invited.



EAI _____
 ELECTRONIC ASSOCIATES, INCORPORATED
 Long Branch, New Jersey

For complete details check No. 20 on handy card, page 51



“YOUR NEXT POLYESTER COMPONENT: mold it or machine it?”

Get an unbiased answer from National because we work either way

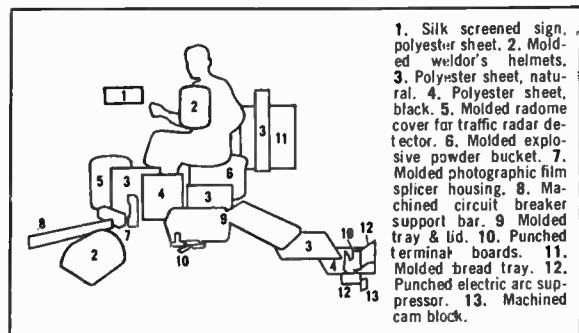
Giving the designer facts to help make the *right* design decision faster is perhaps our best “product.” Offering the broadest line of plastic materials and services permits us to give impartial help. Take polyester glass mat.

If the facts about configuration, volume, performance, operating conditions and cost point to a *molded* polyester shape, we’ll work from scratch—or from your drawings—and deliver 100% usable parts.

If the same facts point to a *machined* part, we’ll work the same way . . . and with the same results. In this case National can furnish four standard grades from which to select the one best material. GP-9100-A is our general purpose, medium cost sheet with good electrical and mechanical properties. GP-9104 is also general purpose, but lower cost. GP-9202 is our flame resistant grade and best electrical grade except for arc resistance. GP-9204 is both flame *and* arc resistant, UL-approved for sole support of current carrying parts at temperatures up to 150°C.

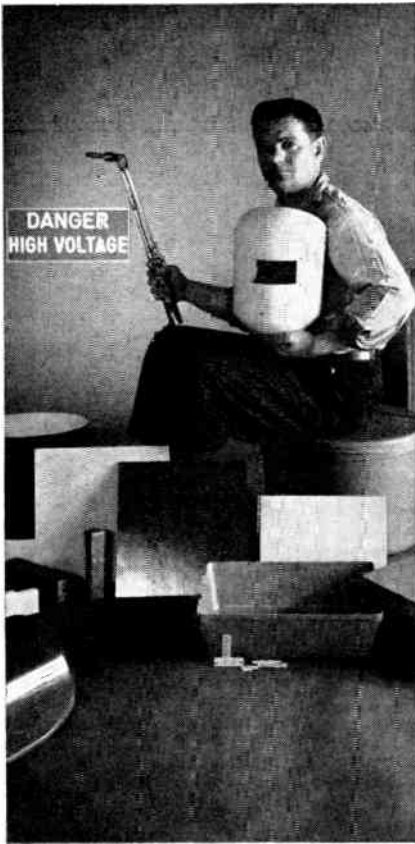
One more point. The problems inherent in machining polyester glass laminates have had a tendency to discourage some designers from considering it. We suggest that you bounce this headache out of your production facilities and into ours.

You see, we are interested in *both* your design and machining problems. Your component will be skillfully machined at one of our four complete, “service-located” fabricating facilities. Send for our Polyester Technical Bulletin 1164. We’ll be happy to include, also, data on the full line of National materials—over 100 grades. Write to National Fibre Co. of Canada, Ltd., Dept. O-8, Toronto 3, Ontario.



1. Silk screened sign, polyester sheet.
2. Molded welder's helmets.
3. Polyester sheet, natural.
4. Polyester sheet, black.
5. Molded radome cover for traffic radar detector.
6. Molded explosive powder bucket.
7. Molded photographic film splicer housing.
8. Machined circuit breaker support bar.
9. Molded tray & lid.
10. Punched terminal boards.
11. Molded bread tray.
12. Punched electric arc suppressor.
13. Machined cam block.

For complete details check No. 31 on handy card, page 51



CHOOSE FROM THESE MATERIALS...

Vulcanized Fibre: 10 standard grades; many special grades.

PHENOLITE® Laminated Plastic: over 80 standard and modified grades; paper, cotton fabric, nylon, asbestos, glass fabric, cotton and glass mat bases; phenolic, melamine, polyester, epoxy, teflon or silicone resins.

PEERLESS Electrical Insulation: coil, strip, corrugated.

Extruded Nylon, "Delrin", "Penton": rod, strip, tubing, special shapes.

Polyester Glass Mat: 4 standard sheet grades; custom molded shapes.

PHENOLITE Copper-Clad Laminates: 10 standard grades.

Combination Materials: Rubber-PHENOLITE; Rubber-Fibre; Wood-Fibre; Metal-Fibre; Asbestos-Fibre; PEERLESS-PHENOLITE.

BACKED BY THESE SERVICES...

Field Application Assistance
Complete Fabricated Parts Service
Stock Program for Immediate Shipment

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Toronto LEnnoX 2-3303
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NATIONAL

FIBRE COMPANY OF CANADA, LTD.
ATLANTIC & HANNA AVENUES, TORONTO
1411 CRESCENT STREET, MONTREAL

Book Review

Semiconductors, edited by N. B. Hannay of the Bell Telephone Laboratories, Murray Hill, N.J.

Here is an unrivalled, indispensable reference on the physical chemistry and fundamental physics of semiconductors, with detailed analyses of important semiconducting materials. The emphasis throughout is on basic principles and phenomena. The chemical aspects and the physics of semiconductor behavior are exhaustively treated.

Semiconducting materials are treated individually, the amount of attention given each material being in direct relation to the degree of understanding of that material which exists.

Each chapter, whether it be on principles, crystal growing, or specific materials is preceded by an introduction placing that chapter in perspective with semiconducting as a whole.

The contributors are all leaders in semiconductor research, and are well known in the particular area in which they write.

By virtue of its organization, thoroughness and authorship, this monograph will stand for many years to come as the standard work on semiconductors.

Semiconductors is published by Reinhold Publishing Corp., 430 Park Avenue, New York 22, N.Y., contains 767 pages, hard cover bound, price \$15.00.

Electronics For Everyone (2nd Revised Edition) by Monroe Upton.

This book explains in "human", simple language how the great "electricians" of the past made the discoveries and inventions that gave us our condensers, batteries, coils, and tubes; how later geniuses erected on the foundation thus laid the wonders of radio, radar, loran, high-fidelity phonograph reproduction, ground-controlled approach systems, television in black and white and in color, X-ray, lie detector, electronic

cooking, satellite and missile electronics, and other important applications of electricity.

It contains the very latest electronic developments and is illustrated with many drawings. It assumes no electrical knowledge on the part of the reader. It leads gradually from the elementary to the more advanced phases of the subject, and brings to life the electrical "greats" of past and present — Faraday, Volta, Tesla, Ohm, Ampere, Franklin, Edison, Farnsworth, and many others.

Electronics For Everyone is published by The Devin-Adair Company, 23 East 26th Street, New York 10, N.Y., contains 386 pages, hard cover bound, price \$6.95.

Television Receiver Servicing (Fourth Edition) by Milton S. Kiver, editor, Electrical Design News, Chicago, Ill.

This book deals exclusively with television repair. The changes in receiver circuitry and service methods since the last edition, in 1953, have been so numerous as to necessitate an up-to-date treatment of TV servicing.

The discussion is extremely practical. The reader is shown how to locate defects by interpreting what he sees on the screen and hears over the loudspeaker. Wherever possible, illustrations of image distortions are provided to show the serviceman what to look for.

Since many of the difficulties that beset television arise in the antenna system, every aspect of that system is considered in detail. The opening chapter is devoted to antenna installation. Chapter 2 deals with the installation and adjustment of receivers. Discussion of the actual servicing of receivers begins in Chapter 3 where the operation and application of test instruments are considered. Thereafter, each chapter is concerned with a particular part of the receiver, with emphasis on circuit operation, adjustment, and servicing.

E AND C EDITOR VISITS DOWNING STREET



Four Canadian trade and technical magazine editors spent the month of April in the United Kingdom as guests of the Commonwealth Relations Office, and under arrangements worked out by the Central Office of Information. While in London the party attended a reception at Downing Street, given by the Commonwealth Relations Office. Shown above, left to right, are: T. W. Lazenby, editor of *Electronics and Communications* magazine; R. L. D. Jasper, Head of Information Policy & Cultural Relations Section, C.R.O., and D. F. Kerr, lately Director of United Kingdom Information Services in Canada, and Director (designate) of British Information Services in India.

SUBMERSION-PROOF CONNECTORS



89 SERIES

The 89 series are good rugged waterproof multi-wire connectors. They provide dependable service even when submerged in mud, ice or water. They are ideal for use in radio and television stations, oil well equipment, railroads, harbours and marine applications. To facilitate handling in rough weather, coupling rings are extra long and heavily grooved. Flats are conveniently located for field servicing with standard open-end wrenches. Caps and chains are provided for all connectors.

AMPHENOL 89 series are available in a large number of standard "MS" inserts. Complete catalog data is available upon request.



CANADA LIMITED

TORONTO • OTTAWA • MONTREAL • CALGARY

For complete details check No. 3 on handy card, page 51

PRECISION-FILM RESISTORS



MOLDED METAL FILM

Controlled temperature coefficient never before available in film resistors.

1/8, 1/4, 1/2, 1 and 2 watt sizes.

Designed to surpass characteristic C of specification MIL-R-10509C.

ME type resistors offer high stability under difficult load and humidity conditions.

Write for data bulletin B-3.



HIGH TEMPERATURE

Continuous full load operation at 200°C. ambient.

1/2 - 1 - 2 watt sizes.

Resistance range 100 ohm to 10 Meg. ± 1%.

The HT series inherent stability allows continuous high temperature operation without hermetic sealing techniques.

The resilient high temperature coating withstands temperature cycling and humidity without deterioration.

Write for data bulletin.



RESISTORS

division of
Renfrew Electric Co. Limited

TORONTO • OTTAWA • MONTREAL • CALGARY

For complete details check No. 27 on handy card, page 51

OPPORTUNITIES

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

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

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

TELETYPE EQUIPMENT FOR SALE

Models 15, 19, 14 (TG.26) Tables, Rectifiers and numerous spares, including complete chests at lowest prices. Lists on request.

Suplex Lamps Limited

239 High Holborn - W.C.1, England

SALES AGENCY OPPORTUNITY

Manufacturer of unique Six Second Scope Soldering Iron is interested in contacting Canadian Agency prepared to import and distribute throughout Canada. The outstanding features of extreme light weight, small size and "Hot in Six Seconds" make it an ideal soldering iron for commercial and home applications.

Box 5017

Electronics and Communications
450 Alliance Avenue, Toronto 9, Ontario

GRADUATE ELECTRONIC ENGINEER

or Physicist required, 25-35, with broad technical background, exceptionally interesting career opportunity in engineering sales. Submit detailed résumé in strict confidence.

Box 5018

Electronics and Communications
450 Alliance Avenue, Toronto 9, Ontario

ELECTRONICS TECHNICIAN

seeks sales position. Graduated from electronics course. Experience includes working as technician in development lab of well-known company, teaching radio at a high school, and serving as service representative for Bell Telephone Co.

Box 5019

Electronics and Communications
450 Alliance Avenue, Toronto 9, Ontario

ELECTRONICS TEACHER

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

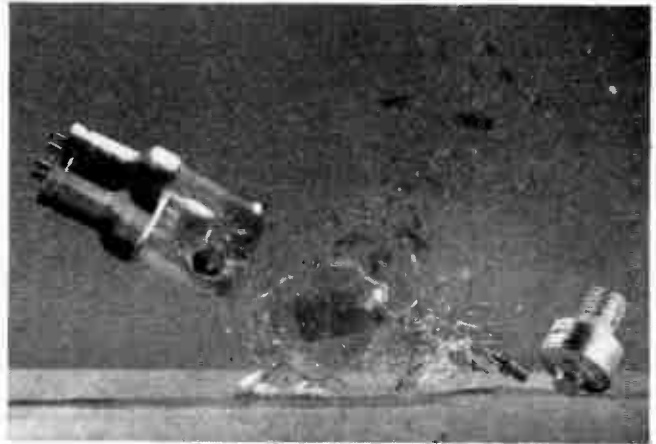
Box 5014

Electronics and Communications
450 Alliance Avenue, Toronto 9, Ontario

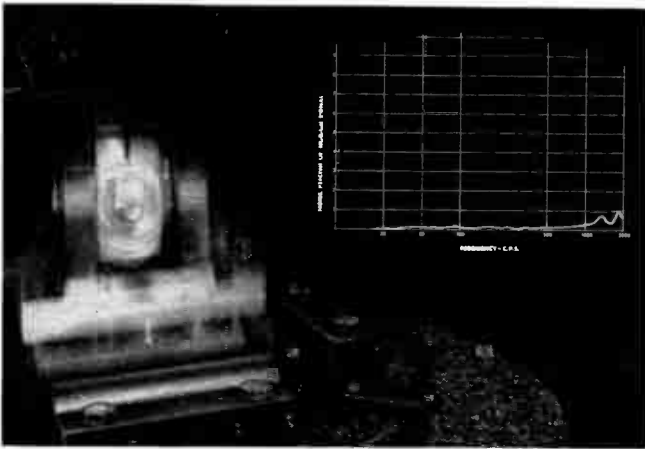
Only EIMAC gives you ceramic "extras" in more than 40 tube types



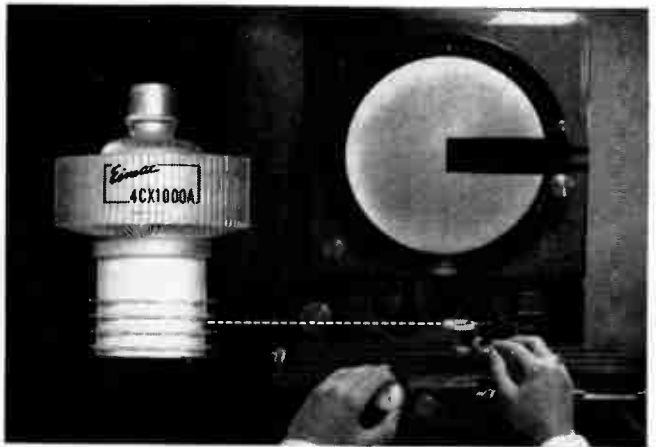
SMALLER SIZE



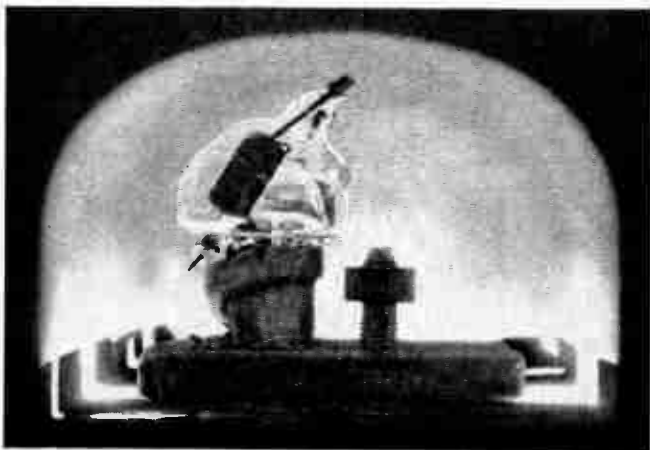
IMPACT SURVIVAL



VIBRATION SURVIVAL



EXACT DIMENSIONAL UNIFORMITY



EXTREME HEAT SURVIVAL



LOWER DIELECTRIC LOSS

Write for literature on these incomparable ceramic reflex and amplifier klystrons, negative grid and traveling wave tubes.



Eimac First for high power amplifier klystrons.

EITEL-McCULLOUGH, INC.
SAN CARLOS CALIFORNIA



2036 Prince Charles Road, Ottawa

For complete details check No. 19 on handy card, page 51

editorial

“. . . and tubes therefor . . .”

According to reliable sources there were 12,500,000 replacement tubes bought in Canada in 1958 for radio and television receiving sets and other entertainment type devices such as record players. The estimated retail sales value of these tubes amounted to \$34,375,000.00 of which amount the federal government collected a 15 per cent excise tax.

The excise tax on the purchase of replacement tubes for entertainment devices has been in effect since the war years when it was presumably imposed as a war tax measure and it has remained on the statute books ever since despite attempts to have it removed.

The wording of the Excise Tax Act which stipulates replacement tubes as an item of excise taxation leaves one with the impression that its inclusion in the first instance was not well nor justly considered, an impression that is strengthened by the fact that of all the many other components that go to make up radio and television receiving sets and other types of sound reproducing entertainment devices, tubes are the only components which are subject to excise taxation when purchased as replacement parts.

The Excise Tax Act as it affects the purchase of replacement tubes for radios, television etcetra reads as follows:

“. . . 5(a) Phonographs, record playing devices, radio broadcasting receiving sets or any combination of the foregoing and tubes therefor; any apparatus or device that enables a person to hear programmes of music distributed by any means whatever or radio broadcasting programmes distributed by any means whatever; but this paragraph does not include any article coming within paragraph (b) of this section . . . 15 per cent.

“. . . 5(b) Television receiving sets and tubes therefor, any apparatus or device that enables a person to see, or to see and hear, television programmes distributed by any means whatever or television radio broadcasting programmes distributed by any means whatever . . . 15 per cent . . .”.

Apart from the typical gobeldegook that is characteristic of government composition the words “. . . and tubes therefor . . .” contained in the above excerpt from the Excise Tax Act stand as out as a prime example, in our opinion at least, of how a civil service administrative mentality by the use of an over riding phrase tied a mill stone around the neck of the Canadian electronic tube manufacturing industry nearly two decades ago as a measure of war time taxation and in unrelenting governmental fashion has not seen fit to relax the imposition long past the day of its necessity and justification.

It is interesting to note with respect to this particular taxation that when the public purchase television or radio receiving sets they pay a 15 per cent excise tax on their original purchase and when they replace “. . . tubes therefor . . .” they pay another 15 per cent excise tax on these replacements.

This ‘double take’ on the part of taxation authorities is, we understand, to be found only in the case of tubes for radio and television receiving sets and other entertainment type devices.

This is a taxation ‘double take’ that government authorities should lose no time in either relaxing or removing without further delay particularly in view of the great numbers of foreign manufactured tubes that are being imported into Canada and which in some instances are underselling Canadian manufactured goods in an alarming fashion. The removal, or at least a reduction of the excise tax on Canadian manufactured tubes, would permit Canadian manufacturers to assume a stronger competitive price position against the influx and increasing sales of foreign made tubes.

Insofar as Canadian tube manufacturers are concerned they are operating against two obstacles. First, adverse government legislation in the matter of the 15 per cent excise tax imposed on the purchase of replacement tubes, and secondly, against the lack of government legislation compelling foreign manufacturers of tubes exporting to Canada to imprint the name of the country of origin on their products.

Of the one hundred fastest selling tube types being manufactured in Canada, Japanese exporters are matching 80 per cent of them with competitive brands and it is significant to note that these one hundred types represents 85 per cent of the total Canadian sale of tubes.

The lack of government legislation to compel foreign manufacturers to imprint the country of origin on their products is tantamount, we believe, to denying the Canadian public the opportunity of purchase discrimination when buying replacement tubes for their radios and television receiving sets.

Legislation to correct this situation, together with some modification of the excise tax on replacement tubes is, we believe, of urgent necessity and should be acted upon by government authorities without delay, assuming of course that government authorities have any altruistic concern for the welfare of the Canadian tube manufacturing industry.

Stamp on top of bulb clearly shows date Bell Laboratories installed Tung-Sol/Chatham 5R4WGY rectifier tubes. September 9, 1958, five years, over 43,000 hours later, the tubes were removed.



Tung-Sol/Chatham tubes operate 43,000 hours – more than five years

Bell Laboratories, Murray Hill, New Jersey — research and development center for new and better telephone components — recently removed two Tung-Sol/Chatham 5R4WGY rectifier tubes, forerunner of the improved 5R4WGB, after more than five years of unbroken, high-quality operation.

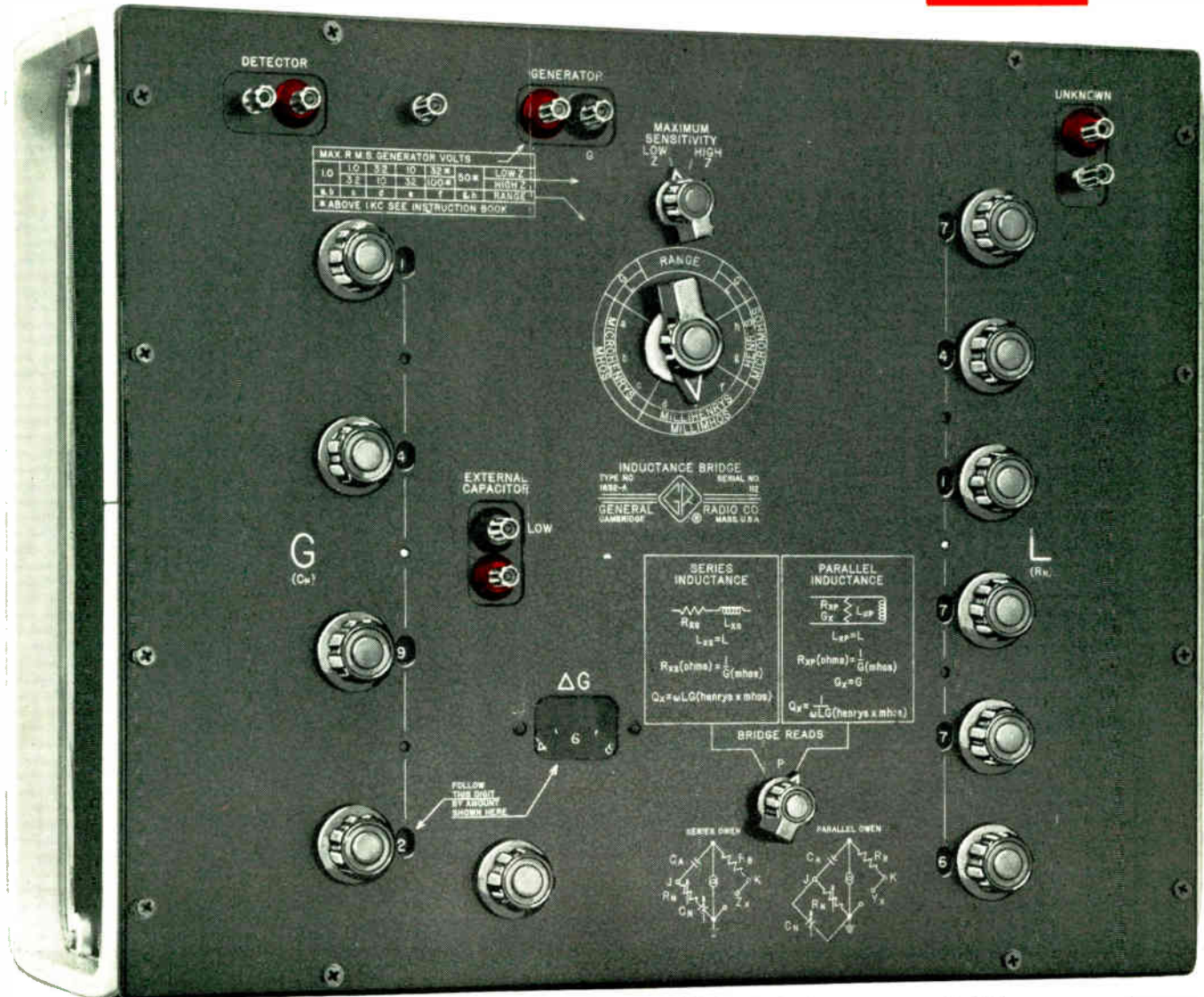
Records revealed that on March 20, 1953, Bell Laboratories installed the rectifier tubes in a frequency distribution amplifier operated at Murray Hill. Removal date: September 9, 1958, more than five years and 43,000 service hours later. Comparison with the normal 5R4WGY warranty of 500 hours underscores the extraordinary performance of these Tung-Sol/Chatham tubes.

More and more tube users in all areas of industry are gaining similar benefits of long-life reliability found throughout Tung-Sol/Chatham tubes. You can too! When you need replacements . . . the next time you order new electronic equipment, specify Tung-Sol/Chatham tubes! For further information, to fill a special socket, contact:

Abbey Electronics, Downsview, Ontario.

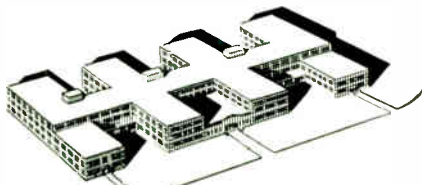
 **TUNG-SOL®**

NEW — FOR THE PRECISE MEASUREMENT OF INDUCTANCE



Type 1632-A Inductance Bridge . . . \$875

- ★ The ideal bridge for the calibration of inductance standards.
 - ★ Wide range — 0.0001 μ h to 1111h.
 - ★ Basic direct-reading inductance accuracy is $\pm 0.1\%$.
 - ★ High resolution — six significant figures.
 - ★ No sliding balance.
- ★ Easy, in-line readout. Range switch locates decimal point and identifies units of measurement.
- ★ Designed for use at 1 kc and lower, the bridge will make measurements to at least 10 kc with slight reduction in accuracy.
- ★ Measures either parallel or series inductance over mid-range; parallel inductance for high-Q inductors, series inductance when Q is low. Direct reading in terms of conductance and inductance.
- ★ Incremental inductance measurements may be made at low a-c and d-c voltages.



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also manufactures
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For complete details check No. 23 on handy card, page 51

1928
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Generator