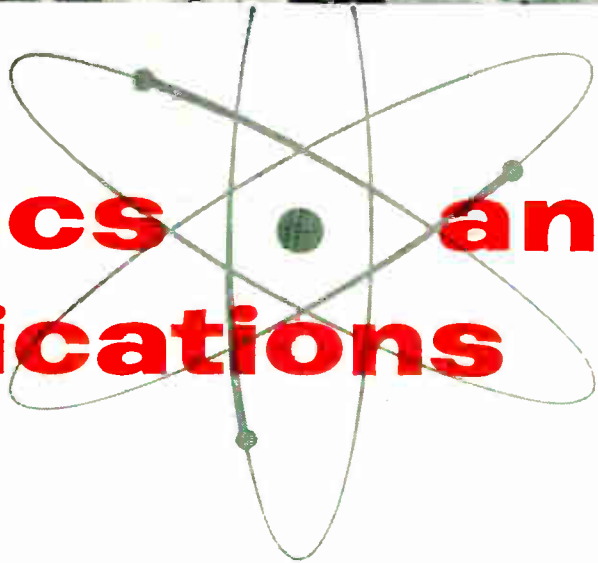


Quieter than a tomb! (Story, page 3)

electronics and communications



an age publication
NOVEMBER 1959

SEE PAGE 55

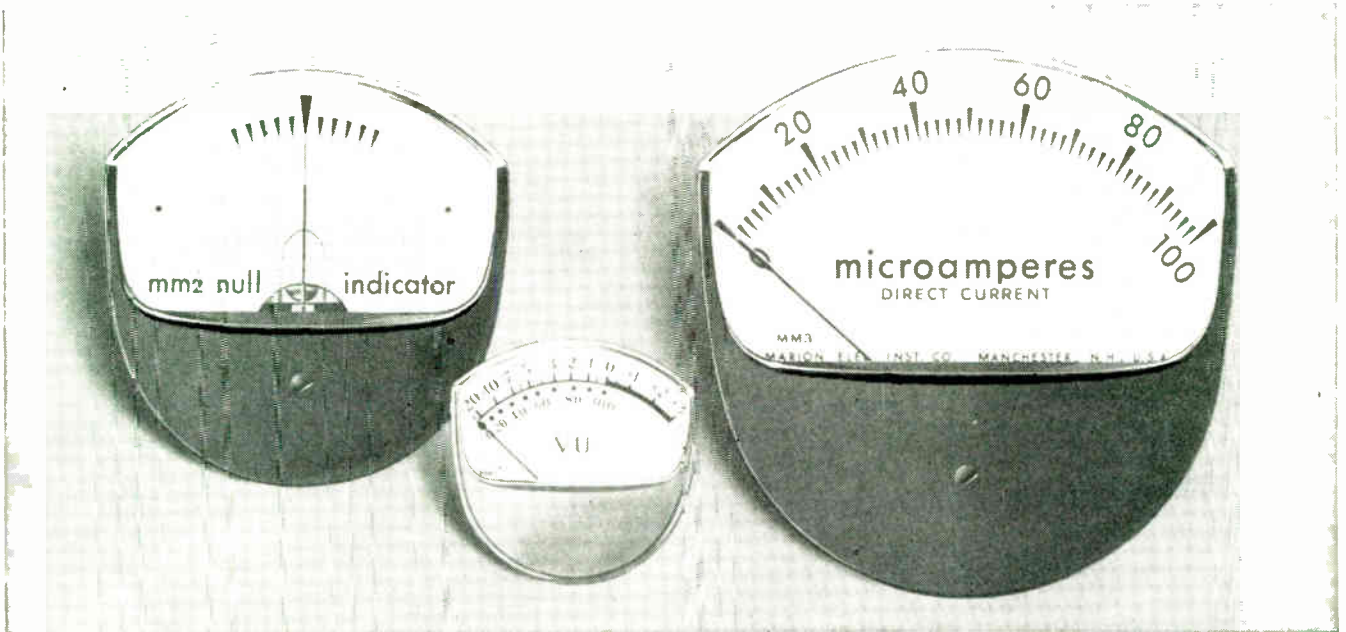
World Radio History

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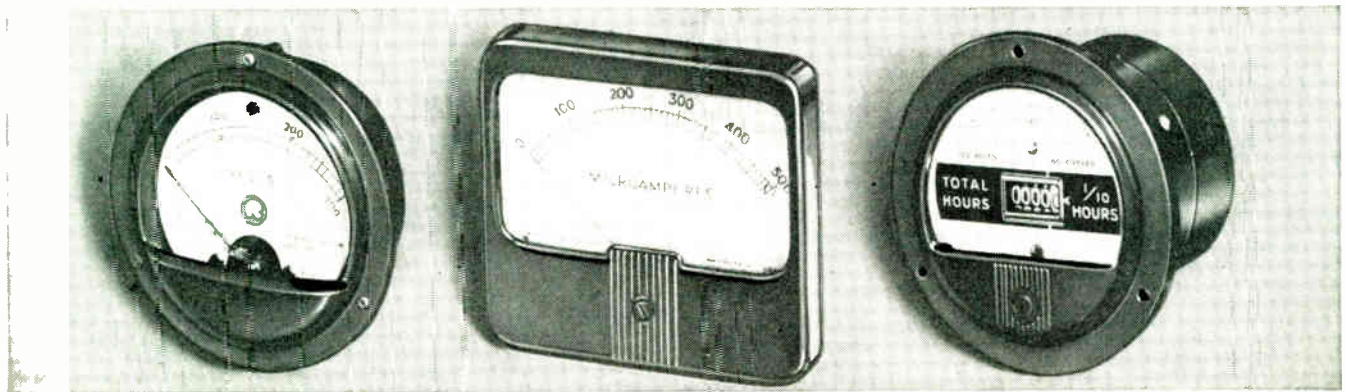
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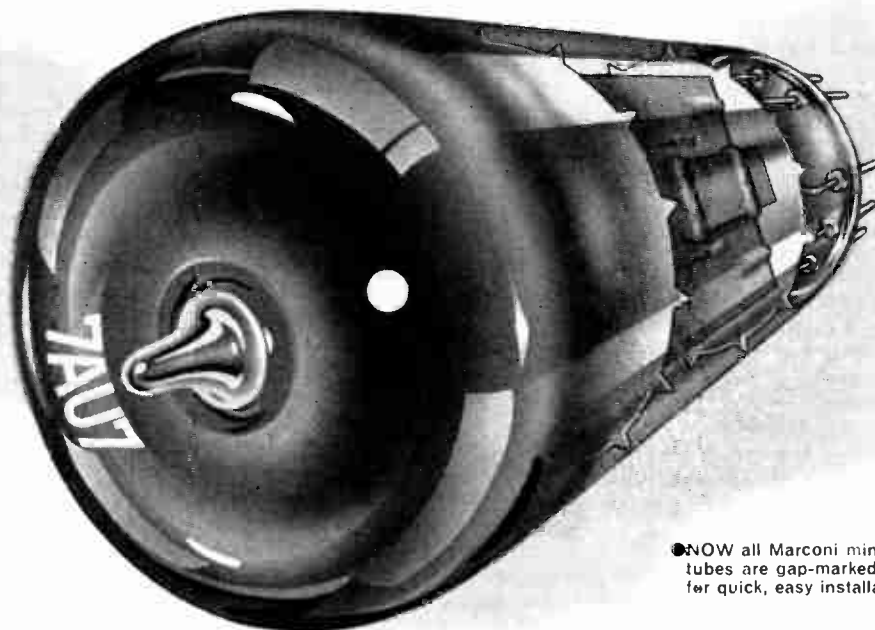
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● gap-marked and type branded on top for
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ELECTRONICS AND COMMUNICATIONS, November, 1959



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**The Microwave Electronic Tube Company
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For complete details check No. 3 on handy card, page 45



an age publication

Electronics and Communications

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

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Subscription Rates: Canada, British Possessions
and United States: 1 year — \$5.00; 2 years — \$9.00;
3 years — \$12.00. Foreign: 1 year — \$10.00.

Member Canadian Circulations Audit Board

Authorized as second class mail
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PRINTED IN CANADA

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COVER STORY

Our cover illustration shows the interior treatment of the "anechoic chamber" at the Northern Electric Company's laboratory in Belleville, Ontario. The wall treatment of this chamber is up to five feet in thickness and creates for the experimenter a close approximation of free space with the propagation of sound waves unaffected either by reflection or by interference from external sources.

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Engineers tuning EIMAC klystron amplifier at I.R.E. Show find it non-critical, reliable

For the first time outside field applications and test installations, engineers had an opportunity to tune an Eimac Klystron amplifier on the air during the I.R.E. Show and Convention in Toronto last month.

The klystron amplifier was operated at 800 megacycles with output power on one kilowatt. Engineers tuning this equipment were impressed with the simplicity of its non-critical operation. Participants found Eimac's external cavity klystrons as easy to tune as a lower frequency negative-grid amplifier.

This drastic demonstration fea-

tured the same type of Eimac Klystron already famous for outstanding long-life, reliability and performance in such troposcatter systems as Dew Line, White Alice and Texas Towers.

An animated display depicting the effect of velocity modulation on electron flow illustrated the circuit isolation and thermal safety factors that make klystrons ideal for UHF microwave applications.

A wide selection of Eimac klystrons, reflex klystrons, traveling wave tubes and negative grid tubes were displayed. Exhibits of Eimac's

advanced work in traveling wave tubes were of particular interest to engineers confronted with rugged environmental applications.

For detailed information on latest Eimac developments, write for your copy of "What's New With The Electron . . . 1959."

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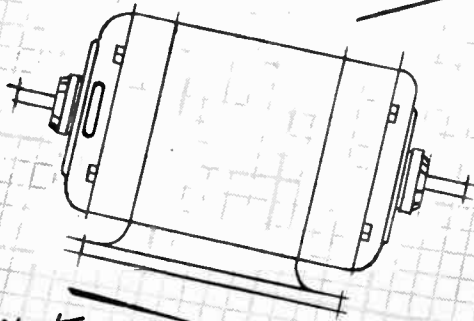
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*Specify Federal's Isonel Magnet
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The outstanding thermal properties of Federal's (Polyester) Isonel Magnet wire permit the operation of motors at higher temperatures—suitable for use at Class F (155°C) temperatures. This means the motor size can be reduced for a given horsepower, or greater horsepower can be obtained from a given size.

While having this advantage of higher operating temperatures, Federal's Isonel possesses the excellent heat shock, chemical and abrasion resistant properties of vinyl-acetal magnet wire. It has improved resistance to flow at high temperatures; and it does not craze, giving higher voltage breakdown and better shelf-life.

*Available in Pay-Off Packs
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For complete details check No. 35 on handy card, page 45

World Radio History



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1600 PIV
750 MA DC

Replacement for types 80, 82, 83, 83V, 5Z3
Max. RMS Voltage . 1100 Circuit F.W.
Max. Peak Current Type Load Any
(ma) 8000 Max. Amb. Temp. . 100°C

S-5017
1600 PIV
750 MA DC

Replacement for types OZ4, 5X4, 5Y4, 6AX5, 6X5
Max. RMS Voltage . 1100 Circuit F.W.
Max. Peak Current Type Load Any
(ma) 8000 Max. Amb. Temp. . 100°C

S-5018
1600 PIV
750 MA DC

Replacement for types 5AU4, 5AW4, 5AZ4, 5T4, 5U4,
5Y4, 5W4, 5Y3, 5Z4, 5931, 6087, 6106
Max. RMS Voltage . 1100 Circuit F.W.
Max. Peak Current Type Load Any
(ma) 8000 Max. Amb. Temp. . 100°C

S-5019 or S-5162
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500 MA DC

Replacement for type 5R4
Max. RMS Voltage . 1950 Circuit F.W.
Max. Peak Current Type Load Any
(ma) 5000 Max. Amb. Temp. . 100°C

S-5033
4500 PIV
250 MA DC

Replacement for types 6AU4, 6AX4, 6BL4, 6U4, 6W4,
12AX4, 17AX4, 25W4
Max. RMS Voltage *3200 Type Load . . . Res.-Ind.
Max. Peak Current Max. Amb. Temp. . 100°C
(ma) 2500 * Input is 1600V Max.
Circuit H.W. with Cap. load

S-5130
10400 PIV
300 MA DC

Replacement for types 866, 866A, 3B28
Max. RMS Voltage . 7400 Max. Amb. Temp. . 100°C
Max. Peak Current For capacitive loads de-
(ma) 3000 rate input voltage 50%
Circuit H.W. and current 20%
Type Load . . . Res.-Ind.

S-5207
1600 PIV
500 MA DC

Replacement for types 6X4, 6063, 6202
Max. RMS Voltage . 1100 Circuit F.W.
Max. Peak Current Type Load Any
(ma) 5000 Max. Amb. Temp. . 100°C

S-5251
1600 PIV
600 MA DC

Replacement for types 5AU4, 5AW4, 5AZ4, 5T4, 5U4,
5Y4, 5W4, 5Y3, 5Z4
Max. RMS Voltage . 1100 Circuit F.W.
Max. Peak Current Type Load Any
(ma) 6000 Max. Amb. Temp. . 100°C

S-5343
7000 PIV
300 MA DC

Replacement for types 816, 836 or 3B28 and 866 at
reduced voltage
Max. RMS Voltage . 5000 Max. Amb. Temp. . 100°C
Max. Peak Current Note: For capacitive
(ma) 3000 loads derate input vol-
Circuit H.W. tage 50% and current
Duty Continuous 20%
Type Load . . . Res.-Ind

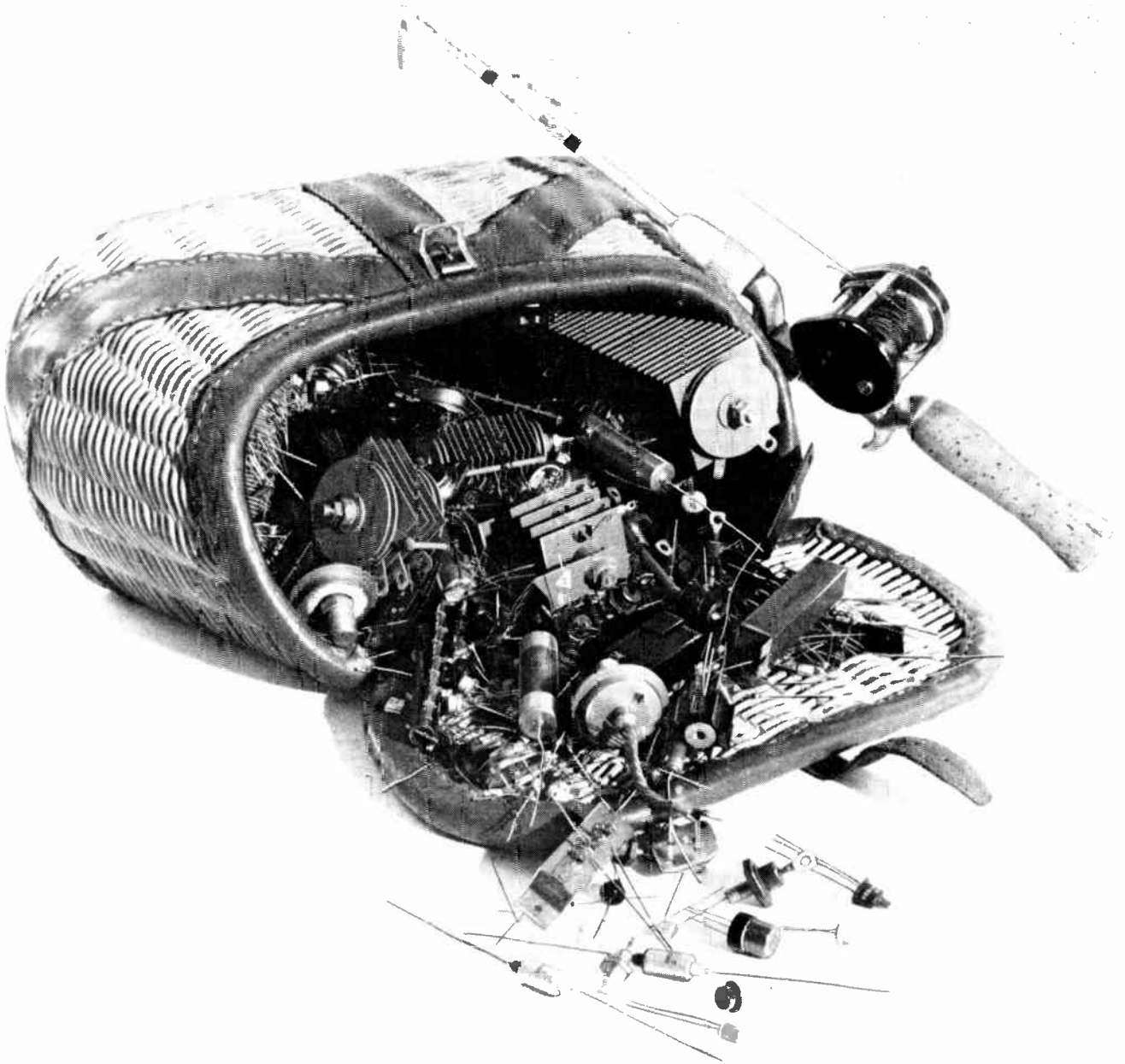
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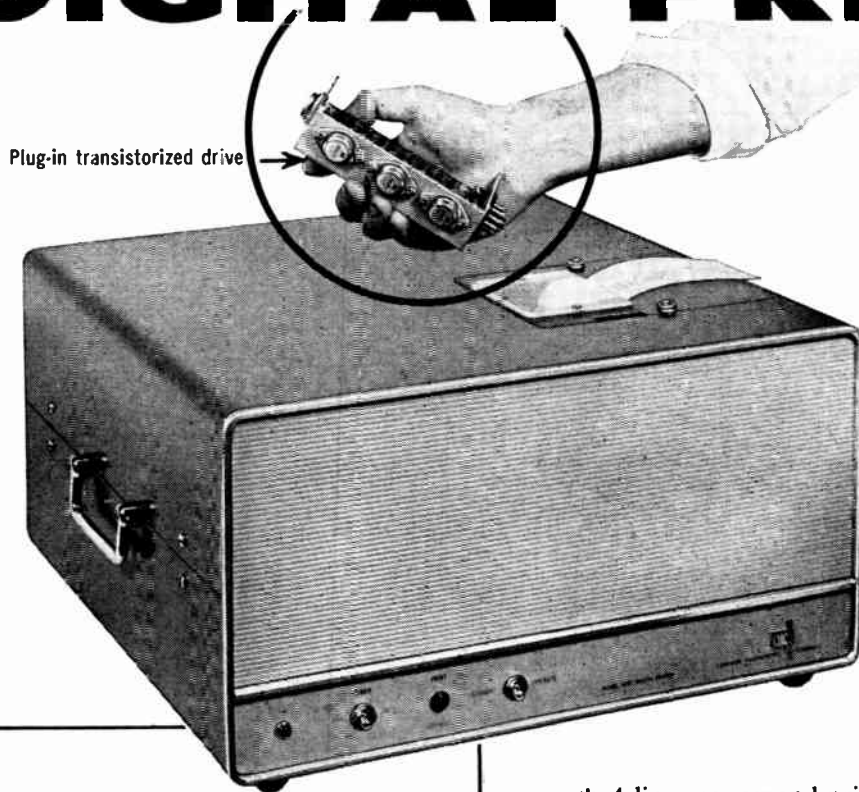
Electronic Tube Section

CANADIAN GENERAL ELECTRIC COMPANY LIMITED

For complete details check No. 16 on handy card, page 45

only CMC makes a

SOLID STATE DIGITAL PRINTER



Plug-in transistorized drive

*Announcing
the 400 CT-*

*The most versatile
digital printer
ever made*

SPECIFICATIONS

Printout capacity	6 digits standard.
Accuracy	determined by basic counting instrument.
Display time	0.2 seconds minimum, maximum controlled by the counter.
Weight	60 lbs.
Power requirements	115 volts $\pm 10\%$, 50-60 cps 25 watts
Dimensions	17" W x 8½" H x 16½" D. (Rack mounting available as option D.)
Warranty	One year on electronics; 1.5 million lines @ 4 lines per second on matrix; 10 million lines @ 4 lines per second on printer assembly, or 1 year, whichever occurs first.
Price	\$1350.00. Add \$10.00 for rack mount.

* 4 lines per second printout * Takes 1-2-2-4 or 1-2-4-8 four line code * No stepping switches * Operates from only 6 volt input * Parallel entry * Special options available including 10 line and analog output * 6 digit printout, up to 12 digits on special order * Rugged unitized construction * Completely compatible with CMC's new solid state frequency-period counters, and other types of transistorized counting equipment.

For a demonstration of this remarkable new printer and complete technical information, call your nearby CMC engineering representative or write to us direct. Please address Dept. 3011.



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



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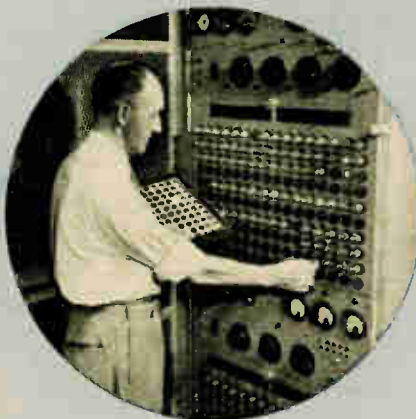
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Northern Electric

TELEPHONE TYPE TUBES

are built for

LONG LIFE!



we manufacture the following tubes

No. 396A

No. 407A

No. 403A

No. 403B

No. 408A

These are double triode tubes with separate, indirectly heated cathodes. Designed for use in amplifier, mixer, oscillator, multivibrator and clamp circuits. The useful frequency extends through the VHF range.

These are miniature pentode tubes having an indirectly heated cathode. Designed for use in amplifier circuits at high and ultra high frequencies.

ELECTRICAL DATA

	No. 396A	No. 407A	No. 403A	No. 403B	No. 408A
Heater Voltage (AC or DC)	Parallel.....	6.3 volts	20 volts	6.3 volts	20 volts
	Series.....	40 volts	40 volts	6.3 volts	6.3 volts
Heater Current	Parallel.....	300 milliamperes	100 milliamperes	175 milliamperes	150 milliamperes
	Series.....	50 milliamperes	50 milliamperes	150 milliamperes	50 milliamperes
Plate Current	$E_b = 150$ volts; $E_c = -2.0$ volts		$E_b = E_c = 120$ volts		$E_b = E_c = 120$ volts
Transconductance	8.2 milliamperes per section 5500 micromhos per section		7.5 milliamperes 5000 micromhos		7.5 milliamperes 5000 micromhos
Direct Capacitances without external shield	Grid to Plate.....	1.3 μmf per section	.....	.....	.019 μmf (maximum)
	Input.....	2.2 μmf per section	.....	.....	3.9 μmf
	Output.....	1.0 μmf per section	.....	.....	2.0 μmf
	Plate-to-Plate.....	0.04 μmf}	.....	.....	.....
Direct Capacitances with external shield	Grid to Plate.....	*1.3 μmf per section	.....	.....	†.010 μmf (maximum)
	Input.....	*2.3 μmf per section	.....	.....	†4.0 μmf
	Output.....	*1.3 μmf per section	.....	.....	†2.9 μmf
	Plate-to-Plate.....	**0.03 μmf}	.....	.....	.....
Plate-to-Plate, Maximum.....	**0.10 μmf}	.....	.....	.....	.....

MECHANICAL DATA

Cathode.....	Coated Unipotential	Coated Unipotential
Bulb.....	T6 $\frac{1}{2}$	T5 $\frac{1}{2}$
Base.....	Small Button, 9-Pin	Miniature Button, 7-Pin
Mounting Position.....	Any	Any

*Pin 5 and external shield (EIA No. 315) connected to cathode pin of section under test. Elements of other section grounded.

**Pin 5 and external shield (EIA No. 315) connected to ground with other elements.

†External shield (EIA No. 316) connected to cathode pins 2 and 7.

No. 416B

This is a planar type triode tube with a metallic shell, designed for use as an amplifier or frequency multiplier at frequencies in the order of 4000 megacycles.

ELECTRICAL DATA

Heater Voltage.....	6.3 volts
Heater Current.....	1.18 amperes
Plate Voltage.....	200 volts
Frequency.....	4,000 megacycles
Gain (50 milliwatts output).....	9 decibels
Bandwidth (3db down).....	10M megacycles
Amplification Factor.....	200
Transconductance ($I_b = 30$ ma.).....	50,000 micromhos
Direct Interelectrode Capacitances	
Grid to Plate.....	1.45 μmf
Grid to Shell ($E_g = 6-1v$; $E_p = 0v$).....	††8.7 μmf
Plate to Shell.....	††.019 μmf
Cathode to Shell.....	42.5 μmf

MECHANICAL DATA

Cathode.....	Unipotential
Mounting Position.....	Any
Weight, Approximate.....	1 ounce
Socket.....	KS14134 (Equivalent to or)

††Cathode connected to shell through cathode to shell capacitance.

2059-4

Complete data sheets may be obtained from your nearest Northern Electric Distributing House.

Northern Electric

COMPANY LIMITED

SERVES YOU BEST

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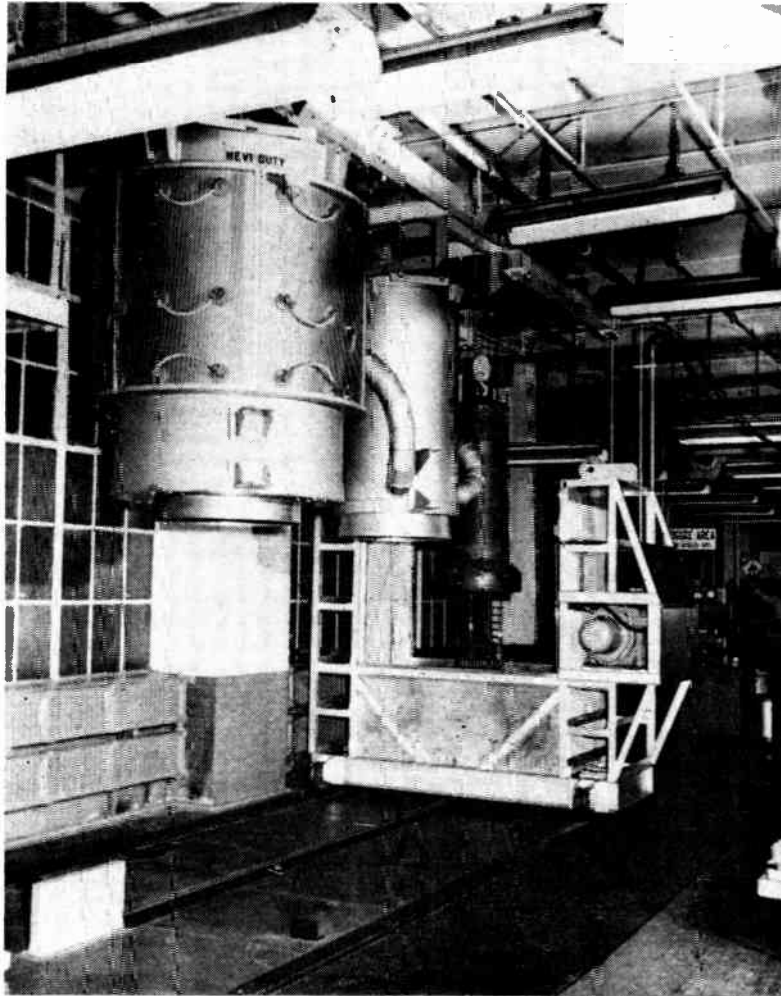


Figure 1. The sintering furnace shown at left operates on the batch method and thus produces the desired uniformity of product. This requirement is obtained by thorough instrumentation controlling the three heat zones shown. The ferrite charge, sealed under an inconel retort, is traversed in the mobile carriage to any of the three positions, firing, cooling and loading.

The prospect for the manufacture of ferrites appears to be excellent and an expansion of production into a greater variety of types, to supply users of ferrites, is presently being effected by the Northern Electric Company Limited. The following article describes the processes now used by the Northern Electric Company Limited in

The manufacture of ferrites

by J. J. Francis and G. R. Rodriguez*

The existence of ferromagnetic materials has long been recognized. The first great application of ferromagnetism was the use of "lodestone" or magnetite ferrite in the navigation compass, a device which became common after the twelfth century. Gilbert's famous treatise "De Magnete" was written in the sixteenth century. Its publication was followed by a continuous interest in magnetism during succeeding centuries.

The great discoveries of the nineteenth century physicists in the fields of electricity and magnetism led to the development of the telegraph, telephone, radio and electric motor and to an increased interest in ferromagnetic materials. Starting with soft "pure" iron for electro magnets and "hard" carbon steel for permanent magnets, the use of silicon steel in 1900, of

*Northern Electric Company Limited, Montreal, Que.

permalloy in 1920, and of ferrites in 1946, has steadily improved and broadened the use of magnetic materials.

Soft ferro-magnetic materials are usually used to increase the storage of magnetic field energy for a given magnetic field while largely confining its extent. A communication inductor can be made more compact by the use of a ferromagnetic core which can be used to confine the field, preventing stray coupling. The use of an efficient core material will reduce inductor losses because the reduced field strength required for a given induction can be obtained with fewer windings, which reduces I^2R and eddy current losses in the windings.

$$Q = \frac{2 \pi f L}{R_e + R_m}$$

Here f is the frequency, L the inductance, R_e the resistance of windings, and R_m the resistance due to the core. The factor Q , multiplied by the permeability, μ , is a useful measure of core quality for inductor design. For other applications special characteristics may be desired. Permanent magnets require large coercive force with high residual magnetization, while memory cores in computers require a rectangular hysteresis loop. For microwave isolators a moderate saturation magnetization with a high, controlled resistivity is desirable so that the material can be magnetized to give a high directional attenuation at a given frequency. The usual desired characteristics are, however, good permeability, good stability and a minimum core loss.

Permeability and core loss for magnetic materials are usually non-linear functions of magnetic field strength, field frequency and temperature: while core shape, core strain, core porosity, crystalline size, core anisotropy (microscopic and crystalline) as well as the basic chemical composition of the core, all affect these magnetic properties. In practice, core material costs can also be an important factor in design and even cheap transformers use special core materials in order to reduce the expensive heat dissipation problems caused by core loss. Core loss is often approximately described by means of the Legg equation.

$$R_m = e \mu f^2 L + a \mu B f L + c \mu f L$$

Here R_m is the effective series resistance, f the frequency, L the inductance, B the peak flux density, while e is the eddy current coefficient, a the hysteresis co-efficient and c the "residual" co-efficient.

The core loss due to eddy currents increases with

the square of the frequency and can be reduced for a given induction at a given frequency by increasing the resistivity of the core material. Silicon steel has a higher resistivity than iron and this is one reason it is a more efficient core material. Core resistance is further increased by laminating the core further limiting the induced currents. Another method is to powder the ferro-magnetic material, mix it with an insulating binder and mould it to shape. Only certain materials with low crystalline anisotropy and magnetostriction such as permalloy can be treated this way or else hysteresis losses grow large. Some otherwise soft magnetic materials can be turned into useful permanent magnets by introducing a second phase, impurities, or porosity. The permeability of soft powdered metal cores is low despite the very high permeability of the powdered metals due to the numerous insulating gaps which, furthermore, being of uneven size and shape decrease core performance.

The second and third terms of the Legg equation concerning hysteresis and residual losses have very complex causes and the equation breaks down for medium and high frequency core materials.

Introduction of ferrites

New types of core materials called ferrites became commercially available after 1946. These materials which were developed in occupied Holland, are polycrystalline ceramics with resistivities of from 10 to 10^{10} ohm cm. They are spinels with an isometric cubic, or hexoctahedral crystal structure of composition $Fe_2^3+O_3 \cdot M^2+O$ where M is one or a combination of divalent metal ions. Suitable ions include iron, nickel, barium, zinc, copper, cadmium, aluminum, manganese, magnesium and cobalt.

These ferrites are made from relatively inexpensive metal oxides using ceramic techniques, pressing the powdered material and then sintering. Because of their high melting temperatures and high reactivities at these temperatures, ferrites cannot be cast like glass or metals. Like powdered core materials, ferrites can be machined only by grinding, but they can be ground very accurately and are dimensionally stable and strong. Although "ferrites" cover a wide range of properties, some generalizations can be made. The resistance of ferrites is so high that eddy current core losses are not significant. The initial permeabilities

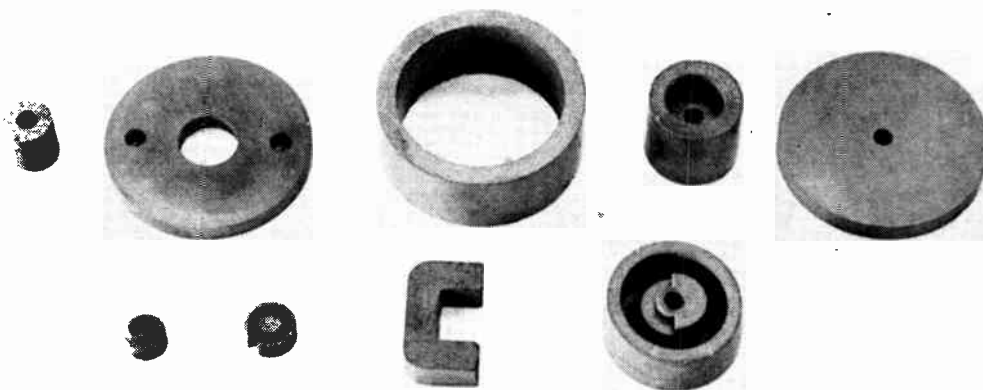


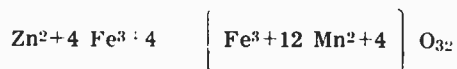
Figure 2. The ferrite parts shown above have been sintered but not ground. The top row consists of the five ferrite components for the #1509 Carrier Filter Inductor, while the bottom row shows a half section of four small ferrite cores.

of some ferrites are very high compared to the powdered metal core materials with which they compete at higher than power frequencies. The maximum permeabilities of ferrites are not high compared with the metal core materials. Permanent magnet and power applications of ferrites do not offer the large performance advantages obtained at higher frequencies but permanent magnet ferrites are cheap and have very useful performances due to their extremely high coercive force.

Transformers, such as television receiver fly-back transformers operating at about 100 kc., use magnesium or nickel zinc ferrite cores very advantageously. Most ferrites have a non-linear B-H curve at medium flux densities and where stability to DC magnetization or modulation in this region is important permalloy cores may be more suitable.

Generally, for frequencies above power frequencies a higher Q core at a lower cost can be obtained by selecting a suitable ferrite. Ferrites with special characteristics such as a high core loss at a given resonant frequency are useful for suppressors and microwave isolators and square hysteresis loop ferrites are used for memory cores, while some "ferrite" materials can be used for cores at frequencies in the 1,000 Mc range.

The ferrites presently made at the Northern Electric Company are manganese zinc ferrites with a very high 100 kc μ Q product of 110,000 and a permeability of about 1500 at 5 gauss flux density. This ferrite is a mixed crystal non-stoichiometric ferrite of approximate composition,



The crystal anisotropy is low and the permeability high because the divalent zinc ions in the tetrahedral sites lower the curie temperature to about 200°F. The magnetostriction and thus the hysteresis is low because of the presence of the ferrite $\text{Fe}_2\text{O}_3 \cdot \text{FeO}$ which has a strong positive magnetostriction. All other ferrites have a negative magnetostriction and the effective

magnetostriction of the mixed crystal ferrite is very low so that coercive force is low despite the ever present internal stresses.

Manufacturing methods

The method of manufacture of ferrites at the Northern Electric Company Limited is fairly typical except that product requirements are very strict and controls are rigid. The main product is the 1509 filter inductor. The ferrite for this inductor must be strong and dense with a minimum of porosity yet crystallite size must not be large or else hysteresis losses grow large. The ferrite must be relatively free of impurity ions while correct composition and a nearly stoichiometric oxygen content must be maintained or else the performance deteriorates greatly.

Briefly, the process consists of mixing the metal oxides, presintering and then grinding the oxides with the addition of a binder, pressing the resulting powder to shape and then sintering in a controlled atmosphere. Finishing is by grinding with diamond and silicon carbide wheels.

The raw material requirements are not quantitatively understood yet, but spectrographic, metallic content, and particle size tests are used regularly. Average particle size must be below one micron, while good purity material in a highly active state is necessary. The activity of the materials is increased by using metal carbonates which decompose into highly active oxides during the presintering operation. The calcium found in small quantities in commercial iron oxides appears to be valuable as a catalyst, but other impurities such as silicon are destructive and difficulty is sometimes experienced in obtaining a suitable material. The raw materials are iron oxide- Fe_2O_3 , zinc oxide-ZnO, and manganous carbonate- MnCO_3 . These are accurately weighed out according to the metal content analysis and then mixed.

Mixing is done with water in a paddle mixer, although dry mixing by tumbling has also proved successful. The wet mix is filtered and the cake is oven baked. The cake is then granulated and presintered. This presintering gives a more homogeneous product and cannot be successfully eliminated. During this operation the manganous carbonate loses CO_2 and the iron oxide loses some oxygen, the resulting material being slightly magnetic.

Presintering after ball milling is repeated in some processes to give a slightly more homogeneous product.

Ball milling the sintered material down to an average particle size of less than one micron follows. The binder and binder solvent are added at this stage. Fifteen per cent of chlorinated naphthalene and 70 per cent carbon tetrachloride are used as binder and solvent. The chief reason for use of a non-aqueous solvent and wax binder is the prevention of the formation of hydrates which are produced when materials such as magnesium oxide are used, although the organic solvent and binder are supposed to give a more dense part after pressing, due to their lubricating nature. Work is going on with the aim of using smaller quantities of water solvable binders and promising results have been achieved.



Figure 3. The unit shown at the left is a double ran hydraulic press of 50 ton capacity used for pressing ferrite parts. The action is completely automatic and a rate of 600 parts per hour can be achieved in a single cavity tool.

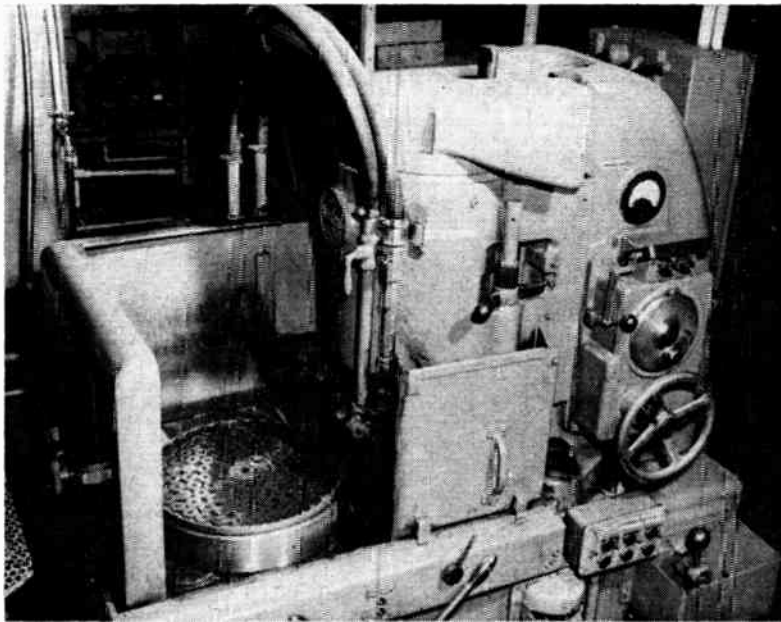


Figure 4. A fine sintered finish required on ferrite parts is obtained by horizontal grinding with #150-D diamond wheels. The sintered parts, being magnetic, are loaded directly on to a rotary magnetic chuck, as shown in the illustration at left.

If the geometry of the part is simple and strong, no binder need be used beyond 4-8 per cent of water. Cohesion is due to the clay-like nature of the predominating iron oxide. Cohesion is aided by the flaky shaped particle obtained by dry ball-milling, the mechanism apparently being Van der Waals bonding. There is evidence that wet ball-milling gives a small size range of spherical particles. The part made with water sinters at a lower temperature, but crystallite size range is somewhat large, and Q and mechanical strength is reduced about 10 per cent.

Apparently, the controlled porosity left by a solid binder in a pressed ferrite tends to inhibit the growth of large crystallites as material with a very small quantity of dry binder has shown unusually high Q and a comparatively uniform grain size.

The wet slurry is milled for 24 hours or more with twice its weight of steel balls. The slurry is removed and the solvent evaporated while being agitated to prevent the settling out of the heavy oxides.

After evaporation, the cake is granulated, oven dried and stored in air-tight containers. As the wax and residual solvent are hygroscopic, difficulty can be experienced in pressing if the humidity is high and the powder is exposed. The pressing is done in an automatic 50-ton Denison press at a pressure of about 50,000 psi and a two second dwell time. One fourth per cent zinc stearate die lubricant is added to the powder before pressing. With 15 per cent wax binder the ferrite density of even a perfectly dense part is only about 55 per cent and the use of smaller amounts of binder permits greatly reduced moulding pressures. The tooling for ferrite parts is carbide, because of the very abrasive nature of the ferrite powders. Ferrites can be extruded but large amounts of plasticisers and lubricants are needed and the material tends to be anisotropic and porous.

A dewaxing operation in a cyclone furnace at 800°F is done to remove the wax binder. The parts are fragile but can be handled if care is taken. No shrinkage or sintering takes place at this low temperature. The rate of dewaxing is critical for too rapid removal of binder cracks the parts.



Figure 5.

Sintering critical operation

Sintering is the most critical operation in the manufacture of manganese zinc ferrites. The resistance and magnetic properties are extremely sensitive to firing temperature and atmosphere while cooling rates are critical. The difference between a good and an unacceptable ferrite can be determined by a 5°F change in soak temperature or a ½ per cent change of oxygen content in the furnace atmosphere. Although a long soak period is desirable in order to obtain a dense ferrite of small grain size, a shorter soak period is required to obtain a reasonable furnace output. Furnace atmosphere is wet nitrogen with a small amount of air added. Manganese zinc ferrite sensitivity to atmosphere is due mainly to the ability of manganese to exist in several valence states.

Too large an oxygen content gives $Mn_3O_4 \cdot Fe_2O_3$.

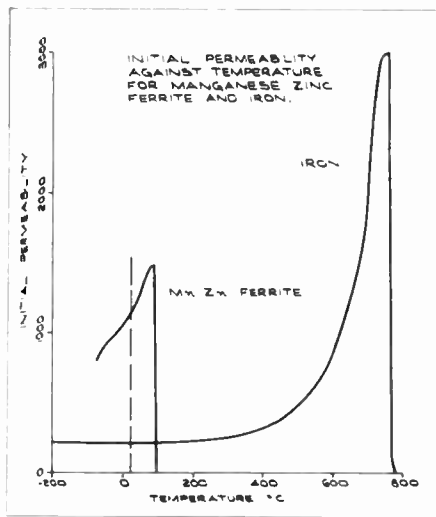


Figure 6.

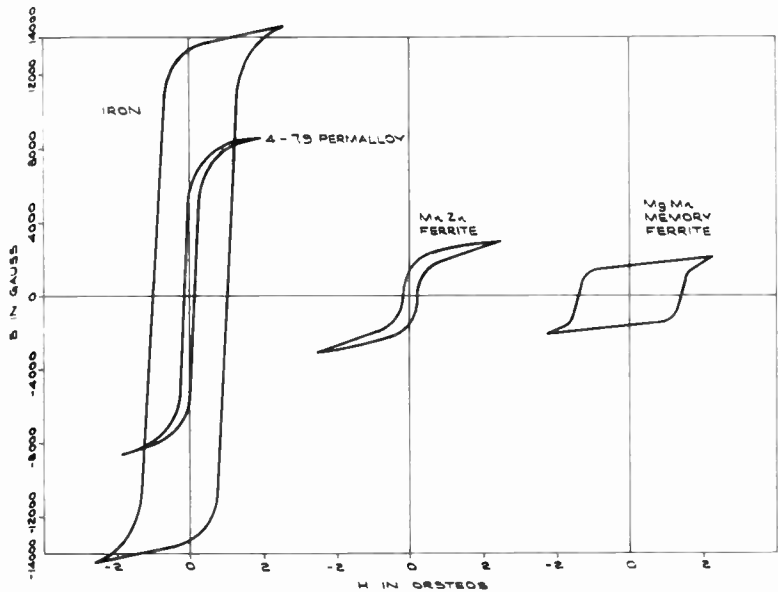


Figure 7.

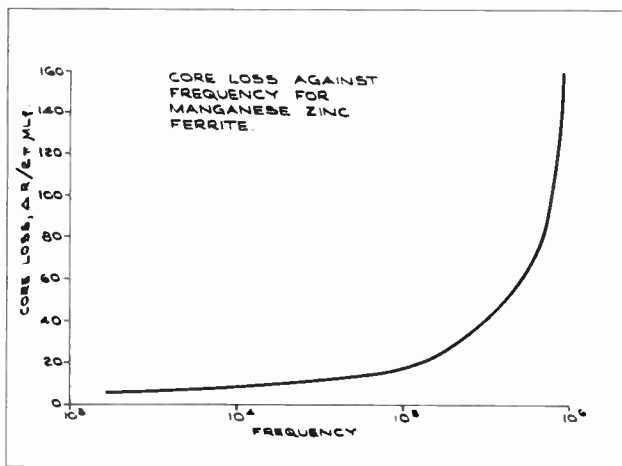


Figure 8.

while too little gives $MnFe_2O_4$. $MnOFeO$ instead of the correct $MnFe_2O_4$. The equilibrium oxygen pressure increases greatly with temperature, so the presintering does not require a special atmosphere. The large bell furnace illustrated was especially designed for ferrite sintering. The firing retort of inconel is dropped from the heating bell and then moved laterally and raised into the cooling bell for a controlled firing cycle. The furnace has three independently controlled heating zones to give an even temperature and the firing cycle is controlled by a Leeds and Northrup D.A.T. control system and recorders. The use of inconel which oxidizes, causes changes in the atmosphere oxygen content and makes the rate of furnace atmosphere flow quite important.

The cooling rates for ferrites are critical because the desired solid solution of complex spinels tend to separate out into mixed crystals of simple spinels, the second arrangement having a lower free energy. Rapid cooling "freezes in" the high temperature configuration, and ion mobility is so low at room temperatures that diffusion cannot be significant. In particular, slow cooling of the non-stoichiometric ferrite allows the separation out of plates of $\alpha-Fe_2O_3$. The occurrence of a given metal ion in a given crystal site in the spinel lattice is also dependent on temperature because at

high temperatures a random distribution of ions in octahedral and tetrahedral sites tends to occur unless one ion has a strong preference.

Rapid cooling also counters the tendency of manganese ferrites to pick up oxygen during cooling. Internal stresses are increased by rapid cooling and if these are high a stress relief operation can be of value, although this has not been found necessary with the present process.

Linear shrinkage of the sintered parts is about 14 per cent, regardless of the binder used, and the fired density is about 4.7. Dimensions as sintered can be held to about 2 per cent and flat surfaces are finished on a number 11 Blanchard grinder equipped with a diamond wheel and a magnetic chuck. Circular surfaces are finished on a Cincinnati centerless grinder using a silicon carbide wheel.

Ferrites can be ground more accurately and easily than comparable core materials. Being slightly porous and non-homogeneous, ferrites tend to fracture and chip easily under the heat and stress of grinding. For this reason, diamond grinding is preferable where extremely clean edges are necessary. Because of their hardness of about 7 on the Mohs scale, ferrites can be easily machined by using ultrasonic grinding methods.

Testing of the machined parts is done at a flux density of 5 gauss on a Maxwell bridge. Special silver contact jigs are used to establish the required 4 turns about the part, and the inductance and resistance is measured. The parts have a permeability of from 1400 to 1600 and a core loss from 3 to 4 ohms per unit permeability per henry to give a μQ of about 110,000. The resistivity is about 1000 ohms cm and the temperature coefficient of permeability is less than .3 per cent per °F per unit of permeability.

The parts are assembled using permacell cellulose acetate cement and bonding in pressure jigs at elevated temperatures. Although core loss is the property under test the related property important for communication inductors is the distortion, defined as V_3/V_1 where V_3 is the voltage of the third harmonic and V_1 of the fundamental. The finished 1509 inductor is capable of linear adjustment to ± 20 per cent by means of the screw adjustable tuning slug, while the Q ranges up to 500. Two other small cup inductors produced are shown in the photograph.

Considered to be one of the most significant developments in instrument design in thirty years, the taut band meter operates on as little as .0000001 watts.

The taut band friction free meter

Ever since the introduction of the original D'Arsonval meter movement, electrical indicating and measuring instruments have generally been restricted to the friction and sensitivity limitations of the pivot, jewel and hairspring types of suspension. Steady improvement of this basic design over the years has provided meters suitable to most requirements, however, with the advent of the many new and highly specialized electrical and electronic devices requiring instrumentation, the need for a movement more sensitive and reliable than that provided by the pivot-jewel and hairspring type became apparent.

A new concept of moving element suspension utilizing the friction free "taut-strip" principle has been made possible through the development of a new alloy used as thin metal bands to support the movement, carry current and provide the restoring torque.

This new development has extended the previous ranges available to sensitivities as low as 2 microamperes for 100 angular degrees of pointer deflection and having power consumptions of the order of .0000001 watts. The true value of this design can only be realized after instrumentation engineers have had a full opportunity to absorb the full meaning of the new sensitivities now made available.

The taut band meter

The new, taut band meter suspension completely eliminates the conventional pivots, bearings and hairsprings to provide a friction free movement with sensitivities of the order of 2 microamperes full scale.

The highest accuracy panel meters previously available had sensitivities of the order of 50 microamperes full scale and were extremely delicate with reference to shock or vibration.

This new development will be of interest to instrumentation scientists who previously were limited by the

more delicate laboratory standards that are subject to frictional and temperature effect errors which pose a barrier to more accurate measurements.

Previous attempts at taut band suspensions with any reasonable length of scale arc had been limited to 50 microampere sensitivities at best, therefore, this new break through is heralded as one of the most important single developments in instrumentation in over 30 years.

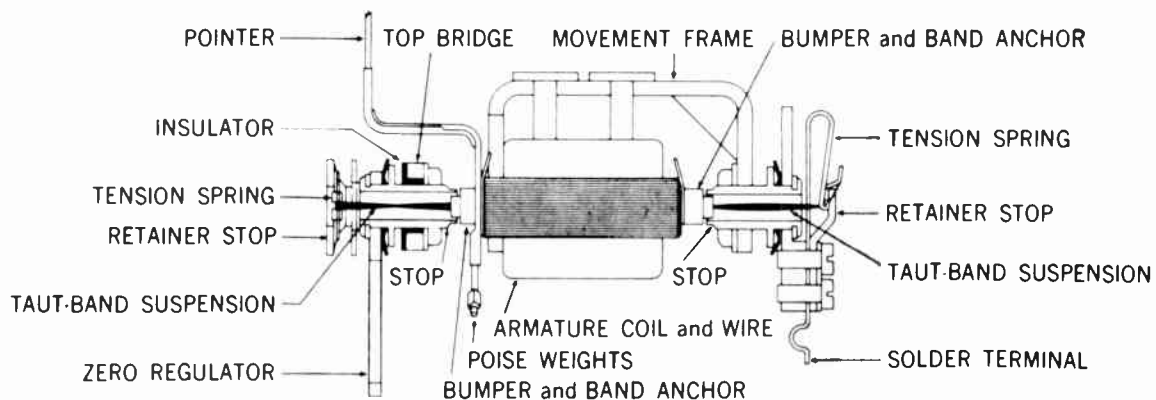
The reliability of these new instruments is also one of their more notable features — there is no friction error so the suspension is free from fatigue effect . . . the complete elimination of wearing parts has increased life indefinitely.

The new type meters have an overload capacity of up to five times full scale current indefinitely and are unharmed by surges up to 300 times normal current.

The new friction-free suspension has been applied to instruments of the conventional 100° panel type DC meters, 250° long scale meters, laboratory standards, AC iron vane meters and AC dynamometer type meters.

Probably the most important feature of the new taut-strip suspensions, is the fact that there are no frictional forces limiting or restricting the sensitivity. The old practice of "tapping out" pivot friction is now a thing of the past.

According to the Hickok Electrical Instrument Company, manufacturers of the instrument, it is now possible to construct moving-iron ammeters (with taut-strip suspensions) having extremely low power consumption. Due to the inherent sensitivities now available, characteristics such as damping can be controlled to a much finer degree than heretofore possible. For example, the new type movement permits measurement of AC voltages and currents of frequencies between 1 and 5 cycles and as low as 0.6 cycles through simple damping.



D'ARSONVAL, PERMANENT MAGNET TYPE METER MOVEMENT

X-rays produced from beta sources are finding new uses by means of nuclear gauges. Areas in which these instruments are employed for measurement and control include plastic films, paper products, rubber, sheet steel and liquid flow.

The nuclear gauge—lab workhorse

by C. A. Stone*

The nuclear gauge is becoming an increasingly familiar part of the automation scene. Instruments employing radioisotopes are being used to measure and control plastic films, paper products, rubber, sheet steel, coating thickness, liquid flow and many other products and processes accurately and with fast response time.

In the past the range of products and product thicknesses or compositions which can be measured has been limited by the lack of gamma ray emitting isotopes with energies in the region from 10-300 kilovolts. True, this is the energy region covered by x-ray machines. However, radiation sources which require no power, have extreme stability, need little maintenance, and are competitive costwise would attract new and widespread applications.

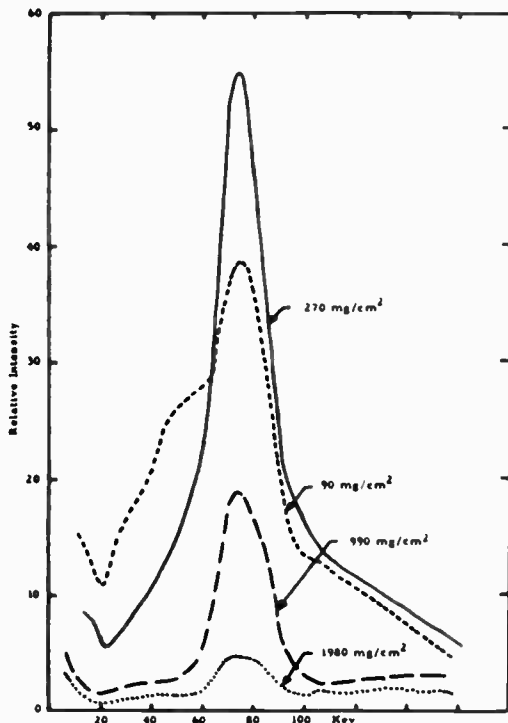
Shortly after the wealth of isotopes became available from nuclear reactors it was apparent that nature had made an omission. In the aforementioned energy region (10-300 kev) there were almost no radioisotopes which emitted gamma rays and which had practical half lives

— i.e., greater than a few months. At the same time, scientists working with large sources of beta ray emitting isotopes were troubled by the bremsstrahlung or x-radiation, which came from source mountings and source shields. Scientists at Armour Research Foundation and Oak Ridge National Laboratories were quick to combine the two “problems” and utilize the x-rays produced from beta sources for measurement purposes.

Since these first uses of “bremsstrahlung sources” a number of empirical designs have evolved, and today there are a few commercial instruments containing such sources of radiation.

The main requirements for an isotopic x-ray source for radiography and most gauging applications may be estimated in terms of the change in detector signal, dI , which arises from a fractional change $d\sigma/\sigma$ in the sample, where σ is the product of thickness and density.

*Supervisor, Nuclear Physics Section, Armour Research Foundation.



Left: Fig. 1: Spectro for Sr⁹⁰ and lead in transmission.

Below: Fig. 2: Spectro for Sr⁹⁰, Y⁹⁰ and tin for different geometries.

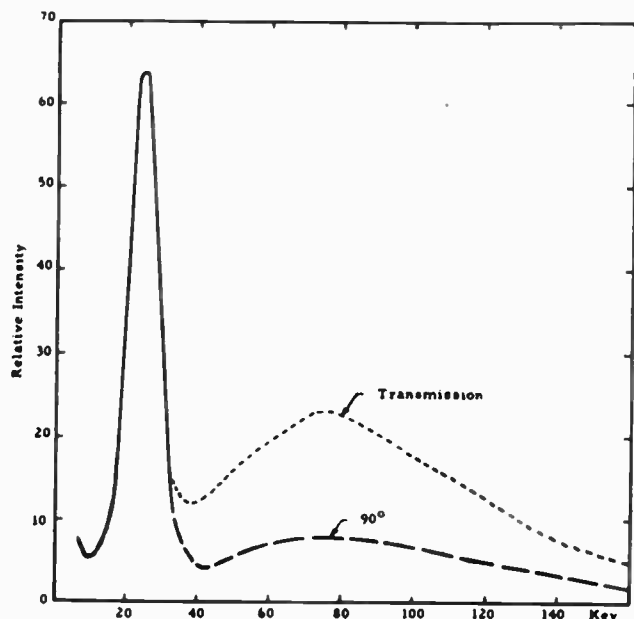


TABLE I

Isotope	Maximum Beta Energy Mev	Half Life	Method of Production
Ca ⁴⁵	0.254	152 days	Reactor
Ru ¹⁰⁶	0.039	1.0 years	Fission Product
Pm ¹⁴⁷	0.223	2.6 years	Fission Product
Tl ²⁰⁴	0.765	3.5 years	Reactor
Kr ⁸⁵	0.695	9.4 years	Fission Product
H ³	0.018	12.5 years	Accelerator and Reactor
Sr ⁹⁰ - Y ⁹⁰	0.61 - 2.18	19.9 years	Fission Product
Ni ⁶³	0.067	85 years	Reactor

This measure of sensitivity can be expressed, for exponential absorption, as

$$S = dI / (d\sigma/\sigma) = \mu u I_0 e^{-u\sigma}$$

where u is the effective absorption coefficient. The maximum sensitivity as a function of u can be obtained by differentiation and is found to be for the value $\mu = I\sigma$.

Thus a high intensity ($I\sigma$) source of energy, such that $\mu = I\sigma$ represents the optimum choice for a specific use. A more detailed analysis shows the desirability of using a monoenergetic source rather than a broad spectrum. This is particularly true when one wishes to measure the variation of a single component in a mixture.

The radiation from betas or electrons of a single energy striking a target is far from monoenergetic. This is due to the bremsstrahlung process, in which the particles radiate a continuum of x-rays in slowing down. This situation is further complicated when the betas come from a radioisotope, since they are emitted with a distribution of energies from 0 to E_{max} . Net result is in x-ray output ranging from 0 to E_{max} , the maximum energy of the beta rays from the particular isotope, and it is mainly this type of source which has been used in the past.

However, there is another phenomenon taking place which can be used to advantage if one wishes to design a more optimum source, i.e. one which has a more nearly monoenergetic output. Characteristic x-rays of the element (or elements) in the "target" being struck by the betas are produced as well as the bremsstrahlung continuum. For a fixed beta energy, the yield of these x-ray lines increases as the atomic number, Z , of the target material decreases. Furthermore, the bremsstrahlung yield varies as E^2 whereas the yield of the characteristic x-rays initially varies approximately as E^3 from $E = 0$ to an experimentally determined energy where the dependence changes to E .

Choice of beta emitter

If the energy spectrum from a beta source is combined with these variations an optimum choice of beta emitter may be made. It follows that to obtain an x-ray source with maximum spectral purity at some given energy a target material whose K x-ray lines are of the desired energy would be used in conjunction with a beta emitting isotope whose E_{max} was as close as possible to the value giving maximum K x-ray yield. Table I lists some of the more practical isotopes and their pertinent characteristics.

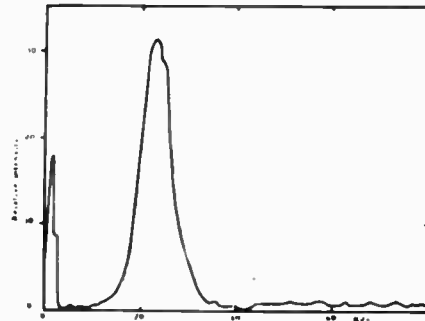
The directional character of the bremsstrahlung can be used to further improve the quality of the source. The angular distribution of these x-rays is highly peaked in the forward direction with respect to incidence of the betas. Thus a source viewed at 90° with respect

to even a partially collimated beam will further minimize the high energy contribution from the bremsstrahlung.

A variety of experimental x-ray sources embodying one or more of these features have been constructed and tested to verify and elucidate the role of the many parameters involved. The radiation spectra were obtained with scintillation counters and analyzed and recorded with the aid of a 256 channel analyzer.

Figure 1 shows the x-ray spectrum obtained with target between the beta source and detector. The influence of target thickness is quite pronounced and while a peak is observed in all cases, the spread is large. This results from the high Z target (lead) and the high beta energy (2.18 Mev).

Fig. 3: Spectra for Kr⁸⁵ and cadmium target.



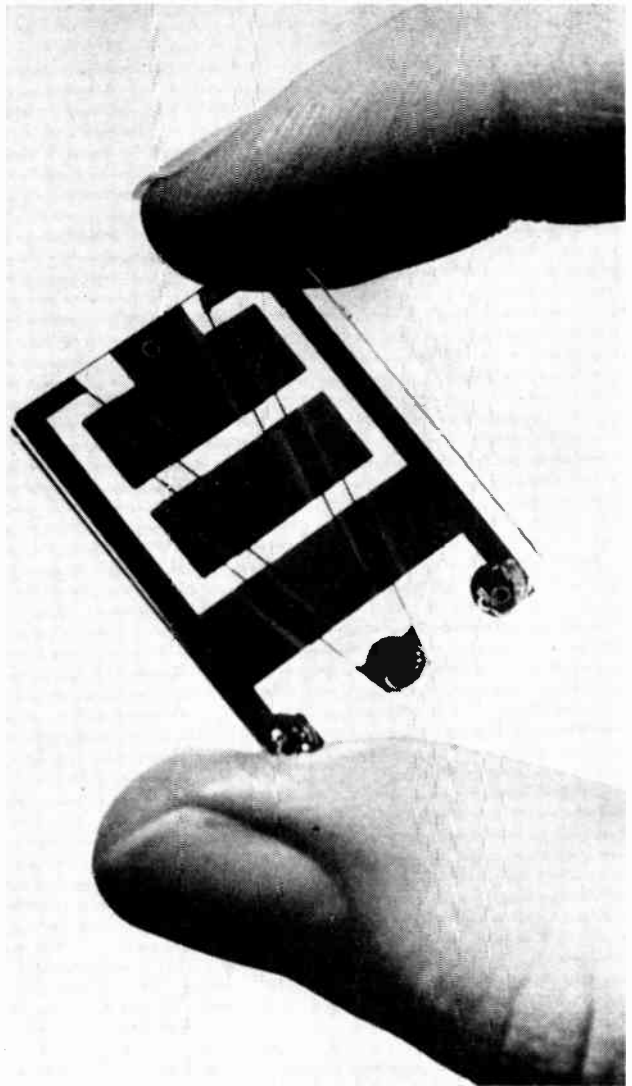
The effect of angular distribution in reducing the high energy output of a source is illustrated in Figure 2. These data were obtained with a tin target and a Sr⁹⁰ - Y⁹⁰ source in the two different geometries shown. The decrease in unwanted radiation is greater than a factor of two.

Resulting spectrum

All of the parameters have been optimized in the measurement shown in Figure 3. Here a krypton 85 beta source (0.695 Mev) was placed in a cone of cadmium as shown. The effective angle at which the detector views the target is approximately 90°. The resulting spectrum is extremely free of extraneous radiation and is limited only by the resolution of the detector.

This work is being continued to further improve the knowledge and design of beta excited x-ray sources. Measurements are now being made with gaseous proportional counters which offer greatly improved resolution over scintillation counters. The end result should be compact, zero power sources which can provide a variable spectrum of x-rays for radiography, density gauging, composition analysis and similar applications.

A six-cryotron circuit of tin and lead vaporized and deposited as thin films on glass. Scientists at Arthur D. Little, Inc., recently made the first operating circuit of these miniaturized, electronic switches. Such thin-film devices using superconductivity will make possible drastic reductions in computer construction costs. The cryotron operates in liquid helium at minus 452°F to take advantage of superconductivity — complete absence of electrical resistance.



A conservative estimate suggests that 2,000 cryotrons may be contained in one cubic inch and contained in circuits that hold promise of speeds on the order of 100 millimicroseconds.

Cryotron switching circuits to reduce computer costs

The first operating circuit of superconductive, deposited-film, electronic devices was announced at the recent meeting of the Solid State Devices Research Conference at Cornell University. This accomplishment by an Arthur D. Little, Inc., team under Albert E. Slade marks the completion of the second stage in the cryotron research program to produce an electronic switching circuit that can reduce drastically computer construction costs.

When the late Dudley Buck, of M.I.T., demonstrated his first successful cryotron on Christmas Day, 1954, it was quickly recognized as one of the first practical applications of superconductivity. Several research teams were soon busy developing the potentialities of this device.

Operating in liquid helium four degrees above absolute zero (4° K or -450°F), the device consisted

essentially of only two parts: a "gate" of tantalum wire nine thousandths of an inch in diameter, and a "control" of niobium wire three thousandths of an inch thick coiled around the gate. Superconductivity in the gate permitted indefinite current flow until resistance was restored by the magnetic field set up by current in the control. The cryotron thus performed the function of a switch, like a transistor.

Two questions dominated early research on the device: Is it feasible? and in what ways might it be superior to other switches for computers? Reliability could prove to be an outstanding characteristic of the cryotron. Theoretically there is no predictable end life as there is with vacuum tubes and transistors. For computers employing thousands of electronic switches, such potentially high reliability would be a major advantage. Only the study of completed machines could

turn up other possible reliability problems such as maintaining the cryogenic environment.

Other questions, too, required answers such as: would the cryotron be cheaper to produce, operate faster, prove more suitable for miniaturization? The search for answers has led during the past five years to the exploration of a wide variety of engineering problems, of suitable metals and their alloys, and of the various circuits appropriate to the cryotron.

The wire-wound device was the object of study during the first research phase. After development of a machine to produce large quantities of the cryotron, came a spot-welding process to assemble the tiny devices with wires so fine that the operator required a microscope. By 1957 the ADL group had constructed a catalog memory containing 1800 cryotrons, which demonstrated that it was feasible to construct operating cryotron circuits. But miniaturizing the element to increase its speed had brought difficult production problems.

One thousand times faster

Research on the wire-wound device led to the conclusion that circuitry constructed in this manner operated too slowly and was too expensive. ADL therefore directed its attention to making cryotrons of thin superconductive films deposited on a glass substrate. Deposited film cryotrons, it was hoped, would open the way to the construction of entire circuits at one time that would prove faster and cheaper.

Vacuum deposition of vaporized metals to produce films 2500 angstroms (.00001 inches) thick offers such substantial advantages over the old method that the research efforts had clearly entered a new phase of development. First it was necessary to develop techniques for depositing superconducting thin films and measuring their characteristics. At the same time Slade's team set about acquiring a better understanding of the physics of thin film superconductors. For example, until they knew the current distribution in a thin film superconductor, the scientists could not predict how current-carrying capacity would vary with the width and thickness of the films.

Among the advantages of vacuum deposited cryotrons are the reduction of inductance for greater speed, the achievement of radical miniaturization, and comparative ease of fabrication. Tests to date indicate that cryotrons may soon be competitive with other electronic switches in speed. Already one thousand times faster than their wire-wound predecessors, the thin film devices can be made of alloys and combined in circuits that hold promise of speeds on the order of 100 millimicroseconds.

The use of masks, or stencils, in the deposition process permits the construction of complete circuits at a time and hence of far greater miniaturization. Constructed with layers of lead, tin, and silicon monoxide (for insulation), a circuit of ten deposited cryotrons requires only a few micrograms of metal. A conservative estimate suggests that 2,000 cryotrons could be contained in a cubic inch. Constructing entire circuits from masks opens the possibility of automation. While making the etched masks may take up to a month, they can be used again and again. One of the outstanding advantages of thin-film circuitry will be the ability to reduce drastically computer construction costs.

When Slade and his colleagues demonstrated for the first time that thin film cryotrons are feasible by producing an operating circuit, they took a positive step toward the day when thin film devices will be used in a superconductive computer. Deposition techniques have been learned. Circuits can be made, and a further increase in their speed is imminent. Scientists must now improve their understanding of the characteristics of the thin film device, concentrating their attention on such problems as its reproducibility and improvement of superconductive-to-resistive transition of the switch. Alloys may hold a key to improved speed after examination of the characteristics of a wide range of possibilities. Circuits that will make better use of the deposited cryotron's characteristics offer another road to improved speed. Design and testing of new ideas are the third part of the current research phase. The present state of the art indicates that the first cryotron computer can be constructed in the next four or five years.

U.K. stimulates industry interest in isotopes

A determined effort is being made by the United Kingdom Atomic Energy Authority to popularize the atom — or, in other words, to get the people to accept the atom and its uses into their everyday life.

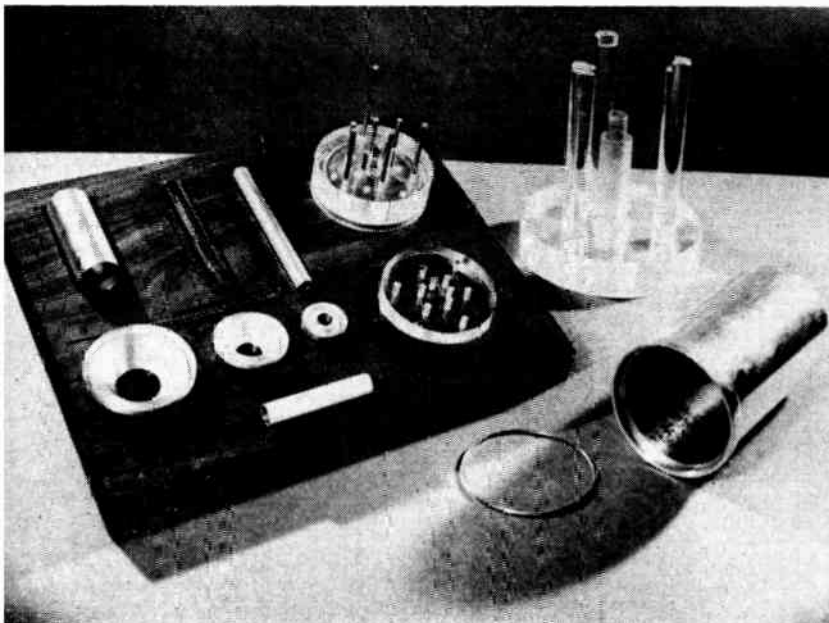
In order to do this a series of courses is being conducted at Harwell, the atomic research station, to which industrial firms are invited to send executives or company officials. Each course lasts for four days and is designed for persons who have had no training whatever in radioactivity, and is meant to stimulate ideas rather than to teach techniques.

The intention is to teach the possibilities of using radioisotopes in everyday industry. On the course an

overall picture is given, in a non-technical manner, of how isotopes can be used, what sort of research is being carried out on further possible ideas, and generally how isotopes can be of economic benefit to industry.

The scheme is proving a great success. So far nearly 400 company directors and executives have attended. An added attraction (?) is that the "delegates" (they are not called students) live at nearby Oxford College during the course.

The course is open to any interested senior company official.



This model of the Nuvistor has linear dimensions approximately ten times those of the actual tube, now under development. Shown on the top row of the display board, left to right, are the plate, grid, cathode sleeve, and lead-loading jig with leads in position ready for assembly. Bottom row includes the plate flange, grid flange, cathode-sleeve flange, and base wafer. Positioned horizontally in the center of the board is the double-helical-coiled heater, and at the bottom, the coated cathode cup. To the right of the board is the assembly and brazing jig. The brazing ring and the tube envelope are in the right foreground.

Hailed as one of the most significant advances in electron tube history, this development opens way to mass production of tiny tubes for electronic equipment for home, industry, defense.

The Nuvistor – high efficiency thimble-size electron tube

A revolutionary development in electron tube design, hailed by engineers as one of the most significant electronic advances in electron tube history, has recently been announced by the Radio Corporation of America with which RCA Victor in Canada is associated.

Development of the new design represents a major breakthrough in tube size, performance, power drain, and reliability, and opens the way to mass production of high-performance, thimble-size tubes having improved ruggedness, reliability and efficiency.

Called "Nuvistors," the new tubes are expected to lead to important electronic developments in such instruments as television sets, communications receivers, and computers, as well as more compact and efficient electronic equipment for defense and industry.

Prototypes of the new tubes are now in advanced development stages at the RCA Tube Laboratories.

Electron tubes have by no means reached the limit of their low-cost, high-performance capabilities. Through the study of new materials, new processes and new techniques, engineers have not only developed the Nuvistor but foresee the practicality of even smaller tubes having power consumption reduced to one twentieth the power required for conventional tubes. They anticipate that receiving tubes of the Nuvistor design can have useful lifetimes of tens or even hundreds of thousands of hours.

The name of the new tube design is based on the

words "nueva" meaning new and "vista" meaning prospect. Hence, the "new look" or "Nuvistor."

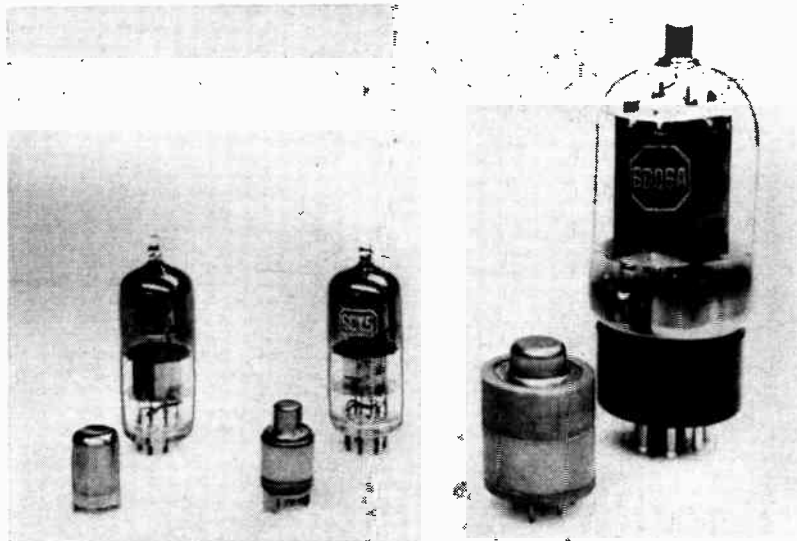
Developmental samples of the "new look" tubes will be supplied to the Canadian electronics industry within the next several months. A small-signal triode and a small-signal tetrode will be offered at first and will be followed later by a beam power tube. According to present plans, the manufacturer expects to start limited commercial production of the Nuvistor tubes in 1960. Plans are also being made for the production of the new tubes in Canada with a similar target date.

In a recent demonstration RCA showed a completely "nuvistorized" tuner unit of a television set in operation. The tuner requires only a fraction of the plate voltage required by conventional tuners. This experimental tuner, believed to be among the smallest ever designed for TV receivers, reduces the over-all volume of conventional tube TV tuner units by approximately one-third.

"Nuvistors" undergo torture tests

The ruggedness of the Nuvistor design has been displayed in several torture and endurance tests. The tiny tube continued to function normally in an electronic circuit when placed alternately in the heating coils of a special furnace (660 degrees Fahrenheit) and in liquid nitrogen (320 degrees below zero F.). In another demonstration, the new tubes were shown operating

Three new RCA tubes, now under development, based on the Nuvistor design concept, are shown beside their larger present-day counterparts. The new-look tubes outperform these types and will make smaller, more efficient electronic instruments possible. Left to right are developmental samples of the small-signal triode, small-signal tetrode, and beam power tube.



continuously in both the special furnace and in liquid nitrogen. Operation of the Nuvistor tubes was not disturbed by a guillotine-type device which repeatedly subjected them to severe mechanical blows.

These experiments, as well as other rigorously controlled laboratory tests, illustrate the high-temperature capabilities of Nuvistor tubes as well as their reliable performance under conditions of severe shock and continuous vibration.

The manufacturers believe these features, plus the tube's compactness and high efficiency, will make the Nuvistor tube design ideal for many types of military and airborne electronic systems. Modern jets, guided missiles, and military vehicles all require sturdy, rugged, and compact electronic components capable of reliable, efficient performance.

Because the tiny tubes have improved electrical and thermal characteristics as well as improved reliability, it is believed the Nuvistor will find a ready market in the television industry. The small-signal triode and small-signal tetrode, already well along in advanced development, will be of particular interest for TV tuner designs and intermediate-frequency amplifiers in view of their small size and excellent electrical characteristics. The beam power tube, now being worked on, is especially well suited for audio output and horizontal-deflection applications in television sets.

Applications in industrial & military equipment

Nuvistor tubes are also expected to offer many advantages for high-speed data-processing equipment.

The new small, high-efficiency triodes and tetrodes will find wide use in the logic and computing circuits of electronic computers. The power tetrode, capable of high peak current at low plate voltage, offers advantages for memory-core-driver applications, and important operation in which information is stored for later use.

It is further expected that the beam power tube could be utilized in series voltage regulators, low-power transmitters, servo amplifiers, and high-power sound systems for a wide variety of industrial applications.

Preliminary tests have indicated that Nuvistor tubes should better meet the very critical military reliability and environmental objectives than larger, traditional-design tubes. The materials used will maintain the excellent resistance of the electron tube to damage from nuclear radiation.

Construction features

For ruggedness, the Nuvistor starts with a strong ceramic base-wafer as a platform on which is erected an array of tube electrode assemblies. Each assembly is held rigidly in place by a tripod-like structure. Nuvistor tubes are made of ceramic materials and strong metals such as steel, molybdenum and tungsten.

The electrodes are strongly supported from one end in a cantilever fashion, a method employed for bridge-building in which trusses are extended from piers. This construction feature eliminates the need for mica support discs or spacers. All the electrodes are small, light cylinders. They are able to withstand a high degree of shock or vibration because of their shape and low mass.

Advantages of Nuvistor construction

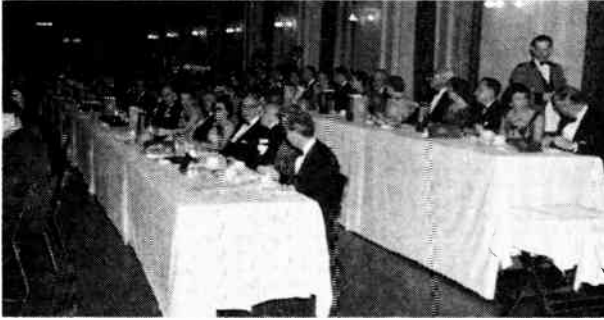
Company officials have cited the following advantages of the Nuvistor construction: (1) cylindrical symmetry and cantilever construction permit the use of accurate jigs for assembly; (2) brazing of assembly in accurate jigs produces a strain-free structure; (3) micas are completely eliminated; (4) high-temperature processing results in super-clean structure; (5) indexing lugs permit safe and easy insertion into tube socket; (6) tubes can operate in high temperatures; and (7) the tubes use no glass which might shatter under mechanical or thermal shock.

The simplicity of the new tube design and the cylindrical symmetry permit a high degree of mechanized assembly. This design makes possible close-spaced electrode assembly in tubes with accuracy and uniformity built into both the jigs and the parts. The high degree of control obtained permits accurate spacing of the tube elements with increased assurance against inter-electrode shorting. Improved uniformity of electrical characteristics also results from this high degree of control.

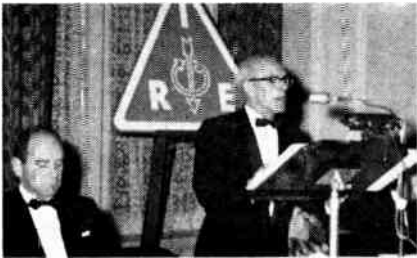
Development of the Nuvistor design concept leads the way to further reductions in size and power requirements and to improved reliability and performance characteristics of electron tubes. Because of the many new techniques already uncovered, it is believed that a complete line of tubes including damper tubes, vertical-deflection tubes, high-and-low voltage rectifier tubes is assured. The 'new-look' design clearly confirms that the electron tube has not yet approached its theoretical limitations.

News Report

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



A count of 81 guests graced the two head tables of the 4th IRE Canadian Convention banquet held in the Royal York Hotel, Toronto, on October 8, indicative of the largest gathering of radio engineers ever to be assembled at one time in Toronto.



Eric Palin, General Chairman of the IRE Canadian Convention Committee, steered the record-breaking IRE gathering through a smooth two and one half hours' performance without breaking a dish.



Alec Barclay, Director of the Canadian Region of the IRE, introduced the American guests at the banquet including "directors at large" and some large directors.



Dr. Ernst Weber, President of the Institute of Radio Engineers, delivered greetings and good wishes to the Canadian Region, IRE and had some nice things to say about Canadians generally.



His Worship Nathan Phillips, Mayor of Toronto, was on hand to welcome everyone to Toronto, "the capital of North America", and to seek out anyone who had \$200 million to loan at a cheap rate of interest for the construction of Toronto's second subway.



Ralph Hackbusch, Director of Engineering, Electronic Industries Association of Canada, introduced the speaker, then leaned back and listened, eyes closed, with rapt attention. We wonder what he was thinking about some of the speaker's remarks.

4th Annual IRE Canadian Convention

Technical sessions attract record attendance

Increased demand in 1960 for communications equipment, precision instruments, TV antennas and many other types of electronic products was predicted by exhibitors at the Institute of Radio Engineers 1959 Canadian Convention which closed in Toronto October 9 after attracting 7720 delegates and visitors.

The 1959 IRE Convention was the fourth to be held in the Automotive Building, Exhibition Park. It provided for an exchange of technical information among engineers and technicians and included over 200 exhibits of electronic equipment displayed by Canadian, United States and overseas firms and scientific organizations.

A total of 109 scientific papers was presented during the Technical Sessions of the three-day Convention. Attendance at many of these sessions was higher than in most previous years and limited in some cases to standing room only.

At the conclusion of the Convention, Fred Heath, Canadian General Electric, was elected Chairman of the Committee responsible for the organization of the fifth IRE Convention. He succeeds Eric L. Palin who planned and directed the 1959 meeting.

"Detailed plans for the next IRE Convention will be based on replies to questionnaires which are now being prepared for distribution to exhibitors," Mr. Heath said.

One of the highlights of the 1960 Convention will be the presentation of an IRE Gold Medal. This award will be made for the greatest administrative contribution to the Canadian electronics industry.



Dave Golden

*“... I’m only a layman
and can only speak
in layman’s terms ...”*

*... and here are some of
the things he said ...*

“... The equipping of Canada’s armed forces — quite apart from the financial problems which it involves — has never been an easy task, and unfortunately it shows no signs of becoming any easier in the foreseeable future. . . .”

“... As a result of the defense production build-up the value of our defense orders placed outside the country declined from over twenty per cent of Canada’s total defense purchases in 1951-52 to less than four per cent four years later. In the matter of defense production we seemed, by 1956, to be largely self-sufficient.

“However, events have not stood still. New complications have crowded in to change the picture radically.

“The most important recent developments affecting the nature of the defense production problem in Canada were, of course, the increasing complexity of modern weapons systems and the growing integration of Canadian and United States measures for continental defense. These developments culminated in the major defense policy decisions of the past year — the cancellation of the CF-105 and its associated programs, and the adoption of the SAGE control system, BOMARC missiles and the F.104 G aircraft. These decisions made

it abundantly clear that, in future, it would be extremely difficult for this country to undertake alone the development and production of its major weapons.

“We had encountered in 1950 a situation which had some points of resemblance to this new situation, when it was decided in certain areas to adopt United States pattern equipment for the Canadian forces; there are, however, two important differences between the two situations. First, the weapon systems of today — and still more so, those of the foreseeable future — are vastly more complicated than were those of the Korean days, and require a range of technical competence beyond our relatively modest resources — excellent though our capabilities are within their limits. Second, Canadian requirements for many of the new weapons are too limited to support domestic production, unlike the greater part of our requirements in 1950 and the years immediately following. Technically and industrially, this country is now less able to “go it alone” in defense production than we were before — despite the impressive industrial advances of the past eight years.”

“... As I said at the outset, I am a layman in such matters of high strategy and I would not presume to expound strategic doctrines. In any event, there are sound reasons, quite unrelated to military planning, which make it inconceivable that Canada should view with indifference any substantial diversion of its defense production from Canada to foreign factories.

“The most obvious objection is, of course, that the defense industry which has been built up in this country is a valuable asset which is not lightly to be discarded. It represents a substantial investment of Canadian resources, a source of livelihood for thousands, and a major repository of technical and managerial skills. As long as the Canadian taxpayers are called upon to support a defense program, they must have the assurance that, as far as possible, their tax dollars will be spent in a manner best calculated to protect this asset. . . .”

“... Almost every development in defense electronics has more or less direct and immediate applications in the civilian market, and whatever engineering and production skills the Canadian electronics industry now possesses can be traced, almost without exception, to the defense programs of the past. To cut off the flow of challenging new defense tasks would give rise to at least a threat of technological stagnation. The Government, as you know, is seeking an answer to this new problem of defense production through co-operative arrangements with the United States, summed up in the term ‘production sharing’. The basic idea underlying these arrangements — that Canada and the United States should pool their economic resources for defense — is at least as old as World War II. . . .”



Stuart D. Brownlee, President of Canadian Admiral and President of the Electronic Industries Association of Canada, who knows a thing or three about the things confronting the Canadian electronics industry, brought good wishes to the gathering from EIA.



Ron Robinson, Vice-President and General Manager of the Electronic Equipment & Tube Department, CGE, thanked the speaker, but we do not think that he learned anything about anything that he did not already know.



Dr. Donald Sinclair, President of General Radio Company, did not say anything at the banquet but officially opened the Convention by cutting through a pre-cut lead pipe because nobody could find a piece of cable suitable for the occasion.

“ . . . As soon as this need (*production sharing*) was recognized, the United States authorities were approached, and the Canadian case for production sharing was presented to them. It was impressed on them that Canadian measures for continental defense were being integrated increasingly with those of the United States, and it seemed only logical that this should be accompanied by closer co-operation in the development and production of weapons and equipment for the common defense of the two countries. In addition, it was indisputable that this country had, on a selective basis, built up valuable engineering and production capabilities; because of the growing interdependence of the two countries it seemed scarcely less important to the United States than to Canada that these capabilities should be used. . . .”

“ . . . The American response to this approach was prompt and co-operative, and within a matter of weeks the production sharing program was launched with an agreed set of objectives. By the summer of this year we had obtained from the United States Government a framework of policy and regulations which opened the way to Canadian participation in their procurement programs — in some respects on an equal footing with American suppliers.

“This removal of roadblocks represents virtually,

a complete acceptance of the Canadian claim to enjoy readier access. To make that claim effective, however, and secure recognition of our ability to contribute, requires a more sustained effort aimed, not at the senior authorities in the United States government, but rather at the widely scattered procurement centers of the American armed services, and the major U.S. defense contractors. This effort is well under way, with officials of both governments working in the closest possible harmony to identify opportunities for Canadian participation and to acquaint American procurement offices and contractors with Canadian capabilities.

“For the future success of the program, yet another step is necessary. The defense equipment which seems to offer the greatest promise for future production sharing is characterized by a very high degree of engineering content. Canada’s ability to share in such programs, therefore, depends on the maintenance and continued development of its engineering capacity. This can only be accomplished if Canadian industry is able to secure development tasks of an advanced character. Once again, the United States authorities have recognized this need and have agreed that production sharing, in the long run, presupposes development sharing. . . .”



Left: Canadian university students who won a free trip to Toronto for the IRE Convention and who were chosen on their scholastic standing are shown at the banquet. They are: Jack Landolt, University of Ottawa; Darryle Black, P.I.T.A., Calgary, Alta.; Donald McDiarmid, University of British Columbia; Roy Young, Ryerson Institute of Technology, Toronto; James S. Brooks, University of Toronto; Terry Bradley, Eastern Ontario Institute of Technology, Ottawa; Lynn Groves, Hamilton Institute of Technology; Achille LeBlanc, Laval University, Quebec City; and Duff Plato, University of Alberta.

Some of the crowd who gathered in the main aisle of the Automotive Building, Exhibition Park, Toronto, to witness the official opening ceremony of the 4th Annual IRE Canadian Convention are shown in the photograph at right.



Left: An official luncheon group photographed on the first day of the Convention. They are from left to right: Dr. George Sinclair, Lt. Col Anatoli Rybakov, Assistant Air Attache, The Embassy of the U.S.S.R., Ottawa, Arthur Vine, United Kingdom Trade Commission, Ottawa, Lloyd Price, Lt. Col. E. Anissimov, Assistant Air Attache, The Embassy of the U.S.S.R., Ottawa, J. R. Wilbey, United Kingdom Trade Commissioner, Toronto, Eric Palin, Chairman of the IRE Canadian Convention Committee and Commander Christie, RCN, Director of Telecommunications, Naval Service Headquarters, Ottawa.



Dr. T. W. R. East of Raytheon Canada Ltd. is shown at left above beside the bright radar display for Canadian Air Traffic chosen as the best Canadian-designed product exhibited at the IRE Canadian Exposition. Presentation of the plaque for the best Canadian-designed product to be exhibited at the IRE Canadian Exposition is shown above being presented to Dr. T. W. R. East of Raytheon Canada Ltd. by Alec Barclay, Director of the Canadian Region, IRE.

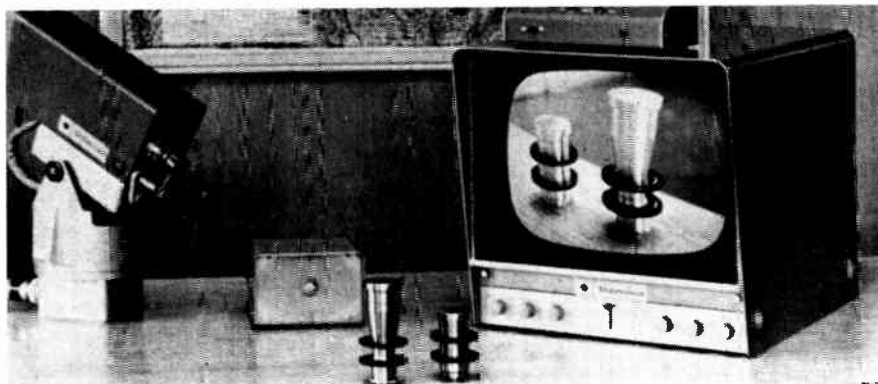


Shown at left are Hugh Leah, Heinz Krueger and Don MacLeod of Bach-Simpson Limited with the controller indicator chosen as the best component to be exhibited at the IRE Canadian Exposition.

Presentation of the plaque for the best component exhibited at the IRE Canadian Exposition is shown at right being presented to Hugh Leah of Bach-Simpson Limited by Alec Barclay. This marks the second consecutive year that Bach-Simpson Limited have been awarded the plaque for the best component of Canadian design to be exhibited at the Show.



Indicative of the hard sell ability of the IRE Canadian Exposition is photograph at left showing a punch press, a product of the Strippit Tool and Machine Limited, which was purchased by T.M.C. (Canada) Limited. Shown at left in the picture is the general sales manager of Strippit Tool and Machine Limited and at the right Doug Carrol, president of T.M.C. (Canada) Limited of Ottawa.



Clarity of the image in the TelAutovision system of closed circuit television is demonstrated in the photograph at left.

Automatic Electric introduces TelAutovision

Automatic Electric, specialists in the field of communications for 65 years have recently made known their intentions to enter the field of closed circuit television. As a companion product to the well known TelAutograph electronic longhand, instantaneous written communication system, Automatic Electric have now introduced a closed circuit television system known as TelAutovision.

TelAutovision was specifically designed for industrial, business and institutional application and does not use entertainment-type television equipment. It is extremely rugged and has a very low maintenance factor.

The cameras can all be easily operated without any special skills or training.

TelAutovision, a versatile closed circuit television system was announced in a special press preview on September 22 last and a demonstration of the equipment revealed the flexibility of the system as three TelAutovision cameras scanned small documents, the room and the south side of the city — all with surprising clarity.

Officials of Automatic Electric Sales (Canada) Limited made known that the TelAutovision system may either be bought outright or acquired on a rental basis.

1959-1960 IRE season presents new features

The Toronto Section of The Institute of Radio Engineers Inc. has begun its 1959-1960 season with advantages and improvements for its members' convenience as well as an interesting program of meetings and other events.

Dinner is now available to members in the Great Hall at Hart House at prices representing a saving of approximately fifty per cent over last year. Furthermore, it is no longer necessary to give advance notice of being present at dinner.

Technical meetings begin at 7 p.m.

and the aim is to have them concluded by 9 p.m. The former after-dinner meetings have been dropped from the program.

Two events are scheduled for November: the first, on November 2, will be sponsored by the Toronto Chapter of the Professional Group on Communication Systems. The paper "Design of Wideband Scatter Equipment" will be presented by M. O. Felix of Canadian Westinghouse. This paper will stress the engineering problems involved peculiar to the design of wideband systems. The second event will be a field trip to Radio Valve Co. Ltd. at Rexdale, on Monday, November 23, to see the latest techniques in the manufacture of cathode ray tubes.

Raymond J. A. Turner, chairman of the Toronto Section, IRE, urges IRE members to give more active support this year than ever before.

EIA-IRE golf tournament drew good attendance

The annual golf tournament of the Electronic Industries Association of Canada and the Institute of Radio Engineers was held jointly on September 24 at the Cedar Brae Golf and Country Club at Scarborough, Ont.

Players teed-off in the early morning, over one hundred persons taking part. Nearly 200 representatives enjoyed a buffet dinner in the evening.

Head table guests at the prize-giving ceremony that followed the dinner included: R. J. M. Allan, EIA vice-president and chairman of the Receiver Division; C. Smith, chairman, Hamilton Section, IRE; D. Knapp, vice-chairman of EIA Components Division; S. D. Brownlee, president of EIA of Canada; E. Walton, chairman of the 1959 EIA-IRE Golf Tournament Committee; T. Purdy, secretary-treasurer IRE (Canada); R. A. Hackbusch, EIA director of engineering; R. Turner, chairman, Toronto Section IRE; R. M. Robinson, past president of EIA; and F. W. Radcliffe, general manager, EIA.

Beatty Bros. get European contract

Beatty Bros. Limited, Fergus, Ont., have been awarded a contract, through the Canadian Westinghouse Company, to build portable microwave masts for use in the Western Europe defense.

These masts are part of two super high frequency "line of sight" microwave radio systems. The first is a truck-mounted, three-hop system with four completely mobile terminal and repeater stations. The second part is a two-hop system with two terminals and a repeater station, the system materials being housed in transportable shelters. The entire system can be transported with a high degree of mobility. When in operation, the system will have capacity for carrying 120 different channels.

Although Beatty masts are used extensively in Canada for all types of communications and radio broadcasting, this will mark the first time Beatty masts have been exported.

Edo (Canada) Ltd. appoints chief engineer

R. R. Hind, vice-president and general manager of Edo (Canada) Limited, Cornwall, Ontario, has announced the appointment of R. A. Lapetina as chief engineer of Edo (Canada) Limited.



R. A. Lapetina

In his new position, Mr. Lapetina is responsible for the design and development of military and commercial electronic systems, especially in the field of underwater acoustics and associated sonar.

A graduate of Columbia University, Mr. Lapetina has had 12 years of experience with Sperry Gyroscope Co., and Edo Corporation, College Point, N.Y. With Edo Corporation he accumulated a broad background in the aircraft field and from 1952 to 1959 he was Edo's chief project engineer on surface ship and submarine sonar systems.

Daystrom creates new executive sphere of duty

Samuel M. Kinney, Jr., has been elected assistant vice-president-finance of Daystrom, Incorporated, of New York City, as announced recently by Thomas Roy Jones, president of the electrical-electronics manufacturing company.

According to Mr. Jones, the position which is a new one in Daystrom, was "established to serve as a means of implementing and accelerating the company's growth-by-acquisition program." He pointed out that Daystrom is an acquisition-minded company and that much of its present strength and size emanates from companies acquired within the past five years. These include the Heath Company, Benton Harbor, Michigan; Weston Instruments, Newark, N.J.; Daysfrom Pacific, Los Angeles, California (formerly American Gyro Corporation); and Daystrom Transicoil, Worcester, Pa. (formerly Transicoil Corporation).

The Canadian subsidiary of Daystrom Incorporated is Daystrom Limited of 840 Caledonia Road, Toronto 19, Ontario, and in Montreal, Que. at 5430 Ferrier Street.

Taylor-Leslie rep for Swiss ultra-fine tubing

Canada's expanding industrial potential has created a new demand for ultra-fine tubing manufactured to rigid specifications. To meet this need, the world's leading manufacturer of such tubing, La Nationale, of Geneva, Switzerland, have appointed the Taylor-Leslie Mining and Engineering Corporation Limited, of Toronto, as their Canadian representative.

Constellation Components Co. distributor for Muirhead

Muirhead Instruments Limited, of Stratford, Ontario, recently announced the appointment of Constellation Components Company of Toronto and Montreal as distributors of Muirhead synchros, servometers and other components. This distributorship covers Ontario, Quebec and the Maritime Provinces.

The Toronto office of the Constellation Components Company is managed by C. G. Bell, B.Sc., P.Eng., while their Montreal manager is E. J. Mulvey, B.Sc., P.Eng.

A wide range of instruments continues to be handled throughout Canada by Muirhead Instruments Limited, whose sales manager is R. W. Watler, P.Eng. Full engineering, parts and service facilities are available at the company's Stratford plant.

Canadian engineers win national electronics award

Two Canadian engineers have won the 1958 National Electronics Conference Award for a jointly-authored technical paper presented before hundreds of top North American electronics experts.

A. J. Buxton and M. O. Felix, electronics engineers at the Westinghouse Company, Hamilton, won the award for their paper, "Performance of FM Scatter Systems Using Frequency Compression". The paper was adjudged the best in terms of scholarship, significance, originality, and clarity among the 100 papers presented at last October's national conference. The award, consisting of \$500 and certificates, was presented October 12 during the 15th annual conference at Chicago.

Mr. Buxton and Mr. Felix are co-inventors of a frequency compression method of improving performance of scatter communications systems by significantly reducing undesirable noise levels. The Westinghouse-developed scatter system is used for long-range beyond-the-horizon transmission of voice, television, teletype, facsimile, telemetering, and data signals over hops of 100 to 200 miles. The company is currently undertaking scatter projects for the RCAF, U.S. Air Force, and Supreme Headquarters Allied Powers in Europe.

CANADIAN DIRECTOR



G. A. Elliott

G. A. Elliott, Vice-President of Robertshaw-Fulton Controls (Canada) Limited and Vice-President and Director of Robertshaw-Fulton Controls International Company has been elected to the Board of Directors of the Canadian Company.

Braun Electronics of Germany operating Canadian company

Braun Electronics of Germany, a company which specializes in electronic home and photographic equipment, has this year opened a separate company, Braun of Canada Equipment Limited.



W. Dube

At present Braun of Canada Equipment Limited is assembling some units and hopes later to manufacture in Canada. Canadian raw materials are

used for manufacture, in any case, in Germany.

Werner Dube, managing director of Braun Electronics of Germany, said in Toronto recently that the company's Canadian operation is the precursor of operations in the United States. "Unlike most companies," said Mr. Dube, "we are starting out in Canada and getting our feet wet here in North America."

Mr. Dube maintains that industrial interdependence among nations is one way of avoiding war.

Braun of Canada Equipment Ltd. have premises at 35 Haas Rd., Rexdale, Ontario.

Houston electronics firm represented by Radionics Ltd.

Frank C. Smith, Jr., manager, Instrumentation Division, Southwestern Industrial Electronics Co., of Houston, Texas, announces that Radionics Ltd. of Montreal, Que., will represent his company in electronic test instrument sales in Eastern Canada.

"Mr. Stanley Ungar of Radionics," states Mr. Smith, "will be glad to supply complete information on Southwestern Industrial Electronics Co. and their products, and will assist customers in their test, measurement, and control work by recommending and demonstrating appropriate instrumentation."

Radionics Ltd. is located at 8230 Mayrand Street, Montreal 9, Que.

E. S. Gould Sales acquire larger premises

With the addition of more stocking lines and increased sales and office staff, the E. S. Gould Sales Company has recently moved to larger premises at 19 Le Royer Street West, Montreal.

Both the office and warehousing space has been more than doubled, which will enable the company to offer better service to its customers and suppliers alike.

Northern Electric extends London plant

Northern Electric Company Limited announces that work will start shortly on the substructure for an extension of its London plant.

The extension will be 570 feet long x 120 feet wide, occupying an area of approximately 68,000 square feet.

The foundations for the new structure will be built by the present contractor, Anglin Norcross (Ontario) Limited, and tenders will be called for the balance of the work early in 1960 so that construction of the extension may be proceeded with next year, if desired.

The construction of this unit was called for in the company's original basic plan for the London plant but the decision to proceed at this time was based upon a reappraisal of future demand.

CGE appointments

Charles A. Morrison, vice-president of Canadian General Electric Company Limited, has been transferred to Montreal where he will act as an extension of the president's office with responsibility for corporate relationships in Eastern Ontario, Quebec and the Atlantic Provinces.

Concurrently Mr. Morrison was appointed manager, Eastern District, Apparatus Department, succeeding Lyman I. Playfair, who has announced his decision to retire on January 1, 1961. Until his retirement date Mr. Playfair will act in a consulting capacity, making available to Mr. Morrison his long experience and knowledge of the company's activities in Quebec, the Atlantic Provinces and Eastern Ontario.

Mr. Morrison has his headquarters in the company's offices at 1010 Beaver Hall Hill, Montreal.

Federal Wire & Cable opens Toronto warehouse

In keeping with its program of constantly improving customer service, the Federal Wire and Cable Division of H. K. Porter Company (Canada) Ltd., Guelph, has opened a Toronto sales office and warehouse at 1396 Martin Grove Road, to serve Federal's customers in the Toronto, Eastern Ontario, Georgian Bay and Northern Ontario territories.

Stocks of Federal's complete line of wires and cables will be carried at the new warehouse including magnet wire, weather proof wires, triplex cable, building wires, and flexible cords. Operations at the new location will be under the supervision of Federal's District sales manager, W. M. Wilson.

T. D. Dalzell appointed sales manager for Ampex

Thomas D. Dalzell has been appointed sales manager for instrumentation products marketed in Canada by Ampex American Corporation, an affiliate of the Ampex Corporation of Redwood City, California.

Mr. Dalzell, who is making his headquarters at Room 607-A, Commonwealth Building, 77 Metcalfe Street, Ottawa, was formerly a technical and sales representative with R-O-R Associates and with Canadian General Electric, both of Toronto. Prior to those affiliations he was in England, during which time he was employed as a sales engineer with Stanley Cox Ltd. and, for the previous eight years, as a radio officer for the Marconi International Marine Communication Co., Ltd.

Electronic parts distributors plan for 1960 show

At the recent annual meeting of the board of directors of the Electronic Industry Show Corporation, plans were discussed for the 1960 Electronic Parts Distributors' Show, which will be held May 16-18 inclusive at the Conrad Hilton Hotel, Chicago, Ill.

A highlight of the 1960 Show is expected to be a professionally planned educational program especially designed to help distributors analyze important business problems and solutions and gain further benefits in their own businesses in the year ahead.

The 1959 Show drew an unprecedented crowd of more than 13,000 and a capacity total of 297 exhibitors and has been the subject of enthusiastic approval by industry members.

Sales promotion program announced by Astral Electric

Astral Electric Company Limited, 44 Danforth Road, Toronto 13, announces a program of expansion in keeping with the increased demand for the British and American electronic lines handled by the Astral Group.

Peter B. Gooderham, general manager, said recently that plans made a year ago were now maturing which were expected to increase greatly sales of hi-fi and industrial products of the Group.

The new sales promotion program is the responsibility of D. W. Rippin, formerly export sales manager of Belling & Lee, Ltd., electronic component specialists in the United Kingdom.

Wm. Stephens now becomes manager of Astral Music Sales, plans for

which include concentrated promotion for Pye, Cook, Audiophile and Zodiac record and tape labels, most of which are manufactured at the company's Toronto plant.

Brian Coyne, for 3½ years Astral's sales rep in Montreal, is being transferred to head office to join the Ontario sales force.

Geoffrey Smith becomes sales representative for Montreal and the Maritimes.

Jack Bastow has been appointed Western sales representative. Mr. Bastow, who has had many years of experience in the field of hi-fidelity component sales, will cover the Western territory from the branch office in Vancouver.

Burroughs and ElectroData form "task force" team

Two major divisions of one of the largest business machine and equipment manufacturers operating in Canada will consolidate into a single "task force" team to offer customers broader service and more all-inclusive product coverage.

The divisions, Burroughs Adding Machine of Canada, Ltd., and the firm's ElectroData (electronics) division, are directed by J. L. Rapmund, general manager. They manufacture business equipment ranging from small adding machines to large-scale electronic computers.

ElectroData sales and service personnel covering the nation and servicing the 205 and 220 computers will be housed in the Burroughs branch offices and will report to the respective Burroughs branch managers, Mr. Rapmund said. Burroughs has extensive electronic computation activities active in atomic energy and aviation industries and in data processing offices in Canada, Mr. Rapmund continued.

"To further strengthen our organization, D. H. Peacock, presently ElectroData district manager, is being promoted to the position of sales manager — computer systems," Mr. Rapmund announced. Mr. Peacock will be assigned to Mr. Rapmund's staff and will direct the electronic computer sales promotion and training activities of the Canadian organization.

New color TV sets introduced

The first completely new color TV line in two years has been introduced by Canadian Admiral Corporation, according to Ed. Whittaker, vice-president — sales.

As an indication of the reliability of the new color sets, Mr. Whittaker said, a one-year warranty is offered on all parts, including the picture tube.

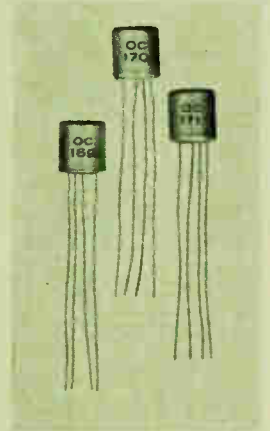
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REFERENCE BULLETIN NO. 3

Stability—Uniformity—Best Value **ANNOUNCING THREE NEW HIGH GAIN, LOW NOISE, V.H.F. TRANSISTORS**

Here is the best value obtainable in db's gain per dollar for low noise—operation at low collector voltage, low collector to base capacitance—three new high gain V.H.F. transistors by Rogers. These high frequency transistors are ideal for such applications as:

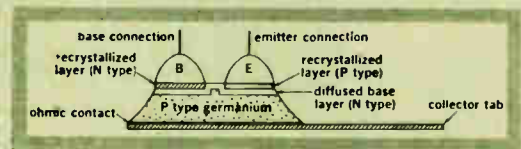
- RF and IF amplifiers in production F.M. receivers
- As mixers, oscillators and RF and IF amplifiers in mobile radio equipment and short wave receivers
- For many applications in instrumentation and industry



How the Rogers V.H.F. Transistor Came to be.

A brand new alloy-diffusion process has been introduced by Rogers in which the best features of the currently used processes were combined, without their drawbacks. In the Rogers 'alloy-diffusion' process, alloying and diffusion take place simultaneously. The transistor is built up on a piece of germanium on which two small pellets are placed. When this assembly is heated at a certain temperature, the germanium dissolves into the metal pellets until saturation is reached and the pellet impurities diffused into the solid germanium. When this assembly is cooled

down, a layer of germanium recrystallises from the pellets as in the normal alloy technique. This process makes it possible to mass produce transistors with a base layer of a few microns for very short transit time and high cut-off frequencies.



TECHNICAL DATA

MAXIMUM RATINGS		OC169	OC170	OC171
V _{ce}		20 V	20 V	20 V
I _c		10 mA	10 mA	5 mA
P _c at T _{amb.} = 45°C.....		50 mW	60 mW	60 mW
TYPICAL CHARACTERISTICS				
Collector to base capacitance		—	1.8 pF	—
Unilateralised power gain	P _g at 0.45 Mc	66 db	57 db	—
	P _g at 10.7 Mc	27 db	31 db	—
	P _g at 100 Mc	—	—	23 db
Noise figure	NF at 0.45 Mc	4 db	4 db	—
	NF at 10.7 Mc	5 db	5 db	—
	NF at 100 Mc	—	—	11 db

For stability, uniformity and the best value in db's gain per dollar, use High Gain V.H.F. transistors by Rogers.

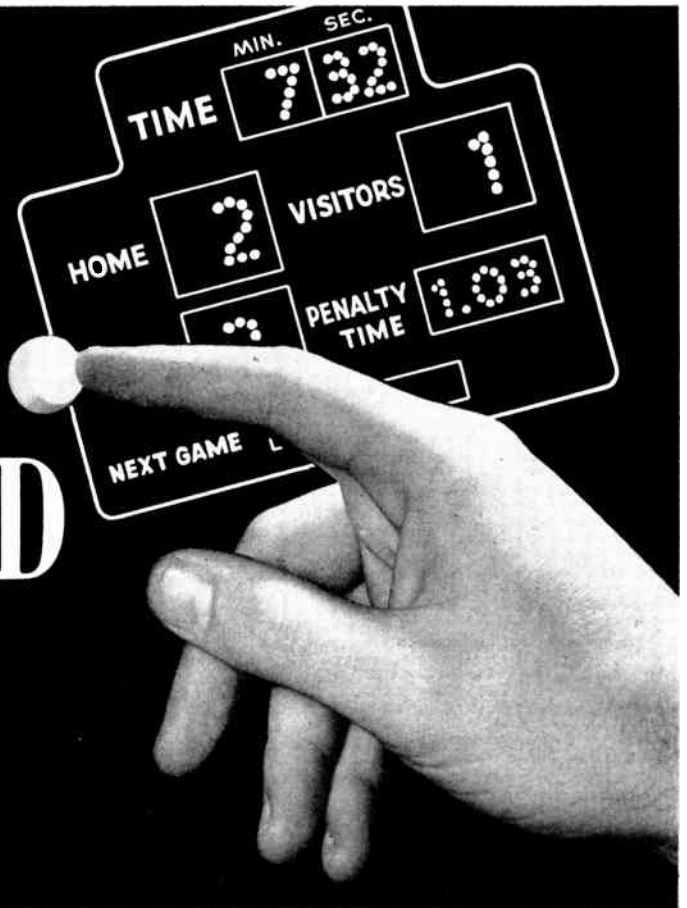
This reference sheet is one of a series from Rogers to keep you fully informed of electronic developments. A specially designed file folder for these bulletins is available from Rogers on request.

You are invited to make full use of Rogers Application Engineering Service at any time, on any problem. Just phone or drop us a line.

ROGERS

electronic tubes & components
A DIVISION OF PHILIPS ELECTRONICS INDUSTRIES LTD.
116 VANDERHOOF AVE., TORONTO 17, ONTARIO

IN REMOTE CONTROLS MARSLAND has made a good name



... and that name is "LEDEX"

Rotary Solenoids • Circuit Selectors and Stepping Relays

In properly designed applications rugged, shock proof "Ledex" Rotary Solenoids will perform their operation millions of times consecutively without special care or maintenance. Combined with rotary type wafer switches they provide many versatile designs of stepping, counting, adding and subtracting, latching and circuit selecting relays, for both DC and AC power supplies.

An extensive number of mechanical features are available in 8 basic sizes in a wide voltage range to meet all requirements.



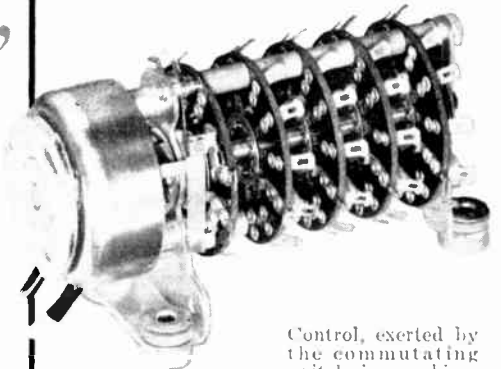
Marsland Engineering have made many special assemblies to customer requirement. Marsland will design and build custom equipment utilizing Rotary Solenoids, and will co-operate in strictest confidence at the design level on problems or equipment involving remote control.

*Manufactured and sold in Canada by
"LEDEX" Rotary Solenoid Division of*

MARSLAND ENGINEERING LIMITED

154 Victoria Street, Kitchener, Ontario.

For complete details check No. 31 on handy card, page 45



Control, exerted by the commutating switch in combination with the control wafer switch makes it possible to select multiple circuits connected by a single manually operated switch. Circuit wafers are made with 8, 10, 12, 18 and 24 positions and provide many combinations. The 12 position switch may utilize factors of 12 . . . 1P-12T, 2P-6T, 3P-4T or 4P-3T.



"Ledex" Solenoids have employment ranging from control of small precision mechanisms to the actuation of rugged components in heavy duty equipment. They provide remote control and reduce the number of mechanical parts required.

Lenkurt

datatel

**SUBSCRIBER'S
SET**



Type 2340A Subscriber Set mounted in the knee-well of a Model 28 Teletypewriter

The new Lenkurt Datatel Subscriber's Set is a completely self-contained Frequency-Shift Carrier Telegraph terminal designed to provide full- or half-duplex telegraph facilities over an open-wire line. Appropriate frequency-determining subassemblies offer a choice of four 2-wire frequency allocations in the high-frequency range 3550 to 5050 cycles and nine 2-wire frequency allocations in the low-frequency range 425 cycles to 3315 cycles.

Carefully engineered by Lenkurt to fulfill the need for a top-quality subscriber's unit at moderate cost, the 2340A features include: slim construction for mounting in the knee-well of a Model 28 Teletypewriter; self-contained power supply for both the electronics package and the telegraph loop; all-transistor circuitry ensuring dependable operation for high-speed service—up to 100 w.p.m.

Fully compatible with both 23A and 43A, the subset combines unusual flexibility with ease of maintenance, and its attractive grey crackle finish blends harmoniously with associated subscriber equipment. Comes equipped with Automatic Electric's new "minimum maintenance" PTW relay and complete instructions for quick installation.

Detailed data and application engineering assistance is available upon request.

AUTOMATIC ELECTRIC



Subsidiary of
GENERAL TELEPHONE & ELECTRONICS

**THE TYPE 86
TELEPHONE FOR
MULTIPLE SERVICE**



Type 86 Telephones provide an efficient and flexible trunk answering service, where a private branch exchange is not justified. They are also useful in conjunction with a branch exchange for personnel requiring frequent or rapid access to lines.

They can be used to answer and hold calls on up to 6 lines—in any combination of outside and local lines. One line can also be used for pushbutton signaling, or to disconnect extension or local line.

**TYPE 85 TELEPHONES
WITH 2-LINE
PICKUP**



Type 85-C . . . combines a unique push-and-turn button with two exclusion keys to provide complete switching facilities. Pressing the first key cuts off all extensions on Line 1, pressing the second reconnects them. Extensions are restored when handset is replaced. Turning the push-and-turn button connects a second line. Pressing it signals secretary.



Type 85-B . . . equipped with two push-buttons for linking or disconnecting extension phones. Can be wired for separate use of two lines. User switches to Line 2 by pressing button. Line 1 is reconnected when handset is replaced.



Type 85-A . . . wired for 2-line pickup and signaling. User turns a button to switch over to Line 2, and can also signal secretary by pushing button. Can be wired for a variety of applications—for use as an extension telephone, for instance, or linking by the turn of a button with an extension phone or handset.



THE TYPE 88T TRANSISTORIZED SPEAKERPHONE

**TINY
MICROPHONE
PICKS UP VOICES
SEVERAL FEET AWAY**

Leaves both hands free for leafing through papers, writing, etc. When telephone rings, user simply presses "on" button and starts talking—in a normal tone, with complete freedom to move about his desk. When conversation is over he simply presses "off" button.

Can be used for telephone "conferences", too. Tiny microphone in base picks up voices several feet away and speaker volume can be controlled so others in room can hear. Transistorized construction eliminates bulky control unit.



**SPEAKER VOLUME CONTROL
IS BUILT INTO TELEPHONE**

For outgoing calls, user presses "on" button, and dials in the usual way, without lifting the handset. "Off" button disconnects. For private conversations, lifting handset cuts off speaker and microphone. To cut off the microphone only, depress the on-off button. A small light tells when handset is "off the hook", or "off" button has not been operated.

**SMALL, NEAT
SPEAKER TAKES ALMOST
NO ROOM ON DESK**



These aids to business efficiency mean **INCREASED REVENUES FOR YOU!** Special Telephones by Automatic Electric

Business organizations spend a lot of time and money looking for new ways to improve efficiency. But the key to efficiency, in many cases, is improved communications.

Special Telephones now available from Automatic Electric, provide simple and effective solutions to many of the problems these organizations are faced with. Conferences, that otherwise could require hours of planning, can now be conducted in a few minutes over special telephones. Several calls can now be retained on the same telephone, and separate, private conversations carried on with the various callers.

Some of the Special Telephones available—all useful sources of additional revenue for Canadian telephone companies—are described here. Call or write any Automatic Electric office for further details.

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

AUTOMATIC ELECTRIC



Subsidiary of
GENERAL TELEPHONE & ELECTRONICS



Easy ways to **EXTRA REVENUE**

The Electronic Secretary® is becoming more and more widely used—right across Canada. In every type of office, it is answering telephone calls . . . during office hours *and* after the staff have gone home . . . recording messages from callers at any hour of the day or night. For subscribers it is saving time and substantially increasing efficiency. For telephone companies it is building goodwill, and boosting revenues as well.

The Electronic Secretary is now available in various models, that help make it valuable to even more subscribers. Offer the Electronic Secretary and its accessories to *your* subscribers. Call or write any Automatic Electric office for further details.

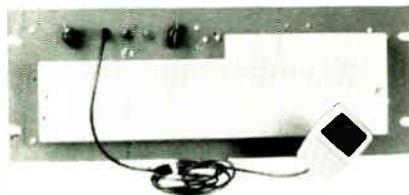
THE *Electronic Secretary*®



THE MODEL BPR-1

A low cost, automatic telephone answering unit, designed specifically for home and small business use. Subscriber can record his own outgoing message—up to 13 seconds—or return to find as many as twelve recorded messages waiting for him. Unit is simple to operate, requires almost no maintenance, and is extremely reliable.

THE MR-1
A monitor recorder with a 1-hour recording capacity. Can be used for any application where monitoring of calls is required. Tape recorder is kept running automatically whenever local line is loaded. A ceramic microphone is included for manual recording.



THE INT 2A
Magnetic intercept recorder. Can be adapted to a variety of intercept applications. Basic playback power is ample for 5 trunks and can be augmented to handle more lines as required.

PLUS THESE IMPORTANT ACCESSORIES

- TAPE ADAPTER ATTACHMENT
- REMOTE CONTROL CALL BACK SET
- VOICE CONTROL ADAPTER

AUTOMATIC ELECTRIC

Subsidiary of

GENERAL TELEPHONE & ELECTRONICS



For complete details check No. 9 on handy card, page 45

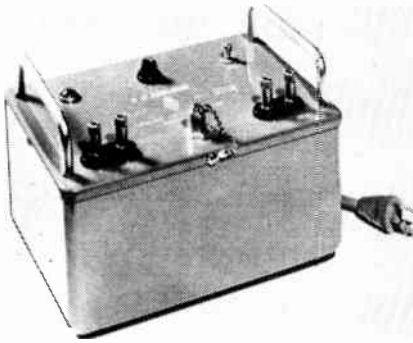
New Products

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 45. Just mark the products you are interested in on the coupon on Page 45 and the information will be in your hands within a few days.

Multipurpose chopper stabilized D.C. amplifier

Item 2487

The new Houston Instrument Corporation Model M-10 Amplifier has a current output proportional to a millivolt input, making it useful for many laboratory and industrial applications.



Used with 0-1 ma. meter movement recorders, it may be used to record inputs of 0-10 millivolts at an input impedance of 10 megohms. The combination may be used to record the output of strain gauges, remote thermocouples, or other transducers in the frequency range 0.2 cps. Used with an 0-1 ma. or 0-100 microampere meter, it becomes a 0-10 mv. or 0-1 mv. D.C. vacuum tube millivoltmeter.

With suitable shunts, it may be used as a current or a voltage amplifier.

Accuracy is 1%, linearity is .5% and drift is less than 50 microvolts referred to the input. A trim adjustment provides for precise calibration for loads of from zero to 5,000 ohms.

Further information or advice on a specific application, is available from A. C. Wickman Limited, 1425 The Queensway, Toronto 18.

High intensity gamma irradiator

Item 2488

A new high-intensity gamma irradiator for research, training and production in such fields as chemistry, petroleum and biology is announced by The Victoreen Instrument Company. The company claims that uses for its Model 770 Radcell are "virtually unlimited."

Heart of the Victoreen Radcell is a cylindrical irradiation chamber 2.5 inches in diameter and 9 inches in depth. This 44 cubic inch capacity provides for irradiation of solid or liquid samples of considerable size. The central chamber is enclosed by a cylindrical metal assembly containing the radioactive source. Around this assembly are wound two helical stainless steel coils bonded together metallurgically. The inner coil provides for flow of fluid samples around the radioactive source, the outer coil provides for flow of refrigerants or heated liquids for temperature control of the sample. Design of the Radcell, with coils surrounding the source, assures maximum utilization of gamma radiation which would otherwise be wasted.

The Victoreen Radcell occupies a space approximately 24 x 36 inches and stands 78 inches high. Shipping weight is approximately 5000 lbs. Optional accessories include peristaltic and refrigerant pumps, special controls and instrumentation, and a device for placing a probe in the irradiation chamber.

Full details on the Victoreen Model 770 Radcell are available on request to Radionics Limited, 8230 Mayrand Street, Montreal 9, Canada.

Radar densiometer

Item 2489

The Ramcor Model 1200 Densiometer is a self-contained field strength meter specifically designed for monitoring radiation levels in areas where the use of high-power transmitters may create a hazard to personnel. The scale is marked "safe" and "danger" and is also calibrated in db with reference to 10 mw/cm². Pick-up antennas are available for all commonly-used radar and communications bands from 200 megacycles up. The Model 1200 is also useful as a field strength meter for tuning transmitters, detecting leaks in waveguide, etc.

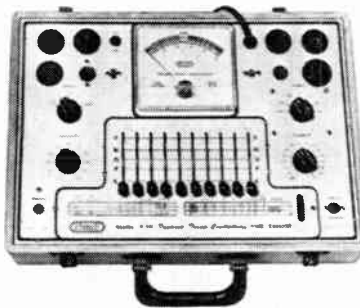
The same instrument is also available as a terminated wattmeter with full-scale ranges of 1 and 10 milliwatts. In conjunction with attenuators or directional couplers, these ranges can be extended as required. Useful frequency range of the Model 1300 Wattmeter is 10 to 10,250 megacycles.

For further information write: Tele-Radio Systems Ltd., 3534 Dundas St. W., Toronto, Ontario.

New tube tester kit

Item 2490

Available in either kit form or wired and calibrated, the STARKIT Model 9-99 Dynamic Trans-Conductance Tube Tester Kit is designed to test tubes under dynamic conditions closely resembling the actual operating conditions of a tube. Tubes are tested for opens, shorts, leakage, heater continuity and quality. 14 separate filament voltages



from .75 to 117 volts are available. It is equipped with 10 five-position lever switches, 4½" meter with "Replace-Good" scale and a roll chart containing the necessary tube data. Each kit is housed in a hardwood case with detachable lid and is supplied with French/English assembly and operating instructions.

Details from Stark Electronic Sales Co., Ajax, Ontario.

Paper base laminate

Item 2491

A new paper base laminate, four times stronger than XXXP, is available from Spaulding Fibre of Canada Limited, Toronto 18, Ontario.

It is being used widely to overcome breakage in servicing on television printed circuits and also for rocket and missile applications where shock or impact problems call for a material stronger than standard XXXP grades.

A modified XXXP with a special reinforcing ply, Spauldite XXXP-793 has an Izod impact strength greater than four times that of NEMA grade XXXP. Its high impact strength makes this material particularly suited to printed circuit applications and minimizes cracking or breaking under shock or impact loading.

Spauldite XXXP-793 is furnished in fabricated parts, sheets or copper clad.

Spaulding Fibre of Canada Ltd., 70 Coronet Road, Toronto 18, Ontario.

DC motor driven variable resistor

Item 2492

A new compact DC motor driven variable resistor designed for stereo, TV and other remote control applications has been developed by C. C. Meredith & Co., Ltd., Streetsville, Ontario. The 6V bi-directional DC motor-gear-train rotates contact arm of the variable resistor at approximately five rpm. Type MD10 has a slip clutch to prevent damage to the motor or control if rotated to the end of the control rotation; optional manual adjustment is also available. The control section consists of a 1½" diameter ¼ to ½ watt variable composition resistor available in resistance ranges from 250 ohms to 10 megohms (linear taper) with a standard tolerance of ± 30% for 250 ohms through 5 megohms and ± 40% for 5 to 10 megohms. Voltage rating across control end terminals is 500 volts DC and voltage rating bushing to terminals is 1000 volts AC for one minute high pot test with 750 volts DC operating maximum. Control section is available in a wide variety of resistance tapers and shaft specifications. Motor section can be adapted to other voltages and speeds required for specific applications. Samples are available at nominal charge.

For further information write: C. C. Meredith & Co., Ltd., Streetsville, Ontario.

Nickel-Cadmium battery charger

Item 2493

Airdesign Corporation, Upper Darby, Pennsylvania announce the availability of Auto-Sil Charger Model RA-4, a full wave silicon rectifier designed to convert 115 ± 10 volt, single phase 60 cycle AC to direct current suitable for charging nickel-cadmium batteries of 24 cells, 20 volts, 129 ampere hour capacity. A self-saturating reactor controlled by an electronic stabilizing circuit automatically maintains the correct potential for charging the batteries at either of two selectable rates.

The maximum power input is approximately 2700 watts with full DC output. The peak power output is 45 volts at 35 amperes direct current.

Further information is available from the Canadian representative J. C. E. Mitchell Electronics, 17 Dacre Crescent, Toronto 3, Ontario.

Silicon diode tester

Item 2494

Model MA-259, Millimicroammeter has been developed to extend the range of Electronics Laboratory, Model DT-257, Diode Tester from 50µa to 0.01µa to measure the low reverse current characteristics of silicon diodes. Used as a millimicroammeter the instrument covers the range from 0.01µa to 1,000µa and is completely self contained and battery powered.



Photo shows the Model MA-259, on the right, and the Model DT-257, on the left, mounted in the Model RA-81, Rack Adapter, to demonstrate the Modular ½ and ¾ rack width facility for ease in rack or bench mounting.

For further information write to: Computing Devices of Canada Limited, P.O. Box 508, Ottawa, Ontario.

PRECISION FREQUENCY MEASUREMENTS...

0.1 to 175 mc. At low cost!



LAMPKIN 105-B

MICROMETER FREQUENCY METER

- Heterodyne type, A.C. operated.
- Measures nearby transmitters, 100 KC to 175 MC (to 3000 MC by measuring multiplier stages of crystal-controlled transmitters).
- Accuracy better than 0.0025%. Resetability 0.0005%.
- Automatic correction for temperature of crystal calibrator.
- Pinpoint CW signal generator 20 MC to 200 MC.
- Size only 13" x 8 1/2" x 5". Weight 9 1/2 lbs.
- Price \$220.00 net (does not include duty).

Satisfaction guaranteed or money refunded.

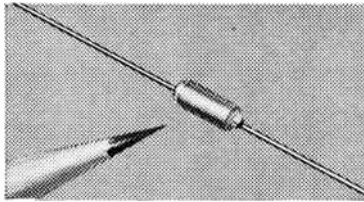
For indication of FM deviation, up to 25 KC swing, at carrier frequencies from 25 to 500 MC, use the companion unit: the LAMPKIN 205-A FM MODULATION METER.

Write today for technical data on both instruments.

LAMPKIN LABORATORIES, INC.

Dept. 707, Bradenton, Florida, U.S.A.

For complete details check No. 30



Solid-Electrolyte Tantalex® Capacitors

The ultimate in reliability, achieved through constant research, is evident in Sprague Type 150D Solid-Electrolyte Tantalex Capacitors. True miniaturization and excellent stability of electrical characteristics make them ideal for transistor circuits in military and industrial applications.

SPRAGUE®

CANADIAN MANUFACTURING REPRESENTATIVE

Micarta Fabricators Limited

18 Toronto Street
Toronto, Ontario

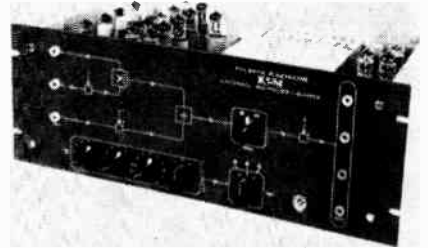
Phone EMpire 8-4251

For complete details check No. 41

New Products

High precision multiplier-divider Item 2495

George A. Philbrick Researches, Inc., 285 Columbus Ave., Boston 16, Mass., announce the Model K5-M Multiplier-Divider — a precision analog computing component with improved long term stability. Based on a new all-electronic semiconductor network, it accepts three variable inputs e_1 , e_2 , e_3 , and provides as output $e_1 e_2 / e_3$. Accuracy as a multiplier, including drift, is better than 1.10 v in all four quadrants.



A three-digit decade provides an adjustable voltage which may be added to numerator, denominator or output, and which serves as an adjustable scale factor for operations involving only two variables. The dynamic response of the unit is determined by a switch setting adjustable, for example, to give less than 1° phase shift at 1 kcps or 3 db attenuation at 14 kcps. The unit is mounted on a standard 7" rack panel. In addition to filament power at 115 vac, it requires 100 ma at plus and minus 300 vdc. The standard range of inputs and outputs is plus and minus 50 v. Typical applications include analog computation, correlation, precision modulation, and control. No external equipment is necessary to obtain products, ratios, squares, square roots or absolute values.

For further information please write to The Ahearn & Soper Company Limited, 384 Bank Street, Ottawa, Ontario.

Pocket sized laugh book . . . FREE

Item 2496

An attractive new, mirth-provoking Laugh Book has been published by Precision Equipment Co. Of interest to everyone, the Laugh Book is of particular value to those who must make an occasional public address or luncheon speech.

Included are many extremely funny cartoons by famous artists . . . cartoons such as Mr. Breger, Mr. Hubert, Cuties, the Girls and Strictly Richter. Also printed in this attractive pocket-size booklet are Precision's famous "Heard In The Locker Room" jokes.

For a bright note in your day, send for your free Laugh Book. Just write to Precision Equipment Co., 4411F Ravenswood Ave., Chicago 40, Illinois, U.S.A.

American Beauty...an iron for every Soldering Job

Whatever your soldering problem, American Beauty has the right iron for your particular job. The finest engineering, best materials and on-the-job experience since 1894 is yours with EVERY American Beauty.

There is a right model, correct tip size (1/4" to 1 1/8") and proper watt-input (30 to 550 watts) to do any soldering job. Ask about which iron will do your job best. American Beauty electric soldering irons are the highest quality made.

ILLUSTRATED IS
CATALOG NO. 3125
1/4" TIP SIZE, 60 WATTS

TEMPERATURE REGULATING STANDS
Automatic devices for controlling tip-temperature while iron is at rest—prevent overheating of iron, eliminate frequent re-tinning of tip, while maintaining any desired temperature. Available with heavy-gauge perforated steel guard—protects user's hand.

YOU CAN'T BEAT A SOLDERED CONNECTION

WRITE FOR 20-PAGE ILLUSTRATED CATALOG CONTAINING FULL INFORMATION ON OUR COMPLETE LINE OF ELECTRIC SOLDERING IRONS—INCLUDING THEIR USE AND CARE.

203-B

AMERICAN ELECTRICAL HEATER COMPANY

DETROIT 2, MICHIGAN



Millie Amp says,
"Get the Best
and pay less!"

"Gold Brand"

METERS

STARK

STARK ELECTRONIC SALES COMPANY
AJAX, ONTARIO

For complete details check No. 42

THE NEW



PYLON CATALOG

IS NOW OUT
WITH INFORMATION ON:

- NEW TRANSISTOR EQUIPMENT, POWER CONVERTERS AND INVERTERS, PBX SUPPLIES
- NEW COAXIAL ATTENUATORS
- PLUS STANDARD EQUIPMENT FROM OUR PREVIOUS CATALOG

Write for your FREE copy
of our Catalog B

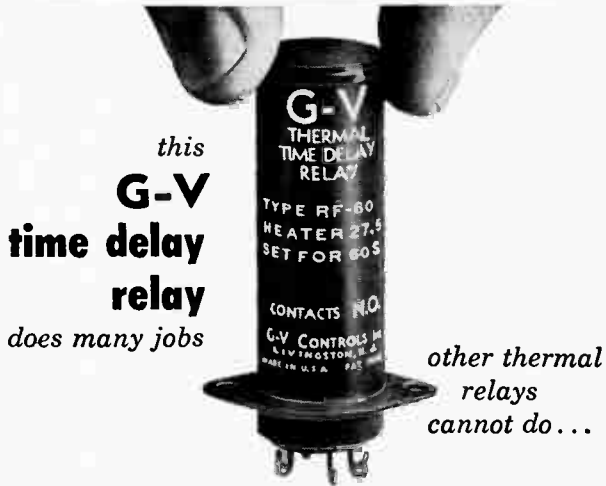


PYLON ELECTRONIC DEVELOPMENT company, Ltd.

Communications Systems and Equipment

161 CLEMENT ST., LASALLE, MONTREAL 32, QUE.

For complete details check No. 36 on handy card, page 45



this
G-V
time delay
relay
does many jobs

other thermal
relays
cannot do...

- For military or industrial use
- Miniature and octal sizes
- Plug-in or flanged mounting
- Hermetically sealed
- Adjustable or non-adjustable
- Delay intervals 1/4 sec. to 5 minutes
- Unaffected by ambient temperatures -70° to 100°C

Our facilities assure prompt deliveries

Write for bulletin and help with your particular problems



G-V CONTROLS INC.

Livingston, New Jersey

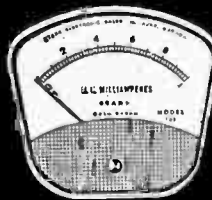
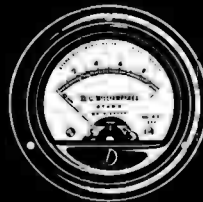
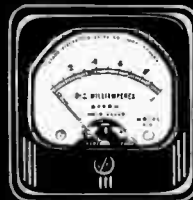
Represented in Canada by:

LEONARD ELECTRIC, LTD., 346 Bering Ave., Toronto 18

For complete details check No. 25 on handy card, page 54
ELECTRONICS AND COMMUNICATIONS, November, 1959

Introducing "Gold Brand"

METERS



11 types & sizes
Low Low Cost
High Quality
Available in all
ranges
VU R.F. A.C. D.C.

Now everyone can afford
quality meters by Stark.
Never before have meters
of such quality, accuracy
and reliability been offered
at such low prices.

Write today for catalogue.



STARK ELECTRONIC SALES COMPANY

AJAX, ONTARIO

For complete details check No. 43 on handy card, page 45

New Products

Cradleclips

Item 2497

A miniature version of the Insuloid Cradleclip system for securing or separating wire groups such as are found in electrical harnesses or other wire and cable installations has just been announced by Electrovert Inc., New York. This new unit makes possible use of Insuloid system in space and weight savings programs, in the production of miniaturized units or other components requiring very small holding devices. Pressure tubing for missiles, aircraft or control assemblies and electrical components such as capacitors, resistors, transistors, etc. may be fastened with this unit.

It's comprised of tough U-shaped Dupont nylon cradle into which a bundle of wires

or a component fits, and an extensible Neoprene clip permanently hinged to the top of one side of the U-shaped cradle. The clip cinches across the U-opening and locks under an inverted lip on the other side of the cradle. Miniature cradleclip units will accommodate diameters of $\frac{3}{8}$ to $\frac{1}{4}$ inches.

Complimentary samples obtainable from **Electrovert Ltd., 265 Craig Street West, Montreal, Canada.**

Rotary solenoids

Item 2498

Leetronics, Inc., of Brooklyn, N.Y., specialists in the design and manufacture of electro-magnetic products and systems offer a new service for obtaining rotary solenoids engineered to specific torque vs angle curve; any angle; voltage AC or DC, electromagnetic or spring return. Angular displacements to 120° available.

Using Leetronics' patented rotary solenoid (Motoroid) as a base, systems are available to perform programmed switching ratchet-

ing and indexing functions in an inexpensive yet efficient manner.

Series 25A and 25B, a small lightweight miniature torque size Motoroid provides pure rotary motion for continuous or intermittent duty. Size 1" x 1".

Series 100 for medium torque size — up to 4 inch-pounds is available with ratchet for angular increment of 10° or 15°. Size 3" x 2".

Series 800 is a large torque size designed for continuous duty. Uses class H coil and high quality insulations to permit maximum operating temperature of 180°C (356°F). Solid bronze bearings and precision Hi-carbon steel shaft.

Leetronics also have a clapper type series of Motoroid rotary solenoids designed for use where true rotary motion with high torque value is required. These units operate on small angles up to 5°. They have accurate repeatability of angle and are readily adaptable to rapid pulsing techniques.

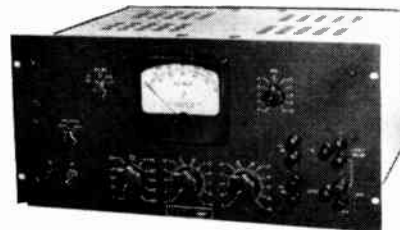
For further particulars write to **William M. Hummel, 150 Pinewood Trail, Port Credit, Ontario, Canada.**

Model 407 power supply

Item 2499

The John Fluke Model 407 Power Supply is a versatile laboratory supply with high resolution and regulation.

The supply is designed to fill almost all laboratory power supply functions including use of a calibration standard.



The power supply features: 0-555 VDC at 300 MA range; 2 millivolt resolution; voltage calibrated to .5%; regulation .01% against line or load; less than 1 millivolt ripple.

In addition, the supply has 2-6.3 volt filament windings and two variable bias outputs (0-25 VDC & 0-225 VDC).

The Model 407 is available in cabinet or rack models.

Available in Canada from **The Glendon Company Ltd., 44 Wellington St. East, Toronto 1, Ontario.**

Universal die base for Strippit hole punching units

Item 2500

Strippit Tool & Machine Company of Brampton, Ontario, has just announced that their Strippit Type "CJ" Hole Punching Units can now be equipped with a new type of Die Base which cuts replacement costs of round and shaped dies by about 50 per cent.

Interchangeable with the previous one-piece pedestal dies, the new bases are locked in the holder by the same method. With this new Die Base, instead of replacing an entire pedestal die, it is now necessary only to replace a relatively low-cost die button, which is readily inserted and locked in the top of the Die Base by a set screw. Die bases for shaped die buttons are keyed to the Type "CJ" Holders and have key slots at 90° intervals to permit keying the die buttons to suit the application.

Of heat-treated alloy tool steel, with a wide base area, these Die Bases provide rigid support for all punching up to the maximum $\frac{1}{4}$ " capacity in mild steel for Strippit Type "CJ" Punching Units. Made to fit all high-dieblock "CJ" units, the new assemblies maintain the original unit dimensions for punching close to the inside of angles.

For full details, write to **Strippit Tool & Machine Company, 118 S. Hansen Road, Brampton, Ontario.**



BOHNE SPRINGS IN QUANTITY

CAPACITY 660,000 PIECES PER SINGLE SHIFT

PRECISION MECHANICAL SPRINGS

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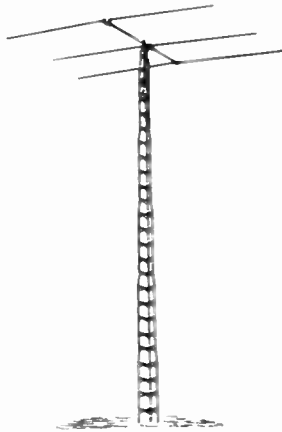
BOHNE SPRINGS

INDUSTRIES LIMITED

1153 QUEEN STREET WEST, TORONTO 3

For complete details check No. 13 on handy card, page 45

NEW THE DELHI SPAULDING STRATO-TOWER



SELF-SUPPORTING TOWERS UP TO 67 FT!

- Heavily galvanized, all-steel construction
- Riveted joints — no rust-prone welds
- Smart, modern styling
- "X" brace design for greater strength
- Beaded channel leg eliminates twisting
- Quickly, easily erected
- A Product of Canada's leading TV Antenna manufacturer

Your Choice of 4 Bases

The Strato-Tower comes with four different types of base: One for anchoring in concrete; one using a screw anchor; another using a cylinder base; and one to be anchored to the side of a building with ground rods driven through holes in the base.

See the Spaulding Strato-Tower today at any Delhi dealer

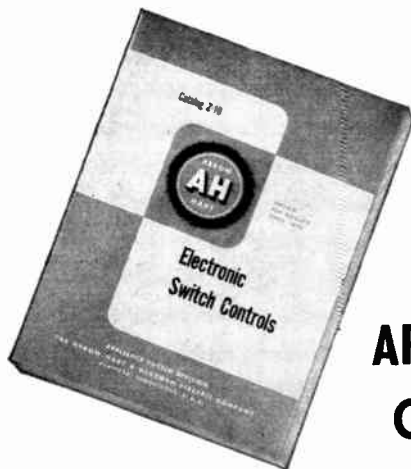
ALSO AVAILABLE:

Guyed towers up to 150 ft. in height and an "Erect-Tower" using a crank-up principle to 100 ft.

DELHI METAL PRODUCTS LIMITED DELHI, ONTARIO

For domestic TV and all types of commercial requirements

For complete details check No. 22 on handy card, page 45



NEW ARROW-HART CATALOGUE

of Electronic Switch Controls (No. Z-10)

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

SEND FOR YOUR FREE COPY NOW!



ARROW-HART & HEGEMAN (CANADA) LIMITED

Industry Street, Toronto 15, Ontario. Phone RO. 2-1101
7365 Mountain Sights, Montreal, Quebec.

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

QUALITY MOTOR CONTROLS • WIRING DEVICES • APPLIANCE SWITCHES
5905

For complete details check No. 6 on handy card, page 45

ELECTRONICS AND COMMUNICATIONS, November, 1959

Build STAMINA Into Your Circuits



SHOWN ACTUAL SIZE

CAMBION® Teflon-insulated terminals and diode clips offer a wide choice of quality-guaranteed components designed to withstand the shock and vibration of today's toughest operating and service requirements. Uniquely fastened Teflon sections provide positive, press-type mountings as well as superior insulation. Spring-loaded diode clips for wire diameters up to .085" and ferrule contact types for pins up to .085" diameter assure tight, troublefree connections. Terminals and clips brass per QQ-B-626a 1/2 hard. Terminals silver plated, clips bright alloy plated unless otherwise specified. Get complete information. Write Cambridge Thermionic of Canada Limited, 2425 Grand Boulevard, Montreal 28, P.Q.

For complete details check No. 14 on handy card, page 45

now...extremely long life!



TWENTY
MILLION
snap-actions—yet
no bigger than a paper clip!

LICON*

TYPE 11 SNAP-ACTION SWITCH

This new Licon precision snap-action switch design eliminates dead break and provides much greater overload capacity. Constructed to military and industrial standards, it can be obtained in a wide differential movement range from .008 to .030. Licon Type 11, a high electrical capacity snap-action switch, is extremely compact... perfect for use where size and dependability are important. Meets MIL S-6743 specifications. Write for Bulletin.

LICON

SWITCHES AND CONTROLS

DIVISION OF

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67 Scarsdale Rd.
Don Mills, Ontario

Exclusive Sales Agents

CONSTELLATION
COMPONENTS LTD.

136 Tower Drive, Toronto

17041 Omega Place

St. Genevieve, Montreal

LI-C

For complete details check No. 15 on handy card, page 45

41

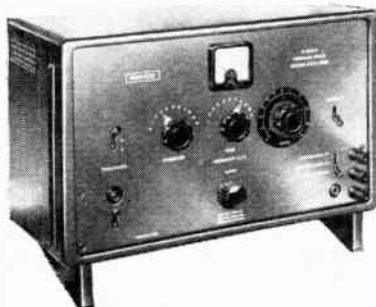
“Here are four of the most STABLE and ACCURATE variable-frequency OSCILLATORS”



D-890-A (with crystal check)
Frequency: 1c/s to 111.1kc/s
Accuracy (max.): 0.05%; 0.005% at spot frequencies
Output (max.): 126v into 8k ohms or 24v into 600 ohms



D-880-A (2-phase)
Frequency: 0.01c/s to 11.2kc/s
Accuracy: 0.2% above 5c/s; 2% at 0.01c/s
Outputs: 10v into 10k ohms and 600 ohms



D-695-A
Frequency: 10c/s to 31.2kc/s
Accuracy: 0.2% above 100c/s; 0.3c/s at 10c/s
Output: 10v into 10k ohms; 2.4v into 600 ohms



D-888-A (Analyser/Oscillator)
Frequency: 200c/s to 650kc/s
Accuracy: 2%
Output (OSC): 2.5v into 600 ohms

Write for Publications 130, 136, 137 & 138

Models cover a frequency range from
0.01 c/s—650 kc/s

MUIRHEAD

PRECISION ELECTRICAL INSTRUMENTS

MUIRHEAD INSTRUMENTS LIMITED, Stratford, Ontario
Telephones: 3717 & 3718

423/3ac

For complete details check No. 32 on handy card, page 45

New Products

Fixed central station remote control

Item 2501

International Systcoms Limited of Montreal announces the development and production of its Type SY-30C, 30 watt, F.M., V.H.F., Fixed Central Station and associated Remote Control Type SAC-1, which will complement and expand the company's present line of V.H.F. communications products.

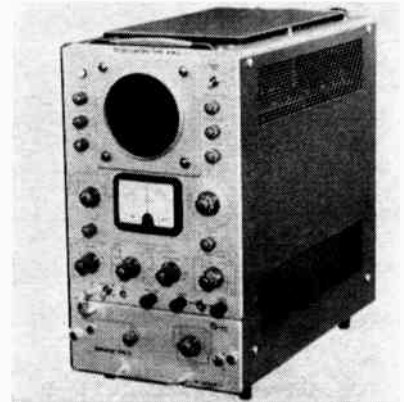
Systcoms' communications products are designed and produced in Montreal. This product line consists of very high frequency and associated apparatus to meet communications requirements in the point-to-point mobile and marine fields of operation.

For complete information write to International Systcoms Limited, 8235 Mountain Sights Avenue, Montreal 29, Que.

Oscilloscope type W.M.8

Item 2502

A new oscilloscope has been added to the range of the Instrument Division of E.M.I. Electronics Ltd. This oscilloscope is a general purpose instrument providing a wide variety of facilities which make it particularly suitable for TV waveform analysis, pulse measurement, computer development and production testing.



The amplifier has differential inputs with a common attenuator switch. The fine gain control enables any signal to be displayed at a convenience size on the 5" cathode ray tube.

The new oscilloscope has a bandwidth of DC to 15 MC/s (—3db), sensitivity is 1 V/cm to 25 V/cm (50 mV/cm to 25 V/cm using Amplifier Type 8).

For further details on this oscilloscope apply to E.M.I.-Cossor Electronics Ltd., 2005 MacKay Street, Montreal, Que.

Millie Amp says,
"I've seen 'em all
and Gold Brand
gives you more
for less!"

"Gold Brand"

METERS

STARK

STARK ELECTRONIC SALES COMPANY
ATLANTA, GEORGIA

For complete details check No. 44



Plunger type control key switches

Operators feeling the clean and positive "Make and break" action in any of the fifty standard spring combinations forget any fear of failure.



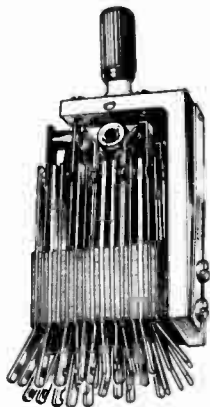
Lever type control switch (Small)

The contact springs made of nickel silver operated by hard plastic rollers on steel cams and silver contacts, ensure perfect performance.

CONTROL KEY SWITCHES

TMC

FOR
LOW
VOLTAGE
MULTIPLE
SWITCHING



T.M.C. CONTROL KEY SWITCHES, precise in design and of robust construction, are today performing their vitally continuous work in varying apparatus all over the world.

Platinum or other metal can be supplied for special operating conditions.

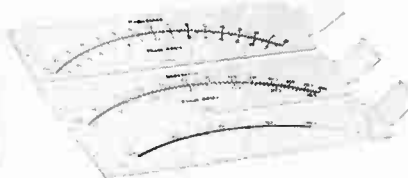
Lever type control switch (Large)

Telephone EM. 6-5314 or write for T.M.C. Control Key Catalogue giving full technical data to:

**TELEPHONE
MANUFACTURING CO. LTD.**
SAXONY BUILDING • 26 DUNCAN STREET
TORONTO, ONT. Telephone EM. 6-5314

For complete details check No. 47 on handy card, page 45
ELECTRONICS AND COMMUNICATIONS, November, 1959

BRUEL & KJAER MODEL 1504 DEVIATION BRIDGE



TESTS UP TO 3,600 COMPONENTS AN HOUR WITH 0.03% ACCURACY

Bruel & Kjaer Deviation Bridges give direct reading of percentage deviation from any selected standard L, C or R. Measuring time is minimized since no balancing or manipulation is required — the entire operation is reduced to connecting the component under test, and instantly reading the result.

- Production test rates up to 3,600 pieces hourly.
- Percentage deviation accurate to 0.03%.
- Large illuminated single scale meter.
- Interchangeable meter scales.
- Built-in calibration standards.
- High stability allows adjustment-free operation.

These bridges operate on carrier frequencies of 100 cycles, 1 kilocycle, 10 kilocycles or 100 kilocycles.



Only
\$275.00

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Phone or write for full specifications and a demonstration.

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1470 DON MILLS RD., DON MILLS, ONT.

TORONTO
Hickory 4-4429

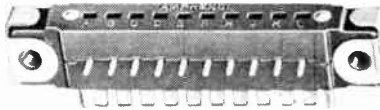
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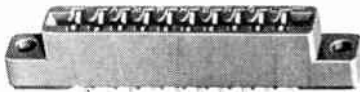
For complete details check No. 38 on handy card, page 45

**HIGH PERFORMANCE RELIABILITY
COMPACT DESIGN — EASY TO USE
PRIN-CIR CONNECTORS**

**WITH GOLD PLATED CONTACTS —
MOLDED BLUE DIALLYL PHTHALATE BODIES**



New 133 Series Plugs and Adapters



143 Series Receptacles for Boards
or 133 Series

PLUGS and ADAPTERS — 133 series — for building modular units, right angle stack-ups, or cable plug-ins. Nylon guide pins to mate with Prin-cir receptacles 143 series: 5 tail styles — 10, 15, 18, and 22 contacts.

RECEPTACLES — 143 series new fatigue-free contacts with circle lip entrance, and long spring base ensure good wiping action. Contacts cannot be "set". 4 tail styles — 6, 10, 15, 18, and 22 contacts.

*For Printed Circuits, as for every major component use,
make contact with AMPHENOL!*

WRITE FOR CATALOG R-2



CANADA LIMITED

349 CARLAW AVENUE, TORONTO 8, ONTARIO

SALES OFFICES: OTTAWA • MONTREAL • CALGARY

For complete details check No. 5 on handy card, page 45

BRAND NEW! READY FOR YOU NOW!

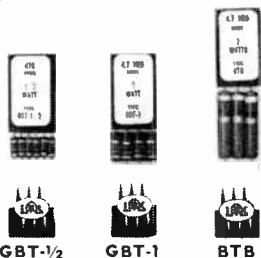
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FOR CARBON COMPOSITION RESISTORS

**IDEAL FOR ENGINEERING LABS,
TECHNICIANS, REPLACEMENT USE**

- Easier to identify, quicker to find
- No mixups, handier to use
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Available in floor and counter displays and a variety of Dealer and Engineering kits. Assortments contain NEW GBT resistors manufactured in Canada. Shown popular RESIST-O-CADDY.



GBT-1/2

GBT-1

BTB

3

HANDY-PAKS

1/2, 1 and 2 watts

Sold by Leading IRC Distributors from Coast to Coast



RESISTORS

division of
Renfrew Electric Co. Limited

349 CARLAW AVENUE • TORONTO 8, ONTARIO

SALES OFFICES: OTTAWA • MONTREAL • CALGARY

For complete details check No. 29 on handy card, page 45

New Products

Multiple functioning speed clips

Item 2503

A new multiple-functioning SPEED CLIP for application on television receivers was announced recently by Dominion Fasteners Limited, Hamilton, Ontario.

Made of spring steel, the new Tinnerman fastener is used as a coupler which joins a long, flat steel control knob shaft to the splined shaft of a potentiometer. Coupling can be accomplished in seconds without the aid of special tools. The control shaft is snapped into the U-shaped end of the SPEED CLIP where it is locked in position by a spring tab. The splined potentiometer shaft can then be inserted by easily pressing it between the semi-tubular spring legs, or by sliding it into the open end.

After assembly, the SPEED CLIP provides an additional function. The oblong dimples on its spring legs engage the splined shaft for positive tuning, yet they offer a safety factor. Once the potentiometer has reached its turning limits, further turning of the control knob results only in slippage of the clip on the shaft as the dimples override the splines. This prevents possible damage to the potentiometer.

The new Tinnerman clip is totally self-retaining, and disconnection for service is extremely rapid with no sub-miniature screws, nuts or washers to lose in a maze of wiring. Its design permits the use of inexpensive, flat stamped stock in the place of rod or tubing for the control shaft.

Dominion Fasteners Limited, Hamilton, Ontario.

Wheatstone and Kelvin bridges

Item 2504

Tools which many electronic, electrical and aircraft manufacturers have constantly required, but from which they have previously been debarred on the basis of cost, are Wheatstone and Kelvin Bridges.

Conway Electronic Enterprises Reg'd of Toronto now offers three models of Wheatstone Bridges, one a straight DC bridge which measures from .05Ω to 50,000Ω using an internal DC source. Another has the same ohmic ranges but will measure both AC and DC resistance as it contains an internal AC source. The third unit consists of a Kelvin Bridge which measures from .0001Ω to 20kΩ.

The accuracy of these instruments is one per cent. They are attractively housed in black hard bakelite cabinets with internal galvanometers. They are guaranteed for one year and sell for extremely low prices.

The first unit described above is known as the Omega I; the second unit is the Omega II and the third unit (Kelvin Bridge) is known as the Omega III.

Further data concerning the above is obtainable by contacting Conway Electronic Enterprises Reg'd, 1514 Eglinton Ave. West, Toronto, Ontario.

Millie Amp says,
"I know quality
when I see it!"

"Gold Brand"
METERS

STARK

STARK ELECTRONIC SALES COMPANY
A.J.A.R. ONTARIO

For complete details check No. 45

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Company

Nature of Business

(State, when applicable, whether electronic equipment or components are manufactured, sold, or used in manufacturing, etc.)

Signature

Position

IF YOU ARE AN ENGINEER, PLEASE SO STATE — when it is not included in your job title.
11-59

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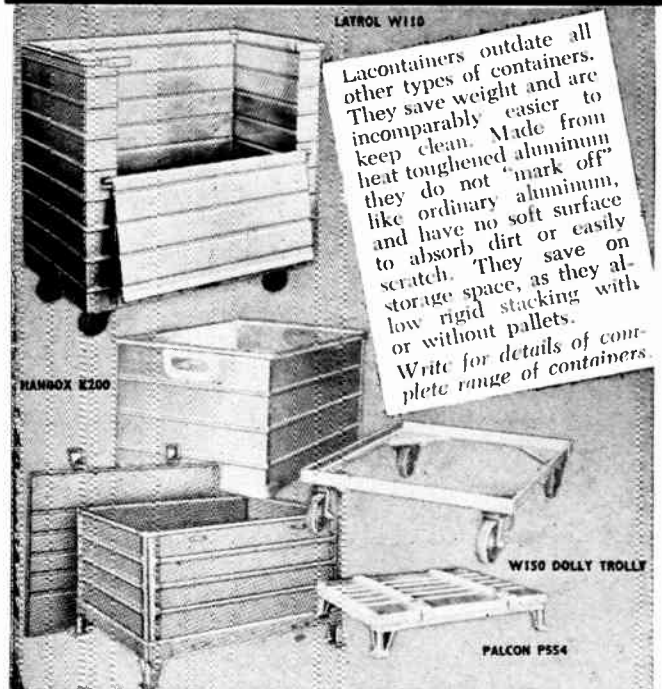
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give you such cleanliness, lightness & economy



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49 Milford Avenue, Toronto 15. Tel: CH.6-2272

For complete details check No. 49 on handy card, page 45

BIG NEWS ABOUT A LITTLE PRODUCT

(ACTUAL SIZE)

Bendix "PYGMY" Electrical Connectors

Gold Plated Contacts	Can be pressurized to current MIL-C-5015 specification
Closed Entry Sockets	High Strength Aluminum Shells
Resilient Scinflex Insert	Variety of Styles Available—General Duty, Environmental Resisting, Potting Types, Jam Nut Receptacles, Hermetically Sealed Receptacles
Alumilite or Cadmium Plate Finish	Wide Choice of Insert Patterns (1 to 55 contacts)
Two Quick Disconnect Couplings—Double Stub Quick Action Thread or Three-Point Bayonet Lock	Designed especially for miniaturized Electronic Equipment
Light Weight	
Small Envelope Size	
Maximum Serviceability	

New "PYGMY" Connectors for Miniaturized Electronic Equipment Installations

Although the newly developed "Pygmy" line of miniature electrical connectors is approximately one third smaller in size and weight than the standard Bendix* AN connector, they provide the same outstanding qualities of serviceability, ruggedness, reliability and resistance to vibration, moisture and corrosion for which all Bendix connectors have become world famous.

If you have an application for miniaturized electronic equipment requiring lighter and smaller connectors than standard AN types, you'll find Bendix "Pygmy" connectors the best possible solution. Write for complete detailed information to:

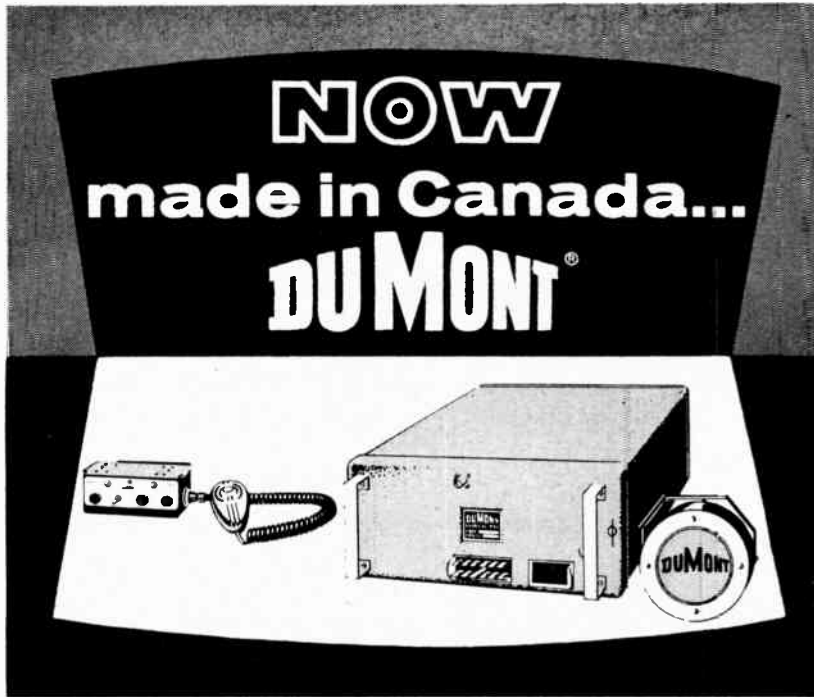
The Canadian Affiliate of
THE BENDIX AVIATION CORPORATION
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AVIATION ELECTRIC
LIMITED

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Branch Plant:
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... the "quality package" in mobile communications

Completely manufactured in Canada . . . a quality Du Mont mobile communications system that gives your choice of 3 power ratings with guaranteed minimums across the band. Competitive in cost, this high-power mobile unit gives base-station stability . . . provides crystal clear reception at maximum working distances . . . is fully certified for land-mobile service and complies with D.O.T. type approval requirements for split channel use. Write for literature on Du Mont mobile radio systems . . . Canada's "quality package" in mobile communication.

● HI-POWER

Mobile units with the equivalent power of a conventional base station.

● HIGH STABILITY

through the use of high precision low drift crystals.

● COMPLETE YET COMPACT

Transmitter, receiver, power supply and all relays in one compact case.

● SEALED SELECTIVITY

If selectivity determined by directly interchangeable fixed frequency filters for either split channel or adjacent channel operation.

DEALER ENQUIRIES INVITED



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AND
DEVELOPMENT COMPANY LTD.**

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Toronto - Ontario

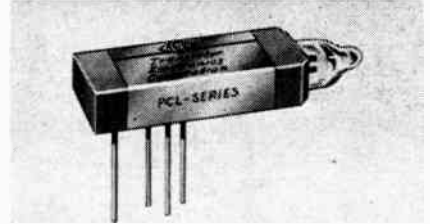
For complete details check No. 24 on handy card, page 45

New Products

Printed circuit lights

Item 2505

Transistor Electronics Corporation, announces a new series of low signal indicating units designed for direct mounting on printed circuit boards. Encapsulated unit includes neon indicator, transistor driver, circuitry, and wire leads. The PCL Series is of value where indication is required for



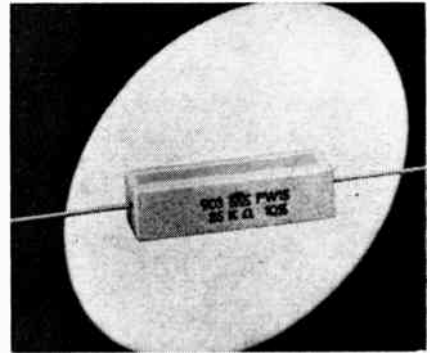
maintenance only, as it eliminates need for separate lamp, holder, transistor, resistors, and wiring costs. Mounts on 1/2" centers, height 1/4". May also be used to drive remote indicator on console or panel.

For details write to Lake Engineering Co. Limited, 123 Manville Road, Scarborough, Ontario.

15 watt resistor

Item 2506

A new 15 watt resistor has been added to the PW series of I.R.C. wire wound resistors.



Type PW15 resistors combine a unique design with a high degree of automatic assembly offering high reliability at low cost. Features include: power rating: 15 watts; resistance: 1 ohm to 25,000 ohms; tolerance: plus or minus 5% or plus or minus 10%; dimensions: 1/2" x 1/2" x 1 1/8" body; leads: axial - 0.032" x 1 1/2".

For further information write to I.R.C. Resistors, division of Renfrew Electric Co. Limited, 349 Carlaw Avenue, Toronto 8, Ont.

Millie Amp says,
"Are you paying
too much for your
meters? Better check
Gold Brand!"



"Gold Brand"

METERS

STARK

STARK ELECTRONIC SALES COMPANY
AJAX, ONTARIO

For complete details check No. 46



THE NEWEST ONE-PACKAGE CONTROL SYSTEM IN RADIO

R5470 MASTER CONTROL SYSTEMS *that have all the facilities
to produce complete programmes*

This one-package control system puts at your finger tips all the facilities you require for all types of programming . . . AM & FM—MONAURAL—STEREOPHONIC.

The MASTER CONTROL SYSTEMS are modern in design . . . modern in appearance . . . modern in facilities. There's a type to meet your particular need.

*Disc Playing Equipment
Console facilities
Talk-Back Equipment
Jackfield & Telephone
Record and Tape Storage*

Ask to-day for complete details on how a MASTER CONTROL SYSTEM can fit into your particular operation.

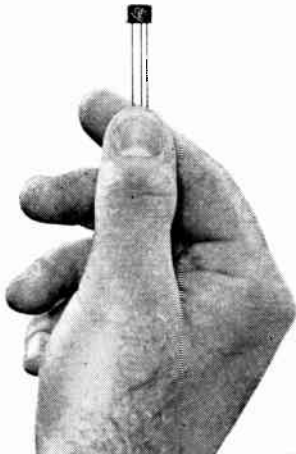
Northern Electric
COMPANY LIMITED
SERVES YOU BEST

. 1059-8

For complete details check No. 34 on handy card, page 45
ELECTRONICS AND COMMUNICATIONS, November, 1959

49

**TEXAS INSTRUMENTS
SEMICONDUCTORS**



**DELIVERED
OVERNIGHT**
Anywhere in Canada

Off-the-shelf
•
Factory prices
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Complete Line
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Lafayette Radio



**Your Authorized
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*For fast, time-saving delivery
anywhere in Canada, order
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ing quantities:*

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Silicon and germanium transistors, silicon diodes and rectifiers, carbon film resistors

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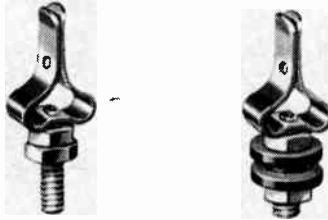
New Products

Miniature test clips

Item 2507

Grayhill Inc., announces two miniature test clips, 2-20 (left) and 2-24 (right).

These clips extend only $\frac{3}{4}$ " above mounting panel and are designed to allow rapid connections without manually opening and



closing jaws. The clips are ideal for testing resistors, capacitors, transistors, and other pigtail-type components. All metal parts are nickel-plated brass except threaded stud, which is nickel-plated steel.

For further information contact: Lake Engineering Co. Limited, 123 Manville Road, Scarborough, Ontario.

Multi-purpose broadcasting unit

Item 2508

Designed to fulfil the demand which the AM and FM radio station market has created, a multi-purpose broadcasting unit has been devised by Northern Electric Company Limited to double either as an audio console in a small broadcasting station or as a stereo console which can be integrated into the system of a larger station.

Known as the R5470 master control system, this equipment provides in one package all of the facilities which are necessary to produce complete radio programs.

Built to high standards far in excess of E.I.A. specifications to provide years of trouble-free service, the equipment is manufactured in six standard types to meet commonly anticipated requirements.

Included with the unit are such items as disc playing and talk-back equipment, console facilities, jackfield, record and tape storage accommodations and telephones. Two Ampex type tape recorders are also provided in this instance.

For more detailed information on this equipment, write: Northern Electric Company Limited, 1600 Dorchester Street West, Montreal, Que.

1 megacycle stable oscillator

Item 2509

The development of a 1 megacycle frequency standard stable oscillator has been announced by RCA Victor Company, Ltd.

The unit which is fully transistorized is designed as a frequency-standard which, when combined with transistorized frequency divider circuits, provides a compact frequency source.

It has maximum application in equipment where a frequency or timing accuracy of 1 part in 10^7 is required. With dividing chains it can provide this accuracy in the range of a few cycles to 1 megacycle and is suitable as the Master Timing Clock for data-handling. There are applications for this unit in Portable Test Jig assemblies where discrete test frequencies are valuable when combined with low size and power consumption.

In the design emphasis has been on the temperature control of the crystal and oscillator using thermistors and a DC Amplifier Servo System. Printed board construction has been used and while it is not at present built to MIL specifications, it will meet wide temperature variations and can be modified to meet these specifications.

For further information contact: RCA Victor Company, Ltd., Technical Products Marketing Division, 1050 Lacasse Street, Montreal, Quebec.

Completely
CANADIAN MADE

**PANEL
MEASURING
INSTRUMENTS**

**PORTABLE
AND LABORATORY
INSTRUMENTS**

**ELECTRONIC
INSTRUMENTATION**

Only a complete Canadian instrumentation facility can offer the kind of service Canadians need. Bach-Simpson Ltd. is complete — in research, design, tooling and manufacture.

If our standard line of instruments, complete as it is, won't meet your requirements, ask us to demonstrate the unique combination of skills we can offer in the design of specialized instrumentation to meet your specific problem.

*Others have, and have been
completely satisfied!*

**Bach-Simpson
LIMITED**

JA 5187

AVAILABLE NOW

The new **MODEL '270'**

A custom instrument
in the *Simpson*
"260" tradition



- Increased accuracy
- Human engineered scales
- Movement overload protection—and a host of other attractive features for discriminating users.

For those who for years have valued the reliability and versatility of the Simpson "260", the Custom-Engineered Model 270 offers a multitude of new features for applications calling for a higher order of accuracy, with no sacrifice in the qualities which have made the "260" famous the world over.

Ranges and scale layouts have been designed for maximum readability with an anti-parallax mirror and knife edge pointer. Precision components and calibration techniques assure accuracies down to $\pm 1.25\%$ on most of the D.C. ranges, with similar accuracy improvements on other ranges. In addition, the operating manual specifies accuracies on

all ranges for a variety of operating conditions, frequency correction curves and a host of useful information.

To conserve this high order of accuracy, a circuit fuse and meter current-limiting diode guard against accidental overload, over and above that provided for in the choice of rugged and generously rated components.

Truly a Custom-Engineered Instrument to suit the present day trend to greater precision in measurement.

Write for further details
Price — \$63.07, Sales Tax Included

The Canadian-made Simpson 260
will continue to be available
Price: \$55.00
Sales Tax Included



1255 Brydges St.

London

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

J-9331

For complete details check No. 11 on handy card, page 45

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.

SALES ENGINEER REQUIRED

Young university graduate required for sale of electronic instruments to industrial, educational and government laboratories. Should be familiar with chemical, nucleonic and electronic test equipment instrumentation. Sales experience preferred but not necessary. Salary.

Box 5020
Electronics and Communications
450 Alliance Avenue, Toronto 9, Ontario

SALES AGENCY OPPORTUNITY

U.S. manufacturer requires sales and possibly engineering facilities for range of DC, regulated, transistor, variable, voltage regulated, power supplies.

Box 5021
Electronics and Communications
450 Alliance Avenue, Toronto 9, Ontario

BRITISH FIRM SEEKS U.K. AGENCY RIGHTS FOR CANADIAN ELECTRONICS MANUFACTURER

A large and reputable firm of British electronic equipment and component manufacturers situated in the North of England is desirous of obtaining U.K. representation rights for Canadian manufactured electronic equipment and components. The firm seeking this arrangement is a supplier of electronic equipment to H.M. Admiralty, Ministry of Supply and the United Kingdom Atomic Energy Authority. In reply interested parties should state the types of equipment or components they are prepared to place on the British market through such an arrangement. Address replies to:

Box 5022
Electronics and Communications
450 Alliance Avenue - Toronto 9, Ontario

CANADIAN REPRESENTATIVE WANTED

American manufacturer of AC, DC, regulated, transistor and variable power supplies is anxious to establish Canadian outlet. In reply submit details of industry connections.

Box 5023
Electronics and Communications
450 Alliance Avenue - Toronto 9, Ontario

SALES PROMOTION OPPORTUNITY

Internal sales promotion man wanted by small sales organization in radio and telephone communications. Responsibility for organizing direct mail catalogues, sales correspondence, etc. Opportunity to participate in future growth.

Box 5024
Electronics and Communications
450 Alliance Avenue - Toronto 9, Ontario

U.S. FIRM SEEKS CANADIAN REPRESENTATIVE

Manufacturer of wide range of electronic components and equipment in the United States seeks to negotiate an arrangement with a Canadian company now established in the electronics business to act as Canadian representative. Please include resume of company history and status in first reply.

Box 5025
Electronics and Communications
450 Alliance Avenue - Toronto 9, Ontario

CANADIAN SALES AGENCY OPPORTUNITY

American manufacturer of power supplies, reactors and toroids seeks to establish connection with Canadian firm to act as Canadian outlet.

Box 5026
Electronics and Communications
450 Alliance Avenue - Toronto 9, Ontario

GRADUATE ELECTRICAL ENGINEER

desires position with Canadian firm. Experience includes flying time of 500 hours as a navigation officer and two years as a telecommunications officer with the RCAF. Opportunity to gain technical experience considered of greater importance than remuneration involved. Complete resume will be forwarded on request.

Box 5027
Electronics and Communications
450 Alliance Avenue, Toronto 9, Ontario

MATURE EXECUTIVE

Twenty-five years' experience in electronics, sales, purchasing, management, industrial sales connection, wide knowledge supply sources components parts, excellent organizer, many personal references. Presently employed, seeking permanent post, possible future investment.

Box 5028
Electronics and Communications
450 Alliance Avenue, Toronto 9, Ontario

INTER-OFFICE EQUIPMENT FOR SALE

One G.E.C. Private Automatic Telephone Exchange Cat. No. PX 2125 wired and equipped for 25 Telephone Extensions and 3 Speech Circuits. One G.E.C. SU. 1102 Battery Eliminator. For use with the above Desk-Wall Type Telephones.

Contact Mr. Rosenberg, RU. 1-3501
Toronto, Ontario

ELECTRONIC ENGINEERS

DEPARTMENT OF NATIONAL DEFENCE (ARMY)

LEITRIM, ONTARIO

\$6840 - \$7860
(Engineer 4)

\$7500 - \$8580
(Engineer 5)

Attractive opportunities are now available for three professionally qualified Engineers with experience in electronic equipment in the communications field.

GENEROUS FRINGE BENEFITS

For complete details and application forms write to:

CIVIL SERVICE COMMISSION OF CANADA OTTAWA

ASK FOR INFORMATION
CIRCULARS 59-1169 and 59-1170

For complete details check No. 19

RCA CAREER OPPORTUNITIES FOR ELECTRONIC ENGINEERS WITH RCA VICTOR

RCA Victor, Canada's foremost pioneer of the electronics age, has openings for several Engineers in its Technical Products Division at Montreal.

Interesting and challenging assignments, calling for individual initiative and creativity, are available at intermediate, senior and supervisory levels in the following areas:

Broadcast, Navigation, and Communication Systems
HF, UHF and SHF Techniques and Circuitry
SSB Receiver and Transmitter Development
Transistor Circuit Design and Application
Amplitude and Delay Equalization Network Design
Television, Medium and High Capacity, Radio Relay Systems
Antenna and RF Filter Design

Vacancies will be filled by graduate engineers having a minimum of three years experience in one or more of the above fields. Salaries and advancement are based on experience and ability. Successful applicants will have access to the most modern and complete facilities and will work alongside engineers and scientists of RCA Victor's Engineering team, in an atmosphere conducive to maximum professional growth.

Challenging opportunities are also open for Sales Engineers in our Technical Products Marketing Division.

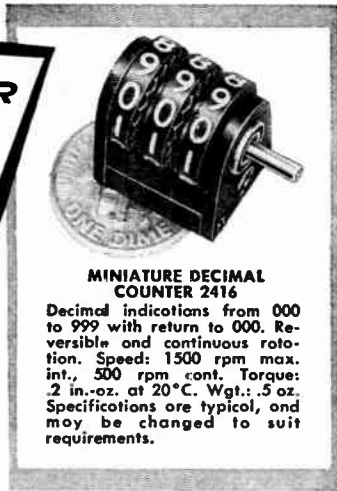
Engineers interested in joining RCA Victor, a company with a full program of employee benefits and a progressive salary structure, are invited to forward a resume of background to:

**Administrator, Technical Employment,
RCA Victor Company, Ltd.,
901 Lenoir St., Montreal, P.Q.**

All replies strictly confidential and will be acknowledged promptly.

For complete details check No. 37 on handy card, page 45

BOWMAR PRECISION COUNTING DEVICES



**MINIATURE DECIMAL
COUNTER 2416**

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

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

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PAGES AND NAME OF
NEAREST BOWMAR
REPRESENTATIVE



Precision
Miniature
Speed Reducers and
Gearheads



Precision
Servo
Packages

AEROMOTIVE ENGINEERING PRODUCTS LTD.

Montreal: 147 Hymus Blvd., Pointe Claire, Que. OX. 7-0810
Toronto: 1912A Avenue Road RU 3-4288

For complete details check No. 2 on handy card, page 45

ADCOLA

(Regd. Trade Mark)

SOLDERING EQUIPMENT

designed for electronic and radio work

- C.S.A. APPROVED
- ALL VOLTAGES SUPPLIED

● Designed for bench line production and continual use.



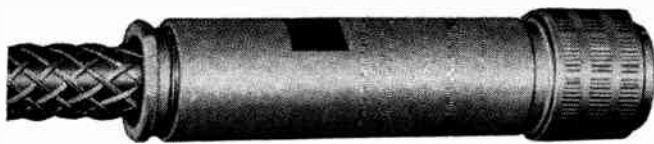
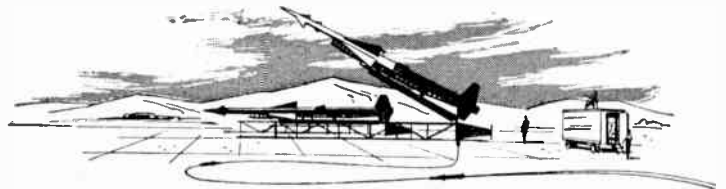
Available in
Tip sizes 1/16",
1/8", 3/16" and
1/4".

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and
SERVICE

● **L. J. LAMB**

● Box 103, Weston, Ont.
● CH. 1-5830

For complete details check No. 1 on handy card, page 45



Why it pays you to specify

Bendix QWL Electrical Connectors for use with Multi-conductor Cable

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

A heavy-duty waterproof power and control connector, the QWL Series provides outstanding features: • The strength of machined bar stock aluminum with shock resistance and pressurization of resilient inserts. • The fast mating and disconnecting of a modified double stub thread. • The resistance to loosening under vibration provided by special tapered cross-section thread design. (Easily hand cleaned when contaminated with mud or sand.) • The outstanding resistance to corrosion and abrasion of an aluminum surface with the case hardening effect of Alumilite 225 anodic finish. • The firm anchoring of cable and effective waterproofing provided by the cable-compressing gland used within the cable accessory. • The watertight connector assembly assured by neoprene sealing gaskets. • The addi-

tional cable locking produced by a cable accessory designed to accommodate a Kellems stainless steel wire strain relief grip. • Prevention of inadvertent loosening insured by a left-hand accessory thread. • The high current capacity and low voltage drop of high-grade copper alloy contacts. Contact sizes 16 and 12 are closed entry design.

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

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

Scintilla Division

Sidney, New York



For complete details check No. 12 on handy card, page 45

Farewell Cartier Square

In addressing the fourth annual IRE Canadian Convention banquet, D. A. Golden, Deputy Minister of Defense Production, stated early in his talk that he was only a layman in the technical aspects of defense electronics and military strategy and could therefore only speak in layman's terms on these subjects. However, in the matter of informing the Canadian electronics industry where its future lay in respect to the much talked-about defense sharing program between the United States and Canada, he made himself perfectly clear. Mr. Golden told the capacity audience of electronic engineers and industry management that the opportunities for industrial effort could no longer be found, with relative ease, within the equipment programs of the Canadian armed services alone. In other words, this means that the hey-day of obtaining plum-sized orders from the Canadian Department of National Defense is a thing of the past.

Mr. Golden pointed out quite clearly the developments in continental defense strategy which had led to this situation and warned that a major readjustment in outlook and operations was required both on the part of government and industry.

Insofar as the readjustment of outlook on the part of the Canadian electronics industry is concerned it must — if it is to operate its manufacturing capacity to the fullest on the production of defense electronics — seek production opportunities to a significant degree in the vast and complex defense programs of the United States and in the face of American competition. The latter words of the foregoing sentence are practically those of Mr. Golden which, in our interpretation, mean that Canadian electronics manufacturers had better forget about Cartier Square and the Department of National Defense in Ottawa and direct their efforts south of the border. They would be well advised also to pay particular note to Mr. Golden's closing remarks when he departed from the written text of his speech to advise that, although the Canadian government had cleared the way for industry to obtain U.S. defense orders, no Canadian department of government nor any Canadian government official could get the orders for them. This part of the deal, Mr. Golden pointed out emphatically, was up to industry itself.

So may we suggest, in the light of the above remarks, that if the Canadian electronics industry desires to remain in the defense electronics business it adopt the theme song of . . . "It's a long, long way to Tipperary. but farewell Cartier Square!"



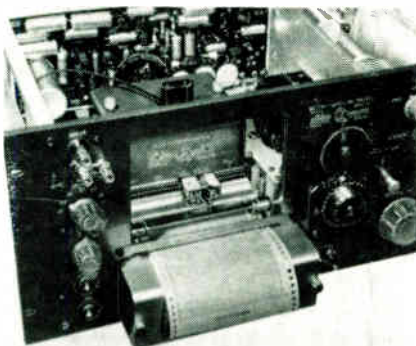
PRODUCTS AT THE SHOW...

The following pages are designed to interest the readers of **ELECTRONICS AND COMMUNICATIONS** who attended the IRE Show — saw products that interested them there — and now would like to know more.

To those who could not attend Canada's 4th Convention and Exposition, these pages will be of particular significance as the section shows a good sampling of the fine products on display.

If you, Mr. Reader, are interested in a particular product or products shown in this section, fill in your name and address on the appropriate postcard, tear along perforations and mail — the supplier will do the rest in rushing you product information to keep you up to date.

Graphic Level Recorder GENERAL RADIO COMPANY



A Graphic Level Recorder has a wide variety of uses in electronics, acoustics and other branches of physical science and engineering. It records on a logarithmic scale the rms magnitude of an A-C voltage rather than the instantaneous value, and can plot the output of an A-C device as a function either of time or of some other parameter than can be made time dependent, such as frequency.

The G-R type 1521-A Graphic Level Recorder is an accurate and versatile instrument for recording from 20 c/s to 200 K/c. In this recorder, a high-speed servo-mechanism of novel design positions an input potentiometer and a pen to produce an ink trace on rectilinear paper.

Potentiometers used with this recorder are interchangeable for ranges of 20, 40 and 80 db. The maximum writing speed of the pen on the 80 db range corresponds to 400 db per second.

In this recorder, four chart speeds are available with the motor supplied with the instrument: 2.5 inches per minute; 7.5 inches per minute; 25 inches per minute and 75 inches per minute. An additional feature of the 1521-A is an accessory linear potentiometer which converts the instrument from a level recorder to a general purpose D-C recorder, with adjustable zero level and 0.8 volt full scale sensitivity. General Radio Reprint No. E-106 is available upon application. This reprint describes in detail the principles of operation, applications and examples of recordings.

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PLEASE SEND FURTHER INFORMATION

PLEASE HAVE SALES ENGINEER CALL

For last minute news about these products and companies, check the pages in the following show supplement.

Aviation Electric Limited	Direct Reading Pocketscope
Bach-Simpson Limited	Frequency Controller-Indicator
Bayly Engineering Limited	Vacuum Tube Voltmeter
Canadian Applied Research Ltd.	R-Theta Navigation System
Canadian Pratt & Whitney Aircraft Company Ltd.	Closed Circuit TV Camera
Canadian Marconi Co., Toronto	Electron Tubes
Canadian Marconi Co., Montreal	General Purpose Oscilloscope
Central Scientific Co. of Canada Ltd.	Cenco-Hyvac Pumps
Daystrom Limited	Instrument Calibrator
General Radio Company	Graphic Level Recorder
Instronics Limited	Panoramic Receiver
Instronics Limited	Analogue Computer
Lake Engineering Company Ltd.	Packaged Oscillators
McCurdy Radio Industries Limited	Monitor Amplifier
Philips Electronic Industries Ltd.	Broadband Communications Equipment
Polarad Electronics Corporation	Precision Noise Generator
Rogers Electronic Tubes and Components	Glass Enclosed Quartz Crystals
R-O-R Associates Limited	Potentiometer Catalogue
Rutherford Agencies	Cornell-Dubilier Transipower
Stark Electronic Sales Company	Gold Band Meters
Sylvania Electric (Canada) Ltd.	Direct Wire TV Camera
Tellurometer Canada Limited	Portable Potentiometer Recorder
T.M.C. (Canada) Limited	Switching Patch Panels

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 Electronics & Communications
 450 Alliance Avenue
 Toronto 9, Ontario

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GENERAL RADIO COMPANY

99 FLORAL PARKWAY

TORONTO 15, ONTARIO



General Purpose Oscilloscope

CANADIAN MARCONI CO. LTD.

A high-grade General Purpose Oscilloscope (Type TF1330) with all the features required for detailed viewing and precision measurement of waveforms.

Response: D.C. to 15 Mc/s with negligible overshoot on signals with rise times down to 0.01 μ Sec.

Sensitivity: Variable in 7 steps from 50 m V/Cm to 50 V/Cm; a signal of only 300 m V will provide full coverage of the 6 x 10 Cm screen.

Sweep Velocity: Variable from 0.1 μ Sec/Cm to 1 Sec/Cm in 15 ranges; X expansion increased fastest sweep to 0.02 μ Sec/Cm. Each range may be standardized against an external signal.

Time and Voltage: Can be measured with 2% accuracy by potentiometers whose calibration is independent of X expansion or Y gain.

Triggering: Can be applied internally on externally, or from an internal supply-frequency source. Trigger mode selection includes a.c. and d.c. coupling, television field sync, and also automatic sync which provides optimum triggering for almost any waveform without readjustment of controls.

Lumped — Constant — Delay Line: Of 0.25 μ Sec allows observation of the trigger signal without distortion or overshoot.

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Electron Tubes **CANADIAN MARCONI COMPANY**

Canada's Largest Supplier of Electron Tubes invites you to send for information on any specific type of tube in the following categories:

Picture tubes Receiving tubes Commercial tubes

Industrial and Military type tubes Camera tubes

Power tubes Microwave tubes

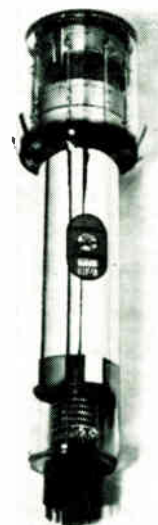
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Direct Reading Pocketscope

WATERMAN PRODUCTS

The Waterman Direct Reading Pocketscope, Hi-Gain, Model S-17A is a novel concept with radically new innovations and portable oscilloscopes. New techniques combine extreme compactness with "large scope" features. This dynamic instrument is comparable to a shoebox in size and a large laboratory oscilloscope in performance. This Pocketscope weighs less than 8 lbs., is 4 3/4" high, 5 1/2" wide and is 10" deep. The direct reading feature allows direct calibration of scales in volts (from 10 MV per division) and milliseconds (from 10 micro-seconds per division). Sync signal in excess of 1 volt peak automatically triggers the oscilloscope. Sync light indicates presence or absence of proper level. Single switch flips trace 90° to increase accuracy for voltage measurements giving effective 2 1/2" vertical presentation. The Pocketscope also features 5% accuracy; large dynamic ranges; controlled edge lighting; trace intensification; internal calibration; full 5 x 10 division viewing area; internal, external and line Sync; AC/DC signal amplifier (DC to 250 Kc/s); horizontal and Sync input.

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CANADIAN MARCONI CO. LTD.

2442 TRENTON AVENUE

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CANADIAN MARCONI CO. LTD.

ELECTRONIC TUBE AND COMPONENTS DIVISION

830 BAYVIEW AVENUE

TORONTO 17, ONTARIO

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AVIATION ELECTRIC LIMITED

200 LAURENTIAN BLVD.

MONTREAL 19, P.Q.

Cenco Vacuum Pumps CENTRAL SCIENTIFIC COMPANY OF CANADA LTD.



The new two-stage series of Cenco-Hyvac pumps is available with a gas-ballast feature to prevent contamination of the pump oil when pumping condensable vapors. The gas-ballast valve located on top of the exhaust housing allows regulation of air flow (gas-ballast) into the compression cycle of the exhaust stage. This ballast flow reduces the compression ratio of the vapor volume in the stage preventing condensation of the vapors in the oil. These pumps are ideally suited for pumping all vapors which do not chemically attack or dissolve in the pump oil, water being a typical example. Ultimate vacuum with gas-ballast is 10 microns Hg. Ultimate vacuum without gas-ballast is .1 microns Hg. Displacement free air ranges from 70 to 140 litres per minute.

An extensive line of Cenco vacuum pumps without gas-ballast is also available ranging from 10 litres per minute to 960 litres per minute free air displacement; ultimate vacuum obtainable ranges from .1 to 25 microns Hg. A complete line of diffusion pumps is also available from Cenco. Cenco vacuum pumps are fully complemented by a complete line of vacuum accessories, including rubber tubing, "O" ring connectors, vacuum gauges, etc.

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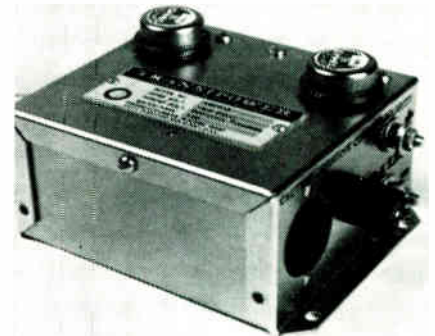
Cornell-Dubilier Transipower RUTHERFORD AGENCIES

CORNELL-DUBILIER MODEL 12TP12 TRANSIPOWER is a light-weight, compact, high voltage power supply designed for use as an alternate to motor generators or vibrator power supplies to power portable or mobile transmitters, receivers, or other electronic equipment. Containing no moving parts, the converter utilizes two high quality heavy duty transistors in an oscillator circuit to create high voltage DC from a 12 volt battery system. Four highly efficient silicon rectifiers are used in two voltage doubler circuits to supply well filtered DC at 500 volts and 250 volts separately or simultaneously.

Chassis and cover are of heavy gauge aluminum anodized to resist corrosion and permit maximum transfer of heat from internal components. Transistors are mounted externally to receive additional cooling from circulating air.

Mechanically, Model 12TP12 features compact, light-weight design with ease of servicing. When cover is removed, a complete and workable power supply is exposed in its entirety for individual testing of each component.

Space has been provided — adjacent to the octal socket used for carrying the output connections — for mounting a small control relay where such is desirable in the use of this power supply.



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Frequency Controller-Indicator BACH-SIMPSON LIMITED



Basically the frequency controller-indicator is a freely indicating frequency meter of advanced design. A miniaturized synchronous motor and AC generator produce an output voltage proportional to input frequency. This voltage is read out on a mechanically suppressed AC rectifier type voltmeter, calibrated in cycles/second.

For the control function, the motor also drives a contactor, actuating a solenoid-operated plant. This plate depresses the pointer at regular intervals, and, whenever the frequency exceeds preset limits, clamps the tubular pointer-tip extension firmly against a plane-surfaced contact. This contact pressure is positive, and independent of meter torque. The control relay coil circuit is completed by the contactor, after the pointer-tip has been clamped, with a resulting increase in contact life.

Such control action can be applied to any quantity which can be indicated on a switchboard meter — voltage, current, temperature, etc. The flexibility of the contact arrangement allows not only upper and lower limit control but programming of various types.

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CENTRAL SCIENTIFIC COMPANY OF CANADA LTD.

146 KENDAL AVENUE
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RUTHERFORD AGENCIES

P.O. BOX 1013
ST. LAURENT, QUE.

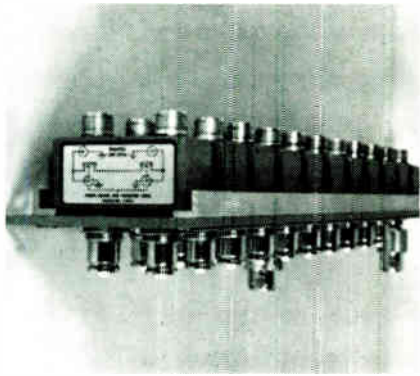
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BACH-SIMPSON LIMITED

1255 BRYDGES STREET,
LONDON, ONTARIO

Switching Patch Panels T.M.C. CANADA LIMITED



The TMC series Models SPP Switching Patch Panels, are improved switching panels for use in RF Signal Distribution systems where a "normalizing" patching scheme is indicated. These panels replace various AN type jack panels and their associated rear jumper connections. The Switch mechanism in these devices is a new coaxial design providing a positive action locking arrangement for the mating plugs. The Panels are standard 19" rack mount and vary in height from 1¾ to 3½ inches.

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Direct Wire TV Camera

SYLVANIA ELECTRIC (CANADA) LTD.

Designed and priced so that many new applications heretofore prohibitive because of cost, are open to prospective users. Multi-camera installations, depending upon layout and distances as well as individual monitors located as far as 1000 feet from a single camera, can be set up without the need for additional amplification. COMPACT, fully self-contained. EASY TO USE, simple as home movies. No special lighting required, operates on standard house power, turret for complete lens flexibility, lifetime engraved circuits, DEPENDABLE, never sleeps. Approximately 50 Watts power consumption with channel coverage, standard 2 through 6 channel frequencies. "Near-Focus" adjustment is provided as standard equipment and is to be used for more clearly observing small type or objects. 250 - 300 lines resolution when used with a Sylvania receiver as the monitor, Vidicon "pick-up" tube. Construction — Complete in a single unit with "Set-up" controls conveniently located. Approx. Dimensions (Excl. of lens and lens hood) L-12", W-7", H-6". Approx. Weight—16 lbs.



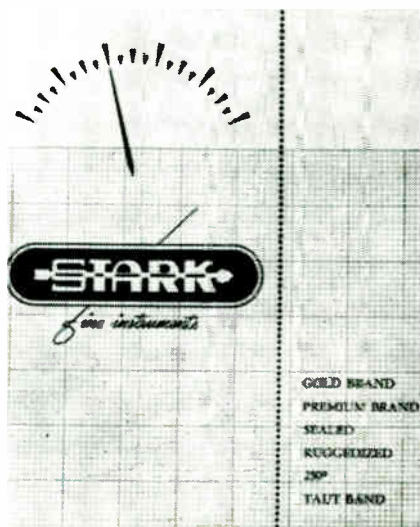
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Gold Brand Meters

STARK ELECTRONIC SALES COMPANY

As you probably know, Gold Brand is the new line of Stark meters built to perform with the best, yet at a new low price.

For many years there has been a need for a really good meter catalogue. Here is a 42 page catalogue listing the new Gold Brand line of Stark panel instruments. For the first time in Canada — a really comprehensive catalogue filled with photographs, scale drawings and complete engineering data.

At last, here it is. If you buy meters, you need this for your file. Send today for your copy — absolutely FREE!

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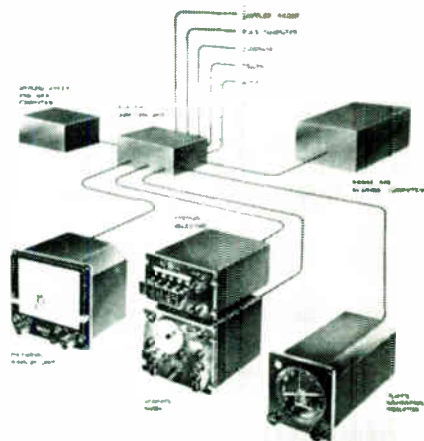
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STARK ELECTRONIC SALES COMPANY

AJAX, ONTARIO

R-Theta Navigation System

CANADIAN APPLIED RESEARCH LTD.



A logical sequel to the current R-Theta Navigation System, which CARL developed and is manufactured in quantity for the RCAF and other NATO countries, ANADAC was developed primarily for use in the light strike fighter. Because of its versatility it is equally suitable for intruder, interception, reconnaissance and ground support operations. A typical system employing several of the ANADAC instruments is shown. The complete series, from which selections can be made to build systems of various capabilities, is comprised of the following units:

(a) Pilot's Navigation Indicator; (b) Control Panel; (c) Vector Addition Panel; (d) Station Selector; (e) Range and Bearing Computer; (f) Ground Speed and Drift Computer; (g) Track Off-Set Computer; (h) Pictorial Display Unit and Coupler; (i) TACAN Off-Course Computer; (j) System Junction Box. The system is built around a multi-purpose indicator which at all times displays steering information and, in conjunction with a dead reckoning analog computer and other units, can give guidance for accurate track-keeping or show a navigation situation in terms of range and bearing from selected reference points. Alternatively this same indicator can display the outputs of various navigation aids such as ADF, VORTAC or TACAN.

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Vacuum Tube Voltmeter

BAYLY ENGINEERING LIMITED

The Type 111A VTVM is a sensitive broad-band voltmeter featuring high stability, accuracy, and reliability. Full-scale voltages of 0.001 volt to 300 volts can be measured over a frequency range of 10 cps to 4 mc. The accuracy is 2% for frequencies 20 cps to 1 mc, and 5% for frequencies 10 cps to 4 mc. The negative feed back amplifier assures high stability and accuracy with changing conditions. The instrument is useful as a broad-band, high gain amplifier over its full frequency range. The 10 db steps of the range switch and calibration of the scale in db simplifies voltage measurements in dbm (0 dbm = 1 mw in 600 ohms).

The meter face is edge-lit for ease of reading. Internal parts are easily accessible by removing two side covers held on by quarter-turn captive fasteners. All components are selected for high reliability. The instrument is entirely made in Canada. Dimensions are 10" x 7" x 10", Weight 18 lbs.



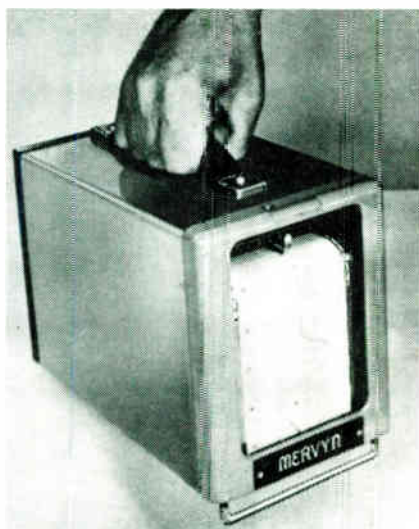
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Portable Potentiometer Recorder

TELLUROMETER CANADA LTD.

The Mervyn Portable Potentiometer Recorder is an all new instrument, and brings the advantages of a potentiometer type recorder to the user of portable equipment. Fully transistorized, it is completely self-contained, and has a battery life of 250 hours. It is extremely compact (7" x 7" x 10") and weighs less than 10 pounds. Particularly suitable for temperature recording, the portable potentiometer can be supplied with a range of input circuits for many different purposes. Ranges covered are from 0.1 MV to 0.1 V. Pen speed is such that full scale travel is achieved in less than one second.

A transistorized chopping system, operating at 1000 C.P.S. minimizes 60 cycle interference. Voltage reference is derived from a Zener diode and Zero suppression is also provided. Accuracy is better than 0.5%. The clockwork motor which can operate continuously for eight days, and the added reliability of transistorized operation make this recorder ideal for use by public utilities, petroleum refineries, and in aircraft design work, as well as routine research and development in all kinds of labs. A 110 V., 60 cycle model is also available.

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BAYLY ENGINEERING LIMITED

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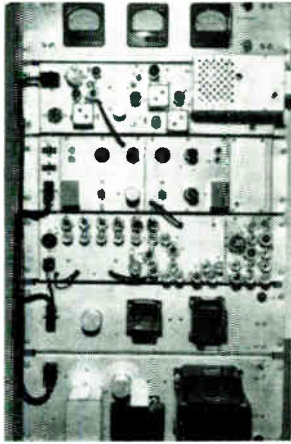
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TELLUROMETER CANADA LTD.

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Broadband Communications Equipment



PHILIPS ELECTRONICS INDUSTRIES LTD.,

The Rogers Majestic broad band series of equipment operating in the 132-174 Mc/s frequency band is designed to provide an economical transmission facility as an alternative to open-wire or cable leads, for short-haul systems from which voice, signalling, alarm, telemetering and control channels can be derived.

This improved version of the well known RBB series of communications equipment is now available with greater power output and an improved receiver noise figure. The base band has been extended to accommodate six voice channels and several features are optional depending upon the requirements of the communications system. The lower noise and distortion permit these units to be used in tandem to form a complete system.

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Monitor Amplifier **MCCURDY RADIO INDUSTRIES LTD.**

Designed to provide sufficient power output for the most demanding applications, the AM403 Monitor Amplifier delivers 30 watts with outstanding frequency response and distortion characteristics. The unit incorporates the famous McIntosh unity-coupled output circuit, providing 4, 8, 16, 600 ohm and 70V outputs. Plug-in transformers are available for input impedances of 150, 600, or 20,000 ohms bridging.

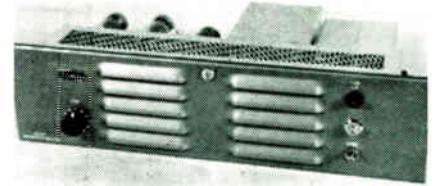
Input Level: Matching, -20 dbm max; Bridging, +18 dbm max

Output Level: +44.8 dbm (30W) S/N Ratio: 84 db below +44.8 dbm

Power Gain: 75 db max, variable Bridging Gain: 55 db max, variable

Harmonic Distortion: Less than 1%, 50-15,000 cps, at +44.8 dbm

Frequency Response: ± 1 db, 50-15,000 cps.



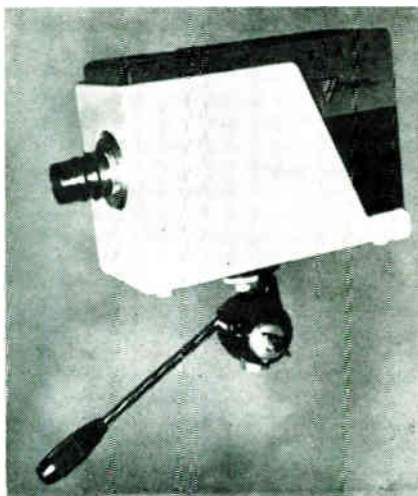
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Closed Circuit TV Camera

CANADIAN PRATT & WHITNEY AIRCRAFT COMPANY LIMITED

A new improved level in performance, reliability, simplicity and packaging has been achieved in the Norden closed circuit TV camera. This camera combines all video scanning and automatic control mechanisms in one 4" x 7" x 10" completely transistorized package, eliminating the usual separate control console and all manual controls except the on-off switch.

Designed to operate on a 115 volt, 60 or 400 cycle supply, this rugged unit automatically and simultaneously compensates for variations in light (5 to 50,000 ft. candles), temperature (0F to +120F) and voltages (95 to 125 volts).

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CANADIAN PRATT & WHITNEY AIRCRAFT COMPANY LIMITED

P.O. BOX 10,

LONGUEUIL, QUEBEC



Panoramic Receiver

RACAL ENGINEERING

The RA.66 Panoramic Adaptor makes use of the novel frequency converting circuit in the RA.17 Receiver. This circuit enables a spectrum of signals 1 Mc/s in width to be converted to a wideband IF, lying between 2 and 3 Mc/s. This IF is passed to the panoramic adaptor.

A generator which provides the X deflection for the display tube is employed also to drive a sweep oscillator. The output from this oscillator is mixed with the IF from the RA.17 Receiver. The signals appearing in the output will depend on the instantaneous frequency of the sweep oscillator and will consist successively of the signals occurring in the spectrum under observation. These are mixed with the output of a 1.4 Mc/s crystal oscillator to provide a final IF of 100 kc/s. After passing through filters determining the bandwidth, the signal is rectified, amplified and applied to the Y plates of the display tube.

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Precision Noise Generator

POLARAD ELECTRONICS CORP.

This instrument provides a stable noise output variable in 1 db steps to a maximum of 20 db, with an interpolation control of 0.1 db, for direct noise figure measurements in vacuum tube and transistor amplifiers, receivers and oscillators.

The noise produced by a diode noise generator is given as 20 db above the thermal noise produced in the generator resistance.

In the Model N-1 Noise Generator, the noise output is accurately maintained at the set level by a feedback circuit which acts to produce the pre-determined dc voltage across the generator terminating resistance. This is done by controlling the filament voltage of the temperature-limited diodes. The system minimizes drift of diode current and makes the output noise calibration independent of terminating resistance.

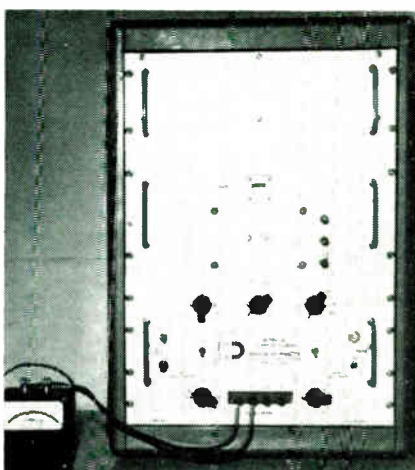
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Instrument Calibrator

DAYSTROM LIMITED

Full scale production of four new AC and DC instrument Calibration consoles — providing calibration accuracy of .05 per cent of indicated value — has been announced by Daystrom's Weston Instruments Division.

The new highly-accurate AC and DC calibrators provide power source, circuitry, and control for the rapid calibration — including design, development, and service calibration — of practically all types of portable, panel, switchboard, and recording-type instruments. The new, self-contained equipment provides measurement accuracy of .05 per cent.

Simplified switching networks permit a single non-skilled operator to calibrate instruments accurately and quickly, compared to the two or more skilled technicians required to operate previous calibration equipment.

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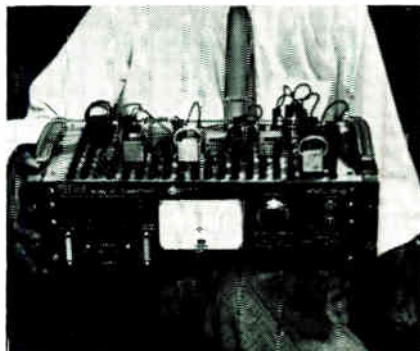
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DAYSTROM LIMITED

WESTON INSTRUMENTS DIVISION
840 Caledonia Road
TORONTO, ONT.

Analog Computer **DONNER SCIENTIFIC**



The smallest full-fledged analog computer ever made — a 10-amplifier model weighing just 23 pounds — is now in production at Donner Scientific Company, Concord, California. Designed for educators, engineers and scientists, Donner's Model 3500 can be used to study almost any physical system that can be described by linear differential equations. The standard, 10-amplifier 3500 will solve up to a seventh order differential equation or a ninth degree Laplace transform. The computer performs accurately with 1 per cent or 0.1 per cent computing component. For solving more complex problems, up to three Model 3500 computers can be slaved together for 10, 20, or 30 amplifier operation. Besides its 10 amplifier channels, the complete computer includes a null voltmeter, five pots for coefficient or initial conditions, and all power supplies and control circuitry. The 3500 can be conveniently operated on desk tops and benches. It measures only 5¼ inches high, 19 inches, and 10¼ inches deep. By removing a few screws, the problem board tilts up for rack mounting. Amplifiers are available in fully-stabilized or unstabilized forms. Unstabilized amplifiers can be converted anytime by adding a plug-in component. For educational use, the 3500's 19-inch problem board can be replaced by two smaller boards which plug into the front panel. This allows separate groups of students to operate one-half the computer simultaneously without interfering with each other.

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Glass Enclosed Quartz Crystals

ROGERS ELECTRONIC TUBES & COMPONENTS

Rogers glass enclosed, evacuated envelope, quartz crystals have been designed for precision equipment where high stability, high activity and low aging (guaranteed less than 3-m for one year at 105°C) is necessary for consistent operation. The glass enclosed crystals are directly interchangeable with the Mil HC 64 and HC 18U metal holder units and can be supplied to Mil 3098B and C5522 specs.

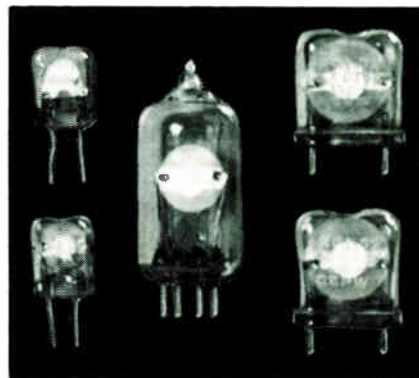
The development of the Rogers Glass Enclosed Quartz Crystals has proven such a significant advance in technique that the manufacturing processes were purchased by the U.S. Government for production in that country.

Complete details, prices and delivery are available on request.

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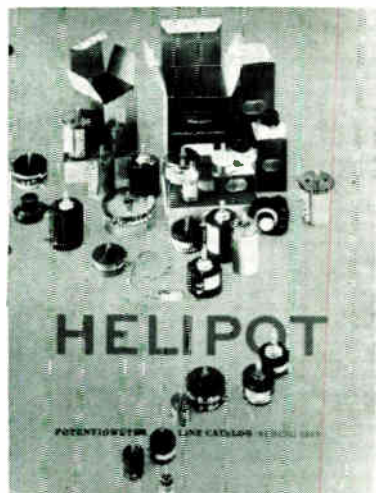
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Potentiometer Catalogue

R-O-R ASSOCIATES LIMITED

20-page catalog presents complete electrical, mechanical and environmental specifications for the complete line of Helipot.

- Single-turn potentiometers
- Multi-turn potentiometers
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Made in Canada. Popular models stocked in Toronto and Montreal

Current price and stock list included with catalog. As the largest manufacturer of precision potentiometers, Helipot offers the greatest selection of standard single and multi-turn, linear and non-linear models available today.

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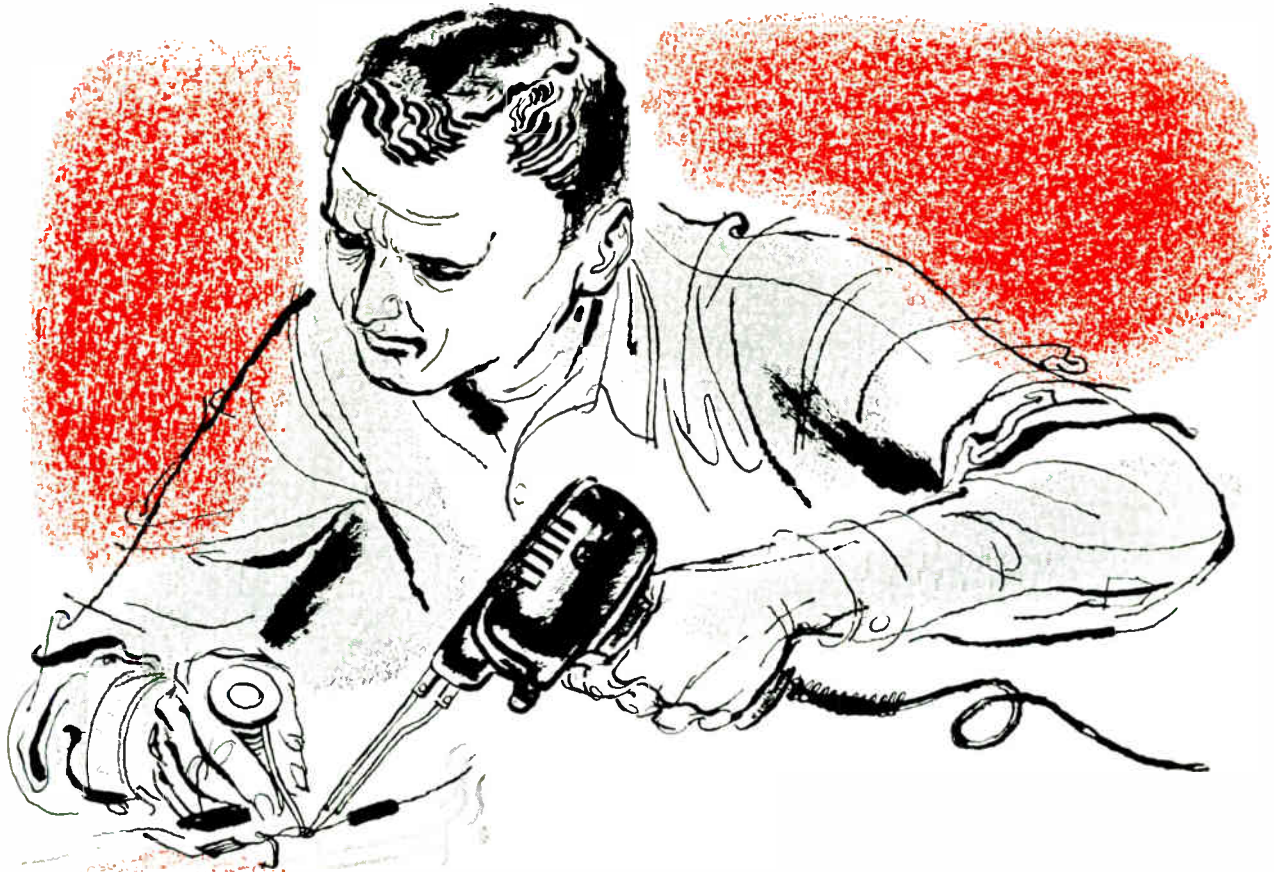
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how many Resistors have you soldered recently?

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

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

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

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

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



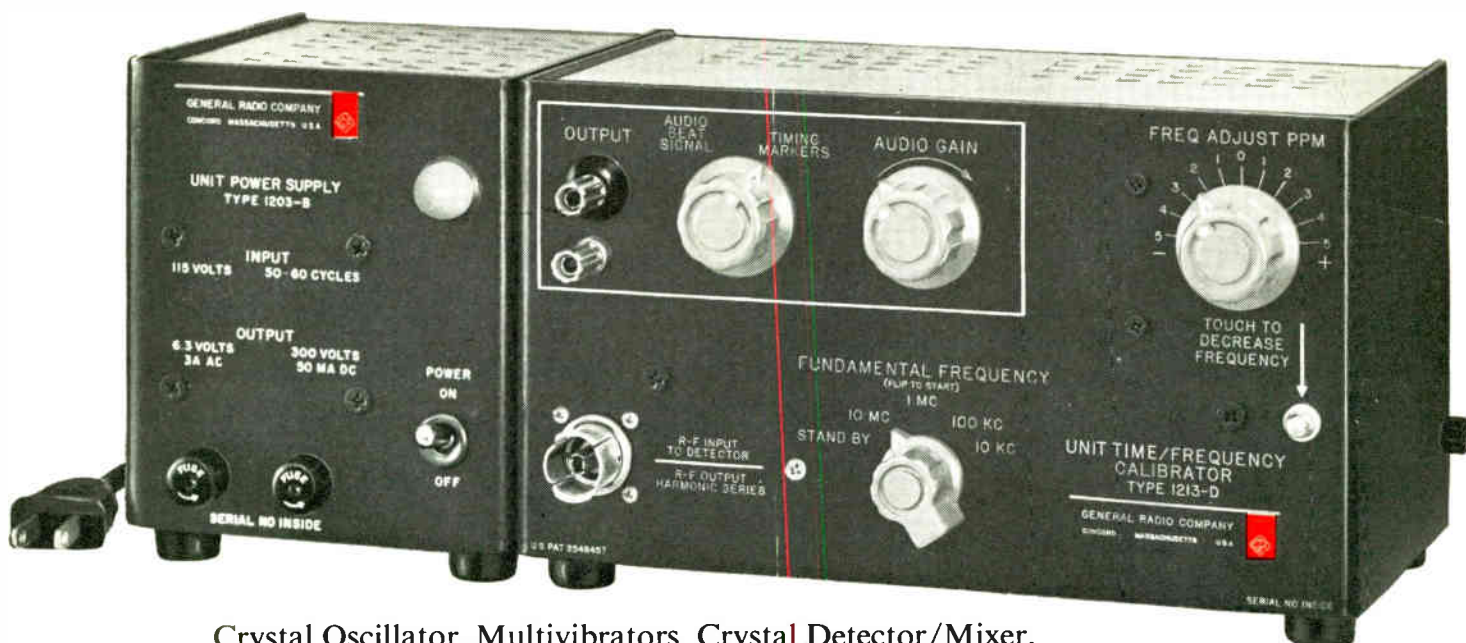
Ceramag® ferromagnetic cores • Slide and Snap switches • Variable composition resistors
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 brushes for all rotating electrical equipment
 Hundred of related carbon, graphite, and metal powder products.

STACKPOLE
Coldite 70+
 fixed composition resistors

For complete details check No. 18 on handy card, page 45



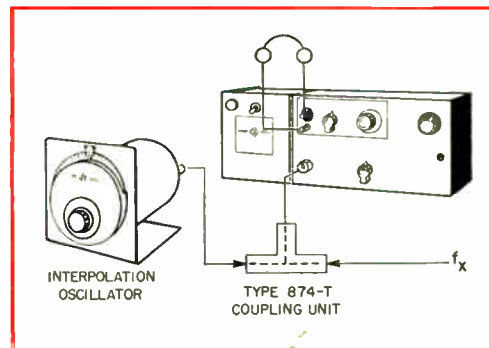
MINIATURE STANDARD and CALIBRATOR for TIME / FREQUENCY MEASUREMENTS



Crystal Oscillator, Multivibrators, Crystal Detector/Mixer, Audio and Video Amplifier stages are all built into this package that takes less than $\frac{3}{4}$ sq. ft. of bench space.

- ★ Accurate crystal-controlled 10-kc, 100-kc, 1-Mc, and 10-Mc fixed marker frequencies; harmonics usable to 10 Mc, 100 Mc, 500 Mc, and 1000 Mc respectively. Output amplitude is 10v peak-to-peak on 10 Mc output; 30v peak-to-peak at lower frequencies.
- ★ *Excellent Frequency Stability* — frequency can be easily standardized with WWV to obtain short-term measurement accuracy to 2 parts in 10,000,000. Momentary line voltage fluctuations of $\pm 10\%$ affect frequency by less than 5×10^{-8} . Combined effects of switching and loading due to external connections are less than 1×10^{-7} .
- ★ The ideal instrument for producing timing markers at intervals from $0.1 \mu\text{sec}$ to $100 \mu\text{sec}$ for calibrating oscilloscope sweeps, receivers, transmitters, and other test equipment.
- ★ Usable beat notes for measurements can be produced with 50-mv input signal.
- ★ Touch-button frequency deviator can be used to introduce a momentary frequency decrease for establishing “sense” in indications near zero beat.

Write for Complete Information



Measurements at any frequency

By simply feeding an interpolation frequency into the Calibrator's mixer along with the unknown signal, you do not restrict yourself to measurements at harmonics of the calibrator's fundamentals. Measurement or standardization at any frequency from 10 kc to above 1000 Mc then becomes possible.

Type 1213-D Unit Time/Frequency Calibrator, supplied with Type 1213-P1 Differentiator for producing oscilloscope timing markers **\$310**

Type 1203-B Unit Power Supply (recommended) **\$40**

Type 480-P4U3 Relay Rack Panel for mounting Calibrator and Power Supply **\$10.85**

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