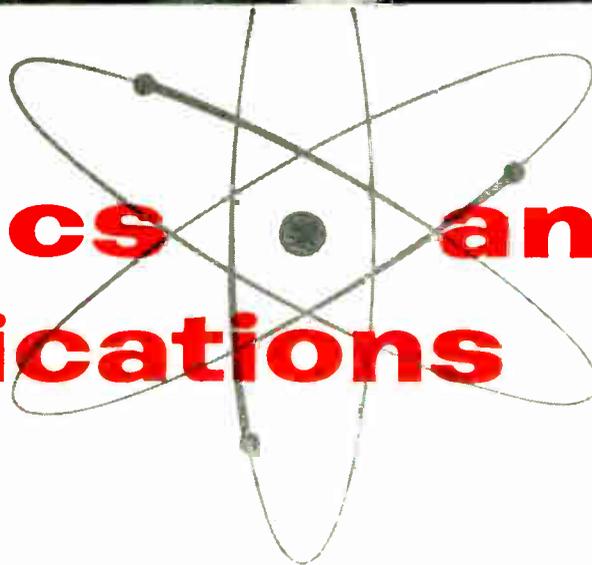


Finger tip miracle to increase radar range as much as 100 per cent. (Description page 5)

electronics and communications



an age publication

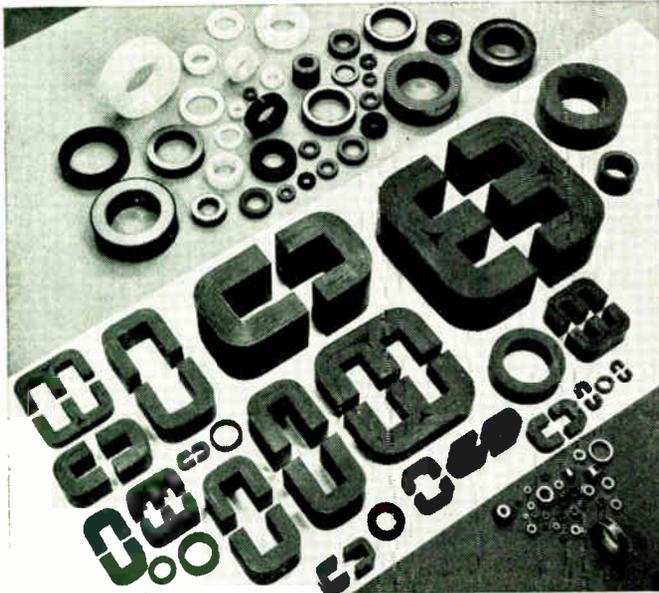
SEPTEMBER 1959

1211C
DEL
CRC
EPM

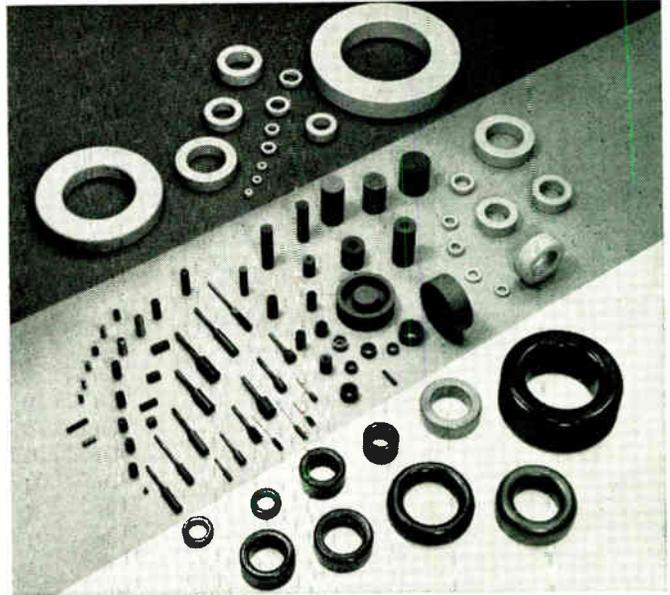
SCARBOROUGH ONT
8 EASTGATE CRES
M. F. W. PREZIOSI

Specify "ARNOLD"

for your **MAGNETIC CORE** requirements



Top to bottom: Tape wound cores, Silectron C, E and O cores, and bobbin cores.



Top to bottom: Mo-Permalloy powder cores, iron powder cores, and Sendust cores.

SILECTRON C-CORES, E-CORES and TOROIDS Arnold C and E cores are made from precision-rolled Silectron strip in 1, 2, 4 and 12 mil thicknesses.

They are supplied in a wide variety of shapes, and in sizes from a fraction of an ounce to several hundred pounds. In addition to standard transformer applications, they may also be supplied for special applications such as saturable reactors, instrument transformers and pulse transformers.

Over 1,000 stock cores are listed in the Arnold Silectron catalog. A wide selection of preferred sizes are carried in stock for immediate shipment. For complete data on C and E cores and Silectron toroids, write for *Bulletin SC-107A*.

TAPE WOUND CORES of High Permeability Materials

Arnold tape wound cores are available made of Deltamax, 4-79 Mo-Permalloy, Supermalloy, Mumetal, 4750 Electrical Metal, Silectron, or the new rectangular-loop material, Supermendur. All except Supermendur cores are available in standard tape thicknesses of 1, 2 and 4 mils; also in special tape thicknesses of ½ mil, 12 mil or other, as required or feasible. Supermendur is presently available in 4 mil cores.

Toroidal cores are made in 30 standard sizes with protective nylon or aluminum cases. Special sizes of toroidal cores are produced to individual requirements. Write for *Bulletin TC-101A*. (TC-113A for Supermendur Cores.)

BOBBIN CORES

Arnold bobbin cores are available in a wide range of sizes, tape thicknesses, widths and number of wraps to suit the ultimate use of the core in electronic computer assemblies. Magnetic materials usually employed are Deltamax and Square Permalloy in standard thicknesses of 1, ½, ¼ and ⅛ mil. Bobbins are supplied in ceramic or stainless steel. Write for *Bulletin TC-108A*.

SPECIAL MATERIALS

2V PERMENDUR . . . a ferromagnetic alloy of cobalt, vanadium and iron that possesses high flux density saturation properties. Its magnetostrictive properties are useful in many transducer applications. Write for *Bulletin EM-23*.

VIBRALLOY . . . a ferromagnetic alloy of nickel, molybdenum and iron whose temperature coefficient of elastic modulus is controllable over a wide range. It has high ferromagnetic permeability, and a rather high coefficient of magnetostriction. Used in applications where a zero or controlled thermo-elastic coefficient is desired.

BARIUM TITANATE . . . A piezoelectric ceramic widely used in ac-

MO-PERMALLOY POWDER CORES Available in a wide range of sizes, from .260" OD to 5.218" OD. They are given various types of enamel and varnish finishes, some of which permit winding with heavy Formex insulated wire without supplementary insulation over the core.

These powder cores are supplied in four standard permeabilities: 125, 60, 26 and 14 Mu. They provide constant permeability over a wide range of flux density, and in many cases may be furnished stabilized to provide essentially constant permeability over a specific temperature range. Large warehouse stocks of preferred sizes are carried for immediate shipment. Write for *Bulletin PC-104C*.

IRON POWDER CORES A wide selection of cores is available, from simple cylinders to special cores of complicated design. The line includes all standard types of threaded cores, cup, sleeve, slug and cylindrical insert cores: for use in antenna and RF coils, oscillator coils, IF coils, perm tuning, FM coils, television coils, noise filter coils, induction heating and bombarder coils, and other low frequency applications. Preferred sizes are carried in warehouse stock for quick shipment. A standard series of iron powder toroids is also manufactured, conforming to the standard sizes proposed by the Metal Powder Industries. Write for *Bulletin PC-109*.

SENDUST POWDER CORES Available in a wide selection of sizes, ranging from .800" OD to 3.346" OD, and in permeabilities of 10, 13, 25, 30, 50 and 80, although not all sizes are available in all permeabilities. They possess magnetic properties generally superior to iron powder cores, but inferior to Mo-Permalloy powder cores in the audio and carrier frequency range. Write for *Bulletin SDC-110*.

celerometers, phono pickups, microphones, ultrasonic grinding and cleaning devices and underwater signaling devices. For more information, write for *Bulletin CM-116*. 7507 C



ARNOLD

SPECIALISTS in MAGNETIC MATERIALS

THE ARNOLD ENGINEERING COMPANY, Main Office: MARENGO, ILL.
CANADIAN REPRESENTATIVE: Bayly Engineering Limited
First Street, Ajax, Ontario . . . Phone: EMpire 2-3741 (Toronto Exch.)

For complete details check No. 7 on handy card, page 61



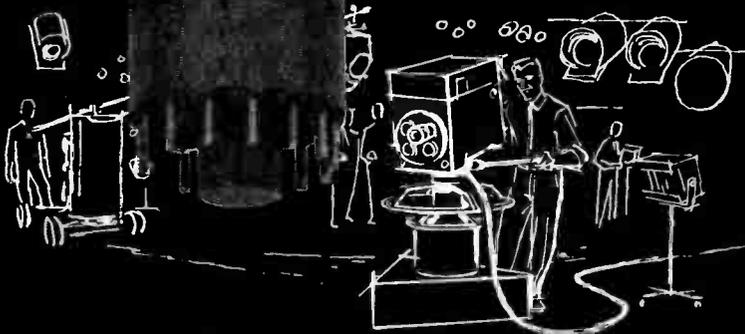
The Latest Improvement in Image Orthicons
THE ALL-NEW MARCONI TYPE 7293*!

for sharp

BLACK
to
WHITE

transition

*without spurious
effects*



*JEDEC registration

From Marconi come new techniques of design . . . improved corner resolution, geometry and picture shading. These three important points are produced by an improved field mesh and give a critically sharp black to white transition. Send for full technical data.

ELECTRONIC TUBE AND COMPONENTS DIVISION

CANADIAN Marconi COMPANY

830 BAYVIEW AVENUE • TORONTO, ONTARIO

BRANCHES

Vancouver • Winnipeg • Montreal • Ottawa • Halifax • St. John's

For complete details check No. 23 on handy card, page 61

ELECTRONICS AND COMMUNICATIONS, September, 1959

TO BE PRECISE

Precision is the keyword at Aviation Electric . . . precision that comes from infinite care combined with exceptional skills. That's the secret of the company's continuous growth in Canadian aviation. Today these skills are practised in one of the country's most modern plants equipped with every technological advance. To be precise, Aviation Electric Limited are specialists in advanced design offering industry the most up-to-date facilities for manufacturing and overhauling aircraft instruments, accessories and components and industrial precision work of all kinds.

DESIGN

MANUFACTURING

OVERHAUL



AVIATION / ELECTRIC
LIMITED

200 Laurentien Blvd., Montreal

Branch Plant: Aviation Electric Pacific Limited, Vancouver Airport, B.C.



an age publication

Electronics and Communications

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

Thomas W. Lazenby, editor
R. C. Poulter, P.Eng., associate editor
D. K. Trowell, editorial assistant
William Bowers, art editor
Guido Milanese, photo editor

H. E. Dallyn, advertising manager
John R. Stocks, assistant advertising manager
Nevill A. Campling, production manager
Bryan Mottershead, circulation department

L. R. Kingsland, managing director
K. E. Gould, vice-president
Paul A. Irwin, office manager

Published by
AGE PUBLICATIONS LIMITED
450 Alliance Avenue, Toronto 9, Ontario
Telephone ROger 2-7225.

publishers of
Wine/Beer/Spirits
Restaurants and Institutions
Automatic Heating/Plumbing/Air Conditioning
Food Service Equipment Supplier

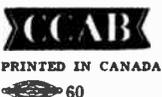
WEST COAST
Dillenbeck-Galavan, Inc.
226 S. Alexandria Avenue
Los Angeles 4, California

U.K. AND EUROPEAN REPRESENTATIVE
Norman F. Keenan
47 Manchester Street
London, W.1, England

Subscription Rates:
Canada, U.S.A. and U.K. Possessions \$5.00 a year
Foreign \$10.00 a year

Member Canadian Circulations Audit Board

Authorized as second class mail
by Post Office Department, Ottawa



contents

SEPTEMBER 1959 Vol. 7, No. 9

- 20 The producers' viewpoint on component standardization
by Julian K. Sprague
- 22 The silicon PNP switch
A step beyond the transistor
- 24 Radio allocation engineering
*Radio spectrum limitations give rise to new profession
by W. B. Smith*
- 28 Low cost stable platform
A Canadian achievement in gyro development

departments

- 11 Electronic Industries Association Report
- 12 CRTPB Newsletter
- 30 Business Briefs and Trends
- 31 News Report
- 44 New Products
- 66 Book Review
- 70 Editorial

COVER STORY

No bigger than a grain of rice or a match head is the gold-bonded diode shown dramatically in our cover illustration. Charles W. Curtis (that's his finger) manager of Hughes' microwave engineering department, says the parametric amplifier, of which the diode is a key unit, may increase radar range as much as 100 per cent.

THE **Bendix**® ELECTRON TUBE YOU NEED IS HERE!

GROUP I—RECEIVING TUBES

HY-G-200®

EIA Type No.	JAN Type No.	PROTO-TYPE	BENDIX Type No.	DESCRIPTION
5838		6X5	TE-3	RECTIFIER. Full-wave
5839	5839	6X5	TE-2	RECTIFIER. Full-wave
5852	5852	6X5	TE-5	RECTIFIER. Full-wave
5992	5992	6V6	TE-8	AMPLIFIER. Beam power
5993	5993	6X4	TE-10	RECTIFIER
6106	6106	5Y3	TE-22	RECTIFIER
6385		2C51/ 5670	TE-21	MINIATURE TWIN TRIODE
6486		6AS6	TE-11	MINIATURE PENTODE
6582		6AK5	TE-35	MINIATURE PENTODE

HY-G-300®

(Reliable, hard glass, ceramic spacers,
300°C Bulb Temperature Rating)

6080WB		6AS7	TE-46	TWIN TRIODE
6082A		6082	TE-55	TWIN TRIODE
6094	6094	6AQ5/ 6005/ 6095	TE-18	MINIATURE AMPLIFIER
6384	6384	6AR6/ 6098	TE-27	AMPLIFIER Beam power
6486A		6AS6	TE-43	MINIATURE RF PENTODE
6582A		6AK5	TE-44	MINIATURE RF PENTODE
6754		412A	TE-36	RECTIFIER. Full-wave
6851		5751	TE-42	MINIATURE TWIN TRIODE
6853		5Y3	TE-45	BANTAM RECTIFIER. Full-wave
6854		2C51/ 5670	TE-47	MINIATURE TWIN TRIODE
6877		½ 6080	TE-48	MINIATURE TRIODE
6889		Top Cap 6384	TE-52	AMPLIFIER. Beam power
6900		5687	TE-54	MINIATURE TWIN TRIODE

COMPUTER TUBES

6888		7AK7	TE-40	GATED PENTODE
------	--	------	-------	---------------

GROUP II—MICROWAVE TUBES

EIA Type No.	JAN Type No.	BAND	BENDIX Type No.	DESCRIPTION
2K50	2K50	K	TE-4	REFLEX KLYSTRON
6116	6116	X	TE-62	REFLEX KLYSTRON
6541		K	TE-30	REFLEX KLYSTRON
6584		C	TE-38	REFLEX KLYSTRON
		Ka	TE-37	REFLEX KLYSTRON
		Ka	TE-53	REFLEX KLYSTRON
6845	6845 (US Navy)	X	TE-59	REFLEX KLYSTRON
6940		X	TE-58	REFLEX KLYSTRON
		K	TE-60	REFLEX KLYSTRON
		X	TE-61	REFLEX KLYSTRON
		V	TE-67	BACKWARD-WAVE OSCILLATOR
		C	RXB- 103401	TRAVELLING-WAVE TUBE AMPLIFIER
		V	TE-66	BACKWARD-WAVE OSCILLATOR

GROUP III—GAS AND SPECIAL TUBES

SPECIAL PURPOSE GAS TUBES

EIA Type No.	JAN Type No.	BENDIX Type No.	DESCRIPTION
5643	5643	TD-17	SUBMINIATURE XENON THYRATRON (MIL SPEC)
5643		TD-37	SUBMINIATURE XENON THYRATRON (COMMERCIAL SPEC)
5947		TT-2	TEMPERATURE LIMITED DIODE
5960		TD-1	COLD CATHODE DISCHARGE
		TD-45	COLD CATHODE DISCHARGE
		TD-28	COLD CATHODE TETRODE THYRATRON
6142		TD-9A	GAS DIODE VOLTAGE REGULATOR
		TD-19	GAS DIODE VOLTAGE REGULATOR
6144		TT-1	NOISE DIODE
6352		TT-29	SUBMINIATURE TEMP LIMITED DUAL-DIODE
6361		TT-25	SINGLE CONVECTRON
5845		TT-30	MINIATURE TEMPERATURE-LIMITED DIODE

GROUP IV—GAS NOISE SOURCE TUBES

Frequency Range KMC	Waveguide Band	Waveguide Number	Bendix Type Number	EIA Type Number	Mount Type	Recommended Mode of Operation	Anode Current MA	Tube Drop Volts	Tube Excess Noise Ratio DB
1.12-1.70	L	RG-69/U	TD-21	6881	90°H	D.C.	250	65	15.2
			TD-29	7101	90°H	A.C. & D.C.	250	130	18.0
2.6-3.95	S	RG-48/U	TD-12	6358	10°E	D.C.	250	80	15.2
			TD-22	6782	90°H	A.C. & D.C.	250	45	15.2
3.30-4.90	S	WR-229	TD-24	6852	10°E	A.C. & D.C.	250	65	15.2
3.95-5.85	C	RG-49/U	TD-10	6356	10°E	D.C.	250	70	15.2
5.85-8.20	X	RG-50/U	TD-10	6356	10°E	D.C.	250	70	15.2
8.20-12.40	X	RG-52/U	TD-11	6357	10°E	D.C.	200	75	15.2
			TD-23	6882	10°E	D.C.	200	115	18.0
12.4-18.00	KU	RG-91/U	TD-18	6684	10°E	D.C.	200	70	15.2
18.0-26.5	K	RG-53/U	TD-13	6359	10°E	D.C.	200	65	15.2

GROUP V—SPARK GAPS

Type No.	OC Break-down KV	Initial Pulse Break-down KV	Repetitive Pulse Break-down KV	Watts Maximum Dissipation	Peak Discharge Watt-Second	Fault Surge Current Amps	Isotope Stabilization	Initial Equipment Usage	Configuration
TG-25	0.400			3	2		Yes	Safety	1
TG-26	0.75			5	2	1000	Yes	Safety	2
TG-27	1.0			5	5	1000	Yes	Safety	2
TG-30	2.0	3.0	2.7	5	14	2000	Yes	Safety	2
TG-34	5.0	8.5	5.5	5	19	3000	Yes	Safety	2
TG-37	10.0	20.0	15.0	5	22	4000	Yes	Safety	2
TG-56	20.0	23.0		7.5	30	5000	Yes	Safety	4
TG-60	50.0			7.5	50	6000	Yes	Safety	4

Many other models of Bendix gas noise source and spark gap tubes besides those shown here are available. There is also a HY-G-500 line of metal ceramic receiving tubes. For a completely up-to-date list, write

COMPUTING DEVICES OF CANADA LIMITED

Head Office: P.O. Box 508, Ottawa, Ontario
Western Office: 712 8th Avenue, S.W., Calgary, Alberta
Toronto Office: 164 Eglinton Ave. E., Toronto, Ontario

5806



COMPUTING DEVICES OF CANADA LIMITED
P.O. BOX 508 · OTTAWA · CANADA

For complete details check No. 28 on handy card, page 61



EIMAC Klystrons are used in most tropo-scatter installations



EIMAC 4KM50,000LQ klystron

NOW, 400 TO 985 MEGACYCLES SPANNED WITH JUST TWO EIMAC 10KW KLYSTRONS

Exceptionally wide frequency coverage, 400 to 985 megacycles, is now available with just two interchangeable klystron amplifiers using the Eimac 4KM50,000LA and LQ 10 KW klystrons. This important tropo-scatter and UHF-TV range can now be covered with a single transmitter. In addition, both tube types offer exclusive design advantages that have made Eimac klystrons the most widely used power tubes in tropo-scatter networks.

Field-Proved External Cavity Design

Extra wide tuning range with single set of tuning cavities. Lower original cost.

Tube replacement cost much lower since external tuning circuitry need not be replaced.

Uniform bandwidth through inductive tuning plus greater broadbanding by external cavity loading.

Wide Range Load Coupler

One coupler covers entire frequency range.

Modulating Anode

Provides simplified overload protection.

Protects cathode from internal arc damage.

EMA Cathode

Combines ruggedness and long life of a pure metal emitter with the high efficiency of an oxide cathode.

Extra large area cathode conservatively rated for exceptional reliability.

Eliminates need for high voltage bombarder power supply, reducing system cost and total power consumption.

Series Connected Body Magnet Coils

Permits use of single power supply and control for body magnets.

Performance Proved Reliability

In tropo-scatter service, individual Eimac klystrons have logged more than 25,000 hours air time.

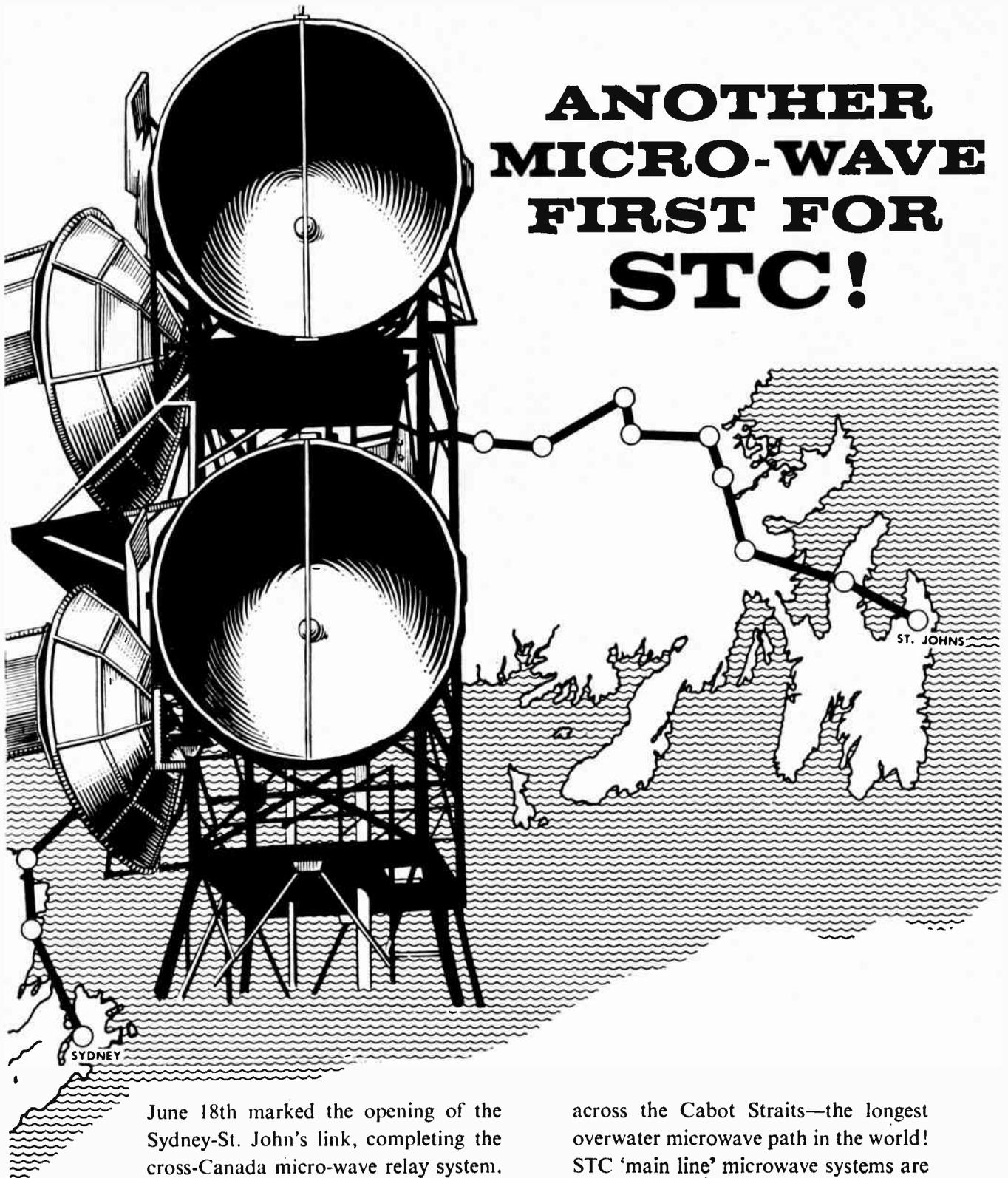
Eimac First for high power amplifier klystrons.

EITEL-McCULLOUGH, INC.
SAN CARLOS CALIFORNIA

World Radio History



ANOTHER MICRO-WAVE FIRST FOR STC!



June 18th marked the opening of the Sydney-St. John's link, completing the cross-Canada micro-wave relay system. Standard Telephones & Cables' inventions and techniques made possible the successful spanning of the 69-mile hop

across the Cabot Straits—the longest overwater microwave path in the world! STC 'main line' microwave systems are in operation all over the world. There are now over 1000 route miles in Canada!



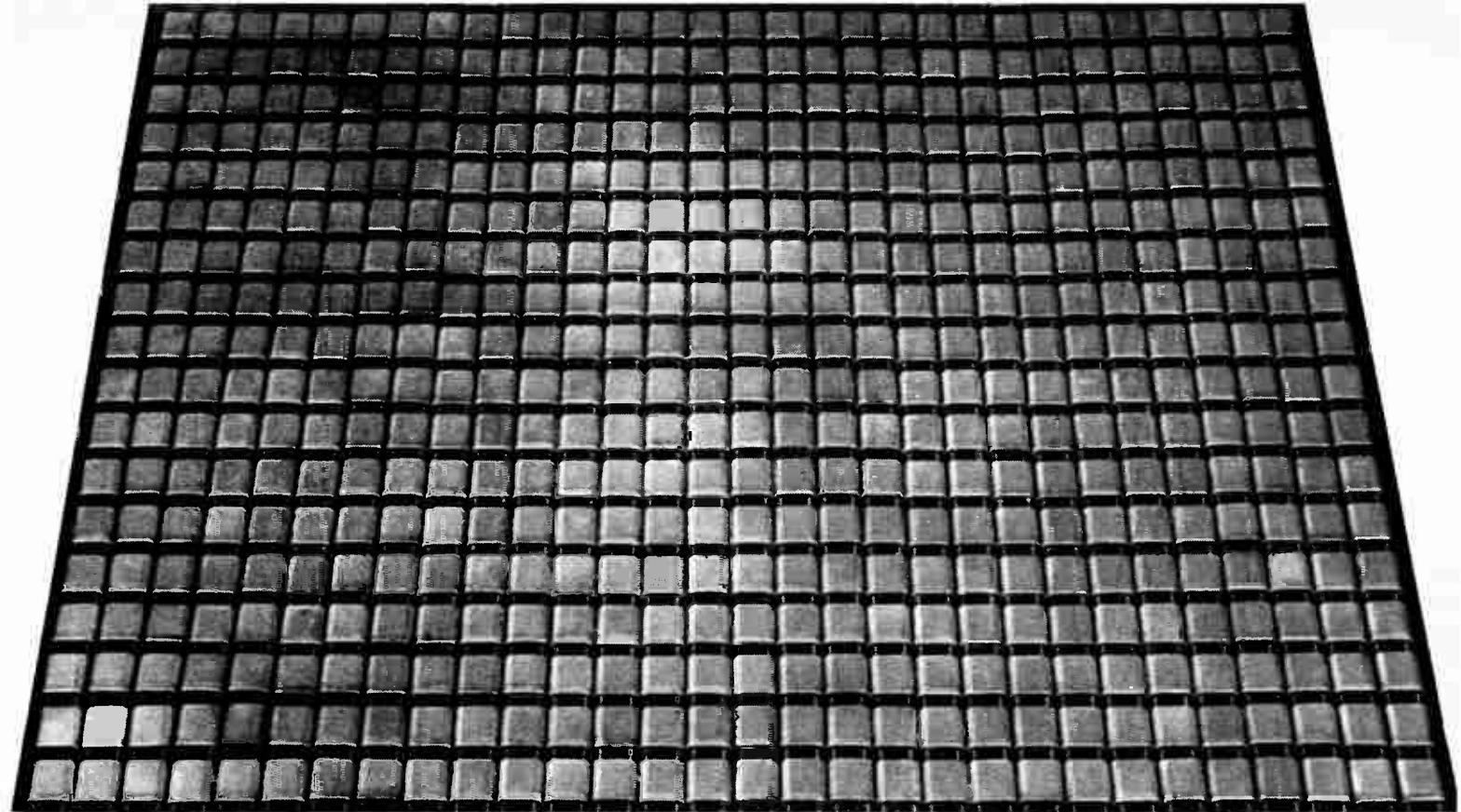
Standard Telephones and Cables Mfg. Co. (Canada) Ltd.

9600 St. Lawrence Blvd., Montreal 12, Que.

AMONG THE FOREMOST IN WORLD COMMUNICATIONS

For complete details check No. 59 on handy card, page 61





Why so many good crystals?

Frequently we are asked by our customers, how come we make so many **good** crystals —

The answer is simple — we just take a little more time, exercise a little more care, use better methods and processes to assure that the crystals we ship are the cream of the crop. In other words, we don't try to just make crystals, we concentrate on making good crystals.

— Are you getting your share?

C. R. SNELGROVE Co.

LIMITED

DON MILLS (TORONTO), ONT. HI. 4-1107-8

SNELGROVE — Canada's Frequency Control Specialist.
Licensed under Bell System Patents.

For complete details check No. 56 on handy card, page 61

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	..... 6.3 volts	..... 20 volts
Series	..... 40 volts	..... 40 volts	..... 6.3 volts	..... 6.3 volts	..... 20 volts
Heater Current	Parallel 300 milliamperes	100 milliamperes	175 milliamperes	150 milliamperes	50 milliamperes
Series	..... 50 milliamperes	..... 50 milliamperes	..... 175 milliamperes	..... 150 milliamperes	..... 50 milliamperes
Plate Current	$E_b = 150$ volts; $E_c = -2.0$ volts (8.2 milliamperes per section)				
Transconductance	5500 micromhos per section				
Direct Interelectrode Capacitances without external shield	Grid to Plate 1.3 μmf per section	..... 2.2 μmf per section	..... 0.19 μmf (maximum)	..... 3.9 μmf}	..... 2.0 μmf
Input	..... 2.2 μmf per section	..... 1.0 μmf per section	..... 0.10 μmf (maximum)	..... 4.0 μmf}	..... 2.9 μmf
Output	..... 1.0 μmf per section	..... 0.04 μmf}	..... 0.10 μmf (maximum)	..... 4.0 μmf}	..... 2.9 μmf
Plate-to-Plate	..... 0.04 μmf}	..... 0.11 μmf}	..... 0.10 μmf (maximum)	..... 4.0 μmf}	..... 2.9 μmf
Plate-to-Plate, Maximum	..... 0.11 μmf}	..... 0.11 μmf}	..... 0.10 μmf (maximum)	..... 4.0 μmf}	..... 2.9 μmf
Direct Interelectrode Capacitances with external shield	Grid to Plate *1.3 μmf per section	..... *2.3 μmf per section	..... † 0.10 μmf (maximum)	..... † 4.0 μmf}	..... † 2.9 μmf
Input	..... *2.3 μmf per section	..... *1.3 μmf per section	..... † 0.10 μmf (maximum)	..... † 4.0 μmf}	..... † 2.9 μmf
Output	..... *1.3 μmf per section	..... **0.03 μmf}	..... † 0.10 μmf (maximum)	..... † 4.0 μmf}	..... † 2.9 μmf
Plate-to-Plate	..... **0.03 μmf}	..... **0.10 μmf}	..... † 0.10 μmf (maximum)	..... † 4.0 μmf}	..... † 2.9 μmf
Plate-to-Plate, Maximum	..... **0.10 μmf}	..... **0.10 μmf}	..... † 0.10 μmf (maximum)	..... † 4.0 μmf}	..... † 2.9 μmf
Cathode	Coated Unipotential				
Bulb	T6½				
Base	Small Button, 9-Pin				
Mounting Position	Any				

MECHANICAL DATA

*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)	100 megacycles
Amplification Factor	200
Transconductance ($I_b = 30$ ma.)	50,000 micromhos
Direct Interelectrode Capacitances	
Grid to Plate	1.45 μmf
Grid to Shell ($E_r = 6-1v$; $E_b = 0v$)	†† 8.7 μmf
Plate to Shell	†† 0.19 μmf
Cathode to Shell	42.5 μmf

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

MECHANICAL DATA

Cathode	Unipotential
Mounting Position	Any
Weight, Approximate	1 ounce
Socket	(Equivalent to or) KSI4134

2059-4

Northern Electric

COMPANY LIMITED

SERVES YOU BEST

For complete details check No. 46 on handy card, page 61

Electronic Industries Association Report

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

Defense Production Sharing Committee Meets

The newly formed Defense Production Sharing Committee met recently in Ottawa for the first time. Under the chairmanship of J. D. Houlding, and representatives of the three divisions of EIA, this committee reports to the Government Liaison Committee of EIA.

At this meeting the general purposes of the committee were enumerated. The overall purpose was to facilitate the increase of defense business placed in Canada under the production-sharing policy now adopted by Canada and the United States. Ways and means of doing this were discussed and decisions made. Various assignments were made to top specialists in the electronics industry who will be responsible for certain aspects of the committee's work. Working in close co-operation with the relevant government department, the committee feels that its prime purpose of getting a fair share of electronics production sharing for Canada will succeed.

Public Relations Committee Meet with Trade Press Representatives

Recently members of the EIA Public Relations Committee and some of the EIA directors met with representatives of the electronics trade press to discuss the seriousness of the radio importation situation and the EIA "Made in Canada" campaign. An informal discussion took place on these two related subjects, and it was noted that the industry felt that the radio importation problem was a national one affecting all levels of the economy. Various suggestions were made on the problem and ways to combat it, one of which was that the public and the distributors and dealers should be made more aware of the seriousness of the situation.

EIA-IRE Golf Tournament

The annual EIA-IRE Golf Tournament and Dinner is scheduled to be held at the Cedar Brae Golf and Country Club, Scarborough, Ontario on Thursday, September 24. During the morning, a meeting of the Components Division is scheduled to take place. The annual EIA-IRE dinner will be held in the evening at which time the golfing trophies and prizes will be awarded.

Components Division Executive Committee Meeting

A meeting took place on August 19 of the Executive Committee of the Components Division. Among other items of business on the agenda was the discussion of the division's program for the coming association year, the appointment of various committee chairmen, and a schedule of division meetings.

First Vice-President of EIA Elected

For the first time in EIA history, a first vice-president position was created at the 30th Annual Meeting of EIA held during the summer months. The honor went to the chairman of the Components Division, Mr. James Key. Mr. Key's title is therefore EIA First Vice-President and Chairman of the Components Division. This new position provides the opportunity for an EIA official to deputize for the president in the event of the president's absence.

Prime Contractors Equipment Engineering Committee

A meeting of the Prime Contractors Equipment Engineering Committee of the Electronics Division was held recently. Under discussion were various matters relating to qualification approval and standardization, particularly as it applied to military equipment and components.

Electronics Division

The Electronics Division held a meeting at the Laurentien Hotel in Montreal on September 3. It is hoped that information about this meeting will be available for the next issue of the EIA Report.

Electronics Industry at CNE

Again the Canadian National Exhibition, in Toronto, has recognized the importance of the Canadian electronics industry to the economy by its annual Radio and Television Day on September 11. The EIA Board of Directors have been invited to the Radio and Television Day luncheon after which they will be conducted on a tour of the electronics exhibition.

Newsletter

Canadian Radio Technical Planning Board

Summer CRTPB Committee Activity

During the summer months the CRTPB executive committee met to discuss DOT Specification No. 103 "Technical Data Required In Support Of An Application For A Radio License Proposing The Use Of Radio Equipment For Which Type Approval Is Not Required". It was noted the comments on Specification 103 were due back in the CRTPB office by October 1, 1959. Other matters were considered, including committee membership, and the fact that the annual meeting may be held in November 1959 instead of December.

The general co-ordinator reported at the Executive Committee meeting that the Sub-Committee on Stereophonic Standards had been receiving many documents regarding proposed stereophonic standards from the United States. It was noted that equipment was now on the market for AM-FM stereophonic reception, and that the Canadian Broadcasting Corporation had approved an FM network between Ottawa, Toronto and Montreal for separate FM programming. It was also noted that the emphasis of the United States stereophonic committee was now on FM transmission.

A report was tabled of the ballot submitted by CRTPB sponsors on the subject of Fixed Land and Maritime Mobile Committee recommendation on the amortization period on Radio Standards Specification No. 116 entitled "Fixed Station Radio Telephone and Telegraph Transmitters, Operating In 1.6 mc/s and 20.0 mc/s Band With Power Output Not Exceeding 500 Watts". The results of the ballot were that twelve members voted, of which ten approved, one disapproved, and one abstained. After discussion it was recommended to the Department of Transport that the three-year amortization period from the final effective date of April 1, 1959 be adopted. The Department was also provided with comments of the one sponsor disapproving the action without identifying the sponsor.

The 13th meeting of the Microwave Task Force on Communication System Parameters was also held during the summer. Definitions for longitudinal circuit, metallic circuit, and longitudinal balance were proposed and these were adopted after some minor changes were made. Other work of a technical nature was also accomplished.

The 6th meeting of the Tropospheric Scatter Committee was held during June. Three new members were added to the committee, and Frequency Utilization, Interference and Hazards Sub-Committee reports were made and discussed.

New Member of CRTPB

At the Executive Committee meeting held during the summer months the Canadian Association of Broadcast Consultants was admitted as a sponsor-member of the Planning Board. The aims and objects of this new member will be featured in a "Who's Who in the Planning Board" in a future edition of the CRTPB Newsletter.

DOT List of Approved Equipment Available from Queen's Printer

The Department of Transport has issued a list of approved radio equipment under the title — "Radio Equipment List, Part A, Type Approved Equipment; Part B, Acceptable Equipment; Issue No. 4, April 1, 1959".

Part A includes all radio equipment which has been type-approved or provisionally type-approved under specific radio standards specifications. Part B lists all radio equipment not currently covered by a specific radio standard specification accepted for licensing technically.

The publication is issued annually with quarterly supplements. Copies are available from the Queen's Printer, Ottawa, at \$1.00 per annum.

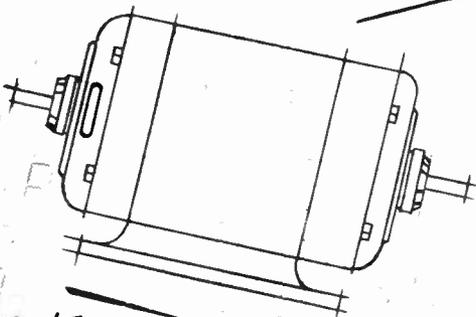
Canadian Radio Technical Planning Board
200 St. Clair Avenue West, Toronto 7, Ontario

F. H. R. POUNSETT, President; C. J. BRIDGLAND, Vice-President; R. A. HACKBUSCH, General Co-ordinator;
R. C. POULTER, Director of Public Relations; F. W. RADCLIFFE, Secretary-Treasurer

FEDERAL ISONEL

Solves High Temperature Motor Problems

Reduce size but maintain H.P.



*Specify Federal's Isonel Magnet
Wire for the windings*

**Now available
in square and
rectangular shapes!**

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 Paks
13-23 in 250 and 500 lb.
24-29 in 100 lb. packs.*

5901

Specify Federal . . . for the best in Magnet Wire.

FEDERAL WIRE

& CABLE DIVISION

H.K. PORTER COMPANY (CANADA) LTD.

DIVISIONS: Connors Steel, Deita-Star Electric, Disston, Forge and Fittings, Leschen Wire Rope, Mouldings, National Electric, Refractories, Riverside-Alloy Metal, Thermoid, Vulcan-Kidd Steel, H.K.Porter Company (Canada) Ltd.

For complete details check No. 48 on handy card, page 61

ELECTRONICS AND COMMUNICATIONS, September, 1959

13

TO SERVE YOU BETTER
 CGE NOW MANUFACTURES
 A WIDE RANGE OF GERMANIUM
 AND SILICON DIODES

**IN34, IN34A, IN35, IN38, IN38A, IN38B,
 IN48, IN51, IN52, IN54, IN54A, IN636
 IN58A, IN63, IN64, IN65, IN67,
 IN67A, IN68A, IN69, IN69A,
 IN70, IN70A, IN75, IN81
 IN81A, IN90, IN116, I
 IN126, IN126A, IN
 IN127, IN127A
 IN128, IN1
 IN198,
 IN58
 I**



For your industrial and military electronic equipment, Canadian General Electric has expanded its semiconductor manufacturing facility to include a comprehensive range of sub-miniature, germanium and silicon crystal diodes. All are of the glass-envelope, hermetically-sealed type. Canadian manufacture automatically brings a reduction in price and a speed-up in delivery time. Also, first-hand manufacturing experience makes C-G-E engineers better equipped to help with your design application problems.

The glass-to-Dumet seals of G-E Crystal Diodes assure uniform, permanent contact between whisker and crystal under severe extremes of temperature, shock and vibration. This "locked-in" electromechanical stability coupled with sub-miniature size can make your electronic equipment smaller and much more rugged.

For complete details on types and new lower prices on J.C.N.A.A.F. approved G-E Crystal Diodes, contact: Electronic Tube Section, Canadian General Electric Co. Ltd., 189 Dufferin St., Toronto, Ontario.



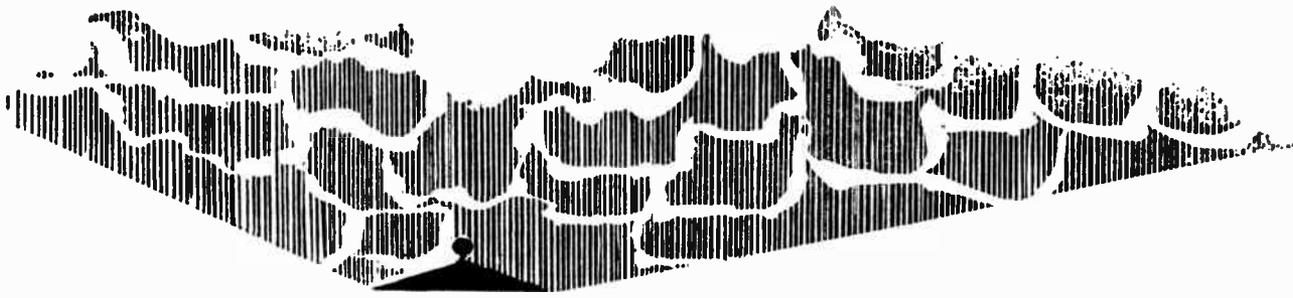
**GENERAL ELECTRIC
 SEMI-CONDUCTORS**

Electronic Tube Section

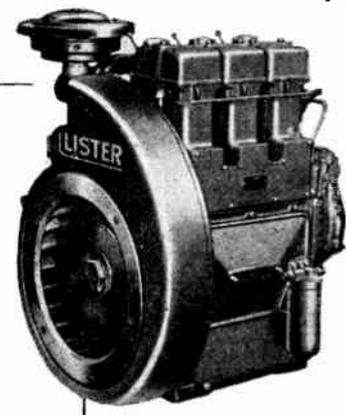
**CANADIAN GENERAL ELECTRIC
 COMPANY LIMITED**

1684-259

For complete details check No. 21 on handy card, page 61



DEPENDABLE POWER



LISTER AIR COOLED DIESEL ENGINES

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

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

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

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

Lister-Blackstone engines 3½—1400 BHP.

CANADIAN LISTER-BLACKSTONE

1921 Eglinton Ave. E., Scarborough, Toronto 13, Ont. LIMITED

VANCOUVER
3135 West Broadway

MONTREAL
25 St. James St., Ville St. Pierre

In the U.S.: Lister-Blackstone, Inc., 42-32 21st Street, Long Island City 1, N.Y.

For complete details check No. 22 on handy card, page 61



*The industry's
most complete
DCU line-*

You can count on CMC for all your DCU needs

CMC now offers original equipment makers no less than 28 standard DCU models, including the new transistorized Model 100T. That's the most complete line available from one source. In most cases, you're supplied from stock in a matter of days.

Price Important?

CMC gives you a double price break. First, you pay less for CMC equipment to start with. Second, you get a special OEM discount on quantity orders. Prices on request.

Quality a Must

There's no excuse for making an inferior DCU. We don't. Your local CMC engineering representative has the facts to prove it.

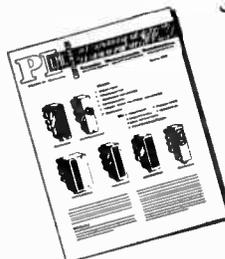
Applications Almost Endless

CMCDCU's fill almost every conceivable circuit requirement for digital data handling systems, counters, scalars, frequency and time interval meters and preset counter-controllers. CMC's units are interchangeable with most existing counting equipment. Including our own.

Ready for Solid State?

CMC is now in production on transistorized DCU's. These compact units incorporate decade readout and coded output matrix. No separate cards and plugs required. Available with vertical number panel or Nixie readout.

Concise Catalog Available



Our new DCU catalog gives you prices and key specs at a glance. If you don't have it, write, wire or call and we will mail it to you free. Please address Dept. 309.

CMC can supply you with better DCU's at lower prices, plus off the shelf delivery. It will pay you to check with us first.

Computer Measurements Company

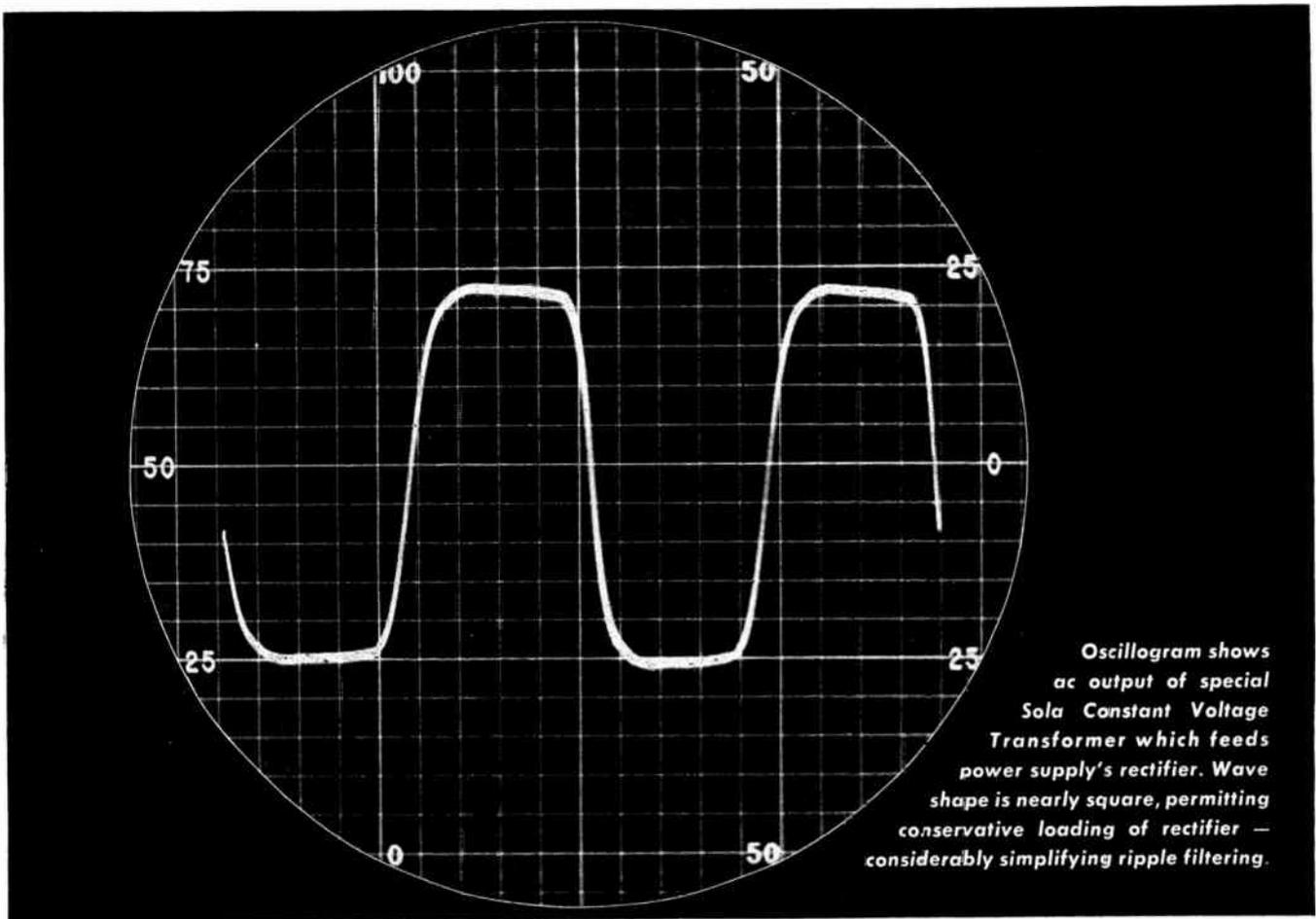
*A Division of
Pacific Industries, Inc.*

ELECTROMECHANICAL PRODUCTS

Markham Road
AGINCOURT, ONTARIO
Telephone AXminster 3-7011

11819 Michel Sarrazin
MONTREAL, QUEBEC
Telephone R14-1932

For complete details check No. 27 on handy card, page 61



Square-wave output of special transformer gives high efficiency in Sola's regulated dc power supply

Sola engineers (men with a keen eye for a trim wave shape) designed a special constant voltage transformer having nearly a square-wave output. Then they linked the transformer with two other components to produce a regulated dc power supply which has notable efficiency.

They fed the regulated output of this transformer into a semiconductor rectifier . . . the low-peak characteristic of the square wave results in a conservative loading on the economical rectifier assembly. It can deliver considerable amounts of current as long as you don't over-voltage it—and over-volting just doesn't happen when the input to the rectifier is Sola-regulated to within $\pm 1\%$.

The rectified voltage feeds into the third component in this happy combination—the high-capacitance filter. The capacitor's filtering job is made easier because the rectified square wave contains a comparatively small

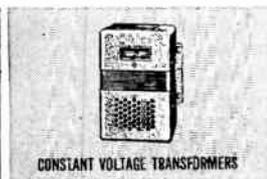
amount of ripple. Final dc output from the filter has less than 1% rms ripple . . . for many applications there is no need for a voltage-dropping, efficiency-cutting choke coil.

The Sola Constant Voltage DC Power Supply has output in the ampere range, regulates within $\pm 1\%$ even under $\pm 10\%$ line voltage variations, and is suitable for intermittent, variable, and pulse loads. It has low output impedance, is very compact, and provides about all you could ask for in maintenance-free dependability.

Hundreds of ratings of these dc power supplies have been designed and produced to meet widely varying electrical and mechanical requirements of equipment manufacturers. In addition, there are six stock variable-output models and six stock fixed-output models with ratings from 24 volts at six amps to 250 volts at one amp.

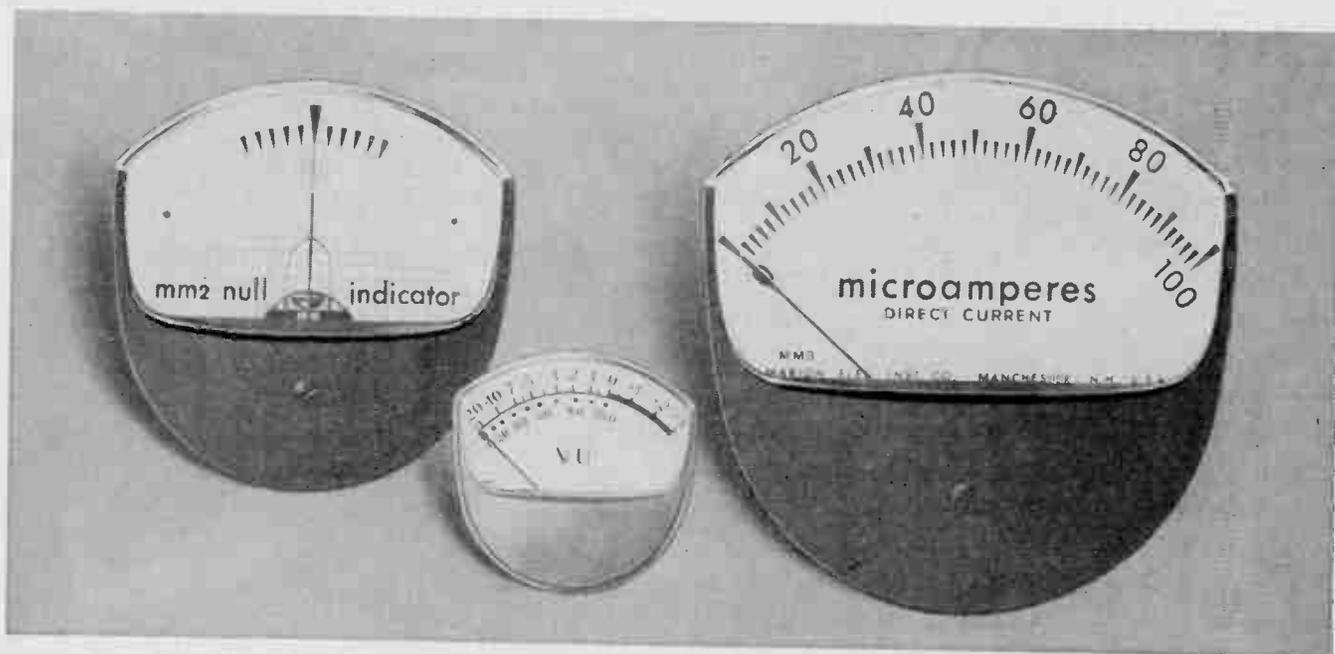
For complete data write for Bulletin 321-5E-DC

SOLA ELECTRIC (CANADA) LTD., 24 Canmotor Avenue • Toronto 18, Ontario • Phone: CLifford 1-1147
In The United States, Sola Electric Co., Chicago 50, Illinois, A Division of Basic Products Corporation

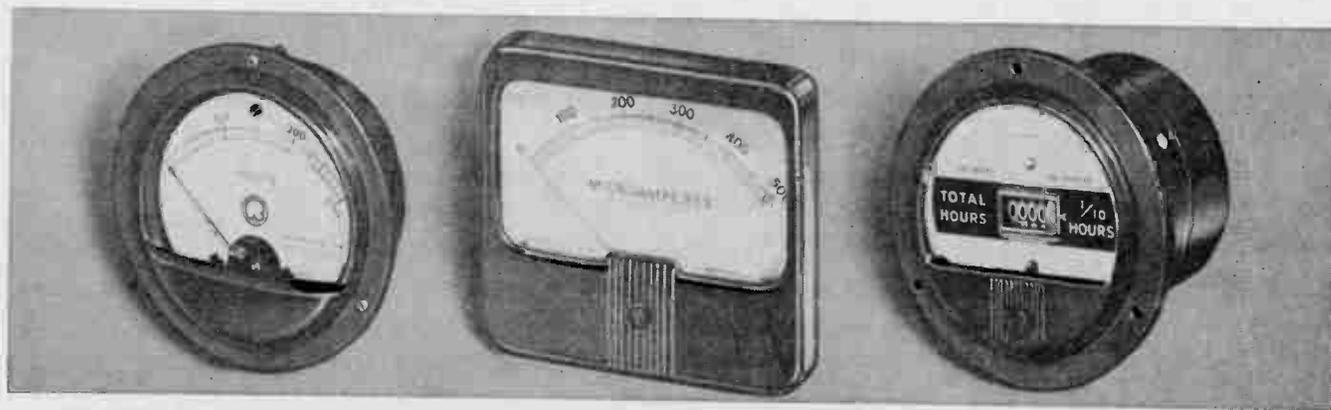


For complete details check No. 57 on handy card, page 61

NOW AVAILABLE THROUGH HONEYWELL **marion** electrical indicating instruments



MARION MEDALIST* METERS—ammeters, voltmeters, VU meters and null indicators—are panel instruments of advanced design, providing greater readability and modern styling in minimum space. Available in 16 standard case colors, or custom colors to match your equipment.



MARION RUGGEDIZED PANEL INSTRUMENTS are specially designed to withstand the most severe requirements of shock, vibration, stress and strain. They are hermetically sealed and immune to hazardous climatic and atmospheric conditions.

MARION STANDARD PANEL INSTRUMENTS for commercial applications provide improved performance at moderate cost.

MARION ELAPSED TIME INDICATORS, in hermetically-sealed or bakelite cases, record running times in maintenance programming, productivity and utilization studies.

Marion Electrical Indicating Instruments are the latest additions to the growing line of indicating, recording and controlling instruments available from Honeywell. Marion offers eight basic groups of electrical indicating instruments and related

products, incorporating the most advanced design concepts and production techniques. For further information, write Honeywell Controls Limited, *Precision Components Division*, Toronto 17, Ontario.

*Trademark

Honeywell

H marion meters

For complete details check No. 38 on handy card, page 61

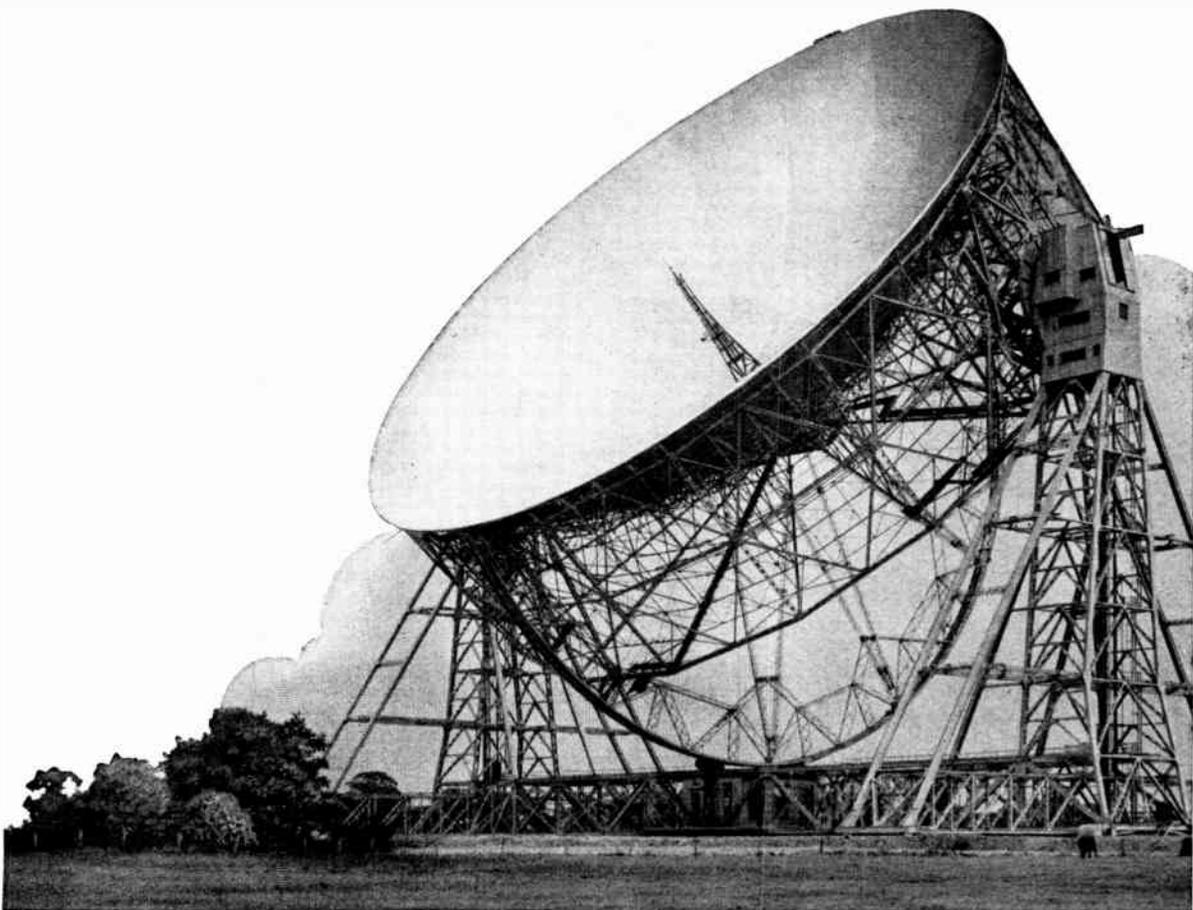
“Britain calling America ... via the moon”



Recently, a new chapter in communications history was opened when scientists from Manchester University at Jodrell Bank transmitted the first messages in morse code and speech to America via the moon.

The transmitting and receiving equipment which successfully sent the messages a distance of half a million miles was designed and manufactured by Pye telecommunications engineers.

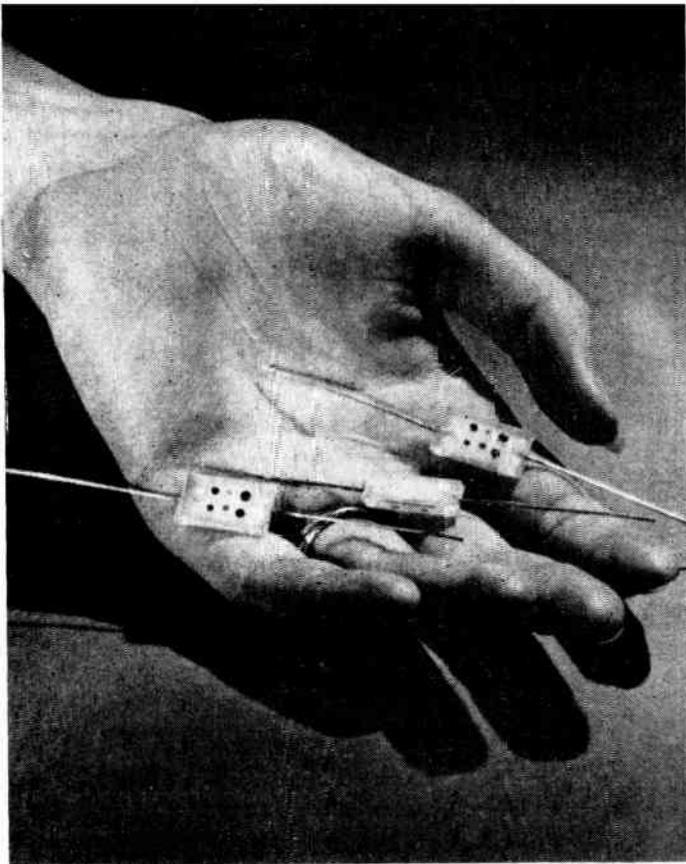
Foremost in design and manufacture Pye Telecommunications equipment is today solving communications problems in more than 90 countries throughout the world . . . *tomorrow in space.*



Photograph by courtesy of the Director of the Jodrell Bank Experimental Station

Pye Canada Limited 84 Northline Road Toronto 16 Ontario
HALIFAX • MONCTON • MONTREAL • WINNIPEG • EDMONTON • VANCOUVER

For complete details check No. 50 on handy card, page 61



These miniature CY-type fixed glass capacitors are made by Corning Glass with a full rating at 125 C. Available in voltage ratings of 300V and 500V DC, they have a continuous operating range of -55 C to 125 C. Volume of these capacitors ranges from 0.005 to 0.080 cubic inches. These capacitors are typical of component standardization progress.

Whether the producer of electronic equipment has as his end customer the home, industry or the armed services, benefits will accrue to that customer in a better, lower cost and more easily serviceable product through component standardization.

The producers' viewpoint on component standardization

by Julian K. Sprague *

The electronics industry is highly volatile and highly individualistic, from an engineering standpoint. New inventions, and new designs, come forward with explosive and sometimes bewildering rapidity. It is also a highly competitive industry, particularly in the area of direct consumer products for the home. It is only natural then, that this combination of forces should result in very strong, and sometimes closely guarded, design prejudices, methods of manufacture, and individual specifications for performance of components.

An electronic components manufacturer, who produces the basic building elements from which the apparatus or consumer product is assembled, must supply the needs of many customers. It is axiomatic in this, as in all other manufacturing, that if he can supply the same item to all customers, his production runs and rate of output can be higher, his production controls can be better, and his processes can be more highly mechanized. The attendant improvements in quality and steady reduction in costs inevitably result in a better consumer device at lower cost in this

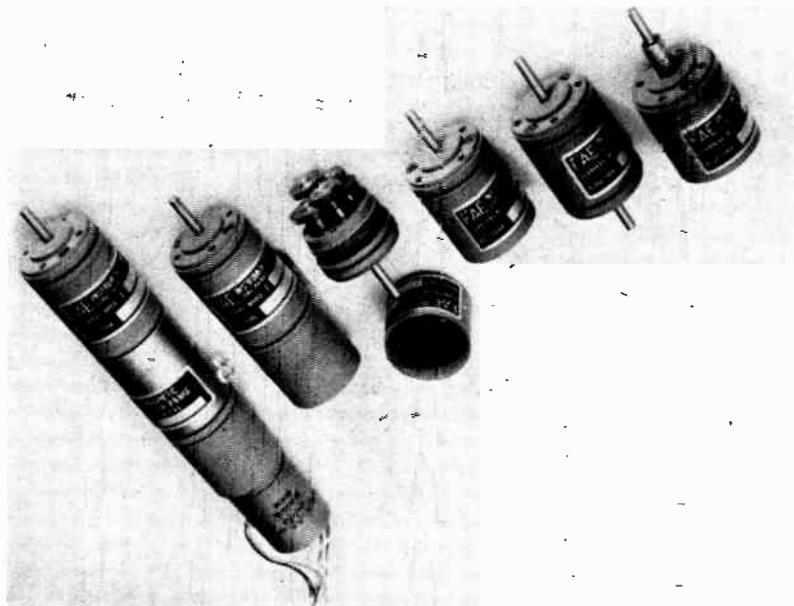
highly competitive field. It is readily understood that the radio or television set producer who is assured of a continuous supply of high quality components at increasingly favorable prices will use this fact to improve his competitive position with the buying public.

It would be a happy situation indeed if these obvious events were fully translated to reality. As we shall see, tremendous progress has and is being made, but we cannot yet claim to have implemented such logical procedures. The principal reasons have been the extremely rapid rate of technological change and the already mentioned individualistic engineering preferences.

Our company for instance must be prepared to produce electronic components of all kinds, both for civilian and military apparatus end use, to over 180,000 individual item specifications. In a single typical year, 1957 for example, our company specifications department wrote 35,017 component part specifications for

* President, Sprague Electric Company, North Adams, Mass.

These precision gear heads manufactured by FAE Instrument Corporation are designed for use in conjunction with BuOrd Mk. 14 Mod. 2 servo motors and through the use of available adaptors can be used on more than one type of motor or system, another achievement of component standardization.



manufacture, of which 11,332 were for entirely new items, and 23,685 covered changes in existing items to meet new customer test requirements, mechanical changes, manufacturing methods or materials. This one activity keeps a staff of approximately 50 highly skilled people busy. This rate of specifications activity has been approximately steady for many years. It is only natural, therefore, that we should be acutely aware of the need for, and the benefits of, component standardization.

Standardization through E.I.A.

In the electronics field the producer of the end equipment and the producers of the components come together and cooperate in standardization through the some 300 engineering committees of the Electronic Industries Association. The recommendations and standards so developed are then coordinated by Committee C83 of the American Standards Association with all other trade associations, the armed forces, and the engineering societies to produce fully integrated American standards. This activity has been in progress for many years and it is safe to say that without such producer-consumer cooperation in standards, our household and industrial electronic devices would not be available at their present low cost.

And yet, the introduction of new technology or new scientific breakthroughs, sometimes overnight, produces revolutions in the components business and introduces highly divergent viewpoints difficult to standardize. For example, the introduction of the etched or printed wiring board method of producing electronic equipment demanded an entirely new family of components, terminals, and mounting hardware.

The introduction of automatic component assembly methods for components, which the etched wire board made possible—the so-called “automation” of electronic manufacture — has produced in the past few years some of the severest headaches of standardization, or the need for it, which have yet appeared in our industry.

The great technological breakthrough of the transistor has created the need for whole new families of miniature components and the need to achieve early standardization if real progress is to be made in their economic production.

Although great progress has been and is being made in component standardization by cooperation between the producers' and consumers' engineers in their committees and associations, and a vast background of basic specifications exists, this process is necessarily slow. Where such standardization must proceed on a voluntary and cooperative basis, with many divergent viewpoints to resolve, several years are sometimes required to produce a standard acceptable to all.

Benefits of components standardization

The manufacturer of components who produces a breakthrough from his research and development programs and so is able to introduce a radically new and desirable component sometimes must be extremely rigid in his standardization of sizes, ratings, and markings. Considering the pressures from many customers, this sometimes has required great fortitude — and sometimes a substantial risk on the part of the components manufacturer before he has won industry acceptance of his necessary standardization. Fortunately, there is now a solid base of standardization of dimensions, preferred numbers, tolerances, and color codes in existence in the electronic components field as a guide.

Some of the direct benefits of this components standardization can be seen from the following figures. Despite major increases over the past several years in the cost of materials, labor, and overhead, our selling prices on several major types of electrolytic and paper capacitors, which our company produces for radio and television sets, are today 5 per cent to 15 per cent lower than they were three years ago. On certain widely used military capacitors on which our company pioneered both development and standardization, our prices are today less than half their initial introductory price of only a few years ago — due entirely to large production of standardized items. On one entirely new component developed for transistor circuitry, the introduction of a fully standardized line has permitted such production efficiencies and economies to be achieved that we have reduced price three times in a single year, and now sell the item for less than 40 per cent of its initial price to an eager and ready market.

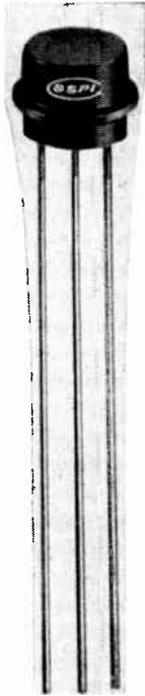


Figure 1.
The PNP controlled switch

The silicon PNP controlled switch is a new semiconductor component representing one of the most significant advances in silicon semiconductor technology since the introduction of the transistor.

The silicon PNP switch

A step beyond the transistor

Developed by Solid State Products, Inc. of Salem, Mass., these new switches are now in pilot line production and have voltage ratings to 200 volts and peak current ratings to 1 ampere. Turn on time in the region of 0.2 microseconds is typical. High gain — high speed — medium power switching, beyond that possible with present day transistors can be achieved using these new switches.

Typical current gains of 500 and power gains of 250,000 are possible at output peak current levels as high as 1000 ma. This compares to current gains of 50 and power gains of 2500 with today's silicon transistors. In addition, the PNP switch requires only an instantaneous input pulse to switch and stay "on". Transistors, on the other hand, require continuous input. Because of their unique properties, the PNP controlled switches open many new application possibilities that up to now were not possible with semiconductors.

Some of the many possible applications include: magnetic core switching, flip flops, logic circuitry, pulse generation and shaping, inverters, motor controls, regulated power supplies, servo systems and high level demodulators. They are particularly suited to AC static switching and control circuits.

Within their ratings, these new semiconductor switches will replace mechanical switching devices such as relays and vibrators with the advantages of reduced size and no moving parts. They can also be used to advantage in place of magnetic amplifiers, thyratrons, tubes, semiconductor diodes and rectifiers, conventional transistors and unijunction transistors to achieve improved switching performance in many applications.

Physically, the PNP switch is similar to a transistor, but instead of just two interacting junctions, the PNP switch has three. The resultant effect, electrically is a device with properties similar to those of a gas thyratron. In the reverse direction, its characteristic is the same as the reverse characteristic of a

conventional diode. In the forward direction, it will either conduct heavily ("on" condition) or block ("off" condition), depending on whether or not a gate current has been applied.

Operation

Operation of the PNP Switch can be readily understood by considering the analogy of two transistors, a high gain NPN unit and a low gain PNP unit.

As shown in Figure 2, the collector current of the NPN unit feeds the base of the PNP, and the collector current of the PNP feeds the base of the NPN. This arrangement gives a positive feedback loop, and when the product $B_1 B_2$ reaches unity the system is self-regenerative.

Figure 3 shows the typical E-1 curve of the system.

With the base of the NPN transistor (Gate) reverse biased, only a small leakage current will flow from cathode to anode. (Junction #2 is biased in the reverse direction.) At this low current level, B_1 and B_2 are relatively low and their product is less than unity. This is the "off" condition of the forward characteristic and the device has a very high impedance.

When a small forward bias current is applied to the base of the NPN transistor (gate), anode current (collector current of the two transistors) will rise, causing an increase in B_1 and B_2 . As the anode current rises to a critical minimum value, the product $B_1 B_2$ reaches unity and the system becomes self-regenerative. When this occurs, the anode current increases rapidly, limited only by the external load. Once the regenerative action has started, the externally applied gate current no longer affects the system and it may be removed. This is the "on" condition of the forward characteristic and the device has a very low impedance.

To turn the switch "off" once it has "fired", the anode current must be reduced to below the sustaining or "holding current", level.

The PNP switch will also "fire" from "off" to "on", with no external gate current, when the anode

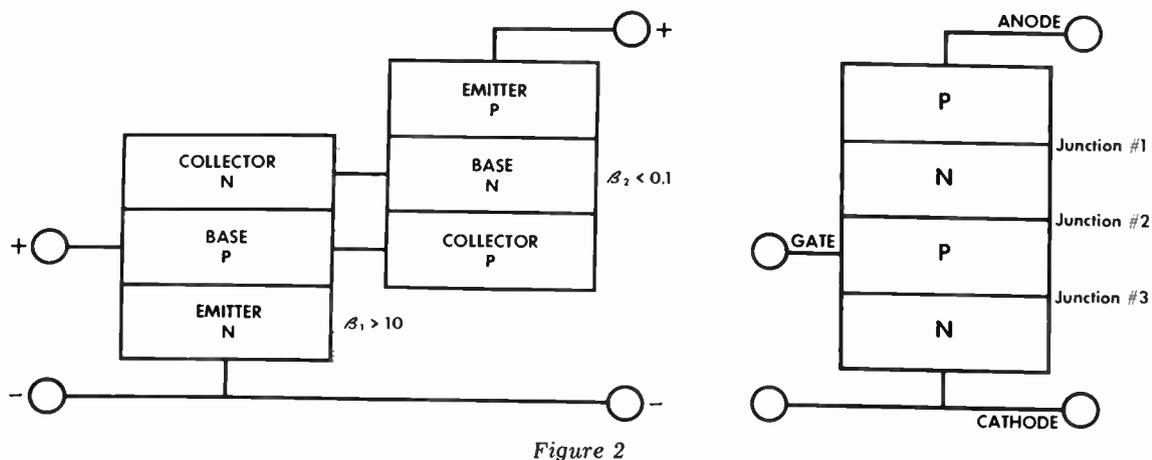


Figure 2

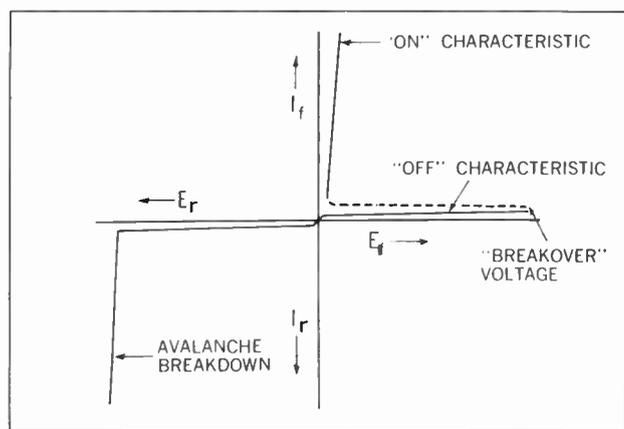


Figure 3

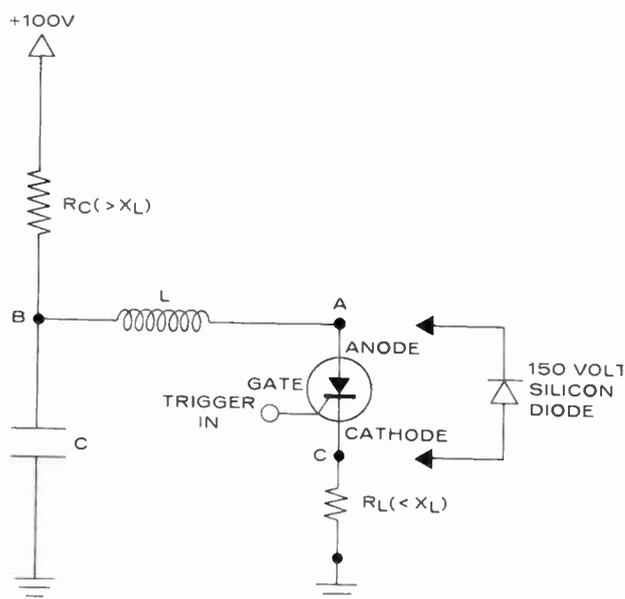


Figure 4

voltage, positive with respect to the cathode, exceeds a value called the "breakover voltage". This occurs because the current flow through the switch rises above the critical value at which the product of the two current gains reaches unity.

When an anode voltage, negative with respect to the cathode is applied, Junctions #1 and #3 (emitter to base junction of the two transistor elements) are biased in the reverse direction. The switch has a high impedance under this condition and behaves essentially the same as a conventional silicon diode in the reverse direction.

A typical application

The circuit diagram shown in Figure 4 shows how the PNPN controlled switch can be used to generate high current half sinusoid or full sinusoid pulses in an application such as magnetic core switching.

With the controlled switch "off", capacitor C charges through R_c so that the potential at points "B" and "A" is 100 volts. When a positive trigger pulse is applied to the gate of the controlled switch it will "fire", becoming essentially a short circuit. C dis-

charges resonantly through L and load R_L . If the PNPN controlled switch were to remain "on", a damped train of sinusoidal oscillations would occur at a frequency determined by L and C. However, after the first half sinusoid of current flow, the PNPN switch goes into the reverse direction and becomes non-conducting, leaving the potential at "B" and "A" at almost -100 volts (depending on the amount of circuit damping). C then charges slowly back to +100 volts, completing the cycle. The circuit can be made self-triggering by deriving the trigger current from the potential at "B".

A silicon diode connected between points "A" and "C" will conduct when the PNPN switch goes into the reverse direction. This diode passes a negative half sinusoid of current so that current through R_L is a full sinusoid. C is resonantly recharged and the potential at "B" returns toward +100 volts much more rapidly than by the relatively slow process of charging through R_c . If the diode is connected between point "A" and ground, resonant recharging current bypasses R_L , so that only the positive half sinusoid current pulse passes through R_L .

Efficient use of the radio frequency spectrum already loaded to capacity has given birth to a new field of endeavor, viz:

Radio allocation engineering

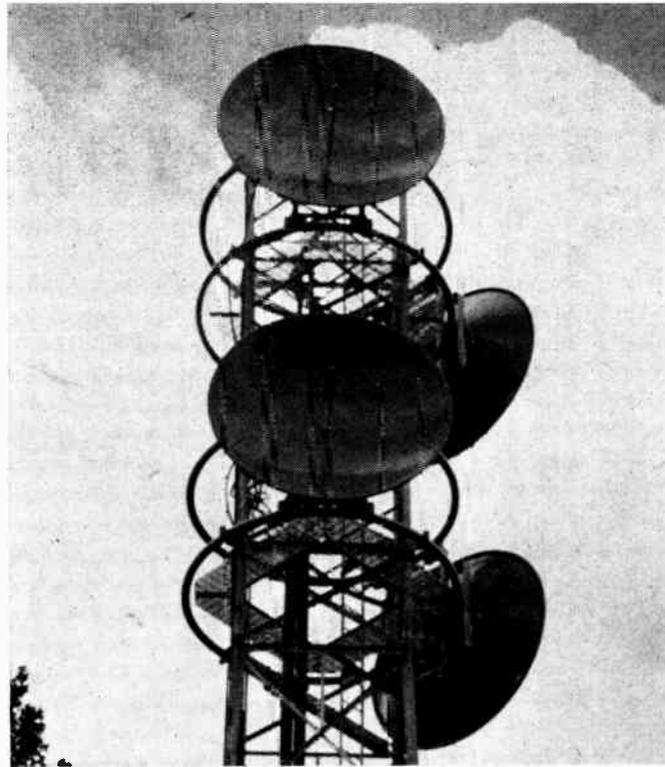
by W. B. Smith *

In recent years there has been a fantastically heavy growth in the use of radio for all purposes. Many and varied pieces of equipment have appeared on the market and new uses have been found for standard items. The upper frequency limits have been substantially extended and new horizons are continually being opened up. However, much of the need for radio turns upon a straight-forward communication requirement, and in general, this must be met by assignments in the currently available and usable part of the radio spectrum.

Many years ago it was relatively simple for anyone wishing to use radio to buy suitable pieces of equipment, obtain a licence to operate it and establish a radio communications circuit with little or no chance of causing undue interference to others or receiving very much interference himself. However, those days are gone and the spectrum has become so congested that no assignments can be made without producing some degradation of service to those assignments already in existence on the same, adjacent and harmonic channels. A major problem has developed to work in new assignments to cover legitimate requirements in a spectrum which is already effectively loaded to capacity. The solution of this problem has given birth to an entirely new field of endeavor, namely radio allocation engineering.

Allocation engineering has been in existence with respect to the standard broadcasting band, ever since 1941 when the North American Regional Broadcasting Agreement came into effect and it became obvious to everyone that no new broadcast assignments were possible without coordination of the engineering parameters with assignments already in existence. This became painfully apparent when it was realized that practically no new assignments were possible without the use of directional antenna systems, the design of which was a complicated engineering matter.

In the standard broadcast band, at the present time, the congestion is so acute in that in the North American region alone there are nearly 4,000 broadcasting stations allocated to only 107 channels. Ad-



Allocation engineering is a must for the design of microwave installations.

(Photo courtesy Blaw-Knox)

mittedly there is some inter-station interference but it is only because of the excellent job of allocation engineering done by the many consultants over the past 15 years or more that this number of assignments is even possible.

With the advent of television the same situation is developing and although the growth of television was anticipated and allocation plans worked out in advance of the requirement, nevertheless much readjustment is necessary due to shifting population centers, opening up of new territories, competitive interests and network programming. The allocation engineer is, therefore, quite necessary in working out suitable assignment details for television stations even though an allocation plan is in existence and many assignments are possible within the structure of the plan. In many instances special arrangements have to be made in order to provide a channel for the establishment of a television station to serve an area which otherwise would not receive television service.

A very similar, though not as acute, problem exists with respect to the FM broadcasting band but there is already on the horizon a number of new technologies such as stereophonic sound, multiplexing of second programs etc. which will test the skill of the allocation engineers to work them into the FM broadcasting picture.

Elsewhere in the radio spectrum a parallel situation has developed or is developing rapidly. In the land mobile field, the 152 to 174 Mc/s frequency range, the congestion in the major centers of population became so acute a few years ago that it was necessary to tighten up substantially on the technical standards of equipment being used for land mobile service. It is a generally recognized fact that when there is a limited amount of spectrum space available there are only two ways by which additional assignments can be made. The first way is to allow each new assignment to produce an overall degradation of service to those

* Superintendent, Radio Regulations Engineering, Department of Transport, Ottawa, Ontario

already making use of radio in that band of frequencies and with the advent of each new user, the usefulness of the band becomes less and less for everyone. The second method is to require everyone making use of radio in that band of frequencies to tighten up their technical standards and pull in their elbows to make room for new assignments. In this way the degradation of service is minimized and is kept within known and controlled technical limits. This last method is the one which has been adopted in Canada with respect not only to the band of frequencies utilized for the land mobile service but as a general principle throughout the spectrum.

Tightening up of technical standards immediately creates two rather difficult engineering problems. The first problem arises in the drafting of the equipment standards and the determination of the tolerable limits and extent of restrictions which must be imposed. The second problem arises when actual assignments are contemplated and involves selection of suitable equipment to do the job with just enough, but not too much, power and with characteristics to give the maximum efficiency of communication with a minimum of interference to others.

Complex situation

The first problem has been met in a most satisfactory manner by the Canadian Radio Technical Planning Board which is a body made up of sponsor organizations, each of which has some interest in the use of radio in Canada. Membership in the Board includes manufacturers and suppliers of radio equipment, user organizations such as telephone companies, electric power companies etc., and people who have a general interest in radio in Canada such as educational institutions, the Canadian Broadcasting Corporation and so on. A procedure exists whereby specifications covering the technical standards of radio equipment are drafted and referred to the Planning Board for their study, comments and recommendations, after which they are promulgated by the Department of Transport and become effective on a date agreed upon by the Planning Board and the Department.

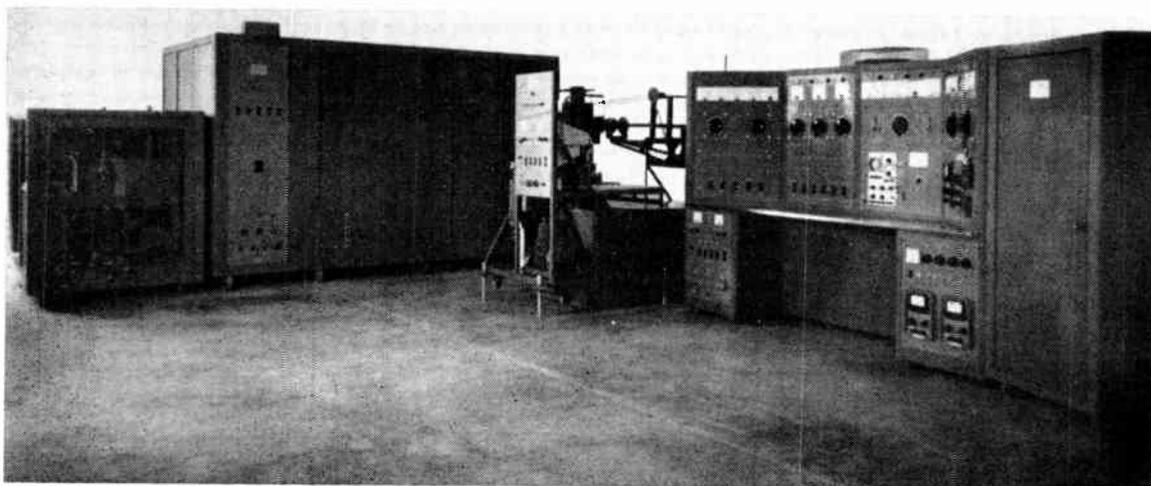
The second problem can be met only by the allocation engineer. The situation has become so complex that it is practically impossible for a layman to understand the various aspects sufficiently well to do anything like a good job of allocation engineering. Heretofore, many people wishing to use radio have

acquired pieces of equipment which they thought adequate to do the job and then have asked for the assignment of specific frequencies and a licence to use this equipment. Sometimes these arrangements work but usually they are far from optimum and performance could be greatly improved had the system been properly engineered. At the present time we are undergoing a transition from an attitude of casual engineering to a recognition of the serious nature of the allocation problem and the reference of the problem to competent allocation engineers.

It may appear to some that the introduction of the allocation engineer into this picture has merely added an additional complexity and additional expense to a potential user of radio. To a certain extent this is correct but it is a most necessary addition in that the spectrum congestion is now such that it is not possible in most instances to get an assignment at all without the services of an allocation engineer. This is one of the prices which must be paid by the general public for the privilege of making very extensive use of radio.

Microwave communication systems and various scatter systems and other techniques which make use of ultra high and super high frequencies definitely require the services of an allocation engineer because the factors which are involved are so complex and the inter-actions so extensive it is not possible for anyone not versed in the art even to make a start on the problem. Such factors as path loss attenuation, fade margins, sporadic scatter bursts and overshoot are all matters requiring engineering attention and, in general, are quite beyond the understanding of people not versed in the art, but these are the very factors which control the economy of spectrum utilization and are the governing factors in making assignments on frequencies of this order.

In the early days of radio the predominant use consisted of either a general broadcast type of emission or a signal which was sent out omnidirectionally from a transmitter and intended for reception by one or more discrete receivers. This picture has, however, changed in recent years and we now deal almost entirely with communication systems. A customer has a requirement to communicate from A to B, from B to C and from C to D etc. or from A to B, C, D etc. In most cases he has no interest whatsoever in communicating between other than the designated points and is not at all interested in having his signal go



A selection of suitable equipment to do the job with just enough, but not too much power, and with characteristics to give the maximum efficiency of communication with a minimum of interference to others is part of the allocation engineer's job.

(Photo courtesy Levinthal Electronics)

A properly engineered system makes use of the right bands of frequencies for the distances involved. Typical of such a system is that of the Diamond Taxi Company of Montreal, the audio amplifying and transmitting control unit for which is shown in the illustration at right.

(Photo courtesy Canadian Marconi Company)

anywhere else. In these cases the allocation engineer can be of tremendous assistance in laying out suitable communication systems to meet the customer's exact requirements with the degree of reliability which the customer really needs. A properly engineered system makes use of the right bands of frequencies for the distances involved so that the signal will arrive with adequate strength where it is needed and with minimum strength everywhere else. Suitable equipment is proposed for use with suitable antenna systems so that sufficient and only sufficient power will be used to provide the required service with the required reliability and all the available power will be directed where it can be most effective. When it is considered that a directional antenna can multiply power by a factor of several hundred and a suitable choice of frequency can lay down a field strength at a certain point with very little actual attenuation beyond that which is characteristic of the mode of propagation being used, it will be appreciated that a properly engineered system is going to be by far the most economical system. In addition, a properly engineered system will cause little or no interference to others making use of radio in the same area or in the same general frequency band. Furthermore, proper engineering will provide a predetermined and determinable reliability which can be made good enough to meet any potential user's actual needs.

The allocation engineer can and should provide the following services to a potential user of radio:

1. Provide a clear analysis of the communication problem to determine whether or not radio is actually the best way of doing the job.
2. An economic appraisal of the situation to see if the probable costs of providing radio communication are justified.
3. An appraisal of the complexities introduced by a radio system as compared with other means of communication which might be under consideration.
4. Advice on Government licensing requirements and policies.
5. Actual design of a suitable communication system.
6. Assistance in the preparation of applications for licensing, antenna site clearances, etc.
7. Preparation of purchasing specifications for radio equipment to be used.
8. Assistance in the preparation of purchasing specifications for ancillary facilities such as buildings, power plants etc.
9. Advice in awarding contracts to get best value.
10. Supervision of actual installation and conducting of acceptance tests.
11. Advice and assistance in maintaining the system in optimum condition.
12. Keeping the user informed of developments in the art which might lead to more or better service out of his existing system.

The Department of Transport is prepared to provide allocation engineers with the maximum amount of information to facilitate their preparation of applications for the licensing of various radio systems. This informa-

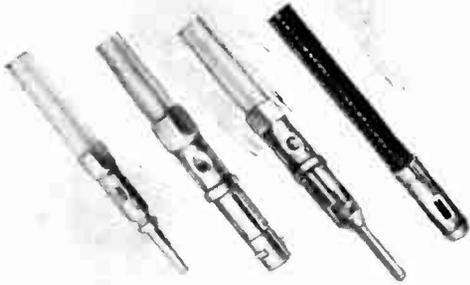


tion includes the best possible data on radio wave propagation, allocations already made and assignments already in existence, lists of type approved equipment, Government policy decisions, changes in international and domestic regulations, and many other factors which have a bearing on the use of the radio spectrum. This information is made available by the Department to consulting engineers engaged in allocation engineering since these people are well known to the Department and it is possible to keep them supplied with up to date information. It is rather obvious that it would not be possible to make this information available to the general public, first because of the bulk of the material involved and second because of its highly complex technical nature it would mean little or nothing to a layman.

We have only one radio spectrum and if everyone is going to be able to get the most effective use out of it each will have to be prepared to have his individual assignments very carefully engineered so as to be as compatible as possible with others who have an equal desire and right to make use of the spectrum.

In conclusion, it is apparent that the demands being made upon the radio spectrum are such that it is no longer possible to make casual assignments of radio facilities and there is an increasing requirement for all facilities to be adequately engineered in order to make them fit into an already congested spectrum. The trend is definitely towards increased and more complex engineering in connection with each and every new facility and if the public intend to continue the present trend of increased spectrum utilization they must be prepared to depend more and more upon the services of allocation engineers.

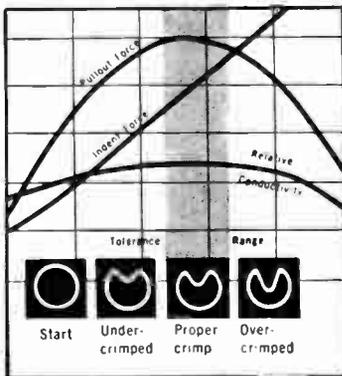
BURNDY Electrical Contacts



and BURNDY Installation Tooling

Designed for each other

TOOLS / CONNECTORS MATCHED
BY WORK CURVE STUDIES



Laboratory work curves like this establish the proper type and depth of indent for every type of connector and wire. This depth then becomes an inherent characteristic of a full cycling control tool, guaranteeing a uniform and complete crimp each time a contact is installed. Thus the tool contributes to the built-in reliability of contacts and tooling designed for each other.



◀ HYPRESS® YD

A semi-automatic pneumatic tool for installing contacts. Contacts are supplied in expendable plastic carry strips. The tool can be operated as a portable tool, or hand or foot operated as a bench-mounted tool. Full cycling control insures uniform completion of each installation.

HYPRESS® Y8ND ▶

A manual tool with removable dies. Ratchet action insures that dies close completely and thus eliminates the possibility of incomplete connection.

HYPRESS Y8ND ▶

A pneumatic portable tool for rapid installation of contacts. Removable dies are interchangeable with M8ND. Full cycling control insures uniform completion of each installation.

*For details on these and other Burndy tools, write
OMATON DIVISION*

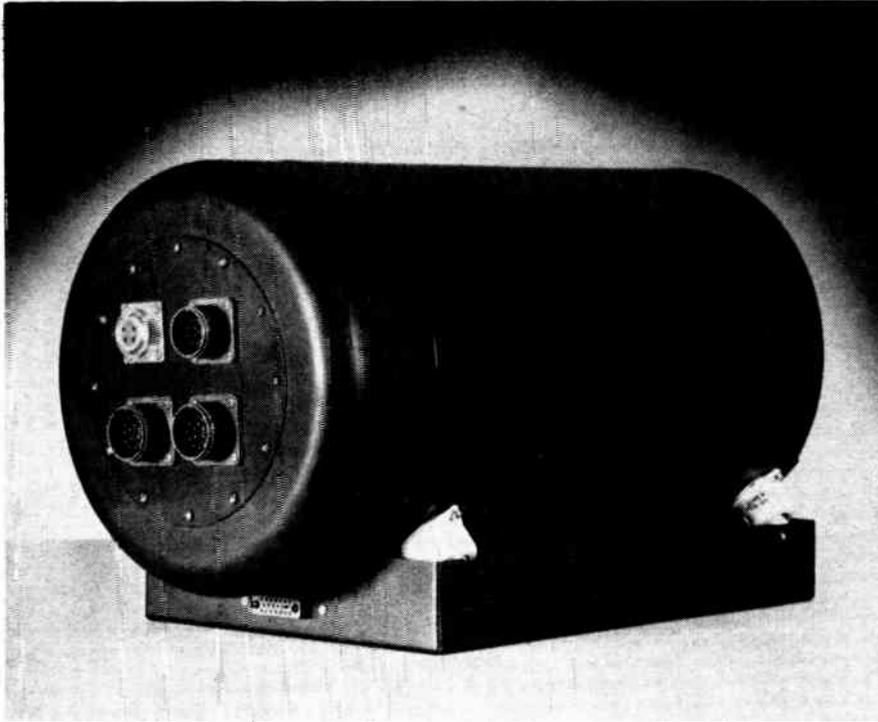


BURNDY

CANADA LTD. 1530 Birchmount Rd., (Metropolitan Toronto) Scarborough, Ontario • Plymouth 7-8761
Offices in Montreal, Winnipeg, Calgary, Vancouver.

For complete details check No. 68 on handy card, page 61

ELECTRONICS AND COMMUNICATIONS, September, 1959



Development model of the low cost Sperry Canada VG/DG Stable Platform. The platform is mounted in the aircraft along the fore and aft axis with the connector end facing aft.

An interesting complex of fine mechanical precision and advanced transistor circuitry constitute the ingredients of a Canadian developed

Low cost stable platform

The V.G./D.G. stable platform is a low cost approach to the problem of providing highly accurate directional and attitude references for use by a human navigator. Borrowing techniques from the inertial navigation field, where the "stable table" first became popular, and combining these with the latest product of years of evolution of accurate directional gyroscopes, Sperry Gyroscope Company of Canada, Ltd. has developed a low cost stable platform. The simple cylindrical container conceals an interesting complex of fine mechanical precision and advanced transistor circuitry.

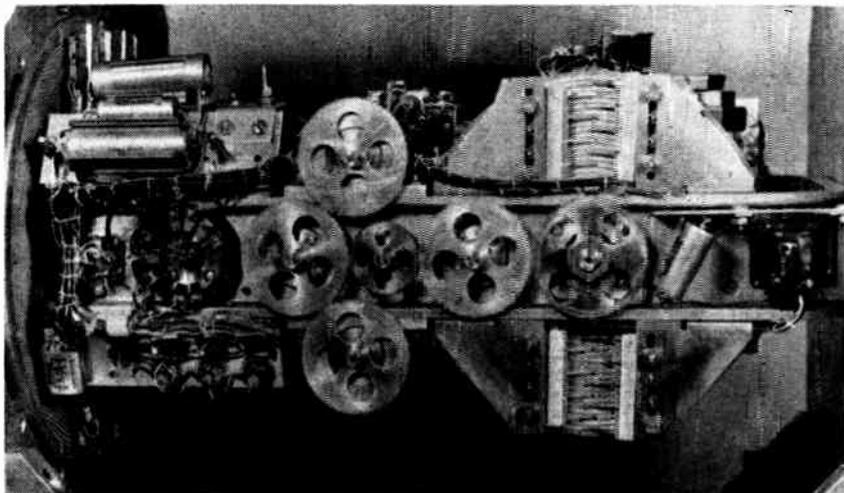
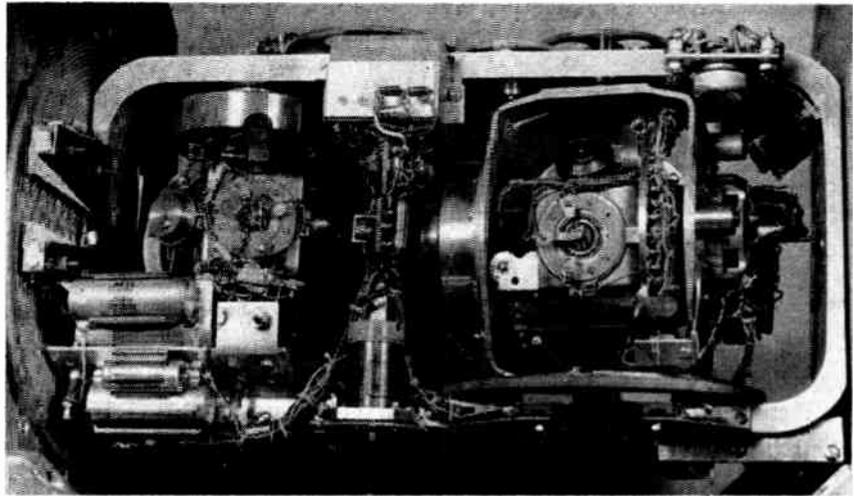
The LDG-1 Directional Gyro developed, and now in production, for the RCAF was used as a basis for this development. This non-floated, induction motor driven gyro, embodying an application of the Rotorace principle to reduce the effect of gimbal bearing friction, is built to operate within limits of $\pm 1^\circ$ per hour random wander. With its outer case replaced by a servo driven pitch gimbal this gyro becomes the directional gyro component of the V.G.-D.G. (Vertical Gyro Directional Gyro) platform, while a second similar gyro, made without the Rotorace feature to reduce cost and embodying certain other necessary modifications, forms the vertical gyro component. The two gyros can be seen in Figure 1. Here the platform mechanism has been removed from the case and placed in a holding fixture. The large rectangular ring is the outer roll gimbal. The directional gyro is

contained in the pitch gimbal at the right end of this ring. The slip ring stack on the azimuth axis of this gyro can be clearly seen. The vertical gyro in its own gimbals is at the left-hand end of the ring and the gyrosphere is clearly visible in the photograph. Figure 2 is taken with the roll gimbal in the same position but with both gyros displaced. The pitch gimbal has been turned to a condition approximating vertical pitch so that more detail of the directional gyro is visible. In particular the three races of the Rotorace bearing on the inner axis of this gyro can be seen at about the center of the right hand section of the outer roll gimbal.

Figures 3 and 4 are side views of the internal structure with the slip ring carrying power to the directional gyro inside the pitch gimbal being especially prominent at the right hand end of Figure 3. The output stage for the pitch servo amplifier can be seen at the right-hand of Figure 4 with the associated pitch drive motor and pinion appearing near the middle of the picture at the upper side of the gimbal. One of the two electrolytic levels which provide a long term gravity reference for the vertical gyro can be seen in the same figure near the left-hand end of the roll gimbal.

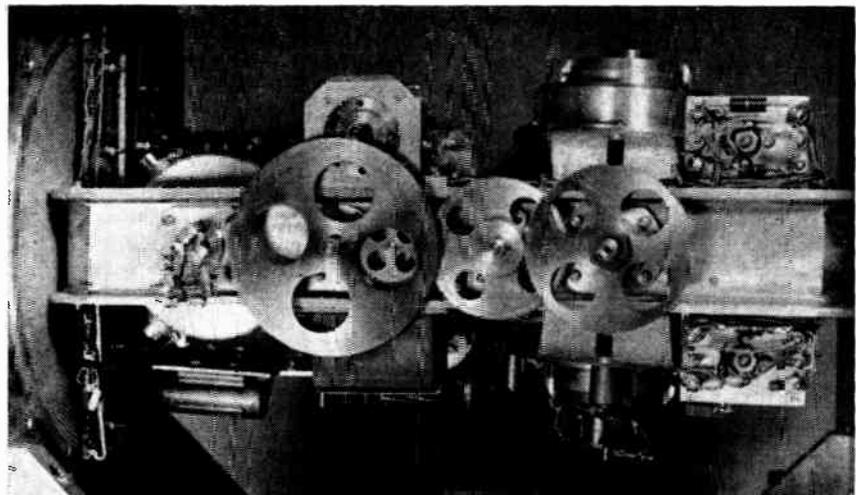
Signals from two electrolytic levels coupled to the pitch and roll axis of the vertical gyro are used to

(Right) Platform mechanism in laboratory holding fixture with DG on right. The roll gimbal is positioned 90° from level flight. The pitch servo amplifier is contained on two boards mounted on the roll gimbal (center and upper right). Two pitch output synchros can be seen in the lower center.



(Left) Platform in straight and level aircraft attitude. From left to right along the roll gimbal are shown the VG slip ring stack, pitch servo gearing, and DG slip ring assembly.

(Right) Platform positioned with roll gimbal 180° from level. Left to right on roll gimbal are pitch liquid level switch, pitch servo gearing, and pitch servo amplifier output stage.



slave the vertical gyro to the earth's gravitational field. Loose coupling permits the gyro to function as a short term reference while long term reference is obtained from the levels. Synchro pick-offs associated with the vertical gyro feed transistor servo amplifiers which in turn drive the roll and pitch gimbals to maintain these in a level condition. The directional gyro carried within the pitch gimbal, which in turn is carried within the roll gimbal, is in consequence maintained at all times with its vertical axis in the

local vertical. Heading information taken from this gyro is then independent of aircraft attitude. In consequence, the inherent high accuracy of the directional gyro can be fully realized.

Tests on a developmental model have indicated that a heading reference can be maintained with this gyro operating as a free gyro within a total random wander spread of about $\frac{3}{4}^\circ$ per hour. In addition attitude information can be taken from the vertical gyro with a verticality of approximately $1/10^\circ$.

business briefs and trends

★ John D. Houlding, vice-president and general manager of RCA Victor Company, Montreal, in a recent address said that chances of getting business in the face of the Buy American Act, Distressed Area Set-asides, security regulations and Congressional lobbies are very slim. The fact that most U.S. companies are well buttressed by existing defense contracts and well able to spend large sums in soliciting new business makes the competition extremely rough.

* * *

★ James Fenton, president of the Telephone Association of Canada told delegates at the 30th annual meeting of the Association that construction expenditures by Canadian telephone organizations exceeded \$291,000,000 last year and the outlook is that a still greater amount will be expended this year to keep pace with continuing public demands for all types of communications services.

* * *

★ Contracts have been let for the first section of a round the world cable system that will link 11 nations of the British Commonwealth. The first two orders call for over 2000 miles of submarine cable for the Scotland - Newfoundland link of the system. The complete system which is expected to be completed in 10 years will cost approximately \$247,000,000.

* * *

★ The number of telephones operated by the 15 largest telephone systems in Canada at the end of 1958 was 4,809,568, an increase of 6.5 per cent over the 1957 year-end total of 4,515,002.

* * *

★ According to a recent survey there is certainly nothing true about the old adage that "there is nothing new under the sun". The survey shows that there is a backlog of 200,000 patent applications piled up in the United States Patent Office awaiting processing and that an average waiting period of three and one half years is required before a patent application can be cleared. In view of the above inventors should pool their talents and produce a 'patience pill' to carry them over this waiting period.

* * *

★ The Reliance Electric and Engineering Company of Cleveland, Ohio, are reported to be planning a capital investment of \$1,000,000 in a new operation in the Stratford area. The company has recently purchased a modern manufacturing plant originally built by Canadian Westinghouse in 1956 and which was vacated in 1958. The plant will be equipped for the manufacture of drives, electronic controls, and gearmotor items now being built at the company's Cleveland plant for export to Canada.

* * *

★ Negotiations for the amalgamation of Norwesto Enterprises Limited and Northern Telephone Company Limited are reported underway. Northern Telephone already owns 52 per cent of Norwesto and the complete amalgamation has the object of achieving administrative economies. Northern Telephone, according to D. McKelvie, president, are currently preparing estimates for the provision of a large number of circuits for the SAGE defense system which may require large capital expenditures.

* * *

★ The American electronic components industry will soon be faced with the toughest competition in its history — competition from Japanese manufacturers merchandising their products in the United States. This according to W. A. Stocklin, editor of Electronics World, who states that Japan today is a nation with engineering and scientific ability not far below that of the United States.

* * *

★ According to Charles W. Fenton, Radio Sales Director of the Canadian Association of Broadcasters, the Canadian sale of radios during 1958 averaged one every 32 seconds.

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

Canadian IRE Convention plans take shape

Many firms prepare to exhibit

As of press date the following firms have indicated their intentions of exhibiting at the forthcoming Canadian IRE Exhibition and Convention to be held in the Automotive Building, Exhibition Park, Toronto on October 7, 8 and 9.

Age Publications Limited (Electronics & Communications magazine), American Electrical Heater Company, Ampex American Corp., Astral Electric Co. Ltd., Atlas Instrument Corporation Limited, Atlas Polar Company Limited, Atlas Radio Corporation Limited, A. T. R. Armstrong Ltd., The American Superior Electric Company, Automatic Electric Sales (Canada) Limited, Aviation Electric Limited, Bach-Simpson Limited, Bayly Engineering Ltd., Beatty Brothers Ltd., Belden Mfg. Co., Bishop Sons & Co. Ltd., Camloc Fastener Corp., Canadian Applied Research Limited, Canadian Electronics Engineering (Maclean Hunter Publishing Co.), Canadian Research Institute, Collins Radio Company of Canada Ltd., Conrad Incorporated, George W. Crothers Limited, Dynamic Gear Company Inc., Edwards High Vacuum (Canada) Ltd., Electro Sonic Supply Company Limited, EMI-Cossor Electronics Limited, Ferranti-Packard Electric Limited, General Radio Company, Glendon Instrument Co. Limited, Hammond Manufacturing Co. Limited, Honeywell Controls Limited, M. J. Howard & Company Ltd., The Institute of Radio Engineers, Kester Solder Company of Canada Limited, Lake Engineering Company Limited, The McBee Company Limited, McCurdy Radio Industries Limited, Masson Seeley & Co. Limited, Measurements Corporation, MEL Sales Limited, National Research Council, Canadian Patents & Developments Limited, Northern Electric Co. Limited, PIC Design Corporation, Polarad Electronics Corporation, Premier Metal Products Co., Radio Trade Supply Limited, Douglas Randall (Canada) Limited, Raytheon Canada Limited, Rogers Electronic Tubes and

Components, R-O-R Associates Ltd., Rutherford Agencies, Sensitive Research Instrument Corp., Sharpe Instruments Ltd., Sigma Instruments, Inc., A. C. Simmonds & Sons Limited, Sola Electric (Canada) Limited, Spaulding Fibre of Canada Limited, Stark Electronic Sales Company, Stripit Tool & Machine Limited, Tektronix, Inc., Telonic Industries, Inc., John R. Tilton Limited, TMC (Canada) Limited, Universal Winding Company, Varian Associates of Canada Limited, Ward Leonard of Canada Ltd., Wholesale Radio & Electronics Ltd., A. C. Wickman, Limited, The Wind Turbine Company of Canada Limited, Andrew Antenna Corporation Limited, Canada Stamp and Stencil Co. Ltd., Canadian General Electric Co. Ltd., Canadian Pratt & Whitney Aircraft Co. Ltd., Canadian Westinghouse Company Limited, Cerl-Dale Limited, C. P. Clare Canada Limited, Daystrom, Limited, Eitel-McCullough, Inc., Heinemann Electric Company, John Herring & Company Ltd., Hysol (Canada) Limited, International Systems Limited, Keithley Instruments, Inc., National Semiconductors Ltd., Philips Electronics Industries Limited, Potter & Brumfield, Inc., Radionics Limited, Renfrew Electric Co. Ltd., R & M Bearings Canada Ltd., Sinclair Radio Laboratories Ltd., Tellurometer Canada Ltd., Canada Wire & Cable Co. Ltd., Canadian Astronautical Society, Canadian Marconi Company, Canadian Radio Technical Planning Board, Central Scientific Co. of Canada Limited, The Constanta Company of Canada Limited, Department of Transport, Electrodesign, Electronic Industries Association of Canada, Intronics Limited, International Rectifier of Canada Limited, Kay Electric Company, Prentice-Hall, Inc., Ryerson Institute of Technology, South Chester Corporation, Sylvania Electric (Canada) Limited, Texas Instruments Inc., Thomas & Betts Limited, John Wiley & Sons, Inc.



D. A. Golden

D. A. Golden, Deputy Minister of Defense Production, will be the guest speaker at the IRE Convention banquet to be held in the Royal York Hotel, Toronto, on October 8. Mr. Golden will speak on the recently formulated plans for integrated defense production between the governments of Canada and the United States.

IRE Convention Exhibit Award 1959

The convention committee has announced that the successful 1958 Exhibit Award competition will be repeated at this year's Convention and broadened to include two awards: one for the most outstanding Canadian product, and one for the most outstanding Canadian component exhibited.

The purpose of the awards is to stimulate research and development in Canada and thereby encourage Canadian companies to develop their own products. Apart from the prestige involved in winning the awards, the recipients and the IRE will benefit from the extensive publicity which has been assured in the trade and business press.

A special Committee has been set up to handle the awards under the chairmanship of H. Ross Smyth of the National Research Council, George Glinski, University of Ottawa, Syd F. Love, Dominion Electrohome Industries Limited, and Jim MacKay of the Department of Transport.

The awards will take the form of engraved sterling silver plaques and will be presented at the Convention banquet on Thursday, October 8th.

Canadian IRE Convention to host members of International Executive

The 1959 IRE Canadian Convention and Exposition will be held October 7, 8 and 9 in the Automotive Building, Exhibition Park, Toronto. It will be the fourth annual Convention and Exposition sponsored by the Canadian Region of the IRE and one of the largest scientific events in the Commonwealth.

One hundred and nineteen scientific and technical papers will be presented during the Convention and over 300 exhibits featuring electronic and nucleonic equipment and projects will make up the Exposition. It is expected that a number of scientists from overseas will participate in the Technical Sessions and that some government scientific agencies from Europe will have exhibits in the Automotive Building.

On the first day of the 1959 Convention a Fall Executive meeting of the IRE International will be held in Toronto. It will be followed on the second and third days by a Board meeting of the organization. Twenty directors and officers, including the eight Regional Directors, are expected to participate in these executive sessions. A. P. H. Barclay, IRE Canadian Region Director is making arrangements for the Toronto meetings which will result from the IRE International's acceptance of a long standing invitation from the Canadian Convention Committees.

Eric L. Palin, Chairman of the Executive Committee responsible for planning and organizing the Convention, announced recently that over 75 per cent of the Exposition space has now been booked. He also disclosed details of the 25 Technical Sessions which will comprise the Technical Program. These will include sessions devoted to medical electronics, engineering management, communication systems, space electronics, solid state electronics and stereophonic broadcasts. There will also be a panel discussion on education and a session devoted entirely to papers presented by scientists from Canada's National Research Council.

C.G.E. pushes sale of industrial television

Cooperative selling has paid off for two Canadian General Electric operations that normally function as completely independent groups. Sales engineers of the Apparatus Department, located in many cities across Canada, who sell industrial electrical

equipment and systems, have teamed up with the company's Electronic Equipment & Tube Department in an all-out sales campaign for the latter department's full line of closed-circuit television equipment.

Murray D. Locke, advertising and sales promotion specialist, Electronic Equipment & Tube Department, pointed out that a number of industrial television installations have been made this year through the cooperation of the two departments.

Andrew Antenna Corp. Ltd. names sales manager

Ross H. Curtis was recently appointed sales manager of Andrew Antenna Corporation, Ltd., Whitby, Ontario, manufacturers of antenna systems. Mr. Curtis' extensive engineering experiences in Canadian communications include his former association with Sperry Gyroscope Company of Canada and with RCA Victor Company,



R. H. Curtis

Ltd. He has been engaged in engineering and marketing work and while with Sperry was a technical representative with the RCAF in Europe.

In making the above appointment, Richard P. Matthews, manager of Andrew Antenna, also announced that John Annett has been promoted to sales engineer. Mr. Annett has been associated with Andrew for over a year working on special assignments.

A. Laws plant manager Potter & Brumfield

The appointment of Alan Laws to the position of plant manager of Potter & Brumfield Canada Ltd., is announced by H. Huntsinger, executive vice-president.



Alan Laws

Mr. Laws joined P & B Canada Ltd. in 1958 and at the beginning of this year was appointed sales manager. He will continue to direct the sales of the company in his new position as well as oversee all other aspects of the plant's operation.

He succeeds Marlin A. Kirk who has returned to the parent company in the U.S. to become staff assistant to the executive vice-president.

Lake Engineering to handle Birtcher products

Lake Engineering Company Limited, has been appointed by the Birtcher Corporation, Industrial Division, Los Angeles, California, as sole Canadian representative in the field of tube and transistor retention and cooling devices.

These include — Kool Klamps for miniature and subminiature tubes and components, retention devices for tubes and components, top-holding retention devices, crystal clips, transistor heat sinks, heat-dissipating tube shields.

Information concerning Birtcher Corporation products may be obtained by writing to Lake Engineering Company Limited, 123 Manville Road, Scarborough, Ontario.

International Systcoms reports financing plans

J. J. Kingan, president of International Systcoms Limited has announced that the company has completed arrangements for long term financial backing from Charterhouse Canada Limited, Toronto.

This financial backing will support the company's comprehensive development program and general expansion.

"Systcoms", a Canadian manufacturing company, with headquarters in Montreal, operating under Federal Charter since 1958, is engaged in the design, development and production of electronic communications equipment. Sales are on a national and international basis, with strong emphasis on export.

Mr. Kingan, himself with many years experience in the electronic industry, has secured the services of personnel with broad experience in the management, design and sales of radio and allied equipment and reports that initial deliveries of type SY-30 Series FM radio-telephone have been met with an enthusiastic response from users. Production of other units is expected to commence shortly.

Polyethylene plant for Quebec

Purchase of a site in Cowansville, Quebec, approximately 50 miles south-east of Montreal in the Eastern Townships, for a plant devoted to the manufacture of "VisQueen" polyethylene film, has been announced by L. A. Hanson, president of Visking Company, Division of Union Carbide Canada Limited.

New type of repeatered telephone cable scheduled for laying in 1961 will permit

Trans-Atlantic link to carry TV pictures

The proposed new Commonwealth telephone cable system between Canada and the United Kingdom (CANTAT) will be capable of carrying BBC television pictures across the Atlantic.

Announcing this, the Standard Telephones and Cables Limited Company of London recently gave details of the system which was first introduced during the visit of Her Majesty the Queen and Prince Philip to Canada.

The historic film record of the Queen's arrival in St. John's, Newfoundland, was transmitted over a distance of more than 5,000 miles, and was seen on British television films the same day.

New scanning apparatus

Although still pictures had long been sent through the first transatlantic telephone cable, a new film scanning apparatus had to be devised by the BBC engineers to carry motion pictures across the Atlantic. This was operated in conjunction with Standard Telephones and Cables Music-in-Band transmission equipment already installed in Oran, Montreal and New York.

The annual report of the Commonwealth Telecommunications Board states that the new type of repeatered telephone cable across the Atlantic (CANTAT) will be laid in 1961.

Standard Telephones and Cables announce that this cable system, which will include more than 90 submerged two-way repeaters, will also be capable of carrying the television film service if required.

To carry the pictures of the Royal tour across the Atlantic, Standard Telephones Cables state that their music transmission equipment normally permits the operation of high-grade circuits which displace either two or three speech circuits in any one 12 circuit group operated over the carrier system. A music circuit displacing two speech circuits has a frequency band-width of 50-6400 c/s and one displacing three circuits, 50-10,000 c/s.

The smaller of the two band-widths was chosen for transmitting the pictures. In order to limit the variation in the group delay/frequency characteristic to a value which could be corrected, it was necessary to restrict the useable video band-width to 4.5 kc/s.

Vestigial sideband transmission was used with a special form of negative-going amplitude modulation. The carrier was five kc/s and the whole of the lower sideband was transmitted, the vestige of the upper sideband extending from five kc/s to 5.5 kc/s.

Other Standard Telephones and Cables equipment, notably radio links and a submarine repeater system also contributed to the success of this achievement. Her Majesty's arrival in St. John's, Newfoundland, formed the first television program for public viewing to be transmitted over the newly installed Standard Telephones Cables microwave system to Sydney, Nova Scotia. From Sydney the television signals were conveyed to Montreal where the program was telefilmed. An extract from this film was transmitted through the Atlantic cable.

A section of the Atlantic cable, between Clarenville and Sydney Mines employs Standard Telephones Cables submerged repeaters in a single cable for both directions of transmission. Standard Telephones Cables equipment, identical with that installed for the first transatlantic telephone cable system, is also being installed for the second cable system which will connect New York and Montreal with Frankfurt in Germany. Standard Telephones Cables Music-in-Band equipment will be installed in Frankfurt.

MEL Sales head office located in Toronto

MEL Sales Limited announces that the head office of the company will be located at 1969 Avenue Road, Toronto 12, Ont. Telephone HUDSON 1-0231.

Allan McQuarrie has assumed the duties of office manager and will be able to answer all queries of a non-technical nature, i.e. prices, deliveries, status of orders, etc.

The head office, conveniently located just south of Highway 401, has facilities for receiving and shipping, set up to give customers the best possible service.

Sales and engineering assistance will be handled by J. B. "Jim" Turner.

The Montreal office is under direction of F. J. Ball at NA. 7-4313 and mailing address is P.O. Box 1352, Postal Station "O", Montreal, Quebec.

Noted electronics engineer passes unexpectedly

Russell H. Varian, chairman of the board of Varian Associates, died recently of an unexpected heart attack while on a vacation cruise in Alaska with his family. He was 61 years old.

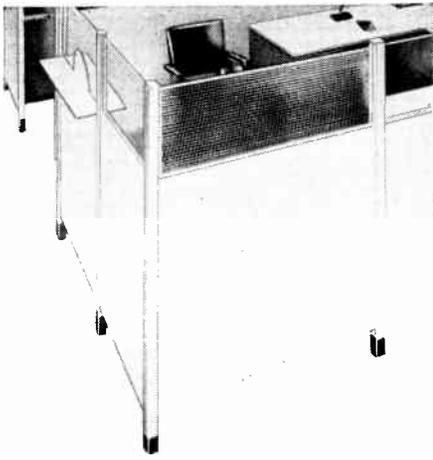
Dr. Varian, the son of Irish immigrants, was born in Washington, D.C., April 24, 1898. He moved to California at the age of four and, after attending public schools in Palo Alto, entered Stanford University. He worked his way through the University, graduating with an A.B. degree in physics in 1925 and an M.S. degree in the same subject in 1927.



Dr. R. H. Varian

Following graduation, Dr. Varian worked and studied in the electronics field. In 1936, he and his brother Sigurd commenced an intensive effort to develop some device capable of operating at microwave frequencies. They foresaw that such an instrument would open up broad new fields of usefulness, principally radar, for which they felt there was an urgent need.

The result, announced in 1939, was the Klystron. It was invented and developed in the physics laboratories at Stanford, with the close collaboration of Dr. David Webster and the late Dr. William W. Hansen. Since the invention led to the development of effective radar, it was credited with being a major factor in Allied World War II victories.

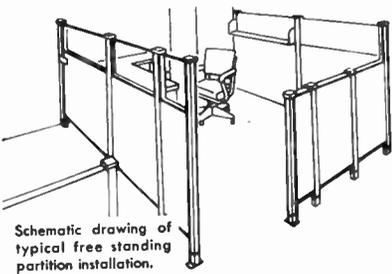


**SUB-DIVIDING?
DO IT THE LOW COST
WAY WITH ...**

Royal

**FREE STANDING
PARTITIONS**

Convenient, yet low cost way to create private offices, sub-divide or enclose general work areas. Any number of the various panel post units can be combined. Available in: Light Grey, Sahara Tan and Willow Green.



Schematic drawing of typical free standing partition installation.

Royal

PARTITIONS

WANT DETAILS?

Clip this coupon to your letterhead and mail to:

**ROYAL METAL MFG. CO. LTD.
GALT, ONTARIO**

PLANTS: 59-44

Royal Metal Mfg. Co. Ltd., Galt, Canada
Royalite Metal Furniture Co. Ltd., Smiths Falls, Canada

For complete details check No. 54

34

**Electrical companies
choose new name**

Associated Electrical Industries, Britain's largest electrical manufacturing company, announces that on July 2, 1959 the staffs of the British Thomson-Houston Co. (Canada) Ltd. and Metropolitan-Vickers Electrical Export Co. Ltd. (both A.E.I. companies) were combined to operate under the name of Associated Electrical Industries (Canada) Ltd., which



H. G. McHaffie

will be responsible for selling and servicing the products manufactured by the many A.E.I. divisions in the United Kingdom and the A.E.I. Switchgear factory in Montreal. H. G. McHaffie, previously managing director of the British Thomson-Houston Co. (Canada) Ltd., has been elected president. R. P. Horlock, director and vice-president, was previously manager of Metropolitan Vickers Electrical Export Co. Ltd., in Canada. Siemens Edison Swan (Canada) Limited, another A.E.I. Company, will continue to operate without change of name.



H. T. Wormell



R. P. Horlock

H. T. Wormell, named a director of Associated Electrical Industries (Canada) Ltd., is president of Siemens Edison Swan (Canada) Ltd.

Associated Electrical Industries (Canada) Ltd.'s head office is located at 766 King Street West, Toronto with branches in Montreal and Vancouver.

**Atlas Radio represents
Audiotex in Canada**

Atlas Radio Corp., Ltd. of Toronto has been picked to represent Audiotex Mfg. Co. in Canada.

Audiotex, a division of GC-Textron Inc., manufactures hi-fi accessories used by listeners of taped, recorded, and broadcast material.

The 150-item line will be sold via self-service display racks through electronic parts supply houses, music stores and selected hi-fi specialists.

Continued on page 39

**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 ($\frac{1}{4}$ " to $1\frac{1}{8}$ ") 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
 $\frac{1}{4}$ " 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

203-B

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

AMERICAN ELECTRICAL HEATER COMPANY

DETROIT 2, MICHIGAN

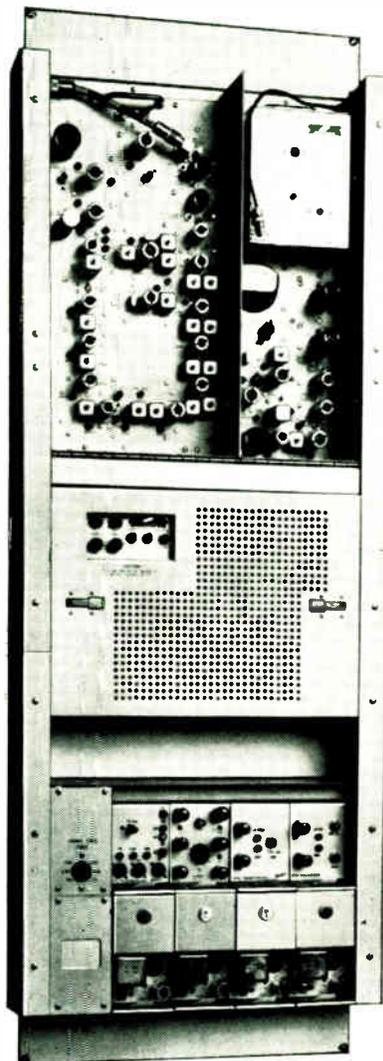


For complete details check No. 5 on handy card, page 61

Lenkurt

TYPE 911

**VHF
COMMUNICATIONS
SYSTEM**



A new, compact, economical carrier/radio package designed for rack, pole or truck mounting in telephone applications requiring from four to eight toll-quality voice channels.

**AUTOMATIC ELECTRIC
SALES (CANADA) LIMITED**

For complete details check No. 9 on handy card, page 61

ELECTRONICS AND COMMUNICATIONS, September, 1959

5954

35

Now - a push-key P

**THE SIZE OF A TYPEWRITER
THE NEW LEICH COR**



BX

It's years ahead in styling—the most compact, easiest-to-operate P.B.X. on the market. No cords to wear or get tangled—handles up to 20 inside lines. And any office girl can operate it after just a few hours practice.

And the new Leich Cordless has a host of other important features. It measures only 16½ inches by 16 inches by 7½ inches—fits on the corner of a desk leaving plenty of space for other duties—weighs only 47 pounds.

Everything has been done to simplify operation and assure dependability. The novel arrangement of the keys and the low, sloping face of the P.B.X. itself, make for fast, easy extension of calls. The keys are colour coded—odd numbered station line keys beige, even numbered black, trunk and operator keys gray—and each key has only one operative position, so the confusion of cam-type, two-way keys is completely eliminated. To simplify operation still further, alternate keys work in opposite directions.

Supervisory lamps show when a party has disconnected or is signalling. Busy lamps indicate stations and lines in use.

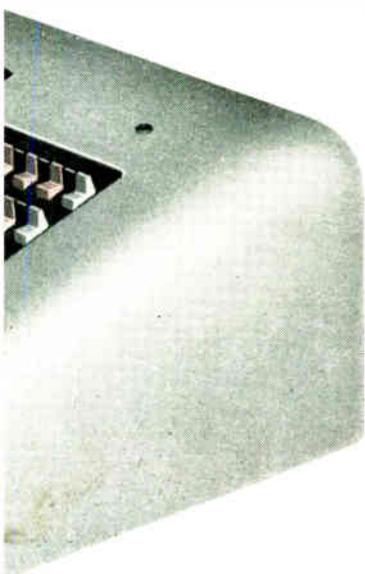
Increase your revenues by selling P.B.X. service. Offer your subscribers the new standard in P.B.X. switchboards, the new Leich *push-key* P.B.X. available in three different models—12, 16 and 20 inside lines.

Call or write any Automatic Electric office for illustrated literature.

WRITER DLESS, FROM AUTOMATIC ELECTRIC

CHECK THESE IMPORTANT FEATURES:

- Built-in multiple on line-keys and trunk-keys eliminates need for wiring each key to every other key—means years and years of dependable service.
- Rugged one-way keys laboratory tested for equivalent of 30 years service without sign of failure.
- All three models equipped with five connecting circuits and five central office trunks to dial or common battery exchanges. Trunks may also connect to magnetic exchanges by external addition of kick coils.



STANDARD

Prompt recall, channel busy lamps, re-ring, through or attendant dialing, through supervision, night service, trunk holding and conference call features are standard with all three models.

OPTIONAL

Hand generators, tie trunks, extra line relays and key telephones are available as optional features.

*This equipment distributed exclusively in Canada by
AUTOMATIC ELECTRIC SALES (CANADA) LIMITED,
185 BARTLEY DRIVE, TORONTO 16, ONTARIO.
BRANCHES ACROSS CANADA.*

AUTOMATIC  ELECTRIC

ORIGINATORS OF THE DIAL TELEPHONE

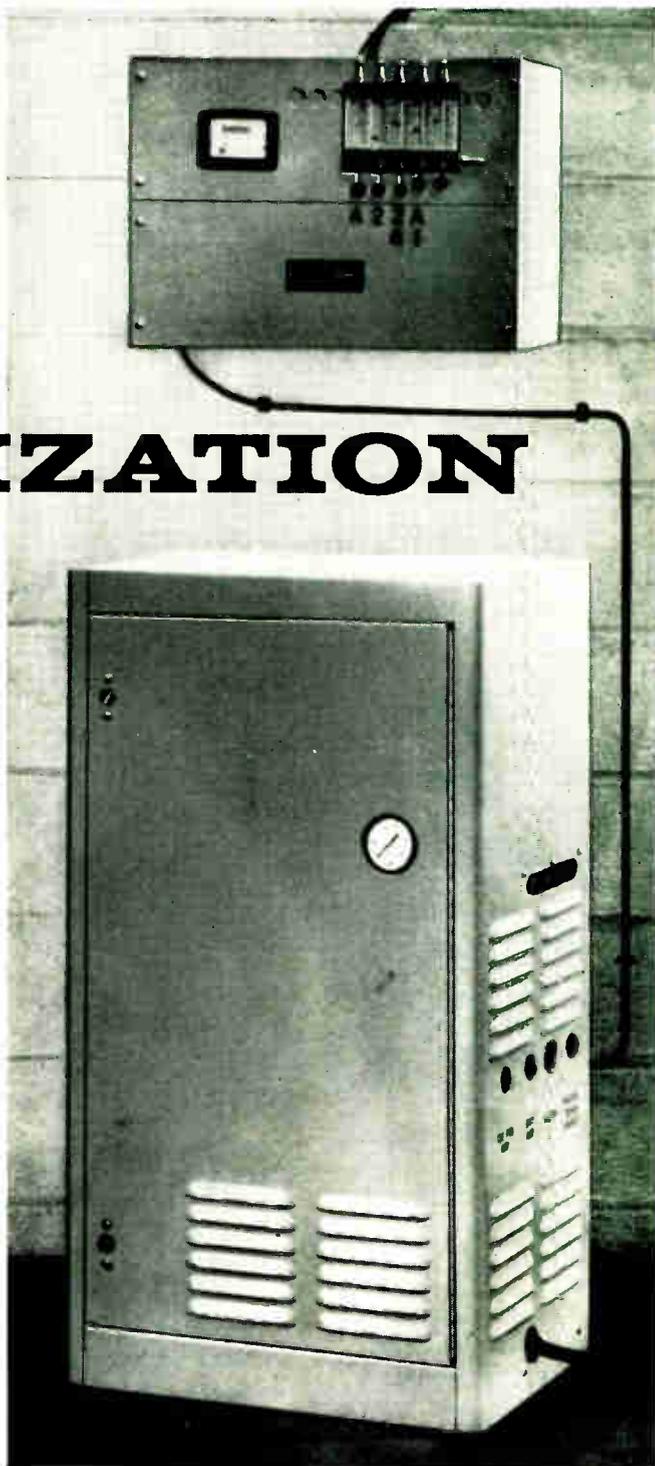


PRESSURIZATION

for your
entire cable
system at

**LOW
COST!**

Not so long ago, pressurization was only economical with high-revenue-earning toll and trunk cables. Today Puregas equipment from Automatic Electric puts pressurization of *your entire cable system* right within your budget. Pressurization gives warning of damage to cable sheaths *before* service is disrupted, and before moisture has had time to penetrate. This means repairs can be handled on a routine basis, during normal working hours, so maintenance costs are kept extremely low. They're kept low for another reason too. With dry air pressurization, *you only need locate and clear the larger leaks*. Puregas equipment makes use of standard refrigeration components to provide continuous drying *with only one moving part*. It is so simple and so reliable it carries a 5-year guarantee, and many units in Canada and the U.S. have run for 10 or 15 years without attention. There are Puregas models to supply 500 or 7000 cubic feet of dry air per day.



Model 500—for small exchanges and toll cable stations.
Capacity is 500 cubic feet per day at 15 p.s.i.

call or write any Automatic Electric office for
illustrated literature.

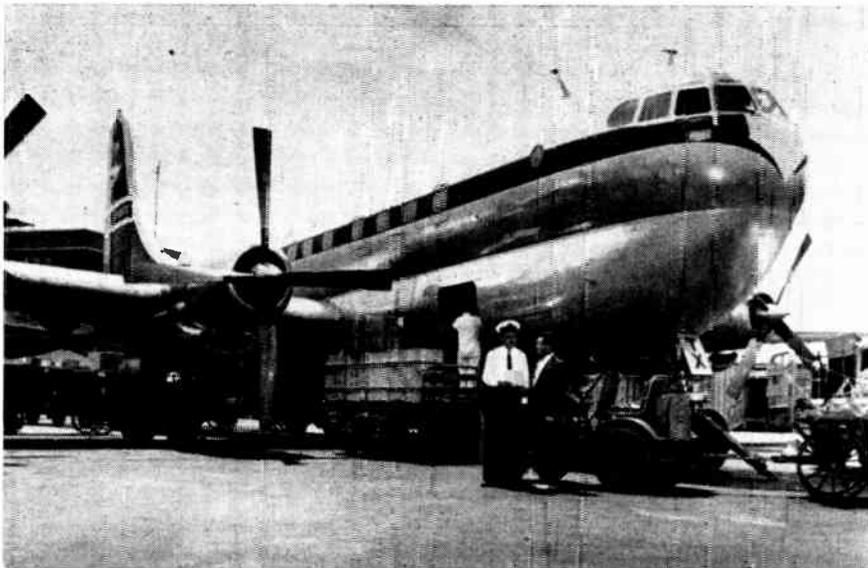
Automatic Electric Sales (Canada) Limited, 185 Bartley Drive,
Toronto 16, Ontario. Branches in Montreal, Ottawa, Brockville,
Hamilton, Winnipeg, Regina, Edmonton, Vancouver.

AUTOMATIC ELECTRIC
SALES (CANADA) LIMITED



5952

For complete details check No. 11 on handy card, page 61



The above photograph shows Ron Price, Toronto manager of Instronics Limited, Stittsville, Ontario, taking delivery of eight tons of Racal communications equipment at Montreal Airport on June 23rd last. The aircraft was leased for the shipment from the British Overseas Airways Corporation and the delivery represents what is thought to be the largest single air shipment of electronics equipment from the United Kingdom.

D. R. Taylor elected to board of directors

A. Bandi, president, Aviation Electric Limited has announced that D. R. Taylor has been elected to the board of directors and appointed vice-president of the company effective July 1, 1959.



D. R. Taylor

Mr. Taylor is a graduate electrical engineer (McGill University) and has devoted his entire career to the aviation industry. He joined the company in 1952 and has held the position of sales manager and director of the engineering products division. In his new position, Mr. Taylor will continue to head the activities of the Engineering, Manufacturing and Sales and Service departments in addition to his new duties as vice-president.

CNT senior appointments announced

Three senior appointments of Canadian National Telegraphs officials at Toronto and Winnipeg are announced by John R. White, general manager.

Harold J. Clarke, general superintendent, western region, is moved from Winnipeg to Toronto as assistant general manager-staff. Replacing him

at Winnipeg is M. L. Prentice, superintendent, Ontario district. Mr. Prentice's successor here is Fred H. Beauchamp, eastern region plant superintendent.

Sigma announces new Canadian representative

Sigma Instruments, Inc., manufacturers of sensitive relays and electromagnetic devices, has appointed the D. T. Shaw Co. as a sales representative. Their main office, located at 2340 Lucerne Road, Montreal 16, will represent Sigma in Quebec, the Maritime Provinces and Eastern Ontario. The D. T. Shaw branch office in Toronto, managed by F. H. Peters, will cover all of Ontario west of Kingston. The Toronto office address is P.O. Box 33, Weston Post Office. Sigma Instruments, Inc., located at South Braintree, Mass., now has a total of 33 representatives in the United States and Canada.

Canadian firm awarded British contract

A Canadian firm has been awarded a major contract by a British company in connection with the manufacture of the new United Kingdom-Canada telephone cable.

Canadian Industries Limited has received an initial contract from Submarine Cables Ltd., of Southampton, England, for over two million pounds of specially formulated polythene

resin for use in the cable. A C-I-L spokesman said the polythene will be used both as the primary insulant and for protective sheathing. The new cable will be lighter and more flexible than the one currently in use. Two-way repeaters will be used, which will do away with the need for a separate return cable.

The cable is a joint project of Canadian Overseas Telecommunications Corporation and the British Post Office. Manufacture of the cable will begin soon with laying to commence in 1961. C-I-L manufactures polythene resin from Alberta natural gas at its Edmonton plant.

Burroughs appoints new Toronto branch manager

F. X. McCarthy is the new manager of the Toronto branch office of Burroughs Adding Machine of Canada, Ltd., J. L. Rapmund, general manager of the electronic and business machine firm, announced recently.

McCarthy, a 25-year veteran with Burroughs, succeeds the late Alex Whitelaw, for many years manager of the Toronto office.

TIME PLEASE



The above photograph shows a TMC GPT-10,000 (AN/FRT-39) transmitter as supplied and installed by TMC (Canada) Limited at the Canadian Government's Department of Transport Radio Transmitter site located near Ottawa, Ontario, for the Dominion Observatory. The key personnel involved in the handover of this installation, are (right to left in the picture) — V. E. Hollinsworth, Chief Radio Engineer, Dominion Observatory, George Adamson, Supervisor, DOT Transmitter Station, Ottawa, and A. G. Sheffield, Sales Manager, TMC (Canada) Limited, Ottawa.

business briefs and trends

★ More and more radio and electronic components and sound reproduction products are being exported from the United Kingdom each year and the trend is continuing. Exports for the first nine months of 1958 were in the neighborhood of £15 million.

* * *

★ Peffer Sound Systems, Ltd. of Kitchener, Ontario, have recently been awarded a \$70,000 contract for microphone and inter-communication installations in Hamilton's new city hall.

* * *

★ Canadian engineering technicians and technologists were told at a recent meeting by L. D. Dougan, P.Eng., vice-president, operations, Polymer Corporation Limited that despite reports to the contrary inflation is not a necessary price for increased productivity. Mr. Dougan told the gathered technicians that "we are now beginning to realize that it's time to go back to work after experimenting for years with organization charts and other such gimmicks." Mr. Dougan noted that "if all the books that have been written these past twenty years on organization were stretched end to end we could walk to the moon and there'd be no need for rockets".

* * *

★ Old-fashioned horse sense still should guide investment decisions even in this scientific era, a leading manufacturer of electronic semi-conductors has told the Security Analysts Society of Chicago. Warren B. Hayes, vice-president, operations, Pacific Semiconductors, Inc., Los Angeles, cautioned the analysts that hard-headed business judgments should be applied to even the most "glamorous" of technical ventures. "These technical ventures are business and, as such, must make good in the marketplace in order to qualify as attractive investment opportunities."

* * *

★ Running counter to the flow of United States electronic equipment that is being imported into Canada, a Toronto company headed by a 31-year old Canadian electronics engineer has broken into the U.S. high fidelity and stereophonic market. Clairtone Sound Corporation Ltd. made its first shipment of stereophonic sets to the U.S. March 12. "We received the initial American order for our stereophonic models on February 18," states Mr. Peter Munk, B.A.Sc., P.Eng., president and co-founder of the company. Less than a year ago the company didn't exist.

* * *

★ British defense authorities have indicated that, rather than depend entirely on the United States for the development of rockets, Britain intends to go ahead with development work on her own intermediate range ballistic missile, the Blue Streak. According to U.K. officials the Blue Streak which is being developed by de Havilland Aircraft Company and which has a reported range of 2,200 miles is more suited for British conditions.

* * *

★ The Bell News reports that pay-as-you-see television has come closer to realization in the Toronto area with the signing of a contract between the Bell Telephone Company and Famous Players Canadian Corp. Limited, August 7. J. J. Fitzgibbons, president of Famous Players and W. H. Cruikshank, vice-president and general manager of the Bell Telephone's Toronto area signed an agreement whereby the Bell Telephone Company during the next few months will install some 84 miles of cable in Etobicoke to make the new type of commercial-free television possible.

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. 42

Radionics Limited take on SEI lines

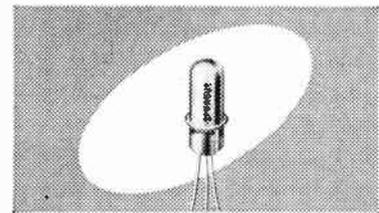
Radionics Limited have announced their appointment as exclusive representative, in Eastern Canada and Manitoba, for Southwestern Industrial Electronics Co., division of Dresser Industries, Inc.

Montreal Section, IRE elects officers

The Montreal Section of the IRE recently elected its officers for the coming year. These are as follows: Chairman — Ray Lumsden, Bell Telephone Co. of Canada; Vice-Chairman — Robert Wallace, RCA Victor Co. Ltd., Tube Division; Secretary — Harry H. Schwartz, president of Electrodesign; Treasurer — Douglas Watson, Engineering Department of Northern Electric Company.

E. S. Gould Company Canadian reps.

E. S. Gould Sales Company, 353 St. Nicholas St., Montreal, Que., Canada, has been appointed factory representative for all of Canada by the Communications Equipment Division of The Hallicrafters Company.



Type 2N393 High-Speed, High-Gain Germanium Micro-Alloy Transistors

Especially designed for modern high-speed computer circuitry, Sprague's Type 2N393 Micro-Alloy Transistors combine high gain with excellent high frequency response. Thus they are particularly well-suited for extremely high-speed switching applications in the megacycle range.

SPRAGUE®

CANADIAN MANUFACTURING REPRESENTATIVE

Micarta Fabricators Limited

18 Toronto Street
Toronto, Ontario

Phone EMpire 8-4251

For complete details check No. 58

ELECTRONICS ENGINEER SEISMOLOGICAL DIVISION DOMINION OBSERVATORY - OTTAWA \$6,360 - \$7,320

There is an immediate opportunity in Ottawa with the Dominion Observatory for an Electrical Engineer or Engineering Physicist with specialization in electronics to design and construct Electronic Seismological Equipment.

Write today for additional information and application form to Civil Service Commission, Ottawa, quoting competition 59-1160.

For complete details check No. 25 on handy card, page 61

CLIP AND MAIL THIS COUPON



COMMUNICATION MASTS

Please send complete information on the following masts I have checked.

- SINGLE MASTS for heights up to 300 feet.
- H MASTS for heights up to 250 feet.

for AM-FM Broadcasting HF-VHF-UHF Communications VHF-UHF Television

- PORTABLE ALUMINUM MASTS for heights up to 150 feet.
- VERTICAL RADIATORS for heights up to 300 feet.

We will design and manufacture custom made masts and towers to suit your specific requirements.

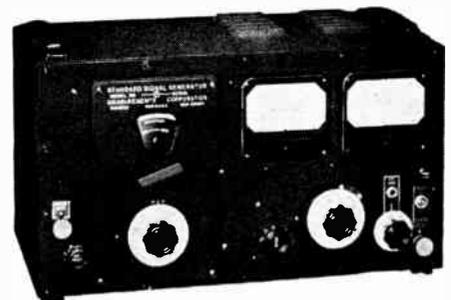
NAME.....
COMPANY.....
ADDRESS.....

467

BEATTY BROS. LIMITED FERGUS, ONT.

For complete details check No. 14 on handy card, page 61

MEASUREMENTS' Standard SIGNAL GENERATORS



MODELS 80 AND 80-R 2 TO 475 Mc

FEATURES:

- Completely self-contained.
- Direct reading scales and dials; individually calibrated.
- Convenient microvolt and DBM output scales.
- Accurate indication of output voltages at all times and at all levels.
- Low residual FM due to hum and noise.
- Provision for external pulse modulation.

Write for Bulletin

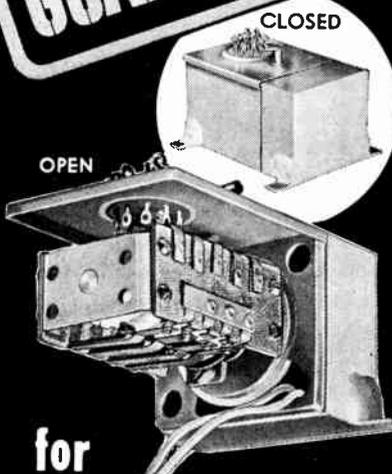
Laboratory Standards



MEASUREMENTS
A McGraw-Edison Division
BOONTON, NEW JERSEY

For complete details check No. 43

GUARANTEED



for
100,000 CYCLES
and
800,000 BREAKS

NEW
miniaturized
solenoid actuated
CAM SWITCH

- ✓ Hermetically sealed
- ✓ Extremely compact, light weight
- ✓ "Reliability engineered" for guaranteed performance
- ✓ Shock & vibration tested in conformance with MIL-E-5272A
- ✓ Operates 24 to 30 volts, DC, at 125°C ambient
- ✓ Rating, 1 amp.
- ✓ Size, 1 3/4" x 1 2 1/32" x 2 3/4"
- ✓ 7-pole, 18-position shorting with interrupter and homing

Designed to meet standards for guided missile systems, this new Cam Switch is typical of special designs by Tech Labs which can be easily adapted to specific needs. Write for complete data.

TECH
LABORATORIES, INC. PALISADES PARK,
NEW JERSEY

For complete details check No. 65

Standard Wire appoints two vice-presidents

Expansion plans at Standard Wire and Cable Limited have prompted creation of two new vice-presidencies. Standard president Edmund S. Rose announces the appointment of Geo. W. Vogan, vice-president in charge of sales and Geo. V. Taylor vice-president of manufacturing operations.

Both Mr. Taylor and Mr. Vogan joined Standard Wire and Cable Limited at the time of the company's founding and have played essential roles in establishing Standard's position as an important producer of wire and cable for the public utility and construction industries.



G. W. Vogan



G. V. Taylor

Mr. Vogan has acquired intimate knowledge of Canada's wire and cable market throughout a 24 year wire sales career. He is well known in the industry from coast to coast.

Mr. Taylor's wire manufacturing background extends over 20 years. In his career he has established a reputation for original design of wire and cable products and of special-purpose cable making machinery as well. He originated certain cables in common use today.

Mr. Taylor will now have the responsibility for co-ordinating Standard's growing machine-building requirements and for overall supervision of product output. Mr. Vogan will direct the company's sales and distribution network across Canada.

Cesco distributes Philco transistors

Canadian Electrical Supply Co. Ltd. has been appointed the exclusive distributor of Philco transistors for the Province of Quebec.

Philco has a complete line of high precision transistors which are designed primarily for industrial use. They feature high quality, reliable performance, stability of operation and long life.

CESCO will carry complete stocks of this line permitting fast deliveries at all times.

TI
SEMICONDUCTORS
ANYWHERE
IN
CANADA
OVERNIGHT
FROM
Lafayette Radio



Your Authorized
TI Distributor

- ONE YEAR GUARANTEE BY TI
- USE-PROVED BY THOUSANDS OF CUSTOMERS

Complete line of Texas Instruments semiconductors and components now available at factory prices in the following quantities:

1-999

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

1-499

sensistor silicon resistors

1-99

tan-TI-cap tantalum capacitors



Call or wire...

Lafayette Radio

Department TI-B
110 Federal Street
Boston 10, Massachusetts

HUBBARD 2-7850 TWX BS-4474

For complete details check No. 66

KAY Precision Electronic INSTRUMENTS



NEW
Kada-Sweep
300

Fundamental frequency sweeping oscillator providing sweep radar IF's between 1 and 260 mc center in wide-band ranges set to your order. Up to 30 crystal-controlled marks completely isolated from circuit under test also set to order. RF output 0.5 V rms into nom 70 or 50 ohms (higher for lower frequency units) AGC'd constant to within ± 0.5 db over widest sweep. True zero base line produced on scope during retrace time **\$795.00**



NEW
Vari-Sweep
MODEL 400

High output all-electronic broadband sweeping oscillator. Fundamental frequency. Continuous, 15-470 mc, in 10 overlapping bands, sweep widths to 30 mc. Direct reading dial. Output 1.0 V rms into 70 or 50 ohms to 220 mc, 0.5 V to 470 mc, AGC'd flat to ± 0.5 db over widest sweep through range. **\$795.00**



Vari-Sweep
MODEL IF

A *Vari-Sweep* with Markers — a complete alignment instrument 4-120 mc in six overlapping bands. RF Output: 1.0 V rms into 70 ohms, held constant by fast acting AGC. Continuously variable pip marker 2-135 mc; up to 11 pulse markers set at customer's specs. Continuously variable sweep width from kc to as much as 40 mc. Direct reading individually calibrated frequency dial. Fundamental frequency, 4-120 mc. Complete with 11 crystal markers...**\$985.00**



Mega-Node Sr.

Calibrated random noise source for measurement of noise figure and receiver gain and for the indirect calibration of standard signal sources. Frequency Range: 10-3,000 mc, output impedance 50 ohms unbalanced into type N connector. Noise Figure Range: 0-20 db. Meter Calibration: Logarithmic in db noise figure; linear in dc ma.... **\$790.00**



Mega-Sweep
111-A

Beat frequency oscillator providing sweeps continuously variable from 50 kc to 40 mc wide in two bands, 10-500 mc and 400-900 mc. Sweep rate variable around 60 cps with line 'lock-in'; RF output from 0.07 to 0.15 V rms into nom 70 ohms, blanked for true zero reference. Calibrated dial shows center frequency. Negligible leakage; low harmonic distortion....**\$595.00**

WRITE FOR KAY CATALOG
All prices f.o.b. Pine Brook, N. J.

**KAY
ELECTRIC
COMPANY**

Maple Ave. Pine Brook, N.J.
Dept. EC-9 Capital 6-4000

For complete details check No. 41

ELECTRONICS AND COMMUNICATIONS, September, 1959

Seabreeze Mfg. Co. expands facilities

Completing a major modernization and expansion project, Seabreeze Manufacturing Limited of Toronto will move all business and manufacturing facilities from the two buildings it now occupies on River Street to a new plant at 66 Jutland Avenue, Etobicoke, early in August.

The new plant has over 60,000 square feet of floor space and is located on five acres on Jutland Ave. in the Queensway-Islington Ave., area.

This wholly-owned Canadian company is the only manufacturer of tape recorders and record changers in Canada in addition to producing stereophonic sound systems and pre-recorded stereophonic tapes, record players, high fidelity equipment, AM and FM radio tuners and components, transistor radios, electric fans, fan heaters and electric ironers and fractional HP motors. These motors are for company use and the industrial market.

WORLD'S FIRST



The above photograph shows a demonstration of what is claimed to be the world's first transistorized radio tuner, the "Tune-A-Dyne", designed especially to convert any phonograph, including the least expensive model, into a radio-phonograph combination. Models other than the Seabreeze 1960 line would require only the addition of a plastic well to make the conversion. Shown above holding the "Tune-A-Dyne" is Arthur K. Tateishi, president of Seabreeze Manufacturing Limited.

The "Tune-A-Dyne" has four transistors using 3 RF stage for high sensitivity. It has an audio stage for high output and a built-in antenna.

250 amp.

(HALF WAVE)

SILICON
RECTIFIER

50 to 400

Peak Inverse Volts



by

Tarzian

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

Write for complete information.

SARKES TARZIAN, INC.
Rectifier Division

DEPT EC-4, 415 N. COLLEGE AVE.
BLOOMINGTON, INDIANA

IN CANADA: 700 Weston Road, Toronto 9
Tel. ROger 2-7535

EXPORT: Ad Auriema, Inc., New York City

For complete details check No. 55

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 61. Just mark the products you are interested in on the coupon on Page 61 and the information will be in your hands within a few days.

TV-FM sweep generator

Item 2421

Now available from Stark Electronic Sales Company, Ajax, Ontario, is the new STARKIT Model SWG-58 TV-FM Sweep Generator designed for use in alignment of receivers for TV, FM, and VHF. It is useful in checking the RF and IF circuits, both tuners and amplifiers, traps, discriminators, etc., within the range of 2 MC to 260 MC.



Sweep width is continuous from 0 to 12 MC on all frequencies and incorporates phasing and blanking control. When combined with its twin, the STARKIT Model MHG-48 Marker Generator, and an oscilloscope, accurate response curves may be obtained.

Further details available by writing Stark Electronic Sales Company, P.O. Box 240, Ajax, Ontario, Canada.

"OJ" carrier telephone system

Item 2422

The "OJ" carrier system, developed by the Northern Electric Company, has been designed for medium haul 12-channel open-wire operation, capable of installation on the same wires as type "OA", "C" or similar types, and on the same pole line as type "J" or similar systems. It is designed for circuit lengths of up to 500 miles, and is intended for the same field of use as type "J". Like "J" carrier, it is not suitable for use on the same line as type "OB", "OC" or "OD" systems except over short distances.

It has one frequency allocation only, 40-88 k.c. for the W-E direction and 100-148 k.c. for the E-W direction of transmission.

Field tests of the "OJ" system over a six month period showed that crosstalk from the "OJ" system into adjacent "J" type carrier systems could not be detected above the normal background noise in this equipment. Crosstalk into "OJ" carrier system was well within Bell System requirements and generally much lower than that experienced between other "J" type systems.

The "OJ" carrier system is considerably more flexible than type "J", in its ability to connect directly to "O" and "ON1" systems at baseband frequencies. It can be dropped in 4-channel groups at a repeater point, a 4-channel "OJ" carrier terminal having been developed for this application. The 12-channel terminal can be supplied partially equipped, and later expanded to full capacity as required. The "OJ" open-wire system can also be easily extended over radio links.

For further details write Northern Electric Company Limited, P.O. Box 6123, Montreal, Que.

Weatherproof revolution counter

Item 2423

Weatherproof sealing is featured in a small, 7-digit, non-reset, add-subtract revolution counter announced by the PIC Automation Controls Division of General Controls Co., 8072C McCormick Blvd., Skokie, Ill.

The new counter is totally enclosed in die cast case with window. Available sealed for outdoor use or unsealed. Also available with adaptor for flexible shaft drive where flexibility in positioning counter is required. Adds 10 counts per forward shaft revolution; subtracts same ratio per reverse revolution. Speeds to 10,000 CPM. Available top coming or top going shaft revolution; right or left shaft extension. Length, 2-19/32; width with mounting feet, 1 1/4; height, 1-13/64. Literature on request.

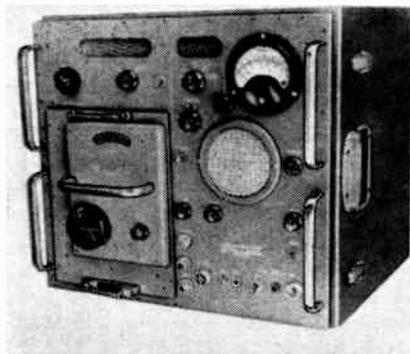
Available in Canada through General Controls Co., Canadian Ltd., 171 Surrey Street, Guelph, Ontario.

Noise and field intensity meter

Item 2424

Empire Devices Products Corporation of Amsterdam, N.Y., has announced the completion of the design of Model NF-112 Microwave Noise and Field Intensity Meter.

The Model NF-112 incorporates the same design concepts as the almost universally used and accepted Model NF-105 which covers the frequency range below 1 KMC.



The Model NF-112 not only provides superior performance, but does so with greatly simplified circuitry and construction which results in a drastic reduction in size and price. It is intended to meet both military and commercial requirements for noise and field intensity measurements in the range of 1-10 KMC/s.

Additional information available from the Canadian representative, Instronics Limited, P.O. Box 51, Stittsville, Ontario.

Normally closed inertia switches

Item 2425

Inertia Switch, Division of Safe Lighting, Inc., New York, N.Y., announces it now has available single pole, double-throw, or single pole, triple throw, miniature inertia switches actuated by acceleration, deceleration, impact, and/or shock. Acceleration sensitivity can be adjusted from less than 1g to over 100g's with an accuracy of 1%.

Choice of contact arrangements: momentary, latching with mechanical re-set, latching with electrical re-set, or latching with negative g re-set; in all contact

arrangements, except for electrical re-set, no electrical power is required.

Constant performance is maintained over: -65° F. to 250° F.

Directional choice: uni-directional, bi-directional, or omni-directional in any one plane.

Response time (to open): Less than one millisecond.

Cross-axis sensitivity: 0.25% per g.

Weight: 1.75 ounce.

Standard length: 1.698" — diameter 5/8".

Guaranteed for 10,000 reliable cycles of operation.

Can survive shock loads superior to 100 g's and extreme vibration without damage.

Miniaturized and other special models can be designed for specific requirements.

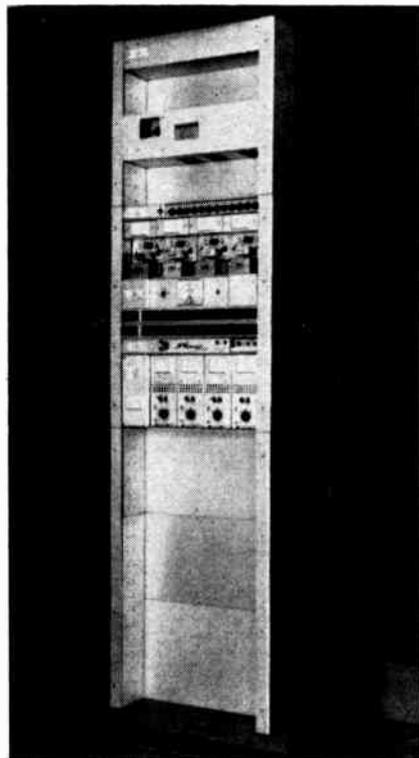
Additional information from Inertia Switch, Division of Safe Lighting, Inc., 527 Lexington Ave., New York 17, N.Y., U.S.A.

Telegraph and data carrier system

Item 2426

New Lenkurt Type 23A Datatel, a versatile telegraph and data carrier system, has been announced by Automatic Electric Sales (Canada) Limited.

Available options include all standard loop arrangements. Where loop length is not excessive, the loop may be operated from the 48-volt central office battery. Bridging or branching arrangements are simplified by optional panels.



Type 23A Datatel can be operated end-to-end or back-to-back with Western Electric Type 43A telegraph systems without use of auxiliary coupling units.

This equipment is fully transistorized and operates from either 48 or 130 volt DC supply. For more information contact Automatic Electric Sales (Canada) Limited, 185 Bartley Drive, Toronto 16, Ontario.

New Products

Miniature plugs

Item 2427

A new miniature MS series of Cannon plugs is now in production at Cannon Electric Canada Limited. Designated "KM", the new miniature is designed and qualified to MIL-C-25955.

Developed for applications in aircraft, missiles and equipment, the new KM features crimp-type, snap-in contacts to eliminate the soldering process and to facilitate field servicing. Contacts are crimped prior to insertion and then snapped into the zytel monobloc insulation with a special contact insert on tool. A special moisture-sealing Neoprene grommet also eliminates potting the connector.

Included in the new aluminum-shell KM series are four basic endbell styles — short, straight, 45° and 90°. These may be used in any combination — on either plug or receptacle — to fit special space requirements. Hermetically sealed receptacles are also available.

These new miniature plugs cut wiring time up to 80 per cent.

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

Delay line kit 120

Item 2428

Valor Instruments Inc., 13214 Crenshaw Blvd., Gardena, California, announces the availability of a new delay line kit. This kit has been designed for maximum versatility for the development engineer. It



consists of five lumped constant delay lines of 0.1, 0.2, 0.3, 0.4, and 0.6 US delays with .05, .06, .07, .08, and .09 US rise times respectively. The delay lines may be used individually or they may be series connected to give any delay from 0.1 microseconds to 1.6 microseconds. For further details write: A. Deskin Sales Company, 6875 Fielding Avenue, Montreal, Quebec, Canadian Sales Representatives.

Engineering design manual

Item 2429

A new 94 page 8½ x 11 size engineering design manual TA21 OG is offered by TA Mfg. Corp., 4607 Alger Street, Los Angeles 39, California. This manual describes a most complete line of standard clamps, line supports, brackets, and shims in a wide variety of shapes and sizes.

Included in the manual are many labor and cost saving installation techniques for all types of electronic, hydraulic and mechanical harnessing problems. Complete information on standard extreme high and low temperature insulating materials plus data on chemical resistance is supplied as an aid for all designers. Over 400 illustrations are used in easy to read perspective style, with weight charts on popular items.

This manual is designed with a fully illustrated index for quick visual reference, and also includes preprinted sketch sheets to save time and simplify design.

A free copy of this design manual may be obtained by writing to: TA Mfg. Corp., 4607 Alger Street, Los Angeles 39, Calif., U.S.A.



HANDBOOK OF AUTOMATION, COMPUTATION AND CONTROL Vol. 2: Computers and Data Processing

Edited by E. M. GRABBE, SIMON RAMO, and DEAN E. WOOLDRIDGE, *Thompson Ramo Wooldridge Inc.* Full details on design of analog and digital computers, and their applications in science, engineering, business. The latest volume in a complete, practical treatment of all aspects of automation and control. 1959. 1093 pages. \$17.50. Vol. 1, Control Fundamentals, 1958. 1020 pages. \$17.00. Vol 3, Systems and Components, *In Press.*

MASERS: Molecular Amplifiers

By J. R. SINGER, *University of California.* The first book on quantum mechanical amplifiers, with applications to radar and other forms of amplification. Summarizes years of research and unifies material on induced emission amplifiers. 1959. 147 pages. \$6.50.

SERVOMECHANISMS AND REGULATING SYSTEM DESIGN Vol. I, Second Edition

By HAROLD W. CHESTNUT and ROBERT W. MAYER, both of *General Electric.* Revised to include latest developments. Starts with basic mathematics, describes nature of physical principles involved, then proceeds to solutions of advanced designs. 1959. 680 pages. \$11.75.

ELECTRONIC CIRCUIT THEORY: Devices, Models, and Circuits

By HENRY J. ZIMMERMANN and SAMUEL J. MASON, both of *M.I.T.* Primarily methods of analysis, stressing the model concept. Uses a generalized theory approach, rather than treating separate theories to meet specific conditions. 1959. 564 pages. \$10.75.

JUNCTION TRANSISTOR ELECTRONICS

By RICHARD B. HURLEY, *University of California.* An answer to the ever-growing need for a book on truly basic knowledge involved in studying characteristics and circuit applications of transistors. 1958. 473 pages. \$12.50.

CIRCUIT THEORY OF LINEAR NOISY NETWORKS

By HERMANN A. HAUS and RICHARD B. ADLER, both of *M.I.T.* Explores a rational approach to the characterization of amplifier spot-noise performance. Based on a single hypothesis, this approach avoids pitfalls previously associated with the effect of feedback on noise performance. A *Technology Press Research Monograph, M.I.T.* 1959. 79 pages. \$4.50.

LINEAR NETWORK ANALYSIS

By SUNDARAM SESHU and NORMAN BALABANIAN, both of *Syracuse University.* A mathematically precise treatment, unifying steady state and linear transient analysis, using thoroughly modern methods, philosophy, and point of view. 1959. 571 pages. \$11.75.

ANALYTICAL TRANSIENTS

By T. C. G. WAGNER, *University of Maryland.* Intensive coverage of the mathematics, broadening the Laplace transform into a more general discussion based upon the Fourier transform. Imparts a sense both of the limitations and applications of this calculus. 1959. 202 pages. \$8.75.

Now available from

UNIVERSITY OF TORONTO PRESS • Toronto, Ontario

New Products

Impedance bridge

Item 2430

The Type 1650-A Impedance Bridge is a highly accurate instrument for the measurement of the inductance and storage factor, Q, of inductors, the capacitance and dissipation factor, D, of capacitors, and the AC and DC resistance of all types of resistors. This bridge replaces the popular Type 650-A Impedance Bridge, offering wider range and better accuracy.

The Type 1650-A bridge has completely new electrical and mechanical design. Five separate bridge circuits give flexibility and wide range.



One important feature of the Type 1650-A is Orthonull, an exclusive new mechanical-ganging device which facilitates measurement of low-Q inductors (or high-D capacitors). Orthonull adds convenience and accuracy and makes easy many low-Q measurements that are practically impossible on other impedance bridges.

The bridge is completely self-contained and portable, with battery-powered, low-drain, completely transistorized oscillator and detector. The unique cabinet design provides a handle and a captive protective cover. With the case open, the bridge panel can be held firmly at any desired angle.

The Type 1650-A Impedance Bridge is equally useful in the laboratory and in the shop. For limit testing, a test jig (Type 1650-P1) is available, which provides a rapid and efficient method of connection in front of the bridge.

This instrument is the product of General Radio Company, 275 Massachusetts Ave., Cambridge 39, Mass., U.S.A.

Overload relay

Item 2431

Stegg Electric Ltd., Belleville, Ontario, announces the development of a unique 400 cps overload relay. This particular unit is designed to interrupt the 115 volt input to an airborne equipment when the load exceeds 35 amperes. When so actuated, a 28 volt DC supply is connected to the relay, keeping it energized until a reset circuit is operated. Normally such a function requires two relays with interlocking armatures.

This unit is claimed to be a major contribution to the Canadian electronics industry, especially as it has 100 per cent Canadian content. In addition to the electrical features outlined above, it is designed to pass the usual environmental conditions encountered in airborne applications.

Further details on this overload relay may be obtained from the sales office — Lake Engineering Co. Limited, Scarborough, Ont.

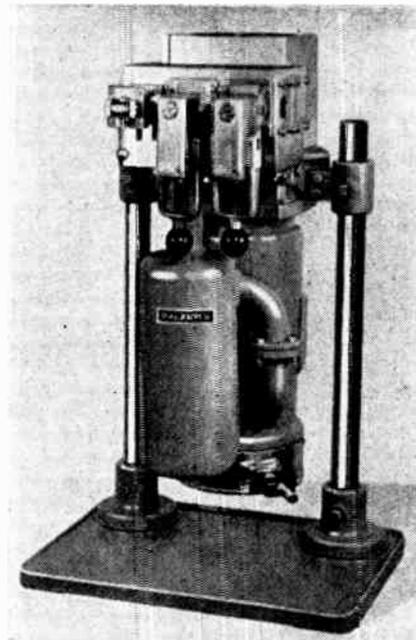
"Packaged" high vacuum pumping system

Item 2432

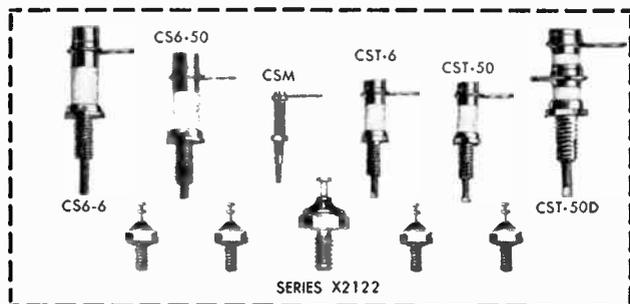
Users of high vacuum pumping systems can now obtain "Building Block" component units that, when assembled, will produce a complete tailor-made system at standard unit costs. Philips Electronic Industries Ltd. have available these all-

metal high vacuum pumping systems in a wide range of pumping speeds and ultimate vacuums down to 5×10^{-7} mm Hg.

The purchaser has a choice of mechanical and oil diffusion pumps, baffles, gauges and combinations of hand and solenoid operated valves.



These systems have been designed to give compactness, versatility and foolproof operation to allow them to be used for a wide range of industrial applications. Complete information can be obtained by writing to the Research and Control Instruments Group, Philips Electronics Industries Ltd., 116 Vanderhoof Avenue, Toronto 17, Ontario.



Shown 1/2 actual size

CAMBION® capacitors ...mighty midgets

CAMBION miniaturized capacitors outperform capacitors several times their size. Their unusual tuning elements practically eliminate losses due to air dielectric and result in wide capacity ranges. Among CAMBION Variable Ceramic Capacitors, Type CST-50 is only $1\frac{1}{8}$ " high mounted, yet its capacity range is 1.5 to 12.5 MMFD's. Ranges of other CAMBION capacitors vary from 0.5 minimum to 25 maximum MMFD's.

CAMBION X2122 Stand-Off Capacitors with ceramic dielectric are exceptionally rugged RF by-pass capacitors for use in high quality electronic equipment. Encapsulating epoxy resin assures rigidity and durability under extreme shock, vibration and humidity. Available in 6 standard values; over-all mounted height under $\frac{3}{8}$ ".

Supplied complete with mounting hardware, all CAMBION capacitors have single mounting studs with locking devices for securing tuning elements. Like all CAMBION components their quality is guaranteed in any quantity ordered. For further details, write to Cambridge Thermionic of Canada, Ltd., Montreal, P. Q.

For complete details check No. 19 on handy card, page 61



Give
generously
to your
United
Appeal

SYSTEMS ENGINEER - ELECTRONICS

\$6,360 - \$7,320

DEPARTMENT OF NATIONAL DEFENCE (NAVY)

OTTAWA

This is an opportunity to design and develop naval equipment for digital or analogue systems.

If you are an Electrical Engineer write today for additional information and application form to the Civil Service Commission, Ottawa, quoting competition 59-1163.

For complete details check No. 26 on handy card, page 61

New Products

Telephone type relay

Item 2433

Two design changes in a Potter & Brumfield popular telephone type relay have significantly increased its operating life, according to a statement made by a spokesman for Potter & Brumfield Canada Ltd. A new stainless steel hinge pin and riveted contact pusher pins have extended the useful life of the LS relay to hundreds of millions of operations.

A recently concluded test showed the new structure's ability to carry 10 milliamps well over 160 million operations. Test results on sixteen 4pdt relays in a self-cycling chain showed only one miss over the entire 160 million cycles.

Measurements made on the relays after every 50 million operations indicated excellent stability. Critical adjustments such as overtravel, contact gap and contact pressure remained well within original adjustment limits throughout the entire test.

The LS can be equipped with up to 20 contact springs. Standard sensitivity is 65 milliwatts per movable arm but for special applications 35 milliwatts per movable can be supplied. Bifurcated contacts are rated at 4 amps, 115 volts, 60 cycles for resistive loads.

4pdt. relays measure 2 3/8" long x 1 1/2" wide x 1 1/2" high and weigh about 3 ozs. For additional information write the **Technical Information Department, Potter & Brumfield Canada Ltd., Guelph, Ontario.**

Phase-sequence indicator

Item 2434

Determinations of the phase sequence can be carried out easily and exactly with the new Siemens phase-sequence Indicator. This light and handy pocket instrument — available through The Ahearn and Soper Company Limited in Ottawa — is housed in a sturdy case and contains a small induction motor consisting of three electromagnets displaced against each other by 120 degrees. A round metal disc pivoted



above the magnet poles. When the instrument is connected to three-phase current, the magnet poles generate a rotating field driving the disc. The rotation of the latter can be observed through the window of the instrument.

Technical Data

Voltage Range 100 to 250 volts, momentarily up to 500 volts.

Frequency Range, 50 to 500 cps.

Power Consumption at:

100 volts, 50 cps about 0.5 VA per conductor

500 volts, 50 cps about 2 VA per conductor

Test Voltage 2 kilovolts.

Dimensions 3 1/4 x 4 x 1 1/2 inches.

Additional data available from The Ahearn and Soper Company Limited, 384 Bank St., Ottawa 4, Ontario, Canada.

Dissipation resistor

Item 2435

The Wind Turbine Company of Canada Limited announces the TRYLON Type TDR-150 High Frequency Dissipation Resistor for outdoor all-weather operation as a dissipation and terminating resistor for Rhombic Antennas in the 5-30 mc range. The resistor is of the lossy delay line type and matches the 600 ohm output impedance of Rhombic antennas. The center of the balanced impedance is grounded.

The unit is small and can be mounted on the Rhombic supporting pole or tower. Having a power handling capacity of 15 KW, the unit is suitable for operation with 30 KW transmitters.

The resistor is useful as a Dummy Load if operated with R.F. ammeters. The all-stainless steel construction provides a durable non-radiating unit.

For further information, write The Wind Turbine Company of Canada Limited, 145 Lucan Street, Waterloo, Ontario.

Solid state subcarrier oscillators

Item 2436

Solid State Subcarrier Oscillators, manufactured by Arizona Telemetering Corporation of Phoenix, Arizona, are of the voltage sensing frequency modulation type and may be used for the measurement of positive and negative DC and/or AC voltages.

The fundamental circuit employed is a transistorized L-C oscillator with a novel method of producing frequency modulation that allows the Artelco subcarrier oscillators to "stand out front" in dynamic linearity. A band pass filter is included. These units are encapsulated to meet rigid vibration, shock, static acceleration and humidity specifications and have an approximate weight of 150 grams.

For further information write to the exclusive Canadian Representatives of Arizona Telemetering Corporation — Mel Sales Limited, 1969 Avenue Rd., Toronto 12, Ontario.

Continued on page 49



When you buy
SPRINGS
SERVICE
COUNTS

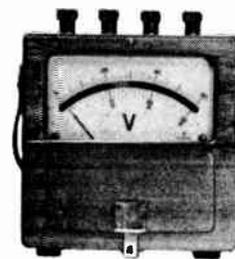
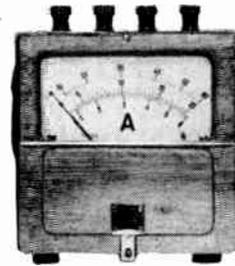
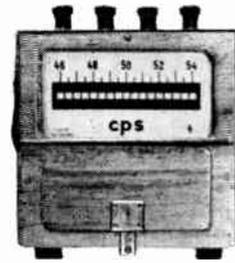
As well as the general headings covered by "SERVICE" such as delivery on schedule, modern manufacturing facilities, etc., Bohne Industries offer their customers Precision Spring Making Experience—gained over the years. You can benefit from this experience—send your specifications, blueprint or sample for quotation.

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

For complete details check No. 16 on handy card, page 61

SH
SIEMENS
 MEASURING
 INSTRUMENTS

A complete outfit of electrical measuring instruments for all applications in workshops, laboratories, test-rooms etc. can be assembled from our Multi-purpose Bench-type and Portable Test Instruments.



PORTABLE TEST INSTRUMENTS

BENCH-TYPE INSTRUMENTS

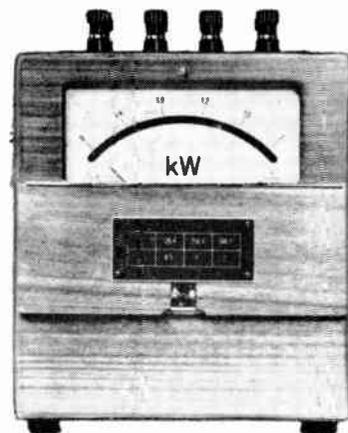


We also have in standard production:

Precision instruments

*Indicating and recording
 switchboard instruments*

Instrument transformers



MS 90 E
 AS-59-22



A&S... stands for Assured Satisfaction

THE AHEARN AND SOPER COMPANY LIMITED

384 Bank Street • Ottawa • Canada

Representing

SIEMENS & HALSKE AKTIENGESELLSCHAFT

BERLIN · MUNCHEN

For complete details check No. 2 on handy card, page 61

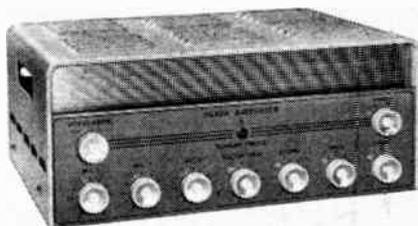
New Products

Public address amplifiers

Item 2437

Designed and manufactured by Northern Electric Company, Belleville, Models PA-35A and PA-75-A, 35 and 75 watt portable amplifiers are intended for medium and high powered sound systems. Each amplifier has the same size and appearance and although they are portable, they can be rack or wall mounted if desired.

Four input channels, with individual volume controls, as well as other desirable features which include bass and treble controls, effective only on Phono Channel, are provided, while microphone channels are equipped with a speech filter with three different settings to compensate for all normal speech requirements.



The units are light in weight and small in size, which makes for easy handling.

Distributed by Dominion Sound Equipments Limited, 4040 St. Catherine St. W., Montreal, Canada.

Crystal oven uses snap-action thermostat

Item 2438

Croven Limited, Whitby, Ontario, announces further development in a crystal oven holding fifteen miniature crystals (type HC-18/U holder) with temperature controlled by a single Stevens Snap-action Thermostat.

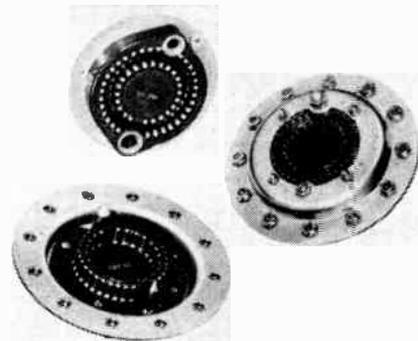
Greater reliability and increased life are assured through the more positive action of the snap-action thermostat. The marked improvement in oven temperature stability is contributed largely to the almost negligible amount of thermal aging.

Further details available from Croven Limited, 628 Kent Street, P.O. Box 1420, Whitby, Ontario, Canada.

Circular rack and panel connector

Item 2439

A new Amphenol circular 54 contact rack & panel style connector has been designed for multi-circuit applications in vapor-sealed equipment.



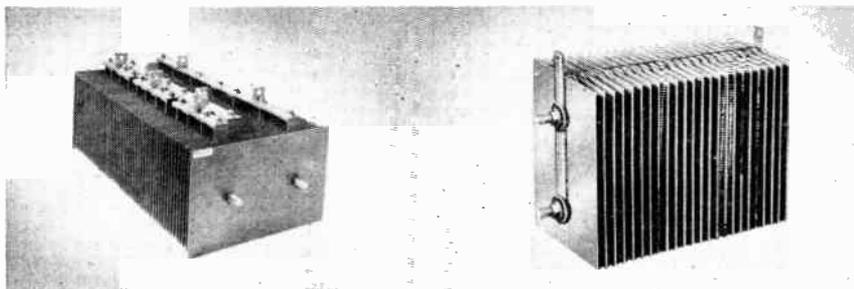
Designated part numbers 26-260 (plug) and 26-261 (receptacle), this connector has ribbon contacts to provide high contact reliability with very low insertion and withdrawal force needed. Connector current rating is 5 amps, and the voltage rating of 300 volts DC at 60,000 feet altitude.

For further information write to: Amphenol Canada Limited, 349 Carlaw Avenue, Toronto 8, Ontario.

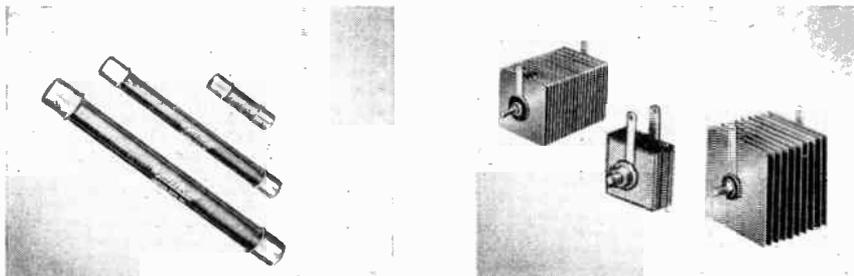
SYNTRON

SELENIUM RECTIFIERS

designed for your application



Industrial Power Rectifier Stacks — high efficiency, low maintenance. Designed for arc welders, heavy d.c. power supplies, etc.



Cartridge Rectifier Stacks — low current, high voltage. Maximum 25 milliamperes, maximum input 15,000 R.M.S. volts.

Commercial Rectifier Stacks — Designed for business machines, elevator controls, magnetic chucks, brakes, clutches, vibratory equipment.

provide higher d-c output for given a-c input because of lower forward drop.

SYNTRON Selenium Rectifier cells are manufactured by a unique vapor deposit vacuum process and quality control method to provide rectifiers of extreme uniformity, long life and stability.

Years of successful industrial and commercial application have proven their dependability and quality.

SYNTRON Selenium Rectifiers are noted for these outstanding characteristics — low voltage drop, low leakage current, low temperature rise and cell uniformity for long stack life.

SYNTRON builds rectifier stacks for every application — from industrial Power Stacks with 12" x 16" cells, down to low current, high voltage cartridge type stacks.

SYNTRON Selenium Rectifiers provide high efficiency, low maintenance and longer life to every application.

SYNTRON Selenium Rectifiers are made in Canada

Write for free informative literature

SYNTRON (CANADA) LIMITED

928 Queenston Road

Dept. "K"

Stony Creek, Ontario

For complete details check No. 64 on handy card, page 61

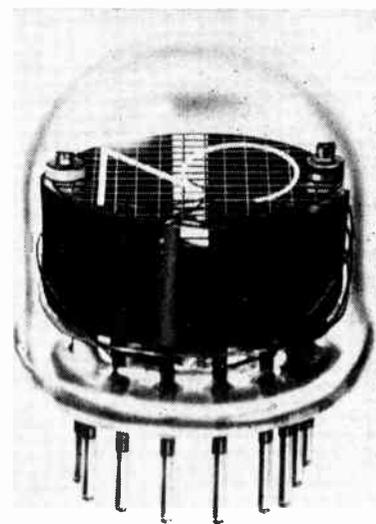
New Products

All-electronic indicator tube

Item 2440

Production of a new ultra long life Nixie® Indicator Tube with life of more than 10,000 hours has been announced by the Burroughs Corporation, Electronic Tube Division, Plainfield, New Jersey. Called the Type B-5031, the new tube is the first of a series of ultra long life Nixies to be made available in production quantities. The series will consist of a line of tubes which correspond with all of the regular types of Nixie® Indicators; the Miniature Type 7009, the Standard Type 6844-A, the Super Type 7153 and the Jumbo Type BD-307.

The B-5031 is an all-electronic indicator which presents the ten numerals (0 through 9) in a common in-line viewing area. It is similar in mechanical and electrical characteristics to the Standard Type 6844-A. The only change which is required to make the tubes interchangeable is a reduction in the value of series anode resistance under rated operating conditions.



In addition to its extremely long life, the new tube retains the features which have made Nixie® Indicators the most popular of readout devices. Typical of these features are: all electronic; wide angle readability; low power; brightness of presentation under all ambient light conditions; rugged design; simple circuit.

For further information on this new long life indicator write to **Burroughs Corporation, Electronic Tube Division, P.O. Box 1226, Plainfield, New Jersey, U.S.A.**

Telemetry keyer

Item 2441

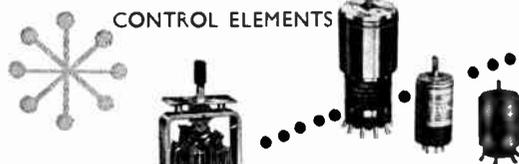
Rotary Devices Corp. has developed a new subminiature pulse width modulator or "keyer" for use in missile or other telemetry systems. The keyer converts an amplitude modulated pulse sequence to a pulse series of constant amplitude and variable width. The output pulses are suitable for modulating a sub-carrier oscillator or RF transmitter. The keyer is characterized by low linearity error, relative insensitivity to phasing of input synchronizing pulse and overall simplicity and reliability.

Specifications include: 1. Input impedance of 5 megohm shunted by 68 uuf; 2. Linearity error less than 1%; 3. Output amplitude 5 volts P-P maximum; 4. Dimensions approximately 3.6 x 1.4 x 2.0.

For additional information, contact: **Rotary Devices Corp., 30 Jay Street, Englewood, New Jersey, U.S.A.**

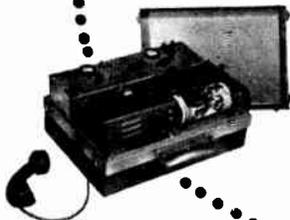
Continued on page 53

CONTROL ELEMENTS



MUIRHEAD

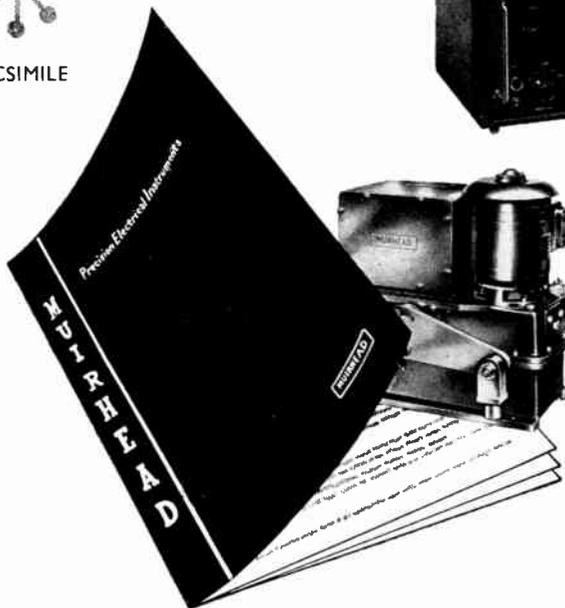
CATALOGUE



INSTRUMENTS



FACSIMILE



This 8-page abridged catalogue is intended as an introduction to the Muirhead range of precision products. It contains abridged specifications and descriptions of Muirhead Analysers, Oscillators, A.C. Bridges and associated equipment; Tuning Forks; Laboratory Equipment and Precision Components; Control Units and Facsimile Transmission Equipment. It is available without charge and will be mailed upon request.



MUIRHEAD INSTRUMENTS LTD · STRATFORD · ONTARIO · CANADA

399 2ca

For complete details check No. 44 on handy card, page 61

for an entirely new
range of time delays

delay intervals:

$\frac{1}{10}$ to 5 seconds

recovery rate:
extremely rapid

specify sturdy, thoroughly
field-tested

**G-V HOT WIRE
TIME DELAY RELAYS**



Series H

Over two years of successful field service in electronic, aeronautical and industrial equipment prove these new G-V relays to be dependable, efficient and accurate.

- Adjustable Delay even though hermetically sealed
- DC or AC of any frequency for energization
- Small and Light. $\frac{3}{4}$ " diameter, $2\frac{3}{8}$ " length. Weight: 1 oz.
- Wide Ambient Range compensated from -70°C to 100°C or higher
- Continuous Energization without damage
- Available in 7-pin Plug-in and Flanged designs

G-V Write for Pub. No. 35 — engineering data and drawings
G-V CONTROLS INC.

LIVINGSTON, NEW JERSEY
Represented in Canada by:
LEONARD ELECTRIC, LTD., 346 Bering Ave., Toronto 18
For complete details check No. 34 on handy card, page 61

UNFALTERING D.C. POWER



Pylon static converters. Model CX-48, connected as main and automatic standby generators, provide a dependable source of 24V and 130V battery power at locations equipped with 48V battery.

Write for information on Pylon static converters and 60 c/s inverters for communications service.



PYLON ELECTRONIC DEVELOPMENT company, Ltd.
Communications Systems and Equipment

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

For complete details check No. 20 on handy card, page 61
ELECTRONICS AND COMMUNICATIONS, September, 1959

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
CANADA ILLINOIS TOOLS LTD.
67 Scarsdale Rd.
Don Mills, Ontario

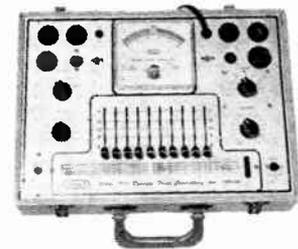
Exclusive Sales Agents

CONSTELLATION COMPONENTS LTD.
136 Tower Drive, Toronto
17041 Omega Place
St. Genevieve, Montreal
L1-C

For complete details check No. 51 on handy card, page 61

NEW!

**Dynamic Trans-Conductance
TUBE
TESTER KIT**



MODEL 9-99

With its simplified controls, fast-acting roll chart, self-cleaning lever switches and $4\frac{1}{2}$ " meter with multi-colour "Good-Replace" scale, the STARKIT Model 9-99 will quickly and efficiently test the ever-increasing number of tubes used in Radio, TV, etc. Each tube is tested under dynamic conditions closely resembling the actual operating conditions of a tube. Every kit is complete with easy-to-follow FRENCH/ENGLISH assembly and operating instructions complete with pin-up style pictorial and schematic diagrams.

Ask for the new
STARKIT Catalogue.

See us at the I.R.E.
Show, October 7 to 9
... Booth 230

KIT \$69.95

WIRED \$99.95

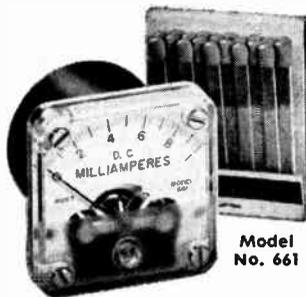


STARK ELECTRONIC SALES CO.
AJAX ONTARIO

For complete details check No. 60 on handy card, page 61

**ADAPTABLE
FOR ALL
APPLICATIONS**

Hoyt Panel Meters



New series for limited space installations. Front opening — 1½" class — 2% accuracy — standard mounting dimensions — front zero adjustment. In DC ranges from 100 microamps; and self-contained rectifier types, VU, and voltmeters up to 300 v.

Be sure of the highest accuracy, dependability, and readability — *plus economy* — with HOYT precision electrical instruments. Moving coil, rectifier, and repulsion types available in a wide variety of sizes, ranges, cases, and colors — many with parallax-free, mirror scales . . . the *complete* Line of matched AC and DC Panel Meters for original equipment or replacement use. Also, custom-designed (including 50-2000+ cycle applications) to meet your most rigid specifications.

Prompt Delivery — M/A Forms mailed on day of shipment.

Service Facilities — strategically located in Canada.



Write Export Manager — new illustrated literature contains descriptions, engineering data, and prices.



ELECTRICAL INSTRUMENTS

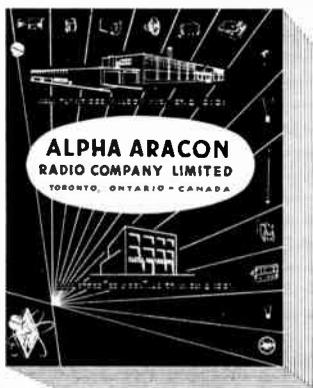
Sales Div.: BURTON-ROGERS COMPANY
42 Carleton Street, Cambridge 42, Mass., U.S.A.

For complete details check No. 18 on handy card, page 61

FREE! 350 page catalogue

Canada's most complete Buying Guide to electronic equipment for Industry, Communications and Research. Thousands of items listed, illustrated and indexed in this complete reference catalogue. Our experienced staff is always ready to serve and assist you in the selection of the right equipment for your special needs at either of our locations.

Ample free parking.



Name

Company

Address

City Prov.

ALPHA ARACON RADIO COMPANY LIMITED
555 Wilson Avenue, Downsview, Ontario.
Branch Office: 29 Adelaide St. W., Toronto

For complete details check No. 4 on handy card, page 61

NEW!

**Multi-Range
MULTIMETER
20,000 Ohms/Volt**

A finely crafted multi-meter engineered to provide accurate test readings from .6 to 6000 DC volts in 7 ranges. The recessed control switch with deep finger pockets and thumb-operated ohms adjust control provide the means of making quick test readings. Housed in a tough, hard-wearing bakelite case with clear-view meter face and easy-to-read dial plate, this unit's features makes it the ideal instrument for both field and bench work.



MODEL MK-3

**NOW
AVAILABLE!**

A completely revised catalogue designed to provide you with full technical specifications on every STARKIT unit . . . yours upon request.

See us at the I.R.E Show, October 7 to 9
... Booth 230

Wired and Calibrated only
\$39.95



STARK ELECTRONIC SALES CO.
AJAX ONTARIO

For complete details check No. 61 on handy card, page 61

**SMALLER - LIGHTER - STRONGER
ARROW-HART Appliance Switches**



**A COMPLETE
RANGE**

For vacuum sweepers, fans, power tools, etc., and radio and electronic equipment.



Send for your free copy of our new catalogue Z-10



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

For complete details check No. 8 on handy card, page 61

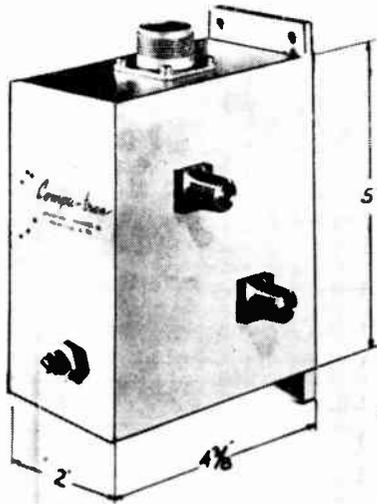
New Products

Differential pressure transmitter

Item 2442

A new zero setting differential pressure transmitter has been announced by the International Resistance Co. Ltd., Toronto. Known as the Model 70-2900, it features 0.2 per cent measurement accuracy, infinite resolution, and zero output pre-set at any point throughout the range.

The shock resistant differential pressure transmitter is suitable for corrosive atmospheres and is available in standard pressure ranges of from 0-100 to 0-3000 psi with differentials up to 100 per cent of range. Inputs available are 6.3 volts or 110 volts AC, and full scale outputs available are 50MV-DC or 5V AC or DC. Sensing element of the unit is a differential transformer with a built-in demodulator for DC outputs.



Differential sensitivity of 1 part in 1000 or better can be readily obtained. Zero point (output at 0 differential) may be readily set in the field under operating conditions.

For further information write to the International Resistance Co. Ltd., 349 Carlaw Avenue, Toronto 8, Ontario, Canada.

Fibre tote boxes

Item 2443

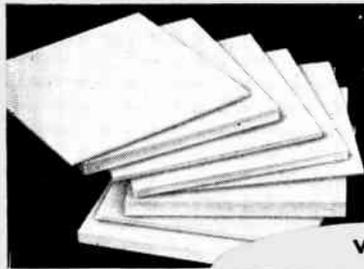
Containers play an important role in plant parts handling. Many times, efficiency can be greatly improved through the proper selection of such materials handling aids as tote trays and boxes. A prominent plastics fabricator has reduced handling costs by installing custom-built Kennett vulcanized fibre tote boxes to handle parts between machining operations.

The new Kennett tote boxes, manufactured by National Fibre Company of Canada, Ltd. solve the problems of parts identification, wasted space, delay and worker fatigue. As an aid to production control, tare weights are stenciled to the sides of the boxes, which range in size from 0.625 to 2.3 cu. ft. Handles at each end of the boxes make lifting safe and easy. Corners and edges are metal reinforced for strength and long life. Boxes are designed for multiple stacking.

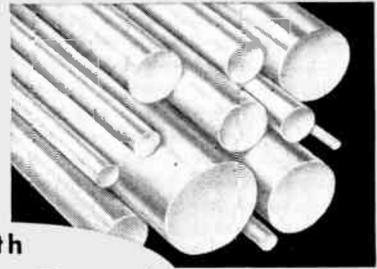
Kennett tote boxes are made of vulcanized fiber, a tough, long-lasting cellulose plastic. Weighing considerably less than metal or wooden containers, they carry heavier payloads and are more easily lifted, handled and moved. Their inherent resiliency cushions shock to protect contents from damage. They will not splinter, crack, dent, rust or corrode.

National Fibre Co. of Canada, Ltd., 107 Atlantic Avenue, Toronto, Ontario.

When You Do It Yourself

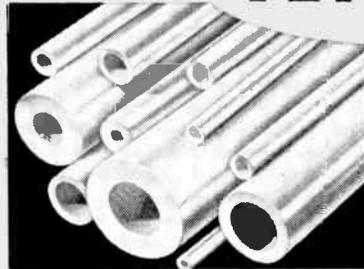


sheet

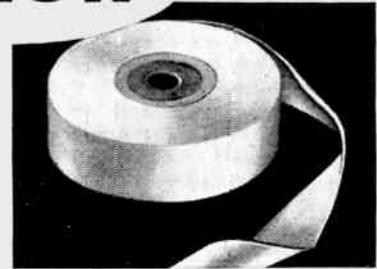


rod

with
TEFLON*



tubing



tape

start with

CHEMLON®

The Best In Teflon

It's a matter of good precaution—Getting the full advantages of this material depends largely on the processing ability of your supplier. He must meet *all* of these qualifications:

- 1 Fabricating experience, facilities and rigid quality control to supply a uniform, non-porous Teflon, free from any flaws, thus eliminating costly rejects or malfunction of your end product.
- 2 Dimensional accuracy—no matter what form you order, it should be carefully sized to industry specifications. Any waste of Teflon adds substantially to its cost, and corrective finishing in your own shop unnecessarily adds production time and expense.

Under the name, Chemlon, "John Crane" gives you full satisfaction on each of these points, plus engineering assistance on any problem you might have.

Contact "John Crane" about your specific needs.
Also ask for Bulletins T-110 and T-122.

Crane Packing Company, Ltd.
Box 134 - Station C, Dept. DCP
Hamilton, Ontario

*DuPont Trademark



MECHANICAL PACKINGS



SHAFT SEALS



TEFLON PRODUCTS



LAPPING MACHINES



THREAD COMPOUNDS

CRANE PACKING COMPANY, LTD.

OFFICES IN PRINCIPAL CANADIAN CITIES

For complete details check No. 29 on handy card, page 61

Prodelin - Prodelin EVERYWHERE...

It Makes You Stop and Think

Everywhere you turn, you see more and more Prodelin equipment being used for RF transmission. Coaxial cable, transmission line, connectors, antennas, and complete systems are all in heavy demand because of Prodelin's superior specs and performance . . . better price and delivery. Review your own needs and you'll see that Prodelin can do the job better for you!

Prodelin Spir-O-line® Spir-O-lok® SEMI-FLEXIBLE ALUMINUM COAXIAL CABLE & CONNECTORS



Whether your problem is weight, attenuation or power, Prodelin Spir-O-line does the job better. With Spir-O-line, you increase your system and aircraft range by reducing attenuation and weight. 1/2" Spir-O-line weighs only 12 lbs./100 ft. . . . handles 400 watts average power with a loss of only 4 DB/100 ft. at 2 KMC. 7/8" Spir-O-line weighs 34 lbs./100 ft. . . . handles 1 KW average power at 2 KMC. with a loss of only 2 DB/100 ft.

(PATENTS PENDING)

Prodelin Series 800 RIGID COAXIAL TRANSMISSION LINE



Ready to meet all demands, Prodelin rigid line is now available in Standard EIA copper, EIA lightweight aluminum and in aluminum with the new Spir-O-lok connectors. All lines feature the electrically transparent compensated pin supporting structure. This field proven feature allows peak powers which approach theoretical values. The 3 1/8" line can handle, at atmospheric pressures, peak powers of up to 3 megawatts with no additional pressurization.

New 4 1/4" line can handle 50 KW average power at 250 MCS, for great savings through less weight and smaller line size.

Prodelin MICROWAVE ANTENNAS



To complement its already famous line of microwave antennas, Prodelin makes available its unique antenna package for 6 and 7 KMC. The package incorporates Spir-O-line semi-flexible coaxial cable and Spir-O-lok connectors for low loss and easy installation. Available in 4, 6, 8 and 10 ft. antenna sizes the system is particularly recommended for use in passive reflector systems or on other short runs. The new system greatly reduces engineering time and component expense.

Prodelin 2-WAY MOBILE ANTENNAS



Prodelin's new series of VHF antennas include the ground plane, the unity gain coax, and the Omni-6. The Omni-6 is a collinear gain antenna designed to meet the need for a 6 DB gain antenna with a minimum of cost and wind loading. All antennas are corrosion resistant and terminate in type "N" connectors. All are capable of withstanding 100 MPH winds while giving superior performance. All connectors are protected by a metallic shield from installation damage and weather.

Send today for full performance data and specifications on the Prodelin line.

Prodelin stocks component parts, supporting hardware, and accessories for all lines.

DISTRIBUTED ON THE WEST COAST BY:
MAYDWELL & HARTZELL, INC.

San Diego • San Francisco • Los Angeles
Phoenix • Portland • Seattle • Spokane

For complete details check No. 49 on handy card, page 61



307 Bergen Avenue • Kearny, N. J.
Dept. EC-9

MANUFACTURER OF THE WORLD'S FINEST
ANTENNAS AND TRANSMISSION LINES

New Products

Metal-ceramic resistance element

Item 2444

A major breakthrough in resistance element design has been engineered by C. C. Meredith & Co. Ltd., Streetsville, Ontario, Canada. The element is produced by an unique process which fires a metal resistance path onto ceramic at temperatures exceeding 600°C. Because the element is very stable to 500°C, it is extremely reliable at the elevated temperatures currently demanded and anticipated in military requirements.



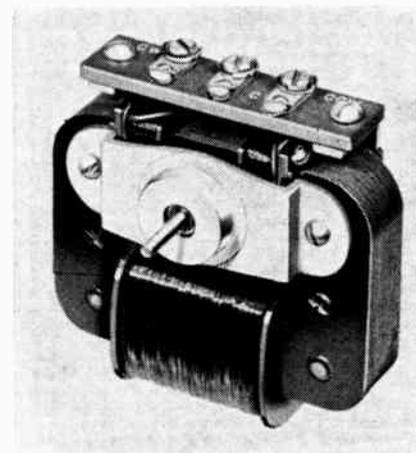
Current data indicates a temperature coefficient under 250 PPM/°C over a range of -63° to +150°C. Resistance range is from 10 ohms to 100K ohms per square. Designed for higher wattage ratings at elevated temperatures. Ceramic bases can be made in a wide variety of shapes and sizes. The metal resistance film can be made to cover an entire surface or an accurately defined pattern. Available for a wide variety of applications including a new C. C. Meredith line of CeraTrol's variable resistors and trimmer pots.

C. C. Meredith & Co. Ltd., Streetsville, Ontario, Canada.

AC tachometer generator

Item 2445

The Barber-Colman reversible shaded-pole motor fulfills the requirements of an AC tachometer or rate generator. With rated AC voltage applied to the main winding, a voltage is generated in the shading windings which is proportional to the speed at which the rotor is driven. Voltage is nearly linear from 1000 to 3000 rpm.



Generated voltage from a typical AYAE rate generator with low impedance shading coils (150 ohms) is two volts per thousand rpm and can be increased to ten volts per thousand using shading coils of higher impedance.

Write for data sheet F 9256, to the Canadian representative — John Herring & Company Ltd., 3468 Dundas St. West, Toronto, Ontario.

Continued on page 56

Introducing STARK "GOLD BRAND" METERS

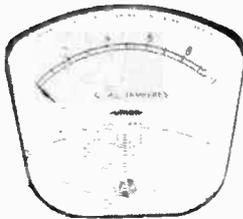
- Priced so low you will be able to include meters wherever necessary.
- Available in any size or range AC and DC to 2% accuracy.
- Rugged bakelite or clear plastic cases . . . round, square or edgewise.
- Complete technical information available now . . . ask Stark Sales.

SEE US AT THE
I.R.E. SHOW
OCT. 7 to 9, Booth 230

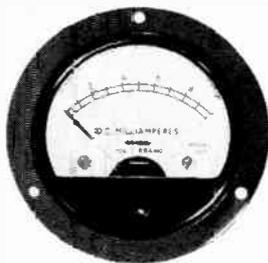
**STARK ELECTRONIC
SALES CO.**
AJAX, ONTARIO



Model 435 — 3 1/2" square



Model 135 — 3 1/2" fan shape clear plastic



Model 325 — 2 1/2" round

For complete details check No. 62 on handy card, page 61

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 1/8",
3/16", & 1/4".

**SALES
and
SERVICE**

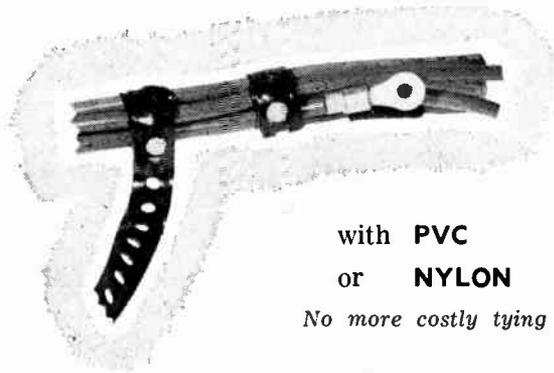
● **L. J. LAMB**
● Box 103, Weston, Ont.
● CH. 1-5830

For complete details check No. 1 on handy card, page 61
ELECTRONICS AND COMMUNICATIONS, September, 1959

CABLE STRAPPING

CAN NOW BE DONE

- Quickly
- Permanently
- Accurately

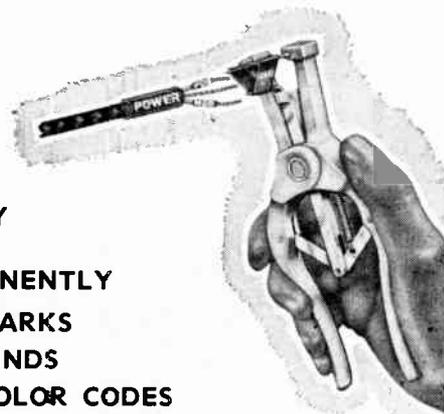


with PVC
or NYLON
No more costly tying

SEND FOR SAMPLES AND CATALOGUE

CABLE MARKING

PREVENTS ERRORS



**SAFELY
and
PERMANENTLY**

- MARKS
- BINDS
- COLOR CODES
- INSULATES
- Temperature ratings to 300°C.

If you have a cable strapping or marking problem . . . send today for samples and catalog to . . .

HELLERMANN CANADA LTD.
44 DANFORTH RD. TORONTO OX. 1-1131

For complete details check No. 37 on handy card, page 61

NEW SMALLER SIZE

Attractive Appearance

IRC 1/2 & 1 WATT COMPOSITION RESISTORS TYPE GBT

MANUFACTURED IN CANADA

Ask our IRC salesmen
about NEW GBT
Carbon Composition Resistors

WRITE TODAY FOR BULLETIN B-1

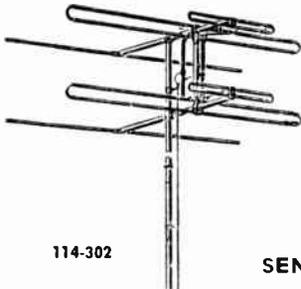


RESISTORS division of
Renfrew Electric Co. Limited

TORONTO • OTTAWA • MONTREAL • CALGARY

For complete details check No. 40 on handy card, page 61

ANTENNAS



114-302

SEND TODAY FOR BULLETIN 2217

TWIN LEAD



214-056

Good TV picture depends on the reliability of the entire set installation. AMPHENOL twin lead is the strongest link in any system, a guarantee of better picture quality. Several types of AMPHENOL twin lead are available for both indoor or outdoor use. AMPHENOL twin lead is supplied in easy to use hanks up to 100 feet; also reels of 500 and 1000 feet.

WRITE FOR COMPLETE CABLE CATALOG W-2

Sold by Leading Distributors from Coast to Coast



CANADA LIMITED

TORONTO • OTTAWA • MONTREAL • CALGARY

For complete details check No. 6 on handy card, page 61

New Products

RF Coil for automated assembly Item 2446

The Essex X-L Coil is a patented RF coil and transformer assembly, produced by a completely automatic, high-speed manufacturing process. It is designed for automatic or fast hand insertion into printed circuit boards.

The Essex X-L consists of a core and outer case molded into a single unit of rugged plastic, ideal for hopper tumbling. The mounting lugs are extensions of the coil itself . . . no separate soldered pieces to loosen or break. The coil has adjustable tuning and either one or two windings.

The X-L has a low-temperature coefficient for inductive drift of plus 50 parts per million per degree centigrade. Samples and literature available on request.

Inquiries from coil manufacturers interested in license agreements will be welcomed. Contact Essex Electronics of Canada, Trenton, Ontario.

Electronic circuit panel Item 2447

Siemens Electronic Circuit Panel GS-DMZ consists of the following components, mounted in a rack cabinet:

The DC Power Supply provides for setting any tension between 300 and 3000 V with an accuracy of 0.02 per cent.

The Amplifier is linear and non-blocking, its threshold sensitivity is about 0.5 mV, its amplification is variable in steps between the factors 2.5 and 10,000.

The Ratemeter is able to measure counting rates between 1×10^3 and 4×10^5 cpm in 9 measuring ranges with a precision better than plus minus 2 per cent.

Counter and Timer are of similar design, each comprising 6 electronic decade counting tubes and two binaries. For operating 15 various counts in the interval 1×10^2 — 4×10^6 and 13 time values in the interval 0.1 — 400 min., can be preset.

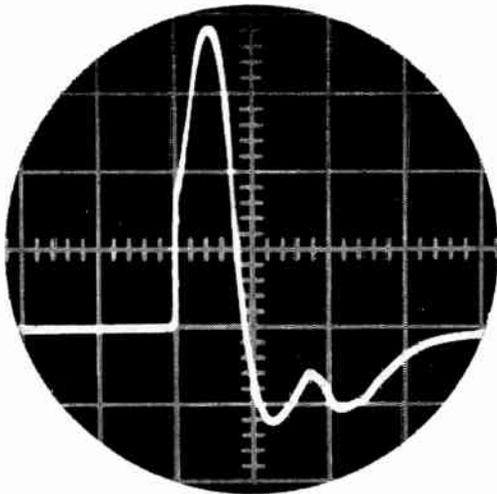


The P.H.A. provides an electronic means of discriminating against either low or high amplitude pulses, resulting in improved peak-to-background ratios with minimal loss of radiation intensity.

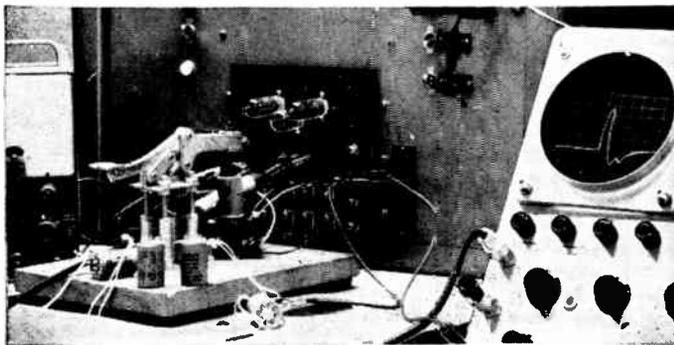
The Recorder "Kompensograph" is a high performance, electronically balanced strip chart instrument, the chart speed variable for 120/300/600/1200 mm per hour.

For detailed information write Viditon Corporation Limited, 384 Bank Street, Ottawa, a member of the Ahearn and Soper Group.

Continued on page 58



HAMMOND PULSE TRANSFORMERS



Test jig duplicating actual conditions the transformer will meet in service.



1. 0.65 μ Sec.
2. 0.6 μ Sec.
3. 0.5 to 2 μ Sec.

Strict conformation to mechanical and electrical specification is ensured by 100% inspection. Each Hammond Transformer is individually tested under working conditions in a duplicate of the circuit in which it will be used.

**These bulletins
are available
on request!**



- | | |
|---------|--|
| 4650 | 3 Phase Special Open Frame Transformers |
| 5023 | JCNAAF-T-19, MIL-T-27A |
| 5057 | Saturable Core Reactors |
| 5060 | Consoles |
| 5100 | Variable Condensers |
| 5106 | Miniature Transistor Mounting Dimensions |
| 5202/03 | Stock Transistor Transformers |

ELECTRONIC • INDUSTRIAL TRANSFORMERS

HAMMOND MANUFACTURING COMPANY LIMITED

H 10 GUELPH ONTARIO CANADA

For complete details check No. 36 on handy card, page 61
ELECTRONICS AND COMMUNICATIONS, September, 1959

**WHAT DO
YOU
WANT
IN A TESTING METER**



The
MODEL
8

AvoMeter

GIVES YOU ...

- Automatic cutout protection
- 20,000 ohms per volt movement
- 4 ac current ranges to 10 amps.
- 7 dc current ranges to 10 amps.
- 14 ac-dc voltage ranges to 2500 v.
- 3 resistance ranges zero to 20 megohms
- 4 easy-to-read scales
- polarity reversing button
- anti-parallax mirror
- external accessories for increased ranges.

ACCURATE • PORTABLE • LIGHTWEIGHT

R.H. Nichols LIMITED 542

4544 DUFFERIN STREET, TORONTO

TORONTO MAIL:
P.O. Box 500
DOWNSVIEW, Ontario

VANCOUVER
624 Vancouver Block
736 Granville Street

For complete details check No. 45 on handy card, page 61

PLAN NOW TO ATTEND
the Fourth Annual

IRE

CANADIAN CONVENTION AND EXPOSITION

Automotive Bldg., Exhibition Park, Toronto
3 Full Days—October 7, 8, 9, 1959

The Showcase of the Electronics Industry

Scientists! Engineers! Technologists!

- HERE IS YOUR once-a-year opportunity to see the latest developments in electronic and nucleonic science . . . displayed over an area of 120,000 square feet . . . by ONE HUNDRED AND SEVENTY of the world's leading manufacturers . . . representing Canada, United States and Overseas.
- HERE IS YOUR once-a-year opportunity to hear some of the world's outstanding experts read technical papers (more than 100 over the three days!) on electronics "today and tomorrow."
- THIS IS YOUR once-a-year opportunity to mingle with more than 10,000 other scientists, engineers and technologists in an exhilarating atmosphere of common interest.

REGISTER NOW!

Programme Sent to You on Request

IRE CANADIAN CONVENTION

1819 Yonge Street, Toronto, Canada

Telephones: HUDson 8-7768 and HUDson 1-3331

Sponsored by the Canadian Sections of the
Institute of Radio Engineers



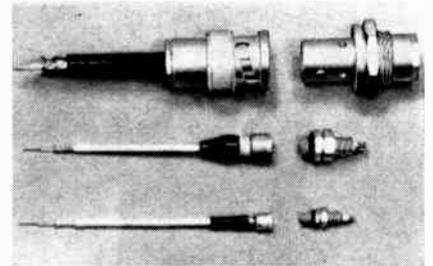
New Products

"Sub-microminiature" connector

Item 2448

What is believed to be the world's smallest coaxial connector has been developed by Microdot, Inc., of South Pasadena, manufacturers of micro-miniature connectors and cables for the electronic, electrical and missile industry.

The new "sub-microminiature" connector is 1/25th the over-all size of a standard BNC connector with 1/50th of the weight. In obtaining the extremely small size, there has been no sacrifice of Microdot's rugged construction and high performance standards. The new connector has recently completed extensive tests for vibration, V.S.W.R., and pull out and insertion ease.



President of Microdot, Clayton Triggs, states "This new development in miniature connecting units is an important addition to our standard line of micro-miniature connectors."

Samples and test data are available from: Microdot, Inc., 220 Pasadena Ave., South Pasadena, California, U.S.A.

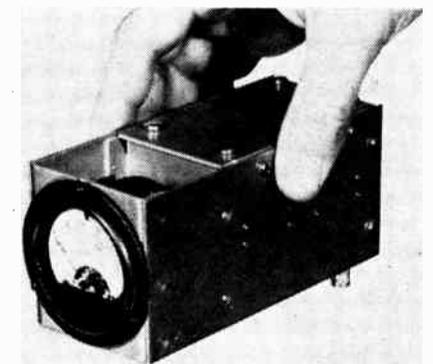
Electronic voltmeter

Item 2449

Model SPD-25, a new electronic voltmeter announced by Metronix, Inc., Chesterland, Ohio, is believed to be the smallest self-contained VTVM ever offered.

Designed to meet MIL-T-945A, Model SPD-25 is thus especially suitable for use in aircraft, missiles and ground support equipment. It operates on power of 400 cycles, 115 volts AC, single phase.

The new VTVM occupies panel space of only 2 3/4 by 2 1/2 inches and is less than 6 inches deep. It is held in place with the three meter screws, with only the meter bezel in front of the panel and the instrument case behind it.



Model SPD-25 is available in any range from 0/30 millivolts to 0/300 volts. The sensitivity of any unit can be changed, in effect, if an external attenuator is used.

Frequency response is 40 cps to 50 kc. Input impedance is 1 megohm, 15 uuf. Stability with 10 per cent change in line voltage is better than 2 per cent. Accuracy of the voltmeter is plus or minus 3 per cent.

Additional information available from Metronix, Inc., Chesterland, Ohio, U.S.A.

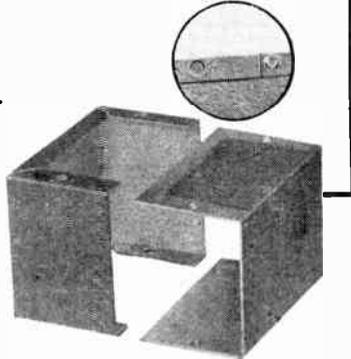
Continued on page 64

For complete details check No. 39 on handy card, page 61

There's extra efficiency
in these
NEW BUD PRODUCTS
and extra savings too!

MINIBOXES

for the first time . . .
miniboxes
with both
snap-lock
and
screw-type
fastening
at no extra cost



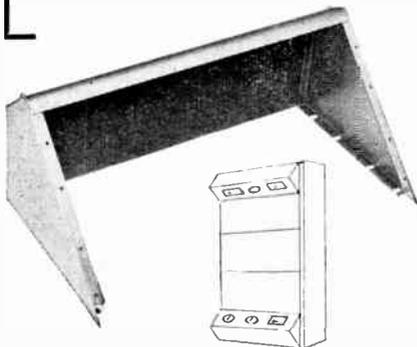
• A multipurpose aluminum box for use in the fields of communications and electronics. The design permits the installation of more components than is possible in other conventionally designed boxes of the same size.

Two-piece construction, each piece forming three sides. The two sections are held together by the engagement of four circular projections into four matching holes.

A unique mechanical principle enables these projections to be easily and quickly knocked out if screw type assembly is desired.

Flanges assure proper shielding. Four self-tapping screws furnished. Made of .031 aluminum. Available in 18 sizes.

DUAL-VIEW PANEL SUPPORT



occupies
no more
rack space
than the
size of the
supported
panel . . .
provides
oblique view
of instrument
panel

• 7" panel support requires only 7" of rack panel space while 10½" panel support requires only 10½" of rack panel space. Panel support cover may be removed for easy servicing on installation of instruments. It has attractive contoured edges. Heavy gauge steel construction. Available in choice of three finishes.

TENATRONICS, LTD.

Davis Drive, East Newmarket, Ontario
Exclusive Canadian Representative for



BUD RADIO, INC.
Dept. EC, 2118 East 55th Street
Cleveland, Ohio

For complete details check No. 17 on handy card, page 61
ELECTRONICS AND COMMUNICATIONS, September, 1959

NEW VOLTMETER

SELECTS TRUE R.M.S., AVERAGE
OR PEAK RESPONSE . . .
ENABLING CORRECT MEASURE-
MENT OF COMPLEX WAVES

This Bruel and Kjaer Model 2409 Electronic Voltmeter is provided with two damping characteristics . . . fast response identical to VU meters for audio work and high damping for low frequency work.

Extra DBM scale for transmission line work, referred to 1 milliwatt in 600 ohms.

Built-in Zener diode voltage standard for instant calibration check, with adjustment accessible at rear.

Response 2 cycles to 200 Kc with 0.2 DB accuracy. Range 10 millivolts to 1000 volts full scale, 2% accuracy.

Input impedance 10 megohms. Used as an amplifier, 60 DB gain in 10 DB steps, with 50 ohm output impedance. Distortion less than 0.2% at 10 volt output. Illuminated scale.

Accuracy of R.M.S. indication within 0.5 DB for signals with crest factors up to 5.



Dimensions 10" x 7" x 5".
Weight only 10 lbs.

Uses standard U.S. style tubes. Operates on 115 or 230 volts, from 50 to 400 cycles.

PRICE ONLY \$220.00

F.O.B. Toronto, sales tax extra.

Supplied complete with application manual,
two uxxx input connectors and line cord.



NOW IN STOCK
AT R.O.R.,
TORONTO and
MONTREAL

R-O-R ASSOCIATES LIMITED

1470 DON MILLS RD., DON MILLS, ONT.

TORONTO
Hickory 4-4429

TELEPHONE

MONTREAL
HUnter 1-0700

For complete details check No. 52 on handy card, page 61

NEW!

**POCKET
MULTIMETER**
20,000 Ohms/Volt



MODEL TM-7

Only 4 5/8" x 3" x 1 1/2" in size, this compact multimeter is equipped with a convenient thumb-operated ohms adjust control... fast action slider switch range control... crystal-clear meter face... easily read dial plate and heavy duty black bakelite case. Sensitivity: 20,000 ohms/volt DC; 10,000 ohms/volt AC.

NOW AVAILABLE!

A completely revised catalogue designed to provide you with full technical specifications on every STARKIT unit... yours upon request.

See us at the I.R.E. Show, October 7 to 9... Booth 230

Wired and Calibrated only
\$29.95



STARK ELECTRONIC SALES CO.
AJAX ONTARIO

For complete details check No. 63 on handy card, page 61

**FOR PRECISION LABORATORY OR
PRODUCTION TESTING**



**FREED 1110-AB
INCREMENTAL INDUCTANCE BRIDGE
AND ACCESSORIES**

Accurate inductance measurement with or without superimposed D.C., for all types of iron core components.

- INDUCTANCE — 1 Millihenry to 1000 Henry
- FREQUENCY — 20 to 10,000 Cycles
- ACCURACY — 1% to 1000 Cycle, 2% to 10KC
- CONDUCTANCE — 1 Micromho to 1 MHO
- "Q" — 0.5 to 100
- SUPERIMPOSED D.C. — Up to 1 Ampere
- DIRECT READING — For use by unskilled operators.

ACCESSORIES AVAILABLE:

1140-A Null Detector, 1210-A Null Defector — V.T.V.M.,
1170 D.C. Supply and 1180 A.C. Supply.

INSTRUMENT DIVISION

FREED TRANSFORMER CO., INC.

1716 Weirfield St., Brooklyn (Ridgewood) 27, N.Y.

Canadian Sales Agents: CONWAY ELECTRONIC ENTERPRISES
1514 Eglinton Ave. West Toronto 10, Ontario

For complete details check No. 33 on handy card, page 61

**HIGH
TEMPERATURE
CAPACITORS
BY BENDIX**

DESIGN FEATURES

Temperature Range... -55° to +315°C. Capacitance... 0.05 to 4.0 uf at 600 VDC. Voltage Range... 600 V to 3000 V per section. No Voltage Derating, Low Capacitance and Power Factor Variation, Environmental Resistant, Hermetically Sealed, Rugged Construction, Nonstrategic Materials, Minimum Size and Weight, High Altitude Operation.

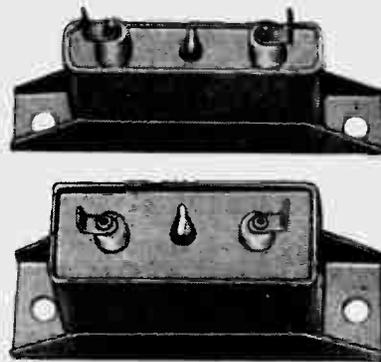
The E-315 capacitor offers proven stability of operation over the temperature range of -55° to +315° Centigrade* with no voltage derating and low capacitance variation. Of rugged hermetically sealed construction and nonstrategic materials, this capacitor is built for high altitude and severe environmental operation.

This nonpolarized capacitor is available in a variety of sizes in a capacity range of from 0.05 to 4.0 microfarads at 600 VDC. It is also available in higher voltage ratings. Performance data and operating characteristics are given in Technical Bulletin SL-61 which is supplied upon request.

*Confirmed by qualification test of 1000 hours at 100% rated voltage over ambient temperature range of -55° to +315° C.

Now Available
in Production Quantity

E-315



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

Scintilla Division

Sidney, New York



For complete details check No. 15 on handy card, page 61

APPLICATION FOR FREE SUBSCRIPTION

INDEX TO ADVERTISERS

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

Key No.	Page No.
1. Adcola Products Ltd.	55
2. Ahearn & Soper Co. Ltd.	48
3. Alford Mfg. Co. Inc.	66
4. Alpha Aracon Radio Co. Ltd.	52
5. American Electrical Heater Co.	34
6. Amphenol Canada Ltd.	50
7. Arnold Engineering Co.	2
8. Arrow-Hart & Hegeman (Canada) Ltd.	52
9. Automatic Electric Sales (Canada) Ltd.	35
10. Automatic Electric Sales (Canada) Ltd.	36-37
11. Automatic Electric Sales (Canada) Ltd.	38
12. Aviation Electric Ltd.	4
13. Bach-Simpson Ltd.	68-69
14. Beatty Bros. Ltd.	41
15. Bendix Aviation Corp.	60
16. Bohne Industries Ltd.	47
17. Bud Radio Inc.	59
68. Burndy Canada Ltd.	27
18. Burton-Rogers Co.	52
19. Cambridge Thermionic Corp.	46
20. Canada Illinois Tools Ltd.	51
21. Canadian General Electric Co. Ltd.	14
22. Canadian Lister Blackstone Ltd.	15
23. Canadian Marconi Co. Ltd.	3
24. Canadian Stackpole Ltd.	71
25. Civil Service Commission	41
26. Civil Service Commission	46
27. Computer Measurements Co.	16
28. Computing Devices of Canada Ltd.	6
29. Crane Packing Co. Ltd.	53
30. Daystrom Ltd. (Heath Div.)	Y7
31. Eitel-McCullough Inc.	7
32. Electronic Research & Development Co. Ltd.	64
33. Freed Transformer Co. Inc.	60
34. G-V Controls Inc.	51
35. General Radio Co.	72
36. Hammond Mfg. Co. Ltd.	57
37. Hellerman Canada Ltd.	55
38. Honeywell Controls Ltd.	18
39. I.R.E. Canadian Convention	58
40. International Resistance Co. Ltd.	56
41. Kay Electric Co.	43
42. Lampkin Laboratories Inc.	41

(Continued overleaf)

Please ADD my name to receive **ELECTRONICS & COMMUNICATIONS**.

Please CHANGE my address for mailings.

NOTE — Card must be completed in full to be valid.

My Name (Please Print)

Mail copies to my home, or business address as noted below.

Street

City Zone Prov.

If you have recently CHANGED your address please note former address here:

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.

9-59

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

- | | | | | | | | | | |
|-------------------------------|-------------------------------|-------------------------------|-------------------------------|-------------------------------|-------------------------------|-------------------------------|-------------------------------|-------------------------------|-------------------------------|
| <input type="checkbox"/> 2421 | <input type="checkbox"/> 2422 | <input type="checkbox"/> 2423 | <input type="checkbox"/> 2424 | <input type="checkbox"/> 2425 | <input type="checkbox"/> 2426 | <input type="checkbox"/> 2427 | <input type="checkbox"/> 2428 | <input type="checkbox"/> 2429 | <input type="checkbox"/> 2430 |
| <input type="checkbox"/> 2431 | <input type="checkbox"/> 2432 | <input type="checkbox"/> 2433 | <input type="checkbox"/> 2434 | <input type="checkbox"/> 2435 | <input type="checkbox"/> 2436 | <input type="checkbox"/> 2437 | <input type="checkbox"/> 2438 | <input type="checkbox"/> 2439 | <input type="checkbox"/> 2440 |
| <input type="checkbox"/> 2441 | <input type="checkbox"/> 2442 | <input type="checkbox"/> 2443 | <input type="checkbox"/> 2444 | <input type="checkbox"/> 2445 | <input type="checkbox"/> 2446 | <input type="checkbox"/> 2447 | <input type="checkbox"/> 2448 | <input type="checkbox"/> 2449 | <input type="checkbox"/> 2450 |
| <input type="checkbox"/> 2451 | | | | | | | | | |

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

- | | | | | | | | | | | | |
|-----------------------------|-----------------------------|-----------------------------|-----------------------------|-----------------------------|-----------------------------|-----------------------------|-----------------------------|-----------------------------|-----------------------------|-----------------------------|-----------------------------|
| <input type="checkbox"/> 1 | <input type="checkbox"/> 2 | <input type="checkbox"/> 3 | <input type="checkbox"/> 4 | <input type="checkbox"/> 5 | <input type="checkbox"/> 6 | <input type="checkbox"/> 7 | <input type="checkbox"/> 8 | <input type="checkbox"/> 9 | <input type="checkbox"/> 10 | <input type="checkbox"/> 11 | <input type="checkbox"/> 12 |
| <input type="checkbox"/> 13 | <input type="checkbox"/> 14 | <input type="checkbox"/> 15 | <input type="checkbox"/> 16 | <input type="checkbox"/> 17 | <input type="checkbox"/> 18 | <input type="checkbox"/> 19 | <input type="checkbox"/> 20 | <input type="checkbox"/> 21 | <input type="checkbox"/> 22 | <input type="checkbox"/> 23 | <input type="checkbox"/> 24 |
| <input type="checkbox"/> 25 | <input type="checkbox"/> 26 | <input type="checkbox"/> 27 | <input type="checkbox"/> 28 | <input type="checkbox"/> 29 | <input type="checkbox"/> 30 | <input type="checkbox"/> 31 | <input type="checkbox"/> 32 | <input type="checkbox"/> 33 | <input type="checkbox"/> 34 | <input type="checkbox"/> 35 | <input type="checkbox"/> 36 |
| <input type="checkbox"/> 37 | <input type="checkbox"/> 38 | <input type="checkbox"/> 39 | <input type="checkbox"/> 40 | <input type="checkbox"/> 41 | <input type="checkbox"/> 42 | <input type="checkbox"/> 43 | <input type="checkbox"/> 44 | <input type="checkbox"/> 45 | <input type="checkbox"/> 46 | <input type="checkbox"/> 47 | <input type="checkbox"/> 48 |
| <input type="checkbox"/> 49 | <input type="checkbox"/> 50 | <input type="checkbox"/> 51 | <input type="checkbox"/> 52 | <input type="checkbox"/> 53 | <input type="checkbox"/> 54 | <input type="checkbox"/> 55 | <input type="checkbox"/> 56 | <input type="checkbox"/> 57 | <input type="checkbox"/> 58 | <input type="checkbox"/> 59 | <input type="checkbox"/> 60 |
| <input type="checkbox"/> 61 | <input type="checkbox"/> 62 | <input type="checkbox"/> 63 | <input type="checkbox"/> 64 | <input type="checkbox"/> 65 | <input type="checkbox"/> 66 | <input type="checkbox"/> 67 | | | | | |

Name Position

Company Nature of Business

Street City Prov.
9-59

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

- | | | | | | | | | | |
|-------------------------------|-------------------------------|-------------------------------|-------------------------------|-------------------------------|-------------------------------|-------------------------------|-------------------------------|-------------------------------|-------------------------------|
| <input type="checkbox"/> 2421 | <input type="checkbox"/> 2422 | <input type="checkbox"/> 2423 | <input type="checkbox"/> 2424 | <input type="checkbox"/> 2425 | <input type="checkbox"/> 2426 | <input type="checkbox"/> 2427 | <input type="checkbox"/> 2428 | <input type="checkbox"/> 2429 | <input type="checkbox"/> 2430 |
| <input type="checkbox"/> 2431 | <input type="checkbox"/> 2432 | <input type="checkbox"/> 2433 | <input type="checkbox"/> 2434 | <input type="checkbox"/> 2435 | <input type="checkbox"/> 2436 | <input type="checkbox"/> 2437 | <input type="checkbox"/> 2438 | <input type="checkbox"/> 2439 | <input type="checkbox"/> 2440 |
| <input type="checkbox"/> 2441 | <input type="checkbox"/> 2442 | <input type="checkbox"/> 2443 | <input type="checkbox"/> 2444 | <input type="checkbox"/> 2445 | <input type="checkbox"/> 2446 | <input type="checkbox"/> 2447 | <input type="checkbox"/> 2448 | <input type="checkbox"/> 2449 | <input type="checkbox"/> 2450 |
| <input type="checkbox"/> 2451 | | | | | | | | | |

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

- | | | | | | | | | | | | |
|-----------------------------|-----------------------------|-----------------------------|-----------------------------|-----------------------------|-----------------------------|-----------------------------|-----------------------------|-----------------------------|-----------------------------|-----------------------------|-----------------------------|
| <input type="checkbox"/> 1 | <input type="checkbox"/> 2 | <input type="checkbox"/> 3 | <input type="checkbox"/> 4 | <input type="checkbox"/> 5 | <input type="checkbox"/> 6 | <input type="checkbox"/> 7 | <input type="checkbox"/> 8 | <input type="checkbox"/> 9 | <input type="checkbox"/> 10 | <input type="checkbox"/> 11 | <input type="checkbox"/> 12 |
| <input type="checkbox"/> 13 | <input type="checkbox"/> 14 | <input type="checkbox"/> 15 | <input type="checkbox"/> 16 | <input type="checkbox"/> 17 | <input type="checkbox"/> 18 | <input type="checkbox"/> 19 | <input type="checkbox"/> 20 | <input type="checkbox"/> 21 | <input type="checkbox"/> 22 | <input type="checkbox"/> 23 | <input type="checkbox"/> 24 |
| <input type="checkbox"/> 25 | <input type="checkbox"/> 26 | <input type="checkbox"/> 27 | <input type="checkbox"/> 28 | <input type="checkbox"/> 29 | <input type="checkbox"/> 30 | <input type="checkbox"/> 31 | <input type="checkbox"/> 32 | <input type="checkbox"/> 33 | <input type="checkbox"/> 34 | <input type="checkbox"/> 35 | <input type="checkbox"/> 36 |
| <input type="checkbox"/> 37 | <input type="checkbox"/> 38 | <input type="checkbox"/> 39 | <input type="checkbox"/> 40 | <input type="checkbox"/> 41 | <input type="checkbox"/> 42 | <input type="checkbox"/> 43 | <input type="checkbox"/> 44 | <input type="checkbox"/> 45 | <input type="checkbox"/> 46 | <input type="checkbox"/> 47 | <input type="checkbox"/> 48 |
| <input type="checkbox"/> 49 | <input type="checkbox"/> 50 | <input type="checkbox"/> 51 | <input type="checkbox"/> 52 | <input type="checkbox"/> 53 | <input type="checkbox"/> 54 | <input type="checkbox"/> 55 | <input type="checkbox"/> 56 | <input type="checkbox"/> 57 | <input type="checkbox"/> 58 | <input type="checkbox"/> 59 | <input type="checkbox"/> 60 |
| <input type="checkbox"/> 61 | <input type="checkbox"/> 62 | <input type="checkbox"/> 63 | <input type="checkbox"/> 64 | <input type="checkbox"/> 65 | <input type="checkbox"/> 66 | <input type="checkbox"/> 67 | | | | | |

Name Position

Company Nature of Business

Street City Prov.
9-59

BUSINESS REPLY CARD
No Postage Stamp Necessary if Mailed in Canada

5c POSTAGE WILL BE PAID BY

ELECTRONICS AND COMMUNICATIONS

450 Alliance Avenue

Toronto 9, Ontario



BUSINESS REPLY CARD
No Postage Stamp Necessary if Mailed in Canada

5c POSTAGE WILL BE PAID BY

ELECTRONICS AND COMMUNICATIONS

450 Alliance Avenue

Toronto 9, Ontario



BUSINESS REPLY CARD
No Postage Stamp Necessary if Mailed in Canada

5c POSTAGE WILL BE PAID BY

ELECTRONICS AND COMMUNICATIONS

450 Alliance Avenue

Toronto 9, Ontario



INDEX TO ADVERTISERS

(Continued)

Key No.	Page No.
43. Measurements Corp.	41
44. Muirhead & Co. Ltd.	50
45. Nichols Ltd., R. H.	57
46. Northern Electric Co. Ltd.	10
47. Northern Electric Co. Ltd.	63
48. Porter (Canada) Ltd., H. K.	13
49. Prodelin Inc.	54
50. Pye Canada Ltd.	19
51. Pylon Electronic Development Co. Ltd.	51
52. R.O.R. Associates Ltd.	59
53. Rogers Electronic Tubes & Components (A Division of Philips Electronics Industries Ltd.)	65
54. Royal Metal Mfg. Co. Ltd.	34
55. Sarkes Tarzian Inc.	43
56. Snelgrove & Co. Ltd., C. R.	9
57. Sola Electric Co.	67
58. Sprague International Ltd.	41
59. Standard Telephones & Cables Mfg. Co. (Canada) Ltd.	8
60. Stark Electronic Sales Co.	51
61. Stark Electronic Sales Co.	52
62. Stark Electronic Sales Co.	55
63. Stark Electronic Sales Co.	60
64. Syntron (Canada) Ltd.	49
65. Tech Laboratories Inc.	42
66. Texas Instruments Inc.	42
67. Wiley & Sons Inc., John	45

ACTIVE CIRCULATION

It costs us a lot of active dollars annually to keep our circulation lists up-to-date and it's important enough to us that we have them audited every year by CCAB (Canadian Circulations Audit Board Inc.).

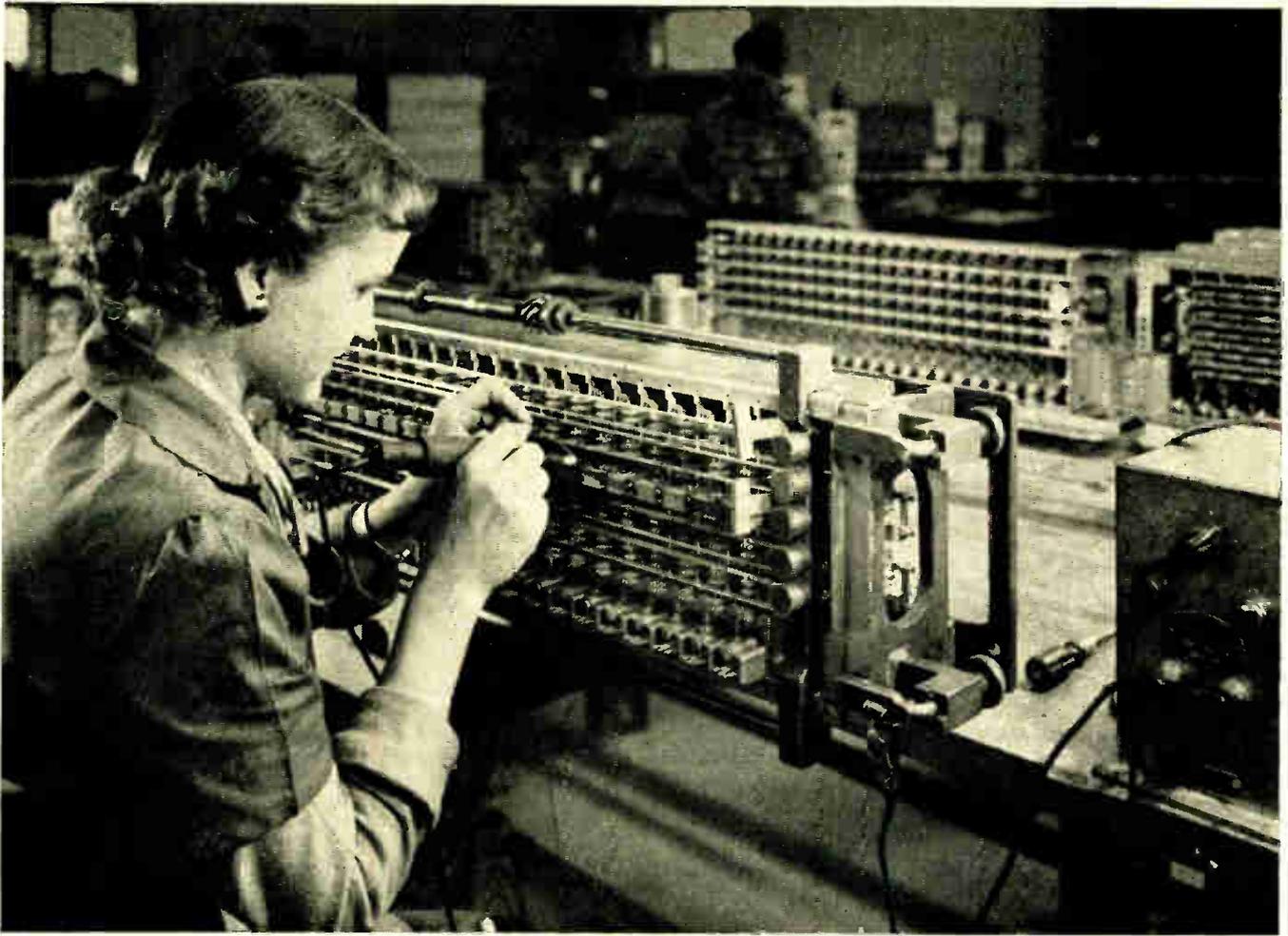
Advertisers trust CCAB audited figures so we get more advertisers and YOU get the high standard of editorial you have always wanted to read.

ELECTRONICS and COMMUNICATIONS

is a



audited publication



Many Lines make Light Work

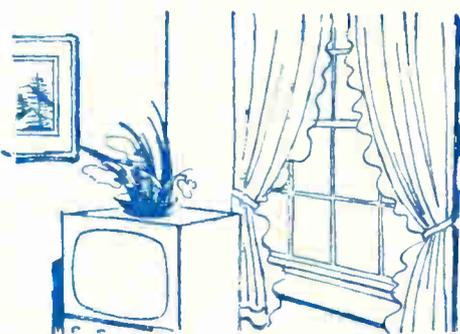
Northern's manufacturing . . . their speed in mastering job essentials rests on their exacting quality-controlled methods — that's progress at Northern. In making complex communication equipment, Northern is known, Canada over, for its leadership.

At Northern Electric, product development never stops . . . advances are forever being made in the field of communications.

Branches are strategically located across Canada to serve your needs.

Northern Electric

SERVES YOU BEST



For complete details check No. 47 on handy card, page 61



CLEAR communication at maximum working distance

...yours
at low cost with
CANADIAN-MADE

DUMONT® mobile radio



Now made in Canada . . . the famous DUMONT "300" series 2-way systems, providing base-station stability in mobile 2-way units! Competitive in cost . . . rugged in design . . . your highly dependable DUMONT system will provide crystal-clear reception at maximum working distance.

Check the many features that make DUMONT Canada's quality package in mobile communication, including . . .

● **HIGH STABILITY** through the use of high precision low drift crystals.

● **UNITIZED CONSTRUCTION** of 3 basic units with chassis-mounted plug type connectors.

● **AVAILABLE** with transistorized vibrator or dynamotor-powered supplies.

DEALER ENQUIRIES INVITED



ELECTRONIC RESEARCH AND DEVELOPMENT COMPANY LTD.

Western Sales Office:
210 - 9th Avenue S.E.
Calgary - Alberta

Eastern Sales Office:
3534 - Dundas Street W.
Toronto 9 - Ontario

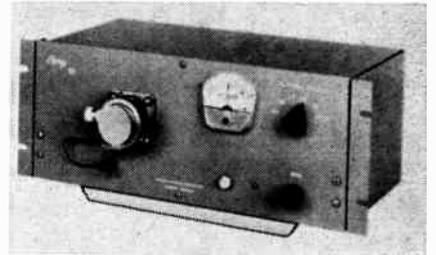
For complete details check No. 32 on handy card, page 61

New Products

Vibrating reed electrometer Item 2450

A new, low priced, vibrating reed electrometer, capable of measuring C^{14} activity to 5×10^{-15} curies per mg Ba Co., H^3 activity as low as 10^{-10} curies per/mg H^3 , and electrical properties as small as 10^{-17} amperes and 0.02 millivolts, is now being marketed by Applied Physics Corporation, Monrovia, California.

The high sensitivity of the new instrument, designated the Cary Model 32, enables smaller amounts of costly tagged material to be used in radioactivity experiments, reducing costs and possible hazard to personnel and experimental subjects.



Unlike many vibrating reed electronics, the new Cary Model 32 is a single, compact instrument. All components, including the input terminal and pre-amplifier, are housed in a single case, requiring less than one square foot of bench space. The design simplicity results in a quality instrument possessing the same superior performance as other Cary Vibrating Reed Electrometers, but available for a much lower initial cost. A minimum of controls make operation exceptionally easy and eliminate the need for special operating skills.

To give the Model 32 greater versatility, the input terminal of the Model 32 accommodates ionization chambers from 50 ml to 1,500 ml, as well as solid and liquid sample accessories.

Complete specifications are available from the manufacturer, Applied Physics Corporation, Monrovia, Calif., U.S.A.

Mobile radiotelephone equipment

A new SY line of FM mobile radiotelephone equipment has been developed by International Systems Limited of Montreal. The equipment features extremely compact construction permitting underdash mounting of all mobile models. The main mobile unit, comprising transmitter, receiver and all operating controls, mounts under the vehicle dashboard. The transistorized power supply mounts on the vehicle firewall.

The 30 watt mobile unit is claimed to be the smallest and lightest unit of that power rating now available. The main unit is only 11 inches wide by 4 inches high by 12 inches deep and weighs 15 pounds. The transistor power supply is 6 inches by 6 inches by 3 inches and weighs 3½ pounds.

The unit is produced in 30 and 10 watt versions and in wide band and split channel models. Simple field conversion can be made from wide band to split channel operation.

The underdash mounting feature, made possible by the compact design, reduces installation and maintenance costs. The lower temperature due to underdash mounting is claimed to improve reliability.

This line of mobile equipments is designed and manufactured in Canada and is claimed to meet all relevant D.O.T. and E.I.A. specifications.

International Systems Limited, 8235 Mountain Sights Ave., Montreal, Que.

ROGERS

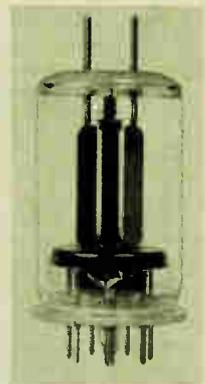
REFERENCE BULLETIN NO. 1

Rogers tube type 5894 for 150 M/c mobile transmitters

The Rogers 5894 is a transmitting double tetrode capable of giving 30 watts output, CCS, in a conservative manner under the field conditions met in mobile communications. It is further capable of giving extreme reliability as a base station output tube producing 60 watts.

Great uniformity is achieved from tube to tube and also in the current division within each tube, with the Rogers 5894.

- Each anode is capable of dissipating 20 watts.
- The cathode is indirectly heated and oxide-coated.
- Maximum ratings apply up to 250 megacycles.
- At reduced ratings the 5894 may be operated at up to 500 megacycles.
- To ensure neutralization over the entire operating band, the tube has built-in cross neutralizing capacitors, the value of which is adjusted to the direct grid-plate capacities.



TECHNICAL DATA

ELECTRICAL

CATHODE:	indirectly heated, oxide coated		
	Heater sections in		
	parallel	series	
Heater voltage 1)	6.3	12.5	V
Heater current	1.8	0.9	A
pins	5-(1+7)	1-7	

DIRECT INTERELECTRODE CAPACITANCES

	each unit	both units in push-pull	
Output capacitance	3.2	2.1	pF
Input capacitance	10.5	6.7	pF
Anode to grid No. 1 (internally neutralized) max.	0.08		pF

AMPLIFICATION FACTOR (each unit)

grid No. 2 to grid No. 1	8.2
--------------------------	-----

MUTUAL CONDUCTANCE (each unit)

at anode current = 30 mA	4.5 mA/V
--------------------------	----------

LIMITING VALUES AND OPERATING CONDITIONS

H.F. CLASS C TELEGRAPHY

C.C.S. limiting values (absolute limits)

Frequency	max. 250 Mc/s	500 Mc/s
Anode voltage	max. 750 V	600 V
Anode input power	max. 2x60 W	2x50 W
Anode dissipation	max. 2x20 W	
Anode current	max. 2x110 mA	
Screen-grid Voltage	max. 300 V	
Screen-grid dissipation	max. 2x3.5 W	
Control grid voltage	max. -175 V	
Control grid current	max. 2x5 mA	
Resistance between control grid and cathode	max. 50 k Ohms	
Voltage between cathode and heater	max. 100 V	

OPERATING CONDITIONS (two sections in push-pull)

	C.C.S.			
Frequency	200	250	430	500 Mc/s
Anode voltage	600	750	520	500 V
Control grid bias	-80	-80	-80	V
Common control grid bias resistor				20 k Ohms
Screen-grid voltage	250	250	250	250 V
Anode current	2x100	2x80	2x100	2x100 mA
Control grid current	2x2.5	2x1.5	2x2.8	2x3 mA
Screen-grid current	16	17	18	20 mA
Peak grid-to-grid driving voltage	200	250		V
Screen-grid dissipation	4	4.25	4.5	5 W
Anode input power	2x60	2x60	2x52	2x50 W
Anode dissipation	2x15	2x17.5	2x19	2x20 W
Tube output	90	85	66	60 W
Tube efficiency	75	71	64	60 %

This reference sheet is the first in 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

From the AMCI Catalogue

AUTOMATIC IMPEDANCE PLOTTERS



- Continuous impedance display with frequency
- Available in portable and rack-mounted units

Type	Frequency Range (mc)	Line Size
12	2.5-250	Type N
11-Q	30-400	Type N
11-PS	180-1100	Type N

SLOTTED LINES



TYPE 1026-4

- Residual swr under 1.010
- Rated error in detected signal under 1.005
- Available with a wide variety of tapered reducers

Type	Frequency Range (mc)	Impedance (ohms)
1026-13	50-3000	50 or 75
1026-8	75-3000	50 or 75
1026-6	100-3000	50 or 75
1026-4	150-3000	50 or 75
1026-2	300-3000	50 or 75

COAXIAL SWITCHES



TYPE 1038

- High power ratings; swr under 1.06
- Pressurized
- Motor-driven and manually operated models

Type	Frequency Range (mc)	Line Size
1038	0-450	6 1/8"
1136	0-500	3 1/8"

Very high peak power models for radar applications

1038-HV	0-450	6 1/8"
1136-HV	0-500	3 1/8"

INSTRUMENT LOADS



TYPE 1108B

- High stability; very low swr
- Nearly all transmission line sizes

Type	Frequency Range (mc)	Line Size	Max SWR
1108B	0-1100	Type N	1.02
2120	0-1000	7/8"	1.03
1112	0-1000	1 5/8"	1.03
1110	0-650	3 1/8"	1.03

HYBRIDS



TYPE 1104

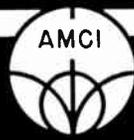
- Very broad band
- Very low residual unbalance

Type	Frequency Range (mc)	Max. SWR	Residual Unbalance (db)
1027-K	60-120	1.4	-50
1027-L	120-240	1.4	-50
1027-M	240-480	1.5	-50
1027-N	480-960	1.6	-50
1098	960-1600	1.6	-40
1102	1600-2400	1.5	-40
1104	2400-3600	1.5	-34
1100-K	60-120	1.4	-55
1100-L	120-240	1.4	-55
1100-M	240-480	1.5	-55
1100-N	480-960	1.6	-55
1099-N	800-960	1.2	-50
1099-O	975-1175	1.2	-50
1024	TV Channels 2-13	1.05	-50

OTHER PRODUCTS

TAPERED REDUCERS
LINE STRETCHERS
DIPLEXING FILTERS
VOR ANTENNAS

TV BROADCASTING ANTENNAS —
directional and omnidirectional
ADJUSTABLE MATCHING NETWORKS
IMPEDANCE STANDARD LINES



ANTENNA SYSTEMS — COMPONENTS — AIR NAVIGATION AIDS — INSTRUMENTS

ALFORD Manufacturing Company
299 ATLANTIC AVE., BOSTON, MASS.

For complete details check No. 3 on handy card, page 61

Book Review

Introduction To The Design Of Servomechanisms by John L. Bower, consultant on automatic control and numerical machine tools and Lecturer in Engineering, University of California, Los Angeles, and Peter M. Schultheiss, Associate Professor Electrical Engineering, Yale University.

This book deals with topics covered in the servomechanisms program at Yale University during the past ten years. It emphasizes a basic understanding of stability and feedback system design, both single and multiple-loop. The authors provide a systematic approach to design, dealing with the principal performance requirements, such as harmonic response, time response, error coefficients and noise response, and giving attention to the common aspects of non-linear operation.

In order to make the volume self-contained, an appendix covering servomechanism components is included which enables the reader to follow examples used in the text and to work representative problems without resorting to outside references.

Introduction To The Design Of Servomechanisms is published by John Wiley & Sons, Inc., 440 Fourth Avenue, New York 16, N.Y., contains 510 pages, hard cover bound, price \$13.00.

Basic Electricity For Communications (Second Edition) by William H. Timble, revised by Francis J. Ricker.

Carefully adhering to the special features which made its predecessor so useful, this edition has been broadened to bring basic electrical principles to bear on a greater variety of fields of application. Its value is extended to such areas as industrial electronics and instrumentation, as well as communications, with examples and problems drawn from all of these fields.

Typical of the revisions are the changes in material on circuit analysis. Ohm's law, Kirchhoff's laws, and Thevenin's theorem are developed during the study of DC circuits. AC circuits. Diagrams have been redrawn, consistent with ASA Standards, and currently used equipment is featured in the illustrations.

New topics treated in the Second Edition include: metallic rectifiers, crystal diodes, transistors, the application of thyratrons to controlled rectifiers, industrial applications of gaseous tubes, time constant in capacitive and inductive circuits, and semi-conductors.

Basic Electricity For Communications (Second Edition) is published by John Wiley & Sons, Inc., 440 Fourth Avenue, New York 16, N.Y., contains 538 pages, hard cover bound, price \$6.25.

Junction Transistor Electronics by Richard B. Hurley, Lecturer in Electrical Engineering, University of California.

Based on numerous lectures given in university and company electronic courses, this book emphasizes the characteristics and circuit applications of transistors. Writing in fresh, uncomplicated terms, the author presents an up-to-date coverage of applied transistor electronics, their internal physical behavior and the important features of equivalent circuits. These major elements are easily introduced by use of simple, intuitive reasoning and descriptions that eliminate complex mathematical procedures.

Accurate, useful tables of transistor circuit formulas and an ample number of numerical examples are included.

The author stresses continuity and organization, covering such topics as: bias stabilization; thermal runaway; switching theory — statics and dynamics; negative feedback; DC amplifiers; DC regulators; oscillators; gain and impedance formulas; saturation currents; breakdown voltages.

Junction Transistor Electronics is published by John Wiley & Sons, Inc., 440 Fourth Avenue, New York 16, N.Y., contains 473 pages, hard cover bound, price \$12.50.

Don't Fail to Attend the Fourth Annual IRE Canadian Convention and Exposition

•

This is the one time during the year when all the electronics industry in Canada meets. Where the latest electronic and communication equipment will be on display. Where electronic engineering achievements will be discussed by competent authorities. It is your opportunity to meet customers and friends.

For a preview of what will be exhibited at the Exposition and industry personnel who will be in attendance at the many booths read the October pre-show issue of

Electronics and Communications Magazine

CANADA'S FINEST Electronic Test Equipment!

in kit form at budget prices

VTVM KIT Model V-7A \$36.95

- Quickly and easily assembled.
- Large, easy-to-read 4½" 200 ua meter.
- 1% precision resistors for high accuracy.
- Etched circuit board assures extreme circuit stability.



"EXTRA DUTY" 5" OSCILLOSCOPE Model O-12 \$80.95

- Laboratory quality, at much lower than usual price.
- Sweep range 10-500,000 CPS, push-pull output.
- Printed circuit boards for faster, easier assembly and assured stability.
- Automatic sync circuit with self-limiting cathode follower.



PROFESSIONAL OSCILLOSCOPE KIT Model OP-1 \$219.95

- Features DC coupled amplifiers and DC coupled CR tube un-blanking.
- Prewired terminal boards provided for all critical circuits.
- Triggered sweep circuit operates on either internal or external signals.
- Polarity of triggering signal may be selected, as well as any point on waveform for start of sweep.



Write for complete information and a free copy of the Heathkit catalogue.

DAYSTROM LIMITED

2 RATHERM ROAD

TORONTO 19, ONTARIO

Distributors of Heathkits in Canada

5932

For complete details check No. 30 on handy card, page 61

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.

ELECTRONICS TEACHER

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

Box 5014

Electronics and Communications
450 Alliance Avenue, Toronto 9, Ontario

GRADUATE ELECTRONIC ENGINEER

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

Box 5018

Electronics and Communications
450 Alliance Avenue, Toronto 9, Ontario

ELECTRONICS TECHNICIAN

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

Box 5019

Electronics and Communications
450 Alliance Avenue, Toronto 9, Ontario

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

Book Review

Wave Propagation And Antennas by George B. Welch, Professor of Physics, Northeastern University.

Extensively tested through eight years' use in preprint form, this clearly presented text provides a general background knowledge of electromagnetic wave propagation and a careful analysis of the fundamental principles of antennas. The subject of antennas is not confined to designated chapters; it is a central theme that runs throughout the book.

By a thoughtful organization and unification of the subject, the author is able to include topics not previously treated at this level. Such recent developments as radar, forward scatter, and radio astronomy fall naturally into the plan of the book. With these topics as with all of the book, Dr. Welch gives practical examples of how principles are applied and presents a series of tested problems.

The major emphasis throughout the text is placed upon the basic principles from which the student must build and extend his understanding. The principles are explained through physical reasoning, aided by elementary mathematics and graphical methods. Dr. Welch's integration of the entire subject matter ties the course together as a meaningful whole.

Wave Propagation And Antennas is published by D. Van Nostrand Company (Canada) Limited, 25 Hollinger Road, Toronto 16, Ontario, contains 257 pages, hard cover bound, price \$6.25.

Following is a list of paperbound books published by John F. Rider Publisher, Inc., 116 West 14th St., New York 11, in recent months.

Basics Of Digital Computers by John S. Murphy, a three-volume "picture-book" course making it easy for anyone with knowledge of the fundamentals of electronics to understand and master the basics of electronic digital computers. Individual volumes in soft cover, \$2.50 per volume; all 3 volumes in single cloth binding, \$7.95.

How To Troubleshoot A TV Receiver (2nd Edition) by J. Richard Johnson. A soft cover book of 160 pages, price \$2.50.

Fundamentals Of Transistors (2nd Edition) by Leonard Krugman. A soft cover book, 176 pages, price \$3.50.

Metallic Rectifiers and Crystal Diodes by Theodore Conti. A soft cover book, 164 pages, price \$2.95.

Repairing Portable And Clock Radios by Ben Crisses and David Gnessin. A paperbound book, 128 pages, price \$2.75.

Basic Pulses by I. Gottlieb, a soft cover book, 176 pages, price \$3.50.

Dr. Alexander Efron is the author of **Mechanics** (price \$1.50) **Light** (price \$2.25) and **Nuclear Energy** (price \$1.25), all three of which are paperbound books in the Basic Science Series and published by John F. Rider Publisher, Inc. of New York City.

In the Electronic Technology Series of Rider publications are the following soft cover books, all edited by Dr. Alexander Schure: **Electrostatics** (price \$1.35); **D-C Circuit Analysis** (price \$1.35); **A-C Circuit Analysis** (price \$1.80); **Vacuum Tube Characteristics** (price \$1.80); **Impedance Matching** (price \$2.90); **Gas Tubes** (price \$1.50).

Plan To Attend The IRE CONVENTION

Exhibition Park — Toronto
October 7 - 8 - 9, 1959

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

Simpson WIDE BAND LABORATORY OSCILLOSCOPE

Model 2610



The wide and immediate acceptance of the Model 2610 has provided ample justification for the original techniques adopted in the design of this instrument. Versatility and convenience, allied with precision performance, make this an ideal oscilloscope for general laboratory use.

The vertical deflection system has a sensitivity in excess of 3.3 millivolts r.m.s./cm. and offers a choice of A.C. or D.C. coupling with either a linear response to 6 Mc/s or a suitable roll-off for transient observations; in the latter condition the rise-time is 80 millimicroseconds with overshoot less than 3%. For pulse observation a 0.3 microsecond signal delay can be switched in. Marker signals can be applied via a differential input terminal.

Associated with the vertical deflection system is a unique and permanent internal calibration circuit which, in conjunction with the built-in meter, permits the measurement of waveform amplitudes to an accuracy of 3%.

The horizontal deflection system offers recurrent sweeps from 3 c/s to 500 Kc/s and precalibrated triggered sweeps of 5, 50, 500 and 5,000 microsecond duration; triggering and blanking can be either internal or external or an external time base signal can be applied.

A flat-faced 5" C.R.T. is used and provision is made for camera mounting.

Conservative operation of components, combined with ingenious design, makes it possible to provide this high standard of performance with reliability, and at a remarkably modest cost.

Price, including signal cables, line cord, graticule and filter — \$550.00, f.a.b. London, Sales Tax Extra.

Bach-Simpson
LIMITED

1255 BRYDGES ST.

LONDON, ONT.

IN U.S.A.: SIMPSON ELECTRIC COMPANY, 5200 W. KINZIE STREET, CHICAGO 44, ILLINOIS

For complete details check No. 13 on handy card, page 61

Molelectronics — a new electronics dimension

It is perhaps true to say that there is no industry in which technological development and progress has been so rapid as that which has taken place in the electronics industry. In the short space of twenty years electronics has made it possible for man to achieve many accomplishments which, without the assistance of electronic equipment, would have remained in the realm of impossibility.

Now, one of the most significant developments in the electronics art is just appearing over the horizon, a development which, when brought to the point of productive fruition, may render possible feats which today would be looked upon as belonging to the world of fantasy.

This new electronic dimension, known as molelectronics deals with the molecular capabilities of materials to perform electronic functions and is described in the Industrial Bulletin of Arthur D. Little Incorporated in the following words:

"The next generation of electronic components may be tiny crystals, tailor-made to handle specific jobs. One or more parts of each unit might be equivalent to a transistor — then other different zones or layers of the same structure would correspond, electrically, to the resistors, capacitors and other circuit elements normally used to make a transistor operate. Using this fundamentally new approach to equipment design, complete electronic circuits can be arranged in a very small volume, without solder joints to cause trouble, and with extremely low power requirements. Considering the techniques and theory involved, a new expression has been coined — molecular electronics, or molelectronics for short.

"Molelectronic devices are the next step beyond the micro-miniature components already used in both commercial and military equipment. For space craft, particularly, payload limitations require the absolute minimum of space, weight and power. Today's transistors are already much smaller than those of only a few years ago; the latest types involve very thin wafers of germanium or silicon, or thin metal films deposited, in a vacuum, on an insulating base, or substrate. The thinner the layer, the shorter the travel time for electrons passing through it, and the higher the frequency at which the transistor can operate. Thus a very thin unit is best suited for microwave applications or extremely rapid switching, as might be required in electronic computers.

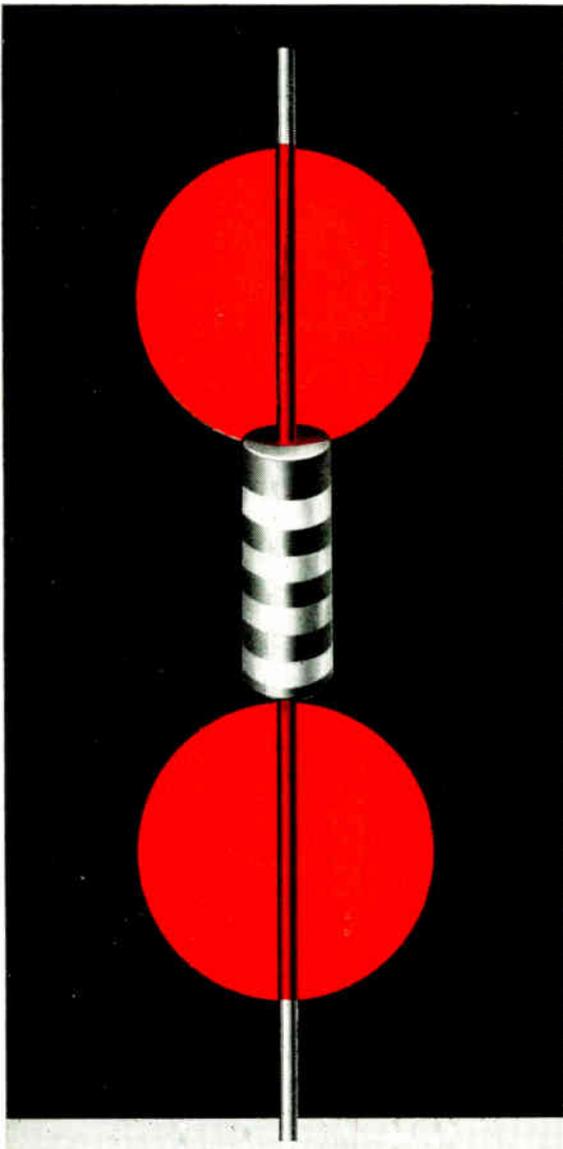
"A number of techniques for producing very small components have already been developed. Transistors can be produced from thin, flat ribbons of crystalline metal drawn from the melt; then leads are attached and transistors sliced from the ribbon. This process may be considerably cheaper than the conventional method of producing transistors. Electron tubes, already smaller than they were five years ago, have been reduced still further in size by using stacks of thin ceramic wafers, to space out the metallic tube elements — cathode, grid, plate, etc. And physicists have developed a number of extremely small solid-state devices for information storage and switching.

"But so far, even the smallest units produced have had to be tied in with other components to make a complete circuit, and any advantages of rapid operation have been offset to some extent by requirements of size. Now solid-state physicists are constructing entire circuits layer by layer, interposing insulating layers as required. The final assembly can be visualized as a stack of thin films, like the transparent layers in a color slide. Each layer is prepared by evaporating or sputtering metal through a mask onto a substrate; insulating layers, generally of metallic oxides, are produced by admitting controlled amounts of oxygen.

"Electronic activity takes place in the final unit in three dimensions — through the crystal, along it, and across it. Wire leads are point-soldered or otherwise bonded to the outside to permit connection to other elements. Within the crystal, electrical and magnetic fields around individual atoms and molecules control the electron flow. The molelectronic circuit designer must start out by effectively redesigning the interior of the crystal, preparing a map of functional areas. Rather than the customary concerns of wiring parts together, his problems relate to crystal impurities, inclusion of unwanted gases and expansion or contraction of the individual molecular layers.

"The Office of Naval Research and the Air Force Research and Development Command have commissioned several manufacturers to design molecular electronic equipment, and some units have already been produced. One is a light-sensitive oscillator which produces a change in frequency as the light intensity varies; another is a tiny solid-state switching device with no moving parts. The oscillator is a single button-shaped crystal having only two external leads, weighing only .02 grams, and occupying only .001 cubic inch. By contrast, the same unit with transistors would require 15 separate components weighing a total of 7 grams, and occupying 1 cubic inch.

"At least eight more molelectronic circuit elements are being developed, largely for use in space technology. The first units will probably be used in laboratory models in late 1959, and military applications in radio and television circuits may come several years later. Meanwhile, new production techniques are being developed; one scheme suggested is to deposit crystal layers by controlling a beam of metallic atoms in a vacuum, as an electron beam is used to scan a television screen. By using a number of beams (and a suitable computer-like control), it should be possible to produce molelectronic assemblies in quantity."



Get a head-start on production with "solder-coated" resistors

You can pretty well take for granted that any one of several leading resistor brands will meet or exceed your performance requirements. But there's another factor to be considered too—ease of handling on your assembly lines. Mainly that means ease of soldering—and here Stackpole Coldite 70+ "solder-coated" fixed composition resistors stand head and shoulders above the field. Not only do these famous cold-molded resistors meet today's critical specifications, but they provide unmatched "solderability" on any hand or automatic, open wiring or printed circuit operation. That makes not only for a real saving in assembly work, but also stands to reduce subsequent service costs resulting from poor soldered connections.



CANADIAN STACKPOLE LIMITED
550 EVANS AVE., TORONTO 14, ONT.

Coldite 70+ Resistors Save You Money on Assembly Work!

Stackpole Coldite 70+ resistors solder easier and stay soldered more surely. Thanks to an extra solder coating applied **AFTER** the usual tin-lead coating, they solder perfectly by **ANY** method—dip or iron. Moreover, resistance variations from normal soldering heat are negligible.

Coldite 70+[®]

FIXED COMPOSITION RESISTORS

CERAMAG[®] FERROMAGNETIC CORES • SLIDE AND SNAP SWITCHES • VARIABLE COMPOSITION RESISTORS • CERAMAGNET[®] CERAMIC MAGNETS • FIXED COMPOSITION CAPACITORS • ELECTRICAL CONTACTS • BRUSHES FOR ALL ROTATING ELECTRICAL EQUIPMENT • HUNDREDS OF RELATED CARBON, GRAPHITE, AND METAL POWDER PRODUCTS

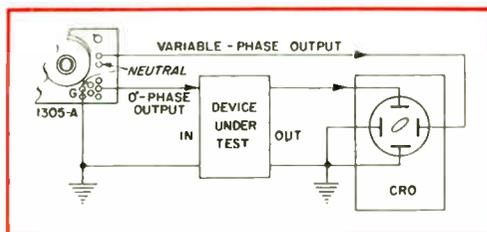
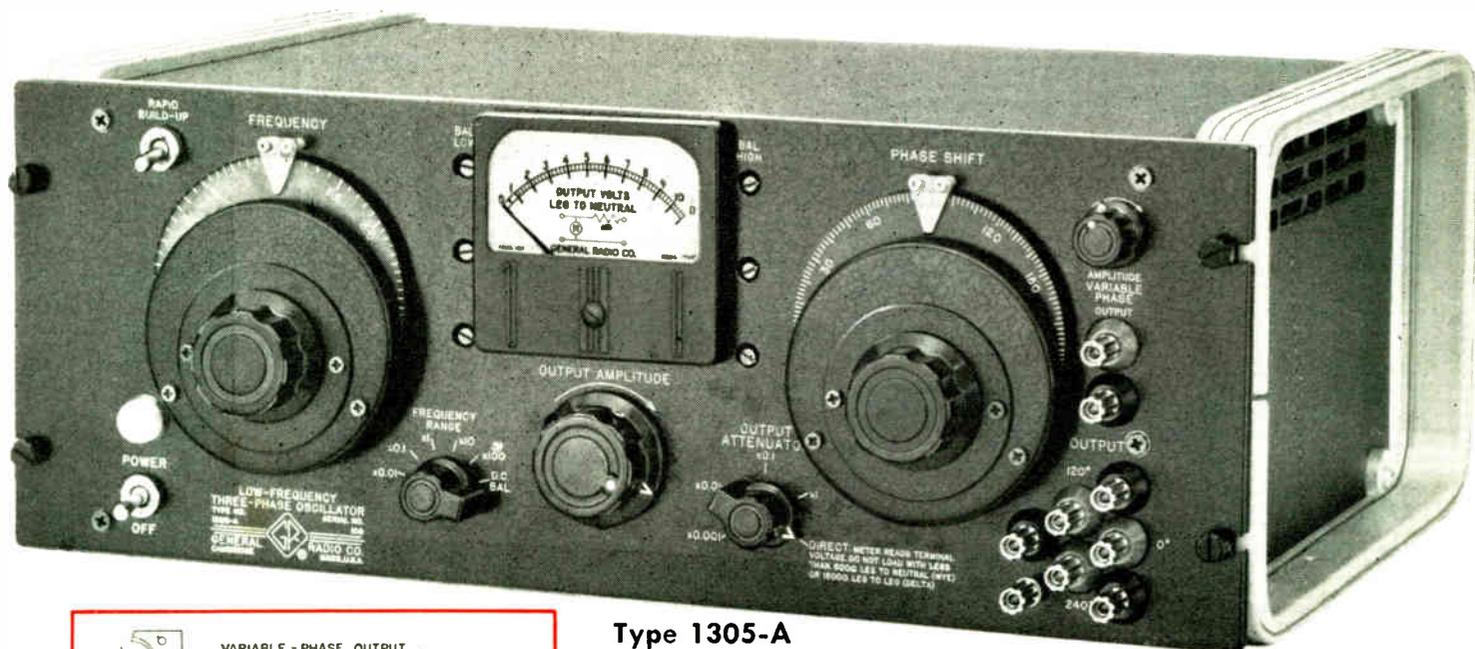
For complete details check No. 24 on handy card, page 61

New LOW-FREQUENCY OSCILLATOR



for the direct measurement of GAIN and PHASE SHIFT

- ★ Frequency range: 0.01 to 1000 cycles per second
- ★ Built-in phase shifter: 0° to 360°
- ★ Direct reading in phase shift, *independent* of frequency . . . no charts or calculations necessary
- ★ Output amplitude stabilized $\pm \frac{1}{2}$ db over entire frequency range
- ★ Three-phase output available . . . four-phase output from accessory adaptor
- ★ Especially useful for the phase-gain measurement of Servo Systems • Recorders • Medical Instruments • Networks • Passive Sonar Equipment • Low-Frequency Amplifiers • Geophysical Equipment • Electrical Analogs of Mechanical Systems • Two-, Three-, and Four-Phase Devices • Seismographic Devices.



Complex transfer characteristics of devices or systems are readily measured with the Type 1305-A Low-Frequency Oscillator. With the setup above, you need only adjust the Oscillator's continuously-adjustable phase shifter until the Lissajous ellipse on the oscilloscope is closed — the dial setting then gives phase shift directly. Gain is readily determined by calibrating the scope face with the aid of the Oscillator's panel meter, and then comparing vertical height of the oscilloscope pattern before and after the device under study is connected to the test setup.

Type 1305-A Low-Frequency Oscillator

Frequency Range: 0.01 to 1000 cycles in 5 ranges. **Accuracy** $\pm 3\%$

Three-Phase Output: 10-volts rms, open circuit, line-to-neutral, behind 600 Ω in each phase. Output constant with frequency to $\pm 5\%$. Phase voltages are equal to within $\pm 2\%$.

Four-Phase Output: (using 4-phase adaptor) 5-volts rms, open circuit, line-to-neutral, behind 600 Ω , phase voltages equal to within $\pm 2\%$.

Variable Phase Output: 1-volt, rms, taken from a 50,000 Ω output control. Accuracy of phase calibration is $\pm 3^\circ$.

Waveform: Total harmonic content is less than 3% at all output attenuator settings and at all frequencies. Line-frequency hum in output is less than 10 mv.

Power Requirements: 105 to 125 (or 210 to 250) volts, 50 to 400 cycles.

Price: \$940.

Write for Complete Information

GENERAL RADIO COMPANY
WEST CONCORD, MASSACHUSETTS

FIRST
Broadcast Station
Crystal Oscillator
1922

Canadian Engineering Office in TORONTO
99 Floral Parkway, Toronto 15, Ontario
Arthur Kingsnarth • Richard J. Pravan
Tel: CHerry 4-6221

Repair Service: Bayley Engineering Ltd., Ajax, Ontario

World Radio History