See description page 5

electronics and communications

an age publication

FEBRUARY 1961

LITTON INDUSTRIES MICROWAVE TUBES

KLYSTRONS

Type Number	Frequency Range Megacycles	Peak Power (Minimum) Megawatts	Cathode Pulse Length Microseconds	RF Duty Ratio	Remarks
L-3270	1250 to 1350	2	8	0.0025	Broadband (100 megacycles between 2 megawatt points)
LT-7504 (L-3035)	1240 to 1360	2.2	8	0.0025	Long range search radar
L-3257	1280 to 1330	4	30	0.0003	For linear accelerator
L-3227	1280 to 1330	5	8	0.002	For linear accelerator
L-3250	1250 to 1350	10	7.2	0.0015	Long range search radar and linear accelerator
L-3387	1250 to 1350	30	7.2	0.0033	Long range search radar
L-3302	2855	10	7.2	0.0015	For linear accelerator and radar
L-3355	1250 to 1350	20	7.2	0.0015	Long range search radar

TRAVELING WAVE TUBES

Type Number	Frequency Range Megacycles	Power Output	Focusing	Duty Factor
L-3266	7000 to 11,000	20 mw	PPM	CW
L-3236	7000 to 11,000	2 W	PPM	CW
L-3470	4000 to 8000	20 mw	PPM	CW
L-3471	4000 to 8000	2 W	PPM	CW
L-3472*	8500 to 9600 7000 to 11,000	10 W 5 W	PPM	CW
L-3264*	100 to 300	100 W	Solenoid	CW

* *In development*

M-TYPE BACKWARD WAVE OSCILLATORS

Type Number	Frequency Range Megacycles	Power Output	Focusing	Factor	Remarks
L-3148	8500 to 11,000	150 watts minimum	Permanent magnet	CW	No holes in a 1.5/1VSWR

A complete line of M-BWO's is available but classified

PULSE MAGNETRONS

Type Number	Frequency Range Megacycles	Peak Power (Min.) KW	Duty Ratio	Remarks
L-3204	8800±25	0.04	0.25	Extremely high duty
L-3105	9300±40	0.10	0.027	Highly ruggedized; frequency stable
L-3028	9280 to 9320	0.12	0.027	Frequency stable; pulse train capability
L-3379	8800 to 9500*	1.0	0.003	Highly ruggedized; frequency stable
L-3058	9330 to 9350*	1.0	0.003	Frequency stable
L-3358	16,000 to 16,500*	1.0	0.001	Highly ruggedized; frequency stable
L-3380	8800 to 9500*	2.0	0.002	Highly ruggedized; frequency stable
L-3359	16,000 to 16,500*	2.0	0.001	Highly ruggedized; frequency stable
L-3381	8800 to 9500*	3.0	0.001	Highly ruggedized; frequency stable
L-3382	8800 to 9500*	4.0	0.001	Highly ruggedized; frequency stable
LT-6233	9280 to 9345	7.0	0.003	High duty beacon magnetron
L-3103	8500 to 9600*	30.0	0.002	High duty version of LT-6543
L-3168	9375±30	30.0	0.002	High duty version of LT-4J52A
L-3306	16,000 to 17,000*	30.0	0.002	High duty version of L-3083A
L-3083A	16,000 to 17,000*	60.0	0.001	Recommended for new systems
LT-6543A	8500 to 9600*	65.0	0.001	Recommended for MTI systems
L-3305	8600 to 9500*	65.0	0.001	Recommended for frequency diversity
LT-6510	9375±30	65.0	0.001	Recommended for MTI systems
LT-4J52A	9375±30	70.0	0.001	Recommended for new systems
L-3312	8500 to 9600*	200.0	0.001	In development
L-3313	8600 to 9500*	200.0	0.001	Hydraulically tunable for frequency diversity
LT-4J50A	9375±30	225.0	0.001	Recommended for new systems

**Fixed frequency versions available generally throughout tunable range.*

CW MAGNETRONS

Type Number	Frequency Range Megacycles	Minimum Power Watts	Remarks
L-3456	350-590	500	These CW Magnetrons may be pulsed to approximately 2 kilowatts peak power and are recommended for component testing.
L-3459	590-975	500	
L-3465	975-1500	400	
L-3464	1500-2350	400	
L-3460	2350-3575	500	
L-3461	3575-4975	400	
L-3467	4975-6175	400	
L-3468	6175-7275	300	
L-3462	7275-8775	300	
L-3463	8775-10,475	250	

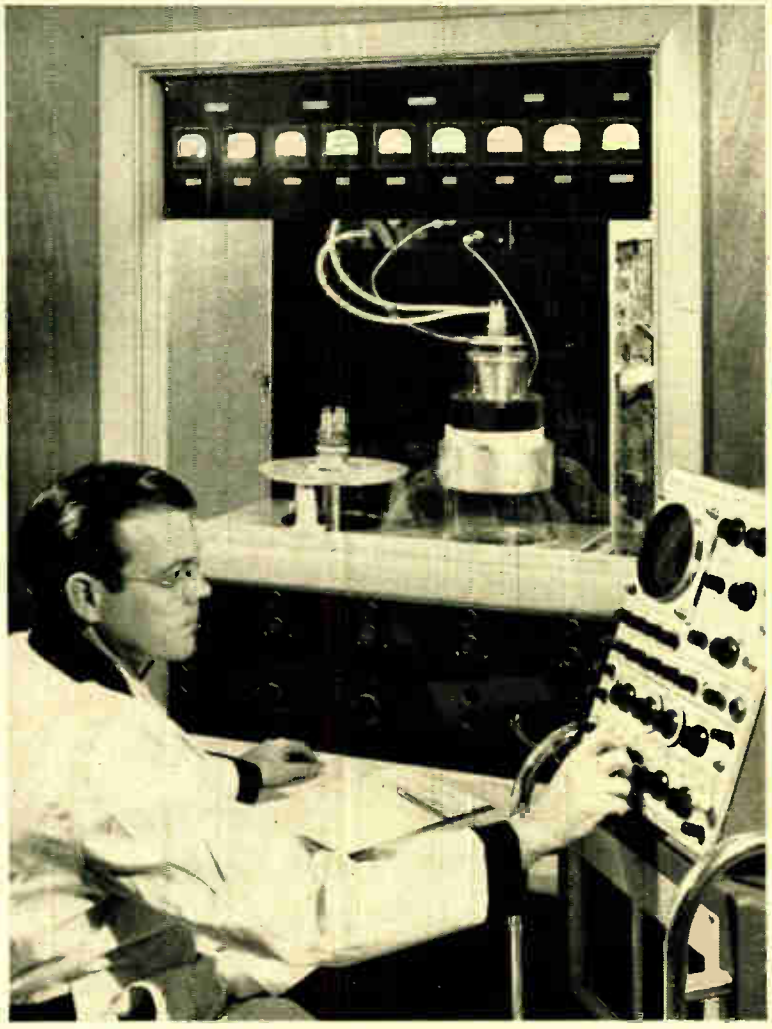
CROSSED-FIELD FORWARD WAVE AMPLIFIER TUBES • BARRATRON® TRANSMITTING TUBES • MINIATURE NOISE SOURCES • DUPLEXERS & TR TUBES • DISPLAY TUBES

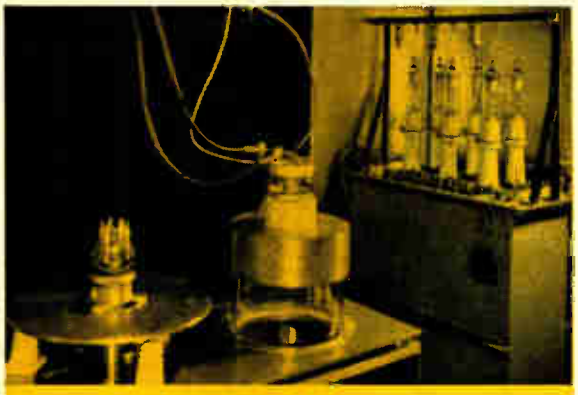
LITTON INDUSTRIES
Electron Tube Division
San Carlos, California

For complete details check No. 23 on handy card, page 43

Marconi Announces

COMPLETE NEW TEST LAB FOR PRE-TESTING SPECIAL PURPOSE TUBES RIGHT HERE IN CANADA





Shown here is the high-voltage power supply —work horse of the new Marconi Test Lab in Toronto. Test facilities are available for testing either air, water or vapour-cooled high power electron tubes up to 200 kw. with static power of 25 kw.

The Lab tests all Special Purpose Tubes for manufacturing defects, or for damage caused in storage or in shipping from the manufacturer. At left, an oscilloscope takes pulse measurements of a BR1102 Tube. Tests are made under simulated operating conditions. Every detail is carefully checked before tubes are shipped...sealed and protected by the Marconi warranty.

Now, annoying lengthy delays and inconveniences caused by faulty Special Purpose Tubes are the thing of the past. No longer need you wait—and *wait*—while these tubes are sent back to the manufacturer—often in the U.S. or Europe—for repair or adjustment.

For Canadian Marconi's new Special Purpose Tube Test Lab, only one of its kind in Canada, is centrally located in Toronto for faster customer service. All tubes are fully tested in the lab before they are shipped out to you. This guards against the possibility of your getting a defective tube. Should any trouble occur on a Marconi Tube, you can be sure of immediate warranty adjustment.

And Marconi experience stands behind Marconi service! Should you have any problems regarding your Special Purpose Tube, a Marconi electronics specialist will be glad to help you out. Just give us a call.

ELECTRONIC TUBE AND COMPONENTS DIVISION

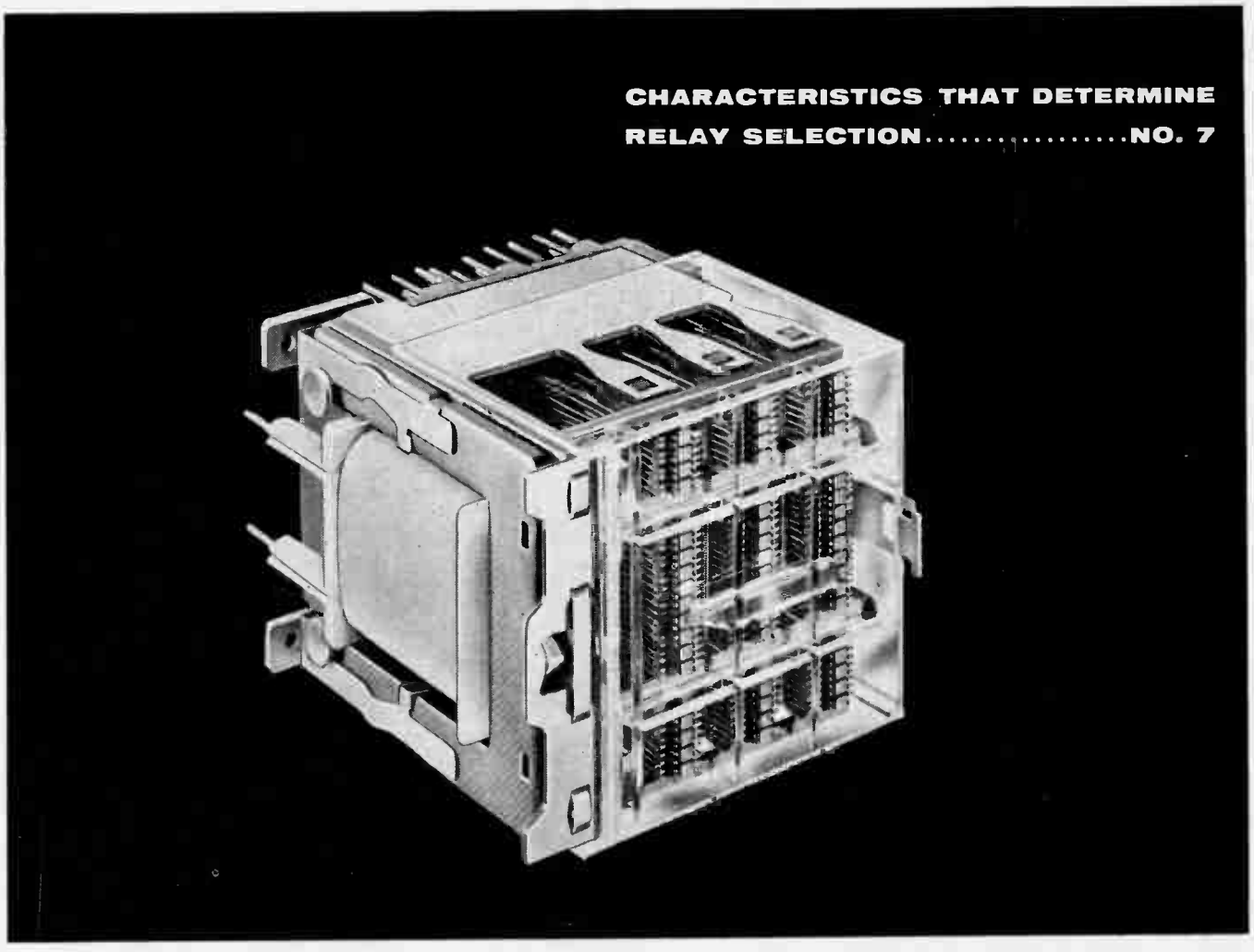
CANADIAN **Marconi** COMPANY

1830 BAYVIEW AVENUE, TORONTO, ONTARIO

Branches: Vancouver • Winnipeg • Montreal • Halifax

For complete details check No. 7 on handy card, page 43

CHARACTERISTICS THAT DETERMINE RELAY SELECTION.....NO. 7



Class W—high capacity, extremely compact and reliable.

when an application calls for many circuit transfers at the same time

Helpful selection data
Class W Series

OPERATING VOLTAGE
6 to 220 volts d.c., or
115 volts a.c. with rectifier

CONTACTS
Twin, Code 0 (palladium-silver). Will carry 3 amps, 150 watts, non-inductive load

CAPACITY
One, two or three levels of 17 Form (break-make) combinations each. Also in combinations of Forms A or B contacts.

OPERATING TIME
Range: 0.015 to 0.040 sec.

RELEASE TIME
Range: 0.005 to 0.015 sec.

The new Class W Relay by Automatic Electric, is the first industrial-control component designed specifically to handle 51 separate circuit transfers at the same time. It is extremely sensitive and reliable—replaces four or more "general purpose" relays—has simultaneous contact operation—and the exclusive design eliminates separate contact adjustment problems.

With a life expectancy of 100 million or more operations, the Class W requires only 4 watts to operate even the largest pile-up. It is available with 6 to 220 volt coils d.c., or 115 volts a.c. with rectifier. Wire wrap terminations throughout assure gas-tight corrosion-resistant wiring, and a transparent snap-on cover with partitions for the separate contact levels provides exceptional dust protection. Essential parts can be readily replaced in the field.

If you would like further information, call or write Automatic Electric Sales (Canada) Limited, 185 Bartley Drive, Toronto, Ontario. Branches across Canada.

AUTOMATIC ELECTRIC
Subsidiary of
GENERAL TELEPHONE & ELECTRONICS

GENERAL SYSTEM

AN ORGANIZATION SERVING CANADIAN INDUSTRIES WITH COMMUNICATION AND CONTROL SYSTEMS

6105

For complete details check No. 5 on handy card, page 43

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CCAB

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60

electronics and communications

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

contents FEBRUARY, 1961

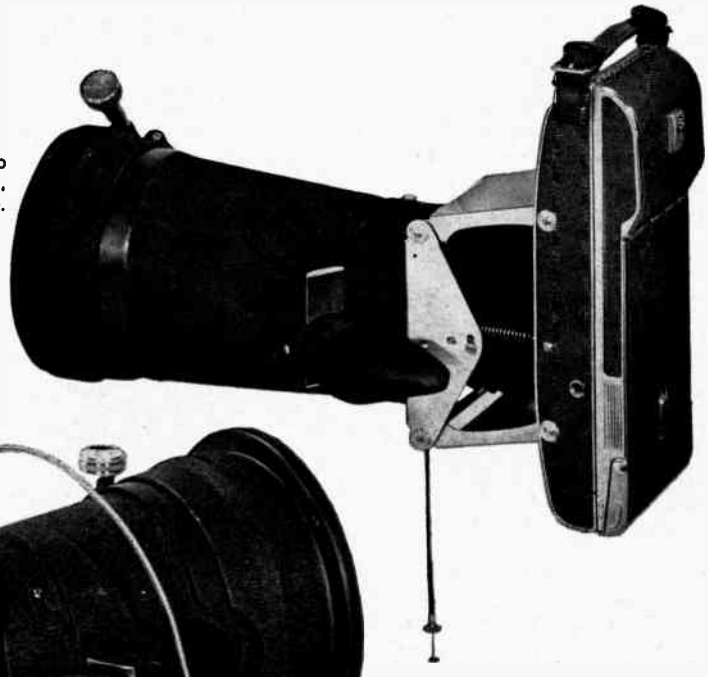
Vol. 9, No. 2

departments

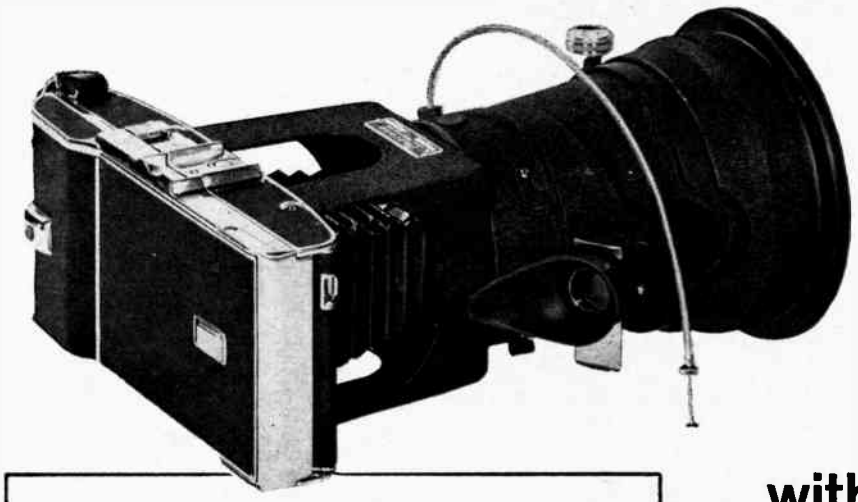
COVER STORY

The world's largest "picture window" shown on our front cover enables sensors to "view" invisible infrared radiation. It has been produced by Hughes Aircraft Company scientists to expand the vistas of infrared detection systems in missiles and space surveillance vehicles. Polishing the 15-inch germanium looking glass, is an optical company technician.

record oscilloscope traces permanently ...in 2 to 10 seconds!



Model F-286 records two traces on each print, each one-half full size.



Model F-296 makes full-size photo record of single transients or identical repetitive phenomena.

SPECIFICATIONS

MODEL F-286

Assembly—Adapter ring, hood, and Polaroid-Land Camera body with special lens mount and two-position shift mechanism.

Lens and Shutter—75 mm f 1.9 Wollensak Oscillo-Anastigmat with #3 Alphax shutter having speeds of 1 sec. to 1/100 sec., T and B.

Focus—Fixed (approx. 8⅜ in.)

Picture Size—3¼ x 4¼ in. Two images photographed on each print: 16-shot roll.

Image Size—0.5: 1.0.

Dimensions—Camera, 10½" x 5¼" x 6¼"; hood, 11" long by 7½" dia.; adapter, 2" by 6⅝" o.d.

Weight—Complete, 7¾ lbs.

MODEL F-296

Assembly—Polaroid-Land Camera, adapter ring, hood, special lens and shutter, support rod, critical focusing device and release cable.

Lens and Shutter—75 mm f 1.9 Wollensak Oscillo-Anastigmat with No. 3 Alphax Shutter having speeds of 1 sec. to 1/100 sec., "time" and "bulb."

Focus—Fixed to give .92:1 image (adjustable for critical positioning).

Picture Size—3¼ x 4¼ producing a single image on each print.

Image Size—.92:1

Dimensions—14" long, 6" high, 10" wide.

Weight—7½ lbs.

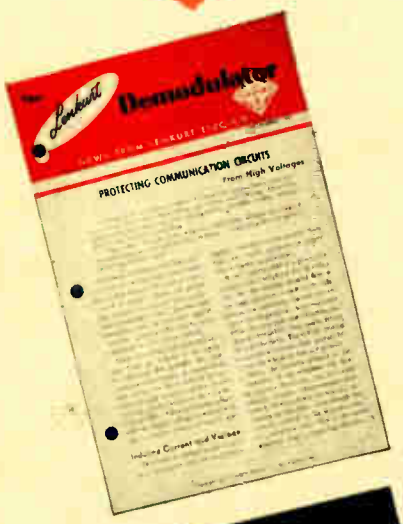
Writing Speed—Normal: 3500 cm/microsec.; pre-solarized (maximum): 8500 cm/microsec.

...with these Fairchild Polaroid® Oscilloscope Cameras

No special photographic skills are needed with a Fairchild Polaroid Oscilloscope Camera. Two models are available. One records single direct-reading, full-size scope images; the other two half-size images on one print. Operation of both is fast and simple, hardly interrupts lab procedures. You can evaluate prints as fast as you can pull them from the camera, enter photo evidence into reports at once.

For literature and prices, write to **Conway Electronic Enterprises, 1514 Eglinton Ave. West, Toronto 10, Ontario, Canada. Dept. D-2.**

For complete details check No. 15 on handy card, page 43



LET "THE DEMODULATOR"

the monthly magazine which has received such enthusiastic support since its introduction in 1952

KEEP YOU UP TO DATE

as it has thousands of others in both Canada and the U.S.A. with timely and important articles

ON CARRIER COMMUNICATIONS

and developments connected with this field. For example, articles have appeared on: Factors affecting the propagation of Micro-waves; Transmission of Dial and Teletypewriter signals; Cable Transmission characteristics; Amplitude modulation, etc., etc. It is circulated

FREE OF CHARGE

to everyone on the mailing list. A limited supply of back copies are also available. Handsome binders to hold 36 copies are mailed to each new subscriber. Check your requirements on the coupon and mail it today

Reprint Book Available

The 32 most-requested articles from the first seven years of The Lenkurt Demodulator have been compiled into book form. The attractive, cloth-bound book is titled CARRIER AND RADIO ARTICLES SELECTED FROM THE LENKURT DEMODULATOR, and costs $2.50, post-paid.

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COMPANY.....

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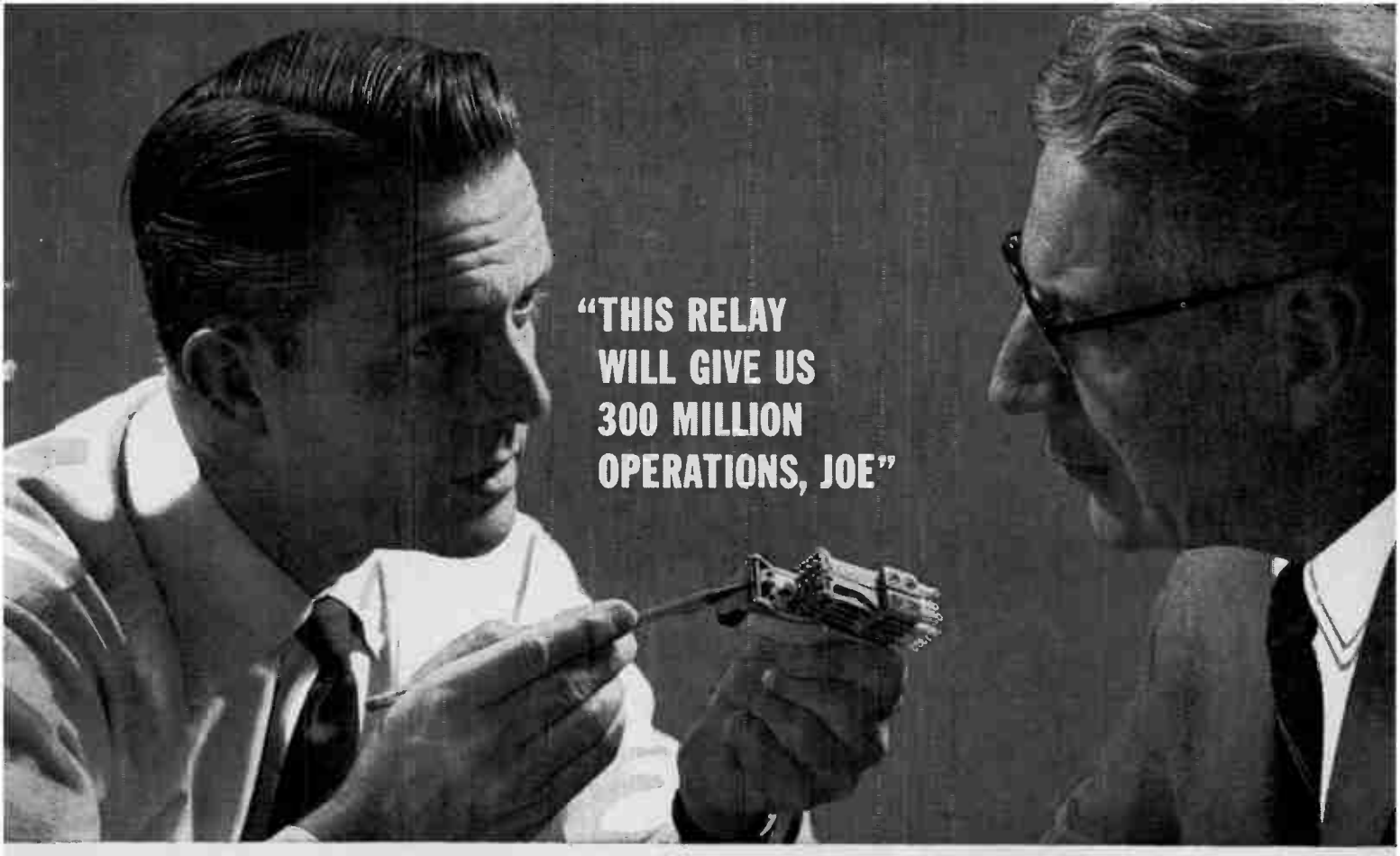
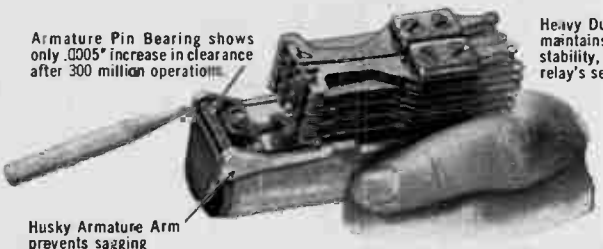
For complete details check No. 22 on handy card, page 43



HERE'S WHY P&B TELEPHONE TYPE RELAYS GIVE YOU

reliable performance over long life



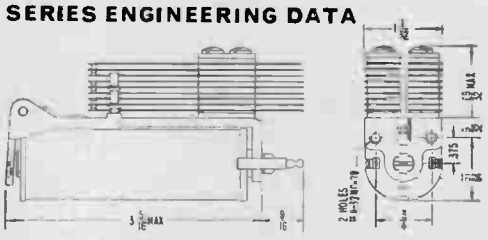
BS SERIES TELEPHONE TYPE

Measure the thickness of the BS series armature arm. You will find the cross section area is greater than ordinary relays of this type. Here is the kind of quality that spells dependability.

Observe that the stainless steel hinge pin runs the full width (not just half) of the armature, providing optimum bearing surface. This pin, operating in a stainless steel sleeve, shows only minimal wear during nearly a *third of a billion operations.*

Best of all, P&B quality costs no more. A whole new plant is being devoted to the production of high performance telephone type relays. Your nearest P&B sales engineer will be happy to discuss your relay problems. Call him today.

BS SERIES ENGINEERING DATA



GENERAL:
- Breakdown Voltage: 1000 volts rms 60 cy. min. between all elements.
- Ambient Temperature: −55° to +85° C. +125° C available on special order.
- Weight: 9 to 16 ozs.
- Terminals: Pierced solder lugs; Coil: One #16 AWG wire Contacts: Two #18 AWG wires
- Enclosures: Dust covered or sealed

CONTACTS:
- Arrangements: DC—up to 28 springs AC—up to 24 springs
- Material: ¼" dia. twin palladium. Up to ⅛" dia. single silver. Other materials on special order.
- Load: 4 amps at 115 volts, 60 cycle resistive
- Pressure: 15 grams minimum

COILS:
- Resistance: 100,000 ohms maximum
- Current: 10 amps maximum
- Power: DC—50 Milliwatts per movable arm. Greater sensitivity on special order. AC—17.9 volt-amps.
- Duty: Continuous
- Treatment: Centrifugal impregnation
- Voltages: DC—up to 380 volts with series resistor. AC—up to 250 volts, 60 cy

MOUNTING: Two #8-32 tapped holes ¾" o.c. Other mountings on special order.

GS SERIES—Excellent sensitivity: 50 mw per movable arm minimum (DC). For applications requiring many switching elements in small space.

LS SERIES—Medium coil relay with short springs and light weight armature for fast action, reliability and long life.

TS SERIES—Short coil relay is available in AC and DC versions. Long life construction. Can be supplied (DC) with up to 20 springs (10 per stack).

P&B STANDARD RELAYS ARE AVAILABLE AT YOUR LOCAL ELECTRONIC PARTS DISTRIBUTOR

POTTER & BRUMFIELD CANADA LTD.

GUELPH, ONTARIO

For complete details check No. 29 on handy card, page 43

MICRO SWITCH

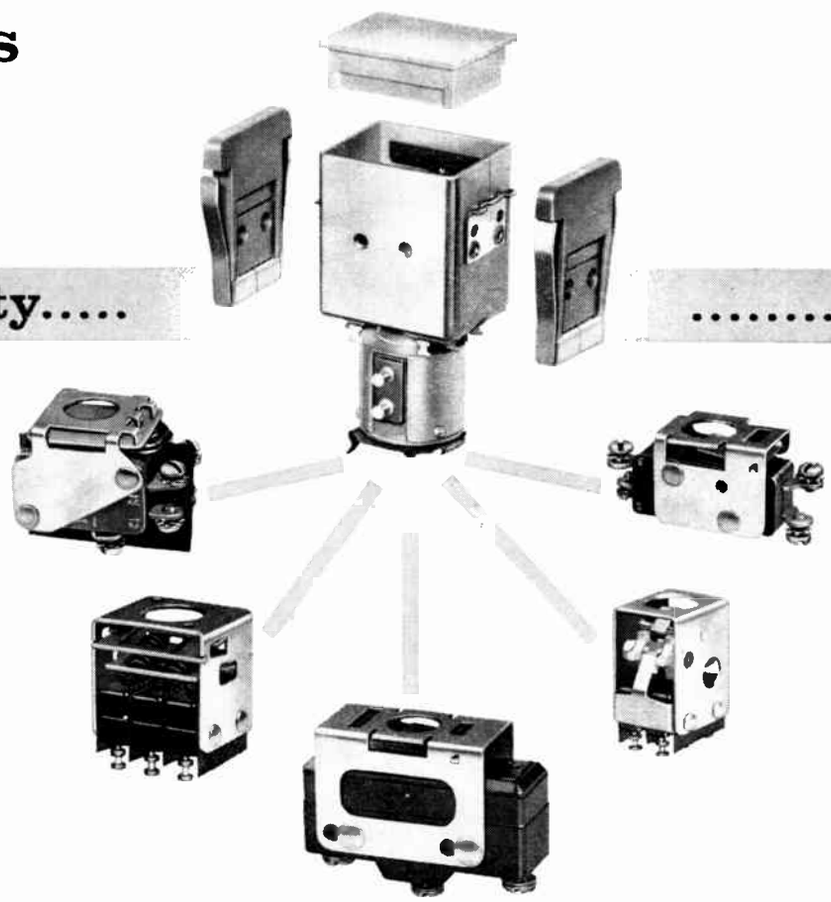
Modular

Lighted

Push-Button

Switches

Reliability.....



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For complete details check No. 20 on handy card, page 43

industry personnel

Automatic Electric sales appointments

S. C. Bird, vice-president and general manager, Automatic Electric Sales (Canada) Limited, has announced two recent appointments.

L. A. Haizelden has been appointed relay sales specialist, Industrial Products Division, located at the head office in Toronto.

W. D. Bishop has been named sales representative, Industrial Products, specializing in TelAutograph telescribing equipment and in industrial closed-circuit television systems, located in Toronto.

Canadian Motorola staff changes

Changes in the national sales organization of Canadian Motorola Electronics Company have resulted in the appointment of **John F. Hooper** as manager — Mobile Sales.

Formerly Ontario region sales manager, Mr. Hooper assumes responsibility for coast-to-coast sales of all Motorola mobile communications equipment. He will remain at the firm's Toronto headquarters in his new capacity.

Gust Landstrom, formerly sales representative in Ontario, has been named assistant manager — Mobile Sales.

Bell employee joins Lenkurt Electric

George T. Hickmott, according to an announcement by Lenkurt Electric Co. Inc., has joined that company in San Carlos, California, as an engineering placement officer.

Formerly with Bell Telephone Company of Canada at Hamilton, Ontario, Mr. Hickmott had been a supervisor of terminal maintenance in the toll department. He started with Bell in 1948 as an installer, later serving as an instructor on loan to the U.S. Air Force for a course in tropospheric scatter radio and channel multiplexing.

TelePrompTer appointment

Spence Caldwell, president of TelePrompTer of Canada Limited, announces the appointment of **Bruce Emonson** as vice-president of that company.

Mr. Emonson has been associated with TelePrompTer of Canada (a division of S. W. Caldwell Ltd.) for a number of years, most recently as manager, and has been responsible for many noteworthy closed circuit telecasts for leading Canadian companies. In addition, he has been supervising the sales and service of the TelePrompTer electronic prompting devices.

A native of England, Mr. Emonson served in the Royal Air Force, specializing in airborne radar systems.

W. D. Bishop

L. A. Haizelden

C. B. Woodley

W. J. Walsh

Northern Electric London plant manager

Announcement has recently been made of the appointment of **C. B. Woodley** as manager of Northern Electric Company's London, Ontario, works, effective January 3, 1961.

Formerly chief engineer of the company's communications equipment division, Mr. Woodley replaces J. R. Houghton whose appointment as assistant general manager of the telephone contract division, with headquarters in Montreal, also became effective January 3, 1961.

Bendix Computer appointment

Appointment of **James A. Robinson** as senior reliability engineer for Bendix Computer Division has been announced by director of engineering Dr. David C. Evans.

Mr. Robinson's experience has been gained from employment by the Walkirt Company, General Communications Company, and with the Canadian government. Mr. Robinson is an engineering graduate of the University of Saskatchewan, and is a member of the Institute of Radio Engineers.

W. R. Ellis joins Indiana Steel

W. Roy Ellis has recently joined The Indiana Steel Products Company of Canada, Ltd., Kitchener, Ontario, as a sales engineer. The announcement was made by ISP's vice-president and general manager, Charles McLeish. ISP of Canada is a subsidiary of Indiana General Corporation, Valparaiso, Indiana.

Mr. Ellis will be responsible for the sale of stainless steel, permanent magnets, ferrites, memory products and whiteware. His territory will cover the province of Quebec, the three maritime provinces of New Brunswick, Nova Scotia, and Prince Edward Island, and northeast Ontario.

Phillips appoints Paragon Time Switch rep

F. W. Barnhouse, marketing manager, Phillips Electrical Co. Ltd., announces the appointment of **W. J. Walsh** as sales supervisor, Paragon Time Controls.

Mr. Walsh was formerly responsible for Paragon Controls with Automatic Electric Sales (Canada) Ltd., and has been with that company for a number of years. Phillips Electrical are now handling the Paragon line in Canada.

Mr. Walsh will be located in Phillips' Toronto office to continue his activities on Paragon sales.

Sperry Gyroscope directors

Two Canadian businessmen have been elected directors of the U.S. owned Sperry Gyroscope Company of Canada, Ltd.

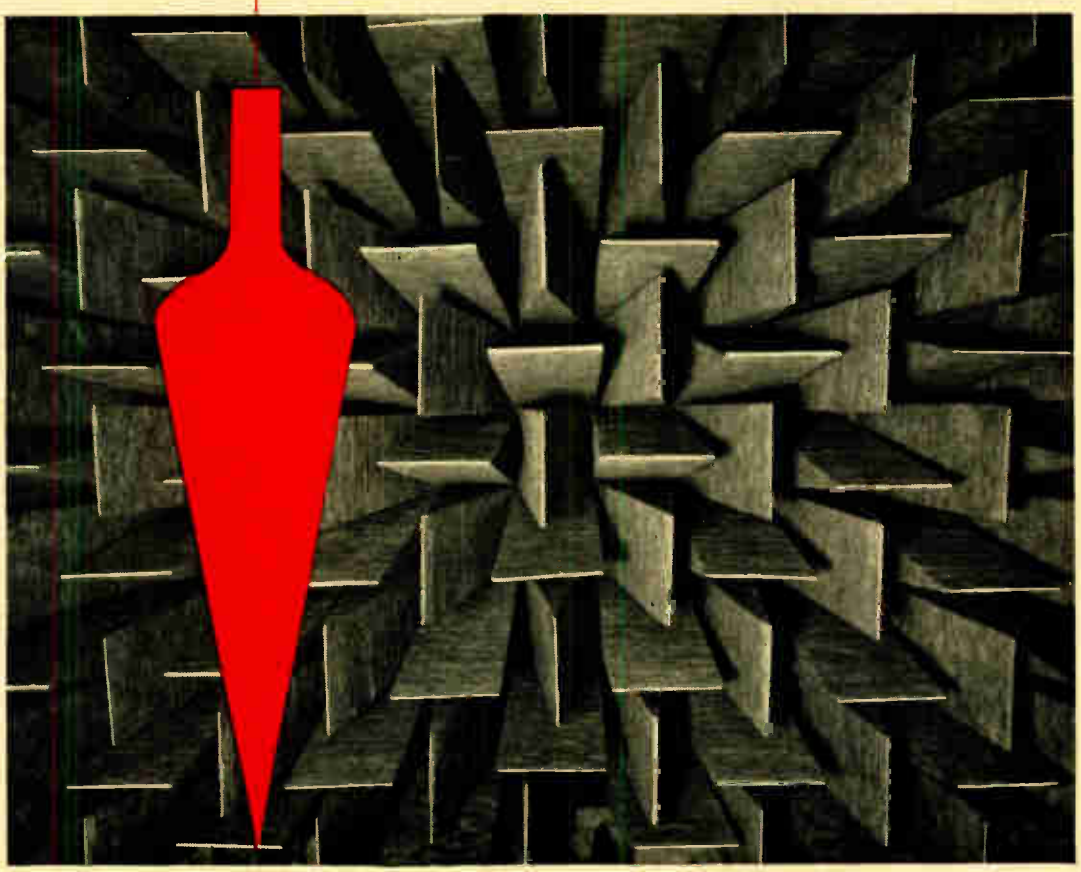
T. R. McLagan, leader of the nation's most powerful business body, the Canadian Manufacturers Association, and president of Canada Steamship Lines Ltd., and **R. E. Morrow,** partner in the Montreal law firm of Howard, Cate, Ogilvy, Bishop, Cope, Porteous and Hansard, have been elected directors of the company.

B. W. King, managing director of Sperry Gyroscope, said that the election of the new directors was an extension of the company's continuing program of Canadianization.

TO PLUMB NEW DEPTHS IN SOUND,

Northern Electric Research and Development Laboratories built a floating anechoic chamber. Although the appearance of this room is weird, its purpose is perfection; for here, there are no echoes, reflections or vibrations to distort the accuracy measurements of sound waves. ■ Wedges of Fiberglas, five feet long, project towards the middle of the room from all six surfaces, so that the equipment under test is completely surrounded by a mass of sound absorbent material. ■ This anechoic chamber is being used to test microphones, speakers, telephone transmitters and receivers, intercom systems and other communications equipment. ■ The chamber is an important new asset, but it represents just a fraction of the total facilities and personnel dedicated to the quest for progress in communications at the Research and Development Laboratories of Northern Electric Company Limited.

■ RESEARCH AND DEVELOPMENT LABORATORIES



Northern Electric
COMPANY LIMITED

SERVES YOU BEST

6660-26

EIA report

by R. T. O'Brien

An increasing number of enquiries with respect to the organization and objectives of the International Electrotechnical Commission has been received in recent months by the EIA and the following brief run-down of the functions of this organization is thought to be in order.

The object of the International Electrotechnical Commission is to facilitate the co-ordination and unification of national electrotechnical standards and to co-ordinate the activities of other international organizations in this field.

Any self-governing country desiring to participate in the work of the Commission may form a committee for its own country and apply for membership. This committee when it has been accepted as a member is known as the "National Committee".

The National Committees are composed of representatives of the various technical and scientific organizations that deal with questions of electrical standardization on the national level. Most of them are recognized and supported by their respective governments. There is only one Committee for each country.

Canada is one of 30 countries currently holding membership in the Commission. The Canadian National Committee of the IEC was founded in 1908 and now operates under the auspices of the Canadian Standards Association (CSA), which is the Canadian member body of the ISO. The membership includes representatives from government, scientific and industrial organizations and power and communication utilities.

The subjects covered by the Technical Committees in Canada are assigned to members who in turn act as advisors to the Committee. Sub-Committees, representative of producer and consumer interests, are formed where necessary and establish liaison with CSA Specification Committees where they exist.

To attain its object the IEC publishes recommendations which, as far as possible, express international agreement upon the subjects dealt with. Although IEC recommendations are not binding upon member organizations, these latter are strongly recommended to follow them when drawing up their national specifications, so as to unify all national specifications and to facilitate commerce.

The work of the IEC is carried on through a Council, a Committee of Action and a Central Office and Technical Committee. The Council comprises the president of the IEC, presidents of National Committees who are ex-officio vice-president, the treasurer, and the secretary. The Council meets at least once every three years.

The Committee of Action is elected by the Council. It is composed of the president of the Commission and nine-vice-presidents or their duly accredited deputies. The past president, the treasurer, and the secretary are members ex-officio but without vote. Members are elected for a period of nine years, one-third being elected at the end of each three year period. The Committee of Action has authority to deal with all administrative questions in the interval between the meetings of the Council. It takes all decisions which it considers necessary to facilitate the operation of the technical work of the Commission. It reports all its decisions to the Council.

The technical work of the Commission is carried out by the Technical Committees, each dealing with a given subject. These are set up by the Council or by the Committee of Action, on the proposal of one or more National Committees and after all the National Committees have been consulted by the central office. The scope of the Technical Committee is fixed at the time of its formation and must be approved by the Committee of Action.

Any National Committee may be represented on any Technical Committee.

A Technical Committee has a chairman and a secretariat appointed by the Committee of Action. One of the National Committees is appointed as secretariat and assumes responsibilities for the progress of the work.

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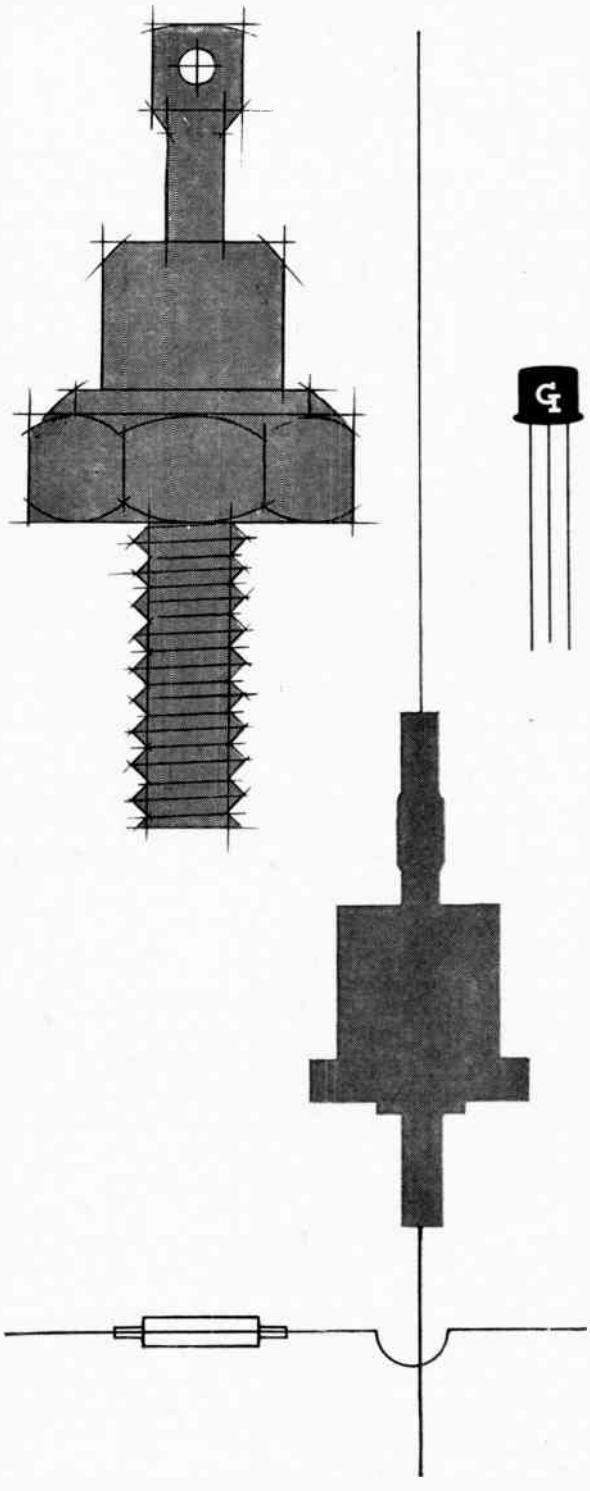

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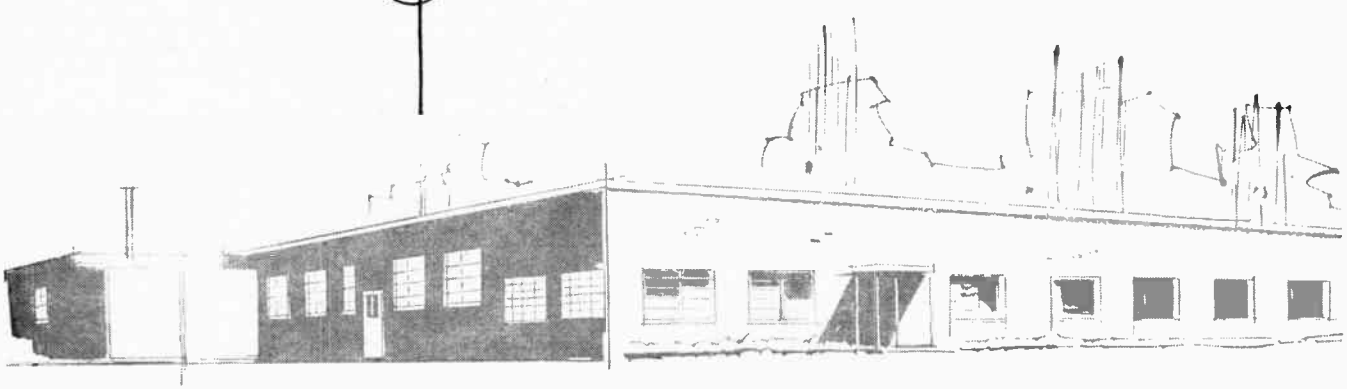


For complete details check No. 17 on handy card, page 43

the industry's business

CHAB-TV Chief Engineer Merv Pickford has his finger on the dial that operates the RCA Victor remote-control equipment. The unique set-up supervises all functions of the transmitter, located 15 miles from the studio in Moose Jaw, without the use of wire lines.

Radio Condenser changes ownership

Thompson Ramo Wooldridge Inc. of Los Angeles, California, has taken steps to acquire Radio Condenser Company of Camden, N.J.

The company has plants and laboratories in Camden, Thornwood, N.Y. and Watseka and Hoopeston, Ill., and operates a Canadian subsidiary, Radio Condenser Co. Ltd. in East Toronto, Ontario.

A producer of variable condensers, Radio Condenser also provides radio tuning devices for the commercial and military electronics fields, and special purpose precision-type capacitors used in military communications equipment.

Carpenter Mfg. Co. appoints Bayly

Carpenter Manufacturing Company of DeWitt, N.Y., manufacturers of special power-driven wire stripping machines are now represented in Canada by Bayly Engineering Limited of Hunt St., Ajax, Ontario.

Bayly Engineering may be contacted for further details concerning Carpenter wire strippers which provide fast, efficient removal of film or bonded insulation including teflon.

Burlec Sales rep for Standard Rectifier

Burlec Sales Limited, with offices at 45 Northline Rd., Toronto 16, Ont., and 1179 Decarie Boulevard, Montreal 9, P.Q., announces its appointment as the Canadian distributor of the Standard Rectifier Corporation.

Standard Rectifier manufacture hermetically sealed diodes.

Lake Engineering appointed rep for Garlock Inc.

Lake Engineering Co. Ltd., of 767 Warden Avenue, Scarborough, Ontario, has been appointed the sole Canadian distributor for Garlock electronic products.

Garlock Inc. specializes in the manufacture of molded extruded and machined products utilizing Teflon, Nylon, Delrin, C.F.T.E., Kel-F and other industrial plastics for electrical and electronic applications.

Quality Control forum

The Toronto Section of the American Society for Quality Control will hold its 8th Annual "All-Day Quality Control Forum" on Saturday, March 11, 1961, at Hart House, University of Toronto.

Represents Westrex Corp.

The Westrex Corporation of New York City, a division of Litton Industries in California, recently announced the establishment of its Geophysical and Oceanographic Instrumentation Laboratory at its New York headquarters, headed by Bernard Luskin, a research associate in geology and chief electronics engineer of Columbia University's Lamont Geological Observatory since 1948.

In Canada, Westrex Corporation is represented by Tele-Radio Systems Limited, 3633 Dundas St. West, Toronto 9, Ontario.

Toronto Section IRE meetings

Two meetings were held during January 1961 by the Toronto Section of the Institute of Radio Engineers.

On Monday, January 9, C. J. McReynolds of Canadian Westinghouse Company Limited presented a paper entitled "Ultrasonic Cleaning". His talk dealt with the principles of ultrasonic cleaning, the systems available and their applications in industry.

Mr. McReynolds, who graduated in electrical engineering from Queen's University, Belfast, joined the Canadian Westinghouse Company in the Industrial Control Division in Hamilton and currently holds the position of Industrial Control Specialist in that section.

The second January meeting took place on Tuesday, January 31, and comprised a tour of the new facilities at the Ryerson Institute of Technology.

EMI TV cameras for Canada

Twelve E.M.I. Electronics image orthicon television cameras and associated equipment are the major items in a $500,000 contract won by Canadian General Electric Co. Ltd. to provide broadcast equipment for Montreal's new television station, CFTM-TV, which will serve the French-speaking population.

The contract was awarded after working demonstrations by several manufacturers' cameras. These demonstrations included complete dismantling and re-assembling of the equipment.

These cameras have already been supplied to Australia, Canada, Germany, Hungary, Italy, Mexico, the United States and Great Britain.

DDP contracts awarded in electronics field

Following is a list of unclassified electronic defense contracts for $10,000 or over awarded during the period December 1-15, 1960 to Canadian firms by the Department of Defense Production.

- Ampex of Canada Ltd., Ottawa, Ont.; magnetic tape recording systems, $25,920; magnetic tape recording and reproducing system and accessories, $23,256.
- Aviation Electric Ltd., Montreal, Que., pre-production phase of registering accelerometers, $122,014.
- British Columbia Telephone Co., Vancouver, B.C., rental of telephone facilities, $32,970.
- Canadian Marconi Co., Montreal, Que., signal generators, $153,055.
- Canadian Vickers Ltd., Montreal, Que., sonar transducer group hoist. $1,456,641.
- Alex L. Clark Ltd., Islington, Ont., photographic equipment, $30,129.
- Computing Devices of Canada Ltd., Ottawa, Ont., aircraft instruments and navigation equipment, $2,357,800.
- DeHavilland Aircraft of Canada Ltd., Downsview, Ont., antenna modules, $24,900.
- E. P. Electric Products Co. Ltd., Montreal, Que., electronic components, $10,243.
- Electronic Materiels International Ltd., Ottawa, Ont., cable assemblies, $13,189; headsets, $13,094.
- Protective Plastics Ltd., Scarborough, Ont., radome spare panels, $16,877.
- Radionics Ltd., Montreal, Que., electronic equipment, $18,075.
- Tellurometer Canada Ltd., Ottawa, Ont., distance measuring equipments, $103,393.

Mel Sales announces subsidiary

Mel Sales Limited, 1969 Avenue Road, Toronto, announces the formation of a new subsidiary company — MELCOM.

Melcom will have the Canadian representation for several major U.S. manufacturers of components for the electronic and allied industries.

C. G. E. awarded million dollar air defense equipment contract

The Canadian General Electric Co. Ltd. is manufacturing approximately $1,000,000 worth of specially-designed electronic equipment as part of the AN/FPS-24 air defense Search Radar contract awarded by the United States Air Force to the General Electric Company (U.S.).

Under a sub-contract from the U.S. company, the Canadian firm will produce a number of oscillator-drive radar units, designed and built by Canadian General Electric engineers under a previous development engineering contract.

R. M. Robinson, CGE vice-president and general manager of the Company's electronic equipment and tube department, said the units are due to be delivered by April of 1961. Parts of the order are being sub-let to Canadian component manufacturers.

The contract provides an "excellent illustration" of the capabilities of Canadian engineers in developing and producing complex electronic equipment for marketing abroad, Mr. Robinson said.

"Scrambler" for business telephones

The first "scrambler" security telephone device for business, industry and law enforcement is now being marketed in Canada by Electronic Materiels International Limited, Ottawa, under a licensing arrangement with the patent holders.

The first "scrambler" phones were popularized early in World War II, when President Roosevelt and Prime Minister Churchill used the electronic wonder to prevent high-level eavesdropping. High government officials today still use such devices from fixed locations, but the cost and complex vacuum tube circuitry have prevented any such use by business.

Appointed reps for Canada

Radionics Limited of Montreal have announced their appointment as exclusive Canadian representative for Electro-Pulse, Inc. of 6711 S. Sepulveda Blvd., Los Angeles 45, California.

Electro-Pulse, Inc. manufacture a broad range of single and double pulse generators up to 10 mc and with extremely fast rise times and flexible repetition rates and pulse durations, as well as variable delays.

Technician adjusts oscilloscope at Canadian Marconi's new laboratory for pre-testing special purpose tubes. In the background is the pressure controlled test room in which tubes are tested under simulated operating conditions.

Military components Symposium

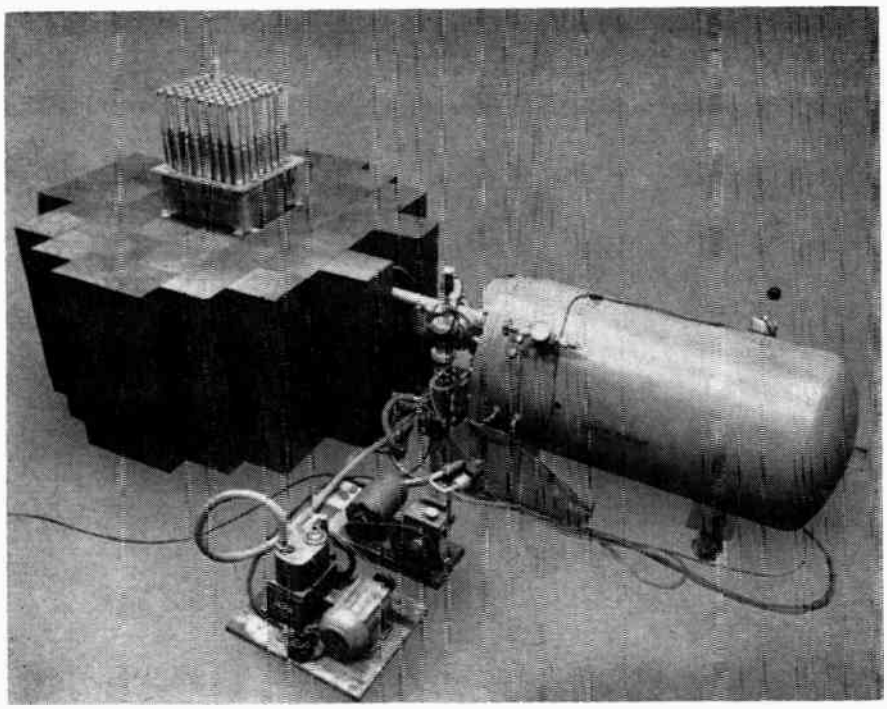
The Armed Services of Canada are sponsoring a Canadian Military Electronic Components Symposium on April 11 and 12, 1961, in Ottawa. The Symposium will be held at the auditorium of the National Gallery, Lorne Building.

The Symposium is intended to explain to industry the present and future thinking and work in the field of electronic components. It will enable industry to obtain a clearer appreciation of service requirements. It is hoped it will lead to an improved understanding of the problems of the services and industry.

Four sessions have been planned for the Symposium as follows: (a) Components Research and Development in Canada (b) Components Standardization (c) Components Reliability and (d) Components Production.

Pre-registration and circular letter will be prepared for the industry, by EIA, in the near future. Proceedings of the Symposium will be published.

Further information on this event may be obtained by writing to Electronic and Electrical Division, Army Development Establishment, 255 Argyle Ave., Ottawa, Ontario.



The illustration to left shows a Van de Graaff pulsed neutron source with sub-critical assembly.

NUCLEONIC NOTES

Pulsed neutrons for reactor research and teaching

Released to Electronics and Communications for exclusive Canadian publication by High Voltage Engineering Corporation, Burlington, Massachusetts.

A source of pulsed neutrons allows the scientist to conduct many important experiments in nuclear-pile technology and neutron physics. These experiments are designed to measure important parameters of a particular moderator or subcritical assembly or to demonstrate some aspect of neutron physics.

Subcritical assemblies

Campbell[1], using a pulsed deuteron beam from a Van de Graaff® accelerator, has investigated the multiplicative properties of a water-U^{235} assembly. The dependence of thermal neutron lifetime on physical dimensions was measured and was found to agree with theory, with a reasonable allowance being made for the age to reach thermal energies.

Borst[2], using a 2-Mev Van de Graaff with the Be^9 (d, n) reaction, obtained an output of about 5×10^{10} neutrons per second and a neutron multiplication of 6.7 in a water-moderated "pickle barrel". The assembly had a criticality factor of 0.85. With the high neutron output from the Van de Graaff, it is possible to carry out lifetime studies of prompt and delayed neutrons, measurements of the effect of impurity in the water moderator and the effect of control rods on the criticality factor, measurements of cross-sections, and many other experiments concerned with neutron physics.

Sjorstrand[3] of Sweden has reported measurements on a subcritical heavy-water reactor using pulsed neutrons. By this method it was possible to determine the criticality per unit volume of moderator and the effect of control-rod geometry on criticality. The overall criticality of the reactor could be measured each time some operating parameter was changed.

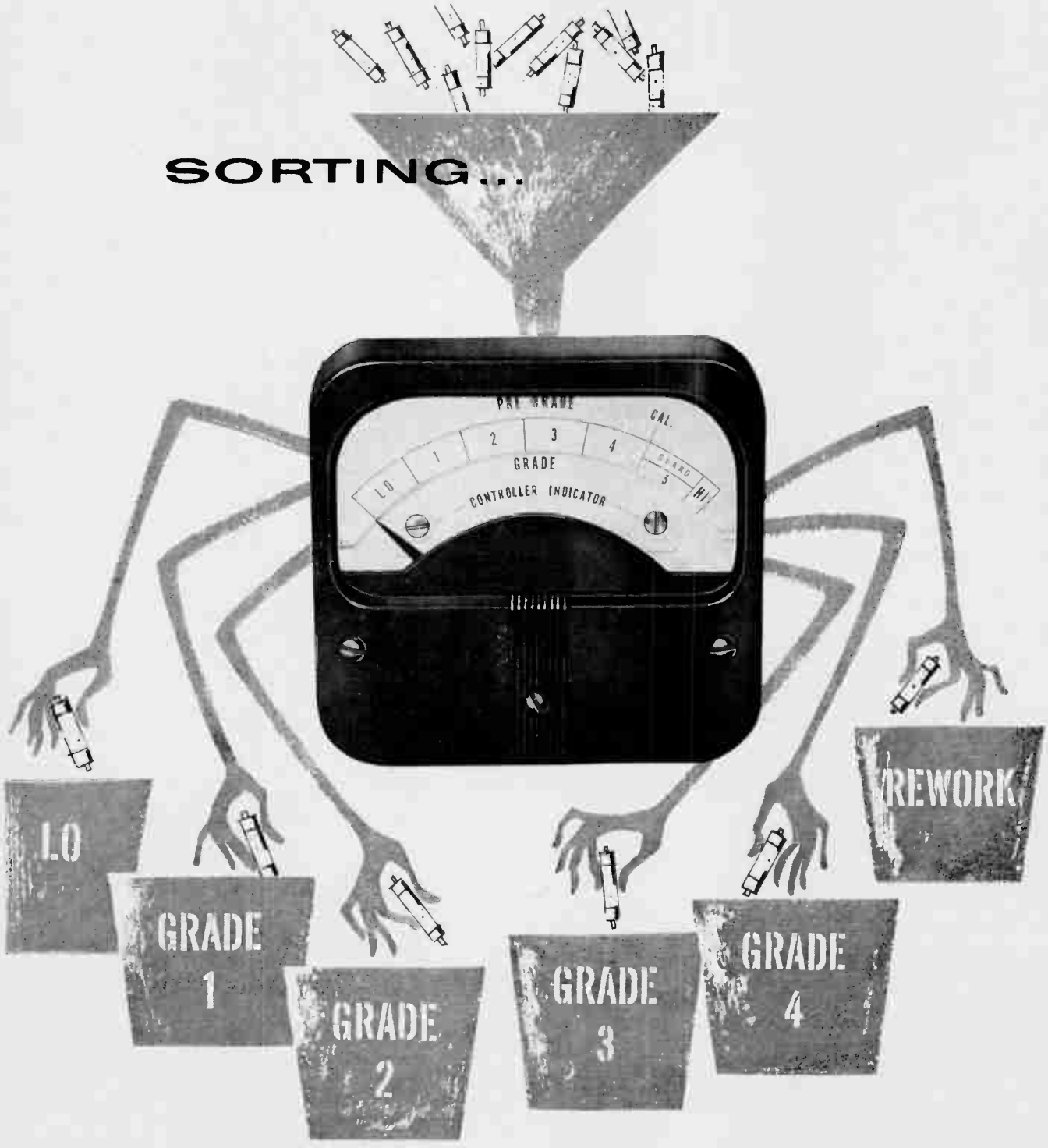
Pulsed neutron sources for teaching

The ability to demonstrate some of the properties of the neutron can be invaluable in teaching. Experiments related to lectures can be designed to show neutron moderation with foils or other types of detectors. This can lead to a discussion of neutron diffusion and capture, and of the effects of different buckling factors and types of moderators. The addition of impurities to the water will alter the mean life, and the capture cross-sections for the impurities can be calculated and compared with other methods of measurement. The multiplicative properties of the assembly and the effect of control rods on the multiplication factor can be ascertained. Thus the student can be shown all the steps in the design and operation of a full scale reactor — with a relatively simple piece of equipment.

The sub-critical assembly can be used for group studies with adequate control for beginning students, but it is by no means limited to this type of teaching. The advanced student can use this device to carry out many important measurements of a fundamental nature which are needed by the reactor designers of today. Many of the gaps in our knowledge of reactor neutron theory can be filled through the use of this type of equipment.

Reference

1. *Campbell, P. H. Stelson Bull. APS 1. No. 4, 183, 1956*
2. *L. B. Borst — Nucleonics Aug. 1956. Vol. 14, No. 8, Pg. 66-68*
3. *N. G. Sjorstrand — Vol. 5, 52, National Conference on Peaceful Uses of Atomic Energy — Geneva, 1955 — P/789*



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For complete details check No. 6 on handy card, page 43

In the type of technical selling required in the defense market the marketing man and the engineer must work hand in hand. Initially the marketing man who makes the personal contact is soon joined by the other half of the partnership, the engineer, and detailed discussions will result.

MANAGEMENT

A workable blueprint for defense spending

Just over two years ago defense production sharing opened up a brand new market for Canadian electronics companies. It also brought with it an entirely new set of marketing problems.

by W. S. Kendall *

For years the Canadian defense electronics industry had been sustained at an approximate 100 million dollar annual level with the budget being split between independent Canadian developments and straight manufacture of U.S. designed products. The development programs usually went to the company having specialized skills in particular areas, and the production of U.S. designs was mostly handled by the Canadian subsidiary of the U.S. parent. The Department of Defense Production, operating under the charter of the Defense Production Act of 1951, worked to maintain a technological base of design and productive skills for a rather limited market. Competition was not a dominant factor under these circumstances and there was little real need for sales initiative. No amount of effort could increase the total available market, nor could it do much to obtain a larger share of the existing market. "Selling" as such was accomplished by senior company executives or by the contracts administrator.

Today the situation has changed. The major contract terminations of 1958 and 1959 finally led to the disappearance of the Canadian market for technical defense development, and defense requirements were limited to straight manufacture, or direct purchase, mostly from the U.S. Since engineering strength was not required it was apparent that the Canadian research and development base would quickly vanish. It was at this point that the U.S. - Canada program of economic co-operation in defense production was initiated. The huge U.S. electronics defense market — 50 times larger than the home market — was opened to Canadians on a theoretically equal opportunity basis. At first this seemed more than a fair trade, but two years and many sales dollars later, there is a growing awareness that production sharing is not going to be any "give away" program. It is a brand new market with an attractive five billion dollar price tag on it but it isn't going to be easy to get at. It is apparent that this market is highly organized, intensely competitive, technically demanding and favoring those companies having advanced skills and knowing what to do with these through planned marketing development.

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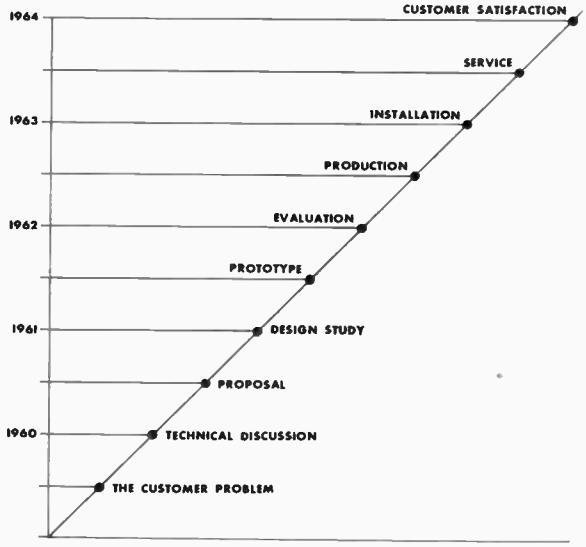
* *Marketing Director, Computing Devices of Canada Ltd.*
The author has noted that facts used in this article have been obtained from official sources and are believed to be accurate. The opinions expressed in this article are strictly those of the author.

It is clear that if Canadian companies are to compete they too must utilize all the techniques of professional marketing. Having a good product or a unique skill is worthless unless it can be matched to a customer's need. The engineer may design an excellent technical product but it takes the marketing man to make that a saleable product.

Although the so-called marketing concept is well accepted in many consumer industries the full meaning of the term has not been as well understood in the defense business. Marketing is much more than just selling, although selling is a fundamental part of it. Marketing is much more than just a department in the company. It is in reality a company philosophy. It is a way of doing business to meet the customer's need The marketing concept is in direct contrast to the old fashioned approach of building a product and then seeking a market. In the defense business today we are not selling technical equipment — we are selling the means of satisfying a customer's need. We are selling the service the equipment will provide. The customer wants reliability — performance — spares — technical support — on time delivery — competitive prices, etc. The marketing manager seeks to meet the total needs of a customer often including those unexpressed or unfelt.

There are numerous definitions of the term Marketing. Economist and consultant Peter Drucker states that *"Marketing is not only much broader than selling, it is not a specialized activity at all . . . it is the whole business seen from the point of view of the final result, that is, from the customer's point of view. Concern and responsibility for marketing must therefore permeate all areas of the enterprise." In the defense business marketing is the process by which the customer is served, all the way from initial determination of his needs, through the long development, evaluation and production cycles, to the ultimate delivery of the product or service to his complete satisfaction.

*The Practice of Management by Peter F. Drucker.



The increasing complexity of the defense requirement, and the lengthened time span for its production, calls for marketing management of an extremely high order throughout the lifetime of the project. Note: There is no relationship here between the steps and the "time" scale. The time scale is only symbolic and should not be connected to the "steps".

To accomplish this function the marketing manager may have under his direction some or all of the functions of contracts administration, sales, sales promotion, sales training, export sales, applications engineering, advertising, market research, economic forecasting, sales forecasting, product planning, servicing, pricing, production scheduling, control of finished goods inventory, etc.

Before discussing in detail how the marketing philosophy and techniques can be fitted to the defense business it might be well to illustrate a typical cycle of events in the evolution of complex technical equip-

Along with today's complex technical equipment programs must go a great deal of technical support. Shown in the above picture is one of the frequent conferences held in the library of the RCA Research Laboratories in Montreal where Dr. R. L. Williams is presenting a problem to a group of the laboratories' research scientists.

ments. Figure 1 illustrates graphically the numerous steps and the long time span from initial customer contact through to the final satisfaction of his needs. It will be seen that the process starts with the customer and ends with the customer. Each activity in between is concentrated on meeting his needs. It is a totally customer oriented pattern with the threads of marketing management interwoven throughout its entire length.

The marketing plan

Since the very essence of marketing management is careful forward planning, the master marketing plan becomes the very heart of the marketing operation. It will be based on the overall corporate objectives and contain in complete detail the marketing tactics to meet these goals. The marketing plan will answer the basic questions of what? why? when? how? where? and who? The plan will contain an analysis of market potential, strength of the competition, economic and political factors, etc. The marketing plan is a dynamic document. It is constantly revised and improved as its weaknesses unfold with the passage of time. This continuous feed back process keeps management objectives tailored to market opportunities. The marketing plan is particularly important in the defense business where results of today's decisions may not be fully known for several years.

The contracts department

The marketing cycle encompasses activities taking place both outside and inside the plant. Without drawing a sharp dividing line the internal activities are usually set in motion with the receipt of a contract. The contract administrator's responsibilities start with the contract acceptance. Before accepting it he must assure himself that:

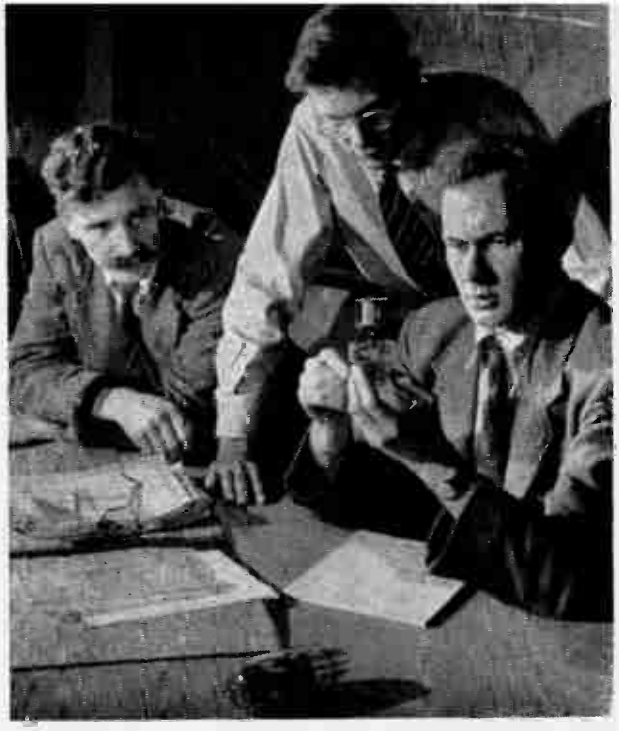
1. The contract agrees with the proposal submitted.
2. Both parties have exactly the same understanding of what is required.
3. All called up specifications are fully understood and acceptable to the company.
4. All financial and delivery clauses are acceptable.
5. There are no "surprises" concealed in any of the clauses.

The contracts administrator prepares a detailed work statement showing precisely what must be accomplished — and when. This then forms the framework for the overall company project plan which in turn becomes the basis of performance measurement for all departments. The contracts administrator sets up his own check points and on behalf of the customer monitors contract performance throughout its lifetime. Any real or potential trouble spots noted are reported to the management area concerned for immediate action.

The contracts administrator has a most responsible position. He stands in the middle, providing the communication link between the customer and the company, but representing the interests of both. More than anyone else the contracts administrator has the opportunity of keeping both the customer and company happy and the program on the rails.

The contracts administrator in many respects has a sales role as well. He should always be one jump ahead in anticipating customer requirements for increased quantities, test equipment, technical support, future spares, etc. An important military program through its various stages of development and changing requirements, can go on for years opening up new sales possibilities to an alert management.

Contracts negotiation and management has assumed



In today's defense market the company getting the order will have the product or capability that meets the customers' requirements and emotion will play no part in the decision. The marketing man's job is to know the resources, skills and capabilities of his company and how to present these to the customer. The above picture shows a group of three British scientists at Mullard Laboratories combining talents and energies in a team effort to produce the best possible design of a product.

greater than ever importance with the opening of the U.S. defense market to Canadian companies. Today's contract administrator must be able to find his way through the maze of U.S. procurement documents, policies and procedures, and correctly interpret them in company negotiations. Failure to do so can result in unexpected losses. The U.S. procurement agencies being so much larger must be more formal in defense contracting than our own Department of Defense Production.

Contract performance is of paramount importance on U.S. military programs. Delivery schedules *must* be met. Failure to perform will almost certainly prejudice a company's chances for future business. Today's complex weapons programs cannot tolerate delivery slippages.

On the other hand meticulous delivery and performance on U.S. programs can open the door to tremendous sales volume and profit for Canadian companies.

Market research

Good market research is the basis of intelligent decision making and is a prime responsibility of the marketing department. There are quite a few sources of information providing both qualitative and quantitative market data. Some of these are listed below:

- Personal customer contact
- Listening posts in headquarters areas
- The business and trade press
- Trade associations
- The Department of Defense Production
- The Canadian Commercial Corporation
- The Department of Trade and Commerce
- Industry and technical symposia
- Published government data
- Industry directories
- Consultants

Continued on page 37

TESTING TECHNIQUE

Corona in coaxial cables

Preparation of cable specimens for corona testing, test circuits and the calibration of equipment are discussed in the following article as a guide to cable manufacturers.

by John P. Agris*

Coaxial cable used with high voltages should be protected against harmful discharges that may occur within the cable or its connectors during operation. If voids within the cable dielectric become ionized, premature breakdown of the insulation can occur.

The ideal method for corona testing would be to test reels of coaxial cable. But because of the total capacitance of the reel, sensitive and expensive equipment is required. Even if such equipment is used, no method is available for locating the points of discharges in a cable. Several manufacturers of high-voltage cable check the dielectric core of the cable which ensures that no voids are present between the inner conductor and the dielectric or within the dielectric.

At the last government-industry meeting of MIL-C-17, the U.S. Army Signal Research and Development Laboratory recommended the use of 5 picocoulombs as the level of sensitivity to be used for testing for corona in r-f cables and USASRDL recommended that methods described here be adopted. Such action would permit comparison of corona results from several manufacturers and ensure that the same requirements are being met.

The preparation of the cable specimens for corona testing is of paramount importance. If the discharges occur at the terminations of the cable sample, the corona extinction voltage of such a specimen does not reflect the inherent cable performance and rejections of cable may result. Consequently for the proper testing of the cable and for his own protection, the manufacturer should make sure that the termination of the samples are corona free.

Cable preparation

An economical and time saving method of preparing the cable specimens for corona testing is illustrated in Fig. 1. After the specimen is prepared, the ends are dipped into an insulating oil to immerse the exposed braid about ¼ inch below the oil surface. Air bubbles should be excluded from the end of the braid under oil. Connection to the inner conductor should be made so as to allow adequate separation from the braid.

The tape should not be applied over the dielectric of the cable. Where the manufacturer of the cable has made the ground connection in the middle of the sample by removing a section of the jacket and then wrapping it with several turns of wire, this braid tends to become loose when the jacket is removed. Care should be taken to wrap such wire tightly.

Use of a resonant circuit for conducting corona tests on coaxial cables offers excellent sensitivity and a means for determining the size of the discharge. The simplest form of such a circuit would be inductor coupling with a resonant frequency in the neighborhood of 100 Kc and 1 Mc.

A test and calibration schematic is shown in Fig. 2A where C_c is the capacitance of the cable specimen, C_b is the capacitance of the coupling capacitor which must be corona free at the test voltage, and $C_o >> C_c$.

The coupling device connects to the input of an amplifier, which has a gain consistent with the capacitance of the test specimens. If the capacitance is in the order of 100 pf, then the signal produced by a corona discharge of 5 picocoulombs will be between 15 and 50 millivolts, and the amplifier of an oscilloscope with 15 mv per in. sensivity at the resonant frequency will be adequate. If the specimen is a length of cable with a capacitance of 30,000 pf, for example, the signal produced by a 5 picocoulomb discharge will be between 15 and 156 microvolts and a pre-amplifier with a gain of about 300 at the resonant frequency will be needed between the coupling device and the oscilloscope.

One example is offered. In Fig. 2A capacitor C_b may have a value of larger than 1,000 pf and must be corona free at the test voltage. Using inductor coupling, L is an r-f choke with a value of 10 mh, and C, which includes the distributed capacitance, is 200 pf to yield a resonant frequency of about 100 Kc.

One variation of this circuit is where the cable specimen is placed across the secondary of the transformer and a blocking capacitor in series with the tuned circuit. The value of the latter may be about 100 pf. All stray capacitances should be kept to a minimum as they affect the sensitivity.

Calibration

The calibration is performed as follows. Cable capacitance C_c is accurately measured. The cable specimen is then charged to a voltage V_c sufficient to provide a minimum charge of 5 picocoulombs. The specimen is then discharged into the resonant circuit with the deflection observed on the scope. This deflection observed on the scope. This deflection should be at least ½ inch for the necessary accuracy. The repetition rate of the pulse generator should be approximately 100 pulses a second. Duration of the pulse should be 10 microseconds or longer, with a rise time of 0.1 micro-

* *U.S. Army Signal Research & Development Laboratory, Fort Monmouth, N.J.*

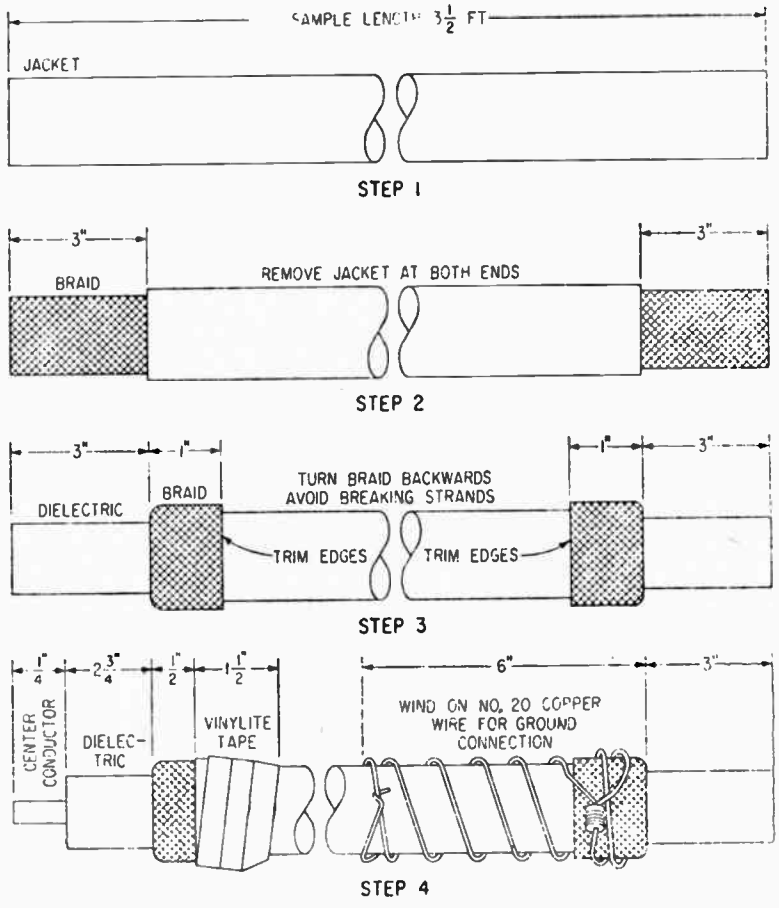


Figure 1 — These four steps represent an economical method of preparing cable specimens for corona testing.

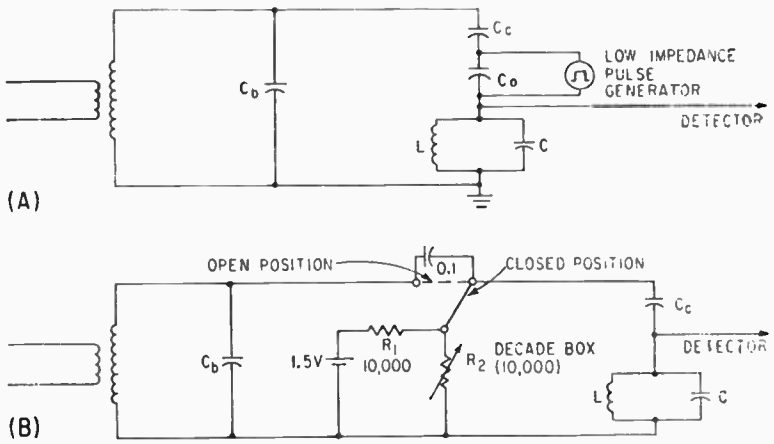


Figure 2 — Two test and calibration circuits which can be used for corona testing of cables.

seconds or less. The output impedance of the generator should be 100 ohms or less. The loss of charge is then calculated by:

$$\text{picocoulombs per inch deflection} = \frac{C_c\ (\triangle V_c)}{\text{inches of deflection}}$$

where C_c is in picofarads and $\triangle V_c$ is in volts.

An alternate method for the calibration is by using the circuit of Fig. 2B. The 0.1-microfarad capacitor must be of noninductive internal construction and must be mounted on the switch with a minimum of lead length to minimize external inductance.

With the switch in the closed position, the cable specimen is charged to a voltage V. When the switch is opened, the specimen discharges into the resonant circuit and deflection is observed on the oscilloscope. The loss of charge is the same as described in the previous method.

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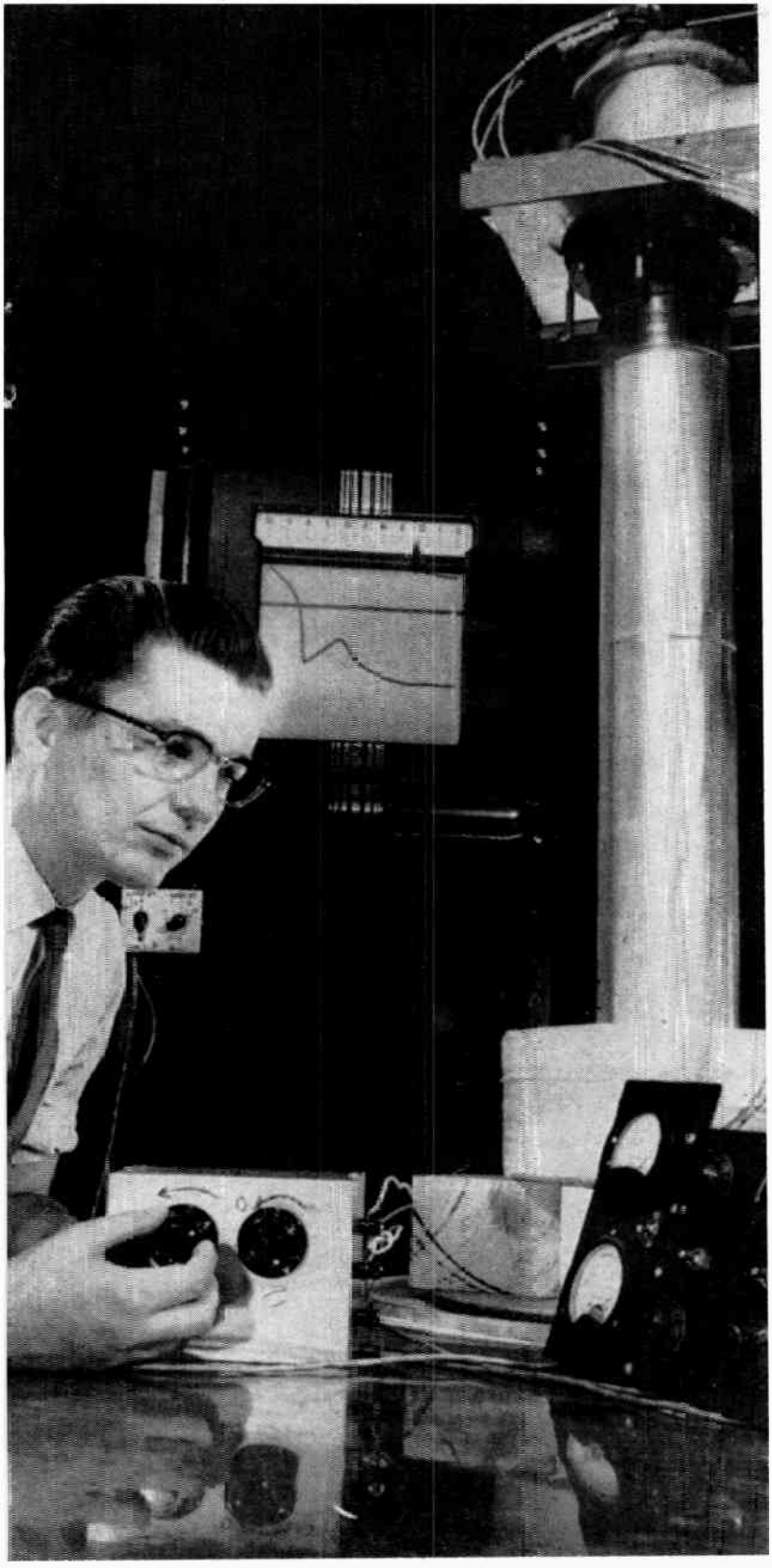
(3) Dielectric Materials Ionization Study, Interim Engineering Report Nr 5, Contract Nobsr-57408.



In the picture at left a scientist at General Electric Research Laboratory in Schenectady, N.Y., adjusts the voltage applied to a thin-film experimental device. In the background is the recording instrument on which a current-voltage curve has been tradced. The dip in the curve marks the region in which negative resistance is observable.

Superconducting thin film tunneling effect

An electronic process known as "tunneling" which has previously proved useful in carefully prepared semiconductor materials, has been observed for the first time in devices of simpler configuration.

by Ivar Giaever *

It would be helpful to begin this explanation by reminding you of the difference between good electrical conductors such as metals, and good electrical insulators such as plastics. Both metals and plastics contain an enormous number of electrons. However, in a metal a significant part of these electrons can move about rather freely within the total volume, while in an insulator the electrons do not wander from atom to atom. We should also remember that electrons are regarded as fundamental particles, and that all electrons carry a fixed amount of electrical charge.

If a small electrical potential difference, or voltage, is applied between the ends of, say, a copper wire, the electrons in the copper will tend to flow through the wire to equalize the applied potential or voltage. This electron flow is referred to as electric current. If we apply a voltage difference across an insulator the electrons will want to flow, but by the very nature of the insulator they are prevented from flowing.

A vacuum may be regarded as a perfect insulator, since it contains no electrons at all. We also have perfect conductors, which we call "super-conductors".

* *Physicist, General Electric Research Laboratory.*

The superconducting state is achieved by bringing certain metals down to very low temperatures. For example, if a ring of lead is kept at the extremely low temperature of 4°K (about 500° below zero on the Fahrenheit scale), current induced in it will continue to flow forever. Some of the metals which have this fascinating property of superconductivity are lead, which is superconducting below 7.2°K; tin, below 3.7°K; indium, below 3.3°K; and aluminum, below 1.2°K.

Another important fact about the superconducting state is that a magnetic field will influence the superconducting properties of a metal, and no metal is known to be superconductive in a high magnetic field.

Scientists have long been intrigued and puzzled by superconductive properties. Only relatively recently has a quantum mechanical theory of superconductivity been developed by Bardeen, Cooper and Schriefer at the University of Illinois. In all theories of conductivity a property of vital importance is the absolute energy of the electrons and how many electrons we have per unit energy range. We speak of this as the electron density of states. The tunneling experiment I shall describe is ideally suited to measure the density of states in a superconductor, and it represents an entirely new approach to the problem.

Experimental technique

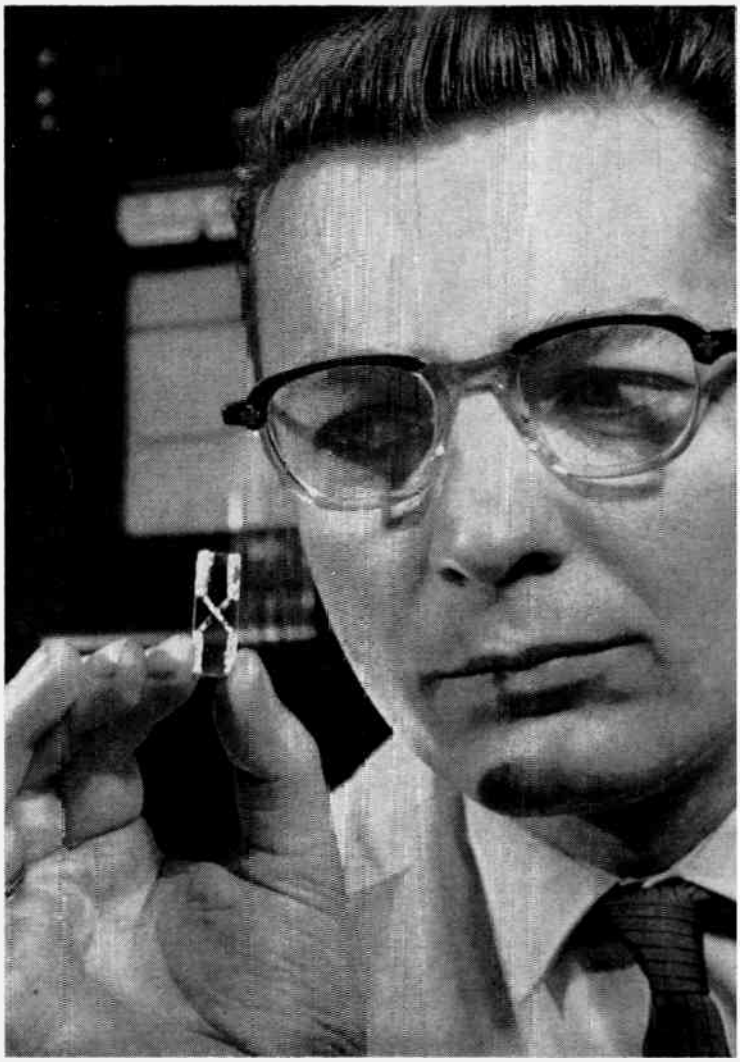
The experiment is basically extremely simple. Let us separate two metals by an insulating layer which is very thin, say only 10 atom layers, or approximately 1/10,000,000 of an inch thick. This sounds like a difficult task, but it may be accomplished in the following way. First we evaporate or vapor deposit a strip or film of aluminum on a glass slide, as shown in Figure 1a. We then expose this aluminum film to air for a few minutes, permitting a very thin natural oxide layer to form on the surface of the aluminum film (Figure 1b). Finally we evaporate a lead film across the aluminum film. This sandwiches the aluminum oxide layer between the two metal films, as shown in Figure 1c.

If a potential difference, or voltage, is applied between the two metal films, a current will flow through the insulating layer! In other words, even if two metals are completely separated by an insulator, they are not electrically insulated from each other, as long as the separation distance is small. In quantum mechanics one would say that the electrons tunnel through the insulator. In more ordinary language one could say that a current flows through the insulator, because a number of electrons large enough to be measured as electric current pass from one metal to the other.

In Figure 2 we show how this current depends upon the applied potential. Curve "a" illustrates tunneling between two metals (in this case tunneling between lead and aluminum through aluminum oxide) when the temperature is at say 10°K. At this temperature neither lead nor aluminum is superconducting. We see that in this situation the current is directly proportional to the voltage.

Curve "b" illustrates tunneling between a normal metal and a superconductor. At low voltages, almost no current flows. The superconductor does not accept electrons with such small energy. We observe this behavior for our aluminum-aluminum oxide-lead sandwich at temperatures between 1.2°K and 7.2°K, where only the lead is superconducting.

Finally, curve "c" shows the tunneling between two superconductors; we achieve this by cooling the aluminum-aluminum oxide-lead sandwich to below 1.2°K, where both the lead and the aluminum are superconducting. In this situation, the first part of curve "c" shows that, when the voltage is low, almost no current flows. This is because electrons with small energies are reflected from a superconductor. Then, as the voltage increases, the current also increases. But after a certain voltage has been reached, the current *decreases* as the voltage increases. Finally, in the last part of this curve, we see that the current increases with the voltage once again and approaches the normal value.

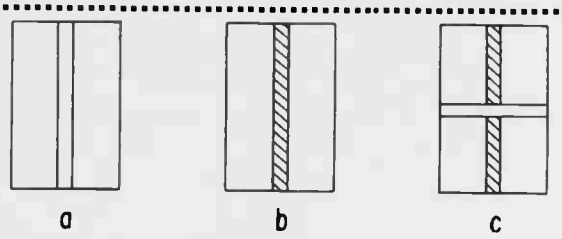


A laboratory sample used in studies of superconductivity and the tunneling effect is held by Ivar Giaever whose recent discoveries have advanced knowledge of these fields. The functioning portion of the device consists of the point at which the two metal strips cross.

The difference between these curves tells us how the important property — the electron density of state — changes when a metal becomes a superconductor. We have also provided a simple means to observe and therefore, hopefully, to understand the effects of temperature variations and the effects of magnetic fields upon superconductors.

Some potential applications

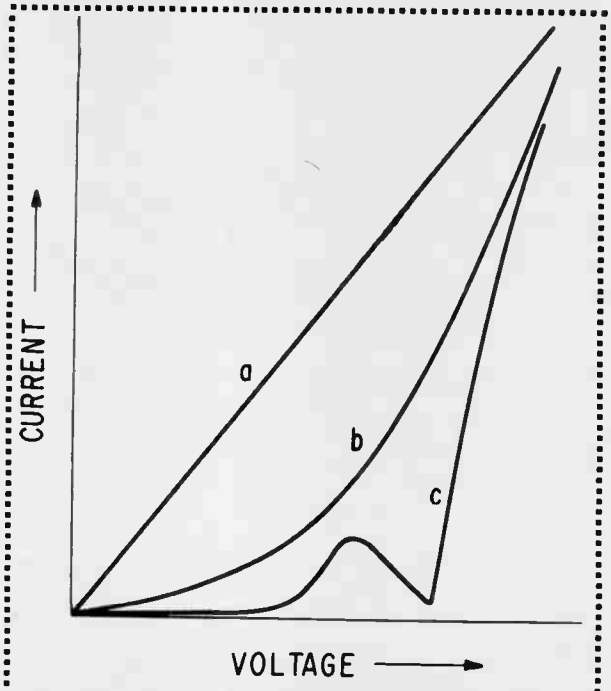
Though at present this discovery is primarily of scientific interest, it seems possible that it may yield a variety of practical applications, particularly because of the negative resistance region and because of the extremely low power requirements of each element.



Preparation of the device: (a) A strip of aluminum is evaporated on a glass slide. (b) The strip is oxidized. (c) The strip of lead is evaporated across the aluminum strip, sandwiching the oxide film between the two metal strips.

Referring to Figure 2 again, we see that quite different current-voltage characteristics can be obtained from the "sandwich" by varying the temperature. Recalling the ability of a magnetic field to return a superconducting metal to its normal state, we readily see how entirely similar current-voltage variations could be obtained by subjecting the sandwich to a magnetic field. Thus, clearly we can achieve triode-like effects by modulating the current through the sandwich with a magnetic field. We have found, for example, that at 0.2 millivolts the current through a lead-aluminum oxide-aluminum sandwich at 1°K changes by a factor of 100,000 between lead in the superconducting and in the normal state!

With regard to the negative resistance effect, the sandwich is unique in that this important effect is independent of the direction in which the current flows through the device. This versatility is not possessed by the tunnel diode. Furthermore, the negative resistance region may be changed by subjecting the device to a magnetic field or by changing the temperature.



Current-voltage characteristics for tunneling through a thin insulating film. (a) Tunneling between two normal metals. (b) Tunneling between one normal metal and a superconductor. (c) Tunneling between two superconductors, showing negative resistance.

Since the current-voltage characteristics are unique, it seems plausible that the devices may require development of unique circuitry rather than be used as substitutes for present devices.

Citizens' band radio for Canadians

DOT to announce licensing policy

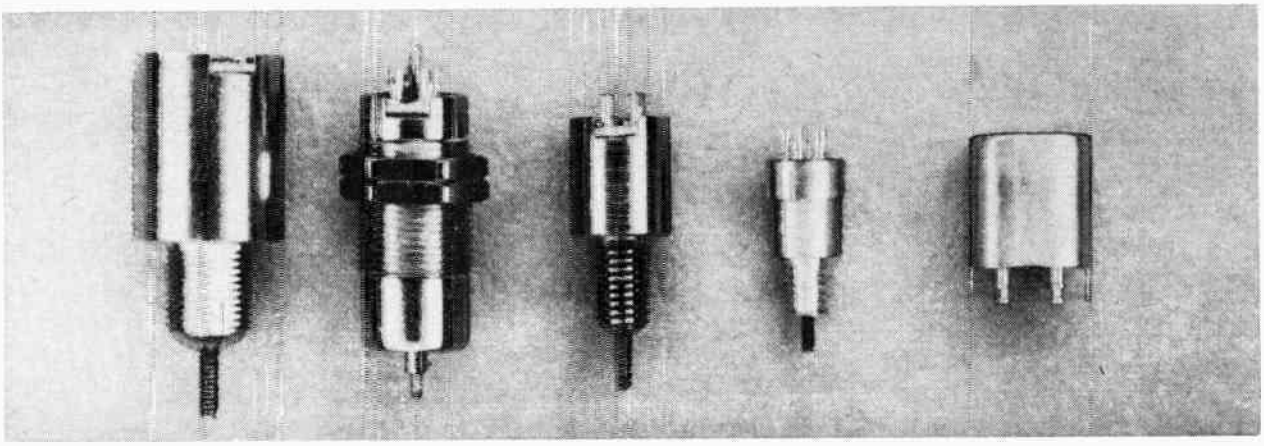
Considerable interest has been generated throughout the industry in the new General Services Band recently announced by the Telecommunications and Electronics Branch of the Department of Transport.

It is understood that provisional specifications covering equipment for this band will be released shortly. The DOT licensing policy will probably be announced during the summer with actual licensing to commence in October or November of this year.

It is understood that there are to be no restrictions on the use of equipment approved by this band which is, as the name implies, "a general service" band in the 27 mc region. A license must, of course, be obtained. This will be a simple procedure, with the actual issuing being done by DOT District Regional offices. The licensee would, however, be required to record the make and type of type-approved equipment for which he seeks a license. There will probably be several types of equipment available ranging from very compact portables to semi-professional types.

Since there will be no restrictions as to equipment applications, the licensee will be able to use it on a truck, boat, as a portable set or anywhere else. The equipment can be used for industrial, private or any two-way general service communications which previously required specific separate licensing with type-approved equipment. Power output (about five watts maximum input to the output stage of the transmitter) will, of course, limit the range and usefulness of the equipment. Due to the fact that all such services will be crowded into a relatively narrow band interference could also limit usefulness to some extent. This will naturally depend upon the extent to which equipment is licensed. However, because the possibility of severe interference does exist the Electronic Industries Association of Canada has suggested the licensing of FM equipment for this band, thereby reducing the interference problem and increasing the usefulness of the service.

It is believed that the opening of this band will offer substantial commercial advantages in the development, manufacture and sale of equipment.



Five unitized shielded coil assemblies are shown in actual size. The second coil from the left is double tuned. At the far right, a printed circuit model. All of these coils are tunable.

COMPONENT DESIGN

An introduction to unitized shielded coils

by William A. Melanson and Norton H. Reamer *

Some of the common uses of unitized shielded coils are presented in the following article. In these applications, as in others, the unitized coil provides a compact electronic package which makes a valuable contribution toward the achievement of reliable performance under severe service conditions.

The engineer who must design compact, rugged, and reliable electronic equipment will find the unitized shielded coil a useful component for many circuit applications. Unitized shielded coils are small inductors and transformers which are totally enclosed in housings of magnetic and conducting materials (Figures 1 and 2). These housings and associated hardware are called shielded coil forms.

Shielded coil forms are now available in both conventional and printed circuit types. A typical model has a brassy body which provides electrostatic and high-frequency electromagnetic shielding. It is often tunable (as shown) to permit precise setting of the inductance value after assembly (Figure 3). The shielded unit is lined with a removable powdered iron cup-core and cap. This magnetic liner provides low frequency electromagnetic shielding. The form is totally enclosed, and its enclosure is of one-piece construction with the exception of the terminal board on one end. The entire assembly is held securely in place by snapping a retaining ring into position, thus sealing the case.

Coils which are held firmly in position inside a strong precision machined metal shield exhibit unusually superior mechanical properties. For example, the double tuned model shown second from the left in Figure 1 has been accelerated to 35g, vibrated to 1200 cps, and shock-tested to 100g in laboratory tests, with no impairment of performance.

Except for direct immersion or extensive exposure to corrosive influences, resistance to severe environmental conditions is also good. The coil operated well after several hours in temperatures varying from 85°C to −55°C. Similar performance was achieved under 96 per cent relative humidity, and high altitude testing.

* *Engineering Department, Cambridge Thermionic Corporation.*

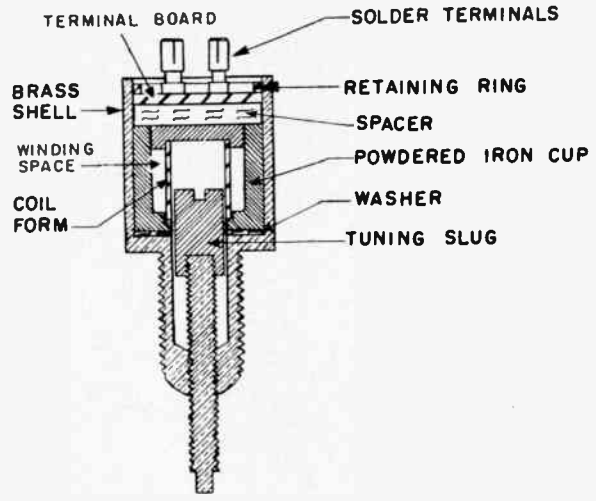


Figure 3 — Cutaway view of a shielded coil form.

Care in coil and case design and construction should be expected to result in good physical properties. However, the effect of small coil size and close fitting shielding on electrical properties is traditionally a more serious matter. How does shielding in general, and the shielded coil form in particular, influence coil performance?

Briefly, coils and other circuit devices are shielded in order to exclude unwanted pickup from random external or internal sources and to prevent feedback which may cause oscillation if the inducing flux is of the proper phase to reinforce the flux of the coil. Shielding also confines the magnetic and electrostatic fields generated by the coil itself to a small area, thereby preventing undesirable coupling with coils in other stages of the equipment.

Two types of shielding are necessary: electromagnetic and electrostatic. Shielding with magnetic materials, such as powdered iron, is effective against low frequency magnetic flux. But at high frequencies a non-magnetic conducting shell is most effective against magnetic flux. The flux induces a voltage in the shell which in turn establishes eddy currents. The presence of the eddy currents prevents penetration of the shield by the flux.

This same conducting shell provides shielding against electrostatic fields. A magnetic material which is a good conductor may also be used. Powdered iron, will not qualify however, because it is composed of many discrete iron particles insulated from each other by the binder which holds them together.

Small size units

The aim of designers has been to develop units of small size which are protected against electrostatic and electromagnetic fields. This avoids a significant reduction in the inductance of the coil or an excessive increase in its distributed capacitance and effective resistance. Inductance, distributed capacitance, and effective resistance must be controlled if the Q of the coil is not to be seriously reduced.

The effectiveness of the shielding of a unitized shielded coil may be demonstrated by measuring the extent of coupling between the shielded coil and an unshielded coil placed nearby. In a laboratory experiment a unitized shielded coil (L_1) was resonated at a frequency of 5 Mc to a Q of 70. An unshielded coil (L_2) was placed next to L_1 and was resonated by adjustment of its tuning slug. At no position of the tuning slug in L_2 was the Q of L_1 changed. This indicates that the shielded coil form prevents any coupling despite the proximity of the two coils.

Shielding in high frequency, closely packed circuits, is generally accompanied by undesirable effects upon the characteristics of the enclosed coil. Both magnetic and non-magnetic shields increase the coil's distributed capacitance and effective resistance. But the two shielding materials produce differing effects on coil inductance.

Non-magnetic shields cause a drop in inductance by increasing the reluctance of the path of the soil flux. Conversely a magnetic shield raises the inductance of the coil by providing a low reluctance path for the flux.

An outstanding feature of shielded coil forms, which have both magnetic and non-magnetic shielding, is almost complete counterbalancing of the two influences

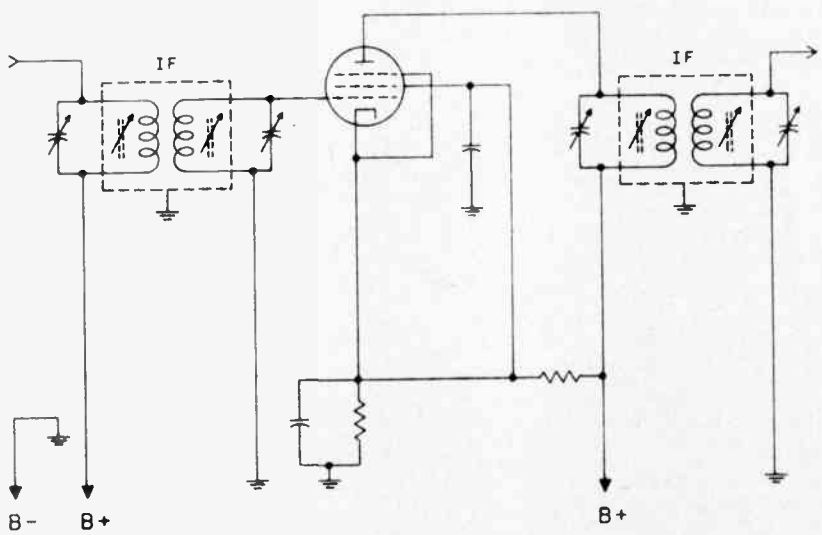


Figure 4 — Typical double tuned IF Amplifier Stage.

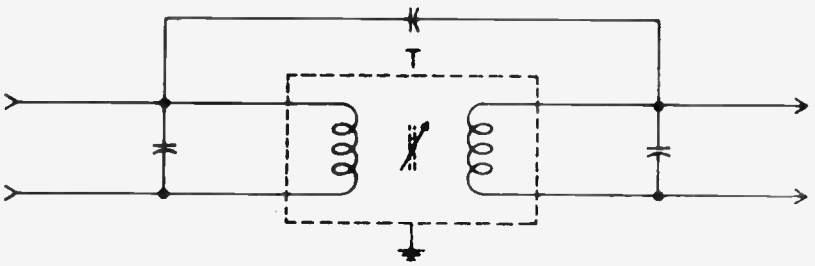


Figure 5 — Combined capacitive and inductive coupling.

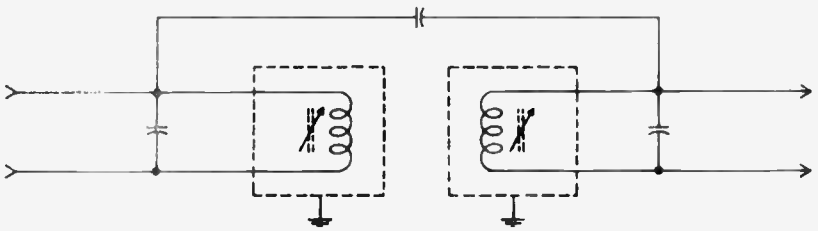


Figure 6 — Capacitive coupling.

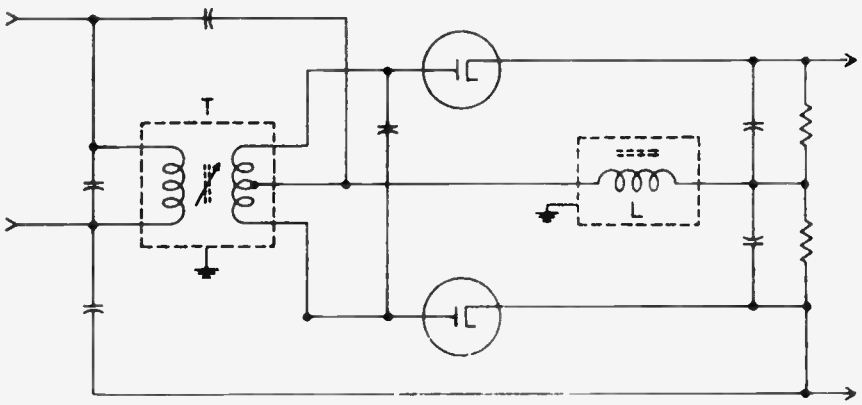


Figure 7 — Typical discriminator circuit.

on the inductance of the enclosed coil. As a result, Q is held to a value much closer to that of a coil in air than would otherwise be possible.

Table I contains data derived from two shielded coils; one tuned to a specific value of inductance, the other varied over an inductance range. In each case the data clearly confirms the restorative effects of the magnetic shielding material on the inductance and Q of the coil.

TABLE I

	Coil in Air	Coil with Non-Magnetic Shield Only	Coil with Non-Magnetic and Magnetic Shield
	(Coil No. 1, Mid-Range)		
Frequency (MC)	25	25	25
Inductance (uh)	0.75	0.64	0.81
Q	92	70	87
	(Coil No. 2, Maximum)		
Frequency (kc)	790	790	790
Inductance (uh)	362	217	475
Q	74	26	72
	(Coil No. 2, Minimum)		
Frequency (kc)	790	790	790
Inductance (uh)	150	109	167
Q	65	26	65

For example, the inductance of coil No. 1 is lowered from 0.75 uh to 0.64 uh when the coil is enclosed in a brass housing. When a powdered iron cup core and cap are added, the inductance is restored to 0.81 uh. In virtually all cases losses will be appreciably but not completely corrected by the magnetic shield. It is clear that in applications where the conducting shield, or "can", is in close proximity to windings of the coil, a magnetic material lining is needed for maintenance of inductance and Q valves.

The influence of inductance, effective resistance, and coil distributed capacitance on the Q of the coil is illustrated by the simple formula: $Q = \frac{1}{3}\frac{L}{C_d}$. A lowering of inductance (L) without comparable decrease in distributed capacitance (CD) is detrimental to Q. And, to the extent that the magnetic shield prevents this, it sustains a higher value of Q. Similarly, increases in effective resistance (R_s) and in distributed capacitance affect Q adversely. Distributed capacitance of the coil is increased because of the capacitive effects between the coil and the magnetic shield. The eddy current and hysteresis losses in the magnetic shield and the eddy current losses in the non-magnetic outer shell are responsible for the increase in the effective resistance of the coil. All factors considered small coils enclosed in a close fitting shield have lower values of Q than similar coils in air despite the beneficial influence of a magnetic liner.

Applications

Unitized shielded coils or transformers may be employed in virtually every type of circuit requiring an inductive element. Nevertheless, economy and good practice call for concentrating their use in applications demanding their unique properties. Where mechanical and environmental service conditions are severe, unitized shielded coils frequently prove the answer. They are also appropriate when space is at a premium but shielding may prove critical.

Common applications for unitized shielded coils include RF and IF transformers, discriminator circuits, oscillator and frequency multiplier tank-circuit coils and filters.

1. **RF and IF amplifiers.** The high impedance, narrow bandwidth RF or IF amplifier has great sensitivity to random pickup from surrounding equipment and circuitry (Figure 4). This random coupling with stray fields appears as interference in the output of the amplifier. The high gain of tuned RF amplifiers also makes them susceptible to instability and distortion from regenerative feedback. Even a small amount of inductive coupling in a multistage amplifier can cause reactance effects which result in significant changes to the effective resistance of the tuned circuit.

Shielding of transformers greatly reduces the danger of undesirable feedback and random interference. The magnetic inner liner of a shielded coil form also tends to improve the low frequency response of the transformer by providing a better path for its magnetic flux. The enhanced flux path is needed to counteract the effect of small transformer size which promotes high frequency response at the expense of the low frequencies.

Unitized shielded coils also permit complex coupling and capacitive coupling. In the former case, the circuit is coupled capacitively at low frequencies and is inductively coupled at high frequencies (Figure 5). When the primary and secondary of the transformer are in separate shielded coil forms, coupling can be exclusively capacitive and control of coupling becomes independent of the physical spacing of the coils (Figure 6).

The small size of unitized shielded coils and their ability to be very tightly packed in a circuit arrangement is a distinct advantage in a multichannel receiver where there may be 10 or more RF coils closely spaced.

2. **Discriminator circuits.** Shielded coil forms may be used in discriminator circuits to prevent undesirable coupling in the transformer or RF choke (Figures 7 and 8).

3. **Oscillator and frequency multiplier tank-circuit coils.** By increasing the sturdiness and mechanical and

Continued on page 39

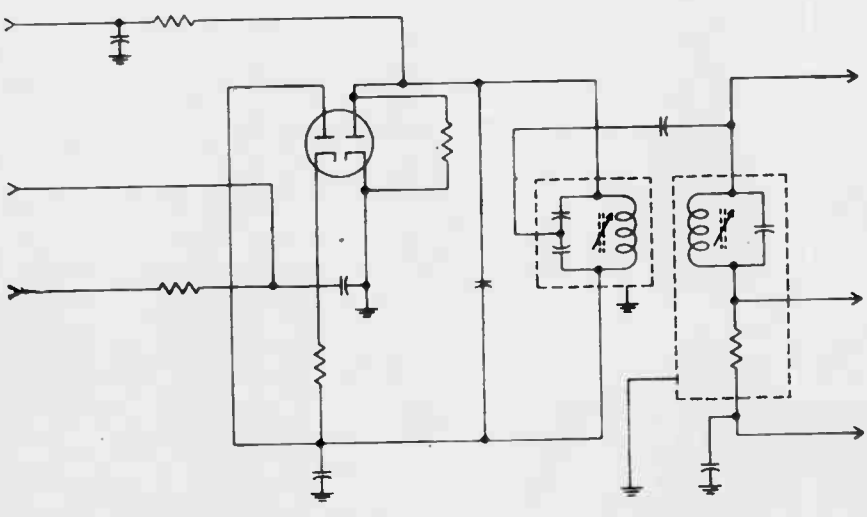


Figure 8 — Discriminator circuit.

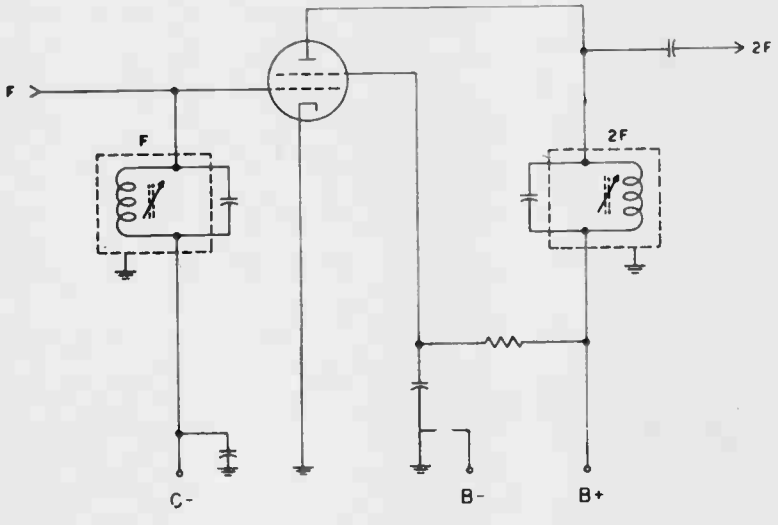


Figure 9 — Frequency multiplier circuit.

product panorama

For further information on New Products use Readers' Service Cards on pages 43 and 44.

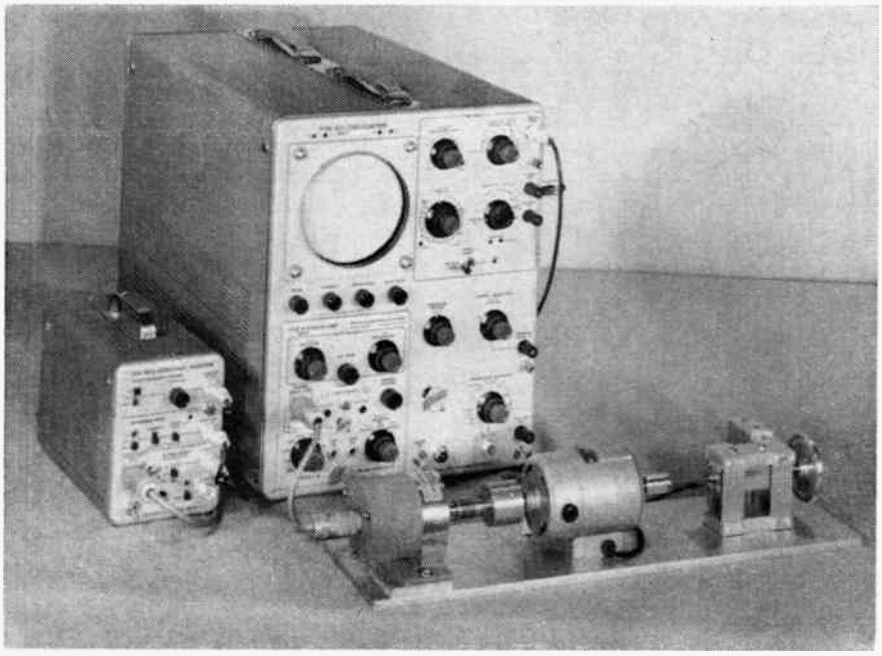
High vacuum gauge

Item 672

A new high vacuum gauge, either portable or panel mounted, for production work and general laboratory use has been developed by The Pulsometer Engineering Co. Ltd. This is a Penning-type Cold Cathode Ionisation Gauge which has a range from 10^{-3} to 10^{-6} Torr. The construction is a ring anode with two plate cathodes, one on either side, sealed in a glass bulb connected to the vacuum system. A permanent magnet produces a magnetic field directed along the axis of the electrodes.

At the cathodes, field emission (that is to say liberation of electrons by high electric field) takes place and the magnetic field causes these electrons to travel in helical paths. Thus, although the dimensions of the gauge may be much less than the mean free path of atoms at the pressure in the gauge, the actual distance travelled by electrons is greatly increased together with their chance of ionising by collision. The final result is that that electrons oscillate between the cathodes in helices and, since the anode has small area, they can cause many ions to be formed before being lost to the anode.

More information obtainable from **Laurie and Lamb, Room 814, Railway Exchange Bldg., 637 Craig Street West, Montreal, P.Q.**



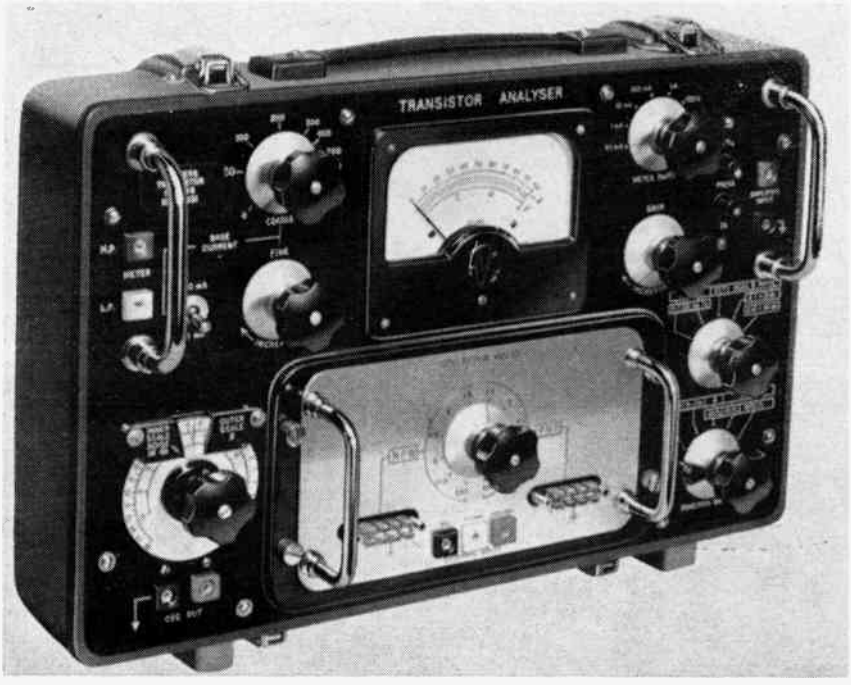
Item 673

Rotan system

Item 673

A type 182A Angle-Encoding Transducer and a Type 183A Rotational Analyzer comprise the new Tektronix ROTAN System. Designed to study rotation-associated phenomena in machinery, the two ROTAN units adapt an oscilloscope to provide horizontal trace deflection proportional to angular displacement of a rotating shaft. The ROTAN System generates a horizontal sweep representing shaft angle — at speeds from essentially zero to 20,000 rpm. Transduced data, such as velocity, pressure, acceleration, or vibration (applied to the oscilloscope vertical input), appears on the crt screen correctly referenced to this instantaneous angular position.

For further information write to **Tektronix Inc., 3 Finch Avenue East, Willowdale, Ontario.**



Item 674

Transistor analyzer

Item 674

Consistent with the traditional high quality of AVO testing instruments, the Transistor Analyzer has been introduced to meet the requirements for a direct reading instrument which is simple to use, yet capable of giving accurate transistor measurements in the grounded emitter configuration. Designed primarily for testing signal and lower power transistors, it can also test high power and switching types with the use of adapters. The instrument may be used for individual and batch testing or in-situ measurements.

For more information contact **R. H. Nichols Limited, P.O. Box 500, Downsview, Ontario.**

Frequency meter and discriminator

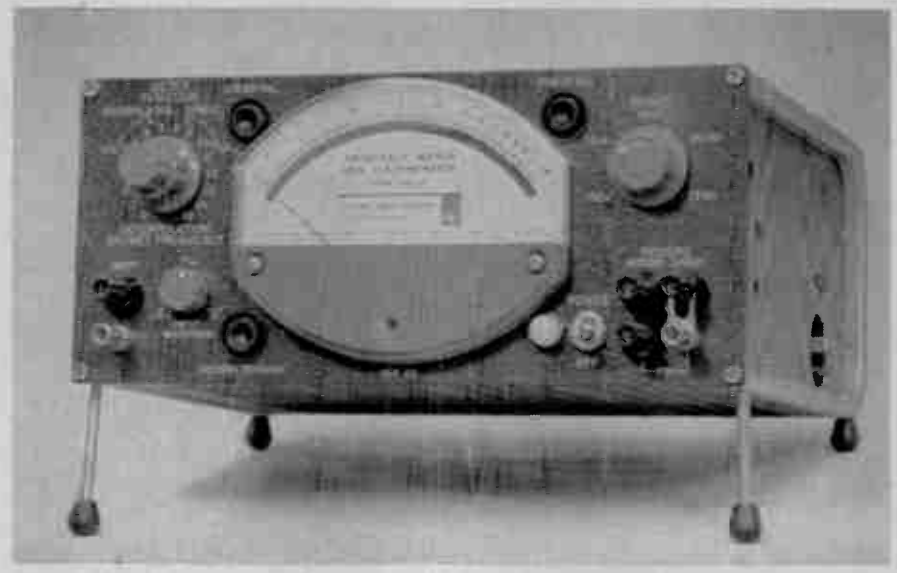
Item 675

A wide-range pulse-count electronic frequency meter (Type 1142-A), direct-reading over a range of 3 cps to 1.65 Mc, has been developed by the General Radio Company.

By means of a calibrated scale-expansion technique, a direct-reading accuracy of 0.1 per cent is achieved.

In addition to its use in direct frequency measurement, the instrument can be used to make highly precise frequency-drift measurements on oscillators and other generators. By measurement of the heterodyne beat between the oscillator and a suitable frequency standard, an accuracy of one part in 10^9 can be obtained.

For more information write **General Radio Company, 99 Floral Parkway, Toronto 15, Ont.**



Item 675

Fast counting ratemeter

Item 676

This measuring instrument, indispensable in laboratories engaged in investigating the use of radioactive isotopes in industry and therapy, has been designed for the measurement of the average values of alpha, beta, gamma and neutron radiation, i.e. for determining the number of impacts with reference to the time unit. The instrument may be used in nuclear research work for the measurement of the intensity of radiation as well as to determine the integrated radiation spectrum.

The test results may be recorded continuously by means of a separate recorder connected to the ratemeter.

For further information write to **Biotronics Laboratories, P.O. Box 744, Station B., Montreal, P.Q.**

Item 676

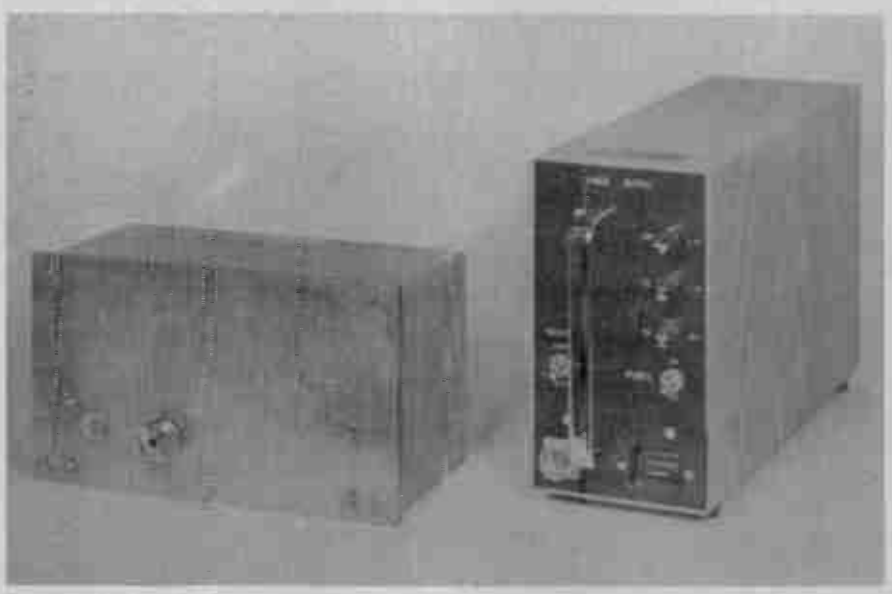
Digital shaft position converter

Item 677

An analog-to-digital converter manufactured by George Kelk Limited will express the angular position of a shaft in the form of electrical outputs suitable for energizing a remote digital type indicator or control instrumentation. The output circuit consists of four decades of 10 circuits each, allowing electrical representation of any number from 0 to 9999.

The unit is compact and sealed in a strong-corrosion-proofed aluminum case. A separate power supply unit is provided. The converter can be supplied for use with 115 or 240 volts ± 10%, 50 to 400 cycles.

For further information write to **George Kelk Limited, 5 Lesmill Road, Don Mills, Ontario.**



Item 677

Solid-state tape transport

Item 678

An all-solid-state magnetic tape system with increased FM capabilities has been announced by Honeywell Controls Limited, Industrial Division.

The LAR 7500 (Laboratory Analog Recorder) can accommodate up to 14 channels of FM record and playback in one rack; six tape speeds can be selected from the front panel and tapes as thin as 0.65 mil base can be handled.

Two basic models are available. One uses a tape width of ½", ¾" or 1"; the other, widths of 1", 1¼", 1¾" or 2". The unit was styled by industrial designer Henry Dreyfuss.

For further information, write to: **Industrial Division, Honeywell Controls Limited, Vanderhoof Ave., Toronto 17.**

Coaxial transfer switch

Item 679

A highly versatile 3⅛" - 50 ohm coaxial transfer switch is now available from Andrew Corporation, designers and manufacturers of antenna systems and transmission lines. Type 6720 automatically switches pairs of 3⅛" transmission lines in less than 2 seconds. Operation is by remote control. The switch can be mounted in any position and supported by the coaxial line if necessary.

Use of the Type 6720 provides rapid switching to stand-by-equipment for high power communication systems and VHF-UHF television stations in the event of main equipment failure. VSWR is less than 1.05 at a frequency range of 0-500 mc.

More information is available from **Andrew Antenna Corporation, Ltd., 606 Beech Street, Whitby, Ontario.**

Automatic sweep drive

Item 680

A new sweep drive which automatically sweeps oscillators and other tunable devices through their frequency ranges is now available from Hewlett-Packard Company.

The new unit, Model AC-97C, is a particularly useful motor accessory for Hewlett-Packard's Model 302A wave analyzer. In this application, it sweeps through the entire range of the wave analyzer for automatic plots of harmonics, spurious responses or intermodulation products with an X-Y recorder. It also converts the Model 302A to a sweep oscillator-tuned voltmeter for automatic frequency response measurements, even in noisy systems.

For further information write to **Atlas Instrument Corp. Ltd., 50 Wingold Ave., Toronto, Ontario.**

briefing the industry

■ **Brewer Hunt, vice-president of** the Northern Electric Company in an address to the American Institute of Electrical Engineers has pointed out that Canadian expenditure in the field of research and development amounted to an estimated $335 million dollars during 1959. Over 45 per cent of the research effort in this country was carried out by industry and less than one third of their expenditures were financed by the Federal Government. In the United States the total expenditures are in the order of 12 billion dollars and industry's share exceeds 75 per cent of which over one half is paid by the Government.

■ **The six remaining Canadian producers of uranium** have banded together to find new uses for their product. A fund of $1,250,000 has been set aside to carry out a program of research designed to find new applications for uranium and it is planned that $250,000 will be spent annually in this industry effort. Present experiments relate to the use of uranium in steel alloys, in heat restraining or storing materials and in semiconductors.

■ **Continuing demand for increased trans-Atlantic** communications facilities has led to a recent agreement between the United Kingdom and Canada to share on a 50-50 basis the laying of a $28 million undersea cable between the two countries that will more than double existing capacity. Authorities believe however, that before the new link is completed increasing demand will outstrip the capacity of the new trans-Atlantic link. The new cable will be part of a $250 million round-the-world Commonwealth cable that will be 24,000 miles long.

■ **J. Herbert Smith, president of Canadian General Electric Company** in a year-end statement has stated that the last two or three years have seen a serious decline in the overall Canadian electronics industry, even though on a world-wide basis the industry has continued to expand at a considerable rate. Canada stands alone amongst western countries in suffering such a contraction, rather than an expansion of its industry. The chief contributory factor in this decline despite continued industry efforts to arrest this development, has been the literal explosion into the Canadian market of foreign produced tubes, transistors and radios, notably from Japan.

■ **Carl A. Pollock, president,** Dominion Electrohome Industries Limited, Kitchener, in a recent announcement stated that "Consumers want more than price, they want a forward step." To this end his company has established a full-year warranty on their television, TV-radio combinations, hi-fi consoles and car radios. The warranty covers all workmanship and parts with the exception of the record player stylus. Mr. Pollock said that in "anticipating this greater awareness, Electrohome has chosen to be the first in Canada to take the forward step in establishing a warranty which recognizes what the public deserves and what the industry needs to better service and market."

■ **A charge has been raised in the House of Commons** by John Smith, Conservative member of Parliament for Lincoln, that certain Canadian companies are trying to find ways and means of getting around the Japanese Government's recently self-imposed restriction on the export of radio tubes to Canada, a restriction that the Canadian tube industry has been clamoring for for the past two or three years. The charge is backed up by an alleged letter received from an official of a major Japanese tube manufacturer which contains information to the effect that certain Canadian importers were negotiating with Japanese tube manufacturers for their products to be shipped first into the United States and thence into Canada.

Light image intensifier tube

Item 681

A new high-vacuum tube — type WX-4047 — which intensifies light radiation by electronic means is available from Canadian Westinghouse. The new tube produces an image of reduced size whose brightness is increased by a factor of 2500 (minimum) for actinic blue input radiation by 1000 for input radiation at a color temperature of 2870 degrees K.

In operation, incoming radiation impinges on a five-inch photosurface which converts the light image to an electron image. Deposited directly on the internal surface of the polished bulb face, the photo cathode is capable of functioning as an integral part of an external optical system. After conversion, the electron image is focussed and accelerated toward an aluminum-backed phosphor screen.

The new tube weighs 6⅛ pounds, has a maximum diameter of 8$\frac{11}{16}$ inches, and is 15¾ inches long.

For further information, write to **Canadian Westinghouse Company Limited, Electronic Tube Division, P.O. Box 510, Hamilton, Ontario.**

A-C panel meter

Item 682

A new low-cost a-c model in the Weston Crown line of panel instruments, with an accuracy of ± 2 per cent of full scale value, has been announced by Daystrom Limited's Weston Instruments Division.

Designated Model 1724, the panel meter employs a movable iron vane mechanism and is available as voltmeters, ammeters, and milliammeters.

Enclosed in a Crown-profiled case, the Model 1724 is equipped with a plastic cover and molded bakelite base. Top and sides of the cover are clear, providing excellent scale illumination and freedom from shadows. High readibility is assured by a black finish lance-type pointer and a black-on-white 2.25-inch scale covering a 90 degree arc. When the instrument is mounted behind a panel, a single small external bulb will provide adequate illumination for use in dimly lighted areas.

For more information on the Model 1724 a-c panel meter, write: **Daystrom Limited, Weston Instruments Division, 1480 Dundas Hwy. East, Cooksville, Ont.**

Oscilloscope record camera

Item 683

A new oscilloscope camera which incorporates complete versatility in recording and maximum operational simplicity is announced by the Allen B. Du Mont Laboratories Divisions of Fairchild Camera and Instrument Corporation with its introduction of the new Type 450 camera. The new oscilloscope camera features interchangeable camera backs and lenses to enable the technician to obtain permanent records in any sizes from 4" x 5" to 35 MM. and in a multiplicity of object-to-image ratios — on regular type or polaroid film and print products.

For further information write to **Bayly Engineering Limited, Hunt Street, Ajax, Ontario.**

E.M.I. Oscilloscope

Item 684

Whether receiving information sent back from a satellite circling the earth, or undertaking routine testing in a laboratory, the oscilloscope is the electronic engineer's maid-of-all-work. In the most general terms oscilloscopes give a visual interpretation of what is going on inside an electric circuit.

E.M.I. makes a range of oscilloscopes to cater for most needs, one of the best-known being the E.M.I. Oscilloscope Type WM 16. Now the versatility of this Type has been increased by two additional plug-in units — Amplifiers Type 7/5 and 7/6.

Type 7/5 provides for high sensitivity (5m V/cm) over a bandwidth of 5 c/s-25 Mc/s when AC coupled, or 50 mV/cm sensitivity over the full bandwidth D-C-40 Mc/s.

The Type 7/6 permits the display of two inputs either separately or differentially with DC or AC coupling. The common mode rejection ratio is greater than 100:1 over the pass band (DC — 25 Mc/s) at a sensitivity of 50 mV/cm.

For further information write to:— **EMI-Cossor Limited, 3077 Bathurst Street, Toronto, Ontario.**

Controlled atmosphere chambers

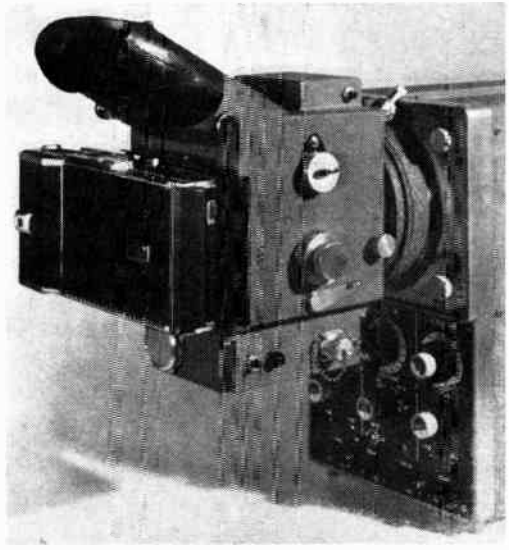
Item 685

The Glendon Company Limited are pleased to announce the introduction of a new product by Delta Design Inc., of California — the "B" Series Controlled Atmosphere Chamber and accessories, to meet your controlled atmosphere needs.

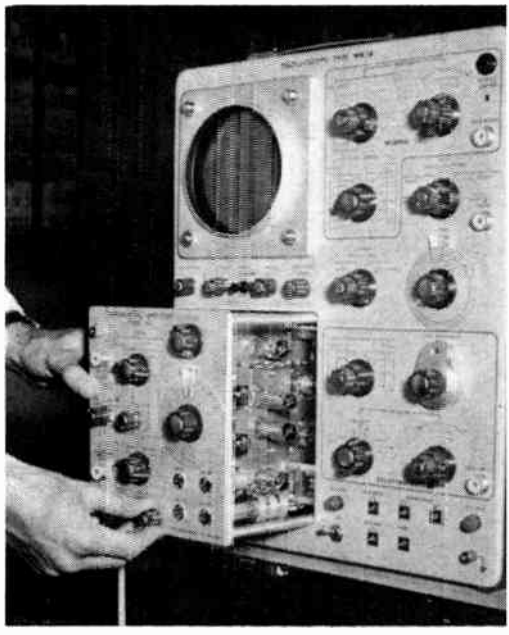
The "B" Series Chambers are capable of handling a wide range of applications requiring controlled atmospheres — nuclear, biological and industrial research; electronic assembly operations; inert welding; inspection; machining; material handling.

For further information contact **The Glendon Company Limited, 603 Evans Avenue, Toronto 14.**

Item 681



Item 683



Item 684

CRTPB newsletter

Prepared by Canadian Radio Technical Planning Board

Committee activity

Notice No. 225 announces a meeting of the Executive Committee at the headquarters on February 7 to look at stereophonic broadcast problems and to review the activity in connection with Planning Board recommendations submitted to the Department of Transport.

The Land Fixed and Mobile Committee, meeting in Montreal on January 19, made a final review of the recommendations on Specification 126. This Specification is a replacement for RSS 126 Issue 1 and RSS 127 Issue 1 dealing with FM or PM equipment operating with 30 Kc channel separation. Introduction of this new issue would not effect type approvals previously granted under the replaced specifications but extends the frequency range to cover the band 150.8 Mc/s to 174.0 Mc/s.

The Broadcast Committee have examined the first drafts for Planning Board comments of RSS 150 and RSS 151, dealing with AM Broadcast Transmitters, and ancillary equipment for use with them, in the 535-1605. Kc/s band. Proposed effective date is April 1, 1962.

The Sub-Committee on Stereophonic Standards meets on February 14. Notice No. 224 announces the continuation of the very important work on recommendations for stereophonic standards. The meeting is to be held in Room 303, Trafalgar Building, 207 Queen St., Ottawa, on Tuesday, February 14.

Frequency allocations for scatter

Results of the CRTPB Ballot on Recommendations of Tropospheric Scatter Committee on Frequency Allocations for Scatter were reviewed by the Executive Committee at the December meeting.

The Department of Transport has been advised that the results of the vote were: 10 for approval, 1 for non-approval, 2 abstentions, and 1 split vote.

Space frequency allocations study

A special study of the frequency allocations problem facing the United States, both nationally and internationally, in space communications has been undertaken by the Joint Technical Advisory Committee (JTAC) at the request of the Federal Communications Commission.

JTAC, which is a high-level technical advisory group sponsored jointly by the Institute of Radio Engineers and the Electronic Industries Association, has established a Committee under the chairmanship of Lt. Gen. James B. O'Connell, U.S.A. (Retired), of the General Telephone and Electronics Corporation to conduct the program. The study will deal specifically with the problems posed by the FCC's inquiry into the allocation of frequencies for space communications of an industry-wide nature.

The Boards of Directors of both IRE and U.S.-EIA have agreed to provide the initial financing of the study, but individual companies will be called upon to support the project by providing pertinent data.

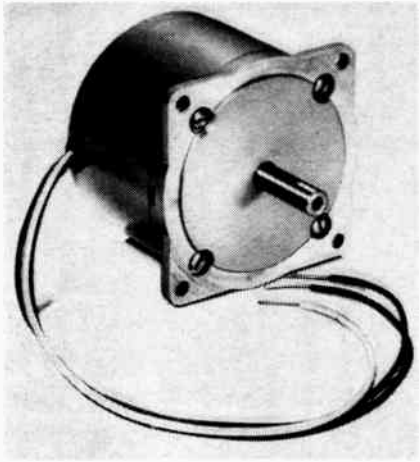
General O'Connell says that the activities of the committee will be devoted to the technical problems involved. To this end recommendations have been made to initiate technical studies in the major problem areas. Such studies can only be effective if they are supported by members of the industry who are willing to actively contribute their ideas, concepts, and recommendations, and are immediately responsive to requests for information from such study groups as may be formed.

"The JTAC's two sponsors, the U.S.-EIA and the IRE also recognizing the need to go beyond the JTAC membership for collecting these data, are furnishing preliminary financial support. However, additional financial aid will be needed for these studies. Due to its unquestioned value to industry, individual corporations will want to support this work in order to establish the United States position for the next international frequency allocation program," General O'Connell said.

50 oz.-in synchronous motor

Item 686

The new Slo-Syn Synchronous Motor type SS50 is a permanent magnet type AC motor ideally suited for a wide range of applications requiring constant, 72 rpm synchronous, speed and/or DC stepping with instant starting, stopping or reversing. Especially useful for instruments and computors, actuating selector switches, tape handling and process timing. Its small size makes it particularly adaptable as an OEM component where space is limited. Slo-Syn type SS50 ratings are: input 120 volts, 40/70 cycles, 1 phase, 0.30 ampere maximum current (at 60 cycles); 72 rpm output speed at 60 cycles, 50 ounce-inches torque. Uses



Class B insulation and is rated for 75°C temperature rise from 40°C maximum ambient under continuous duty. Standard types are available with specially designed planetary gear speed reduction assemblies providing speeds of approximately 16.6, 3.3, 0.67, 0.133 or 0.027 rpm. Has 3 leads, weighs 3 pounds.

For more information request complete Slo-Syn data file from **The American Superior Electric Co., Ltd., 174 Evans Avenue, Toronto 18, Ont.**

Standoff terminals

Item 687

Cambridge Thermionic Corporation announces the addition of new double-turreted standoff terminals to its wide line of standard Cambion® insulated terminals.

The new terminals are available with Diallyl Phythalate insulators (4800 Series) or Melamine (4900 Series). Diallyl Phythalate provides especially suitable characteristics for more demanding circuit requirements. Its dielectric properties surpass Melamine by 5/1. Its dissipation factor approximately 7000/1, permits insulation of much higher frequencies. Other advantages include higher resistance to insulation and much greater resistance to the effects of sunlight, acids, alkalies and fungus.

For further information, write **Cambridge Thermionic of Canada Limited, 2425 Grand Boulevard, Montreal 28, Quebec.**

A workable blueprint for defense marketing

Continued from page 22

The sales forecast

The sales forecast is the foundation of all company planning and of special importance to top management and finance. The best marketing intelligence should be concentrated on the preparation of an accurate document which should come under constant review throughout the year. There is much usefulness in a continuous five year forecast revised with each annual forecast. This system permits a double check on forecasting effectiveness.

Because of the long term nature of many defense programs it is not as difficult to forecast sales, bookings and sales billings as one would think. Initially one may obtain a development job or a study contract. This will lead into further engineering and production program, and even with delivery of finished goods, company interest rarely ends. Along with today's complex equipment must go a great deal of technical support. Often only the manufacturer designing and building the equipment has the necessary knowledge to maintain it in the field. In many cases installations assistance and repair and overhaul support is required. There are always spares, and for obvious reasons the military are generous in spares provisioning. Feedback from field service engineers and field service reports often suggest requirements for next generation equipment. With the use of a lot of judgment, a little optimism and some good luck the sales forecast can come out reasonably well.

Selling the company capability

Up to this point very little mention has been made of the actual sales effort but personal selling is just as necessary in the defense business as in any other business. There is however, an important difference in the type of selling. There is no impulse buying on military products. The purchase is finally made only after a thorough technical evaluation and analysis. The company getting the order will have the product or capability closest to meeting the customer's requirements and emotion will have no part in the decision. This calls for a different kind of salesman and a different kind of selling. The marketing man's job is to know the resources, capabilities and skills of his company and how to present these to the customer.

In this type of technical selling the marketing man and the engineer must work hand in hand. Initially the marketing man by personal contact may uncover the customer need but very soon in the sales cycle the other half of the partnership will join the marketing man and detailed discussions will result. This stage is usually followed by a company decision to submit a technical proposal. During this process — which might take some time — it is important to regard the sale as a planned program with the marketing man having prime responsibility for carrying it along to a successful conclusion. The engineer should not be expected to carry the sales program development,

Continued on page 38

A workable blueprint for defense spending

Continued from page 37

nor should the marketing man assume the engineering responsibility. Each carries to the job a specialized skill and the integrity of the team relationship should be carefully preserved.

In this type of "big ticket" selling costs are high. The cost of a technical proposal may run into many thousands of dollars. Sometimes it becomes hardly less than a complete feasibility study. The risk of failure should be minimized by selecting only those programs where the company has an excellent chance, and where the program itself has an expected long term future.

The proposal should not only discuss the technical approach to the problem, but must go into detail on how the program will be managed and who will manage it. In today's selling it is just as essential to provide a good program management proposal as it is to provide a technical proposal.

Somewhere along the marketing cycle specifications are firmed up, the program is funded, and a contract is received. Although this whole process may be disposed of in a few words it may take months or even years to accomplish. This is why the marketing department must be responsible for program development every step of the way.

Changing trends in the defense market

The marketing staff have an important responsibility in advising management of the changing trends in defense procurement as these may have a major effect on company planning. Typical of recent trends are:

Emphasis on contract performance — Increasingly we will see the performance bonus and the penalty clause written into U.S. defense contracts. A premium will be paid for efficiency and a penalty exacted for poor performance. This system will provide a challenge for good company management and leave little room for the inefficient producer.

Reliability — more and more emphasis has been placed on reliability and this trend is to continue. Within the next ten years component reliabilities and system reliabilities will have to improve by several orders of magnitude. U.S. Air Force regulation 375 - 5 emphasizes this fact and the importance of it by stating that the contractors proposed reliability program will be a major factor in all future source selection.

Systems Management — There is an indication that the smaller company will have greater opportunities to bid on major systems management projects in the future and will be able to enlist the design and productive facilities of very large companies in so doing. The smaller company must have a high element of engineering management skill and be prepared to protect scrupulously the proprietary interests of the larger sub-contractors.

System Studies — because of the increasing complexity of today's weapons systems there will be a great deal more theoretical proving studies before expensive hardware is produced. This will offer excellent opportunities for engineering oriented companies, and will help qualify them for later development and production contracts.

Marketing — A force to be reckoned with

The marketing concept in any company starts with the chief executive and becomes a part of the company philosophy. The marketing department may be very small or very large depending on the size and needs of the company. In a small company the president himself may be the marketing manager and have his own market plan. The important thing is to recognize it as a tool of management to be used in an extraordinarily complex and competitive market to produce growth, profits and technical achievement for the company. For those companies setting up a marketing department for the first time there must be a recognition of the long term nature of the investment. It may take several years from point of decision before a completely organized and highly capable marketing department is effectively handling the customers needs and programs.

In the increasingly competitive U.S. defense industry there has been a growing acceptance of the customer oriented philosophy of marketing. The American Management Association recognizing the needs of this market in 1959 held its first defense marketing seminar in New York followed by a second one in Los Angeles. The theme of these conferences from start to finish was one of planned marketing to meet present and future customer needs. There can be no doubt that defense marketing in the United States today is more than just a philosophy — it is a force to be reckoned with by Canadian companies planning to compete.

Defense production sharing could be the doorway to new profit opportunities for Canadian companies — but modern marketing will be the key.

Introduction to shielded coils

Continued from page 31

temperature stability of coils, shielded coil forms help to avoid microphonics and frequency shifts in tank circuits. In high frequency oscillators, such as tuned-plate-tuned-grid types, unitized shielded coils reduce the tendency toward parasitic oscillations. They can be similarly helpful in reducing low-frequency parasitics (Figure 9).

4. **Filters.** The use of unitized shielded coils in electrical filters precludes the danger of mutual inductance between sections. This permits very close packaging of multisection filters and allows lumped constant filters to be used instead of many more expensive mechanical filters in applications such as IF systems.

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close-up

looking lenswise at your industry in action

Corporal Guy Beaupre and Corporal Len Brandstad (top) hoist into position the disc-shaped antenna which transmits and receives messages.

Standing near a test rack with micro-wave equipment is Corporal Darrel Green (left), Chief Technical Officer Flight Lieutenant J. R. Guthrie and the Commanding Officer of 601 Squadron, Flight Lieutenant C. R. Barrett.

Seated at the Fault Control Switchboard is Leading Aircraftman Al Shaver and pointing to the exact location of a trouble site is Flight Sergeant Gob Gauvreau.

Warrant Officer 2 George Christian explains some of the electronic equipment to (left to right) Leading Aircraftman Snuffy Smith, Corporal Jack Scott and Corporal Frank Greene. These refresher courses are held at 601 Telecommunication Squadron to keep personnel up to date on developments in the communications field.

This month close-up is presenting a photo-feature on the RCAF Telecommunications Squadron which is located in Grostenquin, France, 30 miles from the Air Division Headquarters at Metz. The 601 handles the microwave system which carries the bulk of messages for Canada's NATO Air Division.

Landlines and radio provide alternate communications between the Division and the various NATO headquarters with which it works, and throughout the Division itself. However, most of the day-to-day operational and administrative messages passed throughout the Division and to outside points, are carried by this microwave system.

A second section of a micro-wave tower is being hoisted into place by RCAF personnel.

Dismantling and rebuilding auxiliary power units is the job of the maintenance workshop. Seen here working on two units are (left to right) Leading Aircraftman Joe Elliott, Corporal Colin Carnegie and Leading Aircraftman Ron Shettler.

Leading Aircraftman Bob Salsman checks transmitting equipment for the proper level while Corporal Ray Burke checks frequency of oscillators in individual channels at one of the micro-wave sets.

The relay point crews live in self-contained mobile trailers. During their 60 day period on the crew, cleaning house and cooking are all part of the day's work. Here Leading Aircraftman Tom Hoskins polishes the floor of the trailer while Corporal Bob Silverwood removes a cake from the oven.

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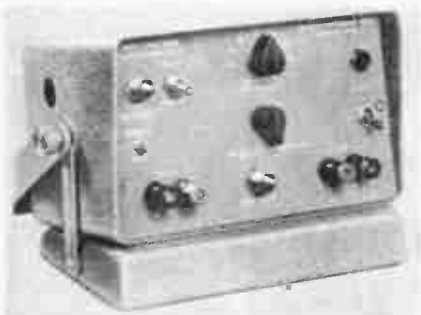
Time base and DC amplifier

Item 688

New HRT-1 time base provides seven rates of sweep voltage for use with X-Y plotters. Rates available from 0.5 millivolts per second to 50 millivolts per second with 2% accuracy, which corresponds to 2 seconds to 200 seconds for 100 millivolts. By resetting the recorder attenuator sweep, rates may be reduced to 1000 seconds, with some loss in linearity.

By rotating the panel selector to "DC Amp", the unit becomes a multipurpose chopper stabilized DC amplifier. Current or voltage sources deliver either an amplified current or voltage as desired, by use of proper shunts.



For example, shunting a 1000 ohm precision resistor across the output terminals gives a drift-free voltage amplifier with a gain of 1000. It is also ideal for use with X-Y recorders as a primary low level preamplifier or with galvanometer 0-1 ma. recorders. Used with a standard 10 millivolt per inch recorder, sensitivities up to 10 inches per millivolt are obtainable.

Further information is available from the Canadian representative, **B. H. McGregor, P.O. Box 156, Station "H", Toronto 13, Ontario.**

Backward diode

Item 689

The Lansdale Division of Philco has put on the market prototype quantities of germanium backward diodes.

The devices exhibit a maximum peak point current of 100 microamperes and a maximum forward voltage of 90 millivolts, at one milliampere. These diodes have a valley capacitance of 3.5 micromicrofarads, a series inductance of 1 microhenry, and a series resistance of 3.0 ohms. The reverse breakdown voltage of one milliampere is 480 millivolts.

The units are hermetically sealed in a TO-18 package and have been designed for low level switching and small signal applications with UHF circuitry.

Possible applications of Philco's backward diode include use of the device as a unidirectional coupling element in tunnel diode circuits and for low voltage clamping circuits.

Additional information may be obtained from **Philco Corporation, Lansdale Division, Church Rd., Lansdale, Pa.**

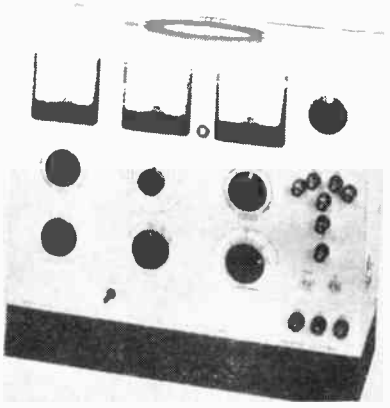
Transistor test set

Item 690

For the first time, power transistor measurements to 30 amperes collector current and 300 volt breakdown test potentials are now possible with the new completely self-contained portable Owen Laboratories Type 300 Precision Power Transistor Test Set.

Direct meter readings or large signal current gain (H_{FE}) and collector characteristics I_{CBO}, I_{CER}, BV_{CEO}, and BV_{CBO} can be made simply, rapidly, and accurately under conditions typical of their actual applications.

The Type 300 Test Set is especially well adapted to quality control Go No-Go checking of H_{FE}, with preset acceptance values.



Sturdily packaged in a single metal case with carrier handle, the set is 17 inches wide, 16 inches high, and 7 inches deep.

For additional information contact the Canadian Sales Representative: **MEL Sales Limited, 1969 Avenue Rd., Toronto 12, Ontario.**

200-channel spectrometer

Item 691

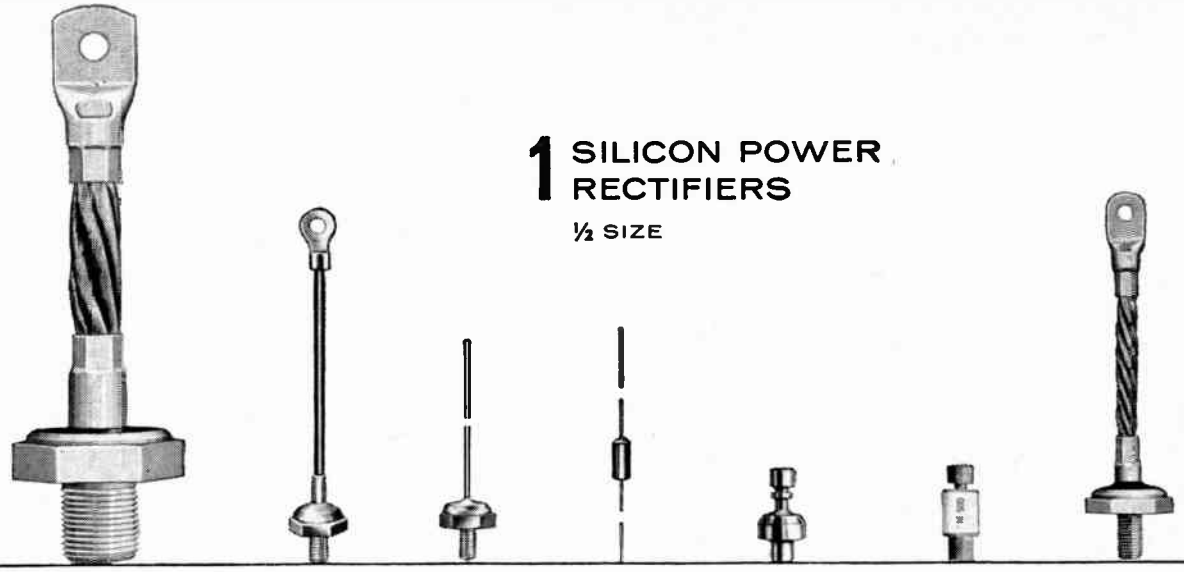
A new dual input transistorized 200-channel spectrometer featuring differential data accumulation is anannounced by The Victoreen Instrument Company.

The Model ST-200D is being delivered with a number of unusual features that add to the instrument's versatility and general usefulness, according to the manufacturer. Among these desirable features is a built-in preset electronic live timer. This timer operates from .01 to 900 minutes with steps of 1, 2, 3, 4, 5, 6, 7, 8, 9 with .01, .1, 10 and 100 multipliers.

Simultaneous linear and log display are included. A circuit board can be provided which substitutes for the amplifier board to provide direct input to the analog-to-digital converter. This permits the Model ST-200D analyzer to be used with an external amplifier such as Victoreen's Model 851 DD-2 unit.

Full details, specification and performance data on the Victoreen Model ST-200D Transistorized Spectrometer are available on request to **Radionics Ltd., 8230 Mayrand St., Montreal 9, Quebec.**

Now...5 designers' lines from Sarkes Tarzian



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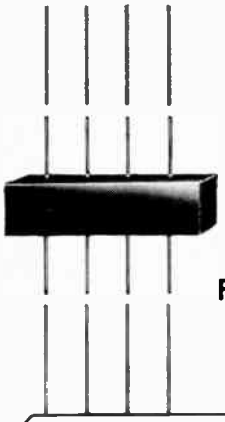


2 MODULAR SILICON RECTIFIERS

ACTUAL SIZE

For printed circuits or terminal strips—2, 3, and 4 section modules of 500 ma diodes, 100 to 600 piv.

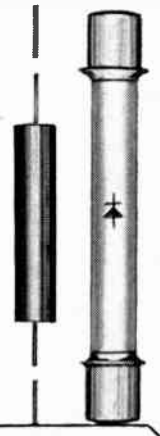
3 SILICON VOLTAGE REGULATORS

ACTUAL SIZE

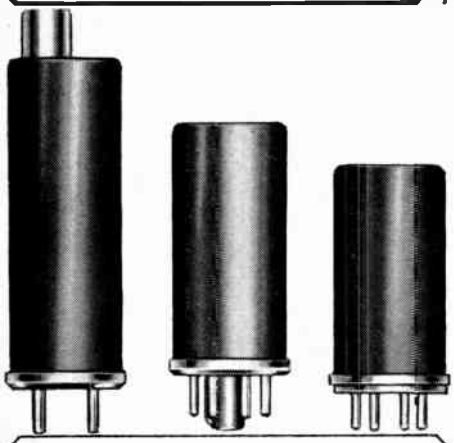
Over 90 units in three power classifications—¼, 1, and 10 watts; 5.6 to 100 volts breakdown.

4 HIGH VOLTAGE SILICON CARTRIDGE RECTIFIERS

½ SIZE



Ferrule mounted and axial lead series, each in 18 different types; 600 to 16,000 piv.



5 SILICON TUBE REPLACEMENT RECTIFIERS

½ SIZE

Nine standard tube replacement units directly interchangeable with more than 95% of all vacuum tube rectifiers; two full-wave replacement units for Citizen's Band radios. Special types on request.

In selecting and specifying these silicon rectifiers and voltage regulators, you can depend on Tarzian experience and ingenuity in manufacturing to deliver high performance devices at realistic prices in the quantities you require, whether for testing or full production.

Competent application engineering service is offered without obligation.

Catalogs and data sheets on all products are available, and will be sent promptly on request.

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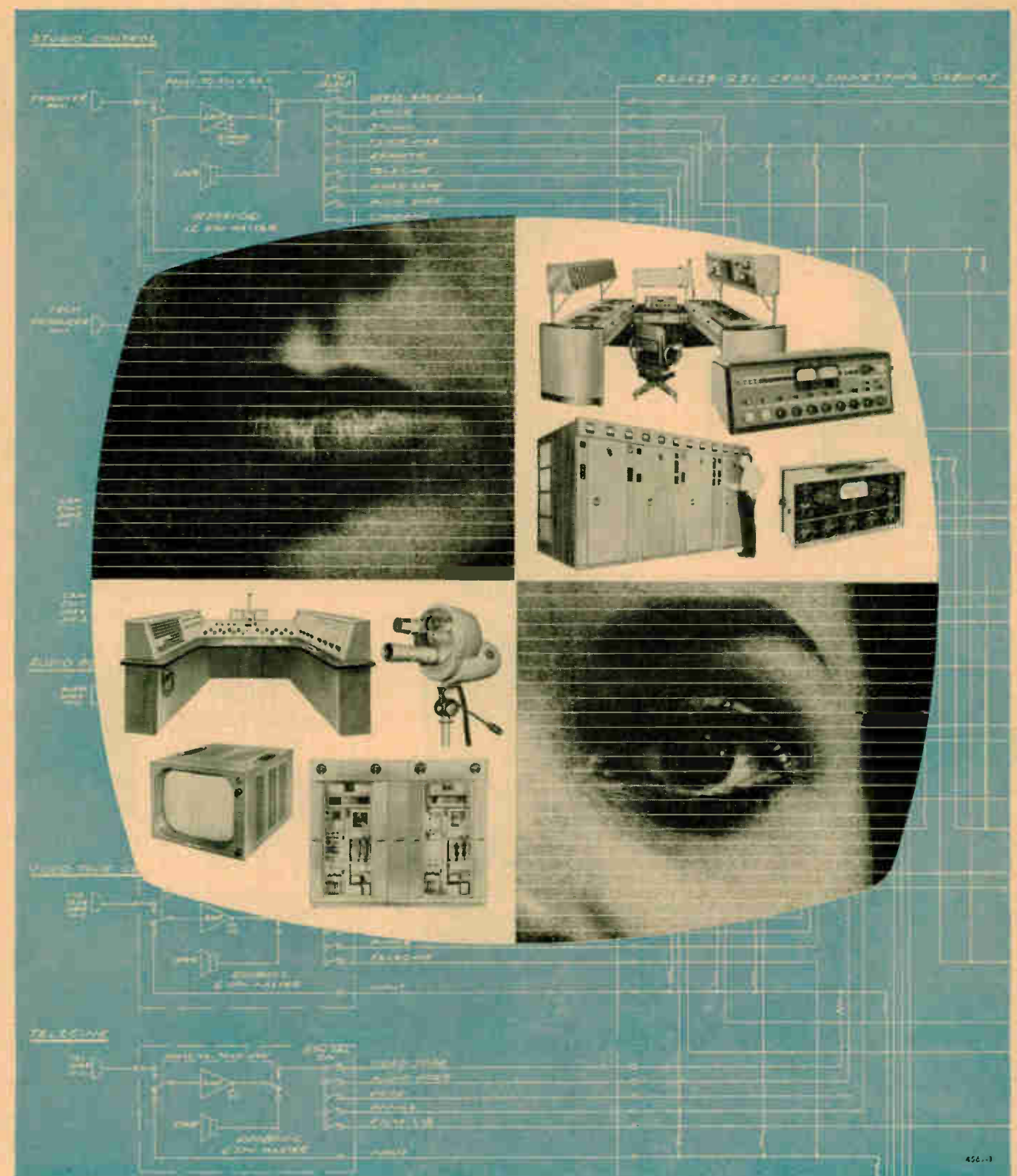
World's Leading Manufacturers of TV and FM Tuners • Closed Circuit TV Systems • Broadcast Equipment • Air Trimmers • FM Radios • Magnetic Recording Tape • Semiconductor Devices

SEMICONDUCTOR DIVISION • BLOOMINGTON, INDIANA

In Canada: 700 Weston Rd., Toronto 9 • Export: Ad Auriema, Inc., New York

For complete details check No. 32 on handy card, page 43



Serving Canada's Broadcast Industry

...with a diversified range of products that can be integrated by our engineers to satisfy the most exacting systems requirements. Northern Electric COMPANY LIMITED

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now!

Raytheon receiving tubes available in Canada!

FOR THE FIRST TIME, a broad line of Raytheon radio and TV receiving tubes is available through Raytheon Canada Limited and your usual Raytheon source.

The equipment you design, produce and service can now gain in dependability through extremely high reliability of Raytheon tubes.

"Raytheon tubes"—a large Canadian manufacturer of electronic equipment has told us—"test best of any tubes we buy. Our inspectors report less than 2% rejects."

Starting now, *you* can have this advantage.

RAYTHEON CANADA
LIMITED

WATERLOO, ONTARIO

RAYTHEON

EXCELLENCE IN ELECTRONICS

For complete details check No. 31 on handy card, page 43

GEROH telescopic masts

Item 692

A series of inexpensive lightweight telescopic masts are available in Canada for the first time. These GEROH masts are available in a variety of heights and top load ratings. Easy to install, the GEROH masts are used on vehicles, or can be used in open locations. Ideal for surveys, temporary or permanent installations, mobile radio stations and numerous other applications.

Complete details are available from **The Ahearn and Soper Company Limited, 850 Belfast Road, Elmvale Acres, Ottawa, Ontario.**

Block terminal boards

Item 693

A new line of commercial terminal boards with conductors molded into the phenolic block is now available in Canada from Len Finkler Ltd. of Toronto. The boards are manufactured by the General Products Corp. of New York.

Twelve different styles are available with a range of 15 to 30 amps at up to 1000 volts. The blocks are of black anti-corrosive electrical grade phenolic compound. They are fully inter-changeable, electrically and mechanically, with other industrial terminal boards.

Detailed catalog available and a complete stock held in Toronto for immediate delivery from **Len Finkler Ltd., 1794 Avenue Rd., Toronto, Ont.**

Tunnel diodes

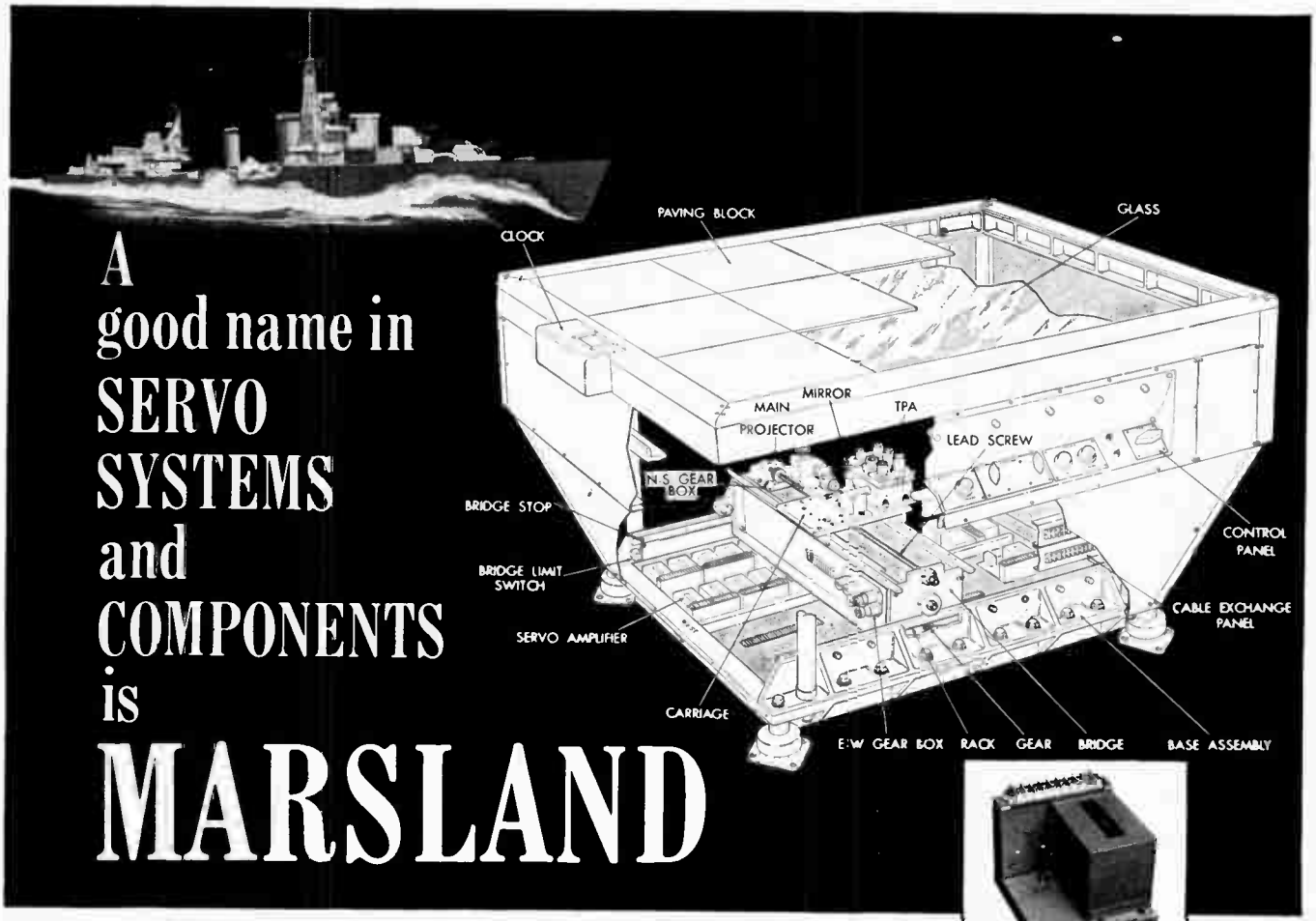
Item 694

A series of 1 and 5 milliamp germanium tunnel diodes, together with two complementary germanium backward diodes, have been introduced by Transitron Electronic Corporation.

The tunnel diodes are designed for excellent high frequency performance and have the close tolerance limits in peak current needed in computers. The backward diodes are designed for use with Transitron's tunnel diodes in logic circuits and other computer applications. The backward diodes also have application in low level rectifier and detector circuits.

Transitron believes this marks the first time that a manufacturer has offered backward diodes with the specifications pegged at the critical points for computer design utilizing tunnel diodes. The leakage current is specified at 400 millivolts and the forward voltage at 15 per cent of the companion tunnel diode's peak current.

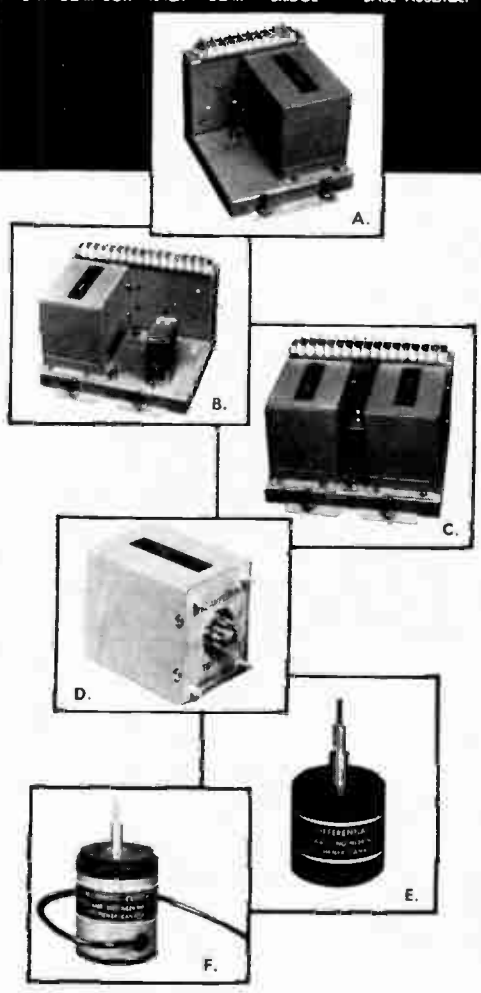
The backward diodes have a typical shunt capacitance of only 3 μμf, making it possible to drive several from one tunnel diode with little reduction in speed. The forward voltage drop is a guaranteed maximum of 30 millivolts. Application notes showing good circuitry design with backward and tunnel diodes are available from **Transitron Electronic Corporation, 168 Albion St., Wakefield, Mass., U.S.A.**



A good name in SERVO SYSTEMS and COMPONENTS is MARSLAND

This precision electro-mechanical-optical computer, used to display the geographical position of a ship and its target satellites, is a current system design by Marsland. From a statement of requirement to a design concept, to a working prototype and to approved production assemblies, Marsland engineers servo-systems meeting the most rigid specifications.

Wide experience and comprehensive facilities enable Marsland to manufacture most of the various system components.



A. Transistor Servo Amplifier. Mod. AM-103. *Application:* Single channel, 400 c. synchronous positioning servo loop. Up to size 18 Bu. Ord. motor, with built-in 400 c. power supply and feed-back damping control.

B. Transistor Servo Amplifier. Mod. AM-102. *Application:* Two channels, 400 c. precision positioning servo loop, (i.e. Resolver). Up to size 18 Bu. Ord. motor, built-in 400 c. power supply, transfer input network, feed-back damping and stick-off voltage controls.

C. Transistor Servo Amplifier. Mod. AM-101 (AM-104 + AM-105). *Application:* High gain, 400 c. synchronous amplifier for highest accuracy velocity integrating servo-loop, using up to size 18 Bu. Ord. motor/tachometer generator. *Built-in:* power supplies, null voltage suppressor, tachometer generator phasing network, speed adjustment and quadrature rejection circuit.

D. Transistor Amplifier, (Pre-Amplifier) Mod. AM-104. *Class A*, all transistor voltage and low power amplifier combined. Voltage gain between rated impedances is adjustable between 50 and 150 V. Built-in power supply, 400 c. (Power Amplifier AM-105 packages in same manner: *Class B*, all transistor synchronous power amplifier-application as positioning and integrating servo amplifier.)

E. Differential, Model M-131. *Body and Mounting:* Similar to size 18 Bu. Ord. motor. All ball bearings. *Application:* Servo mechanisms and computors. *Speed/Torque:* symmetrical mechanical differential max. speed of any shaft 4000 r.p.m.; max. torque output 10 oz. inch.

F. Magnetic Clutch, Model M 133. *Body and Mounting:* Similar to size 18 Bu. Ord. motor. All ball bearings. Max. speed 4000 r.p.m. *Application:* Servo mechanisms and computors. Energizing Power: 24 V.D.C., 3 watts. *Min. Torque:* 35 oz. inch.

MARSLAND ENGINEERING LIMITED

KITCHENER, ONTARIO, CANADA

M/3

For complete details check No. 24 on handy card, page 43

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 Classified Editor of ELECTRONICS AND COMMUNICATIONS, 450 Alliance Ave., Toronto 9, Ontario.

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For complete details and application forms, write to:

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Please ask for Information Circular 61-1153.

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required by
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The appointee to this position will act on assigned semi-conductor projects, as joint service representative in liaison with Canadian, foreign and international committees and agencies to ensure technical acceptability of specified development, production, procurement and application aspects of Canadian interest.
Candidates for this position must possess many years of recent experience in this particular field.
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Sales Manager with executive ability to assist in General Management, is required in a well established Canadian components manufacturing firm. This position offers excellent opportunity with possibility of eventual ownership participation.

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Experienced personable sales technician or sales engineer is required due to greatly increasing business. To sell Electronic and Electrical Instruments to industrial and government organizations. Very fine career opportunity for right man. Call or write:

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desires position in Toronto or Southern Ontario with design or research group. Over 10 years of experience in production, testing, quality control, maintenance and design work in varied fields of electronics. Good knowledge of pulse, microwave and digital techniques. Machineshop and wiring experience of experimental models. Canadian citizen; 30 years of age, married.

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for production of

INERTIAL GUIDANCE SYSTEMS

Litton Systems (Canada) Limited has openings for several engineers with experience on airborne navigation or allied equipment.

Excellent opportunity for challenging work in the early stages of a long term contract involving new equipment using the most advanced techniques.

In addition, Litton requires Field Service Engineers with appropriate experience. Successful applicants should be prepared to accept out-of-plant assignments.

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Engineer required by a Canadian microwave manufacturing facility. Degree in electrical engineering or engineering physics preferred. Manufacturing experience required. Cost estimating experience preferred but not essential. Reply giving résumé of experience and personal information to:

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EMPLOYMENT WANTED

Engineering Technician desires responsible position, design and development in semiconductor or tube circuitry. Write:

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Young executive, able to offer unique background of 14 years in industry, experienced in all phases of sales and marketing of electronic components and equipment; seeks challenging position with dynamic company.

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Reply in strict confidence giving full details of background, salary required, etc.

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Required by rapidly expanding company, good prospects for right man with background in semiconductors or instrumentation.

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seeks position. Factory experience in producing electronic components, with good mechanical and electrical knowledge. Able to set up winding machines, assembly jigs, fixtures and test equipment. 31 years of age, married. Willing to re-locate.

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Wanted by Canadian manufacturer of electrical and electronic components for the Maritime Provinces. Some technical knowledge necessary. Reply giving full details to:

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of supervisory caliber desires position in industrial plant or consulting firm. Location preferences: South Central, South Eastern Ontario or South Central, South Western Quebec. Other locations considered. Four years' experience equipment engineering, telephone company. Four years' experience pulp and paper mill. Complete résumé sent with reply.

Box 5050
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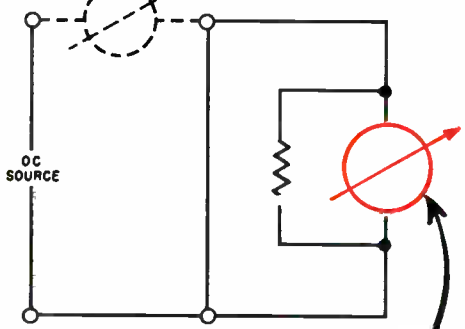
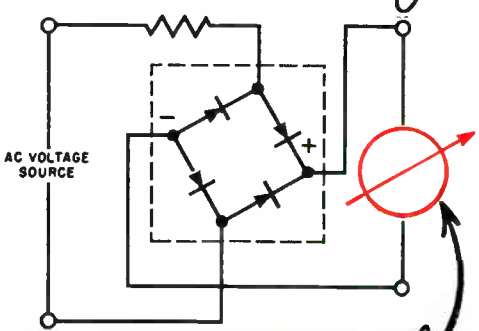
AC current relay

Ammeter



Weston Sensitrol

DC voltage relay



Weston Sensitrol

WESTON SENSITROL FOR MORE RELIABLE CONTROL

Model 1092—the most versatile, all-purpose relay...especially useful in prototype circuitry.

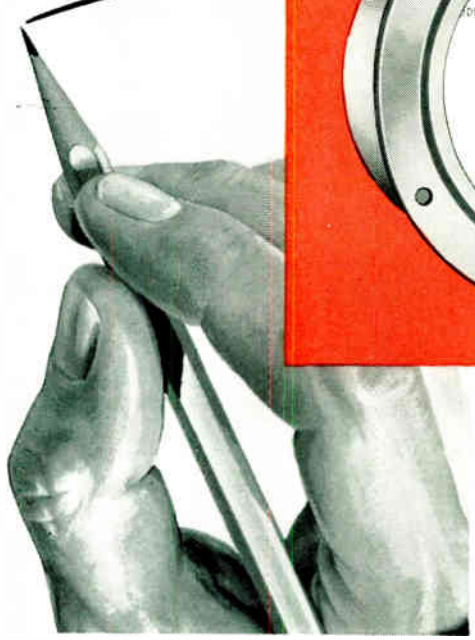
A truly all-purpose relay, the Weston Model 1092 Sensitrol® is serving diverse applications from commercial display to production line control. This meter-type relay with magnetic contacts is also used for continuous pulsing control and in circuits for holding variables such as temperature, voltage and light levels within critically narrow limits.

Simplicity of operation is an important factor in the growing popularity of Model 1092. A single adjustment screw controls a wide range of accurately repeatable DC values . . . from 0-50 microamperes, or comparable span of 0-100 millivolts. This instrument can be mounted on magnetic or non-magnetic panels, thanks to special Weston Cormag® self-shielded movement. It can handle up to 100 milliamperes at 120 volts AC or DC without chatter.

Many economies are possible with low-cost Model 1092 — another factor contributing to its wide application. Because it can be adjusted for an almost infinite number of settings, it eliminates the need for stocking a variety of relays in production work. And since it employs a moving coil mechanism, costly rectifiers and external converters are not required.

For more information, call or write Daystrom Limited, 1480 Dundas Highway E., Cooksville, Ontario. AT 9-3191. 5430 Ferrier Street, Montreal 9, Quebec. RE 1-3476. A subsidiary of Daystrom, Incorporated. Or any office of Northern Electric Co. Ltd.

Model 1092 Sensitrol® Relay has built-in reset mechanism operated with 120 volts AC or 48 volts DC, continuous. Reset time: 0.25 sec. Response time: approximately 0.5 sec. Size: 3.5" diameter flush case for panel mounting.



DAYSTROM

"Daystrom-Weston Instruments are now MADE IN CANADA to Canadian Standards."

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3 POPULAR hp OSCILLOSCOPES

Production or lab instruments—Simple to use, even for non-technical personnel—Moderately priced—Full 10 cm x 10 cm display—Automatic calibration waveforms—Low phase shift—Automatic triggering for optimum presentation—"Times-5" sweep expander magnifies trace, improves resolution.

DC to 200 KC

Models 120A/AR combine minimum controls with ϟ automatic triggering for utmost speed, convenience. Horizontal amplifier dc to 200 KC; phase shift only ± 2° to 100 KC. More X-axis information due to horizontal amplifier sensitivity control, with vernier, 5% accuracy. Balanced input on most sensitive ranges for low level work. Times-5 sweep expander, all ranges. 15 calibrated sweep speeds, 5 μsec/cm to 0.2 sec/cm. Vernier, expander extend speed range 1 μsec/cm to 0.5 sec/cm. 10 mv/cm sensitivity calibrated vertical amplifier, drift-free trace. ϟ 120A (cabinet) or ϟ 120AR (rack), $450.

DC to 200 KC—DUAL TRACE

Models 122A/AR provide simultaneous two-phenomena presentation, are ideal for direct comparison of filter, amplifier output/input phenomena; vibration testing. Unique ϟ front-panel automatic calibrator waveform switch. Twin vertical amplifiers operate independently, simultaneously, differentially. Automatic triggering, automatic synchronization, single trace operation when desired. Sensitivity 10 mv/cm to 100 v/cm, 15 calibrated sweeps, vernier extension. Horizontal amplifier dc to 200 KC. ϟ 122A (cabinet) or 122AR (rack), $675.

DC to 300 KC—"BIG SCOPE" PERFORMANCE

Models 130B/BR provide wide usefulness, simple operation and rugged dependability. 21 calibrated sweep times, 1 μsec/cm to 5 sec/cm. Vernier, expander extend range 0.2 μsec/cm to 12.5 sec/cm. Twin horizontal and vertical amplifiers, phase shift ± 1° to 50 KC; sensitivity 1 mv/cm to 125 v/cm. Balanced input on 6 most sensitive ranges. Common mode rejection 40 db. Stability 1 mv/hour after warmup. Triggering automatic, internally, line power, externally, 0.5 v or greater. ϟ 130B (cabinet) or 130BR (rack), $650.

Data subject to change without notice. Prices f.o.b. factory.

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