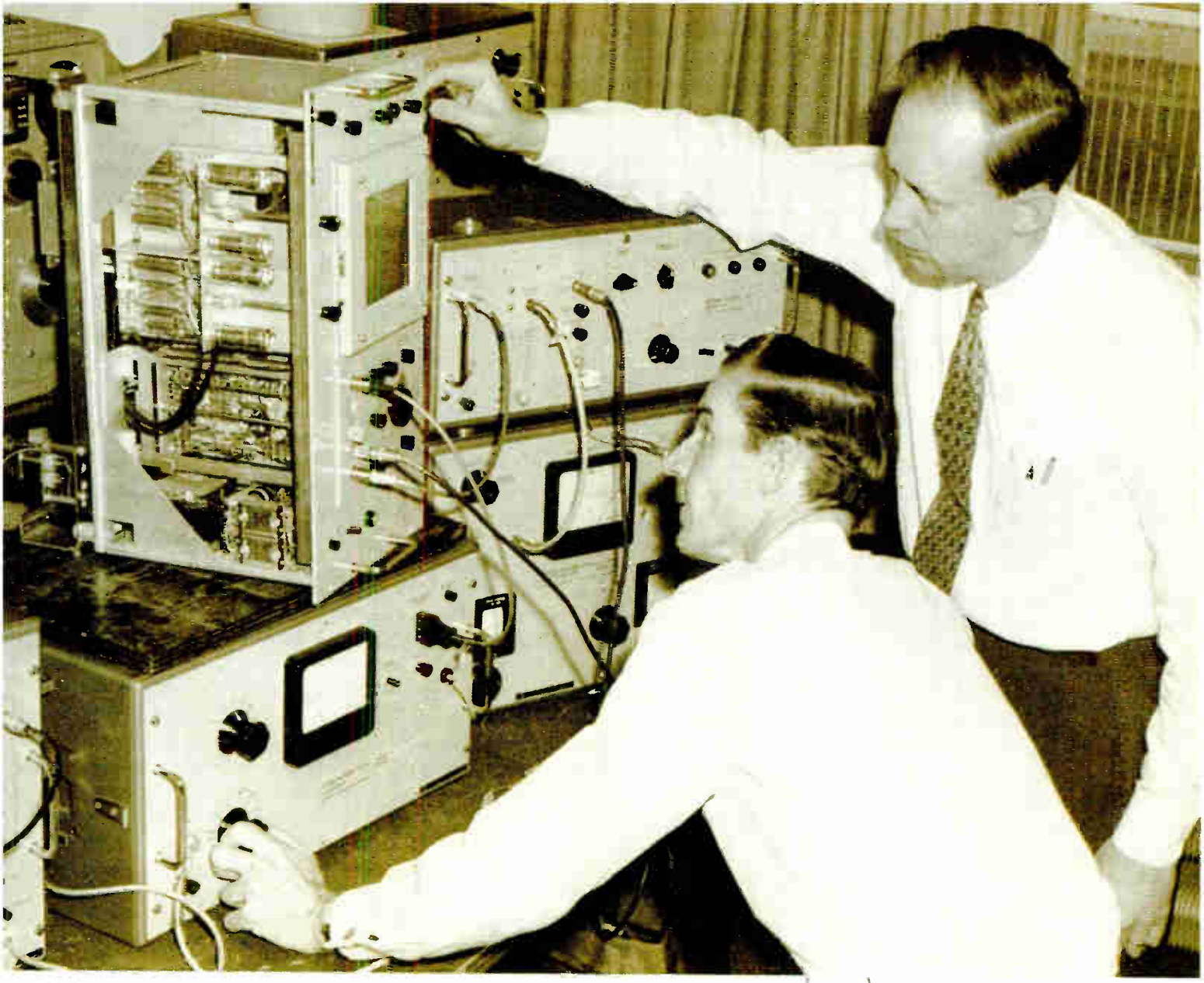
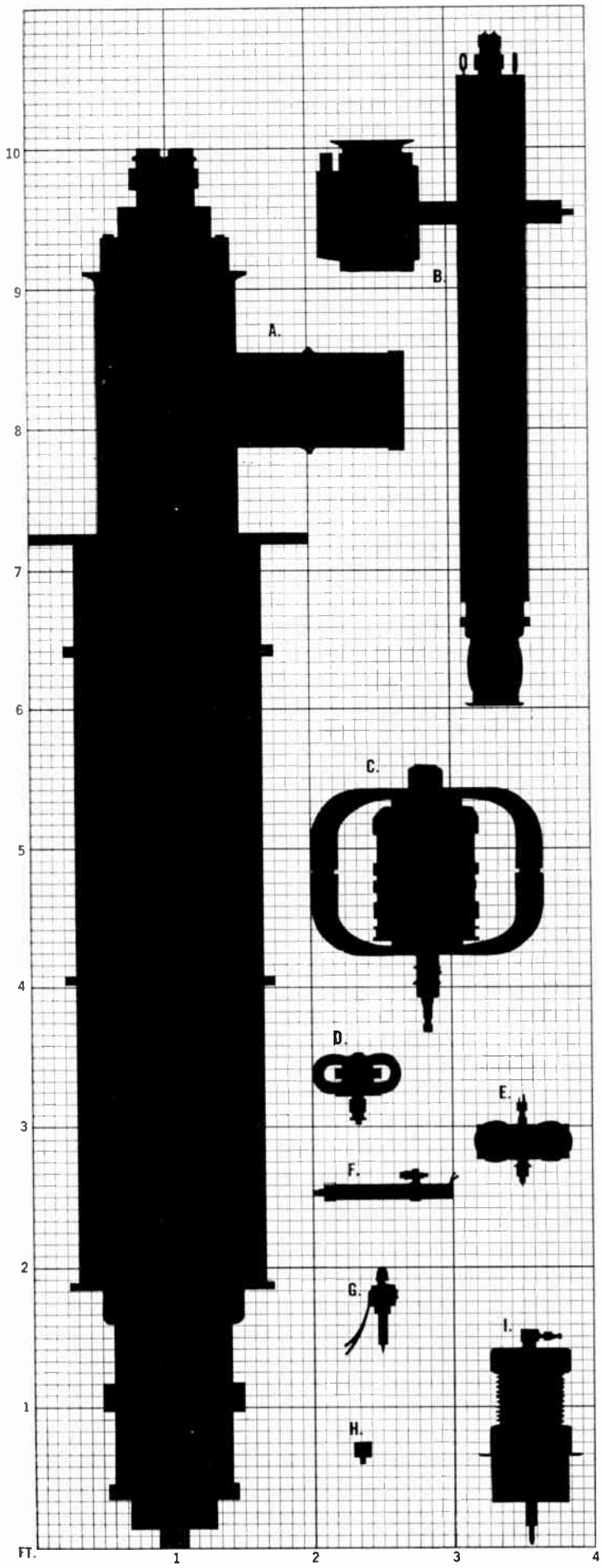


R O-R technicians calibrate wobble display system — see page 5.

electronics and communications

an age publication

AUGUST 1951



ONE METER TO FOUR MILLIMETERS

New Litton Electron Tubes for Advanced Applications

A. L-3403 KLYSTRON TUBE: One of our super power line, a long pulse, power amplifier klystron for the Ballistic Missile Early Warning System, delivering 1.25 megawatts peak power output.

B. L-3270 BROADBAND KLYSTRON: A 2 megawatt L-band klystron offering long life, high peak power, 8 percent bandwidth. Other broadband klystrons, using the exclusive Litton Skirtron techniques, are available with higher power in the L through S-band region with .002-.004 duty cycles.

C. L-3455 HIGH POWER MAGNETRON: A new magnetron delivering a minimum of 2 megawatts peak power at 406-450 mc. with a .002 duty cycle.

D. L-3458 HIGH TEMPERATURE PULSE MAGNETRON: Provides long life operation at ambient temperatures in excess of 662°F. Many hours of 900°F. operation have been achieved in X-band tests.

E. L-3629 FLOATING DRIFT TUBE KLYSTRON: High power, water-cooled klystron oscillator fixed tuned at 33,000-37,000 mc. Power output: 15 watts CW minimum. Other tubes available for immediate delivery from 12-4 mm. wavelength.

F. L-3472 TWT: PPM focused traveling wave tube offers higher CW power — 10 watts minimum — and wider bandwidth in a compact 3-lb. size. Operates in the range of 7,000-11,000 mc. One of a line of TWT's including a 1000-watt X-band pulse tube.

G. MICROTRON: The L-3189, one-kilowatt CW magnetron, is accompanied in package form by an electromagnet and filter assembly, high voltage and filament and isolation transformers. Only 6-second warm-up. Two year warranty for domestic microwave cooking.

H. L-3430 CUBE MINIATURE MAGNETRON: A one-kilowatt miniature magnetron, fixed tuned at 9300 ± 30 mc, weighing less than 9 ounces and no bigger than a normal X-band waveguide flange. Developments at other power levels and frequencies are planned.

I. L-3408 SWITCH TUBE: Provides switching at relatively low control voltage levels with an efficiency of 95 percent. Features high voltage holdoff, high current handling. Collector ratings: 150 Kv; 20 Amps; 10 KW dissipation.

For information on our tube line, exclusive of classified types, send for the 1961 Electron Tube Condensed Catalog. Write to: Lake Engineering Co., Ltd., 123 Manville Road, Scarborough, Ontario

LITTON INDUSTRIES
Electron Tube Division
MICROWAVE TUBES AND DISPLAY DEVICES

For complete details check No. 23 on handy card, page 35

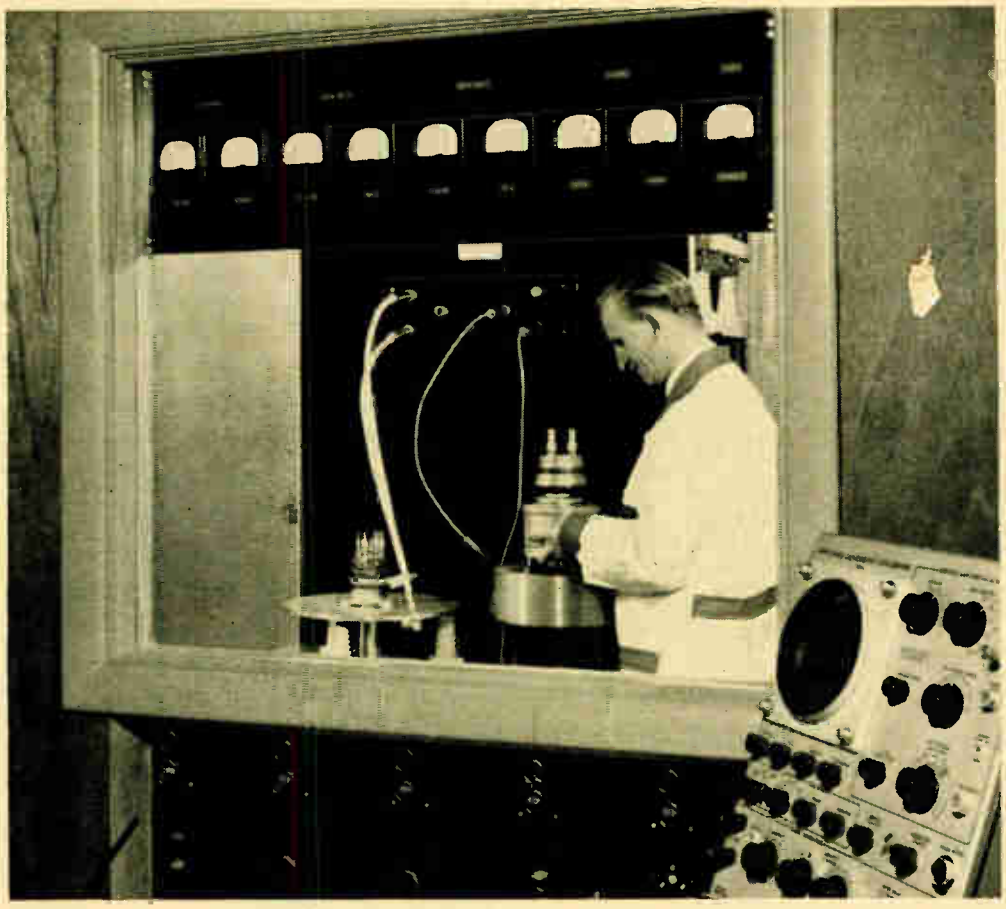
Marconi's

NEW TEST LAB

GUARANTEES PRE-TESTING OF SPECIAL PURPOSE TUBES

PLUS FAST

WARRANTY ADJUSTMENT



Special Purpose Tubes are tested under simulated operating conditions at the new Marconi Test Lab in Toronto—only lab of its kind in Canada. Here a technician connects a BR1102 Tube in a special pressure-controlled test room.

This means new convenience in Special Purpose Tube service for you. If you are in one of the many industries now using Special Purpose Tubes in complicated equipment you know how important this can be . . . how your whole operation can be held up while you wait for replacement or adjustment of a faulty tube. This is because these tubes are *normally* imported by a distributor and shipped to the customer *without* testing. *Not so a Marconi Special Purpose Tube.* Tubes are pre-tested in the new, fully-equipped Marconi Test Lab . . . sealed and protected by the Marconi warranty. If any trouble does occur, you can be sure of *immediate* warranty adjustment. Marconi electronics specialists will give you on-the-spot assistance. This service is as close as your phone.

Canadian Marconi has the widest and most complete range of Special Purpose Tubes in Canada. Marconi's extensive background of experience in electronic tubes and equipment can prove invaluable to you in the selection and use of proper tubes and components for your requirements.

ELECTRONIC TUBE AND COMPONENTS DIVISION

CANADIAN **Marconi** COMPANY

1830 BAYVIEW AVENUE, TORONTO, ONTARIO

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For complete details check No. 10 on handy card, page 35

Arthur E. Maine P.ENG.

newly appointed editor
Electronics and Communications

Age Publications Limited, proudly announce the appointment of Arthur E. Maine, P.Eng., as editor of Electronics and Communications.

Arthur Maine, (known to most of his associates as "Mick") was born in England where he received his primary and secondary school education. He completed his training at The Watford Technical Institute winning an Engineering Honors Diploma with prize award. His first few years in industry were with Marconi Instruments where he was employed in the Development Department, initially working on automatic industrial control equipment and later, on radio beacons. The years 1943 to 1945 were absorbed by war service and during most of this time he instructed at Army Technical Schools. In 1946, Mr. Maine spent a year with the British Supply Ministry where his duties comprised the evaluation of flight control systems of German rocket weapons.

His service with The De Havilland Aircraft organization commenced in 1947 and continued without interruption up to the time of his recent editorial appointment. His first two years with De Havilland were spent as an Electronic Design Engineer where he participated in the design of much new equipment concerned with the company's rapidly expanding Vibration Research Department. His major contribution at this time was the design of a complete automatic stress governing installation used in connection with the prolonged vibration testing of aircraft propellers. Mr. Maine's next appointment was that of Chief Electrical Designer in the Propeller Division where under his direction numerous propeller control devices were designed for a variety of British aircraft. At this time his interest in magnetic amplifiers was aroused and he was able to set forth an entirely novel automatic propeller synchronizer using these devices. The system was patented and is presently in service in the Britannia aircraft. At the conclusion of this work the company entered the guided missile field and Mr. Maine soon found himself engaged in the design of certain advanced and highly miniaturized turbine driven power systems. In order to support this work the company sanctioned the establishment of a magnetics research laboratory and under Mr. Maine's direction a number of new techniques were developed, especially in regard to fast-response magnetic amplifiers.

This work led to his appointment as a member of a British Government Technical Team which toured the United States visiting agencies active in the magnetics area. Continued service in the Guided Missile Division saw Mr. Maine first head of the Servo Control Laboratory and later head of the company's Missile Test Equipment Department.

Late in 1954 the Canadian De Havilland company entered the missile field and Mr. Maine came to

Canada to assist in this work. His first duties were with the Fire Control Group where he participated in the design of airborne computational apparatus which formed part of the Velvet Glove weapon system. Though primarily concerned with power supplies and data displays his group also produced an interesting automatic frequency control working at X-Band. Phasing out of Velvet Glove led to the introduction of Sparrow II and Mr. Maine became Leader of the turbo-alternator Project. The required power unit performance involved the use of extremely advanced electrical machines having quite unusual properties and it became necessary for Mr. Maine and his associates to delve deeply into this area of technology and perform considerable research into flux commutating mechanics.

After the Sparrow II cancellation "Mick" was made Project Leader of a number of comprehensive study programs undertaken by the company relating to the design of advanced power systems for various missiles and manned rockets. At the time of his Electronics and Communications appointment, Mr. Maine carried the title of Chief Electronics Engineer, Special Products Division, De Havilland Aircraft of Canada.

A great believer in the dissemination of technical information, Mr. Maine has written prolifically having 27 technical papers and articles to his credit, and he is also the author of 7 patents. He is a member of several Technical Societies, winner of the 1955 Radio Industries Council award for Technical Articles and is a registered Professional Engineer.

His hobbies are reading, photography and hunting and until pressure of other work forced him to resign, he was a founder member and Vice-Chairman of The Canadian Astronautical Society. "Mick" is married and has four children, the youngest born in Toronto last year.

electronics · and communications

an age publication

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Published by
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450 Alliance Avenue, Toronto 9, Ontario
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Indexed in the Canadian Business and Technical Index of the Toronto Public Library.

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

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Authorized as second class mail by Post Office Dept., Ottawa

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PRINTED IN CANADA
60

electronics and communications

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

contents AUGUST, 1961

Vol. 9, No. 8

departments

COVER STORY

Technicians check the calibration of a wobble display set at R-O-R Associates Ltd. This new Wandel & Goltermann system will plot automatically a graph of frequency against signal level. Display is on a scope. Center frequency can be anywhere between 1 kc and 15 mc, with display width varying from 20 kc to 1 mc. In the vertical dimension, a resolution of 0.01 db is obtained. Two signals (standard and unknown) can be displayed simultaneously. The transmitter and receiver portions can be remote from each other, so a response plot of a complete cable or radio link can be obtained without synchronizing.

WHICH OF THESE 7 DC POWER

You want flexibility and versatility in the power supply line of highly regulated, ripple-free, temperature-current supplies, to heavy current-low voltage instruments,

NEW!

hp 723A, 500 ma output, 0 to 40 v. Transistorized, programmable remotely

hp 723A can be programmed remotely and is especially useful in systems applications where a number of measurements are made automatically at different voltages. Output voltage may be changed merely by changing the value of an external resistance, as with stepping switches for programmed tests. Low noise and ripple make the 723A particularly applicable to low level measurement. New, modular hp package combines compactness with rack-mount and bench-top versatility.

SPECIFICATIONS

Regulated Output:	0 to 40 v dc; 0 to 500 ma dc
Load Regulation:	< 0.1% or 2 mv (whichever is greater) change from 0 to 500 ma
Line Regulation:	< 0.05% or 5 mv for ± 10% line voltage change
Noise and Ripple:	< 200 μv
Remote Programming:	External resistance can control output voltage at rate of 25 ohms/volt
Output Impedance:	< 30 milliohms at 10 cps
Size:	6¼" x 5⅛" x 11"; 21 lbs.
Price:	$225.00

hp 722AR, 2 amps, 60 v output. Transistorized, easy monitoring

High regulation over complete voltage range, highly stable output. Extremely low noise and ripple insure clean measurements. High impedance remote sensing input, which connects directly to the load through wires independent from supply leads regulates the voltage at the load itself despite an IR drop in long supply leads. Separate meters measure current and voltage continuously for easy monitoring. Continuously variable control limits output current.

SPECIFICATIONS

Regulated Output:	0 to 60 v dc; 0 to 2 amps dc
Load Regulation:	< 5 mv change for 0 to 2 amps change
Line Regulation:	< 2.5 mv change for ± 10% line voltage change
Noise and Ripple:	< 250 μv
Output Impedance:	DC, < 2.5 milliohms; ac < 5 milliohms in series with 4 μh
Size:	19" x 5¼" x 12"; 34 lbs.
Price:	$525.00

hp 721A, 0 to 30 v, 150 ma output, versatile, only $145.00!

This ultra compact 4 pounds of power supply gives you easiest possible output voltage monitoring, with a large, easy-to-read meter, plus a four-step current limiter for positive overload protection. Several 721's may be operated in parallel or cascaded for extra flexibility.

SPECIFICATIONS

Regulated Output:	0 to 30 v dc; 0 to 150 ma
Load Regulation:	< 0.3% or 30 mv (whichever is greater) no load to full load
Line Regulation:	< ± 0.3% or 15 mv (whichever is greater) for ± 10% line voltage change
Noise and Ripple:	< 150 μv rms
Output Impedance:	< 0.2 ohms in series with 30 μh
Size:	7" x 4⅜" x 5¼"; 4 lbs.
Price:	$145.00

For complete details check No. 18 on handy card, page 35

SUPPLIES BEST FITS YOUR NEEDS?

on your bench, and hp offers the world's most varied stable laboratory power supplies! From high voltage-low hp is ready to meet your requirement:

NEW!
hp 726AR, 2 amps, 45 v output. Transistorized, programmable!

This newest member of the hp transistorized power supply family provides remote programming plus the same high regulation, stable output over a wide range of line and load conditions as other instruments in the hp 720 Series. Model 726AR is especially useful for applications requiring accurate, repeatable voltages, such as component or production testing. A continuously variable current limiter protects circuits under test from accidental overload-damage. Remote sensing feature.

SPECIFICATIONS

Regulated Output:	0 to 45 v dc; 0 to 2 amps dc
Remote Programming:	External resistance can control output voltage at rate of 100 ohms/volt
Load Regulation:	< 5 mv change for 0 to 2 amps change
Line Regulation:	< 2.5 mv change for ± 10% line voltage change
Noise and Ripple:	< 250 μv
Output Impedance:	DC, < 2.5 milliohms; ac < 5 milliohms in series with 4 μh
Size:	19" x 5¼" x 12"; 34 lbs.
Price:	$500.00

PLUS THESE LAB AND FIELD-PROVED VACUUM TUBE POWER SUPPLIES
for high voltage-low current applications:

hp 711A Laboratory Power Supply	DC output 0 to 500 v, 100 ma max; ac output 6.3 v, 6 amps, or 12.6 v, 3 amps. DC regulation 0.5%.	Inexpensive, versatile high voltage, low current power supply. Metered voltage and current. hp 711A, $250.00 (cabinet); hp 711AR, $255.00 (rack mount).
hp 712B Power Supply	DC output 0 to 500 v, 200 ma max; bias supply 0 to —150 v, 5 ma max; ac output, 6.3 v, 10 amps max. Regulation 0.01% at 500 v.	High quality, high voltage supply; particularly good transient response, regulation and stability. hp 712B, $390.00 (cabinet); 712BR, $375.00 (rack mount).
hp 715A Klystron Power Supply	Beam supply —230 v to —400 v, 40 ma max; reflector supply 0 to —900 v below beam supply, 10 μa max; ac output 6.3 v, 1.3 amps. Modulation capabilities.	Klystron supply, inexpensive general purpose instrument. hp 715A, $325.00 (cabinet).

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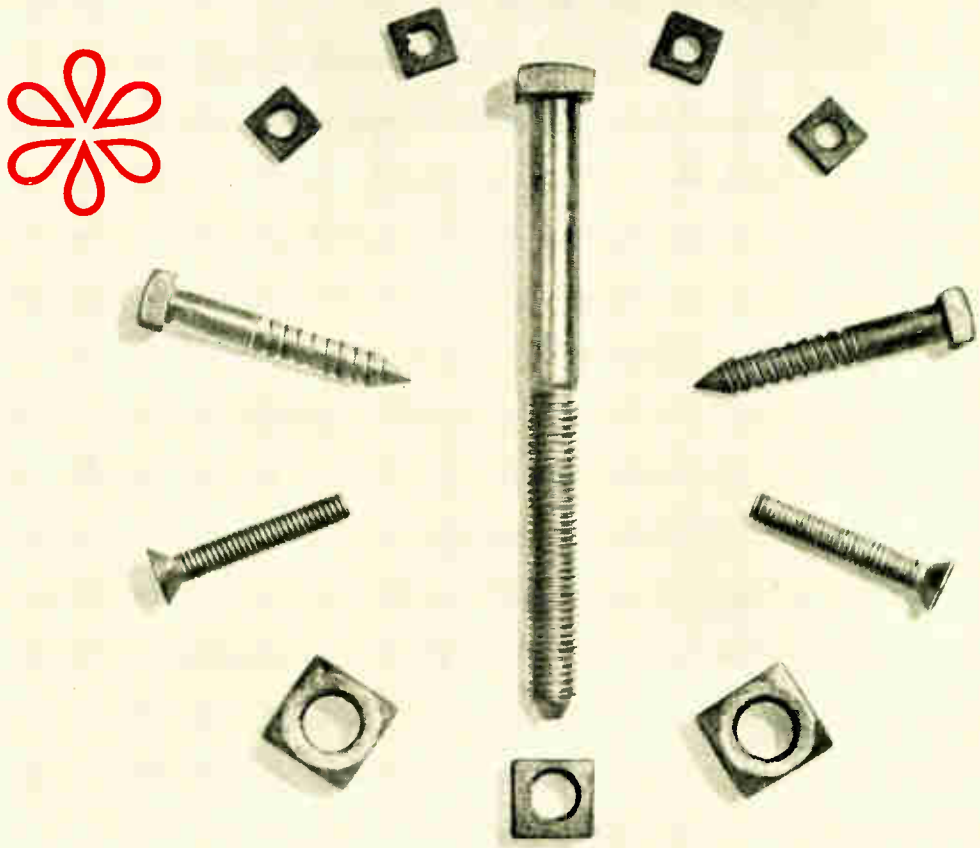

the nuts and bolts of line hardware service

There's nothing ordinary about pole line hardware, be it nuts or bolts, anchors or insulators. Not at AUTOMATIC ELECTRIC.We realize that hardware is as basic to communications as the telephone or the cable. (We also sell telephones and cables.) But because we know the importance of the nuts and bolts of the business, every line hardware order gets red carpet treatment. (Just the same as orders for telephones, cables, or hundreds of other AE products.) ● AUTOMATIC ELECTRIC is your single source of supply for everything in pole line hardware. Choose from famous names like Slater, C.L.M., Kearney, Chance, and others. Order all your supplies from AUTOMATIC ELECTRIC—the company that takes the "hard" out of hardware ordering. For full information write Automatic Electric Sales (Canada) Limited, 185 Bartley Drive, Toronto 16, Ontario. Branches across Canada.

**AUTOMATIC ELECTRIC sells everything in pole line hardware.*

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GENERAL SYSTEM

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For complete details check No. 5 on handy card, page 35

a Genie at your command—

the CALL director

The 30-button CALL director helps secretaries handle more calls, streamlines office operation.

From Northern Electric comes a new-style genie . . . the CALL director telephone. It's the versatile virtuoso of modern business communications. To reach many inter-office extensions—just press a button. To hold a telephone conference—just press a button. To connect outside calls to others—just press a button. The CALL director is available with 12, 18 or 30 buttons and many features to save precious business time.

The CALL director telephone is another step forward in the science of business communications by Northern Electric, who design and manufacture most of Canada's telephones and related equipment.

Northern's extensive experience in this field, along with their creative engineering and design personnel and modern manufacturing facilities are at your command. Branches are strategically located across Canada to serve you.

Northern Electric
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SERVES YOU BEST

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For complete details check No. 25 on handy card, page 35

the industry's business

COTC records new high revenues

Canada's overseas telecommunications facilities provided a record net profit of $1,363,751 during the last fiscal year, it was disclosed in the 11th annual report of the Canadian Overseas Telecommunication Corporation.

Overall revenue increased by 25.9 per cent compared to the previous year in overseas telegraph, telephone, International Telex and leased circuits.

It was revealed that an additional 80 trans-oceanic voice circuits will soon be available. A new Canada-United Kingdom multi-channel multi-purpose cable is now being laid and should be ready for operation "around the end of October". This cable will form the first link of the Commonwealth round-the-world cable.

D. L. Thompson (center), director of Aircraft Branch, Department of Defense Production, is shown accepting the first Canadian-made autopilot computer for the CF-104 aircraft. Honeywell Controls Limited, represented by J. V. Shaudhnessy (left), production manager, Military Products, and J. H. Baldwin, general manager, Engineering Products, manufactures this computer at its Leaside facilities. Delivery of this first unit was made to assist Canadair in completing its first aircraft ahead of schedule.

Private Telex exchange installed for Montreal police

The City of Montreal has installed a private automatic Telex exchange to provide instantaneous communications between the Montreal Police Department headquarters and its 23 city-wide stations.

Full operation will begin by September 1, and installation is being carried out by Canadian National-Canadian Pacific Telecommunications.

This system is also hooked up to the International Telex network which includes Toronto's Metropolitan Police, 35 RCMP offices, and police organizations such as Scotland Yard, the Surete, and Interpol.

Conway appointed as Millivac rep.

Millivac Instruments, Inc., Schenectady, New York, recently appointed Conway Electronic Enterprises, Ltd., 1514 Eglinton Avenue West, Toronto 10, Ontario, as their exclusive Canadian representative.

Montreal office for Whittaker

On June 16, Whittaker Electronics Limited opened their Montreal office at 5056 Chestnut Avenue, Pierrefonds, Montreal. Ken H. Tinker has been appointed Quebec-Maritimes manager.

CGE buys Canada's largest mobile radio service company

Canadian General Electric announced it has purchased an Edmonton firm, Cowley Electronics Services Ltd., as part of a nation-wide program to expand its service facilities in the two-way mobile radio and general communications field.

Said to be the largest independent mobile radio and communications equipment service company in Canada, Cowley Electronics has facilities for servicing and maintenance and presently operates over most of central and northern Alberta, and in northern British Columbia.

Successful IRE Canadian Electronics Conference forecast

Eighty-two technical papers about progress in Canadian electronics will be featured at the IRE Canadian Electronics Conference to be held in Toronto, October 2, 3 and 4.

Fred J. Heath, chairman of the executive committee forecasts an extremely successful meeting. One hundred and twelve companies have already booked space in the Automotive Building, Exhibition Park, Toronto. This represents 76 per cent of the floor space available, a greater show of interest than for any previous conference.

Special sessions are being planned by the Technical Program Committee under the chairmanship of A. R. Low. These will feature solid-state electronics; industrial electronics; plasma physics; nucleonics; data processing in business; computers in control; millimeter waves; and traffic control.

H. W. Jackson, head of Electronic Technology Department, Ryerson Institute of Technology, Toronto, is organizing one of two panel sessions, that on education. The EIA of Canada is organizing the other panel discussion.

Both panel sessions will be held during the afternoon of October 4. All other technical sessions will be held the afternoon of October 2, all day October 3 and the morning of October 4.

National Exhibition of Radio and Television

This annual French exhibition of radio and television products will be held September 14-25, 1961, in the Parc des Expositions in Paris. It is presented by the Radiodiffusion Television Francaise and the Federation Nationale des Industries Electronique.

Owing to the close collaboration which has been traditionally established between the RTF and the industry, the public is invited to view behind-the-scene factors of home entertainment media.

This French national exhibition is open to foreign visitors, but not to foreign exhibitors.

Canadian rep appointed by British firm

Electronic Controls Limited, Belleville, Ontario, was appointed sales engineering representative for Canada for EKCO Electronics Limited of England. EKCO manufactures a broad range of industrial nucleonic gauges, instruments for scientific and medical research, and radiation monitors.

Call for papers for 1962 Electronic Components Conference

The 12th annual Electronic Components Conference, sponsored by AIEE, EIA and IRE, and with participation by ASQC and the Society for Nondestructive Testing, will be held in Washington, D.C., on May 8, 9, 10, 1962. This meeting is devoted to new developments in components, component processing techniques, component evaluation and component materials.

Papers on the subjects of electronic components and materials will be solicited. A 500 word summary, together with the author's name and address should be sent to:

Henry A. Stone, Chairman,
Technical Program Committee,
Bell Telephone Laboratories,
Murray Hill, New Jersey, U.S.A.

The deadline for summaries is October 9, 1961. Authors will be notified of acceptance by November 20th.

To expedite prompt handling 15 copies are requested.

Final papers will be due on January 15 and will be published in the Proceedings of the Conference.

Ottawa firm appointed stocking distributor

Wackid Radio Television Labs, Ltd., 149 Gloucester Street, Ottawa, Ont., was appointed a stocking distributor of CAMBION electronic components, according to an announcement from Lowell Wilkes, sales manager of Cambridge Thermionic Corporation.

Specialists to trade ideas on new sources of energy

Scientists, engineers, businessmen and government administrators from every continent will meet under United Nations' auspices in Rome this summer to pool ideas on ways of using the sun, the wind, and underground heat to help fill the world's growing need for energy.

Some 400 specialists and economic development officials from 61 countries have so far accepted invitations to attend the first UN Conference on New Sources of Energy, scheduled for August 21-31 in Rome.

Their discussions will be based on 250 papers submitted by specialists of 30 countries and 20 general papers prepared by Conference rapporteurs to incorporate basic points presented in each field.

Massey-Ferguson Ltd., Toronto, recently installed this 1401 data processing system. It completes in two hours the equivalent of 5,250 manhours of clerical work. More than 70 delegates attending the National Machine Accountants Association conference in June, were guests of the company to inspect the system. They included (from left) Roy Hargreaves, McCloud Lumber Company, McCloud, California; and James Heacock, Telecomputing Inc., Holloman Air Force Base, New Mexico. M. K. Rossbach, Massey-Ferguson data processing supervisor, explains the operation of the system.

RCA equipment chosen by CBXT - Edmonton

The new CBC television station in Edmonton, CBXT, is to be equipped with an RCA Victor TS-40 video switching system. The station has already ordered an RCA 25 KW transmitter, which when in operation this Fall will give CBXT the most powerful lowband TV signal in North America — 300 KW ERP.

The video switcher will be built to CBC requirements at RCA Victor's plant in Montreal, and will consist of one TS-40 system with remote panels for two studios. An auxiliary preview bus will permit monitoring from the equipment room.

G. R. MacGregor, president of Trans Canada Airlines, examines a read/write head for one of the large magnetic storage drums for TCA's new reservation system during a recent visit to the Toronto plant of Ferranti-Packard Electric Limited. Others in the photo (from left) are: G. W. L. Davis, manager, Technical Services, Electronics Division, Ferranti-Packard; T. Edmondson, president, Ferranti-Packard; C. J. Campbell, director of Telecommunications, TCA; Mr. MacGregor, and E. G. Hazle, senior engineer, Ferranti-Packard.

Manitoba University student wins IRE competition

Region 8 of the IRE recently held a Student Paper Competition which was open to all undergraduate IRE student members and student associate members in the region. Sandy I. Helman, Electrical Engineering, The University of Manitoba, was chosen by a panel of judges from the Ottawa Section. His winning paper was titled "A Cardiac Pacemaker Stimulator." He decided to attend the 1961 IRE Canadian Electronics Conference as his prize, in lieu of the $100 cash award.

John T. Walton, the University of British Columbia, received an honorable mention for his paper "Nuclear Reactor Studies."

W. Hobson & Associates appointed representative

W. Hobson & Associates, 1024 Notre Dame St., Lachine, Quebec, has just been appointed sales representative in eastern Canada by Associated Research, Inc. of Chicago, Ill., U.S.A. The new line includes instruments for testing insulation of electrical, electronic and aircraft equipment.

EIA report

by R. T. O'Brien

Color Television

Although color telecasting is not yet permitted in Canada at least one more Canadian company has announced plans for producing color receivers for sale in the Fall of 1961.

Spokesman for the company say that the demand for color sets from Canadian border areas is due to the increasing number of colorcasts reaching Canada from south of the border.

There are now an estimated 3,000 color set owners in Canada. With much more American network colorcasting being forecast for the coming year this will mean more receiving activity but, unless Canadian color transmissions are authorized and as the number of sets and programs increase, more and more Canadians will be viewing American television, a situation which would be at variance with what the BBG policies hope to achieve.

Committee Briefs

The General H. F. Communications Engineering Committee has been authorized to draft a proposal for an EIA Standard for single sideband equipment.

The Broadcast Equipment Engineering Committee has completed a review of EIA Standard RS-240 (Revision of TR-104-B), "Electrical Performance Standards for Television Broadcast Transmitters". The Committee is now studying, at the invitation of the Department of Transport, the feasibility of beam tilt. Since the Department's Broadcast Procedure 5 will permit the dropping-in of the VHF channels with close geographical separations, radiation in the protecting direction may be curtailed. In many instances there are favorable heights of land available for the location of the drop-in transmitter which are not entirely compatible with the protection requirements. Therefore, the matter of beam tilt as a means of compromising between protection and coverage requirements is being explored.

Evidence of the growing recognition of the need to be competitive in the export field is the authorization to form an Export Committee in the Electronics Division. W. R. Bitcheno of the Canadian Marconi Company, Montreal, is acting as chairman in the organizational phase.

Prompted by increased activity in developments in semiconductor devices the Electronic Tube and Semiconductor Committee of the Components Division is organizing a separate Semiconductor Section. A similar move may be made in the Component Parts Engineering Panel where two separate engineering committees have been recommended.

The Industrial Relations Committee is studying revisions to the "Electronic Technician" monograph published by the Guidance Center of the Ontario College of Education, Toronto. The present issue was made in 1958 and revision is being made to reflect advances in technology, manufacturing methods and the general state of the art.

Representatives of the Land Mobile and Marine Equipment Engineering Committee of the Electronics Division and the Receiver Division Engineering Committee have combined to generate recommendations for the CRTPB for a General Service Band specification.

An Ad Hoc Committee on Research and Development reporting to Government Liaison Committee has been authorized. The committee will survey all aspects of research and development, including applied research in Canadian industry. Comparing findings with what is being done in other countries will enable the Committee to recommend steps which are required to protect the future of the industry in Canada.

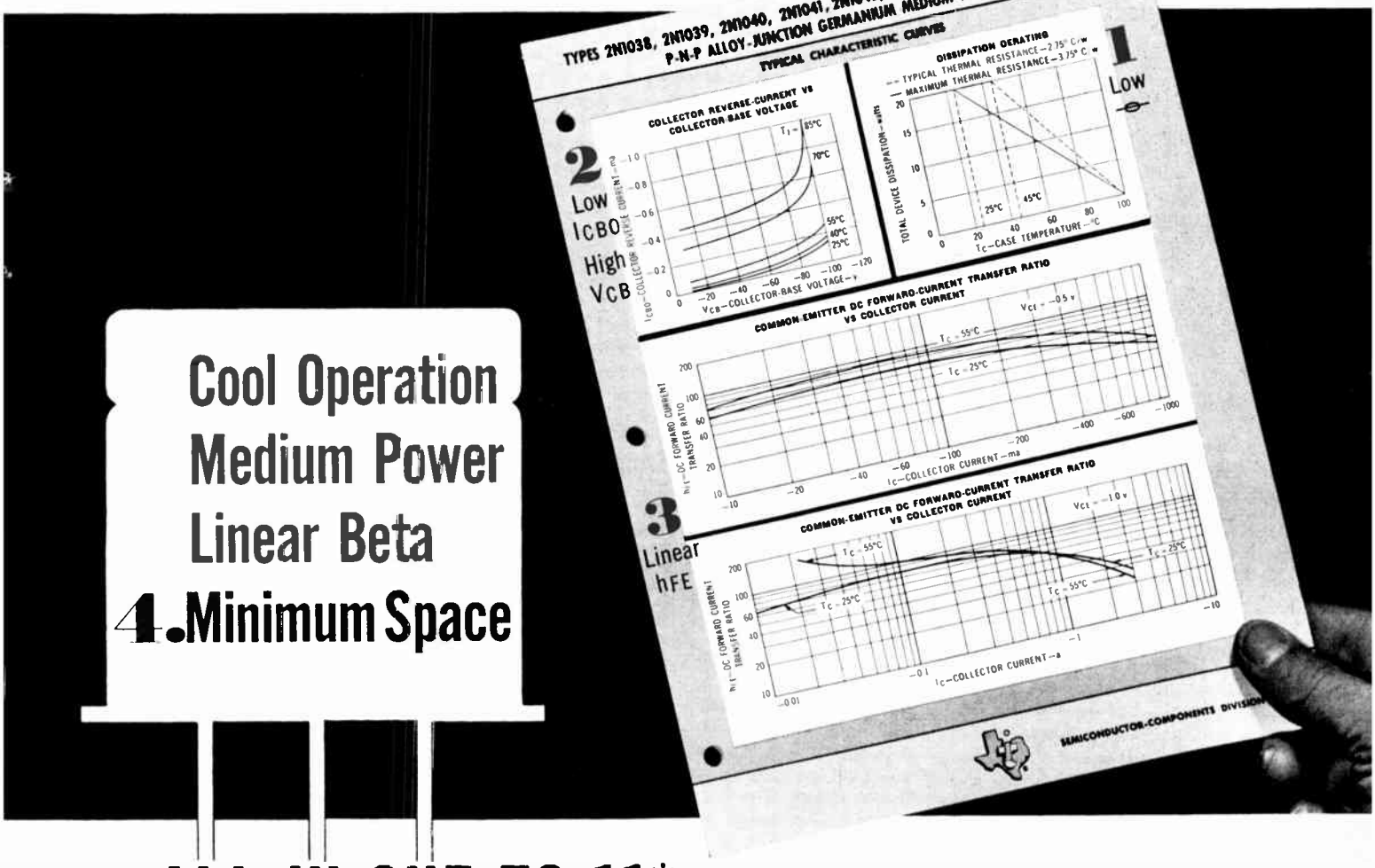
New Publications

EIA has released Standard RS-186-B, "Standard Test Methods for Electronic Component Parts". The methods provide a number of test conditions of varying degrees of severity so appropriate test conditions may be selected for any component.

Two new JEDEC publications are announced. JEDEC 7A covers Registered Bases, Caps, Terminal and Gauges to June 1961. JEDEC 12C is titled Outlines for Semiconductor Devices to June 1961. Enquiries on EIA Standards and JEDEC Publications should be directed to the Association office at 200 St. Clair Avenue West, Toronto 7, Ontario.

EIA-IRE Golf Tournament and Industry Dinner

The 1961 EIA-IRE Golf Tournament and Industry Dinner will be held on Thursday, September 28, 1961 at the Cedar Brae Golf and Country Club, Toronto.



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1. 20 w dissipation in a TO-11 package (with flange or stud heat sink) — maximum heat transfer for greater circuit economy and longer, more reliable component life.

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4. Highest power/size ratio devices available today — Texas Instruments 2N1038 germanium transistors give you *useable* power, *economical* circuits, *compact* designs — all with a TO-11 package. Plus, mechanized production processes assure you *constant-predictable* performance and immediate large quantity availability.

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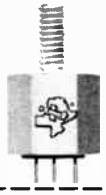
FLANGE or **STUD** for highest dissipation and for easiest mechanical assembly.



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■ **Use-proved in sustained satellite power supply operations.**

■ **Less than 7.8 grams and 0.59 square in. Less than 0.39 in. high.** ■ **Up to 20 watt dissipation in flange or stud heat sink.**

**with 0.025 in. diameter lead*

Device	2N1038	2N1039	2N1040	2N1041	2N1042	2N1043	2N1044	2N1045
I_C	1 amp	1 amp	1 amp	1 amp	3 amp	3 amp	3 amp	3 amp
BV_{CBO}	40	60	80	100	40	60	80	100

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18468

For complete details check No. 34 on handy card, page 35

another Sarkes Tarzian production breakthrough!

Specifications at 25° C			
Tarzian Type	Zener Voltage (V)	Test Current (MA)	Dyn. Imp.(MAX) (Ohms)
VR6	6	25	4.0
VR7	7	25	5.0
VR8.5	8.5	25	6.0
VR10	10	12	8.0
VR12	12	12	10
VR14	14	12	11
VR18	18	12	17
VR20	20	4	20
VR24	24	4	28
VR28	28	4	42
VR33	33	4	50
VR39	39	4	70
VR47	47	4	98
VR56	56	4	140
VR67	67	2	200
VR80	80	2	280
VR90	90	1	340
VR105	105	1	400

Tarzian Silicon Voltage Regulators now at workday prices

1-watt

Epoxy enclosed

6 to 105 volts, in 20% increments

Standard tolerance is 20%
(all common tolerances available on request)

Immediate availability

Sarkes Tarzian did it in 1957 for silicon rectifiers and has done it again in 1961 for silicon voltage regulators...devised production methods that make it possible to offer quality silicon semiconductor devices at a price level that permits their use not only in Sunday circuits but also in workday circuits.

At the new low prices, more circuits can be better protected or improved in performance by the use of these small and inherently rugged devices as clippers, limiters, and regulators.

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For complete details check No. 32 on handy card, page 35

Bourns Trimpot®
Puts the Proof in Humidity-Proof

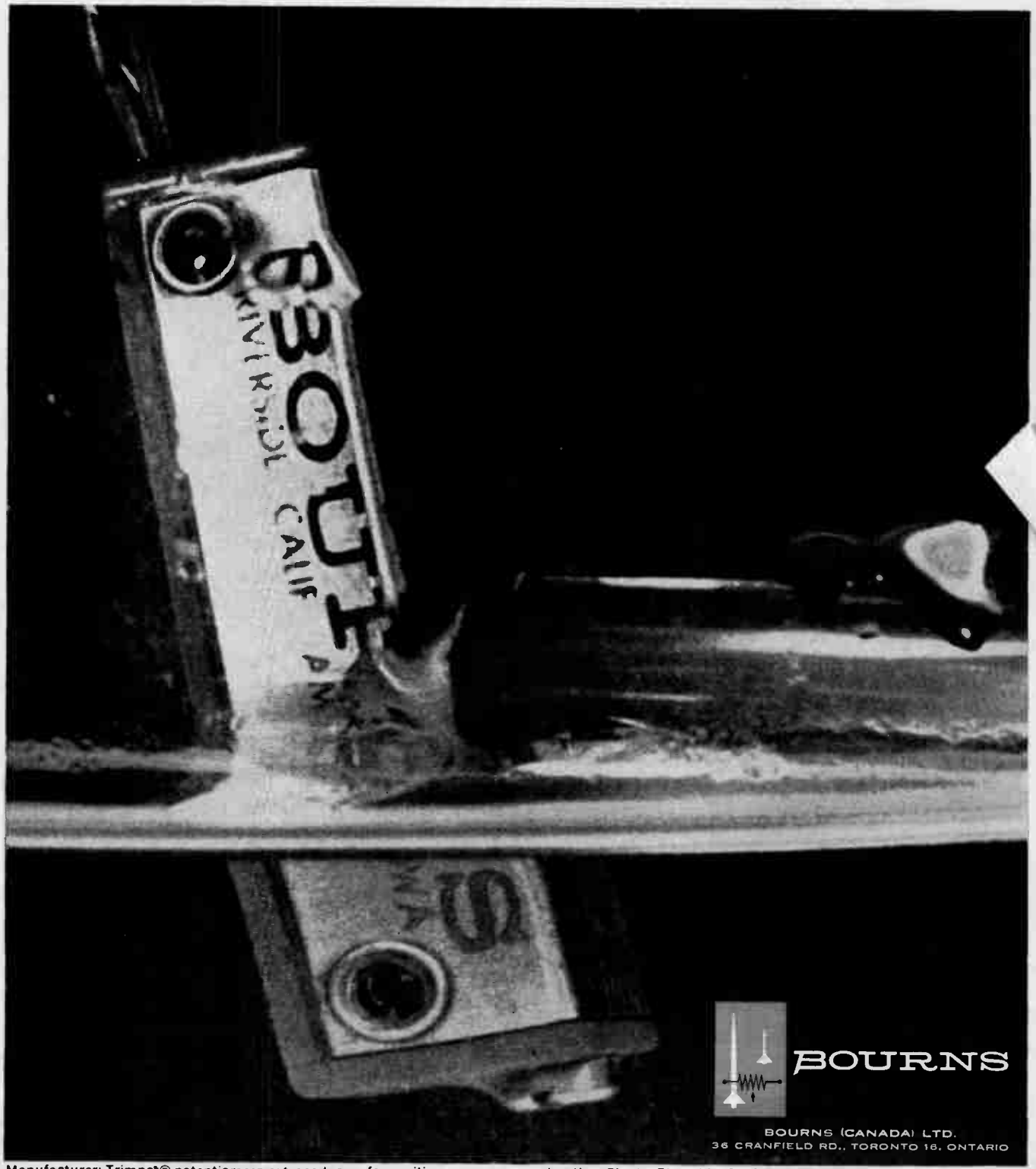
NUMBER 5 — RELIABILITY SERIES

Plunging a potentiometer into near-boiling water is just one of the ways Bourns puts the proof in humidity-proof. Every Trimpot unit made takes this 60-second bath with the water simmering at 90°C. Air expanded by the heat creates four pounds of pressure inside the potentiometer—enough to cause bubbles—if it leaks. Only if the unit is completely leak-free does it pass the test.

Bourns humidity proofing starts at the beginning—with original design and selection of materials. The plastic chosen for Trimpot cases, for example, displays the unusual properties of high insulation resistance and extremely low moisture absorption.

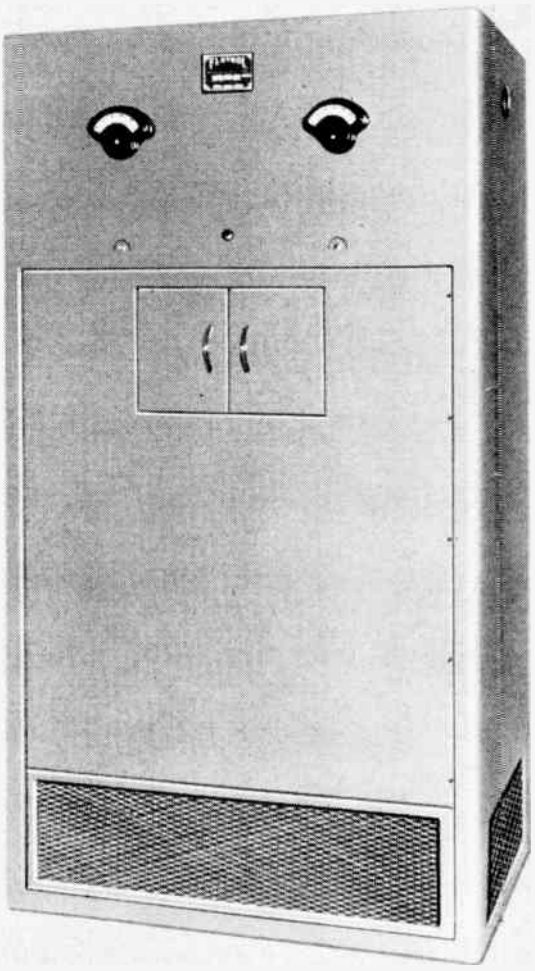
Further protection against humidity results from manufacturing procedures, such as internal potting of the resistance element and sub-components. Finally, Bourns samples all production for compliance to MIL-STD-202A, Method 106 as a routine part of a Reliability Assurance Program. As a result, Trimpot does more than "resist" moisture; it keeps moisture out.

For more information about the industry's largest selection of humidity-proof adjustment potentiometers—wirewound and carbon in a variety of sizes, power ratings, operating temperatures, etc.—contact our plant or our representative, R-O-R Associates, Ltd., of Toronto, Ottawa and Montreal.



Manufacturer: Trimpot® potentiometers; transducers for position, pressure, acceleration. Plants: Riverside, California; Ames, Iowa; and Toronto, Canada

For complete details check No. 8 on handy card, page 35



The strain of drain falls mainly on Lorain

Today, the drain on your batteries can be taken care of *continuously*, with no breaks in efficiency, and no man-hours to bolster costs. FLOTROL battery chargers, made in Canada by Lorain provide completely automatic charging, and operate entirely without moving parts. These modern, reliable units are of the floating charge type, with rectification accomplished by long-life selenium rectifiers, and regulation controlled by saturable magnetic reactors. Automatic overload protection is built-in, and compensation for variation in input voltage is practically instantaneous ● FLOTROL chargers have ample reserve capacity to handle peak loads. They can be operated in parallel without equalizing connections, or in parallel with motor generator sets. Efficient filtering ensures quiet transmission under all charging conditions, and models designed to operate at extremely low sound levels are available for use where charging equipment has to be located in business offices. FLOTROL battery chargers are supplied in single or three phase models, for a wide range of d.c. voltages. For complete information write to Automatic Electric Sales (Canada) Limited, 185 Bartley Drive, Toronto 16, Ontario. Branches across Canada.

**Model 10 KB Three-Phase Flotrol Battery Charger*

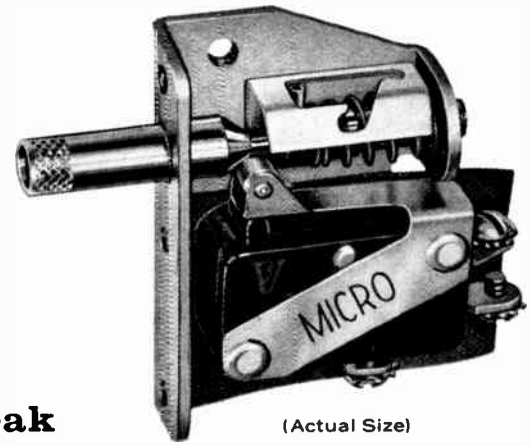
AUTOMATIC ELECTRIC
Subsidiary of
GENERAL TELEPHONE & ELECTRONICS

GENERAL SYSTEM

For complete details check No. 6 on handy card, page 35

NEW

DOOR INTERLOCK SWITCH eliminates momentary circuit break during re-set



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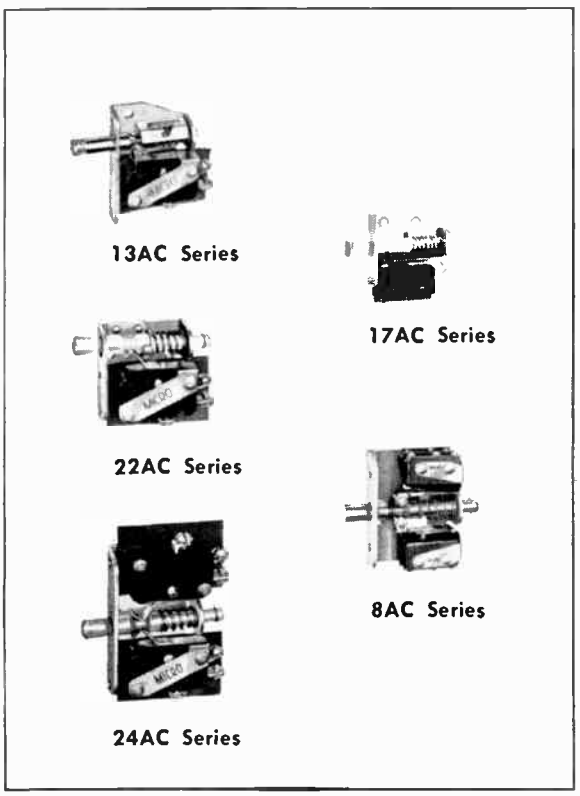


A few of the many different door interlock switches available. Write for Data Sheet 178 to your nearby Honeywell branch or write Honeywell Controls Limited, *Precision Components Division*, Toronto 17.

A new model in MICRO's line of protective door interlock switches, the "13AC" is designed to eliminate that momentary power interruption when the interlock is re-set upon closing the door. This feature is particularly desirable on electronic equipment such as data processing consoles, transmitters or computers.

Door interlock switch assemblies automatically break the power circuit when a door or drawer is opened, make it easy to intentionally energize the circuit for check or test, and eliminate the use of dangerous jumpers or tie-downs. When the door is closed, these devices automatically re-set so that next time the door is opened, power is safely cut off.

MICRO SWITCH door interlocks are the ultimate in reliability as protective devices on cabinets and enclosures containing electronic equipment that may be hazardous to personnel. More than 150 models include environment-proof and high temperature designs, subminiature and multi-circuit assemblies and some with self-lubricating thermoplastic actuating rods.

Honeywell
MICRO SWITCH Precision Switches

For complete details check No. 20 on handy card, page 35

industry personnel

Kehoe appointed personnel director

The appointment of **Paul J. Kehoe** as director of personnel for Burroughs Business Machines Ltd. was recently announced.

In this newly created position, Mr. Kehoe will be responsible for the administration of industrial relations and personnel programs for the electronics and business machines firm and its 1,000 employees.

Manager appointed for new Clairtone division

Peter M. Munk, president. Clairtone Sound Corp. Ltd., announced the appointment of **Eric G. Smith** as manager of the recently created Clairtone-Braun Division, which will market Braun radios and AM/FM radio-stereo record player combinations in Canada and the U.S.A.

P. Marion

M. Moore

L. McNabb

D. J. McTaggart

Alpha Aracon industrial appointments

Larry McNabb has just been appointed sales manager of the Industrial Division of Alpha Aracon Radio Company Limited, Downsview, Ontario. Mr. McNabb is well-known in the industry with experience in retail, wholesale and direct selling in the electrical and electronic fields.

As part of the Alpha Aracon expansion policy two new industrial salesmen have also been appointed. Both **Mike Moore** and **Paul Marion** bring to their new positions a great deal of active selling experience and knowledge.

H. French

P. C. Boire

M. B. Mairs

E. G. Smith

W. O. Forde

C. A. Johnston

C. V. Wing

W. Victor

Manager named to new CAE dept.

William Victor has been named manager of the newly created repair and overhaul and technical services department of Canadian Aviation Electronics Ltd., Montreal. The new organization combines the operation of the repair and overhaul department with that of engineering support and field service.

Appointments announced by Measurement Engineering

The following appointments have been announced by D. A. Bamford, president of Measurement Engineering Ltd., Arnprior, Ontario.

P. C. Boire, B. Eng., M. Eng., P. Eng., was appointed managing director, manufacturing division. Mr. Boire has held the position of chief engineer since joining the company in 1949.

W. O. Forde has been named plant manager. Mr. Forde joined Measurement Engineering Ltd. in 1959.

H. French became manager of quality control dept. He has been chief inspector since 1950.

McTaggart appointed sales manager

The appointment of **D. J. McTaggart,** P.Eng., as sales manager of the Licon Switches and Controls Division has been announced by Canada Illinois Tools Limited, Don Mills, Ontario. Mr. McTaggart will direct the new "direct-sales" policy of Licon miniature and sub-miniature precision switches.

Canadians named Fellows of AIEE

The Board of Directors of the American Institute of Electrical Engineers recently announced the names of two Canadians who have been elevated to the grade of Fellow for their contributions to the Electrical Engineering Profession.

Gordon F. Tracy, professor and head of the electrical engineering department, University of Toronto, was named for his contributions to electrical engineering education; and **Joseph M. Hambley,** general manager, Hydro-Electric Power Commission of Ontario, Toronto, was elevated for contributions to the expansion of a large electric utility.

Johnston appointed sales manager

J. E. Partridge, general manager of Amphenol Canada Limited, Toronto, Ontario, has announced the appointment of **C. A. Johnston** as sales manager.

Mr. Johnston joined Amphenol Canada Limited in 1959 as an engineering sales representative for Ontario.

Tinker joins Whittaker Electronics

Kenneth H. Tinker, previously assistant purchasing agent with Sperry Gyroscope Co. of Canada Limited, Montreal, has been appointed Quebec and Maritimes manager for Whittaker Electronics Limited, Ottawa, which represents manufacturers of instruments and components for the electronic, aircraft, and allied industries.

Automatic Electric Sales engineering appointment announced

S. C. Bird, vice president and general manager of Automatic Electric Sales (Canada) Ltd. announced the appointment of **Clifford V. Wing** to the staff engineering group. In this capacity Mr. Wing will assist C. E. Marshall, staff engineer, in providing engineering assistance to customers and to sales personnel.

Lucas named B.C. and Alta. representative

J. B. Turner, vice-president and general manager of Mel Sales Limited, announced the appointment of **A. C. Lucas** as representative in British Columbia and Alberta. Mr. Lucas will be handling the sale of instruments from Mel Sales Limited, as well as the components for Melcom. His office is located at 911 Anderson Crescent, West Vancouver, B.C.

Canadian field rep appointed

The appointment of **John Young** as Canadian field representative has been announced by Consolidated Vacuum Corporation, a subsidiary of Consolidated Electrodynamics Corporation, a division of the parent Bell & Howell Company. Mr. Young was previously service manager of Bell & Howell Canada Ltd., Toronto.

J. K. Carman

H. J. Merritt

J. Young

H. Webber

Porter (Canada) appoints general manager

M. B. Mairs has been appointed general manager of H. K. Porter Company (Canada) Ltd., Guelph, Ontario.

Mr. Mairs, a graduate in Metallurgical Engineering from the University of Toronto, was formerly assistant general manager of Porter (Canada).

Canadian elected v-p of Detroit firm

Following a meeting of the Board of Directors, C. J. Collom, president, announced the appointment of Canadian **Eugene Small** to vice-president of Weltronic Company, Detroit. Mr. Small will continue his duties as general manager of the Weltronic Co. Canadian Division, Windsor, Ontario.

Finkler salesman position filled

Len Finkler Ltd., a Toronto firm of manufacturers' representatives, announced that **R. G. Rafton** is their new salesman. Mr. Rafton has had 10 years experience in this business and will cover the Original Equipment Manufacturers market for the company.

E. G. Suarez

E. C. Hodsoll

Appointments at Litton Systems (Canada) Ltd.

Recently two personnel appointments were announced by Litton Systems (Canada) Ltd. **E. George Suarez** was named administration manager and **E. C. (Al) Hodsoll** was made operations manager. Both men will have headquarters at the Rexdale plant.

Westinghouse announces management appointments

Three management appointments in the Canadian Westinghouse Company's electronics division at Hamilton were announced recently by division manager G. P. Adamson.

Harry Webber was appointed manager, engineering department; **J. K. Carman** was named manager, manufacturing department; and **H. J. Merritt** was appointed manager, marketing department.

Mr. Webber, former manager of radar and airborne electronics engineering, is a guided missile and fire control radar specialist. Mr. Carman's previous post was superintendent, industrial and manufacturing engineering. For the past several years Mr. Merritt has been manager of radar and airborne electronics marketing.

E. Boyden

J. A. McCormick

R. B. Finkle

New company formed as exclusive Canadian rep

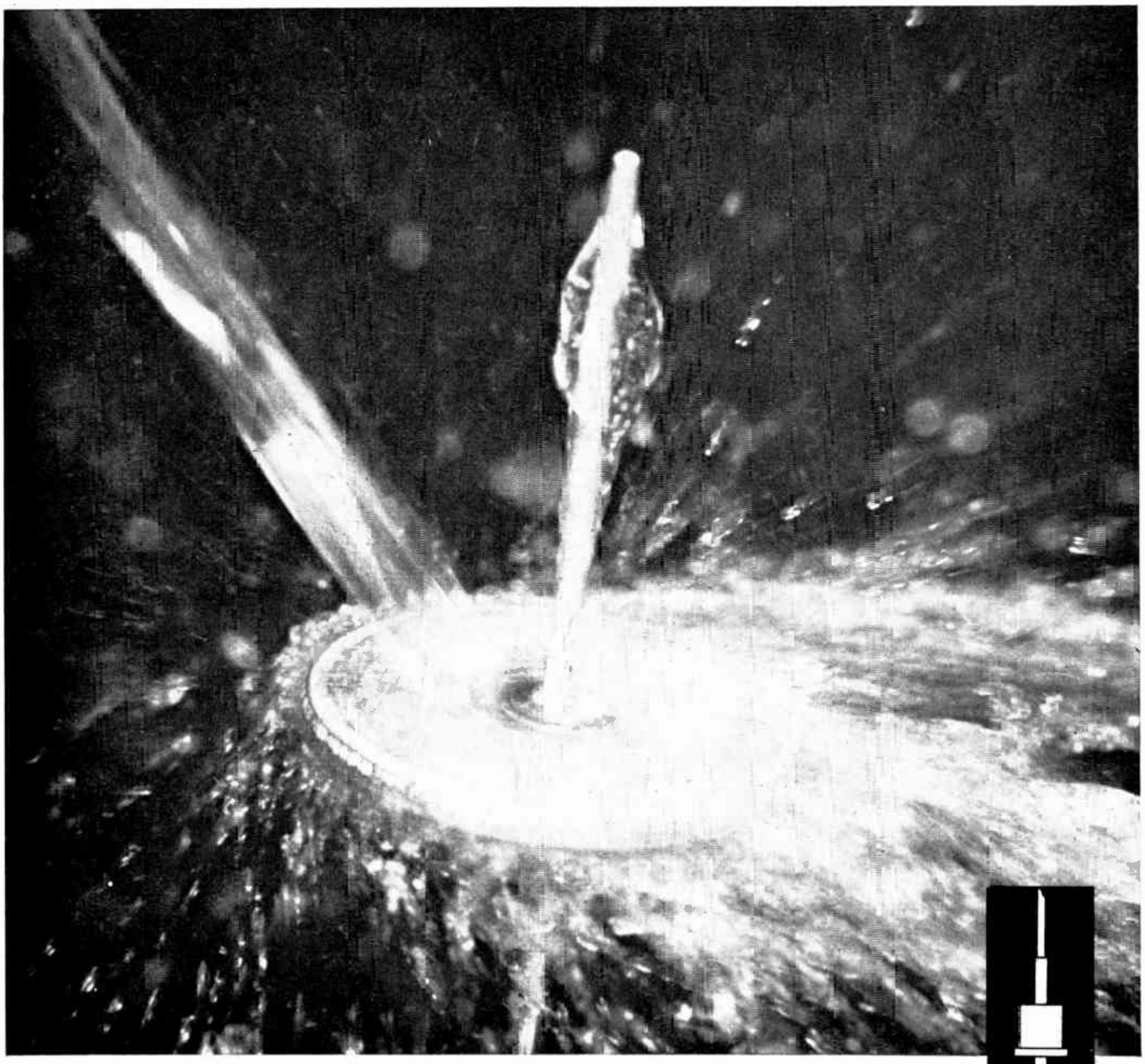
R. B. Finkle, formerly marketing manager for electronic components and special products of the Electronic Tube and Component Division of Canadian Marconi Company, has formed a new company named Tri-Tel Associates Limited at 81 Sheppard Avenue West, Willowdale, Ontario. This company will be exclusive Canadian representatives for the following electronic component lines formerly handled by the E. T. & C. Division of the Canadian Marconi Company: Clarostat resistors and potentiometers; Esico soldering irons; Fisher Hi-Fi components; Jackson test equipment; National receivers and parts; Rogers flybacks, yokes, and coils; Turner microphones.

The other principal associates with Mr. Finkle are: **E. Boyden,** who has had a wide technical background in the electronic industry and who will provide technical liaison; and **J. A. (Joe) McCormick,** well-known in the electronic distributor sales field, who will handle direct customer contacts, sales promotion and sales training programs. **J. M. (Jack) Nelson** of Vancouver, B.C. will be representing the lines in Western Canada for Tri-Tel Associates Limited.

McCormack named Burrough's manager

The appointment of **William M. McCormack** as manager, public relations and assistant to the president has been announced by J. L. Rapmund, president of Burroughs Business Machines Ltd.

Mr. McCormack joined Burroughs in July 1960 to organize a public relations program and to start an employee publication.



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For complete details check No. 16 on handy card, page 35

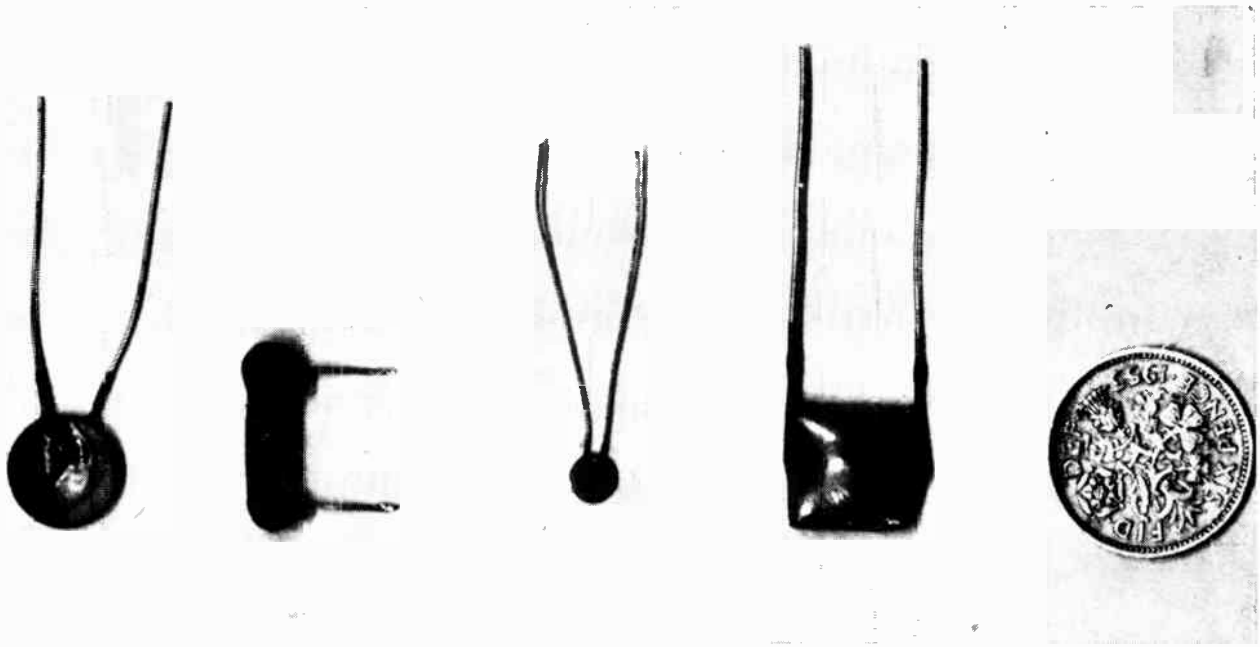


Figure 1 — High permittivity capacitors: (from left) 2000 pF disc; 2000 pF 300 V. tubular; 2000 pF 100 V. thin plate; 1 μF 50 V. film pack; and an English sixpenny piece — same size as Canadian 10 cent piece.

Application of modern materials to electronic components

This article is not an exhaustive survey of materials and components. Only certain recently developed materials and techniques are considered, and developments in thermionic tubes and transistors are excluded.

by J. M. Herbert, B.Sc., and R. G. Martin

Miniature barium titanate disc and tubular units (Figure 1) with capacitance between 500 and 10,000 pf have been in use for several years. The lower working voltages employed in transistor equipments permits thinner dielectrics and has recently led to further miniaturization. The range of values can be increased by firing several layers of dielectric together to form a multiplate capacitor, but this has so far necessitated the use of palladium for the electrodes, which makes such units expensive. Very high permittivity is obtainable near the Curie point, which makes economy possible at the expense of considerable temperature and voltage sensitivity.

Another approach to miniature capacitors is the barrier layer dielectric.

Barium titanate is prepared in a highly conductive form by firing in a reducing atmosphere. Careful oxidation of the surfaces under the fired-on silver electrodes then causes the formation of thin barrier layers which can have capacities of about 1 mfd/cm^2. The resulting component has current-voltage characteristic of two rectifiers connected back to back. The resistance-capacitance product falls off rapidly with applied voltage (Figure 2) and is never greater than three seconds for the particular unit examined here. This may be contrasted with 500 to 1,000 seconds for the multiplate high permittivity unit described previously.

The advantages of the sintered anode tantalum electrolytic capacitor over other types in terms of small size, stability, low leakage current and ability to function at high temperatures are well-known. Very small capacitors with no free electrolyte will shortly be produced in the United Kingdom. The maximum voltage is about 35 V. and power factors of better than 5 per cent are obtainable.

Piezoelectric devices

A considerable advance has been made by the development of lead titanate-zirconate ceramics. Not only has this led to materials with higher piezoelectric co-efficients, but also to materials with properties which are more stable with respect to both time and temperature. Their higher activity makes these materials attractive for pick-up cartridges, ultrasonic generation and under-water signalling. Their stability has led to proposals to use them in filters. An interesting possibility is a three-terminal device consisting of a ceramic disc silvered completely on one side and with the center and periphery silvered separately on the other (Figure 3).

The completely silvered surface forms a common terminal. An input to one part of the other surface causes the disc to vibrate mechanically and thus to give an electrical output from the other part. Energy is only

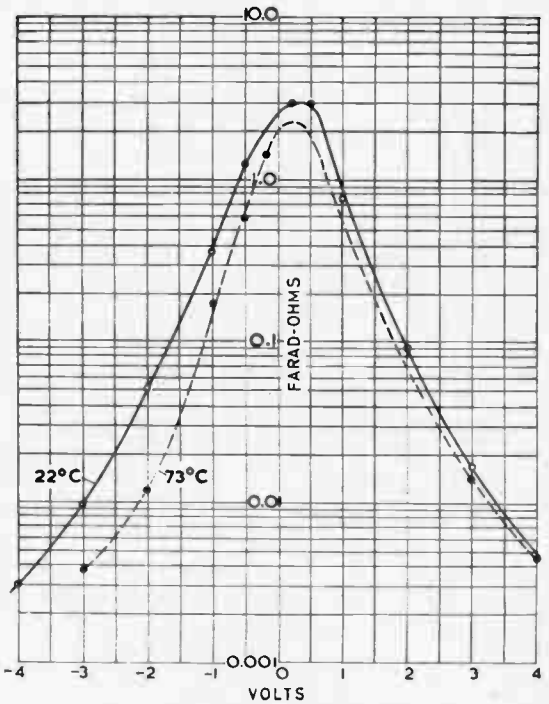


Figure 2 — This graph shows the capacitance product/voltage characteristic of a barrier layer capacitor (2.2 μF — 3V. working).

transferred efficiently when the frequency corresponds to that of a mechanical resonance of the disc, and this device therefore acts as a filter. At present, such units are expensive; a disc with a fundamental radial resonance at 500 kc/s is only 3/16 inch (4.76 millimeters) in diameter, so that it is difficult to control the dimensions to the accuracy needed for close frequency tolerance.

An ingenious electromechanical filter is being produced in Japan. The main control of the frequency is due to two ball bearings vibrating in a spheroidal mode. Barium titanate transducers are used to convert the electrical input to mechanical vibrations and vice versa. Impedance matching is obtained with small transformers. Although complex, the device neatly solves the problem of grinding to frequency by using ball bearings for which a precise technique is well-established.

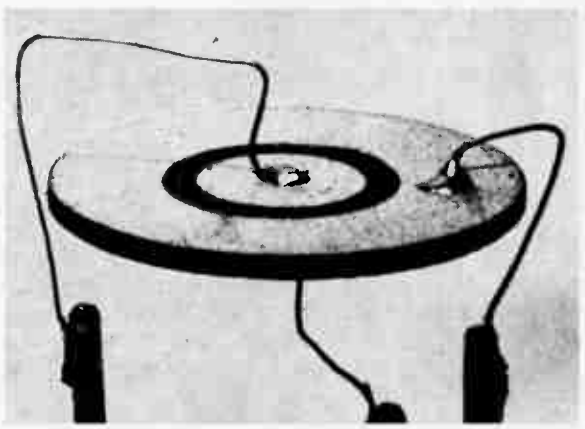
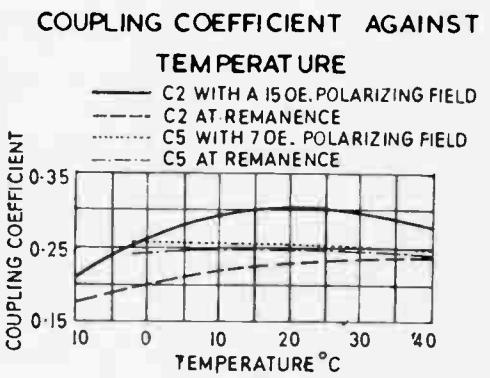
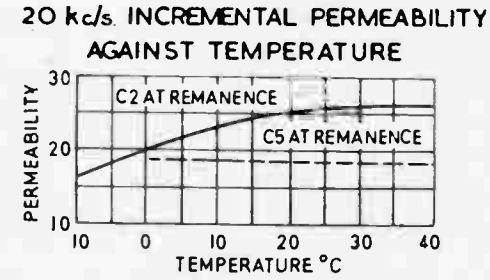
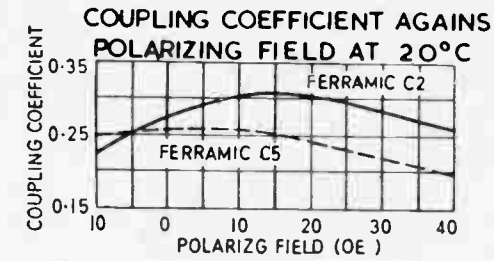


Figure 3 — A three-terminal piezoelectric filter disc.

A new ferrite may also serve as a stable filter element. The temperature at which the anisotropy co-efficient of nickel ferrite is a minimum can be







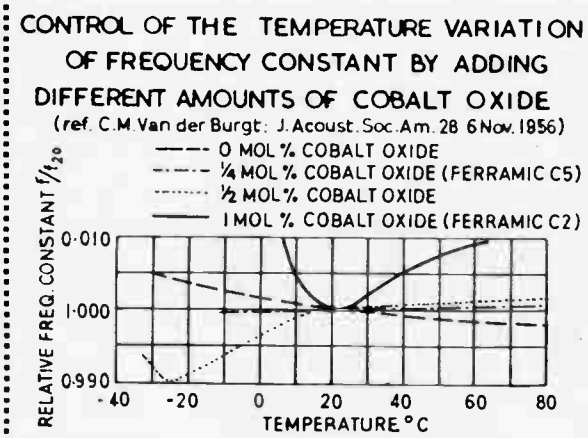


Figure 4 — Charts showing the temperature characteristics of magnetostrictive ferrites.

adjusted by substituting a small amount of cobalt for nickel (Figure 4). As a result the frequency constant for magnetostrictive vibration is very little affected by temperature and the initial permeability is also constant. The material has a coupling co-efficient (in toroids) of 0.25 with a mechanical Q of about 600.

Inductive devices

Many devices have been produced using ferrites at microwave frequencies and there has recently been some interest in single crystals of yttrium iron garnet as a material for a parametric amplifier. Because existing materials are lossy and of a low permeability in the range 10 to 500 Mc/s, little use has been found for ferrites at these frequencies. Some remarkable materials have been developed, notably the Ferroxplanar series, which have permeabilities of 10 or above in this range, and with Qs above unity up to 1000 Mc/s, but little use has been made of them. A 50 Mc/s attenuator has been based on a conventional nickel-zinc body in the form of a transformer core (Figure 5). The core lies in the gap of an electromagnet so its permeability can be varied by varying the current in the magnet winding; the coupling between the windings on the core can thus be varied.

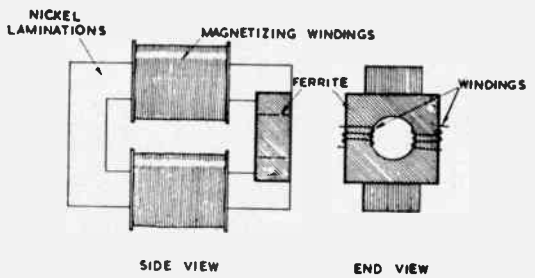


Figure 5 — This diagram shows the variable coupling transformer. The core of the transformer lies in the gap of an electromagnet, so that its permeability can be varied by varying the current in the magnet winding; the coupling between the windings on the core can thus be varied.

Semi-conductor devices

In domestic radio and television, increasing use is being made of silicon junction rectifiers. These are smaller than either selenium or thermionic valve types, drop less than one volt in the forward direction at full rated current and possess a back-to-front ratio of better than 10^6. Although they cannot tolerate large current overloads, this is not proving a great disadvantage with suitable circuit design.

The negative resistance characteristic of tunnel diodes (Figure 6) is being actively exploited in the development of oscillators, amplifiers and storage devices for very high frequencies.

The variation of capacitance of a diode when electrically polarized in the reverse current direction, is used as a variable tuning element in radio equipment. A number of special diodes are now available and the use of this technique for automatic frequency control can be expected to increase.

Newly-developed semi-conductor devices are providing a useful alternative to the rotary generators or vibrators used with many mobile radio equipments. Units of considerable power are possible with the introduction of the three-terminal controlled rectifier, which functions like a thyrotron.

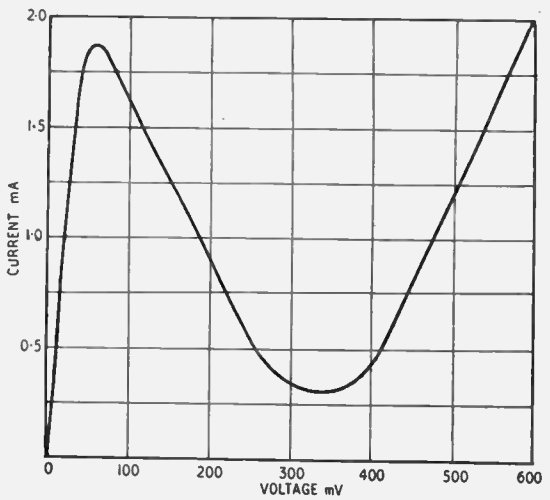


Figure 6 — Tunnel diode — a graph showing the resistance/bias relationships.

The Seebeck effect is well-known, but apart from its use in thermocouples it has not given rise to devices of much practical significance. Today, a number of inter-metallic compounds such as bismuth telluride and lead selenide, offer the prospect of a high conversion efficiency. Work on the production of electrical energy directly from heat is now in progress in several countries, and units capable of supplying some kilowatts with efficiencies of about 7 per cent are already available. An ultimate efficiency of about three times this value is thought feasible.

Another technique for obtaining electrical energy is by use of the Solar cell. It is already used for powering satellites, remotely sited communications equipment, and even hearing aids. The basis of the device is a diffused junction about 0.0001 inch (0.00254 millimeters) below the surface of a silicon wafer wherein the solar radiation is converted to electrical energy. Some 100 watts of power per square meter (10.76 square feet) of surface can be generated with a voltage of about 0.4 per cell and an efficiency of about 10 per cent.

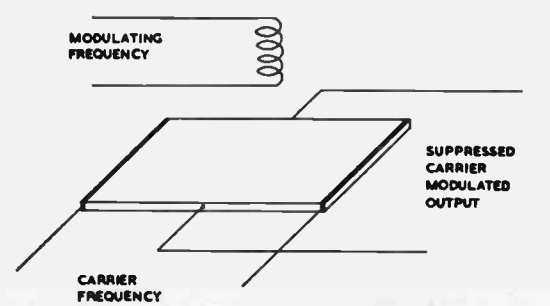


Figure 7 — A schematic diagram of the Hall modulator.

The Peltier effect, whereby a junction of dissimilar metals is cooled when an electric current flows through it in the appropriate direction, now promises considerable influence in industrial and domestic refrigeration. The use of bismuth telluride and related semi-conductors has led to temperature differences of 85°C.

Continued on page 32

PART II

New product planning in the defense market

All pertinent factors and details having direct cost effects on new product planning, may be checked before the project is underway by utilizing this second part of Mr. Kendall's article. Part I appeared in the July issue of ELECTRONICS AND COMMUNICATIONS.

by W. S. Kendall *

New product planning may be the prime responsibility of one man or one department, but it is the business of everyone in the company. New product planning should include the knowledge, skill, experience, and judgment of all line and staff departments. When the master product plan finally emerges there is company wide acceptance as the plan contains a little of everyone in it.

In the checklist that accompanies this article an attempt has been made to look at new product planning from the viewpoint of every major element in the company and, as a final double check, through the eyes of the customer. The checklist is a composite of numerous such lists available and was prepared to be equally suitable for defense contractors wishing to branch into commercial areas or to remain solely a defense supplier.

A checklist can never be a formula for successful decision making. It is useful only as a means of determining whether sufficient information is available to make a decision. The checklist, if properly used, will reduce risk by showing where knowledge is incomplete. It is simply a memory aid — a device for insuring that the problem is thought through. It doesn't necessarily call for a "yes" or "no" decision. It may call for further study on the unanswered areas. It can be adapted to any business by the simple expedient of altering or combining the questions to suit. It can serve as a framework for developing a questionnaire tailored to *your* business.

Although a valuable planning aid, a checklist may at times be an embarrassment because it asks so many questions. Yet that is its very purpose. From the moment of conception of a new idea through the many stages of screening, market analysis, engineering analysis, management and financial analyses, development, production, marketing, etc. there will be thousands — perhaps hundreds of thousands — of questions asked by many different people. It is the ability to anticipate these questions, and provide a satisfactory answer in advance, that constitutes the very essence of good long range planning. Planning is nothing more than simply answering questions in advance and answering them at an optimum point in time. The greatest value in preparing or using a checklist is that it forces the issue on forward thinking.

The checklist which accompanies this article is divided into 16 sections which are discussed individually under headings as follows:

Why a new product?

Most companies have their own reasons for embarking on new product programs. These might have to do with a temporary need, such as keeping a design group busy, or it may be as part of the long range corporate plan. Whatever the reason for product diversification it should be clearly spelled out. The exercise of determining the reason for a new product may highlight the absence of a clear cut company policy or may point up the inadequacy of the reason. There is no justification, for example, in developing a new product merely to utilize an obsolete plant setup. The only legitimate reasons for new product planning are company profits, growth and stability. These are the prime objectives of any business. Diversification, keeping pace with technological changes, utilization of facilities, etc. are only part of a program to meet these objectives. Diversification is not accomplished for its own sake but only as a means to an end. That end is corporate growth.

New product criteria

A new product must meet certain basic criteria. It must be suitable to the customer and the market. It should form a logical part of the company product line, and ideally should be better than anything presently on the market. If it has application to other fields, or patentable features these are added dividends.

The market

New products are developed only to meet market needs. Before market success can be predetermined an analysis of total potential and realizable potential must be prepared. Certain basic questions must be answered as to market location, stability, timing, etc.

New products are the end results of planning throughout the entire company. Typical examples of which include: (left to right, beginning at top) the TSI Model 361 Apti®-Meter, Transistor Specialties Inc.; Type FP. 92 Field Plotter, The Glendon Instrument Co. Ltd.; JKTO-42 Frequency Standard, James Knights Co.; ST-200D Transistorized 200-Channel Spectrometer, Radionics Ltd.; PW Instrument Switch, Interlab, Inc.; Quick Heating Transmitting Tube, Philips Electronics Industries Ltd.; Voltage/Current Dual Channel Amplifier, Hewlett-Packard Co.; T-5 Rapid Filament Tester Kit, Paco Electronics Co. Inc.; Standard Rack Mounting BL-40 H-BLOC, Computer Control Co., Inc.; Silicon High Power Transistors, Silicon Transistor Corp.; Frame Grid Subminiature Tubes, Raytheon's Industrial Components Division; Rectifier Type Voltmeter, Stark Electronics Instruments Ltd.; Butterfly Valves, Edwards High Vacuum (Canada) Ltd.; 3-Watt Wire-wound IRC Resistors, Renfrew Electric Co. Ltd.; Audix Model TA/5B Transistorized Amplifier, Conway Electronic Enterprises Ltd.; Transistorized Power Supply, RC Testing and Control Systems; Double-Turreted Standoff Terminals, Cambridge Thermionic Corp.; Type 7235 Miniature Triode, The Victoreen Instrument Co.; Type 5 Photoelectric Cells, Daystrom Ltd.; "Kool-Tainer" Heat Radiator/Retainer, Lake Engineering Co. Ltd.

* *Marketing Director, Computing Devices of Canada Ltd., Ottawa, Ontario.*

Competition

This is usually the least understood area of market planning for obvious reasons. Your competitor exerts considerable effort to keep his new product planning to himself. Just as you do. It is always a battle of wits — a competition between you and your business opponent. The battlefield is the customer's probable requirement. Market research provides the battlefront intelligence, and your market-oriented product the high powered ammunition. Your basic textbook — Theory of Games of Strategy — states that when the strength of the opposing force is not known it must be assumed to be stronger than yours. It must be assumed that your competitor has better products, better sales coverage, greater skill. If you don't *know,* always give benefit of the doubt to your opponent. One of the costliest mistakes that can be made in marketing operations, is to underestimate the strength of the competition. Particular attention should be given to this part of the questionnaire.

Design and development

At this point in the new product evolution the cost curve is starting to rise very rapidly and the need for control becomes increasingly critical. The use of a master engineering plan and budget with progress and cost check points can provide the mechanism, but only good supervision can make it work. Hence the necessity of having an answer at this point to the basic question, "Who is in charge of this development?" Good supervision is not only important from the cost control viewpoint but equally important from the design aspect. Good design practice and frequent design reviews can save endless trouble later on in production and service. Reproducability and reliability should be assured from the start by including representatives from Manufacturing and Quality Control on the project team.

The engineering prototype should use standard components where possible, be able to operate in its future environment, and meet all specifications. The design must be reliable and built for ease of service and maintenance. It should lend itself to economic production tooling. If foreign markets are being considered the question of power supplies should be looked into.

Timing may be important particularly in a military program. If follow-on production is not assured, costs become doubly important since the development contract must stand on its own in returning a profit.

Possibly the biggest problem in any engineering department is obtaining a frozen design. Engineers by their very nature are perfectionists and must be restrained from continuing product development past the point of economic return. Again the emphasis is on good supervision.

Customer evaluation

If the new product is a military development there may be a period during which the customer will evaluate the prototype equipment and comment on its operational acceptability. This will often be followed by a series of changes before the item is finally released for production. This type of evaluation can be both expensive and time consuming. Costs must be looked at quite closely. Sometimes these can be recovered from the customer, but in many other cases will have to be accepted as part of the cost of doing business.

One of the most common examples of being "penny wise and pound foolish" is the failure to provide an experienced engineer to monitor every move of the evaluation trials. The company reputation may depend on the performance of the prototype. This may seem inequitable since everyone knows there is a period of de-bugging following the development of any product. Yet one must recognize the unfavorable reactions to product failures. It is far better to have a man "johnny on the spot" to correct technical failures before they become irritants in the customer's mind. The wise company will have an experienced technician or engineer on the job, fully equipped with test items and suitcase spares. It is almost an invitation to failure to go away at this time and leave the evaluation to the customer. If possible an active part should be taken in developing the evaluation procedure. Make sure also that your customer clearly understands the capabilities and limitations of your product, and the extent to which it depends on the interface with other equipments.

Purchasing

The purchasing department should have a say in new product development. This department can give useful advice on components, recommending those which are readily available or obtainable at normal prices from more than one source. Because a new product affects every segment of the business it is just as necessary for purchasing to consider the possible added costs as it is for engineering or production. Some planning at this point may mean extra profits later.

Manufacturing

The manufacturing department should always play an important part in new product planning. Manufacturing should have the opportunity of deciding whether the new product fits readily into existing facilities and capabilities. Any product requiring a complete change over of capital items or the hiring of people with new skills would add to the risk. Similarly there would be little point in superimposing a delivery schedule which would prejudice existing customer commitments. Here again, as in every case, cost is a factor. The manufacturing department just like all other departments must attempt to "crystal-ball" all possible costs and forewarn management during the early stages of new product planning.

Quality control

Sometimes quality control is overlooked but in every case the price must be paid later on. The quality control department can reject a product for failure to meet performance specifications, either because of engineering design, or production problems. The measure of a good company operation is the ability of engineering, manufacturing and quality control to get together during the early design stages, anticipate difficulties, and head them off.

Often overlooked is the environmental specification of the end product. Too often the engineering division will design a product that works satisfactorily on the bench, but cannot meet the end operating environment. Here again quality control and engineering should cope with these problems at the earliest point. In technical products the cost of quality control can represent a very substantial portion of the overall product cost. Sometimes this may seem difficult to justify, but when we consider the large investment and strategic importance of today's military equipment, the price paid in quality and failure-proof performance is not out of the way. In commercial or industrial products it is necessary to allow a safety factor in design, but to avoid setting impossible standards which could price a product out of the market.

Financial considerations

Finance and cost considerations interweave throughout the entire pattern of a new product development from the earliest stages through to final delivery and even beyond. Costs which are low during the screening and evaluation phases mount unbelievably fast as a product reaches the design evaluation and proving stages. The finance department should plot a curve of expenses for the total program to show top management just what is involved. On a company-sponsored product there is an optimum point at which a decision to continue or abandon must be made. Here the necessity for forward thinking is clearly shown. For every day past the optimum-abandonment-point management pays — and pays through the nose.

The finance department more than anyone else must accept responsibility for looking at overall costs of the

program. This should include not only the obvious costs but the hidden costs — the costs of failure. Top management must be given the facts on a total basis. It is improper to expect the chief executive to make the final decision without a good understanding of the overall program costs and implications.

The finance department should concern itself with many of the details sometimes overlooked by line divisions, such as the cost of penalty clauses, cancellations, inventory problems, accounts receivable problems, capital equipment requirements, credit problems, terms of payment, etc.

Pricing the new product

Setting the price for a new product is probably as difficult a problem as can be imagined. There are numerous pricing strategies. One could look for the greatest possible profit immediately. Pricing could be based on recovery of development costs in a specified period. A price can be set to discourage the advent of competition, or to yield a regular rate of return. Sometimes a price is set which would enhance the sale of related products rather than yielding a profit in itself. Sometimes too much emphasis is placed on rapid recovery of research and development costs. Such costs should be amortized over the planned lifetime of the product, and ideally should include an element for re-investment in new product development. The defense supplier is accustomed to a philosophy of writing off development and related costs on the first production order. Although this is fully accepted military practice, it is completely incompatible with commercial markets.

Promoting the new product

How often do we overlook the costs of advertising and sales promotion? Sometimes we assume the product will sell itself. This is a false assumption and, no matter how we define it, there will be promotional costs! The actual promotional method may range all the way from engineering proposals to product advertising in high priced media. In any case there will be expenses for sales catalogs, specification sheets, etc. Advertising and sales promotion in some form or another is essential to new product exploitation whether it be a military or a commercial product. Regardless of how these costs are accumulated or charged, it is necessary for top management to have a picture of total expected promotional costs.

Selling the new product

It may be wondered why selling comes so far along in the checklist. The answer is simple. Many things must happen before the sales department has a fully developed and proven product ready for the market. Nevertheless the sales manager must be continuously in touch with his markets and be aware well in advance of the new product release dates. His entire program should be worked out in readiness. Depending on the product, he may have to concern himself with methods of distribution, salesmen's compensation, geographical product areas, the cost of missionary promotion, implications of service and customer training, the effect of competition, economic and market factors, and the sales forecast.

The sales forecast in any marketing operation is the basis of all company planning, without which the original product decision could not have been made. The sales manager must recognize the extent to which the entire company operation is hinged to his market predictions — particularly when introducing a new product. Unfortunately it is not given to any of us to see the future clearly. The best substitute the sales manager can have for his crystal ball is a continuously operating market survey program.

In the sales operation, as always, costs are important. The sales manager must analyze all cost factors in the introduction of a new product. These can sometimes be quite high if the product requires different market treatment. An ideal product is one that fits snugly into the capabilities and distribution methods of the existing sales organization.

THE HIDDEN COSTS OF NEW PRODUCT FAILURE

- Loss of capital.
- Loss of executive time.
- Loss of design and development time.
- Time away from other projects.
- Loss of company and executive prestige.
- Loss of customer confidence.
- Lowered company morale.
- Gains chalked up by competitors.
- Loss of expected company profits.
- Increased company overheads.

Servicing the new product

This is really part of public relations; for without satisfied customers based on good service, a company cannot long exist. The setting up of a service department, sometimes on a geographically dispersed basis, the provision of test equipment, spare parts, training, administration, etc., can add substantially to costs. These costs must be known and included in the product price.

Top management

The chief executive in any company is responsible for the success of the new product program. He may not wish to get into detail but must always know just what degree of risk he is assuming. He must know that the plan is a good one, that it has been checked into as far as possible, that it will be monitored continuously throughout its lifetime, and that everyone concerned fully understands and accepts his particular responsibility. The chief executive must satisfy himself that both short term and long term company objectives will be met with the new product plan. He, more than anyone else, must have a complete picture of total costs, expected sales volume and profits. His questions are likely to be deep and searching.

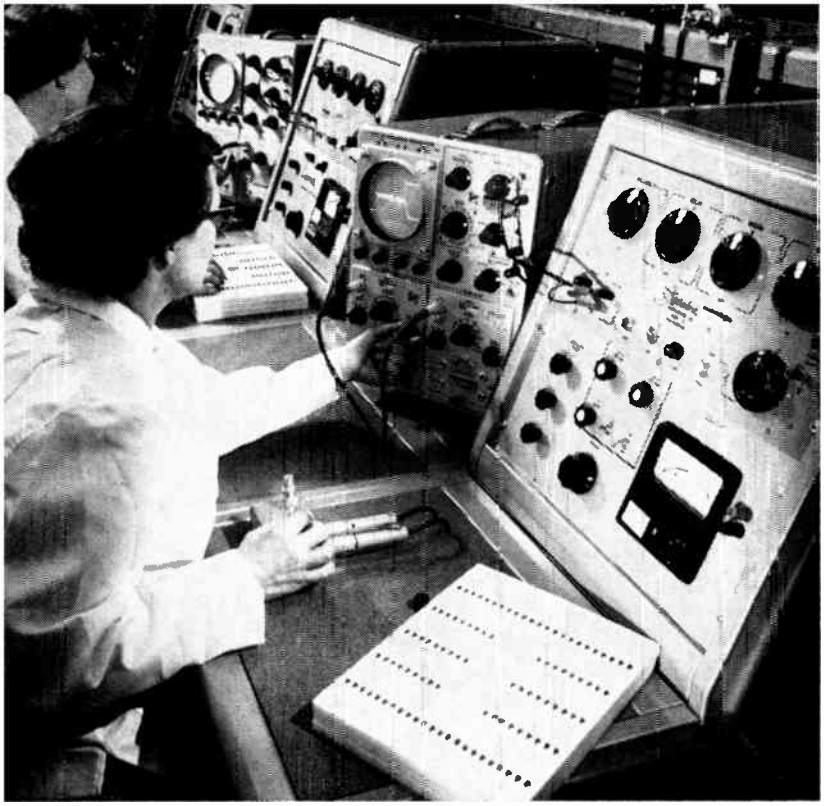
From the customer's viewpoint

Having started with the customer's need, it is appropriate at this time to end by noting how closely it has been satisfied. Peter Drucker in his well known book, "The Practice of Management", describes the two main functions of any business as "innovation" — producing something, and "marketing" — or all of the functions associated with moving a product into the hands of a customer to his satisfaction and at a profit to the company. The customer then is king. All new product planning must evolve around his needs and wants. The new product planning checklist would be incomplete if we failed to ask the questions the customer would himself ask.

Conclusions

The checklist has only one function; by association of ideas to remind all concerned of the factors which should be considered in new product planning. No attempt has been made to avoid duplication in the questionnaire — quite the reverse. There is never a perfectly cleancut interface between departments. Overlap is necessary. Costs are always a common denominator. If there seems undue emphasis on costs throughout the checklist, it is only because the development of technical products today is an expensive process. The traditional 80 per cent failure rate simply cannot be tolerated. The odds can be reduced only with an integrated company new product plan under close executive control. The checklist will have served its purpose if it assists in the preparation of such a plan.

Continued on page 48



A bank of test consoles measures the high speed switching characteristics of transistors.

Epitaxial growth of germanium and silicon single crystal films from vapor phase

Considerable effort has been expended recently on the growth of single crystal films of germanium, silicon and other semiconductors from the vapor phase. This article describes a method which, although not new, has proven capable of producing single crystal films readily applicable in the fabrication of devices.

by George V. Russell *

The hydrogen reduction of germanium and silicon tetrachlorides on single crystal substrates is utilized as shown in Figure 1. Commercial hydrogen is passed through a Deoxo catalytic unit, then through a bubbling bottle containing the tetrachloride. The vapor pressure of the liquid is controlled to provide a definite partial pressure ratio of H_2 to XCl_4. The hydrogen gas, saturated with tetrachloride vapor, is then transported into the quartz reaction tube. A heterogeneous reaction takes place between the heated substrate surface and the reactant vapors and growth of the film commences. Waste gases are carried off through the exit tube where the hydrogen is burned off and other gases are exhausted into a fume hood.

The entire gas handling apparatus was constructed of quartz. The substrates were laid down on a quartz boat supported on a graphite strip which was heated by means of a 10 kw, 450 kc/s R-F generator. Temperature of the substrates was measured using an optical pyrometer with appropriate temperature corrections being applied to the observed readings.

Results

All films of germanium and silicon described were grown on single crystal substrates of the parent material. The substrates were (III) oriented wafers cut from Czochralski grown crystals, lapped, mechanically polished, chemically etched, rinsed in de-ionized water and blown dry in a stream of nitrogen.

A necessary condition for growth of continuous single crystal films is that the partial pressure ratio of H_2 to XCl_4 be greater than 65:1. At such low supersaturations the growth rates tried were from 2 microns per minute to 0.01 micron per minute, with substrate temperatures for germanium from 700-850°C, for silicon 1050-1275°C. Over the growth rate and temperature ranges given, single crystal films were obtained. The choice of particular operating points is governed by the parameters required for the device being fabricated.

For the purpose of this article only silicon devices using N+ substrates and N films, and germanium devices using P+ substrates and P films will be described. Other conductivity type films have been grown in the fabrication of silicon P+ P, N+ P, P+ N, etc., and germanium N+ N, P+ N, N+ P, etc., structures with controlled resistivities and film thicknesses.

The control of etch pit density is governed principally by the cleanliness of the substrate surface. In the case of silicon, the removal of surface oxides is

* *Section Manager, Materials Advanced Development Group, Motorola Inc.*

readily achieved during the period prior to growth by heating the substrate in a dry hydrogen atmosphere. The surface oxides of germanium, however, if present at this stage, are not readily removed. Thus the control of etch pit density becomes a much greater problem with germanium than with silicon due to surface oxides acting as nucleants for disordered growth. This is readily demonstrated, in the extreme, by purposefully leaving an oxide layer on the substrate surface and growing a film. The wafer surface appearance is exceedingly dull and inspection reveals that it has a polycrystalline film.

Assuming that the substrate surface cleaning has been eliminated by correct cleaning procedures, the etch pit density now is predominantly controlled by the substrate temperature and the degree of supersaturation of the hydrogen with the tetrachloride. It is readily apparent that excessive supersaturation, which results in too high a growth rate, will lead to polycrystalline deposits in the extreme and down the line from high etch pit density to what might be called the intrinsic etch pit density, i.e., that of the substrate. At this stage the etch pit density is strictly a result of direct copying from the substrate.

Studies of etch pit densities have been made using numerous etchants. The etchant giving best results, and the one used for evaluation in this report, is a mixture of potassium ferricyanide, potassium hydroxide and de-ionized water.

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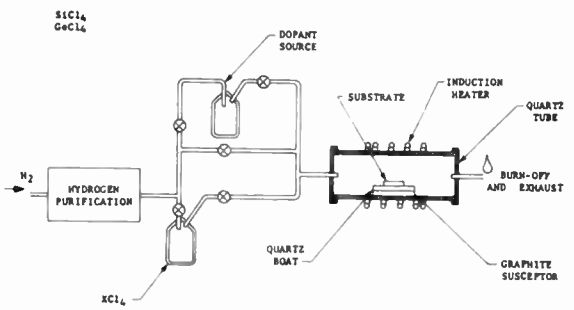

Figure 1 — Apparatus utilizing grown films.

CHARACTERISTICS	2N705	2N828	UNIT
BV_{CBO}	20	25	Volts
BV_{CEO}	8	12	Volts
h_{FE}	40	40	--
$V_{CE(sat)}$ 5/50	0.45	0.21	Volt
$V_{CE(sat)}$ 10/100	1.1	0.35	Volt
t_s	65	30	nsec
$t_d + t_r$	55	50	nsec
t_f	70	35	nsec
C_{ob}	6.0	3.5	pF
f_t	350	400	mc

Figure 3 — Typical characteristics, germanium units 2N705, 2N828.

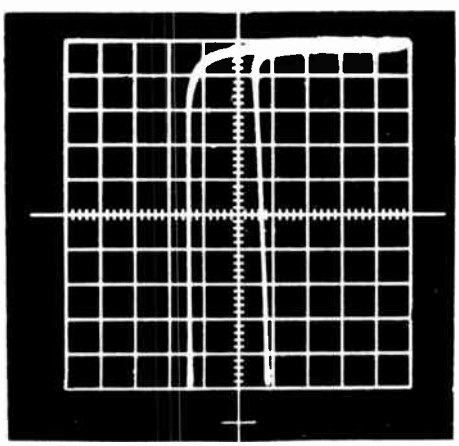

Figure 5 — PNP germanium epitaxial transistor characteristics.

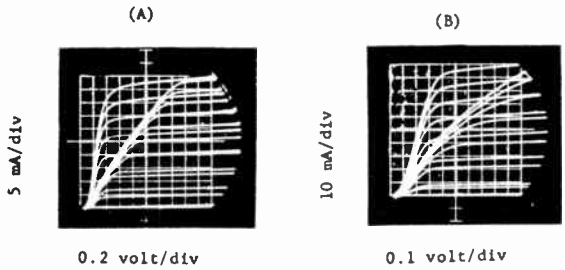

Figure 2 — (A) Silicon NPN epitaxial versus non-epitaxial characteristics. (B) Germanium PNP epitaxial versus non-epitaxial characteristics.

CHARACTERISTICS	2N834	2N706	UNIT
BV_{CBO}	90	50	Volts
BV_{CEO}	55	15	Volts
h_{FE}	40	35	--
$V_{CE(sat)}$ 1/10	0.14	0.4	Volt
$V_{CE(sat)}$ 5/50	0.28	1.3	Volt
$t_d + t_r$	28	36	nsec
t_s	14	25	nsec
t_f	20	30	nsec
C_{ob} (5 v)	2.5	5.0	pF
f_t	500	300	mc
P_o (@ 70 mc)	0.5	0.25	Watt

Figure 4 — Typical characteristics, silicon units 2N834, 2N706.

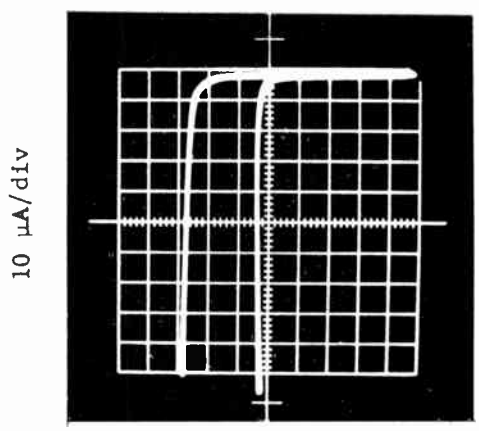

Figure 6 — Silicon epitaxial transistor characteristics.

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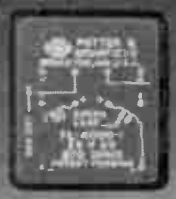
For complete details check No. 7 on handy card, page 35

a New and superior latching P&B relay



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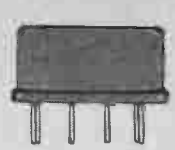
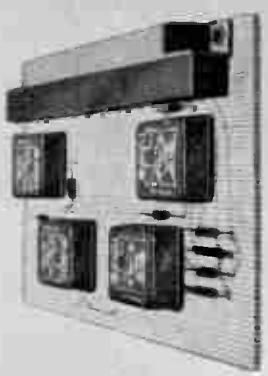


This DPDT, permanent magnet, latching relay is superior on these counts: (1) shorter height for maximum compactness between stacked circuit boards; (2) greater sensitivity (80 milliwatts); (3) better vibration resistance (30 g to 2000 cps); (4) better shock resistance (100 g).

Designated the FL Series, this relay meets all applicable sections of MIL-R-5757D, MIL-R-6106C and ABMA #PD-R-187.

Call your nearest P&B representative today for complete information about the whole P&B family of microminiature relays.



Printed circuit board using 4 FL relays was designed by the Martin Company, Orlando, as part of ground support equipment for a major missile project.

FL SERIES SPECIFICATIONS

Contact Arrangement: DPDT

Shock: 100 g for 11 milliseconds with no contact openings.

Vibration: .195; max. excursions, 10 to 55 cps. 30 g from 55 to 2000 cps. No contact openings.

Linear Acceleration: 400 g minimum with no contact openings.

Pull-in: 150 milliwatts, approx. (standard) at 25°C. coil temperature.

80 milliwatts, approx. (sensitive) at 25°C. coil temperature

Operate Time: 3 milliseconds max. at nominal voltage at 25°C. coil temperature

Dimensions: .485" high, 1.100" long, .925" wide

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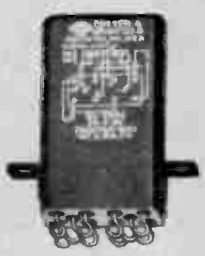
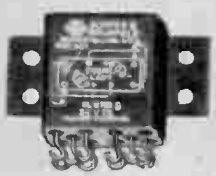


Diode in relay case is used for arc suppression in special applications. Four diodes form full-wave bridge rectifier for 400 cycles.

Non-latching or latching relays in conventional crystal cases with or without shoulder brackets, studs or mounting plates. All types of terminals are available.



Terminals spaced on .200" grids are available on all P&B microminiature relays. These carry a "G" suffix (SCG and SLG) and are .890" high, .800" wide, .400" deep, max.

These 3 relays are shown slightly reduced in size.

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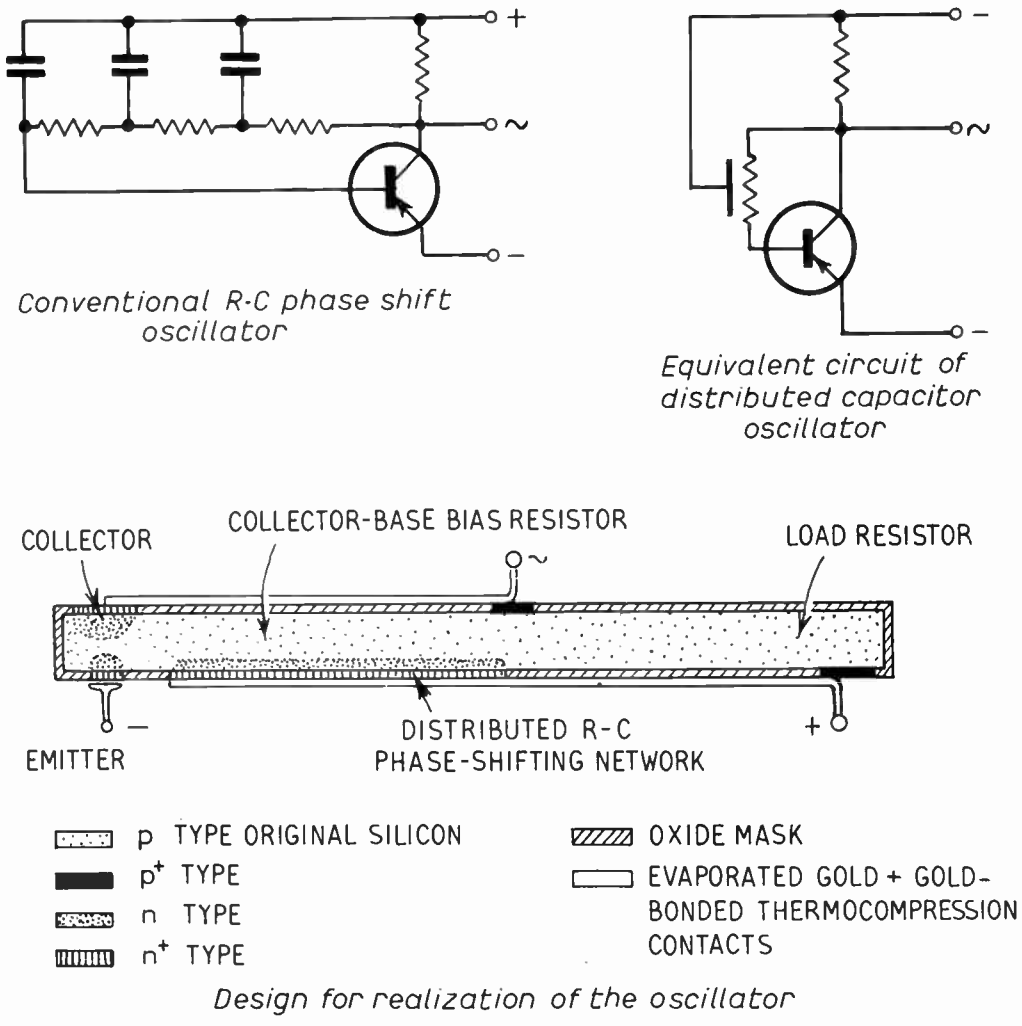


Figure 8 — Diagrams illustrating the silicon solid circuit in which lumped components have disappeared and are replaced by the configuration and controlled properties of a semi-conducting crystal.

Indium antimonide and indium arsenide are being used as the basis of new components utilizing either the Hall effect or the change of resistance under the influence of a magnetic field. They may be used for the detection and measurement of magnetic flux, and in the communications field they may be used to provide linear suppressed carrier modulators. If a Hall element is polarized with a carrier frequency and is placed in an electromagnetic system energized from a modulation source the sideband components can be extracted from the Hall electrodes (Figure 7).

Information storage systems and microminiature devices

Devices using square hysteresis loop ferrites are being developed with greatly improved performances. Equipment with complete cycle times of 200 - 300 millimicroseconds are being developed and further improvements of at least one order of magnitude are being sought.

Three methods of circuit construction mark the stages of a revolution in electronics. The first uses lumped components which can be manufactured as separate entities. It is mainly a means of obtaining minimum size by an automatic assembly technique (micromodule techniques). In the second method (the deposited circuit system) the components are mostly still distinct from one another, but the equipment for assembling the components is the same as that for making them; the manufacture of components and equipment must be merged.

Finally, in the solid circuit, lumped components have disappeared (Figure 8) and are replaced by the configuration and controlled properties of a semi-conducting single crystal. It will take many years of development before the solid circuit forms a major part of equipment, but the extreme compression of circuit functions which it makes possible must eventually lead to its widespread use.

The foregoing article was digested from a longer article which appeared in the "Journal of the British Institution of Radio Engineers", Vol. 21, No. 2.

Canadian licensee given additional line

RF Products, a division of Amphenol-Borg Electronics Corporation, announced Amphenol Canada Limited, Toronto, Ont., a licensee of the American company, has acquired exclusive rights to manufacture and sell the division's products in Canada. Specifically covered by the agreement are IPC and Amphenol coaxial connectors, DK coaxial switches and Amphenol coaxial cable.

CEWA Eastern Division elections held

At the annual meeting of the Eastern Division of the Canadian Electronic Wholesalers' Association, in the Conrad Hilton Hotel, May 22, 1961, the following committee was elected for the ensuing year:

Al Ugar, TV Radio Wholesale (Ontario) Limited, Toronto, chairman; M. I. Rosenthal, Canadian Electrical Supply Co. Ltd., Montreal, vice-chairman; John T. Rochford, secretary.

Committeemen: Al Johnson, Johnson Electric Supply Ltd., North Bay; G. J. Beninger, Provincial Electronic Distributors Ltd., London; Chas. Smith, Capital Sales Limited, Fredericton; and Frank Lemco, Electronic Wholesalers Co. Ltd., Verdun, P.Q.

Al Johnson, Jack Romm and M. I. Rosenthal were the division's nominees for election to the National Board of Directors.

Centralab distributes Welwyn line

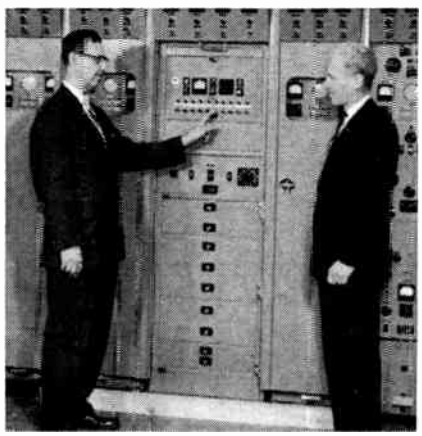
Centralab Canada Ltd. has recently assumed the responsibility for the Canadian distribution through electronic parts distributors of the complete line of resistor products, manufactured by Welwyn Canada Limited. Included will be deposited carbon types, as well as the new metal oxide types.

CESR attends Electronic Parts Distributors Show in Chicago

More than 160 members of the Canadian electronics industry, representing every branch of the trade, attended the 1961 Electronic Parts Distributors Show held in the Conrad Hilton Hotel, Chicago, May 22 - 24.

At the annual breakfast meeting of the members of the Canadian Electronic Sales Representatives, held in the Palmer House, Chicago, May 22, the following officers were elected for a two-year term commencing June 1: R. C. Kahnert, of R. C. Kahnert Sales Ltd., Scarborough, Ont., chairman; J. J. MacQuarrie, of J. J. MacQuarrie Sales, Toronto, Ont., vice-chairman; and Art Ainlay, of Lake Engineering Limited, Scarborough, Ont., secretary-treasurer.

The 18th Annual Canadian Luncheon was held May 23, and was attended by 128 persons. E. G. Hill, retiring chairman of CESR presided. The guest speaker was A. C. Simmonds of Toronto.



D. A. J. McDonald, manager of Northern Electric Company's Belleville Works, is shown some of the features of the new 1 kilowatt transmitter, by J. A. Grant, chief engineer. This transmitter is being supplied to the Department of Transport primarily for shore - to - ship communications. The equipment provides operation on any one of four separate channels while the system may be expanded up to 10 separate channels.

U.S. firms appoint Canadian representative

Douglas Randall (Canada) Limited recently announced their appointments as sales representatives for five firms located in the United States.

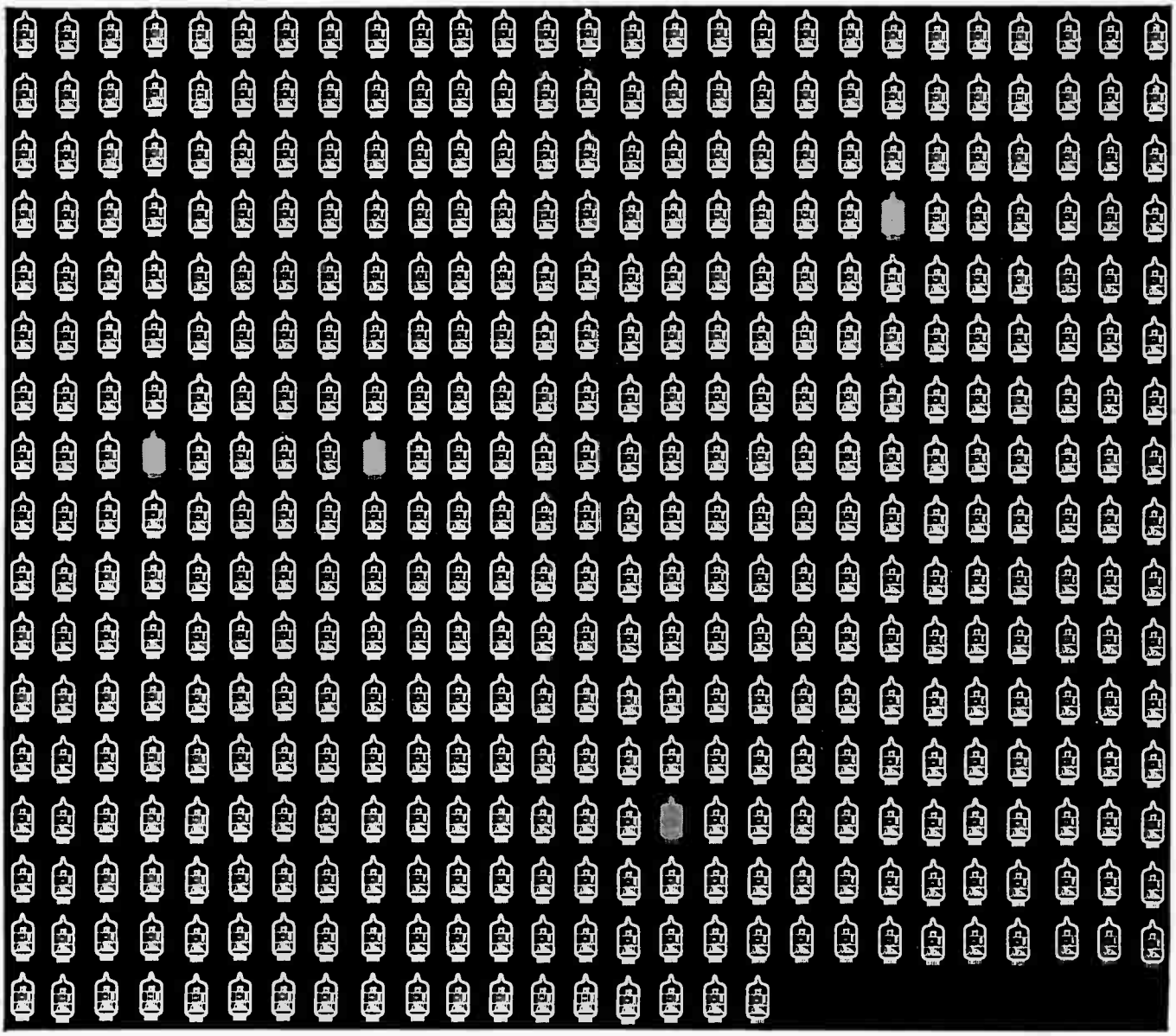
These included: Shepherd Industries Inc., Nutley, New Jersey; The Beede Electrical Instrument Co., Pennacook, New Hampshire; Columbus Electric Mfg. Co., Columbus, Ohio; ECCO Electronic Components Corporation, Yonkers, New York; and Pickard & Burns Incorporated, Needham, Massachusetts.

Ceremony marks completion of trans-Atlantic cable project

The Canadian mainland shore-end of the new trans-Atlantic multi-purpose telecommunications cable being laid by the Canadian Overseas Telecommunication Corporation, was spliced July 10, as the laying of the St. Lawrence River section of the cable got under way at Grosses Roches, Que.

Present aboard the cable ship, HMTS "Alert", were R. G. Griffith, vice-president and chief engineer of the COTC; Deputy Minister of Transport John Baldwin; Gordon W. Stead, Assistant Deputy Minister, Marine; and other officials of the Department of Transport and the COTC.

LONG LIFE



G-E 5-Star tubes prove 99.11% reliable in 10,000 hour life test

Four hundred and fifty type 6829 Five-Star tubes were subjected to a DC life test to study the effects of heater voltage, heater-cathode potential and plate dissipation on vacuum tube life and reliability. Only four failures occurred despite the fact that the test parameters were purposely made severe enough to encourage early failures.

Outstanding performance such as this is proof that the longer service life and ultra-reliability of G-E 5-Star tubes will protect your reputation by increasing the performance and dependability of the equipment you build. *Five Stars are not tubes selected from standard receiving types.* They are specially designed, specially manufactured to cope with particular electrical requirements and to withstand severe environmental conditions such as shock and vibration. Where you can't afford to comprise performance and reliability be sure to specify G-E 5-Star tubes. For full information contact: Electronic Tube Section, Canadian General Electric Company Limited, 189 Dufferin St., Toronto, Ont.

INDUSTRIAL AND MILITARY TUBES

ELECTRONIC TUBE SECTION

TAD-2037-861

CANADIAN GENERAL ELECTRIC COMPANY LIMITED

For complete details check No. 9 on handy card, page 35

TECHNICAL LITERATURE BRIEFS

Fixed station antenna systems: Illustrated brochure (8474C) describing various antenna systems and their installation and prices was issued by **Andrew Antenna Corporation Ltd., 606 Beech Street, Whitby, Ontario.** Item 950

Data handling system in detail: a color brochure on the new Philco 2400 data handling system points up its ability to lower costs and increase productive time one data processing systems. **Marketing Department, NP, Computer Division, Philco Corporation, 3900 Welsh Road, Willow Grove, Pa.** Item 951

Item 952
Speed Electronics catalog: literature dealing with design, test, fabrication, and evaluation of electronic, electromechanical, mechanical devices, printed circuits and terminal boards, has been published by **Speed Electronics, 177 Mill Lane, Mountainside, New Jersey.**

Item 953
Double electrically isolated R.F. rooms: four-page descriptive literature construction of rooms built in demountable sections with minimum attenuation of 120 DB in S-Band. (Specification # 500) describes patented **Erik A. Lindgren & Associates, Inc., Dept. E&C, 4515 N. Ravenswood Ave., Chicago 40, Illinois.**

Item 954
Microwave waveguide filters: 12-page catalog (No. FP61) provides detailed electrical data including band pass and insertion loss on a series of standard waveguide filter designs. **Tech Associates, 23 St. Thomas Street, Toronto, Ont.**

Item 955
Rhenium as applied to electronics industry: 12-page illustrated brochure on the fabrication, applications, price and varieties of Rhenium and Rhenium alloys, is now available from **Chase Brass & Copper Co., Waterbury, Conn.**

Item 956
Eliminates power line interference: an inexpensive electrical bonding brush which can be inserted in Johnson Dead End insulator joints to eliminate arcing due to corrosion of metal parts, is illustrated and described in a bulletin issued by **Erie Fan & Blower Co., Inc., 7 Birdsall Street, Buffalo 2, N.Y.**

Item 957
Digital instrument catalog: a short-form digital instrument catalog (19-92) with details and specs on DC, AC/DC digital voltmeters, preamplifiers, scanners and readouts, was issued by **Kin Tel Division, Cohu Electronics, Inc., 5725 Kearny Villa Road, San Diego 12, California.**

Item 958
Automation accessories keep materials flowing: a brochure describing newly-developed automation accessories for industry to keep hard-to-flow materials moving, was released by the **Automatic Feeder Company, 4752 W. Washington Blvd., Chicago 44, Illinois.**

Item 959
Miniaturized power packs: a two-page bulletin (# 102) contains detailed mechanical data covering complete lines of Transpac miniaturized power packs, and it's available from **Electronic Research Associates, Inc., 67 Factory Place, Cedar Grove, N.J.**

Item 960
Amplitude distribution analyzer applications: a fully transistorized instrument for determining the amplitude probability distribution of random signals is the subject of new literature from **Quan-Tech Laboratories, Inc., Boonton, N.J.**

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INDEX TO ADVERTISERS

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

Techdata for engineers

Tunnel diode circuit design handbook

A 16-page handbook, No. AN-1359A, on circuit design of the tunnel diode has been prepared by the Applications Engineering group at Transistron Electronic Corporation.

It contains sections on the theory of tunneling action; various general circuit considerations; simple switching circuits and four common digital circuits including shift register, ring counter, binary counter and memory circuit.

Transistron Electronic Corp., Wakefield, Mass., U.S.A.

Transistor literature

The Lansdale Division of Philco Corporation has published a "Transistor Guide for Communications Circuit Designers."

It presents a comprehensive summary of the basic ground rules to be followed in designing transistorized communications circuits. Valuable rules of thumb are included to provide circuit designers with a practical understanding of the results that can be expected from transistorized communications equipment.

Philco Corporation, Church Road, Lansdale, Pennsylvania, U.S.A.

Synchro and resolver manual

This 27-page illustrated technical discussion of the electrical characteristics of synchros and resolvers describes in detail the application and significance of such parameters as electrical error, electrical zero, fundamental null, total null, transformation ratio, and phase shift.

When synchros and resolvers are used in systems each of the "data-sheet properties" undergoes drastic change whose nature is thoroughly explained. Methods of measurement and the basic specifications for test equipment are also included.

Theta Instrument Corp., 520 Victor St., Saddle Brook, N.J., U.S.A.

Potentiometer catalog

A 28-page technical catalog on their complete line of precision potentiometers has just been announced by the Electronics Division of DeJur-Amsco Corporation.

Detailed specifications, outline drawings and general information covering a wide range of miniature and full size units from ½"diameter to 5" are included.

Electronic Sales Division, DeJur-Amsco Corporation, 45-01 Northern Boulevard, Long Island City 1, N.Y., U.S.A.

Military components catalog

A listing of the latest military components manufactured by Clarostat Mfg. Co., Inc., is now available. The listing includes all types of Mil. Spec. potentiometers and resistors, and their respective military designations handled by Clarostat industrial distributors.

Canadian Marconi Company, Electronic Tube & Components Division, 1830 Bayview Avenue, Toronto 17, Ontario.

Rigid line catalog

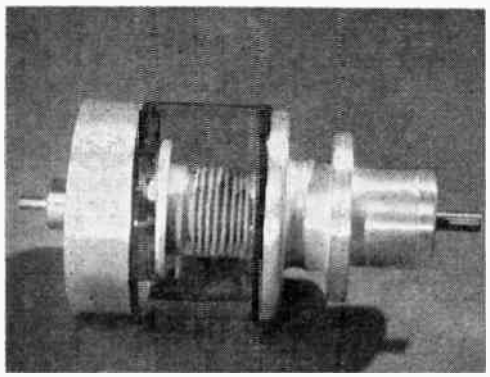
A 20-page catalog covering rigid coaxial transmission lines and associated equipment was recently distributed by ANDREW Corporation of Chicago.

With over 25 years of design and production experience in the field of RF transmission, ANDREW offers a selection of 50 ohm line and fittings in the size range from ⅞" to 9". A new 3⅛" coaxial transfer switch is introduced in catalog CR.

ANDREW Antenna Corporation, Ltd., 606 Beech Street, Whitby, Ontario.

product panorama

For further information on New Products use Readers' Service Cards on pages 35 and 36.



Item 923

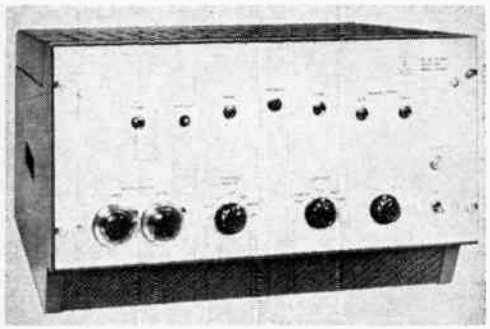
High vacuum variable capacitors

Item 923

The English Electric Valve Co. Ltd. announced the first British commercially available high vacuum variable capacitors. Five units comprise the range, three with capacitances of 5-30, 8-50, 16-80 pF and two with capacitances of 5.5-206 pF. The peak r.f. voltage is 15kV for the first three and 8 and 10 kV for the other two.

The variable capacitor uses a metal bellows, which forms part of the vacuum envelope, to transmit an axial motion to one set of cylinders thus enabling the overlap to be adjusted. A linear capacity law is ensured by the nature of the construction except at minimum capacity when fringe effects cause a small deviation. The capacitors, the largest of which has dimensions of only 9.5" by 3.5", are designed to comply with the requirements of RCS11.

Canadian Marconi Company, 1830 Bayview Avenue, Toronto 17, Ontario.



Item 929

Low cost, durable switch

Item 924

A new switch (Catalog Listing 1DM1) is now available for applications which require precision snap-action switching in a durable low-cost unit. It requires less than one cubic inch of behind-panel space and is ideal for either mechanical or manual operation on refrigerators, vending machines and in other similar applications.

This switch has an electrical capacity of 100 amperes up to 250 vac and ¼ hp 125 vac. Terminals are the only exposed metal parts.

Micro Switch, Honeywell Controls Ltd., Vanderhoof Avenue, Toronto 17, Ontario.

Item 925

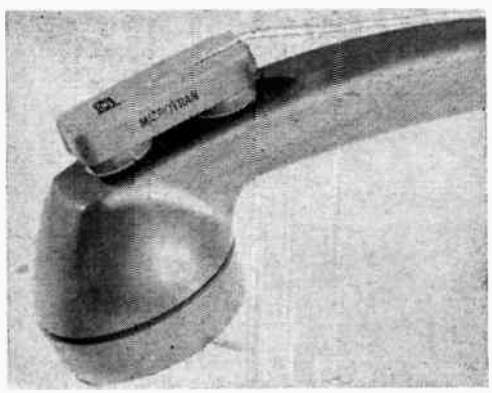
FM-Monitor deviation calibrator

Item 925

The new A-M-I MONOCAL 500 FM — Monitor Deviation Calibrator, available from Tele-Radio Systems Ltd., accurately calibrates the deviation of any FM monitor, using carrier dropout.

The unit, which is self-calibrating to ± 0.02 per cent, may be used directly with FM monitors tuning to 12 MC or equipped with a 12 MC IF strip, and converters are available for frequencies from 50 KC to 200 MC with unchanged accuracy. Deviation ranges are 10, 30, 100 and 300 KC, with extremely low distortion and better than ± 0.5 per cent accuracy at carrier dropout. The output level is a minimum of 0.5 volts into 50 ohms, and is continuously variable.

Tele-Radio Systems Ltd., 3633 Dundas Street West, Toronto 9, Ontario.



Item 930

Compactron tube utilized in Admiral's TV sets

Item 926

A unique circuit, utilizing the newly-developed Compactron tube, which provides greater noise immunity in TV receivers, will be used in most models of the 1962 Admiral television line.

The primary function of the new "Picture Guard" circuit is to provide more stable synchronization in areas of high electrical noise interference (ignition systems, switches, motors, etc.), regardless of signal conditions.

The Admiral line also features use of a new 23" bonded picture tube developed to withstand the highest voltage in the industry, 25,000 volts. Since this new tube operates at something less than capacity — up to 22,000 volts —longer tube life is assured, with improved focus and highlight brightness.

Canadian Admiral Corp. Ltd., 501 Lakeshore Road, Port Credit, Ontario.

Safe, instant disconnect reflectors

Item 927

Safety and low cost maintenance are assured with the new line of Superlok and Lectri-Lok RLM reflectors and High-Bay lighting units.

Shallow dome, RLM standard dome, deep bowl and RLM sign reflectors are available in porcelain or ultranamel finish. All aluminum High-Bay lighting units are available with totally direct or up-light component in concentrating or spread distribution for incandescent or mercury vapor lamps.

Pyle National (Canada) Ltd., 33 Ingram Drive, Toronto 15, Ontario.

Automatic long-term storage recorder

Item 928

The Magnerecord 817-DL long-term storage recorder is completely automatic in operation. This single-channel, two-speed record/playback system is designed to operate continuously for at least eight hours (14" reels — 4800' tape).

A delay tape loop permits the recording of every sound syllable and word; there is no danger of any loss of recording information as the erase head has been eliminated.

By use of a voice-operated relay the recording time may be extended to many more hours than ever before, and possibly weeks at a time. The machine only operates when there is a sound to record; yet the first few words, usually lost in most automatic recorders, are completely recorded on the delay tape loop.

Also available is the Magnerecord P75 Stereo model which has stacked stereophonic heads and matched twin record/playback amplifiers.

Alex L. Clarke Ltd., 3751 Bloor Street West, Islington, Ontario.

Multi-channel pulse height analyzer

Item 929

Radiation Counter Laboratories, Inc., introduced a radically new low cost Multi-Channel Pulse Height Analyzer.

It has 256 channels with a dead time of (13+0.2N) microseconds where N is the channel number. Channel capacity is 65,535 counts and rise and fall times of the A.D.C. are 0.6 microseconds or faster, differential linearity is better than ± 2.0% from channel 3 to 255, while integral linearity is 0.5% or better for the same channel range. Count rate stability is one channel shift at 10,000 counts per second and 5 channels at 50,000 counts per second.

Readout may be accomplished by adding chart recorders, XY curve tracers, scopes or by digital printers.

The Glendon Instrument Company Ltd., 46 Crockford Blvd., Scarborough, Ontario.

Hum-bucking telephone pickup coil

Item 930

Microtran Company, Inc. announced the availability of a new Hum-Bucking Telephone Pickup Coil. This pickup coil has been designed for use with high impedance input tape recorders, amplifiers and dictating machines when used in transcribing telephone conversations.

To eliminate the high stray hum pickup levels usually associated with conventional pickup coils, this new product has been designed with symmetrical hum-cancelling pickup coils. Additionally, this unique pick-up method provides approximately the same level for transmitted and received telephone conversations.

E. S. Gould Sales Co. Ltd., 19 le Royer Street West, Montreal 1, P.Q.

Variable transformer

Item 931

A new, compact 50/60 cycle Powerstat variable transformer series has been introduced having output ratings up to 3.75 amperes with constant current loads and up to 5.5 amperes with constant impedance loads.

Called the 21 Series, these new Powerstats feature several design innovations; gold alloy plated commutator; functionally designed terminal arrangement for connection flexibility; terminal adapters for either soldered connections or push-on connectors; adjustable ⅜" solid metal shaft; square base design for increased strength and reduced over-all height and space behind panel.

Other inherent characteristics include zero waveform distortion, high efficiency, excellent regulation, linear output voltage, smooth control, moderate temperature rise and rugged mechanical construction.

The American Superior Electric Company, Ltd., 174 Evans Avenue, Toronto 18, Ontario.

High accuracy mass flowmeter system

Item 932

A new high accuracy mass flowmeter system for the ground refueling of large military and commercial jet aircraft is available. The system, mounted on a ground cart for easy mobility, has been successfully tested in actual operation by a major airline.

The system can measure flow rate up to 320,000 pounds per hour. The flowmeter's accuracy is unaffected by battery voltage or inverter frequency drift. Frequent recalibration of the instrument is eliminated because of the meter's high degree of stability.

Canadian General Electric Company Ltd., 214 King Street West, Toronto, Ontario.

Raysistor isolator

Item 933

Circuits at 25,000 volts can now be controlled from ground level circuits through a high-voltage Raysistor isolator developed by Raytheon Company's Industrial Components Division.

An electro-optical control device, the new Raysistor consists of a light source and a photosensitive cell contained in a lightproof case. The new high-voltage model is encapsulated in a transparent dielectric fluid and operates with a 25,000-volt differential between the bulb and cell.

It is designed to control x-ray and other high-voltage equipment such as power supplies, bias control of high-voltage regulator tubes, and to meter any high voltage to a ground-level panel meter.

Raytheon Canada, Ltd., P.O. Box 8, Waterloo, Ontario.

Pacemaker amplifier

Item 934

Recently added to Benco's line of single channel and broadband amplifiers is the "Pacemaker" with a minimum gain of 35 db on low band and high band television frequencies, and a minimum gain of 30 db on F.M. frequencies 88-108 megacycles.

Separate input for high band and low band/F.M. with provision to combine inputs for common input lead. Output 2 volts total of all carriers on low band/F.M.; 2 volts total of all carriers on high band. Intermodulation distortion 40 db down.

Benco Television Associates, 27 Taber Road, Rexdale, Ontario.

Digital servo printer

Item 935

This Digital Servo Printer automatically records weight, pressure, position, voltage, current, temperature, and resistance.

The readout is visual, digital and printed, with an accuracy of 1/10 of one per cent. The serial data identification is visual and printed preceding each readout. The Digiprinter is compatible with the most accurate existing standard transducers. The power supply for the transducer and the printed unit are included in the unit. The power input 115 volts 60 cycle, weight 35 pounds; dimensions, 15" wide, 11" deep, and 11" high.

Canadian Research Institute, 85 Curlew Drive, Don Mills, Ontario.

Industrial controls with variable speed drives

Item 936

Tenney Engineering, Inc., Union, N.J., has developed a line of industrial process controls of precisely regulated variable speed drives.

The drives, in both standard and custom-built models, have wide application in almost any industry where a rotating system whose speed must be controlled. The standard line offers .5 to 2 per cent regulation of set speed. Custom drives are available with regulation as precise as .1 per cent.

Special units that regulate to .1 to .25 per cent of set speed, regardless of varying load and voltage, are available for critical control. Drift is limited to .025 per cent.

The power control package of each drive incorporates the electronic control regulator, which eliminates the need for a motor generator set without sacrificing regulation or drift characteristics. The regulator continually monitors the load and automatically corrects to hold DC motor speeds constant.

Mel Sales Ltd., 1969 Avenue Road, Toronto, Ontario.

Rectangular panel meters

Item 937

A series of rectangular panel meters is being introduced by Helipot. Called Beckman Style 42, the meters (approx. 4.1" x 4.7") feature a classically styled bezel and all-metal construction.

They are gasket sealed to keep out dirt and moisture, and steel enclosures protect the movements from effects of magnetic fields and stray RF. These front mounting panel meters utilize glass windows to eliminate errors due to static charges. Scale length is a full 3.97", standard accuracies are 2 per cent.

Helipot Division of Beckman Instruments, Inc., No. 3 Six Points Road, Toronto, Ontario.

Dynamic tester

Item 938

A dynamic tester that uses self-correlation techniques to evaluate brush-type, V-scan shaft encoders has been announced by Litton Systems (Canada) Limited. Internal V-scan selection logic enables the Litton Mark I Dynamic Tester to compare consecutive interrogations with each other, instead of with a second "standard" encoder.

Testing is accomplished under dynamic driving conditions at variable shaft speeds up to 100 rpm. The tester simulates a digital data processor performing V-scan selection on the multiplexed output of several encoders. Outputs are interrogated periodically or on demand.

Litton Systems (Canada) Ltd., Defence Liaison Office, 165 Sparks Street, Ottawa, Ontario.

Ku-band magnetron

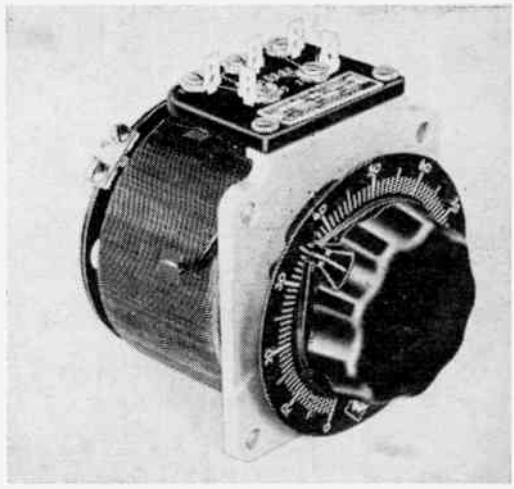
Item 939

A new Ku-band pulse magnetron for advanced airborne radar systems has been announced by Bomac Laboratories. The Bomac BLM-071 magnetron is a fixed-frequency tube, rated at 100 kW peak power, at an 0.001 duty cycle.

Internal construction features include a design for minimizing current leakage, as well as "gettering" any gas liberated during operational or standby life. Operation is possible in relatively high ambient temperatures. Frequency range is from 15.9 to 16.1 kMc.

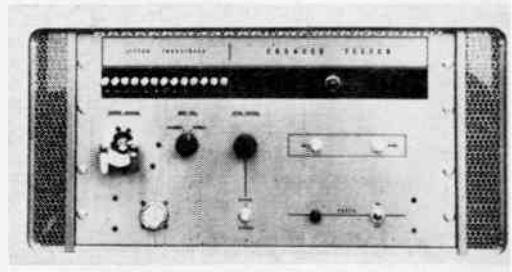
The new BLM-071 magnetron is readily adaptable to navigation, high-altitude mapping, airport surveillance, and similar jobs. Input/output terminals may be pressurized to 30 psia; pulse duration is 0.06 to 1.2 microseconds.

R-O-R Associates Ltd., 1470 Don Mills Rd., Don Mills, Ontario.

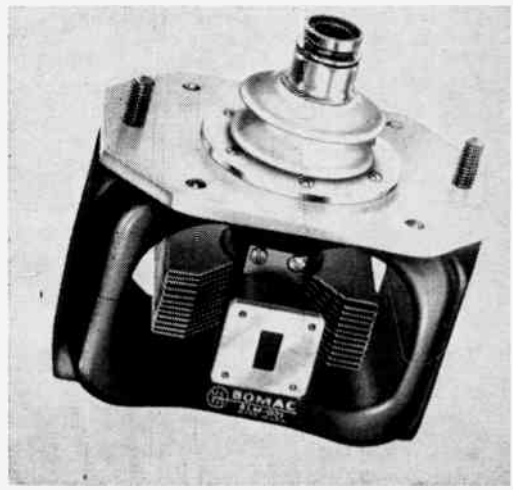


Item 931

Item 933



Item 938



Item 939

Design features of an electrical memory switch for storing multiple digit numbers

Known as the n-Digit Decade Switch, this device was developed as a means of simplifying the automatic control of electrical currents used in testing gyroscopes.

An electrical "memory" switch, capable of storing multiple-digit numbers by using principles of the ordinary combination lock, has been developed by Paul D. Shannon of the Massachusetts Institute of Technology Instrumentation Laboratory.

So close does the switch follow combination lock principles that Mr. Shannon obtained parts for his first prototype by stripping discarded laboratory locks. In operation the switch is first "cleared" and then digits are set into it by turning the shaft alternately right and left and one less revolution each time, after the fashion of a combination lock.

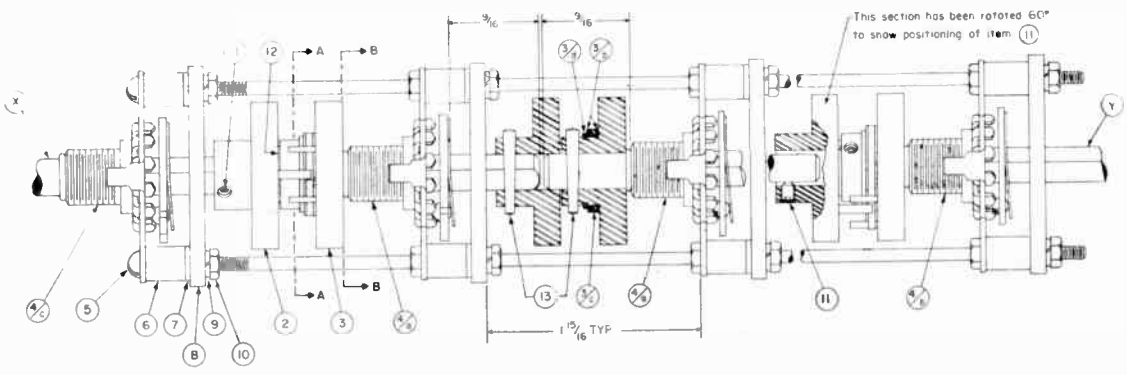
Most memory switches store only one digit. Thus, multiple switches, each with its own dial, are needed to store numbers containing several digits.

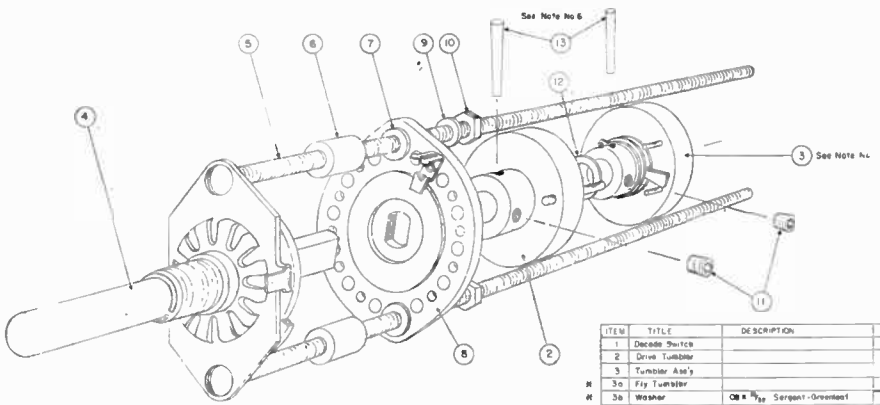
Mr. Shannon developed the new device, called the "n-Digit Decade Switch", as a possible method of simplifying automatic control of electrical currents used in testing gyroscopes employed in inertial guidance systems for missiles and space vehicles.

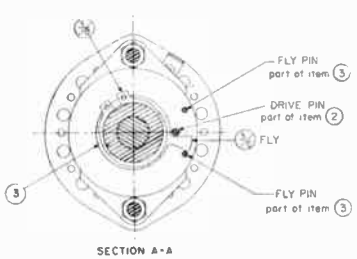
But because of its flexibility, the device could be used to simplify a variety of automatic control systems by reducing the number of switches and dials needed.

The n-digit switch consists of sets of switch indexes and wafers coaxially arranged with tumbler-type couplings between them. The number of indexes depends on the number of digits to be stored. The prototype stores four-digit numbers and, therefore, uses four switch indexes and wafers.

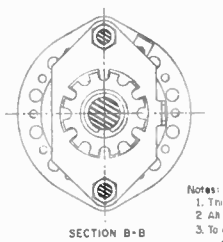
The number of positions on each index wafer







SECTION A-A

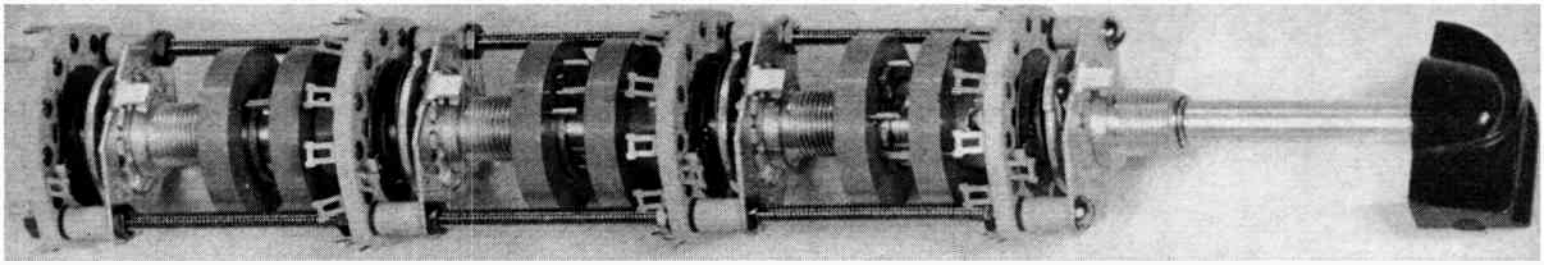


SECTION B-B

ITEM	TITLE	DESCRIPTION	M I T DWG NO	NO REQ
1	Decade Switch		ELD-68938	
2	Drive Tumbler		ELA-68938	3
3	Tumbler Ass'y			3
* 3a	Fly Tumbler		E.A-68937	(3)
* 3b	Washer	OD x 9/32 Sergeant-Greenleaf		(6)
* 3c	Fly	.049 x 11/32 " "		(3)
* 3d	Retaining Ring	TRUARC 5100-46		(3)
4a	Index (30°)	SHAFT LENGTH+ 9/16 BOTH ENDS	CAL PA-300	2
4b	"	" " " (X) END ONLY	"	1
4c	"	" " " (Y) END ONLY	"	1
5	No 4-40 Mach screw	7/16 CAL P-388		2
6	Spacer-Ceramic	9/32 lg " P-329		8
7	No 4 Fibre Spacer	" P-394		8
8	Switch Section	" PA-1		4
9	No 4 Lock-washer	Split ring " P-392		8
10	No 4 Hex. Nut	3/16 Dim. across flats " P-390		14
11	No 4-40 Set Screw			6
12	Washer - Steel	L0031 PIC 83-1		3
13	Pin-Taper	5/8"-9/8" PIC C2-5		6

Notes:
1. This is an original design.
2. All tolerances are ± 1/64 unless otherwise specified
3. To obtain 9/16" shaft length, cut off 1 3/16" from required end of PA-300.
Shaft lengths (X) & (Y) are cut to length at final assembly
* 4. Items (3a) (3b) (3c) & (3d) are assembled to form item (3) prior to final assembly
5. After final assembly consult GR-188 for adjustments.
6. Items (13) are used to pin each tumbler to its shaft after final adjustment

These engineering drawings and legend show how the n-Digit Decade Switch utilizes drive tumblers and fly tumblers similar to those found in ordinary combination locks. Shaft is rotated in alternate directions one less turn each time in order to set digits onto wafers.



The new n-Digit Decade Switch developed at Massachusetts Institute of Technology Instrumentation Laboratory by Engineer Paul D. Shannon, stores multiple-digit numbers by using principles of the ordinary combination lock. Photograph of the four-digit prototype shows the control knob. Note three sets of drive tumblers and fly tumblers which control inner switch indexes and wafers.

depends on the function for which the switch is designed. Twelve-position indexes were used in the prototype so that each digit could be 0 to 9 or plus or minus.

Method of operation

The device uses sets of drive and fly tumblers like those found in standard combination locks. Each index, except for the outermost one, is associated in operation with a drive tumbler-fly tumbler set.

In the operation of the prototype four-digit switch, as the shaft turns continuously in one direction, the first drive tumbler rotates until its drive pin engages the first fly. The fly rotates, at the most, about 60°, then engages the fly pin portion of the fly tumbler. The first fly tumbler rotates the shaft, turning the second drive tumbler until its drive pin engages the second fly, fly pin and fly tumbler. In this manner, after three revolutions at the most, rotary motion is transmitted to the fourth index and it can be set in the desired position. The other three indexes are set — as in the combination lock — by turning the input shaft alternately one way and then the other and one less revolution each time. The outermost index is set lastly — and directly — by final rotation of the shaft.

After the n-digit switch has been assembled, it must be adjusted for the proper sequence of operation. First, the positions of the shaft must be given values — 0 to 9 or plus or minus in the case of the 12-position index. Next, drive tumbler set screws are loosened and all drive pins aligned in approximately a straight line with each wafer set in the same position.

The set screws are tightened and the fly tumblers rotated until each fly is snug between a drive pin and a fly pin in such a way that all four shafts can be rotated in one direction with each index progressing properly through its detents. When all detents are working properly, the set screws are tightened. All six tumblers — in the case of the four-digit prototype — are then drilled, reamed and pinned to their respective shafts with taper pins.

Clairtone appoints European sales reps

Clairtone Sound Corp. Ltd. has established sales representation in England, France, Benelux, Switzerland, Germany and Italy.

E.M.I. Sales & Service Company, Ltd., Middlesex, England, which has almost 200 service depots throughout Great Britain, will provide warehousing and act as delivery and service agents. On the European continent, service agencies are being set up in key cities as Clairtone signs up dealerships.

Clairtone has been traditionally export-minded, and currently is the only Canadian company in its field to maintain a national sales organization in the United States.

U.S. contracts awarded to Ottawa firms

Contracts amounting to $259,670 were awarded to two Ottawa firms by the United States Air Force.

Canadian Commercial Corporation received a contract totalling $234,320 to provide lead covered cable and electrical power cable for airfield construction, and engineering information for telecommunication facilities in Canada.

The other firm was Phillips Electric Company which received a contract to supply general purpose power cable for the amount of $25,350.

McPherson appointed sales manager

A. D. Revill, P. Eng., president of Electronic Controls Limited, Belleville, Ontario, announced that **W. H. McPherson** was recently appointed sales manager of the firm. Mr. McPherson was formerly manager of Development Engineering at Spartan Air Services.

Appointments annnounced at Canadian Admiral

E. Whittaker, vice-president, Canadian Admiral Corporation, Ltd., Port Credit, Ontario, recently announced three new company appointments:

Don L. Blackman was named sales promotion and marketing manager, which is a newly created position; **D. G. Christian** was appointed the new manager of the Vancouver sales branch; and **G. J. Manolescu** was named as manager to take over the Calgary branch, replacing Mr. Christian.

Burroughs announces appointment changes

J. L. Rapmund, president, Burroughs Business Machines Ltd., has announced the appointments of **Stanley G. Haynes** as manager of the Scarborough Plant of the Supplies Division, **Douglas H. Peacock** as district manager of defense contracts, and **Anthony H. Cardwell** as sales manager of general products and data processing systems.

Contract awarded for world's largest uranium refining furnace

Award of a contract for construction of one of the world's largest vacuum melting furnaces to Consolidated Vacuum Corporation, a subsidiary of a division of Bell & Howell Company, by Eldorado Mining and Refining Limited was announced July 12.

The furnace, located at the refinery division at Port Hope, Ontario, will cost more than $100,000 when completed, and will give Eldorado completely integrated facilities to process their uranium metal to castings of nuclear purity.

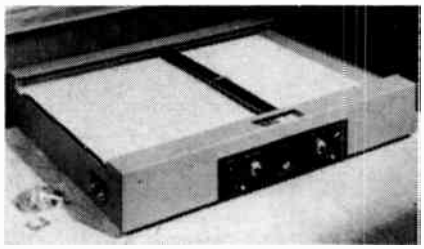
Glendon Co. appointed Canadian agents

Precision Paper Tube Company, with plants in Chicago, Cleveland, and Hartford, Conn., has appointed The Glendon Company Limited, Toronto, as their exclusive agents in Canada for their entire range of products.

X-Y plotter *Item 940*

The new X-Y Recorder is designed to operate from differential transformers. It may be used to plot small mechanical movements or any related variables which can be converted to mechanical movement.

First application is in plotting contours of miniature bearing races. Other applications include mechanical inspection, plotting surface and gear tooth irregularities, stress, strain, pressure, spring and bellows



deflections, and many others. Multiplication factor is accurately adjustable to 1000:1.

B. H. McGregor, P.O. 156, Station "H", Toronto 13, Ontario.

Measures surface finishes

Item 941

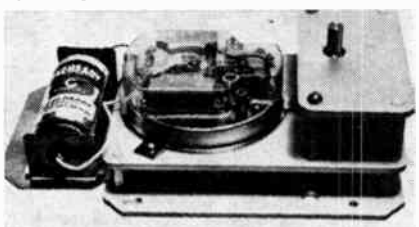
A completely portable, transistorized, battery-powered instrument for measuring surface finishes on metals, plastics, ceramics and organic materials has been added to the line of Brush Surfindicators.

Precision measurements from one to 1000 microinches can be made at any point in a production line or inspection area with the 5½-pound model MS 1000 Surfindicator.

A. C. Wickman Ltd., The Queensway, Toronto 14, Ontario.

Chronometrically governed DC motors *Item 942*

A new series of chronometrically governed DC motors whose exceptionally high accuracy and long life at constant speed are independent of load, line and temperature variations have just been announced by Philips Electronics Industries Ltd.



Currently being used to drive a cordless electric clock and a chart drive with a timing cycle of 192 hours, the motor is now available for other applications requiring high accuracy and low current drain, as for example, operating contacts, cams and actuators where loads are larger and vary over greater limits than the escapement type can handle.

Philips Electronics Industries Ltd., 116 Vanderhoof Ave., Toronto, Ontario.

Transistor R.C. oscillator

Item 943

A newly released, high stability, fully transistorized oscillator with a frequency range from 1.6 Cp/s to 150 Kc/s is now offered by Levell Electronics Limited.

This instrument will find particular application where light weight and extreme portability is required and no external power supplies are required.

Conway Electronic Enterprises Reg'd., 1514 Eglinton Ave. W., Toronto 10, Ontario.

Type 132 power supply

Item 944

New electronically-regulated power supply — Type 132 — provides an easily-portable housing for any Tektronix A-to-Z Plug-In Unit — thus enabling the many plug-ins to be used with or without an oscilloscope in a wide variety of applications.

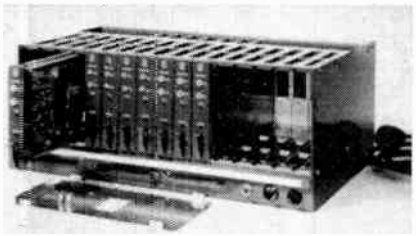
Internal amplifier of the Type 132 has a frequency response of dc to 22 megacycles, risetime of 15 nanoseconds, noise level less than 0.5 millivolts, peak-to-peak (referred to internal amplifier input). Front-panel terminals permit push-pull or single-ended ± input.

Tektronix Inc., 3 Finch Ave., Willowdale, Ontario.

Transistor video distribution amplifier

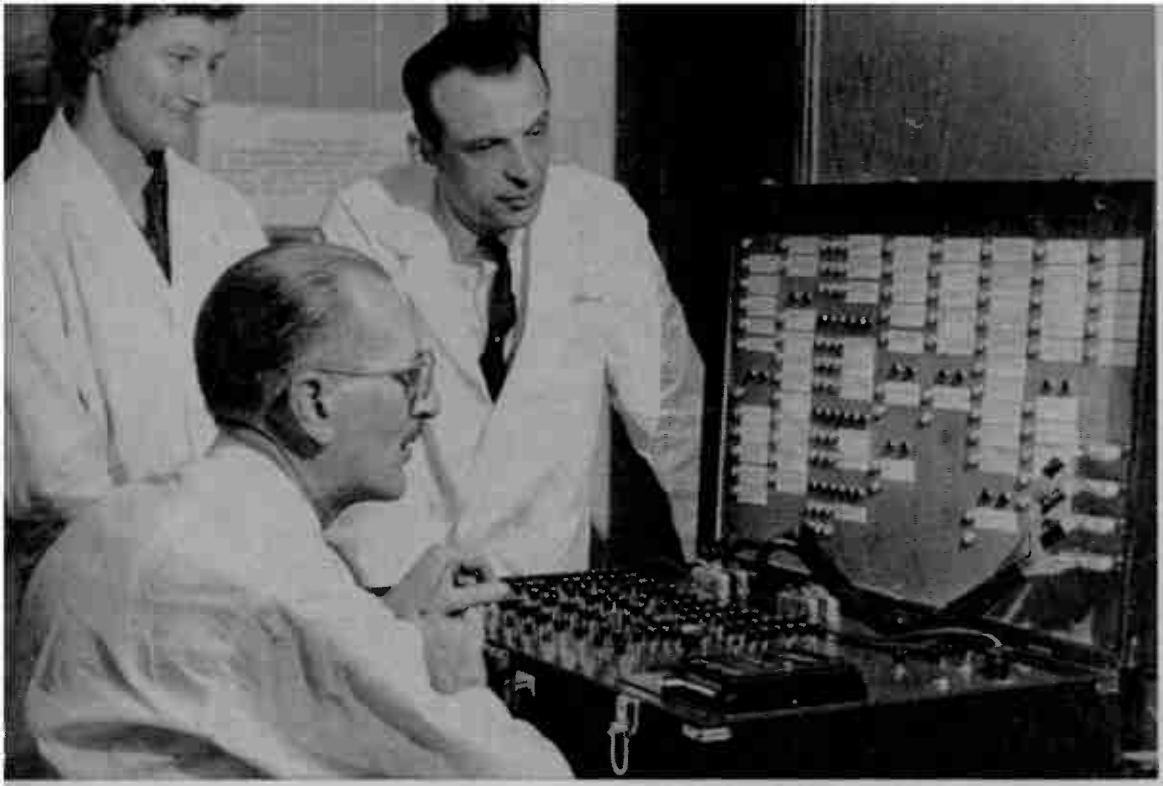
Item 945

A transistorized plug-in module with a built-in regulated power supply which can be used for either color or monochrome video camera chains, was announced by Northern Electric. It incorporates 2 video outputs, each giving 3 volts peak to peak. The startling fact brought about by the



transistorizing of such equipment enables 16 amplifiers to be mounted in 7" of rack space.

Northern Electric Co. Ltd., 1600 Dorchester St. W., Montreal, P.Q.



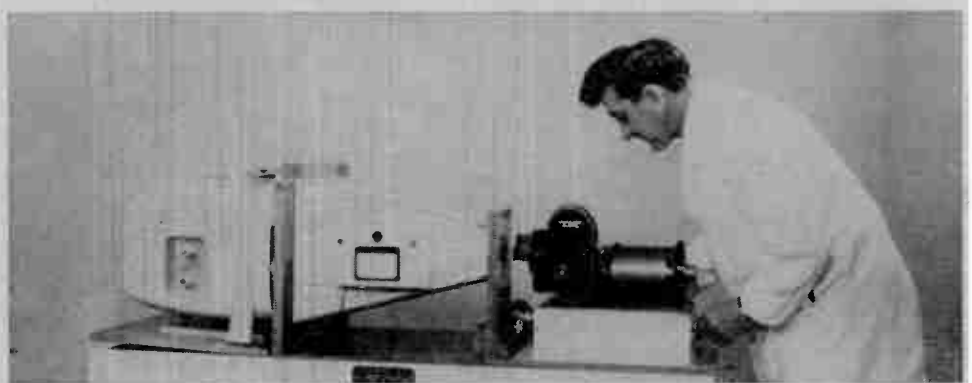
A cytodiagnostic test apparatus is used at the Chicago Lying-In Hospital to train medical technicians in cancer screening. Through the incorporation of Switchcraft push-button Multi-Switches, students may record their diagnoses of specimen; then by pushing another button an instructor may permit students to score themselves; finally all data is shown on a punched card.

close-up

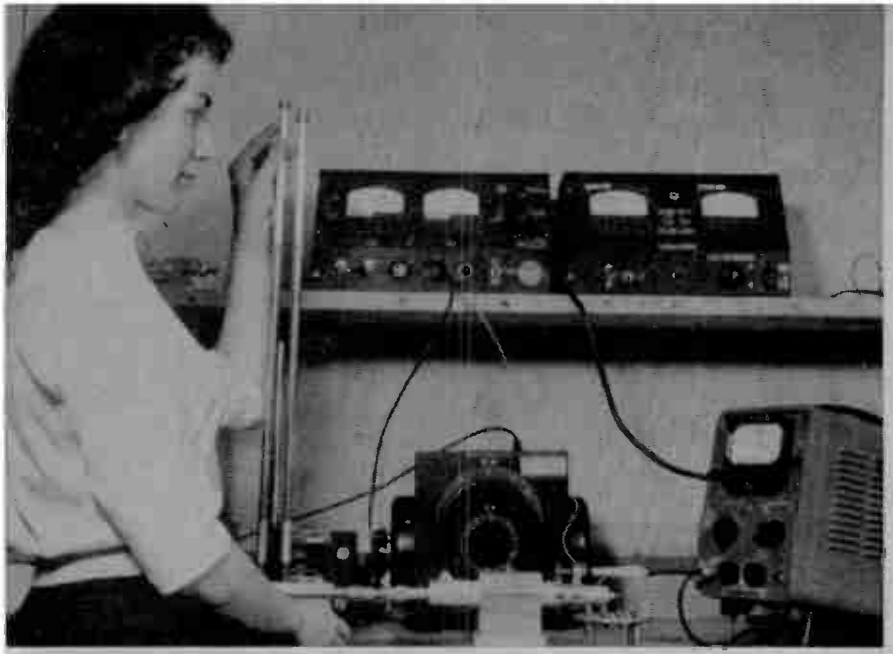
looking lenswise at your industry in action

Production process for Rhenium-Tungsten alloy at Chase Brass & Copper Co., Connecticut, is demonstrated as the operator adjusts the power input for the vacuum furnace where Rhenium-Tungsten is sintered at 2500°C and at pressures of .02 microns.

During the checkout of a finished processor amplifier any dry joints, faulty components or human errors are rigorously sought out and corrected by technicians at Ampex of Canada Ltd.



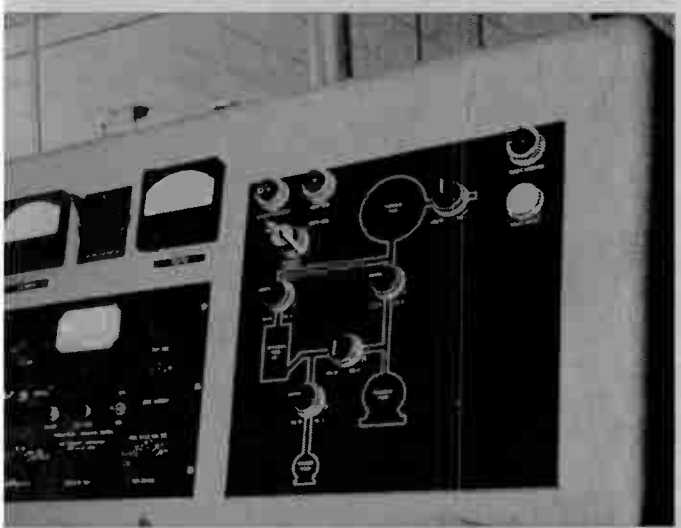
This Cine Recording Unit designed by Marconi Instruments Ltd., Hertfordshire, England, permits direct filming off any television monitor screen. Alternative lenses enable either the whole or a reduced area of the screen to be recorded. A built-in brightness meter ensures correct exposure factors. Already at use in hospitals, the device is believed to have considerable possibilities in industry.



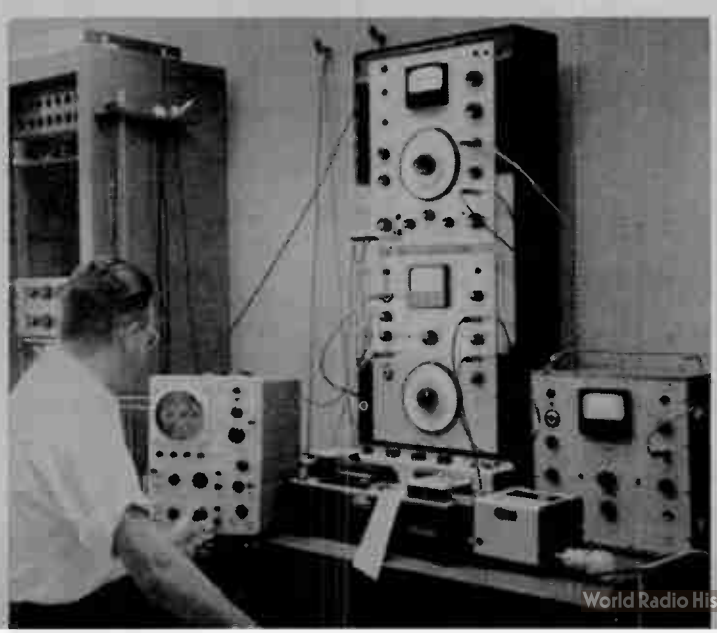
Laboratory assistant uses microwave test apparatus to check power gain of Philco prototype MADT transistor which has been measured at 5 KMC maximum frequency of oscillation. This development promises to greatly increase the usefulness of transistors for UHF space communications.

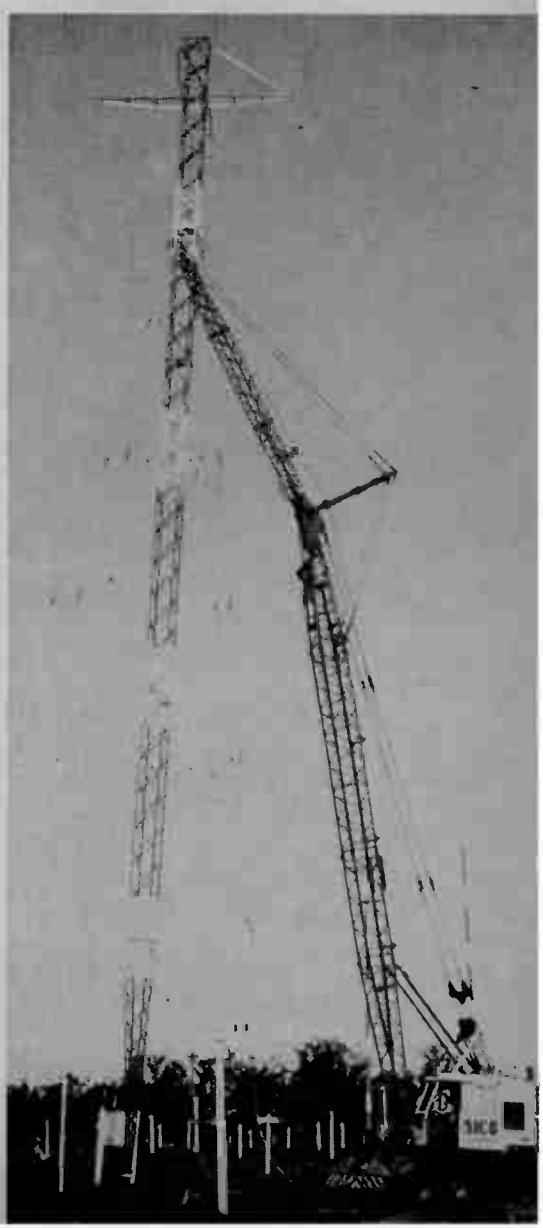
Creed Model 75 teleprinters aboard an aircraft carrier of the Royal Netherlands Navy operate over radio circuits when at sea and can be connected to dockside landlines when ship is in port simply by throwing a switch. This equipment is also in service or on order in over 40 countries.

A 110-foot antennae manufactured by Ajax Engineers Ltd., Toronto, for high frequency broad band radiation of ground-to-air transmissions, has been erected by Trans-Canada Air Lines on a Department of Transport remote transmission and signal site at Beaconsfield, Quebec.



Dick Charlton operates the test gear used for the sound measurement of microphones and other basic communications equipment in the Northern Electric Company's anechoic chamber at the Belleville Works.





briefing the industry

■ **The first big replacement sales period in Canadian television purchases is expected to occur this Fall** as over 2,000,000 Canadian TV owners have sets seven to ten years old. Canadian Admiral Corporation records indicate most of the TV sets being replaced by new ones are between seven and nine years old, so TV sales are expected to increase over present levels by at least 10 per cent per year for the next five years.

■ **RCA Victor has received requests from 23 countries for their solid-state nuclear particle detector** which was just developed a year ago in their Montreal Research Laboratories. Orders for the detectors came from universities and government-sponsored research organizations, as well as from industries around the world.

■ **Canadian National Telecommunications has announced that with the inauguration of Telex service** at Charlottetown, P.E.I., the Telex network now extends throughout Canada from Victoria, B.C. to St. John's, Nfld., and connects more than 3,400 subscribers with major U.S. points and some 40 overseas countries. The Telex international service was recently expanded to include Netherlands, Antilles, Taiwan, Formosa and Panama.

■ **E. J. Sharpe Instruments of Canada, now a publicly-owned Toronto electronics firm,** has established dealerships in Buffalo and Detroit as the beginning of a country-wide representation in the U.S. The company recently began to specialize in electronic educational aids, sound equipment and precision optical instruments.

■ **Scientists in the Chalk River area were recently reported to view Canada as falling behind** the pace-setters in a world of racing scientific change. They believe that Canada's effort in research and technology is dangerously inadequate for the future needs of our country. A nation's spending on research and development is said to be a good yardstick for measuring its technological effort and maturity. Canadian spending — by government, industry and universities — is about one-quarter that of American spending on a per capita comparison. It's also well below Britain's per capita spending.

■ **Canadian General Electric Co., Ltd. has perfected a liquid silicone rubber** which vulcanizes at room temperature and is packaged in aerosol spray form. CGE believes it can be used to apply a thin, uniform encapsulating coating on electronic assemblies and parts. Other uses are also developing in the maintenance field and where thin, thermal, protective, shock absorbing, or non-conductive coatings are desired.

■ **During the 1960's alone 10,000 young Canadians will be required by the electronic computer profession as middle-management men** in "computerized" Canadian business, according to a recent report in *The Financial Post.* These new professionals are called systems anaylsts or designers, applied scientists, manufacturers' systems representatives, and already they are in short supply, The computer manufacturers and consultants expect this shortage to become even more acute as additional computers are installed in businesses.

■ **The U.S. Air Force has placed a $1,500,000 order with Canadian Marconi Co.** for an unspecified quantity of Marconi airborne Doppler navigation systems. Deliveries are to start in August and the equipment will be installed in C-130E Hercules turboprop aircraft assigned to the Military Air Transport Command.

■ **A team composed of a human crew and a micro-miniaturized digital computer was recently proposed** as the logical means of flying future supersonic transports. This proposal was made by Donald W. Richardson, a Hughes Aircraft Co. engineer, at a symposium of the International Air Transport Association held in Montreal. Most of the techniques and hardware needed to develop such a central electronic management system for commercial supersonic aircraft, already exist.

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For complete details check No. 14 on handy card, page 35

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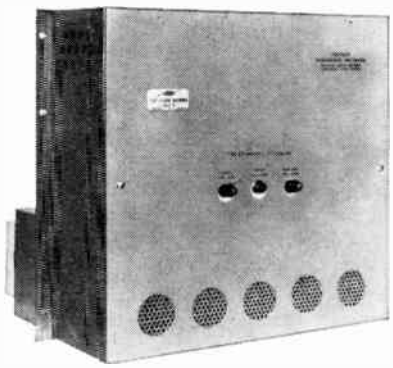

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Communications Systems and Equipment

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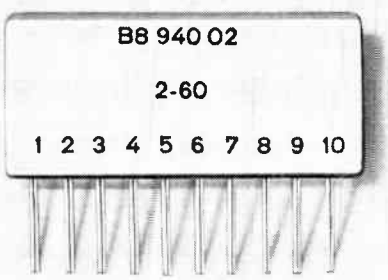
For complete details check No. 28 on handy card, page 35



The present range of units is as follows:

Pulse Shaper
Flip-Flop
One Shot Multi-Vibrator
Twin Emitter Followers
Emitter Follower/Inverter Amplifier
Twin Inverter Amplifiers
Twin 2-Input AND Gate
Twin 3-Input AND Gate
Twin 2-Input OR Gate
Twin 3-Input OR Gate
Shift Register Flip-Flop
Pulse Logic

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Now you can choose from a complete line of compatible circuit functions using the latest techniques in design and made with carefully selected and precisely matched components. Philips Circuit Blocks make large or small production runs speedy, accurate and economical. All Circuit Blocks are hermetically sealed units of a uniform size with all specifications guaranteed. Philips Circuit Blocks can be applied in laboratory or production phases, producing systems from block diagrams. There is no need to test and prove individual circuits. They're the practical answer to the problems of systems design.

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Professional Tubes, Semiconductors & Components Dept
PHILIPS ELECTRONICS INDUSTRIES LTD
116 Vanderhoof Avenue, Toronto 17, Ontario, Canada

PHILIPS

1015

For complete details check No. 31 on handy card, page 35

New Product Planning

Continued from page 27

NEW PRODUCT PLANNING CHECKLIST

Need More Information

1. Why a new product?

1. To meet corporate goals including profits, stability, growth? ☐
2. As a hedge against recession, seasonal cycles or major contract cancellations? ☐
3. To utilize surplus capital? ☐
4. To combat declining profit margins? ☐
5. To meet new market needs? ☐
6. Because of steady decline in market for existing products? ☐
7. To keep pace with changing technological trends, techniques, processes or materials? ☐
8. To diversify the product line? ☐
9. To diversify the field of endeavor? ☐
10. To meet competition? ☐
11. To utilize unloaded productive capacity? ☐
12. To retain skilled design groups? ☐
13. To obtain better utilization of existing sales force and distribution channels? ☐
14. To share advertising or other costs? ☐
15. To convert or re-utilize byproduct material? ☐

2. New product criteria

1. Will the product be suitable to the customer and the market? What are the intended purposes or uses of the product? ☐
2. Will the product be better than anything presently on the market? Unique? Will it provide more benefits to the customer? ☐
3. Will it form part of the company's present product line? ☐
4. Does it fit into the company's long range product program? ☐
5. Will the product have patentable features? ☐
6. Will the product have application to other fields? Industrial? Military? Consumer goods? New applications in the same field? ☐
7. If a military item, do you have a clear work statement from the customer defining the requirement? Are you fully aware of all relevant specifications and tests? ☐

3. The market

1. How big is the total potential market in dollars and/or units? ☐
2. Where is the market located? Domestic? United States? Foreign? ☐
3. Is it a static market? Declining? Expanding? Can the hazard of market changes due to long development lead time be calculated? ☐
4. What share of the market can you expect to capture initially? In what time period? What will your ultimate share be? ☐
5. What indirect or secondary markets exist for this product? ☐
6. If a military product — will there be spares, test equipment, follow-on support, etc.? What is the estimated potential for this? In what time period? ☐

4. The competition

1. What competing products are now on the market? ☐
2. Will your product compete successfully with these as to price, performance, quality, style, service? ☐
3. What are the most accepted features of the competitors' products? Least acceptable? ☐
4. What are most accepted features of your product? Least acceptable? ☐
5. What are the chances of a directly competing product reaching the market before you are ready? ☐
6. Can your competitor quickly update or improve an existing product? Or copy yours? ☐
7. What would be the effect on your sales if this happened? ☐
8. Do you have an advantage due to specialized market skills, techniques or knowledge? ☐
9. Do you have a favorable patent position? ☐
10. What sales, distribution, advertising and pricing methods will be used by your competitor? ☐
11. What sales and distribution advantages do you have? Disadvantages? ☐
12. Does your competitor have a good reputation for quality, performance, service? ☐
13. What is your reputation in this product area? ☐
14. If this is a military funded product development will the Government go out to tender for the production quantities? To what extent can you safeguard your proprietary rights? ☐
15. To what extent does non-product competition exist (i.e. — completely different methods of doing the same job; elimination of the requirement entirely by technological advances; etc.)? ☐
16. What other non-product competition or problems exist (i.e. — experienced competitors; language or political problems; foreign exchange problems; etc.)? ☐

5. Design and development

1. How long will it take to develop the product? ☐
2. Has someone else tried this job and failed? Why ☐
3. How much will it cost to develop? ☐
4. Can you make a profit on the development contract independent of follow-on production? ☐
5. Can you do this job better than anyone else because of unique design skills, background or experience? ☐
6. If not, can you obtain those skills by hiring, subcontracting, or any other method? ☐
7. What would happen to the development if a key employee left for any reason? ☐
8. Who is in charge of this development? ☐
9. Do you have the required capital equipment? ☐
10. Has a definite specfication of prototype performance been arrived at? Does it meet the needs and approval of the customer? ☐
11. Do you have an engineering master-plan with check points for monitoring this product development? ☐
12. Are suitable components available or do they have to be developed? ☐
13. Can the engineering prototype be made to work in the actual environment in which it is to be used? ☐
14. Can it meet the required weight, space and appearance criteria? Military or commercial specifications? ☐
15. Is the design reliable? ☐
16. Can the product be readily serviced, adjusted or operated by the personnel who will use it? ☐
17. Are there any primary power supply problems associated with the different locations where the product will be used? ☐
18. To what standards or specifications must the drawings be made? ☐
19. Can the design be economically tooled for production? ☐
20. Has an adequate attempt been made to engineer value into the product? Does it use standard ccmponents to the greatest possible extent? Are tolerances reasonable? Is the design readily and economically reproducable in production quantities? ☐

6. Customer evaluation

1. Will there be a customer evaluation of the prototype? ☐
2. What will this cost? Who will pay for it? Who will do it? ☐
3. Who in the company wl be responsible for day-by-day liaison with the customer during the evaluation period? ☐
4. Will recommended test methods and evaluation procedures be prepared in advance for the customer? ☐
5. Will adequate support be provided during evaluation to cope with system or component failures? Will service staff and spares be immediately available? ☐

7. Purchasing

1. Are the components readily available? From more than one source? At reasonable cost? ☐
2. Are all raw materials available in quantity? Stable in price? ☐
3. Can standard or lower cost components be substituted for special components specified by the designers? ☐
4. Can critical components or materials be obtained in time to meet the development program? The production program? ☐
5. Will the added purchasing volume for this product allow price breaks on material or components for this and other products? ☐
6. Can procurement for this product be handled by existing staff and methods? ☐

8. Manufacturing

1. Do your facilities lend themselves to economical manufacture of this product? ☐
2. Is this the type of manufacturing with which you are familiar? Has the existing work force the necessary skills? ☐
3. What will be the effect of this program on existing shop load? ☐

4. Will you need additional direct labor staff? Indirect? Are these skills available? What will this add to your costs? ☐
5. Will you need plant alterations or additions? How much will this cost? ☐
6. Will you need additional capital items? What will these cost? ☐
7. What will tooling and set-up costs be? ☐
8. Will you be able to meet the required delivery schedules? Will this require overtime? What will this cost? ☐
9. Could parts, subassemblies or assemblies be procured more economically than made? ☐
10. If production schedules slip, what are the ramifications? ☐

9. Quality control

1. Will the product meet the quality standards of the company? Of the customer? ☐
2. What test equipment will be required for single-shift operation? ☐
3. What additional equipment will be needed for extra shifts? ☐
4. What environmental test requirements are called up? ☐
5. How will you meet these tests? Existing equipment? Added capital equipment? Subcontracting? ☐
6. What will it cost? Who pays for this? ☐
7. What will be the extent of incoming component testing? Is this charged to the project or to overhead? ☐
8. Can quality control testing on this product be handled with existing staff and methods? ☐
9. Are there unusual reliability specifications that require special test techniques or prolonged test cycles? How much will this cost? Is this cost recoverable directly from the customer? ☐

10. Financial considerations

1. What are the total estimated program costs from first study phase through to final production? ☐
2. Is working capital adequate to finance the entire program? What capital will be tied up in inventories and accounts receivable? ☐
3. How long will it take for the new product to reach a break-even basis? ☐
4. What is the long term profit outlook for the new product? ☐
5. What is the total cost of capital equipment required? ☐
6. How is the product usually sold? Cash? Progress claims? Down payment? On an installed basis? Consignment? ☐
7. Will there be profit limitations imposed by the customer? ☐
8. What would be the effects of penalty clauses on this contract? ☐
9. Is this a "crash" program? If so, what additional costs should be anticipated? ☐
10. How will costs be affected by volume? ☐
11. What margin will be allowed in the price for mark-downs, inventory losses, etc.? ☐
12. Are transportation costs significant? Packing? ☐
13. Do you have adequate warehousing, inventory procedures, cost accounting, and reporting for effective control? ☐
14. On what basis will development and engineering be amortized? ☐
15. What patent or legal problems may be anticipated in the manufacture, sale, distribution, or installation of this product? ☐

11. Pricing the new product

1. What are the prices of competitive products? ☐
2. What are the forecasted design and development costs? Tooling costs? Other startup costs? Factory production cost? ☐
3. What other costs will exist? Sales costs, overhead, credit, interest, service, insurance, installation, technical services, etc.? ☐
4. What cost increases must be allowed for foreign distributors' markup? ☐
5. What element of the final price is represented by the amortization of development and engineering costs? How was this arrived at? ☐
6. What element of price will be set aside for product improvement and/or new product development? ☐
7. How much is included in price for warranty? ☐
8. If sold on an installed basis will cost of installation be included in the price? ☐
9. What is the break-even point? What margin is required for profit? What is the maximum price for which the product can be sold? ☐
10. Have you determined what class of customers will be entitled to discounts and allowances? ☐
11. Have you worked out the schedule of discounts and allowances? ☐
12. Have you established policy with respect to F.O.B. point, customer acceptance, cancellation, credit, collections, returned goods, damaged or unsatisfactory items, etc.? ☐
13. If a military product, has it been funded at planning level? At procurement level? ☐

12. Promoting the new product

1. Will this product be advertised? In what media? What will it cost? ☐
2. What special shows, exhibits or displays will be required for product promotion? What will this cost? ☐
3. What will be the cost of catalogs, salesmen's portfolios, point of sale material, mats, etc.? ☐
4. Do you have an existing advertising department and/or agency that can handle this product? ☐
5. What advertising and sales promotion support will be given to distributors, dealers, agents? ☐
6. Will you have a cooperative advertising program? What will this cost? ☐
7. Will the product be sold in export or foreign markets? What additional costs may be expected as a result? (Language problems, different methods, etc.) ☐
8. How will he advertising budget be determined? Percentage of expected sales? An arbitrary amount? Other? ☐

13. Selling the new product

1. To whom will the product be sold? ☐
2. In what geographical areas will the product be sold? ☐
3. What sales volume can be expected this year? Next year? Thereafter? ☐
4. Will the product sell evenly throughout the year? If not, what inventory must be carried? At what cost? ☐
5. What sales distribution methods will be used? ☐
6. What change in the present sales force will be needed? What will this cost? ☐
7. Will the sales force work out of the home office? ☐
8. Will it be necessary to change the present method of compensating salesmen? ☐
9. What sales, service, customer or distributor training programs will be necessary? What will this cost? ☐
10. Will it be necessary to add additional sales, administrative or executive staff to cope with the product promotion and sales? What will this cost? ☐
11. Do you have adequate staff to cope with market research, sales forecasts and sales budget control? ☐
12. Will it be necessary to add people or provide extra training for service department personnel? What will this cost? ☐
13. Will there be an increase in spare parts inventory, tools and test equipment? ☐
14. Are your plans for attaining sales objectives and measuring sales performance realistic and adequate? ☐
15. Have you counted the cost of the "missionary" work you may have to do in introducing this new product? ☐
16. What political, geographic or economic factors could affect this product's sales possibilities or life expectancy? ☐
17. Can the product be licensed for foreign manufacture? ☐
18. If so, can the licensee coordination be handled by existing staff? ☐
19. What additional direct sales costs will there be in serving foreign markets? ☐
20. What additonal agents' or distributors' commissions will have to be paid? ☐
21. What Government approvals must be obtained? ☐
22. Have you considered the cost of sales demonstrations, customer evaluations, test marketing, trade shows and other sales promotional methods? ☐

14. Servicing the new product

1. Will the product require service? ☐
2. Who will provide the service in each geographical area? The company? A subcontractor? The customer? ☐
3. Will additional test equipment be required? ☐
4. Will service training be required? ☐
5. Will it be necessary to maintain spare-parts stocks? For how long? In what area? ☐
6. Can service repair, warranty, spare-parts inventory, fault-return analyses records, etc., be maintained with existing staff? ☐
7. Is product service an obligation of the company or will costs be recovered by a service contract? ☐
8. If a company obligation, have you considered total added operating costs? This year? Next year? Have these costs been included in the product price? ☐

15. Top management

1. Does this product fit into the corporate long-range plans and management new product objectives? ☐
2. Do we have a complete program plan with time and cost check and decision points? ☐
3. Are there sufficient company controls to ensure continuous and careful monitoring of this plan? ☐
4. Does everyone completely understand and accept his role in new product planning and development? ☐
5. Do we have sufficient management experience and judgment in all concerned areas to ensure success? Do we need the advice of an outside consultant? ☐
6. Can we regain all development and promotion costs and have a reasonable profit over the lifetime of this product? ☐
7. If not, are there other related products following which will permit full cost and profit recovery? ☐
8. What has been our company experience in similar areas? ☐
9. What additional skills and abilities do we acquire as a result of this new product development? ☐
10. Does the product use equipment and/or personnel who would otherwise be idle with the present shop load? ☐
11. Will the rate of technological change quickly make this product obsolete? ☐
12. What is the degree of risk in this program? Would company executives finance it if it were their own money? ☐
13. Do we have a clear idea of the total costs involved in this new product development? What is total required capital investment? Over what period? ☐
14. What management contingency should be allowed for overspending or unanticipated costs? ☐
15. Is expenditure for the product justfied in relation to other company expenditures? ☐
16. Can we produce the product in time to market it at the right moment, considering present and projected plant load? ☐
17. Is there a possibility of patent infringement? ☐

16. From the customer's viewpoint

1. Will the product meet the need I have right now? Or will have in the future? ☐
2. Will it do it better? At less cost? Will it save time and effort? ☐
3. Will it be delivered on time to meet my needs? ☐
4. Can I depend on this company for quality products, on time deliveries, service support, competitive prices and good working relationships? How does he compare with his competitors in this respect? ☐
5. Does this company have the long-term stability and financial resources necessary to protect my purchase investment? ☐
6. Can I secure more favorable terms elsewhere? ☐

Epitaxial growth

Continued from page 29

Film thicknesses were measured by delineating the change in resistivity between the substrate and the film. Experiments were also conducted on pulse-plating to delineate this resistivity change.

Quite startling effects regarding the structure of the films can be noticed when large temperature gradients are enforced on the substrates.

Measurement of resistivity of the films has posed many problems inasmuch as conventional 4-point probe techniques are not readily adaptable. One of the techniques giving good results is that of actually making devices, plotting BV_{CBO} versus C_{ob} and interpolating to obtain the resistivity of the film.

Devices made from the grown films have shown that the degree of control over this process is as outlined in this report. Figures 2, 3, 4, 5, and 6, show the story of progress in the design and construction of Mesa transistors. The 2N834 silicon NPN mesa transistor is now widely known; the 2N828 germanium mesa is now being introduced; and other new devices have been made and will be issued when they achieve the production capabilities and reliabilities of presently released devices.

Automated soldering machine

Item 946

Semi-automated or completely automated soldering is now possible on many components produced in and for the electronics industry with Kester's universal soldering machine—SD-4 Model 1.

Kester Solder Co. of Can. Ltd., 51 Bruce St., P.O. Box 1012, Brantford, Ont.

Syntron power point

Item 947

Syntron power point, a silicon bridge rectifier developed by the Syntron Company, allows average savings of 30 per cent in cost and from 50 per cent to 70 per cent in space when compared with similarly-rated conventional silicon stacks.

Corrosion-resistant marine alloy fins serve dual purpose of electrical contact and heat sinks. Power Point ideally replaces selenium rectifier stacks in applications where minimum space and inherent advantages of silicon over selenium are desired.

Syntron (Canada) Ltd., Box 10, Stoney Creek, Ontario.

High megohm bridges

Item 948

Mid-Eastern Electronics, Inc., recently announced the marketing of its new Model 801 and Model 802 Bridges, both meticulously designed for accurate measurement in the Ultra High Resistance ranges.

The Model 801 Bridge is a self-contained unit complete with built-in battery power supply (O=250 volts DC), electrometer amplifier galvanometer and nine plug-in-ratio arms. No auxiliary equipment is necessary and the bridge can be made ready for operation in only ten seconds.

Willer Engineering & Sales Co., 676 Richmond Street West, Toronto 3, Ont.

Voltage reference standard

Item 949

The Viking series 230 voltage reference standards are designed to provide DC output reference voltages having a temperature coefficient of ± .001 per cent/°C from —25°C to +75°C with a regulation of ±.001 per cent for ±10 per cent input changes.

Thetse units operate directly from unregulated DC power sources and supplement the existing line of AC operated voltage reference standards now in production at Viking Industries. Output voltages of 5.7, 8.5, and 10.5 VDC are available.

Douglas Randall (Canada) Ltd., 126 Manville Road, Scarborough, Ontario.

CRTPB newsletter

Prepared by the Canadian Radio Technical Planning Board

Frequency Changes in Maritime Mobile Service

The Department of Transport has announced that the International Telecommunications Union International Radio Regulations were revised at an Administrative Radio Conference in Geneva during 1959 with the new regulations to become effective in May this year.

The Geneva Radio Regulations' changes in the use of frequencies involve radiotelephone and radiotelegraph operations in the Maritime Mobile Service bands between 4 and 27.5 megacycles. This affects Canadian coast stations and ships licensed by the Department of Transport.

Equipment design improvements in recent years provided for an additional family of frequencies at 4, 8, 12, 16 and 22 megacycles. This required there be an adjustment of each existing frequency to a slightly higher frequency.

Working frequencies for Canadian passenger ships are affected also as a result of the Conference decision to provide frequencies for wide band telegraphy, facsimile and special transmission systems, also high traffic ship radio telegraph stations.

Requests for additional information should be directed to the Department of Transport, Telecommunications and Electronics Branch, Air Services Division, Ottawa, quoting file 5850-35-1.

DOT Advised of Voting Results on Specifications Stereo Broadcasting

The Broadcast Committee's final recommendations for FM Stereo Broadcasting Standards have been approved and the Department of Transport has been advised of the results of the Sponsor's ballot.

Telephone Channel Parameters

Approval was also given to the recommendations on Telephone Channel Parameters, as formulated by a special task force of the Microwave Committee.

RSS - 126 (Provisional)

The Land Fixed and Mobile Committee's recommendations on RSS-126 were given unanimous approval. The specification covers Land and Mobile Station FM or PM Radiotelephone Transmitters and Receivers operating in the 148.0 mc/s to 174.0 mc/s band with 30 kc separation.

Interim Recommendations on SSB Specification 122

The Department of Transport has acknowledged receipt of interim recommendations on the Single Sideband Specification RSS-122, which has been nearly two years in the making.

Informed sources indicate that two specifications could result. One would cover SSB equipment capable of compatible operation with convention AM equipment with the other covering equipment designed for single sideband operation exclusively.

New ITU Frequency Allocations Chart

The new Table of Frequency Allocations, covering 10 kc/s to 40 gc/s, has been published by the International Telecommunication Union.

The Chart is issued in accordance with No. 813 of the Geneva Radio Regulations (1959) and is as specified in Article 5 of those Regulations. The multi-colored chart is similar in form to that issued by the ITU general secretariat in accordance with the Atlantic City Radio Regulations (1947). Copies are available in English, Spanish, or French and may be ordered from the ITU General Secretariat, Palais Wilson, Geneva, Switzerland at 3.55 Swiss francs, payment with the order.

Other new publications announced by the ITU include the first editions of the List of Coast Stations, including the half-yearly supplements (530 pages, at 10. Swiss francs) and the List of Ship Stations (524 pages at 6.15 Swiss francs). A complete list of ITU publications, with prices, will be sent free of charge upon request to the General Secretariat in Geneva.

Frequency Assignments and Interference Problems

The Telecommunications and Electronics Branch of the Department of Transport has adopted a procedure for co-ordination of frequency assignments and interference problems resulting from adjacent communication and electronic installations.

engineers' book-case

Introduction the Statistical Dynamics of Automatic Control Systems by V. V. Solodovnikov.

Edited by John B. Thomas and Lofti A. Zadeh, this translation from the Russian fills the need for a text and reference work covering the field of statistical smoothing and prediction theory by developing a general theory of a highly important class of automatic control systems: those subject to probabilistic or random signals. In developing this theory, Solodovnikov brings together the results of a great deal of research in this field that has until now existed only in scattered American and Russian scientific journals.

Dover Publications, 180 Varick St., New York 14, N.Y., U.S.A. soft cover edition; 307 pages; price: $2.25.

Photoconductivity of Solids by Richard H. Bube.

This is the first book to offer a comprehensive analysis of the photoconductivity of solids. It represents an important addition to the engineering literature as a basic tool in all solid-state research. It provides a unified physical description and interpretation of photoconductivity phenomena, drawing examples from many kinds of materials. In addition, the correlation between photoconductivity and other related phenomena in insulators and semi-conductors are discussed.

John Wiley & Sons, Inc., 440 Fourth Avenue, New York 16, N.Y., U.S.A.; hard cover edition; 461 pages; price: $14.75.

World Aircraft Illustrated edited by John Underwood.

This fact-filled volume contains an outstanding collection of photographs and information of the 1960-61 civil and military aircraft of the entire world, including those of the Iron Curtain countries. Data is also included on a number of small planes that are available in "kit" form for amateur builders.

Beneath each photo is information about manufacturer's name and address, type of aircraft and construction, type of powerplant, number of crew and passengers, wing span and area, cruising and maximum speeds, and a brief history of the aircraft, etc.

Aero Publishers, Inc., 2162 Sunset Blvd., Los Angeles 26, California, U.S.A.; Morocco-bound edition; 248 pages; price $8.50.

How to locate and Eliminate Radio and TV Interference, Second Edition, by Fred D. Rowe.

Its content reflects the latest techniques applicable to the location and elimination of radio and TV interference. New and improved electronic components are discussed at length, and their applications analyzed. Of special significance is the discussion of the newest FCC rules and regulations covering this phase of broadcasting.

John F. Rider Publisher, Inc., 116 W. 14th Street, New York, N.Y. U.S.A.; soft cover edition; 168 pages; price: $2.90.

Introduction to Electrical Engineering Science, by Harold A. Foecke.

This is a comprehensive and unified engineering scientific approach that presents the whole field of electrical engineering as an orderly and rigorous structure based on a relatively small number of essential basic principles. Representing a significant departure from tradition, it uses an integrated engineering science approach that gives the student a balanced, over-all view of the field which will serve as a constant frame of reference throughout his professional career. It is designed to be flexible in two important respects: various chapters or parts can be dropped to conform to local needs and conditions; and a considerable number of problems are deliberately designed to serve as springboards for the discussion of specialized topics and applications which could not be treated in the text material itself.

Prentice-Hall, Inc., Englewood Cliffs, New Jersey, U.S.A.; hard cover edition; 778 pages; price: $15.65.

Theoretical Hydrodynamics (Fourth Edition) by L. M. Milne-Thomson.

General aim of this book is to give a thorough, clear and methodical introductory exposition of the mathematical theory of fluid motion, which will be useful in applications to both hydrodynamics and aerodynamics.

Included in this new edition are the formulae of Plemelj for solving certain boundary value problems; a systematic discussion of flow under gravity with a free surface including the method of "tangent flows"; an exact treatment of the surface wave of constant form and the "exact" linearized theory which flows from it; and an account of some comparison theorems.

The Macmillan Company of Canada Limited, 70 Bond Street, Toronto, Ont.; hard cover edition; 660 pages; price $11.25.

Scatter matter

Scanning the international scene

The first of IBM's newest line of high-speed computers to be produced in Europe has been delivered by IBM France. The solid state 7070 system left the Essones plant to join a fleet of other IBM computers and accounting machines at the Renault works near Paris, the world's sixth largest automobile manufacturer.

Visitors from universities, industry and nuclear establishments throughout North America showed great interest in portable contamination monitor displayed by EMI Electronics Ltd., Hayes, Middlesex, England, at the Health Physics Association Convention in Las Vegas, Nevada. This was the only instrument in the exhibition which employed dual phosphor techniques.

The translation from Russian to English at 60,000 words an hour was publicly demonstrated in Washington, D.C. on June 28, for the first time on a C-E-I-R 7090 computer, through activation of all 12 magnetic tape drives with each tape containing hundreds of thousands of word characters.

Two years to the day after the Japanese newspaper Asahi Shimbun began production on the world's first daily facsimile newspaper using the Muirhead Page Facsimile equipment. Yomiuri Shimbun, the second largest Japanese newspaper, went into print with their facsimile edition — again using Muirhead equipment.

As part of the British Railways modernization program its northeastern region is to be equipped with a super-high-frequency multichannel radio telephone system between York and Newcastle via Darlington — a distance of 78 miles. This will be the first multichannel radio telephone and telegraph installation to be used by British Railways. The radio equipment is to be supplied and installed by Marconi's Wireless Telegraph Co. Ltd., and the carrier equipment by Automatic Telephone and Electric Co. Ltd. The system is designed for a maximum capacity of 300 telephone channels, but initially 180 will be in operation.

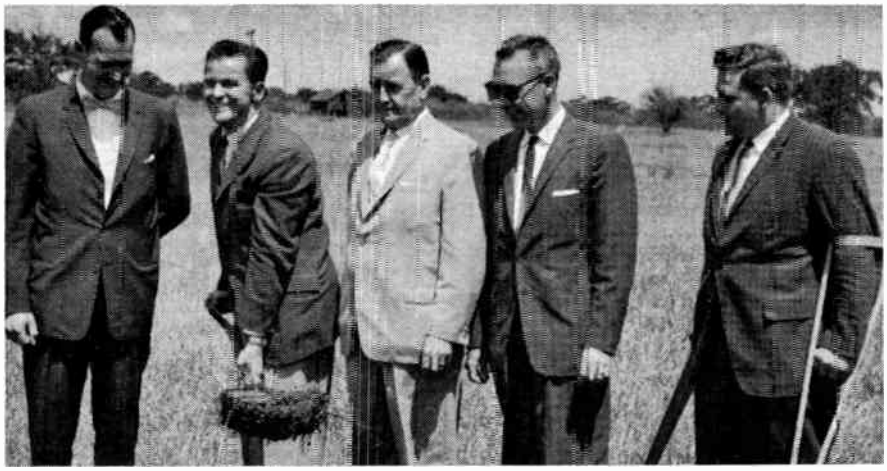
Pye-Ling Limited, Stanmore, England, has been organized by Ling-Temco Electronics, Inc., Dallas, Texas, and by Pye Limited, Cambridge, England, to take advantage of the growing market for environmental test systems in Europe. This pooling of technical know-how is expected to give Pye-Ling Limited a capability unmatched by any other manufacturer in the electronics field.

The Federation Nationale des Industries Electroniques, Paris, France, announced the 1962 International Exhibition of Electronic Components will take place in Halls 50-58, Parc des Expositions, Porte de Versailles, Paris, on February 16-20, 1962. This international exhibition is open to foreign exhibitors, but anyone intending to register should do so as soon as possible because of space limitations. Application forms are available from the administration.

Three ships of the Holland-Amerika line are to be equipped with Racal Ra.102 LF/HF communications receivers. Orders have been placed through Racal's agents in Holland, Koning and Hartman N.V., for the equipments, which are to be installed in the motor ships *Grotedijk, Grebbedijk* and *Gorredijk*. These three ships due to be commissioned in April, May and September next year will be the latest of the Holland-Amerika passenger fleet.

Daystrom, G.m.b.H., Frankfurt, West Germany, received an order in excess of $400,000 for precision electrical and electronic components manufactured by Daystrom's Transicoil Division and Military Electronics Division, both in Pennsylvania, U.S.A. The order is part of a NATO procurement project for European defense.

A Marconi-Siebe, Gorman underwater TV camera will be used by the Suez Canal authority to examine the underwater condition of the canal and the entrances to Port Said and Suez harbors. It is believed that much of the damage caused to the cutting teeth of canal dredgers by submerged debris and the delay in repairing time, will be eliminated when the underwater TV equipment is in use.



Turning the first sod for the new Pyle-National (Canada) Ltd. plant in Clarkson are: (left to right) Ian Morrison, vice-president Pyle National; Robert Harrison, vice-chairman, Toronto Township Industrial Committee; Wm. Courtenay, industrial commissioner; Edward Law, chief building inspector; Carl Madgett, assessment commissioner — all of Toronto Township. Pyle-National will manufacture and distribute electrical connectors, lighting equipment, fittings, etc.

CNT purchases Hay River exchange

The Hay River Telephone Service has been purchased by Canadian National Telecommunications, and full-time operation was assumed July 1. This marks the first step in a plan to expand communications in the Great Slave Lake area of the Northwest Territories.

Hay River now becomes the focal point for a communications network extending north to Yellowknife and southeast to Fort Smith. Nerve-center for the network will be a new telecommunications repeater station currently under construction at Hay River.

Canada's new motor racing circuit installs Philips sound equipment

On June 24, thousands of motor racing enthusiasts headed for the 500 picturesque rolling acres north of Bowmanville for the official opening of Mosport Park, Canada's new motor racing circuit which compares favorably with the best in the world.

When final plans are completed, Mosport is expected to become one of Canada's great tourist attractions. Philips Appliances Ltd., 116 Vanderhoof Ave., Toronto, will provide the park with taped musical programs to be used between races.

The sound system comprises two separate units; one feeding sound to selected areas around the perimeter of the course and the other system quite independently serving the pit and paddock area and intended for feeding instructions to the drivers and crews.

For the track area, eight 120 watt amplifiers are required to feed the 60 sound columns located around the course. Into this system is connected the master microphone at the control tower along with the tape recorder for supplying music. A second microphone serves 12 more sound columns in the starting pit area through the use of two 120 watt power amplifiers.

Fleetwood announces increased sales

Sales of Fleetwood Corporation for the first half of 1961 were 10 per cent ahead of the corresponding 1960 period, according to M. F. Pollock, president.

Sales for 1960 totalled $11,381,423.

Canadian firms participate in ISA Conference at Los Angeles

Eighteen Canadian firms will participate in the Instrument-Automation Conference and Exhibit of the Instrument Society of America which will be held in Los Angeles, California, September 11-15, 1961.

This also is the first occasion that Canada will officially be represented at the ISA Conference. The Canadian display is being designed and prefabricated by the Canadian Government Exhibition Commission in Ottawa, and it will occupy an island stand approximately 2250 square feet in area.

The Canadian firms and their products to be exhibited include:

Atomic Energy of Canada Limited, Ottawa; ½ scale model of Gamma Cell.

Canadian Applied Research Limited, Toronto; stationary and portable magnetometers, automatic tri-film processors, recording cameras, ice detection system (aircraft).

Canadian Arsenals Limited, Ottawa; aerial camera lens in mount, range-finder sight, special windows (glass quartz, infra-red), samples of lenses, prisms and prism assemblies.

Canadian Marconi Company, Montreal; doppler navigation system, doppler computer, frequency synthesizer, photos of microwave equipment.

Canadian Patents and Development Ltd., Ottawa; densimeter, method of increasing the resolving power of optical instruments, infra-red heavy water analyser, pressure head for depth measurement.

Canadian Westinghouse Co. Limited, Hamilton; Linatrol, K-band test set, missing pulse indicator, ballastic range telemetry systems, anti-submarine torpedo, minecom.

Computing Devices of Canada Limited, Ottawa; PRI Mk. 4, photographic reconaissance system.

Fischer Bearings Manufacturing Co. Ltd., Stratford, Ontario; precision ball bearings.

George Kelk Limited, Don Mills, Ontario; shaft position coders, stedivolt A C line voltage regulators.

McPhar-Roberts Limited, Don Mills, Ontario; soniscope concrete testers; eddy wire rope testers, audio frequency magnetic detector.

National Semi-Conductors Limited, Montreal, P.Q.; photoconductive cells.

Needco Cooling Semiconductors Ltd., Montreal, P.Q.; laboratory coolers, thermoelectric baffle.

Nuclear Enterprises Limited, Winnipeg, Manitoba; scintillation spectrometers, berylometer and counter, moisture meter, transcint, air sampler, pulse shape discrimination instruments, universal radiation meter, isotope analyser, pocket dosimeter, polythene phantoms, selection of scintillators.

Oki & Willadsen Limited, Toronto; three display panels of modules and printed circuitry.

Sirco Products Limited, Vancouver, B.C.; precision control switches.

Sharpe Instruments of Canada, Willowdale, Ontario; live control earphones, self potential resistivity unit, ground voltameter, electro-magnetic unit, magnetometer, auditory trainer, language laboratory.

Sperry Gyroscope Co. of Canada Ltd., Montreal, P.Q.; automatic circuit and cable tester.

Timewell Controls Limited, Calgary, Alberta; automatic control and data equipment for the petroleum industry.

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.

HELP WANTED

DESIGN AND PRODUCTION ELECTRONIC ENGINEERS

Applications are invited from junior to senior engineers with experience in the following fields: Communications, Broadcast Equipment, Computers, Airborne Equipment, and Field Service Broadcast Equipment. These openings range from junior engineering position requiring one to three years' experience to senior appointments requiring a minimum of 6 years' experience.

Starting salary commensurate with experience and ability. All applications will be considered in complete confidence. Apply in writing, giving full resumé of experience, to:

Professional Employment
Canadian General Electric Co. Ltd.
830 Lansdowne Avenue, Toronto 4, Ontario

BRANCH MANAGER

Large western electronic distributor requires executive-minded man to manage one of the company's branches. Must have good sales background in electronic industry plus ability to manage and supervise staff. Oustanding opportunity for right man with unlimited future. Remuneration — salary plus bonus. Must be willing to relocate.

Apply in writing, giving full details of previous employment, salary expected, education, etc., to:

Box 5086
Electronics and Communications
450 Alliance Avenue, Toronto 9, Ontario

SALES ENGINEER

V.H.F. TELECOMMUNICATIONS

Salary, Commisson, Expenses and car provided.

TORONTO AREA.

Box 5087
Electronics and Communications
450 Alliance Avenue, Toronto 9, Ontario

DESIGN ENGINEERS AND TECHNICIANS

Expanding instrumentation company with world-wide associations requires design engineers, electronics and electro-mechanical technicians to design and construct a wide range of ground and airborne instruments and sensing systems for geophysical, defense and industrial control use, involving work in frequency spectrum of U.V. to D.C., both high power and low power. Transistor and printed circuit experience desirable. Please apply:

Box 5085
Electronics and Communications
450 Alliance Avenue, Toronto 9, Ontario

QUALIFIED ENGINEERS

required for product design of VHF radio communications equipment. Salaries commensurate with qualifications and experience. Apply in writing to:

Mr. K. R. McLeish
Canadian Motorola Electronics Company
105 Bartley Drive, Toronto 16, Ontario

SALES ENGINEER

Required by well established representative of Canadian and American manufacturers to sell relays, semiconductors, wire wound inductances of all types, and other components to electronics manufacturers in the Toronto area. Sales and technical experience essential. Excellent remuneration for mature and responsible individual. Write giving details to:

Box 5076
Electronics and Communications
450 Alliance Avenue, Toronto 9, Ontario

FIELD SALES MANAGER

Required by nationally known, Toronto based, company of manufacturers' representatives and electronic distributors. (Electronic Components and Instrumentation.)
Must have good technical background plus Canadian Electronic Industry sales experience. Ability to lead a competent field sales force essential.
Send full details of background and salary required in confidence to:

Box 5081
Electronics and Communications
450 Alliance Avenue, Toronto 9, Ontario

COMMUNICATIONS SALES

Sales Engineers required to sell Rogers Majestic Mobile Communications Equipment. Toronto based and Montreal based territories open.

University or Technical School graduate with 3 years selling experience in this or allied fields.

Salary open, Car plus generous bonus system.

Reply in confidence to:

Mrs. S. M. Graham,
Philips Electronics Industries Ltd.,
116 Vanderhoof Avenue, Toronto 17

POSITIONS REQUIRED

COMPONENTS ENGINEER

wants responsible position; 10 years experience in magnetic components, especially in commercial and military transformers — design, production, quality control and sales.

Also experienced in general components evaluation and classification.

B.Sc. degree, age 40, and married.

Box 5084
Electronics and Communications
450 Alliance Avenue, Toronto 9, Ontario

SALES ADMINISTRATOR AVAILABLE

Experience at both manufacturing and distributor levels with thorough knowledge of electronics industry coast-to-coast. Excellent reasons for considering re-location although not necessarily immediately.

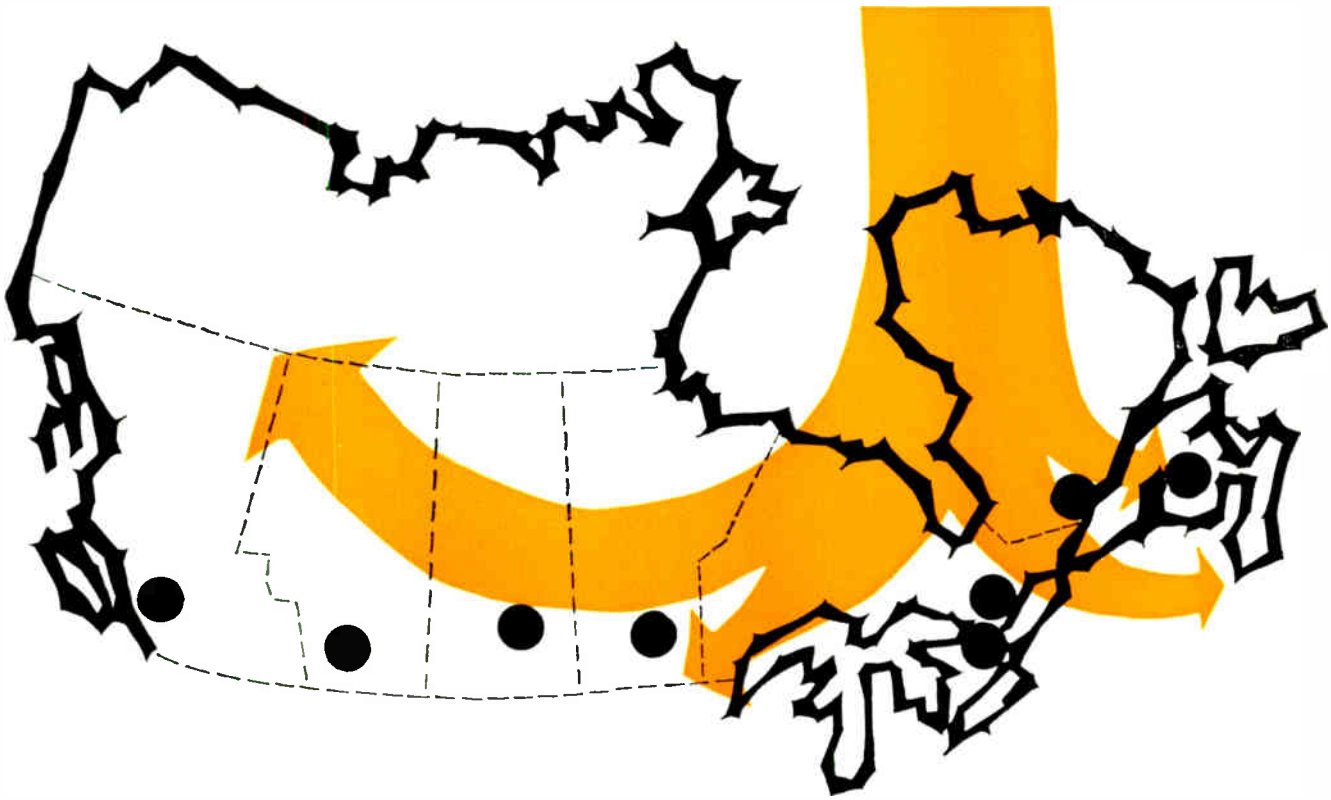
Box 5082
Electronics and Communications
450 Alliance Avenue, Toronto 9, Ontario

ELECTRONIC TECHNOLOGIST

Ryerson graduate, 5 years experience: assist in design, building, testing calibration, trouble-shooting, electrical, electronic controlled automatic machines, instruments, some computer experience. Speaks five languages, age 27, and single. Presently employed, desires more responsible position. Will travel Canada, USA and overseas.

Box 5083
Electronics and Communications
450 Alliance Avenue, Toronto 9, Ontario

LOOK TO **FEDERAL** FIRST



FOR "FULL" SERVICE ACROSS CANADA!

Wherever the name FEDERAL appears . . . on building wire, magnet wire, power cable, communications or specialized applications covering every utility and industrial requirement, Canadian users agree it's Federal first for quality and rugged performance.

Federal's exhaustive product testing during manufacture is just one phase of the "full" service in wire and cable offered. "Full" service also means engineering by Federal which saves your company money. Such as the Magnet Wire "Pay-off-Pak," spools in every convenient size; and wires and cables manufactured with care and precision to meet every safety and performance demand of Canada's complex electrical, electronic and power industries.

To ensure fast delivery of wire and cable—when and where it is required—a full range of standard types are maintained in ten strategically-located centres from coast to coast. Regional management personnel can serve and assist you right on the job. For details of Federal's "full" service write to: Federal Wire & Cable Division, Guelph, Ontario . . . or to the Federal office in Vancouver, Calgary, Regina, Winnipeg, Guelph, Toronto, Montreal, Moncton.

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325 10th Avenue West, Calgary Alta.

TORONTO—W. M. Wilson
1396 Martingrove Rd., Rexdale,

QUEBEC & THE MARITIMES—F. D. Cobbett
5625 Pare Street Montreal 9, P.Q.

FEDERAL WIRE & CABLE DIVISION

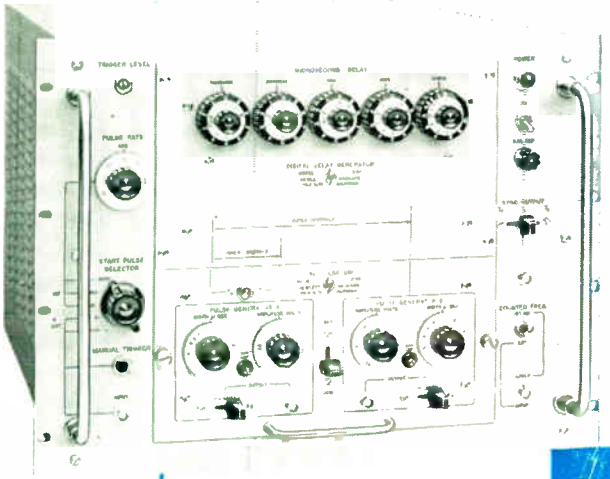
H.K. PORTER COMPANY (CANADA) LTD.

6007

PORTER SERVES INDUSTRY with steel, rubber and friction products, asbestos textiles, high voltage electrical equipment, electrical wire and cable, wiring systems, motors, fans, blowers, specialty alloys, paints, refractories, tools, forgings and pipe fittings, roll formings and stampings, wire rope and strand.

For complete details check No. 26 on handy card, page 35

MEASURE TIME; 0.1 μsec ACCURACY!



218AR Digital Delay Generator produces crystal controlled pulses accurately spaced in time. Pulses or time intervals are initiated by an internal rate generator or an external trigger. The instrument is thus both a digital delay generator and an extremely high accuracy laboratory pulse generator.

219A

219B

219C

Time measurement and pulse simulation in radar, loran, Tacan, DME, oscilloscopes, computers, fast gates, pulse code systems—almost any kind of time measurement single- or double-pulse simulation is now yours quickly and accurately with hp 218AR Digital Delay Generator.

Built along strict military standards, hp 218AR uses a pulsed crystal oscillator synchronizable in *constant phase* with an initial trigger pulse (zero time) to position the two terminating pulses. Time is counted with a 1 megacycle preset counter, and two independent output pulses are available in any relationship.

PULSE GENERATOR PLUG-INS

For utmost versatility, output pulses are generated in various arrangements by three plug-in pulse generators. These include hp 219A, supplying two positive pulses, hp 219B providing two pulses, each positive or negative and variable in amplitude, hp 219C, providing a high power pulse, positive or negative, digitally controlled as to delay and duration, variable in amplitude.

Condensed Specifications

(Basic 218AR Generator; plug-ins essential)

Time Interval Range:	1 to 10,000 μsec
Accuracy:	± 0.1 μsec ± 0.001%
Digital Adjustment:	1 μsec steps, full range
Interpolation:	Variable 0 to 1 μsec
Input Trigger:	Internal 10 cps to 10 KC; External 0 to 10 kc pulses, also sine wave
Jitter:	0.02 μsec or less
Recovery Time:	50 μsec or 10% of interval, whichever is greater
Sync Output:	50 v pos. pulse, 0.1 μsec rise time
1 MC Output:	1 v pulses, 500 ohm impedance
Price:	-hp- 218A, $2,000.00 -hp- 219A Dual Trigger Unit, $100.00 -hp- 219B Dual Pulse Unit, $450.00 -hp- 219C Digital Pulse Duration Unit, $350.00

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

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Field representatives in all principal areas

5626-R

hp World leader in precision electronic counting

For complete details check No. 19 on handy card, page 35