Wire network for SAGE (See story page 5).

electronics and communications

an age publication
NOVEMBER 1960

- Are we selling our defense industry short? - page 22

A 2-WAY SAVING

ON THE RESISTORS THAT ARE SETTING TODAY'S QUALITY STANDARDS

1. Now you can get resistors for today's most critical military requirements . . . direct from a Canadian Manufacturer . . . at favourable Canadian prices. They're Coldite 70+ Fixed Composition Resistors designed to exceed MIL-R-11 requirements and made by an exclusive cold moulding process that assures unmatched load life, moisture resistance, and other important performance characteristics.

2. No other resistors can match Coldite 70+ for production line efficiency — because their exclusive solder-coated leads makes them far and away the easiest resistors to solder by any method This saves your company money on their use.

Coldite 70+ Resistors are the latest development of a firm which, since the early days of radio, has been one of the largest, most dependable resistor suppliers. Laid end to end, the resistors Stackpole has produced would extend around the world so many times you'd get dizzy counting them!

Coldite 70+ Resistors are now made in Toronto by Canadian Stackpole Limited in the complete range of 5%, 10% and 20% "preferred" values in ½-, 1-, and 2-watt styles.

CANADIAN STACKPOLE LIMITED
550 Evans Avenue — Toronto 14, Ontario
Telephone: CLifford 5-2373

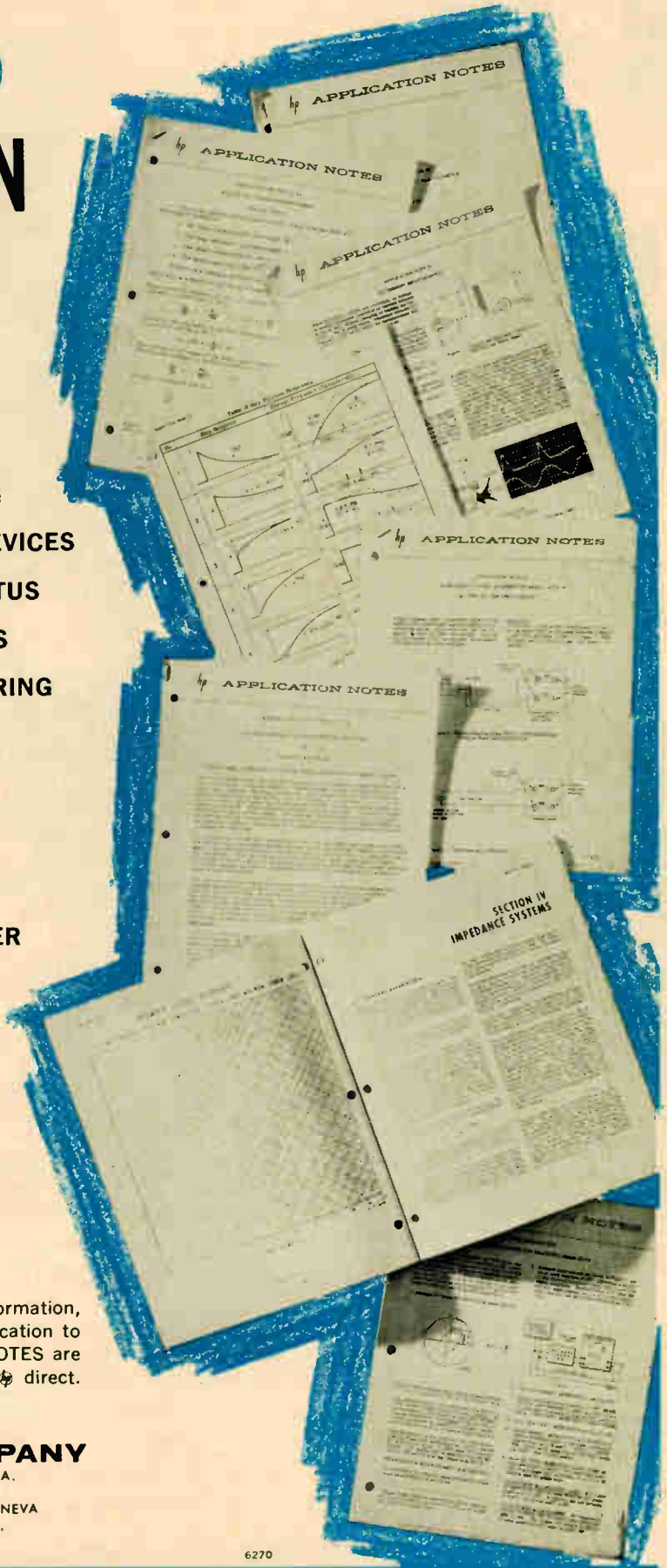
STACKPOLE
Coldite 70+®
fixed composition RESISTORS

For complete details check No. 10 on handy card, page 41

Which of these hp

APPLICATION NOTES

can help you?



#16 WAVES ON TRANSMISSION LINES

#17 SQUARE WAVE AND PULSE TESTING

#18 INTRODUCTION TO SOLID STATE DEVICES

#21 MICROWAVE STANDARDS PROSPECTUS

#27 BASIC MICROWAVE MEASUREMENTS

#29 CONVENIENT METHOD FOR MEASURING PHASE SHIFT

#30 MEASUREMENT OF CABLE CHARACTERISTICS

#34 AC CURRENT MEASUREMENTS

#36 SAMPLING OSCILLOGRAPHY

#37 MONITORING A RADIO TRANSMITTER SIGNAL WITH AN hp 120A OR 130B OSCILLOSCOPE

#38 MICROWAVE MEASUREMENTS FOR CALIBRATION LABORATORIES

#39 STANDARDS CALIBRATION PROCEDURES

#40 HEWLETT-PACKARD ELECTRONICS INSTRUMENTATION FOR TRANSDUCER APPLICATIONS

The above involve both theoretical and "how to do it" information, illustrated, complete, designed for swift practical application to your problem. These and all other hp APPLICATION NOTES are available by calling your hp representative, or writing hp direct. No charge, no obligation.

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hp instruments measure more swiftly, surely

For complete details check No. 21 on handy card, page 41

an age publication

electronics and communications

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

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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

Member Canadian Circulations Audit Board

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

CCAB

PRINTED IN CANADA
60

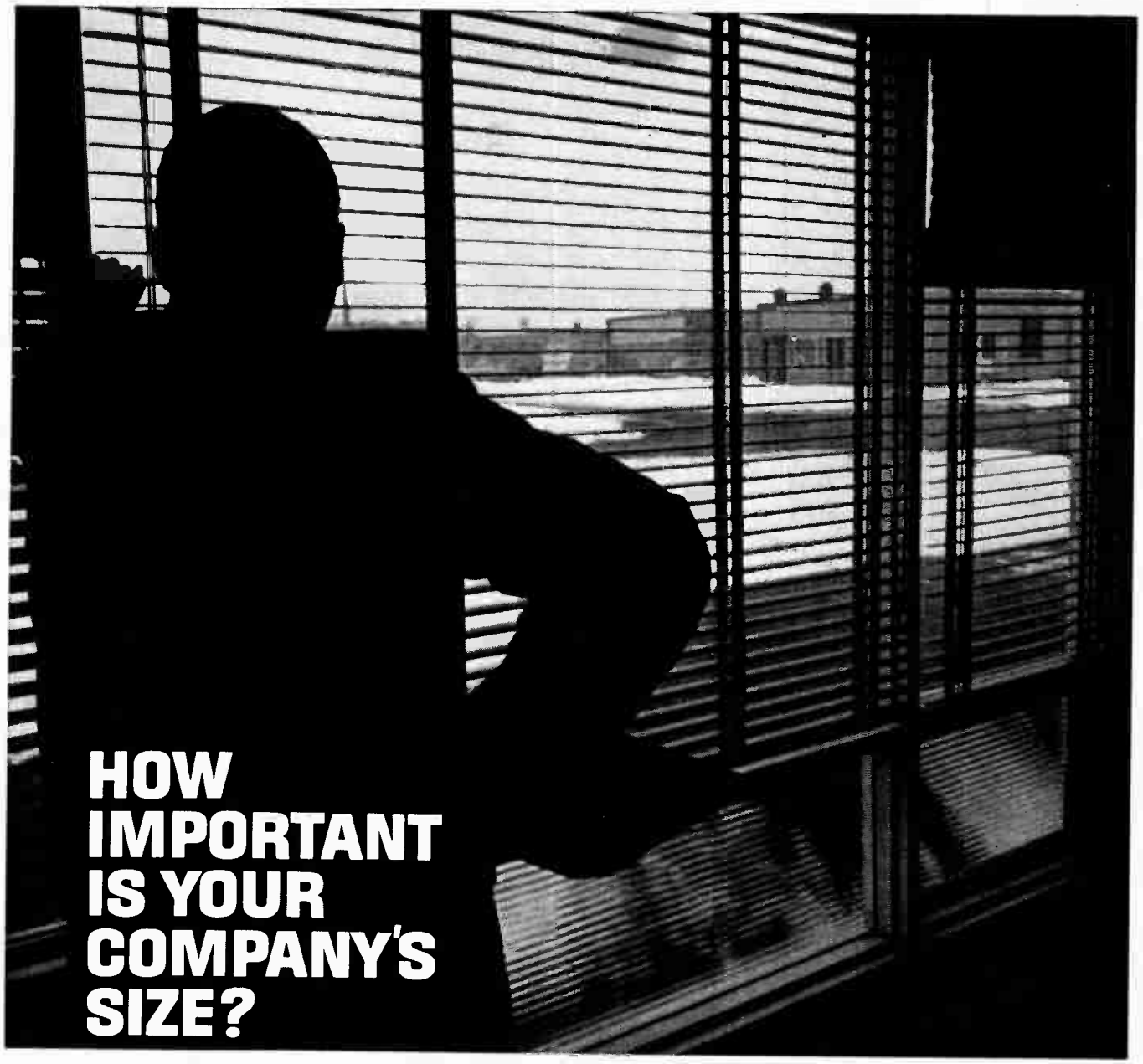
contents

NOVEMBER, 1960 Vol. 8, No.11

departments

COVER STORY

Our front cover illustration shows Raytheon Canada Limited employee Gael Schwartzentruber wiring in a section of harness cable for the SAGE network. This transistorized planned position indicator back door unit is used with the early warning SAGE system. The Waterloo firm is producing 60 such units for the U.S. Air Force under the joint United States-Canada Production Sharing Plan.



A recent experimental study, applying some techniques of motivation research to purchasing for business, indicates that there is somewhat of a preference among buyers for large suppliers.

The smaller company's problem is that of convincing the buyer that it can offer as much assistance as can the large supplier.

This leads to another problem: how can a small company effectively communicate that message to the host of men who make the buying decisions and to the "hidden" buying influences that salesmen cannot pinpoint?

Business publication advertising offers the most effective and economical solution. It gets your message right to the men you want to reach at a cost of only a few cents per contact.

Such advertising conserves the time of your sales organization in missionary work, keeps your company and product names in front of customers and prospects, helps to preserve successful relations with them.

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GET YOUR MESSAGE THROUGH CLOSED DOORS TO PEOPLE WHO SPECIFY AND BUY

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
COMPANY LIMITED

SERVES YOU BEST

2060-5

For complete details check No. 30 on handy card, page 41

EIA report

by R. T. O'Brien

Radio Imports and Unemployment

At a time when Canada's unemployment situation is getting so much attention every Canadian should be aware of facts and figures which relate to the cause of some unemployment — radio imports.

Employment in the Canadian electronics industry dropped 30 per cent between 1955 and 1960. Approximately 400,000 Japanese transistor radios were sold in Canada in 1959. These represented 1,185 jobs Canadians never had a chance to fill. A projection for this year indicates that 1,870 jobs will be lost to Canadians by the end of 1960.

The avalanche of Japanese electronic products continues to flood Canadian markets. The first quarter statistics from the Dominion Bureau of Statistics indicate that electronic exports from Japan to this country were nearly double the level of last year. In some categories, first quarter shipments were nearly as great as those during the entire year 1959.

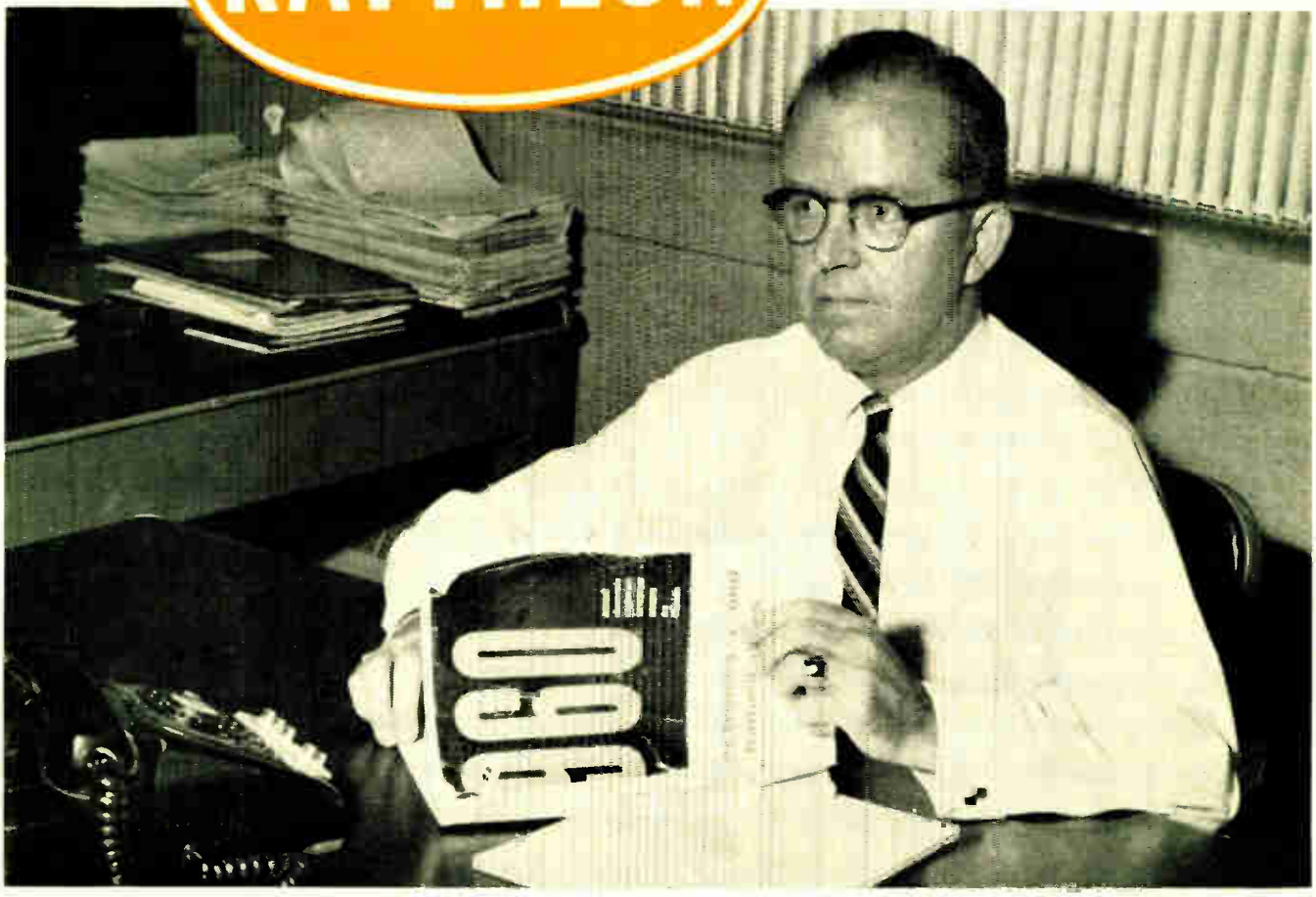
Forty-five per cent of all radios sold in Canada (Canadian produced plus imported) in the first five months of 1960 were of foreign origin. In the same period sales of Canadian produced radios dropped by nearly 12 per cent. It is of interest to note that there is no limit on the number of Japanese radios that can be landed in Canada. Japanese radio imports have increased 769 per cent (in declared value) since 1957 and are still climbing at a rapid rate. If this rate of increase in imports from Japan is maintained, and the rate of decrease on sales of Canadian produced radios continues, then **more radios of Japanese origin will be sold in Canada before the end of 1960 than the total number of radios produced in Canada.** The crux of the situation, of course, is the extremely low wage level for radio assembly labor prevailing in Japan. Radios are produced by Japanese earning from 12 to 16c an hour, a wage level which existed in this country some 60 years ago. In other words, a Japanese radio production worker receives as one day's pay about the same amount that his Canadian counterpart receives in one hour. This is the basic reason why Canadian radio manufacturers are unable to compete with Japan on transistorized radios.

Canadian radio manufacturers recognize that Canada must have two-way trade but feel that radio is carrying an unfair share of the imports. It is significant that, in the two-year period beginning 1957 when the increase in **all exports** from Japan to Canada was only 66 per cent Japanese exports of radios to Canada increased by a resounding 769 per cent.

Secondary manufacturing accounts for 45 per cent of all jobs in Canada, considering personnel employed in production, distribution, sales, and service. In an interview conducted recently the head of one firm responsible for a very large percentage of Japanese radio imports is reported in a prominent journal to have said, "The Japanese imports of transistors now make up 35 per cent of all the transistor sets sold in Canada and we would like to make it 100 per cent if we could." If this principle is carried to the point where prominent segments of Canada's productive capabilities are closed down, and 45 per cent of the labor force is added to the already alarming numbers of unemployed where would this gentleman find customers? An unemployed production worker simply would not spend his reserve savings on a radio — particularly on one which was responsible for his loss of income. Canadian jobs in secondary industry will simply cease to exist if imports continue to crowd out manufacturing.

James E. Coyne, the Governor of the Bank of Canada, has said, "Canadians have been spending too much money abroad to import goods that should be made at home to create employment for their fellow countrymen." Canadian consumers would be well advised to memorize the message prominently posted in the office of one of the largest trade unions in the electronic industry. It reads: **Buy Canadian-Made Products — The Job You Save May Be Your Own.**

RAYTHEON



"There is no better testimonial on the usefulness of the ELECTRONICS AND COMMUNICATIONS Directory than our rather tattered and dog-eared copy of last year's edition. Both my two buyers and I at Raytheon Canada Ltd. rely on it for immediate reference for sources of supply and we feel extremely positive of the service you are rendering the Canadian electronics industry by publishing such a complete and accurate buying guide."

RAYTHEON J. H. Bates

Purchasing Agent,
Raytheon Canada Ltd.,
Waterloo, Ontario.

electronics and communications

450 Alliance Ave., Toronto 9, Ontario — RO. 2-7225

DEADLINE for the 1961 edition of the Electronic Engineers Buyers' Guide for Canada is November 21st, 1960.

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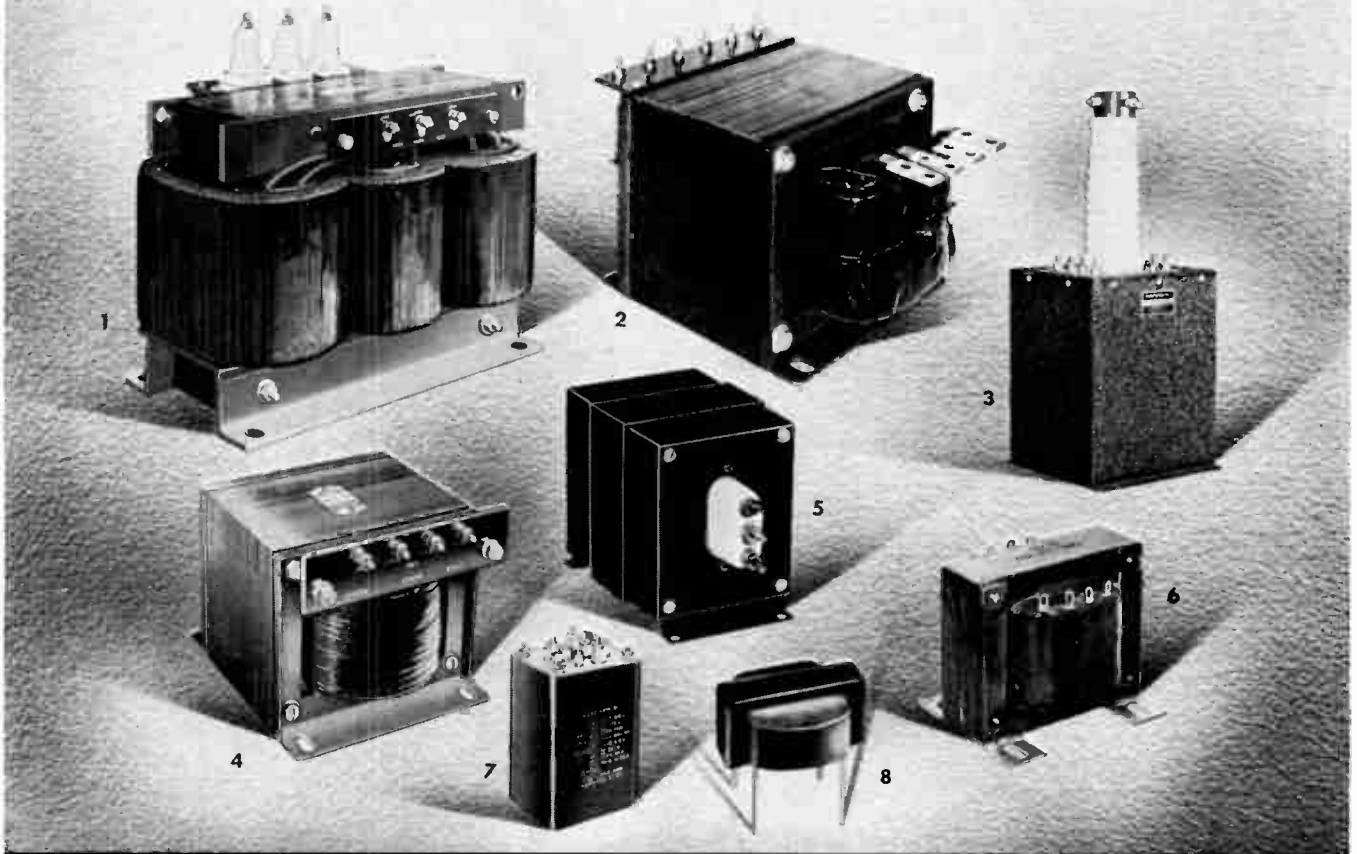
2. Heavy Current Transformers . . . for oil pipe line heating.
3. High Voltage Plate Transformers . . . for test purposes.
4. Power Transformers . . . for modern electronic circuits.
5. Rectifier, Filament Transformers . . . for industrial electronic equipment.
6. Encapsulated Types . . . Plate, Filament, etc. to 1600 cycles.
7. Military Transformers . . . to all specifications oil or epoxy filled.
8. Transistor Transformers . . . with solid leads or pins, for printed circuits.



Transformers to over 54,000 specifications

Hammond makes and stocks more than 1,000 items in ratings from a few millivolts to 40 K.V.A. and offers the experience and facilities to engineer special transformers as single units or in production quantities. Hammond has built transformers to more than 54,000 *different specifications.*

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ELECTRONIC TRANSFORMERS

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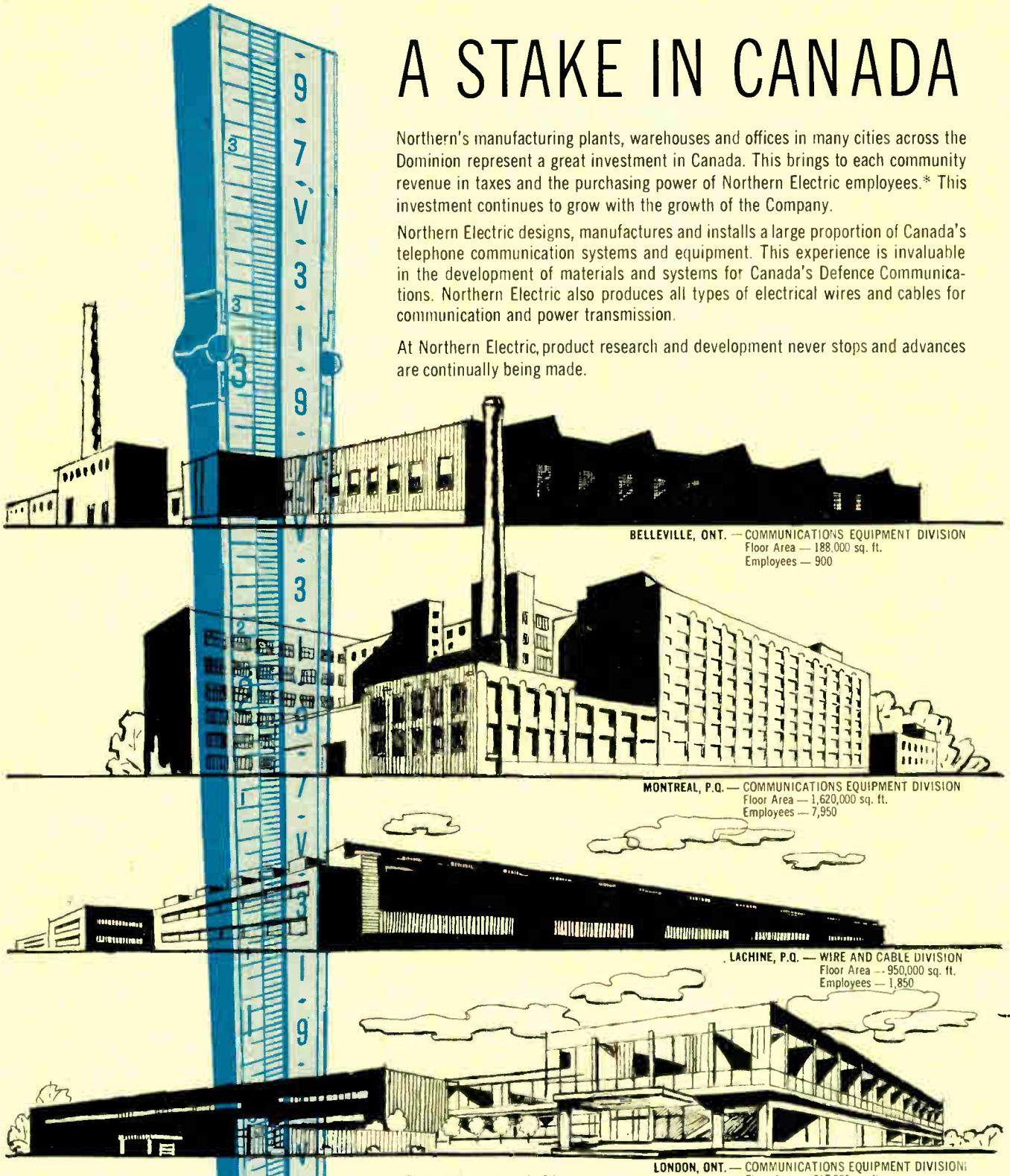
For complete details check No. 18 on handy card, page 41

A STAKE IN CANADA

Northern's manufacturing plants, warehouses and offices in many cities across the Dominion represent a great investment in Canada. This brings to each community revenue in taxes and the purchasing power of Northern Electric employees.* This investment continues to grow with the growth of the Company.

Northern Electric designs, manufactures and installs a large proportion of Canada's telephone communication systems and equipment. This experience is invaluable in the development of materials and systems for Canada's Defence Communications. Northern Electric also produces all types of electrical wires and cables for communication and power transmission.

At Northern Electric, product research and development never stops and advances are continually being made.



BELLEVILLE, ONT. — COMMUNICATIONS EQUIPMENT DIVISION
Floor Area — 188,000 sq. ft.
Employees — 900

MONTREAL, P.Q. — COMMUNICATIONS EQUIPMENT DIVISION
Floor Area — 1,620,000 sq. ft.
Employees — 7,950

LACHINE, P.Q. — WIRE AND CABLE DIVISION
Floor Area — 950,000 sq. ft.
Employees — 1,850

LONDON, ONT. — COMMUNICATIONS EQUIPMENT DIVISION
Floor Area — 317,000 sq. ft.
Employees — 200
(Ultimately, 1,000)

*Total including employees in Sales Division, Telephone Contract Division, Installation Department, Research and Development Department and Headquarters staff, 15,300.

MADE IN CANADA

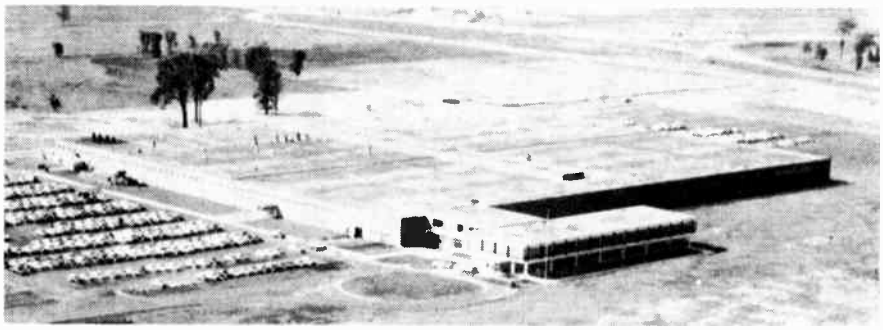
Northern Electric
COMPANY LIMITED

SERVES YOU BEST

6660-6R

For complete details check No. 29 on handy card, page 41

the industry's business



The new London Works of Northern Electric Company Limited which were formally opened on September 30 by Honorable J. P. Robarts, Q.C., M.P.P., Minister of Education for the Province of Ontario. The London Works will be an entirely self-contained manufacturing operation, producing telephone and outside plant apparatus all the way from raw material to the finished product.

Award-winning Scan Converters by Raytheon

Radar-to-TV Scan Converters for simultaneous read, write and partial erase of video signals are in production at the new Raytheon Canada Limited manufacturing plant in Waterloo, Ont. Winner of the 1959 Institute of Radio Engineers Award for outstanding achievement in new Canadian electronic products, several units are already in service.

Raytheon Scan Converters use a two-gun storage tube and output is radar in the form of EIA video for display on standard TV monitors, relay via TV microwave link recording on video tape and other functions.

An important feature of Raytheon Radar-to-TV Scan Converters is complete accessibility of components to facilitate servicing.

Northern Electric Opens London plant

The Honorable J. P. Robarts, Q.C., M.P.P., Minister of Education for the Province of Ontario, officiated at the opening of the new London Works of Northern Electric Company Limited on September 30, 1960.

It is proposed to operate this new London plant as an entirely self-contained manufacturing facility, producing telephone and outside plant apparatus all the way from raw material to the finished product.

Rep appointment for Chas. W. Pointon

Chas. W. Pointon Ltd. recently announced their appointment as Canadian sales representatives for Harman-Kardon, Inc., Plainview, L.I., N.Y., manufacturers of the Harman-Kardon line of high fidelity amplifiers, AM-FM tuners and the Citation line of high fidelity kits. Full details and literature are available by writing the Pointon organization at 66 Racine Rd., Rexdale, Ontario.

R-O-R Associates rep for B-L-H Company

R-O-R Associates Limited, of Don Mills, Ontario, have announced their appointment as Canadian sales representatives of the Baldwin-Lima-Hamilton Instrumentation Division.

The B-L-H Company manufacture load cells, weighing systems, pressure transducers, torquemeters and SR4 strain gauges. With the addition of these transducers to the range of instrumentation already represented, R-O-R can now offer complete systems either for assembly by the user or assembled and demonstrated in the user's plant by R-O-R personnel.

Total computer control system

A completely integrated computer control system, described as "the first by a single company to combine instrumentation from primary elements to final controls", has been introduced by Honeywell Controls Limited for large-scale industrial processes.

Nucleus of the system is the Honeywell 290 digital computer, a general-purpose all-solid-state device specifically designed for process applications and incorporating, the company said, "major advances in computer technology".

The computer was developed by Honeywell's Datamatic Division, producer of high speed electronic data processing equipment for business operations, in collaboration with instrumentation specialists of the company's Industrial Products Group.

Measurement Engineering extends representation

The appointment of Measurement Engineering Limited, Arnprior, Ont., has been announced by Performance Measurements Company of Detroit, Michigan.

Performance Measurements Company has a program of continuing expansion underway, especially in its field of electronic engineering creativity. It will continue production on an accelerated basis in three major fields of activity: digital instrument product line, designing of industrial test equipment and custom-engineered devices, and contracting and sub-contracting in the technical fields.

RCA Victor shares in defense contract

In an address at the annual banquet of the Canadian International Air Show in Toronto this fall, President John L. Burns of the Radio Corporation of America revealed that the RCA Victor Company, Ltd., had taken on a $2,000,000 order covering equipment for an electronic detection and control system, which is part of the North American aerial defense.

Discussing RCA's defense work, Mr. Burns said: "As defense and space electronics has become more and more important, and as our U.S. defense business has grown, we have increasingly drawn our Canadian facilities into both the development and the production phases of this work".

DDP contracts awarded

Following is a list of unclassified electronic defense contracts for $10,000 or more awarded during the period September 16-30, 1960 to Canadian firms by the Department of Defense Production.

- Alpha Aracon Radio Co. Ltd., Downsview, Ont., telephone equipment, $18,815.
- Aviation Electric Ltd., Montreal, Que., electrical equipment, $29,849.
- Canadian Aviation Electronics Ltd., Montreal, Quebec, modification of operational flight and tactics trainers, $53,005; installation of telecommunications facilities, $12,952.
- Canadian General Electric Co. Ltd., Toronto, Ont., components for bombing computers, $609,000; components for missile launching, $137,000.
- Canadian Marconi Co., Toronto, Ont., electronic tubes, $28,154.
- Canadian Westinghouse Co. Ltd., Ottawa, Ont., electronic tubes, $162,998.
- Computing Devices of Canada Ltd., Ottawa, Ont., electronic equipment, $44,162.
- Muirhead Instruments Ltd., Stratford, Ontario, electronic spares, $46,958.
- National Telecommunication Supply Ltd., Ottawa, Ontario, installation of radio transmitters, $12,685.
- Northern Electric Co. Ltd., Belleville, Ont., radar equipment, $473,026; electronic equipment, $48,859.
- Northern Electric Co. Ltd., Ottawa, Ont., electronic test equipment, $330,718.
- Radionics Limited, Montreal, Que., electronic equipment, $25,150.
- Sylvania Electric (Canada) Ltd., Montreal, Que., electrical equipment, $11,242.

Carriere and MacFeeters produce Guardian controls

Announcement was made recently that the Guardian Electric Mfg. Co., of Chicago has entered into a manufacturing arrangement with Carriere and MacFeeters Limited of Scarborough, Ontario, under which the Canadian company will manufacture the complete line of Guardian control products in its components manufacturing division at 82 Northline Rd., Toronto.

The announcement was made by F. F. Rowell, Guardian president, who said Carriere and MacFeeters will produce Guardian designed aircraft, missile and military controls, relays, solenoids, steppers, switches, contactors, aircraft grip and commercial controls under the manufacturing arrangement consummated by the two companies. The Carriere and MacFeeters plant at Toronto will also manufacture Guardian products to be sold through electronic parts distributors located throughout Canada.

Sales and distribution of both Guardian and Carriere and MacFeeters' products will be made through A. C. Simmonds & Sons, Toronto. All enquiries for technical information, catalogs and application data should be directed to A. C. Simmonds & Sons Limited, 100 Merton Street, Toronto 7.

Dominion Electrohome electronics award

The $3,600 Electrohome electronics educational award was won by David Mader of Breslau, a graduate of Kitchener - Waterloo Collegiate Institute.

The award consists of $1,600 to the winner over four years plus $500 per year to the college or university which he enters. The winner, who averaged 88.33 per cent in nine senior matriculation exams, will attend the University of Toronto.

Kulka Electric appoints Desser E-E Ltd.

Eugene Kulka, president, Kulka Electric Corporation, announces the appointment of Desser E-E Limited, 441 St. Francois Xavier St., Montreal, as electronic and electrical sales representative for Canada.

The Desser organization will service all Canada on the complete Kulka line of terminal blocks, switches and wiring accessories, providing liaison between customer and the factory.

Daystrom change of address

Effective October 11, 1960, Daystrom Limited moved into new offices at Cooksville, Ontario. This announcement of change of location applies to the Weston Instruments Division and the Heath-Kit Division. The address is now: 1480 Dundas Highway East, Cooksville, Ontario.

Texas appoints Canadian distributor

Canadian Electrical Supply Company, Montreal, was recently appointed the Texas Instruments Semiconductor-Components distributor in Canada, as announced by R. J. Hanschen, TI Semiconductor - Components division marketing manager.

Texas Instruments is claimed to be the world's largest supplier of semiconductor devices and CESCO is one of the largest distribution operations in Canada with outlets in Montreal, Quebec City, Ottawa, Toronto.

The above photograph shows an operator working the Ferranti-Packard Electric Ltd. rapid electronic catalog look-up system. The Toronto firm has recently received a $150,000 order for this equipment from a Buffalo, N.Y., wholesale drug distributor. The machine reduces the time-consuming chore of leafing through price catalogs and other information and it is expected that the Buffalo installation will arouse widespread interest in both the United States and Canada.

CRTPB newsletter

Prepared by Canadian Radio Technical Planning Board

Land, Fixed and Mobile Committee to Meet

Notice No. 201 of October 13 announces that the Land Fixed and Mobile Committee will meet in Room 1024, Hydro-Electric Power Commission of Ontario, 620 University Avenue, Toronto, Ontario, on Tuesday, November 8, 1960 starting at 9:30 a.m. This meeting is called for continuation of discussion on the draft Department of Transport Specification No. 126.

Executive Committee Meets

The Executive Committee met in the CRTPB office in Toronto on Thursday, October 20. There were 15 items on the agenda ranging from memberships to arrangements for the annual meeting.

Among the many specifications up for appraisal and reports on status were Nos. 132, 133, 119 and 120 dealing with 60 or 30 kc channeling. These were the subject of the report by President F. H. R. Pounsett.

The Maritime Committee reported on the results of the Board Ballot on the committee's recommendations for Department of Transport Specification 134. The title of this specification is "Ship Station AM Radiotelephone Transmitters and Receivers Operating in the 1605-5000 kc/s Band with RF Power Outputs Under 15 Watts."

The Department has been advised that the results of the balloting were: 9 for approval, none for non-approval, and two abstentions.

U.S. FCC Adds Frequencies

The United States Federal Communications Commission recently made the following frequencies available for additional communication uses in the Great Lakes area: 2003 kc (in addition to intership) for use by ship stations for communication with government coast stations concerning passage of vessels on the St. Lawrence and on the St. Mary's River.

156.7 mc/s (in addition to intership) for communication with government coast stations concerning passage of vessels through government controlled locks and government controlled waterways.

156.6 mc/s (in addition to intership and for communication with government stations concerning passage of vessels through locks) for communication with government coast stations concerning passage of vessels through government controlled waterways.

The termination date of January 1, 1961, proposed to be imposed to 2003 kc/s was not adopted, thus making this frequency indefinitely available for the new use.

Communications System for Highway Traffic Control

Communication of voice messages to motorists passing roadside stations has long been considered an aid to safer highway travel.

Electromagnetic radiation would be convenient for such a link. However, the inability to confine radiation to the exclusive use of a select group of vehicles, defeats its practicality. Microwaves are more directional, but not simple. A communication system consisting of an induction radio link operating in the VLF band may be the answer to the driver aid problem.

Currently under appraisal is a system which uses a loop transmitting antenna alongside the road to set up an amplitude-modulated magnetic induction field over the highway adjacent to the loop. Vehicles with receivers pick up the messages as they pass through the field.

Through the use of telephone lines, messages such as "Accident ahead — detour to main avenue — " can be transmitted moments after accidents happen. Modulation can also be obtained from taped repeaters and on-the-spot microphone announcements by law enforcement agencies. A rectangular loop with five foot space in between lines and stretching as far along the highway as necessary makes up the antenna. Both antenna and transmitter can be buried for permanent installation. Emergency antennas composed of a multiplicity of ferrite core solenoids can be substituted.

The Versatile Model 260

Series III

— with improved sensitivity and added convenience, at a new low price.

For 20 years the famous Simpson 260 has become a by-word in circuit analysis and measurement. Still maintaining its fine reputation for quality and the traditional Simpson care and attention in every detail of design and manufacture — the 260 is now available in a new series to keep up with our changing times. The Series III 260 uses printed circuits for added reliability and ease of service. Increased sensitivities are provided at no sacrifice in reliability; added ranges, and a unique scale layout to improve readability.

Best of all — a **new low price** making the finest in measurement available to all sizes of pocket books — all made possible only by complete **Canadian** manufacture.

RANGES:

D.C. Current. From 50 Microamps to 10 Amps in 6 ranges.

D.C. Volts (20000 ohms/volt). From ¼ volt to 5000 volts in 7 ranges.

A.C. Volts (5000 ohms/volt). From 2.5 volts to 5000 volts in 6 ranges.

D.C. Resistance 0-2000 ohms to 0-20 megohms in 3 ranges.

Polarity reversing switch, volume level (decibel) and DBM ranges.

Protective Fusing of Most Ranges
Price $55.00 — Federal Sales Tax Included

The long tradition of fine instrumentation of the Model 260 is now extended to the custom-engineered Model 270, providing increased accuracy, a mirror scale and movement overload protective service, along with full performance data. Write for further details. Priced at **$63.07**

4-8333

Bach-Simpson LIMITED

1255 BRYDGES ST. LONDON, ONT.

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

For complete details check No. 7 on handy card, page 41

LOOK TO FEDERAL FIRST

SMALL LARGE MEDIUM

PAY-OFF-PAKS AND SPOOLS
FOR EVERY SIZE AND TYPE OF MAGNET WIRE

Federal's 20 years of engineering know-how in the proper packaging of magnet wire can pay off for you and your company by achieving increased production and reducing excessive waste.

Federal magnet wire is practically packaged to suit your detailed and exact requirements, whether it be magnet wire from the 2" to 24" spools or in small, medium or large "Pay-off-Paks."

Whatever the size (from #6 to #40) or type of magnet wire required, Federal can supply a complete selection of sizes, shapes and enamels. Federal's engineers can also recommend improvements in your production methods to obtain maximum benefits from Federal's highly functional spool sizes and "Pay-off-Paks."

Let Federal Magnet Wire "packaging" pay off in speed and profits for you. Please write us for further details at P.O. Box 90, Guelph, Ontario.

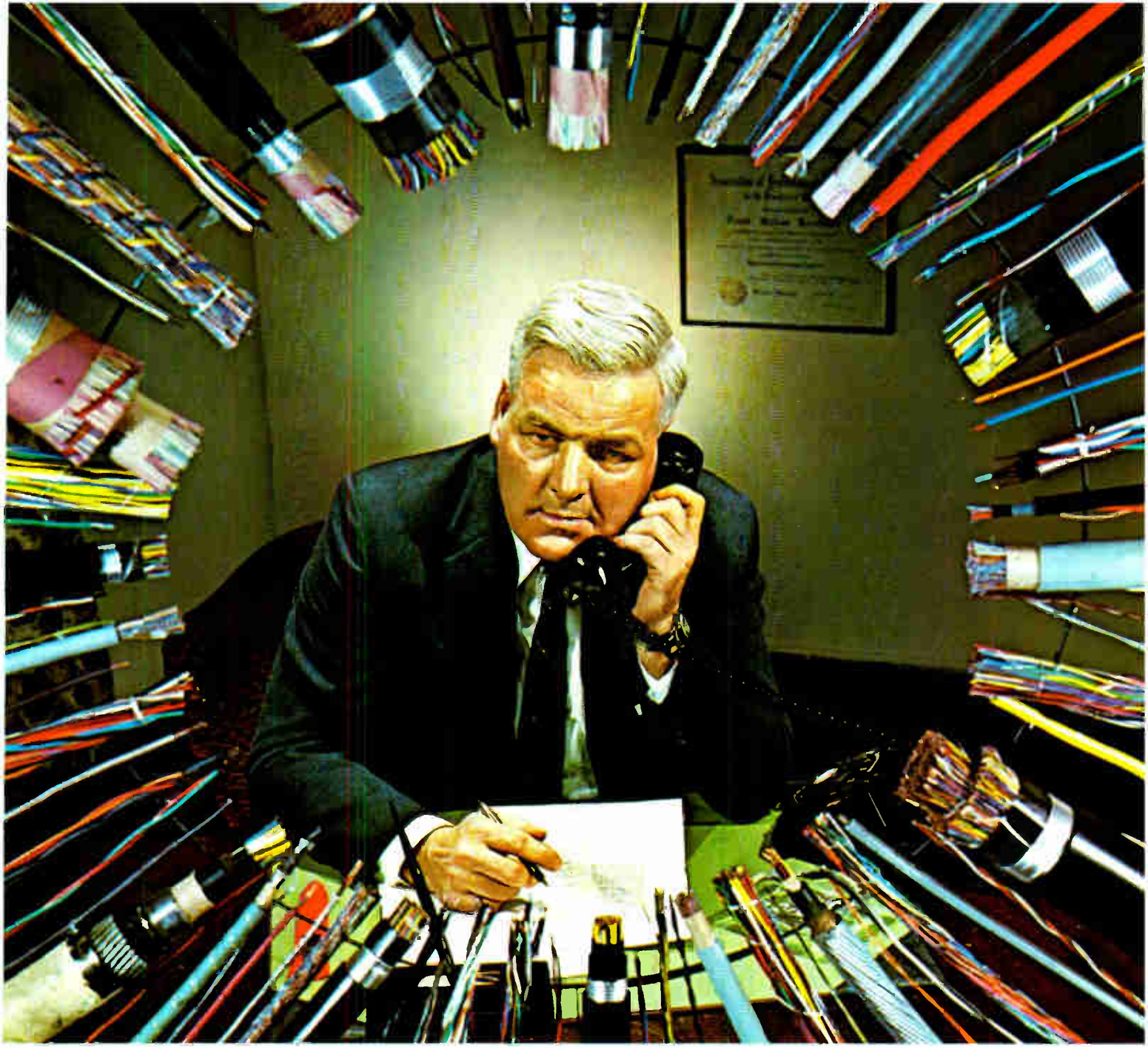
FEDERAL WIRE & PORTER CABLE DIVISION

H.K. PORTER COMPANY (CANADA) LTD.

6008

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. 33 on handy card, page 41



BEHIND THE MAGIC OF TOLL DIALING...

stands the existing network of specialized wires and cables that feeds the modern telephone system. The functioning of the entire complex depends upon the reliability of this wide range of conductors.

Almost as old as the communications industry it serves, Phillips has the experience, the manufacturing facilities and the advanced technical knowledge necessary to produce telephone wires and cables that are second to none!

Phillips Electrical Company Limited. Head Office—Brockville, Ontario. Branches—Halifax, Montreal, Ottawa, Toronto, Hamilton, Winnipeg, Edmonton, Vancouver. The Canadian affiliate of the BICC Group. Phillips Telephone Wires & Cables are also distributed in Canada by Automatic Electric Sales (Canada) Limited.

Phillips Electrical Company LIMITED

WIRES CABLES

6035

industry personnel

J. Wootten

Dr. J. F. Perrier

J. A. McVeigh

B. Vallillee

Brian Engineering sales appointment

J. M. Brian, president of Brian Engineering Limited, Montreal, announces the appointment of **Bruce Vallillee** as supervisor of electronic sales in the Ontario marketing area.

In his new position Mr. Vallillee will be responsible for the marketing and sales of relays, connectors, switches, pilot lights, tape recorders and other electronic components handled by Brian Engineering. He will be located at 2773 Dufferin Street where the company has recently opened new offices.

John Wootten joins R-O-R Associates

John Wootten has joined R-O-R Associates, Don Mills, Ontario to direct the systems and applications operation which is being generated by their broad equipment representation.

For the past twenty years Mr. Wootten has been working in the communications, radar and instrumentation fields, and prior to joining R-O-R was the chief of instrumentation laboratories at Avro Aircraft where he was responsible for all ground and airborne instrumentation projects.

At R-O-R Mr. Wootten will be responsible for all systems engineering and for special applications and adaptation of R-O-R instrument product lines.

F. S. Barton, C.B.E. takes U.K. directorship

Counsellor on Defense Research and Supply in the United Kingdom High Commission in Ottawa from 1955, **F. S. Barton, C.B.E., M.A., B.Sc., M.I.E.E.,** has left government circles and on his return to the United Kingdom has joined the board of directors of Painton & Co., Ltd., manufacturers of electronic components in Northampton, England.

Minnesota Mining appoints R. S. Wallace

A recent announcement by D. W. Handford, public relations manager of Minnesota Mining and Manufacturing of Canada Limited, London, Ont., advises that **R. S. Wallace** has assumed the responsibilities of assistant public relations manager for that company.

Mr. Wallace has been with Minnesota Mining since 1952, and has had successful and varied experience in several facets of the company's operation.

Whittaker address change

Effective October 1960, the new address for Whittaker Electronics Limited will be 1171 Whitmore Avenue, Ottawa 3, Ontario. The telephone number for this company is PA-2-8563.

Sperry Gyroscope appoints Dr. J. F. Perrier

W. J. Riley, P.Eng., chief engineer, Sperry Gyroscope Company of Canada, Ltd., Montreal has announced the appointment of **Dr. J. F. Perrier, P.Eng.,** to the position of Engineering Department Head for Systems.

A lecturer for three years in the Department of Electrical Engineering at the University of Alberta, Dr. Perrier holds a long and successful record of engineering achievements. At Bell Telephone Co., New York, he was responsible for the design, construction and calibration of research television systems. At Canadair Limited, 1955-60, Dr. Perrier participated in the Tartar Missile Proposal to the RCN, assisted in weapon system studies for the Velvet Glove System, was responsible for preparation of missile flight test programs in connection with Sparrow II and was acting group leader of The Weapon System Group.

Dr. Perrier has also participated in the communication system proposal for NORAD.

Lorain Products establish Canadian plant

Lorain Products Corporation, of Ohio, manufacturers of SUB-CYCLE ringing convectors, FLOTROL battery chargers and power supply units for the telephone industry, have established manufacturing facilities in Canada.

The Canadian company, Lorain Products (Canada) Limited, is located at St. Thomas, Ontario, and has a modern plant with more than 13,000 square feet of floor space, 10,000 square feet of which will be used for manufacturing.

General manager of the Canadian company is **J. A. McVeigh,** formerly manager of the Canadian Allis-Chalmers works at St. Thomas. Sales manager is **G. I. Phillips,** an electrical engineering graduate of the University of Manitoba. Mr. Phillips was at one time resident engineer with English Electric Company of Canada Limited, in St. Catharines.

Lorain products are distributed in Canada by Automatic Electric Sales (Canada) Limited, and for the Bell Telephone Company of Canada by Northern Electric Company Limited.

EIA-IRE golf tournament

The Cedar Brae Golf and Country Club at Scarborough, Ontario was the scene of a joint attack on par by the Electronic Industries Association and the Institute of Radio Engineers on September 29. The battle was joined in fine weather when nearly 100 golfers began teeing off at 10:00 o'clock. Following the day's golf nearly 200 representatives enjoyed an excellent buffet dinner and the presentation of trophies. Over 70 prizes were donated by the electronics industry for a variety of golf achievements and lucky draws.

Head table guests were introduced by Ernie Walton of Kester Solder of Canada Company, chairman of the 1960 tournament committee. These were: F. J. Heath, general chairman, 1961 IRE Canadian Electronics Conference; D. Knapp, vice-president of EIA and chairman of Components Division; K. McKenzie, chairman Toronto Section, IRE; J. Key, president, EIA of Canada; A. Barclay, director Canadian Region IRE of Canada; W. F. Wansbrough, vice-president of EIA and chairman of Receiver Division; T. Purdy, secretary-treasurer, IRE of Canada; R. A. Hackbusch, director of engineering EIA; F. W. Radcliffe, general manager EIA.

UNIQUE NEW EIMAC 3CX10,000A3 CERAMIC TRIODE OFFERS VHF POWER—UP TO 20 KW

Eimac expands its ceramic tube line with the introduction of the 3CX10,000A3—the only 10 kilowatt air-cooled ceramic triode in the field. This advanced power tube is intended for use at maximum ratings through 110 megacycles.

An outstanding feature of this clean, efficient ceramic triode is the large reserve of grid dissipation assured by platinum-clad tungsten grid wires. Overload protection has also been built into the 3CX10,000A3 to make it ideal for use in industrial heating—dielectric and induction.

This newly developed triode is also well suited for such applications as broadcast, FM and single-sideband transmitters, ultrasonic generators and sonar pulse amplifiers. It can also be used as a class-AB_2 or class-B linear amplifier in audio or r-f service.

A companion air-system socket and chimney, as shown above, is available with the 3CX10,000A3 to meet your specific requirements. Watch for a low mu version of this high-power triode in the near future.

GENERAL CHARACTERISTICS EIMAC 3CX10,000A3	Height	Diameter	Max. Operating Temp.	Filament Voltage	Filament Current	Frequency for Max. Ratings	Max. Plate-Diss. Rating
CERAMIC TRIODE	8.50"	7.0"	250°C.	7.5	100 amps	110 Mc.	10,000 watts

EITEL-McCULLOUGH, INC.
San Carlos, California

Canadian Representative: R. D. B. SHEPPARD, 2036 Prince Charles Rd., Ottawa 3, Canada.

6009

For complete details check No. 14 on handy card, page 41

W. S. Kendall

W. S. Kendall, the author of the article — "Are We Selling Our Defense Industry Short?" — is one of the few people in Canada qualified to discuss this subject in all its ramifications. Mr. Kendall is Marketing Manager for Computing Devices of Canada Limited, Ottawa.

He is Chairman of the Electronics Division Executive Committee, Electronic Industries Association of Canada, Chairman of the Defense Production Sharing Committee, EIA, and Vice-Chairman of the Electronics Division, EIA. In addition to the foregoing posts held by Mr. Kendall, he is a member of the Board of Directors, Electronic Industries Association of Canada.

Mr. Kendall has been closely associated with the Canadian electronics industry for many years and his knowledge of the current problems facing the industry, especially in the area of defense sharing, results from a keen interest and study that he has made on the subject.

"Are We Selling Our Defense Industry Short?" presents a searching analysis of the Defense Sharing Program, pointing out without prejudice its faults, failures, achievements and hopes. It is a prescription for the remedies that must be administered to the Defense Sharing Program if this program is to be made to work on a fair basis for the Canadian electronics industry.

Are we selling our defense industry short?

Canada's electronic defense industry is fighting for survival. In the absence of adequate government funding for research and development, leading to the production of advanced design technical equipment, this important segment of our technology will disappear leaving behind it nothing but the ghosts of achievements passed.

by W. S. Kendall

Chairman, Defense Production Sharing Committee, EIA

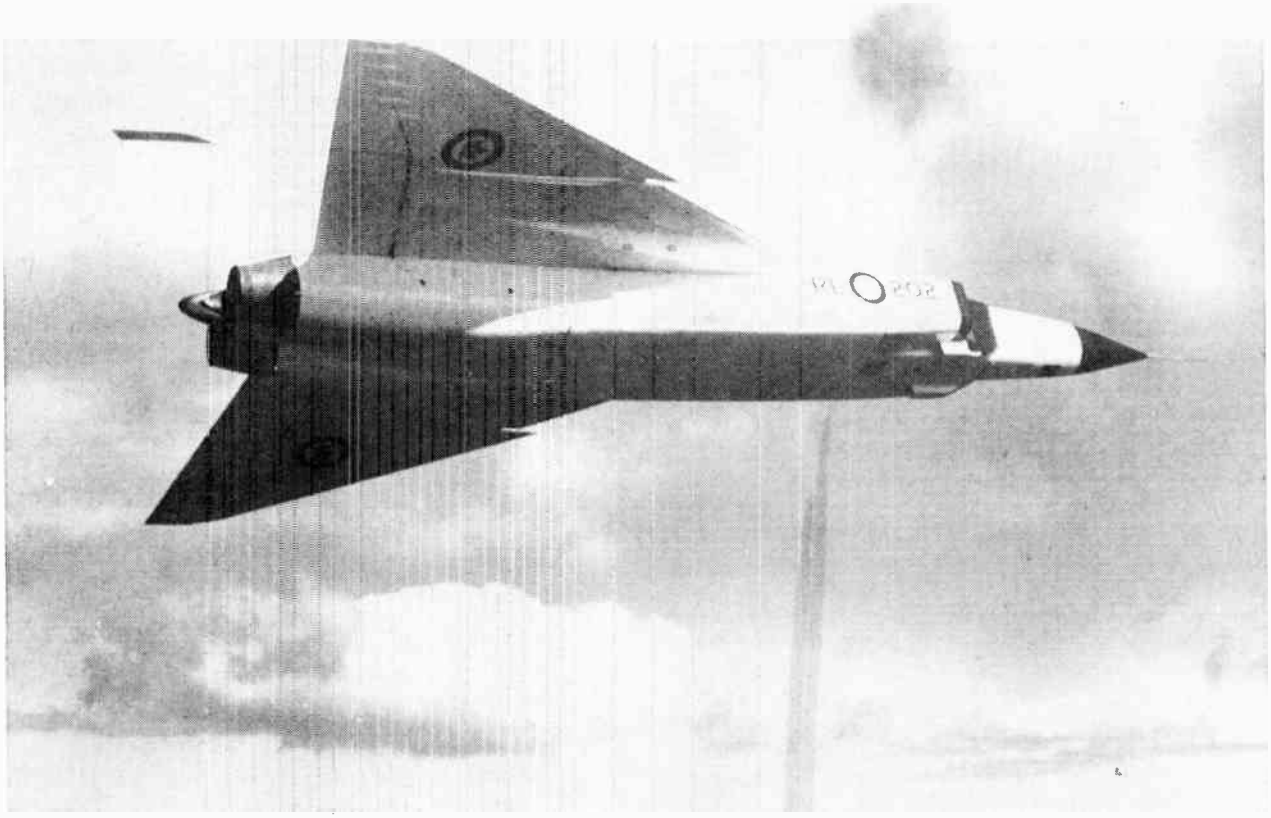
The Canadian electronics industry that won international acclaim for its advanced design doppler, that produced navigation systems destined to become NATO standards; the industry whose specialized skills in ASW, communications, and data processing found ready acceptance in the market places of the world: it is this industry that today looks to its future with concern and dismay.

During World War II Canadian electronic engineers advanced world technology in many areas of fire control, radar detection, aircraft navigation and anti-submarine warfare. Canadian designed and built technical products were shipped to most free nations of the world — including the United States.

Then came Korea — once again the electronics industry rose to the challenge. Canadian engineers and Canadian productive facilities played their full part.

To ensure a permanent place for this vital industry our government, in 1951, formed the Department of Defense Production replacing the former Department of Munitions and Supplies. The new department had the responsibility of not only buying defense supplies and construction on behalf of Canada's armed services, **but also for mobilizing and conserving Canadian defense production capability for both existing and future needs.**

From 1951 through 1958 this Department spent an average of one hundred million dollars annually in building up the technical and productive teams of the Canadian electronic industries. A significant portion of this money went into "state of the art" research and development programs. It was during this period of relative stability that Canadian engineers achieved the technical breakthroughs which today find Canadian electronic equipment in use all over the world. Both



Shown above is one of the prototype models of the Canadian-produced CF-105 Interceptor aircraft. The development and production of this aircraft marked what is believed to be the highest point of peacetime industrial defense preparedness ever achieved by Canadian industry. The cancellation of the CF-105 program on September 28, 1958 has been referred to by some as "the death knell of the Canadian defense industry".

Britain and the United States are using ASW equipment of Canadian design and manufacture. Canadian produced flight simulators and communication equipment are meeting and beating competition in world areas. Canadian navigation systems are providing the split second accuracy needed for 1,500 miles per hour NATO military aircraft and the giant passenger jets of international air carriers.

Canadians took a quiet pride in what a relatively small, although highly technically oriented, defense industry had been able to accomplish both at home and in world markets.

All of this came to an end dramatically and without warning on September 23, 1958.

It was on that day that Mr. Diefenbaker made his historic announcement that in the words of one newspaper, "rang the death knell for the Canadian defense industry". Canada could no longer support the mounting costs of developing and producing weapons systems for its own Services.

The full impact of this government decision was not immediately apparent. It struck home however when skilled Canadian engineers in increasing numbers began seeking in other countries the opportunities and challenge no longer available to them at home. The attempt by the government to halt this exodus with the palliative "nucleous contracts" was a classic example of too little — too late.

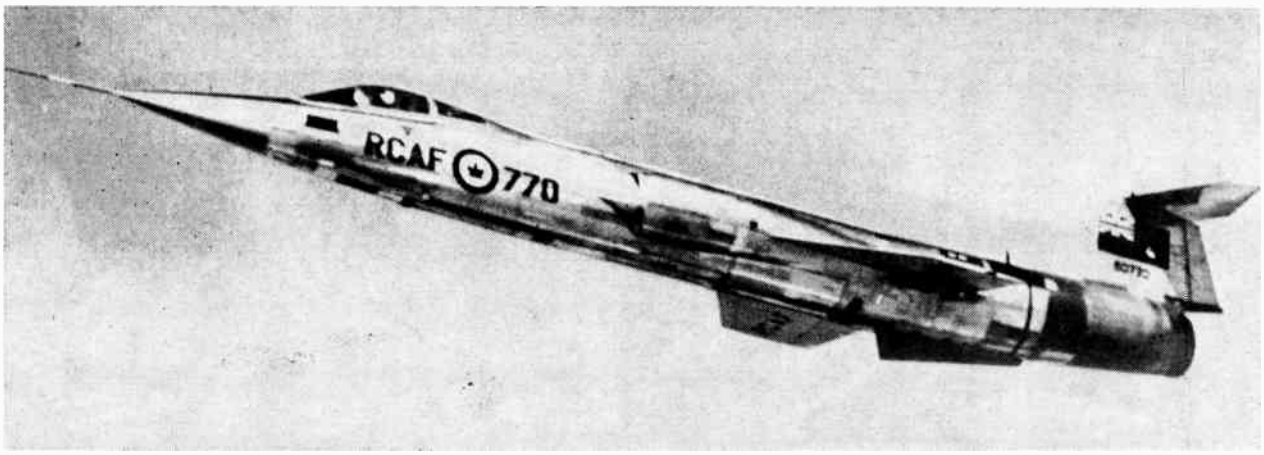
The great white hope was "Production Sharing".

Production sharing—the 2nd year.

Arrangements had been made at top level with United States authorities allowing Canadian industry to bid on defense items of "mutual interest". At that time these were defined as the BOMARC missile, the SAGE computer control program, and the heavy and gap filler radars for the PINETREE warning line. Industry was then exhorted to get out and SELL. The honeymoon was over.

That was the situation two years ago. We had the spectacle of a government supported defense industry without sales staffs being suddenly forced to scramble for business in an intensely competitive, hitherto impregnable market. It was moreover a highly insular market, uninformed on Canadian capabilities, unwilling to learn the complexities of monetary exchange, beset with its own political problem, and slow to release classified information to non-nationals.

That was the situation in 1958.



The CF-104 photographed above is to be produced under Lockheed license at the Montreal factory of Canadair Limited. Canadian-made CF-104's will replace F-86 Sabres in eight squadrons serving with NATO forces in Europe. In addition to Canada, the governments of West Germany, The Netherlands, Belgium and Japan also have selected the Super-Starfighter to re-equip their aerial defense arms in the broadest aircraft procurement program of its type ever undertaken.

It was obvious that production sharing was not going to work overnight but it had to work; the very survival of Canada's defense industry depended on it. DDP moved to clear the road blocks. District offices were strengthened and new ones established. DDP representatives were placed in major U.S. procurement centers. Working groups were set up in Ottawa and liaison channels established with similar groups in the U.S. government. Soon things began to happen.

First the definition of "mutual interest" previously written around the specific Bomarc - Sage - Pinetree air defense program was widened to include **any** defense program for which Canadian companies had capability.

The provisions of the protectionist Buy-America Act which imposed a 12 per cent penalty on Canadian bids were waived on a broad range of defense supplies.

Duty free entry privileges were negotiated on the importation of Canadian defense items.

Procedures for obtaining security clearances and transmission of classified documents were greatly improved.

U.S. government and prime contractor briefings were arranged for the benefit of Canadian industry.

U.S. industry teams were invited to tour Canadian plants and went away much impressed with what they saw.

DDP and Canadian industry teamed up in a major informational program directed to senior U.S. Service and government levels as well as to over 250 major U.S. defense contractors.

Parliamentary approval was obtained for funds to assist Canadian industry in qualifying for U.S. defense business. Of special importance was Vote 504 (later 71) planned to support selected defense development programs leading to production.

The box score to date is impressive and reflects credit on those individuals in government and industry who have given so much thought and time to the task. But has it achieved the required end result? Can we now say that production sharing is working and that our defense industry is truly integrated with that of the United States?

The answer is not reassuring: **Production sharing in its second year of operation is not working in the manner intended by the government or hoped for by industry.**

This discouraging trend is evident not only in the field of defense electronics but in the industrial and entertainment markets as well. Incredibly this general decline comes at a time when in practically every other nation of the Western world, the electronics industry is showing explosive growth. In Britain electronic firms are expanding their physical facilities heavily subsidized and encouraged by their government's interest in research, industrial development and production. European electronic manufacturers in the Common Market are challenging the United States in their rate of growth and development of export trade. In addition there has been rapid growth in the electronic industry in such countries as Japan and this foreign expansion is already having a disastrous effect on Canadian industry.

Production sharing and Canadian technology.

The question may now be asked "Why should Canada maintain a defense industry at all?" The first answer occurring naturally to a Canadian is that in the defense of North America of which Canada is such a great part, we cannot sit back and expect the Americans to do it for us. We must do our share in proportion to our resources. Modern weapon speeds impose a policy of regional coordination, and along with this a coordination of defense development, production and procurement resources to the greatest advantage of both countries. Mr. Diefenbaker has stated "We will not be satisfied with the left overs. Canada has the right to a fair share of the production loaf — and not just the crumbs."

But there is still another reason for maintaining a technical defense capability — one that is not always considered — and that is the effect it can have on a nation's industrial development. New products and techniques resulting from Military R and D encourage investment in plant and equipment, stimulate consumer spending and lead to higher productivity and improved living standards. Few scientific advancements have had greater impact on our lives than electronics. It is today's fastest growing field.

Continued on page 39

The use of transistors for power conversion

Part II High power equipment

Much of the pioneering work on the commercial use of static power conversion equipment has been done in Canada and the problems of design and development of equipment to meet Canadian requirements are discussed in the following article.

by John E. Pinnell, B.Sc. (Hon.) Sen. Member I.R.E.*

The 60 cycle power inverter of large capacity will not be discussed as special attention must be given to circuitry for maintenance of output frequency and sinusoidal waveform. All of the general principles of design of the DC-DC converter are applicable to the inverter, except that the efficiency of the latter is lower because of greater filter loss.

Power output capabilities of static converters in excess of a kilowatt make input and output voltages an important design consideration. The use of higher voltages permits operation at lower currents and helps minimize loss. It should be noted that lost power is proportional to the square of the current. Thus filter chokes, wire size, fusing, connectors and miscellaneous electrical hardware can increase to such an extent that a physical problem of size and weight exists. In general, it can be said that for low current operation, a small decrease in efficiency will offer no economic advantages. For high current operation, the tendency to over-design is somewhat less and it can be expected that low voltage-high current equipment will operate at slightly lower efficiencies.

In most cases, there is no choice of operating voltages. A requirement will exist say for a positive ground 48V DC output from a 130V DC battery system. It will be seen later that input voltage and power output determine a rather rigid pattern which the design will follow. This results from basic building blocks which increase input current and voltage in discrete steps.

The series circuit

The series circuit for use with a 48V DC input has been discussed previously. The input voltage can be extended in steps of about 24V by adding basic circuits in a series connection. If, say, six basic units (each having a pair of transistors) are placed in series, the unit will operate on a nominal 150V DC input (Reference Figure 1).

If, for example, an input current of about 7A is applied, an output of just over a kilowatt is obtained. In this case, transistors with maximum current capabilities of 15A and C-E breakdown voltages of not less than 60V are satisfactory.

Some of the problems associated with the use of the basic transistor square wave oscillator have been discussed in the first part of this article. The development of series circuits and the two transformer techniques were shown to permit operation with increased input voltage and increased power and efficiency. Illustrations of equipment using the various techniques were given.

An equipment designed for use with 150V DC input is shown in Figure 2. The front cover has been removed to expose all wiring. The structure is in keeping with the "one-side access" concept. It will be noticed that transistor pairs are mounted on plug-in modules which contain all basic components common to a transistor pair. This grouping of components forms a basic unit or building block which is common to other types of converters as well.[1] The modules can be removed and all 12 transistors tested with a simple voltohmmeter in less than a minute each.

The use of modules as previously described is a subject which can lead to considerable discussion. A plug-in module suggests that frequent transistor replacement or testing is to be expected. This is not the case. Transistors have a very high reliability and their use in non critical circuitry results in reliable equipment. However, there exists a considerable lack of confidence in transistorized equipment on the part of some users who tend to view the transistor as a rather glamorous substitute for the vacuum tube. The transistor is thus classified as a replaceable element whose characteristics deplete with time. In point of fact, the transistor should be compared with a simple junction diode. Depletion of characteristics undoubtedly will occur in time, as occurs with all components such as capacitors, resistors, etc. The argument in favor

**Chief Engineer, Pylon Electronic Development Co. Ltd., Montreal, Que.*

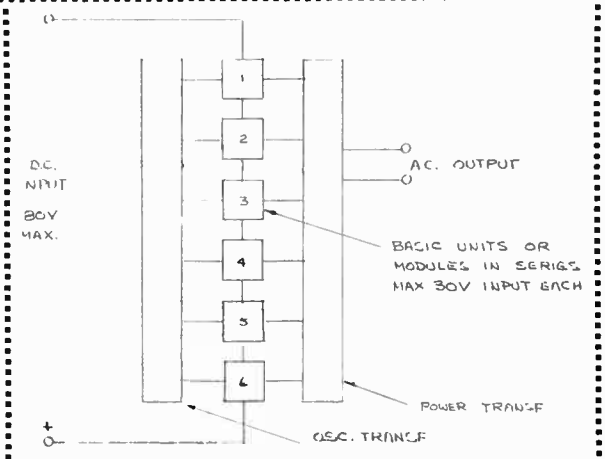


Figure 1 — Series circuit block diagram.

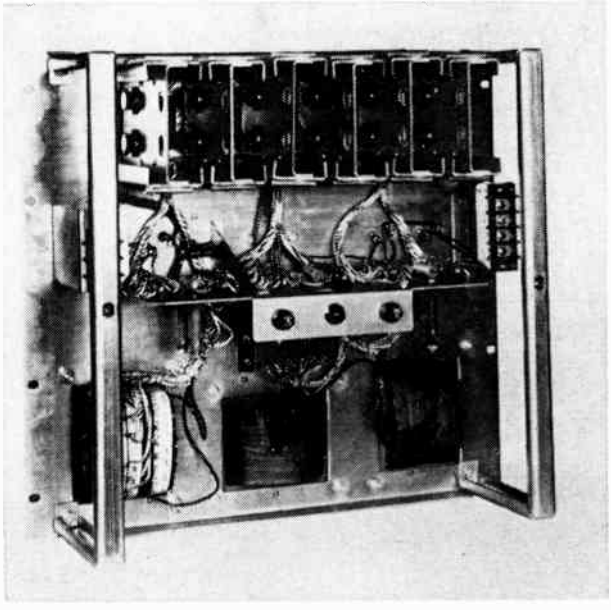


Figure 2 — Model CX130/152A Converter. Input voltage 130/152V DC. Output (isolated) 130V DC at 6A. Unit is shown with front cover removed.

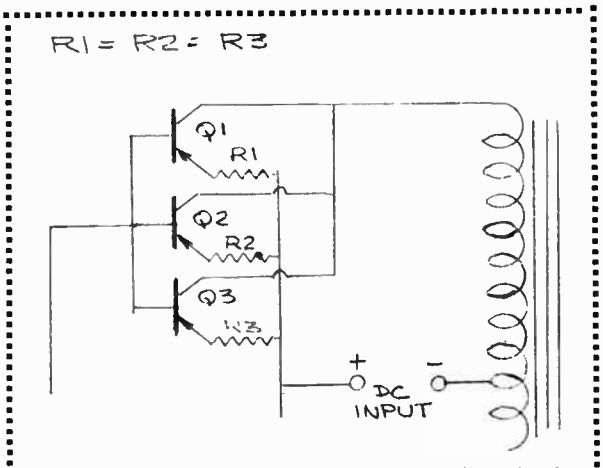


Figure 3 — Parallel transistor operation (load sharing by the use of balancing resistors).

of modules is that the test and replacement of transistors is reduced to a very simple procedure which minimizes the theoretical "outage" time. In some cases, "outage" time is considered a more important factor than long term reliability.

Parallel transistors

Parallel transistors such as shown in Figure 3 can be utilized to boost the current handling capacities of a circuit if certain precautions are taken. Due to the variation in the characteristics of the transistors, some form of equalization or balance is necessary. This is not the case when transistors are used in a series circuit. As a general rule of thumb, the lost power in the balance resistor will equal the power lost within the transistor operation as a switch. In short, each transistor is twice as inefficient and the overall efficiency will drop accordingly. An approximate figure of transistor loss in parallel operation is shown in Table 1. Where a choice exists, it is always preferable to use transistors with the largest current handling capacity rather than parallel operation by equalization methods.

A second method of using parallel transistors is by transformer coupling. Each transistor module or pair, drives a common transformer (Ref. Figure 4). At first sight, one would suspect that load sharing between transistors would be a function of gain. In practice, the transistors are usually overdriven at the base and some form of current limiting applied. It should be noted that the DC resistance of each primary of the power transformer can be considered in series with each transistor. This resistance is never negligible and is nearly always sufficient for adequate balancing. The result is that the transformer coupling results in close load sharing and maximum efficiency if parallel operation is necessary.

The use of parallel circuitry is not recommended if a single and economical transistor can be obtained. While the transformer coupling method does give a reasonably efficient means of handling high currents, the transformers are somewhat larger because of a large number of taps, and interconnection in the correct phase somewhat complex. The availability of transistors with a 50A max. collector current eliminates the need of parallel operation except for the larger units or where low voltage input is demanded.

A comparison of transistor efficiency with respect to maximum collector current is given in Table 1. It is apparent that the use of transformer coupling of 12A transistors in parallel to simulate a 25, 35 or 50A unit, does not result in a significant loss of power. Copper loss in the power transformer can be taken as identical in all three cases. The loss in power by using resistors to balance transistor loading usually results in a heat dissipation problem and a significant reduction of overall efficiency.

Series parallel arrangements

Nearly all conversion requirements can be handled by a combination of series and parallel arrangements as previously described. Input voltage, transistor peak current and efficiency are indicated in Table II. The number of transistors required for the approximate input power is given at the top of each column. The figures in the column indicate input power in watts and the overall efficiency of the unit. The efficiency takes into account transistor, transformer and wiring

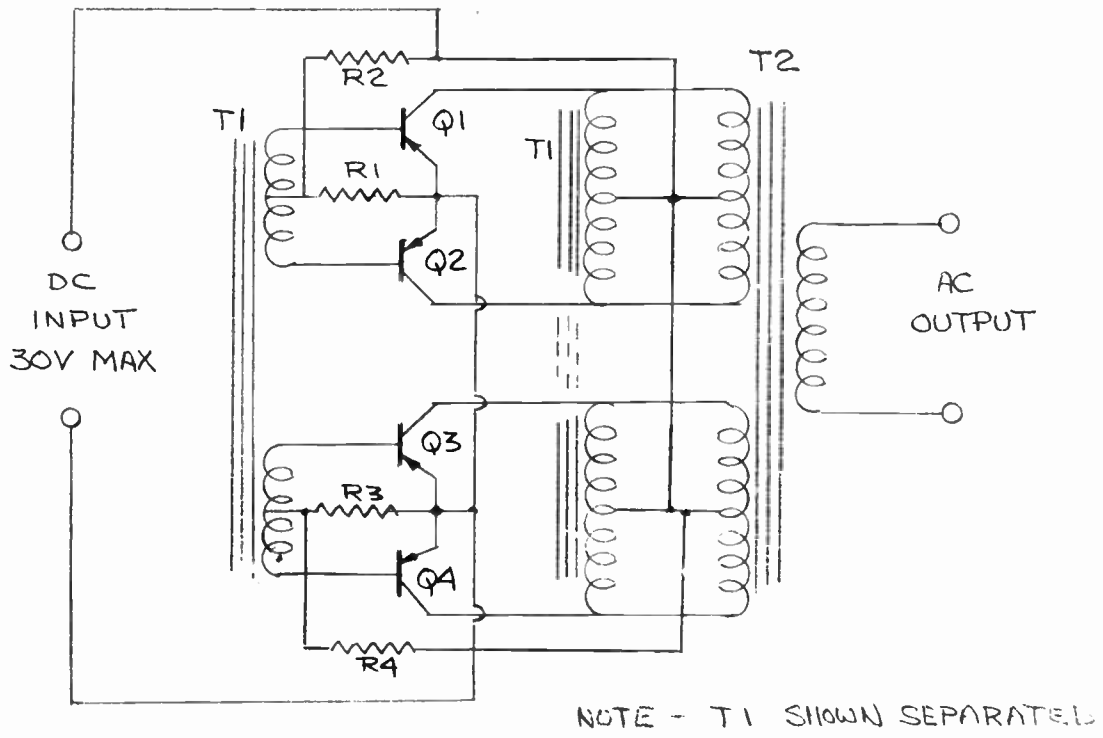


Figure 4 — Parallel transformer coupling.

losses, but does not include input and output filters. Efficiency figures are practical design values and not absolute maxima. Filtering will result in an additional loss of up to about 8 per cent, depending on the degree required.

The output power shown in Table II, for example S 1200X86, represents a series circuit, 1200 watts input at 86 per cent efficiency. This is based on an input current of 25A DC and the use of transistors with a 50A peak current capacity. While it is true that a much greater output can be obtained than that given, the transistor must then be operated near its maximum limits. Apart from the belief* that transistor life is shortened, the equipment becomes much less likely to survive temporary overloads or surges as this "safety" factor is decreased. Methods of fusing for overload protection become difficult. Since converters may be considered as a prime power source, it is necessary to ensure maximum reliability and therefore derate accordingly. A rather conservative figure is a flat 50 per cent derating of the maximum current capacity of the transistors. This means that the transistor can operate at 200 per cent load without exceeding its rating. Table II will give power output data for transistors with peak currents of less than 50A if the power output is multiplied by the following factor.

Max. Current	Conservative Output
10A	x 0.2
15A	x 0.3
25A	x 0.5
50A	x 1.0

**Transistor manufacturers tentatively support the view that life of transistors is increased by derating the peak current and junction temperature below the absolute values. Information on this subject is both confused and difficult to obtain.*

Transistor protection

In the past, a good deal of interest has been focused on the protection of transistors in static power converters, particularly where strings of transistors are used.

TABLE 1 Comparison of Power Loss, for a Pair of Transistors and Equivalent Parallel Operation of 12A Units

Max. Current	Maximum Transistor Loss At Maximum Current					
	Loss Per Pair		Series Resistor (Total)		Transf. Coupling (Total)	
50A	25W	2.0%*	115W	9.0%	35W	2.8%
35A	21W	2.4%	82W	9.4%	25W	2.8%
25A	17W	2.7%	56W	8.9%	17W	2.7%
12A	8.4W	2.8%				

Percentage loss shown for max. current input at 25V DC input.

TABLE 2

DC - DC CONVERTER CONFIGURATIONS

(Transformer Equalization)

DC Input Voltage	No. Of Transistors Used In Equipment (50 Amp Capacity)								
	2	4	6	8	10	12	20	24	40
12	300-83	P600-78	—	—	—	—	—	—	—
24	600-83	P1200-82	—	—	—	—	—	—	—
48	—	S1200-86	—	SP2400-85	—	SP3600-84	—	—	—
130	—	—	—	—	S3250-88	S3250-87	SP6500-87	SP6500-86	—
150	—	—	—	—	—	S3750-88	—	SP7500-87	—
250	—	—	—	—	—	—	S6250-89	—	SP12500-90

Example 1 1500 watts output required for 48V DC input: Tableshows 8 transistors 50A capacity, series parallel configuration at 85 per cent efficiency. Maximum (conservative) power output = 2400 x .85 = 2040 watts. Reduce efficiency by filter loss.

Example 2 1000 watts output at 130V DC input. Use 10 transistors in series for 87 per cent efficiency. Input current is $\frac{1000}{130} = 7.8A$. Use transistor capacity 2 x 7.8 = 15A collector current max.

Probabilities of a single transistor failure producing a chain reaction for total destruction of all transistors was given emphasis. Early attempts at fusing transistor devices for current overload were unsuccessful.

The principal cause of transistor failure is excessive voltage between collector and emitter. This voltage causes a breakdown of the semi-conductor material and will nearly always result in complete destruction of the component. Failures of this type can be prevented by ensuring that excessive input voltage does not occur and elimination of any possibility of self generated voltage spikes or, surges due to an external cause.

Zener diodes and non linear resistances afford positive protection from excessive input voltage conditions. Such protection is usually omitted where confidence is expressed in the constancy of the input voltage. Self generated spikes or surges due to external causes will not occur if suitable precautions are taken at the design stage.

A second cause of transistor failure is where excessive collector current is drawn. This results in overheating and eventual destruction of the unit. Where conservative design techniques are followed, a simple fuse is adequate protection from overload at the output terminals. Additional protection is usually added by protective bias arrangements which further limit the current. In some cases, it is possible to cause oscillations and conversion to cease by an overload. This technique is usually applied to simple inverters.

Chain reaction failures do not occur as might be supposed. In fact, the larger the number of transistors in series or parallel arrangement, the smaller the percentage of transistors will be damaged by any cause. The reason is quite simple. Transistors do not have uniform characteristics. For example, transistor voltage breakdown will vary from say 60 to 150V within the same type and batch. Thus input abuse will cause a breakdown of the lowest rating. Breakdown simulates very large load on the remainder of the transistors and the input fuse will open. The combination of conservative operation of average transistor current and techniques of limiting peak current results in minimizing damage to the other units.

In general, transistor failure is not due to inherent defects of the component, but to external causes. By careful design techniques it is possible to reduce or eliminate the probability of the occurrence of harmful events, the remaining precautions usually being of an educational nature. Experience has shown that the critical period in the life of static power equipment occurs at installation. It is here that close supervision is desirable.

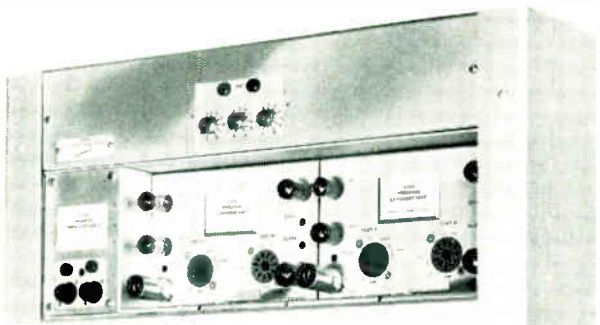
---

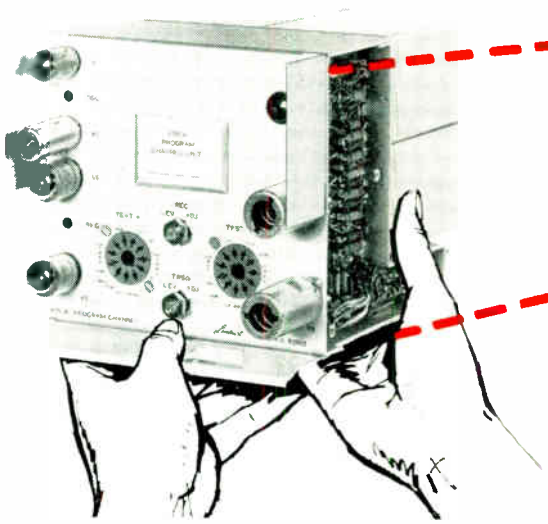
[1] *Transistor Power Units of Giant Capacity. Stanley E. A. Pinnell, P. Eng. Electronics & Communications, Oct./58.*

NOW BY *Lenkurt* program channel facilities you simply PLUG IN!

Lenkurt's new 921A Program Channel provides facilities for the transmission of Schedule A program material over any 45-class carrier system. The program unit plugs directly into a 45-class terminal in place of two normal channel units, with no equipment modifications or wiring required. All power, signal, and control connections are made automatically.

The plug-in design is a particularly important feature when a temporary program facility is required, since the unit may simply be unplugged and the two voice channels returned to service at the completion of the program requirement.





Performance meets or exceeds Canadian broadcasting standards in all respects. Separate transmit and receive circuits permit one-way or simultaneous two-way transmission, and the system provides a control pilot for program reversal or other uses.

Complete specifications may be obtained by calling or writing

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For complete details check No. 4 on handy card, page 41

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Nationwide Customer Toll Dialling is getting nearer every day. A SATT system installed now is a solid investment. For the smallest or largest network, today *and* tomorrow, it can pay very substantial dividends.

CUT YOUR OPERATING COSTS — WITH SATT!

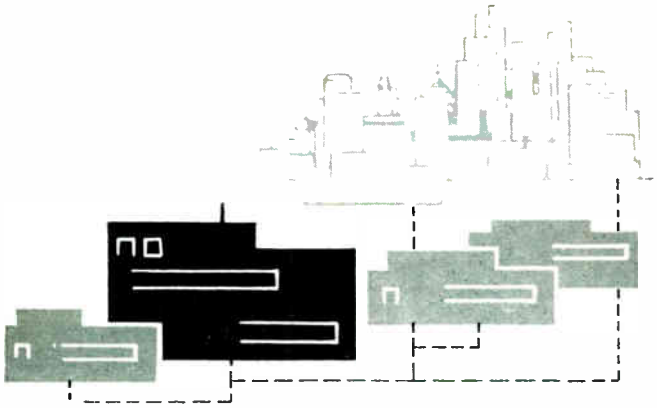
Strowger Automatic Toll Ticketing systems keep an automatic "ticker tape" record of every completed toll call—every item you need to prepare a customer's toll bill. Calling and called station directory numbers, date, time, and the duration of each call are all stored, and recorded the instant the call is completed.

SATT systems provide completely automatic bill processing, but if you prefer a manual method of billing—to tie in with your existing accounting practices—SATT can print a complete toll ticket on each call. Then, next year or the year after, when you're ready to change over to automatic accounting, there's no need for any change in your SATT equipment. In addition, the data used for billing can be made available to your traffic and commercial departments as well.

For complete information contact your nearest Automatic Electric office, or write us direct.

For complete details check No. 5 on handy card, page 41

THE NEW SATT TYPE 59 DUAL-SERVICE SYSTEM



The well-known SATT BD system has proven completely satisfactory in operation, as well as extremely profitable for the telephone companies using it. The new SATT Type 59 Dual Service system now incorporates many improvements based on experience with BD systems — meets all the latest operating requirements of larger toll centres.

- The new system provides customer direct distance dialling (DDD) on a nationwide basis for station-to-station sent-paid messages to all dialable points.
- It can be installed in toll centres to serve exchanges *and* tributary offices. The small amount of special equipment required for tributary offices is inexpensive and readily installed.
- It can serve single tributary offices where toll call traffic and potential revenues justify installation.
- Completed calls are recorded on punched, coded, multi-channel paper tapes that can be automatically converted into typed toll tickets or standard business punched cards.
- Calling party dials a special directing code to access toll-ticketting system, and then either a 7-digit number, or a 3-digit area code plus the required number in the particular numbering-plan area.
- Calling number can be identified automatically (ANI service), or by checking operator (CKO service), and the two methods of operation can be mixed as required. ANI service for instance, may be offered in the toll centre and CKO service for tributary offices. Or ANI service may be provided for frequent toll users and CKO service to other lines.
- Using CKO equipment, high speed toll service can be made available to customers at low initial cost, and subsequent upgrading from CKO to ANI service can be carried out over any period, to any degree warranted.

GUARANTEED DIVIDENDS TOMORROW!

PLUS THESE THREE IMPORTANT ADVANTAGES FOR INDEPENDENT COMPANIES

Low conversion costs

Automatic number identification (ANI) for two-party lines has been greatly simplified, and special party identity dials are no longer required on single or two-party lines. This favors more extensive use of ANI services, as it substantially reduces station conversion costs.

More economical operation

A special new detector provides more efficient ANI service at lower cost, permitting greater initial use of ANI in marginal situations. The detector is based on a SATT system circuit that has proven reliable over 10 years of operation.

Greater choice of access codes

The new Type 59 system provides a much greater choice of access codes. It can use any 1, 2 or 3 digit code, as well as code 112 which is favored by many telephone companies because of its wide use in step-by-step Bell exchanges.

5905-R

AUTOMATIC ELECTRIC

GENERAL SYSTEM

Subsidiary of

GENERAL TELEPHONE & ELECTRONICS

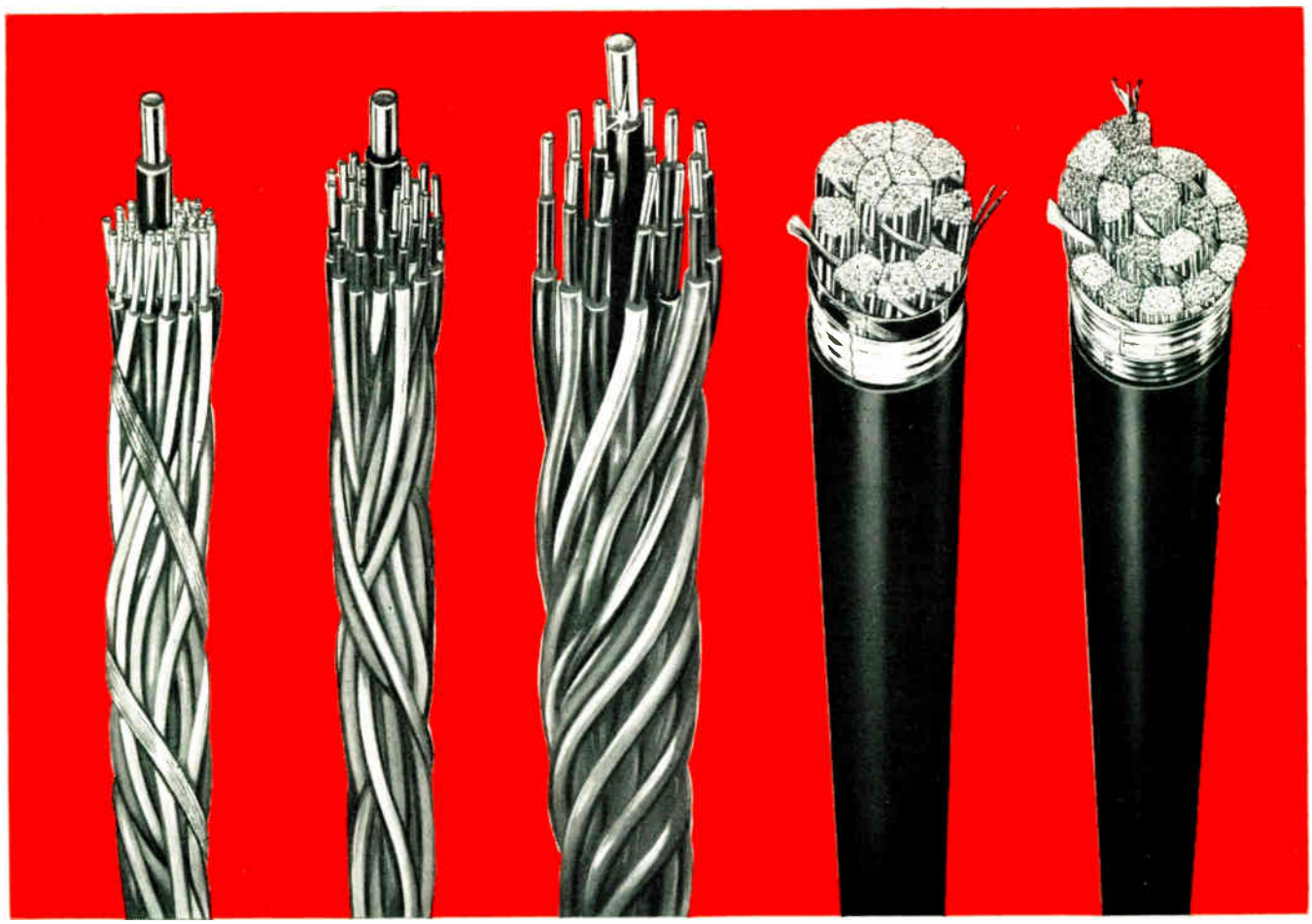
URBAN DISTRIBUTION
—16 poir only
Can be installed directly on the pole or to the underside of existing crossarms. Steel support wire has 1800 lb. breaking strength and is polyethylene insulated. Conductors are size 24 AWG solid annealed uncoated copper insulated with colour-coded polyvinyl chloride compound.

SUBURBAN DISTRIBUTION
—6, 11 or 16 poirs
For direct pole or under-crossarm installation. Polyethylene insulated .109″ steel support wire with breaking strength of 1800 lb. for cables having less than 12 pairs and .120″ steel wire of 2200 lbs. strength for cables having 12 pairs or more. Conductors are size 22 AWG annealed uncoated copper, insulated with polyethylene, and protected with colour coded polyvinyl chloride jacket.

RURAL DISTRIBUTION
—up to 18 poirs
Same installation and support characteristics as suburban distribution cables. Conductors are size 19 AWG annealed uncoated copper insulated with high-grade polyethylene. A tough colour coded PVC jacket protects the polyethylene against damage during installation.

ALPETH
Primarily aerial cable but available for direct burial. Up to 400 pairs of plastic insulated conductors. New simplified even count colour code. Flat or corrugated aluminum shielding gives maximum protection and flexibility. Light in weight . . . extra easy to joint or terminate. Longer runs reduce number of joints. High dielectric strength and low current loss in HF carrier circuits.

STALPETH
Primarily for laying in ducts, but available for aerial installation or direct burial. Up to 2727 pairs No. 26 gauge, paper insulated conductors . . . only half the weight of paper lead, and costs less in all sizes. Soldered steel tape provides completely moisture proof construction.



Five well known cables by *Phillips*

These five popular cables are available coast-to-coast from AUTOMATIC ELECTRIC. We also carry a full range of pole line hardware, tools and accessories. For full information on any of these products, call or write your nearest AUTOMATIC ELECTRIC office . . . the complete source of supply for all communications requirements. *Automatic Electric Sales (Canada) Limited, 185 Bartley Drive, Toronto, Ontario. Branches across Canada.*

AUTOMATIC ELECTRIC GENERAL SYSTEM

Subsidiary of
GENERAL TELEPHONE & ELECTRONICS

For complete details check No. 6 on handy card, page 41

6019

A shaft position indicator

A shaft position indicator using a synchro-resolver as an analog to digital transducer is described in the following article. The overall error of the system is ±0 .3°. Some advantages of the synchro-resolver are discussed.

by A. Staniforth B.A.Sc., M.I.R.E. and P. G. Hodgson*

The conversion of a shaft position to a digital indication may be achieved in a number of ways, two of the more common transducers being the coded commutator and the potentiometer. In this application the synchro-resolver offers some important advantages.

Synchro-resolvers can be manufactured to close electrical and mechanical tolerances; as a phase shift device accuracies of ±0.1° can be obtained. This order of accuracy can also be achieved by the coded commutator but few potentiometers can achieve this figure. The life expectancy of a resolver is of the order of 10^7 revolutions, while the life of both the commutator and the potentiometer may be 10^6 revolutions.

A system of indicating a shaft position by using a synchro-resolver and an electronic counter was proposed by M. B. Wood[1] and a similar method was described by A. T. Arcand et al.[2]

In this application, a digital read-out of shaft angle is provided on an electronic decade counter. This makes the remote indication of a shaft position possible, while avoiding the cumulative errors of a synchro data transmission system. Several displays may be provided in widely separated localities.

An angular reading of shaft position is obtained in the following manner (see Figure 1). A constant frequency is generated and applied to an external counter. This same frequency is divided down, according to the resolution required, and the result is fed to two separate channels. One channel generates a reference pulse, the other produces a pulse shifted in time-phase according to the position of the resolver rotor. These pulses are applied to the counter gate as "start" and "stop" pulses.

Circuit description

Frequency Generator (Figure 2)

The frequency generator consists of a multivibrator (V301A and B) running at 108 kc/s. This frequency is doubled by V305 and V306 to provide 216 kc/s to the counter. For greater stability and accuracy, the multivibrator may be locked to the crystal-controlled 100 kc/s output of the counter, 200 kc/s then being applied to the counter.

Frequency Divider (Figure 2)

Division by 1800 is necessary to provide a resolution of 0.1°. To conserve weight, space and power consumption, cold cathode tubes are used where possible.

V302A and B, driven from the multivibrator, divides by 5, V303A and B by 2, V304A and B by 2, V308 and V309 by 9 and V307 divides by 10 and provides a sinusoidal output.

* *The authors of this article are employed in the Radio and Electrical Engineering Division of the National Research Council of Canada, Ottawa.*

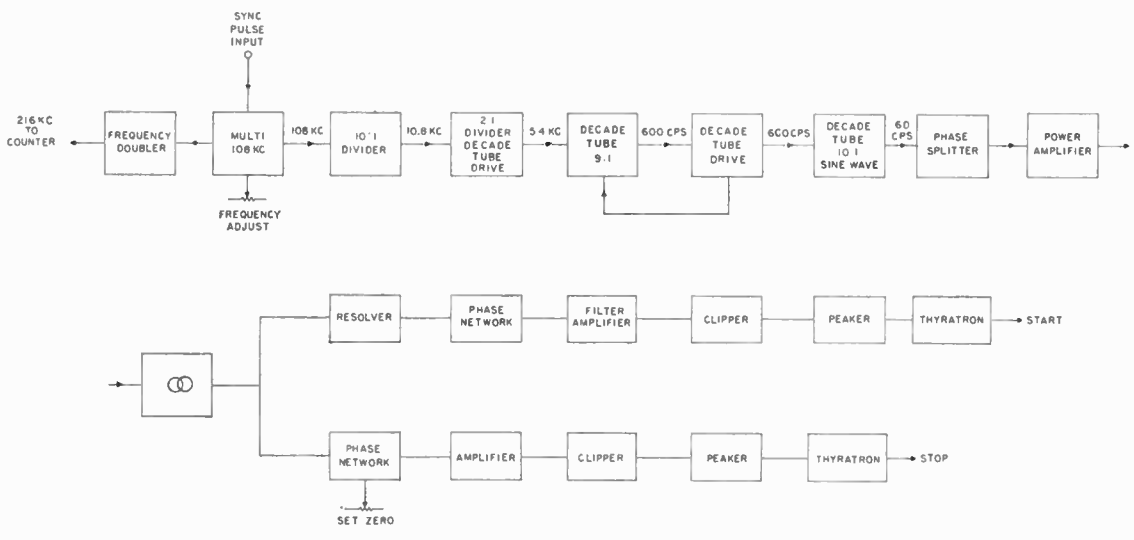


Figure 1 — Shaft Position Indicator block schematic.

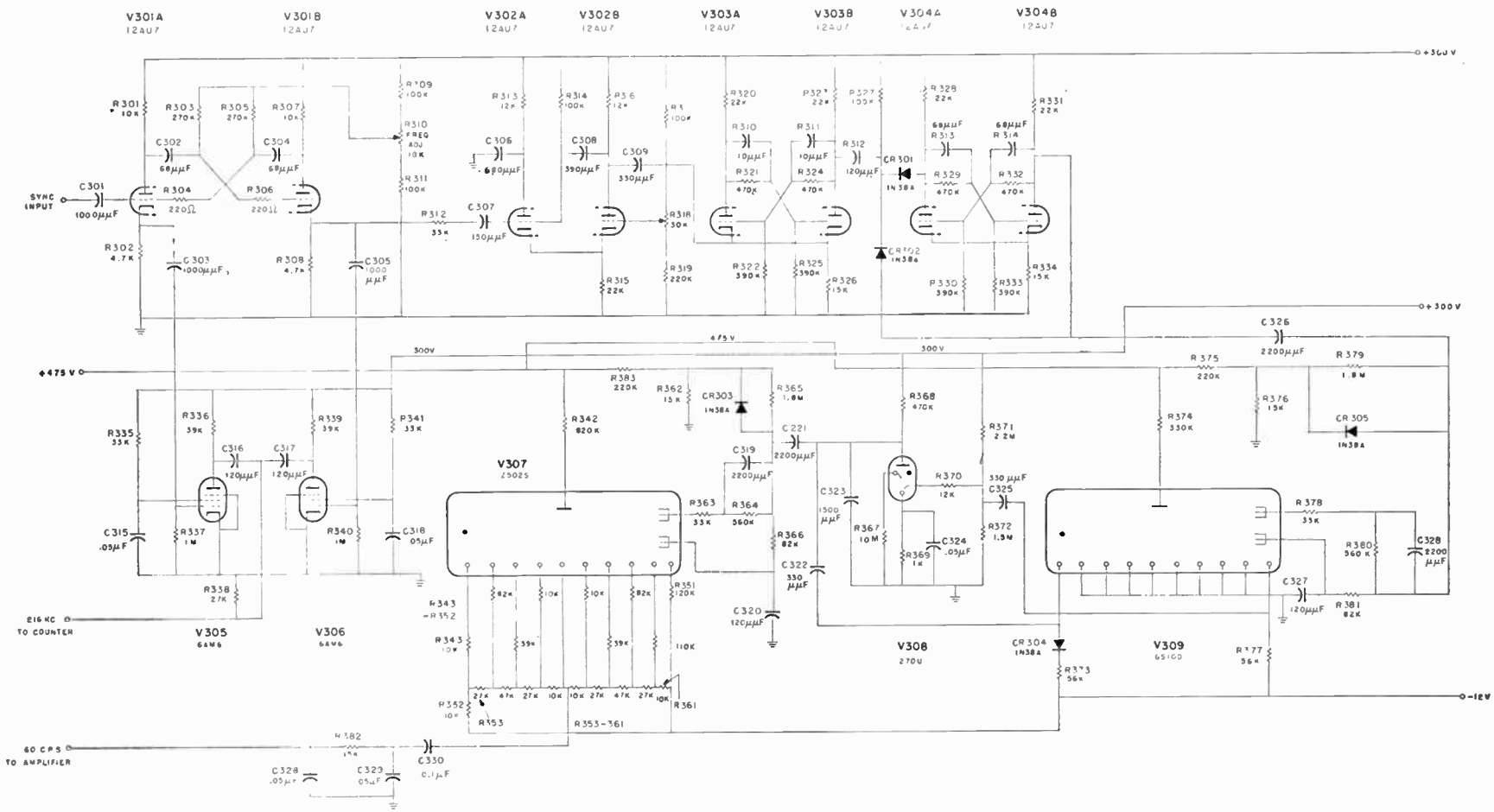


Figure 2 — Shaft Position Indicator Frequency Divider.

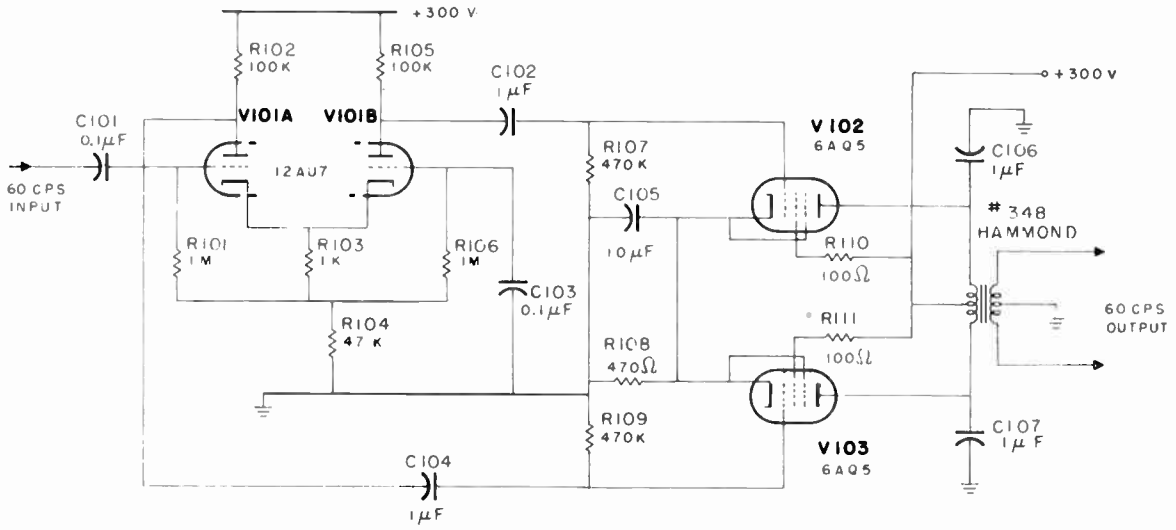


Figure 3 — Shaft Position Indicator 60 cps Amplifier.

60 c/s Amplifier (Figure 3)

The output from the frequency divider is amplified by V101A and B, V102 and V103, and filtered.

Phase Shift Networks (Figure 4)

The resulting voltage from the 60 c/s amplifier is applied to an R, C phase shift network, which is used to adjust the effective zero or datum position of the shaft being measured. The same voltage is also applied to the rotor of the resolver.

The output voltages of the quadrature stator windings of the resolver are proportional to the sine and cosine of the shaft angle. When connected to an R, C circuit as shown in Figure 4, one voltage is shifted $+\pi/4$ radians and the other $-\pi/$ radians. Their vectorial sum, E_0, is a voltage of constant amplitude with a phase proportional to the angle of the rotor.

$$E_1 = E_R \sin a, \quad /+\pi/4$$

$$E_2 = E_R \cos a, \quad /-\pi/4$$

$$E_0 = E_R (\sin^2 a + \cos^2 a), /\beta$$

$$= E_R /\beta$$

$$\text{and } \beta = a - \pi/4$$

$$= \tan^{-1} \frac{E_1}{E_2} - \pi/4$$

Clipper-Peaker Circuits (Figure 4)

The two clipper-peaker circuits are similar except that the resolver channel has a filter to eliminate harmonics generated in the synchro-resolver. The operation of the reference channel is described.

Continued on page 57

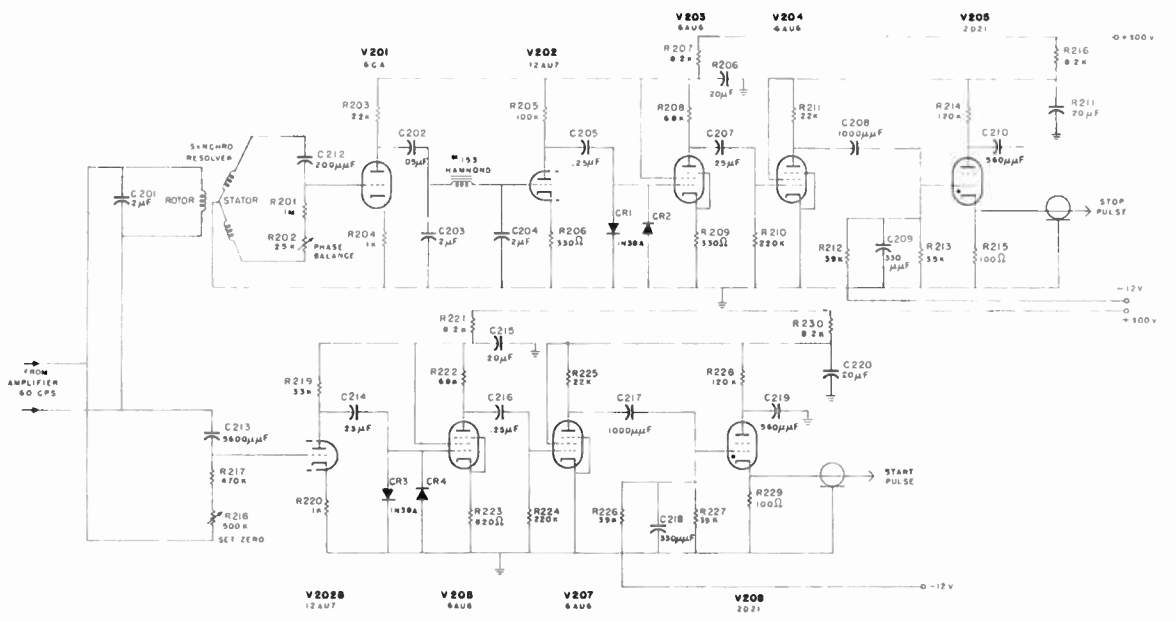
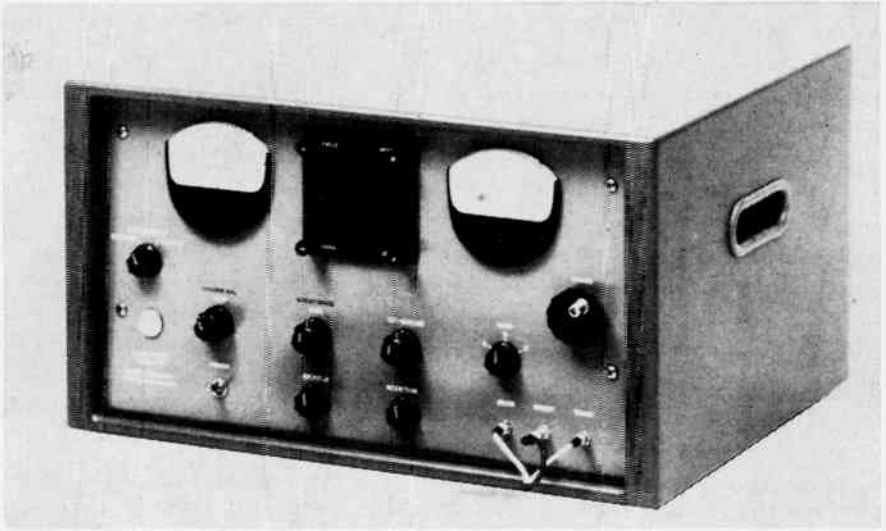


Figure 4 — Shaft Position Indicator Start and Stop Pulse Generator.

product panorama

For further information on New Products use Readers' Service Cards on pages 41 and 42.



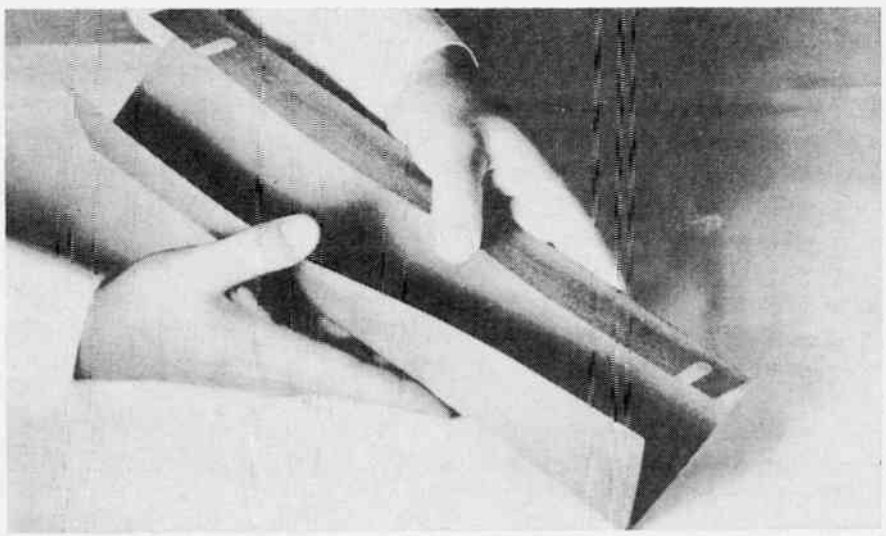
Item 641

Nuclear fluxmeter

Item 641

Varian Associates' new Model F-8 Nuclear Fluxmeter provides precise measurement and/or control of uniform magnetic fields in laboratory and industrial magnet applications. Instrument range is 1 to 52 kilogauss. The F-8 functions without local oscillator near the magnetic field, thus eliminating air gap clutter. It utilizes a probe completely buffered from frequency determining circuitry. Thus frequency instabilities caused by varying external components or probe position are eliminated.

For full specifications, write the **Instrument Division, Varian Associates, 611 Hansen Way, Palo Alto, California.**



Item 642

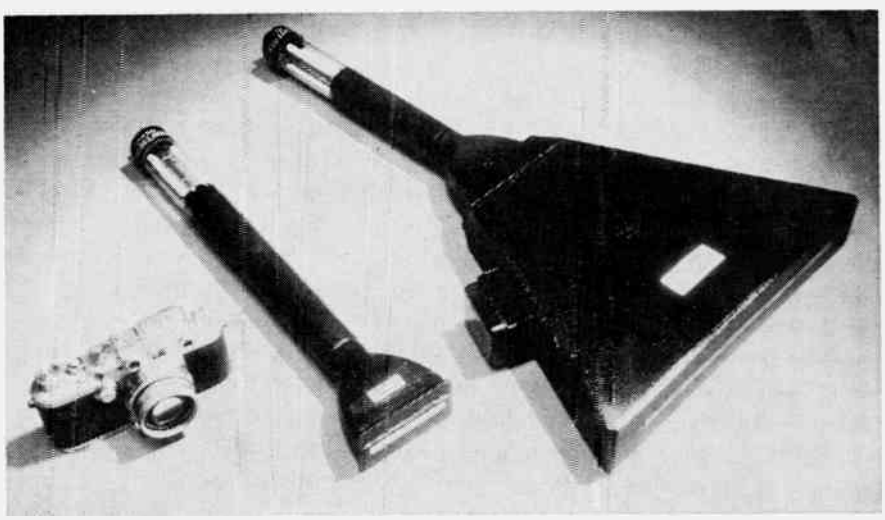
Flame-resistant vulcanized fibre

Item 642

Pyronil "E", a new electrical grade of flame-resistant vulcanized fiber with improved dielectric strength and arc resistance, is announced by National Fibre Co. of Canada, Ltd.

Rated non-burning under ASTM procedures D-635 and D-568, Pyronil "E" is intended for use as a combination flame, heat, and dielectric barrier in electrical and electronic equipment. Its low initial cost and ease of fabrication will cut costs in the manufacture of data processing equipment, business machines, radio, television, and appliances.

National Fibre Co. of Canada, Ltd., 107 Atlantic Ave., Toronto, Ont.



Item 643

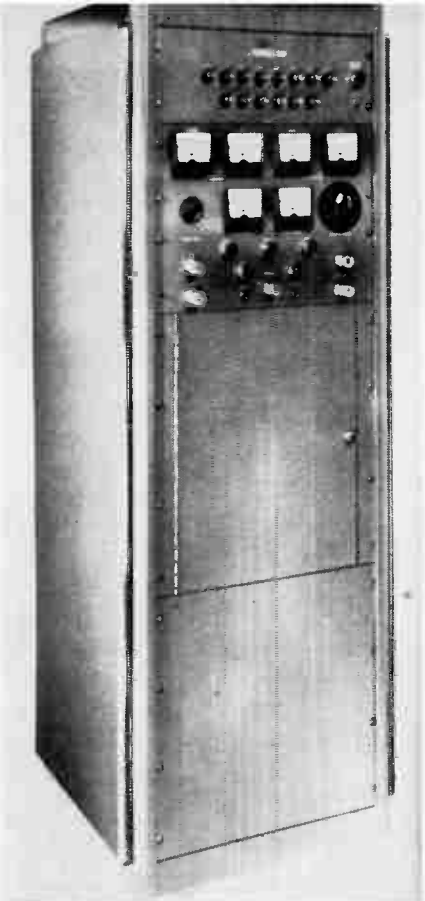
Electrostatic printer tubes

Item 643

Four new electrostatic printer tubes that can translate electronic signals into printed words and pictures on paper have been introduced by Raytheon Company's Industrial Components Division. The high speed tubes can print 20,000 characters per second or more than 10,000 lines of computer output information a minute.

The new QV130 and QV131 tubes have 3" matrices and were designed especially for label and short copy printing. Models QV132 and QV133 are 10" printer tubes and can print electronically-stored or transmitted information on full-page sheets.

Full particulars may be obtained from **William H. Weed, Industrial Components Division, Raytheon Company, 55 Chapel St., Newton, Mass., U.S.A.**



Item 644

Microwave modulator

Item 644

A new high power microwave modulator — Model 10002 — designed to accommodate any of 76 magnetrons, covering 5,400 mc to 35,000 mc, with peak outputs from 20 kw to 500 kw, has been announced by The Narda Microwave Corporation, Mineola, L.I., New York.

High voltage power supply is continuously variable from 0 to 8 KV at 200 ma; pulse power output is 37 KV at 40 A. maximum; magnetron filament supply is continuously variable from 0 to 20 volts at 16 A.

The Narda Microwave Corporation, 118-160 Herricks Road, Mineola, L.I., N.Y., U.S.A.

Coaxial line duplexers

Item 645

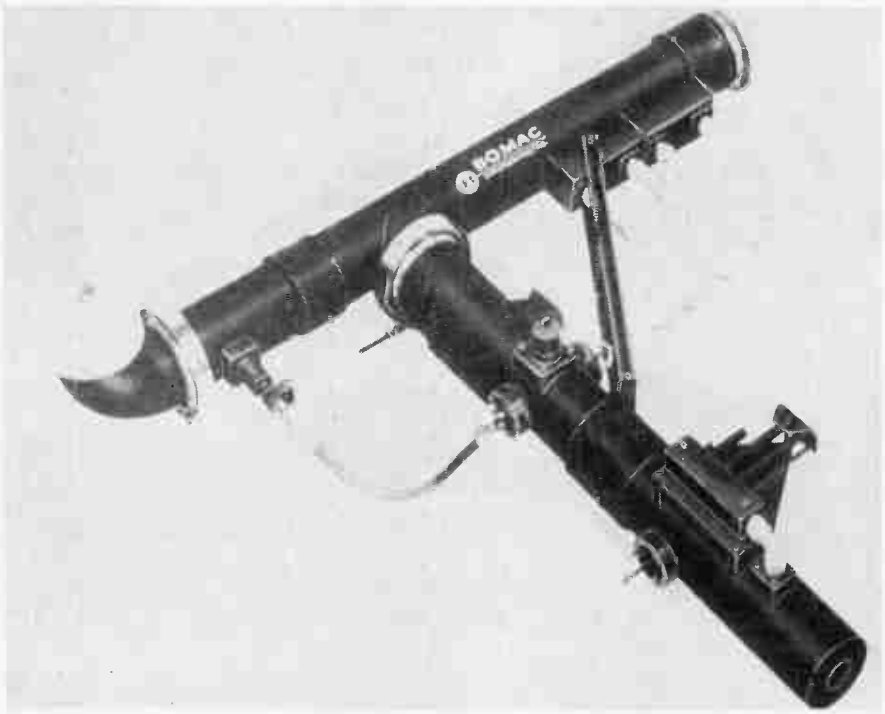
Another addition to the microwave components line offered by Bomac Laboratories, Inc., Beverly, Mass., are the company's new branched coaxial line duplexers, utilizing two cell-type TR tubes and a single cell-type receiver protector tube.

In the 3⅛" unit shown in the illustration, two band pass filters are shown, one in the receiver circuit and one in the AFC pick-up circuit. Visible also are directional couplers used for measuring transmitter power and antenna circuit VSWR.

The unit shown is rated as follows: frequency, 406-450 mc . . . transmitter po, 3 Mw max. . . . transmitter po (av), 5 KW max.

Bomac Laboratories, Inc., Beverly, Mass., U.S.A. or R-O-R Associates Limited, 1470 Don Mills Road, Toronto.

Item 646



Item 645

Transistorized amplifier

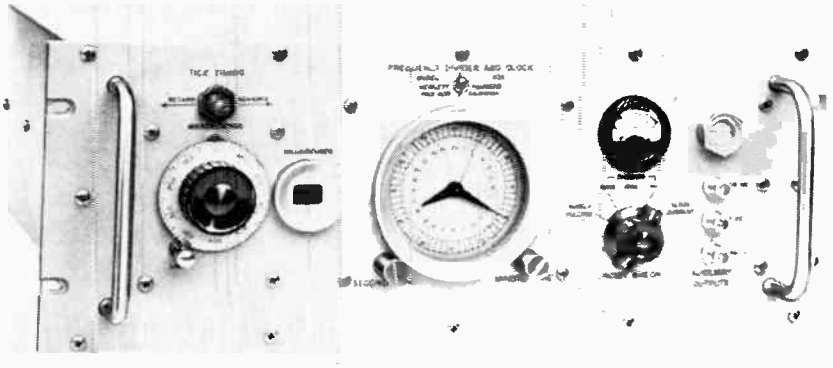
Item 646

Model TA/5M 12 volt battery or AC mains supply unit is a completely transistorized AF amplifier ideally suitable for the reproduction of speech or music and possesses the unique feature of operating from either line power or battery power at will. The unit is intended for public address work, paging for offices, music amplification, aircraft, etc.

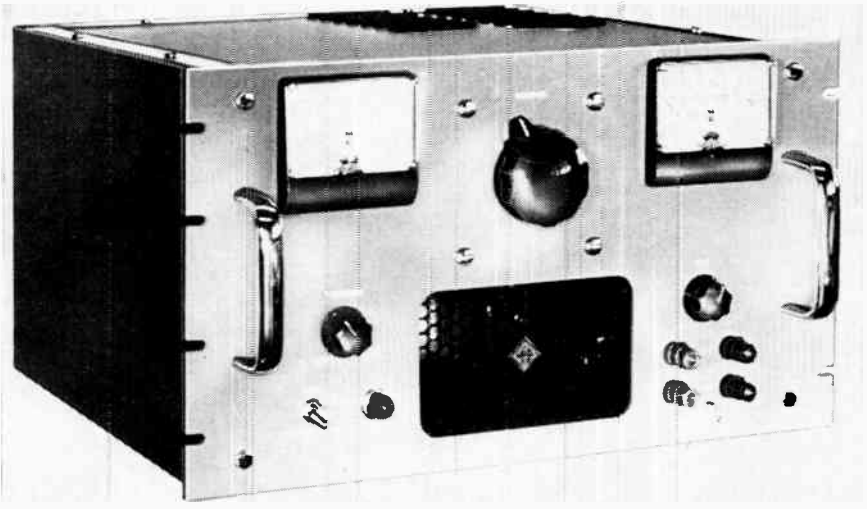
Specifications: Size 5"W x 6"D x 6"H. Input voltage: 110/200/250 volts AC or 12 volts DC. Power output into 15 ohm load: 18 watts. Selector Switch: AC line/battery. Maximum Current (excited): 2 amps. Quiescent Current (unexcited): 200 mA. Frequency response: flat from 70 cps-10 Kcs. Distortion: 2%. Input impedance: 20-5,000 ohms. Input sensitivity: 1 mV. Output impedance: 15 ohms. Tone Control: Treble Cut. Fuse: 1 amp. Cartridge Type.

Conway Electronic Enterprises Reg'd, 1514 Eglinton Avenue West, Toronto 10, Ontario.

Item 648



Item 649



Item 647

Transistorized power supply

Item 647

Extreme reliability, ease of maintenance and close performance specifications are built into the new Mid-Eastern Electronics' ST36-10 transistorized power supply. Features that add to its serviceability include interchangeable plug-in modules and standard sub-assemblies. The bias supply, amplifier and overload circuitry are off-the-shelf plug-in units, while the heat sink assembly, isolation transformer, rectifier assembly and filter capacitor group are standard pretested sub-assemblies.

Output voltage is 0-36 V DC and output current 0-10 amperes, both continuously variable over the full range. Regulation is 0.03% for load changes and 0.005% for line variations. Ripple is less than 500 microvolts. Overshoot does not exceed 1% of voltage setting and recovery is 50 microseconds for half current step changes. Other features include automatic overcurrent protection, freedom from transients and external load change sensing.

Further details from **Willer Engineering & Sales Co., 676 Richmond St. W., Toronto 3, Ont.**

Galvanometer

Item 648

The EEL Type 35 "Unigalvo" is a current or voltage measuring unit with terminals and range switch. The galvanometer unit is accurately balanced and built complete with magnet on a diecast backbone; the unit is mounted in a plastic molded body and cover which offers an effective seal against the entry of dust. A pivottable base plate is fitted with adjustable screw to permit an accurate vertical setting of the reflected light beam. An important feature of the galvanometer design is a unique clamping device which holds the coil rigid and relieves ligament tension when the instrument is not in use, thus providing an extremely robust unit well able to withstand rough handling during transportation. It is operated by a knurled plastic knob protruding through the rear left-hand side of the instrument casing. An additional safeguard is obtained by electro-magnetic damping of the coil which is short-circuited when the "on-off" switch is in the "on" position.

Available from **The Glendon Instrument Company Limited, 46 Crockford Blvd., Scarborough, Ontario.**

Frequency divider and clock

Item 649

A new frequency divider and clock, which makes possible precise time comparisons between stable oscillators and standard WWV or other transmitted time signals, is now available from Hewlett-Packard Company, Palo Alto, California.

The new instrument, Model 113AR, permits adjustment of frequency or time standards for greater absolute accuracy. It also simplifies the obtaining of detailed records of drift rates, or time or frequency differences between oscillators in widely separated systems. Propagation path errors can be averaged out and Doppler errors are virtually eliminated.

Model 113AR, a compact unit measuring only 7 inches high, is conservatively designed from premium components. It is fully transistorized and meets all performance requirements of MIL-E-16400.

Model 113AR is manufactured by Hewlett-Packard Company, and distributed in Canada by **Atlas Instrument Corp., 50 Wingold Ave., Toronto 19, Ontario.**

Continued on page 40

Are we selling our defense industry short?

Continued from page 24

Our government clearly recognizes the contribution these defense scientists and engineers make to our daily lives. Mr. O'Hurley, Minister of the Department of Defense Production, sums it up when he says, "The electronics industry . . . serves three major markets with widely divergent requirements. Defense electronics is just one of these, the other two being the large consumer market for radio and television products and the growing market for industrial applications of electronics. ***Experience has shown, however, that defense electronics has set the pace of engineering in the industry and has produced the developments on which the growth of the other two markets has rested.**

D. A. Golden, Deputy Minister of Defense Production, in a speech to the Institute of Radio Engineers last fall stated, "The development and production of defense equipment has a tendency more and more to set the pace of technological progress of a country."

If "Production Sharing" is to fill the gap in Canadian electronic technology the question we must ask ourselves is "Can production sharing be made to work?"

DDP say that it can. D. B. Mundy, Director of the Electronics Branch and his staff are working to uncover U.S. requirements nearest to Canadian capabilities and to create the climate for success. But as Mr. Mundy says, "This cannot be done without the full partnership of industry." To ensure this cooperation DDP very early brought the Electronics Industries Association fully into the picture. This strong Association representing as it does the combined views of its over one hundred member companies responded immediately to the invitation by establishing the Defense Production Sharing Committee, a senior study group under the chairmanship of J. D. Houlding.

During the next critical year of production sharing this group accumulated and analyzed data from member companies on their successes, disappointments, problems and methods. Liaison was maintained with DDP during the period and a free interchange of information on progress and production sharing procedures was effected.

Here are some of the main observations made by the EIA Defense Production Sharing Committee after its analysis of the first 18 months of production sharing:

1. In its second year of operation there appears to be a decline in production sharing. Although figures are available for the first six months of 1960 only, and could change in the second half, the trend at the moment is just the reverse of what had been anticipated.

2. There is an alarming decline in the Department of National Defense budget for research and development. Industry estimates suggest that this budget may now be less than one per cent of that in the U.S.

3. The Defense Research Board budget is spent on its own internal programs and does not therefore contribute to the maintenance of industrial capability. This serves to further diminish the competitive position of Canadian industry.

4. Department of National Defense funds are being devoted increasingly to installation, operation and maintenance of equipment, and correspondingly smaller amounts are being allocated for the development and manufacture of new equipment.

5. The development funds provided for in Vote 71 are not being effectively applied.

6. The overall electronics industry in Canada is showing a marked and general decline, thus creating a threat of unemployment in skilled elements of the industry.

Advance information essential to Canadian industry

Although industry felt much reason for concern, and even alarm, at the way things seemed to be going, the intent of the study was not to emphasize the problems but to offer constructive suggestions to correct the trend of decline and assist in making production sharing work effectively.

One of the biggest problems seemed to be the lack of opportunity for Canadian companies to obtain early information on future U.S. military requirements.

Canadian companies do not have direct contact with the U.S. Service forward planners and there is no mechanism under the present production sharing organization to permit this. Although DDP have done everything possible to open the doors for Canadian companies it must be remembered that DDP are primarily a procurement agency aware of programs only after they have been funded. Once a program has been funded it is virtually impossible for a Canadian company to break in.

It becomes apparent then that there is a missing link — a gap separating the technical capabilities of Canadian companies from the needs of the customer. Until this gap is bridged we cannot expect production sharing to work effectively, for it is only by obtaining advance development and design work that Canadian companies can demonstrate their technical ability and qualify for the follow-on production programs.

This gap in Canada is in sharp contrast with the situation in the U.S. where industry works closely with the Armed Services in advanced development areas to the mutual advantage of defense and industry.

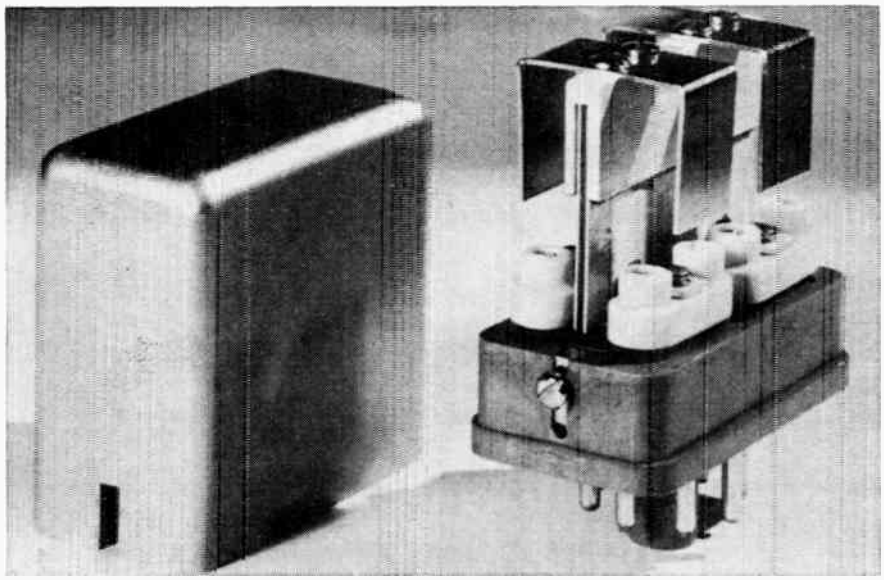
The problem is an old one for the Canadian Electronics Industry and has been the subject of many representations to Ottawa but now has added significance in the light of our present government's integrated defense policy. Unfortunately since production sharing there seem to be even fewer occasions when industry can discuss advanced technical requirements with the Department of National Defense.

E.I.A. believe this missing link could be provided by the technical directorates of the Departments of National Defense working in close cooperation with the DDP.

In other words DND should become a full working partner on the production sharing team.

Continued on page 44

**The emphasis shown in the above text is that of the author.*



Item 650

Crystal oven

Item 650

Specifically designed for use in multi-channel SSB, mobile, marine and aircraft communications equipment, Croven Limited's crystal oven Type SA-4 incorporates the desirable features of compact size, low power consumption and temperature stability required by these classes of service.

The proven reliability and negligible thermal aging of the snap-action type thermostat greatly contribute to the long-term performance of the oven.

For further details and design information to individual specifications, contact **Croven Limited, 500 Beech St., P.O. Box 1420, Whitby, Ontario.**

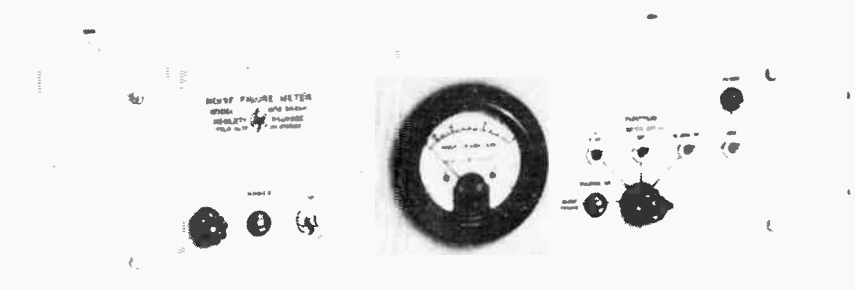
Noise figure meter

Item 651

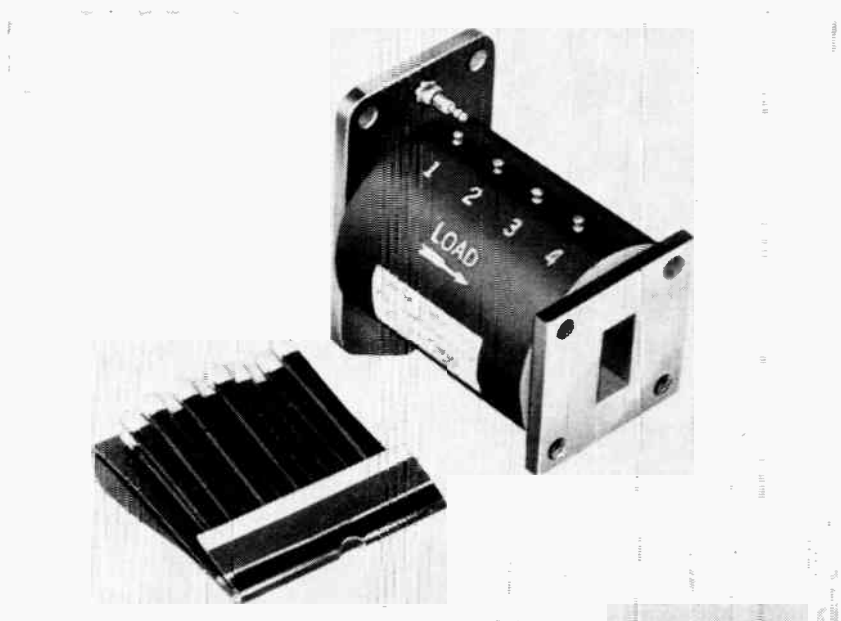
A new noise figure meter which directly and continuously monitors the noise figure of operating radar sets is now available from Hewlett-Packard Company.

The noise figure meter, Model 344AR, is a rugged, militarized instrument which operates automatically and includes a simple front panel calibration. It operates on either a 25 or 30 MC IF Frequency, and is designed for direct application to pulse radars with repetition rates of 90 to 500 pps, or up to 3000 pps with special sampling circuitry. The instrument's fast meter response enables the operator to optimize or adjust the radar system during operation or maintenance.

Model 344AR is manufactured by **Hewlett-Packard Company,** distributed by **Atlas Instrument Corp. Ltd., 50 Wingold Ave., Toronto 19, Ont.**



Item 651



Item 652

Ku-Band phase shifter

Item 652

A new Ku-Band Phase Shifter of exceptionally small size and weight is being marketed by Kearfott Division, General Precision Inc., Van Nuys California, manufacturers of precision microwave components and systems.

Designated as Model No. 5106001, this new small size phase shifter is ideal for use in confined areas where equipment space is at a premium. A high degree of phase shift is offered and all ferro-magnetic resonances are eliminated. The new unit is temperature compensated and is not affected by environmental conditions.

Outstanding features include: Frequency Range of 15-17 KCM (fo ±10 MC); Phase Shift is indicated at 112°; Insertion Loss at 0.5 DB Max; Input VSWR is 1.12 Max; Peak Power is 3 KW. Ambient temperature range of —10°C to +100°C. Length is 2".

Further information on the new Model 5106001 Ku-Band Phase Shifter is available on request to their Canadian Representative: **Lake Engineering Co. Limited, 123 Manville Road, Scarborough, Ontario.**

Continued on page 43

Use this convenient card to facilitate receiving E & C

For more information or literature about any product described or advertised in this issue – use these post paid "more information" cards for quick results

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City ..... Zone ..... Prov. .....

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

.....

Company ..... Nature of Business .....

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

ARE YOU AN ENGINEER? Yes ☐ No ☐

Signature ..... Position .....

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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.

Micropotentiometers *Item 653*

Micropotentiometers provide an accurate source of high-frequency, low-level voltage when used with an external signal generator and micro-ammeter.

Each Ballantine Micropotentiometer consists of a radial resistor, mounted in a Type N female coaxial connector, and a micropotentiometer housing. The 1½ x 1⅝ x 1¾ aluminum housing contains a Type N male input coaxial connector, a UHF type thermocouple, and two high-frequency by pass capacitors. The output voltage of any Ballantine Micropotentiometer can be varied from one-third to full

rated output by varying the thermocouple current over a three-to-one range. In addition, any radial resistor and output connector can be easily removed with a screwdriver and plugged into any other housing, carrying a thermocouple of different rating, to provide additional voltage ranges.

Additional information available from the Canadian representative: **Bayly Engineering Limited, Hunt St., Ajax, Ontario.**

Water Loads *Item 654*

The addition of new C-Band and XB-Band Water Loads to the Sierra 187 series of high-power, liquid-cooled, waveguide terminations has been announced by Sierra Electronic Corporation, a Division of Philco Corporation.

Covering frequency ranges of 5.8 to 8.2 kmc and 7.0 to 10.0 kmc (Model 1 1878-XB), these terminations are precision devices suited especially for Calorimetric RF power measurement applications as well as straight forward dummy loads.

The new terminations employ the proven, ruggedized design of the Sierra 187 series to combine extremely low RF radiation and VSWR (max. VSWR of 1:10 and typical values of 1:05) with maximum reliability and power capability.

All loads comprising the Sierra 187 series utilize a rigid, plastic water tube mounted in a waveguide section and diagonally oriented for impedance matching. An integral heater element is included to permit accurate calibration of a calorimetric power measurement system against a low frequency standard.

Additional information may be obtained from **Sierra Electronic Corporation, Menlo Park, California.**

Continued on page 46

Are we selling our defense industry short?

Continued from page 39

The team should have terms of reference aimed at establishing and maintaining in Canada a broad base of Military/Industrial technology and military manufacturing capacity.

The Association further believes that if Canadian companies are to bid successfully on advanced U.S. technical requirements they must maintain a state of technical preparedness. This cannot be accomplished without R and D. It has been observed that government programs such as the hypersonic studies at CARDE and the DRB satellite program are being sponsored jointly with the United States authorities and technical data accruing from them appear to be more readily available to United States rather than to Canadian industry.

This is a matter of great concern to an industry struggling to maintain technical competence. Government "in house" spending can do nothing to build the industrial capability so vitally needed for the success of our production sharing program and the growth of our nation.

The fact that our government is aware of the need for retaining design and development capability in Canadian industry is shown by the five million dollar development assistance vote 71 announced by Mr. O'Hurley on July 8, 1959. The purpose of the vote was explained as follows:

"This item is closely related to the production sharing program . . . As long as Canada was undertaking the independent development and production of the major equipment requirements of the armed forces, Canadian industry was able to build up and maintain sizeable engineering teams and to develop an advanced technology in a number of fields . . . The weapon systems and equipments which seem to offer the greatest promise for future production sharing are all characterized by a very high degree of engineering content. ***Canadian industry will be able to share in such production programs only if its engineering capacity can be maintained and its technical competence advanced through the performance of appropriate development tasks."**

Production sharing can be made to work

The intention of Vote 71 was to provide the challenging development opportunities necessary to retain Canadian engineers and keep them abreast of the state of the art. This was a brilliant concept and welcomed by Canadian industry, the only comment by many being that it should have been **fifty** million dollars and not **five.**

Unfortunately the utilization of this vote for its intended purpose was almost automatically ruled out by the restrictions with which it was hedged — the more onerous of these being the necessity for matching investment by Canadian companies and the requirement for proving a substantial market before funds would be released. Consequently, only a very small percentage of this vote has been used in support of electronic projects.

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* *The emphasis shown in the above text is that of the author.*

briefing the industry

■ **Air France, "World's Largest Airline",** has ordered the Canadian Marconi Company's airborne Doppler system for universal use in its Boeing 707 jet aircraft. This renowned airline is numbered among the seven international air carriers to adopt the Canadian developed aid. Others to whom equipment has already been delivered are: Canadian Pacific Air Lines, Irish International Airlines, KLM Royal Dutch Airlines, Pan American World Airways, South African Airways, and Varig (Brazil).

■ **There are never enough engineers in business** who have a high degree of business acumen built into their day-to-day technical judgments, a Canadian engineering group manager claims. H. S. Dawson, manager of engineering for Canadian General Electric's electronic equipment department, Toronto, told a management session at the 16th Annual National Electronics Conference in Chicago of a plan adopted by his firm to achieve a greater balance between technical problems and business factors in the work of the department's engineers. He said the whole problem has more significance in the electronics business because of the way in which technology is advancing.

■ **Honeywell Regulator Company** recently announced the formation of a new corporate division whose primary objective will be "the advancement of the state of the art" of complex integrated control systems for industrial and military applications. The move will centralize the company's broad capabilities in developing, installing and servicing specialized control systems such as those needed for complex industrial processes and missile launching installations.

■ **The Canadian Industrial Management Association** through their president, J. T. Harris, of International Business Machines Co. Ltd., have arranged to act again as co-sponsors and to co-operate in the organization of the National Industrial Production Show of Canada, to be held for the third time at the Exhibition Park, Toronto, May 8 to 12, 1961.

■ **The United States Department of Commerce** has reported that during the first half of 1960 the United States imported approximately $1,840,608 worth of parts for electronic computers. According to U.S. government officials the majority of such imports came from Canada with smaller amounts being imported from the United Kingdom, France, Switzerland and West Germany.

■ **Whether or not Canada will decide to participate** in the space research and satellite launching sharing program that is being proposed by the United Kingdom government, a sharing program that would distribute the costs for such a venture between participating members which would include members of the Commonwealth as well as some European countries, is eagerly awaited. So far little enthusiasm has been exhibited by Canadian officials towards the proposals offered by the U.K. Government and it is thought that Canadian officials will decide to forego the offer in favor of maintaining her association with the United States government in this sphere of activity.

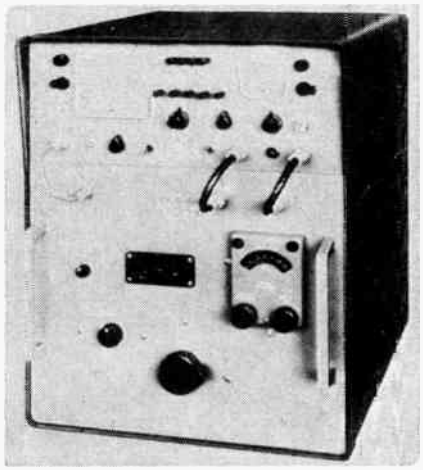
■ **Reports indicate that the Japanese Ministry of Trade and Industry** as well as electron tube manufacturers in Japan are beginning to heed the complaints of Canadian tube manufacturers with respect to the mounting importation of tubes from Japan and are working out plans to alleviate the situation. Government spokesman in Japan as well as industry officials say they are aware of sharp import increases into Canada and the need to set a limit on export volume but no figures have yet been laid down. Official Japanese estimates of the number of tubes shipped to Canada in the first six months of this year amounted to 2.05 million units as compared to 2.3 million units for the 12 month period last year and 401,779 units in 1958.

Field intensity meter and receiver

Item 655

A completely repackaged and redesigned Model FIM Microwave Calibrated Field Intensity Meter and Receiver was announced recently by Polarad Electronics Corporation.

The new Model FIM includes a self-contained power supply, thereby greatly reducing its size and weight. In addition, the new unit has a direct-indicating peak VTVM for ease of frequency location of impulse noise. All input signals can be attenuated up to 80 db in 1 db steps.



The unit is designed for locating and measuring RF interference, field intensity measurements, determination of shielding effectiveness, propagation studies, RF leakage measurements, susceptibility measurements, etc., and analysis of characteristics of transmitters, receivers and other microwave components. This instrument has been approved by the United States Air Force as the only equipment acceptable to perform RF radiation measurements under MIL-I-26600, in the frequency range of 1,000 mc to 10,000 mc. The universal versatility of this instrument has found wide acceptance in both industrial laboratory and field use.

Polarad Electronics Corporation, 43-20 - 34th Street, Long Island City 1, N.Y., U.S.A. *Continued on page 50*

Are we selling our defense industry short?

Continued from page 44

While the intent of the vote is clearly understood by industry, the severe limitations on profit imposed in the past have not provided the financial resources necessary to allow industry to commit itself to matching investment. Moreover, the varieties and vagaries of the military market, even in the United States, frequently render it difficult to provide any clear proof in advance of the existence of a market for a particular product.

The effectiveness of the vote is therefore open to question and the failure by industry to obtain development funds is, in turn, severely limiting its chances of obtaining future production contracts.

The Association feels the criteria for expenditure of funds under Vote 71 should be revised to support the evolution of new techniques in order to maintain the capability in Canadian companies for the penetration of all electronic markets. Such expenditures should not be related to the obtaining of future definitive production but rather to the general development of technological capability in the industry. Experience has shown that production will follow.

And finally EIA suggest the Government look closely at the military business possibilities in NATO countries and other world areas. Certain Canadian companies have been far more successful in these markets than they have in the United States. EIA feel that the concept and mechanisms of production sharing should be extended to the assistance of Canadian electronic technology in all potential markets.

The industry realizes there are problems — but problems are made to be solved. It will take a thoughtful and determined team effort to make production sharing work in the way we all want.

We don't have too much time. Although several Canadian companies are at the moment successful in world markets these successes are the direct result of previous government supported research and development on requirements far in advance of their times. The products meeting success today are the result of the developments of five years ago. We might ask ourselves where are the products this industry will be selling five years from now? There can be only one answer. **They will come from the advanced designs on the drawing boards today.** If these drawing boards are covered up and the engineers have moved on, we won't have new products and our industry will shrivel and die.

The EIA believes that production sharing can be made to work but that results will always be insignificant until some means is found for injecting Canadian technical capability into the earliest development stages of future military requirements both in Canada and in the United States. This will require a partnership of government departments and the full cooperation of industry. Only by solving this problem will Canada's electronic industry be able to accept its full role as a technical working partner with the United States in effective continental defense.

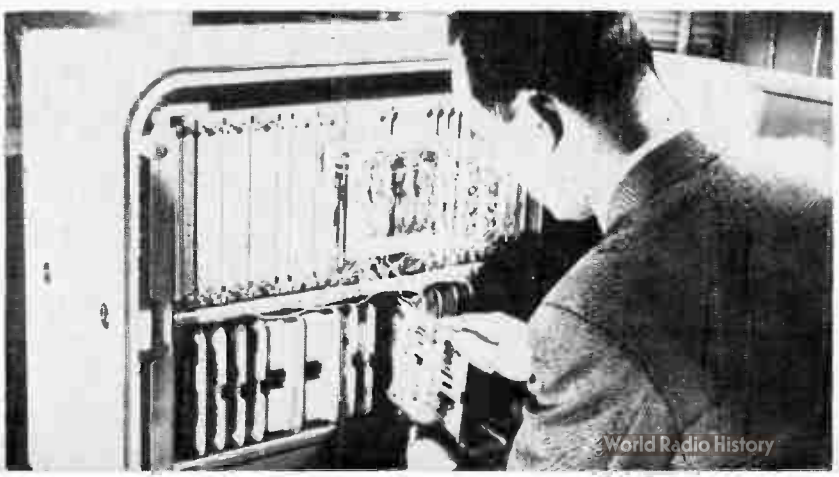
Let's not sell our defense industry short.

close-up

looking lenswise at your industry in action

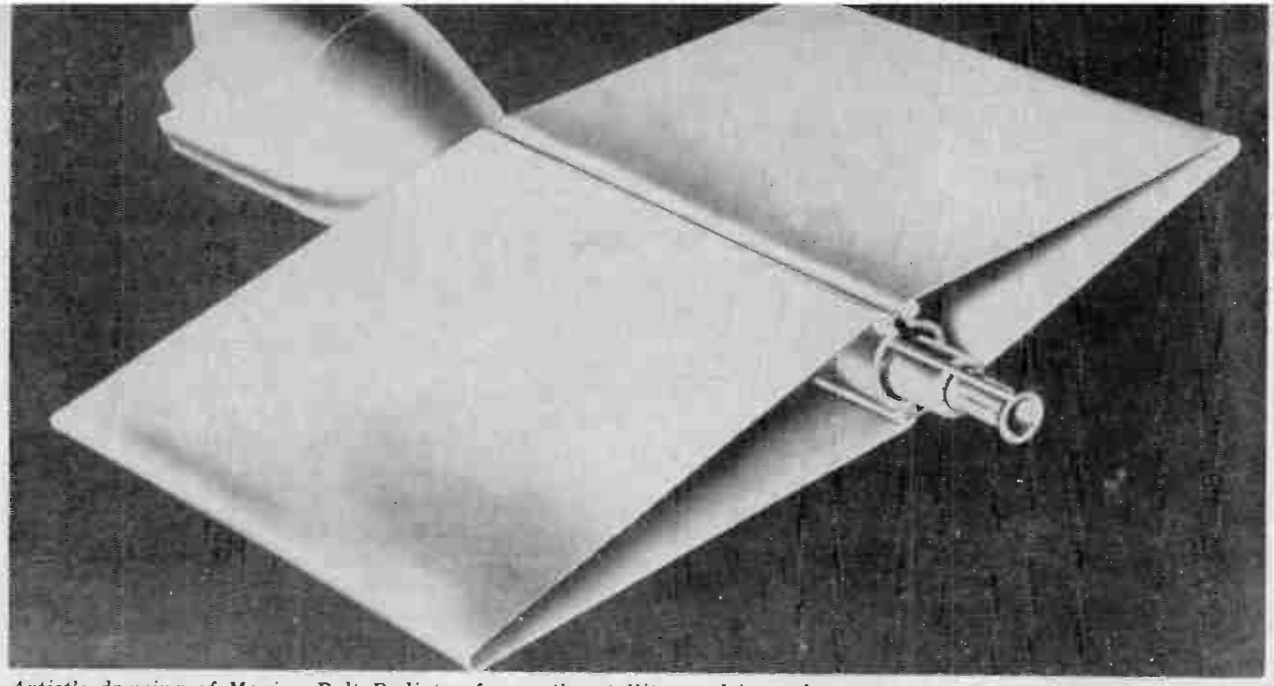
This is probably the largest precision resistor voltage divider built to date. Made by Resistance Products Co. of Harrisburg, Pa., for a Texas firm (everything's bigger in Texas), this network was built on special order as a precision 30 megohm 100 to 1 divider to operate at 30,000 volts with .05 accuracy. (The small resistor being held by the attractive Miss is solely for the purpose of comparison.)

On a recent three-day visit to Canada, Kirpal Singh Gill, chief engineer of Radio Malaya, toured radio and television broadcast equipment production facilities of Canadian General Electric Co. Ltd., and looked over the Toronto operations of the CBC. He is shown here with J. R. Warren, manager of manufacturing for CGE's electronic equipment operation, inspecting an exciter module used in the firm's series of modular television transmitters.

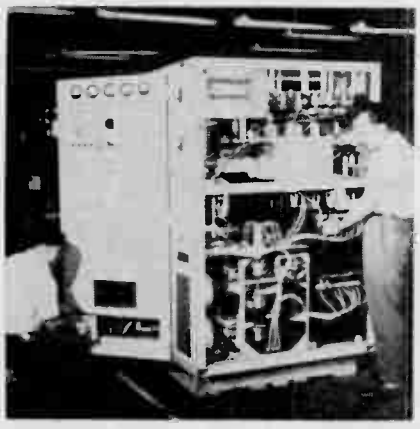


Raytheon Canada Limited employee Lola Wrobel shown above makes final cable adjustment to Bright Display System which converts radar signals into television form. Units are being produced at the company's new headquarters' plant at Waterloo, Ontario. The Bright Display System makes Canada's trans-continental long range surveillance network even more efficient.

Shown at left is a new and remarkably inexpensive on-line analog computer, made in Britain and designed especially for the process industries. In the photo the operator is seen inserting a printed circuit card into the computer. The use of printed circuits ensures that the minimum number of elements is used to solve a particular problem.



Artist's drawing of Moving Belt Radiator for earth satellites and interplanetary space vehicles developed by Rocketdyne, a division of North American Aviation, Inc. Radiator is much lighter than proposed tube and fin type and will continue to operate even if punctured by meteoroids in space. Model of radiator is now undergoing tests in vacuum chamber which simulates space environment.



Final assembly on a 10 kilowatt Northern Electric Tropospheric Scatter Power Amplifier Klystron Bay being constructed at the company's Belleville, Ontario, plant. Designed for an 8,000 mile circuit, this equipment is capable of carrying 240 channels of L and K carrier multiplex. Frequency range: 755-985 mcs.

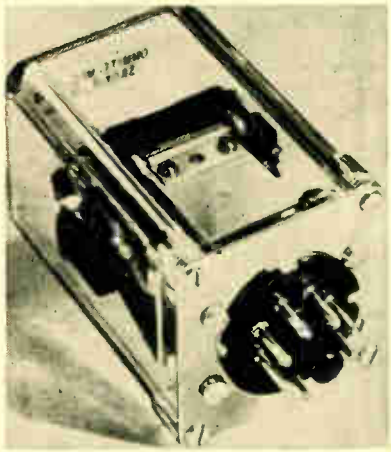
The special products operations at Philco's Lansdale Division has developed a technique for sealing germanium windows to infrared detectors, making possible the fabrication of detectors for use in longer wavelength regions. The development enables detectors to receive transmission of infrared radiation beyond 25 microns (the germanium window may be coated to peak within this range).

To increase the reliability of digital computers logic cards are now potted in pairs and dipped in an epoxy resin. The resulting assembly is completely impervious to humidity, contamination, vibration and shock. After leaving the coating section, the potted assembly is baked at 150°F to harden the thermosetting plastic. Temperature control is critical to avoid damaging the heat sensitive electronic components.

A pair of comely secretaries are "served up" on a 40-foot parabolic "dish" antenna at International Telephone and Telegraph Laboratories, Nutley, N.J. When mounted the antenna and associated electronic equipment will enable ITT scientists to "listen in" on radio signals reflected in space by the moon or other man-made satellites.

Dust-tight relays *Item 656*

The series of Ohmite Manufacturing Company relays designated Series DOS may be obtained with a plastic dust cover where the dust-tight feature is desired. Available at the same cost as the metal variety, the plastic type offers the advantage of visibility permitting observation of the relay for operation, condition, or position of contacts which is helpful in trouble-shooting or routining associated equipment. Drawn aluminum dust covers are also available from Ohmite where this type is still desired. All DOS dust-tight relays (metal or plastic covered) have octal plug-terminated bases for instant insertion into matching sockets.



Model DOS relay is a 2-pole, double throw general purpose relay with contact and terminal carrying parts of molded plastic. It is capable of handling loads normally demanded of considerably larger relays (15-amp contacts). Available for AC or DC operation.

Request Engineering Bulletin 1010 from **Ohmite Manufacturing Company, 3634 Howard Street, Skokie, Illinois.**

Marker generators *Item 657*

Jerrold Electronics Corporation has developed two new crystal controlled marker generators. Models CM-6 and CM-10, which, though they contain six and 10 crystal oscillators respectively, use harmonic and side band techniques to attain many more marking indications.

Utilizing a single center frequency oscillator, it is possible to choose two side band oscillator frequencies to provide a total of five marks, one at the center frequency, two at the band edges and two at the 3 db down points.

The CM-6 is a six-crystal unit housed in a portable cabinet and the CM-10 is a 10-crystal unit developed for rack mounting. Both provide frequency references on response curves of filters, amplifiers and other equipment requiring a predetermined frequency specification.

Jerrold Electronics Corporation, 15th and Lehigh Ave., Philadelphia 32, Pa.

Continued on page 52

Noise figure meter *Item 658*

A new noise figure meter which directly and continuously monitors the noise figure of operating radar sets is now available from Hewlett-Packard Company. Model 344AR is a rugged, militarized instrument which operates automatically and includes a simple front panel calibration. It operates on either a 25 or 30 MC IF frequency, and is designed for direct application to pulse radars with repetition rates of 90 to 500 pps, or up to 3000 pps with special sampling circuitry. The instrument's fast meter response enables the operator to optimize or adjust the radar system during operation or maintenance.

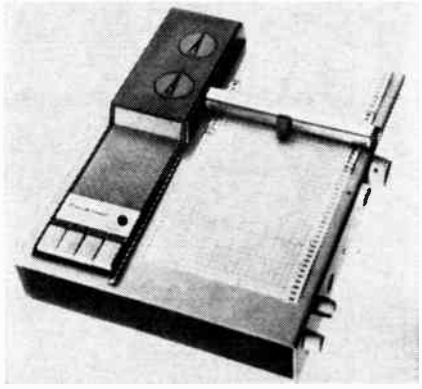
With the compact and transistorized 344AR, system noise figure is measured on a time-shared basis with the radar scan. The unit's high sensitivity minimizes signal and transmitter losses; the noise source may be decoupled 20 db from the main transmitter line. Two alarm functions give visible and electrical indication when an allowable noise figure is exceeded, or a noise source malfunctions.

Hewlett-Packard Company, 1501 Page Mill Road, Palo Alto, California.

Potentiometric recorder *Item 659*

The Scientific and Process Instruments Division of Beckman Instruments, Inc., announces its Laboratory Potentiometric Recorder.

The recorder introduces new design concepts which combine precision performance with the features of low cost and portability. It may be used with various types of laboratory instruments; with a variety of sensing



elements for measurement of such variables as temperature, pH, frequency, etc.; or for direct measurement of DC millivoltages. The voltage span can be varied continuously within the 10 to 100 mv range by turning the span control knob. By turning the zero control knob, the pen zero-setting can be displaced at any point throughout the five inches of pen travel. Repeatability is 0.35% and pen response is 1.0 second over the full scale.

Scientific and Process Instruments Division, Beckman Instruments, Inc., 2500 Fullerton Road, Fullerton, Calif., U.S.A.

scatter matter

Scanning the international scene

A new manned vehicle monitor that can tell at a glance the immediate condition of a pilot and the craft he is flying has been designed for the U.S. Air Force Flight Test Center by International Telephone and Telegraph Laboratories, an associate of STC (Canada) in Montreal.

The new device, to be manned by ground personnel, for the first time will give direct read-out or "real time" safety reports on the physiological and environmental conditions of the pilot, in addition to telemetered "how goes it" information on the vehicle itself.

Complicated business machines able to call each other to exchange information is one of many new developments in communications forecast by Thomas W. Eadie, president of the Bell Telephone Co. of Canada. Other developments include push-button "dialing", 80 per cent of telephones will be colored, calls will be switched electronically and people and machines will be able to talk to each other.

Birmingham Sound Reproducers, of Staffordshire, England, manufacturers of automatic record changers are supplying more than 25 per cent of the monaural and stereo phonographs and hi-fi combinations made in the United States. American customers include Westinghouse, Columbia, Olympic, Motorola, Emerson, Capitol, Symphonic, Trav-Ler, Arvin and other leading firms. Distribution here is handled by BSR (USA) Limited, with headquarters at College Point, L.I., N.Y. BSR sells over 70 per cent of the Canadian market for record changers. Among the major users of its equipment are Canadian Admiral Corporation, Ltd., Canadian Marconi Company, RCA Victor Co., Ltd., Sparton of Canada, Ltd. and Electronic Enterprises, Ltd.

Technical brainpower continues to grow in importance in modern industrial civilization, resulting in a technical manpower shortage that "will be with us from here on", perhaps for centuries. The demand for technical 'know-how' must inevitably increase for many decades, perhaps for centuries to come, probably at a geometric rate, according to Prof. J. R. Weir, of the California Institute of Technology, who recently addressed a symposium on management planning aspects of future manpower shortages. His paper was titled, The Next Hundred Years.

Wells A. Webb, research chemist for Hexcel Products Inc., of Berkeley, California and James Harder, assistant professor of civil engineering at the University of California told a recent gathering of the American Astronautical Society that there is sufficient evidence indicating the possibility of past or present life on Mars to make it practical to instrument the first Mars probe so that it may detect such manifestations should they exist. They also believe in the possibility that Martians may be able to detect capture or destroy rocket probes from the Earth.

Forty Canadian engineers have been selected under the Athlone Fellowship Scheme to go to Britain this fall for two years' advanced training in universities and engineering firms. Of these, 30 have recently graduated; the remainder have already spent some time in industry. These engineers will go to all parts of the United Kingdom — some to universities, others to different branches of industry; while some will spend a year at a university followed by a further year attached to a firm. The candidates have been selected from 13 universities across Canada.

Electronics, Britain's fastest-growing industry, is to have its own newspaper. Heywood and Company launched *Electronics Weekly*, the first newspaper in the United Kingdom and Europe devoted specifically to electronics, on September 6. *Electronics Weekly* is a new concept in scientific and technical journalism. Working within the framework of world electronics, it will provide scientific and technical news coverage on a scale never before attempted in this country.

REPORT

Is the Canadian pleasure boating market being sold?

by T. W. Lazenby, editor

The current issue of *Science and Securities*, a quarterly magazine published by the research department of Harris, Upham & Co., of New York, states that "the fields of optical and magnetic scanning are in their infancy. At this time the major companies are only learning what their equipment can do. The major growth and the profit potential lie in the decade ahead. As this decade proceeds, new companies, no doubt, will develop far faster and more impressive devices for scanning, and our present methods may very well appear to be feeble beginnings."

Of particular interest to Canadians will be the reference that *Science and Securities* makes to the tremendous sums of money that are being spent on electronic gear by the pleasure boating public of the United States. Canadians will be interested in this reference because of the fact that pleasure boating in Canada has boomed in the last few years to the point where it is now estimated that there are over 100,000 pleasure craft of a size and type in which marine electronic equipment such as depth sounders, direction finders and radio telephones may be fitted as complementary accessories. In the United States, *Science and Securities* points out that . . . ." small boat electronics represents perhaps the fastest growing of consumer hard-goods industries. Population growth, plus increasing discretionary income and leisure time, have made boating the sport of millions instead of millionaires. Small boat electronics capitalizes on this trend and on electronic advances rooted in World War II and current military developments.

"Last year, 39 million pleasure boaters — approximately ⅓ of the adult population — spent almost $2.5 billion to keep afloat a pleasure boat fleet of nearly 8 million craft of all types, according to industry spokesmen. Electronics' share of these recreational dollars is variously estimated at from $17 to $20 million. This contrasts with the $7 million estimated for electronic gear on new merchant ships to be constructed over the next several years. Another indicator: of 82,600 licensed marine radiotelephones, more than two-thirds are on recreational craft, even though they are not required by law on this type of boat.

"Whereas boating is historically a 'man's' activity, today the woman of the family is taking a keen part in the purchase, and exercising her influence in the choice of equipment. She is safety-conscious, comfort-conscious and appearance-conscious. This is reflected in the efforts of the marine electronic manufacturers to add decor to their equipment in a bid for the ladies' acceptance. 'Black-boxes' are out. In short, the old-time boat owner who scoffed at the need for a radio-telephone, direction finder, depth sounder, or automatic pilot — and instead preferred to do his boating the hard way — is outnumbered 100 to 1 by those who expect the convenience and safety made possible by modern electronic equipment and are willing to pay for it."

BBG decision on color television based on misleading information?

"The recent press release reporting the decision of the Board of Broadcast Governors against recommending the licensing of Color Television in Canada is very disappointing to the Electronics Industry," said Fred W. Radcliffe, general manager of the Electronics Industries Association.

The basing of the decision, in part as reported in the daily press, on a current lack of viewer demand for color appears very short sighted and irrational in the industry's opinion.

Most of the worthwhile advances in consumer products, which have added so much to Canadian productivity and increased employment, have arisen not after the public have demanded them but after the public have been shown, by the manufacturers' foresight, a better performing and more desirable product readily available.

Had public demand been the basic reason for the release of high fidelity and stereophonic reproduction we would still be without it. Fortunately it did not have to be licensed to be released.

Had we waited for the public to demand talking motion pictures we might still be fed a fare of silent movies.

Had the oil burner industry waited for the public to demand their products most of us would still be shoveling coal and carrying out the ashes.

Industry is constantly being urged to increase productivity. It is the recognized responsibility of secondary industry, which employs over 40 per cent of the labor force (considering service industries related to production jobs), to use its development and productive processes to improve continuously all consumer products so that better performance, appearance, and value will expand consumer demand through exposure of new products and maintain employment at high levels.

Color Television can only be exposed to the Canadian public by Canadian television stations being licensed to transmit it. Once Canadians generally have an opportunity to see for themselves how much better color television is, and given adequate programming and reasonably priced merchandise, then in our opinion they will demand it. But you do not ordinarily demand something which is unknown to you.

Some of the information on which the Board's decision was reported by the daily press to be based on appears to be misleading. There are certainly more than 50,000 color television sets in use in the U.S.A., probably 10 times more. 367 of the 520 television stations in the U.S.A. are now equipped for network color — nearly 25 per cent are equipped to originate their own color programs in some form.

Canadian stations should be similarly freed from present restrictions. Let the Canadian people see how much color will add to their television enjoyment and they will not be slow to ask that it be made available to them.

Raytheon radar for Switzerland

Installation began this fall of two air traffic control systems, produced by Raytheon Canada, Ltd., to cover Switzerland's major air routes.

The long-range radars are similar to those produced by Raytheon Canada for the Canadian Department of Transport. Particularly suited to meet Switzerland's air route surveillance needs, those purchased by Radio Suisse, S.A. will serve control centers at Geneva-Cointrin Airport and Zurich-Kloten Airport.

RCA Victor microwave network

A microwave network for which the radio equipment was designed and built by RCA Victor Company, Ltd., has brought new television programming to the Gaspe peninsula and the Campbellton area of New Brunswick. Seven microwave stations, from Rimouski in Quebec to Mt. Carlton, N.B., span a distance of 141 miles.

The system is operated jointly by Canadian Pacific Telegraphs and Canadian National Telegraphs. It was designed initially to transmit TV programs from the CBC network through the control center at Rimouski, but can be easily expanded to carry telephone and teletype channels as well.

Course on transistor circuits

To meet the needs of engineers and technicians who seek training in electronics, International Correspondence Schools Canadian, Limited, have announced a new course, "Principles of Semiconductor-Transistor Circuits".

Two completely new text books — "Semiconductor Diodes" and "Transistors and Transistor Circuits and Applications" — have been added to ICS electronics courses and they form an important part of the newly-announced course.

TORONTO SECTION IRE 1960-61 MEETINGS

Thursday, November 3, 1960
"The Use of Microwave to Support High Altitude Platforms", Dr. R. L. McFarlan, President of IRE. Sponsored by the Toronto Chapter of the IRE Professional Group on Communications Systems.

Monday, November 14, 1960
"Acoustics and the Ear", W. E. Hodges, Electro-Acoustical Consultant.

Monday, December 5, 1960
Tour of Trans-Canada Telemeter, 3010 Bloor Street W.

Monday, January 9, 1961
"Applications of Ultrasonic Energy", Canadian Westinghouse Co. Ltd., speaker to be announced.

Tuesday, January 31, 1961
Tour of New Facilities at the Ryerson Institute of Technology.

Thursday, February 16, 1961
Students' Night
Joint Meeting with AIEE, Toronto Section; AIEE, Student Branch; IRE Student Branch; IRE Student Associate Branch. Senior students present papers in competition for cash prizes.

Monday, February 27, 1961
Joint Meeting with Canadian Astronautical Society. Sponsored by the Toronto Chapter of IRE Professional Group on Communications Systems. "Canadian Topside Sounder Satellite", by Dr. R. C. Langille, Defense Research Telecommunications Establishment. Meeting will be held at de Havilland Aircraft of Canada Ltd.

Monday, March 13, 1961
Annual Stag Night
(Four Winds Dining Room, Steeles Avenue West). "A Civilian's Life in Thule, Greenland," by B. E. Davies, Canadian Westinghouse Ltd.

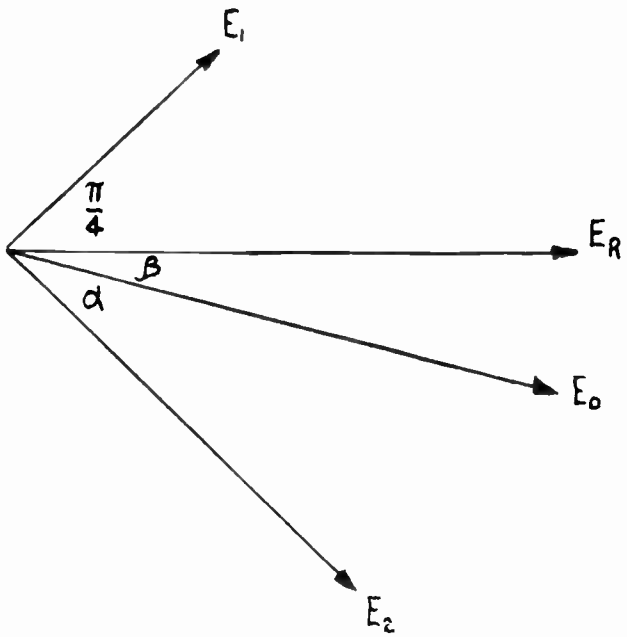
Monday, April 3, 1961
Subject to be announced. Sponsored by the Toronto Chapter of IRE Professional Group on Communications Systems.

Monday, April 24, 1961
"Controlling Traffic with an Electronic Computer," L. Casciato, Traffic Research Corp. Ltd., a division of KCS Ltd.

A shaft position indicator

Continued from page 35

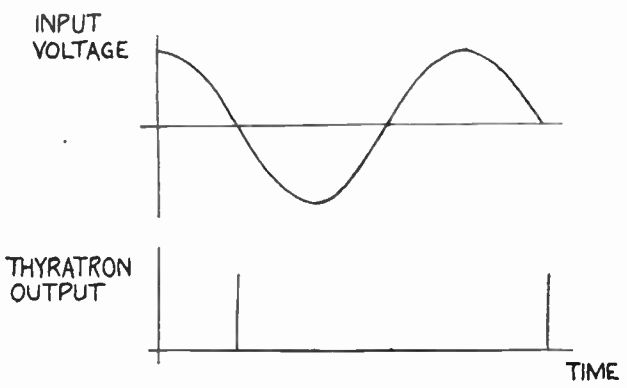
The sinusoidal output from the phase shift network is amplified and limited by V202B. The clipped waveform is amplified in two stages (V206 and V207) to improve the rise time, and differentiated to provide a positive pulse to the thyratron (V208). The output of the thyratron is a positive pulse, generated at the positive to negative zero crossing of the original sine wave.



The pulses from the thyratrons are used to gate the counter, either one opening or closing the gate, depending on the desired direction of increasing angle.

Electronic Counter

The counter used in this application must have the following characteristics and facilities. It must be



capable of counting at 216 kc/s and have facilities for gating this frequency by external pulses; for a system accuracy of ±0.3°, the counter should have an oven-controlled 100 kc/s oscillator, with a stability of at least 1 part in 10^5.

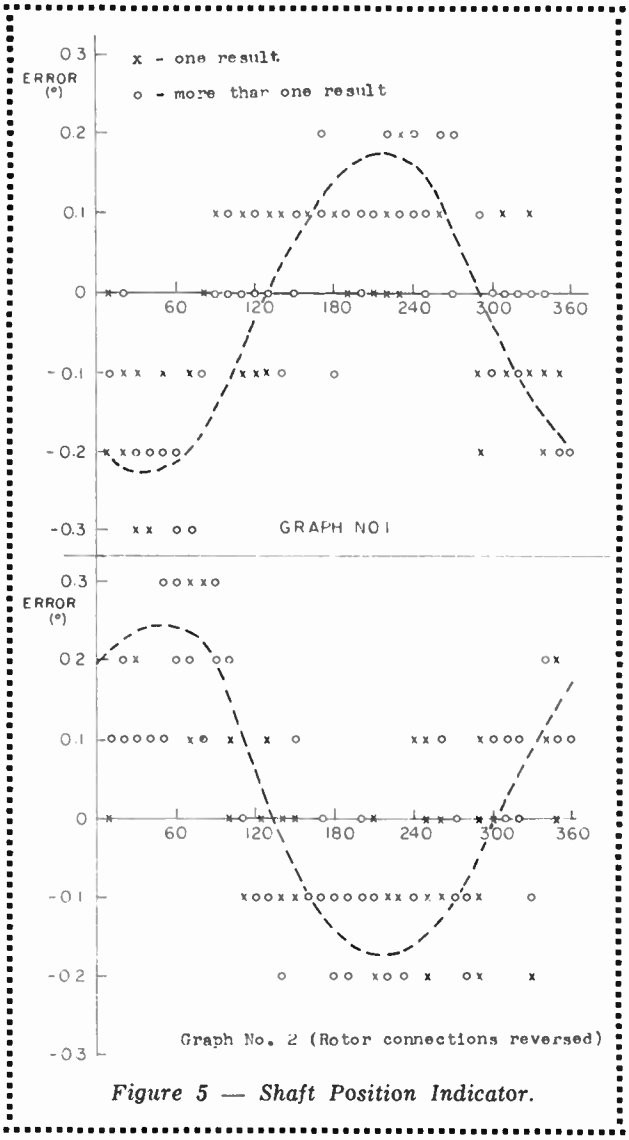


Figure 5 — Shaft Position Indicator.

Performance

The maximum overall error was ±0.3° with the multivibrator locked and ±0.5° free-running. This error appeared to be of period 2π radians of shaft rotation (Figure 5). The resolver unit used was not a high unit and some of the error can be attributed to inaccuracies of the windings and to eccentricity.

The angle reading on the counter was not constant but fluctuated ±0.1° due to phase modulation by noise in the two channels. With the generating multivibrator free-running additional jitter was caused by frequency shift; this shift resulted in the stator output voltages being non-quadrature. Error due to jitter was included in the measurement of the overall error.

References

[1] *M. B. Wood, "The Synchro-Resolver as a Shaft Position Transducer", Electronic Engineering, June 1958.*

[2] *Art Thomas Arcand, et al, "Digital Airborne Tape Recording", IRE Wescon Convention Record, Vol. 2, Part 5, 1958.*

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.

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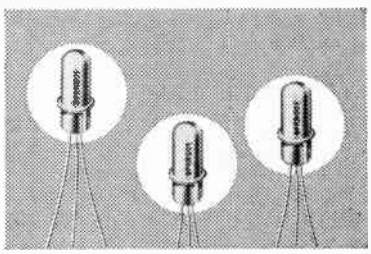

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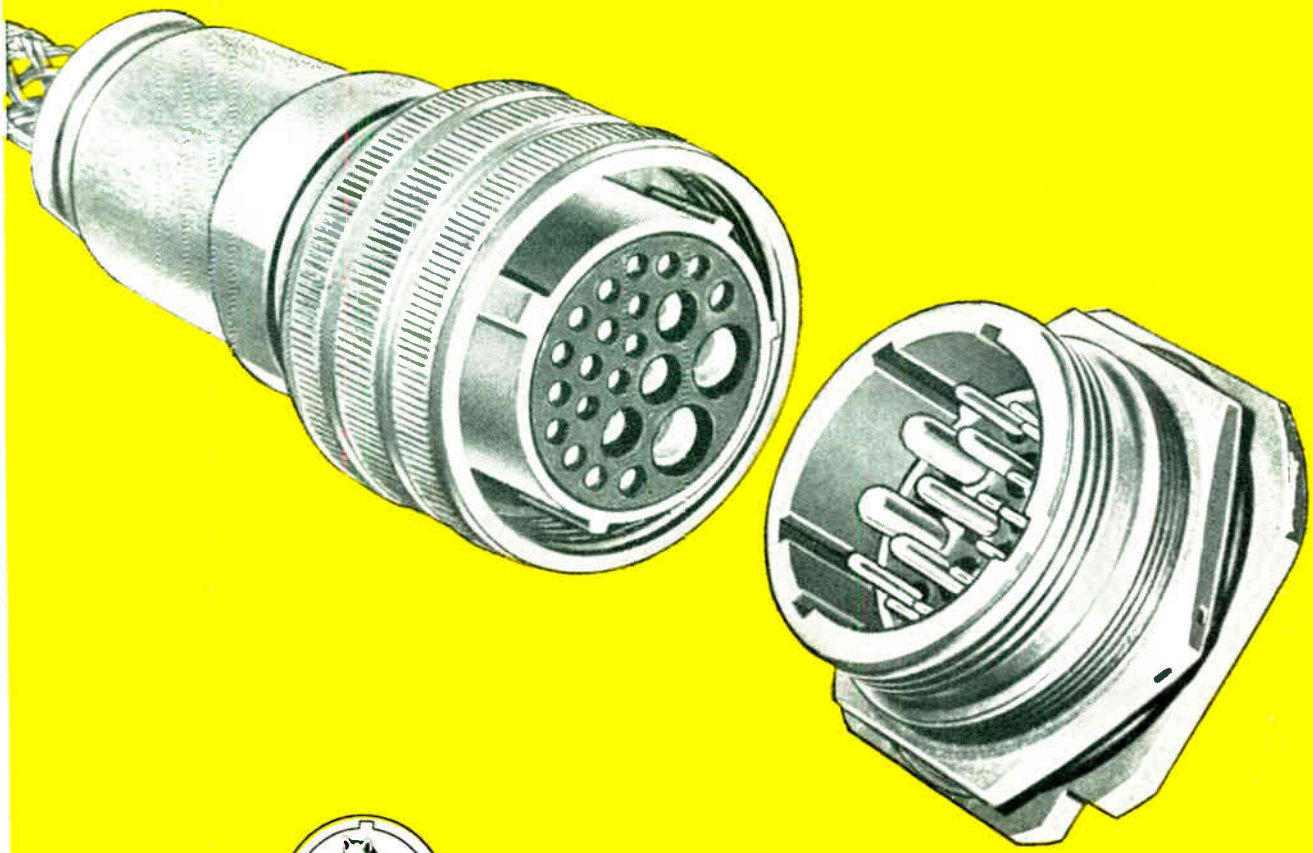

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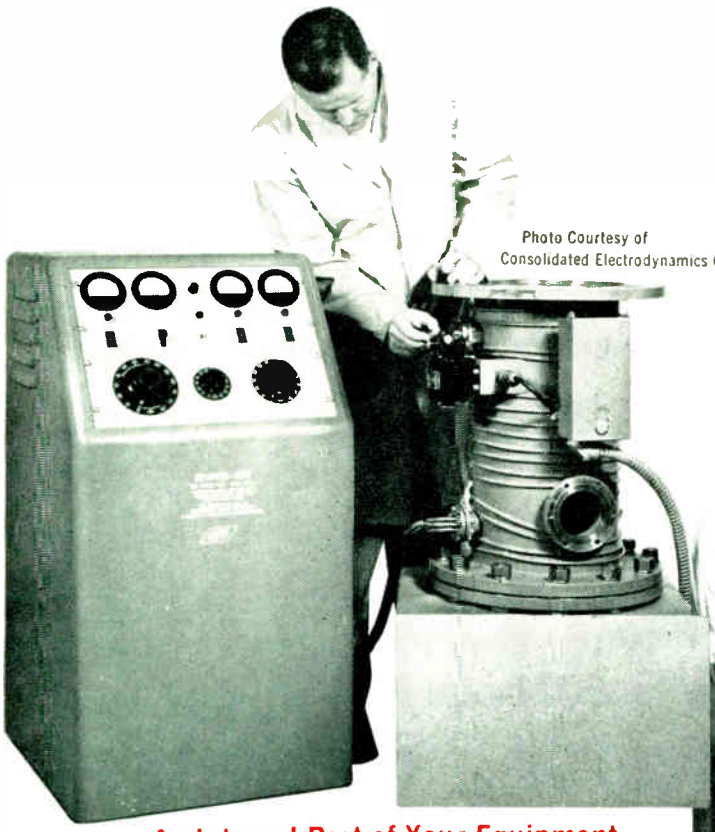

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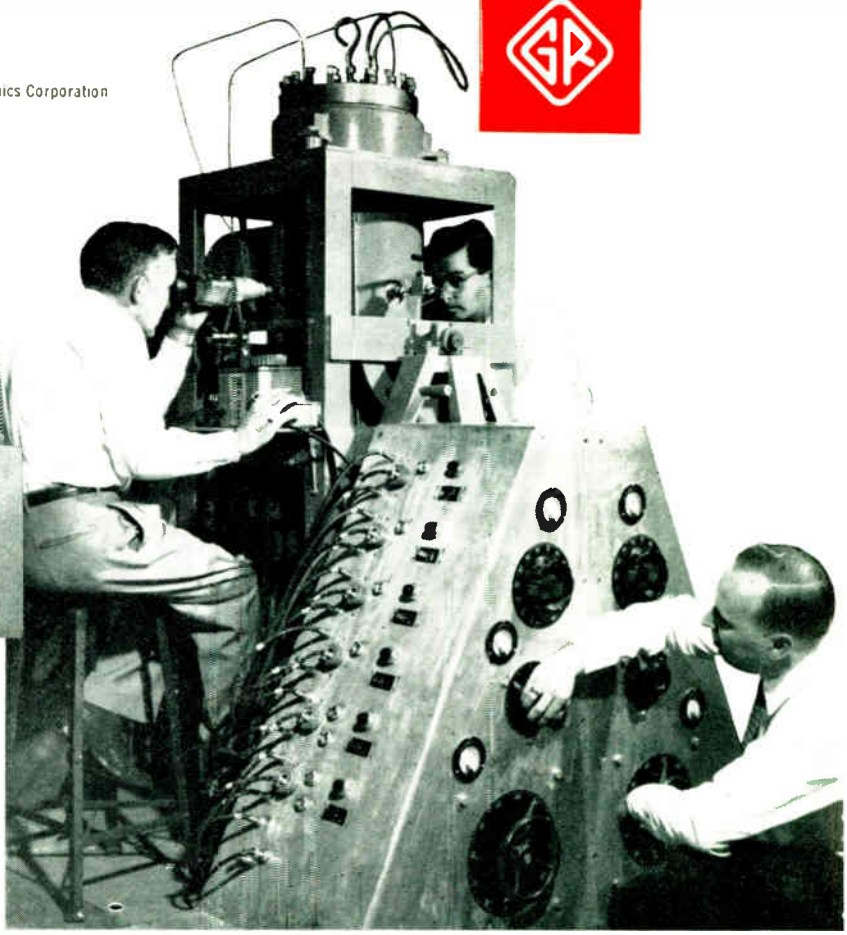

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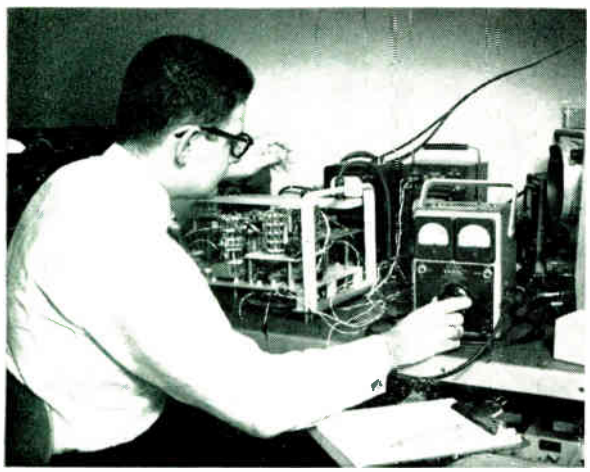

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