

The Journal of

THE BRITISH INSTITUTION

of

RADIO ENGINEERS



VOLUME 17, 1957

Published by the Institution at

NINE BEDFORD SQUARE, LONDON, W.C.1

Price: 7s. 6d. monthly, 80s. per year

Telephone: MUSEum 1901-3

Telegrams: Instrad, Westcent, London

BOUND VOLUMES OF THE JOURNAL

Limited numbers of the following bound volumes are available:—

Volume 6 (1946)	...	£2 12s. 6d.	Volume 12 (1952)	...	£3 15s. 0d.
Volume 7 (1947)	...	£2 12s. 6d.	Volume 13 (1953)	...	£3 15s. 0d.
Volume 9 (1949)	...	£3 5s. 0d.	Volume 14 (1954)	...	£3 15s. 0d.
Volume 10 (1950)	...	£3 15s. 0d.	Volume 15 (1955)	...	£3 15s. 0d.
Volume 11 (1951)	...	£3 15s. 0d.	Volume 16 (1956)	...	£4 0s. 0d.

Note : Indexes are bound with each of the volumes. Bound volumes issued between 1927 and 1945 inclusive and in 1948 are no longer available.

Bound volumes can be supplied at 15s. per volume if members send their copies of the appropriate *Journals* to the Publications Department, 9 Bedford Square, London. W.C.1. Otherwise the charge for a complete volume is as stated above.

DECLARATION ON FAIR COPYING

Under the terms of the Royal Society's Declaration on Fair Copying, to which the Institution subscribes, material may be copied from any issue of the *Journal* which is *out of print* and of which *no reprints are available*.

CORRIGENDA

No. 4, April 1957

Pages 228, 229 and 230: A note of the corrections which should be made to these pages is published on page 350 (July 1957).

PRINCIPAL CONTENTS OF VOLUME 17, 1957

	<i>Page</i>		<i>Page</i>
JANUARY			
The Armorial Bearings of the Institution ..	3	Principles of Design of Battery Operated Frequency Modulation Receivers. R. A. LAMPITT (Member) and J. P. HANNIFAN (Associate Member) ..	173
The Presidential Address of GEORGE A. MARRIOTT	5		
The Circuit Development of a Heavy-duty Balancing Machine. L. H. VALE (Associate Member)	15	A European Common Market ..	188
Materials used in Radio and Electronic Engineering: 5. The Electrodeposition of Metals. A Survey prepared by the Technical Committee of the Institution ..	35	Remote Presentation of Radar Information by Microwave Link. G. J. DIXON and H. H. THOMAS ..	193
The Design and Application of a General-Purpose Analogue Computer. R. J. A. PAUL, B.Sc., and E. LLOYD-THOMAS, B.Sc., A.C.G.I.	49	A Contribution on the Triode System of the Cathode Ray Tube Electron Gun. M. E. HAINE, M.Sc. ..	211
A Low-noise Travelling-wave Tube Amplifier for the 4000-Mc/s Communications Band. D. H. O. ALLEN, B.A., and J. M. WINWOOD, M.A.	75	The Characteristics of Magnetic Recording Heads and Tapes. H. P. SPRING (Associate Member) ..	217
FEBRUARY			
Interpretation of Responsibility	89	Convention Venues ..	241
The Application of Transistors to A.M. Broadcast Receivers. B. F. C. COOPER, B.Sc., B.Eng.	95	The Development of Nuclear Power. SIR JOHN COCKCROFT, O.M., F.R.S. ..	245
Amplitude Modulation of Microwaves by Tunable Transmission Waveguide Filters. M. H. N. POTOK, B.Sc., Ph.D. (Associate Member) and J. BARBOUR, A.R.T.C. ..	109	The Properties of Semi-conductor Devices. A. A. SHEPHERD, Ph.D. ..	255
Noise and its "Spectrum." F. N. H. ROBINSON, D.Phil., M.A.	115	The Design of Phase-linear Intermediate-frequency Amplifiers. A. VAN WEEL, Dr.Tech.Sc. ..	275
Variation of Cable Loss with Standing Wave Ratio. E. G. HAMER, B.Sc.(Eng.) (Member)	121	Recent Developments in Mobile Radio in Britain. J. R. BRINKLEY (Member) ..	287
Implications of Phase Precompensation in a Television Transmitter on the Shape of the Radiated Signal. A. VAN WEEL, Dr.Tech.Sc.	129	JUNE	
MARCH			
The Status of the Engineer	137	Maintaining Interest ..	297
Principles of the Light-amplifier and Allied Devices. T. B. TOMLINSON, B.Sc., Ph.D. (Associate Member)	141	Some Nucleonic Instruments for Clinical Use. E. W. PULSFORD, B.Sc. (Associate Member) and N. VEALL, B.Sc. ..	299
A Simple Direct Reading Thermistor Bridge. JOHN SWIFT, B.Sc.	155	The Dounreay Atomic Energy Establishment. R. H. GARNER, B.Sc.(Eng.) (Associate Member) ..	308
An Experimental Study of Some Fading Characteristics of 10 cm Waves in the Scatter Region. D. G. KIELY, D.Sc., S.J. ROBINSON, B.A., and F.C.CHESTERMAN	161	Backlash and Hysteresis Effects in Automation Systems. PROFESSOR L. M. VALLESE, Dr.Sc. ..	315
		Detection of Pulse Signals in Noise: Trace-to-Trace Correlation in Visual Displays. PROFESSOR D. G. TUCKER, D.Sc. (Member) ..	319
		Detection of Pulse Signals in Noise: The Effect on Visual Detection of the Area of the Signal Paint. J. W. R. GRIFFITHS, B.Sc. (Associate Member) ..	330
		Guidance for Authors of <i>Journal Papers</i> ..	339

JULY	Page	OCTOBER	Page
Electronics in Automation	345	Automatic Inspection as the Key Control Element in Full Automation. J. A. SARGROVE (Member) and D. L. JOHNSTON, B.Sc.(Eng.)	529
The Development of a Business Computer System. A. ST. JOHNSTON, B.Sc., and S. L. H. CLARKE, B.A.	351	31st Annual Report of the Council of the Institution	536
Fluid Density Measurements by Means of Gamma-Ray Absorption. R. Y. PARRY and A. E. M. HODGSON, D.L.C.	365	Some Aspects of Process Control Instrumentation. J. R. HALSALL, Dip.El. (Associate Member)	551
The Inductosyn and its Application. H. J. FINDEN and B. A. HORLOCK (Associate Member)	369	The Design of a "Basic" System of Position Control for the Traversing Tables of Machine Tools. K. J. COPPIN, B.Sc., A.R.C.S. (Associate Member)	563
Barium Titanate and its Use as a Memory Store. D. S. CAMPBELL, B.Sc.	385	Theory of the Helical Waveguide of Rectangular Cross-section. R. A. WALDRON, B.A.(Cantab) (Associate Member) ..	577
Automatic Counting Techniques Applied to Comparison Measurement. C. C. H. WASHTELL (Member)	397		
AUGUST			
Research in Radio Astronomy	405		
High Speed Analogue-to-Digital Converters. G. J. HERRING, M.Sc., and D. LAMB, M.Sc.	407	Voluntary Service	593
Computing Applications Where Analogue Methods Appear to be Superior to Digital. R. J. GOMPERTS, M.A., Lic.èscSci. ..	421	The Work of Standing Committees ..	594
Integration of Computer with Factory Processes. A. H. COOPER, B.Sc.	431	Back-Scatter Sounding: An Aid to Radio Propagation Studies. A. F. WILKINS, O.B.E., M.Sc., and E. D. R. SHEARMAN, B.Sc.(Eng.)	601
Electronic Heating and Automation. M. T. ELVY (Associate Member)	443	Ferroresonant Circuits of Digital Computers. C. B. NEWPORT, B.Sc., and D. A. BELL, M.A., Ph.D.	619
SEPTEMBER			
The Third Clerk Maxwell Memorial Lecture: "The Diffraction of Short Electromagnetic Waves." SIR LAWRENCE BRAGG, O.B.E., M.C., F.R.S.	467	The Application of Analogue Computer Techniques to the Design of Aero Engine Control Systems. A. D. JEFFERY (Associate Member), J. M. DEMPSEY, H. SAVILLE, B.Sc.(Eng.) and K. GILL, B.Sc.(Eng.)	633
The Role of Gamma-ray Level Detection Systems in Chemical Plant Instrumentation. E. W. JONES	473	Automatic Ultrasonic Inspection. H. W. TAYLOR, B.Sc.	649
An Introduction to Radio Aids to Air/Sea Rescue. G. W. HOSIE	481		
The TALBE—A V.H.F. C.W. Radio Aid for Air/Sea Rescue. W. KIRYLUK (Associate Member)	489	DECEMBER	
Recent Advances in Automatic Assembly. L. H. GIPPS and K. M. MCKEE, B.Sc. ..	501	Time to Read	665
Automatic Positioning Systems for Machine Tools. C. R. BORLEY, B.Sc., C. H. BRAYBROOK, B.A., and J. COATES, M.A. ..	513	"S.A.R.A.H.": A U.H.F. (243 Mc/s) Pulse Coded Air/Sea Rescue System. D. KERR	669
Application of X-ray Image Intensification to Industrial Problems. A. NEMET, Dr.Sc.Techn. (Member) and A. HEWETT-EMMETT	523	Logical Design of a Computer for Business Use. R. J. FROGGATT, B.Sc.(Eng.) ..	681
Subject Index	729	Instrumentation for the Control of Process Streams in Some Atomic Energy Projects. H. BISBY, B.Sc., A.K.C.	697
List of 1957 Convention Papers	731	Electronics and Process Control Systems. J. M. KEATING, B.Sc., and P. V. SLEE, B.Sc.	707
Index of Persons	732	Techniques for using Computers for Office Work. E. A. NEWMAN, B.Sc., and M. A. WRIGHT, B.Sc.(Eng.)	717
Index of Papers Abstracted	733		

THE BRITISH INSTITUTION OF RADIO ENGINEERS

(FOUNDED IN 1925)

INCORPORATED IN 1932

PATRON

HER MOST GRACIOUS MAJESTY QUEEN ELIZABETH II

VICE-PATRON

Admiral of the Fleet
The EARL MOUNTBATTEN of BURMA,
K.G., P.C., G.C.B., G.C.S.I., G.C.I.E., G.C.V.O., D.S.O., LL.D., D.C.L., D.S.C.

GENERAL COUNCIL, 1957

PRESIDENT

G. A. MARRIOTT, B.A.(CANTAB.)

IMMEDIATE PAST-PRESIDENTS

L. H. BEDFORD, C.B.E., M.A.(CANTAB.), B.Sc., F.C.G.I.
P. ADORIAN
W. E. MILLER, M.A.(CANTAB.)
Rear-Admiral SIR PHILIP CLARKE, K.B.E., C.B., D.S.O.

VICE-PRESIDENTS

L. H. PADDLE
J. L. THOMPSON
Professor EMRYS WILLIAMS, PH.D.
Professor E. E. ZEPLER, PH.D.

ORDINARY MEMBERS OF COUNCIL

Members :—
Air Vice-Marshal C. P. BROWN, C.B., C.B.E., D.F.C.
A. D. BOOTH, D.Sc., Ph.D.
F. G. DIVER, M.B.E.
E. M. ELDRED
H. J. LEAK
Captain A. J. B. NAISH, M.A., R.N.
J. W. RIDGEWAY, O.B.E.

Associate Members :—
R. H. GARNER, B.Sc.(Eng.)
R. N. LORD, M.A.
E. W. PULSFORD, B.Sc.

Companion :—
A. H. WHITELEY, M.B.E.

HONORARY TREASURER

G. A. TAYLOR

CHAIRMEN OF LOCAL SECTIONS IN GREAT BRITAIN

and ex-officio Members of Council
H. BRENNAN, B.Sc. (*Member*) North-Eastern
C. W. N. REECE (*Associate Member*) Scottish
Professor E. WILLIAMS (*Member*) South Wales
S. WHITTAM, M.A. (*Associate Member*) North-Western
R. A. SPEARS (*Associate Member*) Merseyside
J. CUNNINGHAM SANDS (*Associate Member*) West Midlands
D. L. LEETE, B.Sc. (*Associate Member*) South Midlands

●

GENERAL SECRETARY

GRAHAM D. CLIFFORD

●

9 BEDFORD SQUARE, LONDON, W.C.1

Telegrams: INSTRAD, WESTCENT, LONDON

Telephone: MUSeum 1901-3

STANDING COMMITTEES 1957

The President is *ex officio* a member of all Standing Committees

PROFESSIONAL PURPOSES

Chairman : Professor Emrys Williams, PH.D.

Rear Admiral Sir Philip Clarke, K.B.E., C.B., D.S.O.; W. E. Miller, M.A.; J. L. Thompson; Professor E. E. Zepler, PH.D.

1957 CONVENTION

Chairman : L. H. Bedford, C.B.E., M.A., B.Sc., F.C.G.I.

A. D. Booth, D.Sc., PH.D.; J. E. Rhys-Jones, M.B.E.; Denis Taylor, PH.D., M.Sc.; Professor D. G. Tucker, D.Sc., PH.D.; Professor E. E. Zepler, PH.D.

PROGRAMME AND PAPERS

Chairman : R. N. Lord, M.A.

C. R. Bates; J. D. Collingwood; R. J. Cox, B.Sc.; K. W. Cunningham, B.Sc.; G. L. Hamburger, DR-ING.; I. A. Harris; F. T. Lett; E. J. G. Lewis; I. Maddock, O.B.E., B.Sc.; G. P. Thwaites, B.Sc.; T. B. Tomlinson, PH.D.; R. F. Vigurs; A. G. Wray, M.A.

FINANCE

Chairman : J. L. Thompson.

A. F. Bulgin; S. R. Chapman, M.Sc.; Rear Admiral Sir Philip Clarke, K.B.E., C.B., D.S.O.; H. J. Leak; W. E. Miller, M.A.; G. A. Taylor; A. H. Whiteley, M.B.E.

MEMBERSHIP

Chairman : Capt. A. J. B. Naish, M.A., R.N.

Air Vice Marshal C. P. Brown, C.B., C.B.E., D.F.C.; B. J. Burridge; H. E. Drew; L. Driscoll, B.Sc.; E. M. Eldred; N. F. Felton, S. Goodyear; K. H. G. Kearsley-Brown; W. G. J. Nixon; W. McMenemy; W. P. Rowley, M.B.E.; J. Sykes; Major P. A. Worsnop.

LIBRARY

Chairman : E. A. W. Spreadbury.

W. M. Dalton; F. E. Lane; L. W. Meyer; J. A. Sargrove; J. C. Winterburgh, D.L.C.

TECHNICAL

Chairman : F. G. Diver, M.B.E.

B. R. A. Bettridge; E. A. H. Bowsher; C. S. Fowler; A. W. Godden, B.Sc.(ENG.); G. Hersee; A. D. Jeffrey; Group Captain S. G. Morgan; Commander A. C. Pitman, R.N.; S. J. H. Stevens, B.Sc.(ENG.); A. J. Tyrrell; E. E. Webster.

EDUCATION AND EXAMINATION

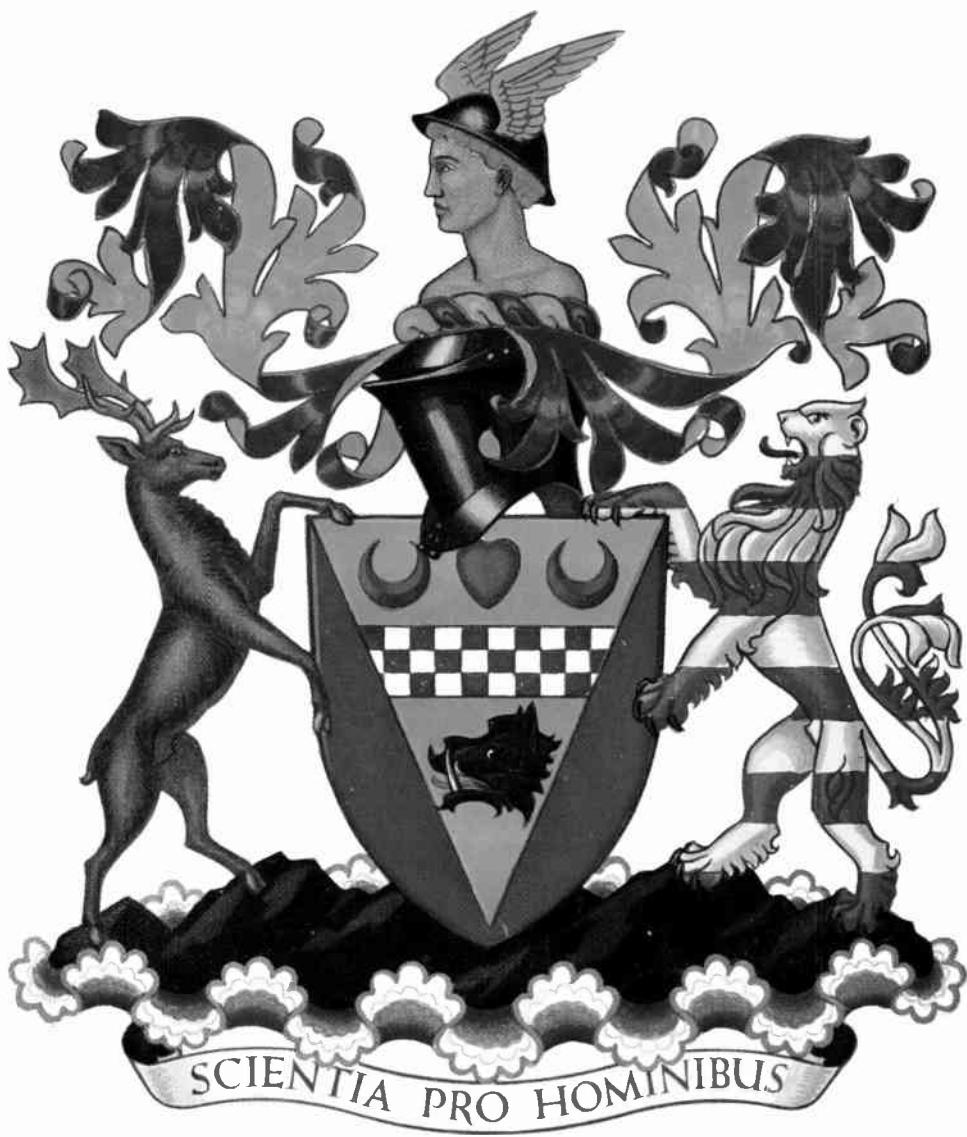
Chairman : E. W. Pulsford, B.Sc.

D. A. Crowther; J. E. Everett, B.Sc., M.Sc.(ENG.); D. Fotheringham, B.Sc.; W. D. Hatfield, B.Sc.(ENG.); J. A. Hutton, B.Sc.; Sqn. Ldr. W. L. Price, M.Sc.; W. J. Perkins; R. S. Roberts; J. C. Winterburgh, D.L.C.; P. O. Wymer, B.Sc.

Trustees of the Brit.I.R.E. Benevolent Fund

Chairman : The President of the Institution.

Rear Admiral Sir Philip Clarke, K.B.E., C.B., D.S.O.; E. J. Emery; G. A. Taylor (Hon. Treasurer); A. H. Whiteley, M.B.E.; G. D. Clifford (Hon. Secretary).



The Armorial Bearings of
The BRITISH INSTITUTION of
RADIO ENGINEERS.