

THE RADIO AND ELECTRONIC ENGINEER

The Journal of the Institution of Electronic and Radio Engineers
(formerly *The British Institution of Radio Engineers*)



VOLUME 27, 1964

January – June

Published by the Institution at

8–9 BEDFORD SQUARE, LONDON, W.C.1

Telephone: MUSEum 1901

Telegrams: Instrad, London, W.C.1

BOUND VOLUMES OF THE JOURNAL

Limited numbers of the following bound volumes are available:—

Volume 6 (1946) £2 12s. 6d.	Volume 18 (1958) £4 10s. 0d.
Volume 7 (1947) £2 12s. 6d.	Volume 19 (1959) £4 10s. 0d.
Volume 9 (1949) £3 5s. 0d.	Volume 20 (1960) £4 10s. 0d.
Volume 10 (1950) £3 15s. 0d.	Volume 21 (January-June 1961)	£3 10s. 0d.
Volume 12 (1952) £3 15s. 0d.	Volume 22 (July-December 1961)	£3 10s. 0d.
Volume 13 (1953) £3 15s. 0d.	Volume 23 (January-June 1962)	£3 10s. 0d.
Volume 14 (1954) £3 15s. 0d.	Volume 24 (July-December 1962)	£3 10s. 0d.
Volume 15 (1955) £3 15s. 0d.	Volume 25 (January-June 1963)	£3 10s. 0d.
Volume 16 (1956) £4 0s. 0d.	Volume 26 (July-December 1963)	£3 10s. 0d.
Volume 17 (1957) £4 10s. 0d.	Volume 27 (January-June 1964)	£3 15s. 0d.

Members' own copies of the *Journal* can be bound into volumes at a cost of 17s. per volume (postage and packing extra: 4s. Great Britain; 5s. Overseas).

The appropriate *Journals* should be sent to the Publications Department, 8-9 Bedford Square, London, W.C.1.

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*.

CORRIGENDUM

Volume 27, No. 1, January 1964 Page 6, 2nd Column: after the seventh paragraph, two paragraphs were omitted. The text of these paragraphs is given in the February issue, page 86. A correction slip may be obtained on application from the Institution's Publications Department.

PRINCIPAL CONTENTS OF VOLUME 27, 1964

JANUARY

The Presidential Address of John Langham Thompson	3
A Novel Type of Magnetic Recording Head. J. C. BARTON, PH.D., and C. T. STOCKEL, B.SC.	11
The Scalar and Vector Potentials of the Infinite Sheath Helical Aerial. T. S. M. MACLEAN	21
Modes of Oscillation of a Grounded Grid Cyclotron Oscillator. D. N. BASU MALLIK, M.SC.(TECH.), and B. R. NAG, M.SC.(TECH.), M.S., D.PHIL.	27
Design of Transistor I.F. Amplifiers—Stability and Power Gain. K. R. WILSHER and A. DABROWA, B.SC.	37
A High-efficiency Low-frequency Power Source for Vibration Excitation. B. H. VENNING, B.SC.(ENG.), A.C.G.I.	55
Design Principles of the Magnetic Tape System for the <i>Atlas</i> Computer. D. B. G. EDWARDS, PH.D., M.SC., D. ASPINALL, PH.D., M.SC. and T. KILBURN, D.SC., M.A....	65
Digital Data Processing Considerations in Radar. P. J. CHILD, B.SC.(ENG.)	75

FEBRUARY

Cold Cathode Tubes and their Applications	85
A Survey of Cold Cathode Discharge Tubes. D. M. NEALE, B.SC.	87
The Design of Second-harmonic Detector Heads and their Application to the Reading of Digital Information and the Measurement of Low Speeds of Rotation. D. B. G. EDWARDS, PH.D., M.SC., E. M. DUNSTAN, M.SC., PH.D., and C. J. TUNIS, PH.D.	99
An Equalizer for an Electro-magnetic Vibrator System Employing Analogue Computing Techniques. E. J. ELLIS	125
Sensitivity of an Oscillator to Periodic Conductance Changes. A. G. J. HOLT, PH.D., DIP.EL.	133
The Prediction of the Optimum Noise Performance of a Reflection Cavity Maser. C. R. DITCHFIELD	149
The Performance and the Flux Patterns of a Special Shape Multi-aperture Device. D. J. MORRIS, DIP.ENG., M.SC.	153

MARCH

Change of the Institution's Name	165
A Comparison of Five Methods of Low-pass Passive Filter Design. A. G. J. HOLT, PH.D., DIP.EL.	167
A Phase Modulation Data Transmission System for use over the Telephone Network. A. P. CLARK, M.A.	181
Electronic Digital Ratio Equipment. A. RUSSELL	197
Pay Television by Wire. P. BASS	209
Standardization of Signal Specifications for Pay Television Systems. D. W. HEIGHTMAN	213
Low Cost Electronic Arithmetic. D. W. THOMASSON	219
The Telephone Channel Capacity of Transmission Lines. D. A. GRAY, B.E.E.	229
Analysis of Series Regulators as Active Two-port Networks. R. A. ZAKAREVICIUS, B.SC., M.ENG.SC.	237

APRIL

The Pattern of Future Conventions	245
Cross-colour and Luminance Twinkle in N.T.S.C. Colour Receivers with Various Display Devices. K. G. FREEMAN, B.SC.	247
The Design of a Linear-phase I.F. Amplifier for Colour Television Receivers. J. O. SCANLAN, B.E.	255
Methods of Distinguishing Sea Targets from Clutter on a Civil Marine Radar. A. HARRISON, B.SC.	261
Antisymmetrical Amplifier Networks. A. W. KEEN	277
Investigation of Relaxation Oscillations in the Output from a Ruby Laser. D. D. BHAWALKAR, M.SC., W. A. GAMBLING, PH.D. and R. C. SMITH, PH.D.	285
The Charge Storage Diode as a Logic Element. W. D. RYAN, M.SC., PH.D. and H. B. WILLIAMS, B.SC., PH.D.	293
A Low-cost Magnetic Tape Control System for Machine Tools. P. H. G. BURGESS and R. L. DUTHIE	301
A Digital Data Link for Aircraft Communication. W. J. BATTELL, B.SC.	315

PRINCIPAL CONTENTS OF VOLUME 27, 1964

MAY

A Society for Electronic and Radio Technicians	325
A Broadband Balanced Idler Circuit for Parametric Amplifiers. J. D. PEARSON, M.SC., and K. S. LUNT, B.SC.	331
Automatic High-speed Measuring Systems for Complex Products and Shapes. J. A. SARGROVE	337
Transistor Current-switching Circuits. Y. N. BAPAT, PH.D.	353
Electronic Melodic Instruments. K. A. MACFADYEN, M.SC.	365
Simulation by a Single Operational Amplifier of Third-order Transfer Functions having a Pole at the Origin. L. K. WADHWA, M.SC., M.S.(ELECT. ENG.)	373
Correlation Techniques in Studio Testing. A. N. BURD, B.SC.	387
Discussion on "An Engineering Approach to the Design of Transistor Feedback Amplifiers"	349
Noise in Silicon Carbide Non-linear Resistors. A. G. J. HOLT, PH.D., DIP.EL., P. L. BAINBRIDGE, B.SC. and F. W. STEPHENSON, B.SC.	381
Effects of Baking on the Excess Noise Produced by Carbon Composition Resistors. A. G. J. HOLT, PH.D., DIP.EL., P. L. BAINBRIDGE, B.SC. and F. W. STEPHENSON, B.SC.	384

JUNE

Information Explosion	397
Stereophonic Broadcasting and Reception. J. G. SPENCER and G. J. PHILLIPS, PH.D., M.A., B.SC.	399
Double-sideband Parametric Conversion Using Non-linear Resistance and Capacitance. K. L. HUGHES, B.SC. and D. P. HOWSON, M.SC.	417
Parametric Up-conversion by the Use of Non-linear Resistance and Capacitance. D. P. HOWSON, M.SC. and A. SZERLIP	425
Parametric Amplifiers and Converters with Pumped Inductance and Capacitance. D. G. TUCKER, D.SC., and K. L. HUGHES, B.SC.	435
The Digital Analysis of Electron-optical Systems. B. A. CARRÉ, M.A., B.SC. and W. M. WREATHALL, M.A.	446
A Novel Ferrite Quarter-wave Plate. J. HELSZAJN	455
Some Bandwidth Compression Systems for Speech Transmission. J. S. WILLIAMS, M.SC.	459

DIVISIONS AND LOCAL SECTIONS OF THE INSTITUTION

G R E A T B R I T A I N

East Midland

Chairman: D. REANEY, A.M.Brit.I.R.E.
Honorary Secretary: T. L. PERRY, A.M.Brit.I.R.E.,
9 Goscote Hall Road, Birstall, Leicester.

Merseyside

Chairman: A. W. MEWS, A.M.Brit.I.R.E.
Honorary Secretary: B. J. SWAINSON, A.M.Brit.I.R.F.,
23 Redgate, Ormskirk, Lancashire.

North Eastern

Chairman: R. W. WALKER, A.M.Brit.I.R.E.
Honorary Secretary: W. A. DAVIS, A.M.Brit.I.R.E.,
"The Cottage", Beckenham Avenue, East Bolden, Co. Durham.

North Western

Chairman: F. J. G. PORTER, A.M.Brit.I.R.E.
Honorary Secretary: B. A. HORLOCK, A.M.Brit.I.R.E.,
35 Partridge Avenue, Baguley, Manchester 23.

Scottish

Chairman: W. R. EADIE, A.M.Brit.I.R.E.
Honorary Secretary: R. D. PITTILO, B.Sc., A.M.Brit.I.R.E.,
35 Crawford Road, Burnside, Rutherglen, Glasgow.

South Midland

Chairman: G. W. MACKENZIE, A.M.Brit.I.R.E.
Honorary Secretary: A. W. PIERCEY, A.M.Brit.I.R.E.,
102 Alstone Lane, Cheltenham, Gloucestershire.

South Wales

Chairman: N. HUGHES, B.Sc., A.M.Brit.I.R.E.
Honorary Secretary: C. C. EVANS, M.Sc., B.Sc., A.M.Brit.I.R.E.,
Glamorgan College of Technology, Treforest, Glamorgan.

South Western

Chairman: Squadron Leader D. R. McCALL, B.Sc.,
A.M.Brit.I.R.E.
Honorary Secretary: W. C. HENSHAW, M.Sc.,
3 Northwick Road, Bristol 7.

Southern

Chairman: A. E. CRAWFORD, M.Brit.I.R.E.
Hon. Secretary: G. G. BLOODWORTH, M.A., A.M.Brit.I.R.E.,
Department of Electronics, University of Southampton,
Southampton, Hampshire.

West Midland

Chairman: P. HUGGINS, M.Brit.I.R.E.
Honorary Secretary: E. L. GARDINER, B.Sc., M.Brit.I.R.E.,
223 Tettenhall Road, Wolverhampton.

O V E R S E A S

Canadian Division

Chairman: G. ZELINGER, M.Brit.I.R.E.
Administrative Secretary: Colonel J. A. D. CRAIG
Room 1304, 330 Bay Street,
Toronto 1, Ontario.

Auckland Section

Chairman: D. P. JOSEPH, M.Brit.I.R.E.
Honorary Secretary: C. W. SALMON,
P.O. Box 3381, C.P.O., Auckland.

Karachi Section

Chairman: S. A. AZIZ, B.Sc., M.Sc., M.Brit.I.R.E.
Hon. Secretary: Lt.-Cdr. M. I. KHAN, P.N., A.M.Brit.I.R.E.,
7 Harmony House, Frese Road, Karachi, Pakistan.

Indian Division

Chairman: Major-General B. D. KAPUR, B.Sc., M.Brit.I.R.E.
Administrative Secretary: Captain G. SWAMINATHAN,
33/3 Infantry Road, Bangalore 1.

Wellington Section

Chairman: B. A. BERNON, A.M.Brit.I.R.E.
Honorary Secretary: W. C. LEE, B.Sc., A.M.Brit.I.R.E.,
11 Henderson Street, Karori, Wellington W.3.

Lahore Section

Honorary Secretary: MUHAMMAD KAREEM, A.M.Brit.I.R.E.,
Bungalow 266b, Victoria Road, Lahore.

Johannesburg Section

Chairman: M. C. DICKMAN, A.M.Brit.I.R.E.
Secretary: R. S. MYERS,
P.O. Box 133, Johannesburg.



Vandyk

JOHN LANGHAM THOMPSON

President of the Institution 1964

