

wireless world

MAY 1977 40p

Electrolytic capacitor tester
Radio in the '80s

**New isotope
scanning
technique**

Australia \$A1.20
Canada \$1.50
Denmark Kr. 5.00
Finland Fmk. 6.50
Germany DM. 4.50
Greece Dr. 45.00
Holland Dfl. 4.50
Italy L. 900
Malaysia M\$3.25
New Zealand \$NS1.40
Norway Kr. 10.00 incl. moms
Portugal Esc. 40.00
South Africa R. 1.10
Spain Ptas. 80.00
Sweden Kr. 6.90 incl. moms
U.S.A. \$1.50

BBC EXCLUSIVE
Quad Decoding Part 1
Variomatrix Adapter



NEW

Automatic fm/am Modulation Meter

How long does it take for you to make a series of modulation tests with the meter you are using? The M.I. TF 2304 Automatic Modulation Meter eliminates at least five manual operations for each test and even more per test when a series of measurements is to be made. That can save you hours in a production day.

When connected to a transmitter, the TF 2304 automatically tunes to the carrier frequency and automatically sets the level, all within a few seconds. Exceptionally efficient screening and a very low distortion mixer ensure locking to the wanted signal. It is only necessary to select the required mode and range and the meter will read either deviation or % depth. L.E.D. lamps indicate if the signal level is too high or low and a push-button inserts a 20 dB attenuator to extend the maximum input level to 1 watt.

The basic frequency range is 25-1000 MHz and there are 8 peak deviation ranges covering 1.5 kHz f.s.d. to 150 kHz f.s.d. and a.m. depth ranges of 30% and 100% f.s.d. all with a modulation frequency range of 50 Hz to 9 kHz. Modulation symmetry can be checked by push-button selection of positive or negative deviation and peak or trough amplitude.

The accuracy of modulation measurement is $\pm 3\%$ of full scale so transmitter deviation can now be set close to the permitted maximum with a consequent increase in efficiency.

The TF 2304 can be operated either from mains or internal rechargeable battery. It's small and light and there's a comprehensive range of accessories including a carrying case.

The price will pleasantly surprise you. Ask for full details.

mi: THE AUTOMATIC CHOICE

MARCONI INSTRUMENTS LIMITED,

Longacres, St. Albans, Hertfordshire, AL4 0JN. England. Telephone: St. Albans 59292. Telex: 23350.

A GEC-Marconi Electronics Company.
WW-001 FOR FURTHER DETAILS

wireless world

Electronics, Television, Radio, Audio

MAY 1977

Vol 83

No 1497

Contents

- 35 Surround sound — time to consolidate
36 Radio in the '80s by *Duncan MacEwan*
41 BBC Matrix H by *P. A. Ratcliffe and D. J. Meares*
46 World of amateur radio
47 Automatic electrolytic tester by *A. Drummond-Murray*
50 Variomatrix adapter for System 45J and Matrix H
by *Michael A Gerzon*
51 H.F. predictions
52 Logic design — 4 by *B. Holdsworth and D. Zissos*
55 Viewdata — 4 by *S. Fedida*
60 Letters to the editor
Mobile radio planning
Do-it-yourself biofeedback
Audibility of phase effects
63 News of the month
Annan and technology
ITU Conference results
British Rail high-speed track measurements
67 Two-stage linear amplifier by *Helge Gronberg*
71 Power semiconductors — 2 by *Mike Sagin*
79 Circuit ideas
Linear voltage/frequency converter
Pulse-counting frequency comparator
Op-amp power output stage
82 New tomography machine by *John Dwyer*
85 New products
APPOINTMENTS VACANT
INDEX TO ADVERTISERS

Current issue price 40p, back issues (if available) 50p, at Retail and Trade Counter, Paris Garden, London SE1. By post, current issue 55p, back issues (if available) 50p, order and payment to Room 11, Dorset House, London SE1 9LU.

Editorial & Advertising offices: Dorset House, Stamford Street, London SE1 9LU.

Telephones: Editorial 01-261 8620; Advertising 01-261 8339.

Telegrams/Telex, Wiworld Bisnespres 25137 BISPRS G. Cables: "Ethaworld, London SE1.

Subscription rates: 1 year: £7.00 UK and overseas (\$18.20 USA and Canada). Student rate: 1 year, £3.50 UK and overseas (\$9.10 USA and Canada).

Distribution: 40 Bowling Green Lane, London EC1R 0NE. Telephone 01-837 3636.

Subscriptions: Oakfield House, Perrymount Rd, Haywards Heath, Sussex RH16 3DH. Telephone 0444 59188. Subscribers are requested to notify a change of address. © I.P.C. Business Press Ltd, 1977

"USA mailing agents: Expeditors of the Printed Word Ltd., 527 Madison Avenue, Suite 1217, New York, NY 10022. 2nd-class postage paid at New York.



Front cover is a print produced by the Tomoscanner, described by John Dwyer on page 82 of this issue. Print supplied by J. & P. Engineering (Reading) Ltd.

IN OUR NEXT ISSUE

Loudspeakers and rooms. A discussion by James Moir of the interaction between the output of a loudspeaker and the acoustic performance of the listening room.

Matrix H decoding. Circuit details of a matrix H variable matrix decoder, a development of Sansui's Variomatrix, for use with experimental surround-sound programmes.

Using a microprocessor. The start of a series of articles on the design of a typical processor-based control system, starting with no assumptions of prior knowledge on the reader's part.

ISSN 0043 6062

ibpa
International Business
Press Associates

ABC
ASSOCIATION OF
BUSINESS OF THE GREAT
BRITAIN & IRELAND

QUAD-Quarter of a century of amplifier development



The Acoustical Manufacturing Co. Ltd. have been designing and producing amplifiers since 1936 but it was not until 1951 that the Q.U.A.D. 1 was introduced, the forerunner of the Quad series of Amplifiers which have earned an unrivalled reputation for originality of design, excellence of performance and reliability in the ensuing twenty-five years.

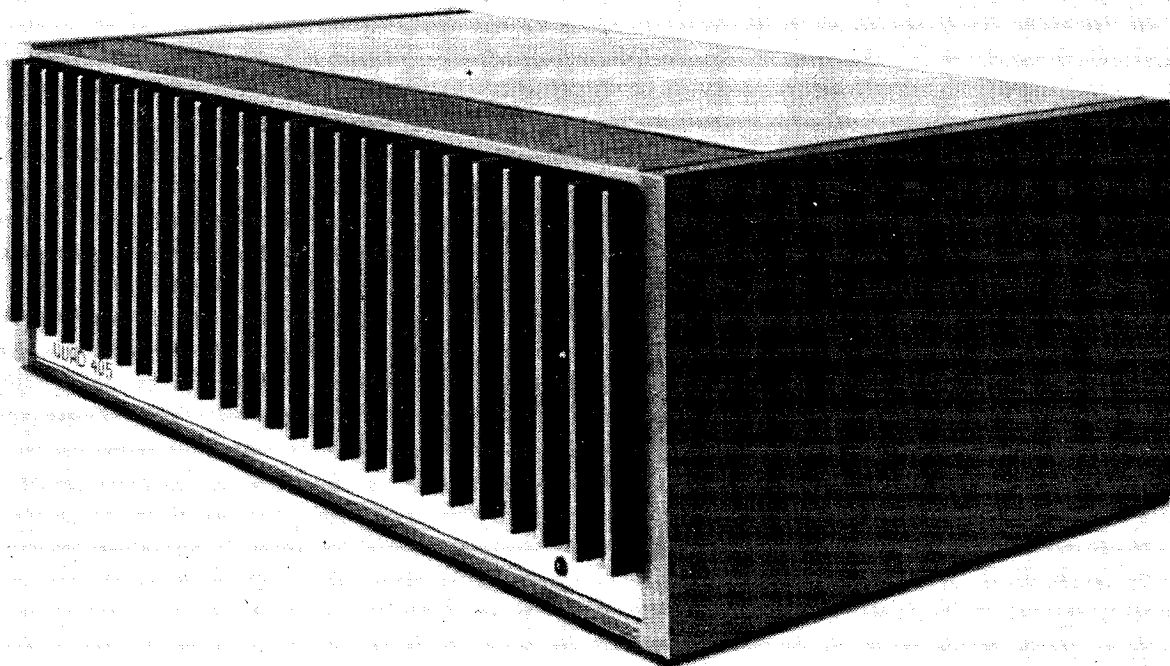
The introduction of the Quad 405 current dumping amplifier represents yet another contribution to the science of sound reproduction.

Current dumping successfully overcomes many of the problems associated with high power amplifiers, crossover, thermal tracking and matching of components, added to which the complete absence of adjustments or alignment requirements, ensures that performance will be consistently maintained.

For further details on current dumping and other Quad products write to Dept. WW

The Acoustical Manufacturing Co. Ltd.
Huntingdon, Cambs., PE18 7DB
Telephone: (0480) 52561

**Design Council
Award 1976**



QUAD

**for the closest approach to the original sound
for twenty-five years.**

QUAD is a Registered Trade Mark
WW-064 FOR FURTHER DETAILS

wireless world

Editor:
TOM IVALL, M.I.E.R.E.

Deputy Editor:
PHILIP DARRINGTON
Phone 01-261 8435

Technical Editor:
GEOFFREY SHORTER, B.Sc.
Phone 01-261 8443

Assistant Editors:
MIKE SAGIN
Phone 01-261 8429
RAY ASHMORE, B.Sc., G8KYY
Phone 01-261 8043
JOHN DWYER
Phone 01-261 8620

Production:
D. R. BRAY

Advertisement Controller:
G. BENTON ROWELL

Advertisements:
PHILIP NOSSEL (Manager)
Phone 01-261 8622

LEO KEMBERY
Phone 01-261 8515

CHRIS PRIER
Phone 01-261 8037

Classified Manager
BRIAN DURRANT
Phone 01-261 8508 or 01-261 8423

EDDIE FARRELL (Classified Advertisements)
Phone 01-261 8508

JOHN GIBBON (Make-up and copy)
Phone 01-261 8353

Publishing Director:
GORDON HENDERSON

Surround sound — time to consolidate

It may seem strange that when surround-sound equipment sales are at a low level, the systems confrontation is still unsettled, and people apparently are disillusioned by the whole thing, interest in surround sound seems as high as ever among broadcasters, particularly in Europe. This apparent paradox is the consequence of having forced quadrasonics on the public, discovering what went wrong (*Wireless World*, December 1974) and trying to put it right second time round. *Wireless World* is in the midst of publishing details of what may be the most significant contributions to the art, reflecting an escape from the blind alley into which quadrasonics, as conceived at the turn of the decade, appears to have led.

One of the effects of these early attempts at coding two channels for surround use was to send people away thinking of other ways of doing it. One such avenue, followed independently by Duane Cooper and Peter Fellgett, in 1971, led to the omni-phaser idea. This phase-encoding of direction could, by simple sum and difference matrixing, produce a reasonably compatible stereo pair of signals. The snag was a 90° phase difference between the pair.

A derivative of this was therefore studied by the BBC Research Department in 1973. Dubbed Matrix H, it was last in a list of eight arrangements tested. The front part of its pan-locus was bent toward the in-phase mono point on the energy sphere, which gave a front centre sound a reduced phase difference of 48° and appeared to give commendable overall compatibility.

Then in 1975 an effort was made to achieve a compromise, between the limit of RM on the one hand and BMX on the other, that would suit both broadcasters and the record industry. But the move failed (see *News* page 65) and messrs Fellgett and Gerzon were left to put forward their idea for a provisional

industry standard in *Electronics Letters* later that year.

Now that patents have been granted, fuller details of this NRDC-sponsored work are available. They show that a range of options exists for pairwise mixed material to enable a variety of needs to be met; indeed the H matrix could almost be one of the options.

For a surround encoding to be universally adopted, allowance must be made for the addition of a third channel where feasible (a fourth would allow three-dimensional sound reproduction but that seems very much in the future), the resulting system not then needing "rescue" by non-linear circuitry.

The record industry seems well able to produce band-limited carrier-channel discs, but the transmission of quadrature sidebands along with the in-phase difference-signal sidebands can have undesirable effects in some stereo receivers. To prevent this one could transmit the quadrature information at a level chosen to reduce these effects to agreed proportions, hopefully negligible. And to avoid signal-to-noise ratio problems it follows that the bandwidth of this third channel would need to be restricted. Design procedures are now available that allow computation of third signal coefficients so that reduction of its level does not upset localization.

What we now have is the opportunity to standardize on a rational, unified surround sound technology, which will meet the needs of broadcasters and the record industry, now and for the foreseeable future, with an assurance that the system is not likely to be bettered. As these two British proposals — BBC H and NRDC J — have much in common, it would be most unfortunate if this opportunity were to be wasted. We urge the two parties to get together: there is so much to be lost by fighting and so much to be gained by pulling together.

Radio in the '80s

Broadcasting and the ideal sound receiver of the future

by Duncan MacEwan, *Chief Engineer, Radio Broadcasting, BBC*

A number of policy changes and trends in broadcasting over the last two decades have a very definite bearing on reception difficulties and the adequacy or otherwise of present day receivers:

- There has been a move away from mixed programming on networks towards channels and stations which can be clearly identified with one particular kind of output, e.g. news, orchestral music, light middle-of-the-road music, rock, country and western, "pop", etc. This "generic broadcasting" concept applies to a greater or lesser extent in many countries of the world today. The BBC itself has for its own national networks such a format (as indicated in Fig. 1).

- Within these basic frameworks, however, most countries run networks which also offer strands or segments of specialised programming, e.g. education, ethnic languages, sport, motoring information, immigrants' programmes, etc. Fig. 2 shows something of BBC Radio's special programme services within its four networks, which it can be seen offer seven different programme outlets. Such widening of choice to the listener must be matched by his ability to take advantage of this by means of a receiver with adequate facilities.

- Programme scheduling on networks has become much more closely geared to the realities of life in the '70s. For example, television competition, not only from outside but also from within the same organisation, is recognised by radio programme planners. Peak listening times — breakfast, middle of the day and early evening — are established and programme patterns developed against such a background. In the process, some of radio's inherent advantages — speed, range of outlets, fulfilling needs which television cannot — can be capitalised on. As a second example, different programming is scheduled during clearly identifiable leisure times, which are the weekends and weekday evenings for most. Furthermore, listening habits have changed dramatically. The television set now occupies the place in the room previously held by the mains radio of the '40s and early '50s, and by far the largest amount of listening is

now done on portables, but with a growing element in cars.

- The introduction of more radio services, many of which have found their outlets on f.m. However, in some parts of the world, for a variety of reasons, countries have grown to rely heavily not just on a.m. in the medium wave-

band but also on long waves. This gives rise to the need for a three-waveband set, even before any short-wave requirement is taken into account for those who either actually need such a facility in order to receive their own national services, or simply wish it in order to extend the range of choice by being able

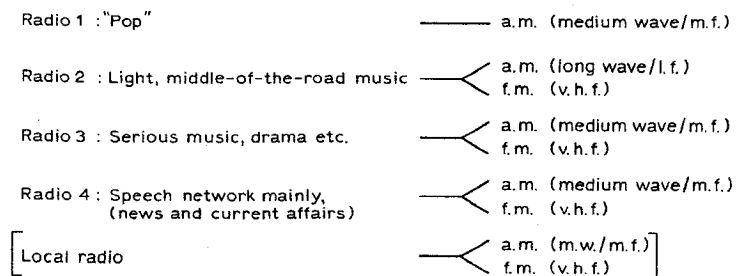


Fig. 1. The basic "generic network" concept used by BBC Radio. Note that there is a total of nine outlets.

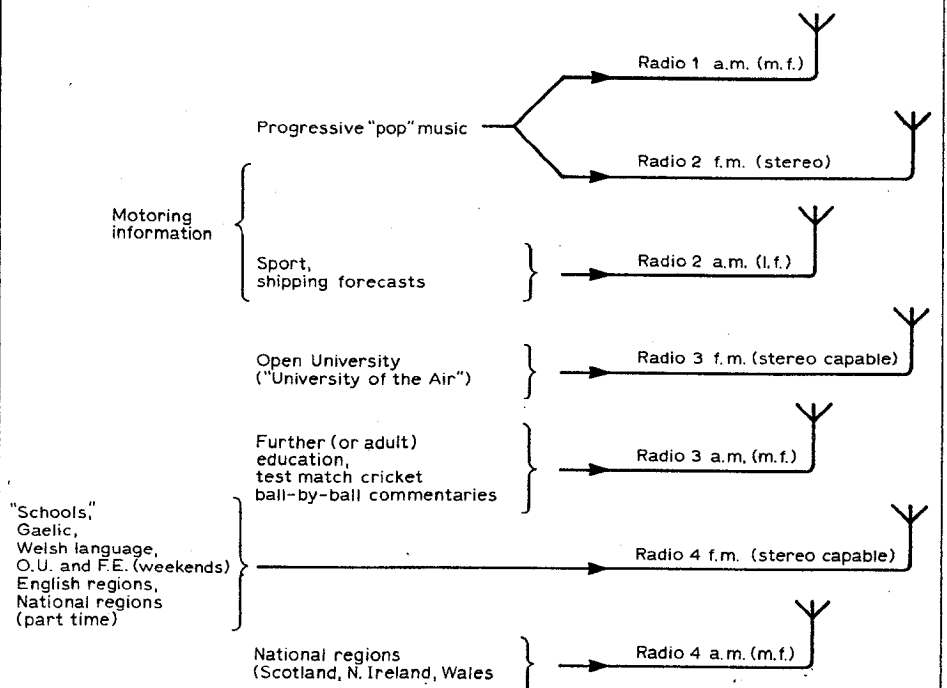


Fig. 2. Examples of specialist programming on BBC Radio's seven network outlets. Note that radio sets must have three wavebands, m.f., l.f. and v.h.f.