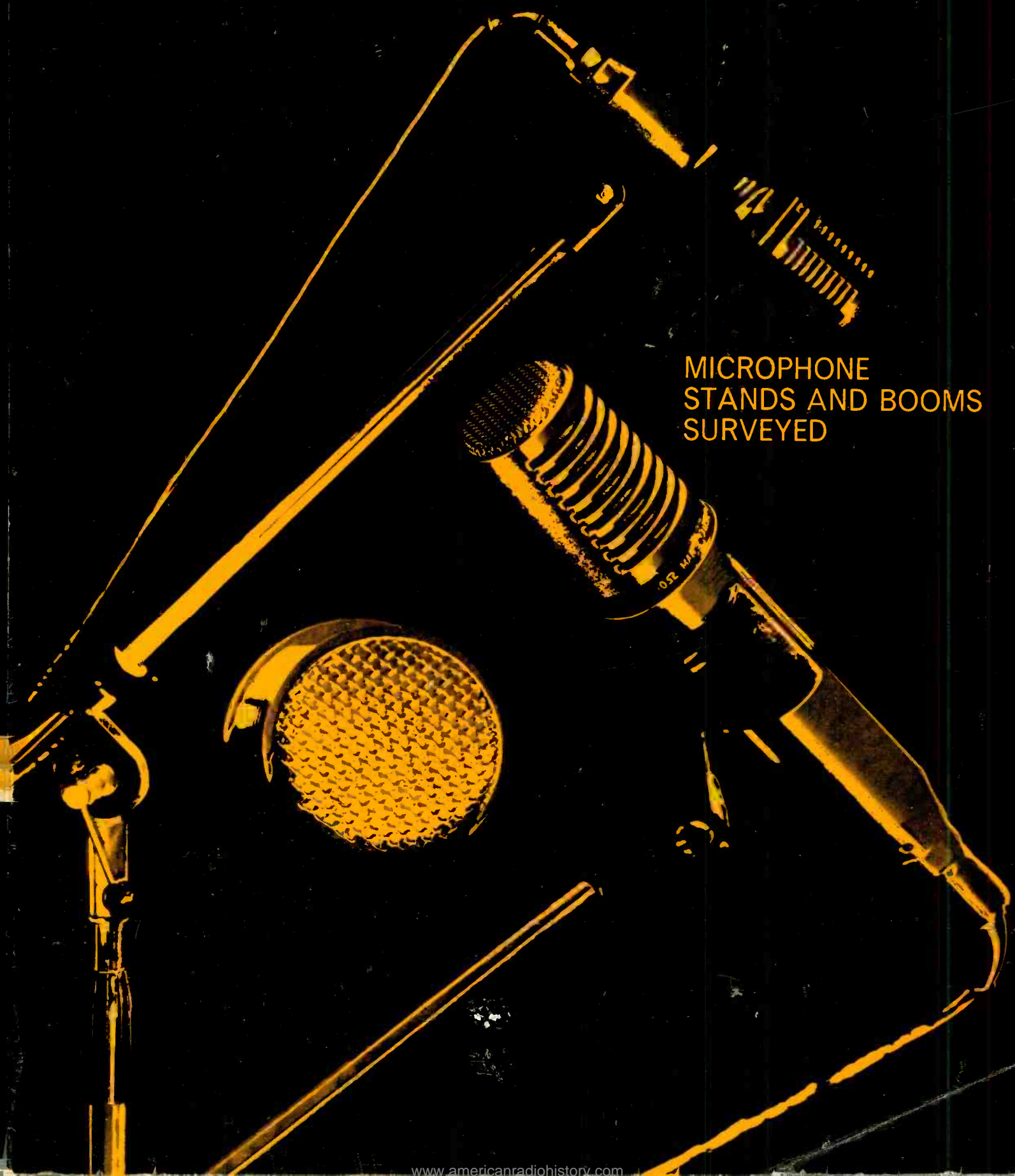


May 1974 25p

studio sound

AND BROADCAST ENGINEERING

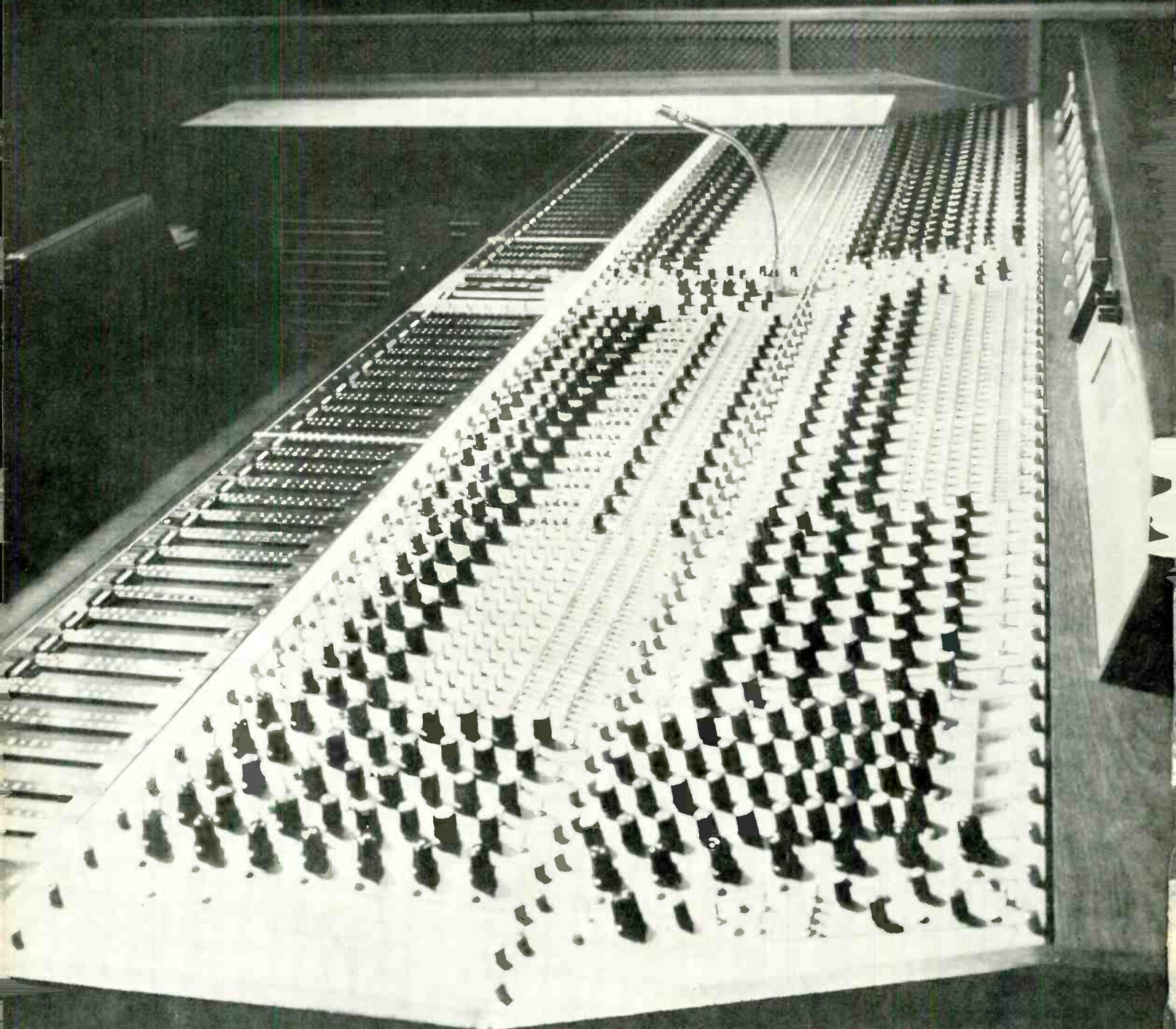
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MAY 1974 VOLUME 16 NUMBER 5

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CONTENTS

FEATURES

HOSPITAL RADIO—BRISTOL FASHION By R. I. Elliott	28
THE LAW OF COPYRIGHT By Brian Haines	42
WHAT'S WRONG WITH QUADRAPHONICS? By Michael Gerzon	50
SURVEY: MICROPHONE STANDS AND BOOMS	52
THAT WAS THE FESTIVAL DU SON By David Kirk	56
THE ECONOMICS OF SOUND RECORDING STUDIOS By Denis Comper	60

COLUMNS

NEWS	22
PATENTS	26
DIARY	34
BROADCASTING By Adrian Hope	38
FIELD TRIALS: Kepex 500 By Angus McKenzie	41
VIDEO By Roderick Snell	46

REVIEWS

CHADACRE PH950 AND BRUEL & KJAER 2426 By Hugh Ford	62
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SUBSCRIPTIONS

STUDIO SOUND, published monthly, enables engineers and studio management to keep abreast of new technical and commercial developments in electronic communication. The journal is available without charge to all persons actively engaged in the sound recording, broadcasting and cinematographic industries. It is also circulated by paid subscription to manufacturing companies and individuals interested in these industries. Annual subscription rates are £3 (UK) or £3.30 overseas.

CORRESPONDENCE AND ARTICLES

All STUDIO SOUND correspondence should be sent to the address printed on this page. Technical queries should be concise and must include a stamped addressed envelope. Matters relating to more than one department should occupy separate sheets of paper or delay will occur in replying.

BINDERS

Loose-leaf binders for annual volumes of STUDIO SOUND are available from Modern Bookbinders, Chadwick Street, Blackburn, Lancashire. Price is £1 (UK) or 95p (overseas). Please quote the volume number or date when ordering.

DURING MARCH the BBC held a press conference to demonstrate some experimental quadraphonic recordings and to explain what work the corporation were doing in this field. Mr C. B. B. Wood, head of the engineering information department, explained before the demonstration that the corporation had no intention of adopting or experimenting publicly with any four-two-four system until the present impasse had been fully resolved. They were aware, as Mr Wood put it, that there were 'various ways of putting four pints into one quart pot', but they would not wish to give the public any encouragement to buy equipment that might later have to be discarded. For this reason they had to be wary even of experiments using two stations, such as Radio Two or Radio Three for the front channels and Radio Four (after closedown) for the rear.

Mr J. D. MacEwan, chief engineer, radio broadcasting, who conducted the demonstration of four track tapes, said that they could not countenance the use of any system which would limit vhf coverage at acceptable quality—meaning a good signal to noise ratio, in this case—in the areas served by the transmitters. This does seem to indicate that a system such as that developed by JVC would not be acceptable. The statement went on: 'The BBC is actively investigating all the various proposals (and indeed has one or two very promising ideas of its own), but at the moment is not ready to make a firm decision.'

It could be, then, that after all the trumpet-blowing and ballyhoo, some system could still be adopted other than one of the seemingly-eternal triangle: SQ, QS and CD4. With the BBC dreaming up their own systems, and the National Research and Development Council providing funds for the development of another system, on which we reported in January, once again the four channel field is, as they say, wide open.

The BBC are engaged in talks with the National Quadraphonic System Committee in the United States and with the European Broadcasting Union. After a period in which some members of the recording industry and others seemed heartily sick of the whole business, and in which the public, for once, were not biting the glistening but ultimately flat-tasting cherry, four channel sound may yet come alive again, and it is heartening that the adoption of one system or another by various mammoth recording organisations has not forced a technically-poor but cheap way of getting more money from the punter onto the More Discriminating Consumer. It should be noted, though, that the only thing that saved the MDC, whoever he might be, from the steamroller effect is that the steamrollers have, until now, been pulling in opposite directions.

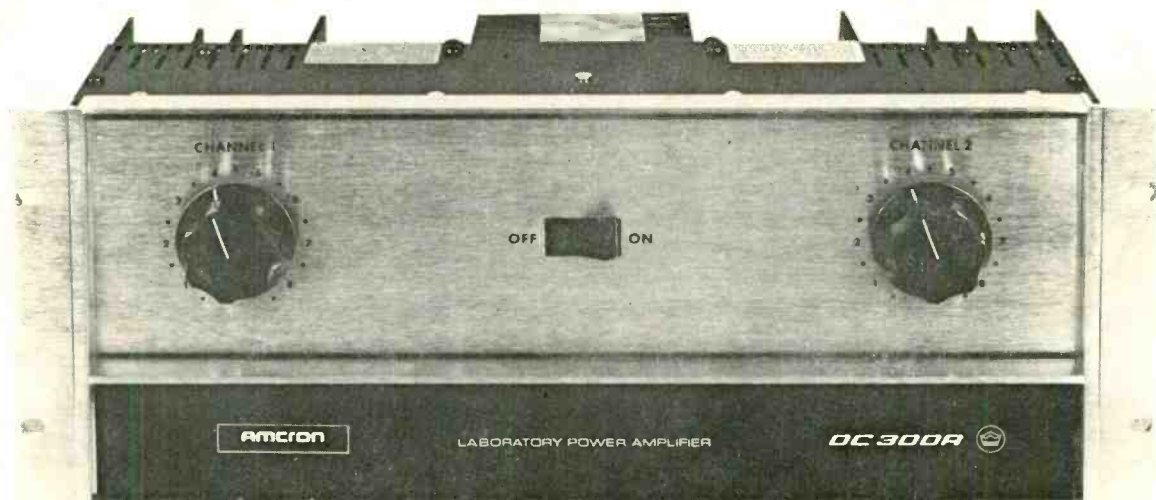
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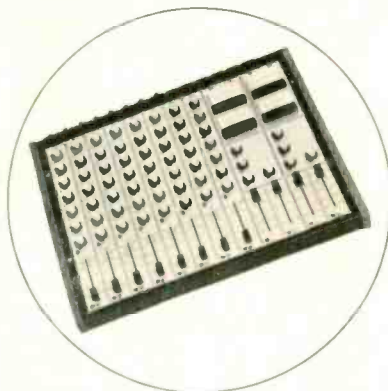
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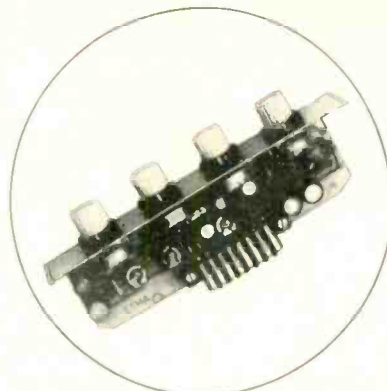
The original black **MODULAR RANGE** has been re-designed to provide an economical multi-track system. All new system modules incorporate their input and output connectors, and this minimizes their base cost.

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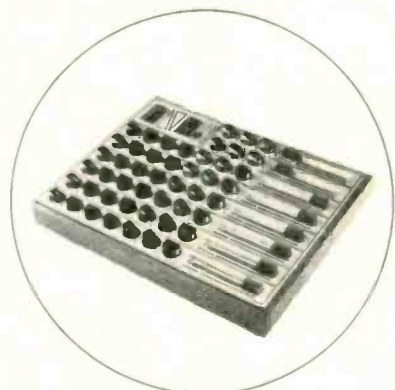
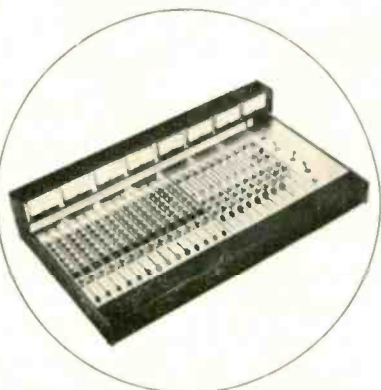
Output modules mix amp, output fader, echo return with two-band equaliser, monitor fader and panpot.

Auxiliary modules echo send with top lift, cue send with two-band equaliser, talkback to studio and cue, oscillator, main monitor level, monitor select, voltage regulator.

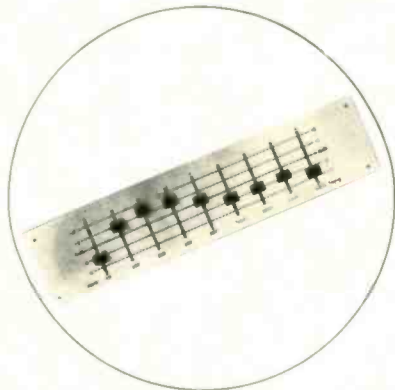
The **QUASI RANGE** presents a low cost custom semi-modular mixer. The units are robustly constructed on an all-steel chassis, with attractive teak side cheeks. Connectors may be of jack or Cannon type. Up to 12 modules can be accommodated with two or four outputs. The inputs may be high or low Z and jack switching may be incorporated. They feature continuously variable sensitivity, three-band equalisation, echo and cue outputs, linear fader, panpot and routing switch if applicable. The output module contains two channels incorporating equalised echo return, main faders and output meters.



Two new low cost signal processing modules are available, these may be fitted to any existing equipment by the four potentiometer bushes. A front panel and connector are supplied. The 6:1 **COMPRESSOR** has variable input, output, attack and release controls. It can be used for special effects, peak level control and for automatic mixing. The **NOISE GATE** is an electronic gating device. The control parameters are input level, gating threshold, attenuation depth and gate release time. Possible applications are: Noise reduction, feed back suppression, intercom, special effects.

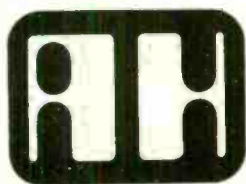
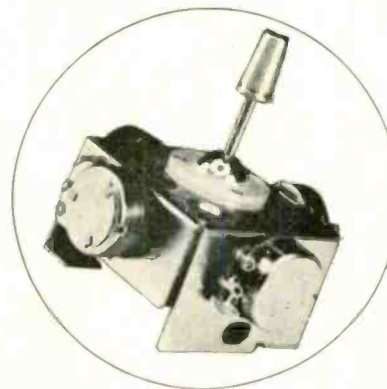


The **MINIATURE MIXER** is a six channel stereo unit employing a single P/C board construction and incorporating facilities found in mixers many times the size and price. The console is mounted in a teak case and connection is via phono jacks. The input channels feature sensitivity, treble, mid bass, echo, cue pan and fader controls. Main outputs have individual echo returns and VU type meters monitor the outputs. The unit may be operated from batteries or an external low voltage supply.



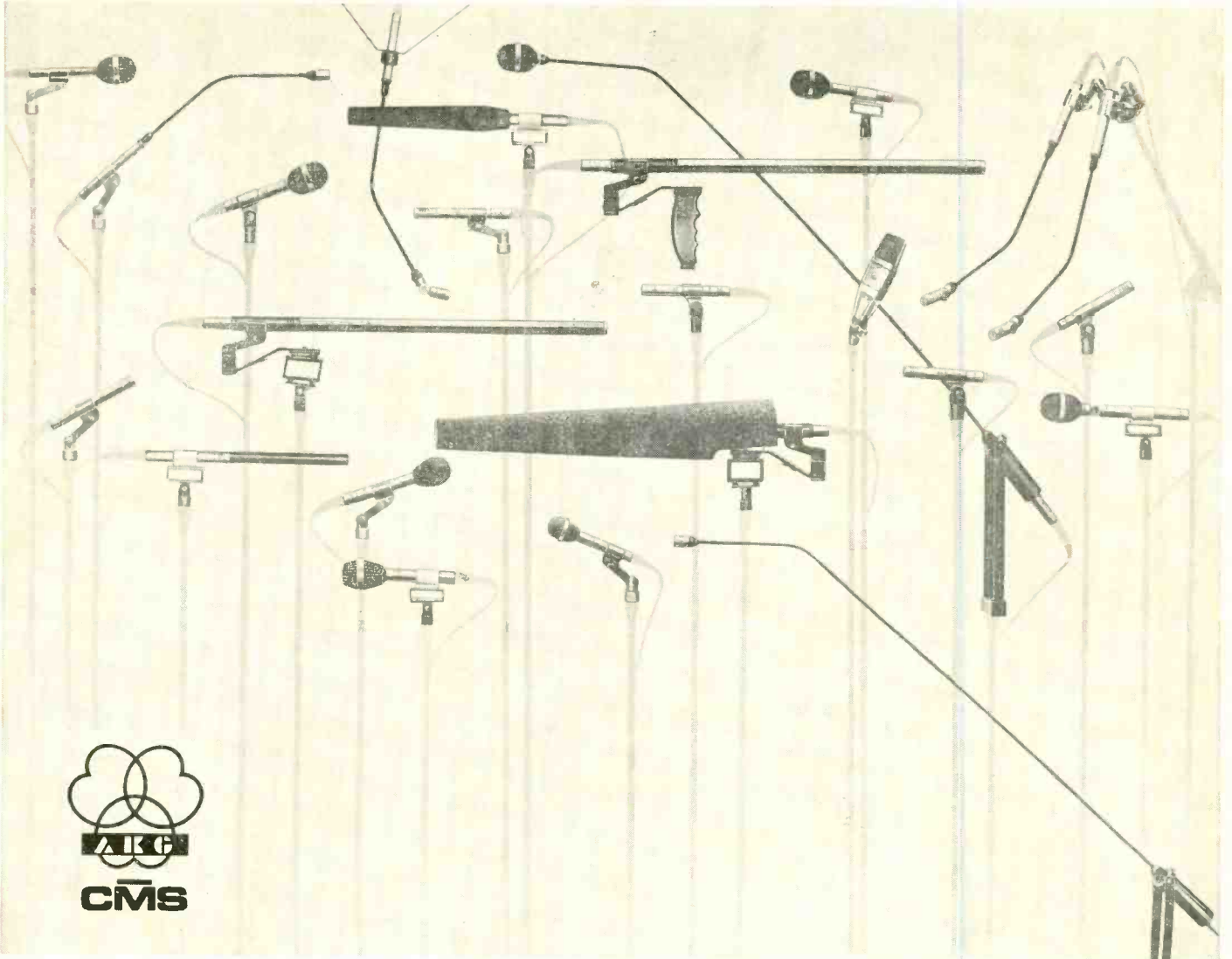
The new **GRAPHIC EQUALISER** allows the response curve of an audio system to be varied at nine frequencies at octave intervals by an amount of plus or minus 12dB. The curves are designed so that they blend in to give a smooth response. The slide faders give a graphic indication of the response. The unit is constructed on a single P/C board and is available in rack mounting format. Various applications include: Wide range programme, monitor and P/A environmental equalisation and noise suppression.

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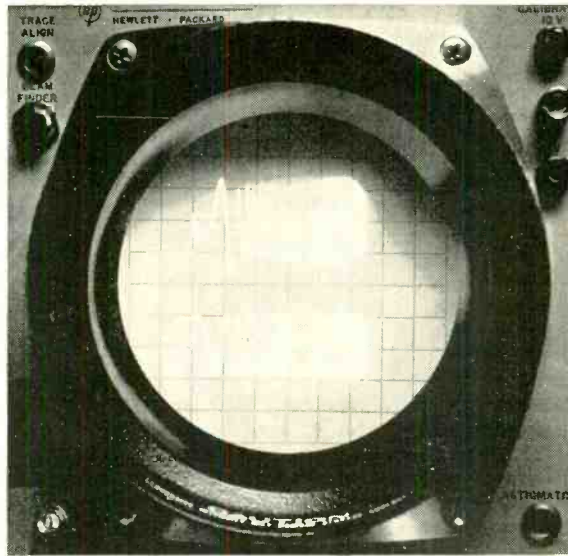


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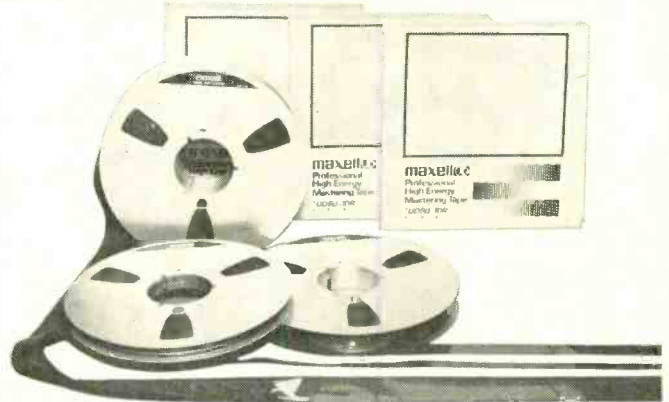
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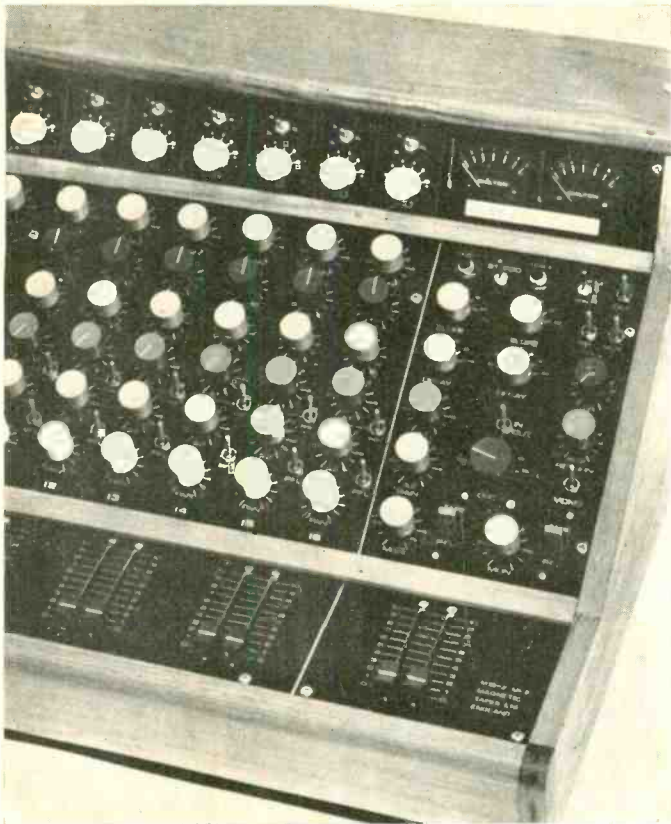
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HUGH FORD review
STUDIO SOUND Oct. 1973

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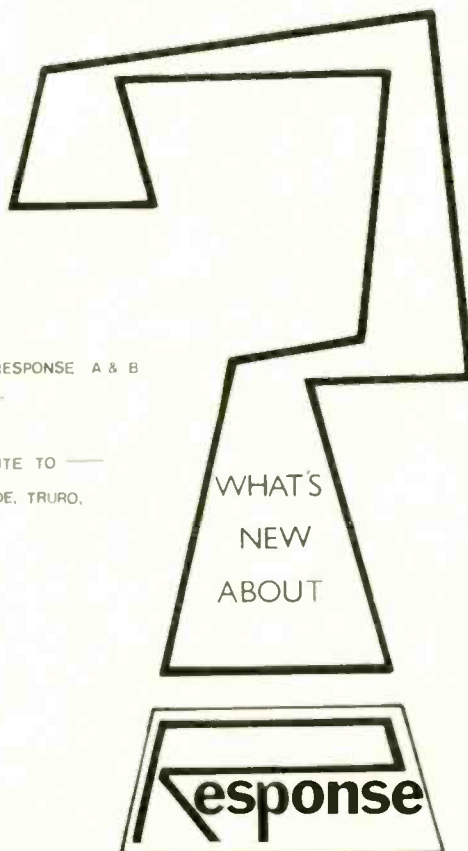
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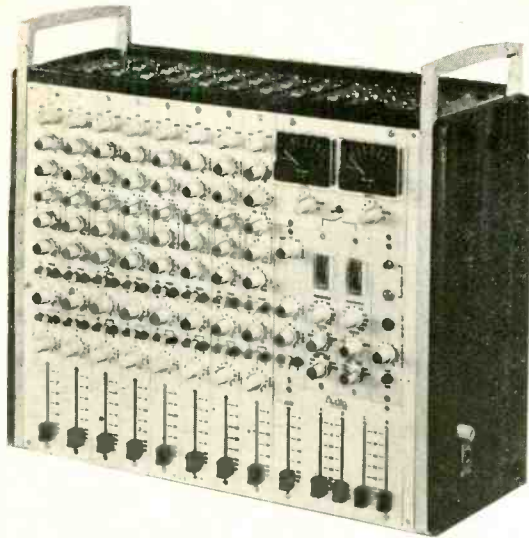
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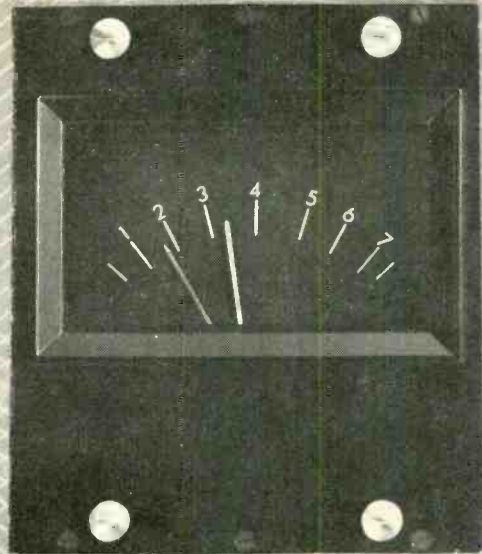
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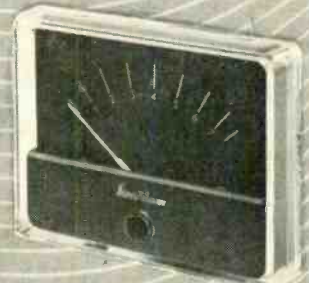
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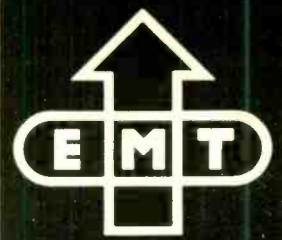
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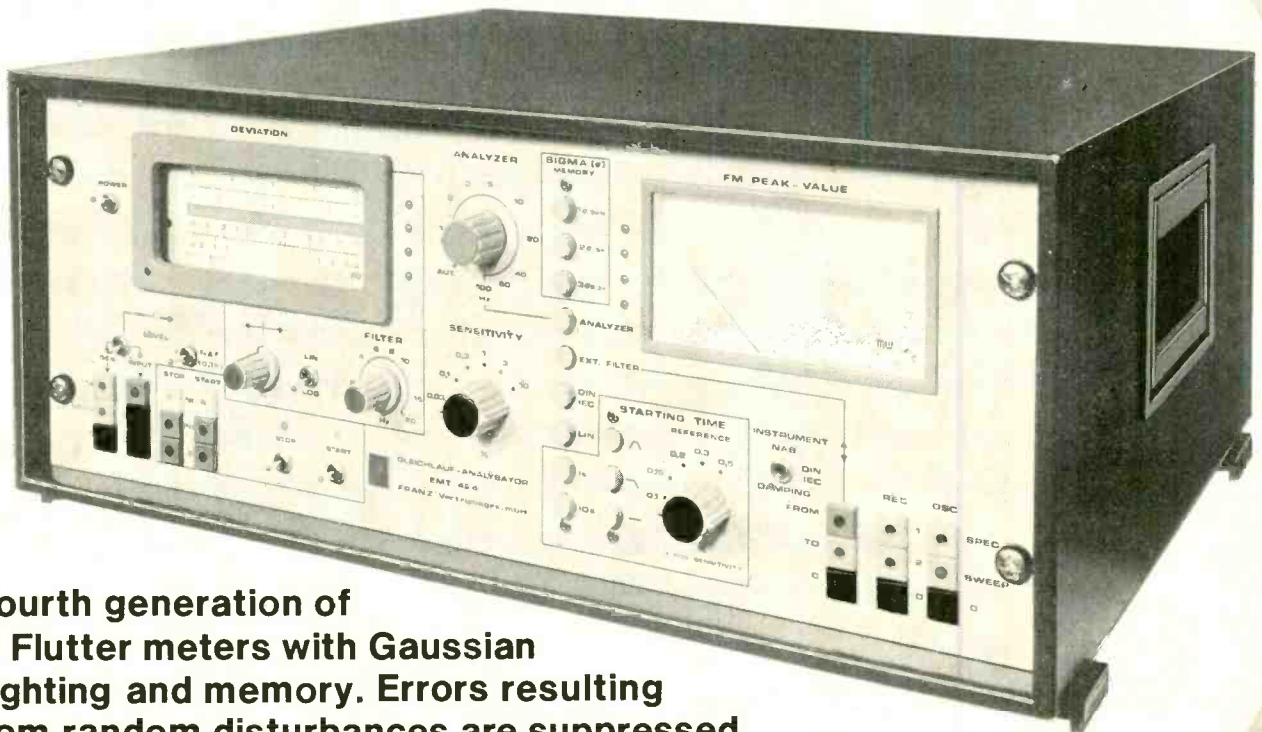
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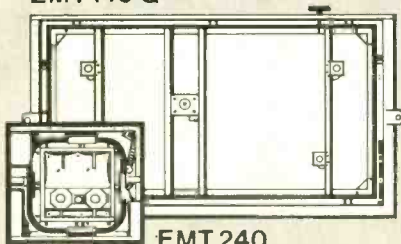


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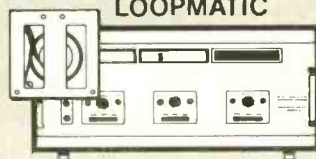
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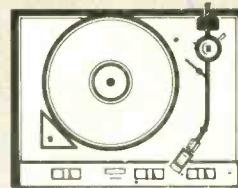


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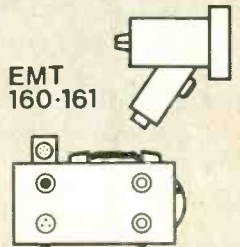
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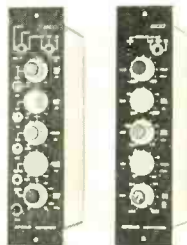
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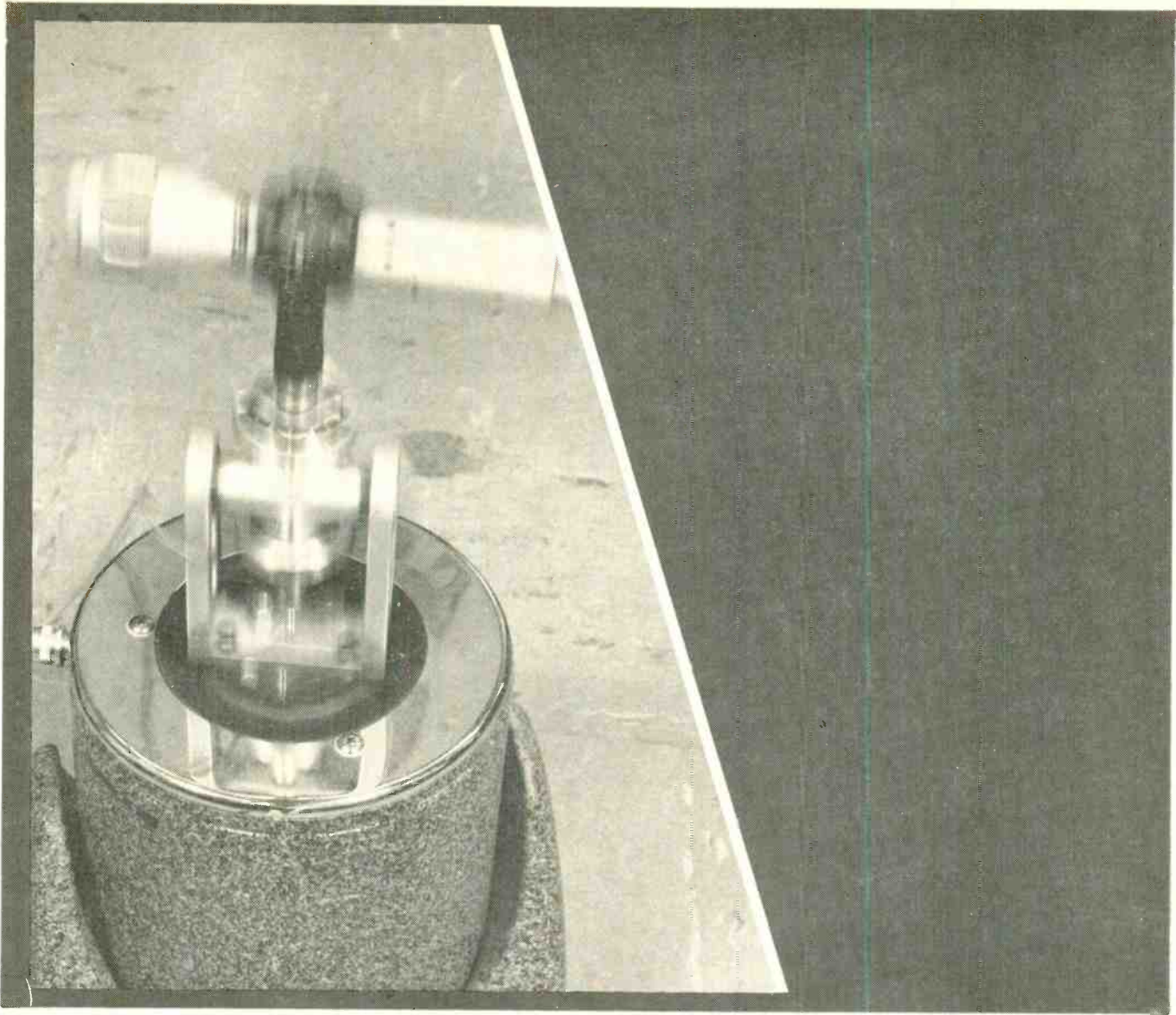
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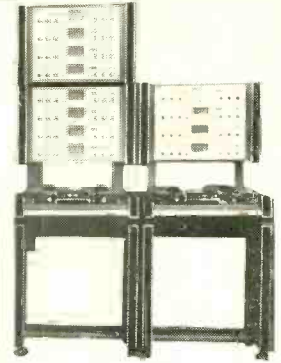
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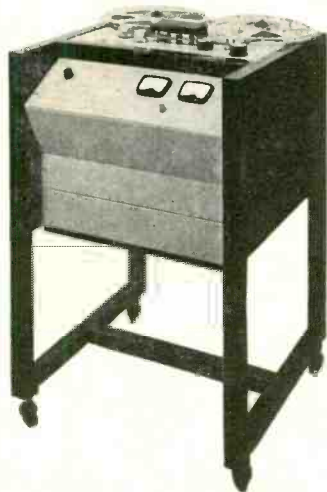
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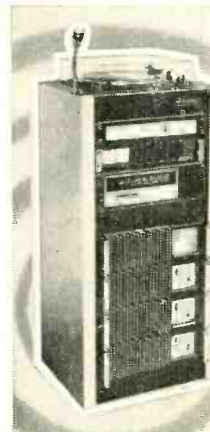
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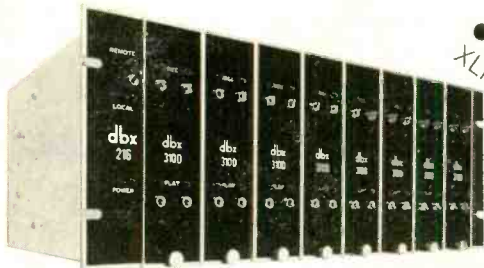
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Joint venture

NEVE HAVE WON an order from EMI worth at least £250,000. In a statement issued at a press conference held at the Bristol Hotel, W.2, on February 21, Mr Derek Tilsley (Neve's marketing director) said that the contract was the largest they had ever received. 'The initial order [is] for six consoles . . . Five of the consoles are destined for studios overseas, making a significant contribution to exports: these consoles will be located in EMI studios in Cologne, Singapore, Wellington, Paris [and] Stockholm'. The sixth console would go into EMI's Abbey Road studios in London.

The statement went on to say that the designs for the desk had been a joint venture between the engineering departments of EMI and Neve. 'The sound control consoles will be the most comprehensive yet produced by the Neve companies.' We understand that 600 drawing prints were issued by the Neve drawing office during the course of the negotiations before the contract was signed. EMI engineers spent some time at Neve's Melbourne factory discussing their requirements and inspecting the facilities.

EMI had spent a year or so assessing the merits of various manufacturers, of which the most important had to be 'the quality of the sound'. Mr W. H. Rand, technical director of EMI International Operations, told **STUDIO SOUND** that the reason EMI had chosen to use Neve instead of building the desks themselves was that 28 studios round the world needed to be re-equipped. EMI wanted all of them to have interchangeable facilities and an identical sound. 'There was the problem of production facilities. We reached the stage where we could either expand our own or look somewhere else.' EMI had looked at four or five other manufacturers in the UK, Germany and the USA. None could produce the required quantity.

Gus Cooke of EMI's Abbey Road studios commented: 'I'm very happy about it. We examined the whole field of control consoles—we took a long time thinking about it.' Abbey Road will get one of the two largest desks; the other will go to Cologne. The two desks are not identical, however. Like

the other four they will be custom-built.

Derek Tilsley told **STUDIO SOUND** that, despite the three-day week, output during January 1974 had been far higher than during January of the previous year. They had a generator which supplied all their needs, including heating. Last year Neve had an output worth £1,500,000, all of it delivered. There were over 50 desks being produced, most of them custom-built. Two-thirds of the company's output had been exported.

Sulamoss make Response

A **WEST COUNTRY** firm are now making Response mixers. The mixers were designed and built by Audio Applications until that firm ceased trading towards the end of last year.

Sulamoss Ltd, of The Parade, Truro, Cornwall, have now bought the rights of manufacture for the mixers. In a statement the firm said they were improving the design of the mixers in a number of ways, including improving the paintwork and hard-anodising all the exposed aluminium surfaces. 'Improved construction techniques have enabled a great deal of interwiring to be eliminated, therefore reducing the number of connectors and enhancing the overall reliability. Work so far indicates that with all planned improvements incorporated, improved performance will result, bettering the already good figures for the machine.'

Zero 88 are supplying the electronics for the mixers and Sulamoss are assembling them. Mr Dick Cullup, a director of Sulamoss, told **STUDIO SOUND** that Zero 88 were also helping with the redevelopment work. The Response mixer will sell for about £675. Sulamoss are also developing the *A Series* and have already had an order for such a desk from Magritte Music in London. It will have 24 inputs and 16 outputs.

Sulamoss say they are interested in setting up a franchised distribution in London. They 'would be particularly pleased to hear from anyone interested in the agency they are offering'. They also say they are able to offer after-sales service on any mixers bought in the past. They have tried to contact those who bought Response mixers but have not managed to trace them all. Those interested should phone



EMI's Mr W. H. Rand, and Mr Derek Tilsley of Neve.

Dick Cullup at Truro 77342.

Tall orders

PYE TELECOMMUNICATIONS will deliver £170,000-worth of equipment to Saudi Arabian government departments. The order includes single sideband telephone equipment, Pocketfones and mobile radio telephones.

Pye have already got a £35,000 order from Fouad Salim Saad of the Lebanon for 500 items of radio paging equipment, and TCN9, a Sydney commercial tv station, have just ordered a £250,000 colour television outside broadcast unit from Pye TVT Ltd. The unit will be supplied with three colour cameras and is expected to be used to broadcast shows from the Sydney opera house for worldwide distribution.

IBA contract

APPLICATIONS FOR the Teesside and Nottingham commercial radio contracts were invited on February 20. The closing date is May 8. Teesside will cover a population of 680,000 and the rates payable to the IBA in the first three years will be £36,500, £41,000 and £45,000 respectively.

Shure move

SHURE ELECTRONICS Ltd have moved all but their service department

from 84 Blackfriars Road, London SE1 to Eccleston Road, Maidstone, Kent ME15 6AU. Telephone: 0622 59881.

The new offices are larger and more modern than before, allowing Shure to take on additional staff to cope with increased business and to ensure prompt delivery to all areas.

Manx Radio committee

THE ISLE of Man government has appointed its committee of enquiry into Manx Radio. The members will be Mr Mark White, head of BBC Radio Two; Mr J. C. Wilkinson, chairman of Telefusion, a director of Trident Television and of Trident discount warehouses; and Mr Nicholas Wilson, an investment consultant and market research specialist.

Mr Wilkinson and Mr Wilson are both Manx residents and Mr White hopes to retire to his home on the island, which he now visits three times a year.

Commenting on the size of the committee, Mr Tim Gudgin of the Government Office said that it would allow the committee to work with greater speed. The Association of Broadcasting Staffs would be invited to attend the committee and present a paper. As we reported last month, the

24 ▶



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NEWS

paper is expected to recommend salary increases for Manx Radio staff which will come 'as something of a shock' to the Manx Radio Commission.

IRN editor

MR RONALD ONIONS, head of radio news at Capital, has been appointed editor of Independent Radio News the national news network set up by London Broadcasting to supply news to the local commercial radio stations.

Sheffield and Rotherham

THE IBA have awarded the Sheffield and Rotherham commercial radio contract to Radio Hallam. The chairman of Radio Hallam is Mr Gerard Young, CBE. JP, who is also chairman of the Sun Alliance & London Insurance Group, and of Tempered Group Ltd. Broadcasts will start in the first half of 1975.

The group also includes Keith Skues, who is expected to become head of programmes. He was with BBC Radio One for three years before which he had been a freelance dj with the light programme since 1967. He joined the staff of the BBC in 1970 and last year he was promoted to editor for Radio One. He produced 'The History of Pop'.

Other members of the group include Mrs D. de Bartholome, lately chairman of Sheffield High

School for Girls; George Darling PC, former member of parliament, journalist and broadcaster; Jean Doyle, a lecturer and housewife who has broadcast on BBC Radio Sheffield on consumer affairs since that station began; John Jewitt JP, managing director of Footprint Tools and activist for commercial travellers and boys' clubs; William MacDonald, who is expected to become managing director of the station, has been active in newspaper publishing and is a former council member of the International Radio and TV Society, New York; Thomas Watson JP, managing director of Sheffield Newspapers and former editor of the *Sheffield Star*; and Herbert Whitham, secretary and chief executive of Brightside and Carbrook Co-operative Society.

Windlesham lecture

IN ONE OF this year's Granada Lectures Lord Windlesham, formerly minister with special responsibility for information in the Conservative government, said that the tone in which much of the political debate had been carried on before the last election might have brought discredit to the practice of politics. He expressed concern about the effect of television coverage of the election on the electorate. He was also worried that experienced reporters and producers could influence the choice of issues and the way they were perceived.

In a recent survey conducted by Marplan for *Broadcast* magazine, seven per cent of those asked said their minds had been changed by broadcast coverage of the election. This percentage comprised ten per cent of the women asked and three per cent of the men. Nine per cent of those aged between 18 and 34 and five per cent of those aged 35 or above had changed their minds because of the broadcasts, but there seemed to be no difference in the percentage between ABC1 and C2DE social classes.

The number of people who took part in the survey was 299, all from the London Area. Rod Allen, editor and publisher of *Broadcast*, said: 'Bearing in mind that the survey was taken in the London area, the relationship between this figure and the five per cent swing from Conservative to Labour in the London area is inescapable'.

The survey could not be used to reinforce Lord Windlesham's remarks, however, since much of the broadcasting under discussion was not conducted either by broadcasters or journalists but by ad agencies hired by the politicians. When the election went against the Conservatives there was some speculation that the tastelessness and mediocrity of a party political broadcast starring Anthony Barber had been responsible. March 8's *Campaign* reported that Roe Humphreys, their advertising agency, had been dismissed with unusual swiftness.

The IBA say there will be adjustments for the cost of living calculated according to the retail price index.

The Teesside station will transmit on 95 MHz from Bilsdale and 257m from near Stockton.

Nottingham's station will cover 600,000 people at £32,500 rental to the IBA in the first year, £36,000 during the second year and £39,500 in the third, again with provision for rising costs.

The Nottingham station will transmit on 96.2 MHz from Colwick Wood and 301m from Trowell.

BRMB advisory committee

THE IBA HAVE appointed Mr F. E. Pardoe as chairman of Birmingham's local radio station local advisory committee. Mr Pardoe is principal lecturer in communications studies at Birmingham Polytechnic. Other members of the committee will be appointed shortly.

Mr Pardoe was born in Birmingham in 1915 and taught there for over 30 years. He started the country's first communications studies course in 1965 at Birmingham Polytechnic.

All clear

THE BBC General Advisory Council has been advised by one of its sub-committees to press the Ministry of Posts and Telecommunications to clear service users from the vhf bands. The recommendation was considered by the General Advisory Council at its meeting on February 6. The sub-committee recognised that an increasing load was being put on broadcasting channels and that additional coverage would have to be provided in the vhf bands. For this reason it would be necessary 'to clear, at the very least, the 97.6 to 100 MHz band for broadcasting, as is the case in other countries'. The sub-committee suggested that the BBC should carry out a 'determined programme' to make people buy multiwave sets.

The Paper on the use of Radio Frequencies for Sound and Television broadcasting in the United Kingdom also gave details of the progress of the expansion programme to bring three-station television coverage to the whole of the UK. Under the programme 98 per cent of the population would be receiving all three stations by 1979 at a cost of £4 million a year. The other two per cent would be small communities of 1,000 people or less. By the mid 80s the number of such communities still to be covered would have been substantially reduced. 'Thereafter a point would be reached in which any supposed obligation to reach 100 per cent coverage had to be weighed against steeply rising costs. Consideration might have to be given to alternative forms of finance, possibly with the assistance of national or local government, bearing in mind that people living in areas furthest from main centres of population might have a strong claim on public resources for access to popular entertainment and cultural influences.'

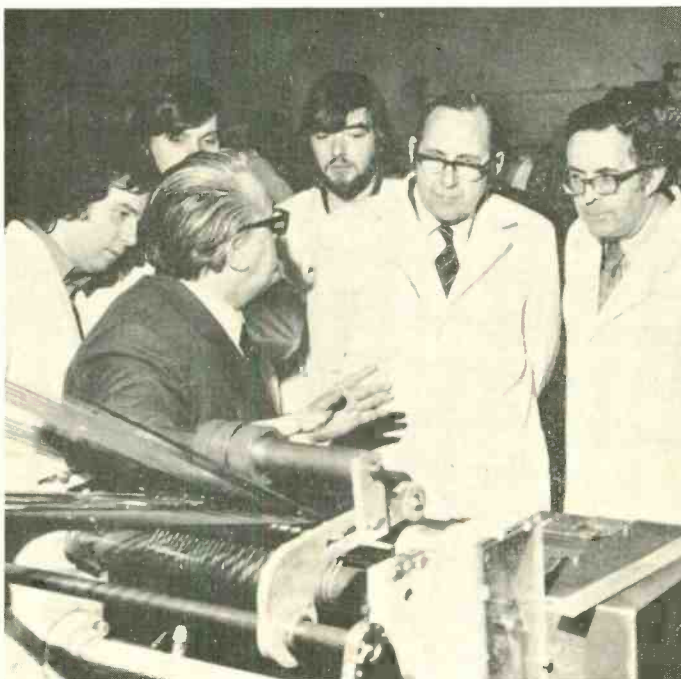
EMI visit

MEMBERS OF the Audio Engineering Society toured the Emitape manufacturing plant on February 15 following a lecture by Ray Gilson, technical consultant to EMI Tape Ltd. During the tour the AES members were shown tape slitting techniques and test equipment.

On the increase

PYRAL HAVE announced that they have had to increase some film and disc prices. Pyral say the increases are due to the rising cost of triacetate base for film and of aluminium circles for discs. For example, their 16 mm film used to cost 0.42 pence a foot for both triacetate and polyester. The price of triacetate is now 0.482p a foot. At the same

AES members at a slitting machine. See 'EMI Visit'.



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Berkshire Industrial Park, Bethel, Connecticut 06801, U.S.A. Telephone: (203) 7446230. Telex 969638. Hollywood Office: Telephone: (213) 465 4822.

NEWS

time Pyral have reduced the price of 16 mm polyester film from 0.42p a foot to 0.352p.

For discs Pyral used to charge 64p for 18 cm direct record discs and they are now charging 70p. A 36 cm *Mastereo* disc used to cost £2.45 and the new price is £2.56.

Mr F. D. Walter, Pyral's company secretary and a director, told *STUDIO SOUND*: 'Now that the market is in such a state of flux at the present time we cannot say how long we can hold these prices; we anticipate another increase before

very long'. A full list of the new prices is available from Mr John Smailes, Pyral UK, Airport House, Purley Way, Croydon, Surrey CRO 0XZ. Telephone 01-681 2833.

AKG prices

AKG HAVE increased most of their prices. They issued a new price list in February with a statement regretting that they had had to increase many prices by about ten per cent. The reasons they gave were increased manufacturing costs and 'the deterioration in the exchange rate between sterling and the Austrian Schilling'.

Not all the prices had been increased, however, and the *D145*, *D1200* and *D2000* microphones and *K60*, *K100* and *K180* headphones had been kept at the same price.

New price lists can be obtained from Mr Peter Eardley at AKG Equipment Ltd, telephone 01-229 3695.

Accelerated speech playback

A METHOD of speech time compression is being offered by the Oxhey Service Centre, 494 Bushey Mill Lane, Bushey, Hertfordshire. The system is based on an ITT *Studio 60* 4.75 cm/s cassette recorder, modi-

fied to operate at any speed between 1.9 and 7 cm/s. This permits up to 3.5 hours of programme to be recorded on a normally 1.5-hour *C90* cassette. More important, it is claimed that speech can be reproduced at up to 60 per cent faster than the original speed while maintaining a high degree of intelligibility. No attempt is made to prevent mickeymousing, the point of the application being that a listener can easily learn to accept speech presented in this way. Suggested users include students, particularly those with impaired sight.

THE FOLLOWING list of Complete Specifications Accepted is quoted from the weekly Official Journal (Patents). Copies of specifications may be purchased from The Patent Office, Orpington, Kent BR5 3RD.

February 6

- 1348866 Bendix Corporation. Co-ordinate determining device employing a slowly varying difference signal to determine approximate cursor position.
- 1348876 Tektronix Inc. Colour television matrixing circuit.
- 1348877 Alden Research Foundation. Electrode assemblies for facsimile recording apparatus.
- 1348882 Standard Telephones & Cables Ltd. Age in fdm systems.
- 1348922 Nissan Motor Co Ltd and ISHII, Y. Multiplex transmission method.
- 1349034 Xerox Corporation. Semi-encoded facsimile transmission.
- 1349047 Pye Ltd. Isolator.
- 1349049 Tesla Narodni Podnik. Oscilloscope free running and triggered synchronisation sawtooth voltage control circuit system.
- 1349061 International Computers Ltd. Strip magnetic head transducer arrangements.
- 1349107 Hitachi Ltd. Dynamic focusing circuits for cathode ray tubes.
- 1349188 Bofors, AB. Picture generating unit responsive to a video signal.
- 1349190 Fuji Telecasting Co Ltd. Image-transmission.

February 13

- 1349215 Bolex International SA. Cinematographic apparatus.
- 1349427 Pioneer Electronic Corporation. Telephone speech recording device.
- 1349480 Honeywell Information Systems Inc. Tape cleaning apparatus.
- 1349484 Soc D'Etudes Techniques Et D'Enterprises Generales. Selective dissemination of data.
- 1349489 Neckermann Versand KGAA.

- Sound source cabinets.
- 1349518 National Research Development Corporation.
- Optical character reader.

February 20

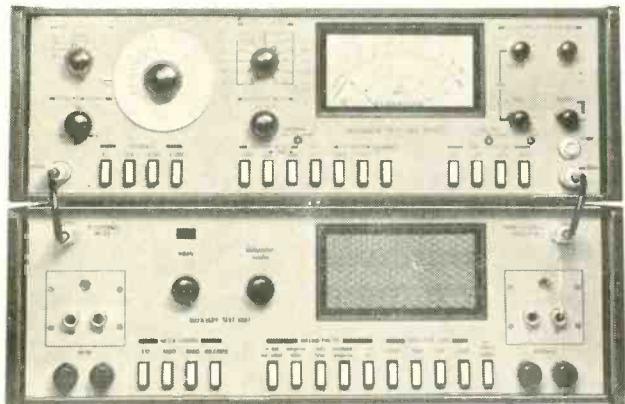
- 1349632 Singer Co. Hand held magnetic reader.
- 1349642 Plessey Co Ltd. Telephone instruments.
- 1349665 Matsushita Electric Industrial Co Ltd. Recording apparatus.
- 1349675 Matsushita Electric Industrial Co Ltd. Display devices.
- 1349687 Hell GMBH, DR-ING Rudolf. Devices for clamping a picture original to a transport clamping surface for photoelectric scanning.
- 1349734 Post Office. Arrangements for amplifying and reproducing audio frequency signals.
- 1349858 Eastman Kodak Co. Apparatus for advancing motion picture film.
- 1349861 Hughes Aircraft Co. Antenna direction control system.
- 1349883 Eastman Kodak Co. Strip handling apparatus.
- 1349886 Eastman Kodak Co. Strip storage cassette.
- 1349921 Research Frontiers Inc. Light valves.
- 1349923 Marconi Co Ltd. Circuit arrangements for producing two closely spaced frequencies.
- 1349943 EMI Ltd. Gain control arrangements.

February 27

- 1350023 Siemens AG. Electroacoustical transducers.
- 1350051 Teire, J. M. Enclosures for loudspeakers.
- 1350076 Communications Patents Ltd. Wired broadcasting systems.
- 1350096 Siemens AG and Zeiss, Carl. Use of sensing arrangements of the electronic raster-scanning kind in the investigation of a field of view.
- 1350116 Hughes Aircraft Co. Automatic equalizer for communication channels.
- 1350122 Electronic Research Associates Inc. Sound reproducing equipment.

- 1350142 Telefonaktiebolaget L. M. Ericsson. Controllable attenuator.
- 1350159 Keio Giken Kogyo KK. Band pass filter for electrical or electronic musical instruments.
- 1350165 Tektronix Inc. Display baseline stabilization circuit.
- 1350213 Brandt, O.G., and Tocquet, B. Electroacoustic transducers.
- 1350226 Kureha Kagaku Kogyo KK. Piezoelectric electro-acoustic transducers.
- 1350266 Philips Electronic & Associated Industries Ltd. Electro-optical modulation device.
- 1350272 Eastman Kodak Co. Information-recording materials containing antistatic agents.
- 1350337 Barmag Barmer Maschinenfabrik AG. Apparatus for the contactless inductive transmission of measure data in the form of electrical voltages and currents.
- 1350371 Motorola Inc. Four channel audio systems.
- 1350437 Philips Electronic & Associated Industries Ltd. Recording and/or playback apparatus.
- 1350439 Philips Electronic & Associated Industries Ltd. Circuit arrangement for generating a variable magnetic field.
- 1350455 LA Cellophane. Method and apparatus for electrographic reproduction of originals.
- 1350469 Xerox Corporation. Method and apparatus for rapidly scanning a document.
- 1350480 Philips Electronic & Associated Industries Ltd. Character display systems.
- 1350492 International Business Machines Corporation. Positioning magnetic transducers.
- 1350498 Elliott Bros (London) Ltd. Display systems.
- 1350515 Commissariat A L'Energie Atomique. Interferometric light modulators.
- 1350627 Thomson-CSF. Liquid crystal electro-optical modulators.
- 1350655 Siemens AG. Reproduction of alphanumeric characters represented in a digital pulse train.
- 1350692 Computer Optics Inc. Image transfer devices.

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Since the early years when they relayed football commentaries from above a shop to six hospitals, the Bristol Hospital Broadcasting Service have moved on to better things.

The service is now operated from the Bristol Royal Infirmary and consists of two studios and an equipment room supplying an audience of 23 hospitals.

Hospital radio— Bristol fashion

R. I. ELLIOTT

THE HOSPITAL Broadcasts Society, as it was then called, began in Bristol in 1952 when soccer commentaries of Bristol City and Bristol Rovers home games were relayed to six hospitals. By 1954, a further six hospitals were also receiving the programmes, which now included record request shows. These were recorded in members' homes until 1959 when premises were made available above a local record shop.

In 1967, HBS moved into an office block which provided them with a studio and control room. Far from soundproof, but luxurious by their previous standards, it meant that record request programmes could now go out live. It also added the facility of allowing patients to phone in requests and messages, hearing them within the hour. For five years that office block was home to a dedicated band of amateur broadcasters until, just over a year ago, they moved into their present studios.

From here, they provide programmes to 23 hospitals, with over 7,500 patients and a further 2,000 'staff'. Apart from the record requests, and football, they also cover all local cricket, rugby, boxing, wrestling and ice-hockey. Interviews with visiting personalities, live concerts, and many other entertainments have been produced, plus a daily local news programme, which is intentionally very

parochial in concept.

The Bristol Hospital Broadcasting Service studios are above a ward in the Bristol Royal Infirmary and consists of two studio suites and an equipment room. The larger of the two studios is 7 x 4m, and its control room is 4 x 3m, while the smaller studio and control room are both 3m². Before any work was started on the rooms, the society consulted an acoustic architect at the BBC who gave them a detailed drawing of the requirements to convert the rooms into reasonable studios. Unfortunately, the builder and sound engineer had considerably differing ideas of the definition of 'soundproof'. Apart from the usual double glazing and double doors, the main treatment was thick carpeting on the wood-block floor and acoustic absorbers on the walls to absorb the lower frequencies. In fact these, combined with heavy curtaining at one end of the room, are so successful that the main studio, while being ideal for speech, is a little too dead for music. This is easily rectified, though, using a Grampian reverberation unit.

The larger control room is equipped with a ten channel custom built mixer, which was originally designed as a portable. The facilities on this desk include cleanfeed (foldback), two groups, and prefade listen. All these are available on all channels. The power amplifiers



are Quad 303 which provide the studio loudspeakers with cleanfeed. This gives any listener without headphones in the studio a much better idea of what is going on, rather than having the loudspeakers constantly cutting in and out. The talkback is normally heard on loudspeakers and headphones, except when a microphone is connected to a mixer input and faded up. Under these conditions, the talkback is automatically cancelled from the speaker and routed only to the headphones. The automatic system which does this is linked to the cue lights and prefade circuit.

How many times have you heard a record or tape cued up while the fader has inadvertently been left open? With the BHBS system, this is impossible as the prefade is inoperative until the fader is completely closed. Similarly, a microphone cannot be faded up without the studio cue lights going on.

For normal record request programmes, the desk is set up for Radio One/Two (opting in and out of network), three microphones, two tape machines, two SIS cartridge machines, and two grams, although all channels can be switched to accept microphones of any impedance for live sessions. The small control room has a nine channel desk with the same facilities as the larger room but with only

one SIS jingle machine. All grams used are Thorens decks with B & O cartridges. The mic amps and gram amps in each control room are completely interchangeable with the other room.

The remaining room is the equipment room, cum workshop, cum office, cum store. From this description, you can probably guess that it is usually in one hell of a mess. Right in the middle of this mess is the Post Office line connection box, where all the incoming and outgoing lines are terminated. From this box all the lines go to U links for access, before they go to the distribution amplifiers.

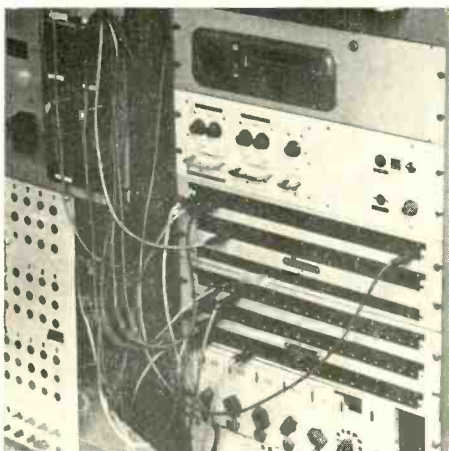
The main output to all the hospitals is fed from a low line amplifier, with a spare on standby. Radio One and off-line monitor are fed round both control rooms and to the outside broadcast points from EMI distribution amps. Also on the equipment bay is the automatic switching unit; whereby any OB point can route itself into the network simply by applying 18V dc to its own programme line.

There are six outside broadcast points; four of which are at sports grounds, each equipped with a three channel Vortexion mixer, ITT lip microphones, and a Grampian effects mike. The remaining two OB points are at the Bristol Hippodrome and the Colston Hall, for relaying classical concerts, variety

shows, local operatic societies and so on.

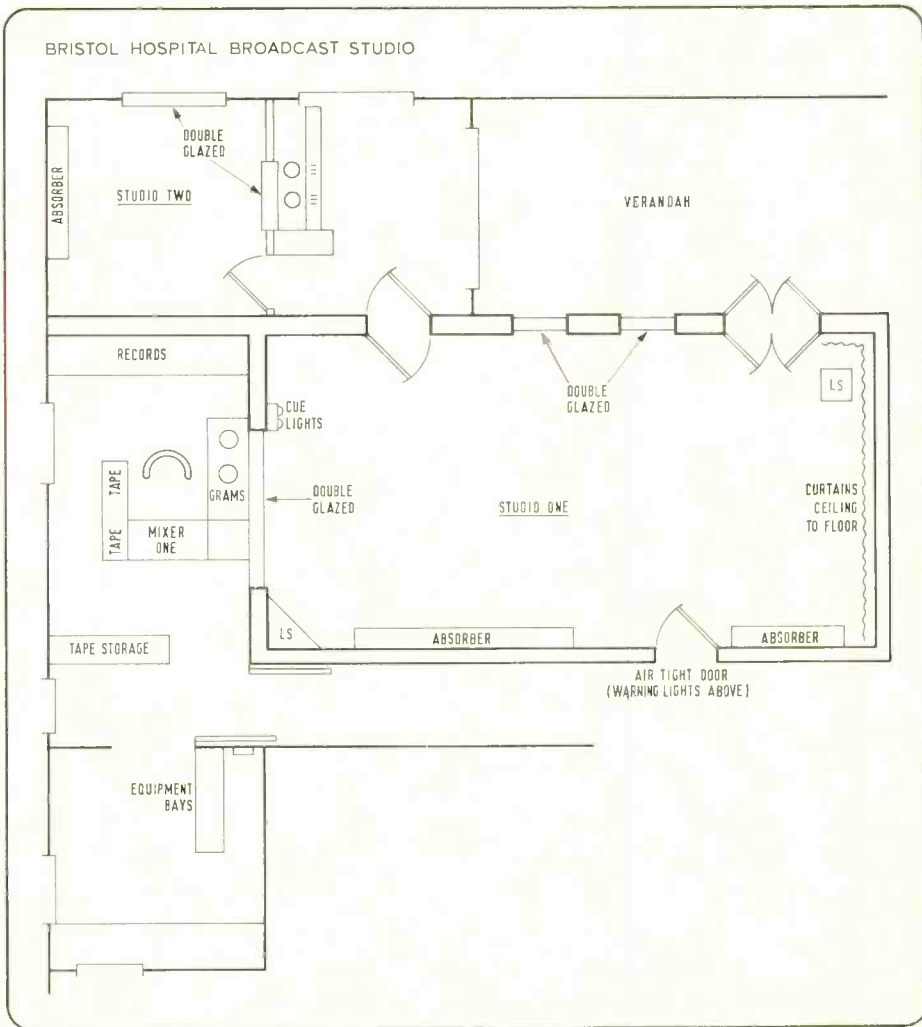
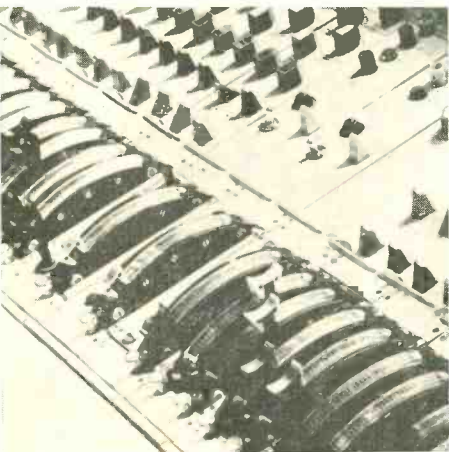
The BHBS's latest acquisition is a 24 channel EMI mixer. Harlech TV (West), having purchased a Neve, found that the EMI desk was surplus to their requirements and kindly donated it to BHBS free of charge. An ambulance has now been purchased to convey the mixer, and studio Three should be on the road by mid-December. This will be used extensively to put patients themselves on the air; by taking record request programmes live from wards, and by scheduling patients' quizzes.

The programming, without which all of this equipment would of course be unnecessary, has certainly come a long way in the last 21 years. So, too, have the facilities which have been built, acquired, and scrounged by a motley crew representing all walks of life. From schoolteachers to a telephonist, and from prefabricated building salesman to a bank manager. They are all far-removed from their everyday jobs when they give up their spare time to go into the studio and soldier, type, introduce records, or just offer advice. Everyone is a complete volunteer and nobody receives any out of pocket expenses of any kind. Only one thing drives them on. The knowledge that their particular brand of therapy is just what the doctor ordered.



Above : section of the equipment bay

Below : the EMI desk



Capital Radio

Dear Sir, I have read with interest Adrian Hope's comments on the problems he has encountered in (a) knowing that the Independent Local Radio stations are making or intending to make a great deal of use of stereo; and (b) receiving noise-free stereo from the IBA's Croydon transmitters.

On (a) all I can say to Adrian is 'cloth ears'. For many weeks before the opening of the London transmitters my colleague Peter Ashforth could be heard every hour describing our plans for London and saying 'these tests on vhf are not in stereo but it is expected that vhf music programmes, when they begin, will include stereo' or 'the vhf transmissions will also include stereo programmes'. This went on day after day, night after night. In addition, all our printed information made it quite clear that we expected the ILR programme companies to make a great deal of use of stereo and that all our vhf transmitters and the distribution links between the local studios and the vhf transmitters were being made stereo capable.

And before the start of London Programmes, a limited number of test transmissions were made in stereo. I'm sorry, Adrian, you weren't listening—but IBA spent a good deal of time and effort spreading the stereo story.

Now (b), and again we are puzzled. What did you expect? 120 kW e.r.p. from Croydon in order to overcome the directional characteristics of aerials, no matter where, pointing towards Wrotham? This would hardly please listeners in South London! Actually, unless your aerial is unusually directional, we are surprised if in north-west London it will not pull in stereo from Croydon (not so very different in direction from Wrotham for you). Be a sport and check it again—you may get a surprise. So no, we are not using 120 kW e.r.p.—but nor does Radio London with 17 kW e.r.p. from Wrotham. And our 1 mV/m contour from Croydon, with 2 kW circular polarisation, gives us a sensibly better coverage area than the published maps of Radio London! Yes, I know Radio London is not a stereo station.

Croydon does *not* give the same service area as the BBC national/regional networks from Wrotham but then we are authorised only to provide 'local sound broadcasting services' and, like every other radio service in the UK, we are told by the Ministry of Posts and Telecommunications the maximum power we may use. For London this happens to be 2 kW circular polarisation—we use 2 kW circular polarisation and it's as simple as that.

We are satisfied that our coverage is a fairly close fit to what we predicted. We know that some people outside this area can get us in stereo but we are naturally more concerned that the vast majority of people inside the coverage area should be able to do so. There are bound to be some who get mono when they cannot get stereo.

We know that most can—*cōn amore*. We

recognise that there are some places where an aerial pointed at Wrotham is not suitable for stereo from Croydon—but Croydon is altogether the more logical site from which to provide a local vhf radio service to Londoners. Some listeners may need to swing their aerials a bit—a few may need two aerials if they want stereo also from out in the Kent countryside.

But if a listener was prepared to put up a special aerial to get Wrotham stereo in the days when there was relatively little to be heard is it asking too much for him or her to make some effort to get the cornucopia of stereo from Capital?

Yours faithfully, Pat Hawker, IBA Engineering Information Service, 70 Brompton Road, London SW3 1EY.

Cloth Ears comments :

Isn't this all just one more example of good old British muddle? After the war we started transmitting 405 line tv again to avoid compensating the few thousand owners of pre-1939 sets. In fact most of those sets were useless anyway because their electrolytics had broken down during the long wartime period of non-use. So a quarter of a century later we are still footling round with dual standard transmissions. And now we have had mostly mono test transmissions for a stereo station and local Radio London and local Capital and LBC going out from different aerials at different powers with the mono BBC station putting out far more power than the stereo commercial stations. I'd bet it's the fruit of yet another technical decision taken by politicians with first-class honours degrees in Ancient Greek.

Distant Capital

Dear Sir, I feel I must object to Adrian Hope's article on Capital Radio in the January **STUDIO SOUND**. Firstly, on the subject of reception problems, I live the far side of the Severn Bridge and have a Tandberg 1010 running on six feet of Woolies bell wire I call an aerial. This points vaguely towards Oxford which is my local BBC stereo transmitter (Wenvoe is still running on a wet string link from London) and I have received Capital since it opened. Admittedly the noise sometimes gets a little overpowering but the station is listenable to 75 per cent of the time. Last week I got around 15 μ V, which really turned on my decoder.

So I can't see why Mr Hope should get such a poor signal. A friend of mine who has a Woolies Wire Wonder on a *Stereofetic* in Hounslow also gets a very good stereo signal on Capital.

What's all this about 2 kW transmitters? I understand from a recent *Wireless World* article on Capital that e.r.p. is what it's all about, as was the figure of Mr Hope's of 16.5 kW for Radio London. I'm afraid I can't believe Capital's e.r.p. to be 2 kW.

Secondly, if Mr Hope is going to offer technical criticism then I suggest he goes

somewhere he can receive it properly first. I also thought programme quality to be better than he described—better than some of the Beeb's output anyway.

I must also take this opportunity to thank John Dwyer for an excellent 'Wither the Beeb?'; being an insider I found it very true. Yours sincerely, P. J. Reed, High Sheil, Castle Crescent, St Briavels, Nr Lydney, Glos.

Distasteful

Dear Sir, John Dwyer's distasteful self-satisfaction in not having been told of any other errors in his 'Wither the Beeb?' article prompts me to offer some information which may enable 'other readers to judge for themselves how accurate the piece is'.

Firstly, an error of both fact and copy—'Douglas Muggerridge, Controller of Radios One and Two . . .' followed by 'Ian Trethowan, Controller of Radios One and Two . . .'. Ian Trethowan is, of course, Managing Director, Radio.

The constraints governing prerecorded sessions for radio are the result of BBC-Musicians Union agreements which have been in force for many years. There was a time, Mr Dwyer, when musicians played the whole 'repertoire' in a single live broadcast! Pre-recorded sessions allow for retakes if serious artistic or technical errors occur, but they are meant to be a substitute for a live performance, not a gramophone record, and each item is usually broadcast twice only.

BBC Allowance Regulations define precisely when taxi fares may be claimed for late-night transport—there is no 'sometimes' about it. Most commercial recording studios charge clients for taxis home for staff working after 11pm.

Radio Four's network IDs are played by French horns, not trombones (a small, checkable inaccuracy!).

However, the real point of discussion would seem to be not how accurate or otherwise the article was, but why it was published in the first place. In a magazine entitled 'Studio Sound and Broadcast Engineering', containing as it does such excellent reviews, field trial reports and features, the inclusion of such a generalised, rambling and often petulant attack on the attitudes, policies and idiosyncrasies of the BBC seems difficult to justify.

Yours faithfully, John Andrews, 'Hambleton', Kirkwood Crescent, Burghfield Common, Reading, Berkshire.

John Dwyer comments :

I have sufficient faith in what I wrote to say that, if the article was inaccurate, distasteful, self-satisfied, generalised, rambling and petulant, then I must assure readers that I have every intention of continuing to produce articles that are inaccurate, distasteful, self-satisfied . . .

It is no part of a journalist's job, whether he

works for an engineering journal or not, to ignore the social and political implications of that part of life with which his magazine is concerned. Thanks to the blinkered insularity of scientists and engineers such as Mr Andrews, if we aren't fried up by radiation from nuclear waste we shall probably be throttled by plastic packaging. Mr Andrews must forgive my arrogance in being concerned about how the BBC uses my money. And his.

Amcron DC300A

Dear Sir, Just a short comment on the excellent review done by Hugh Ford on the Amcron DC300A. On page 60 (January) in the second column he mentioned that 'there is no indication of the current rating of the mains fuse'. The rear label mounted on the end of the transformer does in fact carry this information, indicating that the fuse should either be a 10A for 117V line or 5A for 240V line. The same label does carry quite a lot of other information and I can appreciate that it would be better to have separate fuse data adjacent to the fuse holder. However, presumably economics decide that one master label shall be used for all the user information. Finally, every new amplifier carries a cardboard tag tied to the mains lead indicating what line voltage the amplifier is connected for. It is true of course that this label is easily torn off and lost but certainly every one I have seen has had it on initially. Further, the individual test sheet on each DC300A indicates the mains line voltage and even the carton is marked 240V. Small points, I concede, but probably worth mentioning to show that we do try! No other criticism can be made of the review which was conducted in detail, and I just wish other journals could provide such professional assessment of the professional equipment they occasionally seek to review.

Yours faithfully, I. M. Marshall, Director, Macinnes Laboratories Ltd, Macinnes House, Carlton Park Industrial Estate, Saxmundham, Suffolk IP17 2NL.

Burwen 2000

Dear Sir, After Hugh Ford's review and Angus McKenzie's field trial on our 2000 Noise Eliminator (February/March STUDIO SOUND), I made some experiments regarding its dynamic accuracy. Understandably, in view of the expense of the Model 2000, Mr McKenzie applied the worst possible operating conditions so as to show up any flaws in the system. The reported poor results were obtained from what I consider to be misapplication of the Noise Eliminator. I admit, however, that to achieve the superb sound recording of which this system is capable it requires not only the very best of associated equipment but, also, some care, understanding, and perhaps a little bit more work. When properly applied, I feel we are quite justified in the current change of the name of the Model 2000 to Perfectly Clear™ Audio Processor.

Although the 2000 has been classified as a noise reduction system, its most important advantage is in the reduction of distortion and noise during large signals. Purer signals are obtained for two reasons: (1) the 3 dB/dB

compression characteristic reduces the level of a +16 VU input signal to +5.3 VU at the tape and (2) the 13 dB of high frequency de-emphasis in the 1.3k to 10k Hz region rolls off harmonics and noise generated by the tape. Due to the short time of less than 1 ms it takes the record compressor to reduce its gain upon the sudden application of a signal, the head room increase to +16 VU is available not only for steady state signals but also for transients. Secondary advantages are the tremendous increase in dynamic range of the tape machine to 110 dB, the complete elimination of background noise, and the maintenance of flat response within 0.2 dB from 20 to 20k Hz at all times. These advantages are achievable without detrimental side effects for both tape recording and the transmission of signals over telephone lines and radio links, provided certain precautions are taken as outlined in the following discussion.

Bandwidth effects

Inherent in the operation of any wideband complementary compression-expansion system is the possibility of feeding in an input signal beyond the bandwidth of the tape recorder or transmission medium and thereby causing dynamic errors. The effect of such an input signal is to cause compression in the record channel which is not exactly matched by expansion in the play channel because the transmission medium passes only a portion of the record signal. Audibly the effect is a reduction in system gain whenever the input signal content beyond the transmission bandwidth is comparable to or larger than the content within the passband. Thus the bandwidth of the input signal must somehow be limited or filtered so that it does not exceed the bandwidth of the transmission medium.

Mr McKenzie amply demonstrated this effect when he recorded organ music together with low frequency rumble using the 2000 audio processor. Mr Ford also reported on the gain errors in the reproduction of pink noise due to the presence of 8.33 or 10 Hz sine wave inputs. In the development of the 2000 this is one of the points that received a great deal of attention and I have subsequently made some measurements on the extent of the effect and ways of preventing it.

In my own experiment I placed a Burwen 3000 omnidirectional microphone near the floor of my studio where there is a bass pressure buildup, and turned on the outside exhaust blower. The noise picked up was well filtered acoustically so that nearly all the signal content was below 20 Hz. The instantaneous peak value of the noise was read using our VU306 peak VU Indicator which has response down to dc. The low frequency noise was then attenuated by varying amounts, using a calibrated attenuator, and mixed with varying levels of a 400 Hz sinewave. The combined signal was then recorded and played at 38 cm/s using the 2000 audio processor and a Stellamaster tape machine. The tape machine made with NAB characteristics had a record-play frequency response up 1.8 dB at 35 Hz and down 3 dB at 24 Hz. Finally the 400 Hz content of the playback signal was measured using a tuned filter and ac voltmeter.

Briefly the results were as follows. Adding the noise to the tone caused a reduction in system gain of about 4 dB when the instan-

aneous peak level of the noise exceeded that of the tone by 10 dB. The effect was a fairly steady and negligible 2 dB when the peak level of the noise was equal to that of the tone. Below a peak level of -60 VU the maximum effect on the tone was 2 dB regardless of how low in level was the tone. This is because the 2000 becomes a linear amplifier rather than a compressor and expander for signal levels below -66 VU. From these measurements one might expect what Mr McKenzie found: excessive low frequency noise causes low level audio signals to be reproduced several dB lower and reverberation dies out too quickly. On the other hand the measurements indicate that, if certain steps are taken to hold the peak level of the low frequency noise below -60 VU, the entire 110 dB dynamic range can be reproduced accurately.

Next I switched the microphone to the cardioid pattern and measured the noise. There was a decrease in noise of 20 dB relative to the 400 Hz sensitivity of the microphone. Then I added into the microphone channel a high-pass filter to cut off frequencies below 35 Hz. The filter had a peak of +0.5 dB at 60 Hz, attenuation of 3 dB at 35 Hz, and a slope of 18 dB/octave. I recorded the 400 Hz tone and microphone noise again. This time I found that the peak level of the low frequency noise could be raised as high as 50 dB above the level of the tone before the gain error on the tone increased to 2 dB. Thus changing to a cardioid microphone reduced the susceptibility to noise by 20 dB and adding the high-pass filter made a further 30 dB improvement.

To reduce the possibility of dynamic errors due to noise outside the audio range there is already built into the 2000 an 18 dB/octave high-pass filter having a 3 dB point at 15 Hz. At high frequencies there is an 18 dB/octave low-pass filter having a 3 dB point at 33k Hz. In addition, the rectifier which measures the tape signal level and provides the gain control signal for either compression or expansion has built into it a 10k Hz low-pass filter with a slope of 18 dB/octave. The high frequency filtering takes care of such noises as pulses from light dimmers and high frequency bias from tape machines. Low frequency filtering in conjunction with the use of cardioid microphones is adequate to prevent gain errors in normal studio recording where the acoustic signal-to-noise ratio is high. Filtering built into the 2000 is about the maximum practical which will still allow frequency response flat within 0.2 dB from 20 to 20k Hz through record and play. Therefore it was felt that any additional filtering needed for special situations is more properly a function of the studio console.

Many studios customarily use high-pass filtering on most of their multitrack channels and I recommend this practice particularly for use with the 2000 audio processor. In studio use there are many opportunities for very low frequency transients to occur due, for example, to floor vibration, bumping a microphone, or blowing into it. For voice work, an 80 Hz high-pass filter and a good windscreen are quite effective in preventing problems. Such filtering is also useful for most musical instruments as it not only helps noise problems but also reduces leakage from the bass instruments.

LETTERS

Instruments which produce low frequencies such as the bass drum generally produce such high acoustic levels that the signal-to-noise ratio is not a problem and no filtering is needed.

For classical recording and distant microphone pickups, low frequency rumble may be a problem. Frequently such noise arises from air current at the microphone location. Its presence can be detected by listening to and measuring the compressed record signal before the music commences. In most cases the use of a good wind screen and cardioid microphone is sufficient. However, high noise levels will require the addition of a high-pass filter. When using the better studio tape machines, the cutoff frequency of the high-pass filter can be in the range of 27 to 30 Hz. The problem of noise susceptibility can be further alleviated if the low frequency response of the tape recorder is equalised to flat down to 20 Hz using the compensator built into the 2000. Mr McKenzie commented that this compensator should have been built into the playback side because the record response of a tape machine is generally flatter than the playback response. This is true but it was felt more important to place the compensation in the record channel where it would not accentuate the very low frequency noise from the tape playback amplifier which might otherwise cause playback errors. What is most important is achieving flat response through record and play down to 20 Hz.

Signal level

It is obvious that any compression/expansion system, whether Dolby, DBX or Burwen, tends to magnify the effects of tape sensitivity. With the 3 dB/dB expansion on the playback side of the 2000, it is of course impractical to splice two pieces of tape together if their levels differ by 2 dB since the effect is magnified to 6 dB. The problem is overcome very simply by standardising the playback levels of various tapes instead of the record levels. This is accomplished by recording a 0 VU calibration tone at say 440 Hz and adjusting the record side of the tape machine to produce the standard playback level. For the highest accuracy the input tone level and tape recorder meters should be carefully calibrated. A very sensitive check on the entire system can be made by recording through the 2000 in the record mode and then playing back in the play mode and measuring the output of the processor. Admittedly calibration of the tape is a bit of work but, if an important recording is to be made, it is very necessary to know that each channel is operating correctly, has the proper level, and a steady output.

If the playback level is properly standardised, splicing becomes practical. In many instances, however, transferring the signal to another tape machine can replace mechanical splicing since the 2000 eliminates thumps from the tape recorder electronics when switching in and out of record.

Equally important as standardising the playback level is keeping the tape heads clean to minimise dropouts. Millisecond dropouts have hardly any more effect with the 2000 than in conventional recording because the gain recovery rate of the playback processor is slow.

Long term dropouts caused by particles of dirt are disastrous whether the processor is used or not. Therefore in my own recording I find it desirable to wipe off the heads after as little as ten minutes of operation. It may not be necessary but it is good insurance.

Knowledge of the instantaneous peak signal levels is very important to making good recordings. A standard VU meter may read as much as 25 to 30 dB too low on percussive peaks. European peak meters read closer to the truth but their attack times are still too slow. I prefer to use our VU306 peak VU detector which will register peaks as short as 5 μ s and hold them steady on a standard VU meter for 2s. 0 on the meter is set at normal +10 VU. Recordings made at this peak level tend to be 6 to 8 dB lower in level than recordings made with the standard VU meter, but that is what it takes to preserve the peaks. As an auxiliary function, the peak VU dc output from the 2000 can be used to feed a conventional VU meter. As Mr Ford noted and our specification sheet points out, this meter reads the record level signal which has already been compressed by 3 dB/dB.

Frequency response

Probably the most important source of error when using the 2000 is imperfection in the frequency response of the tape machine. Although the frequency response of the 2000 never varies from flat, there can be an overall gain error. This can show up for example on a kettle drum beat which might occur at a peak in the frequency response of the playback head. If the drum is the loudest sound, it may increase the system gain slightly during the beat. If the other instruments are louder, their sounds will tend to determine the system gain and there will be little effect. Audibly such a gain error in small amounts is not at all unpleasant and may even seem to improve the dynamics of the music. In large amounts however as can happen after several generations of recording the gain error can become objectionable.

The very best possible fidelity is attained when the tape machine is carefully aligned on the playback side using a standard alignment tape and then through record and play for flat frequency response with no peaks higher than 1 dB. The low frequency response can be flattened down to 20 Hz using the compensator in the 2000 mentioned earlier. Best performance is attained if the tape is played on the same machine on which it is recorded since the record side of this machine is likely to be aligned to partially compensate playback errors which are likely to be different on another machine. Most studio machines have input and output audio transformers whose frequency response changes somewhat with loading. Therefore best alignment can be attained when the frequency response measurement is made through the machine and the 2000 set in the off mode. Measurement of the system frequency response with the processor in record and play modes yields completely false information since frequency response errors are magnified by the playback expansion.

Some studios make a practice of recording tones at three different frequencies at the beginning of every tape so as to enable a rough check out of the frequency response the next

time the tape is played. I strongly recommend this idea and even carrying it further using tones at 30, 100, 440, 2k, 10k and 15k Hz. Then if the tape is transferred to another machine the possibility exists for correcting any misalignment problems. If the frequency of the 440 Hz tone is precise it is also possible to check the accuracy of the tape speed. When aligning against the test tones the 10k Hz response should not be brought up more than 1 dB above flat in order to compensate the 15k Hz tone because the audio processor measuring circuits are sensitive only to frequencies up to 10k Hz.

The circuits of the 2000 processor are permanently stable and require no periodic maintenance. What is needed to make the finest sound recordings is some loving care applied to other studio equipment and in particular quality checks on the tape, alignment of the tape machine, and frequent cleaning of its heads. The procedures I have suggested are simply good tape recording practice and can be helpful to any studio concerned with quality whether or not our equipment is used.

Yours faithfully, Richard S. Burwen, Burwen Laboratories Inc, 209 Middlesex Turnpike, Burlington, Massachusetts 01803.

Hugh Ford comments:

I have read with some interest Mr Burwen's comments upon my review of the type 2000 Noise Eliminator in conjunction with Angus McKenzie's field trial.

Unfortunately it would appear that Mr Burwen undertakes his evaluation of his products in his own ideal surroundings and that he takes a large number of unusual precautions when making recordings such that the limitations of the Noise Eliminator system are minimised.

To start with, while agreeing with my comment that gain errors are introduced by infrasonic inputs, he goes on to state that 'low frequency filtering in conjunction with the use of cardioid microphones is adequate to prevent gain errors in normal studio recording . . .'. I agree with this comment, but is it realistic to ask the user of a noise reduction system not only to add filters during studio use, but also to dictate the type of microphone to be used?

In my opinion it is desirable to include both high pass and low pass filtering in any audio equipment which has excessive bandwidth, for 'the wider one opens the window the more muck flies in' and intermodulated muck can easily appear within the audio spectrum.

Turning to the matter of recorded levels, I am not happy that the specification is clear about the function of the 'peak VU meter' and I remain most unhappy about the linearity of the meter output. From the point of view of actual tape overload this is a potentially useful facility, but it does not in any way contribute the problems of maintaining levels on tape so far as editing is concerned.

The editing problem is far from satisfactory even if every tape has standard levels recorded at the beginning and end of the reel. If we optimistically assume a ± 0.25 dB error in each of the following: tape uniformity, metering of record level, metering of replay level and overall system stability, we arrive at a possible ± 1 dB error which can be converted into a total error of 6 dB from one reel of tape to another—this is obviously quite impossible to edit!

As I stated in my review, and now feel strongly having heard the recordings made by Angus McKenzie, the Burwen may find applications in improving links.

Angus McKenzie comments:

In reply to Mr Burwen's exhaustive treatise on Mr Ford's review and my field trial of the Burwen noise reduction system, I would make the following comments, which you may care to publish.

1. *It is entirely impracticable to put on tones at the beginning of a reel, let alone six tones as Mr Burwen suggests, and subsequently to have to copy any tapes where there is a tape sensitivity difference of more than 0.5 dB or so in order to allow editing between reels. Recording artists would certainly not be prepared to wait, and clients would definitely not be prepared to pay while the musicians were waiting.*

2. *Mr Burwen states that he usually cleans the tape recorder's heads after every ten minutes or so. One can imagine the reaction of a large orchestra under recording session conditions if the engineer's voice is heard on the talkback loudspeaker saying 'just a moment everybody, while we clean the tape recorder heads!'*

3. *I disagree completely with Mr Burwen's reasoning that the bass compensation should be on record. He recommends that the same tape machine should be used for playing back to ensure correct bass response overall. The reader can well imagine the expense of transporting an enormous 24 track machine around the world, with the necessary number of Burwen units, in order to dub Burwen tapes sold to various countries. Mr Burwen states that he has not come across machines having variations in bass replay response; I would suggest that he takes a few measurements on the most popular machines sold in Europe. He will find that the bass end on most has a response of up to ± 1.5 dB with respect to the response at 1k Hz. Perhaps he has not noticed this phenomenon since Ampex test tapes have fewer bass frequencies recorded on them, and also do not have a gliding tone band.*

4. *Mr Burwen seems to assume that almost all potential users of his system would use close mic techniques, and proposes 75 Hz bass cut on all mics except those used for bass instruments. Many engineers like to use fewer mics, and for classical music many use stereo pairs, either for a general balance or for reverberation pick up. It seems to me that he is not aware that many European studios use 25 mm capsules with extended bass response, which I admit usually pick up a certain amount of concert hall rumble. The use of an extended bass range, however, can add greatly to the realism of a recording, although I agree that attenuation below 20 Hz is perfectly reasonable. The Royal Albert Hall organ recording that I made amply shows the gain errors produced in the system, which my colleagues and I found quite intolerable.*

5. *Mr Burwen does not comment about my finding that the correct replay gain is not established for some while after replay has started. He does, however, mention that some replay time constants are fairly slow, to get over some faults in the system. It would appear that my finding is interlinked with these slow time constants. This in itself would seem to render the use of the system rather fraught with difficulties.*

I am sorry to have to criticise Mr Burwen's reply so heavily. I cannot help feeling that this entire correspondence merely helps to underline the faults which Mr Ford and I have already adequately covered in our articles. We also note with interest that the equipment has been renamed. It is perhaps unfortunate that the replay only dynamic filter was not submitted for field trial since I feel that it is of more use generally than the overall noise reduction system.

False impression

Dear Sir, We were impressed by the comprehensiveness of the survey of noise reduction equipment published in the February/March issue of STUDIO SOUND. However, we would like to make a few additional comments.

In the block diagram of the Dolby system at the top of page 54, the processing during playback is shown as a feed-forward arrangement, when it is, in fact, one of feedback instead. Feed-forward is used in the recording mode, resulting in a fully complementary action.

In the case of the 364 Cinema Noise Reduction Unit, the low-frequency roll-off observed by Mr Ford is not an error, as the review states, but has been incorporated in this unit to attenuate low frequency thumps produced by the 'ground noise reduction system' used in conjunction with all variable area optical sound tracks, including Dolbyised tracks.

I would like to add also that we found it embarrassing to discover our full-page advertisement in the middle of the reviews of the noise reduction equipment. We would like to think that the editorial content of the magazine is independent of whether or not we advertise. I am sure this is the case, but such unfortunate placement of an advertisement does not contribute to confidence.

Yours faithfully, Robert Berkovitz, Head of Advertising & Information, Dolby Laboratories Inc, 346 Clapham Road, London SW9.

It has for years been our policy to tolerate the placement of advertisements near to more or less relevant editorial matter. Hence the inclusion of vtr ads near the 'Video' column, exhibition participants' copy near exhibition previews, and similarly appropriate advertising near product surveys. This is intended as a service both to the reader and to the advertiser. The fact that absolutely no other editorial/advertising collusion exists in STUDIO SOUND is only too painfully obvious to many of our advertisers.

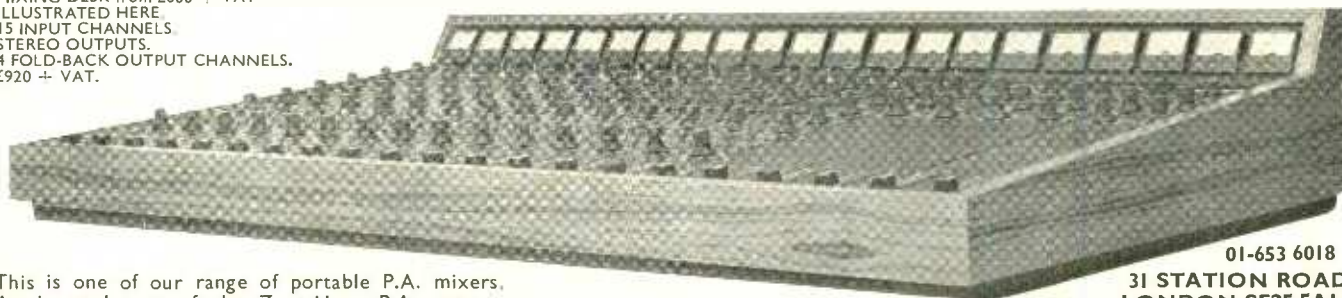
Perhaps an appropriate point at which to apologise to one of our most faithful advertisers, Rupert Neve & Company, for shabby treatment accorded to their dynamic processors in our February/March survey. Current Neve processors are the 2251A compressor and 2253 limiter. Ed.

A

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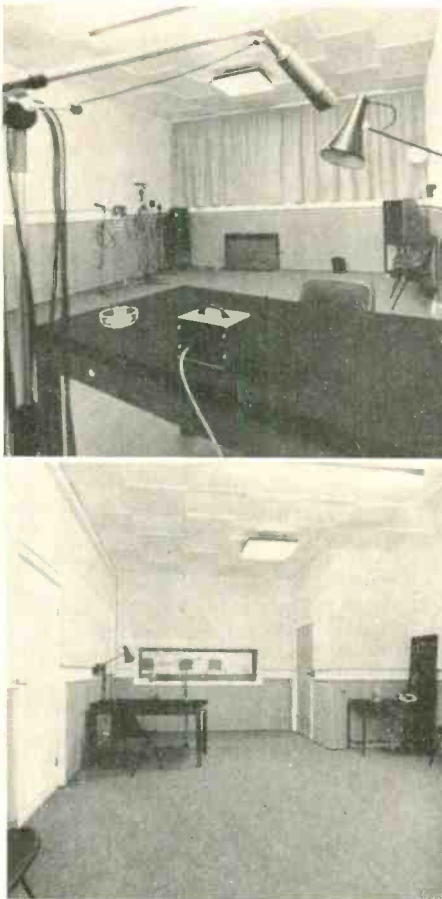
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Two views of the main studio at Speech-Plus Recordings, detailed recently in this column.

CHESTER HAS its first recording studio. Abbot Sounds, which opened last October, was started by Bob Turner, lead guitarist with a local group called the Black Abbots for 12 years. A few years ago he bought a Revox recorder and became more and more interested in sound recording and reproduction.

The studio is underneath the Royalty Theatre where the Black Abbots made their name (it says here) and the rooms below the stage, which were used briefly for a discotheque, have been sound-proofed. The studio measures 9.2 by 5.2m and can take 20 musicians.

Bob and his two associates, Dave Carden and Mick John, built the studio themselves in eight months. Dave is another guitarist and was associated with Freddie Starr for five years. Mick is a local session musician.

There are three tape machines: a high speed Revox, a two track TRD and an eight track Brenell. The mixer is a 11/8 Allen & Heath which they say was delivered within four days of the order being placed. It has two compressors, an internal patch panel and illuminated ppms. Elsewhere, Astronic equalisers are provided. The monitoring is on Tannoy's driven by Crown amps.

Abbot Sound have 20 micro-

phones: Sennheisers, Neumanns, Calreca and AKGs. There is a drum booth and an 1880 Bechstein grand which Abbott got cheap and for which they have been offered large sums since they bought it.

Engineer Mick John says he is using 3M tape, which is proving very tolerant: 'We have demonstrated its latitude by peaking at as much as 12 dB over the top without noticeable distortion'. The 3M press handout also says: 'As yet the Brenell eight track/Scotch 206 combination does not warrant Dolby noise reduction, but this facility would be added should the studios progress to 16 or 24 track operation with its increased over-dubbing noise levels'.

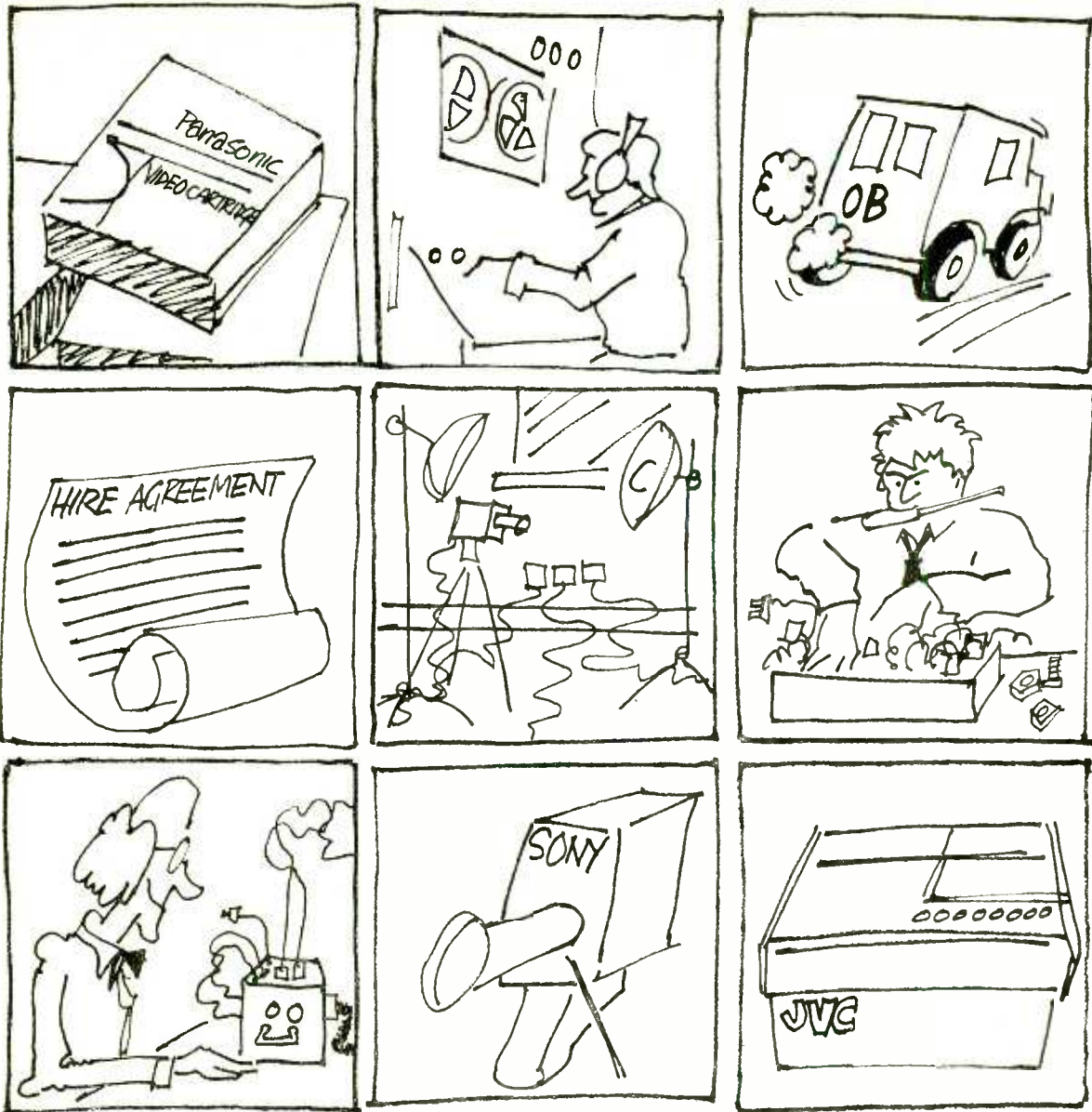
Engineer Mick John told me they had no definite plans to go 16 or 24 track as yet, but they had already started building another studio for vocal and overdub work with its own control room. 'This will save us using the large studio for small jobs,' he said. Abbot Sounds' telephone number is Chester 314405.

Last year was a good one for Paragon Films. When the company was formed in 1970 they drew up a three-year plan which stated where they hoped to be at the end of that time. The target, I am told, was reached by the beginning of the third year. Hardly surprising,

36 ▶

Mick John at Abbot's Allen & Heath





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DIARY

I suppose, when you consider that one of the three staff directors is Patrick Lichfield—yes, he of the Burberry raiment, no less.

In 1973 Paragon did ads for the COI (including army, navy and air force), WRAC and Royal Observer Corps, tv commercials for children's games, women's magazines and products like Quick Brew tea, which starred R. Hudd. Among the industrial films and documentaries they made, was a film about a team of girl skydivers directed by Derek Conrad. The soundtrack was specially written and recorded by Tony Cole, who wrote the score for 'Take Me High'. The film was started last year and finished at the end of February for release later in the year.

Paragon won a number of awards last year, including the SFTA John Grierson Award for a film called 'Memorial', which was directed by James Allen. This 12-minute film was an attempt, and a highly effective one, to recreate the thoughts and feelings of soldiers as they fought the battle of the Somme. There is no dialogue, and no actors were used. The camera saw what the soldier might have

seen, and the music and sound effects combined to make a devastating attack on war.

The film had already been the British entry at the Cannes and Venice film festivals as well as being monitored for eight international festivals. It won the Gold Award at Cork and Tehran and the Silver at Chicago and Venice.

Odd, really, that Paragon should also make army recruitment films; as Marty Feldman satirised that scene: 'Join the Regular Army. Go to interesting places. Meet interesting people. And kill them.' Still, I digress. James Allen also won the Grand Prix at the Paris Film Festival with a production for the Brewers' Society called 'I know What I Like' and starring Bernard Cribbins. Paragon also won the premier award at BISFA for 'Just a White Line', for the Redland Corporation and the *Tv Mail Award* for 'Two Boys', for the COI. The managing director of Paragon, Charles Cary-Elwes, has been reported as saying: 'We have many films in production at the moment and look forward to 1974 being even busier than 1973'. He could well be right.

Finally, a postscript to the mobile feature we did last month. Manor's Phil Newell phoned me

from his bed of pain to say Manor were building another mobile. Other things are happening but they're on the secret list.

PSR, London. This studio was the one I reported on some months ago under the name of Pop Sounds. Brian Goodman told me the name Pop Sounds may give the impression that they were only interested in doing pop music, so they've changed it to PSR. In any case the word 'pop' has rather a quaint ring.

They've also made a great many changes to their desk. It now looks a great deal more like a desk should, and I believe it's been given a good going over by two electronics engineers who used to be with Soundcraft of Switzerland: Peter Harris, who redesigned the desk, and Dave Norman. In the end they spent all of one night on it and were still working on it at 0925, with a session starting at 0930. All went well, though, and with the addition of improved monitoring I hope PSR get the success they deserve. They have two telephone numbers: 01-998 6088 and 01-223 2544.

Like any other new studio PSR have had a slow start but business seems to be picking up well now. Alan David of Grandma Music brought Barry Reynolds's band in for rehearsals and they may do some demos there. Alan has been booking the studio by the week and the band did an audition at PSR for Tamla Motown and RCA.

Multi-instrumentalist Jack Lancaster, who was a member of the Barry Reynolds band and, like Barry, an ex-member of Blodwyn Pig, brought his own band in after he had seen PSR and, if that keeps happening, Brian Goodman needn't worry. The band is called Karass.

The latest I hear is that PSR are

looking for an eight track machine.

The Village Recorder, Los Angeles. The Village have put in new monitor speakers. The new system 'allows a producer to hear a balanced stereo or four channel mix from any position behind the console'. The monitoring changes have been made in the Village's Studio B. While working out the system Rob Fraboni, Village's chief engineer, visited London, Jamaica and Paris. Also involved in the project were Geordie Hormel, the owner of the studio and developer of the design, and acoustic consultant George Augsburger.

In a statement, George Augsburger said the installation had several elements which were unique. These included new angles at which the four speakers were positioned on the walls and the use of multiple reflecting surfaces. The studio was closed for one month while the room was rebuilt. The architect for the physical reconstruction was Jack Edwards and he and Geordie Hormel worked on the decor.

According to Rob Fraboni: 'The ceiling has been dropped or angled to focus the sound towards mixer and producer; the four speaker enclosures have been positioned permanently in the wall and reflecting surfaces have been developed for the corners of the wall, the angled ceiling and the back wall'.

The cabinets, crossovers and reflectors were custom made. The speakers are JBLs with two 38 cm low frequency units angled inward so that their axes cross, one mid-range driver, two super high range drivers, a 'serpentine acoustic lens' for frequency dispersion in an enclosure intended 'to provide a good, wide dispersion so you can be in more than one position at the console and hear all the information.



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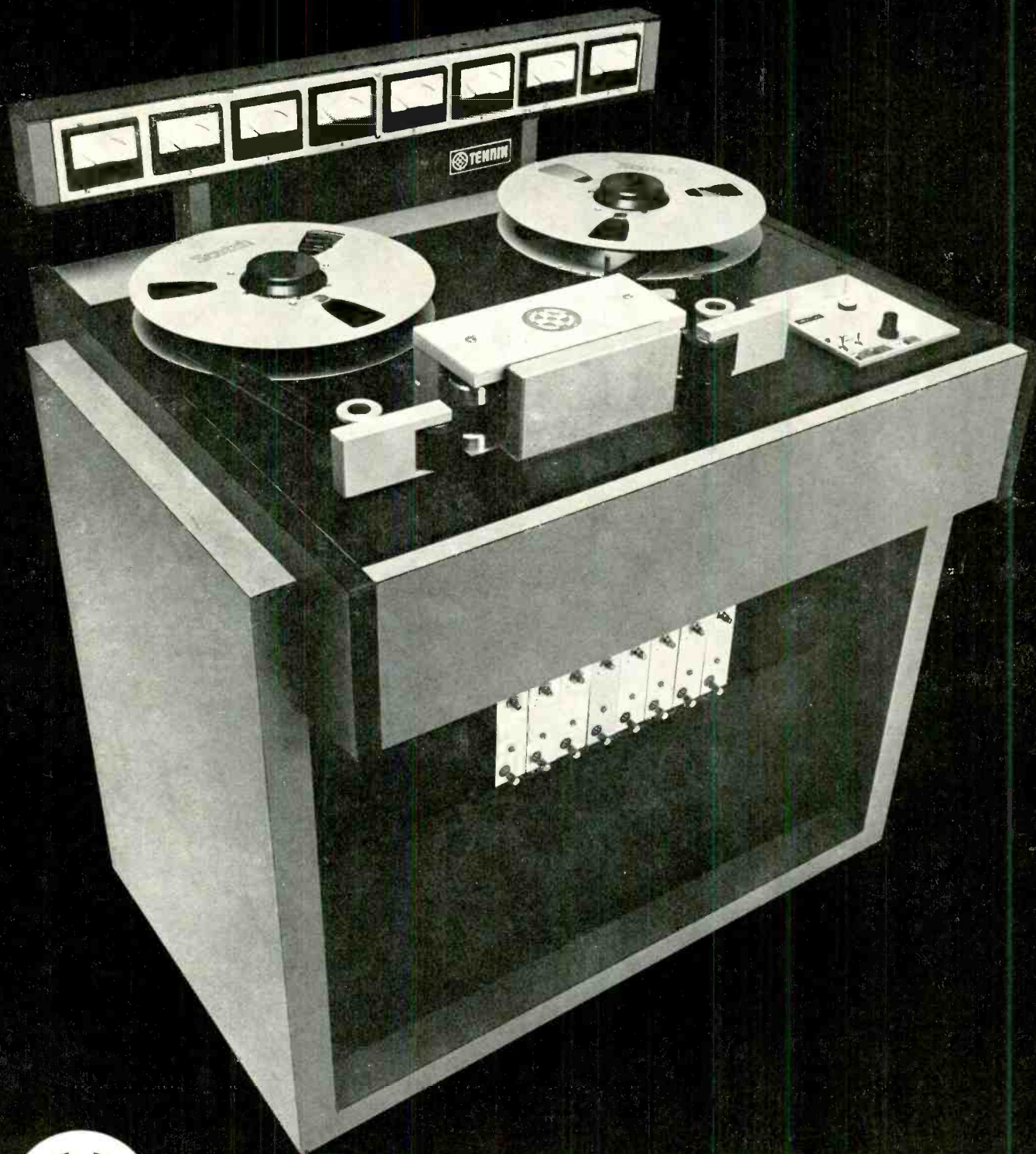
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PROFILE: ROBIN SEDGLEY

By Adrian Hope

THE ONLY way to write an accurate appraisal of BBC balancing policy would be to write about every individual balancer and that would be as endless a job as maintaining the Forth Bridge. It may come as a surprise to some people (who see the BBC with definite policies in many areas) to learn that there is no rigid BBC policy on microphone techniques, the individual always having plenty of scope to put his own pet ideas into practice. Sometimes those ideas work, sometimes they don't. There are balancers working for the BBC who have no sympathy whatsoever for the bands they are asked to handle and there are others who are welcomed by most band musicians. Some of those sympathicos have a more modern approach than others but in each case it is the end that justifies the means.

The piece we recently published on BBC sound mixer Joe Young was intended as a personal profile showing how one man went about the job in his own particular way. The idea behind the present piece is to show how another man goes about a similar job in a rather different way but with equally happy results. After writing the Joe Young piece I asked several studio musicians for names of other balancers who they particularly enjoyed working with. The names that cropped up included Brian Burgess, John White, Jim Isaacs and Ken Gregory (who has now left for other pastures). But the name that occurred most frequently as a balancer with a modern approach and happy results was that of Robin Sedgley. I therefore contacted Robin Sedgley and asked him if I could come along and look, talk and listen. He agreed and the session decided on was one by the BBC resident Big Band who, in recent years, have achieved a well-earned reputation as a tightly knit studio orchestra. For reasons which I hope will later emerge, I would say that the potential of that band has never yet been fully exploited.

For a decade or so, the BBC have been employing a regular band of musicians for featured showcases, backing singers and the bread and butter recording of music to play over the air in the gaps between recipes. The band have always been made up of talented musicians and, originally at least, many of them worked in jazz clubs at night and were only too pleased to have the security of a regular BBC salary, even if the music they were asked to play was pretty dull. The way the band originally sounded was summed up by what they were unofficially christened: 'The Royal Engineers'. Mercifully, a few ears in the BBC (including those of Bryant Marriott, one-time BBC Jazz Club producer) recognised the potential of the band and saw that, if they

had something decent to play, they would be well worth listening to. So gradually budgets were stretched to allow the commissioning of special arrangements and the band started to sound like a band.

Steve Allen more or less took over where Bryant Marriott left off and it was he who set up and produced the big band album which was released by BBC Enterprises as part of Auntie's 50th birthday celebrations. And it was Marriott and Allen who nurtured the current policy of commissioning guest conductor-arrangers to do individual sessions with the regular band. There also arose a general enthusiasm on the part of the band for having the same balancer as often as possible. By doing this they reproduced the sound they wanted to over the air and in turn became more enthusiastic in the studio. Robin Sedgley, one of the balancers, has worked most regularly with the band and the Sedgley-Big Band session seemed an obvious choice for this STUDIO SOUND profile.

Incidentally, Sedgley was the engineer on the BBC Enterprises big band lp so it's 100 per cent Beeb through and through and quite something to be proud of. All the more surprising then that it seems to have been aired far more by the IBA out of Croydon as part of their Capital-LBC test transmission broadcasts than by Auntie herself.

Sedgley himself has a background very similar to Bryant Marriott. He was active in the college jazz and big band field, went to University, and spent around ten years with the BBC. Although, while working, Sedgley was economical with words and devoted himself to the job in hand with no distractions, he was quietly open before, after and during tea-breaks. His enthusiasms are all centred around big band music and jazz and he's obviously never happier than when talking this over with musicians on a session or anyone else with something worthwhile to say. Musicians who work with him tell how he carries round his own library of favourite tapes and plays them in the breaks of dull uninspiring sessions. As an ex-trombonist and band leader himself, he is also more than capable of following the 'control' scores which the session conductor provides for the box. Flies in the wall tell the apocryphal story of when one producer with dangerously little knowledge of music told Sedgley how the band in the studio seemed to be playing the scores all wrong. 'As I understand it,' said the producer, 'at the end they should be going to letter C, then to letter O, then to letter D and then to letter A'.

On the day I was present there was no such producer problem. Peter Wall, over from ABC in Australia, was producing even though he is with the BBC for only three weeks in every year. Talking to Wall left no doubt that he also is not only sympathetic to, and knowledgeable about big band music, but he has no shortage of practical experience in multi-track recording. He has worked with

bands like Ellington and Basie as part of his ABC job and, incidentally, in ABC all recordings are made in eight track stereo rather than straight down into stereo. This is usually BBC policy (other than where a recording is to be issued by BBC Enterprises as a disc). I say usually because although most Radio Two material goes straight down into stereo (because there is just no time to record *and* remix) eight track recording is now used for a fair amount of material recorded by the BBC for broadcasting on Radio One. This is because most Radio One sessions tend to contain fewer items than Radio Two sessions (sometimes only two or three per session) and there is thus time both to record and remix during a single three and a half hour session.

When I saw Wall and Sedgley record the Big Band straight down into stereo, things were going so well that Wall only once had to raise one minor query. Wall was quiet because there was no need to be otherwise but of course the occasional producer is let loose on a studio session with so little to offer that they might as well just not be there. As one musician remarked, of a producer who shall remain anonymous: 'He's got a perfect pair of ears; no holes in them!'. Incidentally, although insignificant in itself the one query that Wall did need to raise tells quite a lot about how the BBC band is recorded.

At the session I attended Barry Forgie was the guest conductor-arranger and I gather he is well known among musicians for writing exciting but exhausting scores for the band to play. The band musicians are paid a basic salary per week and are required to do seven three and a half hour sessions each per week. If every session were like Forgie's, they would all die young. But most of the time the sessions are easier, for instance backing vocalists or 'coasting' with easy scores already well known to them. Hard or easy the general requirement is that they should successfully record ten (or sometimes even 11 or 12) separate numbers per session. This requires an incredibly high standard of musicianship and although the band is predominantly young in age the way it tore through some of Forgie's scores rates it for me as one of the best bands around.

One number in particular, *Cinnamon and Clove*, was a real killer for the brass section. After a run-through the red light went on and the band tried a take. The first take was ditched half way and then a second take tried. This time the band went right on through to the end and the subsequent silence from the studio musicians and Barry Forgie suggested that they were happy out there. But Peter Wall had some reservations and quietly (with the call back into the studio switched off) suggested to Sedgley that they might try it again. 'Wait and see what they say,' advised Sedgley, 'they'll soon let you know if it needs doing again. They know their own pace.' Almost immediately from the studio mikes came Forgie's voice asking if they could take it again—and at even

faster tempo. This they did and the take was perfect. That, for me, is what producing a professional studio band is all about; not justifying one's existence as producer in the box with helpful suggestions like 'Let's take it once again boys, but an octave faster'.

The session in question was in the BBC's Maida Vale studio Three. At the moment the BBC have studios all over London including the Paris (which is still mono) and the Playhouse (also still mono but which many people like for its acoustics and atmosphere and so hope will eventually be converted to stereo). The Camden (where I saw Joe Young) has gone and the Golders Green Hippodrome (with Neve desks) is in its place. At Maida Vale the BBC have three studios in current use with fourth and fifth studios currently being re-equipped and a sixth under construction. Incidentally, anyone entering the main door at Maida Vale and looking for the music studios must pass through a sinister corridor, off which the dozens of doors lead to mysterious rooms labelled 'Radiophonic Workshop, no entry, keep out' or words to that effect. The mind boggles at what goes on behind those doors. Music studio One has an old BBC *Type D* desk, but studio Two has a new Neve with 24 channels in and four stereo groups out which can also be used for eight track monitoring. Studio Two is a fairly live studio but studio Three (which I was visiting) is fairly dead and tends to be used for most purposes other than beat groups. The latter usually find their way to Langham One or Aeolian Two where there are eight to 16 Neves. Although acoustically dead, Maida Vale Three is in fact a very large studio which can be curtained off half way to bring its effective size down when the full floor space isn't needed. Most of the BBC's multitracking (where strings go down during one session and brass at another) tends to be done at the Langham or Aeolian Studios. Otherwise recordings go straight down into stereo on two track Studers. Such multitracking as is done (be it for disc issue or reduction into stereo for broadcasting) is handled with eight track Studers. As with Studers, the BBC seem to be standardising on Neve desks and Maida Vale Four and Five are currently being equipped with these. Presumably studio Six will also take a Neve when the time comes. Regardless of studio, for the most part the BBC overdub for multi-layering between two machines rather than using an eight track facility. The band backing is played over studio monitors on foldback and the vocals built up from there. Robin Sedgley describes his stereo approach as basically panned mono and explained to me that he uses a separate mike for each instrument whenever possible. 'I wouldn't say it's my policy to take individual and collective balancing out of a musician's hands because I don't specifically set out to do this,' he says. 'But often this is what inevitably happens when you pursue the advantages that one mike per man can bring. Although this technique can be very dangerous, it does in practice offer the reward of enabling a musician to concentrate on his playing rather than making him play and lean in and out for solos. I feel that this way the musician is doing what the balancer should be worrying about. If we do the worrying over the sound for them, then the musicians can play their best leaving everything else to the balancer.' This seems pretty



Robin Sedgley (top) and the BBC Big Band



much in conflict with the Joe Young approach of setting up an electronic balance and leaving it fixed with the musicians handling their own balance from then on. And there is plenty to be said for both attitudes.

'Once you enhance one instrument,' says Sedgley, 'you must really go on and enhance everything; so you might as well mike everything and take the internal balance of the sections out of their hands. That way you can also cope with the problems of a lot of doubling (for example sax players changing to flute) and wind up soloists to pull out their solos when necessary. I realise a danger is that the musicians then feel they don't need to blow; but then we are back to the continual argument between specialisation and diversification. If the same band works with the same balancer everyone knows what is expected of him; but then the BBC likes to see some diversification.'

I pursued the question of multimiking and remixing. 'Well I love some of the old Billy May and Ray Anthony records in mono that were made probably with just one mike, and even the Benny Goodman Carnegie Hall Concert was a remarkable feat for a one mike recording. But when you listen to that kind of music you are automatically adjusting to the era and making allowances. What people hear on modern records they expect to hear from BBC broadcasts and recordings and we must multi-mike to get it.' All this makes me wonder just what it is that has brought about a fairly rapid change in the BBC. After all, the first Neve desk was put in only a year or so ago. Is it the BBC who encourage their balancers to have a more modern approach, or is it (more likely, I would think) the balancers who have pushed the BBC powers into line with the world of commercial recording? I asked Robin Sedgley about his views on multitracking. 'Well my personal view is that there is a little too much reliance in the commercial world on multitracking and remixing. Unless you use a mike on everyone, with a 32 track recorder, you may be lulled into a sense of false security and let studio mistakes slip by on the assumption that you can always correct them on remix. If there has been spread-over from source to source or between mike to mike, especially in a live or fairly live studio, then you may find that it just isn't possible to cover up the mistakes as you thought you could. So on the whole I prefer to go straight down into stereo and get it right in the studio, with scissors editing to replace a bad passage or ending perhaps.' Indeed on the session that I attended there were three scissor edits to be handled before the tapes could be sent upstairs for broadcasting.

'Where multitracking can go really wrong is if say four trumpets are on one track and the balance between them is wrong. Then no amount of remixing will correct that fault. I have heard musicians complain many times of engineers' assurances that it will be okay on the remix as a sort of get-out clause. But of course it often isn't. Certainly I'd like to do some of the harder musical sessions on multi-track, with as many shots at it as possible, but time is always against me. At the Beeb it tends to be once or twice through and red light on.'

I watched Sedgley mike up for the radio band beforehand. He used an *M160* Beyer on

■ BROADCASTING

each of the trombones to give them a bit of edge with a BBC *STC4038* ribbon mike on the bass trombone to make it rounder and fuller as it has its own built-in edge. He used an *AKG D202* on each of the trumpets and on all but one of the saxes, because it causes fewer problems when they change over and double on flute. (Blowing a flute close into a ribbon mike can usually be guaranteed to end in tears.) I noticed that the baritone sax alone was miked with a Beyer *M160* and Sedgley explained that this was simply because the baritone chair was nearest the bass drum of the drummer's kit and he wanted to avoid any spread over of the bass drum sound into the baritone sax mike. The bass drum itself was miked with one of the massive floor mikes that the BBC always seem to use (a *STC403* moving coil monster that can cope with some pretty hefty thumps), four *M160*'s round the kit, and an *STC4038* strung over the top. 'But you could use more or less anything over the top,' remarked Sedgley. Tuned percussion (vibes, etc) was miked with *M160*, *C12A* and *4038* microphones and the guitar with an *STC4038* because it is doublesided and thus allows the player to stick one side into his amplifier and face the other for acoustic playing. The piano was miked with a *D109* wrapped in rubber and pushed into one of the frame holes. 'This gives a boxy sound which would only be noticeable without equalisation and if the piano were absolutely on its own. Mixed in with the rest of the band you don't hear the boxiness,' said Sedgley.

Bass guitar had a split feed both direct into the Neve desk and into the player's own amp for monitoring. But the cabinet was miked too and both the direct feed and the miked feed mixed. String bass was miked with a *D109* wrapped in rubber and pushed in the f-hole, and while I was there the bass player was very interested in Sedgley's use of a little compression on the bass feed into the desk. In fact he popped in and out of the control box several times and was more interested in hearing how his instruments sounded than in grabbing a cup of tea in the break. Another trivial point but a pointer to the way the band works.

Around this time (as Sedgley remembered how someone had once been astonished at his use of six mikes on the drum kit alone) Peter Wall remembered a session in Australia he had been recording. The drummer took one look at the mikes the engineer was putting on his kit and told him he didn't want his kit miked at all. After a little argument the drummer reluctantly agreed that his kit could be miked, but with one important proviso—under no circumstances was the bass drum to be miked. But Australians are notoriously blunt. 'If you didn't want anyone to hear it, you shouldn't have brought it,' said the engineer, and stuck down a floor mike next to the bass drum.

Sedgley dislikes the use of screens to help keep separation between mikes. 'I feel that musicians play more as a band as opposed to mere sections, when without screens,' he explained. 'The various ambiances and slight spread over create an atmosphere which is less clinical and you get a sense of performance. But that's provided of course that spillover is controlled and is what you want it to be. You

can cure more spillover than you think possible, given a fairly dead studio and careful relative placing of good cardioid mikes.'

In the control box Sedgley keeps a couple of Tannoy monitors fed from Quad *50D* amps at pretty high level. This makes idle conversation more trouble than it's worth. A Studer runs continually at 38 cm/s to provide a tape delay and a pair of EMT plates are also used. For recording proper, two Studers are used (also at 38 cm/s). The BBC now use mainly 3M tape which they buy in bulk (BBC type *102*). All used tape is sent to a BBC service unit which cuts out all the leader and splices up reels of so-called service tape which is used for speech recordings only. All music is recorded on virgin tape so inevitably the BBC lose several spools a day. The empties are returned to 3M who fill them up. All the BBC recordings are CCIR equalised.

The difference in basic approach between Sedgley and Joe Young means that their handling of the desk during recording is very different. Whereas Young's hands move around over the controls, never touching them, Sedgley's hands flit continually between virtually every fader like a butterfly in a cabbage patch. Sometimes he moves them a fraction; sometimes not, as if simply reassuring himself that they are all still there or anticipating the need. His eyes remain glued to the two BBC style meters fitted to the Neve desks (one showing left and right channels in red and green and the other sum and difference in white) and during recording he listens through the monitors off tape. The point of this, of course, is that there is not time to play everything back afterwards and it is quite impossible for the tape engineer to monitor off tape through headphones in the same room as studio monitors running flat out. I asked about phasing, with memories of a friend of mine whose lead singer on a vocal group was totally phased out in mono. (If it had been done deliberately it would have been very clever to place the lead singer half way between two mikes for stereo and rig them exactly out of phase to cancel her out in mono.) 'I don't bother too much about it,' says Sedgley. 'To be honest I tend to go for what sounds right.' And of course the fact that each instrument is miked separately, with no two adjacent mikes picking up the same sound, makes rigid attention to phasing less necessary.



After around three hours of the three and a half hour session had gone by there was about 25 minutes of music in the can and as Sedgley remarked 'the band must be on their knees by now'.

Peter Wall phoned upstairs to see whether they need really press on for another five minutes of recorded music. None of this conversation was heard out in the studio and the verdict from upstairs was that yes, they must press on. So the next two tracks are recorded without a full run-through on either.

The problem is that business is business. Ten separate items are needed for a week of a so-called 'strip show' and so ten numbers must be recorded. This is because two numbers a night must be slotted into the show for the five nights of the week. As the show lasts at least an hour anyone tuning in to hear just the music will be thoroughly irritated by everything else that intrudes for what seems like almost all the time. And anyone tuning in for no particular reason will be rewarded by a couple of tracks that just happen to crop up during its course. This to me seems to sum up the BBC and explain the love-hate relationship which we all have with it. Here we have a band which, given the right arrangements, can play with precision and enthusiasm that matches the old Ted Heath band at its best and even the current bands led by Buddy Rich. With the right man out front and the right scores to read, the BBC radio band makes Duke Ellington and Count Basie sound like the tired old imitations of their heydays that they now are. If those 30 minutes of Forgie scores plus BBC Big Band recorded by Sedgley were put out as an lp it would probably not only sell reasonably well, but also bring mild rave reviews from a great many record reviewers. As it is the 30 minutes will be chopped up and used as inter-chat filling for a late evening strip show and perhaps repeated as inter-recipe fillings for something similar in the mornings. Whether you regard that as a criminal waste of creative talent or a laudable effort at keeping the standard of broadcast live music up to disproportionately high levels, depends entirely on your attitude of mind. You pay your money on your annual licence fee and you takes your choice. Come to think of it, if you don't own a television set you don't even have to pay your money to take that choice!

For sheer indulgence I went along a week or so later to a BBC Jazz Club recording in the same studio. Laurie Monk was producer and Sedgley was again the balancer. The mike set-up was very much the mixture as before ('Why break a winning streak,' grinned Sedgley) and the Colin Purbrook Octet roared through some of the leader's original scores. Peter Clayton in his announcement rightly described it as a jazz Super Group. After an afternoon's rehearsal and a hard recording session the band trooped through into the control box to hear a playback. Musically it had all been virtually flawless, with the musicians tired but happy, as the saying goes. As they stood relaxing after a job well done in the corner producer Laurie Monk turned to the assembled group of spent musicians and remarked casually: 'Okay chaps, Robin and I are ready to record any time you are'.

If he hadn't been joking you would probably have read about it in the daily papers by now.

KEPEX 500

By Angus McKenzie

MANUFACTURERS' SPECIFICATION

Attack time: Less than 20 μ s.
Release time: Variable from 50 ms to 6s.
Active expansion range: Greater than 60 dB.
Expansion ratio: 2:1 from 0 dB to 30 dB expansion, gradually increasing to 4:1 at 60 dB expansion.
Signal-to-noise ratio: Minimum 85 dB below rated output.
Distortion: Less than 0.5% total harmonic distortion under normal operating conditions.
Insertion loss: 0 dB, internal adjustment provides up to 20 dB gain.
Frequency response: ± 1 dB, 20 Hz to 40k Hz.
Threshold of expansion: Variable from -35 dBm to +20 dBm.
Output: ± 18 dBm into 600 Ω .
Meter range: 0 dB to -30 dB (display); 0 dB, -3 dB, -6 dB, -9 dB, -12 dB, -18 dB, -24 dB and -30 dB.
Meter accuracy: Instantaneous gain ± 1.5 dB.
Meter speed: 100% response to gain change in less than 25 μ s.
Power requirements: +24V dc at 125 mA negative ground. +100V dc at 3 mA. negative ground.
Dimensions: (Standard mounting case type 501) height 178 mm, width 38 mm, depth including connector lugs 183 mm.
Price: £181.50
Manufacturers: Allison Research Inc, 7120 Sunset Boulevard, Hollywood, California 90046, USA.
Agents: F. W. O. Bauch Ltd, 49 Theobald Street, Boreham Wood, Herts.

THE KEPEX 500 expander was reviewed by Hugh Ford in the November 1972 *STUDIO SOUND* and this field trial should be read in conjunction with that review. The expander is designed to work from a source having a low output impedance and can drive circuits of 600 Ω or higher. As with the Allison *Gain-Brain*, it requires 24V dc but also an additional 100V ht to work the neon indicator lights described in the review.

The Kepex produces some most useful effects. However, if a programme source is fed through without other sources being mixed in with its output, the sound could easily be quite intolerable. It must therefore be audibly checked in context and so it was used for some eight track reductions of Pop type material. A tape was chosen which had a considerable amount of low frequency breakthrough between several channels. Also, some of the percussion type sounds had spread noticeably on to channels being fed from mics placed in fairly close proximity to quieter instruments. The Kepex could be set to allow only the output peaks of any particular channel to be mixed in with other channels. In some cases it was used to stop coloration and reverberation

of unequalised sources from being audible on the expanded channel. It usually did this very successfully, although it was frequently found quite difficult to reach a compromise between its effect being unnoticeable overall and too much expansion producing audible rather violent changes of volume.

Quite frequently it was necessary to alter the controls during a mixdown if the instrument or group being fed through had changed in general volume or style. The Kepex should make it much simpler to achieve a very tight balance from a tape where instruments are spreading. On occasions, too, it could quite possibly make usable commercially a master tape which might otherwise be discarded. However, it cannot really be recommended for classical music since its effect might stand out rather noticeably.

The key function allows the expansion to be controlled by an independent input. This can either be obtained from another channel or from separate equipment. An audio oscillator having varied waveforms available down to frequencies of a fraction of a Herz can produce quite extraordinary variations in output and give many most interesting psychedelic effects. Very strong pulsating rhythms can be applied to instruments and, if the tempo is chosen carefully, can sound very appropriate. Although this keying modulation could produce violent effects on the main programme chain, the modulation itself was not directly audible on the output. This was proved by applying speech to the keying circuit when the input programme was music. No speech was audible on the output but, if the decay time were set to fast, the modulation envelope of the speech waveform controlled the gain very effectively. The connections from the main programme and the side chain were then reversed with both speech and impulse sounds being fed into the side channel and white and pink noise fed into the main channel. Some extraordinary percussive type sounds were obtained, and the delay after the initial noise transient could be usefully varied. Several types of gunfire sound effect could be imitated and were most effective when reverberation was added. With tape delay the potentialities are enormous, and studios specialising in complex balances of Pop material would find many more uses still.

The three potentiometers of the Kepex are labelled 'range', 'decay' and 'threshold'. The range control allows an expansion downwards to inaudibility at a controlled expansion rate, whereas the threshold control determines the dynamic range level point below which expansion takes place. The decay control permits the speed at which volume reduction is achieved to be adjusted when a louder signal is succeeded by a quieter one below the threshold. When the keying facility is used, this control adjusts the decay of volume after the keying signal itself is either reduced or cut. As with the Allison *Gain-Brain*, switched

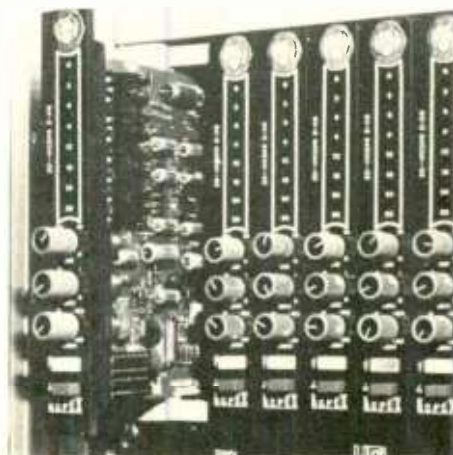
positions would have been preferable to allow particular settings to be repeated.

Hugh Ford noted some fairly high distortion figures when the Kepex was used at high levels. This distortion was noticeable when a comparison was made with the original signal, particularly when not too much expansion was in use, making the two signals nearer the same dynamic range. During the field trials, the output was loaded by 10 k Ω and no bass loss was audible under these circumstances; the distortion did not sound anywhere as bad as that produced by 600 Ω loading. In a mixdown, therefore, I doubt whether any distortion products would be audible, especially since any number of units used would not all be significantly contributing to peak level at the same time. Distortion products would tend to be covered up by contributions from other channels.

Both the key and in/out switches were of the push in and out type, and were completely reliable. The styling of the Kepex is similar to that of the *Gain-Brain*, and the edge connectors are compatible between the two, allowing for easy interchange.

An unusually low input impedance of approximately 2.7 Ω could cause problems when the Kepex is used with some types of preamplifier. I feel strongly that any input impedance to a device of this type should be a minimum of 10 k Ω . There would be many occasions when users would wish to employ a Kepex into a 600 Ω load and I therefore agree with Hugh that the output coupling capacitor should be increased to 20 μ F or so in order for the specification to be met. It is most inconvenient to find 100V dc for the neon circuits and I feel that this should have been redesigned to work off 24V in a similar manner to the *Gain-Brain* indicators.

A demonstration record which shows well the flexibility of the unit is available from F. W. O. Bauch Ltd, and intending purchasers would be recommended to ask for a copy.



The law of copyright

BRIAN HAINES

FOR THE majority of people, copyright protection is of interest as a means of earning money from an original work. When a commercial transaction is not in contemplation, there is no real need for protection. This is self evident but apt to be forgotten by the theorists who, being academic, forget the practical aspects of commerce.

Going back into history, it will be remembered that the letters Cicero wrote to Atticus were copied by the scribes of Atticus and freely presented by him to the friends of both. As he intended them for circulation, he would probably have authorised the copying had his consent been required. The fact that they went all over the known civilised world did not bother him at all; so far as he was concerned the copies belonged to whoever received them. With changing attitudes regarding property, greater dissemination of knowledge, ease of transport, and growing commercial interests, the need to protect propriety rights has become of greater importance.

Naturally no-one wishes to curtail the basic instinct of a copyright owner's desire to obtain the greatest return for his original work. On the other hand, a number of political philosophies consider that an individual should not be able to restrict the access of the general public to mental wealth that must necessarily be a product of a general accumulation of culture within the public domain. Within the legal systems of some states, a spirit of competition is encouraged; in other legal and religious systems such an attitude is restricted in favour of co-operation.

Even within western legal systems, there are basic and fundamental differences in attitudes towards the ownership of property and the resolution of the passing of ownership that makes dealings between two systems of law extremely difficult. Even such a simple point as the meaning of ownership is the subject of much debate among academic lawyers, so that the expression 'copyright is intellectual property capable of ownership' is not going to mean the same thing all over the world.

Financial reward

Cicero expected his letters to be read, and was flattered that they should be considered worth copying. In his case there was no dilemma as to how to extract some financial reward at the same time as disseminating his knowledge. His work was reproduced for its own sake, and he was known as an author who was worth copying. Had he been able to place his voice on record, he doubtless would not have objected to such recordings being copied for he had no commercial motive in the initial production. The dual barrier of being worth copying and of reaching a wide audience in order to be known did not therefore exist.

With this sort of background, it is not surprising that different nations find it difficult to agree upon a common copyright law to cover the whole world. Many of the emergent nations, whose gross national product hardly equals the advertising expenditure of some of the wealthier corporations in the western world, cannot afford to pay royalties upon the copyrights of the larger industrialised countries whose development is far in advance of their own. These nations therefore restrict copyright protection within

their country in order to further the education, in the broadest sense, of their people with a view to raising the standards of living. A foreign copyright owner then has the choice of negotiating terms or trying to establish a claim based upon conditions unilaterally imposed by his own state, which may not accord with the principles of the (to him) offending state, and perhaps finally receive nothing.

Generally it is the case that pirate works in foreign countries cannot hurt the home market unless the intention is that they are to be imported into the home market. However flourishing the sale of pirate works may be in a foreign country, they can only damage the copyright owner if he also has a market there at the same time. Fortunately, the majority of countries to which it would be worth developing a market of any substance will have protection similar to that of the home market. Further, even pirates have to make a profit; quality, immediate novelty, and a seal of genuineness could well win the battle of competition in the small areas of difficult protection.

Treaty agreements

In the last century, the more advanced nations sought to give protection to each other's works by treaty agreements. Such a multiplicity of bilateral agreements was unsatisfactory and unwieldy and led to the first meeting of the developed nations in Berne to agree a multilateral treaty whereby the Berne Copyright Union was founded in 1886. The member countries of the union agreed to grant reciprocal rights to each other's works and to incorporate into their own laws the broad rules laid down by the convention. One of the basic principles being that copyright protection should be granted without any formalities. It was this requirement that precluded the USA from joining. Their laws require certain registration procedures and have kept them out ever since.

Subsequent to the first convention, there have been a number of revisions of the rules of the BCU to take account of the developments in the fields of arts; for instance television, sound recording and films, which were either unknown or in their infancy at the earlier meetings. The speed with which the members revise their own laws to conform to the modifications tend to be slow according to relative importance placed upon the subject in each individual country. It took Britain until 1956 to implement the requirements of the 1948 convention. And although, for instance, Thailand as well as Britain are members of the BCU, the marked difference in protection to be found in the two countries goes to show the variance between theory and practice. The initial conference at Berne was followed by revisions at Brussels, Rome and Stockholm. The Stockholm revision was an effort to establish a true international copyright agreement and also to try and make it possible for the USA to join the BCU, which so far has not happened.

It was unsatisfactory that there should be a large block of countries outside the BCU, notably the USA and the Pan-American countries. This led to the establishment of the Universal Copyright Convention in 1952, sponsored by UNESCO. The basic require-

ment here was of a much lower standard and it was simply that the member states should provide adequate and effective protection, which means just as much or as little as each member individually decides it shall mean. It does, however, have the saving grace that among the 58 member states there is some form of protection to be obtained and that foreign works can obtain protection in the USA without the onerous formalities that were previously required. It is interesting that the USSR have joined the UCC and observers are watching with interest to see how they will deal with the situation.

Unhappily, the protection given to sound recordists in Britain as a separate right is not fully recognised as a fit subject for artistic protection in many other countries. It arose virtually by accident in this country and even now is the subject of some controversy by societies representing authors and composers. Some 11 countries also recognise this right together with the notice of this right to the public by the printing of a small p within a circle to denote protection. In the new general revision of the USA Copyright Law at present before the Senate, the section on sound recordings resembles the Copyright Act 1956 very closely—as do the Australian Acts. It can be expected that other Pan American countries will follow the USA which is probably the most important market outside Europe for British recordings.

It is probable that other states will join, now the USSR have joined the UCC but, for the reasons given, the actual value of this will depend upon the political climate within each country, their desire to trade, and many years of government inaction.

Application of the law

The Application of the Law of Copyright in the studio can be an extra burden of worry. This is a complex branch of the law where a passing acquaintance with the general form will indicate when specialised legal advice should be obtained.

Copyright is a legal right given to makers of original artistic works to prevent others from copying the works for a certain number of years. The copyright is infringed if the work is reproduced without the consent of the copyright owner. The penalty in Britain for such infringement can be a fine of up to £50 or two months imprisonment together with a civil liability for damages.

Copyright is not a monopoly right; in this it differs from a patent. If two persons independently compose identical pieces of music, both would hold a copyright; neither would infringe the other's right to reproduce his own work.

The first owner of a copyright is generally the author or maker of a work; he may sell or assign this right to another who will have all the original rights of the first holder. Continental European law sees a residuum of control remaining with the first holder, who may protect his reputation from mutilations of his work, but this concept has yet to find full acceptance in Britain.

The principle of copyright is accepted in all civilised countries who each have their individual domestic laws giving varying forms of protection. It is therefore possible to import a

work which will be freely on sale in one country and infringe the law in the other.

The bulk of the law in Britain is now contained in the Copyright Act 1956. Prior to this date the law had a chequered history culminating in the Copyright Act 1911, some of which still applies. In both these Acts, copyright is defined in its nature and application. Because of the many ways in which a work may be reproduced, and the technical advances the law is unable to foresee, the definitions are extensive but not always legally settled.

Audio copyright

There are two distinct rights to be considered in the making of a record. Firstly the right of the author of the material recorded. Secondly the right of the maker of the recording. Although the author's right has always been protected, the 1956 Act re-enacted them and also created a defined copyright in sound recordings (together with films and sound and television broadcasts) and generally widened the protection in these media.

The Act defines a sound recording as 'the aggregate of the sounds embodied in and capable of being reproduced by means of, a record of any description, other than a sound track associated with a cinematograph film. And a record as 'any disc, tape, perforated roll or other device in which sounds are embodied so as to be capable (with or without the aid of some other instrument) of being automatically reproduced therefrom'. This definition would seem to cover all forms of disc and tape recording.

The legal maxim 'Consent negates legal injury' applies with as much force to copyright as elsewhere. If consent is obtained to make a copy, which means all forms of reproduction, then there will be no infringement; the law is concerned with the people from whom consent must be obtained.

Authors' rights

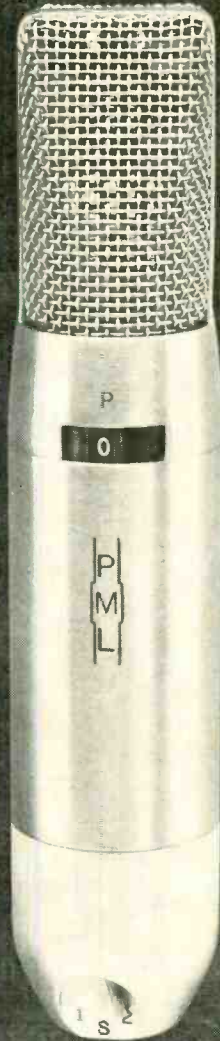
Broadly speaking any literary, dramatic or musical work less than 50 years old will be protected by copyright and it will be an infringement of the copyright to record, adapt, or cause to be performed in public without the owner's consent. Where there are two or more authors for words and music, then a consent will be required from all since they have individual copyrights. An important exception arises in the case of previously recorded works; this is known as the 'compulsory licence to record'. It arose from the strong lobbying by the manufacturing companies at the time of the introduction of the 1911 Act; they wished to ensure that a composer who had consented to his work being recorded once by one person, should allow others to do so as well.

Compulsory licence

The 1956 Act allows studios to record for retail sale work that has previously been recorded if the following conditions are satisfied.

1. The record must have been previously made or imported into the United Kingdom by or with the consent of the copyright owner (or his assignee.)

AB Pearl Mikrofon- laboratorium.



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48 volt, variable pattern.
Also available as
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HES Electronics - Brussels, TSV series telephone balancing units, and studio equipment

Inovonics Incorporated - Campbell California U.S.A., Audio electronics.

Roland Zeissler Werk Für Elektro Mechanik - Cologne, Racks and instrument housings.

■ COPYRIGHT

2. The records were the whole of the work or a similar adaptation.
3. If part of a work, then the previous records were part of the work. The former being the authorised version, the latter must not be a new work.
4. The owner is given notice in statutory form in accordance with the Board of Trade Statutory Instrument SI 866 (1957) before the record is made.
5. The appropriate royalty is paid.

The difficulties of knowing whether an authorised record has been previously recorded are overcome by the regulations laid down in SI 866 (1957) and 2076 (1962) reg 4 where the prescribed procedure is laid out in full. It must be noted that this right does not extend to either literary or dramatic works.

The maker's right

The technical and musical skill of making a record is recognised and protected by the Act of 1956. The maker of a record has a copyright in the actual record itself and it is therefore an infringement to copy the record, for example by tape recording another's disc.

The copyright of a sound recording is in the maker, who may in this instance be a limited company, or in the person who commissioned the record for money or money's worth, and the maker must be a British or British protected subject.

A copyright will subsist in the first recording and in every recording that has been published; the period of copyright being 50 years from publication. It is an infringement of the copyright either directly or indirectly to make a record embodying the record, to cause the record to be heard in public, or to broadcast the record. The first two conditions do not apply to certain foreign recordings and there are special exceptions of interest to non-profitmaking organisations and organisations offering residential facilities, as a result of earlier court actions. Where recordings are used for educational purposes or by the government then the criteria alter and the particular circumstances will govern the nature of the protection.

Because of the ease with which mistakes can be made, the 1956 Act requires that records recorded after 1956 shall be labelled with the year of first publication. An owner cannot then complain of infringement if he fails to comply with the regulations unless he can show the records were issued without his knowledge or authority, or he had taken all reasonable steps to ensure that they would not be issued in the United Kingdom without such a label.

The 1956 Act specifically makes an exception whereby a person switching on a radio or television broadcast from either the BBC or IBA in public does not infringe the copyright in a recording. Other broadcasts (such as pirate stations) are not so excepted.

The law recognises that art is a very personal matter and that there are persons who will take advantage of loop-holes in statutory regulations. The 1956 Act therefore provides its own saving clause, which reads: 'Nothing in this Act shall affect the operation of any rule of equity relating to breaches of trust

or confidence'. So, when all else seems lost, there is still a chance injustice can be righted.

A copyright is infringed when an original work is reproduced without the permission of the copyright owner. By an extension of the law under the Copyright Act 1956, this protection is extended to sound recordists (who may be limited companies) in contra-distinction to the general rule that a copyright owner should be an individual.

If a shop should start selling tape cassettes of proprietary brands of records they have either made themselves or imported from abroad without the permission of the copyright owner, then they will be 'infringing' copies and therefore illegal. Their wrong would be the offering for sale and the actual copying if they made the cassettes themselves. This is a situation that has arisen as a problem since the autumn of 1972 when a number of retail outlets such as supermarkets, auto-accessory stores and photographic shops began selling eight track cassettes of popular music. Much of this stock has originated in the USA where 'pirate' recording studios have found difficulty in distributing their goods in the home market, since the Title 17 of the United States Code was amended to 'protect against unauthorised duplication and piracy of sound recording' on February 15, 1972.

As a result of this law, and the imminence of a new Federal Copyright law where the sound recordist is given protection in the States analogous to the protection given to British sound recordists by the Copyright Act 1956, the home market for pirate recordings contracted sharply with the prosecutions taken by Copyright owners. The pirate recordists looked for new markets and found a ready market in Britain where the public were eager to purchase cheaper recordings.

Such illicit recordings that come on the market have a possible action at the suit of three copyright owners. Firstly the recordist, secondly the composer and thirdly the author. The recordist, being in the stronger position commercially as well as having the independent right conferred by the Act, would be the proper plaintiff.

Corresponding to this situation is the 'bootleg' recordist who records live performances at, for instance, a Pop concert and reproduces the recordings for sale. Here the offence is against the Dramatic and Musical Performers' Protection Act, 1958, and although an academic question remains as to the copyright in the recording itself, such a recording offered for sale is illegal and actionable at the suit of the performers.

The procedure

Two remedies are open to copyright owners for infringement; civil and criminal. At the moment the criminal remedies are somewhat derisory as a deterrent although it is possible that under the Criminal Justice Act 1972 compensation could perhaps be payable to a copyright owner to an amount not exceeding £400 in addition to the punishment of the offender by a fine not exceeding £5 or two months in prison. The procedure would be the same as that outlined below in respect of bootleg recordings. The civil remedy is perhaps the best that could be devised in any circumstance. The object of the civil action is to stop

the sale of the pirate recording, claim damages and see that the offence will not be recommitted.

Regardless of the country of origin, which will normally be the United States (although a few middle Eastern recordings may be on the market) but on the whole the quality of these Eastern recordings will preclude them being purchased by any except very indigent members of the public; any recordings which are not approved by the copyright owners will be infringing copies. If labels and containers have been copied to resemble other brands then further offences are committed which could warrant police action for forgery, and the civil offences of passing-off and various trade mark offences.

The first step the copyright owner or his nominee must take is to obtain evidence of the infringement. This consists usually of purchasing an infringing copy from the shop in question and obtaining a receipt from the offender. At this stage, if the infringement is not too serious, a letter demanding that the copies be withdrawn and the stock either delivered up or destroyed may suffice to stop the distribution; as Court proceedings are not mandatory and there is always an outside chance that the offender has a valid defence. If the offence is serious enough to warrant Court action then an 'ex parte' application is made to the High Court for an interlocutory injunction to stop the sale of the recordings. In theory this is a pre-trial remedy to prevent further abuse until a trial can be held when the defendant can reply to the charge. In practice the parties agree to terms whereby the infringer pays the costs of the action, delivers up all the copies in his possession, renders an account of the proceeds of his trading in the illegal copies, and pays agreed damages to the copyright owner; the Court sanctions the agreement instead of trying the action, the sanction taking the form of a certificate from the Registrar of the Chancery division of the High Court. In this way the infringing copies are withdrawn from sale in as little as 24 hours from the time action is commenced.

There are a number of defences open to the defendant in an action for copyright infringement; the premier being consent of the copyright owner. If the infringer intends to defend the action then the interlocutory injunction will be followed by a trial where the copyright owner will ask for a perpetual injunction.

Penal sanctions

The penal sanctions taken under the Dramatic and Musical Performers' Protection Act, 1958, are in respect of the bootleg recordings that appear from time to time. These could originate from live concerts or from sound or television broadcasts. So far as broadcasts are concerned, the broadcasting authorities are reluctant to take action as they are in the curious position of having to please the same public whom they should prosecute, but insofar as there may be copyright owners within the broadcast material, then it is within the power of those persons to take action. The number of bootleg recordings are necessarily small and the quality likely to be below the usual standard; the sale depending upon topical popularity. However the penalty for

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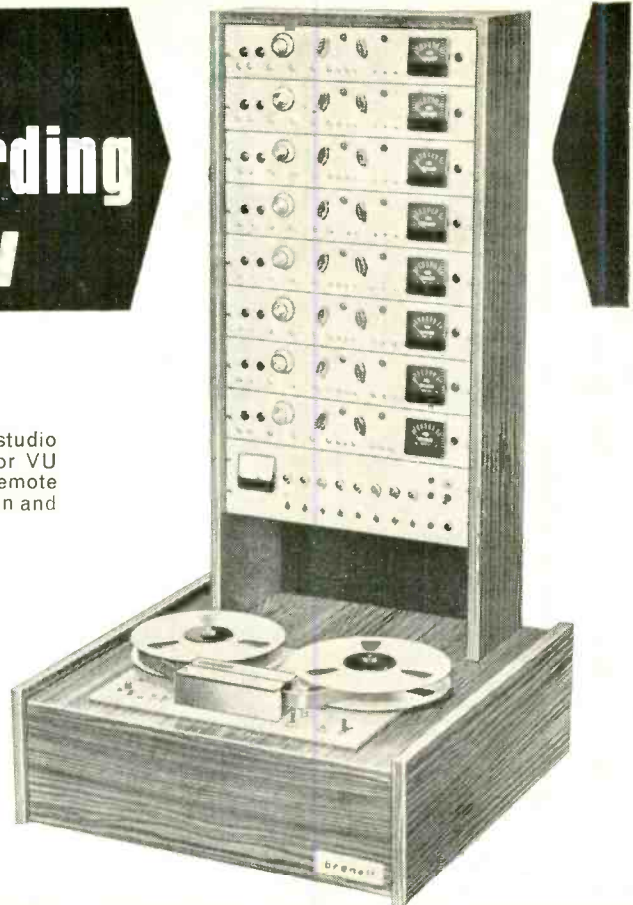
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VIDEO IN RETROSPECT

THE CCTV scene is changing so rapidly at the moment that my ploy of keeping the editor waiting until a few days after the final copy (*Sometimes missing the boat in the process!*—Ed) does not allow all information to be up to date. The following notes bring some recent video articles and reviews into perspective.

Reviews in hand include two new versions of the Philips vcr (together with the 60-minute cassettes not available at the time of the first review), the Electrocraft single tube colour camera, and the National portable vtr/camera system. An NTSC version of the National EIAJ/1 cartridge vtr is currently under trials and will be the subject of the next test report. Finally Sony's two new high resolution monochrome 12.5 mm vtrs are due for test within the next month or two.

Low light television

In the April 1973 article on low light cameras, it was regretted that the advantages of silicon target camera tubes were not available for the many Japanese cctv cameras using 17 mm tubes, in particular the hand-held cameras that accompany the battery portable vtrs.

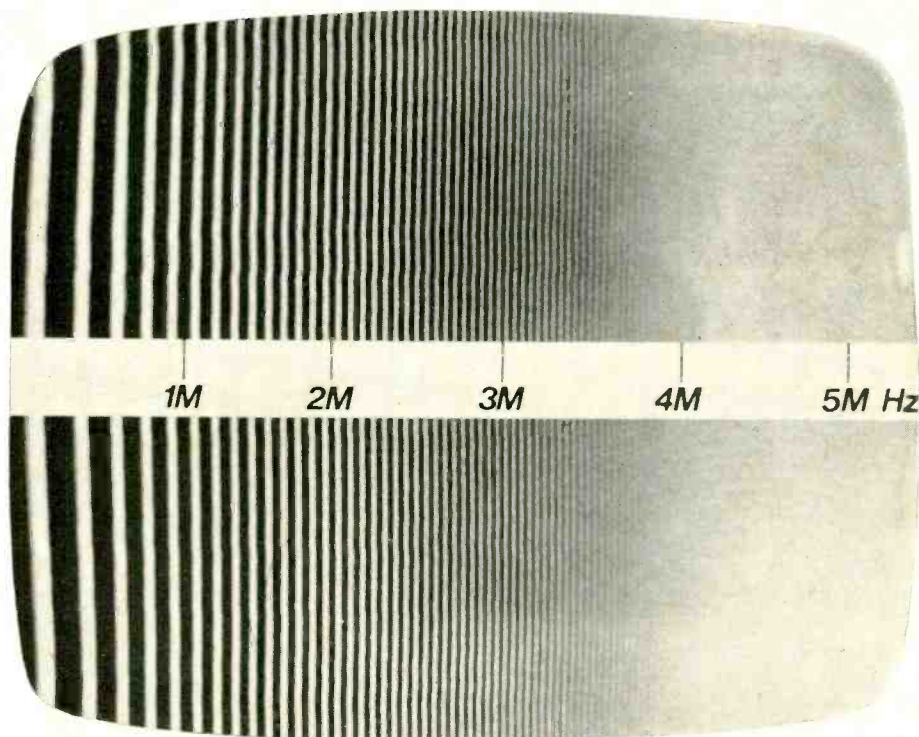
RCA, who have been active in silicon target technology from the start, have now released a tube which is mechanically interchangeable with those used in the Sony, Shibaden, Nivico, Akai and National portable cameras.

To recapitulate the main features of the silicon tube, it gives a sensitivity increase over conventional antimony trisulphide vidicons of about five times in natural light and about 60 times in tungsten light. It has also greatly reduced 'lag' or image smearing (which improvement we were unsuccessful in showing in the photographs on pages 41 and 42 of the April 1973 article). Finally, it is not damaged by exposure to sunlight or spotlamps.

The price of these advantages is the loss of the automatic sensitivity adjustment included in all low cost cameras, and an initial outlay of £190 for the tube. This means that the iris has to be adjusted whenever the brightness of the scene varies and with an untrained user this takes some practice.

The loan sample tube from RCA was installed in a Shibaden FP707 camera (which forms part of that company's 12.5 mm portable vtr system). Having two systems side by side, comparisons could then be made between the two types of tube.

Knowing that their voltage requirements are different, some cctv technicians have been reluctant to try silicon tubes in their own cameras and for this purpose RCA's installation leaflet is to be recommended. In practice, it is usually only the target bias which needs



altering as in normal cameras this is varied between 0 and +100V by the age circuit. For a silicon target, bias should be fixed at about +8V.

With only that alteration, a spectacular improvement in low light performance was noted with the same lack of grain and lag that was noticed with the 25 mm tube. The small bright spots seen in the earlier silicon tubes, which were the result of faulty target diodes, are scarcely visible with this RCA tube and the level of other blemishes was also low in the sample tested. In a perfect camera, the silicon tube's resolution is slightly worse than that of the best antimony trisulphide tubes. Used with a portable vtr whose resolution limit is well below that of the camera, this difference was masked. One point not mentioned in the previous review was the performance with gas discharge lighting: conventional fluorescent tubes, for example. The shorter wavelengths of their radiation result in the loss of most of the sensitivity advantage of silicon targets and RCA pointed out that similar results may be obtained from mercury vapour lights.

The users appreciated the improved picture quality at all light levels and the smaller apertures gave a greater depth of field. Some beginners were put off by the need to operate the iris during shots but the more experienced found the fixed sensitivity an advantage.

Cctv lenses

Many cctv users accept whichever lens is delivered with their camera but there is now a wide choice which gives the informed or

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specialist user the chance to improve his results. In our recent field trial of the Sony AV-3420/AVC3420 battery portable vtr/camera system (December 1973), the two most needed improvements were greater sensitivity at low light levels and a wider range of lenses. The widest angle of the Sony/Cannon f12.5 to 75 mm 1:1.8 zoom lens was still inadequate for some of the indoor shots we wanted, and out of doors the 6:1 zoom range was sometimes too small.

The new Tamron series (imported by Bell & Howell A/V), apart from covering the normal range at relatively low cost, includes two lenses worth particular attention: the PYG20 5.4 mm f2 wide-angle fixed lens and the PZ2011 10:1 f2 zoom. Since trying these two on various Japanese 17 mm cameras, we regret not having had them for field trials of the Sony Video Rover.

The zoom range of the PZ2011 is from 12 to 120 mm which, when compared with a 25 mm fixed lens, has a viewing angle varying from double to one-fifth (i.e. from about 60° to 6° horizontally). This lens is, of course, larger than the 4:1 to 6:1 zooms normally fitted to

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VIDEO

portable vtr systems but its extra flexibility is worth the slight inconvenience of its size.

The widest angle of most zoom lenses is generally between 50° and 60° horizontally, which is too small for many situations as most people who have tried indoor recording soon find out, so the Tamron *PYG20* (with its 4.5 mm focal length and enormous viewing angle) was tried with indoor and close-up shots. This lens has fixed focus and no iris and so is less convenient to use on cameras without adjustable carriage focus. We will still be able to use it with the Shibaden *FP707* and Sony *AVC-3420CE* portables and the near fisheye acceptance angle did not produce too much geometric distortion for many shots.

Viewing filters

Our camera tests allowed us to try the Spectra viewing filters marketed by Keeline Productions of 1 Spring Villas, Broomfield Place, London W13 9LH, for helping with cctv lighting. Designed for the film industry and consisting simply of a 25 mm glass filter in a small metal frame with a handle, they look too simple to be worth their cost of over £4 but in practice they are surprisingly useful. The instruction leaflet claims that the filter compresses the brightness contrast range to that of film and, while this is clearly not strictly true, it does reduce the brightness level to the point

where variations are more noticeable. Viewing a typical cctv scene with the panchromatic filter showed that darker sections of the scene which were clear to the naked eye would be lost on the screen and that sections which rely on colour rather than brightness variations for clarity will merge on a monochrome picture. Although the camera viewfinder can give this information, the filter is more accessible for lighting a scene, particularly out of the studio.

Sony U-Matic

Since our report on this vcr system in the September 1973 issue, several public demonstrations have aroused much interest particularly among large companies whose American sections are already using NTSC *U-Matics*. Sony's first *D-100* cassette copier has just been installed at Audio & Video Ltd (Whitfield Street, London W1) who will probably be copying programmes for this type of user.

Action Video (who loaned *STUDIO SOUND* the NTSC *U-Matic* for our September report) have shown a keen interest in the system and jumped the gun with the release of their own PAL and SECAM modified machines. Two of their more interesting 'specials' are a player for airborne use and a complex system for continuous or timed automatic playback.

Left: Camera supplied with the Sony *AV-3420* battery vtr, reviewed December 1973.

Right: Sony's new *VO-1800* PAL/NTSC *U-matic* vcr.

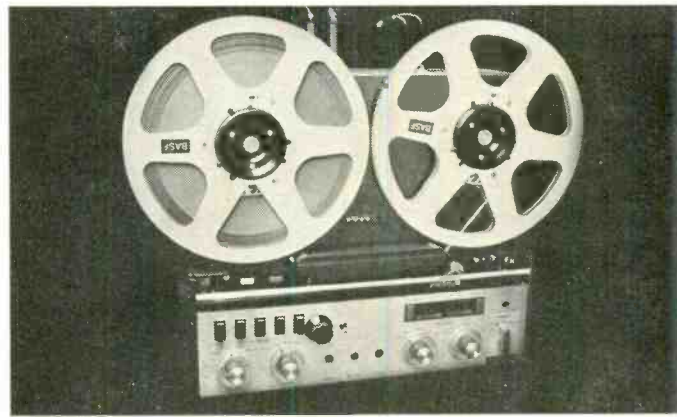
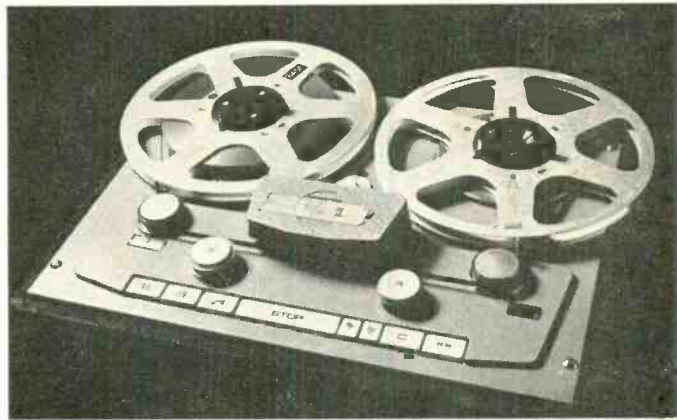
The first batch of European *U-Matics* has been released by both Sony and JVC. National are expected to follow suit shortly. The JVC machines (imported by Bell & Howell) are the *CR6000E* recorder (£819) and the *CR5000E* player (£664), which are the PAL counterparts of the NTSC version already tested. There are several differences between the new Sonys and the *VO-1600* we tested, although the transport and most of the electronics are the same. The *VO-1810* recorder is larger and heavier but has uhf modulator, an eight-pin EIAJ receiver/monitor socket, and a modification to the record logic to allow use with an external time switch. The front panel changes include a tape counter with a 'memory' of the type described in the JVC *CR6000* report. The space originally taken by the tuner is given over to dual level meters and slide faders for sound, switchable audio limiters and age, a video source selector and separate indicators for video record and colour. The panel which includes the tape transport keys now incorporates two extra tape controls; 'pause' and 'repeat'. One criticism levelled at the *VO-1600* system was the need to unlace the tape and return it to the cassette for even the shortest pause in playback; with the *VO-1810* this is overcome. The repeat is in effect a short-term rewind, again with the tape fully laced to save time. Having noted that the colour pictures from *U-Matics* are as good as most 25 mm vtrs, it now looks as though Sony are giving them more of the features of a studio machine.



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COST PER HOUR (Sony tape): Based on typical discount price of £8.50 per 18 cm reel.	£12.75	£8.50	£8.50	£6.90
Compatible with:	DKV2400 Portable	Sony, Shiba, Sanyo, National, JVC and Ikegami ranges	Shiba EIAJ/1 cartridge vtr and 1974 Shiba SV600 series (?)	Shiba <i>SU6JO</i> range Sanyo, National, JVC and Ikegami
HORIZONTAL RESOLUTION:	270 lines	300 lines	300 lines	240 lines
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The BBC recently held a press conference on four channel sound to tell us that they had nothing to report. With the rest of the industry wondering what happens next, and in some cases not caring, Michael Gerzon suggests remedies for defects in presently available systems.

What's wrong with quadraphonics

MICHAEL GERZON

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FEW PEOPLE in the recording business (and, if it comes to that, few record buyers) are happy with the present state of the quadrasonic art. Those who are have argued that this is a temporary state of affairs (like the hostility which met the first days of stereo) which will evaporate as soon as the quadrasonic skills of the recording engineer increase with experience. As one who has argued for surround sound from the beginning, and whose first experiments were in 1965 and 1968, may I beg to differ? Quadrasonics, as at present widely conceived, is a dead end.

Don't misunderstand this flat pronouncement. I am not saying there is no future for surround sound in the home via four or more speakers. What I am saying is that most present methods of achieving this aim, whether they be 'matrix' or 'discrete', are quite incapable of optimum results and do not do what they claim to do. The fault lies partly in studio equipment incapable of giving good quadrasonic results, and partly in erroneously conceived 'quadrasonic' systems which leave the apparent localisation of sounds at the mercy of the listener's imagination.

The aim of quadrasonic systems has in the main been to duplicate the effect of the 'original' four track mastertape in the recording studio. This would be fine if one were sure that the four track tape were actually duplicating the precise intentions of the recording engineer and producer. The trouble is: it isn't.

Any producer is at the mercy of the limitations of the studio equipment. If he wishes for a certain effect on the recording, he may well have to accept a poor imitation of it if the studio equipment is not capable of the precise effect he wants. Moreover, the effect desired may only be obtained even approximately at precisely one listening position with one size and shape of loudspeaker layout, with the listener having to face precisely in one direction. Clearly a recorded effect that is so critical is not much use except for indulging in ego-trips.

And yet some of the effects obtained by conventional 'discrete' systems are precisely of this nature. I refer in particular to side-centre sounds (i.e. side-right or side-left). These are conventionally obtained by feeding or panning a mono sound equally to the two speakers on the relevant side. It is a matter of experience that a forward-facing listener does not hear such a sound as lying completely at his side unless he seats himself in *just* the right position and takes care not to move his head even by the tiniest amount. Otherwise the sound tends to jump to the front or to the back speaker at that side with the slightest provocation. Some producers of quadrasonic drama have refused to use side positions because of this unpredictability, and one inventor of 'matrix' systems has justified the admittedly dreadful side performance of his 'matrix' system by pointing out that sound engineers 'do not want to use side positions anyway'. Of course they don't, if the results are bad!

Sounds positioned in the front and back quadrants with conventional quadrasonic panpotting are only a little better. In the bad old days of two-speaker stereo, we were all told how bad it was to angle speakers more than 60° apart at the listening position, as one then got 'hole-in-the-middle', where middle sounds fled to one edge or the other of

the image at the slightest provocation.

Yet now some people expect good results from 'discrete' quadrasonics with the front speakers angled 90° apart. The laws of good sound haven't changed and, if one wants stable sound images between the speakers, one is forced to sit in a 'quadrasonic seat' that is tiny in comparison even to the 'stereo seat'.

The effects of this grotesquely poor sound image stability have been predictable. Since the only 'discrete' sound images that are stable are the four corners, sounds have been piled up in those positions with gaping holes left elsewhere. Since even front centre images are unstable, there has been a temptation to indulge in (legitimate) 'interior' positioning effects which sound like no position in the real world but which have the virtue of not being any more 'wrong' in one listening position than in another. In so far as between-speaker sound images have been made to work, this has been achieved mainly by the ears noticing a difference in directional effect from corner-only sounds. When between-speaker sounds occur on their own, they become hard to localise.

Of course, there can be no disputing that recordings based mainly or solely on the four corners are capable of a great artistic success—one notes the acknowledged masterpieces of electronic quadrasonic music *Philomel* by Milton Babbitt and *Kontakte* by Stockhausen. However, one cannot deny that not to have any other possibilities is extremely restrictive, both for the creative Pop or electronic producer and for the classical man with a 'concert hall' approach.

The poor localisation of 'discrete' four channel tapes made using conventional quad pan pots is made even worse by two other phenomena that have been known for many years. It was shown by de Boer in 1947¹ that widely-angled stereo speakers produced a sound image which, after some experience, could be interpreted as being elevated above or depressed below the line joining the speakers. The effect was small for speaker angles up to 60° but the elevation increased to around 40° for a 90° interspeaker angle. This effect was not always heard by inexperienced listeners, which suggests that the directional information reaching the ear is not heard as a 'natural' sound position but that one can learn to give it some sort of interpretation. In fact, the effect is closer to the 'interior' effect than to that of height.

Shuffler circuit

The other phenomenon disturbing localisation is the effect described in 1957 by Clarke, Dutton and Vanderlyn² in connection with the EMI 'Stereosonic' system, whereby the width of a stereo image in the treble differed from that in the bass. They suggested the use of a 'shuffler' circuit which narrowed the treble by reducing treble stereo separation. However, this does not reduce the degree of image blurring thus caused, as shown by Harwood³ in 1968. This blurring is not too disturbing when confined to a mere 60° of angle, but is not acceptable in a 360° image.

Thus far there have been three published approaches to surround sound reproduction. Starting with the worst approach and ending with the best, these are:

- (1) 'Matrix' systems, which aim to imitate

'discrete' systems via less than four channels.

- (2) 'Discrete' systems, which use four channels and create phantom inter-speaker images by feeding (panning) sounds only to the two adjacent speakers.
- (3) 'Harmonic Synthesis' or 'kernel' systems.

The last approach requires some explanation. Commercial examples are the UMX family of systems of Nippon Columbia and the Japanese RM Regular Matrix system (which does *not* include Sansui's QS system which is only an approximation to RM), and also the British NRDC ambisonic system.

Kernel systems start from the observation that the effects one would like to produce include a continuum of directions around the listener. Such systems imagine a limited number of channels being used to convey the sound to the listener, but are designed to recreate a continuous range of directions around the listener approximating the original. This recreation may take place via (say) only four speakers but the signals fed to the speakers do not in themselves matter; only the directional effect of the sound field at the listener matters. (It is interesting that this philosophy is close to that expressed in Blumlein's famous 1931 stereo patent.¹)

Kernel algebra

Because the aim of a kernel system is to convey through a finite number of channels an infinite number of directions (and thus an infinite number of channels), the mathematics used is not 'matrix' algebra (which is used only to describe transformations of a finite number of variables) but 'kernel' algebra (which is the corresponding mathematics used when one has an infinite continuum of variables).

Although the author was working with a kernel approach to surround sound as early as 1970,² and had privately developed a general mathematical theory of such systems at the time, such systems were developed rather later than 'discrete' approaches (1968) or 'matrix' approaches (1969). As a result, such kernel systems are only now beginning to be marketed, by Nippon Columbia and also as the NRDC ambisonic system (with which the author has recently become associated).

Properly designed kernel systems are capable of results considerably superior to 'discrete' systems,⁶ and even a two channel kernel system gives results comparable to a four-channel discrete system. This is achieved by feeding signals to all four speakers to create phantom images, and not just the two speakers adjacent to the desired sound position. If one still thinks in terms of 'discrete' systems, the signals fed to the other speakers would be called 'crosstalk' but this crosstalk is not undesirable. Quite the opposite, it is absolutely vital in order to ensure the correct localisation of the phantom sound image.

Several difficulties lie in the way of adopting kernel systems. The most important is the present lack of availability of studio equipment for handling it. It is perfectly feasible to design kernel-type panpots but, as far as I am aware, none has yet been marketed. Such panpots would indeed give side-position sounds when

they say they do, and would give front or back quadrant sound with stable localisation. A detailed study shows that kernel systems are capable of a far wider range of control facilities for creative or realistic studio use than is any 'discrete' approach. Devices are being developed at the moment that permit sounds to be moved close to one's ear or far away, which rotate whole sound fields, which pan sounds in the whole of three-dimensional space (above and below as well as in all horizontal directions), and which modify the spatial distribution of sounds without sacrificing good sound imaging. Most of these things cannot even be approximated by 'discrete' or 'matrix' approaches.

Compatible system

It is possible to convey kernel recordings in a reasonably compatible manner via many existing 'quadraphonic' media, including RCA/CD4 type 'discrete' discs, four channel tapes, cartridges and cassettes, RM discs, the Nippon/Columbia UMX systems, and via two channel, three channel or Dorren FM. The only system directly incompatible with a 'kernel' or sound-field approach is the SQ system which needs a vari-matrix type interface unit to convert kernel recordings to SQ.

However, there is a yet more advanced approach based on the kernel approach but designed to ensure the best possible results. I call this the 'Psycho-acoustic' approach because it is based on the idea of tailoring the sound field at the listener to give results subjectively as close as possible to the original effect picked up by the microphones or intended by the producer. Conventionally, the way of inventing quadraphonic systems has been to state a few desired mathematical conditions and then to adjust the decoding unit empirically to give the 'best' possible result with the fixed encoding system thus obtained. This applies to most kernel systems as much as to discrete and matrix systems. The trouble is that there are tens or hundreds of variables in the decoder that can be adjusted, and each decoder has to be tested on a wide variety of sound material. Thus it would be most surprising if the best systems are actually found by this method.

As far as I am aware, systems now under development under the direction of the National Research & Development Corporation are the first to have been developed the other way round. What we have done is to study the various mechanisms by which the ears localise sounds. This, after all, is what we want to get right in the listener's home! A considerable number of calculations of the sound localisations deduced by various possible theories were made for various different systems of reproduction. Rather assuming one particular theory, those systems are isolated that gave the best possible results according to all of a number of theories. These theories¹⁰ were chosen to fit experimental localisation data by a wide variety of workers. Thus, rather than guessing a system and then trying to make it work, we said what we wanted it to do according to available experimental evidence on the human ears and constructed systems which would do this.

The results showed that in fact several of the available kernel systems were probably

capable of being reproduced with good results *provided* that special decoders different from those hitherto suggested were used. Among systems that passed the theoretical tests were the regular matrix systems, the two-channel (BMX) and three channel (TMX) versions of the UMX system, but *not* (via four speakers) the four channel QMX version. Other failures were the two channel periphonic (i.e. with-height) system of Peter Schieber⁷ and the author,⁸ and also the four channel periphonic or tetrahedral systems,^{5, 8, 9} when played via a tetrahedron of speakers. The anomalies of the latter system were calculated to come rather close to those experienced by the author in earlier experimental work.⁹ However, theory shows that the anomalies disappear when a cubic speaker layout is used for periphony, and this has been confirmed experimentally by John Wright.

A surprising discovery has been a new three channel periphonic system which satisfied none of the mathematical criteria laid down by the author in his general theoretical paper⁸ on with-height reproductions but passes the 'psycho-acoustic' theoretical tests with flying colours. This system is suitable for fm broadcasting and fits neatly in the universe of workable systems. It has many desirable properties which make it distinctly attractive, and it now seems possible to design periphonic systems that are usable in the home.

The situation now, as far as studio practice is concerned, is that recordings can be made using four channels that may be encoded and decoded via any of the technically feasible domestic surround-sound systems that are capable of good psycho-acoustic results. However such four channel kernel recordings require other studio processing devices (panpot, microphones etc.) than those presently commercially available. Moreover, the four channel signals thus obtained do not, of themselves, give ideal surround sound reproduction but must be fed to decoder circuits that are advanced variants of the primitive and ineffective 'shuffler' circuit used in the Stereosonic system^{2, 3}. Both for reasons of mono and stereo compatibility and for ease of processing, the decoded version of the signal cannot be used in the studio while the signal is being processed or dubbed, but may only be used for monitoring purposes.

A-format

We thus end up with four types of four channel 'surround sound' signal in the history of psycho-acoustic kernel recording. It starts off life in what I term A-format, which is the form in which the four channel signal is derived from the microphones, taped, mixed, pan-potted etc. This signal format has been chosen to be reasonably compatible with existing 'discrete' four channel signal practice, and uses L_B, L_F, R_F, R_B signals as usual. Another signal format, also not involving any phase shifts, is used within studio processing equipment for reasons of simplifying design. This is known as B-format. The signal format on disc, tape or radio by which the information is conveyed (via two, three or four channels) to the consumer is called C-format ('coded' format) and may involve phase shifts to ensure

Microphone stands and booms surveyed

St305

Shock absorbing floor or table stand with 80 mm base radius. Price: £14.60.

St102A

Floor stand telescoping from 910 to 1630 mm x 370 mm screw-in tripod base radius. 700 mm boom arm. Price: £25.

St200

Floor stand telescoping from 1100 to 1800 mm x 290 mm folding leg tripod base radius. Price: £25.

SHF1

140 mm x 45 mm radius table base, intended for permanently mounted goosenecks. Price: £2.40.

ALTEC

Altec Corporation, 1515 South Manchester Avenue, Anaheim, California 92803.

Agents: Theatre Projects Sound Ltd, 10 Long Acre, London WC2E 9LN. (01 240 5411)

UMS-100

Floor stand telescoping 875 to 1600 mm x 125 mm radius base. Price: £7.00.

UMS-101/2UMS-101/2

Floor stand telescoping 850 to 1500 mm x 125 mm radius base. Price: £8.50.

UMS-103

Floor stand telescoping 900 to 1600 mm x 150 mm radius base. Price: £11.00.

UDS-100

Table stand, 100 mm x 75 mm radius base. Price: £2.50.

UDS-101

Table stand telescoping 200 to 320 mm x 75 mm radius base. Price: £3.50.

BEYER

Eugen Beyer Elektrotechnische Fabrik, D71 Heilbronn, Theresienstr. 8, PO Box 170, West Germany. (Phone: 07131 82348).

Agents: Beyer Dynamic (GB) Ltd, 1 Clair Road, Haywards Heath, Sussex. (0444 51004).

ST199

Floor stand. Price: £8.48.

ST220

Floor stand with floor sound attenuators. Price: £21.04.

ST201

Floor stand available in heavy duty or foldaway leg formats. Basic price: £10.27.

ST205

Light-weight floor stand. Price: £8.48.

ST210

Floor stand with boom arm available in two formats. Basic price: £17.08.

SCH211

Boom arm. Price: £6.39.

SCH211/1

Telescopic boom arm. Price: £7.50.

SCH212C

Boom arm. Price: £18.75.

ST200

Table stand. Price: £2.50.

ST200.1

Table stand. Price: £7.41.

ST233

Table stand. Price: £10.18.

ST300KV

Plastic tripod table stand. Price: £2.05.

DANNER

Konstantin Danner, 1000 Berlin 62 (Schoneberg), Akazienstrasse 28, West Germany. Phone: 0311 781 1822).

Agents: F. W. O. Bauch Ltd, 49 Theobald Street, Boreham Wood, Hertfordshire, WD6 4RZ. (Phone: 953 0091).

M27210

Floor stand. Extends from 1200 to 2000 mm.

MFS3

Floor stand. Rubber tube mounted on a cast iron base. Extends from 1000 to 1800 mm.

M31

Tripod floor stand.

M32

Collapsible floor stand. Extends from 1150 to 1800 mm.

M210

Floor stand with boom attachment. Boom extends to 750 mm.

M184

Floor stand with boom, on heavy duty casters. Extends from 1800 to 2500 mm. Boom reaches 1200 to 2900 mm.

M35

Floor stand. Extends to 5000 mm.

G35

Boom attachment for M35. Has a reach of 2500 mm. All prices are on request.

EAGLE (Japan)

Agents: Eagle International, Precision Centre, Heather Park Drive, Wembley HA0 1SU. (Phone: 01 903 0144).

FS2

Floor stand telescoping to 1500 mm. Price: £4.48.

FS3

Floor stand telescoping to 1380 mm. Price: £4.48.

FS268

Floor stand telescoping to 1700 mm, incorporating BA132 boom. Price: £7.84.

BA132

Boom arm extending to 700 mm. Price: £4.25.

DS1

Table stand 90 mm high x 63 mm base radius. Price: £1.

DS2

Table stand telescoping 180 to 310 mm x 65 mm base radius. Price: £2.12.

PRO S3

Screw-leg tripod to suit 285 mm S1 stem or S2 787 to 1447 mm telescoping stem. Price: £1.80 (S1), £4.80 (S2), £4.80 (S3).

PRO S4

Boom arm with 787 mm maximum extension. Price: £4.80.

PRO S5

Boom arm with 1015 mm maximum extension. Price: £5.40.

EMI

EMI Sound & Vision Equipment Ltd, RCF Products Division, 8 Barton Road, Bletchley, Milton Keynes MK2 3HZ. (Phone: 0908 71551).

977-108S

Straight boom low level microphone stand with screw leg base. Extends to 1275 mm. Price: £15.89.

AKG

Akustische & Kino-Gerate GmbH, Wien, Brunhildengasse 1, A-1150 Wien, Austria. (Phone: 0222 921647)

Agents: AKG Equipment Ltd, 182/4 Campden Hill Road, Kensington, London W8 7AS (Phone: 01 229 2695)

St1

Miniature tripod 80 mm high x 135 mm base radius. Price: £2.10.

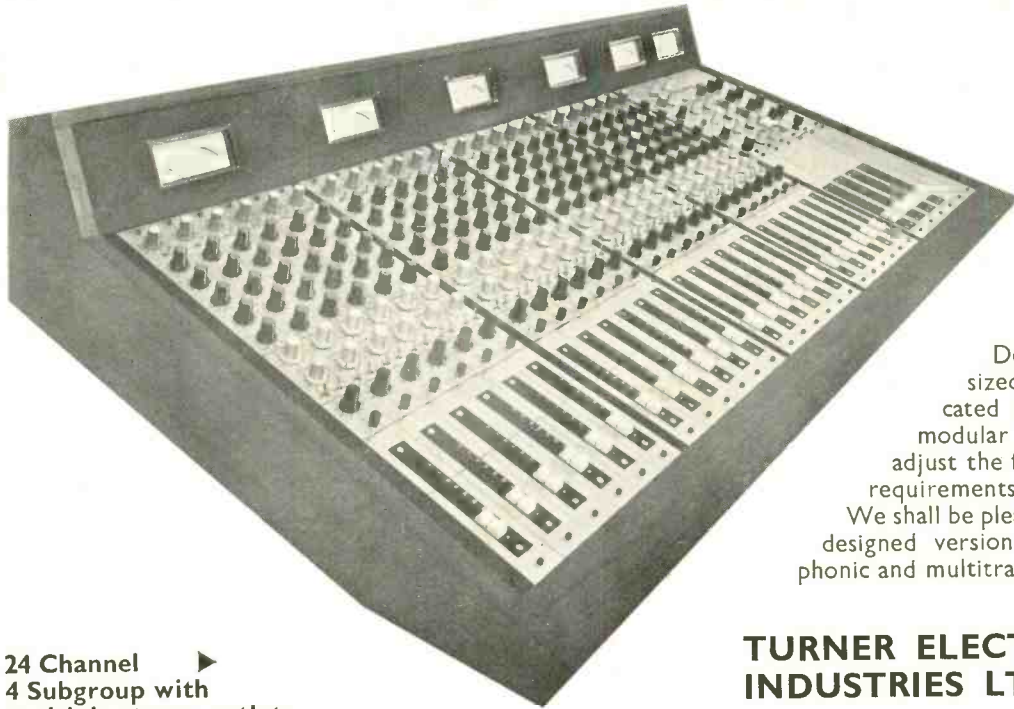
St4

Rectangular table base with optional cue facilities. 150 x 90 x 23 mm. Price (basic St4A): £6.

St12

Banquet stand telescoping from 350 to 550 mm x 180 mm base radius. Price: £16.30.

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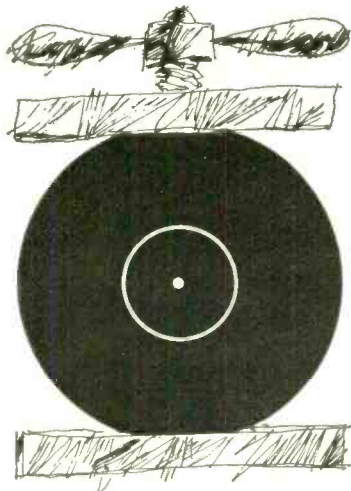
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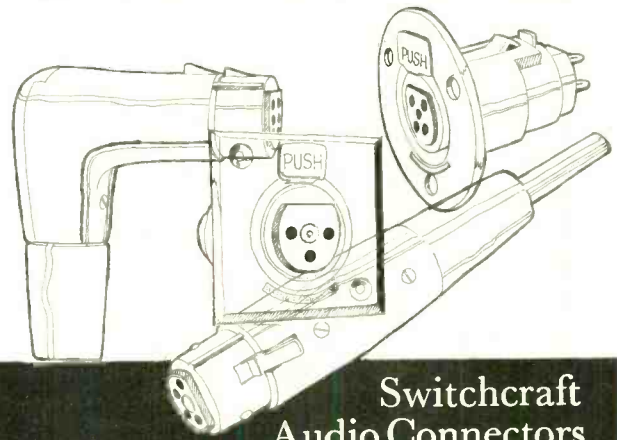
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■ SURVEY

977-119S

Curved boom low level microphone. Stand with screw leg base. Extends to 1515 mm. Price: £19.21.

977F

Folding leg base. Radius 320 mm. Price £7.66.

977R

Round base of solid steel coated with black pvc. Radius: 1252 mm. Price: £4.91.

977S

Tripod, screw leg base. Chromium plated. Radius: 320 mm. Price: £6.24.

977-115

Straight boom arm. Chromium plated. Overall length 1040 mm. The boom reaches 1130 mm. Price: £7.66.

977-120

Curved boom arm. Chromium plated. Overall length: 1255 mm. The boom reaches 1130 mm. Price: £9.20.

977-121

Multi-microphone boom arm. Overall length: 1220 mm. Price: £10.20.

977-111

Banqueting table top stand. Extends from 610 mm to 850 mm. Price: £9.06.

977-109

Telescopic table top stand. Extends from 405 mm to 685 mm. Price: £7.88.

977-110

Short table top stand. Extends to 90 mm. Price: £4.71.

FILMS & EQUIPMENT

Films & Equipment Ltd, 147 Wardour Street, London W1. (Phone: 437 7711).

F & E boom

Heavy duty transportable stand and boom adjustable from 1600 to 4300 mm height and 4000 mm maximum reach. Price: £80 (plus £10 with favouring device, £10 for anodising, and £4.50 for locking wheels).

GRAMPIAN

Grampian Reproducers Ltd, Hanworth Trading Estate, Feltham, Middlesex. (Phone: 01 894 9141).

717

Folding floor stand extending from 990 to 1500 mm. Price: £8.40.

S4

Table stand extending from 304 to 520 mm. Price: £6.58.

S8A

Floor stand extending from 1060 to 1500 mm. Price: £12.75.

KMAL

Keith Monks (Audio) Ltd, 26-28 Reading Road South, Fleet, Nr Aldershot, Hampshire. (Phone: 02514 7316/3566).

£4 STUDIO SOUND, MAY 1974

MS/S

Light-weight floor stand with screw-in legs. Price: £10.36.

MS/M

Heavy-weight stand with screw-in legs. Price: £14.15.

MS/L14

Studio chrome floor stand. Price: £17.08.

MS/PA/G

Toggle floor stand. Price: £16.36.

BS/1/B

Banquet stand. Price: £8.47.

BA/S

Light-weight boom arm. Price: £6.

BA/M

Heavy duty boom arm. Price: £7.20.

BA/L 42/2

Weighted boom arm. Basic price: £9.59.

AB PEARL

AB Pearl Mikrofonlaboratorium, Knuts-gatan 6, S-265 00 Astorp, Sweden. (Phone 042 515 20).

Agents: Allotrope Ltd, 90 Wardour Street, London W1V 3LE. (Phone: 437 1892/3).

1215

Telescopic floor stand. Brass tubing with rubber damper. Foldaway legs. Extends to 1800 mm.

4602

Cast-iron table stand. Radius: 45 mm.

4603

Light-weight table stand. Chrome plated brass. All prices on application.

P & N

Agents: Johnson-Brody Marketing Company, 394 Northolt Road, South Harrow, Middlesex HA2 8EY. (No telephone).

138PB

Microphone floor stand with polypropylene base. Price: £8.27.

102S

Microphone stand with screw leg base. Price: £10.92.

102F

Microphone stand with folding leg base. Price: £12.21.

115

Straight boom arm (long). Price: £6.96.

120

Curved boom arm. Price: £8.36.

123

Low level stem. Price: £1.83.

137

Short boom arm. Price: £6.12.

119S

Curved low level microphone stand complete. Price: £17.46.

119F

Curved low level microphone stand complete. Price: £18.75.

109

Table top microphone stand—telescopic. Price: £7.16.

110

Table top microphone stand. Price: £4.28.

111

Table top stand with curved top tube. Price: £8.24.

134

Table top tripod microphone stand. Price: £2.15.

PYE

Pye Business Communications Ltd, Cromwell Road, Cambridge CB1 3HE. (Phone: 0223 45191).

ET907

Floor stand telescoping from 1067 to 1829 mm x 206 mm base radius. Price: £14.50.

ET908

Table stand telescoping from 457 to 762 mm x 102 mm radius. Price: £11.

ET6204

Table stand base, 150 x 123 x 47 mm. Variety of switch and cue options. Price (base only): £5.50.

RESLOSOUND

Reslosound Ltd, Spring Gardens, London Road, Romford, Essex RM7 9LJ. (Phone: 70 61926).

MS11B

Telescopic floor stand with tripod base of heavy cast iron. Extends from 1016 mm to 1584 mm. Price: £11.50.

MS70

Portable telescope floor stand. Heavy cast centre with tripod base. Extends from 1016 mm to 1584 mm. Price: £13.

MS180

Professional boom arm. Extends to 2083 mm. Price: £15.

MS200

Table stand with heavy circular base. Extends from 410 mm to 660 mm. Price: £9.50.

MS300

Circular desk base with fixed chrome stem. Price: £5.50.

MS500

Miniature desk base. Price: £3.50.

SENNHEISER

Sennheiser Electronic, 3002 Bissendorf, Hannover. (Phone: 05130 8011)

Agents: Hayden Laboratories Ltd, 17 Chesham Road, Amersham, Buckinghamshire. (Phone: 02403 5511).

MZS142

Floor stand telescoping 410 to 138 mm. Screw-leg tripod. Price: £9.

MZS144

Floor stand telescoping 840 to 1580 mm. Screw-leg tripod. Price: £12.40.

MZS210

Floor stand with anti-vibration mounts concealed in tripod legs. Telescopes 840 to 1580 mm. Price: £22.15.

MZS211

Boom arm extending to 840 mm. Price: £7.90.

MZB415

Fishpole boom telescopes from 1115 to 4000 mm. Price: £32.65.

Table stands

Range of mounts to suit specific Sennheiser microphones. Details on request.

SHURE

Shure Electronics Ltd, Eccleston Road, Maidstone, Kent ME15 6AU. (Phone: 0622 59881).

X123

Heavy duty floor stand. Extends to 1800 mm. Price: £15.

X124

Boom attachment. Overall length 1100 mm. Price: £7.80.

X125

Light-weight floor stand. Extends to 1700 mm. Radius of base 200 mm. Price: £9.

S33B/33P

Heavy duty desk stand. Price: £6.

S37A

Desk stand. Price: £3.60.

S38B

Light-weight desk stand in black finish. Price: £1.80.

S39A

Vibration isolation desk stand. Plastic housing with

heavy duty foam internal isolation. Price: £9.60.

S55P

Distant pickup isolation. Price: £9.60.

VITAVOX

Vitavox Ltd, Westmorland Road, London NW9 9RJ. (Phone: 204 4234).

CN226

Pedestal stand (long). Radius 207 mm. Price: £10.85.

CN346

Pedestal stand (short). Radius 207 mm. Price: £10.85.

CN225

Table stand. Radius 95 mm. Price: £9.20.

CN224

Table stand. Radius 95 mm. Price: £9.20.

CN167

Desk stand. Radius 65 mm. Price: £8.10.

■ COPYRIGHT

such illicit recording is high with a possible fine not exceeding £400, or a maximum of not more than two years imprisonment. In a case last year such a fine was imposed, only to be reduced to £250 on appeal. It must be remembered this is not a copyright action but is an action very close in its application, and the procedure to be followed is the same as that which can be taken under the Copyright Act 1956. The procedure to be followed, which is common to all summary proceedings, is by way of 'laying information' and this can be laid by any member of the public. It could be laid for instance by the manager of a recording studio who saw illicit recordings on sale of a performance he knew that his company had recorded; but such involvement is not a prerequisite to laying the information. The information is laid before a magistrate when either a warrant or a summons is issued by the court according to whether the accused will come to court, voluntarily or not. The informant would have to provide evidence of his complaint, this would be by the usual method of showing a sample recording, a receipt, and sworn affidavits by the artists that neither they, nor their agents, had given permission for the recordings to be made. The case would then be heard by the magistrates who would inflict an appropriate penalty. Such criminal proceedings if contemplated must take place before any civil proceedings for recovery of damages.

Other sanctions

The Copyright Act 1956 provides in section 22 for a copyright owner to give notice to the Commissioners of Customs and Excise to prohibit importation into this country, copies of his work. A strict reading of the section would seem to exclude recordings although much depends upon the word 'printed'; and as a matter of practical application would be difficult by reason of the clerical work involved and the physical limitations of the department's manpower. An alternative solution would be for the department to disclose to a copyright owner the information contained in the returns made to them by importers under the Customs and Excise Act 1952. With this information,

action could then be taken against the importers by way of an injunction in the usual manner. There is however a difficulty that such information is confidential, given to the Commissioners under a statutory duty, and is protected by the Finance Acts 1967 and 1972; but on the other hand there is no actual statutory prohibition which precludes the department from disclosing such information in appropriate circumstances.

The duty of the Commissioners of Customs and Excise is to collect and account for the 'revenues of Customs and Excise' of goods entering the country. Clearly, once they are satisfied that the duty has been paid, then a consignee is authorised to remove his goods as soon as possible. On the other hand, Her Majesty's Customs should not be used as a medium to perpetrate an illegality, which clearly the importation of pirate recordings will do, and by allowing the importation they are passively assisting in an illegality. The Commissioners should therefore be under a duty to right a wrong that has been committed.

Following the case of Norwich Pharmaceutical Co and others, versus Commissioners of Customs and Excise (2 All Eng. 1973), where the plaintiffs were in a similar situation to a copyright owner seeing illicit copies of his work on the market—the House of Lords decided that information in the possession of the Commissioners should be disclosed; they added that in a case of doubt they should only disclose the information under an order of the Court at the expense of the person seeking it. Although this particular case concerned Patent rights, it would seem that where a copyright owner sees either from actual recordings on the market, or from published statistics of goods entering the country, that pirate recordings are flooding the market from abroad, he may be able to trace the source under an order from the Court, and put a stop to it.

There are then a number of remedies the copyright owner can take, and it is in his own interest that he should purchase the following Acts from Her Majesty's Stationery Office: The Copyright Act 1911; The Copyright Act 1956; Registered Designs Act 1949; Dramatic and Musical Performers' Protection Act 1958; and have them on hand in his office.



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That was the Festival du Son

DAVID KIRK

TAKE ONE London Audio Fair, add its Sonex equivalent, a little of the APRS Exhibition and mix well with the French broadcasting authority—ORTF. The result is the Festival du Son, annual exhibition of the French audio industry. Held each spring and now in its 16th year, the Festival has hitherto occupied the Palais d'Orsay on the Paris left bank opposite the Louvre. After two intervening years at the Grand Palais it moved in 1974 to the newly built Palais des Congres at Porte Maillot on the western edge of the city. So newly built, indeed, that electric clocks and other detailed fittings were still being installed as the exhibition opened.

The core of the Palais des Congres is a large auditorium, the Grand Salle. Behind the stage is a smaller Salle de Conferences. These are integrated with the exhibition areas in the manner of fig. 1, which shows one of the three practically identical surrounding floors.

Fig. 2 illustrates the interior of the Grand Salle and the way in which echo scatter surfaces have been embodied in the decor. Some idea of the building's size may be gained by comparing the ORTF auditorium in the floor plan with the size of nearby exhibition rooms. The structure can be seen to be ideally suited to the various requirements of audio equipment manufacturers.

A secondary advantage of dividing the exhibition area into 'avenues' was the ease with which a visitor could examine every display. This contrasts with the nagging suspicion that one has missed a substantial section of displays in the maze of stands at an Audio Fair or in the confusion of corridors at a hotel-based exhibition.

Consumer audio is concerned largely with music and this point did not go unnoticed by the Festival du Son organisers. An elaborate programme of live music was contributed under ORTF auspices throughout the March 11 to 16 exhibition duration. These occupied the latter half of each day while the mornings were devoted to technical lectures and discussions.

Another 'musical' touch: each avenue of

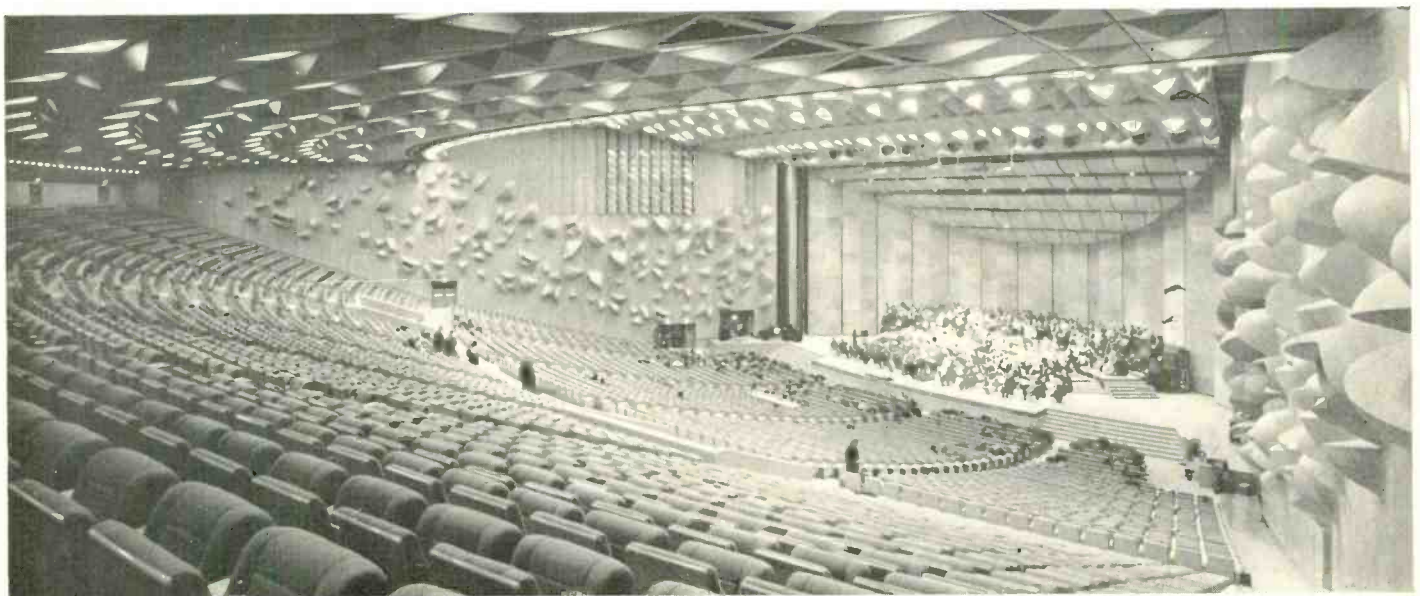
the exhibition floors commemorated a notable composer. Hence *Avenue Henry Purcell*, *Avenue Claude Debussy* and so on. It seemed wise not to query the presence of an *Avenue Raymond Cooke* in the Kef demonstration room, nor the 1610 birthdate annotated thereon.

Before proceeding to a resumé of the exhibition itself, the supporting catalogues deserve mention. Thirty francs (£2.70) purchased a concise 56 page catalogue and 30 cm 'haute fidelite' lp. Much better value, at 8F (72p) was a 268 page Principal Exhibits Report which included photographs and brief specification of almost every item on display. The only major omissions from this production were prices, but the disease of rapid inflation is by no means confined to Britain. Price too may be the reason why French manufacturers have made relatively little impact on the British audio market: 3A, Audax, Audiotec, Barthe, Cabasse, Elipson, ERA, Erelson, Ermat, Esart, Filson, Gego, GP, Helium France, Hencot, Kontakt, Laboratoire Electronique du Son, Lem, Linear Speaker, Neophone, Reynaud, Scientelec, Siare, Sonic, Speed Electronic, Teppaz, Titan Electronique and Voxson—

FIG. 2 (below): Grand Salle.

FIG. 3 (right): Pathe Marconi PA428 display.

FIG. 4 (far right): AEG-Telefunken's hall of mirrors.



where are your British agents? On the other hand, British manufacturers selling into France and exhibiting at the Festival du Son included Armstrad, Bowers & Wilkins, Cambridge Audio, Celestion, Connoisseur, Dynatron, EMI, Ferguson, Ferrograph, Fidelity, Gale, Garrard, Goodmans, Harrison, Kef, Leak, Lecson, Lustraphone, Multicore, Quad, Radford, Rank-Wharfedale, Sinclair, SME, Syke and Kirsch, and Transcriptor.

Acoustical, a name associated in Britain with Quad, relates in France to a Dutch company producing gram turntables, amplifiers and radio tuners.

Acoustic Research need little introduction. Occupying one of the larger demonstration rooms, they employed two giant peak level indicators to show the relative programme strength fed to their loudspeakers. The current AR range includes models 2, 2AX, 3A, 6 and LST, of which the latter is the largest with one 305 mm, four 38 mm and four 19 mm drivers.

ADC, American makers of audio transducers, displayed their XLM, Q36 and 10E/4 stereo gram pickups and a range of loudspeakers.

Agfa-Gevaert exhibited a selection of magnetic tapes: PE525, 555, 36, 46, 66 and the new PEM368. A 6.25 mm tape for studio applications was also shown in the shape of PEM268.

Aiwa (Tokyo) displayed two cassette recorders designed for chrome oxide tape, model AD150 incorporating Dolby B noise reduction.

Akai (Tokyo) had evidently diversified since the days when they concentrated on open reel tape machines. Besides the GX60AD and GX260D cassette machine and AP002 gram turntable, they showed a selection of separate and integrated tuners and amplifiers.

AKG are not generally associated with gram pickups but there it was, the PU2R, a conical dynamic with diamond stylus.

Ameron showed their familiar DC150 and 300A amplifiers with the less familiar IC150 control unit and 224 loudspeakers.

Armstrad meant amplifiers of unusual styling (IC2000/2 and IC4000), a 5000 tuner amplifier and 2500 loudspeaker.

3A (Art et Acoustique Applique) exhibited a variety of loudspeakers of which the largest was the horn loaded Audiotora, 1050 x 490 x 450 and weighing in at 70 kg. Just 330g were 3A's Audio Electrostatique headphones.

One could continue in this way, ad nauseum, through the exhibits of some 200 companies only to prove that consumer audio in France is in much the same state as consumer audio in Britain. Let us concentrate, therefore, on *la différence*.

Audax, not to be confused with Audac and Audix, are like 3A a French company specialising in loudspeakers and headphones. Newest item in their range was the 25 kg Eurythmique 60 speaker incorporating five drivers and handling 60W.

Audiotec (Arcueil) produce a series of amplifiers and tuner-amplifiers. Also in their demonstration room were the company's CES electrostatic headphones and E75 four-unit 30 kg loudspeakers.

Jacques Barthe (Paris) displayed systems employing their Rotofluid gram turntables, TR40 tuner, 7270 amplifier, and BA, JBA and Junior loudspeakers. Smallest of the latter was the 12.9 kg JBA.



BASF displayed a new studio tape, DPR26LH in addition to an expanding range of cassette recorders.

Cabasse (Brest) exhibited an extraordinarily wide variety of loudspeakers, most powerful of which was the 1,100 x 660 x 400 mm 100W Ouragen.

Elipson (Bagneux) specialise not so much in loudspeakers as in spherical loudspeakers. Among the largest of their distinctive range, the 15 kg BS50/2 contains one 60 mm and one 210 mm unit within its own 500 mm diameter. Handling capacity is 30W. Most Elipson loudspeakers are supplied with tripods, an exception being the 4010 which comprises a BS50 2 on a rectangular column housing a 280 mm bass driver.

ERA (Paris) and Ermat (Confolens) both exhibited amplifiers and loudspeakers, ERA having in addition a substantial variety of gram turntable formats.

Erelson (Ville d'Avray) displayed their 12T12 and 24T12 loudspeakers while ESART (Paris) concentrated on tuners and amplifiers. The ESART demonstration room was as remarkable for its metal-pyramid decor as for the sound emerging from the E50 loudspeakers.

Ferrograph displayed a 27 cm version of their Series 7 recorder; three speeds and a free explanation of why Ferrograph are still using

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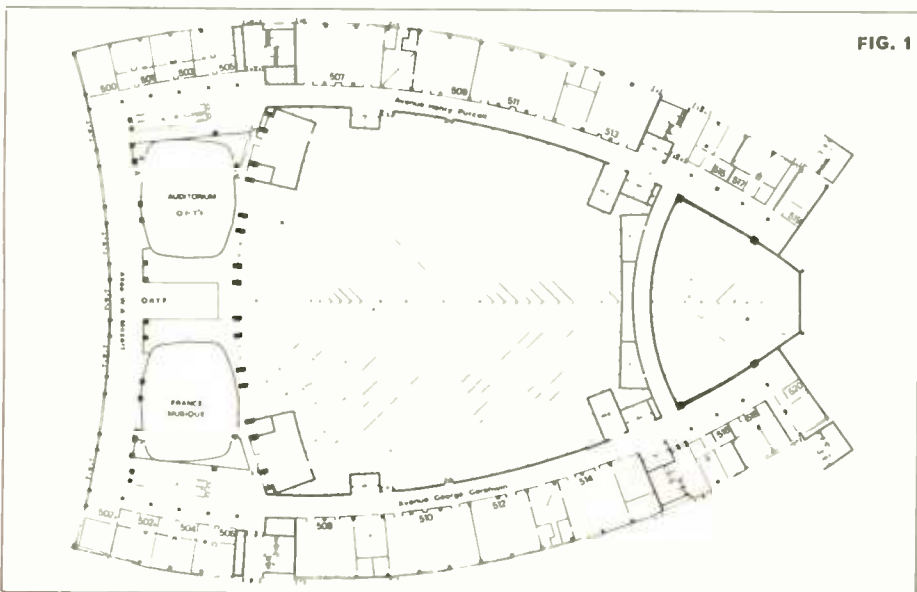


FIG. 1

APRS 74

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pressure pads. Whatever the theories against such pads, the writer's 7 is the only machine he has found capable of ironing the crinkles out of mangled tape. Alongside this recorder, the *S75*, was Ferrograph's 60+60 stereo amplifier and a successor to the Wearite head deflexer—the *D2*.

Filson (Paris) exhibited an exceptionally wide range of tuners, amplifiers and loudspeakers. Their *FJ100* power amplifier was perhaps unique among the Festival exhibits in employing valves. Most powerful of the Filson loudspeakers was the 25 kg *70W Controle*, employing one 315 mm, one 170 mm, and two 25 mm drivers within 380 x 650 x 420 mm cabinet dimensions.

Frank (Frank-Radio Union, Brussels) displayed their *875* audio control unit, remarkable only in that it parodies the style of a studio mixer. Twelve straight faders along the near edge of the unit govern input mixing and left/right bass and treble, four of the eight input channels having independent lf and hf tone controls. Panel size is 600 x 300 mm and the depth 100 mm.

Gego (Mer) demonstrated a complete system comprising *GP* gram unit, *GAT225* tuner-amplifier and *GES* loudspeaker, the latter incorporating two drivers (210 and 25 mm) and rated at 30W.

GP Electronic (St Denis) concentrate on amplifiers and offered two designs—the 2 x 12W *AS216* and 2 x 18W *AS230*.

For original styling, **Helium France** would be difficult to surpass. They carried the French partiality for spheres beyond the realm of loudspeakers to entire system cabinets. The *Regie 1003* comprised an *ERA 555* gram turntable, *ADC 550XE* pickup, tuner and 25W amplifier in a hemispherical plinth with hemispherical Perspex lid. A similarly neat leg arrangement prevented the *1003* from rolling away.

Hencot (Bourg-La-Reine) manufacture three-speed NAB spool stereo tape recorders, their two basic series being the *800* and *H67*. Both

operate at 38, 19 and 9.5 cm/s and are produced in ½-track and ¼-track formats. Curious that **Henri Cotti & Cie** have no representatives in Britain though no doubt price has some bearing on this.

At the distal end of *Avenue Raymond E. Cooke (1610-1910)*, Kef demonstrated their *Reference 104*, *Chorale*, *Concerto*, *Cantor*, *Cadenza* and mini *Coda* loudspeakers. A brief discourse upon how one defines a 'monitor' concluded with the realisation that Kef didn't know and **STUDIO SOUND** didn't know either; beauty is in the ear of its beholder.

Kontakt (Le Pre-Saint Gervais) exhibited their *T304* tuner, *V304* amplifier, *ST400* tuner-amplifier and *C7* 'chaîne compacte'. The latter comprised a Dual *1218* gram turntable, Shure *M91MG* pickup and Kontakt electronics.

LEM (Chatillon) displayed examples of their wide variety of microphones, a range now including electret units. Since the death of their former British representative, the company have had no agency in these islands. This seems unfortunate since the LEM range includes such specimens as the *CMU506* capacitor microphone, selling in France at approximately £54. Other units include the *DO42* lavalier dynamic at £38 and *DU70* unidirectional dynamic stick at £59.

Linear Speaker (Orgeval) showed a range of loudspeakers and drive units, including the *L1052* enclosure weighing 20 kg, measuring 660 x 360 x 320 mm and containing three drivers (250, 140 and 50 mm). Claimed power capacity was 45W.

Neophone (Paris) were another company exhibiting amplifiers, loudspeakers and disc reproducing systems. In the latter category, the *Neomusic 2 x 20W* comprised a turntable with Shure *M447* pickup, Neotuner, Neoamplifier and two Neospeakers.

Visitors to the **Pathe Marconi** (Courbevois) room were confronted by a dummy *PA128* amplifier rather larger than the 460 x 365 x 160 mm original. Fig. 3 shows the beast, two colour television lissajous displays taking the place of the programme level meters. The amplifier itself is rated at 80W into 8Ω.

Power (Vincennes) meant amplifiers with

ratings of up to 2 x 150W (unspecified load) from the *SAP270* replete with front panel VU meters.

J. M. Reynaud specialised in loudspeakers, rectangular and curved. Weighing 50 kg, the 60W rated *2008* was the largest of their designs. This utilised eight drive units: two 200 mm, four 130 mm, one 37 mm and one 24 mm. Overall dimensions were 410 x 740 x 445.

Sciencelec (Mer) demonstrated their *Club P* gramophone turntripod and a variety of amplifiers and tuners. These were heard through the company's *Eole 250* loudspeakers, rated at 30W and incorporating a 210 mm and a 25 mm driver.

Siare (St Maur-des-Fossés) meant loudspeakers, ranging in size from the 4.7 kg (400 x 260 x 195 mm) to the 40 kg *Delta*, the latter rated at 80W and containing four drivers: two 310 mm, one 170 mm and a dome tweeter.

Sonic (Paris) exhibited their *AFP200*, an integrated amplifier of unusual styling capable of delivering 100W per channel into 8Ω. These were heard through *FB1PH* and *NB50S* loudspeaker by the same company.

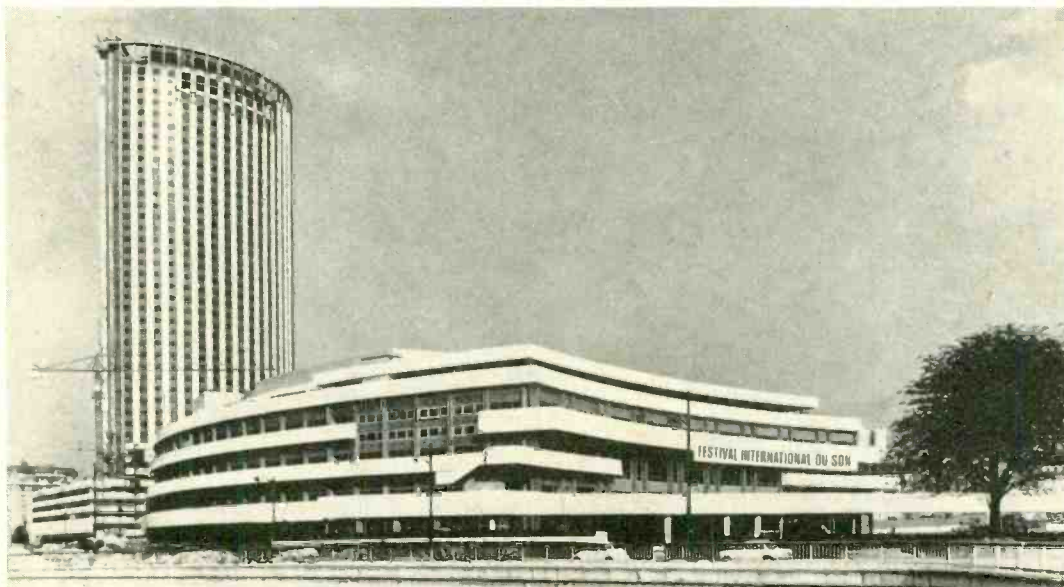
Speed Electronic (Paris). Another amplifier, another loudspeaker. The *SE200* fed up to 20W per channel (4Ω load) into two *SE20* enclosures, the latter measuring just 250 x 250 x 250 and housing single 170 mm drive units.

Teppaz displayed a variety of compact disc reproducing systems, tuners and loudspeakers. Model *2500ES* comprised a BSR *810* turntable with Shure *M75* pickup atop a 25W ps channel tuner-amplifier, plus two loudspeakers. Platter weight of the turntable was quoted as 3,900 kg ... some turntable.

Titan Electronique (La Plaine-St Denis) also exhibited disc reproducing systems but based on their own turntables. Most elaborate of their variants was the *HF40* rated at 20W per channel.

Voxson: two amplifiers, one tuner, a tuner-amplifier and the *B311* loudspeaker. Of the amplifiers, model *H305* was the most powerful in being rated at 2 x 50W.

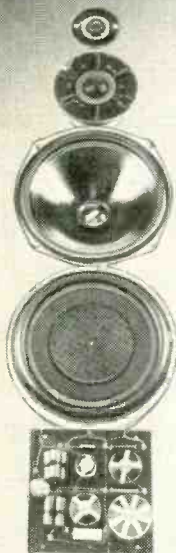
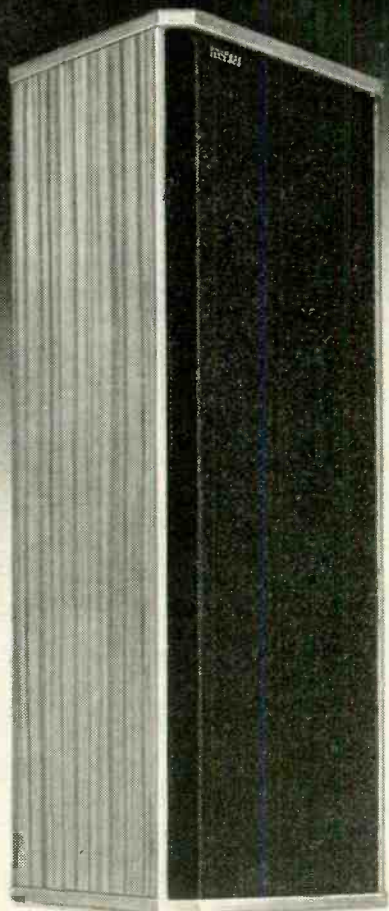
Which concludes a very watts-conscious report on the 1974 Festival du Son, written to a very tight deadline.



The Palais des Congrès, Porte Maillot.

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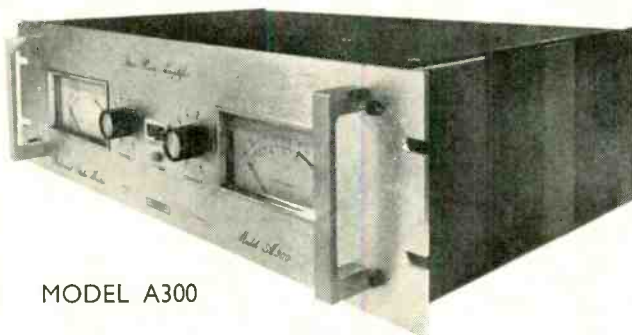
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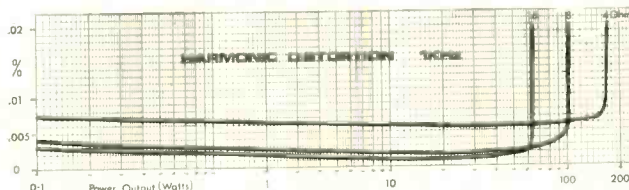
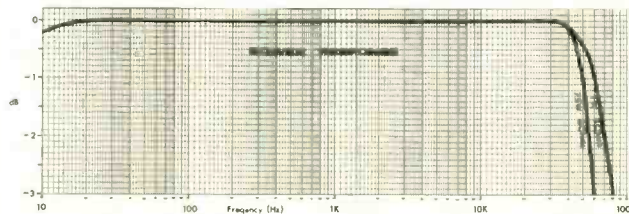
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During many months of last year, studios seemed to be opening at the rate of one a week. Denis Comper gives some business advice that may help to prevent them closing at the same rate this year.

The economics of sound recording studios

DENIS COMPER

SO, YOU'VE had the idea of starting a recording studio. You have good reasons. To put it simply your market research shows sufficient demand for the facilities to be offered to generate a rate of cash flow to pay the overheads and make a satisfactory return on capital. You decide to go ahead. Well, what now and what next?

It is easy to say, as many do, that any business is the same as any other business. Like all generalisations this is not only a half-truth but downright misleading, particularly when applied to recording studios. Of course, things like book-keeping and paying the Inland Revenue are much the same but studios require very special skills both psychological and technical, to say nothing of a good pair of ears. Studios differ too from each other in such particulars as acoustics, facilities, that important intangible 'atmosphere', and the personalities of the people who run them.

With the number of new recording studios increasing steadily, and more on the way, this is a good time to take a look at some of the problems and pitfalls awaiting the unwary or the inexperienced. Not that this piece is intended as any form of discouragement—far from it. Running a successful studio is an exciting and rewarding challenge but it can only be successful if the running is done in the right direction and according to the rules of the game.

There should be a tidy and logical sequence for all the functions to be performed and the little rituals to be danced when starting up a business. If there were, the whole thing would be too easy to be worth the effort, all the fun would go out of it, and a lot of professional people would be on hard times. Not so much a logical sequence as a pattern of events, some happening together and others separately; all generating problems. A start must be made with something if the dream is to become reality. Why not begin by recruiting the services of two people without which no business can be run comfortably? In no order of importance but first an accountant used to dealing with your kind of business. No good having one who is a wizard at mergers and flotations and cannot get with the nitty-gritty of a small operation, lacking the connections and contacts invaluable to you during the start-up period. Second a lawyer who suits your particular requirements and who knows his way through the jungle called Music Business. There is also a third man essential to confident trading—a sympathetic bank manager, and it is to be hoped he will be more frequently engaged in pouring out the sherry than sending out curt notes about overdraft limits. Under no circumstances, whether by ignorance on your part or simply by default, must you permit either your accountant or lawyer to attempt to run your business for you. The bank manager will never interfere, unless he forecloses or he puts a receiver in.

Bank managers are easy and pleasant people to deal with, provided they are kept fully informed and in advance of events. The same goes for accountants and lawyers too but with a difference. They are 'instructed' by their clients so that they may 'advise'. In order to instruct it is necessary for you to know the subject. With the accountant this can mean just a day-to-day working knowledge of how

to keep the books, control the stock, and pay the overheads, wages and taxes. More than that will depend on how much you expect your accountant to do for you. The more he does, the more he will charge, but it can be well worth it. Your time has a price too, remember.

A good lawyer can be a great help and comfort particularly during the planning and start-up phase. It is true to say, though, that he can only be as good as his client's instructions. This means you must have knowledge of the law as it affects you and your business. It is disturbing to find so many business people operating in sublime ignorance of laws which have been enacted for their protection, benefit and welfare by their elected representatives in Parliament. With such people all can go well for a long time until they suddenly find themselves deep in legal trouble which could easily have been avoided. Then they rush off to a lawyer, expecting him to put all to rights at the stroke of a pen like the sick man who waits until the illness is terminal before asking the doctor for a cure in a bottle of pills. How are you to know which laws are relevant to your business activities? Well, why not ask your lawyer? The local public library will lend you the books. Be warned—a little knowledge is a dangerous thing. The law may be an ass but it has a powerful kick.

To decide on the appropriate structure for your business is not difficult if careful thought is applied to the problem. Whatever decision is made, you must take into account the first three years expansion projection. If your business is to grow very rapidly, it is bad not to have a structure which will carry the growth. Little businesses and big businesses compare not by size but by kind; it can be most inconvenient to have to change the kind of structure within a couple of years. On the other hand it can be just as bad to go big straight off, perhaps too big for you to cope with all at once. Your expansion projections may be wisely modest. Is it to be, then, a one-man operation with yourself as first and senior employee? Many studios are run very successfully with the minimum of headaches on this pattern. One thing to be avoided is the hand-in-the-till method of trading. Many one-man businesses get into awful trouble through this. Heed your accountant's advice, always keep a trading account and a separate private account, and don't pay for things out of the one which should be paid for out of the other.

Partnership

Perhaps a partnership is what you have in mind. This will only work happily, and go on working, if a proper partnership agreement is drawn up by your lawyer at the very outset and, to avoid possible conflict of interest, by lawyers acting individually for each of the other partners. Long-term friendship is much to be cherished, but don't rely on it in business. The partnership agreement when signed must be accepted by all parties without qualification or mental reservation. Never make the mistake of tolerating some minor objection just to get the project off the ground in the hope that all will come right in the end because it hardly ever does. Rather scrub the whole deal than risk a fatal disagreement when the money comes rolling in. A successful business can

only have one ultimate boss. Let there be no argument about who is senior partner.

A limited liability company could be the answer, particularly if you are looking for finance. The very last reason for this choice should be your wish to be a company director. Better by far to be a humble employee with a profits related service contract, having built-in options, than a permanently worried, kicked around, sat upon, over taxed, insecure, under paid director (there is no other sort), but if you must be then you must. The company structure will depend in the main on how it is to be financed and you will be wise to seek advice. A limited liability company has certain trading advantages, it would seem, if only in that its suppliers have confidence in the knowledge that its behaviour is governed by the Companies Acts and its records can be examined at Companies' House on payment of a small fee—anyhow that's the theory.

Sufficient resources

Without money nothing happens. Henry Ford, who said a lot of things, maintained that nothing happened in the world until the First Man sold something to the Second Man. Different words with the same meaning. Whatever form your business is to take, you will need money. If you have sufficient resources to provide self-finance so much the better, except that it isn't always a good idea to use your own money. After all, you are going to make a vital contribution in the form of educated management, and banks are there to sell money to worthy purchasers. Whatever the source of finance is to be, even yourself, a good sales proposition (a Proposal) must be prepared to convince all concerned, including you, that the studio idea really is worth risking the money. All business is a bit of a gamble, it is up to you to keep the odds short. If the source of the money is to be other than your own resources, be it a Bank, a Finance House (Merchant Bank) specialising in high risk venture capital, or a private individual looking for an interesting out-of-the-ordinary investment, your chances will depend on how well the Proposal is presented. In any selling situation good first impressions are essential to ultimate success, and your Proposal must give that good first impression to your intended backer. The preparation of the Proposal is not quite the job for either your accountant or your lawyer, though a few are very good at it; rather a combination of the skills of both garnished with experienced salesmanship. You may decide to call in the help of a specialist. Choose potential backers with the greatest care, and study the terms on which finance may be offered very, very carefully.

How much money will be required depends on many factors. Whatever you estimate the original sum to be the end result will likely cost 50 per cent more. It can be as bad to budget for too much as it is to seek too little, although it is true that the ease to difficulty differential is in inverse proportion to the amount to be borrowed, which is bankers' talk for saying the more you want the easier it can be to get it, provided, always provided, the Proposal is copper-bottomed and watertight.

No good trying to start a studio if you have nowhere to put it. Premises are needed and,

when found, will be a prime feature of the Proposal. Perhaps you have the very place in mind, right location, good access, adequate floor area and so on, just like an estate agent's handout. There is a whole family of problems associated with premises and the head of the family is planning permission.

Obviously, at a very early stage in your deliberations, you will have considered premises or a site and found what you consider to be the right place, at the right price, on the right terms. However suitable it may be from your point of view, unless it is an existing recording studio established for a year or two and trading quite legally throughout the whole of that period, you will need a form of permission from the local council before starting operations—certainly before you are committed to purchase. What form of permission will depend on circumstances. If you want to erect a purpose-designed building on a vacant site, application for planning permission must be made, and this is a job for an architect. Suppose you wish to convert an existing building, which is more usual. Again this is a job for an architect, who will know what form of permission must be granted and consents given before work can even start, and he will know too how to keep the Borough Surveyor happy by observing all the regulations and bylaws, as well as a handful of relevant Acts. The serious problems arise when the intended premises are situated in a district zoned under the Town and Country Planning Act as a residential area. Take, for example, a de-consecrated church in a quiet residential street; it will be showing signs of delapidation and has become a target for vandals. Ideal for a recording studio you might think and saving it from ultimate ruin will be welcomed by the neighbours. The local planning committee may have other ideas. Not wishing to establish a precedent by allowing commercial/industrial activities to encroach on a residential zone, they will refuse your application for 'change of use' in favour of a Youth Club which will cause a great deal more disturbance to the neighbours than you would have done. Possibly the case with the least chance of success is the domestic conversion. The cellar in your house may be ideal for your studio but, unless you happen to live in a commercial/industrial zone, the chances of getting permission to convert and operate are extremely remote. To go ahead without permission is to ask for trouble and there is a lot to be had.

If you are one of those people who look upon the host of rules and regulations which order our lives merely as petty restrictions to be ignored whenever they are inconvenient, then running any sort of business is not for you. If you number among the thousands who run successful businesses with nothing more dramatic than the annual argument with the tax man, then read on.

Basic laws

While you will have acquired a working knowledge of the law as it affects the day to day running of your business, helped by advice from your lawyer now and then, there are some basic essentials which must be dealt with during the earliest period of planning. Not only will you be beholden to your local council

for permission to start operations, but also for the observance of a number of regulations of various kinds. Although, if you employ an architect he will deal with the actual technicalities, or maybe your lawyer will, it is important for you personally to establish a good relationship with the permanent staff in the appropriate departments of your local council. They cannot make policy decisions, that is for the elected council members to do, but they can offer invaluable advice and guidance.

Official invitation

An Englishman's home is his castle. Well, maybe once upon a time that was true. Now there is a small army of officials who enjoy a permanent right of reasonable access particularly to business premises. About the only one who can't get in without a warrant signed by a magistrate is the poor old policeman, but you may invite him in. It's not a bad idea to invite all the others as well through the contacts you will have made at your local council offices. Then they all may come at the right time and just the once right at the beginning.

Who are all these officials? You must make sure of that for yourself. As they share interests and responsibilities it can vary from district to district but here is a guide. There is the Borough Surveyor who must approve building standards, including quite minor structural alterations to ensure everything is safe, not likely to fall down, and is adequately ventilated. The Public Health Inspector is also interested in ventilation, as well as drains, and whether you have suitable lavatories now that a converted building is to be occupied by more people than it was originally designed for. The Rating and Valuation officer will have to assess a new rateable value and as his calculations are necessarily arbitrary you may not accept his first figure as final. The Factory Inspector will want to see if you comply with the Acts where, and if applicable, and that you display certain statutory notices. The Fire Officer will check on fire-proofing, provision of extinguishers, exit signs, emergency lighting and whether there are enough escape routes with doors opening outwards. The man from the Electricity Board will require the mains wiring to be up to standard and will advise you on how to buy your electricity at the best rate. The man from the Water Board may be interested in inspecting the plumbing, if there have been some drastic alterations to original pipe runs, and he can certainly help to eradicate those tiresome clonks from the hot water system. All these officials have responsibilities which overlap each other and varying interpretations of the rules. Your efforts at co-ordination can reduce complications and the secret is to get them on your side right at the start. Although your architect will deal with most, if not all, of the officials concerned as part of his brief, you may not employ an architect and, even if you do, you will still be there after he has moved to his next job.

One fine body of men whose co-operation you need to cultivate is the Police. It is their duty to know just about everything going on in their area and they appreciate being told without having to find out. Running a studio lays you open to a number of irritations

CHADACRE PH950

By Hugh Ford

MANUFACTURERS' SPECIFICATION:

Supply voltage: $\pm 9V$ dc to $\pm 15V$ dc.
Input impedance: 100 k Ω .
Control input impedance: 10 k Ω .
Control amplifier gain: 34 dB.
Output impedance: 1 k Ω .

To enhance the phasing effect a small amount of treble boost is incorporated.

Manufacturers: Chadacre Electronics Ltd, 63 Stratford Broadway, London E15.

Price: £28.50.

TO QUOTE FROM the information provided with the unit: 'This module was created to produce an effect which has become increasingly popular in modern music, and carries the name of *phase*. The sound may be compared to the variation of a jet aircraft as it traverses the sky at high speed.'

The purpose of the unit is not to construct a miniature electronic Heathrow Airport in the studio but to provide an effect akin to severe fading of a radio link. In fact, listening tests with the Chadacre module gave virtually identical effects to a very bad hf link, including the distortion that is present when severe fading occurs.

As may be seen from the manufacturers' specification, this unit is supplied as a module without power supplies. The module consists of a good quality printed board with solder pin connections for inputs and outputs and two potentiometers which are mounted by their tags to the board. All components are of industrial quality and other than resistors and capacitors include two field effect transistors and five type 741 operational amplifiers.

Reference to the block diagram (fig. 1) shows that the audio input is first fed to a buffer

amplifier, the output of which is split so that one output of the buffer feeds the unit's output. The second output of the buffer is fed to two voltage controlled delay equalisers in series, from where it is mixed at the units output with the signal from the input buffer amplifier. The resulting output depends upon the signal frequency and the total phase shift introduced by the two voltage controlled delay equalisers.

The delay equaliser may either be controlled from a variable frequency triangular waveform generator, or may be controlled from an external ac or dc source fed to the equalisers from a buffer amplifier with a nominal 34 dB gain.

The measured performance

Initial measurements were directed to the performance of the unit with no phasing signal applied. The input to the phasing buffer amplifier was therefore disconnected. As no input or output levels are specified it was thought wise to attempt to determine suitable levels. Power supplies were connected at the maximum rated voltage of $\pm 15V$, the audio output loaded with 600 Ω and a 1k Hz signal applied to the input. Attempts to determine the output clipping level failed, as an enormous amount of distortion occurred well below clipping point, and the following figures show the distortion level with the 'response' control set so that minimum distortion occurred. Distortion showed a very substantial increase when this control was operated.

Input level	Third harmonic	Second harmonic
+10 dBm	5.8%	4.6%
0 dBm	2.2%	4.4%
-10 dBm	less than 0.05%	0.21%

These figures show that the unit is hardly usable at inputs above -10 dBm; however, noise in the output was measured at -85.4 dBm [-92.5 dBm(A) weighted], which shows that there is a fair dynamic range available, the units overall gain being in the order of zero.

Fig. 2 shows the distortion in the output signal with a 1 kHz input at 0 dBm and that, when the fundamental is phased out, the

distortion components rise at a most alarming rate. The second harmonic rises to -18 dB relative to the original output level, the third harmonic going through the most peculiar antics around the maximum rejection point.

Input and output impedances were found to be virtually as stated in the specification at 100 k Ω input impedance and 1 k Ω output impedance. The latter is too high and can be lowered by simply changing a couple of components.

The remaining part of the unit is the internal triangular waveform generator, which was found to be variable in frequency from a full cycle occupying 1.2s to a maximum of 14s. Supply voltage had very little effect upon this timing and the waveform was reasonable triangular as fig. 3 shows.

The power requirements were 17 mA at $\pm 15V$ supply, or 10 mA at $\pm 9V$ supply, which should give something around ten hours operational use if the unit were powered as suggested from PP3 batteries and assuming a few hours use each day.

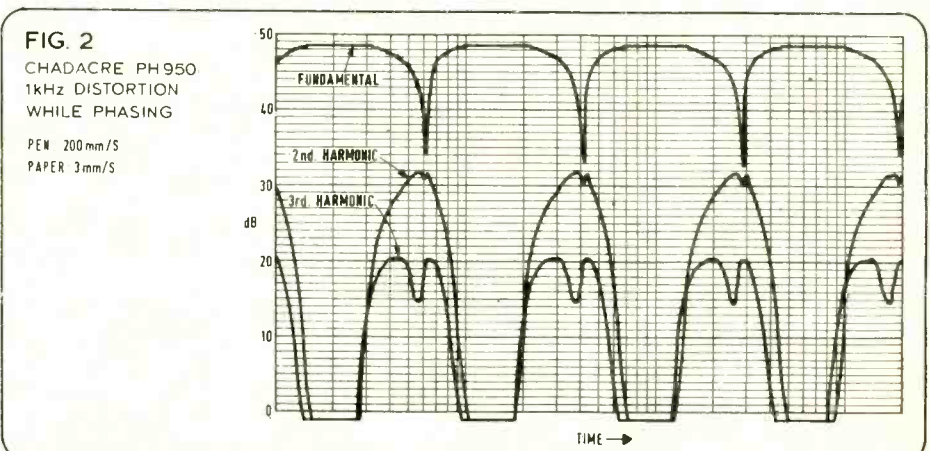
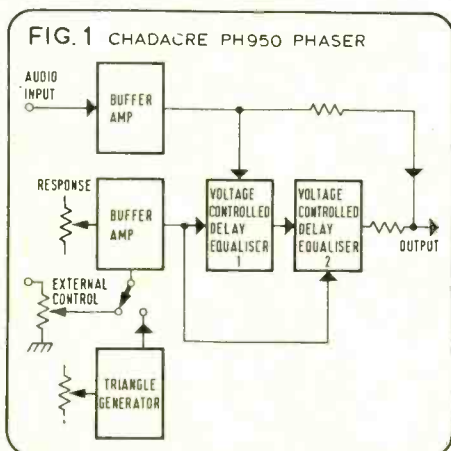
FIG. 3



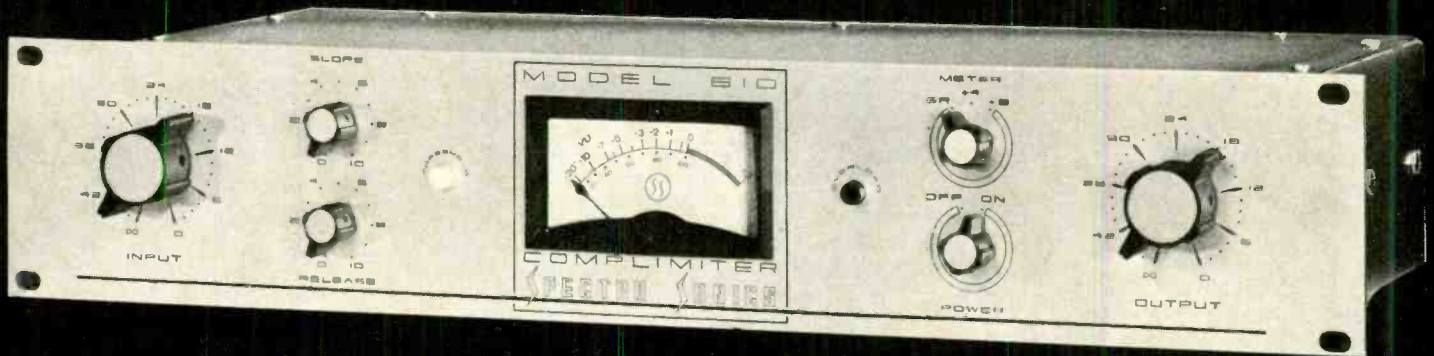
Summary

The Chadacre instant-phasing module certainly does not come into the bracket of high quality sound processors. This has already been shown and is even more clearly demonstrated by fig. 4 which is a plot of the frequency response with the unit 'phasing' as the plot progressed.

64 ▶



NUMBER 1!



"COMPLIMITER"™

PERFORMANCE: The SPECTRA SONICS Model 610 "COMPLIMITER"™ can accomplish, independently or simultaneously, limiting and compression functions with performance that is unequalled by most *linear amplifiers*. The minimal noise inherent in this system assures a low threshold of -40dBm and permits an input sensitivity substantially greater than other systems. Through the use of the most advanced circuitry, the Model 610 "COMPLIMITER"™ has the fastest attack time (100 nanoseconds to 2 microseconds). The "COMPLIMITER"™ allows undistorted recording and transmission at levels that are measurably higher than those commonly in use. In tape recording, for example, this "limiting only" mode eliminates approximately 6dB usually set aside for tape overload protection.

RELIABILITY: The extensive use of the "COMPLIMITER"™ in the audio industry confirms the highest order of confidence in reliable, consistent operation.

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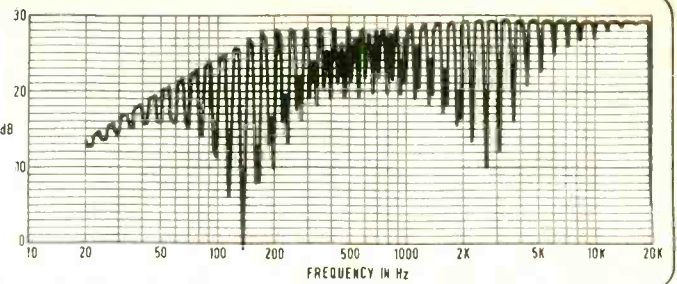
CHADACRE PH950

Maybe this unit has applications with the more extrovert form of Pop music but, to be quite blunt, I do not like the noise it makes and regard measurements on it as rather a joke. I know that there are many people who cannot live without distorted sound and they may like this device. This taste is not a matter for engineers, who can make more interesting things with the £6 worth of components.

H. D. Ford

FIG. 4
CHADACRE PH950
FREQUENCY RESPONSE
WHILE PHASING
RESPONSE CONTROL
FULLY ANTICLOCKWISE

PEN 200 mm/S
PAPER 1mm/S



BRUEL & KJAER 2426

By Hugh Ford

MANUFACTURERS' SPECIFICATION

Voltmeter range: 1 mV to 300V full scale deflection. **Scale ranges:** 0 to 3.5V and 0 to 11V. In 'Auto' mode, the range shift occurs at approx. 2.5V and 10V. A certain 'hysteresis' is built in to secure stable reading in the shift areas.

dB range: -80 dB to 50 dB; referred to 1V.

dBm range: -80 dBm to 52 dBm; referred to 0.775V (1 mW in 600Ω).

Input impedance: 1 MΩ across 47 pF (in all ranges).

Frequency range: Fast Mode ±0.2 dB from 20 to 200k Hz, ±0.5 dB from 200k Hz to 500k Hz. Slow Mode ±0.2 dB from 2 Hz to 200k Hz, ±0.5 dB from 0.5 Hz to 500k Hz.

Indication:

Rms: True reading of signals with crest factors up to five. Averaging time, fast: approx. 270 ms slow: approx. 3s. External capacitor: 1s per 2.5 μF.

Peak: +peak, -peak, max peak and peak hold functions selectable on front panel. External reset via socket on rear panel. External time constant and rise time via socket on rear panel.

Average: Fast (according to standards for VU measurements). Slow.

Rectifier characteristics: Dynamic range 40 dB. Accuracy +10 dB to -20 dB: ±0.5 dB; -20 dB to -30 dB: ±1 dB.

Reset function: Manual by knob on front panel or automatic via socket on rear panel.

Amplification: 60 dB to -50 dB in 10 dB steps.

Attenuator accuracy: Better than 1%.

Meter scale accuracy: Better than 1% at full scale deflection.

Signal outputs: AC: 1V ±2% for full scale deflection. Output impedance approx. 100Ω.

BCD data socket: Output: 8-4-2-1- BCD signal with range information. Input: BCD signal for external range control

Signal-to-noise ratio: 10 mV to 300V greater than 60 dB. 3 mV greater than 50 dB. 1 mV greater than 40 dB.

Power supply: 100 to 240V, 50 to 400 Hz, 9W.

Hwd dimensions: 133 x 140 x 200 mm (KK 0024 cabinet).

Weight: 2.3 kg.

Accessories available: Meter Scale for dBm measurements (SA 0166); meter scale for VU measurements (SA 0169).

Price: £306.

Manufacturers: Bruel & Kjaer, DK-2850 Naerum, Denmark.

Agents: B & K Laboratories Ltd., Cross Lances Road, Hounslow, Middx.

BASICALLY THE B & K 2426 voltmeter is an autoranging version of the 2425 voltmeter which was reviewed in the November 1973 edition of *STUDIO SOUND*. However, in

addition to the autoranging facility there are a number of other features which have been modified.

As a result of the autoranging function, the methods of range indication and of range selection when the automatic function is switched out of circuit are unconventional. The range in use is indicated by a series of 12 miniature neon lamps located behind the meter scale plate, with appropriate calibration in 10 dB steps on the scale plate; this system gives excellent readability and ensures that there is no possibility of confusion when the alternative meter scales for dBm measurement of VU measurement are in use.

Range selection in the 'Manual' mode is achieved by two spring-loaded pushbuttons identified as 'up' and 'down'. Each time a pushbutton is operated, the range changes in a 10 dB step up or down as the appropriate button is depressed. When in the 'Auto' mode, the range changing occurs in the downwards direction as the meter approaches 25 per cent full scale deflection; and in the upwards direction at approximately 100 per cent full scale deflection. As a result of the fact that the automatic range changing function is controlled by the output of the instrument's rectifier system, the speed with which the automatic range change occurs is controlled by the measuring mode selected. This has the result that the change point corresponds very closely to the above-mentioned meter deflections, irrespective of the shape of the input waveform.

This means that in the fastest metering mode the range does not switch erratically until the meter is presented with a large mark-space ratio waveform; for instance, the interval between full scale tone bursts has to be increased to about 4s before erratic switching occurs. If it is then necessary to switch to the manual mode or to change to the slow metering time constant. When using the rms or average 'fast' modes, the range switching in the upwards direction is virtually instantaneous and in the downward direction it is completed within a few seconds.

So much for the automatic range selection. It is an extremely useful facility for 'hands off' measurements and, in particular, the instrument works as an automatic multirange VU meter in the 'fast' and 'average' rectifier condition. As a side product of the autorange facility, it is possible to select range by remote control via the rear panel DIN socket which also has connections for external time constants and a dc output providing 1.10V corresponding to full-scale meter deflection.

When in the 'auto' mode of operation, the

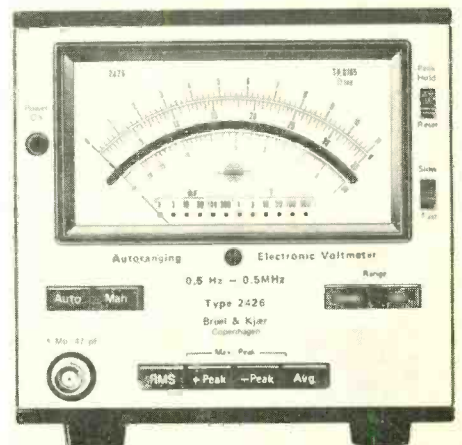
four BCD data lines used for remote range selection can be used for remote range indication. Unlike the manual version previously reviewed, the type 2426 cannot be operated from an external dc power supply. With the remaining exception that the full-scale deflection has been increased by ten per cent, the instrument is identical to the manual version previously reviewed.

Because of this similarity, I did not feel it appropriate to undertake a full set of performance measurements for this brief review but did make the point of doing a number of spot checks in case something had altered in the design. No deviations from specification were found.

At a cost of £306, this is no cheap millivoltmeter but it offers facilities which to my knowledge are not found in any competitive instrument. It can be used as an autoranging VU meter with a genuine average rectifier characteristic and standard ballistics. It also offers genuine rms measurement plus a very fast peak measurement which can indicate either positive peak, negative peak or maximum peak.

From an audio point of view, there are limitations in that the basic sensitivity of 1 mV full-scale deflection is on the low side and that the instrument does not have facilities for any filters such as an 'A' weighting network or band pass filtering.

The autoranging facility worked very well and I have no complaints in this direction. While autoranging may be a bit of a luxury for general laboratory use, it certainly can save a considerable amount of time with many forms of production line testing.



REVOX

HS 77



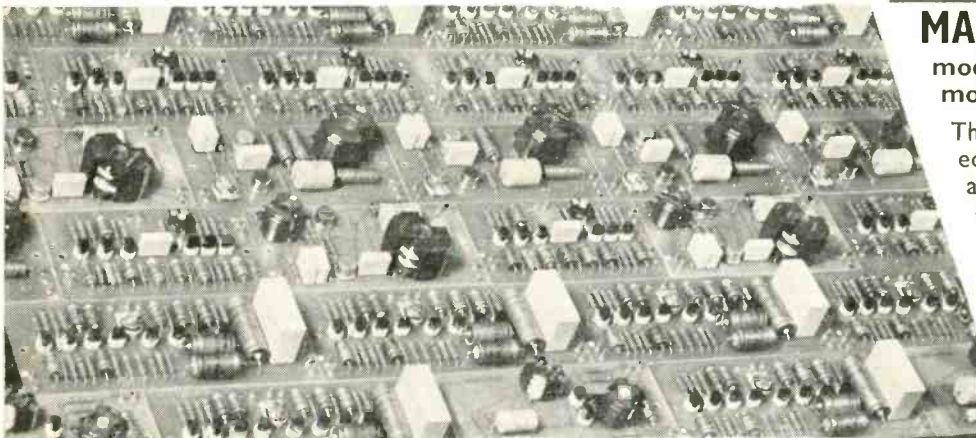
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STUDIO ECONOMICS

mainly caused by the behaviour of your customers, the very people who keep you in business; a fact never to be forgotten. Not that they will misbehave deliberately but some can be thoughtless of the rights of others, especially when in high spirits after a really great session. Things like Nuisance, banging car doors in the dead of night; Obstruction, blocking the pavement with drum kits and amps while loading the van, or parking in the wrong place; even Trespass and Breach of the Peace. There is always somebody around ready to make a complaint, justified or not. As the job of the Police is to defend the law rather than to prosecute after the law has been broken (in other words they are there to keep

the peace), they will give you all the help and advice they can and that is very considerable. You only have to ask.

"Put the strength of the Insurance Companies around you!" intones the voice of Deryck Guyler while the effects man bangs on a dustbin lid. What happens if you fall ill or, perhaps worse, your ace engineer is run over by a bus and a whole series of sessions is cancelled because the customer will only work with him and no one else. Even worse than that is when the lead singer of the number one group in his ecstasy trips over your mic cable and breaks a leg on the eve of a million dollar tour. Oh yes, you must be well insured. There is certain insurance you are required to have by law and insurance you should have for your own protection. With the help of your accountant get a top class Lloyds broker to advise you. It doesn't cost that much, it's tax deduct-

ible, and worth every penny for peace of mind alone.

Meanwhile, back at the studio, you will have been dealing with another family of problems concerned with equipment, acoustics and how to present your facilities as an attractive package to eager customers. All that is another story, but the day will come when you sit proudly at your gleaming control console with everything checked out, and working the way you want it. The musicians will be tuned up ready to go. Reach for the start button, on to record, slate 'section one, take one', red light on, and high above the music coming from the monitors, in the back of your mind, will sound the satisfying clink of the cash register. And have you ever thought of how many people look upon their jobs merely as a source of sufficient income to enable them to do something else?

QUADRAPHONICS

compatibility or other desirable properties. Lastly, we have D-format ('decoded' format) which is the set of signals fed to the listener's loudspeakers to produce a correct subjective effect in the listening area. The D-format signals can be chosen in a fashion largely independent of the C-format coding used to convey the information to the consumer.

At first this seems an absurd complexity but it should not in fact make life difficult. For most of his working life the recording engineer will handle A-format and only the circuit designer need know about B-format which is a sort of four channel 'sum-and-difference' signal. Moreover the conversion circuitry is simple and the formats have been chosen for minimum complexity and maximum compatibility with present-day 'discrete' signals so that no sudden revolution in the recording methods will be required. D-format will only be needed in the studio for monitoring and is necessary if the best and most accurate reproduced effect is required. For a rather less accurate effect, A-format may be fed directly to the loudspeakers. As at present, the coded format (C-format) on disc or radio is different from

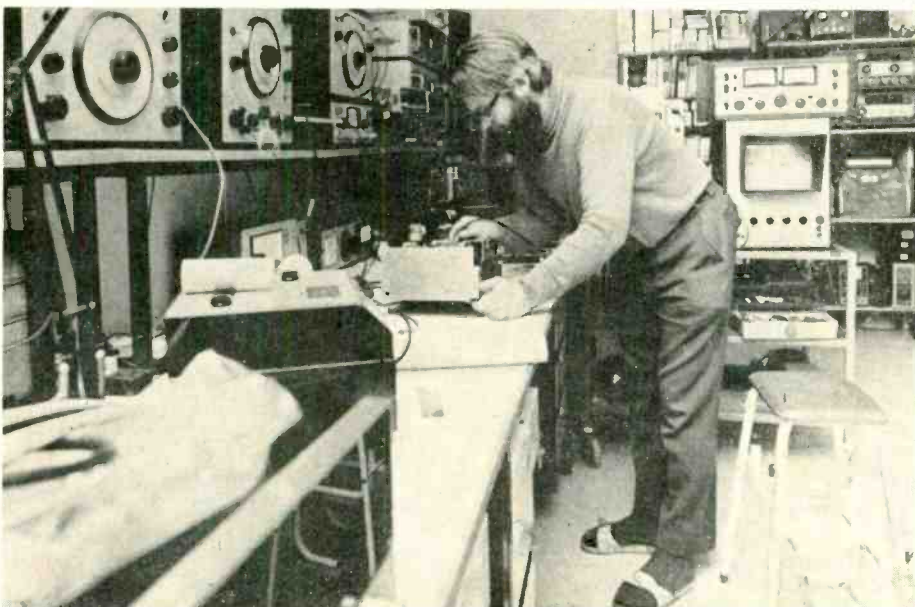
the signal format used in the studio, and may be chosen to be compatible with most current 'matrix' or 'discrete' coding methods. The D-format signal in the listener's home will depend on the cost and complexity of his decoder but can be chosen for results greatly improving current methods.

To summarise, present studio quadrasonic processing equipment, designed for the so-called 'discrete' effect, gives very poor and unstable phantom sound images. A new generation of systems (called kernel systems) and associated studio signal processing equipment are under development in various countries to overcome these problems. A new approach based on the study¹⁰ of the human hearing system has isolated those systems capable of results far more effective than discrete systems, which suggests which systems should be used and how they should be 'decoded' via four or more speakers for best possible results both horizontally and for sound in a three dimensional space including all directions and all distances. Studio signal handling formats designed to minimise problems and maximise inter-equipment compatibility are at the moment being studied and finalised, so as to avoid the mess that lack of

standardisation would cause.

The technical approach outlined in the above will hopefully break the impasse caused by 'quadrasonic' approaches which could not even give reasonable results on master tape, barring 'interior' and the four corner positions, except if the listener were precisely central. The approach has been conceived so as to permit the creative producer a freedom of sound control not existing in 'discrete' approaches, including the full dimensions of three-dimensional space, 'interior' in-the-head effects, closeness, and the ability to move and modify whole fields of sound as well as individual sounds. These same features permit 'realistic' ambient concert hall recordings to be made with improved realism (reckoned by some to be as great a step beyond the best quadrasonic as that is over the best stereo), and with a flexibility of control not hitherto possible.

While the range of possibilities are such that they are never likely to be exhausted, the technical understanding of psycho-acoustic kernel systems is now sufficient to point the way to removing many of the 'bugs' that have seemed inevitable and incurable in previous approaches.



The Hugh Ford test facility.
See *Equipment Reviews*.

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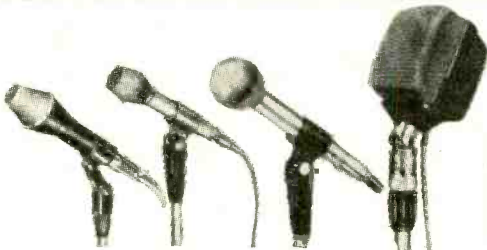
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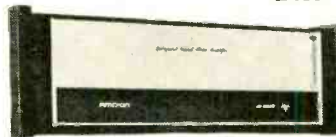
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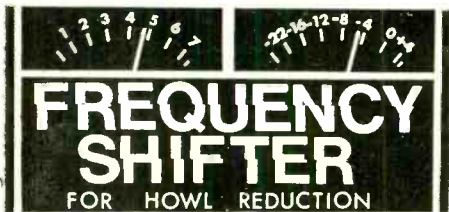
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INDEX TO ADVERTISERS

Acoustico Enterprises Ltd.	9	D.B.X. Incorporated	21	Quad-Eight	71
Action Video Ltd.	35	Dixons Technical Ltd.	17	Raindirk Ltd.	23
AKG Equipment Ltd.	7	Ferroglyph Co. Ltd.	27	Revox	72
Alice (Stancoil) Ltd.	8	Francis, J. J. (Wood Green) Ltd.	10	R.E.W. Audio Visual Ltd.	67
Allen and Heath Ltd.	6	Franz Vertriebsgesellschaft m.b.H.	15	Rola Celestion Ltd.	59
Allotrope Ltd.	43	Fraser-Peacock Associates Ltd.	36	Rumble Ltd., C. H.	53
Apollo Electronics	16	Future Film Developments Ltd.	16	Sagamore Publishing Co. Inc.	55
A.P.R.S.	57	Grampian Reproducers Ltd.	20	Scully-Metrotech	13
Audio Design Recording	45	H. H. Electronic	12	Sescom Inc.	8
Audio Developments	14	Industrial Tape Applications	11, 20, 65	Shure Electronics Ltd.	19
Baileys	16	Keith Monks (Audio) Ltd.	47	Spectra Sonics	63
B.A.S.F. (United Kingdom) Ltd.	49	Klark Teknik Inc.	37	Starman Tapes	20
Bauch, F. W. O., Ltd.	27, 53	Macinnes Labs Ltd.	4, 23	Sulamoss Ltd.	12
Beyer Dynamic (G.B.) Ltd.	18	Magnegraph	65	Theatre Projects (Sound) Ltd.	16
Bias Electronics Ltd.	20	Magnetic Tapes Ltd.	10	Trident Audio Developments Ltd.	5
Brenell Engineering Co. Ltd.	45	Miniflux Electronics Ltd.	65	Turner Electronics Ltd.	53, 59
Cadac (London) Ltd.	2	Mustang Communications	10	Turner, Ernest, Electrical Instruments Ltd.	14
Communication, Accessories & Equipment Ltd.	45	Naim Audio	8	Zoot-Horn Ltd.	33
		Neve, Rupert, & Co. Ltd.	25		

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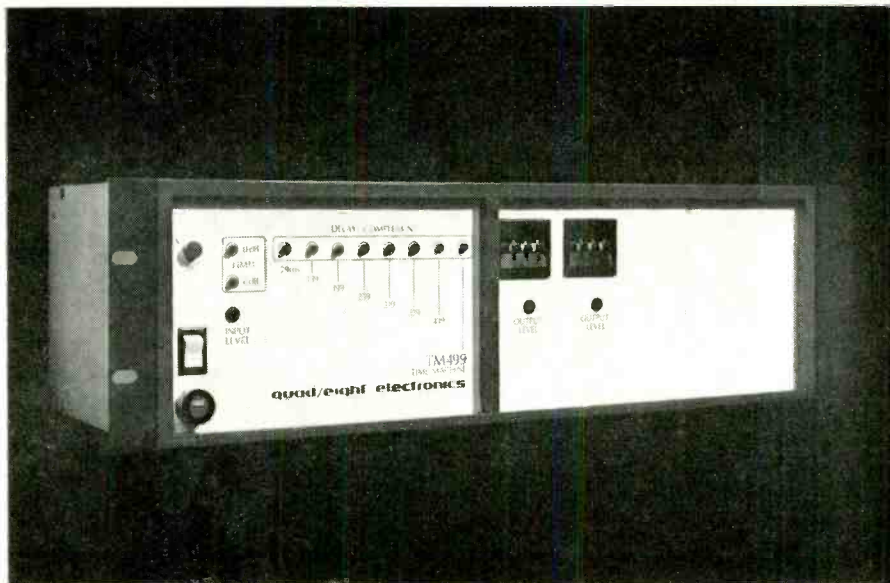
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