

February 1991

\$5.00 £2.00

A LINK HOUSE MAGAZINE

# STUDIO SOUND

AND BROADCAST ENGINEERING

**AES PREVIEW  
PARIS**





Metropolis is one of the most prestigious recording studios ever designed. And within it, you'll find the ultimate in audio equipment.

The new Focusrite studio console.

It embodies Focusrite's commitment to the highest standards of sonic purity.

When compared with the approach taken by Metropolis, it becomes apparent that they have shared the same vision.

To create the finest recording environment in the world.

An experience we're sure you'd like to share.



## No Compromise



NOTHING SHORT OF EXCELLENCE

FOCUSRITE AUDIO ENGINEERING LIMITED, UNIT 2, BOURNE END BUSINESS CENTRE, CORES ENO ROAD, BOURNE END, BUCKS SL8 5AS, ENGLAND. TELEPHONE ++44 (0)628 819456 FAX ++44 (0)628 819443  
AUSTRALIA: G U V T (02) 550 5548 BENELUX: TEM (02) 466 5010 CANADA: IMAGINATIVE MARKETING (514) 595 3966 DENMARK: SLT (01) 713 344 FRANCE: SCV (1) 48 63 22 11 GERMANY: THUM & MAHR AUDIO (02173) 78060  
HONG KONG: DIGITAL MEDIA TECHNOLOGY 601 4050 ITALY: AUDIO EQUIPMENT (39) 2000312 JAPAN: TIMELORD 10468) 73 6226 NORWAY: LYOROMMET (02) 37 0218 SWEDEN: TAL & TON (031) 803 620 USA: SONIC IMAGE (708) 653 4544



# STUDIO SOUND

AND BROADCAST ENGINEERING



Conversation with Quincy Jones

<b>Editorial:</b>	Studio Sound's viewpoint on events and trends, and their implications	<b>5</b>
<b>News:</b>	Events, news, moves and comment from inside and outside the recording industry	<b>7</b>
<b>Products:</b>	Information on new products, developments, upgrades and software updates	<b>14</b>
<b>Music News:</b>	Product updates and developments from another side of the business. Compiled by Zenon Schoepe	<b>21</b>
<b>Live Sound:</b>	Keeping abreast of live sound news and equipment.	<b>22</b>
<b>Maintaining Digital Audio Quality:</b>	Francis Rumsey looks at some of the factors that can affect digital audio quality in the recording chain	<b>24</b>
<b>AES Preview:</b>	A list of exhibitors who will appear in Paris together with a brief description of their displays	<b>37</b>
<b>Business:</b>	No Track technology in car stereos; audio-for-video editing. By Barry Fox	<b>50</b>
<b>Conversation with Quincy Jones:</b>	The producer, musician, composer and arranger talks to Corinne Simcock	<b>55</b>
<b>Sounding out D-2:</b>	Paul Headland of Wild Tracks post-production house gives his views on using D-2 video for audio	<b>58</b>
<b>Perspective:</b>	The audio engineer's identity crisis is dealt with by US columnist Martin Polon	<b>62</b>
<b>ESbus:</b>	Tim Frost looks at its applications at the Finnish broadcasting company	<b>66</b>
<b>Sound Foundation:</b>	Tim Leigh Smith visits a mobile recording facility based in Wales	<b>72</b>
<b>VCA's Revisited:</b>	Ben Duncan updates his recent series with some new information	<b>78</b>
<b>Monitor Systems:</b>	Part ten of Philip Newell's series investigates the different priorities of different recording studios	<b>84</b>

# Master Studio System



*Frank Filipetti at Right Track Recording, New York City*

*International Headquarters: Begbroke, Oxford, England OX5 1RU · Tel: (0865) 842300  
Paris (1) 34 60 46 66 · Milan (2) 612 17 20 · Tokyo (3) 54 74 11 44  
New York (212) 315 1111 · Los Angeles (213) 463 4444 · Toronto (416) 363 0101*



# STUDIO SOUND

AND BROADCAST ENGINEERING

February 1991  
Volume 33 Number 2  
ISSN 0144 5944

## EDITORIAL

**Editor:** Keith Spencer-Allen  
**Assistant Editor:** Julian Mitchell  
**Co-ordinating Editor:** Ann Lowe  
**Secretary:** Elaine Sweeney  
**Consultant:** Sam Wise  
**Columnists:** Barry Fox, Martin Polon (US)  
**Regular Contributors:**

Janet Angus	Mike Lethby
James Betteridge	David Mellor
Mike Collins	Terry Nelson
Ben Duncan	Francis Rumsey
Dave Foister	Zenon Schoepe
Yasmin Hashmi	Patrick Stapley

## ADVERTISEMENTS

**Executive Ad Manager:** Steve Grice  
**Deputy Ad Manager:** Phil Dearing  
**Advertisement Production:** Alicia Smith  
**Secretary:** Lianne Davey

## CIRCULATION

**Circulation and Development Manager:**  
Colin Enderson  
**Controlled Circulation Manager:**  
Maria Udy  
**Enquiries:** See classified advertisement

**Director:** Doug Shuard  
**Publisher:** Steve Haysom

**EDITORIAL & ADVERTISING OFFICES**  
Link House, Dingwall Avenue, Croydon CR9 2TA,  
UK. Tel: 081-686 2599. E-mail: 78.DGS1071. ESI:  
STUDIOSOUND-UK/US.  
Fax: 081-760 5154/0973.

**NEWSTRADE DISTRIBUTION (UK)**  
UMD, 1 Benwell Road, London N7 7AX, UK.  
Tel: 071-700 4600. Fax: 071-607 3352.

## AMERICAN OFFICE

**Publishing Services Manager:** Fred Vega  
Studio Sound, 2 Park Avenue, 18th Floor,  
New York, NY 10016, USA. Tel: (212) 779-1212.  
Fax: (212) 213-3484.

## JAPAN & FAR EAST AGENT

**Contact:** Mikio Tsuchiya, Media Sales Japan Inc,  
Tamuracho Bldg 3 3 14, Shimbashi, Minato-Ku,  
Tokyo, Japan. Tel: (03) 504-1925. Telex: J25666.  
Fax: (03) 595-1709.

© Link House Publications plc 1991 all  
rights reserved

Origination by Lawrence-Allen (Colour Printers)  
Ltd, Gloucester Street, Weston-super-Mare, Avon  
BS23 1TB.  
Printed in England by Andover Press Ltd, Telford  
Gate, West Portway Industrial Estate, Andover,  
Hants SP10 3SF.



A LINK HOUSE  
PUBLICATION

Studio Sound and Broadcast Engineering  
incorporates Sound International and Beat  
Instrumental

Studio Sound is published on the third Friday of  
the month preceding the cover date. The  
magazine is available on a rigidly controlled  
requested basis, only to qualified personnel (see  
classified advertisement for terms)

ABC

MEMBER OF THE AUDIT  
BUREAU OF CIRCULATIONS

Total average net circulation of 19,169 per issue  
during 1989.  
UK: 5,272. Overseas: 13,897.  
(ABC audited)



## When it's spring again

The next European AES Convention is in Paris in mid-February. The following year's European AES Convention will be in Vienna and marks a break in the rotation of sites for the European Convention that lasted most of the '80s. The next Convention on the US West Coast will be in '92 in San Francisco not in Los Angeles. The Spring AES Conference of 1991 will be in Detroit but more importantly it is a joint Conference with SMPTE, something that, with the title of *Television Sound, Today and Tomorrow*, makes a great deal of sense.

Whatever the reasons for these changes—whatever pressures, whatever unavailability of venues has led to them—we should welcome them positively, particularly those in Europe. Over the last couple of years there have been many opinions expressed about suitable venues and the suggestion that maybe a permanent site would be preferable. Permanent sites obviously have the attraction of repeatability and the fact that all the positives and negatives are known in advance. In the US it may be that the static nature of shows is important and that being based in a major centre of the media industries is essential (although the NAB in Las Vegas may disprove this to a degree).

In Europe we definitely have different stages of development throughout the continent. In Western Europe we have countries such as Spain that are building and expanding a recording and broadcasting infrastructure as fast as they can. At the other side of the continent, we have numerous ex-Eastern Bloc countries with enormous 'wants lists' but as yet little purchasing ability. Changes within many other countries in Europe have led to increased broadcasting activity and demand for programming and hence recording facilities. It is clear that whatever developments are currently taking place in Europe they are not restricted to just a few centres.

For what I can only assume are airline politics and governmental support for national carriers there are some locations in Europe that are difficult to get to from certain other points. This has an immense effect on the spread of nationalities that visit a Convention. We notice this particularly from the magazine's point of view when we attract new subscriptions for the magazine. Paris attracts many visitors from Africa, Spain and Italy, which is to be expected, but perhaps less expected is the presence of Turks, Eastern Europeans and, for some reason, many Norwegians. Hamburg has the expected mid Europeans but also a large number of Scandinavians and Poles.

The siting of the Convention, therefore, has interesting side effects other than just the particular chosen locale. I look forward with great interest to the next few European Conventions—Vienna in '92, Berlin in '93 and Amsterdam in '94 and to see how they shape up as venues. If at the end of this 'round' it is felt that a permanent site is still a desired choice, then so be it, but without a doubt something would be lost in the changing nature of the shows and their variety.

If on the other hand the results on both the AES's and exhibitors' sides seem positive, then how about looking at locations in Spain, Italy, Scandinavia and then maybe even small conferences or 'regional shows' in Hungary, Czechoslovakia or further afield. While the current economic climate is not suitable for costly experiments in location there will hopefully be a time when the effort of a Convention in a promising but unproven location will be seen as a positive investment for the future.

Enjoy Paris.

Keith Spencer-Allen

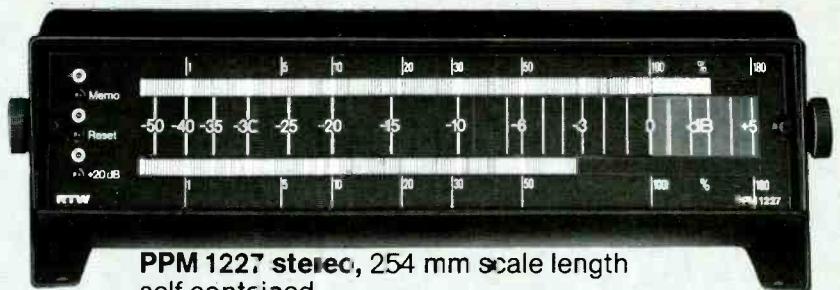
Cover: Photography by Tony Petch



# RTW Peak Programme Meter

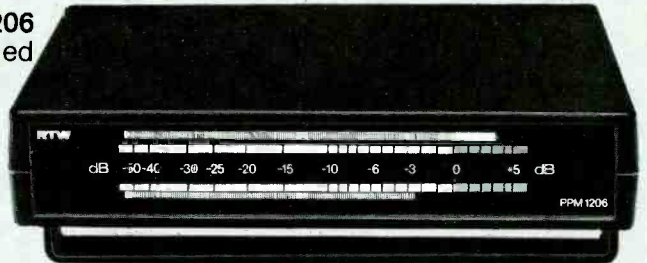


**PPM 1109 stereo**  
Analog + Digital  
Audio Peakmeter



**PPM 1227 stereo**, 254 mm scale length  
self contained

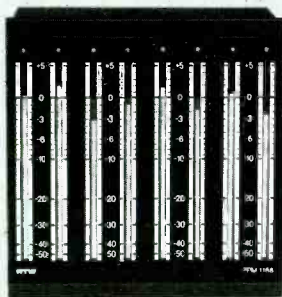
**Model 1206**  
self contained



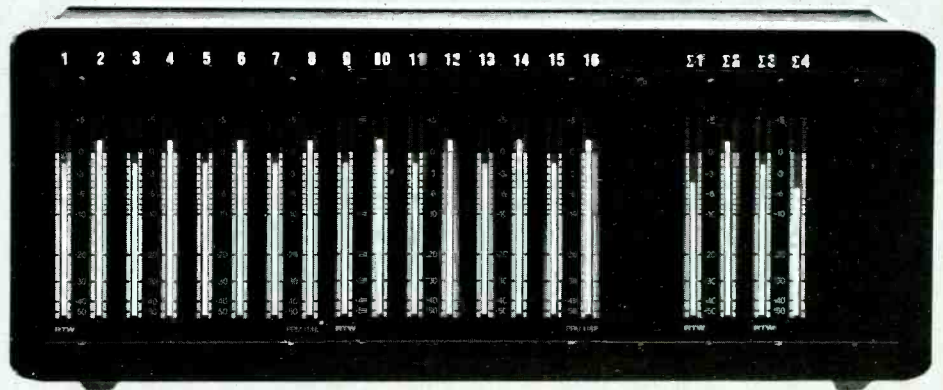
Peak programme meters  
for monitoring the peak level  
in analog and digital audio



**PPM 1118**  
2-Channel  
Module



**PPM 1188**  
8-Channel  
Module



**Multi-Channel Unit 16-4 and 24-4**

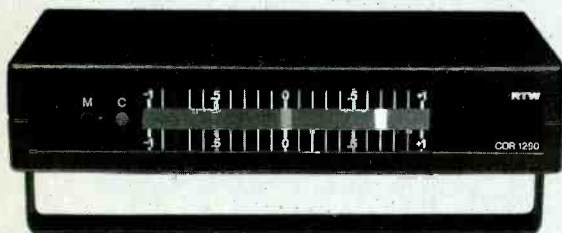
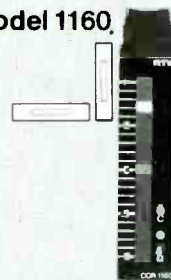
# RTW Correlator

Compatibility meter  
displays the phase correlation  
of stereo recordings

**Correlator Model 1170**



**Correlator Model 1160**



**Correlator Model 1260**  
self contained

# RTW

**RADIO-TECHNISCHE WERKSTÄTTEN GMBH**

Telephone (221) 70913-0 · Tx 8885 217 · Fax (221) 70913-32  
Elbeallee 19 · Post Box 7106 54 · D-5000 Köln 71 · W.-Germany

**Australia:** SYNTEC INTERNATIONAL, Tel (2) 4064700 · **Austria:** ACOUSTA ELEKTRONIK, Tel (662) 846164 · **Belgium/Netherlands:** P.A.C., Tel NL: (40) 424455 · **Canada:** J-MAR ELECTRONICS LTD., Tel (416) 4219080 · **Denmark:** S.C. Sound APS, Tel (2) 998877 · **Finland:** AV-POINT ICS AB, Tel (0) 5666733 · **France:** SCV-Audio, Tel (1) 48632211  
**Great Britain:** AUDIO & DESIGN LTD., Tel (0734) 844545 · **Italy:** AUDIO EQUIPMENT SRL, Tel (39) 2000312 · **Japan:** SANIX CORPORATION, Tel (3) 7025315 · **Korea:** DAESAN INTERNATIONAL INC., Tel (2) 7368442 · **Norway:** SIV. ING. BENUM AS, Tel (2) 145460 · **South Africa:** ELTRON LTD., Tel (11) 7870355 · **Spain/Portugal:** SINGLETON PROD., Tel E: (3) 2377060 · **Sweden:** AV MEDIA AB., Tel (755) 65498 · **Switzerland:** AUDIO BAUER AG, Tel (1) 4323230  
**Switzerland:** TECNAD A.S., Tel (21) 8060606 · **USA:** ESL ELECTRONIC SYSTEMS LAB., Tel (305) 7911501



# Sennheiser buy Neumann New service agency for 3M

Sennheiser have announced their take over of Neumann, the Berlin-based microphone, mixing console and mastering equipment manufacturer. According to Sennheiser's head of sales Dr Burkardt Schwaebe, there will be no conflict of interest caused by the takeover and both companies will benefit. Schwaebe commented, "We shall be looking to the synergy effect that a combining of forces will bring in R&D. We are particularly happy about Neumann mixing desks, which are the sort of products that Sennheiser has been looking for."

At this stage there don't seem to be any plans for structural changes within Neumann or plans to move Neumann from their Berlin production base.

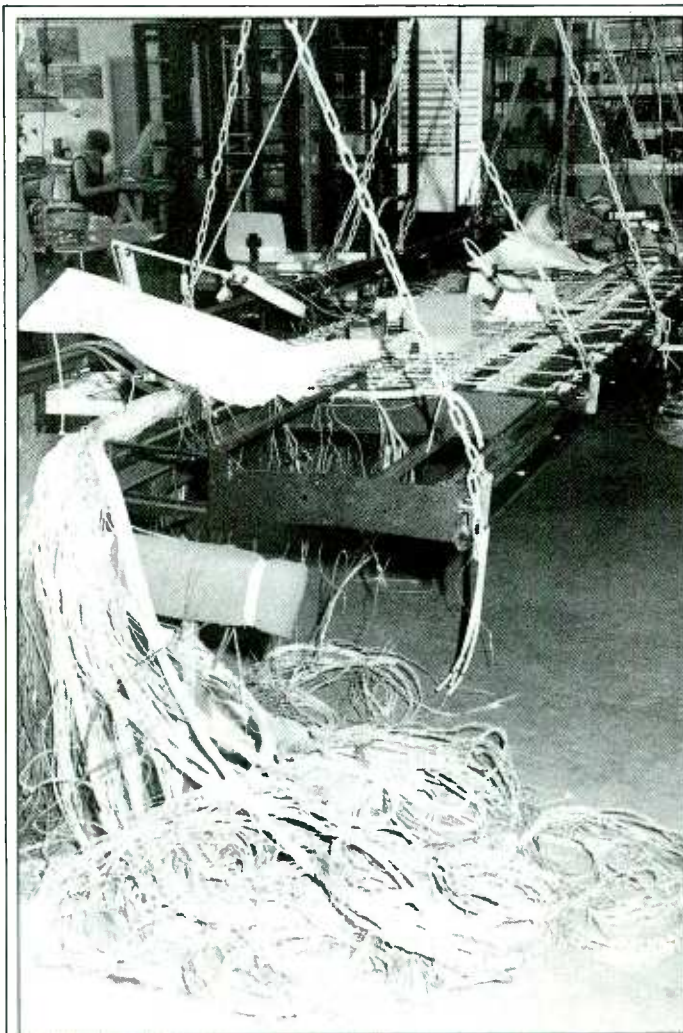
Georg Neumann, a developer of the condenser microphone, founded the company in 1928. Today Neumann employ 210 people and achieved a DM 22 million (approx £7½ million) turnover in 1989. In the same year Sennheiser, who currently employ 1200 people, had a turnover of DM 130 million (£45 million), a figure which is expected to grow to DM 149 million (£52 million) in 1990.

## Levell bought by AET

Levell Electronics have recently joined the Advanced Electronic Technologies Group. Levell have been established manufacturers of test and measurement equipment for nearly 30 years. Their core products are RC oscillators, insulation testers and AC/DC voltmeters, which are sold into a wide range of markets. Other Levell products include capacitance meters, multimeters and thermometers.

Levell will continue to manufacture these products and the substantial investment being injected by AET promises more new products will be launched in the future. Sister companies in the AET Group include Digitron instrumentation Ltd.

Since joining, Levell have moved to the AET headquarters at Technology House, Mead Lane, Hertford, Herts. The new sales manager is Nick Bebbington and he can be contacted on 0992 501231.



A custom ordered Neumann mixing console being assembled at their factory in Berlin, Germany

## In brief

- Redwood City, CA, USA: **APRS system for Ampex:** An audio tape labelling system, approved for use by the Association of Professional Recording Services and similar to a design widely used in Europe is now being made available in the US by Ampex Recording Media Corporation and the APRS.
- Wembley, UK: **JVC plans major video market shake-up:** JVC Professional Products (UK) Ltd are planning a major shake-up of the professional video market in the UK and Irish Republic through the creation of an elite group of JVC Professional dealers who will seek to

raise the standards of customer service and satisfaction. The dealers will form one part of the JVC PRO-S Club.

- Menlo Park, CA, USA: **DigiDesign number 315 in business mag:** The December 1990 issue of *Inc.* magazine has ranked DigiDesign number 315 on its 1990 list of the 500 fastest growing privately held companies in America. Rankings are based on the percentage increase in sales from 1985 through 1989. Companies had to show at least \$100,000 but no more than \$25 million in sales for 1985 and had to register a sales increase between 1988 and 1989.
- London, UK: **Royal Academy permit digital pianos:** The Royal

Academy of Dancing is to permit the use of approved digital pianos for its examinations in the UK and in 45 overseas countries—the first time an instrument other than the traditional piano has been allowed in its 70 year history.

The first digital piano approved is the *Clavinova*, manufactured by Yamaha, which is currently being used at the Academy's London headquarters alongside Yamaha's *Disklavier*, a traditional acoustic piano with the added benefit of a digital record and playback facility.

The Academy has identified instant and accurate playback and tempo changes without pitch change as the main benefits in relation to its own particular needs.

## Digital audio seminars

Beginning in February 10 digital audio lectures and seminars are to be presented by John Watkinson, Richard Salter of Focusrite and David Pope of Cambridge Audio. Contact Media Production Services, Bon Marche Building, Ferndale Road, London SW9 8EJ, UK. Tel: 071-737 7152.

Academy of Dancing is to permit the use of approved digital pianos for its examinations in the UK and in 45 overseas countries—the first time an instrument other than the traditional piano has been allowed in its 70 year history.

The first digital piano approved is the *Clavinova*, manufactured by Yamaha, which is currently being used at the Academy's London headquarters alongside Yamaha's *Disklavier*, a traditional acoustic piano with the added benefit of a digital record and playback facility.

The Academy has identified instant and accurate playback and tempo changes without pitch change as the main benefits in relation to its own particular needs.



## Master Rock could rock-on

At the time of writing Master Rock studios in Kilburn, London, had been put up for sale by their receivers after calling them in late last year. Master Rock hope that a buyer can be found for the whole studio and its contents to avoid an auction situation, which wouldn't realise the studio's true worth.

The studio found itself with problems as a result of their bank calling in a loan. It was ironic that in the current dismal climate for studio business Master Rock's problem was not lack of work, they were in fact booked solid for 4 months and are still receiving booking enquiries.

• We have just heard of a major Los Angeles studio that is also in

difficulties. Soundworks West, who after 6 months of operation were boasting a client list that included Bruce Springsteen, Tiffany and John Denver, have filed a petition of voluntary reorganisation under Chapter 11 of the Federal Bankruptcy Laws.

Soundworks commented that even with all their success, the size, sophistication and cost of the Soundworks West facility put a severe financial strain on their parent corporation, Soundworks West Ltd, a Californian corporation. Soundworks services will continue uninterrupted and their location at 7317 Romaine Street shall remain open for business as usual during the pendency of this proceeding.

## E-mu receive venture capital

E-mu Systems, the American electronic musical instrument company, have closed a \$2 million financing package with Matrix Partners of Menlo Park, California. Joseph Rizzi, a principal in Matrix Partners, commented that E-mu's innovative applications of their proprietary custom VLSI technology

was key to the musical instrument firm being included in their portfolio of emerging technology-orientated companies. Rizzi further stated that he and partner Rick Fluegel will gain seats on E-mu's board of directors and that their firm's investment is designed to fuel the next phase of E-mu's growth.

## Address changes

• **Eela Audio** are moving to Parmentierweg 3, 5657 EH, Eindhoven. Tel: 040 510484.  
• The telephone and fax numbers of **Arup's** Winchester office have been amended to 0962 869111 and 0962 867270 respectively. The address is

unchanged.

• **Harris Grant Assoc** have relocated to The Property Building, Pinewood Film Studios, Pinewood Road, Iver, Bucks SL0 0NH, UK. Tel: 0753 631022. Fax: 0753 651528.

## Exhibitions and conventions

**February 19th to 22nd** AES 90th Convention, Palais des Congrès, Paris, France.

**April 8th to 10th** Cable & Satellite Exhibition 1991, Olympia, London UK.

**April 15th to 18th** NAB, Las Vegas, USA.

**June 5th to 7th** APRS, Olympia 2, London UK.

**June 13th to 18th** International Television Symposium, Centre des

Congres, Montreux, Switzerland.

**June 25th to 27th** Multimedia 91 conference & exhibition, Olympia 2, London UK.

**July 10th to 12th** Pro Audio Asia 91, World Trader Centre, Singapore.

**July 10th to 14th** The International Music Show, Olympia 2, London UK.

**September 8th to 11th** Light & Sound Show 91, Olympia 2, London UK.

## News from the AES

Our next lecture will be held on Tuesday February 26th and will be given by Floyd E Toole on

**Loudspeakers, Rooms and Listeners – An Overview.** Many years of trial and error, along with a few scientific investigations, have yielded a relatively coherent picture describing the physical and perceptual events in concert halls. Only recently has the corresponding attention been applied to the stereophonic reproduction of sound in homes and control rooms. In both fields there are domains of fact and folklore. This presentation is a review of the physical factors involved in the replication of satisfactory sound and stereo-image quality in listening rooms. Where possible, the relationship between measurements and perceptions will be presented. Part of the discussion will, of necessity, touch on the issue of what individual listeners regard as satisfactory. Comments and questions from the audience will be welcomed, so come prepared.

The lecture will be held at the IBA, 70 Brompton Road, London SW3. The IBA is opposite Harrods and Knightsbridge Underground, between the Nationwide Anglia Building Society and Boots. The evening starts with coffee at 6.30pm followed by the lecture at 7.00pm.

To help future planning, the date, speaker and title of the following meeting is listed below (more details will be available next month).

March 12th  
**Digital Audio Broadcasting**  
E Meier-Engelen

And now is the time to start planning for the next **AES European Convention**, which will be held at the Palais des Congrès in Paris between February 19th and 22nd, 1991. With a wealth of papers, workshops and technical visits and the largest exhibition of pro-audio equipment to be seen in Europe in 1991, it is the event not to be missed.

The next event to note is that the AES British Section will be organising a conference on the subject **Will You be Legal?— Implications of 1992 to Audio and Video Engineers** on Tuesday March 19th, 1991. This will cover the effects of legislation to be implemented on January 1st, 1992. This legislation affects manufacturers, designers and installers of professional audio and video equipment and systems. It is intended to reveal the extent and scope of the legislation and will be discussing the strategies for coping with both the legal and engineering consequences of the European performance standards which are involved. Ignorance of the law is, we are advised, no defence.

For further details on any of the above or information on joining the AES, please contact: **Heather Lane, AES British Section, Lent Rise Road, Burnham, Slough SL1 7NY, UK. Tel: 0628 663725. Fax: 0628 667002.**

## People

• **Tannoy Goodmans International** have announced the appointment of Richard Gainsborough to their export team as export sales manager.

• **Focusrite Audio Engineering** have announced the appointment of Rodger Bain to develop Focusrite's marketing of recording studios in the UK. Under this exclusive agreement Bain will be responsible for developing market awareness of the Focusrite *Studio* console and other Focusrite products as well as maintaining customer liaison.

• **Martin Cook** has been appointed general manager of **Fostex UK**. Cook has a strong background of sales and

marketing in the professional audio and video fields and comes to Fostex from Video Time where he was MD.

• **Altec Lansing** have announced the appointment of Mark Bird to the position of marketing manager for **Dynacord** products in the US.

• **DAR** have announced the expansion of the company's sales team to include Gillian Blackburn in the position of pro-audio sales.

• Following the opening of **Sennheiser's** UK office, Paul Whiting has been appointed sales and marketing manager and John Willett is technical manager.



# The Otari MX-80. More than worth a second look.



**Y**ou'll already know the Otari MX-80.

As the truly 'professional' way to record 24 tracks on a less than exorbitant budget. Allow us, then, to introduce you to the Otari MX-80 for a second time.

As the truly professional way to create a more flexible, enterprising studio on a budget that's every bit as economic.

All you need do is combine a pair of MX-80 machines. And add an Otari EC-102 synchroniser.

Now this won't simply afford you two tape facilities.

But all those additional tracks you've long hankered after. For experimenting on. For laying down effects. For avoiding unnecessary bouncing. And for compiling vocals and solos.

With all this goes the added convenience of recording direct to tape. And, as you'd expect, the extra mobility of two smaller machines.

What may surprise you, however, is the price. Stacked against a larger 24 track recorder.

Of course, your (first) Otari MX-80 will still answer all your 24 track requirements. As professionally as ever.

While the second will be on hand to double the attraction of your studio.

The Otari MX-80.

Now twice the machine.

Otari (UK) Limited, Unit 13, Elder Way, Waterside Drive, Langley, Slough, Berkshire SL3 6EP. Telephone: (0753) 580777. Telex: 849453 OTARI G. Fax: (0753) 42600. Otari Deutschland GmbH, Rudolf Diesel Strasse 12, D-4005 Meerbusch 2, West Germany. Telephone: 010 49/2159/50-861-862 or 863. Telefax: 010 49 2159 1778 • UK: Stirling (071) 624 6000  
• NORWAY: Benum 2-145460 • SWEDEN: Intersonic B-7445853 • FINLAND: Studiotec (9) 0-592 055 • DENMARK: S.C. Sound 42 99 88 77  
• FRANCE: S.C.V. (1) 48632211 • ITALY: T.D.S. (2) 33 40 03 50 • GREECE: Bon Studio (1) 3602942 • SPAIN: Fading (1) 4086700 • PORTUGAL: Amperel (1) 532227  
• BELGIUM: T.E.M. (2) 4665010 • AUSTRIA: Siemens 222-717115255 • SWITZERLAND: Audio Bauer (1) 4323230..

**OTARI**®

## Agencies

- **EMO Systems** have announced the appointment of five new distributors for their products. In Japan the distributor will be the Tokyo based Matsuda Trading Company. Tel: 03 295 4731; in Korea the Seoul Sound Trading Group. Tel: 02 584 4313; in Eire Control Techniques, Ireland. Tel: 966866/966464; Northern Ireland Sound Control. Tel: 0232 772491; in Finland, Nores Oy who are based in Espoo. Tel: (90) 520 311.
- Celestion have won the distribution rights of the **Foster** line of high frequency horns and tweeters. Celestion International, Foxhall Road, Ipswich, Suffolk IP3 8JP, UK. Tel: 0473 723131. Fax: 0473 729662.
- Australian company Freedman Electronics will now distribute the complete range of **Carlsbro** PA systems in Australia. Freeman Electronics, 89-91a Liverpool Road, Summer Hill, NSW 2130, Australia. Tel: 612 797 9941.

- **Carlsbro** have appointed More Music in Belgium as their new Benelux distributor of the Carlsbro range of bass, lead and keyboard combos; loudspeaker enclosures, monitors, power amplifiers, powered mixing consoles and full range PA systems. More Music, Hovesteenseweg, 2450 Meerhout, Belgium. Tel: 14 30 32 30.

- **Bruel & Kjaer** have appointed Professional Equipment SRL to represent the range in Italy. Professional Equipment, 20142 Milano, V Le Famagosta 37. Tel: 02 81 36 032.

- Italian sound reinforcement and pro-audio equipment designers and manufacturers, **db Technologies** have appointed AKG Acoustics to handle distribution of their products throughout the UK. AKG Acoustics, Vienna Court, Catteshall Wharf, Catteshall Lane, Godalming, Surrey GU17 1JG. Tel: 04868 25702.

- **Canford Audio** have recently been appointed sole UK agents for **Illsonic** acoustic tiles. This new arrangement ensures a ready stock availability

from Canford's Washington warehouse. Canford Audio plc, Washington, Tyne & Wear NE38 0BW, UK. Tel: 091 417 0057.

- **Tape Automation** are looking to appoint agents for their *X-L Minor* audio cassette loader. Potential agents should have a background in audio engineering sales and technology. As well as making new sales contacts and organising demos, all agencies are expected to provide local support in the customer's own language both before and after sale. Contact Ray Worth at Tape Automation on 0242 676792 (UK).

- **Clair Bros**, the touring sound company, recently announced their intention to enter the installations market and have now appointed Elliott Bros (Audio Systems) Ltd, to represent their systems services in Europe. Elliott Bros, Osney Mead, Oxford OX2 0ER, UK. Tel: 0865 798000. Fax: 0865 792062.

- **Audiomotion Systems**, Sudbury, MA, USA, have made several appointments for the distribution of the *Uptown* moving fader console

automation system, in the US and another in Canada. Redwood Marketing has North Carolina, South Carolina, Florida, Tennessee, Kentucky, Alabama, Mississippi and Georgia; Audio Systems covers Oregon and Washington; Phil Reddish Sound has Ohio; and Adcom Electronics operates throughout Canada.

In Australasia, Arley Communications in Victoria will represent them in Australia and New Zealand; the K2 Corporation in Tokyo will cover all Japan; and Linfair Engineering & Trading in Taipei in Taiwan. For Europe Trans European Music will represent in the Benelux countries; Lydrommet will cover Norway; Tal & Ton have Sweden; SC Sounds for Denmark; SCV in France; and Audio Equipment in Italy.

- **tc electronic** have recently signed an agreement with Sterling do Brasil, in Rio de Janeiro, for exclusive distribution of tc products in Brazil.

## In brief

- **London, UK: Dreamhire and MCC join forces:** Audio rental company Dreamhire and the Mac Consultancy Company (MCC) have formed a partnership to launch and promote *Prometheus*, a brand new multimedia workstation. Although the applications of *Prometheus* extend to all areas of multimedia, MCC and Dreamhire will use the system specifically to merge the separate areas of audio and video post-production into a single discipline.

- **London, UK: ITV sound training win award:** The 1990 National Training Award has been given to the Independent Television Association for the training initiative they and the ITV companies developed to ensure that stereo TV transmissions began successfully in the Autumn of 1989.

- **Middlesex, UK: BSKyB still on Marcopolo:** British Sky Broadcasting have announced that they intend to continue to broadcast the full BSKyB service of five channels on the Marcopolo satellite for an indefinite period, subject to the franchise being withdrawn by the IBA. Upon the withdrawal of the BSB franchise, everyone who has installed BSB receiving equipment for their private use will be offered Astra satellite TV equipment and



**Dreamhire's Nick Dimes and Jim Baker of MCC with the Prometheus multimedia workstation**

installation free of charge.

- **Basingstoke, UK: The Sony tour:** The Sony Broadcast & Communications DAT team have conducted a promotional tour covering 23 countries across Europe and Africa. The group have been addressing invited audiences of broadcasters and audio professionals, discussing a wide spectrum of DAT-related issues. All sessions included a demonstration of the new Sony *PCM-7000* professional DAT products.
- **Chessington, UK: DAR Guide:** The

1991 *SoundStation Product Guide* is now available from Digital Audio Research. Compiled in response to increasing requests from broadcast, film and post-production professionals, the 12 page colour booklet provides an overview of the features and capabilities of DAR's *SoundStation* digital audio production system along with recent enhancements and product options.

- **Hatfield, UK: Macca's live on the X-880:** 300 hours of music; 102 concerts; 520 miles of tape; 3,320,000

Mbytes of storage; one X-880. The Mitsubishi X-880 32-track digital recorder bought by Paul McCartney towards the end of 1989 was used to record all the material for the recent triple album *Tripping the Live Fantastic*.

- **London, UK: National Transcommunications set-up:** Broadcasting minister Peter Lloyd has announced the setting up of a new company, National Transcommunications Limited (NTL) and the transfer to it of the Independent Broadcasting Authority's engineering assets and liabilities. Over the past year the IBA's engineering operation has seen extensive restructuring to pave the way for the formation of the new company and its subsequent privatisation. The assets and liabilities being transferred to NTL consist mainly of the IBA's television and radio transmission networks. The technical research and development facilities of the IBA are also being transferred to the NTL. The Government intend that NTL, which is to be temporarily owned by the Crown, will be sold by private tender as soon as practicable in 1991.

- **London, UK: Transco raise £1,270 for DEAF:** In the absence of a DEAF dinner-dance last year Transco, the London based audio and video tape distributors, held a Christmas party and raised £1,270 for the DEAF charity.



Every audio professional knows that the DAT format is ideal for portable recording. But at HHB we believe it need not cost the earth.

That's precisely why we've joined forces with Aiwa to design our own professional DAT portable – the HHB1 Pro.

In spite of its compact dimensions, the rugged HHB1 Pro offers a wealth of features for the professional user. A single

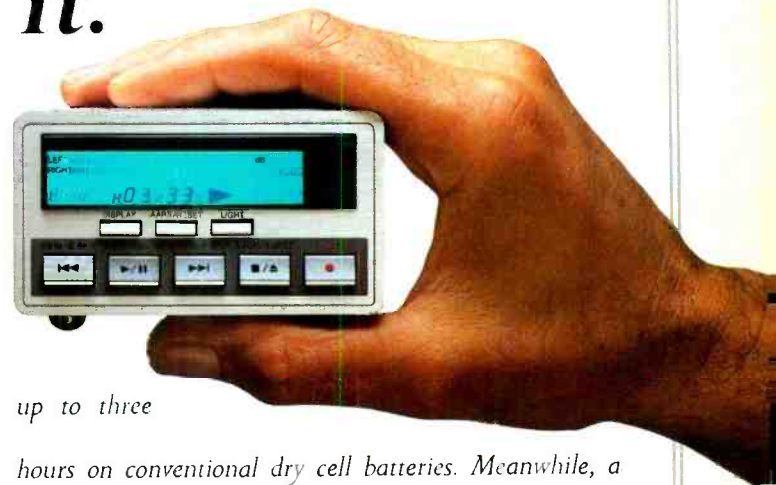
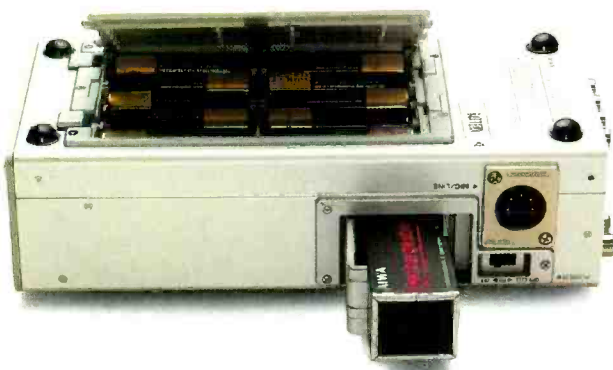


The HHB1 Pro stripes tape with 'absolute time' information as it records. So whenever you insert a recorded cassette, you can see precisely where you are on the tape. With Sony's PCM-7000 range of studio DAT recorders capable of editing to absolute time as well as time-code, you can be confident that your HHB1 Pro will function as their ideal low-cost acquisition partner.

The HHB1 Pro records for

## A professional DAT recorder that goes easy on your pocket. And in it.

5-pin XLR switchable mic/line input allows stereo recordings in the field, while audio quality is assured thanks to the latest single-bit oversampling conversion technology. Of course, AES/EBU as well as SPDIF digital interfaces are provided as standard. And because the Pro's informative LCD display can be illuminated, monitoring in low-light conditions could not be more convenient.



up to three hours on conventional dry cell batteries. Meanwhile, a multi-voltage transformer and a NiCad battery pack – together with a selection of useful professional accessories including a wired remote controller – are supplied as standard. Since it weighs in at under £1,000 and less than a kilogram, picking up an HHB1 Pro from the world's number one DAT centre just couldn't be easier.



GENELEC 1035A IN JVC AOYAMA STUDIOS NO. 401

# GENELEC®

ANYTHING ELSE WOULD BE SECOND BEST

FINLAND: Tehtaantie 17, SF-74100 Iisalmi, tel. 77-13311 fax 77-12267, AUSTRIA: Audio Sales tel. 02236-26123, BELGIUM: Hes Electronics tel. 02-466 81 80, KOREA: Seoul Sound Technology tel. 2-584 4311, FRANCE: Publison Audio Professional tel. 1-43608464, GREECE: Kem Electronics tel. 081-687 8514, HONG KONG: Power Source Development tel. 3-7456189, ITALY: Audio Equipment S.R.L. tel. 039-2000312, JAPAN: Otartec Corporation tel. 03-332 3211, THE NETHERLANDS: Audioscript B.V. tel. 02155-20400, NORWAY: Siv. Ing. Benum A/S tel. 02-145460, SPAIN: Promovisa tel. 081-535 20 17, SWEDEN: Intersonic AB tel. 08-7445850, SWITZERLAND: RTG Akustik AG tel. 061-231912, TURKEY: Ömer Trade & Representation tel. 90(4)-1380296, UK: SSE Marketing tel. 071-387 1262, USA: Quest Marketing tel. 617-964 9466, WEST GERMANY: Audio Export Georg Neumann & Co. GmbH tel. 07131-62470.



## Contracts

- A completely refurbished Ampex *ATR-102* tape machine has been sold to Oxford Digital, the engineering consultancy based in Eynsham, Oxfordshire, by **Army's Shack** in the UK, who service and hold spares for all Ampex machines made since the 1950s.
- FWO Bauch have announced that Magmasters studio in London has become the first facility in the world to have had two **Harrison Series Ten** consoles installed.
- A new recital hall has been built at La Mortella, the home of the late British composer, Sir William Walton, on Ischia, Bay of Naples. **Marek Pytel**, an independent London-based sound and video system designer has chosen the equipment for recording there. The list includes two B&K *4006* omnis and two B&K *4011* cardioid mics; an 8-channel Soundtech series A mixing desk and a Technics *SV260A* DAT recorder.
- Recent US **Studer** contracts include *A827* 24-track recorders to Village Production in Tornilla, Texas; SAS Productions in San Antonio, Texas; Music Annex in Menlo Park, California; The Bakery studio, Sunset Sound and Sunset Sound Factory, and Conway Recording all in Hollywood.
- **TSC**, London, have recently completed a new studio for producer/writer Peter Vale in purpose built West London premises. Equipment includes a Soundtracs *Quartz* console, Otari *MX80* tape machine and Acoustic Energy monitors.
- The Lansdowne Group, London, UK, have upgraded their digital editing facilities by investing in a Sonic Solutions CD Mastering System. The system, supplied by FWO Bauch, has been installed in the completely refurbished digital editing suite at CTS Studios, along with new ATC monitors and Sony *DMR 4000*, *1630* and *1610* machines.
- **Pro-Bel**, Reading, UK, have installed a 128x128 high density video and dual audio assignment switcher in the new master control room of Sky Television. The Pro-Bel Matrix, which is currently equipped with modules for 64 inputs and 64 outputs on each level, will add extra facilities to the new master control room the enlarged Sky operation now requires.
- **Pilchner Associates** planners and contractors of Ontario, Canada, have announced the completion of the new



Walter Becker with his new Soundtracs IL 4832

Winfield Sound recording studios. The studios have been designed by Pilchner and feature a fully floating Reflection Free Zone control room and incorporates the third installation of the RPG Diffractional made by RPG Diffusor systems. The control also features a 40-input Solid State Logic *4000 G* series console with Studer tape machines with Dolby SR.

- Walter Becker, founder member of Steely Dan, has bought a **Soundtracs IL 4832** console to install in his recording studio, on the Island of Maui.
- **tc Electronic** of Denmark have recently delivered 15 of their *1280* stereo delay lines to PKE Ltd, Kewdale, Australia, for use as a broadcast telephone obscenity delay.
- **Sony Broadcast & Communications** have been awarded a major contract by Radio Romania in Bucharest to re-equip the

station's audio facilities, worth DM 900,000 (approx £312,000). Major items included in the contract are an *APR-24* multitrack recorder plus nine *APR-5000* series 2-track recorders, one *MXP-3036E* production console, and two *MXP-2916* broadcast consoles.

- **Studer** have recently completed an installation for a post-production studio at the BOP Radio in Bophuthatswana. The system consists of a Studer *A820* 24-track recorder, two *A820* ¼ inch master recorders all with integrated Dolby SR/A and a JVC *PR 900* U-matic. All machines are provided with Studer *TLS4000* synchronisers. Also supplied is an SSL *4000 G* series console with synchroniser controller.
- CBS Network in New York recently completed installation of **Studer's 963** console in Control Room 45. The console is currently being used for production of the



Adrian Kerridge (seated) with Lansdowne's new Sonic Solutions System

nationally televised Joan Rivers show. The console is configured with 36 inputs, which enables multiple sources in either stereo or mono to be brought in, and various separate feeds to be sent out to accommodate the show. CBS engineers customised the console with their own communications system.

- Ocean Sound, the Portsmouth, UK, area commercial radio station, have installed a 32-input *Saber* console in a new production studio. A large frame *Saber* was chosen to allow for extra inputs to be added.
- The *Boxer 5* monitoring system, from **Harris Grant Associates**, has already won four European customers. One of the first clients for the new 5 is The Hit Factory, London, UK. Other contracts include The Strongroom in London, Sound Studio 'N' in Cologne and Chateau du Pape Studios in Hamburg.
- Recent UK projects for **Harris Grant Associates** include the complete technical and acoustical refurbishment of The Hit Factory, London and the PPS1 post-production studio in Eldon Street for BBC Radio. The consultancy have also been commissioned by producer Jazzy B of Soul II Soul to manage the acoustic design and technical spec for two studios and control rooms at his new recording facility in Camden.
- Recent orders for **NED** systems from broadcasting companies include WDR, Germany's largest broadcaster who have chosen a *Synclavier 9600*; Nippon Television in Tokyo who have purchased a *PostPro SD*; and Video London who have ordered an 8-track *PostPro*.
- Advantage Audio, Los Angeles, have announced their recent acquisition of an Otari Sound Workshop series 54 console. Advantage's series 54 is configured with 46 dual-path faders and outfitted with Otari's *DiskMix 3* moving fader automation system.
- The Music Palace, Long Island, have upgraded their 56-input *Neve 8128* console with *Flying Faders* automation. Soundcastle, Los Angeles, have remodelled their Studio One to accommodate a new 72-channel *Neve VRP* with *Flying Faders*.
- Ravensbourne College have purchased an **Audio Kinetics ES.Lock** machine control and synchronisation system for their TV department. The *ES.Lock* system now installed comprises two *ES.Lock 1.11* synchronisers and one *ES.Lock Penta* five-machine controller.



## Fostex G-24S 24-track tape machine

Fostex have recently launched the G-24S 24-track 1 inch tape machine. This is equipped with an integral synchroniser, VTR control and Dolby S-type noise reduction. Fostex have placed much emphasis on systems integration with the G-24S and to this end there is provision for MIDI transport control and integral SMPTE-MTC conversion, which will allow close interfacing with music sequencing software. The built-in chase synchroniser allows SMPTE control as a slave transport with all operating controls on the front panel, which in turn can be tilted or removed for remote control. An RS422 serial port allows direct connection to VTR equipment using the Sony 9-pin protocol for control.

Dolby S-type noise reduction is fitted as standard (as in the Tascam MSR-24S). S-type was originally

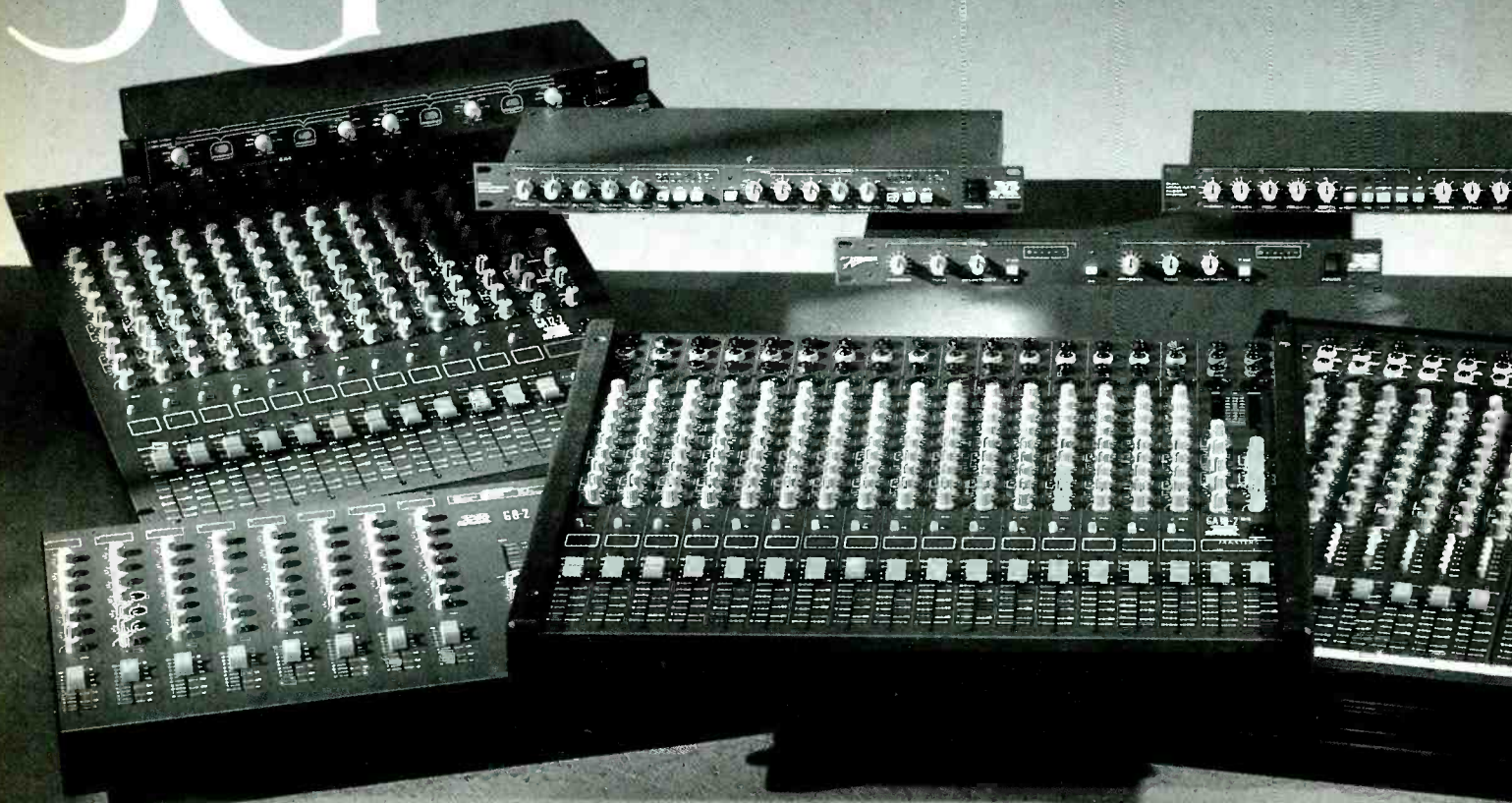
designed for narrow track recording such as compact cassette use and employs techniques derived from other Dolby pro and domestic formats including SR. Other features include jog shuttle and spot erase; programmable meters; SMPTE timecode generator; master transport control mode; programmable record in/out; and wide range of automation features including 10-point memory, preroll, autolocate, autoplay, autoreturn and zone limiting.

**UK:** Fostex UK Ltd, 1 Jackson Way, Great Western Industrial Park, Southall UB2 4SA. Tel: 081-893 5111.

**USA:** Fostex Corporation of America, 15431 Blackburn Avenue, Norwalk, CA 90650. Tel: (213) 921-1112.



3G GUARANTEED TO WORK





## Crown CM-30 miniature mic

Crown (Amcron outside USA) have introduced a miniature supercardioid with particular application for suspension over choirs or orchestras. The CM-30 requires 12-48 V phantom power and incorporates electronics that attach to an electrical plate for installation into a ceiling electrical box. The mic has a sensitivity of 13.5 mV/Pa and an impedance of 150 Ω. A strain relief will clamp the

mic cable at the desired length.  
**Crown International, PO Box 1000, Elkhart, IN 46515, USA. Tel: (219) 294-8000.**  
**UK: (as Amcron) Shuttlesound Ltd, 4 The Willows Centre, Willow Lane, Mitcham, Surrey CR4 4NX. Tel: 081-640 9600. Fax: 081-640 0106.**  
**UK: HHB Communications Ltd, 73-75 Scrubs Lane, London NW10 6QU. Tel: 081-960 2144.**

## Dyaxis new features

Studer Editech have announced a new software release, *MacMix 3.1*, for the *Dyaxis* bringing improvements in the editing of data, a new digital equaliser and the entry of numeric values. *MacMix 3.1* introduces a Cut/Copy/Paste function, which can be used as a means of transferring information between Mix and Tracklists in any combination and in either direction. The equaliser offers

EQ windows for parametric and graphic EQs with the addition of gain control. Timecode values can now be entered with a new type-in Editor function for the track window.  
**Studer Revex America Inc, 1425 Elm Hill Pike, Nashville, TN 37210, USA. Tel: (615) 254-5651.**  
**UK: FWO Bauch Ltd, 49 Theobald Street, Borehamwood, Herts WD6 4RZ. Tel: 081-953 0091.**



## Summertone timecode monitor

The Summertone timecode monitor is a freestanding unit designed to check timecode from tape, generators, etc, for faults such as jumps, holds and dropouts, etc. Each check can be individually switched on or off and in certain cases acceptable tolerances set before registering a fault. Errors can trigger an audible alarm as well

as being stored in memory with the timecode reference point at which the error was detected. The log of errors can be output to a printer when required.  
**UK: Raper & Wayman, Unit 3, Crusader Industrial Estate, 167 Hermitage Road, London N4 1LZ. Tel: 081-800 8288.**



**T**ake a close look at 3G mixing consoles, amplifiers and signal processors and you will see a range of products designed with extraordinary attention to detail and hand built to the highest specification by British craftsmen. It is this uncompromising commitment to quality that confidently allows 3G to offer a 3 Year Guarantee on all products.

3G professional audio products are renowned for excellent ergonomics, robust chassis and superior sonic performance. They offer a choice of sizes, features and options to meet the many different needs of sound professionals.

With all this you could be forgiven for thinking that 3G professional audio products are expensive, however you will be pleasantly surprised to find very competitive prices throughout the range.

For further information complete the coupon below.

**3 YEAR WARRANTY**

**3G** • MIXING CONSOLES  
 • SIGNAL PROCESSING  
 • POWER AMPLIFIERS

Sole UK distributor:

HW International, 3-5 Eden Grove, London N7 8EQ. Tel: 071-607 2717

To: HW International, 3-5 Eden Grove, London N7 8EQ. Please send me details of 3G Professional Audio.

Name \_\_\_\_\_

Address \_\_\_\_\_

Postcode \_\_\_\_\_



## Aiwa HHB1 Pro DAT

The result of a collaboration between Aiwa and UK company HHB Communications, the *HHB1 Pro* DAT recorder has been introduced through HHB. The unit is based on an existing Aiwa portable but significantly reworked for professional applications. The unit weighs under 1 kg and has balanced mic/line input as well as both AES/EBU and SPDIF digital I/Os. It is supplied with a wired remote controller, XLR splitter lead and a switchable illuminated LCD display making it suitable for location uses. The machine stripes tape with 'absolute time' information as it records enabling users to see a

display of exactly where they are on the tape.

HHB say they see the *HHB1 Pro* as being a useful tool particularly when partnered with the Sony *PCM-7000* range of studio DAT recorders as they are capable of editing to absolute time as well as timecode. Powered on dry cell batteries, the *HHB1* can record for 3 hours although a multivoltage transformer and NiCad battery pack are supplied as standard.

UK: HHB Communications Ltd, 73-75 Scrubs Lane, London NW10 6QU. Tel: 081-960 2144. (Also available through HHB appointed agents in Europe.)

## Opcode Film Music Software

Opcode Systems have released *Version 3.0 of CUE—The Film Music System* for the Apple Mac. *CUE* is a set of programs that allows composers and music editors working to picture to store and organise soundtrack data as well as automating paperwork and calculations for synchronisation. Features of the software include Cue Sheet for entering cue point timings; several means of calculating tempos to match 'hits'; Custom Score Paper layout for sketching music cue;

automatic production summaries for creating master cue lists, performing rights cue lists and spotting notes; MIDI events triggers for sound FX; realtime and SMPTE lock features including Streamers and Punches, Click Track playback, tempo tap, MIDI playback and MIDI clock output. *Version 3.0* has upgrades in almost all areas of operation.

Opcode Systems Inc, 3641 Haven Drive, Suite A, Menlo Park, CA 94025-1010, USA. Tel: (415) 369-8131.

## Rane FPL 44

The Rane Corporation have added a 4-channel *FPL 44* Quad Program Limiter to their *Flex* series of half-rack width modular processors. The *FPL 44* features a 'Servo Lock' used in the *DC 24* where each channel can be switched to Auto Slave. This links the sidechains of the selected

channels so that they all follow the limiting action of any one channel. Each channel also has a bypass switch and threshold control. **Rane Corporation, 10802 47th Avenue West, Everett, WA 98204-3400, USA. Tel: (206) 347-7757.**

UK: Music Lab, 72-76 Eversholt Street, London NW1 1BY. Tel: 071-388 5392.

## New 3M mastering products

3M launched a new analogue mastering tape during the LA AES. 3M 996 is described by 3M as able to record at +9 dB over NAB level while still improving on print characteristics. 996 is bias compatible with 3M 226. The production process is claimed to involve 100% laser scanning of the tape to maintain quality. Limited quantities of the tape will be available this year with all major formats and lengths being supported during the first quarter of 1991.

996 is supplied with a *TapeCare* library box, which is an impact resistant, lightweight plastic casing also resistant to dust and humidity. Mouldings in the casing allow tapes to be stacked without slipping while

the design also includes a carrying handle. The hub support system allows the reel to rotate freely in the case giving greater protection to the reel and the tape. The design includes space for the tracksheets and labelling and the box can be marked with chinagraph pencil. 3M will also be using the case for 275, 800 and the logging tapes.

Lastly, 3M have introduced a longer digital audio U-matic cassette in the form of the *AUD 80+*, which has a playing time of 83.5 mins. **3M Professional A/V, 223-5N-01, 3M Center, St Paul, MN 33144, USA. Tel: (612) 733-3888.** UK: 3M UK, PO Box 1, Bracknell, Berks RG12 1JU. Tel: (0344) 26726.

## Leader 300 portable oscilloscope

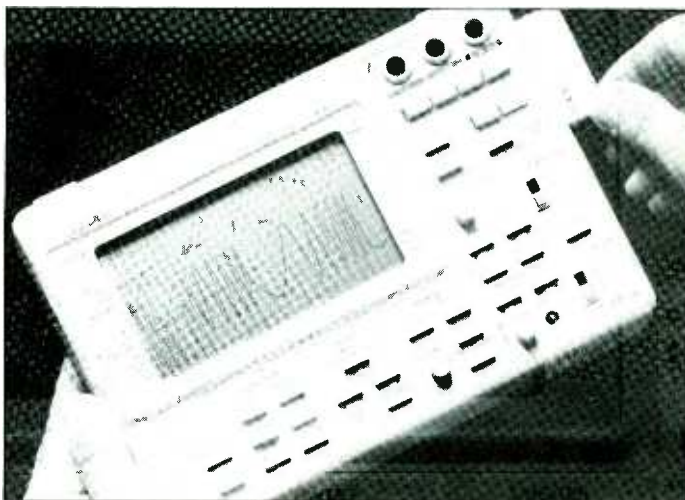
While not an exclusive audio product, the new model 300 portable digital storage oscilloscope from Leader Instruments would appear to have some useful applications. The display is a large LCD (60×113 mm) its size rendering it unaffected by nearby electromagnetic fields and the complete unit is 240×165×44 mm weighing under 1 kg. The 300 has a sampling rate of 30 million samples/sec and a bandwidth of 10 MHz permitting the display of signals into video frequencies.

In addition to 2-channel oscilloscope functions there is digital storage capacity with memory back-up for 10 displayed waveforms on each channel plus 40 waveforms per channel on non-volatile slot-in memory cards. Other features include a pre-trigger

function that allows capture of part of a waveform occurring before the trigger as well as facilities for analysis of logic timing.

The 300 incorporates a digital multimeter function, separate from the oscilloscope sections, that allows full autoranging on six measurements that can be made and displayed simultaneously on the waveform on display. All operations are linked to a data logging function with a clock facility and provide a print-out of long timespan operations via a dedicated printer.

**Leader Instruments Corp, 380 Oser Avenue, Hauppauge, NY 11788, USA. Tel: (516) 231-6900.** UK: Leader Instruments (Europe) Ltd, Raglan House, 8-24 Stoke Road, Slough SL2 5AG. Tel: 0753 38022.







# DIGITAL



ISSUE 5  
WINTER 90/91 ♦ AUDIO ♦ TIMES ♦ ☎ 081 960 2144

## SCREENSOUND EXCLUSIVE

ScreenSound has been the subject of a whole series of refinements by SSL. Its new capabilities as a powerful digital audio post-production centre have to be experienced to be believed. Massive off-line storage on optical disc is now complemented by 'Sound Net'. This major system enhancement allows multiple ScreenSound users to share, copy and backup work. As a result, ScreenSound can now offer 56 channel audio playback, and 48 hours of instantly retrievable audio on hard disk. Available exclusively from HHB.

From around £50,000.

## NEVE MODULES

You don't have to own a Neve console to access the famous Neve sound. HHB now distributes the Prism series of Dynamics and Equaliser modules and the 33609-12 range of Limiter-Compressors. Prism EQ Module: £368 Prism Input & Dynamics Module: £525 33609-12 Limiter Compressors. From £1,830.

## AKAI DD1000 TAKES OFF

Now in stock at HHB, the Akai DD1000 is a four channel hard disk recorder providing up to an hour of 16 bit audio. Capable of digital track bouncing, the DD1000 can function as a low-cost multi-track device. It's also ideal for use in any midi-based production environment. Applications include radio programme and jingle production as well as digital editing. The DD1000 can also perform as a highly efficient on-air cart machine or be triggered to play back live backing tracks. £7,750.

## STEREO MIC FEVER!

What is it with you people? Why have you suddenly gone mad for stereo microphones? Could it be all those portable DAT recorders you're buying? Our hottest selling stereo-mics are all Sony models: the ECM-979 at £210 and the remarkable ECM-MS5 at £695. We now have the ECM-959 – a superb mic normally packaged with the TCD-D10 portable. Just £122.



## KENWOOD'S AFFORDABLE CD-R

Now recordable compact disc – to the red book standard – is an affordable reality. For broadcasters and audio-post production specialists, that means instantly accessible jingles and SFX libraries. For recording studios, it allows CDs of different mixes to be supplied to record company clients on demand. HHB

is delighted to offer the Kenwood CD-WO (Write Once) system, which is also CD-ROM and CD+Graphics/PQ compatible. The Kenwood CD-WO can function with any IBM PC and blank media costs are surprisingly low. Now available in the UK from HHB, the CD-WO starts at around £15,000.



## APOGEE A/D ARRIVES AT LAST

When it comes to optimising the performance of digital audio systems, be it for CD Mastering or for broadcast uplinks/downlinks, Apogee leads the way. We're delighted to offer the Californian company's latest A/D and D/A conversion technology on an exclusive basis in the UK. The no-compromise A/D 1000 is a stereo, 19 bit, portable processor that incorporates Apogee's remarkable 'PSD' dither technology. Digital outputs to all formats plus word clock at £1,395. Another portable device – the 18 bit A/D 500 – offers similar features (minus the dither and some digital outputs) at just £795. Apogee's D/A converter, the D/A 1000, is the finest yet devised, incorporating new dual 20 bit, 8x oversampling converters that offer a substantial improvement on previous 1 bit designs. Available from HHB at £1,195.

## SAMPLING ROLAND'S LATEST

The S770, with its full bandwidth and 24-voice capability, usually comes with 2Mb of RAM. It is supplied by HHB with a further 14Mb of RAM free of charge (normally an extra £1,000). The device has an integral 40Mb hard disk for massive off-line storage of samples and programmes. It's proving as popular with our broadcast customers as it is with recording studios. Comprehensive range of both digital and analogue inputs and outputs as well as SCSI interface to CD ROM and optical disk drives. From HHB, the 16Mb Roland S770 is just £4,347.

## NO-COMPROMISE NEAR-FIELDS

The excitement surrounding ATC monitors is fully justifiable. The superb performance of the SCM 50A and SCM 100A models is already legendary, but the new SCM 20 is following in the footsteps of its bigger brothers. The '20' is quite simply the first near-field design to provide the transparency that professionals require for the monitoring of high quality digital sources. The briefest look at the standard of workmanship and the quality of the components confirms this is no-compromise British speaker design at its best. Listen and you'll understand the enthusiasm. No faddish colouration, just the source as it was recorded. Available exclusively from HHB. £1,150.



## UPDATE YOUR EVENTIDE

The Eventide H3000 Series is something of a phenomenon. If you already own one of these remarkable 'Ultra Harmonizers' we can add the effects and features from any other model in the H3000 range. Card updates start from as little as £80. We can also retrofit the HS322 Sampler Board, which provides 24 seconds of 16 bit audio, just £995.

## ROLAND SDE-3000A CONTINUES

Excellent value for money, the SDE-3000A offers a delay time of up to 4.5 seconds and eight effect memories. In studio production or live sound, this is one of the most popular effects devices HHB has ever sold. We've also secured fresh stocks. Available exclusively from HHB. £725.

– All prices exclude VAT.

## NEWS FROM EUROPE'S DAT CENTRE

According to Sony's Roger Lagadec, HHB has been responsible for more than 25% of all professional DAT sales worldwide. Be that as it may, the company's principal objective has always been to provide customers with a range of practical, cost-effective solutions each of which offers superb performance. As ever, our DAT range is backed by the most experienced and well-equipped service team in the industry.



## SONY DTC-55ES

The first official consumer DAT recorder, the DTC-55ES is also packed with useful features. This includes the ability to automatically record sub-code data, and a long play facility. HHB can confidently recommend this SCMS-equipped model to professional users for a wide range of playback applications. £477.

## PANASONIC SV-3700

Great value, professional recorder with balanced XLRs, AES/EBU and SPDIF digital I/Os, 4 digit error-rate display, head-hour counter, jog shuttle control and rack kit. Just £949.

## SONY DTC-1000ES

The Industry Standard. The

excellent build quality and no-compromise component specification typical to first generation Sony equipment has helped to make the DTC-1000ES a reliable performer in thousands of professional facilities worldwide. Featuring our legendary 44.1 kHz modification, the DTC-1000ES is available exclusively from HHB at just £1,130.

## SONY TCD-D3

It had to happen. The DAT Walkman, complete with detachable power supply. SCMS-equipped/SPDIF digital in and out. Useful 'long play' mode. Limited stocks only. £549.



## AIWA HD-S1

Super-reliable as well as tiny, this model has been upgraded by Aiwa with 1-bit oversampling A/D and D/A converters. SCMS equipped/SPDIF digital in and out £520.

## PORTABLES IN THE PIPELINE.

HHB's Portable DAT range is set to grow still further with the introduction of the Aiwa HHB 1 Pro in early 1990, followed later by the launch of the much-anticipated – and highly modular – Stelladat.

# The Power

AudioFile remains the standard by which all hard disc recorders are measured and that position of strength has earned it a reputation as the "The Power Tool".

The recent marriage of AudioFile PLUS to the Logic Series of dynamically automated digital mixing consoles sets another industry standard.

This combination of unrivalled mixing power and operational flexibility is already providing creative and economic benefits to facilities and their clients throughout the world.

AMS offer a powerful alternative to traditionally labour intensive, time consuming and expensive working methods.

Whether you own an AudioFile or not, talk to us - you'll find us as flexible and forward thinking as our products.



AMS Industries plc, Billington Road, Burnley BB11 5ES, UK Tel: (0282) 57011 Fax: (0282) 39542



# Tools...



**AMS**

**OFTEN IMITATED - NEVER EQUALLED**

AMS Industries Inc, 1180 Holm Road, Suite C, Petaluma, CA 94954. USA Tel: (707) 762-4840 Fax: (707) 762-4811



**C =  $\pi d$**  (Archimedes: 250 B.C.)    **I = E/R** (Ohm: 1827 A.D.)  
**F = M  $\cdot$  a** (Newton: 1687 A.D.)    **E = mc<sup>2</sup>** (Einstein: 1905 A.D.)

led to new possibilities in life

**4 x 2 = 1u** (Citronic: 1988 A.D.)  
 can do the same for you.



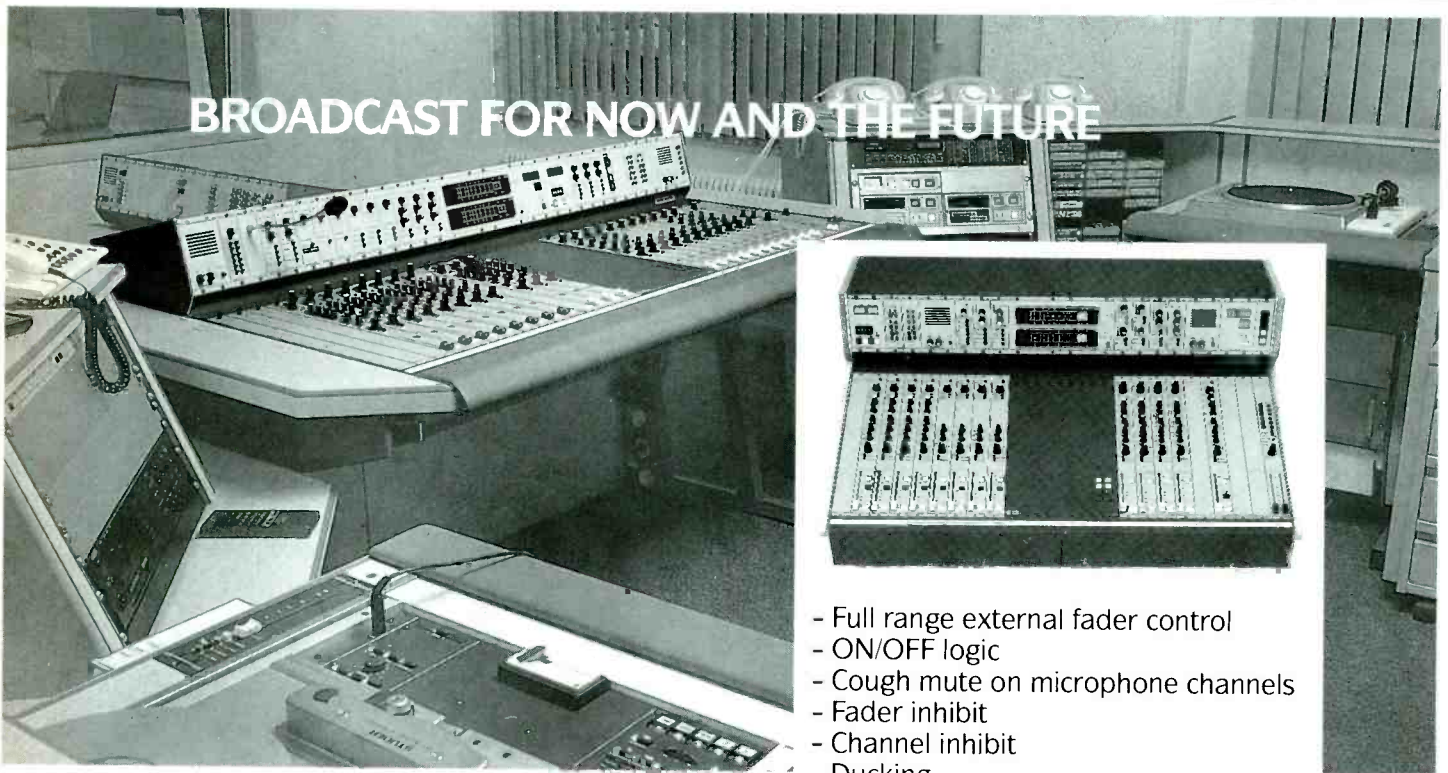
## SPX5-41

the revolutionary new Dual Four-way State Variable Crossover  
 from

**CITRONIC** PRO AUDIO

Citronic Limited  
 Bowerhill, Melksham SN12 6UB  
 Wiltshire, England  
 Telephone (0225) 705600  
 Telex 444131  
 Fax (0225) 709639

**SUCCESS BREEDING SUCCESS**



BROADCAST FOR NOW AND THE FUTURE

The EELA AUDIO S 240 is a versatile broadcast mixer, designed in collaboration with broadcast engineers. Therefore it is equipped with many facilities required by broadcasters in the nineties. It is appreciated by producers and operators for its ergonomics and simplicity in operation.

- Full range external fader control
- ON/OFF logic
- Cough mute on microphone channels
- Fader inhibit
- Channel inhibit
- Ducking
- Overall limiting
- Selective limiting/compression
- Multiple Clean Feed

**eela audio**

Parmentierweg 3, 5657 EH Eindhoven Airport, Phone: 040-510484, Fax: 040-570482



# Alice®

## PRODUCT SUMMARY 1991



### ALICE AIR 2000™ BROADCAST MIXER

The AIR 2000 is the latest in the range of high specification modular on-air consoles **designed specifically for heavy duty use by professional broadcasters.**

A high level of flexibility allows the user to specify various main-frame and module options, so that the console can be tailored to individual requirements. Channel modules may be arranged in virtually any order and the universal bus system allows the user to reconfigure the layout to suit changing applications.

Microphone and Stereo line input channels, with or without EQ, are available as is a sophisticated Telco module (two may be fitted for conference calls). Inputs, insert points and main outputs are active balanced for ease of installation.

All input modules use world renowned P&G plastic conductive faders and incorporate VCA control to improve stereo matching and optimise fader life.

Comprehensive opto-coupled logic for remote control of turntables, CD machines, cartridge machines etc, is standard.

Studio to transmitter selection and phone-in delay equipment can be easily controlled from the AIR 2000 in conjunction with an Alice Studio Router (MTX3).

Each frame size includes 1 x Output Module, 1 x Control Monitor Module, 3 x VU or PPM Meters, 1 x Dual Timer Module and 19" Rack Mounting 3U Power Supply.

	Price £
Alice AIR 2000 12 Module Main Frame	2362.00
Alice AIR 2000 16 Module Main Frame	2466.00
Alice AIR 2000 20 Module Main Frame	2571.00
Alice AIR 2000 24 Module Main Frame	2675.00
Alice AIR 2000 28 Module Main Frame	2780.00
Alice AIR 2000 32 Module Main Frame	2884.00
Alice AIR 2000 8 Module Width Script Tray	176.00
Alice AIR 2000 Blank Module – Single Module Width	20.00
Alice 2001 Dual Microphone Input Module	347.00

	Price £
Alice 2001 Dual Microphone Input Module with EQ	388.00
Alice 2002 Dual Stereo Line Input Module	361.00
Alice 2102 Dual Stereo Line Input Module with EQ	413.00
Alice 2003 Telco Input Module (for external hybrid)	322.00
Alice 2005 Studio Monitor Module	429.00
Alice 2008 Eight Way Stereo Remote Input Selector	277.00
Alice 2009 Triple Tape Remote Control Module	325.00
Alice 2010 Ten Station Talkback Module	457.00
(Suitable for use with Alice TLK 10 Talkback System)	

### ALICE MONITOR UNIT MSU-10



This 2U rack unit is intended to allow monitoring of 10 stereo or mono line-level sources, and **features built-in 10+10 watt power amplifiers** to drive 8 ohm loudspeakers. A headphone jack is also provided with a separate level control. A loudspeaker mute input allows the unit to be used in areas with live microphones.

Unity gain balanced line-level outputs permit the MSU10 also to function as a source pre-select unit. Level meters may be either PPM or VU type. Line level audio connections are via XLR's and are active balanced.

**MSU10 VU £ 927.00**  
**MSU10 PPM £1094.00**

### ALICE STATION OUTPUT ROUTER MTX3



This 2U rack unit allows logic control and audio switching of up to three stereo studios to on-air, and controls the station's profanity delay unit. **Solid state audio switching is used eliminating unreliable relays.**

On-air routing is via two illuminated push buttons per studio on an offer-accept basis. A further two illuminated push buttons allow control of a profanity delay system (push buttons not supplied but are fitted as standard to the Alice AIR 2000 mixer).

Audio inputs and outputs are active balanced via XLR connectors. Control inputs from each studio are via 9 way D connectors.

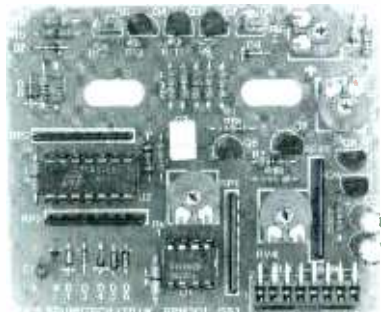
**MTX3 £925.00**

**ALICE EQUIPMENT IS BUILT TO LAST – BACKED BY OUR FIVE YEAR LIMITED WARRANTY.**

**ALICE SALES**  
**0444-248071**

## ALICE PPM DRIVE CARDS

Suitable for use with Sifam peak programme meters. Single channel cards have mounting slots to match meter studs spaced 25.4mm (1”) and 38.1mm (1.5”). The dual channel 704 card is designed to fit the Sifam 74 twin movement meter. Cards are supplied calibrated and with matching connector. *Suitable Sifam PPM meters can be supplied if required – call for details.*

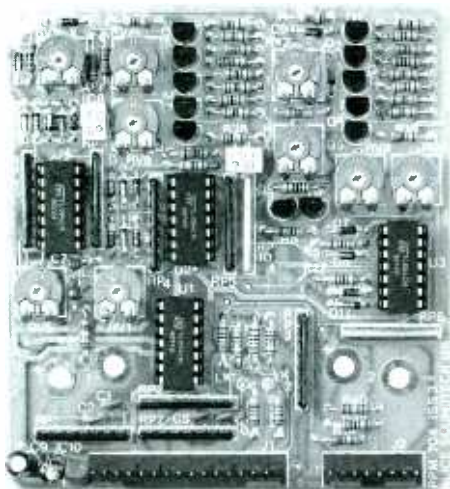


PPM301

**PPM301:**

Balanced input drive card with PPM6 LED drive capability.  
Size: 60 x 75 x 20mm  
Power requirements: Dual rail DC in the  $\pm 9$  to  $\pm 18$  volts range.  
Sensitivity:  
Adjustable in the range  $-8\text{db}$  to  $+10\text{db}$

**PPM301 £41.00**



PPM704

**PPM306:**

Unbalanced input drive card.  
Size: 69 x 56 x 20mm  
Power requirements: Dual rail DC in the range  $\pm 9$  to  $\pm 18$  volts.  
Sensitivity:  
Adjustable in the range  $-6\text{dB}$  to  $+10\text{dB}$ .  
Appearance similar to PPM301.

**PPM306 £31.00**

**PPM704**

Balanced input dual drive card. Features metering of ‘left and right’, ‘sum and difference’ and ‘sum and difference  $+20\text{dB}$ ’ selectable by an external switch (not supplied). Capable of driving two individually adjustable PPM6 LED indicators.  
Size: 100 x 92 x 20mm  
Power requirements: Dual rail DC in the range  $\pm 9$  to  $+18$  volts.  
Sensitivity:  
Adjustable in the range  $-6\text{dB}$  to  $+10\text{dB}$ .

**PPM704 £99.00**

## MATCHAMP™ ULTRA LOW NOISE MICROPHONE AMPLIFIER



The Matchamp XT131 is a state of the art balanced microphone amplifier module which achieves a noise performance within 0.5dB of theoretical with 60dB maximum gain and 150-200 ohm microphones.

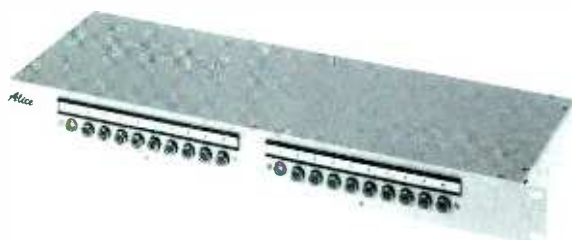
The device requires few external components and offers excellent frequency response, noise performance, distortion, signal handling and common mode rejection.

The unit is an extremely small (30 x 20 x 15mm) PCB mounting module with 0.1” spaced pins.

Also available as a ready-built mic amp card, with connections via an 8 pin Molex type connector (mating connector and 4k7 reverse log gain pot supplied). Gain range 10dB to 60dB. Dimensions 55mm (w) x 38mm (d) x 20mm (h).

**MATCHAMP MODULE ONLY £34.00**  
**MATCHAMP MIC AMP CARD £41.00**

## ALICE INPUT EXTENDERS IPX10-2 AND IPX12-2



Dual interlocking push button banks select line level stereo sources to two channels on a mixing console thus allowing cross fading from source to source. Inputs are balanced on multi-way connectors.

Stereo balanced outputs are on XLR connectors. The unit also provides routing of the mixers remote start pair to the selected source. Jackfield style legend strips allow inputs to be labelled.

**IPX10-2 (10 stereo inputs) £330.00**  
**IPX12-2 (12 stereo inputs) £335.00**



## **ALICE DISTRIBUTION AMPLIFIERS**

A range of high performance distribution amplifiers allowing single outputs to be split to a number of different destinations. Each output is via a separate balanced buffer, thus preventing a short circuit affecting any other output. Outputs may be individually unbalanced, allowing any combination of balanced or unbalanced equipment to be driven.

Input gain is adjustable in the range of 10dB loss to 20dB gain via a multi-turn preset. Rack mounted units have an integral power supply with an IEC mains connection. Single and dual, 6 or 10 output versions are available. All versions are 1U rack mounted. Additionally, an 8 output Eurocard version is available.

### **DA6-1**

1 input, 6 output mono distribution amplifier with XLR connectors.

**DA6-1 £294.00**

### **DA6-2**

Dual version of DA6-1. Suitable for stereo or dual mono distribution. May also be configured as 1 input 12 output mono distribution amplifier by internal links.

**DA6-2 £399.00**

### **DA10-1**

1 input 10 output mono distribution amplifier, with input on XLR and output via multiway connector.

**DA10-1 £413.00**

### **DA10-2**

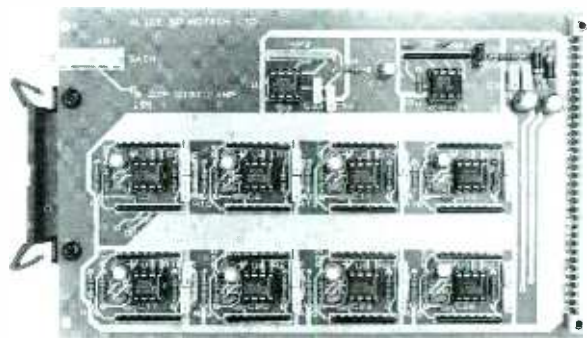
Dual version of DA10-1 suitable for stereo or dual mono distribution.

**DA10-2 £573.00**

### **EDA8-1**

1 input, 8 output distribution amplifier based on a 100 x 160mm Eurocard. Inputs and outputs are balanced via a 32 way DIN 41612 connector. Power requirements are  $\pm 15$  volts at 80mA.

**EDA8-1 £121.00**



## **ALICE MATCHPAK™ PRO-INTERFACE**



A bi-directional stereo unit, for interfacing unbalanced semi-pro equipment to professional balanced line levels. Fitted with four XLR connectors for balanced and four phono sockets for unbalanced connection.

Input and output gains are factory set for a nominal 10dB attenuation line to equipment and a nominal 10dB gain equipment to line and are user adjustable to interface other levels.

**MATCHPAK £162.00**

## **ALICE TALKBACK UNIT TLK-10**



The Alice TLK10 talkback units are designed for instant communication between studios, newsroom and other technical areas. Each unit has 10 individual push to talk buttons allowing selection of destination as well as talk-to-all. Incoming talkback illuminates the senders button for ease of reply.

Complicated wiring is avoided by use of IDC ribbon cable between each station and a central connection unit (TLK-CCU). A 9-way D-type connector allows logic signals for mute of external monitoring systems or of the internal talkback loudspeaker. The TLK 10 is 2U 19" rack mounting, with a depth of only 89mm to allow installation into work surfaces. The TLK-CCU is 3U 19" rack mounting.

Ribbon cables fitted with connectors can be supplied to special order.

The system is fully compatible with the Alice Air 2000 broadcast mixer.

**TALKBACK STATION TLK 10 £688.00  
CONNECTION UNIT TLK CCU £161.00**

**APPLYING FOR A NEW RADIO LICENCE?  
CALL ALICE FOR TECHNICAL ADVICE.**

**ALICE SALES  
0444-248071**

## SOUNDTECH™ SERIES A MIXER



The Soundtech™ Series A is designed to meet the demand for a competitively priced high performance mixing console for use in radio, TV and video production and portable applications. The fully modular construction and choice of seven sizes of frame allow the customer to specify the ideal mixer for the job.

Mains inputs and outputs are active balanced for easy connection to either professional or semi-professional equipment.

Stereo input modules feature built in domestic interface and phono pre-amplifiers. **Fader start is fitted as standard.** Mono input modules have switchable 48v phantom power and local monitor muting. The telephone input module produces a mix-minus cleanfeed for connection to a hybrid. The master output module is available with a choice of VU or PPM meters.

The VCA output limiters sound superb either as overload limiters or as effects processors. The Soundtech Series A mixer carries a 12 month limited warranty.

### Price £

Soundtech Series A Main Frame 4 (up to 4 input modules)	296.00
Soundtech Series A Main Frame 6 (up to 6 input modules)	313.00
Soundtech Series A Main Frame 8 (up to 8 input modules)	336.00
Soundtech Series A Main Frame 12 (up to 12 input modules)	364.00
Soundtech Series A Main Frame 16 (up to 16 input modules)	393.00
Soundtech Series A Main Frame 20 (up to 20 input modules)	421.00
Soundtech Series A Main Frame 24 (up to 24 input modules)	449.00
Soundtech Series A Output Module VU	572.00
Soundtech Series A Output Module PPM	778.00

### Price £

Soundtech Series A Blank 1 Width	17.00
Soundtech Series A Blank 6 Width	41.00
Soundtech Series A Blank 8 Width	52.00
Soundtech Series A Script Tray	169.00
Soundtech Series A Input Module Mic/Mono Line	116.00
Soundtech Series A Input Stereo Line with EO	164.00
Soundtech Series A Input Stereo Line	136.00
Soundtech Series A Telco Input Module (for external hybrid)	179.00

## CALL 0444-248071 FOR OUR LOWEST PRICES ON

- |                                 |                                    |
|---------------------------------|------------------------------------|
| ★ ALL TYPES OF STUDIO EQUIPMENT | ★ BROADCAST TRANSMITTERS & AERIALS |
| ★ TURNKEY INSTALLATION SERVICES | ★ CUSTOM STUDIO FURNITURE          |
| ★ BROADCAST COMPUTER SOFTWARE   | ★ ACOUSTIC ROOM DESIGN             |
| ★ NAB CARTS AND MAGNETIC TAPE   | ★ PRE-WIRED SYSTEMS                |

## PRODUCT RANGES AVAILABLE FROM ALICE

AKG Microphones & Headphones  
Ampex Magnetic Tape  
Audiopak NAB Cartridges  
Beyer Microphones & Headphones  
Bird RF Test Equipment  
Canford Audio Products  
Cartridge Technology NAB Carts  
Century 21 Music Library  
Denon CD Cart Players  
Drawmer Compressor Limiters  
Electrovoice Microphones & Loudspeakers  
EMT Broadcast Turntables  
HCD Transmitters  
Heco Loudspeakers

HW Radio Mic Systems  
Inovonics Transmitter Processors  
ITC Cart Machines  
K&M Microphone Stands  
LAD Turntables  
Leevers Rich Bulk Erasers  
Lindos Audio Test Sets  
Marantz Cassette Machines  
Neuman Microphones  
Optimod Transmitter Processors  
Quad Amplifiers  
Revox Tape Machines  
RCS Broadcast Aerials  
Saphire NAB Cartridges

Sennheiser Microphones & Headphones  
Shone Acoustic Products  
Shure Microphones & Mixers  
Sifam VU & PPM Meters  
Sonifex Cart Machines  
Sony CD & DAT Machines  
Spendor Loudspeakers  
Studer Tape Machines  
Switchcraft Jackfields  
Tascam Tape Machines  
Technics CD & DAT Machines  
Uher Tape Machines  
Wiercliffe Bulk Erasers  
Zonal Magnetic Tape

### ALICE SOUNDTECH PLC

Unit 1, Ashwyn Business Centre, Marchants Way, Burgess Hill, West Sussex RH15 8QY  
SALES 0444 248071 FAX 0444 236888

Prices are Pounds Sterling and are subject to Value Added Tax where applicable and Carriage.  
Certain products may only be available through Alice Soundtech Dealers.



## Software

● **Opcode** have released a Mac editor/librarian for the Kurzweil *K1000* that allows sounds to be created and edited on the synth and stored with enhanced programme manipulation on disk. In common with other librarians packages from the company features include graphic editing of all envelopes, all changes transmitted immediately to the *K1000*, built-in sequencer for monitoring changes, exporting of patch names to Opcode's *Vision* sequencer, editing of voices from any bank or library, comparison of edited and original sounds and bundling of patch types in one document.

Additionally the program expands on the *K1000*'s layering abilities and envelopes can be edited from the Layer Window. A Master Editor shows channel numbers, volume, pan, polyphonic limitations and note limitations and these are adjusted with sliders, buttons and pop-up menus. Velocity maps and custom tunings can also be controlled.

● Aside from C-Lab's highly acclaimed *Version 3.0* of *Notator/Creator*, which adds a number of powerful editing options and a manual that surpasses all others to what was already an impressive program, the company have released three education-oriented software packages.

Intended as an introduction to MIDI, composing, arranging and editing, *Notator Alpha* integrates notation and sequencing. *Midia* attempts to make MIDI understandable to the beginner and demonstrates the interaction between the program and an instrument with screen action and text. The program's graphic tools include footswitches, pedals, faders, a screen keyboard and the program also includes a MIDI event list, byte calculator, input filters and a universal dump utility. Finally, *Aura* is an ear and rhythm training program featuring interval listening exercises, scale training, melody dictation and rhythm dictation/training.

## Samplers

● **Syco** have sole UK distribution on a 70 Mbyte+ proprietary library for Roland's *S770* sampler available on Sony optical or 48 Mbyte Syquest cart. Sounds already include rock and ethnic percussion, orchestras and guitars. The collection will be added to over a 12 month period.



## Yamaha's breakthrough box—the TG33

Set to cause as big a stir in the middle market as Roland's *MT32* and later *D110* did with their multitimbral accessibility and immediately appealing sounds, Yamaha's *TG33* tone generator is a flat top module that can also be rackmounted. Based on the synthesis principles of the company's *SY77* flagship, the *TG33* combines 128 AWM waveforms with 256 FM waveforms into 128 presets and 64 user locations with additional support from memory cards.

Elements, ie FM and AWM waveforms, can be combined in twos or fours with a maximum polyphony

of 32 on a two-element sound. The module offers vector control of element detune or level via a joystick and this can be programmed automatically to occur each time a key is pressed, or be played live and recorded into a sequencer. This in itself increases the palette of sounds obtainable from the *TG33* manifold and is something of a breakthrough in its price bracket.

For multitimbral use the unit offers 16 multiplay memories, which are configurations of sounds that each have their own MIDI channel, level, pan, note shift, output assignment (two pairs of stereo outputs) and

global control of effect type (there are 16 on board), send levels and balance. Dynamic voice allocation is included to avoid note stealing and the module comes with a comprehensive collection of drum sounds.

Yamaha makes much of the *TG33*'s openness to programming and with features like the global editing of attack and release envelopes of all sounds combined under vector control this would seem to be the case. All told, a very important development.

Studio Sound's Music News is compiled by Zenon Schoepe

## MIDI Mixer 7s

Software specialists Mark of the Unicorn have entered into hardware manufacturing with the 1U stereo *MIDI Mixer 7s*. Offering seven stereo inputs each with bass, treble, pan and two effects sends, plus a stereo aux input and master noise gate with

adjustable attack and release, the devices can be stacked. All control is derived via MIDI allowing live sources to enjoy a degree of automation from a sequencer.

**Mark of the Unicorn, Cambridge, MA, USA. Tel: (617) 576-2760. Fax: (617) 576-3609.**

**UK: Sound Technology plc, London. Tel: 0462 480000.**

## Ensoniq EPS16 Plus

Ensoniq have added the *EPS16 Plus* sampling workstation to their list of products. This features 16 bit sampling, 24 bit effects and an upgraded sequencer over its predecessor. Effects include reverb,

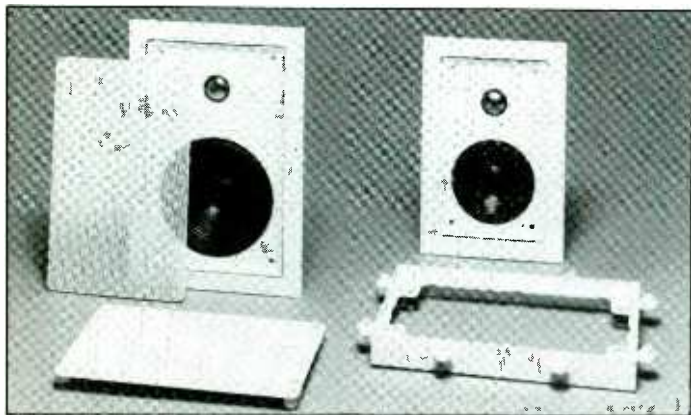
chorus, delay and distortion and the improved sequencer allows MIDI automated mixdown. A user programmable Flashbank memory option is now also available.



## E-mu orchestral expansion kit

E-mu have released a 4 Mbyte orchestral expansion kit for the *Proteus/1*. This doubles the amount of memory in the machine and 30 16 bit orchestral instruments have been included from the *Proteus/2*. Each of these has been multisampled and 46 additional digital waveforms add to the sound creation possibilities of the unit. Derived from the new orchestral samples, 128 new ROM presets include woodwinds, brass, percussion, ensembles, keyboards, bass, textures and sound effects. The kit can be installed by authorised E-mu service centres.

All *Emax IIs* will now come with stereo sampling as standard at no extra charge. This provides true phase coherency, 64x oversampling, digital anti-aliasing filters, and automatic ADC calibration. The company have also doubled the internal RAM of Turbo *Emax IIs* to 8 Mbyte and reduced the price of *Emax 4* Mbyte machines and 2 Mbyte expansion kits.



## JBL amplifiers and loudspeakers

Several new product lines from JBL include *SR4700*, *8300*, *2100* series loudspeakers and *SR* and *ES* ranges of power amplifiers.

The *SR4700* series loudspeakers consists of six models that follow on in the tradition of the *Cabaret* series. New features include lighter cabinet design coupled with higher strength, bi-radial horns with titanium drivers and vented gap cooling low frequency drivers.

The *SR* series power amplifiers are designed for sound reinforcement with a low feedback-low distortion design philosophy. The three models are *SR6615* (150 W/channel), *SR6630* (300 W/channel) and the *SR6650* (500 W/channel).

The *ES* series power amplifiers meet the requirements of sound contracting applications. Five models are available ranging in power from 75 W/channel into 4  $\Omega$  (20 Hz to 20 kHz, both channels driven) to 600 W/channel.

The *8300* series of flush-mount wall speakers includes the *8305* and *8306* 2-way models. The units are suitable for all sound contracting applications as well as more specialist situations such as theatres and cinemas. In order to help installers, a separate installation kit is available that allows the fittings to be installed

without unpacking the loudspeakers.

The *2100* series of coaxial speakers consists of the *2142H*, *2152H* and *2155H*. The *2142H* combines a 12 inch low frequency section together with a 1 $\frac{3}{4}$  inch titanium dome high frequency section and features more uniform directivity above 1 kHz and bi-amp terminals. The *2152H* and *2155H* combine 12 inch and 15 inch LF drivers respectively with titanium dome compression drivers coupled to specially developed flat-front bi-radial horns. Special attention has been paid to dispersion above 8 kHz in order to maintain even coverage and power response.



## Electro-Voice catalogue

A new catalogue featuring the full line of Electro-Voice music equipment offers detailed information, specifications and photographs of E-V's, line of electronics, stage systems, microphones, components

and accessories. The catalogue marks the first time that all music products are listed in one source. To obtain a copy of the catalogue, write to Electro-Voice at 600 Cecil Street, Buchanan, MI 49107, USA, or their agents.

## Rolls PM50 and ADB2 stage boxes

The Rolls Corp have released two handy boxes, the *PM50* personal monitor system and the *ADB2* active direct box.

The *PM50* allows performers to mix their own microphone signal with the main programme signal as required. The box is fitted with monitor and microphone level controls, two headphone jacks and monitor-in jack. The *PM50* can be powered separately or by phantom power (9 to 25 VDC) through the monitor jack.

A 6-channel distribution

amplifier/power supply is also available to configure large systems.

The *ADB2* direct box accepts signals from -10 to +40 dB and is phantom powered (9 to 48 V). Bandwidth is quoted as 1 Hz to 50 kHz with S/N of 100 dB. Output is -10 to +2 dB balanced.

Facilities include two  $\frac{1}{4}$  inch jacks, XLR-type output connector and input attenuator switch with 0 dB/20 dB/40 dB positions.

Rolls Corp, 7023 S 400 W, Midvale, UT 84047, USA. Tel: (801) 562-5628. Fax: (801) 562-5655.

## Nexo contracts in Europe

Nexo have announced further contracts for their range of speaker systems. In France the Lagoona Group worked with a 50 kW pre-release of the new Nexo touring system, which will officially be launched at AES Paris. Radio France have placed an order for the *S12000* system. French chef Paul Bocuse has chosen a Nexo system for installation at his new venue in Lyon, the Abbaye de Paul Bocuse, which will be used for receptions and corporate meetings. In Havana, Cuba, the National Opera have installed a system featuring the Nexo *PC Line* range. Spanish Nexo distributors 220 have supplied *PC212* systems to the opera company 'El Gran Teatro Del Liceo' of Barcelona, and as a touring system to the theatre company 'La Cuadra de Sevilla'.

## Mark IV VP

Roger Gaines has recently been named a vice-president of Mark IV Audio. Gaines will primarily be responsible for overseeing management of manufacturing operations for all the companies in the Mark IV Audio Group. Gaines has been promoted from within the company.

## Klipsch KP-320 loudspeaker

The *KP-320* compact loudspeaker enclosure is designed for sound reinforcement. Housing a 15 inch LF driver, a hybrid Tractrix horn/compression driver and a 12 inch passive radiator, the cabinet size is approximately 40% smaller than a typical 2-way system. It has just a 15 inch speaker due to the passive radiator, which permits lower cabinet tuning without long vents. The passive system also helps prevent over-excitation of the woofer when the cabinet is overdriven.

The horn design is based on the new Tractrix equation, which means that the horn characteristics vary from exponential at the throat through to conical for the mid section and hyperbolic for the mouth. Benefits include higher output with less distortion, good polar response and better transition to the woofer.

The system is also fitted with the KLIP tweeter protection circuit, which allows all the usable output of the speaker on peaks and does not degrade the sound quality.

The *KP-320* may be stand-mounted separately or used in combination with the *KP-115-SW* subwoofer. For special systems, both enclosures can be rackmounted in 32U.

Specifications include a frequency response of 49 Hz to 15 Hz  $\pm 4$  dB, sensitivity of 101 dB SPL at 1 metre and a maximum continuous output of 124 dB/1 metre with 225 W input. Nominal impedance is 8  $\Omega$ .



**West German Rental & Studio Facility in the beautiful Black Forest area**

offers for the first time in the UK

Digital Video + Film Post-production Systems for Voice Over, Voice Replacement, Synchronisation, Music Production, Jingles etc.

our **SYNCLAVIER** and **8-TRACK DIRECT-TO-DISK Digital Audio Systems**

in several different versions (we currently own three Synclaviers and two 8-Track Direct-to-Disk Systems) available for hire

with and without operator on short or long term basis at extremely reasonable rates (also at your location in UK)

Ask for our 'On the Road' rental rates or our low prices for our Studio Rentals. You will be pleasantly surprised.

We also rent our Video Post-Production rooms equipped with A/B/C Roll Betacam, Ampex ADO, Chyron Super-Scribe and much more

**MM-TECHNOLOGY**

Vertriebsgesellschaft audio/visueller Elektronik mbH

Bachstr. 2 · 7502 Malsch b. Karlsruhe · West Germany  
Tel: (49) 7246 5005 Telefax: (49) 7246 5009

**FOR AUDIO ADVICE THAT ISN'T OFF THE SHELF**

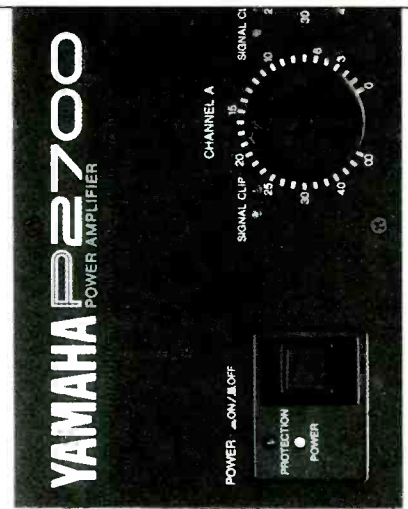
LONDON BOROUGH OF ISLINGTON

**BRITANNIA ROW SALES**

Call us for effective advice in music recording, broadcast, sound reinforcement systems and installations.

Telephone: 071-226 1226 · Fax: 071-226 5396

BRITANNIA ROW SALES LTD. 35 BRITANNIA ROW LONDON N1 8QH



**TWO INSTANTLY FORGETTABLE NEW POWER AMPS FROM YAMAHA**

Put Yamaha's new P2700 and P2350 power amps in your rack and you'll never need to think about them again. They'll always be there for you, calmly delivering 350 wpc (8Ω) and 175 wpc (8Ω) of effortless power with uncompromised sound quality and workhorse reliability.

One thing P Series users do remember about their amps however is the power to price ratio. And always with a smile.

**YAMAHA**  
THE SPIRIT OF MUSIC

For further information on the P Series Power Amplifiers, please complete this coupon and send to: Yamaha-Kemble Music (UK) Ltd., MI & Pro Audio Division, Mount Avenue, Bletchley, Milton Keynes, MK1 1JE.

Name \_\_\_\_\_  
Address \_\_\_\_\_  
Postcode \_\_\_\_\_

# MAINTAINING DIGITAL AUDIO QUALITY

Francis Rumsey looks at some of the factors that can affect digital audio quality in the recording chain

Digital audio is not 'pure perfect sound for ever', as was once suggested, but it can offer a more transparent recording and reproduction path than analogue audio, provided engineers are aware of the factors that may affect sound quality. Many myths exist concerning what can and cannot affect sound quality in a digital audio system and the following article is intended to air some questions and provide some possible answers.

## Boundaries

Before starting, some boundaries must be laid down. Firstly detailed aspects of converter design will be excluded since this is a highly specialised area and one over which few practising audio engineers have any control. Secondly, we shall consider only conventional linear PCM (as used in nearly all recording systems), as opposed to non-linear systems such as NICAM, or data compression systems such as apt-X and Dolby Adaptive Transform Coding, since these are systems designed for the specific purpose of squeezing a lot of audio into a small bandwidth, and thus involve deliberate trade-offs between effects on sound quality and bandwidth reduction. Thirdly, this is not really going to be a 'digital vs analogue' article, since that subject is too wide and too plagued with subjective prejudices.

We shall look specifically at how sound quality can be maintained through a recording and reproduction system, as well as when copying signals from one system to another, and investigate the likely points at which the quality

could be affected. It would also be good to look at such factors as whether digital interfaces can affect sound quality (as was recently suggested) and whether expensive outboard converters are worth the money. If you disagree with anything that is said, please write in and start a dialogue, since it is only by free exchange of views that the subject as a whole moves forward.

Finally, it would be good if we could start from the fundamental premise that the A/D and D/A conversion process is capable of accurate sampling, quantisation and subsequent reconstruction of an audio signal within the limits dictated by the sampling rate, timing accuracy and number of bits per sample. There are still those who believe that this process is fundamentally flawed and that a system representing a smooth audio signal in terms of little staircases can never be as good a curvaceous-old analogue. We can spend a lot of time discussing how to make this conversion and reconstruction process closer to the ideal but we should accept that it works in principle. A reconstructed audio signal, after it has been D/A converted and lowpass filtered, is not a staircase-like waveform, even if examined under a microscope. The error in quantisation (and any error in the timing axis due to clock jitter) manifests itself as random noise provided the signal has been correctly dithered at the A/D conversion stage.

## Signal chain

Apart from in the transducers (microphones and

loudspeakers), which both analogue and digital systems require to communicate with our analogue ears, it is in the recording or transmission process that the greatest potential for degradation of the signal lies in an analogue system. In the case of analogue AC-biased magnetic tape recording there is potential for harmonic distortion, IM distortion, phase distortion, frequency response errors, variations in speed (wow and flutter), hum, noise, compression, drop-out and modulation noise. The sound quality of the signal chain is affected by all these artefacts of the recorder and will depend on the state of alignment of the tape machine, as well as the cleanliness and state of the heads, type of tape and age of the machine. Despite these points, the analogue tape recording process, like the internal combustion engine, has been developed to a point where it is capable of high performance, due to careful optimisation.

Considering for a moment the case of a vinyl record as the recording medium, it is clear that similar comments apply. A piece of dirt in the groove directly affects the sound that comes out of the loudspeakers, since the reproducing stylus and subsequent amplifier cannot distinguish between a movement of the stylus due to a genuine deviation of the groove and a movement caused by the piece of dirt. Similarly, any slight roughness in the plastic of the record will be turned into noise on the audio output and any vibrations of the turntable will be heard by mechanical transfer via the stylus to the output. Any speed variations in the turntable will be translated into variations in the output pitch.

The point of listing the artefacts of the storage device that affect sound quality in an analogue system example is to contrast the situation with that of the digital system, where the artefacts of the storage or transmission process may not necessarily be directly reflected in the sound output. When a recording/replay or transmission/reception system is designed, one of the fundamental goals is to ensure that the binary data recorded may be recovered with reasonably low error rate on replay or reception and then an error correction system capable of dealing with errors at the anticipated rate is built. A digital recording system relies for its success on the premise that the difference between a binary 1 and a binary 0 will be discernible in the replay process. Fig 1 shows the factors that may mitigate against this. Timing

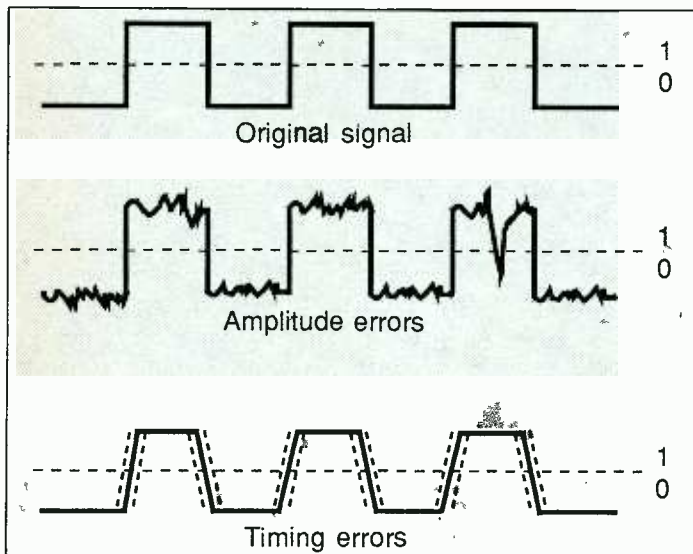


Fig 1: The effects of amplitude and timing anomalies on digital data

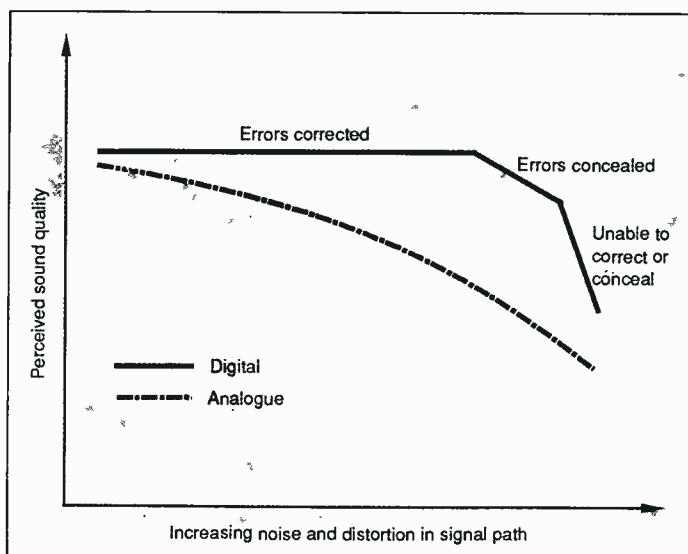


Fig 2: Relative performances of analogue and digital audio in the face of an increasingly poor signal chain



# Examine your Options

The complexity of today's studio environment demands an operational flexibility not available in a single console, until now! The VECTOR 432 from Trident.

Equally comfortable in Music or Post Production and built to Broadcast standards, the VECTOR is truly the console of choice. All this and Trident sonics at an affordable price.

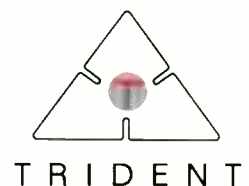
Examine our competition and then investigate the VECTOR. We are sure you will find your options are few.



Photograph by Andy Phillips

## TRIDENT VECTOR AT 145 WARDOUR STREET, LONDON

- ▲ 32 balanced multitrack routing buses.
- ▲ A/B/C/D balanced stereo buses with mix matrix and Main Output Bus compressor.
- ▲ Grouping and automation of 12 switches per module via SMPTE or MIDI.
- ▲ P & G faders. Sealed conductive plastic pots throughout.
- ▲ Four band Parametric equaliser splittable between both Channel and Monitor with individual bypass switches.



The VECTOR 432 is available with a wide range of options including:-

- ▲ LCRS Film, Stereo Input, Effects return & 4 way Dynamics modules. VCA grouping, VU or bargraph meters.
- ▲ Single VCA (channel), Dual VCA (channel & monitor), or Moving fader automation systems, any of which may be integrated with the Trident Machine Control, enabling sophisticated cue list management, cycles and 'drop in' of master, slave and MIDI (virtual) transports.

errors affect the system's decision because they may result in confusion over when an event occurred and amplitude errors can affect the decision because they may result in confusion over whether the datum was a 1 or a 0. Noise and distortion in the recording or replay chain can affect both timing and amplitude of the signal.

Errors occur in replayed data when the timing or amplitude of a signal is so badly affected that a particular bit is reproduced in the incorrect sense (ie a 1 is detected as a 0 or *vice versa*). Error detection mechanisms are incorporated within the audio data to check for the presence of errors and these are used to signal the presence and location of an error to the error correction circuits that follow. Fig 2 shows conceptually how typical digital and analogue recording systems compare in the face of increasing noise and distortion in the signal path. The digital system's sound quality remains unaffected as the quality of the signal path gets worse, up to a point where the error correction system becomes unable to cope with the resulting number of random errors.

## Effects of data errors

Typically, the types of phenomena that affect replayed sound quality in an analogue system (drop-outs, dirty heads, etc) result in replay errors in a digital system. Whether or not these errors then go on to manifest themselves as changes in sound quality depends on how good the error correction system is at coping with them. In a well-designed system, performing as it was intended, replay errors are fully corrected in

normal operation and it is only occasionally that errors occur that are beyond the correction capacity of the system.

In disk-based or 'tapeless' systems the situation with errors is rather different, since the disk drives and controllers that are used as stores handle their own error correction. These drives have come from the computer industry, where any error in data could be fatal, and thus the effective error rate tends to be extremely low. Disks are mapped by the disk controller to avoid writing data in any so-called 'bad blocks' and thus data tends only to be stored in error-free locations. There can be no such thing as 'interpolation' or 'hold' in a computer system used for, say text processing, since an ASCII character is either correct or it is not. It is not normally possible to interpolate between the letters of a word to guess the missing letter!

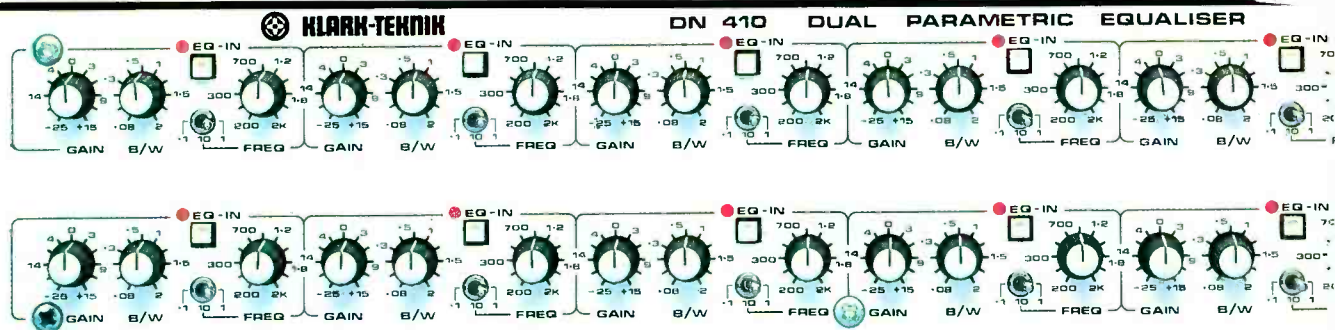
*Indication of errors:* Most professional recording systems indicate error status to some extent and it is important to know how to interpret these indicators. Common labelling for error correction indicators shows lights in order of seriousness of the error. For example, the Sony *DMU-30* digital meter unit, which may be attached remotely to the *PCM-1630*, displays in the order CRC, Parity, Average, Hold, Mute. In many cases the lights are coloured green, orange and red, again to indicate the seriousness of the error. The panel opposite describes this in more detail. Often these error status lights have an artificial 'permanence' that keeps them alight for a second or so, even if the error only lasts a millisecond. A short 'hold' on the light does make errors easier to see but holding too long may hide the true state of affairs and make it difficult to tell the difference between indicator hold and prolonged error conditions.

Most professional or 'professionalised' DAT machines have been equipped with only two lights to indicate error status: red and green. The red light usually indicates an error likely to affect the audio output (a serious one, in other words), while the green light indicates an error that has been fully corrected. The front panel of Sony's *PCM-1630* only shows 'Mute' and 'CRC' states, although the intervening states may be seen by removing the front panel. This is true of many systems, which do not always show the full error status on the main display preferring not to worry users unless they decide to invite worry by removing the cover over the error status lights.

Some systems have optional error analysers or counters, such as the Sony *DTA-2000* and the new Panasonic DAT machines, for displaying or printing the number, type and location of errors on a recording. These can be useful in quality-controlled environments when it is vital that tapes are either error-free or only contain correctable errors. Such a printed analysis also provides an insurance policy in the event of a tape being damaged by someone, or not replaying correctly in another location, since it is then possible to state (in time-honoured tradition) that the tape itself was alright when it left you.

*Effects and interpretation of errors:* Only true correction will result in an unaffected audio output, since true correction restores erroneous samples to their original state perfectly, in which case there is no difference between a corrected sample and the equivalent original sample. Some professional systems have been designed to either correct perfectly or mute the output, and sound or show a warning. In this way a master recording being checked could not pass if it contained any

# Parametric Equalisation



Klark-Teknik Research Limited, Klark Industrial Park, Walter Nash Road, Kidderminster, Worcestershire DY11 7HJ, England. Tel: 05621741515 Telex: 339821 KLART K G Fax No: 05621745371



uncorrectable errors. This is a good approach in cases where perfection is important but there may be instances where being able to replay a tape is more important than the precise fidelity with which it is replayed. Some systems may be switched between these two states in order to allow the replay of erroneous tapes without muting (this mode is called 'PB Muting Off' on Sony EIAJ-format PCM adaptors such as the PCM-701).

In most consumer systems (eg, CD players), error correction status is not shown, since presumably it would result in too many complaints about faulty hardware or software! In such systems interpolation and holding is often allowed, since it is assumed that replay of some sort is preferable to a muted output. For this reason, errors in consumer digital systems are often audible on the system output as spits and clicks, or even broken-up audio in bad cases.

The regularity and seriousness of errors is an important indicator of the state of replay, the state of the tape and the state of the replay machine. Prolonged periods of interpolation-type errors should be regarded with concern, since the audio bandwidth will be halved during a prolonged bout of interpolation. If such errors continue on every tape that is replayed, it may indicate that heads are dirty or worn. If the errors only accompany particular recordings then the fault clearly lies with the tape and may indicate a worn or faulty tape. Errors that accompany particular tapes may also be the result of differences in mechanical alignment between the record machine and the replay machine. Prolonged periods of 'green', correctable errors (CRC, Parity) will not affect the quality of the audio output but still should give cause for

concern, since a correctly working system should only show the occasional flash of 'green' error during normal operation.

**Minimising error rates:** Error rates can be minimised in a number of ways, some depending on the tape machine and some depending on the tape. It has also been shown that the environment in which the machine and tape are housed can affect error conditions.

Any physical handling of a digital tape will cause fingerprints to be left on the surface and although these might be considered unimportant, they are in fact a good sticking-point for dirt and represent a considerable contamination at the wavelengths involved. Fingerprints can result in replay errors of varying seriousness and should be avoided. It is sometimes possible to clean a tape (especially the open reel varieties) by carefully wiping the recording surface with a slightly moist cloth around the area of the fingerprint and this has been shown to reduce the resulting errors in many cases. This technique also helps around difficult splice edits, where the tape has been handled and glue from the splicing tape may have caused dirt to stick, resulting in a poor join. Splice-edits on both DASH and PD machines may sometimes be made to play in cases where previously they did not in this way.

Cigarette smoke and other such airborne contamination is not helpful to any recording system where fine tolerances and short wavelengths are involved, since the particles of smoke represent a considerable obstacle in comparison to the dimensions involved in digital recording.

Machine alignment is paramount to good performance, just as it is in analogue systems, and many people forget this fact of studio life

once they start using digital equipment. Mechanical alignments may need to be performed regularly, using manufacturers' test jigs and test tapes, in order to keep the error rates low on digital recorders. It is not so necessary to align the system electronics regularly, since such adjustments as bias and EQ are not required in the same way in digital systems. The mechanical tolerances required for good performance in a digital system are much finer than those required in analogue recording.

Head and guide cleaning is an important aspect of regular maintenance, as it is in analogue recording, although greater care is usually required than with analogue machines. Each manufacturer may recommend particular cleaning materials and it is wise to use these. Isopropyl alcohol is not good for cleaning digital heads and guides, since it is slightly greasy but ethyl alcohol or freon sprays are usually reliable. Any cleaning cloths or wipes should be free from stray fluff or anything else that might contaminate the mechanism. It is not wise to use much pressure when cleaning the heads, or to scrub them at all, since they are more delicate than analogue heads.

It is also possible that tapes from other machines may not replay so well as recordings made on the machine itself, and this again is normally the fault of poor mechanical alignment of one or both of the machines. Just as one adjusts the azimuth of the replay head to optimise the replay of tapes from other machines, using tones at the start of the tape, so it may be necessary to adjust the alignment of a digital machine to accommodate a poorly-aligned recording, although it must be admitted that no standard procedure has been adopted for this purpose and that there is still some way to go in

## ...DN410 - The Universal Equaliser

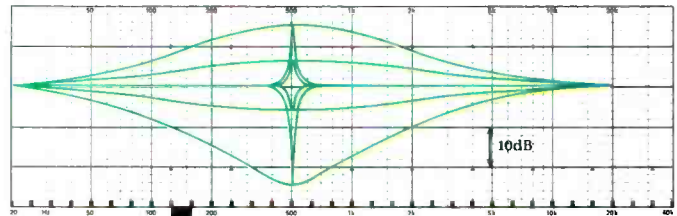
**Unprecedented control** - with ten *universal* parametric filters, each capable of performing the full range of notch filter and broadband functions anywhere 20Hz to 20kHz.

**Outstanding audio quality** - carefully designed for minimal distortion and lowest noise, the DN410 re-affirms Klark-Teknik's reputation for sonic excellence.

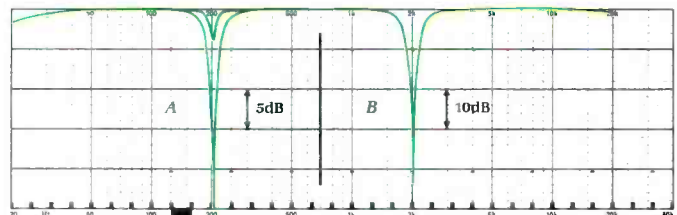
**Professional features** - with low and high cut filters, dual/mono mode select, fail-safe bypass and a choice of termination standards, the DN410 is thoroughly engineered - to suit your application.

**Klark-Teknik reliability** - designed-in from initial concept, the Series 400 parametrics feature quality assurance in the best traditions of Klark-Teknik.

**Parametric**

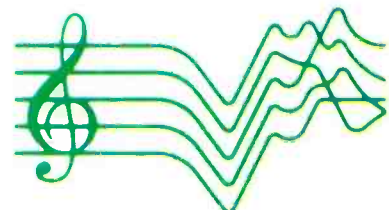


**Notching**  
A. Single filter  
B. Two filters



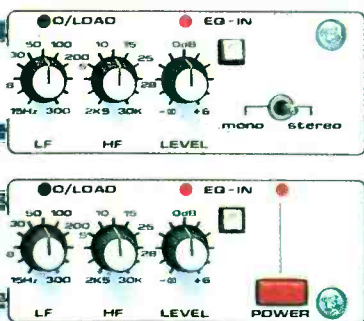
### The DN410...Specifications

Frequency response (20Hz-20kHz)	± 0.5dB
Distortion @ +4dBm	< 0.01% @ 1kHz
Equivalent input noise (20Hz-20kHz unweighted)	< -90dBm
Channel separation	> 75dB @ 1kHz
Filter bandwidth	Variable from 1/2 to 2 octaves
Maximum boost/cut	+15 to -25dB
Maximum output level	+22dBm



E Q U A L I S A T I O N

**KLARK TEKNIK**  
The first name with sound system designers



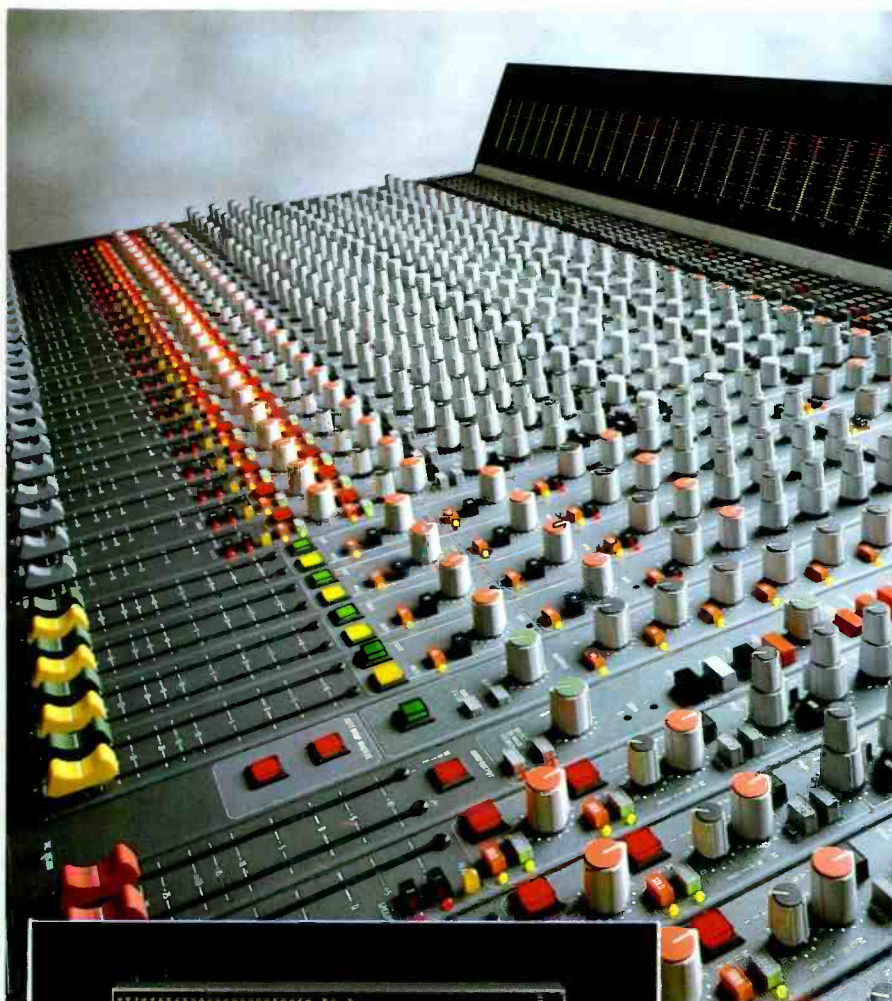
Klark-Teknik Electronics Inc. 200 Sea Lane, Farmingdale NY11735. Tel: 516 249 3660 Fax: 516 420 1863

Klark-Teknik (Singapore) Pte Ltd. 7500A Beach Road, 05-305 The Plaza, Singapore 0719. Tel: 293 9736 Fax: 293 9736



# TAC Magnum

QUALITY ASSURED, PRICE UNBEATABLE



You need an edge. The world is competitive and you're creative but hard-pressed. You need a console that allows your creativity to shine through without compromising your finances.

Building consoles to meet that specification is what TAC does to perfection. We deliver an unbeatable combination of performance, features, construction and price.

We know console technology. The MAGNUM is proof positive and is perfect for multitrack, video post and broadcast production. Look at this checklist for comparison:

**CONFIGURATION:** 24-buss in-line console with dual-input technology, allowing each channel to have two independent signal paths.

**EQUALIZER:** the powerful 4-band semi-parametric equalizer can be split between channel and monitor paths, giving 72 inputs with eq on mixdown in the 36 input chassis.

**AUXILIARIES:** 8 Auxiliary sends – four mono and two stereo – can be fed from channel or monitor signal paths. Sends 7 & 8 can also be routed to the 24 busses for extra effects feeds. 8 effects returns, with sends to all 8 Auxiliaries, are provided.

**SOLO/PFL SYSTEM:** MAGNUM has a Master Status controlled in-place solo switch on both channel and monitor paths. When de-activated, solo switches provide a full Pfl facility. MAGNUM also has two independent Mute groups.

**AUTOMATION:** channel mutes can be automated via MIDI; C-MIX fader and mute automation system can be fitted.

**CHASSIS:** welded steel with a pcb-based bussing system and an expandable 288-point TT jackfield.

Some of the many other vital facilities include channel fader reverse, 30-segment LED meters with peak hold, optional stereo line inputs, 8 audio subgroups and comprehensive control room monitor system.

TAC MAGNUM. The only choice.



Total Audio Concepts  
Unit 17, Bar Lane Industrial Park, Bar Lane, Basford,  
Nottingham NG6.0HU.

Telephone: 0602 783306.  
Telex: 37329. Fax: 0602 785112.

In the USA:  
10815 Burbank Blvd, North Hollywood,  
California 91601.

Telephone: 818/508 9788. Fax: 818/508 8619.





defining the alignments that most affect replay. In systems using VTRs as the recorder (EIAJ format, JVC format and PCM-1610/1630 format), tracking adjustments are often required to minimise replay errors, since the tracking affects how accurately the replay head scans the recorded track. The only solution in the case of incompatible tapes may be to replay the recording on the machine on which it was recorded and make a digital copy onto a properly aligned machine.

The Sony PCM-1630 system in conjunction with its DMR-4000 recorder offers read-after-read facilities, which involves the reading of each helically scanned track twice, offering additional protection against track errors by automatically deciding what data to use in the event of errors from one of the heads.

Humidity and temperature may also affect the rate of replay errors although many recorders have built-in 'dew' indicators to show when the humidity or condensation level is too high for them to operate (they usually prevent themselves from being turned on in such situations). Some users have found that digital tape recording equipment appears to perform better in a cold environment although the precise reason for this has not been discovered. It may be because static electricity and high humidity are not so prevalent in these conditions. Although tape type does not directly affect sound quality, as it does in analogue systems, the principal measure of a digital tape's performance is its error rate.

## Effect of timing errors

Concerning timing errors in replayed or received data, it is important to show that these need not be reflected in wow and flutter in the resulting audio (which would indeed affect sound quality). It

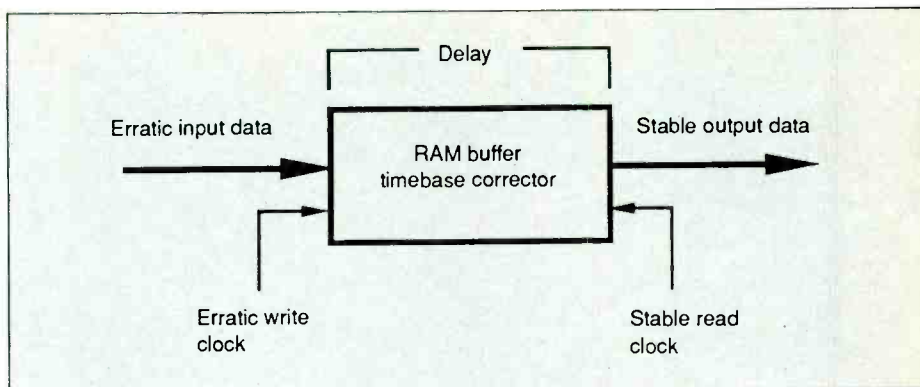


Fig 3: A RAM timebase corrector may be used to relock audio data with reference to a stable source

is possible to use a short-term memory store to 'iron-out' any speed variations in the replay or reception of digital audio data by relocking the data according to a suitably stable reference (see Fig 3). Even if, for example, the audio data replayed from a tape or CD has speed variations, it may be written temporarily into such a short-term store and read out a fraction of a second later at a steady rate, controlled by a crystal oscillator whose stability can be measured as a few parts per million (in other words, wow and flutter can be made undetectable). Provided that the order in which the data is read out of the store is the same as the original order of the audio samples, and the timing of those samples is as steady as, or steadier than, that used in the original conversion process, the sound will not have been affected. This concept of relocking or timebase-correction of digital audio is vital to the maintenance of high sound quality.

As digital audio conversion becomes more sophisticated and gains higher resolution, the criteria for stable clock sources will become more rigorous. Digital audio can suffer as much from errors in the time domain as it can from errors in

the amplitude domain and this is often ignored. In addition to the control of the nominal sampling rate of digital audio signals, it is necessary to consider the effects of short term timing errors on signals affecting the positions of significant instants of the digital signal. This is known as 'jitter'. Jitter can arise through external interference, random noise and crosstalk between signals, and if not corrected may adversely affect the audio in a number of ways. Firstly, a larger number of errors may result during decoding due to the difficulty in determining the positions of bit edges, and secondly the audio quality of D/A conversion may be affected because timing variations result in modulation of the analogue signal. The effect of this is very similar to the effect of quantising error, ie increased low level noise and distortion.

From a systems point of view, devices should be able to lock to an incoming signal with a degree of jitter and clock modulation. In order to eliminate the subsequent effects of jitter on the audio signal it is important that each device 'dejitterises' the incoming signal clock using a suitably filtered phase locked loop at the sync separation stage to relock the signal. Clock dejitterisers, such as that recently introduced by Apogee, are becoming available with extremely high specifications to suit the requirements of modern high resolution converters, with the added advantage of a moderately wide lock-in range.

The AES have specified in their draft recommendation on signal synchronisation that sample clock modulation should be limited to less than  $\pm 1$  ns, sample-to-sample, at all modulation frequencies above 40 Hz, to make wow and flutter insignificant, and that jitter should be less than  $\pm 0.1$  ns per sample clock period to keep noise modulation below acceptable limits in a 16 bit system. Jitter tolerance should be made even tighter *pro rata* in the case of systems operating to resolutions greater than 16 bits. Fig 4 shows this diagrammatically and it can be seen that if we want a 20 bit converter to perform as such, the requirement for clock stability is very tight indeed.

It should be remembered that consumer or semi-pro digital audio equipment may not operate to the same standards of timing accuracy as professional equipment so digital audio signals from such devices should be treated with care. Such devices should not normally be used as clock references unless the clock accuracy can be verified and tests have proven that the clock frequency error of such equipment regularly exceeds 50 parts per million. Furthermore, the standalone D/A converters used in expensive hi-fi systems do not always do anything to relock the incoming signal before it is converted and this may lead to severe phase modulation of the audio,

## Stages of error correction

### True correction

Up to a certain random error rate or burst error duration, an error correction system will be able to reconstitute erroneous samples perfectly. Such corrected samples are indistinguishable from the originals and sound quality will not be affected. Such errors are usually signalled by green lights showing 'CRC' or 'Parity' failure.

### Interpolation

When the error rate exceeds the limits for perfect correction, an error correction system may move to a process involving interpolation between good samples to arrive at a value for a missing sample. The interpolated value is the mathematical average of the foregoing and succeeding samples, which may or may not be correct. This process is also known as concealment or averaging and the audible effect is not unpleasant although it may result in aliasing of audio frequencies above one quarter of the sampling rate and a reduction in audio bandwidth. Interpolation is usually signalled by an orange indicator to show that the error condition is fairly serious. In most cases the duration of such concealment is very short but prolonged bouts of concealment should be viewed warily, since

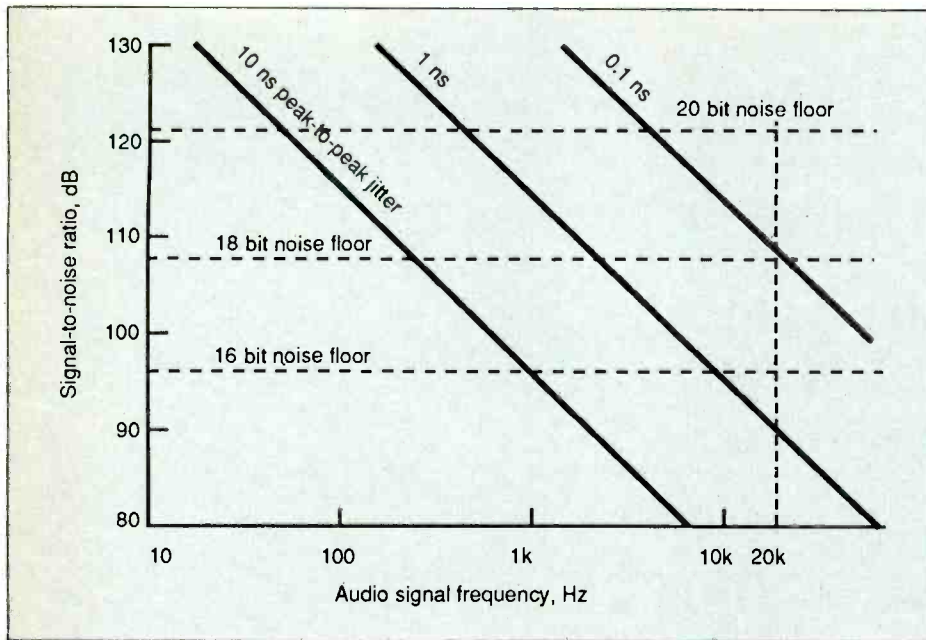
sound quality will be affected. This will usually point to a problem such as dirty heads or a misaligned transport and action should be taken.

### Hold

In extreme cases, where interpolation is impossible (when there are not two good samples either side of the bad one), a system may 'hold'. In other words it will repeat the last correct sample value. The audible effect of this will not be marked in isolated cases but is still a severe condition. Most systems will not hold for more than a few samples before muting. Hold is normally indicated by a red light.

### Mute

When an error correction system is completely overwhelmed it will usually effect a mute on the audio output of the system. The duration of this mute may be varied by the user in some systems. The alternative to muting is to hear the output, regardless of the error. Depending on the severity of the error, it may sound like a small 'spit', click, or even a more severe break-up of the sound. In some cases this may be preferable to muting.



**Fig 4: The effect of different amounts of random timing jitter on S/N ratio (non-oversampling conversion) showing typical noise floor for 16, 18 and 20 bit systems**

resulting in noise or distortion. It is wise to consider passing the digital audio from consumer equipment through a signal synchroniser, such as DAR's *DASS-100*, before contribution to a professional system and such a device should reference audio to a more stable clock. Further responsibility for clock stability should lie with the converter itself.

## Role of converters

It is with the converters of a digital audio system that the responsibility for sound quality lies. Here, and only here, provided that the rest of the system has faithfully carried through the audio data without corrupting it or modifying it, is it possible for the 'sound' of a digital audio system to be adversely affected. Naturally, the sound can be intentionally modified between the converters, but here we are discussing the problems of unwanted and unintentional degradation of the signal. (Digital signal processing between the A/D and D/A converters, such as often exists in digital audio systems, may intentionally modify the audio data samples due to such operations as mixing, filtering, equalisation and effects, and in such cases it is possible for sound quality to be adversely affected if the processing operation does not preserve the accuracy and integrity of the audio signal).

The A/D converters that first 'digitise' the analogue signal are responsible for the 'sound quality' of the data to be subsequently recorded, processed or transmitted, and the D/A converters that finally return this signal to the analogue world are responsible for the eventual quality of what is replayed. Since it is not possible to extract information from a signal that was never there in the first place, it follows that the replayed sound quality can only ever be as good as that of the A/D stage of the chain. This suggests that the quality of A/D conversion is paramount to good system performance, since nothing can be done at the D/A stage to make up for deficiencies in a preceding A/D converter. Distortions introduced at the A/D conversion stage become inherent in the signal.

There is a current trend in the hi-fi world to attach expensive D/A converters to CD players

and DAT machines in an attempt to improve sound quality and it may be possible to achieve this improvement in some cases. It is also claimed that with the same high quality D/A converter, different CD players sound different, or even that different digital interfaces between CD player and converter sound different, and this would appear to be impossible given the above argument unless uncorrectable errors were being carried through, or timing jitter in the digital signal were being passed on to the converter. It has been shown in some such cases that the error rates (which could have been suspected as the cause of differences in sound quality) are not markedly different between CD players but that expensive outboard D/A converters do not all relock or dejitterise the digital signal before conversion, rather using the clock derived directly from the digital input of the converter to control the conversion process. It is not surprising in this case that differences are apparent between sources, since the degree of jitter each produces will vary depending on the type of interface and the state of the source itself.

Digital data should always be timebase corrected before conversion to preserve sound quality and it might be suggested it is properly the rôle of the converter to achieve this, since it is reasonable to expect a converter to furnish itself with a clock of suitable stability for the resolution claimed. A converter claiming to be 18 bit accurate will only be so if the clock is stable within certain limits (see Fig 4). There is little point in attaching esoteric high resolution converters to systems with unstable clocks, unless the user can be sure that the clock used for the conversion process itself is not just the clock derived from the incoming digital input.

## Cables and sound quality

Cables and other interconnections carrying digital signals need have no effect on digital audio sound quality, provided again that timing and data errors are corrected. This contrasts with the situation in an analogue system in which interconnections may have a noticeable effect on sound quality, there being a considerable market

for highly priced pieces of wire that lay claim to improved audio fidelity.

There is a danger when discussing sound quality in digital audio of attributing the cause of degradation to the wrong part of the system. For example, a user may replay two different DAT recorders via an external D/A converter, connecting them to the converter using the consumer SPDIF interface. He may say that they sound different and thus that DAT machine A is better than DAT machine B, when in fact the sound quality difference was actually due to the lack of retiming in the converter and that DAT machine A's SPDIF output had some jitter on it. Conversely, he may compare interconnecting just one DAT machine to the converter with both SPDIF and AES/EBU interfaces in turn, and say that the AES/EBU interconnect sounds better. Again this would most likely be due to the converter not retiming the data, since the cheaper, unbalanced SPDIF might suffer worse clock degradation than the professional AES/EBU.

Clearly it is difficult to decide exactly what is at fault, since the interface should incur as little degradation as possible but perhaps, as suggested above, it is the job of the converter stage to correct such things prior to conversion, since timing and data errors are normally correctable in digital audio, whereas they are not in analogue audio, and the converter is the last possible stage in the system at which timing errors could be removed. We should decide where the 'clean-up our clocks' campaign is to be targeted.

It is possible for random data errors to be introduced by poor digital interconnects or by interconnection over long distances but in normal operation this is rare. There is little in the way of error correction in any of the digital interface standards, the most being simple even parity, and thus if there are errors they will usually be heard as 'spits' or 'ticks' on the audio output of the system. Such errors will not normally manifest themselves as a gradual degradation in sound quality and any artefacts of this kind are more likely to be caused by uncorrected timing problems.

## Recording levels and sound quality

The dynamic range of a linear PCM system is governed principally by the number of bits per sample and is limited at high signal levels by the sudden onset of distortion resulting from clipping when the converters run out of headroom. Just below this clipping point the distortion of a 16 bit linear PCM system is very low (it is at its lowest level in relation to the audio signal) and there is a sudden audible transition from a very clean signal to a very distorted signal as the overload point is exceeded.

There is a fixed maximum level of quantising noise (referred to the clipping point described above) in a non-oversampling linear PCM system, and, provided that the system is correctly dithered this noise will be of a broadband nature, not correlated with the signal. Modern oversampling A/D converters exhibit noise and distortion levels that fall slightly as the signal level falls, such that in one example of a commercial 20 bit converter (the UltraAnalog *ADC 20048*) the large signal THD+N (Total Harmonic Distortion plus Noise) measurement is  $-98$  dB FS, while the small signal THD+N figure is  $-108$  dB FS. Noise shaping is now often used to shape the noise spectrum such that it is the least subjectively



**SOME HAVE THE RIGHT BRAND... BUT THE WRONG PRICE**

**SOME HAVE THE RIGHT PRICE... BUT THE WRONG BRAND**

**SOME HAVE THE RIGHT SERVICE... BUT THE WRONG STOCK**

**SOME HAVE THE RIGHT STOCK... BUT THE WRONG SERVICE**

**BUT THE PLACE WHERE EVERYTHING IS RIGHT  
IS RIGHT HERE.**



**234, rue de Crimée - 75019 PARIS  
Tél. : 33-1-40-38-01-12 - Fax : 33-1-40-35-02-72**

**SEE US AT THE PARIS AES SHOW**

**FRENCH DISTRIBUTOR FOR :**

- CAD PRODUCTS, MIXERS, PROCESSORS, EQUITEK 2 MICROPHONE.**
- RADIO SYSTEMS COUPLED WITH A SONY DTC 1 000 DAT.**
- ATC STUDIO MONITORS.**

**We ship worldwide**

annoying, and thus the noise spectrum is not flat with frequency.

The trend, nonetheless, is for distortion and noise (as a proportion of the signal) to get smaller as signal level rises, until the clipping point is reached, thus it might be suggested (at least on systems of 16 bits and lower) that one should control the recording level so that the highest level signal comes as close to clipping (0 dB FS) as possible without actually exceeding it, although normally a number of dB of headroom would be allowed for unexpected peaks. There is no gradual onset of distortion as recording level increases in a digital system. In this way the maximum dynamic range of a digital recording may be obtained within the constraints of a system's performance.

Now that resolution greater than 16 bits is available on some systems it will become possible to leave a useful headroom margin for operational convenience, without incurring the penalty of unacceptable noise. The EBU and AES are working on the standardisation of relationships between electrical input and output levels and 0 dB FS, since there is the distinct possibility that users of 20 bit systems will record well below 0 dB FS once they have 120 dB of dynamic range to play with, while 16 bit users will have to record nearer the top in order to achieve maximum dynamic range. The problem would thus arise that systems adjusted so that 0 dB FS always replayed at a fixed electrical level (say +24 dBu) would typically replay 16 bit recordings louder than 20 bit recordings. Proposals exist for there being three electrical output level standards for 0 dB FS on 16, 18 and 20 bit systems, being respectively +12, +18 and +24 dBu.

## Digital interfacing pitfalls

**Level relationships:** As indicated above, one may run into problems when considering where 'peak recording level' lies in relation to 0 dB FS (Full Scale or 'peak bits'). This may be a problem electrically when interfacing in the analogue domain, but it may also be a problem digitally when copying via interfaces such as the AES/EBU.

As already suggested, now that 18 and 20 bit recordings are feasible, users will be freer to use the 100 to 120 dB of available dynamic range without needing to control the recording level in order to peak near full scale. Consequently higher resolution recordings may peak perhaps 10 to 12 dB below 0 dB FS, whereas 16 bit recordings may peak very near to 0 dB FS in order to make maximum use of the available dynamic range. If a 20 bit recording peaking 12 dB below 0 dB FS is copied digitally to a 16 bit device, using the convention of keeping the MSB (Most Significant Bit) at the old resolution as the MSB at the new, the 16 bit result will be seriously under-recorded and thus will sound noisy. Clearly some form of digital level correction would be required between the devices in order to raise the level of the 20 bit example described above so that it peaked near the top of the 16 bit scale. A digital fader with optimal redithering at the output resolution may be used for this purpose and some of the interface processors described below perform this function.

**Interface format processors and converters:** A certain amount of intervention may be required between devices when interconnecting them digitally. This may be in order to modify status flags to suit a purpose or to correct the status of

certain flags to match the signal. It may also be necessary to perform operations on the audio signal, such as de-emphasis and gain correction, or to convert the signal from one interface format to another. One way of doing some of these things is to pass the signal through a full-blown digital mixer but this may not be necessary in most cases and a mixer may not allow the format conversion or flag modification. For this reason a number of devices have been introduced that allow various degrees of modification to signals emanating from the standard digital interfaces.

The ADT *FC-1* will dither the digital signal optimally for one of three possible output resolutions (16, 18 or 20 bits), for conversion of signals between systems of different resolutions, ensuring the maintenance of sound quality when copying high resolution signals to lower resolution systems. A number of other functions are also offered, such as DC-blocking (important for removing DC offsets introduced by badly aligned A/D converters), digital highpass filters, coincident time correction, channel phase and L/R reversal.

Another example of an advanced device in this vein is the Digital Audio Research *DASS-100*. It takes the important step of offering sample rate conversion between any of the standard rates (32, 44.1 and 48 kHz,  $\pm 2\%$ ), as well as compensating for varispeed inputs of up to  $\pm 10\%$  of these frequencies. There are optional interfaces to virtually every possible format (AES/EBU, SPDIF, SDIF-2, ProDigi, Yamaha *DMP-7D* and Sony 50-pin SDIF) and inputs may be mixed together with gain correction. Other features include the synchronisation of inputs to a reference clock (see above), the variable delay of signals, the generation of a system sync signal from one of a number of sources, the pre- or de-emphasis of signals in the digital domain and the generation of audio test waveforms in the digital domain. Sample rate conversion may affect sound quality, depending on how well and how accurately it is done, but most modern devices quote noise due to the rate conversion process as being well below the typical floor of most converters. For example, the *DASS-100* is quoted as introducing distortion and noise at  $-105$  dB ref 1 kHz at 0 dB FS (equivalent to 18 bit noise performance).

## Conclusion

Some potential areas of concern regarding the maintenance of sound quality in digital audio systems have been highlighted. It would be good to continue the debate and to encourage informed discussion (as opposed to simple subjective preference for one system or converter over another). We must become as good at maintaining high sound quality throughout the digital audio signal chain as we are in the analogue world. □

### References

- Synchronisation of digital audio equipment in studio operations* (draft). Audio Engineering Society, AES11-19XX, 1990.
- Fourré R, Schwarzenbach S, Powers R '20 bit evolution'. *Studio Sound*, May 1990.
- Shelton, T 'Synchronisation of digital audio'. *Proceedings of the AES/EBU Interface Conference*, London, September 12th to 13th, 1989. Audio Engineering Society.
- Story, M 'The AES/EBU interface and analogue-to-digital conversion'. *Proceedings of the AES/EBU Interface Conference*, London, September 12th to 13th, 1989. Audio Engineering Society.
- Rumsey, F J *Digital Audio Operations*. Focal Press, 1990.
- Watkinson, J *The Art of Digital Audio*. Focal Press, 1988.

## TASCAM European Distributors

Hi-Fi Stereo Center Kain  
Muenchner Bundesstrasse 42,  
5013 Salzburg,  
AUSTRIA.  
Tel: (0662) 37701

Beltronic  
Rue de la Celidee Straat 29,  
1080 Brussels,  
BELGIUM.  
Tel: (32) 2 424 0233

So and Hoyem A/S,  
Bulowsgarden,  
Bulowsvej 3,  
1870 Frederiksberg C,  
DENMARK.  
Tel: (031) 22 44 34

Studiovox Ky,  
Atomitie 5C,  
SF-00370 Helsinki,  
FINLAND.  
Tel: (80) 562 3411

Teac France Sa,  
17 Rue Alexis de Torqueville,  
92182 Antony,  
FRANCE.  
Tel: (01) 4237 0102

Elna SA,  
59/59A Tritis Septemvrius St.,  
Athens 103,  
GREECE.  
Tel: (01) 8220 037

Greenlands Radio Centre,  
PO Box 119,  
3900 Godthab,  
GREENLAND.  
Tel: 299 21347

GBC Italiana spa,  
Viale Matteotti, 66,  
Cinisello Balsamo, Milan,  
ITALY.  
Tel: (02) 618 1801

Hjodriti — Hot Ice,  
PO Box 138,  
Hafnarfirdi,  
ICELAND.  
Tel: (01) 53776

AEG Nederland NV,  
Aletta Jacobslaan 7,  
1066 BP Amsterdam,  
NETHERLANDS.  
Tel: (020) 5105 473

Audiotron A/S,  
Seiduksgt, 25,  
PO Box 2068 Grunerlokka,  
0505 Oslo 6,  
NORWAY.  
Tel: (02) 352 096

Goncalves de  
Avenida 5 de Outubro, 53, 1,  
Lisboa 1,  
PORTUGAL.  
Tel: (01) 544029

Audio Professional SA.  
New address for contact:  
Auprosa,  
Francisco Tarrega, 11,  
08027 Barcelona,  
SPAIN.  
Tel: (93) 340 2504

Erato Audio Video AB,  
Asogatan 115,  
116 24 Stockholm,  
SWEDEN.  
Tel: (08) 743 0750

Telion AG,  
Rutistrasse 26,  
CH. 8010 Zurich,  
SWITZERLAND.  
Tel: (01) 732 1511

Teac Deutschland GmbH  
Bahnstrasse 12,  
6200 Wiesbaden-Erbenheim,  
WEST GERMANY.  
Tel: (06121) 71580

## TASCAM





# SERIOUSLY PROFESSIONAL

In recent years DAT has assumed a central role in professional stereo mastering. Until now, however, many studios wishing to enjoy the undoubted benefits of DAT recording technology had little choice other than a modified domestic unit.

Now TASCAM, one of the worlds leading manufacturers of digital and analogue tape recorders introduces the DA-30 Digital Audio tape recorder which has been designed specifically for the sophisticated needs of professional audio applications.

Our commitment to recording quality means that the DA-30 carries, as standard, features that on many machines either require modifications or are expensive options:

ADS/EBU and S/PDIF Digital Interfaces allowing direct connection to digital equipment from multitracks to domestic CD players.

44.1 and 48 KHz sampling rates (front panel switchable) and 32 KHz (digital input only)

1 Bit (  $\Delta \Sigma$  ) A/D technology and 18 Bit 8x oversampling D/A converters for superior audio performance

Margin feature displaying the headroom remaining in dB

15 pin parallel interface, allowing external control of the DA-30's transport

Wired remote control

So, to get a serious professional in your studio, call into your local TASCAM dealer today.

**TASCAM**  
the right track



Whether you're in the business of acquisition, post production or transmission, the Sony professional DAT range now offers the digital answer.

Low cost, high density, fast access, 16-bit PCM stereo recording - the strengths of the DAT format

already benefit thousands of professional users throughout Europe.

With the PCM-7000 series, Sony combines these strengths with new technology and operational features, tailored precisely to the needs of both

**SONY**

For further information contact:  
 Athens 01 2818273 Basingstoke, UK 0256 55011 Brussels 02 7214950 Cologne 0221 59660 Copenhagen 042 995 100  
 Dubai 04 373472 Helsinki 0 50291 Jeddah 02 6440837 Lisbon 01 573046 Madrid 091 3581335 Milan 02 618381  
 Netherlands 02966 81911 Oslo 02 303530 Paris 01 49454000 Rome 0396 5920237 Stockholm 08 7336100 Vienna 0222 61050  
 Zurich 01 7333311 Eastern Europe, Vienna 0222 554606 Middle East, Geneva 022 7336350 Africa, UK 0256 55011



# Sony professional DAT.

Designed by professionals  
for professionals

**PRIZE DRAW TICKET**

**AES PARIS**  
19-22 February 1991

Prizes will be:-

Tuesday 19 February - Sony ECM-MS5 Stereo Microphone

Wednesday 20 February - Sony MU-R201 Digital Reverberator

Thursday 21 February - Sony TCD-D10Pro Portable DAT Recorder

The Draw will take place on the Sony stand, D-52, at 4.00pm each day

To enter the Draw, bring this card with you to the Sony stand after completing the details on the reverse.

*Good Luck!*

**SONY**  
THE LEADER IN DIGITAL AUDIO.

**PRIZE DRAW TICKET**

**AES PARIS**  
19-22 February 1991

Prizes will be:-

Tuesday 19 February - Sony ECM-MS5 Stereo Microphone

Wednesday 20 February - Sony MU-R201 Digital Reverberator

Thursday 21 February - Sony TCD-D10Pro Portable DAT Recorder

The Draw will take place on the Sony stand, D-52, at 4.00pm each day

To enter the Draw, bring this card with you to the Sony stand after completing the details on the reverse.

*Good Luck!*

**SONY**  
THE LEADER IN DIGITAL AUDIO.

Digital is an attractive and  
Sony dealer for full details -

Sony Broadcast  
& Communications



# FREEDOM OF CHOICE



## Concept Series Modular Mixing Consoles

Among the standard options available on the Concept series of mixing consoles are choices of: Eq type, frame size, subgroup type, number of aux sends, type of metering, degree of mute and fader automation. Special requirements can also usually be accommodated. The consoles can be configured for film or sound recording, theatre applications, broadcast and live sound reinforcement. You have the freedom of choice over the facilities you want. One thing is always standard however – the transparency of sound and technical excellence that the Concept series has become renowned for.



Hill Audio Ltd., Hollingbourne House Hollingbourne, Maidstone, Kent ME17 1QJ England. Telephone: (0622) 880555 Telex: 966641 Hill G Fax: (0622) 880550  
Hill Audio Inc., 5002B N. Royal Atlanta Dr, Tucker, GA 30084 USA. Telephone: (404) 934 1851 Fax: (404) 934 1840 Telex: 293827 HLAD



# AES PREVIEW

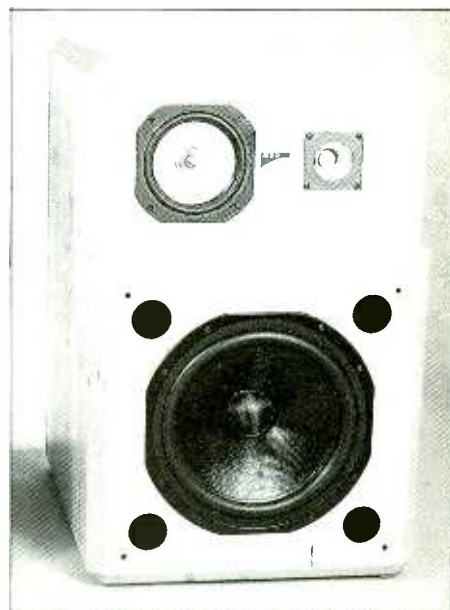
The 90th AES convention will be held during 19th to 22nd February at the Palais des Congrès, Paris, France. A list of exhibitors has been compiled together with details of their products and services available at the time of going to press

## A

● **Adams-Smith:** exhibiting audio-for-video editing, tape synchronising, VTR emulation, timecode and MIDI equipment for audio and post-production studios. ● **AD Systeme:** introducing the *Previewer* for the film dubbing and audio visual market. The *Previewer* is designed to eliminate the problem of remembering multiple cues, by giving the user 7 seconds warning of up coming cues. This standalone device will display tracks on a CGA/RGB monitor in 16 different colours so, for instance you can easily differentiate between music and dialogue by choosing different colours. AD Systeme will also be launching a tape machine controller for their *Optifile* 3D automation system. ● **AEQ:** exhibit includes the portable broadcast mixer *MP-10* featuring universal dialling system for communications using standard telephone line exchanges; *BC-1000* broadcast modular mixing system; and the *Systel-3000* digital telephone system. ● **AESD:** will be showing their range of monitors including new products the *Monitor Fifteen*, *Bass 12* and *Bass 18* units. Main exhibit includes *Monitor 157* 19 inch rackmount stereo audio monitor for applications in video/film post-production and *Monitor 159* 1U rackmount bandpass filter unit. ● **AGAP:** will be exhibiting their *SYGAR* system, a radio broadcasting network automatic management system. It is specially designed to control operations within each local station by digital data transmission. The *AGAP GAETAN* system is a digital audio local programmes management system, which features a PC-compatible based traffic and local event schedule software. ● **Akai:** showing the *DD 1000* magneto optical disk-based audio recording system including the unit's *Mac* software for editing of all functions on screen using windows, mouse and graphics; the *DL 1000* full remote for up to seven *DD 1000s* controlled as one; *DR1200* digital multitrack recorder; *S1100* high-end sampler; and digital patchbay. ● **AKG:** will be showing the full range of microphones, headphones and signal processors. New products from the US division include the Orban *4000A* transmission limiter, which has been designed for control of peak modulation levels for transmission; the Orban *290Rx* adaptive enhancement processor uses a three-step process: harmonic restoration with patented distortion-cancelling circuitry adding second harmonic energy without adding intermodulation distortion; spectral restoration, which improves definition by dynamically analysing the spectral balance of the programme

and re-equalising as necessary; and single ended noise reduction. New dbx products include the *363X* dual noise gate; *dbx 160XT* compressor/limiter, which is an update to the previous model with the addition of *XLR* connectors and balanced input and output; the *dbx 1531X* graphic equaliser mono 31-band or dual-band 15-channel. Also on display is the *DSE 7000* RAM-based digital sound editor. ● **Alphaton:** will display active and passive DI boxes, active and passive mic and line splitters, an impedance matcher and matching links. Also shown will be a new 10-input active DI box, *SM-6000*, an acoustic and electronic phase checker, *PC-100*, and a digital cable tester, which identify faults in balanced and unbalanced cables. The new *HCU* headphone monitoring system allows up to 25 headphone stations to be interconnected. ● **Altec Lansing:** featuring *VIR-Vari* intense horn, electronics, speaker systems, amplifier ranges, computer-aided time delay. ● **Amek/TAC:** AES will be the first showing of Amek's new machine control option, which interfaces the Amek/Steinberg *Supertrue* automation with the *Motionworker* synchroniser controller. The combination allows the engineer to control a number of tape machines from the console itself using switches such as *GOTO*, *GOTO AND PLAY*, *SET*, *CYCLE* and *HEAR ONCE* in conjunction with the interactive cue list already available on *Supertrue*. Also premiered at AES is Amek's dynamics package, which allows each *Mozart* channel to be fitted with a software controlled compressor, limiter and gate. Several types of gate and compressor can be selected for each channel from a variety of screen displays. Main exhibit includes the *B2520* console, which is the broadcast version of Amek's *G2520* upgraded by the addition of eight stereo subgroups as well as 24 multitrack buses; the Amek *Medici* equaliser; Amek *Classic* broadcast console system; and *BCII* broadcast console system. AES sees the European launch of TAC's new professional compact mixing console the *B<sub>1</sub>*. The new 4-bus console has been designed for smaller sound reinforcement and video post-production applications and features electronically balanced inputs, busing and outputs, 4-band semi-parametric EQ, six discrete auxiliary sends and four stereo effects returns. Video post-production versions are available with both serial and parallel AFV interfaces to video edit controllers, eight 2-track returns to the monitor section are provided to cater for the trend towards larger numbers of mastering machines required. Main exhibit includes the *Bullet* range of consoles; the *Magnum* recording console; the *MICE* MIDI interface; *Scorpion* and *SR9000* live

desks. ● **Amfon:** will be showing the first two versions in their *Blue Line* series of microphones: *BL-9* condenser (48 V phantom powered) and *BL-3* dynamic. Features of the two mics include the Amfon *BL-920* low noise wide band amplifier; claimed less noise, up to 10x greater bandwidth and more precise handling of dynamics and Amfon's 10-year warranty. ● **Ampex:** new product on show is the *478* low print mastering tape, also on show for the first time will be the new accessory line designed solely for the professional market. Main exhibits include *456 Grand Master* analogue recording tape, *467* digital open-reel and U-matic cassettes. ● **AMS:** exhibiting *AudioFile PLUS* hard disk editor/recorder with eight inputs/outputs and 16 outputs; *Logic 1* full digital automated mixing desk to interface *AudioFile*; *ST250* stereo microphone. ● **Apex:** new products on show include three new equalisers the *GE 215* 1/3-octave stereo (2x15 bands); *GE130* 1/3-octave mono (1x30 bands); and *GE230* 1/3-octave (2x30 bands); all units have balanced in and outputs and variable high and lowpass filters. Also new is the *MP-2* mic preamplifier and the *STC-1* Studio controller, which is aimed at radio stations and based on a DCF decoder and a realtime clock. Up to 36 machines can be controlled, be it tape recorders, CD players or cart machines. ● **Aphex Systems:** showing the full line of Aphex signal processing equipment including the *720 Dominator II*. ● **Ariel:** will be showing a signal processing workstation based on the *NeXT* computer. The principal components of the workstation are a high-speed calculation engine, a realtime operating system and a utility for using dynamic graphical user interfaces. The workstation is being developed and marketed in conjunction with IRCAM, the French research institute. ● **ATB:** displaying spring pads, single or in-reel, with or without bosses; coloured leader tape; *Inox* pins. ● **Audio Developments:** their comprehensive range of professional sound mixers and ancillary equipment. The *AD062* and *AD145* ranges include edit mixers designed to interface with a range of edit controllers. Also on display is the *AD150* series of microphone amplifiers and equalisers. ● **Audio Kinetics:** launch of AK's new emulation software for the *ES.Lock* control and synchronisation products. The new package enables the *1.11* synchroniser to work with any machine controller capable of using the Sony



AESD Monitor Twelve



serial command protocol. This in turn enables video editors to drive the *1.11s*, and will suit any applications where audio or film transports might be used in conjunction with a video editing system. Digital workstations, like *ScreenSound*, *AudioFile* and *SoundStation II*, which are able to drive transports using Sony serial, can now be tied into a *1.11*-based control system. The full range of *ES.Lock* products will be presented, including *Penta* and *Eclipse* controllers, together with automation systems *MasterMix II* and *Reflex*.

● **Audiomotion Systems:** demonstrating the latest developments in the *Uptown* moving fader console automation system. This provides full control of the mixing process in the studio by replacing fader modules with microprocessor controlled motorised faders that allow instant recall of any mix. Parent company Sellmark will also be demonstrating the new slimline version of the *Omnitrac* linear motorised fader and the *CPA* range of conductive plastic tracked faders, which can now incorporate flexible leads, overpress and microswitches. ● **Audio Precision:** new products include the *Portable One* audio test set for field service, studio maintenance and bench testing. *Portable One* is a self-contained test set featuring full 2-channel architecture for realtime amplitude balance, gain/loss, crosstalk and phase measurements, in addition to THD+N, SINAD, optional IMD, wow and flutter, noise, frequency and new AC mains check and generator load impedance measurement features. New features for *System One* include new DSP software for simultaneous multitone signal generation and analysis, enabling frequency response, harmonic and intermodulation distortion measurements in 1 to 2 seconds. ● **Audio-Technica:** displaying their range of microphones and accessories.

● **Audiomatic:** cassette duplication production.

● **Audiopak:** complete range of broadcast tape cartridges with redesigned shells for easier identification. ● **Audioscope:** exhibiting the series *9000* system that includes different functions like curve tracer, spectrum analyser, ppm/vu level metering function. VCA automation display and a reverberation time analyser. The system is controlled via a *PC* and is provided with a disk drive to store data, a serial/parallel out for printout and to communicate with an external computer for automated measuring procedures.

● **Audix Broadcast:** featuring *ACC* series audio mixers employing one module per function so you select only the facilities you want. Different versions are available for continuity, production and editing applications: *AAT* series of assignable audio mixers with memory retrieval facilities

enabling complete desk state storage and fully automated recall; *ARM* series of rackmounting amplifier modules including microphone, distribution, line send and line receive amplifiers.

● **Augan:** optical multitrack recorder/editors *Go-oP 204P* and *Go-oP 408AV*. The *204P* is a 4-track and the *408AV* an 8-track machine. Both machines offer syncing to SMPTE and MIDI and two AES/EBU and two SPDIF outputs. The *204P* can be uprated to eight channels and both machines can be linked to work together.

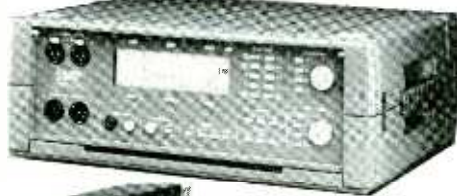
● **Autograph Sales:** exhibiting the *Studio* series products and sound reinforcement range from Meyer Sound.

## B

● **Barco-EMT:** display includes the *EMT 442* digital PA processor for electronic suppression of feedback disturbances in PA systems, working on the principle of adjustable, programme-controlled frequency shifting; the *EMT 448 E* spot reproducer and non-volatile EPROM memory; *EMT 246* digital reverberator and the *EMT 445* digital audio delay unit for signal processing.

● **BASF:** displaying bulk audio tape, bulk video tape, calibration and alignment tapes and cassettes, loopbin mastering tapes. ● **Beyer Dynamic:** dynamic, condenser and wireless microphones, dynamic headphones and headsets, gooseneck/microphones and mic accessories.

● **BFE Fernmelde & Elektronik KG:** no information received. ● **BGW Systems:** displaying their full range of power amplifiers including signal processing, professional, *T-series* and Grand Touring amplifiers. ● **Broadcast Electronics:** will be exhibiting the *Phase Trak 90*, *Dura Trak 90A* and *Splice Trak 90* cart machines; *DV-2A* digital recorder/playback unit; and *FX50 50 W* FM exciter. ● **Bruel & Kjaer:** introducing a new equalisation system for the *4003* and *4006* omnidirectional microphones. Also featured are the type *4012* cardioid microphone and the type *5930* head and torso simulator, *HATS*. ● **Bryston Audio:** featuring their full range of amplifiers. ● **BSS Audio:** launching a



Audio Precision  
Portable One



D&R Marilon

hand-held remote controller for the *TCS-804* dual time corrector. The *FPC-800* provides a complete functional extension of the *TCS-804* front panel facilities, interfaced via a standard radio mic link or *XLR* tie-line so that time-alignment and distance correction adjustments can be made from any location around a concert arena or install site. The unit can address a system of up to 16 *TCS-804* units, independently controlling all delay time, level and mute parameters plus memory store and recall functions.

## C

● **Cabasse:** three ranges of speaker systems: active, passive and active, and servo-controlled speakers. ● **Canford Audio:** new products to be shown at AES include the Canford universal 3-way splitter for Neutrik connectors, battery headphone amplifiers, *Trouper* cable crossovers, recessed floor and wall connector boxes, uninterruptible power supplies, rack fans and *Polysand* jack plug cleaner. ● **Cavendish Developments:** duplication systems.

● **Community Light & Sound:** European debut of their new processor-controlled trapezoidal speaker system, the *RS220*. The *RS220* has found service in theatres, churches and live sound reinforcement. Also exhibited are the *RS880* processor controlled concert system with related subwoofers, the *M4* compression mid range loudspeaker and other components for large voice-announce systems, and the *CSX* range of musical reinforcement loudspeakers. ● **Crest Audio:** professional amplifiers, sound reinforcement consoles, modular amplifiers, computer control systems. ● **CRL:** no information received.

● **Crown International:** featuring the *Macro Reference 750 W/channel* amplifier featuring convection cooling and bridged mono and parallel mono modes. ● **CST Manufacturing:** showing the *PP 2000* audio cassette printer, *PP 2000V* video cassette imprinter, 'O' card insert machine and rotary cassette printer.

## D

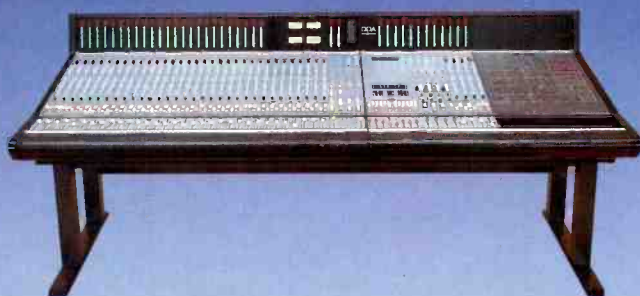
● **D&R:** will be showing their entire range of consoles including the *Stylyx* and its new sister console the *Styline*, which can be ordered with in-line modules having split EQ and six aux sends. All the original *Stylyx* input modules can be used in the *Styline* console too; the *Marilon* console has been designed with a maximum amount of inputs in a small space (three inputs per module). For the first time at an AES is the *Avalon* series featuring 32 bus, full 4-band parametric EQ and eight auxes per module.

● **Dalet Digital Media Systems:** displaying their range of software for radio stations in areas of automation, integration as in the automatic planning, an interactive generation of the broadcast logs, and on-air digital playback.

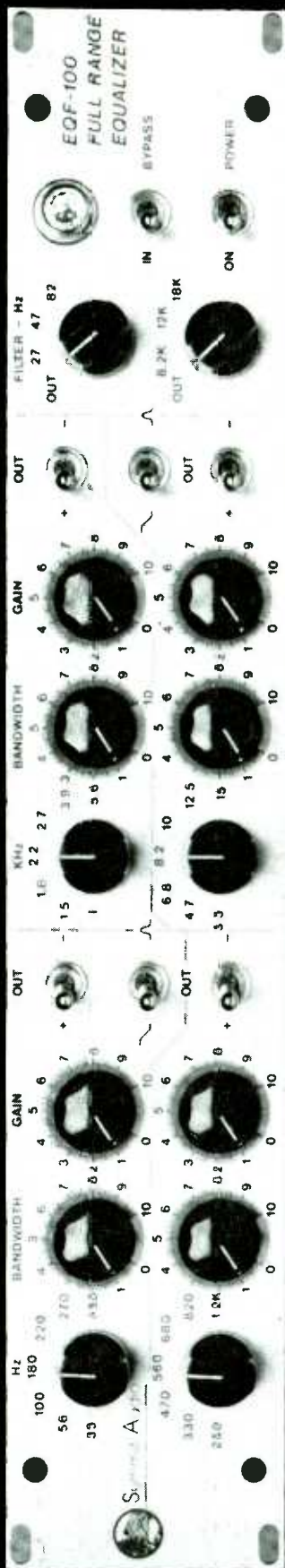
● **DDA:** new product for the show is the *Profile 24-bus* mixing console, designed around a similar concept to the *DMR12* desk. *Profile* features 56 modules in a 2.4 metre frame, offering 32 mic inputs with 24-track monitoring, all modules have 4-band fully parametric EQ, 10 auxiliary buses with a direct aux out feature and 24-bus routing. This concept allows monitoring and mixdown to be performed from the same position on the desk, eliminating crosspatching and switching, and resetting of EQs. An automation package is offered with full colour graphics, VCA faders, noise gates and cue list editing. Also featured will



# LISTEN



# VACUUM TUBE SIGNAL PROCESSING AT ITS FINEST



Summit Audio Inc.

P.O. Box 1678, Los Gatos  
California 95031 U.S.A.  
408-355-2448  
FAX: 4083951403

be the *DCM224V* post console with the *Uptown* moving fader system. ● **DIC:** complete line of DAT (DAT and 8 mm video cassettes). ● **Digram:** showing direct-to-disk recording system for use with *PCAT* compatible computers. *PCX3* is capable of realtime data compression and decompression resulting in the ability to store 1 minute of CD quality mono audio per Mbyte of hard disk memory space. Applications include digital tape recorder and jukebox for radios, TV, recording studios. Also on show *XTRACK*, software to run with one or more *PCX3* cards. *XTRACK* allows you to run two, four, six or eight independent audio tracks within the same computer. ● **Digital Audio Research:** European launch of DAR's *SoundStation DSP* and *DASS 100*. DAR will also be demonstrating enhancements to *SoundStation II*. *SoundStation DSP* adds segment-based digital signal processing and audio parameter automation to *SoundStation II*. *DASS* is a standalone, multifunction digital audio interface, which provides sampling frequency conversion, format conversion and other essential functions for digital audio devices. ● **Digital Audio Technologies:** featuring the *StellaDat* portable R-DAT machine. ● **Digitec:** the complete *DS* range of digital audio equipment and systems including the *DS-P* audio processing unit and mixing console, the *DS-C* series of converters, the *DS-M* routing switchers, the *DS-PPM* multipeak meter; also on show, the digital audio broadcast systems from Numisys, and the ABAC-Rustin analogue post-production console. ● **Dolby:**

featuring Dolby *SR* for recording, broadcast and video post-production, Dolby *Surround* and Dolby *AC-2* digital audio coding technology for transmission systems. ● **Dorough Electronics:** displaying the stereo signal test set, which allows dynamic measurement of level, balance, crosstalk, phase and S/N. ● **Drawmer:** new for the show is the *DS404* quad gate offering the choice of hard or soft gating. Soft gating using programme adaptive techniques makes the unit a versatile expander capable of handling vocals and submixes. Chain linking allows all four gates to be linked if required. Also, making its European debut is the *DL241* auto-compressor, incorporating many automatic functions. A full auto attack/release compressor combines the smoothness of the 'soft knee' principle with the precision of a 'ratio' control. An expander/gate features Drawmer's new 'programme adaptive expansion' circuitry that eliminates 'chatter' on or around threshold. ● **Dynacord:** featuring processor-controlled amplifiers, time delays, equalisers, mixers, speaker systems, ELA-Electronics.



DAR DASS100

● **Eela Audio:** featuring the *Reportophone*; and various consoles for broadcast and audio follows video (AFV). ● **Electro-Voice:** showing the *DeltaMax* electronically-controlled speaker system;

*MT-2* Manifold Technology concert sound system; studio microphones; horns and drivers.

● **Estemac Electronic:** tape testing equipment: the *TMC* torque test meter for audio cassette and the *DOC110* drop-out counter for the evaluation of video tape. Also their range of audio cassette duplication tape. ● **Estudios Gema:** audio cassettes C-0 range; audio/video duplication; record pressing; CD manufacturing. ● **Eventide:** featuring the *H3000SE Ultra-Harmonizer* with 19 algorithms, including vocoder, reverb II, multishift, band delay, string modeller, instant phaser, stutter and patch factory along with all 11 original *H3000* algorithms, 200 factory presets, function generator and soft functions. Also featuring the *HS395* internal sampler board option for all *Ultra-Harmonizers* 47.5 seconds stereo, 95 seconds mono, 16 bit 44.1 kHz sampling. *VR240* digital voice-logging recorder records up to 180 hours of voice-quality audio on as many as 24 channels using compact DAT cassettes. Also available in play-only version.

## F

● **Fairlight:** European debut of the Fairlight *MFX* (music and FX), which is a 24-track disk recorder for audio post-production. This is based around a hardware user console providing dedicated controls for track selection and non-destructive editing functions. *MFX* provides integrated control for external video and audio

machines. A fully featured autolocator with looping, marked timecode points and automatic punch in/out is provided. Multiple tracks can be edited at the same time and the range of editing operations include slipping, cut and paste, fades and crossfades, level control and track bounce. *MFX* can also perform all the functions of the Fairlight *Series III* CMI (sampling, waveform processing, sequencing) with the addition of any MIDI music keyboard. Up to 32 Mbytes of waveform RAM can be installed in the system. Up to 20 hours of on-line hard disk storage can be provided. ● **Feltway:** featuring a range of professional powered monitors. ● **Fidelipac:** displaying their range of broadcast audio endless loop cartridge recorders; reproducers; eraser/splice finders; bulk erasers; cartridge alignment equipment; cartridge storage systems; on-air and recording lights, and accessories. ● **FM Acoustics:** featuring the *FM 801A* high power amplifier based on the FM Acoustics proprietary Class A input voltage gain circuitry. The new driver and output stages and the refined power supply allow a claimed increased dynamic range. Also on show is the *FM 236* and *FM 236/4* precision electronics crossovers and the complete range of *Forcelines* cables. ● **Focusrite:** The AES is the venue for the first showing in continental Europe of the Focusrite *Studio Console*. ● **For.A:** featuring the *Sirius* designed as a solution to the completely automated radio station. The heart of the system is the memory, which can be expanded

## E



“I need to trim  
mutes in frames  
- without running  
tape all the time”



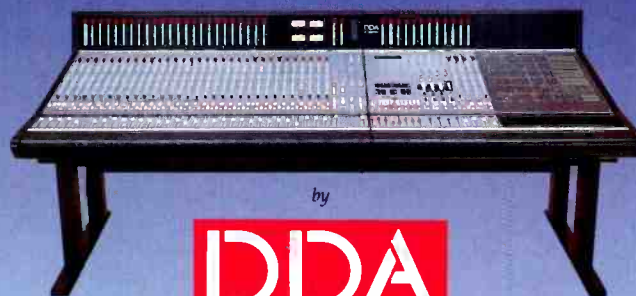
The DCM224V makes more efficient use of studio time, with one-pass editing.

An off-line editing mode allows any or all of the 24 switch functions per channel, including mutes and effects sends, to be modified in single frame steps, without having to run tape.

For a demonstration of this remarkably flexible console call DDA, or Stirling Audio Systems in the UK.

WE LISTENED

DCM224V




by

**DDA**

a Klark-Teknik Company

Dearden Davies Associates Limited Unit 1, Inwood Business Park, Whitton Road, Hounslow, Middlesex TW3 2EB, United Kingdom. Telephone: 081 570 7161 Fax: 081 577 3677  
Klark-Teknik Electronics Inc., 200 Sea Lane, Farmingdale, NY 11735, USA. Telephone: (516) 249 3660 Fax: (516) 420 1863  
Klark-Teknik Singapore PTE, 7500A Beach Road, # 04-308 The Plaza, Singapore 0719. Telephone: 293 9736 Fax: 293 9738

Distributed in the UK by  Stirling Audio Systems Ltd, Kimberley Road, London NW 6 7SF Telephone 071 624 6000 Fax: 071 372 6370

www.americanradiohistory.com

*Ce qui n'est pas  
Clair n'est pas  
français*

*Antoine de Rivarol 1753-1801*



## **AESD Studio Series Monitors**

**Designed to be used anywhere  
an accurate reproduction of  
source material is required for  
precision audio analysis.**

**SEE US AT  
THE AES STAND  
NO. B16**

**AESD**



AESD Ltd., Unit J, 44 St Pauls Crescent, London NW1 9TN, Telephone + 44 (0) 71 267 4313, Fax + 44 (0) 71 267 3983



up to 8 hours of 16 bit stereo playing time. The memory can be controlled from a number of playback and/or record/playback operation units. Each operation unit can supply a transmitter channel or can be used to record audio into the memory. All units can work completely in parallel so it is possible to transmit totally different or totally identical audio from all channels, as well as use all channels for simultaneous recording. Also on show is the *AFV-500* audio-for-video mixer and the *AM-100* audio follows video mixer.

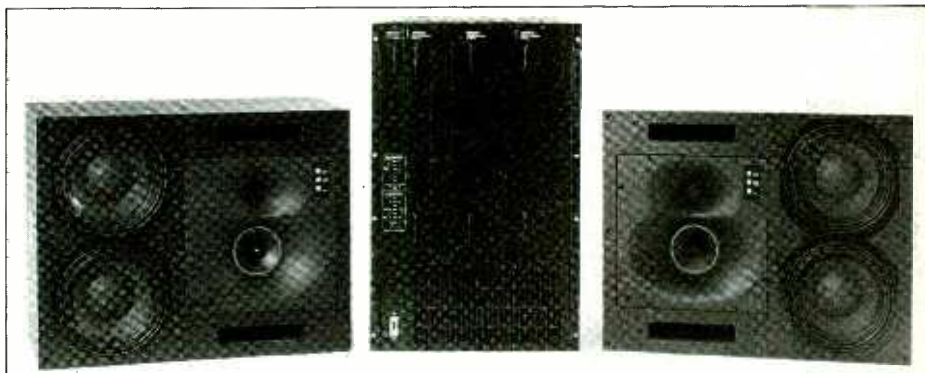
● **Fostex:** will be launching the *G-24S*, the new 1 inch 24-track recorder, which incorporates the new Dolby S-type noise reduction. Full MIDI implementation provides for desktop multitracking and enables complete integration with music sequencing software. A built-in chase synchroniser means that the machine is SMPTE controllable as a slave transport and an RS422 serial port enables the machine to link directly to video tape recording equipment. Also on the stand will be a demonstration of the 9-pin RS422 protocols now implemented in the *D20*, and hands-on demos of *DES* the new edit control system for the *D20*. ● **Fougerolle:** exhibiting the *Melody* mono/stereo recorder/player with removable disk.

## G

● **Gauss:** exhibiting full range of speaker components. ● **Genelec:** will be demonstrating their full range of active monitoring speakers, and for the first time at a European AES the new model *1033A* will be shown. The *1033A* active monitor is a smaller version of the *1034A* and designed for use in small and medium sized control rooms. A Directivity Control Waveguide (DCW) has been included to decrease the system's overall directivity and to optimise its free field and reverberant. ● **Ghielmetti:** will be showing the range of studio quality audio signal distribution boards. ● **Giese Electronic:** will be showing audio recording systems; timecode equipment; video, audio, film synchronisers; and ADR systems. ● **Gotham AG:** range of professional audio cables. ● **Goutam:** will be showing their new monitor desk *Aries Astrid Monitor 40/8/2* in a 40-channel version. Also shown will be *Apollo* 8-bus console and *Artemis* 12-bus for studio recording. ● **GTS Fabrications:** no information received.

## H

● **Harmonia Mundi Acustica:** will be showing their graphical user interface, a high resolution integrated graphic system providing SMPTE timecode control of all functions. ● **Harrison:** featuring the *SeriesTen* console and introducing the Harrison *ARS-9* audio routing switcher, which has been designed for multiroom recording, video post, broadcast and film. Also featured is the *PRO-790* console, which includes 12 to 32 mono or stereo inputs, as well as two aux sends with level trims. ● **Haufe:** will be featuring their compact active input and output modules. Also shown will be the *100-70V* audio transformers. ● **Heil:** will be exhibiting the *DCM-111* dynamic control monitor with integrated amplifier; *CH-207* speaker system for vocals and surround effects; *CH-112* compact sound diffusion system; *MTD* compact size sound reinforcement system with dedicated controller and amplifiers; and incremental, high power arrayable sound reinforcement system for indoor and outdoor use;



**Genelec 1033A**

medium throw and long throw applications.

● **HES Electronics:** exhibiting the *HDTB* intercom system, which will be shown for the first time at the AES. The *HDTB* outstations are designed around a front-panel extrusion which forms the basis of a compact unit with a frontal area of 128×204 mm and only 75 mm deep. The system runs on an *AT PC* built into the matrix rack. The configuration software is provided on floppy disk and is designed to configure off-line each customer's specific operational and hardware requirements. Also shown will be HES engineering audio modules for broadcast applications; integrated broadcast telephone system, which includes a series of modules for custom-builds. ● **Heyna:** range of duplication equipment. ● **HHB Communications:** their full range of DAT recording hardware; signal processing and monitoring products. HHB will also introduce Kenwood's CD 'Write Once' system and the European premiere of Apogee's new A/D and D/A conversion technology.

## I

● **ICM:** cassette duplication supplies. ● **IED:** Innovative Electronic Designs: exhibiting a broad range of professional computer-controlled audio equipment designed to provide the architect, contractor, consultant and end user with an audio system tailored to specific needs. Applications include stadia, arenas, exhibition halls, courtrooms, etc. ● **Ilsemann** range of labelling, packaging and foil wrapping machines for compact and video cassettes. ● **INA:** no information received. ● **IRP-Knowles:** range of signal processing products.

## K

● **King Instrument:** displaying their full range of audio and video cassette loaders. ● **Klark-Teknik:** new for a European AES are the *DN735* solid state recorder and the *Midas XL3* live performance console. The *DN735* has been specifically designed to solve the problems experienced with editing programmes in stereo. Adding two extra tracks of audio to standard VTR machines, it simplifies editing when audio is required to crossfade from scene to scene. The *Midas XL3* can double as a FOH desk and a monitoring console. Also on show will be the new, optional, rackmounting outboard *Midas Matrix*, which has been designed to complement the *XL* series consoles. Main exhibit features series *500* dynamics; series *700* digital delay line; *DN780* digital reverberation system; series *300* graphic equalisers; *DN60* realtime spectrum analyser; and *Jade One Mk II* active monitoring system.



**Fostex G-24S**

● **Klein & Hummel:** displaying their range of speaker systems, amplifiers and equalisers. ● **Klotz Digital Audio:** will be exhibiting their *Oak Link* system, which is a fully digital audio transmission and distribution system based using fibre-optic cables to connect transmitters with an unlimited number of receivers. *Oak Link* supports up to 64 analogue and digital inputs and outputs.

## L

● **Lafont Audio:** will be exhibiting the *XL 600* console, 32-group, automation ready; *XL 800* 32-group automated console with built-in dynamics and parametric equalisation; and the *XL1000* large automated film console. ● **Lester Audio Laboratories:** featuring the *DAS-2000* digital audio transmission system with 64 channels, 16 return lines, through fibre-optic cable. ● **Lexicon:** introducing new software for the *Opus* and *Opus/e* digital audio workstation. *Version 3.0* features Automix, CPEX time compression/expansion and machine control. Also featured is the *LXP-15* multi-effects processor; and the *LFI-10* digital format interface. ● **Lindos:** showing the *LA100* audio analyser, an audio measurement system comprising the *LA101* synthesised oscillator and the *LA102* measuring set. ● **Lone Wolf:** showing the *MIDITap*, a fibre-optic LAN connectivity system incorporating the new protocol MediaLink. ● **Loughborough Sound Images:** introducing two new PC plug-in boards particularly suited to audio processing. The 50 Mflops *DSP96002* system board which features a multimaster connector bus and a large on-board memory configuration of 5 Mbytes of SRAM; and the *TMS320C30* processor board, which has a prototyping area onto which users can integrate their own custom designed I/O interfaces. ● **LTM:** no information received. ● **Lydkraft:** featuring the new Tube-Tech *PA 6*



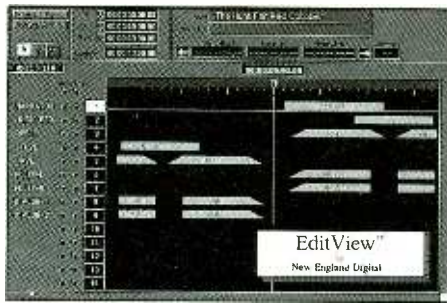
headphone amplifier. Using vacuum tube design the PA 6 can be used in the studio control room for high quality headphone monitoring, and also as the power amplification to drive the cue system in the studio. Here the PA 6 replaces the customary power amplifiers used with most studio cue systems. Also showing on the Lydkraft stand will be NLE Elektronic who are showing the NLE 1000 professional power amplifier. ● Lyrec: showing their range of tape recorders and duplication equipment.

## M

● **MBI Broadcast Systems:** in addition to the 12, 16 and 24 series mixers, MBI will be launching two new ranges; the series 20 designed for use in live on-air broadcast applications and the series 30 for use in programme production and network continuity. ● **Media Touch Systems:** displaying Media Touch control system. ● **Medien Bulletin:** German broadcasting publication. ● **Meyer Sound Labs:** exhibiting their full line of sound reinforcement and recording products, including the HD-1 and MSL-10A, the VX-1 stereo programme equaliser and the DS-2 arrayable midbass loudspeaker. ● **Milab:** to be found on the Klark-Teknik stand, Milab will be introducing the new LSR 2000 microphone. This condenser microphone has been designed for live use with a claimed SPL of 133 dB before saturation. The LSR 2000 will also operate on 12 to 52 V phantom power. ● **Minim Electronics:** will be showing their range of Ambisonic surround sound equipment for recording and playback in professional situations. Clock systems, including the *Presenter's Clock* will also be shown. ● **Mitsubishi:** will be showing their complete range of digital recorders including the X-880 32-track; 20 bit X-86; and new products that will be announced at the show itself. ● **Mosses & Mitchell:** range of audio and video jacks and jackfields together with a range of accessories. ● **Musicbox:** will exhibit C-0s sonic welded, C-0s screwed, library cases, endless loop cassettes, short-time cassettes, V-0 VHS cassettes, blank cassettes.

## N

● **Nagra Kudelski:** displaying their range of tape recorders including the Nagra D helical scan digital machine. ● **New England Digital:** European debut of NED's new software and interface options for their *PostPro* and *PostPro SD* recorder/editors, including an enhanced version of *EditView*, a tape style software editing package that allows users to manipulate disk and *Synclavier* RAM samples simultaneously, while

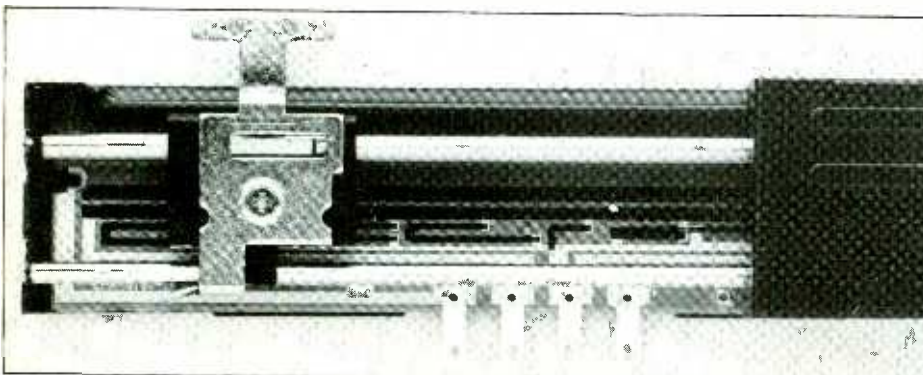


**EditView software from NED**

offering BVH/BVU and VPR-3 machine control for edit-to-picture applications. LucasFilm's *SoundDroid* offers a film-style interface allowing editors to manipulate sounds from a screen-based cuesheet. ● **Neumann:** will be showing their range of microphones and consoles. ● **Neutrik:** introducing the new R series XLR-sockets; new bantam-type 'tiny telephone' plug for easy assembly; the A1 test and service instrument with an RS232 interface and TS03 software package; Neutricon N, a robust circular connector system with push-pull locking and up to eight contacts, user definable, in crimps, hardwire or PCB-mount versions. ● **Neotek:** the *Encore*, Neotek's post-production console, will be making its European debut. Also on display will be the *Elite* console. ● **Neve:** new products for the show include the Neve 44 series of consoles for broadcast or audio editing applications; stereo high resolution 20 bit AD/DA converters; and a special stereo module for use with the V series range of consoles. Neve will also focus on *Flying Faders* automation, following modifications that enable the system to be retrofitted to a wide variety of consoles. The Neve VRP console will be on show for the first time at a European AES. ● **Nexo:** featuring the new TS2400 touring system, the first enclosure from the new top of the line range from Nexo. Features include compact design (1022x791x597 mm); the most powerful Nexo system available using the new 3 inch diaphragm neodymium treble drivers; enclosure has six separate flying points with Aeroquip track for ease of flying and angling. Also featured Nexo's new *LSub* range designed to provide high power servo-controlled low and very low frequencies, to augment new or existing systems when extended bass response is required. ● **NTP:** making its AES debut, the new NTP 612 analogue audio switcher; the new 477-100 ppm, which is a new and high precision, microprocessor controlled peak programme meter. Established products include NTP control systems; full range ppm and vu meters; phase meters and oscilloscopes and microphone pre-mixer.

## O

● **OD&ME:** featuring the *Monoliner MkII*, the



**Prefer CPA-8200 fader**

new improved version of the *Monoliner* technique for CD manufacture.

## P

● **Pastega:** will be showing their full range of wireless microphone systems. ● **Penny & Giles:** displaying the full range of professional studio faders and precision controllers. ● **Philip Drake:** new products include the PD 5040 automatic stereo corrector, which provides detection, indication and correction of time delay, phase inversion and signal level errors in the stereo audio signal path; PD 5050A A/D and D/A converter; PD 600 series in-band radio talkback; PD 2000 series broadcast stereo console. ● **PHL Audio:** a new French company manufacturing high efficiency loudspeakers. Products introduced at the show will be a 6½ inch midrange driver for direct radiation or for horn mounting; a 15 inch bass driver, with 3 inch or 4 inch voice coil. ● **Plasmec:** on show for the first time is Plasmec's ADAS, the stereo hard disk recorder compatible with the Atari ST range. Also on display will be the Mosses and Mitchell range of professional jacks, jackfields and accessories; and the Lone Wolf MIDITap system, a new generation of 4-in, 4-out MIDI processor featuring the Medialink protocol. The 1U rackmounted unit gives control over a MIDI system, providing long range and interference-free operation via fibre-optic cable. ● **Precision Devices:** showing their range of drivers for Turbosound and other speaker manufacturers including the new 21 inch and 24 inch bass drivers. ● **Prefer:** will be showing the CM-48 *Mini Pro-Mix* mixer suitable for some audio-visual applications, sound recording and discotheques. Also showing the plastic carbon fader CPA-8200 and 2CPA-8200. ● **Publison:** will be demonstrating the latest developments of the *Infernal Machine* workstation 4000.

## Q

● **Quad Electroacoustics:** will be exhibiting their range of professional power amplifier products and the ESL-63P loudspeakers. The 520F series offers 180 W/channel into 4 Ω; the 510 model features a multitap output transformer and is ideally suited to 100 V line output operation. The recently introduced 240 offers 75 W/channel in a 1U package and will be shown along with the first of its VCA options. ● **Quantec:** introducing their new 2400 low noise microphone-preamplifier featuring the molecular noise floor principle. The 19 inch 1U rackmount unit contains two amplifiers and is mains powered. All gain settings, highpass filter and phantom power switchings are controlled clickfree by a microprocessor, which can be remotely controlled. ● **Quested:** showing the new H208 monitoring system for A/V post-production and home studio environments. Also details of their active and passive monitoring systems.

## R

● **Ranson Audio:** will be exhibiting their touchscreen control surface for use in radio stations as a live assist and/or automation system. Various other associated hardware products will be exhibited such as Sony CDK006 CD jukeboxes, Inovonics 250FM computer-controlled stereo FM audio processor, *Vigilante* stereo FM processor. Ranson Audio will also be launching their own



Fred says, if it's worth recording it's worth

# FRIDA

FRIDA combines the well established editing facilities of FRED with its own fully comprehensive tape recording facilities ensuring the highest studio standards - wherever the action is.

Unique family features include:

- lightweight
- portability
- modular design
- ease of operation
- sensible pricing

and FRIDA is available in TC versions and models covering all working situations.

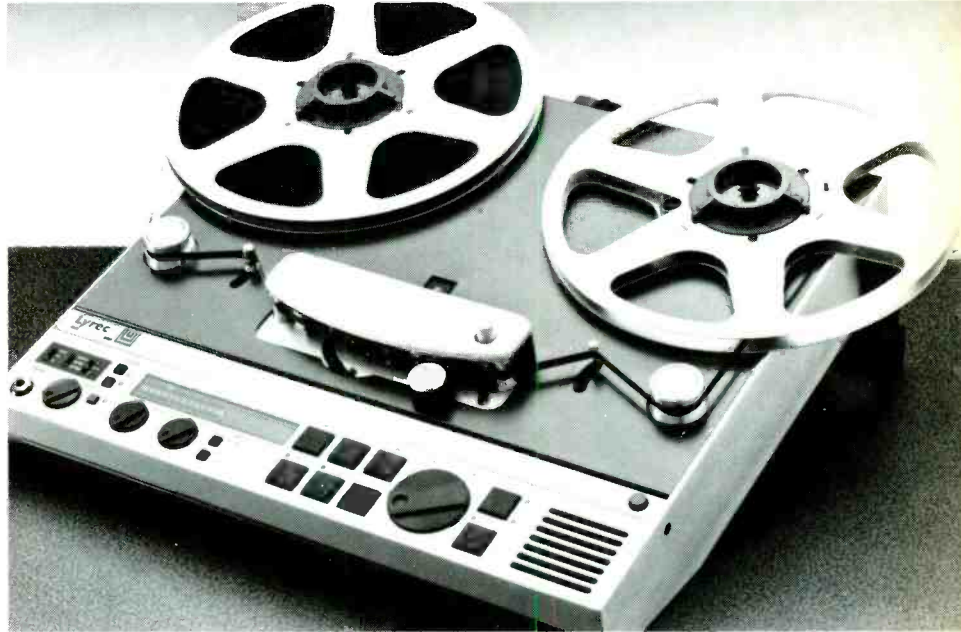
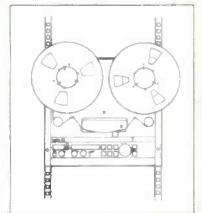


Table-top

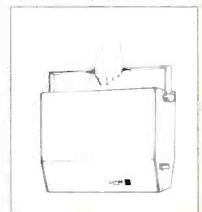
Console



Rack-mounted



Portable



Lyrec Manufacturing A/S  
Box 123 (Mileparken 22), 2740 Skovlunde Denmark  
Tel +45 44 532522 Fax +45 44 53 53 35

#### European Distributors

	Tel	Fax
Austria:	+43 22 36/26123	+43 22 36/83223
Belgium:	+32 11 415278	+32 11 491662
Finland:	+358 0 5661644	+358 0 5666582
France:	+33 1 42815047	+33 1 42858247
Greece:	+30 1 6475659	+30 1 3639234
Italy:	+39 2 817839	+39 2 8136032
Netherlands:	+31 20 141749	+31 20 140065
Norway:	+47 2 797730	+47 2 796154
Switzerland:	+41 18400144	+41 18410726
U.K.:	+44 84427 8866	+44 84427 8810
W. Germany:	+49 6171 4026	+49 6171 4401

# Mozart

“AMEK has achieved a goal which has always eluded me: cost-effective production of mixing consoles of the highest quality.

MOZART, with its combination of advanced signal paths and revolutionary automation, integrated to an unusual depth in the console, impresses me greatly.

The possibilities offered by MOZART are completely new.

During 1989 AMEK invited me to make my own contribution to the MOZART system.

Within the framework of signal flow and automation specified by AMEK, I have designed my own input module which features circuitry built entirely to my specifications. This has resulted in a version of the MOZART which could, as it were, bear my signature.

A new microphone amplifier has been designed which combines the integrity and sonic quality of the highest grade transformer designs with new circuitry which overcomes the fundamental problem of low frequency distortion encountered in even the best of the classic designs.



MR. RUPERT NEVE

Similarly, a very high grade line input stage has been developed which, again, combines the proven qualities of the best transformer with the state-of-the-art performance now achievable. The input device, in fact, behaves much like a transformer and I have called it the T.L.A. (Transformer-Like Amplifier).

Equalization has often been a compromise in the past because it has been expensive in terms of space and component cost to provide the audio quality and completeness of control which

might be found in the best outboard equalizers. But this is exactly what I have done in my version of MOZART... achieved the best possible audio performance and within a realistically-priced console input channel.

This unique combination of engineering has, for the first time, brought my designs within reach of a greater range of producers, engineers and studios than

was ever possible before.

My work with AMEK thus opens up a new era of collaboration in the industry which I hope will help set new standards in console design and introduce a new concept of value.”

## & I



Head Office, Factory and Sales, Amek Systems and Controls Ltd, New Islington Mill, Regent Trading Estate, Oldfield Road, Salford M5 4SX, England. Telephone: 061-834 6747. Telex: 668127. Fax: 061-834 0593.  
AMEK/TAC US Operations: 10815 Burbank Blvd, North Hollywood, CA 91601. Telephone: 818/508 9788. Fax: 818/508 8619.



digital audio hard disk storage system. This will be shown working with the *Media Touch* control software and also a standalone system. ● **Rebis Audio**: range of modular audio processors. ● **Renkus-Heinz Europe**: will be featuring the *EASE* (Electro-Acoustic Simulation for Engineers) computer program. The English version of this CAAD program is distributed worldwide by Renkus-Heinz. Also on show will be the *CM* range of cluster modules from the *Smart* and *Pro-Guard* ranges of processor-controlled loudspeakers; examples from the range of compression drivers, horns and custom enclosures from Renkus. ● **Rohde & Schwarz**: range of standards converters. ● **RTW**: will be exhibiting the *1190* DMS metering system, tailored to interface with the Sony *PCM-3324* digital multitrack. Also on display will be the model *1195* programme timer; and RTW's full range of phase meters and peak programme meters.

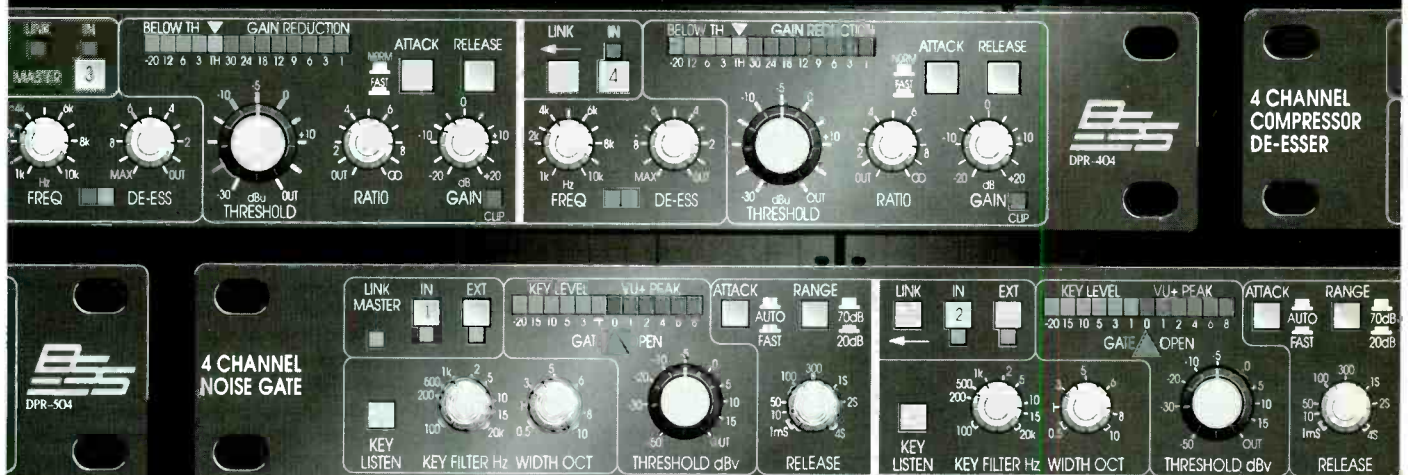
## S

● **Saki Magnetics**: will be displaying their complete line of long life ferrite heads, including 1 inch heads for Ampex, MCI-Sony, 3M Mincom, Otari, Revox, Scully and Studer recorders. Also on show will be their line of 24-track 2 inch metal and playback heads for recorders made by Ampex, MCI-Sony, 3M Mincom, Otari and Studer. A recent new product is a long life ferrite head for the *BVII* series Sony 1 inch video machines. ● **Sanken**: range of professional microphones. ● **Saturn Research**: will be showing for the first time their new 24-track recorder, the *Saturn 624*. Based on the *Saturn 824*, the *624* retains the same transport. The standard remote control

features track and master monitor selection,  $\pm 50\%$  varispeed, as well as return-to-zero and return-to-last-play positions. Saturn will be showing the *624* with fully automatic record alignment and a new remote bargraph metering system with alignment zoom facility. ● **SAV**: French audio dealer displaying products from Orban, ITC, Harrison, DAR, Videotek and Pesa. ● **Schneider**: showing their audio C-0 cassettes, audio and video reels and their video hubs. Empty reels and cannisters for film and computer tapes. ● **Schoeps**: will be exhibiting the *Colette Programme*, a modular condenser microphone system, which comprises 16 different mics with different frequency response and directional patterns, CMC amplifiers for various demands and active accessories that fit in between capsule and amplifier. ● **SCV Audio**: range of sound reinforcement and broadcast products. ● **Seem Audio**: display includes the *Seepart*, 8-input portable audio mixer. The mixer fits a 19 inch rack; *Seesam 2*, 8- to 24-input compact broadcast audio mixer; *EH018* for remote control of a tape recorder via a phone line. ● **Sennheiser**: range of microphones, headphones and accessories. ● **Sescom**: new products include eight new hand-held test instruments for the studio professional called *Field-Pro*. There is also a new series of in-line audio transformers and pads. ● **Shure**: featuring *VP88* MS stereo microphones, *L* series wireless systems; *FP* series portable mixers and amplifiers; *AMS* automatic mic mixers. ● **Siemens**: their range of communications systems. ● **Sig Tech**: no information received. ● **Solid State Logic**: featuring *ScreenSound* digital audio editing, mixing, recording system for off-line video and film post-production and audio-for-video editing applications. *ScreenSound*

interfaces with VTRs/VCRs and film reproducers with full machine control; *SoundNet* is designed to work in conjunction with multiple *ScreenSound* system. It enables users to share, copy and back-up work without compromising system power and performance; *SL 4000 G* series master studio system; *G* series studio computer; *Logic FX* range of 1U 19 inch rackmounting units containing *G* series electronics; *SL 5000 M* series audio production system; *SL 5000 M* series film post-production system; and *Instant Reset*, a proprietary computer system that can be interfaced with the *SL 5000 M* series. Allows all switch settings on every cassette to be stored and reset. ● **Sonifex**: will be introducing the *DISCARD* digital audio system for radio broadcasting. The *DISCARD* system is a compact, inexpensive 16-bit digital stereo system expandable to 6 hours airplay. Current products include the *μHSX* series NAB cartridge machines and *CQ* series compact cart machines. ● **Sonosax**: full range of mixers including the new version of the *SX-S* mixer which comes with a new frame to stand up to harsh treatment and conditions. ● **Sony Broadcast**: new products on display will include *TCD-10 PROII* DAT recorder with absolute time recording; *PCM-2700* low cost 4-head DAT machine; PC-based error verification system for DAT; *DSP-D7* digital delay unit; *DSP-R7* digital reverb unit; *MXP-2900* series of broadcast and video post-production consoles. Current equipment includes the full range of professional DAT machines; *VSP-8000* digital audio mixer for video post-production; and CD mastering equipment. ● **Soundcraft**: worldwide debut of a new in-line recording console. The new console is designed to be the closest thing to an "SSL in the bedroom". A combined I/O module

# The multiple choice....



....advanced in design, simple and effective in use....

The **DPR-404** 4 Channel Compressor De-Esser  
The **DPR-504** 4 Channel Noise Gate



**BSS Audio Ltd.**, Unit 5, Merlin Centre, Acrewood Way, St Albans, Herts AL4 0JY England  
Phone: (0727) 45242 Fax: (0727) 45277 Telex: 265612 BSS G

an **EdgeTech** company  
a member of the **AKG** Group



# QUALITY USED EQUIPMENT

from Tony Larking

## CONSOLES

AMEK 2500 36 channels-Mastermix, 1 owner from new	VGC £19,995
HARRISON 40 CHANNEL 24 SERIES VCA subs, 6 aux, installed in private studio for the past 5 years	VGC £17,500
NEVE 8068 32 channels, p bay	VGC £29,950
NEVE 5316 36 channel broadcast console	VGC £24,950
NEVE BCM102	VGC £POA
SOUNDTRACS QUARTZ 3200 32 channels, 64 line inputs with EQ, midi muting, only 2 months use, new purchase price £17,900 SAVE £4,905	As new £12,995
SOUNDTRACS CP6800 40 channels, 24 monitors, p bay, 64 line inputs in remix, automated routing, muting	VGC Bargain £15,000
SOUNDTRACS CM4400 32/24 p bay, CMS2 automation	VGC £6,995
SOUNDTRACS CM4400 32/24 external GPO patchbay	Bargain £5,500
SOUNDTRACS IL4832 with Tracmix fader automation	VGC £29,500
Above console without automation	£22,000
SOUNDTRACS MRX 26/8/16-p bay	Ex demo £6,450
SOUNDTRACS 600 24/8/16 unused	As new £4,500
SOUNDTRACS 16/8/16 34 line inputs in remix	VGC £1,500
DDA AMR24 36/24 p bay, installed approximately 6 months	VGC £25,995
DDA AMR24 44 frame, fitted with 28 channels	Immaculate £25,995

## MULTITRACKS

AKAI ADAM 24 track digital system (2xDR1200, may split) with remote, private use only	VGC £POA
AKAI MG14D with autolocator, little used	As new £1,850
MCI 24 track with remote, an early 2" recorder looking for a good home	Bargain £2,995
mitsubishi X850 very low hours	VGC £POA
OTARI MTR90 MK2 24 track, remote/auto, low hours	VGC £15,995
SATURN 24 track, remote auto	VGC £15,995
STUDER A80 MK2/3 24 track, MK3 headblock conversion, remote/auto, one careful owner from new, maintained by FWO BAUCH	VGC £11,995
STUDER A80 MK3 24 track, remote auto, one owner, 2,600 hours	VGC £POA
STUDER A80 16 track, remote, only 3,200 hours	VGC £3,995
STUDER A510 2 track recorders (2 available)	As new £POA
STUDER B67 various machines available, phone for details	£POA
STUDER A80 MK1 2 track, less than 500 hours use	VGC OFFERS
SOUNDTRACFT 24 track, 9 memory autoremate, nice condition	£5,500
SOUNDTRACFT MK3 24 track with autolocator, private use only	VGC £7,995
SONY 3324 24 track digital recorder	VGC £29,500
FOSTEX E16	VGC £POA

## VARIOUS

NEUMANN U47 valve mic with PSU	£1,600
NEUMANN U67 valve mic with PSU	£995
FOSTEX 4030 SYNCHRONISER with 4035 remote	VGC £995
DOLBY SP24 24 channels Dolby A	VGC £4,750
DOLBY M24H 24 channels Dolby A	VGC £2,995
EMT 140 stereo transistor echo plate with remote, 1 owner	VGC £POA
BEL 24 CHANNEL NOISE REDUCTION simultaneous encode/decode 30db noise reduction	VGC £500
SOUNDTRACFT 2" 16 track head block	New £750
AMCRON DC390A power amp	VGC £395
SENNHEISER MKE212/3 boundary mic (2 available), boxed	As new £275 each
PULTEC ME5 valve EQ	VGC £995

## STUDIO FURNITURE (NEW)

18U STUDIO RACK grey laminate	New £195
18U STUDIO RACK ash, wood finish	New £295
STUDIO POD 13U, angled mobile rack, grey laminate	New £295
STUDIO POD 13U, angled mobile rack, ash, wood finish	New £395

## 24 TRACK PACKAGES

SOUNDTRACS CM4400 32/24 p bay with Studer A80 Mk2/3 with remote and autolocate	£16,000
SOUNDTRACS CM4400 with Soundcraft Mk3/24 track	£12,500

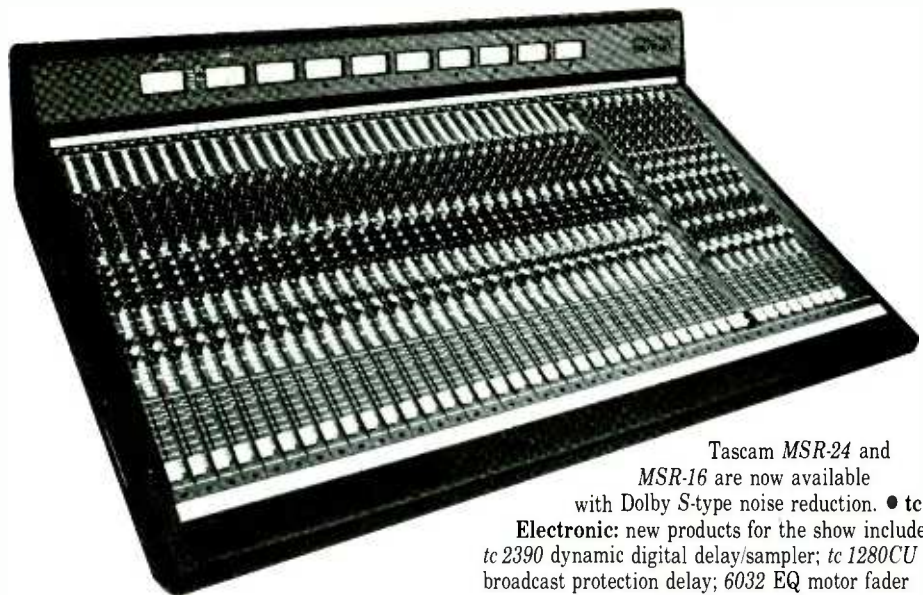
## WANTED FOR CASH

OTARI MX80 & MTR90 24 TRACKS  
USED RECORDING CONSOLES ETC

## EXPORT ENQUIRIES WELCOME



TEL: 0462 490125  
FAX: 0462 490126  
All prices are exclusive of VAT



## Soundtracs Sequel

gives access to dual signal paths, one for monitoring and the other for recording, each fitted with individual noise gates, splittable 4-band EQ and six aux sends, available with 24, 32, 40 or 48 inputs, which can be either dual line or in-line (I/O). ● **Soundtracs** will be displaying the new Quartz production console. The console is an in-line design with computer mute automation of channels and auxiliaries; the new Sequel sound reinforcement console bridges the gap between the SPA console and the MX range. The input channels of the Sequel feature a 4-band parametric equaliser with highpass filter; the new PC 32 series console is an extension of the range of PC-MIDI 24 and 16, fitted with 32 input/output channels with 72 line inputs on mixdown. ● **Start:** recordable CD system. ● **Steenbeck:** film related audio products. ● **Studer:** new for AES is the remote digital sound memory developed for the D820-48 digital multitrack. The sound memory board has 40 seconds total capacity (4x10; 3x13; 2x20 or 1x40); also featured is the new digital telephone hybrid; and the new digital broadcast mixing console Studer D920, which processes digital and analogue signals, switched together with an existing analogue console free of feedback; the new active 2-way monitor speaker Studer A623 for nearfield monitoring applications. ● **Summit Audio:** vacuum tube signal processing equipment. Equalisers, compressor/limiters, mic and instrument preamplifiers. ● **Sunkong Europe:** complete range of audio pancake duplicating cassette tapes. ● **Switchcraft:** range of connectors and patchfields. ● **Symetrix:** featuring the DPR-100 and DPR-44 recording and editing workstations. Both systems feature realtime level control, EQ settings, compression, limiting and compression. Both systems use an Apple Mac II series but have the option of using a unique dedicated control surface, which features moving faders, stereo master, with solo, mute and pan controls for each channel.

## T

● **Tannoy:** will be displaying their complete range of studio monitors. Also featured will be their range of Contractors PA loudspeakers, supplemented by the CPA 15.2 bass bin and the CPA 15FM on-stage monitor. ● **Tape Automation:** audio and video cassette tape loaders. ● **Tapematic:** range of tape loading and duplication equipment. ● **Tascam/TEAC:** the

Tascam MSR-24 and MSR-16 are now available with Dolby S-type noise reduction. ● **tc**

**Electronic:** new products for the show include tc 2390 dynamic digital delay/sampler; tc 1280CU broadcast protection delay; 6032 EQ motor fader remote; and the 8201 AES/EBU test generator/analyser. The tc 1280CU offers profanity delay for radio talk shows by holding 7 seconds of audio within the device until you want to delete a comment. ● **TFT:** no information received. ● **TOA:** Saori integrated digital sound reinforcement processor; AX-1000 automatic microphone mixer, a new line of 'Engineered Sound' loudspeakers, which include 14 speaker systems, five components and three mounting brackets. ● **Trident:** will be exhibiting the Vector 432 console complete with Trident machine control systems and moving faders. Standard features include 32 group outputs, four matrixed stereo buses, eight aux sends and a stereo bus compressor. Also on show are the series 80 and 16/24 consoles. ● **Turbosound:** featuring their new Flashlight system and the new TFM 250 and 350 floor monitors.

## V

● **VDB:** exhibiting a complete range of carbon and glassfibre microphone boom poles. VDB are also displaying the Audio Limited range of RMS 2000 radio microphone systems.

## Y-Z

● **Yamaha:** will be showing the DMR8 digital mixer/recorder, an integrated digital recording system offering a 28/32 bit 24-channel digital mixer with total automation, an 8-track 20 bit digital recorder, three digital effects and a synchroniser; DRU8 digital recorder, 8-track 20 bit digital recorder; DMC1000 digital mixing console, which offers a total of 22 inputs with eight programme buses, one stereo bus, four aux buses, 100 mm touch-sensitive motorised faders and total automation capability; S1520S speaker system with the Yamaha Y20 active servoprocessor and the C20 digital system controller. ● **Wolke:** range of test equipment and heads. ● **Zonal:** new products include 700 series high dynamic range studio mastering tape available in ¼ inch, ½ inch, 1 inch and 2 inch; and 750 series loopbin mastering tape available in ¼ inch, ½ inch and 1 inch. □

The latest issues of Studio Sound will be found on Stand N45 along with sister publications Broadcast Systems International and One To One. Editorial and advertisement staff look forward to seeing you on the stand or around the exhibition.



# MEET US

90th AES-Convention, Paris      AKG-Booth No: T44, Hall Ternes

## NEWS:

- AKG Wireless Microphone System 900
- AKG K 270 Talkback
- Turbosound - product range
- BSS Audio - product range
- Orban - product range
- dbx professional - product range



AKG AKUSTISCHE U.KINO-GERÄTE GESELLSCHAFT M.B.H.  
Brunhildengasse 1, P.O.B. 584, A-1150 Vienna/AUSTRIA  
Tel.:(1) 95 65 17-0, Telex 131839 akgac a, Fax: (1) 95 65 17- 245

**D**o you remember how, around a year ago, Sony unveiled Micro DAT? It was a miniature DAT recorder that used a postage-stamp sized cassette with greatly simplified rotary head mechanism. Anyone who really believed that Sony really planned to take the business world by storm with a broadcast quality dictation machine needed their heads testing—especially as Sony talked about the Micro DAT recorder incorporating SCMS copy protection.

A lot of people inside the industry reckoned that Sony saw Micro DAT as a fall-back for R-DAT. If R-DAT failed on the domestic market, Sony would offer Micro DAT as a next generation *Walkman*. It is still far too early to say whether R-DAT will succeed or fail, so it is too early to predict whether Micro DAT will become a consumer product.

But already Sony has adapted the clever technology used to keep the mechanics of Micro DAT simple and keep the price low. The technology is called NT, short for No Track. It is being used in the new generation of US R-DAT car players, due to go on sale in the US this winter and in Europe in the spring.

Although Sony have not kept the use of NT in its R-DAT players a secret, the company certainly haven't made any fuss about it either. In Europe the technical explanation of the mechanics in the car player was so garbled ('a proprietary tracking system utilising large scale RAM data processing') that the significance passed unnoticed. In Japan, Sony gave more technical details but it took a while for anyone to click.

It can only be a question of time before Sony builds No Track into portable R-DAT players. These can eventually be as small as a packet of cigarettes and probably not much more expensive than a good quality conventional *Walkman*. This could pull the rug from under Philips' DCC system, which uses stationary heads to record on a cassette the same size as a conventional analogue cassette.

But note well that the benefits of NT apply just to playback-only machines.

To put NT in perspective, remember that R-DAT recorders rely on a rapidly rotating drum carrying tiny heads that scan the tape obliquely. During recording, the heads lay down parallel, helical tracks (like the threads of a screw), which are less than 14  $\mu$ m wide—one quarter of the width of a human hair. On playback an electronic servo system must steer the heads over the track pattern with micrometre accuracy. The servo must compensate for changes in the tape, caused by temperature or stretching and for alignment errors between different machines. The tight mechanical tolerances necessary make DAT expensive.

Philips' DCC system uses stationary heads, which lay down 16 parallel tracks (two pairs of eight) along the length of the tape. Because there is no rotating drum or servo, it is cheaper to make. But the cassettes only play for 90 minutes (with autoreverse half way), compared to 4 hours (at half speed) from a much smaller DAT cassette.

In an NT deck (whether Micro DAT or R-DAT) no attempt is made to follow the tracks accurately

## Barry Fox

### No Track in car stereos; audio for video editing

on playback. Instead the size of the R-DAT drum is halved, from 30 mm to 15 mm, its rotational speed doubled from 2000 RPM to 4000 RPM and the tape wrap doubled from 90° to 180°. The playback heads sweep over the general area of the tracks, reading at least four at a time, twice over. So the same data is read several times over. All the data read is temporarily stored in solid state RAM memory, where it is re-assembled in correct order and redundant data discarded. There is time to do this because the drum is reading at twice the speed of recording. So the system accurately re-constructs the recorded signal from only a rough reading.

All the No Track electronics are built into two chips. So electronic complexity, which is cheap, replaces mechanical precision, which is expensive.

The car unit combines a DAT deck, radio tuner and control electronics for a CD player in a single unit no larger than a conventional car cassette deck. This can cope with the vibration from bumpy roads, which might defeat the servo system of a conventional DAT recorder. So Sony is already well on the way to making a very small DAT *Walkman*.

**T**he public still believe that only pop music recordings are edited. In his autobiography, *Long Time Gone*, Dave Crosby tells how the track 'Lee Shore' from the *Crosby-Nash Live* album was part recorded at Central Park in New York City and part in the Syria Mosque in Pittsburgh, because the engineers in Record Plant's mobile had a stand up, fall down fight during the NY gig.

Any imperfection in a concert performance often passes with the moment; if captured in a recording it will soon grate on the ears. Hence Decca make no bones about the fact that a typical classical recording lasting an hour has, on average, an edit every 10 seconds and takes up to 100 hours to finish.

There is a nice example of this on recent Decca recording *Top Tenors*. During the World Cup, Europe's three most famous tenors Jose Carreras, Placido Domingo and Luciano Pavarotti, forgot their rivalry for the sake of soccer and performed on the same outdoor stage in Rome. During Carreras' first song, *Lamento di Federico* by Francesco Cilea, a jet aeroplane flew low over the concert stage. Being a live concert, there was no chance of a re-take. Although 50 microphones were in use, with Mitsubishi 32-track digital recorders (there were two full orchestras and over 200 musicians), all the mics picked up the same plane sound.

Back in London Decca engineers did a crossfade between the evening concert, the afternoon

rehearsal and the evening concert again, much like the Crosby-Nash edit. The result is a seamless join with virtually no aircraft sound.

Unfortunately Carreras had jokingly blown a kiss at the aircraft as it passed overhead and this was captured by the TV cameras. Decca is releasing *Top Tenors* on video disc and tape as well as audio, so their engineers have had to work separately on the video soundtrack and leave just enough of the aircraft noise audible for Carreras' kiss to the air to make sense. The 'original' TV version, shown by Channel 4, was wholly unedited and thus makes an interesting reference for comparison.

It's worth remembering that Decca was the first European company, in 1978, to make digital sound recordings. Tony Griffith's team, who had been working on the ill-fated Teldec video disc, modified IVC 1 inch reel-to-reel video recorders to record digital stereo sound. Although Decca now has a couple of 3M and a couple of Mitsubishi multitracks, most recordings are still made straight to 2-track. At Decca there is an all-digital policy. None of the 2-track material ever goes back to the analogue domain. Over the last decade Decca has built up a library of nearly 20,000 reels of digital tape, all now made on location because, since the Philips buy out, Decca has had no recording studios of its own.

Tony Griffith's policy is "no error concealment tolerated". All tape copies are made under monitor control of a computer, which monitors errors and flags anything that cannot be corrected. The error detection circuit is hooked to the tape stop button.

Decca was also first to build an editing unit that can control three digital stereo recorders, two playing back and one copying, all running in synchrony to give seamless crossfades between takes. Since 1981 Decca have quietly been building their own digital editing machines.

Decca do not use magnetic hard disks for editing. Operas are too long. Everything stays on tape. To avoid wear and tear on the video tape machines, caused by constantly rewinding to edit points, a 10 second section of sound around the point to be cut and joined is temporarily stored in RAM. Like the original prototype 3M digital editing system, a graphic trace of the sound is also displayed on screen to help find the exact point to cut and join.

From Day One, back in 1978, the Decca recorders had the capability to put 18 bit code, sampled at 48 kHz, on tape. But back then only 16 bit converters (running at around 15.5 bits) were available. It is only now that Decca feels safe to upgrade to 18 bit recording, using ganged 4 bit Delta modulation chips from dbx. These give 19.5 bit resolution, which is rounded down to 18 bit for recording. Currently Decca has over 50 2-track digital recorders, which have all been converted.

Tony Griffiths has built up a demo tape of classic classical edits. Apart from the World Cup Carreras join, there is a nice point where a top note sung by Luciano Pavarotti in *Rigoletto* was found to be spoiled by the sound of a car revving outside the hall. Crossfades between three takes did the trick. □



# SOUNDSTATION

# DSP



SEE US AT  
THE AES  
IN PARIS

YOU HAVE A CHOICE IN  
DIGITAL AUDIO EDITORS,  
UNLESS YOU WANT...

- ① 2 to 16 Channels
- ① Ease of use
- ① Affordable Power and Speed
- ① Rewriteable Optical Disk
- ① WORDFIT
- ① TIMEWARP
- ① Machine Control and Autolocate
- ① Full Expandability
- ① Digital Interfaces
- ① Chase Sync

ONLY AVAILABLE ON SOUNDSTATION

The unique and essential disk based recorder and editor for video, film and audio post-production.

**NEW**

## SEGMENT BASED PROCESSING

A revolution in speed and convenience - now available on the powerful new, 16 channel SOUNDSTATION DSP system. Segment Based Processing lets you add digital parametric EQ, gain and panning to every individual audio segment via the SOUNDSTATION DSP console.

DIGITAL AUDIO RESEARCH LIMITED

2 SILVERGLADE BUSINESS PARK · LEATHERHEAD ROAD · CHESSINGTON · SURREY KT9 2QL · ENGLAND  
TELEPHONE (0372) 742848 · FAX (0372) 743532

DIGITAL AUDIO RESEARCH





# Some classics



**SONY**<sup>®</sup>

For further information contact:

Athens 01 2818273 Basingstoke, UK 0256 55011 Brussels 02 7214950 Cologne 0221 59660 Copenhagen 042 995100  
Dubai 04 373472 Helsinki C 50291 Jeddah 02 6440837 Lisbon 01 573046 Madrid 091 3581335 Milan 02 618381  
Netherlands 02968 81911 Oslo 02 303530 Paris 01 49454000 Rome 0396 5920237 Stockholm 08 7336100 Vienna 0222 61050  
Zurich 01 7333311 Eastern Europe, Vienna 0222 554606 Middle East, Geneva 022 7336350 Africa, UK 0256 55011

[www.americanradiohistory.com](http://www.americanradiohistory.com)



# will never date



## ....the PCM-3348.

Sony Broadcast & Communications European Headquarters  
Jays Close, Viables, Basingstoke, Hampshire RG22 4SB, United Kingdom  
Tel: (0256) 55 0 11, Telex: 85 84 24, Fax: G2/G3 (0256) 47 45 85

Sony Broadcast & Communications 



# EVERYTHING AUDIO

Soundcraft



**SOUNDCRAFT** CONSOLES GET OUR HIGHEST RECOMMENDATION. WE SELL THEM ALL FROM **DELTA** TO THE **6000**, FROM **200BVE** TO **SAC2000**. CALL US NOW ON A VERY COMPETITIVE **SOUNDCRAFT/TASCAM MSR 24 PACKAGE**.

**TASCAM** RANGE OF PRODUCTS INCLUDES SOME REALLY SHINING STARS, NOT LEAST THE 24 TRACK ON 1" **MSR 24**. WE CAN DESIGN A **PACKAGE** INCLUDING THIS FINE MACHINE TO SUIT YOUR BUDGET/FEATURE BALANCE. CALL US **NOW** TO ARRANGE A **DEMONSTRATION**.



TASCAM

AKAI



**AKAI** SAMPLERS ARE RENOWNED FOR THEIR STUNNING AUDIO QUALITY AND DURABILITY. WE STOCK THEM ALL INCLUDING **S950**, **S1000** AND **S1100** AND HAVE A HUGE LIBRARY OF QUALITY **SAMPLES** WHICH IS AT THE DISPOSAL OF OUR CUSTOMERS.

THE **G16** AND **R8** CONTINUE A TRADITION OF **EXCELLENT** VALUE FOR MONEY MULTITRACKS FROM **FOSTEX**. WE SUPPLY THEM BOTH AS PART OF **AMPSOUND PACKAGES** OR INDIVIDUALLY. PHONE FOR A **SPECIAL DEAL** TODAY.



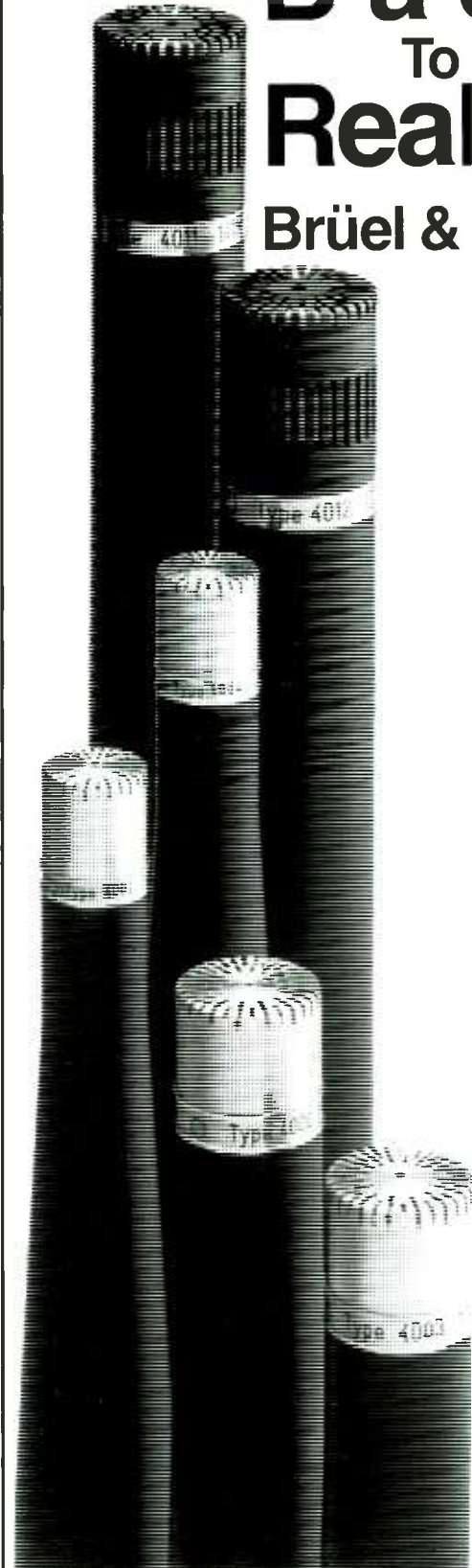
FOSTEX

**AMPSOUND** SUPPLY, INSTALL AND BACK-UP AUDIO AND COMPUTER PRODUCTS TO THE **HIGHEST STANDARDS** AT THE MOST COMPETITIVE PRICES. **AND THERE IS ALWAYS A RANGE OF USED, AND OR, EX - DEMONSTRATION** PRODUCTS AVAILABLE.



153A VICTORIA STREET . ST ALBANS . HERTS AL1 3TA  
TEL: 0727 50075 . FAX: 0727 58977

# Back To Reality Brüel & Kjær



FOR DETAILED INFORMATION FILL COUPON & RETURN TO:

Brüel & Kjær  
Pro Audio (UK)  
Harrow Weald Lodge,  
92 Uxbridge Road,  
Harrow,  
MIDDX HA3 6BZ.  
Tel: 01-954 2366

Brüel & Kjær  
Pro Audio  
18 Nærnum  
Hovedgaade,  
2850 Nærnum,  
Denmark  
Tel: + 45 42 80 0500

## Series 4000 Microphones

Name \_\_\_\_\_

Address \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_







**H**e is arguably one of the greatest record producers and musical arrangers. His CV reads like an epic and his abilities seem widely spread. Among his achievements, he played trumpet with Billie Holiday, led the Basie Band, was a top record company executive, has composed around 40 film scores and produced *Thriller*; the highest selling album ever. Not content with that he is now producing films.

During a rare break in his hectic schedule there was an opportunity to find out what he's really like. And for the man himself, it was a chance to vent his frustration at the way technology and commercialism have taken over the industry.

Looking at him now, there are no physical or mental legacies from the two aneurisms that almost took his life in the '70s. He came through two delicate brain operations in which the odds for survival were stacked heavily against him, and looks fit and relaxed as he sprawls in the comfort of his hotel room.

"I have a different attitude towards life and my health now; I put a little more focus on it. But I'd be lying if I said I'd really slowed down. I'm just better at having fun," he says, with a smile that suggests he knows how to party.

And he's learnt to take time for holidays instead of going from project to project. "Any time I see a hole where there's time for relaxation I have to jump right into it because I know I'm going to get my brains beat out for the rest of the time. Phone calls, meetings... it never stops.

"I'm forced to organise my time very systematically because I have to concentrate on a lot of diverse things. I learnt from Steven Spielberg to dissect the process of production and see exactly where I am needed. Everyone's got 10 million questions and they're trying to get his attention, but he won't have it. He doesn't let

# CONVERSATION WITH QUINCY JONES

Corinne Simcock interviews musician, arranger, composer and producer Quincy Jones

anybody dilute his time."

So it doesn't come as a surprise to learn that Jones has no further plans to work with Michael Jackson despite the success of *Thriller*, which spawned an unprecedented seven top 10 singles.

"We did *Thriller* in just 2 months. There was no messing around, we just had to get it finished. Your intuition takes over under pressure and some beautiful things happen when you just blast it out.

"That album sells 40 million records, so then we've got to take 14 months to do *Bad*. 14 months! It was the dullest thing. And now it's all about clothes deals and merchandising and stuff before the album's even made."

He blames technology... or rather, the overuse of it: "People get locked into technology and everything's on computer. You can sit around in the studio for 5 hours like an idiot just waiting for them to fix it. Whatever you want to do,

someone says, 'No you can't do that, it's on the computer, man.'

"Even my own engineer started giving me that shit. You just want to scream, 'Well take it off the goddamn computer and put it on something else,' you know?"

As he points out: "If everything's on the computer and it's the computer making the records, well, let's just go home and let the computer make the records then."

These days he's extremely selective. He'll deal with artists on his own label—like Oscar Peterson and Herbie Hancock—as executive producer, and just be there when he's really needed. "There's no point sitting around in the studio 18 hours a day 'til your ears have gone and you can't hear a thing. I can't be promiscuous with my time any more, I have to make every minute count.

"I got sick of technology taking over the industry, to tell you the truth. Look at the way



most producers work now. They're in their own home with their Linn 9000, they got the D50 and they got the M1. They never see another human being.

"Well I think it's really boring. I don't care how it sounds, it's boring. So one day I said, 'Man, I don't give a shit how dated it is, I want a live rhythm section. I want a Fender Rhodes, a straight Fender bass, John Robinson on drums and Steve Lukather on guitar.'"

And they did it. All the instruments were 20 years old but the audience didn't know the difference. "They loved the song and it was a number one hit on *Secret Garden*. It was a great feeling, because we could change the feel from bar to bar, we could get inside it and be more sensual instead of just bum, chan, bubum programming and quantising something to a 16th.

"Sure I use samplers and synths. But I spent half of my life studying orchestration from Rimski Korsakov to Ravel and I know what it is all about. I don't have to have a machine come up and tell me."

Quincy, of course, learnt the hard way: "We used to have to write DDLs in our scores because we didn't have the technology to do it. And we didn't have a multitrack when we worked with Lesley Gore, we had to synchronise a mono tape over here to join up with that one over there, because we were the first people to stack records.

"But once you've learnt what the principles are, the technology doesn't delude you. Then you're on top and it becomes just another instrument.

"I used the first synth the public had ever heard on the soundtrack to *Ironsides*. To me, a synth is just like adding seven more letters to the alphabet. I'm not going to give up a string section, or flugal horns or flutes.

"Synths should be like seasoning. They don't replace any of those instruments. Yet I've seen kids who don't know what a drum kit is when they see one. They honestly thought it was a little machine.

"Music has changed so radically over the last few decades. I don't think it has the capacity to change that radically again. I mean, It takes a long time to develop from pure individuals like

Louis Armstrong through to Motown.

"There'll always be a brilliant musical mind. . . there'll always be a Stevie Wonder or a Charlie Parker. But with technology the way it is now, they're removing the biggest workshop there is."

He's talking about jam sessions—remember them? The interfacing of musicians in the true sense of the word: face-to-face. "The communal thing's gone now, instead everyone's got these

---

## I got sick of technology taking over the industry, to tell you the truth. Look at the way most producers work now. They never see another human being

---

little industrial units in their houses.

"Each is on his own tiny island and musicians don't get the chance to look each other in the eye. Consequently, all the music is sounding basically the same."

And he bemoans the fact that the motivation is mainly money: "The goals are now success and fame orientated and I think that's the wrong place to come from. I have guys come crying to me when they're 25 years old saying, 'Man, it's almost over for me. I'm not rich yet and I haven't had a hit record.'"

"We never ever thought about that shit. Hit record? What is that? It never occurred to me to have a hit record. . . I couldn't have cared less. It was about wanting to learn about all the different kinds of music, everything from classical to funk.

"Driven by success and fame? Balls. I think that's really sad. The important thing is to have that pure spirit. . . just to be good and to love what you do."

At the age of 57, Quincy has a lot of ambitions left. He produced his first film—*The Color Purple*—in 1985, and the word 'retirement' doesn't figure in his vocabulary. "I just hope I get a chance in the next 20 years to be able to realise some of my dreams. There's a lot of crazy things I'd like to do. . . preposterous, really."

Like what? He looks bashful.

"Oh. . . lots of things."

"He gets a burst of courage and decides to elucidate.

"Like the Pushkin film, for instance. I'm determined to get that film on the screen the way I see it. I'm calling it a rock 'n' roll epic, and I'm not going to let anyone alter my vision.

"In Russia even today, any 18-year-old will tell you their biggest hero is Pushkin and it's very unusual to have a poet of Ethiopian descent become a prime architect of a culture the way he did. He was a wild man."

Now Jones is to produce the film as a co-venture with the Soviet Union and even has permission to shoot in the Kremlin. He's rightly proud of his achievements but not arrogant. "I'm proud of lots of things, not least the transition from records to film. I'm proud of Michael's success, of *We Are The*

*World*—America's answer to *Live Aid*—of *The Color Purple*. . . lots of things stand out in my mind.

"But so does being raised with Ray Charles, or working with Basie and Sinatra. It's a lifetime experience of things you never forget. Each has different dynamics on your life but they're all very strong."

In fact, he's extraordinarily humble about his success, "Oh, I've just been around a long time."

But so have a lot of other people, and none of them has matched him?

"They're just not as nosey as me I'm curious about everything and as long as you're curious, you always discover things. I'm at the height of my career now, so I must have done something right to still be going."

As a tribute to a living legend, Warner Brothers have made a feature-length documentary focusing on his life and covering four generations of American culture with a montage of memories and music.

The extraordinary cast of *Listen Up* features interviews with jazz giants such as Miles Davis, Ella Fitzgerald, Ray Charles and Sarah Vaughan in what tragically was to be her final film appearance.

Even Frank Sinatra, Barbra Streisand and Michael Jackson agreed to take part, though the latter refused to appear on camera and even insisted the lights were off.

It takes guts for a man to put himself under the microscope and reveal his true self to the world, warts and all. And though guts is something Jones has never been short of, his first reaction when asked to do the film was fear. "It was the thought of having all my dirty linen washed in public: I hadn't exactly lived like a monk," he says.

But he was persuaded by film producer Courtney Sale Ross, a close friend he'd met at one of Stephen Spielberg's dinner parties. For her, the inspiration for *Listen Up* wasn't just Quincy Jones the musician, it was Quincy Jones the man.

And since, when it comes to praise, Quincy is the last to blow his own trumpet, the final words go to Ross:

"He has a genuine warmth, a way of relating to people that makes them feel instantly at ease, as if they were longtime friends. Whether he is talking to top musicians or somebody on a street corner, he gives people a consideration and respect that makes them feel good about themselves," she says.

"To me, that is the mark of a great human being; one with the capacity to bring out the best in others." □



Photo courtesy of Warner Bros Inc

From the new feature film depicting his life story, Quincy Jones meets the younger generation in his old neighbourhood of Chicago's South Side

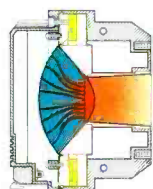


# It Takes More Than A Little Neodymium To Change The Face Of Driver Technology.



Hailed as the catalyst for a new generation of high performance compression drivers, the rare earth compound neodymium showed up in our R&D lab shortly after it was first formulated. But its extremely high cost and sensitivity to heat had to be overcome before neodymium could live up to its full potential.

The availability of this highly magnetic, extremely lightweight material coincided perfectly with our development of the Coherent Wave™ phasing plug.



*JBL's 2450J Neodymium Compression Driver with Coherent Wave™ phasing plug provides in-phase combining of sound waves for extended high frequency performance. JBL's patented diamond surround titanium diaphragm with new embossed dome greatly reduces distortion and damage at high SPL.*

This new design, a phasing plug with annular apertures of constant path length, uniformly directs sound through to the throat providing in-phase combining of sound waves for extended high frequency performance. This new technology is combined with our patented diamond surround titanium diaphragm, incorporating a new embossed dome, to reduce the possibility of distortion or damage at high SPL.

**2450J**

The 2450's smaller size translates to tighter spacing of horn arc arrays, more even and precise coverage and greatly reduced requirements for delay. Plus, the 2450 nets out at a mere 4.8 kg (10.5 lb). The benefits of this dramatic weight reduction include lower shipping costs to the site or on the road and significantly less load bearing requirements for both structures and rigging. With built-in mounting points, the 2450 will take much less time to install.

Yes, it took more than a little neodymium to change the face of driver technology. But we're confident you will find the breakthrough results were certainly well worth the wait and the effort.



JBL Professional  
8500 Balboa Boulevard, Northridge, CA 91329  
© 1988 - JBL Incorporated A Harman International Company

# SOUNDING OUT D-2

## Post-production house Wild Tracks have been working with audio on the D-2 digital video standard. MD Paul Headland tells how they work it

**A**s video sound dubbing was always to be the major part of Wild Tracks' business, we established a principle from the outset: buying VTRs was to be essential to our studios to provide a comprehensive service to clients.

In February 1987 when we started the facility, 1 inch was the predominant format so we bought a machine straight away. Betacam rapidly became more important, especially when the SP machines appeared, so we bought our *BVW-75P* in April 1989. At around the same time we also

purchased a second 1 inch machine to cover down time on our first machine and to allow copies and laydowns/laybacks to both of our 24-track dubbing studios. We often deal with 1 hr programmes and waiting for a free 1 inch is not to most clients liking! It is now apparent that a second Betacam will be needed before the turn of the year.

This brings us to the current position on standards. Our feelings are that it will be some while before we see 'the wonder, component, cheap (well cheaper than D-1)' format.

Our latest purchase, in January 1990, was a Sony *DVR-10P* D-2, which we believe made Wild Tracks the first independent UK audio post-production house to install a D-2 machine. Initially work was slow but we now regularly receive tapes from five or six edit houses with no compatibility problems, either inserting sections of audio or replacing any of the audio tracks complete. It is, of course, important to set up the tracking for each tape before editing audio, which in practice is very easy and takes only a few seconds using the displays provided on the control panel.

From the audio perspective there are three specific areas where the D-2 provides added value. Firstly, where clients demand higher sound quality than can be provided by either 1 inch or Betacam analogue tracks; secondly, where the project requires stereo; and finally, it's ideal for foreign language productions.

Taking these in order, there are programmes that will always be subject to multiple generations due to their complexity. It is fairly obvious that the degradation experienced with Betacam and 1 inch will be completely removed when working with the four digital audio tracks of the D-2 format. This often means enormous savings through not having to replay the original material from the rushes tapes. Very helpful when today's producers' budgets are already severely strained.

When editing stereo programmes on D-2, the stereo overlaps on shot changes are simplified, leaving the mix to be completed later in the audio session. This can only be achieved on a VTR with four fully editable audio tracks, which the D-2 provides. This also makes possible a stereo mix and a stereo music and effects mix on the same cassette. Essential for foreign sales.

With foreign language versions, four languages can be recorded on the same cassette, with possibly the English mix (for reference only) on the reduced quality analogue cue track. Less submasters are needed and the quality of the submasters are exactly as good as the master.

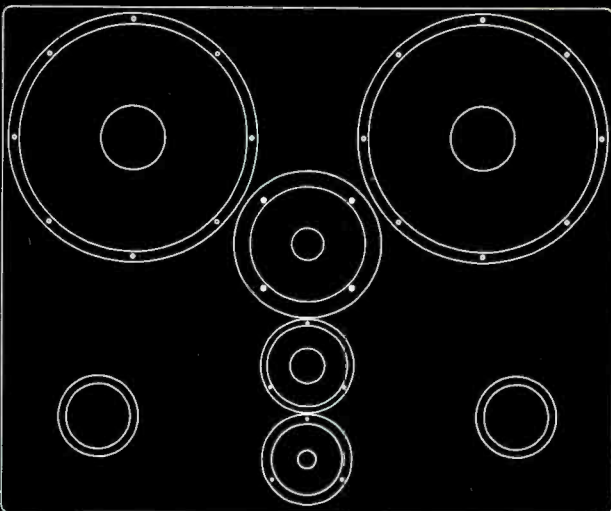
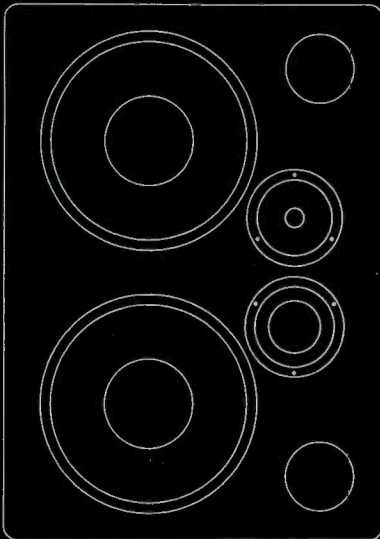
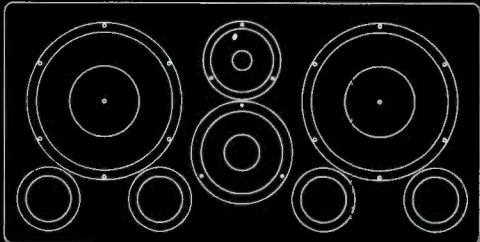
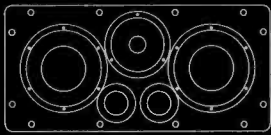
We have noticed that when editors are working from Betacam SP to D-2, they are more likely to use rushes audio from the AFM tracks. This immediately improves the whole audio quality as



Wild Tracks' video transfer bay—D-2 machine centre foreground rack



## OUR MONITORS



## can't speak for themselves...

"We recorded and mixed the Beautiful South's new album on these little M1 nearfield monitors. They really are outrageously accurate, ridiculously loud, and the record's No. 1!"

**Mike Hedges**  
Record Producer

"One of the reasons that people come here is the monitoring. I recall that Polydor called me up to congratulate me once. They had just had 3 separate projects from here, with 3 different engineers, going to 3 different cutting rooms. Every one was cut flat. It was the first time ever, apparently! Do I like my M2s? I couldn't live without them!"

**Rod Gammons**  
Berwick Street Studios

"I use M2s in my own studio and on location. Working with artists like George Michael, Hall and Oates and Living in a Box I need a reference point which is absolute."

**Chris Porter**  
Engineer and Producer

"Our dubbing engineers feel that we have the best audio Post Production facilities in the Network. We use Dynaudio Acoustics M3 systems throughout, and they play a key role in this claim."

**Graham Lee**  
TVS Southampton

"The DA-M4 is simply the best monitoring system that money can buy. It's the first setup I've had where the console doesn't get stacked up with different monitors. People like them so much, they ask me to swap apartments with them! Seriously, though, out of 10 album projects since May, only one has had to be remixed. That's impressive."

**Freddy Hansson**  
Sweet Silence Studios, Copenhagen

## **dynaudio** acoustics

The Studio  
13-16 Embankment Gardens  
London SW3 4LW  
England  
Telephone 071-352 8100  
Telefax 071-351 0396

# T

# OP MARK'S



Mark Knopfler & Guy Fletcher pictured in their London studio

Launching a new band with a unique style requires talent.

Capturing that talent direct to disc requires experience.

Mark Knopfler and Guy Fletcher have both that talent and experience.

Experience dictated the choice of console for Mark's private studio.

Their new band "The Notting Hillbillies" recorded their first album on the IL3632 and as with many albums recorded on Soundtracs consoles, theirs has been an immediate success.

The Soundtracs IL 3632 is a compact, sonically pure console with multiple inputs (76) each with access to an exceptional equaliser. It enables production of either analogue or digital recordings of a standard demanded by the most discerning engineers, artistes and producers.

Soundtracs – combining talent with experience.

**SOUNDTRACS**

**IL3632**



UK Distributor: Larking Audio Tel 0462 422466 Fax 0462 421171

91 EWELL ROAD, SURBITON, SURREY, KT6 6AH, ENGLAND  
TEL: 081-399 3392, 081-390 8101  
FAX: 081-399 6821 TELEX: 8951073 STRACS G





**Studio Two with SoundStation DSP**

the AFM tracks are a considerable improvement over the regular analogue tracks. If only they would use the AFM tracks more often!

There are several functions that increase the all round capabilities of the D-2. A multipoint autolocator function provides fast and reliable access to specific points within any programme, a

built in two-machine editor and the Read-Before-Write process, which allows operators to play back the audio tracks, process them and then re-record them in synchronisation with the original audio in one operation. This must, of course, be used with caution because the original audio will be lost.

The menu-driven display system is extremely comprehensive, with built-in diagnostics. Operators can save the machine's setup to memory, allowing fast and easy retrieval as and when required.

It should also be mentioned that the cassettes have several 'lock-out' plugs, including one that prevents control track and video recording. This is great for an audio house, by engaging the 'orange plug' there is no risk of accidentally erasing the pictures or control tracks—something that will put all producers' minds at ease.

Our next move is to interface the D-2 to our 16-output *SoundStation DSP*, which we have recently installed. This will improve quality by keeping all audio recording in the digital domain. We have bought a *DASS100* interface unit from Digital Audio Research to allow sample rate conversion from 48 kHz to 44.1 kHz and back for the laydown/laybacks.

To make life easier with the ever-increasing number of formats and therefore machines, we have installed a 16x16 six-level routing switcher. This allows everything to be wired into video, 4-track audio and timecode configuration and makes laydowns/laybacks and copies much faster. This way we can give the maximum flexibility to our clients.

With the inevitable move towards digital systems we see the D-2 as a major step in bringing 4-track digital audio to both broadcast and corporate programme makers alike. When linked to our *DAR SoundStation DSP* system the audio remains in the digital domain, which will itself become increasingly important as broadcasters move over to NICAM digital stereo transmissions and D-MAC, with its enhanced sound capabilities for satellite transmissions. □

## The AR2400. The *BEST* combination

When it comes to choosing a multitrack recorder, the AR2400 offers the best combination of features, build quality, reliability and value for money in the world.

Consider these facts . . . . .

- ★ Fully professional standard 2" format configuration
  - ★ Audio performance comparable to, so called, top range products
    - ★ Heavy machined chassis
    - ★ Heads and motors from the best European suppliers
    - ★ Full in-house manufacture from PCB to precision machined parts
    - ★ Excellent reliability backed up by 2 years warranty
    - ★ Costing around 50% of an MX80
- ..... THEN choose.

For more information about this or any other Studio Magnetics products, call or write to:

**STUDIO**  
MAGNETICS

STUDIO MAGNETICS  
UNIT 4  
RADFORDS FIELD INDUSTRIAL ESTATE  
MAESBURY ROAD, OSWESTRY  
SHROPSHIRE SY10 8HA

TEL. 0691-670193  
FAX. 0691-670194

**S**kipper Jackson had 12 years of audio experience under his proverbial belt. He had been the driving force behind Hit Formula Studios until he had been bought out by his partners. He had gone on to be chief engineer and head mixer at half a dozen other studios in town. He had been out of work before. He would be out of work again. No sweat. But today, having picked up his 10th weekly unemployment cheque of \$65.00 from the State-run Department of Human Resources, he now had an obligatory interview appointment with a job-search counsellor.

The woman who would be talking to him seemed pleasant enough. She was in her mid-40s but seemed quite hip and he thought to himself that he might even enjoy this experience. He sat down in the comfortable chair in front of her desk and awaited the interview.

"Hello, I'm Ms Evans and I will be talking to you today. I specialise in the entertainment industry."

"Well, I never really thought of myself as being in the entertainment industry. I always felt I was in the audio industry," Skip replied.

"You are 35 years of age, is that correct?" the woman asked.

"Yes, I am," replied Skip.

"Why do they call you Skip or Skipper?" The woman look querulous.

"Because I am a take-charge kind of a guy in a session," he responded.

"By session, you mean a 'session' in a recording studio," Ms Evans sighed.

"That is absolutely correct," he said.

"You have written down your occupation as audio engineer," she continued.

"That's because it is what I do, what I am and what I have been for the last 12 years," he replied.

"Where did you go to get an engineering education?" Ms Evans asked.

"I never went to an engineering school, *per se*," Skip answered nervously.

"If you never went to an engineering school, how can you call yourself an audio engineer?" Ms Evans seemed puzzled.

"Because I 'engineer' recording sessions that lay down the tracks to make CD records of music that people like yourself buy in record stores," Skipper nervously elucidated.

"Where did you go to school and what did you study?" she asked suspiciously.

"I went to the University of California at Berkeley and I received a Bachelor's Degree in Psychology," Skip testified proudly.

"Mr Jackson, that is all well and good but in this state it is a misdemeanor punishable by both fine and jail sentence to represent yourself as an engineer when, in fact, you really aren't one. In this state as in many others, you must register as a professional graduate of a recognised institution of engineering higher education to receive a permit to practise your profession. Isn't it more accurate to call yourself a 'mixer' or a 'technician'?"

She ended on a particularly strong note, Skip thought.

"I am a full member of the Audio Engineering

---

## Martin Polon

---

### Who are we? Our US columnist with the audio engineer's identity crisis

---

Society with international offices in New York City!" Skip protested angrily. "I have been so for the last 12 years," he ended.

"I am a member of the United States Kennel Club but that does not make me either a dog or a kennel," retorted his interviewer turned tormentor.

"Lady, your job title is probably counsellor but that doesn't stop you from being a professional busybody. You probably have a licence for it."

With that, Skip stood up and marched out of the room—quite sure that his unemployment cheque would stop since it was clearly obvious that he was neither beast nor fowl. He was only an audio engineer. Or was he?

**W**ith apologies to all the employment counsellors in the world who have been hoisting audio engineers up to be released painfully onto this or similar petards, I can only say that the confusion over what we are really called and what that relationship to what we do might be—is about as clearly defined as the obvious world standards on high versus low—pin 2 or pin 3—when wiring XLR Cannon-type connectors.

The basic question has been asked before. 'Who are we? Who are those of us who toil in the services of the electronic and/or acoustical enhancement of the musical muse? The question has become much more important these days as audio professionals are facing lower pay scales and inconsistent job status than is probably appropriate because of lack of a consistent definition of 'who we are?'

Below you will find a condensation of some of the descriptions used by audio practitioners themselves as well as at personnel or 'human resource' departments in companies or within government entities. Audio job descriptions are also used at employment agencies and in unemployment offices. Labour unions add their own set of descriptions as do certain professional guilds. In short, it indicates what a jumbled hodge-podge of job descriptions we have in the audio business.

#### Are we engineers?

We are if we have graduated from a recognised and accredited four year school of engineering. If not, we frequently continue to refer to ourselves as 'audio' or 'sound' or 'balance' or 'mastering' or 'PA' engineers. This despite the fact that the rest of the universe does not always recognise that distinction. In fact, the appellation 'Engineer'

may be illegal to use without appropriate certification in many jurisdictions. It is a curiosity that of those who call themselves audio engineers in the Western World, only about 20% are truly graduates of an engineering education. It is equally curious that audio engineering is the only branch of engineering where non-engineering educated practitioners use the title of engineer along with those who really are. Have you ever heard of anyone calling themselves 'computer engineers' or 'mechanical engineers' or even 'electrical engineers' who have never been to engineering school?

#### Are we technicians?

We are if we are doing work that is technical in nature and generally involves repair as well as operational evolutions.

#### Are we electro-acousticians?

We are if we have graduated from a recognised four year institution with a degree in physics and/or engineering. This title is sometimes used by those without degree accreditation.

#### Are we mixers?

We are if our work involves the setting of levels, balancing sounds and making qualitative judgements on the control of various sound sources for music recording, broadcasting, film, concert reinforcement, general sound reinforcement, etc.

#### Are we recordists or re-recordists?

We are if we are involved in any part of the direct chain of making an original recording or of re-recording an original recording or of repackaging an existing recording.

#### Are we operators?

Similar to 'mixers' and sometimes to 'recordists'. Frequently called a 'board operator'. Generally, those who operate sound or recording systems but usually in non-union, governmental or corporate environments.

#### Are we Tonmeisters?

We are if we are graduates of less than a handful of schools in the European Community that offer four year higher education 'Tonmeister' programmes producing recording Major Domos; combining a technical education with a musical one. This title is again one of those much abused by those who use it without justification.

#### Are we sound men or sound persons?

We are if we work for an organisation or agency that uses outdated labour classifications to categorise personnel and their payment for services. The generic 'sound man' was in many ways a kind of acoustical repair man, who would operate and fix sound systems in schools and institutions.

#### Are we soldiers, sailors or marines?

We are if we are currently supplying British and American military forces with broadcast music, news and information via the British Forces Broadcasting Service (BFBS) or the Armed Forces



# Ready to Rack



Sixgate. Six professional quality noise gates in a single rack unit package. Features include Key Inputs and Sidechain inserts.



Quadcomp. Four professional quality compressor/limiters in a single rack unit package. Features include Sidechain inserts, multi LED gain reduction metering and stereo link switching.



Multi Q. A six channel parametric equalizer, with an exclusive internal patching system that lets the user access up to 6 channels of parametric EQ, either individually or in multiples without the need for patch leads. A unique creative tool for any EQ situation, in one rack unit.

## ARX Systems

**United States and Canada**  
ARX SYSTEMS U.S.A.

Tel: 714 649-2346

**Great Britain**

MTR Ltd

Tel: 0923 34050

**Spain**

Excel S.A.

Tel: 811 2563

**Belgium**

Eurocase

Tel: 3 239 6995

**France**

Etelac

Tel: 1 43 002770

**Germany**

Mike Rolands Music Service

Tel: 06 174 23433

**Italy**

Armonia Nova

Tel: 39 51 765 068

**Austria**

MTEC

Tel: 43 7242 60860

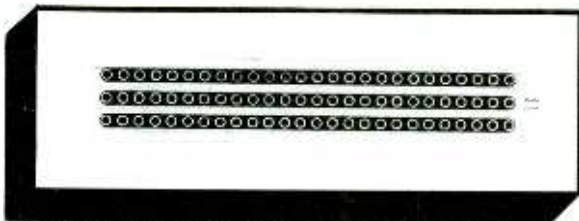
**Sweden**

TAL & TON

Tel: (0) 31 80 3620

# Media

14 The Markham Centre, Station Road,  
Theale, Berkshire RG7 4PE,  
United Kingdom.  
Telephone: (0734) 303800  
Fax: (0734) 323121  
(IDD +44 734)  
Telex: 858893 FLETEL G



## APP SERIES

Audio Patch Panels

- Wide range of 20, 24, 26 Ways with 1/4" BPO Jacks
- 2 or 3 Rows of 1/4" BPO Jacks, in 2 U Height
- High Density version has 2 Rows of 1/4" BPO Jacks in 1 U Height
- 2 Rows of 48 and 52 Ways of Bantam Jacks in 1 U Height
- Stereo Spacing of Jacks as standard
- Can be supplied Connectorised with choice of Rear Connector
- Combined Audio+Video Format also available



# Studio House Audio

## NEW AND 2<sup>ND</sup> HAND LIST

<b>MIXING CONSOLES</b>			
AMEK 2500 40 input/patchbay	£27,500	Sony DTC 100ES	£1,090
AMEK 2500 36 with Mastermix	£22,000	Tascam DA30	£1,150
AMEK Angela 32	£15,000	Studer AB10 time code	£3,995
TAC 24/8	£2,500	Studer AB12 console NEW!	£3,750
Trident TSM 40	£15,000	Studer B67 console	£1,500
Harrison 24 series 40 input & patchbay	£15,000	Tascam 52 NB	£1,200
Soundtracs MRX 24/8/16 patchbay	£3,950	Tascam 52	£800
Soundtracs PC Midi 24 patchbay	£3,950	Revox A77 vgc	£275
DDA AMR 2436 input patchbay, 6 months old	£25,000	Sony PCM 701	£400
Soundtracs CM 4400 32 patchbay CMS1	£7,950	Sony PCM 601	£600
AHB Sigma 44/24 patchbay	£14,000	Uher CR240 complete	£295
Soundtracs CP 68000 4C input with Tracmix 2 years old	£17,950	Revox B710 as new	£495
AHB System 8 16/8	£850	Tascam 122	£250
Clyde Elec. B'cast console	£1,750	Aka GX912	£325
Soundtracs IL4832 2 buss 104 line ins 1/2 year old	£2,200		
Tascam M600 32/16/32	£5,550	<b>FX</b>	
Tascam M520 20/8/16	£2,400	AMS RMX16	£2,750
Tascam M216 16/4/2/8mon	£500	AMS 1580S 6.5 Harm DG	£3,250
Tascam M5 8/4/8	£495	Lexicon 224 XL	£3,750
Tascam M3 8/4/8	£395	Lexicon SME card for 480L	£500
Tascam 3500 32/8/24	£4,750	Lexicon PCM70	£1,500
Yamaha 1202 NEW	£495	Lexicon 480L	£5,950
Studiomaster II 24/16/2	£3,750	TC 2290 32 sec	£2,000
Studiomaster Trackmix 24	£2,900	DBX 165	£400
Seck 18/8/2	£800	Yamaha Rev7	£395
Seck 12/8/2	£650	Dolby 330, 361, Cat22, K9, SR etc	£POA
		BEL 2400, BD80s, BC series NR	£POA
		Aka S1100 NEW	£2,750
		Aka S1000 NEW	£1,950
		Urei 1178 NEW	£850
		Aka S900 as new	£650
		White 4400 pair room eq	£800
		SA PPE 2400 Midi parametric	£750
		Drawmer DS 201X	£295
		Drawmer DL 221	£295
		Digitec DSP 256 NEW	£350
		Digitec IPS 33B NEW	£600
<b>RECORDERS</b>			
Mitsubishi X850 (3 years)	£POA	<b>MONITORING</b>	
Otan DTR 900 (1 year late st/w)	£POA	ATC SCM 250 pair	£2,500
Otan M+ 80	£15,500	UREI 813C pair	£2,250
Otan MTR 90 II rem/loc	£13,500	JBL L250 lop-sided pyramids	£1,500
Studer A800 III	£18,500	JBL 4411 pair	£700
3M M79	£5,500	JBL 4401 pair with stands	£250
Soundcraft SCM 760 III 24 v/h	£8,000	Harrison X800	£495
Tascam ATR80 24 rem/loc	£13,950	Studiomaster M-FET 1000	£495
Saturn 24 Rem/loc	£14,500	Yamaha NS10M pair	£175
Aka Adam	£POA	Omniphonics S100 amp	£400
Soundcraft SCM 381 16T 2"	£2,500	Omniphonics S50 amp	£250
Soundcraft SCM 762 II	£6,500	Quad 303	£100
Tascam MSR24	£5,500	JBL 4333 Pair	£895
Tascam MS 16 complete	£4,100	JBL 5234 elec x-over	£250
Tascam 85-16B complete	£2,750	Whites 4400 eq/3-way x-over	£1,200
Tascam 85-16 complete	£2,000		
Tascam MSR16	£3,000	<b>MICROPHONES</b>	
Tascam 38	£895	Calrec Soundfield	£2,500
Fostex G16	£3,500	Neumann 47, 56, 84, 86, 87, 89, 170, M49	£POA
Fostex E16 with 4050 remloc	£2,700	AKG 414, 460, 28A, 224, 451, 112, 202, 190, 12 etc, etc	£POA
Fostex E16	£2,250	Sennheiser 405, 441, 421, 416, 431	£POA
Fostex B16	£1,500	EV RE20, PL92A, ND757, ND40S	£POA
Otan MX5050B III BT	£1,600	Shure 57, 58, 91, 548, 54, 17	£POA
Fostex M80	£695	Beyer 69, 88, 201 + DT100 HP's	£POA
Fostex R8	£1,000	Mic stands galore, booms from	£20
Tascam 34	£495		
Tascam 3440	£495		
Tascam 388	£1,300		
Tascam 238	£750		
Tascam 688	£1,200		
<b>MASTERING</b>			
Aka DD1000 optical	£7,850		
Kenwood CD-WO	£POA		
AMS Audiofile	£24,000		
Denon DTR 2000	£695		

EXPORT PRICES  
(UK Customers please add VAT)  
EXPORT A SPECIALITY

**WANTED FOR CASH COMPLETE STUDIOS**



# 0663 764244

STUDIO HOUSE AUDIO

High Lane Village, Nr. Stockport SK6 8AA

Fax: 0663 762328

Radio and Television Service (AFRTS).

**Are we police officers?**

We most frequently are if we perform tasks as forensic audio specialists, analysing recordings authorised by recognised authority and made surreptitiously. Other duties include analysis of recordings made by answering machines, police despatch logging recorders, etc. Such work is regularly performed for the UK's Special Branch, the American FBI, the Canadian RCMP and for city police forces.

**Are we cinema audio specialists?**

We are if we record and re-record movie sound at the major film studios and related facilities; and we happen to belong to a Guild called the Cinema Audio Society (CAS). This organisation serves the same purpose as the film industry's professional cinematographers' society (ASC) and others.

**Are we theatrical stage employees?**

We are if we operate sound systems in auditoria or arenas, mix or re-record sound used in the production of motion pictures or television programmes, or run projectors at movie palaces—and belong to the international union for theatrical and stage employees, IATSE.

**Are we electricians?**

We are if we mix or record sound at recording studios or television networks such as CBS or network affiliated or independent television stations or install sound systems—and belong to any one of several international electricians' unions such as the IBEW.

**Are we broadcast employees?**

We are if we operate, mix or record or re-record sound at television networks such as the BBC or NBC or ABC and at affiliated or independent

television stations around the country—and belong to a broadcast employees' and technicians' union such as the NABET.

**Are we custodians and janitors?**

We are if we operate, mix or record sound at hotels and resorts—and belong to a union of hotel technical, repair and custodial employees.

**Are we audio-visual technicians?**

We are if we work with audio-visual and other

To gauge some of the effects of such industry-wide identification anarchy, it is only necessary to turn to anecdotal evidence. One former manager of audio services and audio-visual activities at a major US educational institution identified the problem this way. "For over 10 years I fought the personnel department both at the campus level and at the statewide level to pay our audio people a comparable wage to that earned by outside professionals. Unfortunately, all our people were classified only as sound technicians and could not

be compensated properly. The personnel department kept telling us that sound 'people' were not professionals, were not well educated in their field, had no professional journals in their work area and had to be considered as belonging to a 'trade' category rather than as belonging to a 'practitioner' category. They always justified their position by copying articles on sound people from personnel magazines. I always asked if they had any articles on unsound people but they always

ignored my questions. They also continued to view audio people as jacks of all trades but never as masters of any particular one."

To further the confusion, remember that in terms of professional affiliations, audio people can belong to the AES (Audio Engineering Society), SMPTE (Society of Motion Picture and Television Engineers), SBE (Society of Broadcast Engineers), ASA (Acoustical Society of America), SPARS (Society of Professional Audio Recording Services), APRS (Association of Professional Recording Services), ISCE (Institute of Sound and Communications Engineers), IBS (Institute of Broadcast Sound), etc.

**T**he answer to the current job ID confusion for the audio business is to standardise on a professional appellation that will win the respect of the industry as well as the respect of employers and managers. The title I would recommend (and have done before), is that of audio practitioner. It is universal enough to cover the multitude of tasks that can be performed and it conjures up a level of professionalism sadly lacking in many of the titles in use today. With it, or for that matter some other standard descriptor acceptable to the audio industry, those working in the business of audio will have a tool to provide a justification for fair salary levels and an upgrading of on-the-job status. We are all professionals working in an industry with a demanding and complex technology. It is high time that audio people receive the same breaks as say computer professionals.

The first step is the hardest but it is time to take it. □

---

**The reality is that there are over 100 job categories involving audio in use today around the world...the current confusion and multiplicity of identifications for the performance of virtually the same job is costing audio professionals in many cases, a realistic living wage**

---

multimedia and utilise audio equipment as part of our mission.

**I**wish I could say that this massive list is complete. It is not. It would push this article into filling the entire magazine; not to mention becoming more than a little boring. Yet the reality is that there are over 100 job categories involving audio in use today around the world. What is wrong with that, you ask? The problem is that the industry-wide status of employees in audio and the concomitant issue of their pay ranges depends on projecting an image of professionalism the world over. The current confusion and multiplicity of identifications for the performance of virtually the same job is costing audio professionals in many cases, a realistic living wage.

**STEREO STABILIZER 5**



- Rack mounting frequency shifter for howl reduction in public address and sound reinforcement
- Mono version, box types and 5 Hz fixed shift boards Mark 5 also available

**SURREY ELECTRONICS, The Forge, Lucks Green, Cranleigh, Surrey GU6 7BG  
Tel. 0483 275997 ★ Fax. 276477**



**ALWAYS  
A  
GREAT  
DEAL  
ON  
OFFER.**

**IF YOU DON'T SEE  
WHAT YOU WANT  
PLEASE RING  
MIKE OR JENNY**

**MIXING CONSOLES**

NEVE V3. 60 frame. 60 channel. Necam 96 automation.	EP.O.A.
NEVE V3. 60 frame. 48 channel. Necam 96 automation.	EP.O.A.
NEVE 8108. 48 channel. Necam 96 automation.	EP.O.A.
NEVE 5316. 36 channel. 8 group. 8 monitor. External patchbay.	EP.O.A.
SSL 6048E. G series computer. T/R. Left hand patchbay.	EP.O.A.
SSL 4056E. 48 channel. Patchbay. Producers desk. As new.	EP.O.A.
SSL 4064E. 48 channel. G series computer.	EP.O.A.
AMEK 2520. 40 frame. 40 channel. Master mix 1 automation ready. Extended patchbay. Immaculate.	EP.O.A.
AMEK 2500. 36 frame. 36 channel. Patchbay. Master mix 1 auto.	EP.O.A.
HARRISON MR3. 28 frame. 28 channel. VCA faders. Patchbay.	EP.O.A.
SOUNDCRAFT INLINE. 36 channel. Patchbay. Stand. Immaculate.	EP.O.A.
SOUNDCRAFT 2400. 28 channel. VU metering. Patchbay. Stand. Private use only.	EP.O.A.
SOUNDCRAFT TS24. 56 frame. 48 channel. Patchbay. Master Disk Automation.	EP.O.A.
SOUNDCRAFT TS12. 40 channel. Extended patchbay. V.G.C.	EP.O.A.
CADAC. 28 channel. VCA faders. Many extras. Private use only.	EP.O.A.

Please telephone for complete list of consoles for all studio and P.A. applications.

**24 TRACK MACHINES**

MITSUBISHI X850. Low hours. Excellent condition. Choice of 3.	EP.O.A.
SONY 3324. with 3310 remote.	EP.O.A.
OTARI MTR90 MK2. Autolocator/remote. Low hours. Choice of 3.	EP.O.A.
OTARI MX80. with remote. Private use only.	EP.O.A.
STUDER A820. with dolby SR. Auto/remote.	EP.O.A.
STUDER A800 MK3. Auto/remote.	EP.O.A.
STUDER A80 MK2. with MK3 headblock. Remote/auto. Low hours.	£12,250.00
STUDER A80 MK2. Auto/remote. Low hours.	£11,000.00
SOUNDCRAFT 760 MK2. with 9 memory autolocator. Private use only. Special Bargain.	£5,000.00
LYREC 532. with 16 memory autolocator. Private use only.	£5,750.00

Many other multitrack machines available.

**MASTERING MACHINES**

OTARI MTR10. 1/4" with CTC.	£3,500.00
OTARI MTR12. 1/4". 7.5/15/30 ips with CTC. Ex. demo.	£4,250.00
OTARI MX50/50. 1/4". 15/30 ips with CTC. Immaculate.	£2,850.00
STUDER A80 VU. 1/4". 15/30 ips.	£2,500.00
STUDER B67. 7.5/15/30 ips. Choice of 3.	from £1,200.00

**OUTBOARD EQUIPMENT**

LEXICON 480L. with larc.	£4995.00
LEXICON 224XL.	£4,500.00
LEXICON 224. with remote.	£2,250.00
LEXICON LXPI.	£290.00
LEXICON MRC.	£175.00
AMS DMX 15-80. 1 sec/1.8 sec or fully loaded.	EP.O.A.
AMS RMX16.	£2,300.00
DRAWMER 1950.	£500.00
DRAWMER DS201.	£210.00
DRAWMER DL221.	£250.00
SCAMP RACK. Choice of 2.	EP.O.A.
YAMAHA SPX90.	£295.00
VALLEY PEOPLE 610.	£450.00
VALLEY PEOPLE GATEX.	£250.00

Please telephone for our complete list of outboard equipment and our comprehensive selection of microphones, amplifiers, monitors and other equipment.

**IF YOU  
MISS US AT,  
*MIDEM 91*  
STAND 19.06**

**VISIT  
M.S.AUDIO  
AT  
AES PARIS  
ON  
STAND T64**

**M.S. AUDIO**  
EUROPE'S  
LEADING SPECIALIST  
IN USED  
PRO-AUDIO EQUIPMENT.

Only 30 minutes from central London,  
10 minutes from London Heathrow airport,  
40 minutes from Gatwick airport.

Offering:  
Full demonstration facilities for all equipment.

Purchase of unwanted equipment.

Shipping, freighting and insurance arranged  
worldwide.

Full studio installations.

After sales service including warranties on  
multitracks and consoles.

**RING NOW  
ON  
(0932)  
872672/874768  
FOR MONTHLY  
MAILSHOT**



IS A SUBSIDIARY OF M.S. MANAGERIAL SERVICES LIMITED

NORTH LODGE, STONEHILL ROAD, OTTERTON, SURREY KT16 0AQ.  
TELEPHONE: 0932 872672 INTERNATIONAL: +44 932 872672 FAX: 44(0) 932 874364

# Drawmer

**D L 2 4 1**  
*auto compressor*

**THE BEGINNING OF A NEW GENERATION**



The DL241 Auto-Compressor is the first of a new generation of dynamic processors incorporating many automatic functions allowing the engineer to achieve optimum results in the minimum set up time.

A full Auto Attack/Release Compressor successfully combines the smoothness of the 'Soft Knee' principle with the precision of a 'Ratio' control. The unit can also be switched to allow the flexibility of manual control of Attack and Release times.

An Expander/Gate features Drawmer's new and unique 'Programme Adaptive Expansion' circuitry which eliminates 'chatter' on or around Threshold.

A 'Zero Overshoot', 'Zero Response Time' Limiter with variable Threshold allows the user to set an 'absolute output signal level' that will not be exceeded.

Drawmer Distribution, Charlotte St. Business Centre, Charlotte St., Wakefield, W. Yorks., WF1 1UH, England. Tel: 0924 378669 Fax: 0924 290460





Main post-production room with Eclipse keypad and screen built into the mixing console

## ESBUS APPLICATIONS IN FINNISH BROADCASTING

FBC are pioneers and large-scale users of Audio Kinetics ESbus machine control systems with over 60 units in use. Tim Frost reports on how and why

**L**ike most broadcasters, FBC have to work with a wide range of source material formats, with a heavy reliance on film. When plans for the audio production side of TV were being implemented, the head of TV sound operations Pauli Vellonen, was looking for a way to make all the audio sources work together. Whether stereo or multitrack tape, video, sep mag, workstations, or anything else the industry could come up with, he wanted the audio hardware to integrate into the editing process with the minimum of effort from the engineers.

Finnish equipment distributor Studiotec introduced FBC to the possibility of the, then not quite finalised, Audio Kinetics ESbus

Finnish TV and radio started regular TV transmissions in the late '50s from an existing AM transmitter building in Helsinki. As the stations grew, they moved to a new facility outside the capital, which was later further expanded. But the organisation outgrew its inherited buildings and an adjacent greenfield site was allocated for a completely new transmission centre. The centre was opened in 1986 bringing all the operations of the organisation together under one roof. The 12,000 m<sup>2</sup> floor space over five floors encompasses the three TV stations, radio, studios, international control centre post-production and engineering facilities, as well as the 140 metre antenna tower.

synchroniser. This opened the possibility of a distributed intelligence system where every machine could be operated using exactly the same connectors and controllers, offering a simple and reliable way of controlling machines and locking the whole of the complex to the same master timecode.

Five years on, FBC are one of the biggest single users of the AK ESbus, with over 60 units at their Helsinki headquarters and Tampere regional studio site, 150 km north of the capital.

Although workstation systems were becoming an option when Vellonen was looking for audio systems, it was too early to move away from the traditional technology. He chose an unproven package because it offered the ability to reduce a wide range of existing and future machine formats down to a single control interface.

"If we had workstations from the outset, we could do all the synchronisation within the workstation but as there is no disk archive format, you need to transfer back to tape of some type, with sync code.

"As long as we are running tape, we have very large tape archives and we have to deal with a lot of other broadcasters and production houses where we cannot specify what format the material comes in on—we had to have a system which could do the work quickly, in sync.

"We designed the audio editing and post-production rooms to be entirely self contained, but with additional access to multitracks and other equipment like sep mags, in a central machine room."

They created three pairs of audio post-production rooms and currently they are adding pre-production rooms for effects spotting. Engineers at FBC stay with a project from start to finish, moving through the different production and post-production areas, so it was important that the rooms all have a similar operational feel.

The busiest rooms are used for basic everyday functions of adding soundtracks to their own programmes and adding Finnish narration to imported programming. The larger rooms are used for editing and cutting.

Although the TV side do have their own music studios, they can use the larger facilities offered by Finnish radio, on the same site.

Vellonen, with the help of AK and Christer Hämelin from Studiotec, defined a control and synchroniser system centred on each of the control rooms but with access to the universal house sync.

The house video sync is fed via a distribution amp to the AK 'Systems Services Unit' mounted in a rack in each of the rooms. The SSU takes the house video sync and then locks its own internal time line generator to it. That locally generated timecode is then sent out to on a multiway to sockets throughout the room, as a very local network. For each wall outlet there is an audio multiway, which includes fader start connections, a technical mains and 25-pin D connector for the ESbus. Although only 15 pins are needed, the 25-pin D connector is used for its extra physical reliability.

Every tape machine and automation system is fitted with an *ES1.11* synchroniser which is controlled directly from the SSU.

Since the multiway carries audio and the timecode lines, simply by plugging the machine into the wall connectors, the engineer has all the audio signals he needs coming up on the patchbay and full control over the machine. He also knows the machine is locking to a timecode that is frame accurately matched to the code going to every other machine in the complex.

If a recorder goes down then it can be replaced by simply wheeling in another machine and plugging it in. Also since, any of the *ES1.11*s can be switched over to be a time line master, then in the unlikely event of an SSU going down in the middle of a session, the engineer can switch over a spare *1.11* to give him house sync and be back up and running in a matter of minutes.



# Time Is Money.



*The Harrison  
Series Ten B  
by GLW*

Time is important to you and your customer. So we have developed a console and automation system which allows you to minimize your efforts while maximizing your efficiency, no matter whether you are using tape machines or disk based systems.

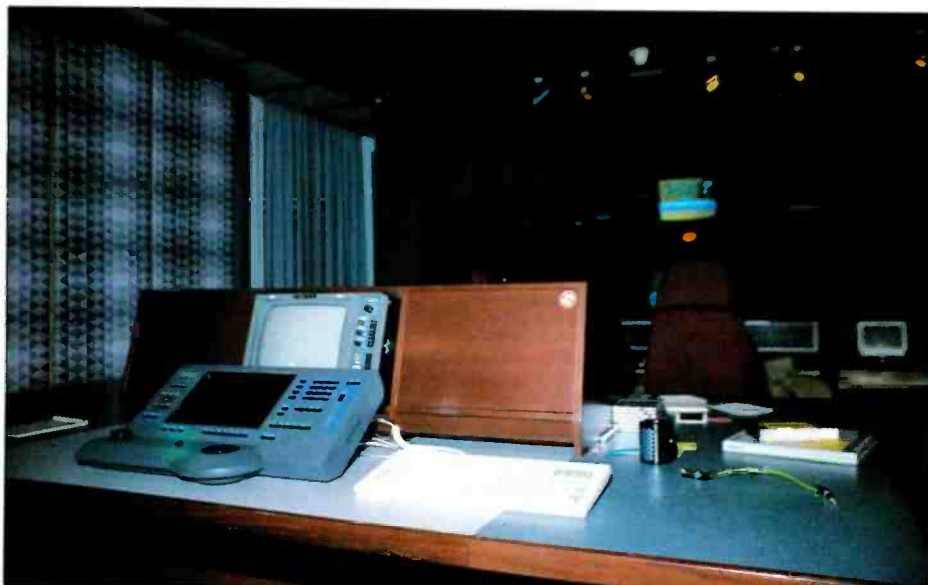
Want to know how we do it? Call Martin, Brad, or Gary at 615-331-8800.

 **Harrison** by GLW  
**SERIESTEN**

GLW, INC. • Manufacturers of Harrison Consoles • 437 Atlas Drive,  
Nashville, Tennessee 37211 USA • Telephone (615) 331-8800 • Facsimile (615)  
331-8883 • Telex 413838 (GLW.NASH)



Machine room housing sep mags and telecine



DAR SoundStation in main post-production room

As far as the engineer is concerned it doesn't matter what the format of the audio machine is, as the *ES1.11* creates a universal interface. The only machines that aren't moved around between the rooms are the multitracks, FBC have Studer 24-track analogue and Sony 3324s, and the sep mag film units, which are all located in the machine room two floors above the main audio floor.

These are physically patched when needed, using a multipin patchbay in the machine room wired to the patch panel in each of the audio rooms.

All the machine controls come up on the AK *Eclipse* keypad built into the control desk in each room, which in turn is linked to an IBM PC.

Studiotech modified the *Eclipse*, separating the keyboard, screen and electronics. Hämelin had to be careful about the system wiring to make sure the longer cabling did not create problems.

"The hardware is in a 1U box, with just a reset button. AK were doubtful about splitting the display from the keyboard, like IBM who also do not recommend long leads on their keyboards. We tried it out ourselves, putting the display on a ribbon cable; providing you know what you are doing it can work perfectly well."

One of the other problems not experienced

generally in the UK, is a high level of static caused by the heating needed during the very cold winters. Hämelin added extra earthing to avoid system crashes.

"Here, during the winter, the static electricity is a lot higher than you get in UK. You are always getting little shocks and sparks and, of course, static can kill the computer systems.

"Here we have a separate ground track so that

the keyboards are directly connected to earth; that way the spike will go directly to earth rather than down the interface cable into the keyboard multiplexer. During the installation we tested out how much the system can take, and we know that it can cope with the normal static surges."

At the time the system was ordered, the *ES* was still under development and it was difficult for Vellonen and AK to define what the final system would be. The minimum specification was the earlier *AK Q.Lock 4.10* system and in fact, *Q.Locks* were installed initially, later to be replaced by the *Eclipse* units.

For Vellonen, once the overall principle of distributing the control/synchroniser intelligence had been established, the important parameters became the range of use and ruggedness of the system.

The controller had to work easily at a basic level while allowing sophisticated use by engineers who really get into the system.

Training on systems like the *Eclipse* is taken very seriously, with fully equipped training rooms where the engineers work in groups or individually.

Vellonen commented: "We have approximately 90 engineers and generally they are at various levels of expertise on the system, but they all need to be familiar with the essential control.

"One of the features of the *Eclipse* is its multilevel working, it doesn't shut out the basic user and as the appetite grows you can work in a more rewarding way.

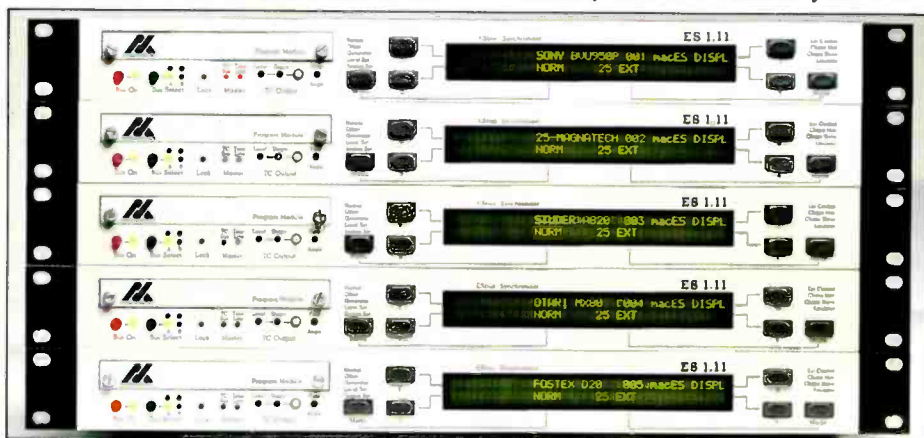
"We have the specialised guys with specific expertise. For the more skilled guy, the *Eclipse* gives him better opportunities to work at different levels. He can build up complicated sequences and tie into the desk automation. If he is clever and understands the system fully, he can do what he likes."

Reliability of software updates is of especial concern, particularly for a large user pushing the system to its limit. With each software update, and FBC are just about to run up the new *Level Three* software, Vellonen gains the new features he has been asking for, but then there is some proving time for the system.

"We were originally lacking some features which didn't work quite the way we wanted. We have discussed a lot of these features with AK and at the moment we are on a special release which is just for us.

"When the new *Level Three* software is put in it, we can't put it on just one or two machines, it has to be put in across the board, into every part of the FBC—so it has to work. With new versions, you get the features you want but sometimes you lose the robustness.

"Obviously we also work differently to users in



Audio Kinetics ES.Lock ES1.11s



# SEEPORT THE PORTABLE AUDIO MIXER

There has never been anything like it!  
**YOU NEED IT!**

Includes  
a variety of  
features for  
radio, TV,  
film and  
video.

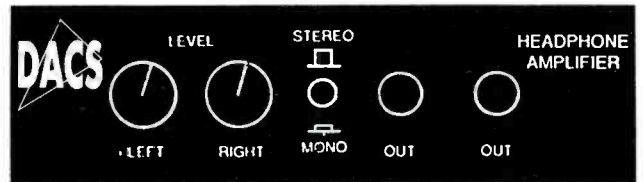


**SEEM AUDIO** Broadcast  
Telecommunication  
Audio/Video

P.O. Box 115  
N-1380 HEGGEDAL, Norway  
Tel.: +47 2 79 77 30  
Fax: +47 2 79 61 54 Telex 79 207 SA N

## DACS MODULAR MONITOR SYSTEMS

The simple and effective  
choice for monitoring



Monitor Mix 1 — 8 into 1 audio (line or mic)  
Monitor Mix 2 — 4 into 2 (pan and vol per channel)  
Headphone amplifier — Stereo or 2 into 1 mixing. Clean power to 2 pairs  
of stereo headphones

Panel size — 5.2" x 1U high

These modules are extremely high quality.

Using them, complex and effective monitoring systems can be assembled easily.  
Call us and speak to Douglas Doherty to discuss your monitoring requirements.

### Audio Interface Accessories

**Line Boost** — 8 inputs at  $-10\text{dBV}$ , 8 outputs at  $+4\text{dBm}$ , balanced outputs  
available as purchase option or retrofit.

(Distortion at Max Output  $<0.011\%$ , S/N into 600R  $>96\text{dB}$ , Crosstalk  $>93\text{dB}$ )

**Passive Level Match Board** — 8 inputs at  $+4\text{dBm}$ , 8 outputs at  $-10\text{dBV}$ ,  
balanced input version available.

**Unbalanced Distribution Amplifier** — configurable as 1, 2, 4 or 8 in to  
8 out with adjustable gain.

**Balanced Distribution Amplifier** — 1 in — 6 out and 1 or 2 in — 12 out.

**Balanced Input and Output Boards** — Unity gain transformer action  
electronic balancing boards.

(Output Boards  $1\frac{1}{2}''$  by  $1\frac{1}{4}''$ , Input Board  $1''$  by  $1\frac{1}{4}''$ , Output distortion  $<0.019\%$ ,  
Input distortion  $<0.011\%$ )

**Stereo Pro Interface Board** — Line level balanced inputs and outputs to unbalanced outputs  
and inputs respectively. These boards are factory set to operate for nominal balanced in and  
out at  $+4\text{dBm}$ , unbalanced side at  $-10\text{dBV}$ , but gain settings can be adjusted to user  
specification.

( $3\frac{1}{2}''$  by  $2\frac{1}{4}''$ , specifications as per Balanced input and output boards above)

For Retail outlets, UK & foreign, trade enquiries and further information

**DACS Ltd, Stonehills Complex, Shields Road  
Pelaw, Tyne & Wear NE10 0HW**

Tel: 091-438 5585 ★ Fax: 091-438 6967



With 40 years' experience in the design and manufacture of several hundred thousand  
transformers we can supply

## AUDIO FREQUENCY TRANSFORMERS OF EVERY TYPE YOU NAME IT! WE MAKE IT!

### OUR RANGE INCLUDES:

Microphone transformers (all types), Microphone  
Splitter/Combiner transformers, Input and Output transformers.  
Direct Injection transformers for Guitars, Multi-Secondary  
output transformers, Bridging transformers, Line transformers,  
Line transformers to B.T. Isolating Test Specification. Tapped  
impedance matching transformers, Gramophone Pickup  
transformers, Audio Mixing Desk transformers (all types),  
Miniature transformers, Microminiature transformers for PCB  
mounting, Experimental transformers, Ultra low frequency  
transformers, Ultra linear and other transformers for Valve  
Amplifiers up to 500 watts. Inductive Lcosp transformers.  
Smoothing Chokes, Filter, Inductors, Amplifiers to 100 volt line  
transformers (from a few watts up to 1,000 watts), 100 volt  
line transformers to speakers. Speaker matching transformers  
(all powers), Column Loudspeakers transformers up to 300  
watts or more.

We can design for RECORDING QUALITY, STUDIO QUALITY,  
HI-FI QUALITY OR P.A. QUALITY. OUR PRICES ARE HIGHLY  
COMPETITIVE AND WE SUPPLY LARGE OR SMALL  
QUANTITIES AND EVEN SINGLE TRANSFORMERS.

Many standard types are in stock and normal despatch times  
are short and sensible.

OUR CLIENTS COVER A LARGE NUMBER OF  
BROADCASTING AUTHORITIES, MIXING DESK  
MANUFACTURERS, RECORDING STUDIOS, HI-FI  
ENTHUSIASTS, BAND GROUPS AND PUBLIC ADDRESS  
FIRMS. Export is a speciality and we have overseas clients in  
the COMMONWEALTH, EEC, USA, MIDDLE EAST, etc.

Send for our questionnaire which, when completed, enables  
us to post quotations by return.

## SOWTER TRANSFORMERS Manufacturers and Designers

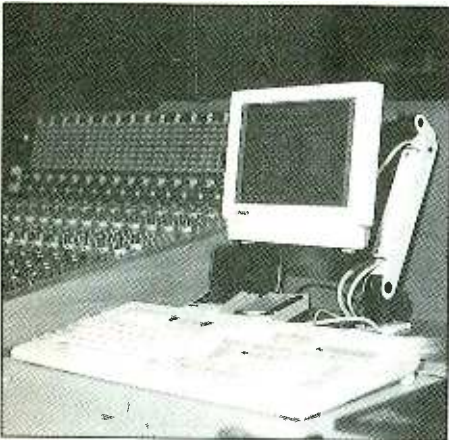
E. A. SOWTER LTD. (Established 1941). Reg. No. England 303990  
The Boat Yard, Cullingham Road, Ipswich IP1 2EG,  
Suffolk. PO Box 36,  
Ipswich IP1 2EL, England.

Phone: 0473 252794 & 0473 219390 — Fax: 0473 236188 — Telex: 987703G

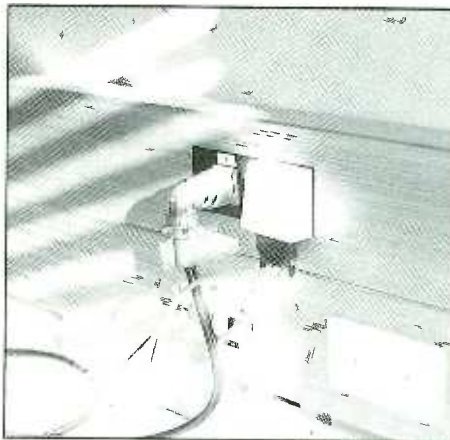




Sony and Studer 24-tracks



The Finlux flat screen, high resolution display is ideal for audio use because of its low noise



Typical multiway power, audio and ESBUS outlets making machine replacement easy

the UK and have different priorities, for example in the UK they don't work so much with film."

FBC are heavy users of film. The local regions have a preference for 16 mm over video for origination, and film is considered the prime interchange format between Finnish Broadcasting and other countries including bordering Sweden and the USSR where they have joint productions. The machine room has 10 sep mag transports, which are also controlled by the *ES1.11* format. The *1.11* generates bi-phase to control the transport, which is also locked to the house video sync. So to the engineers, the sep mag transports are simply another audio source controlled in the same way as any other unit.

Foreign film material is transferred to 1 inch video for adding Finnish language. Few programmes are fully dubbed, foreign programmes like documentaries have their commentaries replaced with Finnish ones but the rest of the soundtrack is left untouched, with subtitling doing the majority of the translation work.

This does not apply so much on children's programmes, where a lot of the output has to be dubbed. FBC were just completing the redub of a 26-part Disney animation series, using 13 actors for 250 voice parts. This was recorded directly to the Sony digital multitrack taking two months to complete.

The audio for this particular project was being put together in a main editing room with a GML fader-equipped Studer and a DAR *SoundStation*.

The *SoundStation* is also locked to an *ES1.11* and the room's video source is S-VHS because it offers good picture quality for editing and, more importantly, locates and locks up very quickly. Directly under the video monitors are lights set up as a 'traffic light' system to show the editors when the machines are all locked together. The controls for these come from the events relays on the local SSU unit.

Here, as in the other areas, *Eclipse* software is loaded onto an IBM PC for off-line work. One new item was a neat flat screen display developed in Finland by Finlux, Europe's third largest TV manufacturer. The high resolution display, which can be used on audio systems because it produces very low electrical noise, is mounted on a movable arm and takes up almost zero desk space.

The computer also runs the *Digifind* library software developed by Swedish broadcasting. *Digifind* logs all the effects tracks available on CD and is a purely passive system loaded just on the computer in the room.

The FBC complex is already wired for computer networking, which is used in a fairly limited way for work scheduling and for booking the production and editing units. The plan is eventually to have centralised library call-up on the network and, further in the future, calling up audio from a central audio store as and when the hardware becomes available.

Most of the audio eventually ends up on the Sony *3324* multitrack and apart from maintaining

high audio quality, Vellonen explained that a main function for the machine room Sony *3324*, one of the three owned by FBC, is as an archive unit.

"We have to do so many separate mixes for a programme. We can do the final international and national mixes on the *3324* and archive whole tape and then you are archiving everything, including your source material. As our international sales can come in 2 years after making programmes, we need an efficient storage format and the *3324* takes a quarter the space of analogue 24-track. The machine costs around the same price as analogue with noise reduction, and I believe it is actually easier technology for the users."

The Finns have been transmitting in NICAM for some years and the complex is fully stereo equipped. At the moment, the stereo programming accounts for 2 to 3 hours a day, mostly music, light programmes and sport but this output is slowly being increased.

"It is very much more complicated and expensive to do things like drama in stereo as it needs more time in planning and in the field; but in light entertainments, music and sport it is much easier. Because the complex is fully equipped for stereo, we will produce these programmes in stereo even if they are to be transmitted in mono, so that we have a stock of stereo programming for use in the future."

NICAM is also used for dual language transmissions, transmitting in Swedish to the 6% of the population for whom it is their first language.

The one big seller in the UK for stereo TV are the big movies. Although 35 mm prints come with stereo soundtracks, FBC does not transmit films in stereo as it is yet to install either stereo heads or a Dolby decoder.

Unlike the UK, where both the BBC and ITV have held back promoting NICAM until at least 70% of the country can receive it, the Finns have got used to partial coverage. Reception of each of the three TV channels grew first around the main cities and then spread to cover the whole country. This is accepted to the degree that they have a stepped licence fee, depending where you live in the country and how much of the 'national' service can be picked up in that area.

The future holds further expansion. FBC transmit three channels, TV1, 2 and 3. The third channel started 'provisional' transmissions in 1986 and is developing its national coverage.

Eventually the new commercial station MTV, whose offices are on the same campus as FBC and connected to it via underground walkways, will take over the third channel. At the moment MTV has transmission slots on the other channels, mixing public and private broadcasting on each station. New studios are now being planned, with work commencing in '91.

Having established the ES control, Vellonen is happy to wait until all the new hardware possibilities have been fully developed before considering any radical change.

"The studio rebuild project will probably take at least 2 years. We have the overall plan but the hardware is undecided. The ES will integrate into the new studios and exactly how, will determine what kind of working methods we will adopt.

"We are working now in the traditional way, with the audio separate from video. But in the future with digital video machines, it may become much more integrated.

"But there are so many open questions which are going to take a decade to sort out, and we have to make programmes now." □



# SCHOEPS

Colette series with interchangeable capsules for a variety of applications

unequaled for expertise  
in design and  
engineering

with a  
constantly  
expanding  
range of products



**SCHOEPS**  
STUDIO  
CONDENSER  
MICROPHONES



**BLM 3**  
professional  
boundary layer



**BLM 03 C**  
professional  
boundary layer



**MK 2 S**  
special omni



**MK 21**  
wide  
cardioid

#### Contact

**AUS** dB audio  
Junction Terrace,  
16 Princess St.  
Kew, Victoria, Australia. 3101  
Tel.: (03) 862 1070

**A** Studer Revox Wien  
Ges. m. b. H., Ludwiggasse 4,  
1180 Wien, Tel.: (02 22) 47 33 09

**B** Heynen N.V. Bedrijfsstraat 2,  
3500 Hasselt, Tel.: 011-22 96 64

**CDN** Einova Ltd.  
325 Rue Clément Ouest,  
Lasalle, Québec H8R 4B4.  
Tel.: (001) 514-364 21 18

**DK** PSS, Aaboulevarden 38,  
2200 Copenhagen N.  
Tel.: 01-39 00 37

**SF** Lounamaa Electronics Oy,  
Uimarintieku 27 A, 00330 Hei-  
sinko 33, Tel.: 90-488 566

**F** ELNO S.A., 18-20, rue du  
Val Notre Dame, 95100 Argen-  
teuil, Tel.: (1) 39 82 29 73

**HK** Audio Consultants Co., Ltd.  
58 Pak Tai Street, Tokwawan,  
Kowloon, Hong Kong B. C. C.  
Tel.: 3-712 52 51

**I** TDS - Tecniche del Suono  
S r.l., Via De Cagnoli 9,  
20151 Milano, Tel.: 33.40.03.50

**IL** Kolinar Ltd., 18 Ha'arba'a  
Street, Tel-Aviv, Tel.: 03-26 32 98

**J** Imai & Company Ltd.,  
1-6 Tomihisacho, Shinjuku Tokyo,  
Tel.: (03) 357-0401

**NL** Heynen B.V.,  
P.O. Box 10, 6590 AA Gennep,  
Tel.: 08851-96111

**N** Siv. Ing. Benum A/S, Boks  
145 Vinderen, 0319 Oslo 3,  
Tel.: (02) 14 54 60

**P** G. E. R. Av. Estados Unidos  
da América, 51-5°, Dto.  
1700 Lisboa, Tel.: 80 46 77

**E** Singleton Productions,  
Via Augusta, 59, Desp. 804  
Edif. Mercurio,  
08006 Barcelona, Tel.: 2 37 70 60

**S** NATAB Akustik AB,  
P.O. Box 6016, 55006 Jönköping,  
Tel.: 036-14 24 80

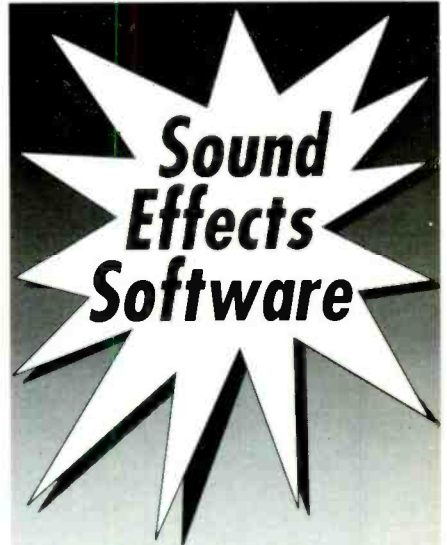
**CH** TECNAD SA  
- Au Glapin -  
1162 ST-PREX,  
Tel.: (0 21) 8 06 06 06

**GB** Scenic Sounds Equipment  
Marketing Ltd., 10 William Rd.,  
London NW1 3 EN,  
Tel.: 01-387 1262

**USA** Posthorn Recordings,  
142 West 26th Street, 10th Floor,  
New York City, N.Y. 10001,  
Tel.: (212) 242-3737

Schalltechnik Dr.-Ing. Schoeps GmbH

P.O.B. 41 09 70 - Fax: (07 21) 49 57 50  
7500 Karlsruhe - TX. 7 826 902 - Tel.: (07 21) 943 20-0



## Sound & Music Catalogging Professional Librarian

- Organizes Tapes, DATs, Samples, Floppy Disks, Compact Disks, Broadcast Carts & LPs.
- Contains presorted catalog listings of Compact Disk sound effects & production music libraries.
- Provides easy data entry for your own libraries, checks spelling and allows descriptions of virtually unlimited length.
- Searches library catalogs by sound, style, mood, category, title, synonym or description.
- Enables multiple word searches using AND, OR, ALSO & NOT to specify exceptions, alternatives.
- Sorts & Cross-references by Format, Length, Media, Project, Recordist or Source Roll.
- Allows unlimited number of custom categories.
- Controls Compact Disk playback via Sony CDK-006 60 disk multi-player "jukebox".
- Networks up to 32 stations and 16 jukeboxes.

## Sound Effects Spotting Sound Supervisor

- Manages spotting lists referenced to reel, scene, time code or feet/frames.
- Provides search, copy & paste from library to spotting lists.

## Dialogue (ADR) Spotting Spotmaker

- Organizes replacement dialogue lines, sorts by character, reel, scene & footage.
- Prints standard cue/line sheets as well as a variety of other forms
- Transfers data to Cueprinter for mixing cue sheets.

## Cue Sheet Printing Cueprinter

- Prints standard re-recording cue sheets in feet/frames or timecode on any size paper.
- Confirms footages to picture changes.

**LEONARDO SOFTWARE**  
10378 Holman Avenue  
Los Angeles, California 90024  
PH: 213.277.5161 • FAX: 213.277.9086

LEONARDO



# SOUND FOUNDATION

Educational and world music projects form just part of the repertoire of the ex Manor Mobile now renamed and based in Wales

**F**ounder Andre Ktori originally came to Wales as a singer-songwriter to record some demos for Warner Bros using a small mobile run by Solar Sound, a Welsh language record label. Cenfyn Evans, the owner, was setting up a studio to record backing tracks as part of an educational package based on computer music. He invited Ktori to join him to manage the studio but the scheme could not survive cuts in education funding and it folded in 1987.

Ktori decided not to return to London but to buy the equipment and run his own studio. He acquired a 2 inch 16-track MCI and a Soundtracs desk. The first year was very successful, recording male voice choirs and orchestras as well as pop music but there were problems attracting bands to a quiet part of mid-Wales without proper residential facilities.

Although there were tempting alternatives such as a large farmhouse and castle in 100 acres near Bantry Bay in the south of Ireland for less than £60,000 (\$117,500) market research suggested the best bet was going mobile even though record companies in England expressed little interest in another mobile unless it meant lower rates.

The Welsh national television service, Sianel Pedwar Cymru (Channel Four Wales), carries programmes in Welsh made by BBC Wales, HTV Wales and many independent production companies. Being a musical nation there are programmes featuring all types of music requiring an audio mobile. The BBC Wales sound control vehicle had been taken out of service leaving only two units based in the area: an HTV Wales sound truck and the elegant Black Mountain Mobile from Derwen Television Facilities working for television, radio and CD Video.

Ktori was planning to design and build a truck when he discovered that Virgin was selling the old Manor Mobile, built in a 20x8x8 ft (6 m x 2.4 m<sup>2</sup>) air conditioned freight container carried on a flat semi-trailer with air suspension. "Rather than

go through all the headaches of how to build it and what sort of suspension to put on it, here was one that was tried and tested."

The truck had been on the road for 18 years and had an impressive track record. It came at a reasonable price with its venerable 40-channel Helios desk.

In the new livery of the Sound Foundation mobile, the truck is now based at Andre Ktori's home/studio just outside Lampeter where it is used for mixdowns when not otherwise occupied. At present, engineers are hired for particular jobs but the plan is to take on a full-time balance engineer as work increases. Bookings are handled by studio manager Sian Welsh, who came from the original Lampeter studio, and the truck is looked after by assistant engineer Wyn Jones. Maintenance support is by Otto Garms who is something of a local legend, looking after Rockfield Studios in Monmouth and the Black Mountain Mobile, among others. Will Shapland, Manor Mobile's chief engineer, was very helpful with spares and diagrams for the truck.

## Container contents

The tailboard accepts three sets of 27-way multicore cables for a total of 81 lines between venue and truck. The main patchbay has ¼ inch break jacks normalised to route 40 mic lines to the desk channels.

Quite a bit of mobile recording history is preserved in the Helios desk, which began life with 30 channels routing to eight group faders and was extended with the extra 10 channels and routing to 24 tracks. It has three-band EQ with HF ±10 dB peaking at 10 kHz, eight-position MF from 700 Hz to 6 kHz, four-position LF from 60 Hz to 300 Hz, plus a 50 Hz roll-off selectable to 3, 6, 9, 12 or 15 dB and a highpass filter operating at 40 Hz or 80 Hz. The unusual thing is that it is passive EQ.

"The 10 k is sweet and quiet," enthuses Ktori. "I love this desk, the sound is superb."

Channels have two foldback (pre-fader) and two echo sends (switchable pre/post) but this is being altered so foldback is switchable pre/post and echo is post-fader to provide more post-fader sends for mixdown effects. Each channel also has two switchable insert points on the outboard patchbay.

The 30 main channels have rotary switches for routing output via the eight group faders for tracks 1 to 8 and direct to tracks 9 to 24. Panpots can be switched in to send stereo to pairs of group faders. The extra 10 channels are on a rackmounted panel beside the main console with full input, EQ and aux sends but no routing. Ten individual mono outputs and a mixed stereo pair fed from the panpots are available on the outboard/multitrack patchbay.

The console has 24 vu meters and a stereo ppm for broadcasters who do not believe in vu. Speakers are Tannoy *SRM 15X* dual concentrics driven by Amcron *DC300*, and Yamaha *NS 10* nearfield driven by Quad *303*. Rackmounted to the right of the console is a separate 24-channel monitor mixer with aux sends, switching for sync head or solo and curious five-position pan switches. "I like that monitor board, it's nice and simple. You don't mess around, it's just for listening."

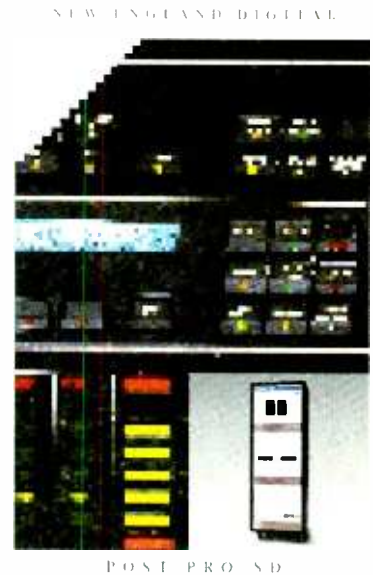
The multitrack patchbay is wired for two 24-track machines, normalised for parallel operation and overpluggable for 48-track. Initially the truck made use of the MCI 16-track ("which I really loved") but this had to go in favour of a pair of 3M *M79* 2 inch 24-track machines at a very good price from Don Larking along with a 3M 16-track. "We're deciding whether to use that as spares or get it up and going. I would like to have kept the 16-track MCI and had a 24-track beside it but it's the market that controls what we have in here. People don't want to be bothered with a 16-track headblock."

A useful switch panel allows a selection of tones from 50 Hz to 15 kHz to be fed to any track on either machine and monitored without involving the console. Twenty-four keys select output of each track from either machine to the monitor mixer. Bel *BC3* noise reduction is used for in-house projects and the multitrack lines include a set of Edac connectors for the insertion of hired dbx or Dolby.

For stereo there is a Sony *DTC-1000ES* DAT machine and two Studer *B67* ¼ inch 2-tracks with their own tone source and vu meters for line up. Cassettes are catered for by a Denon *DRM700* three-head and a couple of *DRM500* Dolby *HX Pro* two-head machines. The plan is to move the tape machines up front,



# All in one.



## INTRODUCING A WHOLE NEW CONCEPT: THE POSTPRO™ SD.

Presenting the smart alternative to multi-manufacturer component sampling and hard disk recording systems: New England Digital's PostPro SD. For the first time, random access performance is uninhibited by multi-manufacturer incompatibilities. With the PostPro SD, you get all the editing power of Direct-to-Disk™ recording, plus a fully integrated Synclavier® sound module. Switching between music and effects, sound design and editing, recording and sequencing is truly seamless, truly transparent. The PostPro SD is the first hard disk recorder/editor that lets you go beyond cutting sounds: it allows you to create them. There's also another very important PostPro SD feature: our Total Commitment support package. It means our commitment to you extends beyond technology to offering financing alternatives, training, responsive service and regular software updates.



Synclavier and the New England Digital logo are registered trademarks. Direct-to-Disk and PostPro are trademarks, and Total Commitment and The smart move are service marks of New England Digital Corporation. © 1990 New England Digital UK, Ltd., Elsinore House, 77 Fulham Palace Road, Hammersmith, London W6 8JA. Tel: (44) (0)-81-741-8811

**SEE US AT: AES, PARIS — STAND D502/504**

TCD is the new digital division of Thatched Cottage Audio based in a brand new 5,000 sq. ft. complex adjoining the present Royston site. Having become Europe's largest 8 and 16-track specialist the time had to be right to move into the completely domain, whilst continuing to provide the same quality of friendly efficient service combined with a comprehensive range of equipment kept permanently in stock and on demonstration. You may not have realised that although we are not based in a major city we CAN deliver goods the same day anywhere in the UK. Why not give TCD a try? Regular clientele include Real World, Livingstone, Swanyard, Erasure, Iron Maiden, Sinead O' Connor, UB40 the Who and record companies include MCA, Chrysalis, Island, WEA, RCA - shouldn't you be on this list.

### SECOND HAND & EX-DEMO UNITS

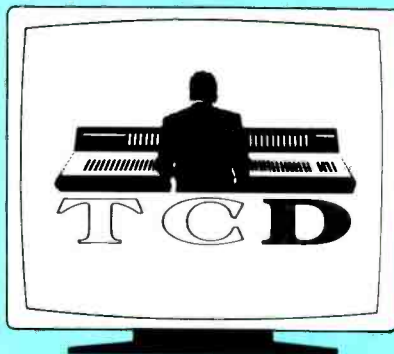
Acoustic Energy AE2 ex-demo	£499
Waldorf Microwave amazing analogue synth	£799
Proteus XR mint	£865
Sony DTC1000ES	£875
Bayer MC740	£550
Fostex 4030 synchroniser	£750
Aphex 612 Expander/Gate	£399
Korg M1	£850
Tascam ATR60 2-track 1/2" inc. trolley, mint	£1500
Electrospace Time Matrix-6 delays in one	£299
Fostex 4050 remote/autolocate/SMPTE for E16	£399
Protus 1	£550
Tascam MSR24-24 track	£5999
Yamaha SY55 (smaller SY77)	£599
Tannoy Little Gold Monitors	£499
Akai S1000 KB (full S1000 + keyboard)	£2499
Tannoy Super Golds (15")	£1299
Allen & Heath Saber 24:16:24	£5999
Tascam MSR16	£2999
Fostex 5030 8 way line matching amps (+4db-10db)	£150
Symatrix 511a single ended noise reduction	£299
Yamaha TX7 (DX expander)	£299
TAC Magnum (demo) 26-26 + patchbay	£10999
Bel BD80S (stereo 16 sec sampler)	£399
Bel BDE2400ES (24-sec fully editable MIDI sampler)	£499
Soundtracs Quartz 32 channel. (3 months old)	£14999
Soundtracs PC Midi 24	£4500
Fostex R8 (demo)	£999
Saber 24:16:24 plus Tascam MSR24	£11999
Soundcraft 6000 26:24 mint	£8500
Akai S1000 inc 2 meg expansion s/h	£1999
Akai MG14D	£1599
Casio DA2	£399
Fostex 4010	£499
Roland D50	£599
Studiomaster 16:16:2	£799
Graft high speed cassette copier	£399
Atari 1040 + Monitor + Creator	£599
Tannoy Little Red Monitors	£399
Korg M1R ex (extra 2 meg)	£899
Akai A - DAM (complete)	£11,999
TC 2290 (16 seconds)	£1199 + VAT
Akai Digital 12-track (complete package)	£11535 + VAT
Apple Macintosh IICX 4/80 (including Soundtools)	£6225 + VAT

This is a small selection from our current stock - give us a call and we will be happy to send you a full up-to-date list. All prices exclude VAT.

The latest issue of our 40 page full colour magazine is now available along with our current price list. Write or telephone for your free copy.

If you require any further information on any of the services which we can provide give us a call on 0223 208110 or on the main TCA number 0223 207979 (11 lines) for full details and brochures. The faxpack, which give details of installation facilities, the service department, demonstration facilities, the recording school and the equipment should answer any questions. If you are converting any kind of audio purchase, why not give us a call - you have nothing to lose! We didn't become the largest pro-audio retailer in EUROPE without being the best!

# THE SAME AMAZING SERVICE AND CHOICE BUT NOW DIGITAL



### WE SELL KEYBOARDS

Despite our prominence in the pro-audiomarket some people still don't realise we sell keyboards! In fact, our dealerships include Yamaha, Emu, Ensoniq, Roland pro-audio, Akai, Korg, Waldorf and Casio, with all popular models in stock (along with staff who know how to use them). Next time you need a keyboard, sampler or expander why not give us a call?

### PACKAGES

At Thatched Cottage we have put together a number of packages based upon complete systems, each offering compatible items with substantial discounts (although it is possible to change them within a given package). Whole studio systems are available for 8, 16, and 24 track, and we have faxpaks on 4 & 8 recording, MIDI, our Thatched Cottage school and finally financial advice (loan and leasing schemes available). All the details are free - just give us a call.

### TCD HOT TECH

Roland S770 the ultimate sampler?  
Korg Wavestation - new blockbuster.  
Akai A-dam 12 track digital.  
Akai DD1000 optical drive recorder.  
Casio DA7 DAT.  
Zoom guitar processor.  
Akai S1100 sampler  
Yamaha TG77 (rack SY77)

### TCD SPECIAL OFFERS

Korg M3R	£499
Akai S1000 2 meg expansion boards	£150
Seck 12:8:2 desk	£699
Function Junction Plus	£550
Alesis Microverb II	£99
Alesis Midiverb III	£175
Drawmer DS201 gates (unbalanced)	£250
EVS1 expander	£259
Akai S950 3/4 mag esp boards	£125
Alesis HR16 drum machine	£199
Yamaha TG55 sample player	£399
Multiverb RT (under half price)	£149
Atari 1040 + monitor + C-Lab Notator	£750
Roland U220	£433
Sound Ideas C-D library	£299
Alesis Quadraverb update chip (extra effects)	£17.99
Roland D50	£694
Alesis Quadraverb inc. update	£275
Casio DA7	£499
Technics SL1200/1210	£275

### Allen & Heath Saber - £3999 + VAT

We have obtained a strictly limited supply of the famous A & H Saber. Each desk is configured 16:16:2 (giving full 32 inputs, all with eq and midi), set within a twenty four input frame allowing future expansion. This world class console has six full sends and is the ideal desk to accompany the Fostex G16 or Tascam MSR16.

This advertised at around half the retail price - if you are considering a professional sixteen or twenty-four track console - give us a call!

### STOP PRESS.....TCA TRAVEL

TCA Travel, in case you didn't know our fully equipped ABTA/IATA Thatched Cottage travel agency has been up and running for some time now, expanding our high standard of service and great value into the travel industry, whether you are organising a tour, visiting a trade show or simply booking a holiday, give us a call. What have you got to lose? Contact Gill Scott or Nicki Brazier on 0223 314577 or 0860 450499 (mobile).  
ABTA No: 89158

### IN BRIEF

Recent agencies include TAC (look at the magnum console), Amek, Neve, Tannoy professional, Focusrite and AMS. We are still waiting for the Yamaha Digital Workstation, but the Akai Adam12 track is selling well (we have deals on fully loaded S1000 + disk drives as well). We can package the Tascam MSR24 1" 24 track with most desks. Computerwise, C-Lab and Cubase are still most popular and the Proteus II full orchestra module is simply stunning.

Recent visitors to our 24 track studios include Ches Hawkes and Nik Kershaw working on a soundtrack for a new film with Roger Daltrey, and several new MIDI courses have been added to the school prospectus. Finally, last month's complete studio installations included Neneh Cherry, David Sylvian, Adamski, LA Mix and Amazon.

### ATARI SOUND TOOLS PACKAGE

Digidesign Sound Tools for Atari. Atari Mega 4 inc monitor and mouse. DAC 200 meg. R/MHard Drive (+ interface).  
Total package price ..... £3750+VAT

### AKAI MG14D - £1799 + VAT

A rack mounted two track recorder, with an additional two tracks for synchronisation, the MG14D is a superb quality recording tool. Balanced/unbalanced connections, a full autolocate/remote available, and noise reductions built in, give totally professional quality at an amazing price (autolocate/remote - £299 + VAT).  
Limited stocks available.

### Sony DTC55ES DAT player - £475 + VAT

Hot on the heels of their industry standard DTC1000ES comes the revolutionary new Sony DTC55ES. With switchable rates of 32khz, 44.1khz and 48khz, coupled with audio, digital and optical inputs and outputs. Unlike other cost-effective DAT recorders on the market the DTC55ES comes complete in a fully rack mounted format, with full track identification and search facilities. At present there is nothing in the market which even begins to compete with its many features and amazing price - £475 + VAT !!

North Road, Wendy,  
Nr Royston, Herts

TEL: 0223 208110  
TEL: 0223 207979 (TCA)  
FAX: 0223 207952  
24 HRS: 0860 445172



# TCD

## THATCHED COTTAGE DIGITAL



between the Tannoy monitors, adding a VCR with Audio Kinetics *Pacer* synchroniser and a colour video monitor for mixdown to picture. A second colour monitor will replace the present monochrome CCTV link.

Microphones from AKG, Neumann, Shure and Sennheiser, and spare Tannoy *SRM 12X* monitors, etc, are carried in a belly box beneath the trailer.

## Overboard outboard

There is a large range of outboard gear since the truck is used for mixdown as well as tracklaying. Four A&D *F760* compressor/limiters that came with the desk, Alesis *XT* digital reverb, ART pitch transposer, Bel *BD80* digital delay, Drawmer *LX 20* dual expander/compressor, *DS 201* dual gate and three *DL 221* dual compressor/limiters, Klark-Teknik graphic equalisers, Lexicon *PCM41* digital delay processor, Montarbo *R16* multi effects processor ("because we like the delay on it"), six Roger Mayer noise gates to shut down unused mic channels on live gigs, a couple of Rebis racks with two *RA201* and two *RA222* gates, an *RA202* de-esser, four *RA203* and an *RA223* compressor/limiters, two *RA204* parametric EQ and an *RA206* oscillator, Yamaha *REV7* digital reverb and *SPX90II*.

Unusual effects include an IQ-Systems stereo clarifier "like an *Aural Exciter* but instead of having just the one harmonic it's got three—basically it's a fryer, it just frazzles any vocal or acoustic guitar", and a Roland *DSP-2000* digital audio high presence processor "made originally for the nutty hi-fi enthusiast with lots of money, but it's really nice high presence digital reverb" for that extra zing on snare drums or a sizzle on the vocals. It even has motorised remote control.

For stage mic splits Britannia Row supplied a useful unit, which includes 32 channels of SCV active mic splitter. Inputs have switchable phantom power, zero or +20 dB gain switch and three sets of outputs with separate ground (earth) lifts. Any channel can be selected to a monitor panel with LED meter and headphone socket "so we can check if it's the PA end or our end very quickly". The unit also has two sets of 32 passive Y-splits. A Clear-Com *CS-100* base station in the truck provides intercom with buzzer and light signals to stage crew belt packs.

## Foundation courses

Sound Foundation is still involved in educational work with a foundation course in sound (hence the name), which makes use of the truck as a mobile control room. Dave Ward of Gateway, London, helped out with ideas and information.

"Training is becoming a real issue," Ktori contends. "The industry is starting to recognise that they want trained people although some still prefer to train their own. There is a need to train people who are interested in the industry: either to put them off and get rid of all the glamour or to give them foundation knowledge."

Five course modules cover basic sound recording, the physics of sound, music technology from MIDI to digits, effects and processing, mixing and production. Modules have been presented for the Carmarthenshire College of Technology and Art course in Theatre and Media Technicians' Skills at Gelli Aur. Next year there will be MIDI weekends for Afan College at Margam Park in South Wales.

As a mobile control room the truck carries a wide range of MIDI equipment: Akai *S950* digital sampler with numerous disks full of sounds and *ME30PII* MIDI programmable patchbay, Bokse *SM-1* timecode generator with SMPTE to MIDI converter and *US-8* universal synchroniser, which can handle clicktrack or pre-MIDI drum machines, Roland *S-330* digital sampler and *D-110* multitimbral synth module, all linked to a Cheetah touch sensitive master keyboard and Atari *1040ST* computer with software packages such as *Pro 24*, *Cubase* and *Notator*.

## World Music

The mobile's first major outing was to Glastonbury in June for

# DN735

SOLID STATE RECORDER

Every second counts when solving stereo problems in V.T. Editing.



When time is of the essence, Klark-Teknik's DN735 digital audio recorder cuts your stereo lay-off editing time dramatically. Compatible to all post production environments, it makes the whole process simpler. And it's a far more cost effective solution than any tape machine.

Its primary function is to add an extra two

tracks of high quality audio to standard VTR machines in order to simplify stereo editing. The standard memory of 44 seconds stereo is expandable to almost 3 minutes. The unit can record and play back short passages of stereo audio in synchronisation with other devices via an externally applied SMPTE time code (LTC).

The RS422 interface, which is fully compatible with current broadcast serial control equipment, makes the DN735 equally powerful when adding stereo audio to random access digital picture storage devices.

Klark-Teknik's technology short-cuts your lay-off time with unmatched reliability.



**KLARK TEKNIK**  
The first name with sound system designers

Klark Teknik Electronics Inc.  
200 Sea Lane, Farmingdale, N.Y. 11735, USA.  
Tel: (516) 249-3660 Fax No: (516) 420-1863

Klark-Teknik Research Limited Klark Industrial Park, Walter Nash Road, Kidderminster, Worcestershire DY11 7HJ, England. Tel: (0562) 741515 Telex: 339821 KLARK G Fax No: (0562) 745371

Klark-Teknik (Singapore) Pte Limited  
7500A Beach Road, 04-308 The Plaza, Singapore 0719  
Tel: 293 9736 Fax No: 293 9738

# MAGICAL MIXOLOGY

Introducing the SM 82  
Stereo 8-Channel  
Line Mixer

M

ore mini-mixer sorcery from Rane. The SM 82: a mixing powerhouse in a miniscule chassis. Packed with the functions and features that cutting-edge performers desire.

**16 SEPARATE INPUTS** on the rear accept discrete Left and Right line level programs. Or a single cable plugged into the Left input will drive both L and R from a mono source, without having to use a "Y" adapter.

**STEREO AUX SENDS**, along with the stereo aux loop and return level control, allow you to create very flexible effects magic.

**FULLY EXPANDABLE** via the Master and Auxiliary Expand jacks, any number of SM 82s can be linked together to handle a staggering number of inputs.

**SUPER LOW-NOISE PERFORMANCE** allows you to mix and route programs to your ear's content, with virtually no loss in signal quality. In fact, the SM 82's specs are better than 16-bit digital performance!

**THE MS 1 MIC STAGE** accessory, available separately, allows you to use mic level programs with the SM 82, complete with phantom power and variable gain.

The new SM 82 Stereo 8-channel Mixer. Another supernatural musical miracle. From the wizards at Rane.



**RANE**

10802-47th Ave. W.  
Everett, WA 98204  
(206) 355-6000

UK Distributor: Music Labs.  
Tel: 071-388 5392  
Fax: 071-388 1953





the annual music festival organised on behalf of the Campaign for Nuclear Disarmament (CND). The idea being to put the truck through its paces and to produce a record of the event, which the organisers could sell at next year's festival. BBC Transcription covered the main stage so Sound Foundation took the World Music stage with a wide range of performers and some unfamiliar instruments. Will Shapland returned to the familiar desk as engineer.

At the time the truck had only the MCI 16-track tape machine so rapid changeovers were required. "While Wyn was taking one tape off, Will was putting another tape on. Wyn would grab the end of that to bring the leader round and it would be going in seconds. And it was all without saying a word to each other," Sian Welsh reports.

There were the usual sorts of problems such as getting power from a generator that was also feeding the catering areas so the truck supply dipped every time the freezers started up.

Stage sound was by Audiotech using mainly Shure SM57 dynamic cardioid mics. A feed of the intercom between the main PA desk and the stage monitor desk proved invaluable for keeping track of stage mic splits. The stage crew readily agreed to use Sound Foundation's condenser mics, so the grand piano was covered by a couple of AKG C414 and there were C451 overhead mics on the drum kit. WOMAD organisers provided some useful advice on how to approach the more exotic instruments. Sennheiser MKH 816 shotgun mics picked up audience ambience for the recording.

With almost no sound checks the pattern was to record several items from the middle of each set. Even then the exuberant performance of some African drumming bands like Ythingo and Kariakoo created a problem as they danced around the stage while playing. This was solved with another pair of Sennheiser shotgun mics on stage. Stand still or we fire?

Back at Lampeter some 50 tracks were mixed in the truck by Ktori with producer Geoff Haslam. The final selection features music from Africa, Asia, South America... all around the world. "It's a bizarre collection but there's a nice album there, it's very tasty," claims Ktori, who might be biased.

Another recent project was a Christmas single for the Kerland Foundation, a charity that works to improve the quality of life for people who suffer brain damage. Rhythm tracks were laid down at Lampeter then a 100-voice choir was added at St Giles

Church in Wrexham and finally the tapes went to Mark Angelo Studio in London where various celebrities who support the Kerland Foundation contributed their vocals prior to final mixdown in the truck at Lampeter.

Meanwhile there are Cardiff-based television production companies like Criw Byw (Live Crew), making *Fideo Naw* (Video Nine) for S4C featuring live Welsh pop music from a different location each week, and Greeneye Productions, making *Live and Direct* which likewise travels, with plans to go into Europe in 1992 for a broader spectrum of Celtic music from Scotland, Ireland and Brittany in Northern France.

## Country mansion music

In recent years quite a few albums have been recorded at some stately home or country cottage. Sound Foundation have negotiated packages for residential recording at several "really spectacular places", which can be turned into temporary studios with first class catering and accommodation. "It's quite exciting really," Ktori confesses. "We like to travel with the mobile and we like the studio type of work as well as doing the live recording."

There are many attractive locations in Wales and Ireland (Lampeter is about an hour from Fishguard for ferries to Rosslare) ranging from secluded cottages to town houses in Cardiff or Dublin. Anyone would be tempted to record at the curious holiday village of Portmeirion in North Wales where the cult TV series *The Prisoner* was filmed. Other venues are available in England, Scotland, France, Spain, Italy and further afield.

The aim is to take over an entire establishment to avoid conflict with other residents. The Sound Foundation crew are visiting possible locations to check that acceptable acoustics and noise levels can be achieved with the aid of screens and close mics where necessary. Rates should be competitive with residential studios. Package prices include hire, haulage and any ferry costs for the mobile plus transport for the band and their gear as well as accommodation. Ideal for those who want to record in their chosen location with a Helios desk. □  
**Sound Foundation, Felin Denys, Silian, Lampeter, Dyfed SA48 8LX, Wales. Tel: 0570 422877.**

# VCA's REVISITED

## Ben Duncan updates his VCA series

This update covers SSM's new 2018 VCA, which is the upgrade of the 2014 device measured in the original series<sup>1</sup>. VCA Associates' MTA1537 has also been retested. (Readers may recall<sup>2</sup> that VCA weren't aware that we needed sample devices, owing to some obfuscation in the chain of communication.) This report should be read in conjunction with parts 3 and 4, in the August and September 1989 issues. Tests began by evaluating four samples of each IC, to check for conformity and to be sure that the DUT was typical. (Abbreviations P82.)

### SSM 2018

Released in September 1990, the 2018 is a direct, plug-in upgrade of the SSM 2014, now four years old. The 2018 is best appreciated as a Mk2 version of the 2014; SSM cite lower distortion in Class A-B, narrowing the differences between the Class A and A-B modes of operation. The 2018 is also said to need less compensation for stability, which should enhance HF sonics. The punchline is that the new part will be about 15% cheaper.

All the other VCAs that have been looked into are operated open-loop; there is no global feedback. SSM's VCA family is different. Their OVCE configuration Fig 1 looks like an op-amp to the outside world. It has differential inputs, and before the VCA can be used, feedback networks

have to be wrapped around the overall circuit. This allows a wide range of possibilities, enabling the VCA element to be 'embedded' in filters, equalisers, panners and other circuits, so they can be controlled remotely and/or by digital means. In the original series of tests, the 2014 was operated in the inverting mode (Fig 2). However, the non-inverting mode (Fig 3) is more likely to be preferred by equipment designers, as WCOIWWI. Are there any differences? To answer this, the 2018 has been evaluated in two configurations, in both Class A and Class A-B modes.

### Bandwidth

The 2018 showed a slightly rising HF response of +1 dB and +0.5 dB at 200 kHz in the inv and non-inv modes respectively due to interaction with the Audio Precision's load reactance. The 20 kHz squarewave response showed nothing serious but to be sure there wouldn't be any RF oscillation (a recurring problem with the 2014), significant series output resistors of 470 Ω and 1k were fitted to the inv and non-inv test circuits respectively to stand-off the load reactance. SSM actually recommend 1k for AP measurements with the 2014. A smaller resistor could be used for the inverting mode, as it's possible to add a small lead compensation capacitor Cc (Fig 2) to control stability. Response for both test circuits was then

respectable, being substantially flat beyond the audio band, with the -1 dB point placed between 100 and 200 kHz, depending on the gain command.

### Noise

Table 1 summarises the 2018's noise across the matrix of operating conditions. As might be expected, the non-inverting condition gives the lowest noise for both A and A-B modes. In this condition, Class A-B is 10 dB quieter. The unity inverting configuration (comparable to the 2014 tests) is 2 and 7 dB noisier for Class A-B and A respectively (Fig 4). At -50 dB, the difference narrows proportionately, with Class A being an all but imperceptible 2 dB noisier than A-B in the inverting mode, while in the non-inv condition, Class A may be taken to be identical to A-B, considering the average difference (½ dB) is smaller than the measurement uncertainty of ± 1 dB. As for environmental noise, all the results were at least 12 dB above the test setup's residual.

### An error correction

Initial comparisons to the 2014 noise data revealed an historic measurement error arising from the 1k series resistor that SSM had fitted to the output of the assembled test circuit they supplied. This sets up a significant attenuation against the 150 Ω termination, employed to minimise environmental noise pickup. At first sight, the noise figures can be corrected by simply deducting the attenuation, assuming it to be invariant over the audio band. However, the moderate source impedance (around 130 Ω) created in one side of the interconnect acts to unbalance the

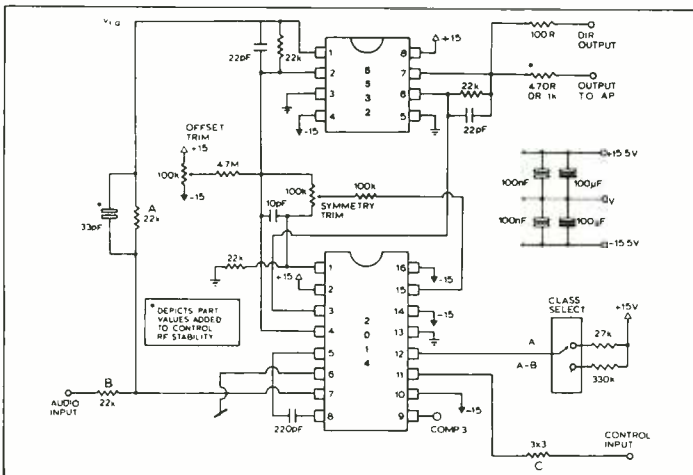


FIG 1: SSM-2014 test circuit showing OVCE configuration. A, B, C are external components seen in Fig 2

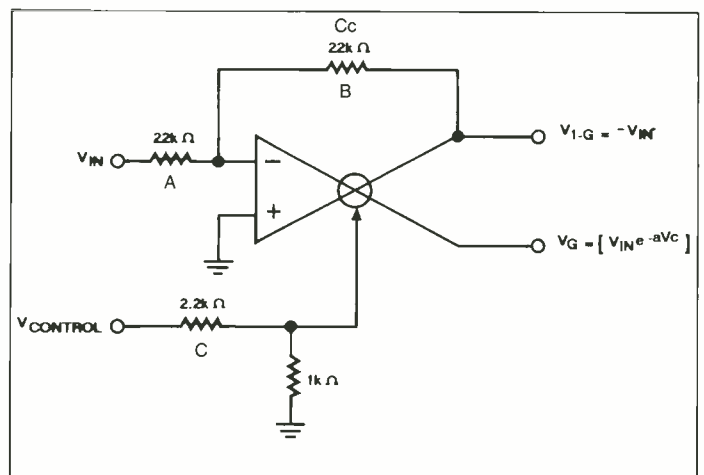


FIG 2: Inverting VCA. Cc is capacitor in parallel with B

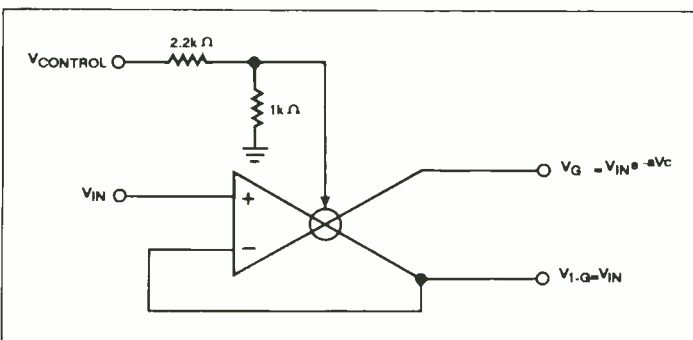
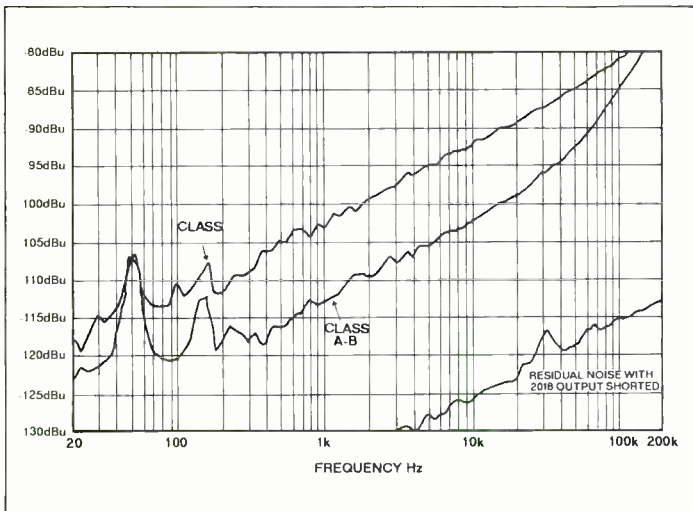


FIG 3: Non-inverting VCA

TABLE 1 No Signal Noise  
1 kHz spot noise figure

Model	Class	Condition	Gain command	1 kHz Noise figure	Difference between A and A-B	Apparent corner frequency
SSM 2018	A	inv	0 dB	-96 dB	15 dB	40 Hz
	A-B	inv	0 dB	-111 dB		
	A	non-inv	0 dB	-103 dB	10 dB	120 Hz
	A-B	non-inv	0 dB	-113 dB		
	A	inv	-50 dB	-119 dB	2 dB	-
	A-B	inv	-50 dB	-117 dB		
	A	non-inv	-50 dB	-117 dB	0 dB	-
	A-B	non-inv	-50 dB	-117 dB		
MTA 1537	A	-	0 dB	-116 dB	-	100 Hz
	A	-	-50 dB	-126 dB		





**FIG 4: SSM-2018 noise, inverting mode, at 0 dB gain command**

line. In turn, magnetic noise spectra (in particular) are magnified. Fortunately, there aren't any of these at 1 kHz, the main test frequency. However, the net error in the noise figure is still indeterminate, due to noise pickup in the cable. To make a valid comparison in one direction, the 2018's noise was retested in the same test circuit as the 2014, with the 1k output resistor *in situ*. At unity gain, the 2018's Class A midband noise was 4 dB higher. In Class A-B, it was virtually the same, at 1 dB higher. The 2014 and 2018 were then recompiled without the series resistor. The results showed that the 2018 had lower noise but again, the

difference is indeterminate because of mild RF oscillation in the 2014. The 2018 was between 6 and 18 dB quieter in all modes except Class A-B non-inv, where it actually read 6 dB noisier.

Overall the 2018's absolute noise isn't in question, while in comparison to its predecessor, it seems generally quieter in most configurations, although exact comparison is frustrated by different compensation requirements. Meanwhile, the noise figures published in the original series<sup>1</sup> for the 2014 in the inverting mode are approximately 15 to 20 dB optimistic—for which we apologise.

**TABLE 2 Modulation noise**

+2.75 V applied to input (see Fig 2, Sept 1989)

Control port shorted

Figures express noise in excess of no signal residual, with input shorted

Model	Class	Condition	Description
SSM 2018	A	inv	<2 dB at all frequencies
	A-B	inv	4 dB at 20 Hz rising to 8 dB at 1 kHz and above
MTA1537	—	—	3 dB at 20 Hz, falling to nil above 300 Hz

**TABLE 3 THD vs frequency**

Unity gain setting

+10 dBu drive

100 k load at output

Model	Class	Condition	THD+N% at 1 kHz	THD+N% at 20 kHz
SSM 2018	A	inv	0.01%	0.01%
	A-B	inv	0.006%	0.06%
	A	non-inv	0.0045%	0.0055%
	A-B	non-inv	0.006%	0.045%
MTA1537	—	—	0.002%	0.002%

Turning to modulation noise **Table 2**, the extra noise created by applying +2.75 V to the input was effectively no different to the 2014, with negligible extra noise in Class A and only a modest amount in Class A-B.

## Harmonic distortion

**Table 3** displays THD+N at two frequencies, across the matrix of operating conditions. By

is that we're seeing a typical THD of 0.01% in Class A-B, bringing Class A-B into the range of Class A VCA designs. The minimum THD for Class A-B is now the same as for Class A, since ultimately noise and the linearity of the rest of the circuitry become dominant. However, at the present time I think the 2018 is about at the limits of monolithic performance for this parameter. With some real sweating, I think I could get it down to 0.005% but there's a law of diminishing returns, which any manufacturer must consider.

"A final major goal was to improve the noise if possible. It would take many pages to describe all the factors involved here. Mainly, I redesigned anything I could in the context of the main development, which has resulted in a few dB of noise reduction. The Class A noise has come down significantly due to the optimised core transistors, approaching the state-of-the-art for Class A-B noise for monolithic circuits. The theoretical limit is still a few dB away and, as always, is tied directly to a tradeoff with distortion and power dissipation.

"Overall, the design (and redesign) of the OVCE has involved a fascinating combination of theoretical and engineering issues. In order to get the THD down to 0.01% in Class A-B, one must be able to characterise the distortion mechanisms almost perfectly, right down to the second order effects. Then in order to verify and specify the resulting mathematical models, you have to pay unusually close attention to the magnitude and phase spectrum of the distortion products over gain, signal level and operating condition. The determination of diverse and simultaneous distortion phenomena in the 2014 was the most challenging engineering problem I have ever solved. Even so, the quest for perfection goes on!"

## About the Twenty-Eighteen

**Doug Frey is professor of electronic engineering at Lehigh University in Pennsylvania. He was also responsible for the unusual, original circuitry that became SSM's 2014 and related VCA ICs. Here he talks about the engineering challenges presented by the 2018. It should serve to make readers aware that any remaining imperfections in VCAs as experienced behind the console aren't down to any lack of diligence on behalf of the manufacturers!**

"The purpose of creating the 2018 was to redo the 2014 in full custom. The engineering problems involved in implementing our OVCE architecture monolithically, are very serious. Looking at the 2014 in retrospect, it amazes me that we were able to turn out such a good part as we did.

"Our first objective was to redo the 2014 in such a way that it would be user friendly, not requiring so many RC compensation networks. Stability was enhanced by redesigning the output amplifiers and internally compensating them for unity gain. The unity gain compensation allows one to band-limit the output in a VCA application, by paralleling the main feedback resistor with any sized capacitor you want. So the stability and oscillation anomalies that equipment designers sometimes noticed shouldn't occur.

"My next objective was to implement the core transistor circuitry in such a way that it would be immune to internal and external thermal gradients. These problems manifest themselves as an increase in distortion at low frequencies and a temperature dependence on the symmetry (distortion) trim setting. Connoisseurs of VCAs will know that core asymmetries can cause the trim point to be dependent on signal level and gain-command. These issues mainly relate to Class A-B operation, although there is a fundamental relationship between Class A-B 2nd harmonic distortion and Class A control

feedthrough.

"I used what I believe is a unique circuit design concept, coupled with a carefully contrived geometry, to cancel out thermal gradients appearing in the various orientations possible on the die. The result has impressed even me! There is virtually no low frequency increase in distortion at any signal level and virtually no shift in the symmetry (distortion) null point with temperature. I had an ulterior motive for this conquest of the core layout problem. I dream of an internally trimmed VCA. This can only be manufactured practically after this kind of performance has been achieved. Unfortunately, there are still some more engineering problems to be solved but internally trimmed 2018 ICs may appear in the not too distant future.

"Another objective related to the core design was to improve the Class A-B distortion. In order to have any hope of doing this in a mass produced part, the core first had to be improved to eliminate the anomalies discussed above. I then needed to redesign the distortion correction circuitry. The 2014 demonstrated that my approach (as described in the patent) could work but it could not correct distortion reliably over process variations, to better than 0.05% at best (for +12 dBu signals). The 2018 includes extra circuitry, which not only cancels distortion products effectively but also tracks excellently over process (hence batch) variations. The result

# Manufacturer's addendum

We greatly appreciate the opportunity to have Ben Duncan evaluate the *SSM-2018* VCA. However, there were some discrepancies in his evaluation circuit that led to substantially decreased *SSM-2018* performance.

An original design goal of the *2018* was to have pin-for-pin compatibility with the earlier implementation of the Frey topology, the *2014*. In fact, the *2018* preliminary data sheet states that it 'upgrades existing *SSM-2014* sockets'. While this is true, using a *2014* application circuit does not permit realisation of the *2018*'s full virtues. As he did not have the benefit of an *SSM-2018* evaluation fixture and for the sake of consistency in the original article, Duncan used the 'outboard OVCE' circuit on the *SSM-2014* evaluation PCB, which we now know appears to cause the most trouble for the *2018*. The final data sheet on the *2018*, which is expected to be available shortly, will contain a section on upgrading *2014* sockets. Additionally, an evaluation PCB optimally laid out for the *2018* is being prepared.

Specifically, there were two problems, with Duncan's evaluation circuits:

- The *2018*, when operated as Class A-B in

the *2014* outboard OVCE configuration, exhibits an oscillation at the signal's zero crossing. This results in an increase in distortion and noise.

- The Class A circuit shows a 10 kΩ resistor for R<sub>B</sub>, which results in an overbiased gain core and increased noise. Correspondence has revealed that just such a 10k resistor could have been inadvertently fitted to the ready-built test circuit we supplied for the *2014* VCA tests last year. Readers should be aware that this value has never been recommended; for proper biasing of both VCAs, the data sheet recommends a minimum value of 33k.

It should be noted that a dramatic improvement in Class A-B distortion made by the *2018* is not reflected in this article since measurements were not taken at medium gain or attenuation settings, such as ± 20 dB. The *2018* produces roughly five times better distortion figures than its predecessor at these settings.

The reviewer was kind enough to provide us with detailed documentation of his measurements prior to publication. We have included data from our bench tests under the same conditions to provide what we believe to

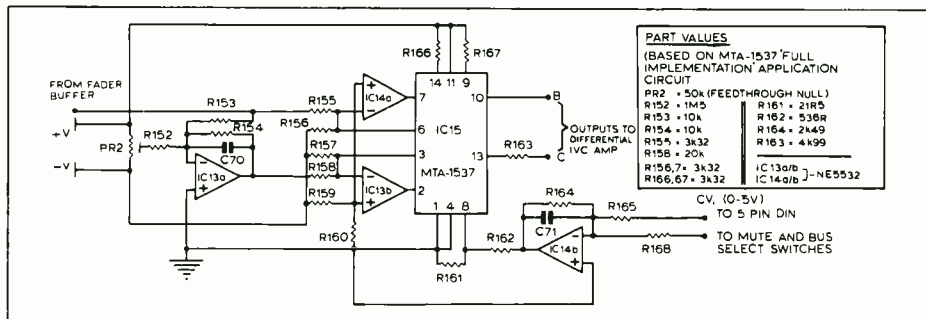
be a more accurate representation of the *2018*'s potential. We would encourage readers to perform their own evaluation of the *SSM-2018* in a recommended application circuit and advise any discrepancies to us at Analog Devices.

**TABLE 1 No Signal Noise**  
1 kHz spot noise figure

Class	Condition	Gain command	1 kHz Noise figure
A	inv	0 dB	-103 dB
A-B	inv	0 dB	-112 dB
A	non-inv	0 dB	-103 dB
A-B	non-inv	0 dB	-113 dB
A	inv	-50 dB	-117 dB
A-B	inv	-50 dB	-118 dB
A	non-inv	-50 dB	-118 dB
A-B	non-inv	-50 dB	-119 dB

**TABLE 3 THD vs frequency**  
Unity gain setting  
+10 dBu drive  
100 k load at output

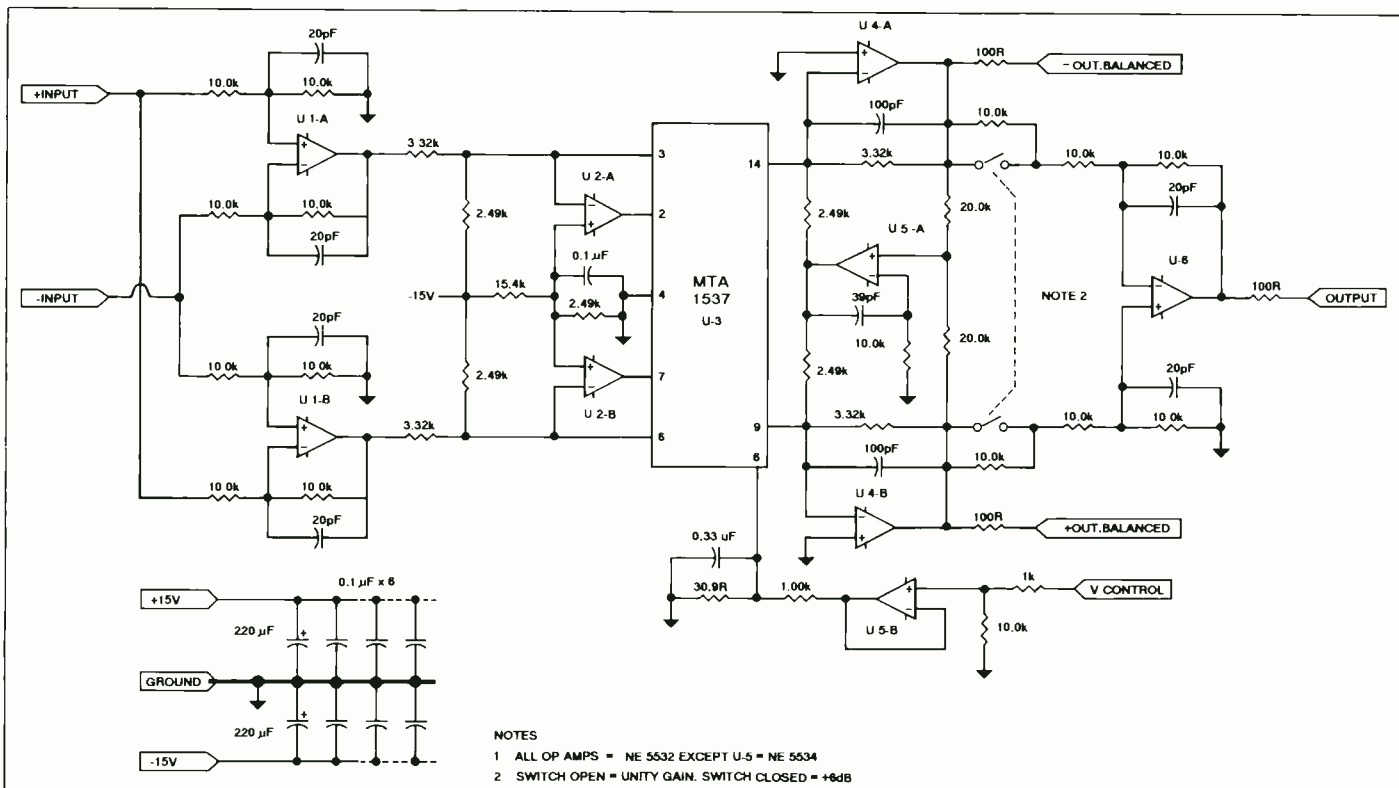
Class	Condition	THD+N% at 1 kHz	THD+N% at 20 kHz
A	inv	0.0056	0.0065
A-B	inv	0.0055	0.056
A	non-inv	0.0045	0.0045
A-B	non-inv	0.005	0.03



**FIG 5: MTA1537 test circuit (part of Hill Audio Concept series mixer module)**

themselves, the figures can be misleading. The Class A 'distortion' is almost exclusively noise. Also, in Class A mode, the THD+N plot vs frequency is completely flat, up to 50 kHz. The Class A-B THD+N is mainly distortion with a bit of noise, showing the usual kind of spiky but fairly symmetrical residue. Also, the distortion rises sharply above 3 kHz, reaching 10 times the 1 kHz figure just above the audio band.

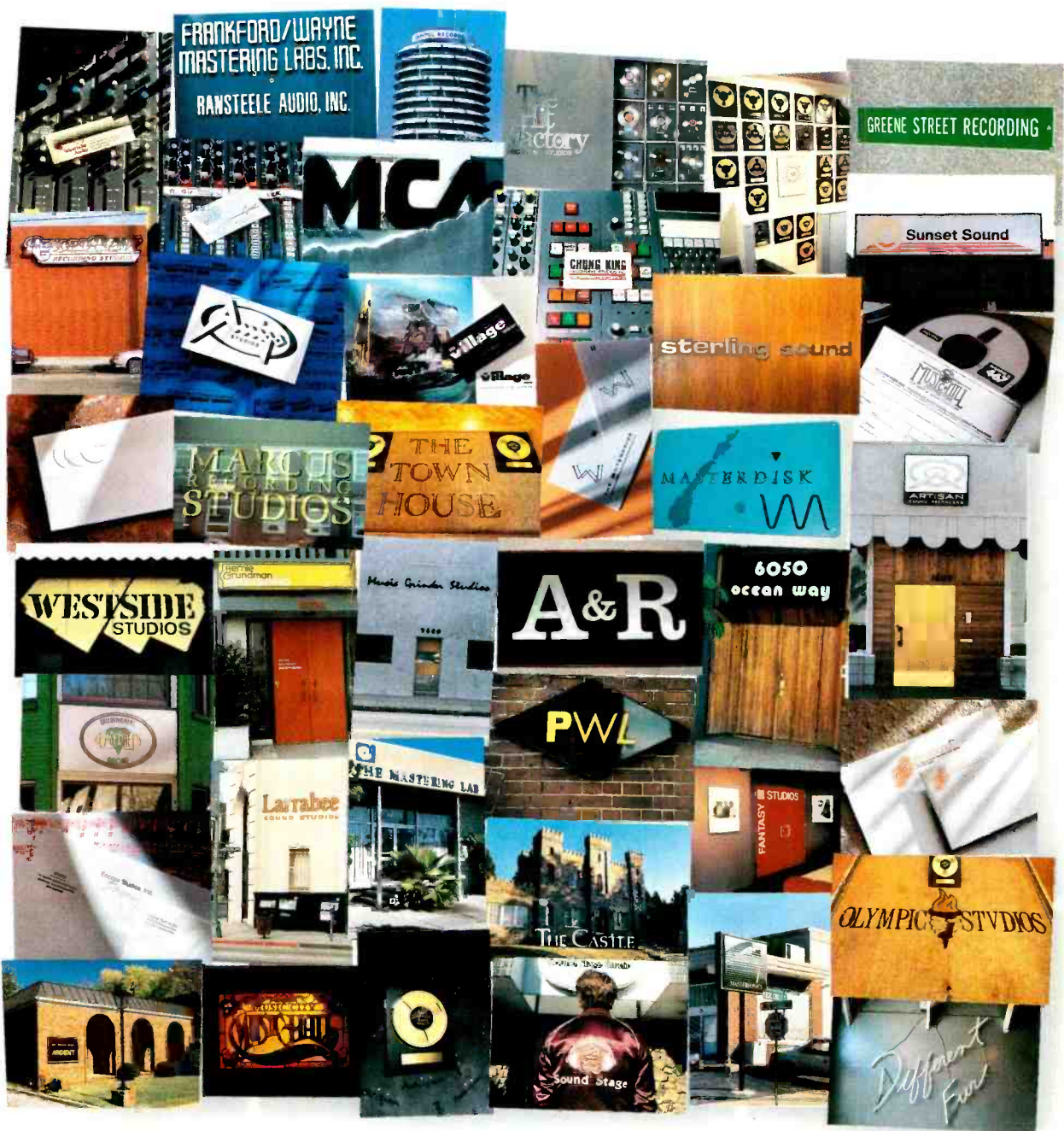
Compared to the *2014* at 1 kHz in the inv mode and with unity gain, THD+N (quite spiky stuff) is at least an order lower in Class A-B, whereas the Class A residue is all noise and unchanged. At 20 kHz, Class A THD+N is nearly an order



- NOTES**
- 1 ALL OP AMPS = NE 5532 EXCEPT U-5 = NE 5534
  - 2 SWITCH OPEN = UNITY GAIN. SWITCH CLOSED = +6dB

**FIG 6: Updated test circuit for MTA1537 VCA**





## MORE STUDIOS GO GOLD ON AMPEX THAN ON ALL OTHER TAPES PUT TOGETHER.



*Every studio pictured here has earned the prestigious Ampex Golden Reel Award for creating a gold album exclusively on Ampex audio tape. Find out what makes Ampex tape right for your sound. Just call or write for a copy of our new 456 Technical Brochure, and see why Grand Master® 456 is engineered like no other tape in the world.*

**AMPEX**

A MASTER OF ENGINEERING

Ampex Great Britain Limited • Acre Road • Reading, Berkshire, England RG2 0QR • (0734) 875200

lower. As the 2018's residual is still all noise at this frequency, and assuming the noise performance is mostly unchanged, the improvement suggests a commendable reduction in distortion. Turning to the non-inv circuit (Fig 3), and comparing it to the 2014, the 2018's unity-gain command THD+N in Class A is 6 dB down (half) at 1 kHz, and a whole order lower for Class A-B. Again, at 20 kHz, the tables are turned: Class A-B residue is slightly less while the Class A residue is an order lower. Once the lower noise of the non-inv mode is accounted for, as well as the appearance of common mode distortion in the associated NE5532 op-amps (owing to non-inverting condition) then the relative differences in THD+N between the inv and non-inv modes are small under practical operating conditions.

In common with other VCAs that require external trimming, THD testing was complicated by the interactive nature of the trim process. Even with the (expensive) multiturn preset fitted to SSM's demonstration PCB, Class A-B trimming was unusually sensitive, requiring nudges to a

fraction of a turn to get 'best possible' residual readings, enough to see consistent differences between the operating modes. Such precision is unlikely to be realised in mass production without adjustments to the trim range and/or some preselection. Also in common with some other makers' VCAs, the optimum THD trim depends on the operating mode (A is different to A-B). It also varies with frequency; the null points at 1 kHz and 3 kHz are quite different.

Overall, the 2018 has less distortion than the 2014. In common with another maker's Class A-B VCA, the performance and sonics of the 2018 in Class A-B mode will depend to a great extent on the sympathies of the designer who integrates it into an equipment design and the quality of post-production THD trimming.

## VCA MTA 1537

VCA Associates supplied a ready assembled evaluation PCB, following the circuit in Fig 6.

## Abbreviations & acronyms

DUT:	Device Under Test
Inv:	Inverting—so signal polarity is flipped
Non-Inv:	Non-inverting
Order:	Difference factor of 10 times (less or more)
OVCE:	Operational Voltage Controlled Element
WCOIWWI:	Equivalent to word-processist's WYSIWYG for sound engineers: What Comes Out Is What Went In

Compared to Fig 5 the new circuit has been developed over the past 2 years to get the best signal-to-noise ratio out of the MTA1537, while minimising common mode distortion in the surrounding op-amps. Two control range modes are available, one requiring a +6 dB gain in the output stage and a control voltage spanning from -V to (small) +V. This latter configuration enhances dynamic range and slightly reduces the apparent equivalent input noise, by 1 to 2 dB. To avoid introducing any extra variables, the normal, unity gain mode was chosen (switch open).

## Bandwidth, noise and distortion

The test circuit's bandwidth was fine as supplied (Fig 6), being about -0.3 dB at 100 kHz with unity gain command and almost the same at the -50 dB command. Looking at Table 1, the noise performance is now 8 dB and 9 dB better at unity and the -50 dB gain command respectively.

Befitting a pure Class A device, modulation noise was almost non-existent, as in the original test. The slight reading (below 2 dB) at low frequencies is probably not mod noise but a combination of  $\frac{1}{f}$  ('flicker') noise from the DC source and the surrounding NE5532 op-amps, aggravated by the increasing temperature and thermal feedback, as the 5532's output stage warms up. The same consideration applies to the SSM 2018 in Class A mode.

The MTA1537's unity gain THD+N residuals were nearly an order of magnitude lower. This squares with the 8 to 9 dB reduction in noise, ie the residue is overwhelmingly noise. Overall, the MTA1537 is the quietest Class A VCA IC to be measured, at some 4 to 5 dB quieter than its nearest rival, depending on configuration. Harmonic residues are below the noise at the extreme audio frequencies and gain settings, and modulation noise is effectively negligible, if there is any at all. The only people it won't completely satisfy are the makers of console automation systems, who would always like just a little less noise for the worst case summation—when dozens of channels are open simultaneously. □

### References

<sup>1</sup>Ben Duncan, 'VCAs Investigated', Parts 1 to 4, *Studio Sound*, Jun, Jul, Aug, Sep 1989  
<sup>2</sup>'VCAs Investigated' (letter), *Studio Sound*, Nov 1989

### Postscript

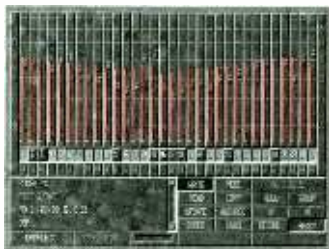
VCA Associates have become exclusive worldwide distributors of Aphex's VCA-1001 VCA

# Your days as an Octopus are numbered

If you work with an unautomated desk, you've probably longed for the day when affordable automated mixing makes the nightmare of manual mixing a thing of the past. Thanks to Optifile 3D that day has arrived.

Optifile 3D is a very cost-effective pro SMPTE system that's fittable to any console. Its stunning array of mixing applications makes it the first choice for many console manufacturers.

Contact The Home Service today for the new brochure and discover how easily you can have Optifile 3D fitted to your desk.



OPTIFILE



Australia - Greater Union Village Technology - (02) 550 54 88 Belgium - EML - (011) 34 83 39 Brazil - Libor - (11) 34 85 39  
 Canada - Video Telecom - (514) 333 14 01 France - AD Systeme - (1) 42 53 51 18 Hong Kong - Audio Consultants Co Ltd - (852) 351 36 28  
 Italy - Audio Fulombi - (02) 254 07 21 Malaysia - Meteor Sound & Lighting Systems - (03) 291 65 59 New Zealand - Protel - (04) 854 874  
 Norway - Audiotron A/S - (02) 35 20 96 Switzerland - Decibel SA - (021) 921 75 93 Sweden - Soundtrade AB - (08) 730 04 00  
 Spain - Twin Cam Audio - (03) 675 50 11 Singapore - Swee Lee Co. - 336 78 86 Taiwan - Linfair Engineering - (2) 321 44 54/6  
 UK - Studio Timeline - (081) 994 11 33 Venezuela - Acoustilab - (02) 987 48 45 W.Germany - Mega Audio - (067) 21 26 36



# Extreme Measures

-110.0

-115.0

-120.0

-125.0

-130.0

-135.0

-140.0

-145.0

-150.0

0.0

5.00k

10.0k

15.0k

20

## High-performance Audio Testing With System One + DSP

DESIGNING, MANUFACTURING and MAINTAINING high-performance analog & digital audio equipment places **extreme** demands on your test equipment. Your test set must have **extremely** low residual noise and distortion as well as **extremely** high accuracy... and the variety of systems under test calls for **extremely** flexible test set-up and control.

**System One + DSP** from **Audio Precision** is the solution. The trace below is a **System One + DSP** FFT spectrum display showing the residual distortion performance of our generator and analyzer. 2nd harmonic distortion of the sine wave is 125dB below the 1kHz fundamental level before nulling. The 3rd, 5th & 7th are all even lower!

This self test is typical of the high-performance, high-accuracy measurement capability of **System One + DSP**.

### System One + DSP features include:

- Dual Channel FFT Analyzer – Signals up to 80kHz may be acquired and analyzed with 16 bit resolution.
- Waveform Capture – Acquire and display signals on the PC screen for analysis in time domain “digital storage oscilloscope” mode.
- Harmonic Analysis – Perform harmonic analysis such as measurements of individual distortion components, with automatic tracking to 9th harmonic.
- Processing Power – Dual high-speed 24 bit internal DSPs and precision 16 bit analog I/O conversion.
- Low residual THD + N – Total analog system THD + N (22kHz bw) .001%. DSP analysis permits resolution of distortion as low as 145 dB below fundamental.

**System One + DSP... When you're serious about performance.**

System One

Audio  
precision



P.O. Box 2209, Beaverton, OR 97075  
503/627-0832 1-800/231-7350  
FAX: 503/641-8906, TELEX: 283957 AUDIO UR

INTERNATIONAL DISTRIBUTORS Australia: IRT Electronics Pty. Ltd. (02) 439 3744 Austria, Eastern Europe: ELSINCO elektron GmbH, Wien (222) 812 17 51 Benelux: Trans European Music NV, Belgium (02) 466 50 10 Canada: Glentronix Ltd. (416) 475 8494 Denmark: AudioNord Danmark A/S 86 12 88 11 Finland: Gerelec OY 77 13311 France: ETS Mesureur (1) 45 83 66 41 Germany, West: RTW GmbH 221 70 91 30 Hong Kong: TRP Consumer Electronics, Ltd. 867 2008 Italy: Medea S.r.l. 2 445 38 28 Japan: TOYO Corporation 3 279 0771 Korea: Myoung Corporation 784 9942 Mexico: Vari S.A. 5 250 73 94 New Zealand: Audio & Video Wholesalers, Ltd. 71 73 414 Norway: Lydconsult (09) 19 03 81 Portugal: Acutron ELA 1 941 40 87 Singapore & Malaysia: TME Systems PTE Ltd 286 4608 Spain: Telco Electronics, S.A. 1 231 7840 Sweden: Tal & Ton AB 31 80 36 20 Switzerland: Tecnad SA (021) 806 06 06 Taiwan: Litz Technologies Ltd. 703 6280 U.K.: SSE Marketing Ltd. 01 387 1262

# MONITORING SYSTEMS

## DIFFERENT PRIORITIES

### PART 10

Phil Newell continues his series

**M**onitoring design is still a combination of art and science: the art allows for the adjustment of those parameters for which the science has, as yet, no solution; while the science provides the solid base from which those adjustments can be made.

In a paper<sup>1</sup> presented to the 8th AES

Conference on *The Sound of Audio* in Washington DC (May 1990) Floyd Toole made the following statements in the opening section of his presentation:

"Stereophonic reproduction attempts to reconstruct, in the minds of listeners, replicas of the timbral and spatial effects of acoustical events that have occurred at earlier times and other

places... assuming that the necessary information has been properly encoded in the recording, the replication can be successful only to the extent that the loudspeakers are capable of reproducing the appropriate sounds and that listening rooms are capable of conveying those sounds to the ears of listeners... In practice, much of the musical pleasure survives the gauntlet but it is clear that there are arbitrary variations in the record/reproduce process that should not be there.

"Stereophony is an encode/decode process. When a listener sits in front of a pair of loudspeakers in a room, the sounds arriving at the ears are the only information that the perceptual system has to work with. If the sounds are different in different circumstances, the perceptions will be different.

"The only real solution is to control these variations and, ultimately, to standardise the important factors. At present, there are no industry standards for either loudspeakers or rooms, the design objectives are inconsistent and methods of control are not uniform...

"Some of the difficulty stems from the restriction to two channels. This limits the directional and spatial effects that can be presented to a group of listeners...

"Conventional stereo cannot recreate all of the directional impressions that may have been part of an original live performance, unless the original 'performance' was a studio creation monitored through a pair of loudspeakers in a control room...

"Another difficulty with stereo reproduction is that the eyes see an acoustic space that is not consistent with the auditory illusion presented by the recording. The awareness of an incompatibility between what is seen and what is heard is difficult to ignore.

"At the emotional level, there is the lack of a sense of occasion. One is at home, instead of at an elegant concert hall (or jazz club, or rock concert), dressed up, surrounded by similarly motivated strangers, experiencing a performance by real artists on a stage—whom one can see."

Prof Toole's statements outline very clearly many of the limitations of the studio monitoring and subsequent domestic reproduction processes.

## Variables

Lack of standardisation through the recording chain stems from the fact that the market supports an industry that has no common source or destination. There are three factors that continue to sustain this state of affairs, namely:

*Anti-trust laws*—Back in the '30s and '40s, cinemas were generally owned or licensed by the major film studios, only showing the films from those studios to which they were affiliated. Cinemas and film dubbing theatres were designed to correlate well and films were optimised for presentation in appropriate theatres. Some time

## Computer Concepts Digital Commercial System

### Kiss carts Goodbye!

▶ **DCS** is not only the comprehensive cart replacement system, with fully automatic interfaces for satellite distribution, or the reception of sustaining services; it is the only system offering fully integrated two way traffic management for AM and FM combos.

▶ Localised advertising on each transmitter, focuses coverage, improves competitive edge and generates more revenue.

▶ Large hard disk audio data store suitable for general programme recording purposes, as well as cart replacement. Interfaces to Selector and Media Touch.

▶ Low cost stand alone units, or multi terminal networked systems using established commercial networks, with central or distributed database.

▶ Full manual or automated flexibility, with comprehensive remote control facilities and software support via modem.

▶ Specialist multi terminal news editing systems with unique contiguous access - for parliamentary chambers and conference reporting.

European Distribution.

**AUDIO DESIGN**

Unit 3 Horseshoe Park Pangbourne  
RG8 7JW UK  
Tel: 0734-844545 Fax: 0734-842604



around the '50s, anti-trust (monopoly) laws forced the demise of this state of affairs to allow free enterprise such that any cinema was free to show any film.

Standardisation was lost and optimisation for the different systems was no longer practical. In the world today, free enterprise and market forces seem to be the spreading philosophy. Under such circumstances, imposition by anyone of standards for music recording and reproduction would be unthinkable in any mandatory way. Free enterprise tends to create diversity rather than commonality and it is almost certain that whoever was losing out from any standardisation would surely take legal action for supposed restriction of ability to trade.

*Tail chasing*—The capacity for the evolution of self-fulfilling prophecies has been great. A typical example of tail chasing would be that for whatever reason, a certain monitor system becomes popular in the early stages of the recording industry. A range of microphones with complementary deficiencies becomes widely used as the subjective effects of the combination are deemed to be acceptably natural. The use of those microphones becomes so widespread that some subsequent monitoring systems are deemed in turn to be unnatural by virtue of the playback of recordings made by the earlier combination. Monitor systems that are deemed to be acceptable often tend to have similar complementary defects. New microphones, as with the new loudspeakers are generally forced to toe the original erroneous line.

Such errors are not gross, or very simple measurement would have cried foul at a much earlier stage, but they have occurred and there are many who would say they have led to gross repercussions on quality.

There are unacceptably wide spectral differentials in the recorded sounds that reach the music buying public. Some of the deviation is between company and company, where each have had large-selling albums for whatever reason. All too often the magic selling point has been attributed to the sound, so subsequent releases by that company are tailored to match. Some differences exist in mixes from one studio to another, which given their disparity is understandable. Other differences exist from country to country, often reflecting local trends. An enormous section of the industry will follow whatever sonic trend is selling well at any particular time regardless of any reference to accuracy or neutrality.

*Personal preferences*—Who hears what, is as enigmatic now as ever. In the classical world alone, whether producers opt for Blumlein pairs, M+S microphones, coincident pairs, spaced pairs, *Soundfield* microphones, stereo pairs with spot microphones, close microphone multichannel recording with ambient pairs, or whatever other microphone system anybody would choose to use, is almost inevitably to some degree down to a personal preference. There is no doubt that some choices are forced by suitability due to restrictions in the recording environment but, nonetheless, subjective tastes have their very strong say in the matter.

Quite simply, some people gain more enjoyment from the dynamics and presence of close microphone techniques, some wallow in the spaciousness of stereo pairs, while others opt for just about all points in between. I do not believe that anything can, or even should be done about this. People listen to music for their own personal

pleasure. The problem for the recording industry is that no one combination of loudspeakers, amplifiers, crossovers or rooms, can be optimised for the most lifelike sensory illusions for all the choices of recording technique. When one adds to that equation the idioms and technical demands of the electronic/rock music industry, then have pity on the designers of reproduction systems, which are required to be all things to all people.

## Current dilemmas

We do not have the technology to produce such all-encompassing systems.

The classical concept of studio monitoring design has been to achieve 'the closest approach to the original sound', as the Acoustical Manufacturing Company so aptly stated in their advertising literature shortly after World War II. Unfortunately, only the absolute, definitive re-creation of the original soundfield would be free of compromise and even then, it may not ultimately achieve its objective. As this goal is neither achievable now, nor likely to be achieved in the foreseeable future, compromises must be made. It is these compromises that lead to endless subjective argument in the hi-fi press as to which loudspeakers or amplifiers are 'the best'; the lack of correlation between measured and perceived response only serving to fan the flames of the debate. Ironically, in order to achieve a realistic perspective on the problem, it would seem prudent to begin with something tantamount to a conclusion.

The 'absolute' goal of the re-creation of the original soundfield need not necessarily lead to the ultimate monitoring system for the following three reasons. First, the very introduction of the listener into that soundfield would disturb it in such a way as to render it no longer original. Second, with much modern, electronically generated music, an original soundfield never existed. Third, other sensory cues such as vision can have a very great bearing on overall perception such that what may be accurate, may not always be perceived as real. It is reality as opposed to pure accuracy that must be the goal of efforts to achieve practical monitoring designs. Reality in this sense being the overall transmission of an illusion that the producer intended to create.

A magazine editor asked me, jokingly, if I were implying that an odour of camel sweat would be desirable when listening to dance music from nomadic Arab tribes. I answered, "Probably", but that this would depend on whether the listener had previously experienced such smells in the context of the music. If so, then it is possible that a less definitively accurate system could 'sound' more natural and realistic with the addition of the odour, than a more definitively accurate system without.

## Sensory integration

While we deem ourselves to be 'listening' to a monitor system, in reality tactile senses are usually playing a relatively large part in our perception of events. The inability of headphones to vibrate one's chest cavity is a serious drawback in their ability to 'accurately' portray rock music or the proximity to the bass drum of a marching band. In a concert hall with what may be generally accepted to be a good acoustic, it would be very difficult if blindfolded, to locate with any degree of accuracy the position of a violin on

stage from a listening position half way down the hall. Visual cues can 'lock-in' our auditory localisation in such a way that ears alone cannot achieve. Herein lies one of the major caveats in monitor design: whose reality are we dealing with?

A well known studio designer was somewhat bemused to find that a control room he had built with a  $\pm 1\frac{1}{2}$  dB  $\frac{1}{3}$ -octave pressure amplitude accuracy was not being as well received as an earlier room, with the same amplifier/loudspeaker configuration but with only a  $\pm 3$  dB  $\frac{1}{3}$ -octave pressure response. He could not understand why this should be the case, especially as the new room definitely sounded better to him. Caipura and Deutsch<sup>7</sup> published findings on the use of monitor equalisation that have a great bearing on this designer's dilemma. They suggested that experience can allow us to expect certain characteristics from certain shapes, sizes and surface treatments in any given room. Upon entering a room, the brain can put a correction curve on to our perception in order to accommodate the anticipated effect of the room. Electronically superimposing the inverse of the room response upon the loudspeaker system with monitor equalisers will 'double correct' for the room; once electronically and once by the brain itself. The result would be the perception of an equalised sounding monitor system, which nevertheless offered a relatively flat response to a conventional analysing system.

The  $1\frac{1}{2}$  and 3 dB rooms discussed earlier were of a design in which virtually all the visual surfaces, other than the floor and the front walls, were fabric-covered frames concealing a great depth of acoustic 'trapping'. The rooms as seen by the eye were most definitely not the rooms as perceived by the ear. It is highly probable that in the two rooms referred to, the visual cues for the  $\pm 3$  dB room more closely matched the auditory expectation from that space than did the  $\pm 1\frac{1}{2}$  dB room, which contained considerably more complex acoustic treatment behind the scenes in order to achieve its very creditable pressure amplitude response. Indeed, the room had been built as an acoustical 'non-environment', which could initially fool the brain, especially as such things do not occur in nature.

Listening blindfold under similar circumstances, it is feasible that the  $1\frac{1}{2}$  dB room could be rightfully perceived as more sonically accurate than the 3 dB room but this raises some very interesting questions. If a person's sight began to fail over a course of months as opposed to years, then assuming the listener's hearing remained constant, would the preferred working environment shift from one studio to another as the visual relevance of the design became a lesser proportion of the overall sensory stimulus?

## Arbitrary nature of compromise

Given the aforementioned interrelationships of the senses, a wedge is immediately driven between certain of the compromise decisions that must inevitably be made when designing monitor systems for recording say, an electronically based rock band or a chamber orchestra in an auditorium. The latter generates a complex soundfield within its performing environment. Any attempt at capturing the 'natural' sensation of being there, will almost inevitably involve some form of binaural recording, where the positional cues for the listener, either live or

recorded, are essentially relying on inter-aural time and phase differentials. Spot miking of any instruments to be highlighted, or at the extreme, close microphone multitracking of the entire ensemble, would immediately destroy any attempt to re-create or capture an original soundfield. No such integrated soundfield ever existed! One would need to be a very strange animal indeed with a couple of dozen ears on long antennae in order to hear simultaneously what is going on 6 ft from every instrument or section in the ensemble, which is after all what the microphones are picking up. To help to make this unreality somewhat more plausible, overall pairs of ambience microphones may be used in an attempt to weld the whole thing together. Beautiful it may well sound but accurate it most certainly is not. Reproduced music is only an illusion.

The spot microphones, which may be used to highlight an instrument in an orchestral mix, will usually be panned into the overall mix by the ubiquitous panpot. The left/right positioning is largely based on amplitude differentials between the two channels and less on the phase and time cues of the main stereo pair. At the absolute extreme from the pair of microphones on the chamber orchestra is the entirely electronic generation of sounds for certain modern bands. These 'sounds' never actually exist as anything other than waveforms in a computer until they are first heard over the monitor system. The overwhelmingly vast majority of these sounds will be amplitude panned into the overall mix, after any amount of external ancillary processing has been carried out.

The ideal monitoring system would have a frequency response from DC to infinity with neither linear distortion (phase and amplitude)

nor non-linear distortions (harmonic, intermodulation, rattles) and would be sited in an acoustically neutral environment. The sound source would almost certainly not comprise two loudspeakers as is conventional today. As this ultimate goal is way beyond the technology of the 1990s, we must inevitably compromise our results. The very wide disparity in sound sources as discussed above, together with the consumer reproduction systems ranging from headphones, motor vehicle systems, conventional domestic hi-fi and audiophile systems, not to mention the myriad of other reproduction systems, render many of the design compromise points mutually exclusive. If quality were all important, it would seem more prudent to mix for 'hi-fi' and make compensations within the equipment of car stereos and the like, rather than compromise at the mixing stages. Unfortunately, this would involve extra cost in a very cost conscious consumer equipment market, and also involve the fitting of a switch for older, non-compensated recordings, with the attendant risk of consumer confusion. Commercial concerns are the problems here. No one system can be truly representative of the wide range of domestic systems and environments and no system designed for the phase and time subtleties of stereo pair pick-ups from an orchestra would be capable of delivering the earth shaking low end demanded by reggae artists, synthesiser bands or film soundtracks. We are faced with multiple systems for reference.

## Hidden objectives

In another paper<sup>3</sup> presented to the 8th AES Sound of Audio Conference in Washington DC,

David Moulton pointed out very strongly an underlying shift in a large portion of studio monitoring usage: the generally unacknowledged fact that certainly for a large percentage of the time, the monitoring system of a modern recording studio has become an extension of the sound production process, an extension of the computer-based instrumentation. That the loudspeaker itself has become, without formal recognition, the predominant musical instrument of our time. Music is being created on loudspeakers for playback by loudspeakers. There is no reality, there is no reference other than what is perceived in the mix, in the studio of origination. Given the disparity in monitor systems, that reference must be arbitrary.

Even the usual stereo pair of loudspeakers is following a pragmatic convention. It is relatively easy to site a pair of loudspeakers in roughly symmetrical locations in most rooms. Much of the commercial failure of quadraphony was due to the fact that most rooms have a door in at least one corner, or a window in the centre of a wall, each precluding a permanent symmetrical location for a four-loudspeaker set up. Having said this, however, there is no magical reason why two-speaker stereo should be capable of the ultimate audiophile's Utopia. It cannot! Among others, Michael Gerzon<sup>4</sup> has been strongly pushing the concept of three-speaker stereo as a greatly superior format. Much loudspeaker evolution has been dominated by the constraints of the possibilities from the two grooves of a vinyl disc. A third channel is easily realisable from a three-channel digital storage medium so, unshackled, we may soon begin to see moves towards multi-loudspeaker systems for the 'high end' of the market. Indeed, Gerzon's ingenious proposals

**Rycote**

Beware imitations!

The result of continual original research

WINDSHIELDS, SHOCKMOUNTS, WINDJAMMERS

Rycote Microphone Windshields Ltd  
Unit 6, New Mills  
Slad Road, Stroud  
Glos. GL5 1RN England  
Tel: (0453) 759338  
Fax: (0453) 764249

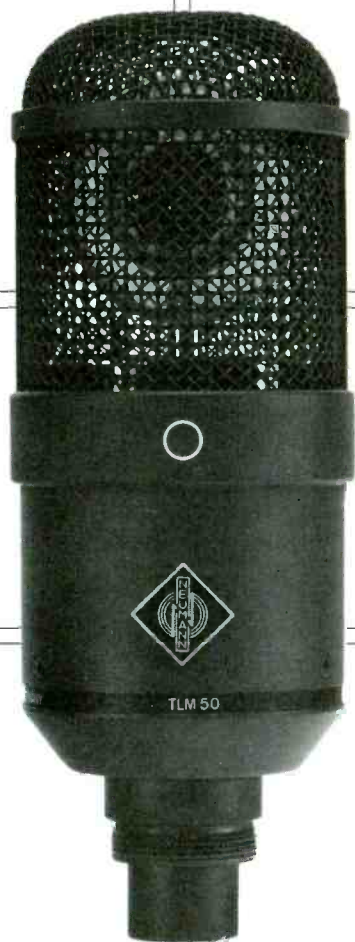


new  
from



neumann

See us at the Paris AES  
N51 Level L Hall Neuilly



### TLM 50 Pressure Microphone

- polar pattern omnidirectional
- high loadability, transformerless circuit
- small pressure capsule built-in in a 40 mm sphere
- nickel membrane

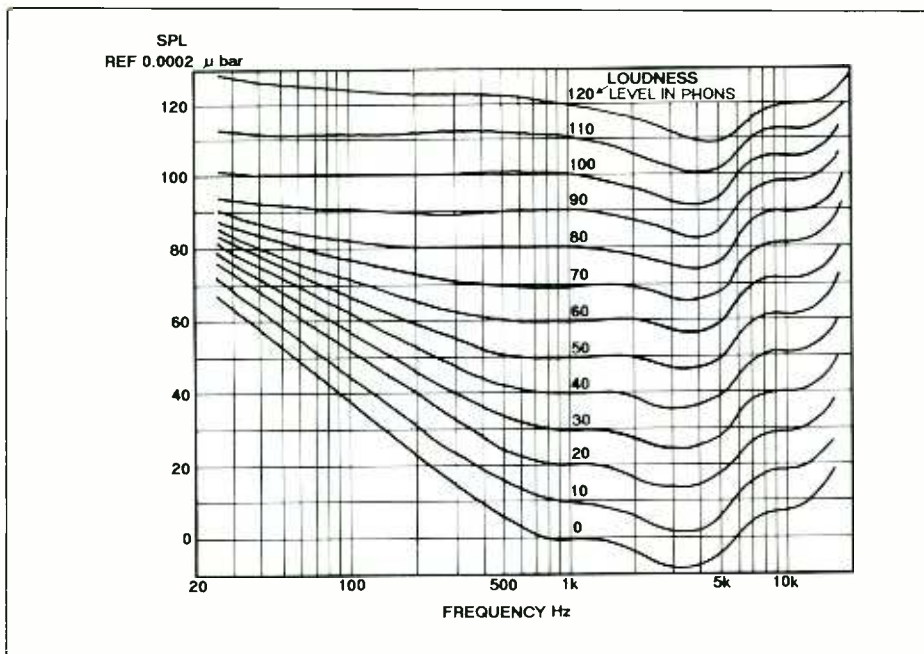


### KMS 140 and KMS 150 Condenser Soloist's Microphones

- polar patterns: KMS 140 cardioid / KMS 150 hypercardioid
- built-in very effective protection against pop- and other explosive sounds
- high-loadability, transformerless circuit
- extraordinarily true sound transduction free of coloration



Exporter  
AUDIO EXPORT GEORG NEUMANN & CO GMBH  
Postfach 1264  
Badstraße 14 · D-7100 Heilbronn  
Tel.: (49) 7131-6247-0 · Telex: 7 28 558 audex d



**Fig 1: Classic Fletcher and Munson contours of equal loudness for pure tones, clearly showing higher levels being required for equal loudness as the SPL falls. In other words, at 110 dB SPL, 100 Hz, 1 kHz and 10 kHz would all be perceived as roughly equal in loudness. At 60 dB, however, 10 kHz and 100 Hz would require a 10 dB boost, in order to be perceived as equally loud to the 1 kHz tone.**

would allow for total inter-format compatibility from three-channel stereo masters.

## Capturing the illusion

Music is essentially a medium for transmitting emotions from one being to another. The emotion or sentiment can be between persons, between a person and a place, a thing, or whatever. Music has little meaning if it carries no emotional content, so the ability of a monitor system to reproduce or aid in the creation of the music's emotional content is a very high priority in its design. A technically poor loudspeaker will rarely fulfil the demands of full emotional transmission, yet a technically excellent loudspeaker may not faithfully carry the intended illusion and feeling.

Two monitor systems, remarkably similar when measured in terms of conventional performance parameters, may be markedly different in their ability to deliver the nuances of an artistic performance. It is in this area where we run into the real conflicts of opinions. In previous pages, we discussed the possibility of a person with gradually failing sight changing his or her preference between two control rooms as the visual input into the total sensory equation gradually reduced. In a different way, two measurably similar loudspeaker systems may be deemed better or worse, one to the other, entirely down to the fact that one listener may have a preference for the subtle timbral characteristics of one of the two, especially when reproducing the music and instruments to which that person usually listens. Ironically, should that listener proceed to listen to music of a type they would typically avoid it is not inconceivable that the decision would be reversed in terms of subjective timbral neutrality.

Let us suppose a listener's preference in music were for recordings of string quartets using stereo microphone pairs. Time and phase accuracy would be fundamental performance requirements for the reproduction of the string quartet in order to

achieve timbral neutrality and spatial discrimination from the stereo pair recording. Reproduction of such a performance may have to be achieved at the expense of the generation of high sound pressure levels and some bass extension. Anyhow, there is no need in terms of definitive accuracy to be capable of reproducing music at any level above that which can be achieved by the real thing. A violin at 120 dB could not possibly be accurate because a violin can never generate 120 dB in real life. Reproduction at higher levels will, as a function of our hearing responses, cause us to perceive the instrument to be top and bottom heavy at larger than life SPLs. The classic Fletcher-Munson curves in Fig 1 illustrate this point well.

In order to approximate more closely to a coincident source, thus enabling time and phase accuracy over a reasonable listening area, the loudspeaker unit may have to be reasonably small, which in turn will place limitations on the maximum SPL, particularly at low frequencies. So this system may well, in an appropriate room, sound remarkably neutral while reproducing the string quartet but what of the rock band with heavily predominant bass guitar and bass drum? Almost certainly, the recording would be via a close microphone technique with positional imaging being panned in a purely amplitude domain. Phase and time performance characteristics would still be important for timbral neutrality but any subtle degradation in mid-range tonality may well be a very small price to pay for the powerful bass extension at the naturally high SPLs of some rock music. In order to recreate the sensation of sitting 10 ft in front of a drum kit in an ambient room, a very high SPL capability is essential for a suitable loudspeaker's performance characteristics.

In terms of true accuracy, the natural amplitude of reproduction is just as important as any other parameter. Just as absurd as a solo violin at 120 dB is a close microphone recording of a full drum kit at 70 dB. Neither can be considered natural. Given the imperfections in the systems, the compromise points for reproducing different music can be forced to very different locations due

to some of the mutually exclusive constraints of the real world. High SPLs demand large physical size, while time/phase accuracy demands small size, to enable compact location of the drivers for a coincident source approximation. The larger systems can, of course, be optimised for time/phase coherence but only for one point in space, elsewhere, alignment errors will normally be greater than those for a well aligned, physically smaller system.

If listeners favour a certain genre of music then they may well choose a loudspeaker system that is more desirably 'accurate' than another. A differing musical programme, however, may change that decision and here there is full justification for one person using two different monitoring systems depending on the type of music being recorded.

## Specialist systems

Purists may grimace at the 'different monitors for different music' concept but we must be aware of all of the underlying reasons. The enormously wide range of end user systems will ensure that whatever subtleties lie within a mix, on disparate systems, some will be highlighted and some degraded. The main object of the monitoring environment is to allow the producers, engineers and artists to be aware of the existence of as many subtleties as possible in order to make them available to the creative process, in the sure and certain knowledge that they will not all be manifest on any one domestic system. It is now effectively *de rigueur* to take home the final mixes for assessment on several systems before the recording is available for general release.

There are certain limitations common to all loudspeakers. Much modern studio-created music will be heard only over loudspeakers: the total overall performance never existed in real life. There has been an insidious acceptance of loudspeaker limitations, which has led to such limitations even being exploited to advantage in the recording/reproducing processes. Music—created on loudspeakers for performance by loudspeakers.

## Summing up

We therefore, have differences of opinion on musical type, musical performances, relative balances, dynamic close microphones or spacious pairs, and even almost immeasurably small subtleties of texture, which may be of great significance to one listener while totally escaping another. Standardisation of the major parameters is a very worthwhile goal but absolute agreement upon the order of priorities will probably not exist until either human beings are cloned, or until loudspeakers and rooms can be produced with responses several octaves beyond conventional audio limits, and power response errors in the region of one part in  $10^{12}$ .

### References

- 1 Floyd E Toole, *Loudspeakers and rooms for stereophonic sound reproduction*, AES preprint 8th International Conference on *The Sound of Audio*, Washington, DC, (1990)
- 2 Dennis R Caipura & Ors, 'Audio fidelity: the grand illusion', *Recording Engineer and Producer*, Vol 20, No 11 (Nov 1989)
- 3 David Moulton, *The creation of musical sounds for playback through loudspeakers*, AES preprint 8th International Conference on *The Sound of Audio*, Washington, DC, (1990)
- 4 Michael Gerzon, 'Three channels—the future of stereo?', *Studio Sound*, Vol 32, No 6 (Jun 1990)



# CLASSIFIEDS

Advertisements for this section must be pre-paid. The rate is £1+VAT per word, minimum £20.00+VAT. Box Nos. £10.00+VAT. VAT (UK only) & rate \$2.00 per word, minimum \$50.00, Box No. \$10.00 extra. Semi-display rates on application. Copy and remittance for advertisements in APRIL '91 issue must reach these offices by 15th FEBRUARY addressed to: The Advertisement Manager, Studio Sound, Link House, Dingwall Avenue, Croydon CR9 2TA. Cheques made payable to Link House Publications (Croydon) Ltd. Note: Advertisement copy must be clearly printed in block capitals or typewritten.

Replies to Box Nos. should be addressed to the Advertisement Manager, Studio Sound, Link House, Dingwall Avenue, Croydon CR9 2TA, and the Box No. quoted on the outside of the envelope. The district after Box No. indicates its locality. **SEX DISCRIMINATION ACT 1975:** No job advertisement which indicates or can reasonably be understood as indicating an intention to discriminate on grounds of sex (e.g. by inviting applications only from males or only from females) may be accepted, unless (1) the job is for the purpose of a private householder or (2) it is in a business employing less than six persons or (3) it is otherwise excepted from the requirements of the Sex Discrimination Act. A statement must be made at the time the advertisement is placed saying which of the exceptions in the Act is considered to apply.

The attention of advertisers is drawn to "The Business Advertisements (Disclosure) Order 1977", which requires that, from 1st January 1978, all advertisements by persons who seek to sell goods in the course of business must make that fact clear. From the above date consumers therefore should know whether an advertisement relates to a sale by a trader or a private seller.

## SERVICES

**CASSETTE DUPLICATING:**  
**GAUSS Loop-Bin / TELEX In-Cassette**  
**High Quality Blanks / Label Printing**  
**OPEN REEL DUPLICATING**  
 (ANY SPEED - ALSO TO BROADCAST SPEC.)  
**SPEECH RECORDING**  
 (VOICE-OVERS; LANGUAGES; AUDIO-VISUALS)

**SPEECH-PLUS RECORDINGS LTD.**  
 UNIT 32, NO. 19, PAGES WALK, LONDON SE1 4SB. TEL: 071-231 0961

### FOR ALL YOUR RECORDING NEEDS

AMPEX · BASF · MAXELL · AGFA · JVC  
 AUTHORISED NATIONAL AUDIO/VIDEO TAPE DISTRIBUTOR  
 Spools, boxes, blades, splicing and leader tape. Blank custom wound cassettes C1-120, labels, library cases and cards. C-zeros, pancake, etc. Broadcast Cartridges.

 **12 Britannia Road**  
 Sale, Cheshire M33 2AA  
 Tel: 061-905 1127  
 SOUND AND VIDEO SERVICES  
 FOR QUALITY, PRICE AND SERVICE

### EAST MIDLANDS AUDIO

**STUDER-REVOX**  
**NEW AND USED SALES**  
**SERVICE - SPARES**

APPROVED CONVERSIONS  
 A807-A807 VU: POA

#### MACHINES CURRENTLY IN STOCK

STUDER C37, 7½, 15 IPS STEREO	£1,000.00
STUDER A62, 7½, 15 IPS STEREO	£750.00
STUDER B62, 7½, 15 IPS STEREO	£1,200.00
STUDER B67, 7½, 15 IPS STEREO	£1,750.00
STUDER A80, RC, VU MK TWO	£2,200.00
STUDER A80, VU MK ONE	£2,200.00
STUDER A80, 16 TRACK 15. 30	£4,800.00
STUDER B67, Portable VU	£1,800.00

ALL MACHINES FITTED WITH NEW PARTS AS REQUIRED

REVOX A700 AS NEW	£850
REVOX B77 MK TWO HS NEW	£1,300.00
REVOX PR99 MK THREE NEW	£1,850.00
REVOX C270 HS NEW	£2,450.00
REVOX C270 TIMECODE	£3,050.00

ALL + VAT

**TEL 0246 275479**  
**FAX 0246 550421**

## THE COMPLETE SERVICE.....

**D·I·R·E·C·T·**

- Record Pressings
- Cassette Duplication
- Compact Discs
- Post Mastering
- P.Q. Encoding
- Print & Reprographics
- Video Duplication
- Competitive Prices
- Free Quotations

*Make it with us*  
*We make the hits*

**SRT**

MARKET LEADERS

☎ 081-446 3218 LONDON

☎ 0480 61880 CAMBRIDGE



### THE CASSETTE DUPLICATING SPECIALISTS

Real time & high speed loop bin duplication, printing & packaging. Blanks wound to length  
 TEL: 061-973 1884



### TAPELINE

Blank & Duplicated Cassettes

New Tapematic Loop Bin Duplication & Loading High Spec Professional Bin Mastering

- \* 120+ Real Time Duplication
- \* Ferric & Chrome Cassette supplies
- \* Printing & Packaging, cases & accessories.

FOR HIGH PERFORMANCE CASSETTES

CALL 061-344 5438

Tapeline, Unit 2, York Works, York Street  
 Audenshaw, Manchester M34 5HD

### MASSED NAKAMICHI'S IN LONDON!

ULTIMATE QUALITY REAL TIME CASSETTES  
 UNBELIEVABLE RATES \* DAT TO DAT COPYING  
 AND EDITING \* BLANKS WOUND  
 \* COMPUTER PRINTED LABELS

AURAL CASSETTES 081-460 7435

### jbs records

### MUSIC-SPEECH-DATA

REAL-TIME/HIGHER-SPEED Quality Cassette Duplication and Blanks from 1-1000. Computer printed Labels. Solo, V, Ysel, Sony Betamax or R-DAT recording Fast Security Delivery service.

FILTERBOND LTD, jbs records div. FREEPOST  
 19 SADLERS WAY, HERTFORD, SG14 2BR 0992-500101

**MIDICATION:** All engineering, sound design and programming includes S1000, D50, M1, Minimoog, TX7, Cubase. Reasonable rates for extensive experience, tours undertaken. Peter Cornell 081-675 2571.

**WANTED: DEAD OR ALIVE!** Pultec EQs; Fairchild & Teletronix Limiters; Neumann, Telefunken, AKG, RCA and Schoeps microphones. Tube McIntosh or Marantz amps and preamps. Sontec, ITI and Lang EQs. Neve or API equipment. Boxes of old tubes; Urei, Orban, United Audio, dbx and other outboard gear. Ampex ATR102s or 104s. Parts for MCI JH110/114 recorders. Altec 604s/crossovers/Tannoy speakers, JBL 2231; Altec 288h drivers. Miscellaneous equipment of all types. Please contact: Dan Alexander Audio, 2944 San Pablo Avenue, Berkeley, CA 94702. Tel: (415) 644-2363. Fax: (415) 644-1848.

HIGH SPEED HIGH QUALITY LOOP-BIN  
 DUPLICATING BY SRL TAPE SERVICES

REEL-REEL	IN...OUT	QUALITY CASSETTES
<ul style="list-style-type: none"> <li>● DOLBY A</li> <li>● NAB</li> <li>● IEC</li> <li>● FT PCM DIGITAL</li> </ul>		QUALITY CASSETTES
AUDIO CASSETTE		QUALITY CASSETTES
<ul style="list-style-type: none"> <li>● DOLBY C</li> <li>● DOLBY B</li> </ul>		QUALITY CASSETTES

THE BETTER THE MASTER, THE BETTER THE COPY!  
 HOW MANY WOULD YOU LIKE? 100-5000  
 081-828 3555 081-268 5555 PHONE FOR PRICE CHECK

# TRIDENT DI-AN

40 x 32 x 32  
RIGHTHAND PATCHBAY

96 CHANNELS  
AVAILABLE ON REMIX

CONSOLE APPROX. 2 YEARS OLD

SUPPLIED WITH  
VERSION 2.1 SOFTWARE

AVAILABLE WITH  
AUDIO KINETICS  
REFLEX AUTOMATION SYSTEM

FULL TECHNICAL REPORT  
AVAILABLE ON REQUEST

**RING NOW**  
ON  
(0932)  
**872672/874768**  
FOR MONTHLY  
MAILSHOT



NORTH LODGE, STONEHILL ROAD, OTTERSHAW, SURREY KT16 0AQ.  
TELEPHONE: 0932 872672 INTERNATIONAL: +44 932 872672 FAX: 44(0) 932 874364

## ADVERTISERS' INDEX

AESD	42
AKG	49
AMEK Ltd	28, 46
Ampex UK	81
Amsound	54
AMS Industries	18/19
Audio Design	84
Audio Precision	83
Audio Research & Technology	63
Britannia Row	23
Bruel & Kjaer	54
BSS	47
Citronic	20
DDA	39/41
DACS	69
Dennis the Fox	31
Digital Audio Research	51
Drawmer Distribution	65
Dynaudio Acoustics	59
Eela Audio	20
Focusrite	IPC
GLW	67
Genelec	12
HHB Communications Ltd	11, 17
Hill Audio	36
The Home Service	82
H/W International	14/15
JBL	57
Klark-Teknik	26, 27, 75
Larking Studio Furniture	48
Leonardo Software	71
Lyrec Manufacturing	45
MS Audio	65
Media Products	63
MM Technology	23
Neumann	87
New England Digital	73
Otari	9
Rane Corporation	76
RTW	6
Rycote Microphone Windshields	86
Saturn Research Ltd	IBC
Scheeps	71
Seem Audio	69
Solid State Logic	4
Sony Broadcast Ltd	34, 35, 52, 53
Soundcraft Electronics	IBC
Soundtracs	60
Sowter Ltd	69
Studio House Audio	63
Studio Magnetics	61
Summit Audio	40
Surrey Electronics	64
Teac UK	32, 33
Thatched Cottage Audio	74
Trident Audio	25
Yamaha	23

## PARTRIDGE ELECTRONICS

- ◆ Two Mic. Inputs + Line Input ◆
- ◆ Auto - Manual Control ◆
- ◆ D.T.M.F. or L.D. Dialling ◆

OUTSIDE BROADCAST UNIT

EASY TO CARRY

FLIGHT CASE

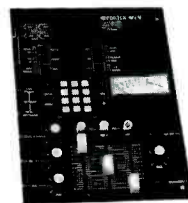
BROADCAST OVER

STANDARD PHONE NETWORK



## REPORTER

Model T26



UNIT D  
318 HIGH ROAD  
BENFLEET  
ESSEX SS7 5HB  
TELEPHONE: 0268 793381

**QUALITY CASSETTE MASTERING AND COPYING.** any quantity, Video duplication PAL/NTSC/SECAM transfers, 24 hour, seven days a week service. G.W.B.B. Audiovision, 42 Lancaster Gate, London W2 2NA. Tel: 071-723 5190.

**TRIDENT TSM 32x24 MIXER.** This desk is absolutely immaculate and is in new condition, was custom built to my order by Trident 3 years ago and installed in my private studio, the desk has countless modifications by Trident including LED metres throughout, all switchable PPM or VU characteristics. The mainframe has been built longer to house 19 inch outboard effects, improved patchbay, all channels in quadraphonic, can be used for extra sends. 56 channels fitted, would accept a further 12 channels. Many more modifications too numerous to mention. Retirement from music business forces sale. £27,000. May consider finance or leasing terms. Tel: 0757 638106.

**THE COMPLETE SERVICE.** Disc cutting, pressings, duplicated cassettes and blanks. Bin Masters. Location Recording. Free Brochure. Tam Studio, 13a Hamilton Way, London N3 1AN. Tel: 081-346 0033. (X)

**DISC CUTTING EQUIPMENT** and systems bought, sold, installed and manufactured by TAM/ENGLAND, 13a Hamilton Way, London N3 1AN. Telephone: 081-346 0033.

**LOCKWOOD, TANNOY,** etc. New and used equipment bought, sold, serviced. Authorised Tannoy specialist. Lockwood Audio, Tel: 0923 210254 Fax: 0923 240558.

**RARE BARGAIN!** A matched pair of Bruel & Kjaer 4006X omni-directional microphones; 48-V Phantom-powered. Little-used, as new, original cases and frequency charts. Complete with mounting clips, windscreens and extra capsule grids. They perform as a superb stereo pair. Only £500 each, including VAT. Tel: (0222) 514403.

## STUDIO SOUND

AND BROADCAST ENGINEERING

### CIRCULATION DETAILS

**STUDIO SOUND** is available without charge to key personnel actively engaged in sound recording in any part of the world. Copies must be individually requested. Non-qualifying readers will be notified in writing and invited to take out a subscription (see below for details)

**NEW READER ENQUIRIES:** Link House Publications plc, Link House, Dingwall Avenue, Croydon CR9 2TA. UK. Tel: 081-686 2599

**EXISTING READER ENQUIRIES:** Circulation Dept, Studio Sound, Link House Magazines Ltd, Central House, 27 Park Street, Croydon CR0 1YD, UK

Changes of address should be notified in writing to this address and the label containing the old address and reference number should be enclosed to ensure accuracy

**SUBSCRIPTION ENQUIRIES:** Subscription Dept, Studio Sound, Link House Magazines Ltd, 120-126 Lavender Avenue, Mitcham, Surrey CR4 3HP. UK

The cost of an annual subscription to **Studio Sound** is:  
UK: £24.00  
Overseas surface mail: £30.50/US\$52  
Overseas air mail: £52.50/US\$89  
USA airspeeded delivery \$70  
The publishers reserve the right to refuse applications considered inappropriate and restrict the number of free copies sent to any one company or organisation



S

# THE PEDIGREE IS SOUND



THE SATURN 624

To win in today's competitive recording market: to enhance the quality of your clients recordings, *and* to remain within a tight budget, you need a special breed of multitrack.

The Saturn 624 *is* such an animal.

At less than \$20,000 it brings top studio specifications within reach, combining cost effective engineering with exceptional reliability and the stunning audio purity of it's stablemate,

the Saturn 824.

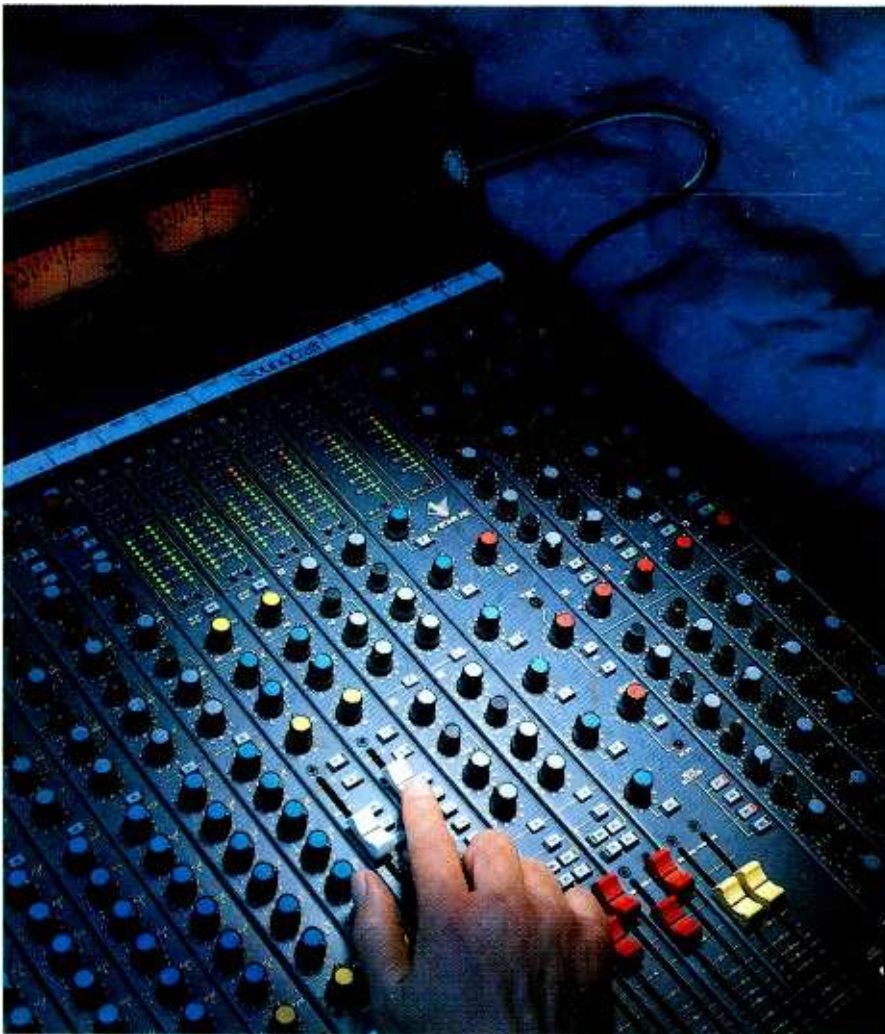
With this pedigree it's rather a foregone conclusion that the Saturn 624 multitrack, the new thoroughbred, will be a winner.



<b>AUSTRIA</b>	AUDIO SYSTEMS	01 910 4545	<b>FRANCE</b>	EDLCO	(1) 43 63 97 45	<b>ITALY</b>	AUDIO EQUIPMENT	(059) 2000312	<b>SPAIN</b>	LEXON	203 48 04
<b>BELGIUM</b>	MILL'S MUSIC CENTRE	3 828 92 30	<b>GERMANY</b>	G.T.C.	41 02 62062	<b>INDIA</b>	PROFOUND	022 6269147	<b>SWEDEN</b>	TAL & TON	021 80 36 20
<b>CANADA</b>	SOUNDRAFT CANADA	514 685 1610	<b>HONG KONG</b>	MEGA AUDIO	67 21 2636	<b>NETHERLANDS</b>	J.T.M. PRODUCTIONS	035 211920	<b>UK</b>	LARKING AUDIO	0462 422466
<b>EGYPT</b>	ALPHA AUDIO	(202) 245 6199		AUDIO CONSULTANTS	3513628	<b>NORWAY</b>	LYDROMMET	(02) 370218	<b>USA</b>	REDWOOD MARKETING	615 254 7400

# What singles out the Venue as the best PA desk in its class?

SOUNDCRAFT ELECTRONICS LTD. UNIT 2, BOREHAMWOOD INDUSTRIAL PARK, ROWLEY LANE, BOREHAMWOOD, HERTS. WD16 5PZ, ENGLAND TEL. 041-207-5050 TLX. 2119K SCHAFT G. FAX. 041-207-0194 H A Harman International Company



○ The Soundcraft Venue is certainly full of surprises.

Like the stereo return module.

Complete with width control and linear fader, its full stereo capability gives unique versatility for front-of-house mixing, a feature normally associated with more expensive desks. ■ ■

But our surprises don't stop there.

An alternative dual group module (fitted with Soundcraft's famous 3-band Equaliser) can also be specified.

And together with the option of a powerful matrix module Venue's output flexibility is enhanced in even the most demanding situations.

What's more, with a choice of mono and stereo inputs (with or without mute group facilities) you can specify as many individual configurations as you like.

Such Soundcraft design cunning means that you won't find any other console that's as compact and versatile. ■

And one that also fits perfectly into your budget.

As usual, Soundcraft is in a class of its own. ●

Soundcraft  
**VENUE** 