

MAY 1993

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STUDIO SOUND

AND BROADCAST ENGINEERING

THE INTERNATIONAL
PRO AUDIO MAGAZINE

TAPE LIFE
AN ERA OF CON

DAT92

Digital Audio Professional Audio App

DAT

ACCURACY SOUND
FORMER METAL PARTICLE

DAT ON TRIAL

How Safe Are Your Masters?

Eight Leading Tape Brands Tested

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One of three Scenarias at
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AND BROADCAST ENGINEERING

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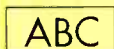
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The Right Stuff

What qualities define a satisfactory piece of equipment? In addition to specific functional requirements, the key factors are those such as ease of operation, reliability and cost-effectiveness. Becoming more specific to the recording studio, factors like size and heat dissipation come into play. Put these considerations alongside application specific requirements and it seems unlikely that the demanding roles played by most of the equipment we use could be filled by anything other than a purpose-designed and built units. Obviously, it is for this reason that the recording activities of the audio industry are supported by companies heavily involved in advanced research and manufacturing processes.

Yet there are conspicuous examples of 'chance placings'—instances where equipment intended to fulfil some other role has found itself well, if not perfectly, suited to a studio function. An obvious example of this is that of the Atari *ST*; designed as a relatively cheap games computer (with pretensions toward being a small business PC), the humble *ST* readily found itself adopted as the 'standard' music computer in Europe. Part of this can be attributed to the presence of MIDI ports on the machine—popularly rumoured to have been included at the request of Jack Tramiel's son—and part to the flexible nature of a computer. This latter point is borne out by the use of another home computer, the Commodore *Amiga*. The *Amiga*'s main selling point was the powerful graphics it made available for computer games programs, and it was this quality that has seen it used in the production of professional graphics for television, for example. More recently, the *Amiga* has found itself part of the fully professional Questech *Charisma Cleo* digital video processor.

Of course, this phenomenon is not limited to computers or to the recording studio. Simply broadening the scope to include the performance of music we can include the Hohner *D6 Clavinet* which was actually designed to be an electric version of the spinet rather than the '70s 'funk machine' it turned out to be. And there is the charming application of replacement Mini clutch cable as an ideal replacement for broken Wurlitzer piano sustain pedal cables. All these pieces of equipment had what might be termed 'the right stuff'.

Returning to the studio, the most significant current example of subverted technology has to be that of DAT. Originally designed as a consumer format but blocked by politics, DAT is now in everyday use as a 'professional' audio format (as well as having found further favour in computer circles as a data backup medium). To this end, there are an increasing number of 'professional' DAT machines appearing on the market. But DAT is not without its detractors. Having lost recordings in the past through tape decay of various sorts, it is not surprising that certain professionals are alarmed by this acceptance of DAT—the cassettes are small and easily lost, the tape is narrow and thin and its storage properties have yet to be put to the acid test of time.

DAT is growing in popularity, and if it is to command the faith of professional users, we need to know more about its performance. It is for this reason that this issue of *Studio Sound* carries a bench test on various manufacturers' tapes, including ageing tests carried out in a purpose-built environmental chamber. The results published here should help us all to acquire a better insight into the merits of Digital Audio Tape, and an update which will appear in a later issue will provide further data on ageing. The jury is in recess; does DAT have the right stuff? We shall see. ■

Tim Goodyer

Cover: DAT tapes

Photography: Nik Milner

In-brief

● The founder of Trident Audio, Malcolm Toft has formed a new console manufacturing company, Malcolm Toft Associates Ltd (MTA). The first product from the company was shown at the Berlin AES and was the *Series 980* console—a split input-monitor design offering 32, 40 or 48 inputs. MTA. Tel: 0252 318700.

● Touchwood, a new studio in Leeds, UK, has opened offering music composition, production and recording; music technology training and consultancy; and remixing, MIDI preproduction and digital editing.

Just to prove we do like to encourage music production north of Watford. Tel: 0532 787180.

● CTS Studio One has just completed their largest film soundtrack recording sessions of the year so far—Sylvester Stallone's *Cliffhanger* movie. 90 musicians from the London Philharmonic Orchestra have been playing music by Trevor Jones. CTS. Tel: 081 903 4611.

● HHB Communications have increased their distribution throughout North America, with the appointment of Independent Audio of Portland, Maine as the company's stateside business coordinator. Contact Fraser Jones, Independent Audio, 295 Forest Avenue, Suite 121, Portland, Maine 04101-2000, USA. Tel: +1 207 773 2424. Fax: +1 207 773 2424.

● Saki Magnetics is expanding its product line of professional magnetic recording heads and launching a sales campaign aimed at marketing 1/4-inch, 1/2-inch, and 2-inch heads to broadcast and recording studios. Tel: +1 818 880 4054.

● AMS-Neve and OLE Ltd have collaborated to produce an interchange format which allows the transfer of audio on magneto-optical disk from a OLE produced *Lightworks* nonlinear video system to an *AudioFile* nonlinear audio system.

In a separate announcement AMS-Neve have decided to participate in Avid Technology's Open Media Framework Interchange OMFI. AMS-Neve join over 50 other companies from the computer, video, film and audio industries who are working together to develop formats for the exchange of digital information. 'The establishment of standards for data interchange obviously has significant implications for the future of postproduction techniques' commented AMS-Neve MD Mark Crabtree.

Queen's Award

Solid State Logic (SSL) has been awarded a 1993 Queen's Award for Technological Achievement. The award has been made for SSL's digital audio editing systems which are used in TV, video and film soundtracks around the world. The latest award complements SSL's two previous Queen's Awards for Export.

Managing Director, John D. Jeffery commented, 'The Queen's Award for Technological Achievement is the most prestigious award to be conferred on SSL for its success with digital technology. We are honoured and delighted to receive this award, and welcome it as recognition of the imagination and technical excellence of our design and engineering team.'

SSL has enjoyed worldwide success in recent years with its family of digital recording, editing and mixing systems. The company's *ScreenSound* simplifies the recording and positioning of sound to picture with operation controlled by strokes of an

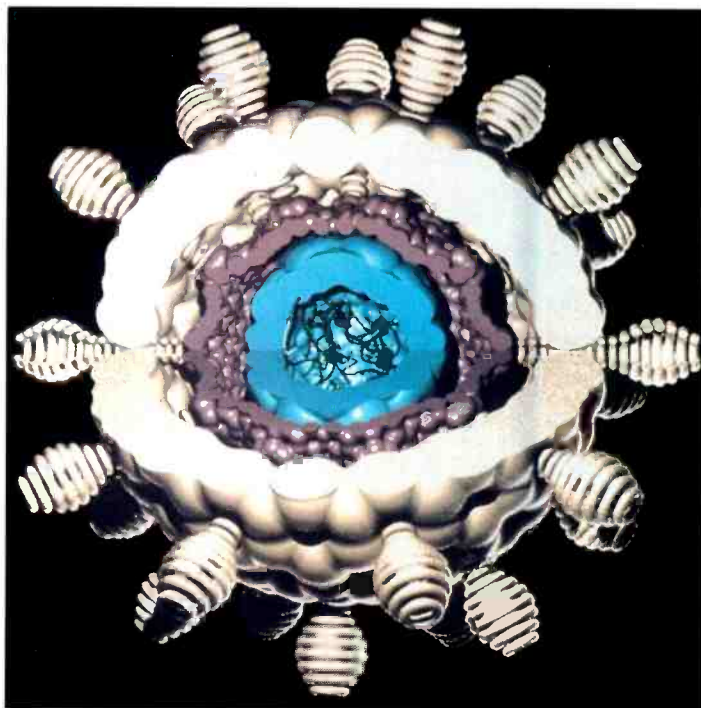


SSL's MD John D. Jeffery, seated, and Engineering Director Phil Hill.

electronic pen on a computer graphics tablet. Their sound networking technology, *SoundNet*, allows operators to work on the same or diverse soundtracks. The latest addition to the digital family, *Scenaria*, integrates digital pictures and sound in the one system.

The company's recording and mixing systems are also responsible for producing over 70% of No.1 singles, according to a recent survey conducted by *Billboard* magazine.

Solid State Logic's sales around the world last year amounted to £28m. Solid State Logic, Begbroke, Oxford, OX5 1RU, UK.



London-based Red Alert specialise in the generation of animated graphics for science and documentary programmes. This animation was from a recent Channel 4 programme *The Puzzle of HIV* and generated on a Sun SPARCStation IPX the standard multimedia workstation

AMS-Neve launch Logic 3

At last month's NAB Convention AMS Neve officially launched their *Logic 3* digital mixing console, although a prototype was seen at the Berlin AES Convention in March. The new mixer is being marketed as low-cost at around £40,000 (\$60,000) and will operate alongside *AudioFile*; *Logic 3* uses an assignable control surface which incorporates four motorised faders, 12 Logicators controls and a high resolution colour TFT screen.

In its maximum configuration, the desk allows control of up to 32 mono or 16 stereo inputs, 8 mono or 4 stereo subgroups, a maximum of 4 stereo aux sends and 1 stereo main output.

ERRATUM

The studio which graced the December issue was Marco Film in Montreal, designed by Daniel Saguin of DanAudio Inc and constructed by Patrick Bernsen. The apples visible on screen behind the Euphonix CSII were from Jean Claude Lauzon's film, *Leola*. ■

● AMS-Neve also announced a price review at NAB for the *AudioFile* hard disk editor and *Logic 1* postproduction system. Cost savings resulting from the 'rationalisation of manufacturing operations at the time of the merger' are being passed on to customers in price cuts of up to 50%.

DISQ tests start

Initial studio testing on the AT&T *DISQ* Digital Mixer interface to SSL *G Series* consoles have started at Masterfonics Studios in Nashville. *DISQ*'s interface to Neve *VR* consoles equipped with GML *Series 2000* automation was developed by George Massenburg Labs last year. The interface to Neve *VRs* with *Flying Faders*, developed by Martech, a division of Martinsound, was completed in February.

DISQ works in conjunction with the most popular analogue consoles in use today, and its software based to accommodate future advances in technology. The core of the system is the AT&T parallel processor, a powerful DSP originally designed to support such applications as radar and sonar signal processing, speech recognition and object recognition.

Planning is under way for customer trials of *DISQ* at major

studios in New York and Los Angeles this spring and summer. Three studios in Tokyo will also try out the system.

AT&T Digital Studio Systems.
Tel: +1 919 279 7680.

Wanted! Inspired Recording

The Inspired Recording Company are looking for unique, original and inspired instrumental music with a view to commissioning five artists to write material for international commercial release on CD.

The company has been formed on the premise that there is a huge untapped resource of talented musicians and composers who are creating music which is falling outside the constraints of current commercial trends.

The company is therefore asking for submissions of demo tapes but with a few restrictions. Entries should be as far as possible removed from the three-minute-pop song or established genres. For that reason they are looking at instrumental music, although any music using the human voice as an instrument as opposed to a vehicle for lyrics, is more than welcome.

Inspired Recording Company,
Sonia House, 32 Shaftesbury Road, Watford, Herts, UK.
WD1 2RQ.

The Radio Stars

The 1993 Sony Radio Awards attracted a large and star-studded audience in London recently. Among the 33 categories intended to celebrate the achievements of radio broadcasting in the UK were awards for News and Current Affairs (won by *Good Morning Ulster* and *File on Four*), phone-ins (won by Radio 2's *Hayes over Britain*) and best actor and actress. Additionally, there were special awards recognising the best local station (Oxford's Fox FM), metropolitan station (Clyde 2), national station (Classic FM), as well as Sony's own Special Award which went to radio journalist Misha Glenny. The Radio Awards Gold Award was presented by Willie Rushton to jazz veteran Humphrey Lyttleton.

One of the disappointed parties were the Capital Radio team who put together the entirely digitally



Abbey Road Studios have installed an AMS-Neve VRP Legend console

Birth of a Legend at Abbey Road

Abbey Road Studios have installed an AMS-Neve VRP Legend console in their large orchestral Studio 1. This, along with the SSL 8000 series in Studio 3 and the AMS-Neve Capricorn in the Penthouse, is the third console to be purchased by the studio in under a year.

The 64-input Legend is fitted with Flying Faders and replaces a seven-year-old SSL 4000E. The console may, however, be acting as a stopgap as plans to install a second Capricorn console in Studio 1 are a strong possibility—Abbey Road have been given the option to swap desks once they have made a thorough appraisal of Capricorn. The studio's technical manager, Neil Aldridge, commented that it was still too early to make a firm commitment to

Capricorn.

'We had a sticky period just before Christmas,' admitted Aldridge, 'but we're positive that we're back on line now and that the latest software revision has sorted out all the small bugs. The decision whether or not to install Capricorn in Number One will be totally client driven and once we get some constructive feedback we'll think very seriously about its suitability.'

In anticipation, Studio 1 has been prewired for Capricorn to allow for the quickest possible changeover. The opportunity has also been taken to build a new front end to the control room which houses B&W Series 3 Matrix 801 speakers (left, centre, right), B&W subwoofers and video monitors.

Patrick Stapley



An invisible Danny Baker along with Terry Wogan, Caron Keating and Producer John Inverdale receive the Sony Radio Award for Outstanding Sports Broadcasting from Olympic Gold rowers Johnny and Greg Searle

produced Michael Jackson—*King of Pop* late last year. Although nominated for both the Documentary Feature and Popular Music Programme awards, the Capital production secured neither. Instead, Radio 4's *Soundtrack: Jason and the Thunderbirds* and Radio 1's *Unsung Heroes* took the honours.

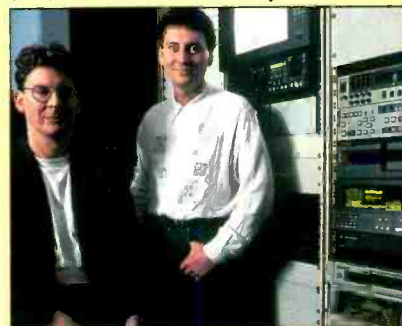
Additional glamour was lent to the

event by the choice of presenters such as Emma Freud, Louise Lombard, Chris Eubank and Francine Stock—though sadly less by the inclusion of Jeremy Beadle and David Mellor.

Terry Wogan's thank you to Danny Baker for not showing up to accept the Outstanding Sports Broadcast award for Radio 5's coverage of the Barcelona Olympics and John ►

Contracts

- Tokyo's NHK Corporation have recently ordered a Logic 2 and two AudioFile Opticas from AMS-Neve to equip their new HDTV postproduction facility in Tokyo
- DigiDesign in California has chosen a D&R Orion console to complete their in-house studio.
- ▼ Silk Sound and The Bridge have installed Sony DVR28P D2 and Panasonic AJD 350 D3 to add to Beta SP, 1-inch, BVU SP, VHS and U-Matic capabilities, linked to all seven studios from a central bay



Robbie Weston and Rick Dzendzera of Silk Sound and The Bridge

- BBC Scotland has bought a Lightworks nonlinear video and audio system with five hours storage capacity bringing the total number of systems in use throughout the BBC to nine. Other recent contracts include Capital Cities/ABC Inc and NBC Productions and Sveriges TV AB, Sweden's national TV company.
- RTE (Radio Telefis Eireann), the Irish national broadcasting organisation, has installed a Korg Soundlink random access system plus an A1 effects unit with remote for its CEL studio in Dublin.
- Sony's DMX-E3000 digital audio mixer for audio-for-video applications have recently gone to Carlton TV, Molinare and Telecine in London and European broadcasters NRK and WDR
- Soundhouse Studios, based in Shepherd's Bush, London, have recently bought two DDA Q Series 40-channel mixing consoles from Stirling Audio Systems.
- Recent sales of Euphonix consoles include a 96-fader CSII to the Digital Sound & Picture (DSP) facilities on Los Angeles; three consoles systems for Radio Quebec; a CSII system to Stonebriar Communications, a division of the JC Penney Company; and a 56-fader CSII system to Paramount Pictures for mixing audio on the *Entertainment Tonight Show*.

Exhibitions 1993

- **The LIVE! Show, London**
May 11th-13th, The Royal Horticultural Halls.
- **SATIS, Paris**
featuring an audio section. May 25th-28th, Parc des Expositions
- **Broadcast ASIA, Singapore**
June 1st-4th, New World Trade Centre
- **ITS Montreux June**
11th-15th
- **Multimedia 1993, London**
June 15th-17th Earls Court 2
- **NAMM, Chicago June**
18th-20th
- **APRS, London June**
23rd-25th, Olympia 2
- **Pro Audio & Light 1993, Singapore**
July 7th-9th, New World Trade Centre
- **British Music Fair, London**
Olympia 2, July 25th-27th
- **PLASA, London**
Sept 12th-15th, Earls Court 2
- **Photokina, Cologne**
Sept 14th-20th
- **Vision 1993, London**
Film and Video Equipment show, October 5th-7th, Olympia
- **AES New York 95th Convention**
October 7th-10th, Jacobs Javits Convention Centre
- **SBES, Birmingham**
4th November, Metropole Hotel

Peel's admission that he was 'a bit pissed' as he received the award for National Broadcaster from Feargal Sharkey helped make this year's event particularly memorable.

More DAT

PMD Magnetics—distributors of blank magnetic media—have introduced a new range of DAT tapes. The tapes are manufactured in Japan and packaged by PMD in the UK. The tapes are claimed to 'combine quality, availability and competitive pricing to good advantage', and come in 60, 90 and 120-minute lengths.

PMD Magnetics, PO Box 19, Stratford upon Avon, Warwickshire CV87 0QJ. Tel: 0789 268579.

David Martin

A statement from Martin Audio's Managing Director David Bissett-Powell on the 4th May described how two people had been taken into

custody in connection with the disappearance of David Martin. Later one person was released without charge, however, the other man, Colin James, was charged with David's murder. Colin James had been an acquaintance of David Martin's for many years and they had had brief business dealings together on several occasions.

At the brief appearance at High Wycombe Magistrates court, on Monday 3rd May, Colin James was held in custody until another appearance a week later. It could take around three months to reach the stage of committal proceedings and then still further time will elapse before going to trial.

Canada's radio research

The Canadian Broadcasting Corporation (CBC) and the Canadian Association of Broadcasters (CAB)



After last month's 4D launch from Deutsche Grammophon comes the first release, John Eliot Gardiner conducting Brahms: *Hungarian Dances and Dvorak: Symphonic Variations and Czech Suite*. Matrix number 437 506-2. More news on DG's new 4D recording technique in next month's letters section

have announced the formation of Digital Radio Research Inc, which will launch experimental digital radio services in Canada by late 1993.

The objectives of the new company are to build and operate a number of transmitting installations to be used for digital radio research and development, and to commission and publish research studies on digital radio broadcasting technology.

Michael McEwen, the Chairman of the new company commented, 'There is no doubt that Canada is taking the lead in the transition to digital radio broadcasting.' ■

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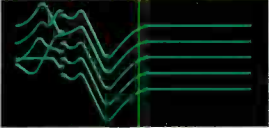
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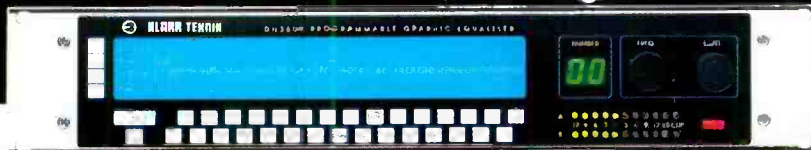


DN3600

PROGRAMMABLE
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Instant control, easy access.



The new DN3600 provides a perfect union of Klark Teknik precision with breathtakingly straightforward control.

The largest LCD display available in a 2U rack space shows either a single 1/3 octave 'graphic' display, a combined curve, or both channels. Also shown are high and low pass filters and two notch filters per channel.

The unique Alphanumeric memory

display allows fast save/recall; four 'soft keys' access display sub-menu options and there's full Password Protection.

Dedicated backlit switches include each equaliser centre frequency, while rotary controls for band and level provide extra instant access. You may link channels for accurate stereo tracking and 'Q' can be switched between DN3600 and DN27 curves. There's Auto

Gain, maintaining constant level whatever the curve; Pro MIDE; 66 memory patches and a DN60 interface.

Audio quality is stunning, too, with unrivalled dynamic range and headroom. We've even sealed the front panel behind a tough membrane for years of trouble-free use.

The DN3600 from Klark Teknik. For instant control, nothing touches it.



KLARK TEKNIK

a MARK IV company

The first name with sound system designers

Klark Teknik PLC, Klark Industrial Park, Walter Nash Road, Kidderminster, Worcestershire DY11 7HL, England.
Tel: 015621 744545 Fax No: 015621 745374

In-brief

● **Masterbloc AXK monitors.** The AXK range is designed with user-system and environmental compatibility as a priority, the object of which is to give clients more control over their purchase, as for example the type of termination used, driver bias, HF polar response, reflex cab tuning, etc. AXK precision monitors are available from 500W to 2kW and from £2,400 to £3,500 dependant on spec. Masterbloc Systems. Tel: 0268 711 031

● **Korg Soundlink update V.3.** New enhanced features for the Soundlink random access digital audio multitrack system include sampling frequency conversion of stereo sound pair; alphabetical search for sounds; stereo EQ edit; improved scrub function; Exabyte 8500 tape drive support. Korg UK. Tel: 081 427 5377.

● **Apogee Wyde Eye cables.** Apogee Electronics have launched an exclusive line of digital cables—the Wyde Eye series. The range is available for a variety of digital interfacing applications, including SPDIF, Wordclock and AES-EBU formats. The cables are designed to offer superior performance for interconnects with Apogee's digital audio converters and other digital equipment. Features include proper impedance for correct termination; connectors with controlled impedance characteristics; and gold pin connectors with high strength strain reliefs. Cable lengths are available in 1, 3, and 5 metre lengths. Apogee Electronics. Tel:+1 310 915 1000.

● **Automation ready Sapphire.** Soundcraft has introduced the Sapphire LC, an automation ready version of the in-line recording and postproduction console. The LC is the result of joint development with the automation manufacturer, AD Systeme. The LC offers fully professional VCA fader automation of all long-throw mix faders, requiring only an additional plug-in CPU unit and a colour monitor and QWERTY keyboard. Features include mute writing from console controls; full colour graphic display of fader and mute status; floppy disk storage of mix data; and frame accurate with 0.9dB fader resolution. Soundcraft. Tel:0707 665000.

Prism DSA-1

The DSA-1 is like a hand-held digital multimeter but is specifically for digital audio. Among its features are jitter measurement and jitter removal, carrier amplitude, phase and HF attenuation measurements as well as the means to monitor audio or the incoming line and to decode user-bits and channel status. The DSA-1 provides comprehensive measurement of signal quality so that unsatisfactory sources or transmission links can be easily identified; this in turn will help to avoid the common AES interface problems such as occasional clicks or failure to operate once locked.

The DSA is programmable and in addition to several fixed test sequences, users may define their own, both in terms of parameter limits (such as jitter amplitude) and which parameters are included in the test. The unit is shipping now but Prism have advised that there is a considerable backlog of orders.

Prism Sound, William James House, Cowley Road, Cambridge, UK. CB4 4WX. Tel: 0223 424988.

USA: Sprocket Digital Professional Audio and Video, 211 North Victory Boulevard, Burbank, CA 91502. Tel: +1 818 566 7700. Fax: +1 818 566 4477.

Augan enhancements

The Augan 408 OMX optical multitrack recorder-editor has been



Pioneer's heavyweight power amps

enhanced due to customer feedback. New features include a new jog-shuttle wheel; audio waveform display; EDL autoconforming; and advanced library management system. A version of the equipment called the 408 S OMX has been released with an advanced digital signal processing board which provides audio playback on all output channels in jog and shuttle mode; time compression and expansion; pitch shifting and compression-limiting.

The 808 OMX is a 19-inch expansion unit which gives the 408 an additional four inputs both in analogue and digital formats. The RC2 dialogue film editor is a special remote control for the 408 system and has been designed with the requirements of film editors in mind. The unit is equipped with the familiar Steenbeck flatbed controller. Using the serial control and biphasic

inputs and outputs of the 408, video and film machines can run lip-sync with the audio during the editing process. Other enhancements to the whole system include the BISS-AU radio broadcast automation system designed in cooperation with Deutsche Aerospace (DASA); and the MO disk jukebox with a capacity of 20 discs giving a total of 60 hours playing time.

Worldwide sales: Augan Instruments BV, Wilhelminastraat 31, 6881 LH VELP, Netherlands. Tel: +31 85 648966. Fax: +31 85 644785. UK: Studer Revox UK Ltd, Foster House, Maxwell Road, Elstree Way, Borehamwood, Herts. WD6 1JH. Tel: 081 953 3533. Fax: 081 207 5103.

Pioneer power

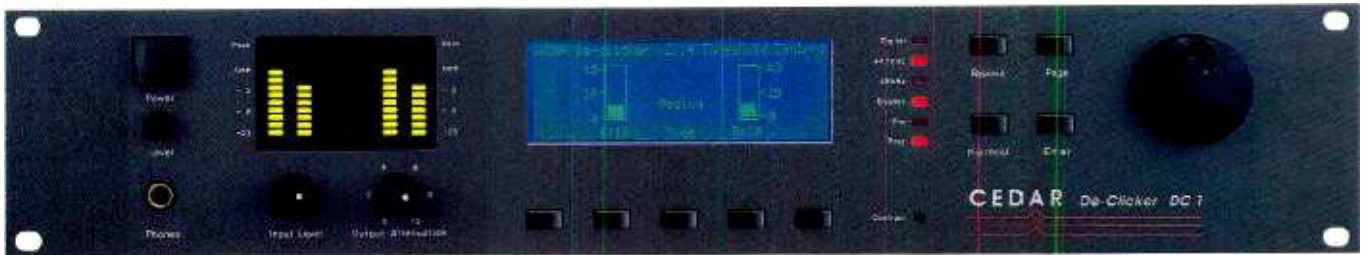
Pioneer High Fidelity (UK) have launched a pair of power amplifiers intended for use within large speaker systems in studios, clubs, concert halls and related applications. The M-V2000 and M-V3000 delivers 350W at 4Ω and 500W at 4Ω respectively and both are 2U in size. A system know as Dynamic Amplifier Protection (DAP) is built into both units which is claimed increases reliability and keeps the performance at optimum level. Among the DAP circuits is RTD (Rapid Thermal Detection) which is a device capable of providing real-time thermal protection against transistor overheating. UK: Pioneer (GB), 1-6 Field Way, Greenford, Middlesex UB6 8UZ. Tel: 081 575 8040. ▶



Augan RC2 remote for film dialogue editing



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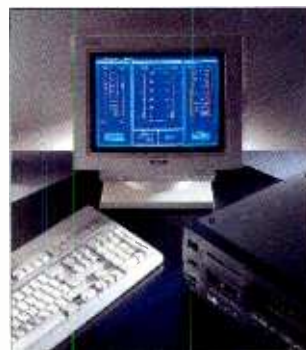
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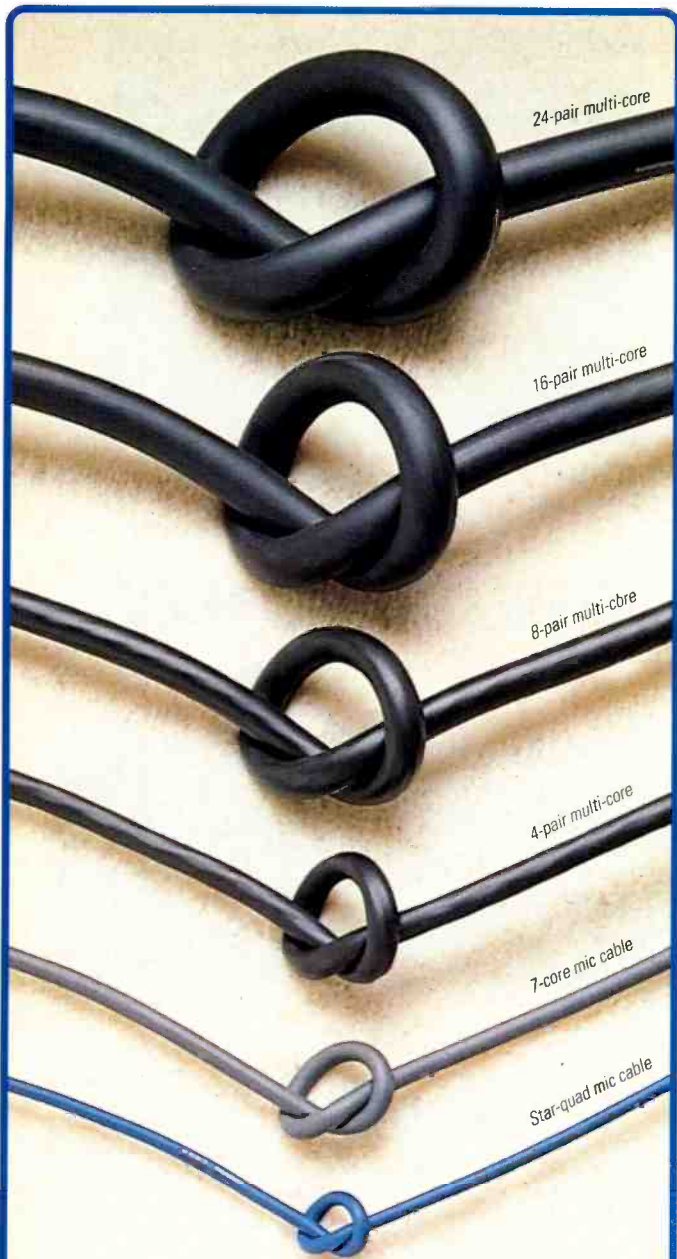
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Hof Professional Audio

The *Dynamic Master* is one of a new series of 1U-high stereo effects processors from Hof combining five different gain-control functions including 'Classic' and 'Pop' settings. The *Spectral Exciter I-Class A* features high and low-frequency enhancement, improved stereo imaging and automatic level control. The *Exciter II* model is as per the *Exciter I*, but with two additional effects: Glitter and Room Exciter. The *HF-16* is a 16-channel controller providing DCA level automation via MIDI sequencing.

Hof Professional Audio,
Rauchleitenstrasse 63, 8010 Graz,
Austria. Tel: +43 316 36913.
Fax: +43 316 36913-9.

Colourless Paint-Pot

Crookwood, a new audio company, headed by ex-Focusrite designer, Crispin Herrod-Taylor, has launched a remote microphone preamplifier, dubbed the *Paint-Pot*, because of its unusual cylindrical construction (see picture opposite). The *Paint-Pot* is designed to be placed next to the microphone, rather than some distance away (electrically speaking), in the control room. The dual channel *Paint-Pot* features DC coupling, impedance matching, equalisation, precision phantom powering, built in MS decoders and fine gain control.

The high headroom capability and power amplifier output stage allow the *Paint-Pot* to drive any length of cable, while coping with a wide range of input levels from mics, pick-ups and synths. The *Paint-Pot* can be controlled remotely via a separate serial link to the optional remote controller, allowing it to be used in replacement of the console channel strips in demanding applications or traditionally to bypass the poor input stages present in some consoles.

Crookwood, The Old Police House, Cookham, Berks. SL6 9BS.
Tel: 0628 528026. Fax: 0628 531959.

Musikon

Musikon have launched the *Audio Ambiente* series of sound booths.

Available in three versions in either Standard or High Quality construction, the booths feature a wide variety of geometric shapes combined with advanced reverberation and isolation characteristics.

Musikon GmbH, Adalbertstrasse 7-8, D-W1000 Berlin 36, Germany.
Tel: +49 30 615 2024.
Fax: +49 30 614 5459.

BNS

The new BNS 4-19 pro monitor speaker features a coaxial driver and woofer (optional) in standard rack dimensions and is intended for OB vans, small studios and applications where space is at a premium. The 4U-high system is available in both active and passive versions.

Vandenberghe Profenex BV, de Hoogt 8, 5175 AX Loon op Zand, Netherlands. Tel: +31 4166 3965.
Fax: +31 4166 3885.

d&b Audio Technik

The *02 Series* passive controller loudspeaker system is intended for use for cost-effective SR installations. The system consists of the *902-LS* and *602-LS* two-way loudspeakers (90° and 60° dispersions), *902-BX* bass extension cabinet, *1801-SUB* subwoofer and *P1200L* main frames. The frame houses a dual-channel power amplifier and the *902-CO/ M* controller module which allows the speakers to be used in the various passive and active modes.

d&b Audio Technik AG, Postfach 1325, Eugen-Adolf-Str. 134, 7150 Backnang, Germany.
Tel: +49 7191 62063.
Fax: +49 7191 87470.

dbx

The *dbx 296 Spectral Enhancer* is a dual-channel, 1U-high processor for enhancing high and low frequency detail, and reduce hiss. The HF Detail section works dynamically in order to add EQ 'when it is needed'. The 296 is recommended for highlighting vocals and giving fatter synthesiser sounds.

AKG Acoustics Inc., 1525 Alvaro Street, San Leandro, CA 94577, USA. Tel: +1 510 351 3500.
Fax: +1 510 351 0500.

PRODUCTS



Set your mic amps to 'remote' with Crookwood's *Paint-Pot*

UK: AKG Acoustics plc, Vienna Court, Lammas Road, Godalming, Surrey GU7 1JG.
Tel: 0483 4 25702. **Fax:** 0483 4 28967.

Dolby

DSTL is an all-digital studio transmitter link incorporating Dolby's AC-2 bit-rate reduction technology. Features include increased fade margin compared to analogue FM systems, and an occupied RF bandwidth of 250kHz for two programme channels and two aux channels.

US: Dolby Labs Inc., 100 Potrero Avenue, San Francisco, CA94103-4813.

Tel: +1 415 558 0200.

Fax: +1 415 863 1373.

UK: Dolby Labs Inc., Wootton Bassett, Wiltshire SN4 8QJ.
Tel: 0793 842100. **Fax:** 0793 842101.

Quancom

The *1200-Series* audio interfaces from Quancom are designed to provide a single operating standard within a studio system—for both digital and analogue sources and destinations. This allows a simple patch matrix to be used for the whole facility with the entire system based on Genlock as opposed to word clock. The

components of the system include the *Abacus* diagnosis-monitor unit for AES-EBU digital ports, the *Zombies* bidirectional converters for non-AES-EBU standards and the *T-fitting* clock source.

Quantec Tonstudioteknik GmbH, PO Box 440253, 80751 Munich, Germany.
Tel: +49 89 333034.
Fax: +49 89 393161.

Symetrix

The *601 Digital Voice Processor* is a single-channel A-D interface which includes processing such as mic preamplification, parametric EQ, filtering, gain reduction, de-essing and AGC. The analogue input is mono but stereo signals can be accepted via the AES-EBU or SPDIF input.

Symetrix, 4211 24th Avenue West, Seattle, WA 98199, USA.
Tel: +1 206 282 2555.
Fax: +1 206 283 5504.

Valley Audio

Valley Audio have released the *Model 730* digital dynamics processor. This stereo unit features both analogue and a range of digital inputs together with virtually unlimited possibilities for gain reduction and dynamics ►

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No other machine offers this powerful combination of features. Harnessing the 'life and warmth' of eight active tube stages and the low noise and reliability of solid state electronics, the Drawmer 1960 provides the ultimate direct interface between the sound source and the recording medium.

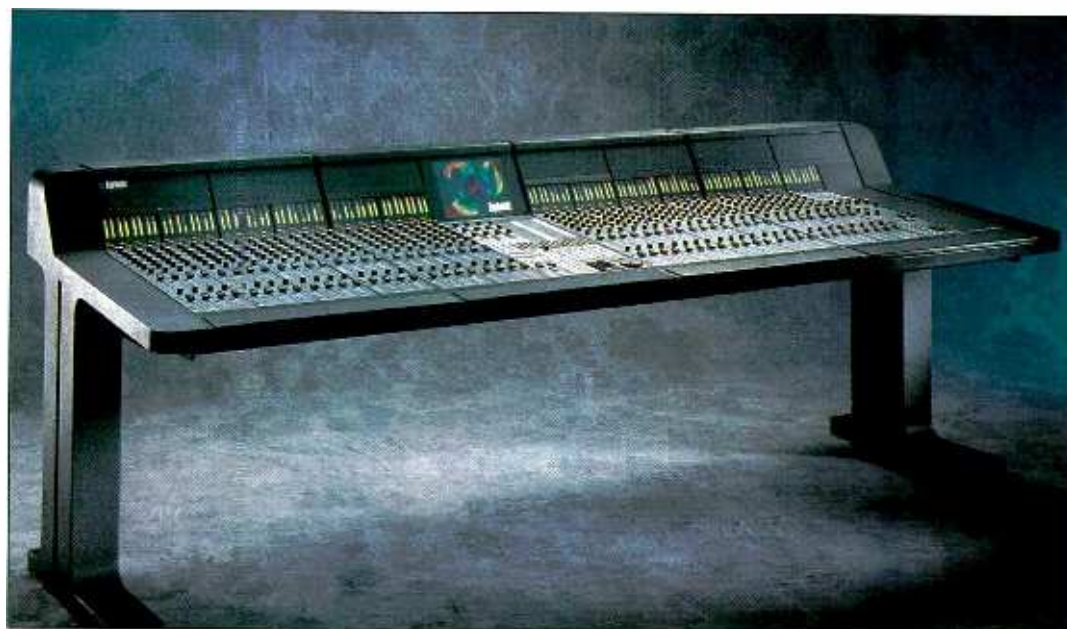
Drawmer

DRAWMER DISTRIBUTION, CHARLOTTE ST BUSINESS CENTRE,
 CHARLOTTE ST, WAKEFIELD, WEST YORKS WF1 1UH, ENGLAND.
TEL: 0924 378669 **FAX:** 0924 290460

processing. The *Model 730* has MIDI interfacing and can also be used as a stand-alone A-D-D-A converter.
Valley Audio Products Inc, 9020 West 51st Terrace, Merriam, Kansas 66203, USA.
Tel: +1 800 800 4345.
Fax: +1 913 432 9412.

New desk from Euphonix

At this year's NAB exhibition, Euphonix introduced the *CS2000* digitally controlled studio system. This is the first showing of the open architecture audio mixing platform. The new console comes with the latest Euphonix software package, *V2.0*, which manages the operation of the system. *V2.0* contains a new automation system which enhances the Total Automation concept originally established two years ago when the *CSII* was introduced. *V2.0* also includes new project



Euphonix *CS2000* 'open architecture audio mixing platform'—new for NAB

management software and supports the addition of up to 96 extra mix buses and aux sends. The high speed digital Mix Controller platform is fully modular allowing customers the option of enlarging the console frame in their studio after installation. The *CS2000* can be specified in configurations from 16 to 176 faders, with one to four operator versions available. Each fully automated channel has two

stereo-mono faders, eight aux sends, two mic inputs, four line inputs, five programmable outputs, 24-48 multitrack buses and two digitally controlled equalisers as standard. Euphonix President, Scott Silfvast, explained the concepts behind the system, 'The *CS2000* is what we term an open architecture system, in other words we have made provision for many new features and modules that

are planned for the next several years. We want this system to stand the test of time and be as flexible in the year 2000 as it is today.'
Euphonix, 220 Portage Avenue, Palo Alto, CA 94306, USA.
Tel: +1 415 855 0400.
Fax: +1 415 855 0410.
UK: Studio Sales, 9 Hatton Street, London. NW8 8PR.
Tel : 071 258 3454.
Fax: 071 262 8215. ■



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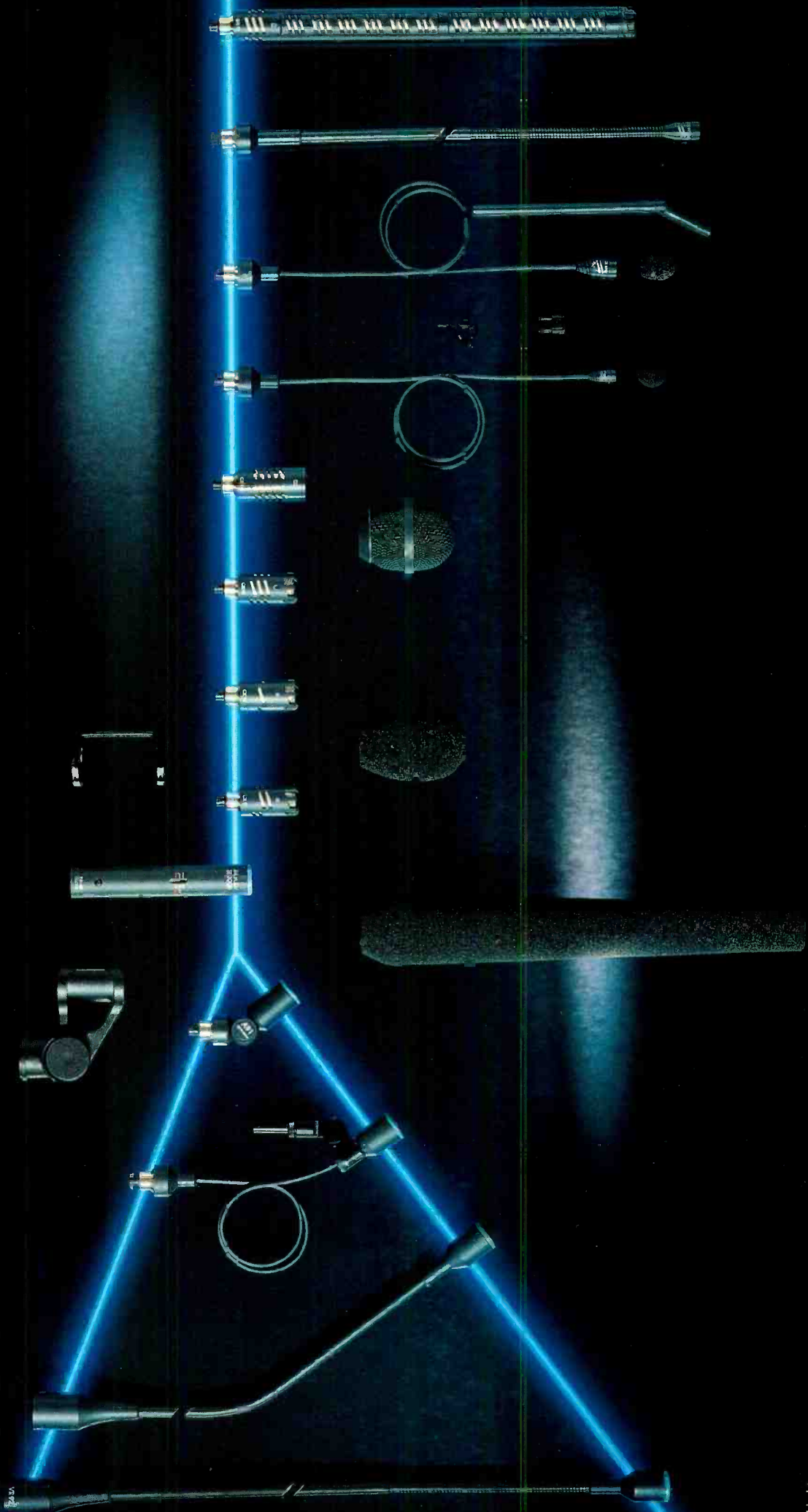
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E-mu Vintage Keys

E-mu are on a roll, so it is with confidence that we welcome *Vintage Keys* to the fold of *Proteus*-type sample playback modules. Drawing on the excellent E-mu library and concentrating on those golden sounds of yesteryear, *Vintage Keys* is all about the type of keyboard that is no longer available for sensible money—the sort that cannot be lifted by one average human, that refuses to stay in tune for longer than the first half of the solo and that occupies a lot of space for a single-note drone. The type that you always quite liked but you could never fathom, and the type that you quite simply do not want to have around the house. *Vintage Keys* promises to be the acceptable face of all the fumbling, exasperation, bewilderment, mysticism and dashed expectations that would be part of owning the collection of keyboards represented by these samples.

As with valve mics, the aura of nostalgia that surrounds vintage

keyboards largely precludes the light of realism that reminds those who actually ran their own that they could be unreliable and temperamental dogs. They had charm but then too much charm does tend to sicken. Gear gets superseded because of technical progress but also for very practical reasons and more than a dollop of fashion, but it is perhaps more of a comment on the capabilities of the modern synth than on the limitations of the ones they replaced that a unit like *Vintage Keys* can arrive today and get people excited.

With *Vintage Keys*, E-mu have maintained the superb spartan simplicity of the *Proteus* front panel and even improved it. *Proteus* drivers have experienced one of the most logical and accessible sound modules ever built and bear witness to the fact that the successful amalgam of front panel controls and LCD does rely on vast quantities of both so much as a little thought at the design stage to

make frequently-accessed parameters readily available and adjustable. Thus it is that *Vintage Keys* employs a 16 x 2 LCD with a dial, two cursor keys instead of the former one, plus dedicated MASTER and EDIT function buttons to do the business elegantly. Again three programmable stereo paired output sockets are provided to handle the 32-voice polyphony which can be eaten into by sound 'stacking' and chorusing, if you like that sort of thing, but in practice poses few problems. As ever, making the unit work for you multimedially is simple and satisfying.

Vintage Keys responds to polyphonic and monophonic aftertouch, four MIDI controllers and comes with two LFOs and two envelope generators. Suitable inclusions for a device of this origin are low-pass filters (two-pole or four-pole) with resonance.

Rather than go through all the routines, which are similar to those on the *Proteus*, lets talk sounds. The samples used as the basis for patches are drawn from the Hammond B3, Mellotron, Farfisa organ (God bless it), Yamaha CP70, Wurliizer electric

piano, Fender Rhodes and Dyno-My-Rhodes, Minimoog, Micromoog, Model 55, Moog Taurus pedals, Oberheim Matrix 12 and OBX, ARP2600 and String Ensemble, Sequential Prophet 5 and that rehearsal room door-stop favourite the Hohner Clavinet. There is also a collection of single cycle waveforms sucked from Moogs, OBs, ARPs and B3s plus tons of harmonic, single-cycle, multicycle and looped waveforms for the sackcloth-and-ashes brigade.

I take exception to the presence of various drum kits on a unit of this complexion. In the same way I find the guitar, bass and horn samples unnecessary—surely E-mu do not believe that *Vintage Keys* is the answer to some bedroom-bound *Portastudio*-owner's search for a good all-rounder tone module? *Vintage Keys* is a supplement to existing systems and the inclusion of DX7 samples, even if one was played through a *Rockman*, is as inappropriate as the single Fairlight vocal sample is paltry and stretching the interpretation of 'vintage'. Why no modular Korgs, other organs and

AIWA HHB 1 PRO. PROFESSIONAL, PORTABLE DAT



The Aiwa HHB 1 Pro – well known as a “Best Buy” low cost professional portable DAT recorder – packs an uncompromising list of features into a rugged, compact design. Facilities like dry cell and rechargeable battery power, a multi-voltage power supply, AES/EBU digital I/O and a unique - non SCMS - copy prohibit-free SPDIF digital I/O, balanced mic./line inputs and illuminated LCD display, a wired remote control and full indexing facilities.

The HHB 1 Pro is supplied complete with an XLR splitter lead for the balanced XLR mic. input. For failsafe operation, a “Key Hold” switch disables front panel controls. Counter functions include “Program Time”, “Absolute Time” and “Tape Counter”. The unit can simultaneously accommodate ten dry cell batteries and a rechargeable battery, extending power-up time to up to 4 hours. The HHB 1 PRO is also available as part of “The Kit”, along with Sony ECM979 microphone and accessories in a steel reinforced flight case.

A BATTERY OF FEATURES AND A CHOICE OF BATTERIES



Vintage Keys from E-mu Systems—nostalgia with a safety net

other Sequentials?

This aside, *Vintage Keys* is an absolute blaster with phenomenal realism. Organ sounds are full of dirt, complete with slow and fast Leslie and the glassiness that is so characteristic. *Mellotron* male and female voices seem weak in isolation but body up nicely, while the violins and flutes evoke instant nostalgia. The single *Farfisa* sample is sensitively cheap but could have done with company.

The *CP70* samples in bright, mellow and vanilla flavours must be pretty authentic because I never liked the original much either. The brighter of the two *Wurlitzer* samples is close particularly on the left hand but does not quite ring enough on its own. I cannot make my mind up about the *Fender Rhodes* or *Dyno-My-Rhodes* but the *Clavinet* is truly funky. Filter modulated and resonance *Moogs* samples are superb although the *Taurus* pedals failed to make me want to go to the toilet which is strange because the unit has an incredible amount of bladder-tingling bass energy available elsewhere, including the

Model 55 with resonance and the other *Moogs*. All the *Matrix 12s* are superb with two lead samples, one of which is characteristically throaty, two pads plus an *OBX* sawtooth. The *ARP2600* with filter modulation starts well but loops blandly while I have to admit to still liking the *Solina String Ensemble*. All four *T5s* are fine representations.

The presets are good; the 384 patches, (256 of which are user-programmable) kick-off with the wheeziest tonewheel you will have heard since 'Nantucket Sleighride' (all the organ patches are striking in their variety and realism). Similar sentiments apply to the analogue synth manifestations which work well at conveying the mood and are very playable. There are pads here that you simply will not find anywhere else. The *Moogs* are brilliant. There are some more modern sounding patches which, while interesting, do not sit that comfortably among the more traditional stuff.

Combining vintage samples at programming yields some outrageously powerful combos with

textures that defy description so on this point alone *Vintage Keys* scores very highly. Being similar to the *Proteus*, editing is anything but daunting and permits dramatic but usable changes to be made easily by altering primary and secondary components to begin with. The 249 waveforms and samples offers frightening original sound potential and you will need the filters if only to spare the tweeters in the upper registers. It is worth bearing in mind that the overwhelming power of some of the samples can swamp similar or more delicate ones if not mixed sensitively. Mapping MIDI controllers to things like the filters can approximate knob-twiddling on the real thing.

Older synths mean different sounds to different people—something that cannot always be said of new instruments where patch recognition generally gives the game away. Consequently the realism of *Vintage Keys* depends upon your own appreciation of what it is that characterises, for example, a *Matrix 12*. However, one thing the old things

all had in common was a depth and movement, and this by and large is reproduced faithfully by this unit. It would be foolish to imply that *Vintage Keys* gives you full access to all these old synths' palettes of noises—it is more a case of somebody's idea of a 'best of' collection and as such it has most of the hits but no B-sides. It is difficult not to be impressed with *Vintage Keys* because there is nothing quite like it—it has got to be one of the most justifiable buys around at the moment. You will not hear these sounds easily anywhere else. If they don't take your head off, then nothing ever will. ■

**E-mu Systems, PO Box 660015,
Scotts Valley, CA 95067-0015 usa.
Tel: +1 408 438 1921.**

**UK: E-mu Systems, Adam Ferguson
House, Eskmills Industrial Park,
Musselburgh, East Lothian, Scotland,
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Contact: Martin Westwood



HNB Communications Limited
73-75 Scrubs Lane, London
NW10 6QU England
Phone: 081 960 2144
Fax: 081 960 1160 Telex: 923393

CONTACT YOUR HNB DISTRIBUTOR FOR DETAILS

Express yourself

As the name suggests, the Aphex *Expressor* forms part of their range of dynamic processors which also includes the *Compellor* and the *Dominator*. Aphex have never been backward in giving their equipment names which shout its function—as opposed to boring model numbers which serve only to confuse. That said, they may have gone too far with another recent model; while most of us would hope nobody would notice we had a Big Bottom, Aphex have registered it as a trademark.

The *Expressor* name does, in fact, sum up what the unit does, although might mislead some into assuming that (being Aphex) it combines a psychoacoustic enhancer, or 'exciter' with a compressor. There is no enhancer onboard, but there is an HF expander of which more later.

Essentially the *Expressor* is a versatile compressor with a few novel extras. It provides comprehensive control over all the usual functions—threshold, attack, release and ratio—with enough scope on all to give anything from gentle control to crunching effects. The manual seems to suggest that it is primarily an effects box and that seekers of subtlety should look elsewhere (to another Aphex product of course) but I think this is uncharacteristically modest. With ratios down to 1.1:1, attack times from 0.5ms to 100ms and release times from 0.4–4s, smooth level control is perfectly possible. On the other hand, the ratio also goes up to 50:1, the threshold

down to -20dBm and an input control gives up to 15dB of gain, so heavy-duty squeezing is also available, with up to 18dB of gain makeup provided on the output.

Most of what you might reasonably ask of a compressor can be achieved with the *Expressor* along with things you are less likely to want; the attack time can be set fast enough to provide enormous clicks on bass material, which while useless in itself shows the available range quite impressively. A simple switch selects Soft Knee mode, which effectively uncalibrates the threshold control but provides the expected distinct difference in the processed effect. The Aphex VCAs are, of course, pretty quiet, so the unit contributes very little noise however hard it is working.

Metering comprises two rows of LEDs, one showing gain reduction and the other showing output level referenced to either -10 or +4. The output meter stops at +3vU and is much faster than a VU meter, which means that when the *Expressor* is being driven hard it simply pegs, which is not very helpful. The unit will deliver up to +25dBm, and bearing in mind what it does I would have thought a wider-ranging meter would be more useful.

The most obvious extra feature is the HF Expander already mentioned, which sits after the compressor and is intended to correct the dulling effect often associated with compression. As the manual points out, simply

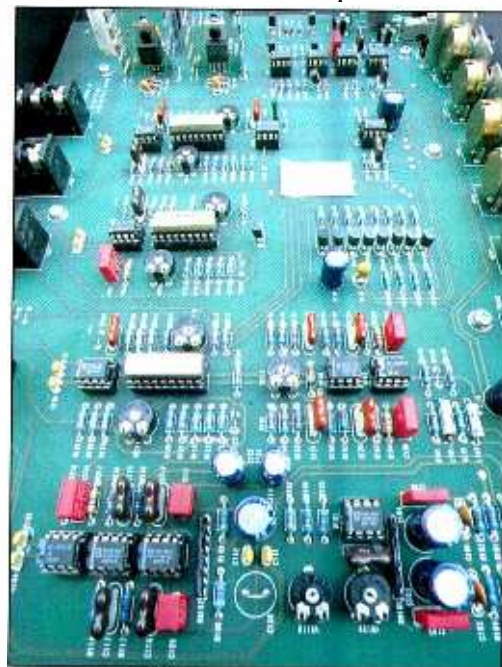
boosted. It will never apply more than 6dB of gain to the chosen HF band, so the effect is subtle, but it does work, restoring sparkle to processed signals quite effectively and helping them cut through a mix. The expander will work down as low as 2kHz, so even does the job on bass guitars.

Bass signals are also the beneficiaries of a button labelled SPR, which stands unhelpfully for Spectral Phase Refractor. This is intended to correct the frequency-dependent phase shifts which take place as a signal passes through more and more electronics, pulling the resultant delayed low end back into line with the top. This, say Aphex, 'restores bass clarity and punch without any increase in amplitude'. I was not

connector alongside side chain Send and Return jacks for inserting outboard processing such as EQ.

The manual is clear and instructive, although largely unnecessary since most of what the *Expressor* does is so familiar. A helpful section shows various suggested settings for a range of signals from guitars to vocals to drums, which while not perhaps to everyone's taste can provide useful starting points for the less experienced.

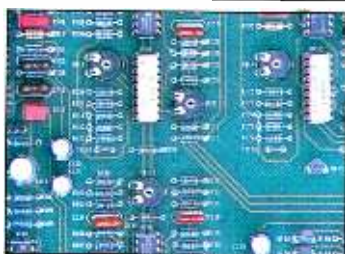
I have used the *Expressor* somewhere on virtually every session I have done since I have had it, simply because it is so easy to get what is needed out of it quickly and to tart the sound up a bit as well. It is



Lifting the lid on the *Expressor*



The Aphex *Expressor*—should seekers of subtlety look elsewhere?



Circuit board detail

cranking the top end up on a heavily compressed signal can be disastrous since it will just emphasise the noise brought up by the compression. The *Expressor* gets round this by turning up the HF only when gain reduction is being applied in the compressor, and staying flat at all other times. The amount by which it does this—its ratio—is variable, as is the lower limit of the frequency range being

where the unit giving the greater gain reduction at any moment will control the pair. With the SLAVE switch pressed, however, the slave unit will follow the master's gain reduction without having any influence the other way round.

The back panel carries electronically balanced XLRs for in and out, together with three 1/4-inch jacks—the aforementioned Link

hard to imagine a compression job it could not handle, and it would undoubtedly find a lot of use in anyone's rack. ■

Dave Foister

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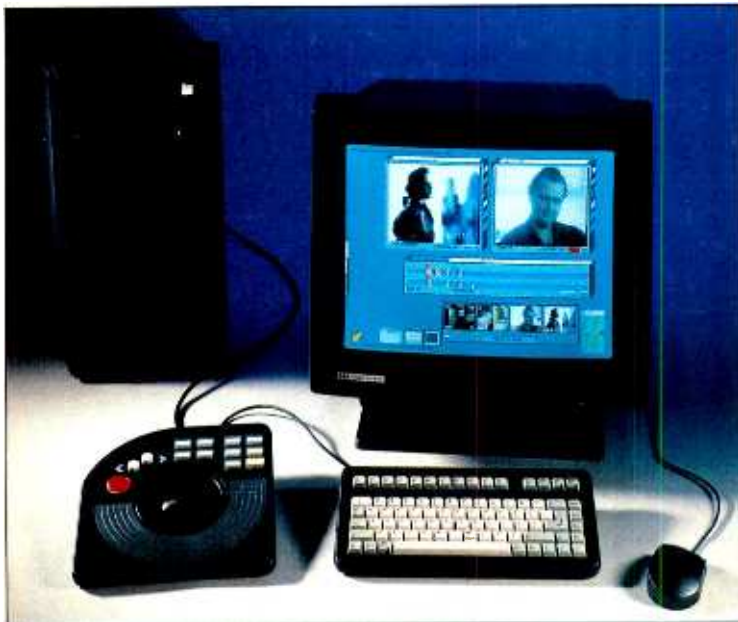
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Lightworks system now with 'fully pro' spec audio

TV Heaven

At the same time as the Berlin AES Show, the somewhat less publicised Television Show was running at London's Business Design Centre. This TV Show puts the industry in context, with not just the whizz-kid hardware but exhibitors representing producers, venues, studios, special effects companies, costumiers and the full range of facilities, services and equipment that are each part and parcel of the TV industry.

Sound was very much a part of the Show, not so much in its own right as a stand-alone item—there were no tape machine or loudspeaker companies exhibiting—but as an integrated element within the postproduction process.

The advent of effective, moderate cost video compression has meant that the number of computer-based, nonlinear video editing systems has risen almost as rapidly as nonlinear audio packages. Companies who have traditionally treated sound as something that 'just came out with pictures' are now beginning to take a much more active approach.

At one end of the scale was *Lightworks*. The company, OLE, freely admit that, since their nonlinear audio systems are used primarily off-line, sound quality has not been a major consideration. However, having released the system with a somewhat perfunctory audio capacity, they have upgraded the system to a 'fully pro' spec because XLR connections and 48kHz sampling are something of a standard. Having done this, OLE now find that lower-end users like the idea of using the video edit system for basic audio cuts—no doubt, this is to be followed up in the not too distant future with more audio-related software.

How far nonlinear video manufacturers are moving into audio was amply demonstrated by Avid who parallel launched their *Audio Vision* multitrack system at AES and the TV Show. Working on a *Mac Quadra* platform with proprietary interface cards, *Audio Vision* has all the essential features of a good multitrack record-edit-processing system which also (naturally) works within the framework of a

nonlinear video edit suite.

Avid's approach, and one taken up by others in the video edit manufacturers, is to take advantage of existing hardware and either port it over completely, or work with the manufacturers to provide an interface with their software systems. They have already elicited the active assistance of DigiDesign, Lexicon And TimeLine, buying in technology rather than attempting to develop and build it themselves.

As a software developer and hardware integrator, Avid do not have to reinvent the wheel and can rapidly move into the markets previously dominated by the audio companies who are now moving in the other direction—adding video features to hardware systems. Avid's next move will be into digital mixing, with their own hardware console driving the computer software system, further blurring the border between video and audio manufacturers.

None of this is to say that the 'video' companies have it all their own way—SSL were generating their fair share of interest with *ScreenSound*, demonstrating that dedicated systems remain the preferred route at the top end of the market. Ironically, in a world dominated by video systems of every description, the latest feature that SSL were demonstrating was their system's ability to lock-up to film transports.

With piracy an ever-present consideration made more real by digital storage, some directors and producers are moving back to film as the image medium for postproduction work, simply because film is so much more difficult to steal or dupe than video. Among the facilities vying for attention, the newly completed Air Lyndhurst complex made a big splash promoting itself not just as a music recording venue as, at its present size, it is one of the few studios that can comfortably accommodate a full orchestra for soundtrack recording and provide a dubbing venue and film location.

After all their market research, Air still had something to learn from meeting an industry concentrated in one place: having looked at all the ways of getting to the decision maker in TV, they discovered that everyone who is anyone in English TV still lives in Hampstead. Rumours that the industry will be concentrating the bulk of its promotional spend in the *Ham & High* local newspaper have yet to be confirmed. ■

Tim Frost

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Seen for the first time at AES Berlin: DAR's Sabre

Sabre—the latest addition to the DAR family of digital audio workstations—was launched at the Berlin AES to an enthusiastic response. The product is the 'baby' of the DAR range and meets the increasing demand for cost-effective, high performance digital audio workstations. The system is an optical disc-based, 8-channel recorder-editor suitable for a variety of applications including dialogue editing, effects preparation and spotting, music production, and short or sectionalised TV, film and radio production. Sabre can be viewed as a totally self-contained workstation or as a companion to high-end DAR systems where it provides system compatibility—for example preproduction work can be prepared on an 8-channel Sabre for transfer to a 16-channel Sigma.

The hardware components of the system comprise a 4U-high processor rack with one (standard) or two optical drives, a dedicated control console (100mm x 300mm x 290mm), a 14-inch colour video monitor, a mouse, and a keyboard. The console retains DAR's individual styling, but is smaller than previous controllers due to the removal of the gas plasma touchscreen which is replaced by the stand-alone monitor. Control of the system is divided between the console and screen, and operationally remains virtually identical—the major change is that the pointing device is a mouse rather than a finger.

Sabre uses removable double-sided M-O discs

SUPER SABRE

(680Mb), providing 58 minutes recording time per side at 44.1kHz—the system will also operate at 32kHz and 48kHz. As the discs hold both audio and editing information, projects can be easily and quickly interchanged between workstations. DAR have maximised the data rate from disc by optimising the allocation of data into large contiguous blocks rather than fragmenting it—no data compression is used. The system will allow continuous playback of six channels, and is capable of simultaneous 8-channel playback depending on density. The standard Sabre I-O arrangement is 2-in 8-out for analogue, and 2-in 2-out for digital (AES-EBU and SPDIF).

Full time code chase facilities are included, and the system will look to a variety of external sample clock references. Remote control for two external machines is also part of the package.

On screen

As with other DAR workstations, the main screen contains all the necessary information for directory and editing operations. A separate

screen exists for recording audio into the system and a number of pop-up windows are accessible from both screens.

The main screen, or Playback and Editing page, is sectionalised into six areas. At the top is the ▶

Bringing optical disc technology to DAR digital audio workstations and dropping the price barrier are just two facets of the Sabre discovered by Patrick Stapley

System Status window which identifies the name of the playback sequence (Reel) and displays time code information, sample clock source and so on; directly below this is an error message field.

The next area provides display and access to the directory which contains all the audio Segments. A Segment may be defined as a piece of audio which can be variable both in terms of its duration and width of tracks. The display has three windows which allow the various hierarchical levels of the directory to be viewed. On start-up the system defaults to show the highest level, Groups, in all three windows. Groups (SFX, Music, Dialogue and so on) can be

opened to another window (by dragging the selected Group with the mouse) to display their contents—SFX for example could contain Crowds, Doors, Explosions and so on. The same procedure can be repeated to reveal the Segments making up the chosen category—Crowds could contain Applause, Laughter, Boos and so on. These subdivisions may continue, depending on how the user wishes to arrange the directory, and quite complex structures can be created—to help the user search for 'buried' Segments, a Find facility is included that will locate the Segment by name.

The directory may also contain playback sequences; once named and saved these are referred to as Reels and are identified by the tape spool symbol following the analogy of a multitrack tape. Other symbols are used in the directory such as vertical scissors to show that the Segment is made up from other Segments (as in the case of an edited piece of music or a group of effects), and a clock face to indicate the Segment has been TimeWarped (time companded by up to $\pm 50\%$).

Below the directory is the Current Segment Information Window which gives details on the selected Segment; directory address (SFX, Cars, Masarati), number of tracks, time code start and stop times, duration, mark point (if entered), and any comment added by the user.

The next part of the screen takes up the majority of the lower half and displays the eight channels or 'tracks' horizontally. Audio Segments are positioned in these tracks to create a playback sequence by either assembling them from the directory or dropping them in directly from an external source. At the left-hand side of this display is a Status Window from where each channel is enabled-disabled for editing (horizontal scissors symbol), drop-in recording ('R' symbol) either manual or automated, and monitored playback (loudspeaker symbol).

The bottom of the screen is taken up with a series of command keys such as Copy, Name, Unlink, Spot, Move, Load and so on, which will affect the currently-selected item on the screen, or select other operations.

The console

The control console is just over half the size of previous designs. Although keys are laid out differently, they remain grouped together by function which will be familiar to DAR users. All keys are dedicated to a particular function—the system does not operate with soft keys.

The console also contains two rotary controls; a large shuttle wheel for rocking over an edit point and for setting varispeed playback (± 4 times with constant sample rate output); and a detented Vernier knob which is used to control various selected editing functions: Slip, Gain, Parameter (functions such as TimeWarp and Waveform Editing), Zoom, Trim, Slide (splice shift), and Crossfade.

A single long-throw fader, situated on the right-hand side of the console, acts as a main fader controlling output level from playback enabled channels.

Creating a reel

There are two main methods of creating a Reel: Sequential Assembly in which Segments are joined contiguously to form a continuous piece of audio as with music editing, and Spotting Assembly where Segments are positioned relevant to time code on specific channels as with syncing audio to picture. Both methods can be used ▶

THE OPTICAL ADVANTAGE

DAR's Sabre with its 8-channel output shows that computer optical discs are now a serious contender as the primary recording medium for multichannel audio postproduction, and that there does not need to be a magnetic Winchester hiding inside somewhere for the system to work properly. (Most other optical disc systems, such as the Akai DD1000, have only offered four simultaneous outputs per drive, or, like the Angan 408 OMX, have incorporated a Winchester buffer to achieve a greater number of simultaneous outputs.) In the computer mass-storage market, though, magnetic and optical technologies tend to spur each other on to ever greater feats of performance, and currently it is still possible to achieve far superior performance from magnetic Winchester drives than from optical drives. This said, optical cartridges have the one overriding advantage of removability, and this must be traded against the higher storage capacity, transfer rates and access times of Winchesters.

For operations in which projects are moved around between systems, or where a project may need to be removed from a system quickly to make way for another, optical discs are clearly attractive. A project may be reinstated anywhere in the world with all the edit data intact simply by reinserting the appropriate disc into the drive. Removable discs also make the problem of backup and archiving less important, since the integrity of M-O cartridges is high, and many may consider it quite acceptable to keep the original project disc without a backup. The alternative to removable discs is networking, whereby multiple users share common resources over a computer data network, and where jobs may be passed around between workstations. Optical fibre networks with sufficient speed to make audio networks a reality, such as the FDDI (Fibre Distributed Digital Interface), are only just beginning to appear with digital workstation products, but it is likely that such technology will grow in importance over the next few years. Even so, the network approach is normally used among a group of operators on one site, and this may not always suit operational requirements. The psychological advantage of being able to walk away with the half-finished or completed project in one's briefcase should not be underestimated.

As far as costs are concerned, the price of standard 5.25-inch M-O cartridges is definitely coming down. At the Berlin Convention one salesman was touting unbranded cartridges at \$80 (about £50), being the lowest price seen by this author to date.

Francis Rumsey

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within the same Reel.

With Sequential Assembly a source Segment is selected from the directory, a command key is then selected from the bottom of the screen (either Copy or Move), and a destination point is selected on a channel in the playback sequence placing the Segment at that position. If the Segment is composed of more than one track, the lowest numbered track will be positioned on the selected channel—for example a stereo Segment placed on channel 1 will be automatically assigned to channels 1 and 2. The operator must therefore ensure there is room for multitrack Segments before positioning them.

There are a number of ways to position Segments relative to time code. Segments marked with an anchor symbol are time code fixed, and by using Copy or Move commands will be placed at the corresponding time code point in the playback sequence. However, if the Spot command is used, fixed Segments can be positioned at the vertical NowLine (analogous to a tape replay head) in the playback sequence. This provides a useful method of accurately positioning Segments in relation to picture: if a synced VCR is being controlled from *Sabre*, the NowLine can be positioned at the exact start of a visual event and the relevant Segment placed in sync accordingly. Alternatively, the Segment time code can be offset in the directory to match the event time code, and it may then be synchronously Moved or Copied.

More than one Segment may be positioned in the playback sequence at a time. The Up To command will allow a contiguous set of Segments from the list to be selected; the And command allows non-contiguous Segments to be chosen. However, multiple Segments grouped in this way must have the same number of tracks. The resultant block of Segments can be named and will appear in the directory as a Group.

Once audio has been positioned in the playback sequence, it can be Copied or Moved from channel to channel. It can also be Slipped in relation to time code providing the Segment has not been time-code fixed, and that it does not bump up against another fixed Segment on the same channel. Segments may be Unfixed at any time using a command key.

Segments can be manipulated in a number of ways either in the playback sequence or directly from the directory. A selected Segment can have its overall Gain changed, be Cut into two, Looped, TimeWarped, and have its Crossfade-Fade times and shape adjusted at its In and Out points in real time (from four samples to the approximate length of the shorter of the two Segments being crossfaded, using linear, logarithmic or half sine curves).

All Segments are stored in *Sabre* with up to 3-second Handles—that is to say that extra audio exists before and after the boundaries of the Segment. This allows a couple of other useful functions: firstly, the ability to extend Segments using the Trim function, and secondly the facility to shift (Slide) the position of a splice two Segments while the audio remains fixed in time.

Redundant Segments or parts of Segments can be erased by assigning them to the Bin, which is a permanent Group identified in the directory by a dustbin. The contents of the Bin will be emptied at the end of the session, but can be retrieved up until then. Another permanent Group is the Table which is designed as a temporary Segment store.

Playback can be Reel-based—where all enabled channels will be monitored—or Segment based—where just the selected Segment (either from the directory or from the playback sequence) will

be monitored. Single key operation allows playback from the preceding Segment up to the selected Segment, and from the selected Segment to the end of the next Segment. An autolocator is provided, plus up to 250 Mark points can be entered per Reel and-or Segment.

Reels themselves can be subdivided into separate Reels; and multiple Reels may be merged together to form a continuous sequence. Additionally, it is possible to Slip an entire Reel against time code, and to insert or delete silence in selected sections of a Reel thus creating or removing offsets.

Options

Options available for *Sabre* include a second M-O drive, four analogue inputs rather than two, VTR Emulation, Autoconform, and Exabyte backup (software for DAT backup is standard). The system will not support DAR's automatic dialogue synchronisation system WordFit or the DSP options available on the larger DAR systems. *Sabre* is not expandable above eight channels.

A future development that will affect *Sabre* is networking. However, the convenience of removable optical discs and their inter-system compatibility already provides some of the advantages offered by this facility.

Conclusion

Sabre completes the DAR range by providing a relatively affordable, stand-alone, high performance digital audio workstation that offers both compatibility and operational familiarity with previous DAR workstations—primarily the top-of-the-range *Sigma* and the modular *Delta*.

The use of optical disc for main storage, brings with it the advantages of a removable, erasable and robust storage medium. Although the access time of M-O drives is slower than hard disk, DAR have maximised the data rate without resorting to compression techniques.

Sabre does not include DSP capabilities and will require an external mixer for functions such as EQ and panning; alternatively, a project can be transferred to a high-end DAR system for DSP and mix processing.

Sabre is suited to facilities where a high performance system is required, but without the full complement of features and level of expandability offered by more expensive digital audio workstations. It is equally suited as a companion to a high-end DAR workstation, where it can be used for preparation thus freeing up the larger system for more complex and lengthy production work. ■

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PATRICK STAPLEY began his career in pro audio in 1972 at London's Abbey Road Studios where he worked with artists as diverse as Paul McCartney, The Damned and Matumbi, and was involved in quadraphonic remixes of Tubular Bells and Dark Side of the Moon. Patrick also ran his own production company and worked as Falconer Studios' Production Manager before beginning writing for *Studio Sound* in 1985.

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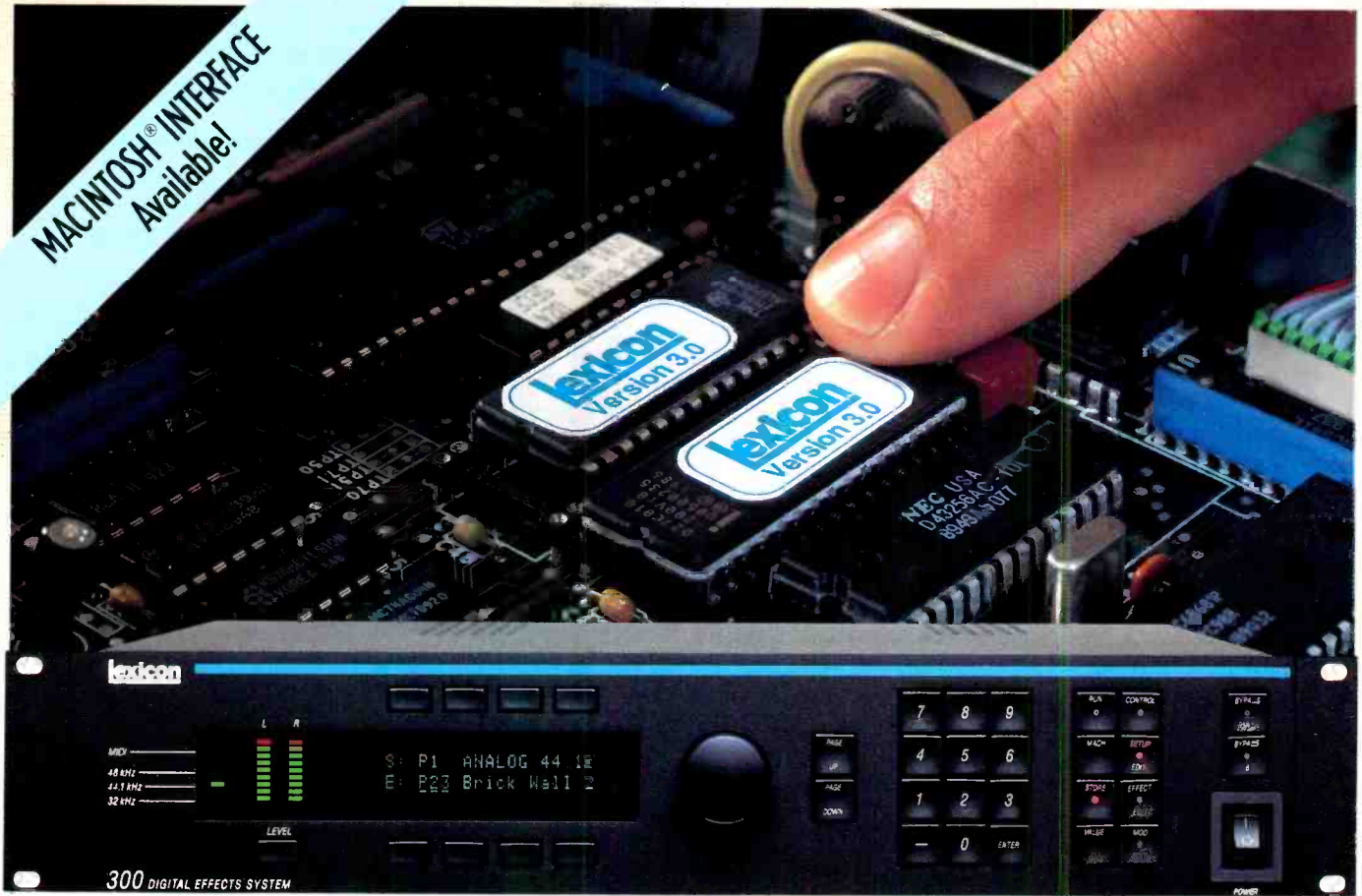
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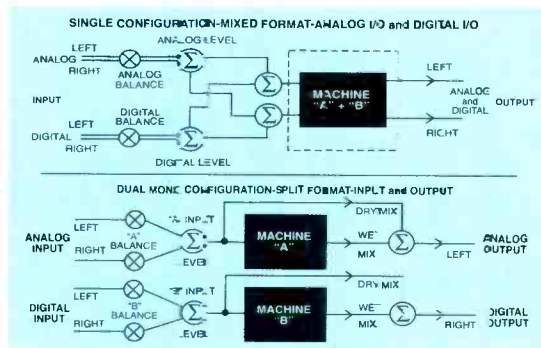
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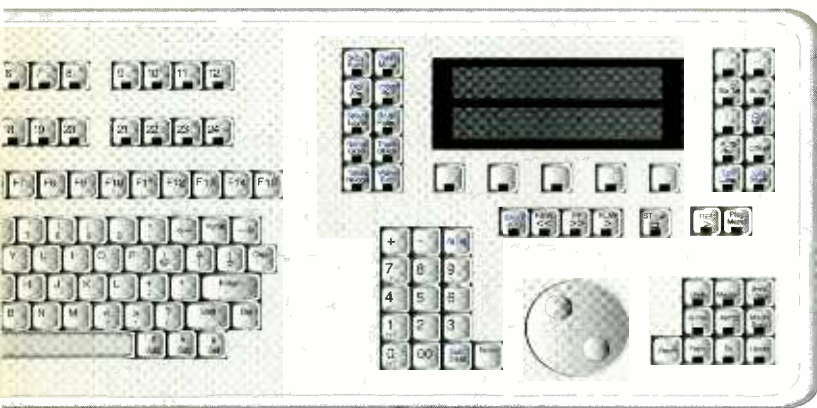
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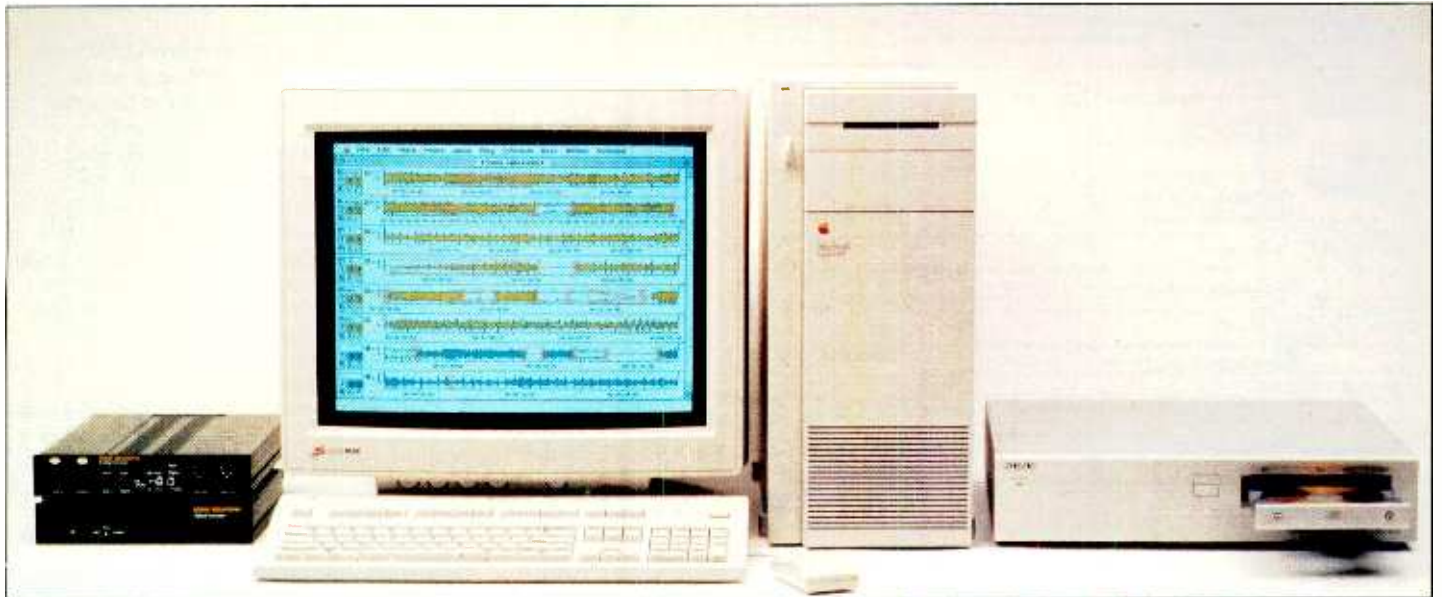
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SonicStation II boasts up to 62 tracks of up to 24-bit recording

SONICSTATION

American company Sonic Solutions have established something of a 'Rolls Royce' reputation over their seven-year history, having earned a reputation for painstaking attention to detail and innovative ideas. Part of the elitism that surrounds Sonic's system is perhaps attributable to its early adoption by classical music editors who found its nonlinear, sample-accurate editing and versatile crossfade facilities ideally suited to their needs.

But just like the Rolls Royce, the system was

Having established themselves at the top end of digital audio, Sonic Solutions are looking for a piece of the down-market action. Patrick Stapley looks at Sonic's solution

not in everyone's price range and other systems (like Digidesign's *Sound Tools*) became a cheaper, more realistic option for many users. In an effort to broaden their client base, Sonic Solutions (along with other high-end digital audio workstation manufacturers) introduced an entry-level system which was both affordable and fully expandable. The *SonicStation* provided a platform which included many of the features that had made the original system popular, with provision to add on software and hardware options as and when necessary. The *SonicStation* (SS-117) has now been superseded by the *SonicStation II* (SS-120) which incorporates a number of new features including extra processing power and memory, plus the ability to process material ranging from 16–24 bits.

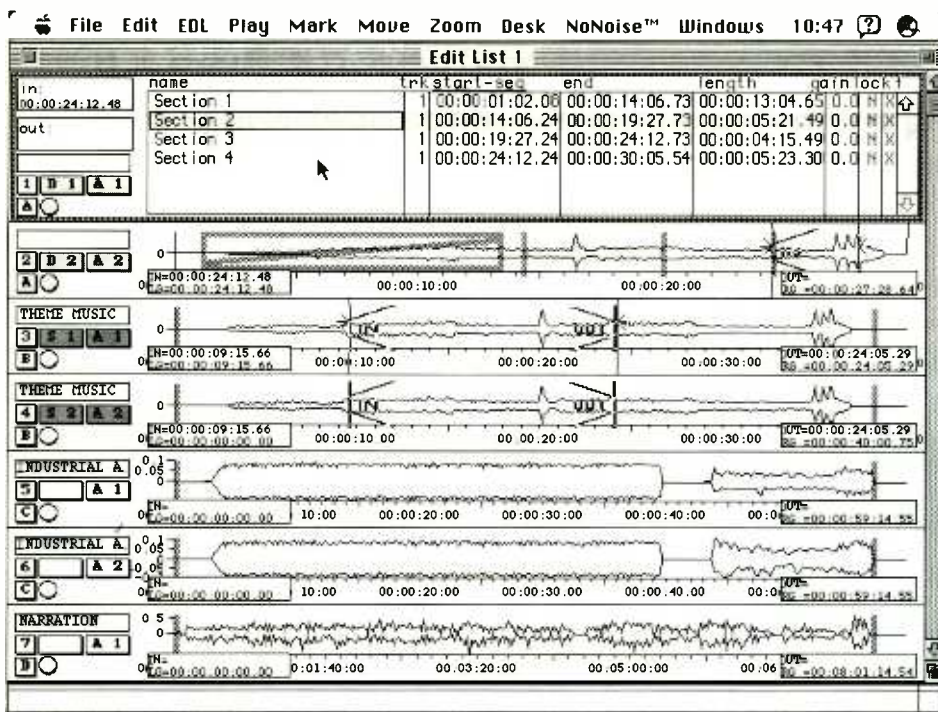
The system

The *SonicStation* system consists of both software and hardware components and runs on a *Macintosh* fitted with at least two NuBus expansion slots. The computer must have a minimum of 8Mb of RAM and a hard disk with a minimum of 5Mb of free space for the system software. The system then 'daisy-chains' to external hard disks. At the heart of the system is the SSP-3 processing card which slots into one of the NuBus expansion slots. This also provides fibre optic connectors for two channels of digital I-O (AES-SPDIF), a time code connector (8-pin

mini DIN), and a SCSI connector for interfacing the external hard disk or disks. The user interface is via the computer's mouse and keyboard, although an optional hardware panel is available for control of mixer functions.

When the system is booted, the first screen that appears is the mixing desk. This basically comprises a 4-channel input section and a stereo main output arranged in a familiar mixing console layout. The other main screen is the Edit Window which displays audio in horizontal panels—depending on setup, there can be up to 32 panels (or tracks) displayed at one time, but for stereo editing purposes the default is just four. The total number of tracks available in the system is 62.

Along the top of the screen is a menu bar providing access to pull-down menus and submenus. Basic operation of the system remains the same. Audio is recorded into a sound file from where it can be accessed and placed in an edit decision list. Sound is then displayed in the Edit Window panels in a variety of ways, the most common being a waveform display. From here it can be played back (by pressing the space bar on the keyboard, or Play from the on-screen Transport Panel which mimics the appearance and action of tape transport buttons, or by accessing the Play menu). Audio can then be moved between panels and edited; in the case of stereo editing, sections of audio are moved from Source Panels to Destination Panels to be ►



Edit list screen

compiled into a master.

To monitor the audio, the panels are assigned to one of the four input channels on the mixing desk with the limitation that only two active signals can be monitored by one channel at one time. An edited piece of audio is regarded as a dual signal because at the transitional point two pieces of audio will overlap during the crossfade. However, if this poses limitations, the number of mixer channels can be extended up to a maximum of 24.

The system is capable of recording and playing back sound simultaneously which provides facilities like background loading—expanded systems with extra digital I-Os can both upload and download to the hard disk simultaneously while editing and monitoring take place.

Mixing desk

The *SonicStation II* Mixing Desk is a 4:2 digital console, providing control over level, mute, phase reversal, pan, equalisation (two bands per channel, selectable between parametric, hi-shelf and low-shelf), insert, routing and source selection. The standard system includes automation for level and pan functions, but this can be expanded to provide full dynamic automation. As mentioned the display mimics a conventional desk layout with faders and sliders which can be controlled in two ways: firstly the head of the fade-slider can be dragged using the mouse, or alternatively nudge buttons incorporated in the display can be accessed giving control in small increments—the pan slider, for example, has 100 positions to the left and 100 to the right. Fader resolution may be increased by selecting Long Faders from the desk menu which produces a much finer response from the mouse. Provision is also made for fader presets, and three Hot Spots to the right of each fader provide instant set to unity, +20dB, or infinite attenuation. Faders and other channel functions can also be ganged together to form stereo pairs (channels 1 & 2, 3 & 4).

Above each fader are the EQ windows displaying the type of filter selected and the parameter values (boost-cut, frequency, Q or

sharpness). Each filter has a frequency range of 1.0Hz–22.050kHz with ± 24 dB boost or cut; the sharpness control applies to shelf filters and selects the Order of the slope (1–4), the higher the Order the greater the amount of signal processing required, and multiselection of High Order filtering can result in the system's processing power being exhausted. Filters are controlled from a set of three sliders that appear in the centre of the mixing desk screen, and like faders and pans can also be adjusted using nudge buttons. Hot Spots are again provided for (quick set) of regularly used values, and filter may be copied from adjacent channels by selecting the Grab Right or Grab Left function. Channels can be cascaded (channels 3 and 4 route to 1 and 2) thus doubling-up on signal processing.

At the top of the channel strip display are a group of five buttons that deal with SOLO, MUTE, EQ BYPASS, PHASE INVERT, and ROUTING (routing on a standard *SonicStation II* is restricted to two output buses (M1 and M2), on expanded systems four outputs are available). Additional button placed between channels 1–2 and 3–4, allows EQ to be bypassed for stereo pairs. The output section contains two main faders that can be locked together for stereo fades. The faders provide attenuation only, operating from 0dB down to infinity. The output can be configured to operate in stereo or mono; in mono three options are available combined mono, left duplicated to right, or right duplicated to left.

Output level meters are sited above the main faders and include switchable indicators for peak or peak hold metering.

Editing

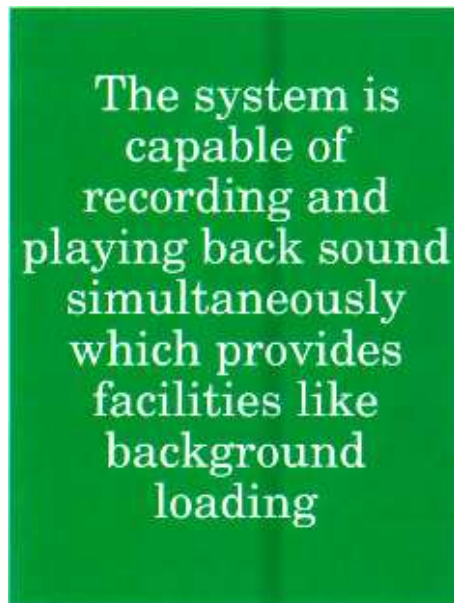
There are three main styles of editing in the system—Insert-Delete, Segment, and TextList—elements from each can be combined to suit the operation at hand. Insert-Delete is nearest to conventional tape editing, where audio is spliced together to form a composite; Segment relates to dialogue or sound-effects-type editing where the audio tends to be treated as a number of self-contained blocks or segments; and TextList

allows the user to edit already defined segments of audio directly from a panel list.

As mentioned, the Edit Window displays audio in a series of horizontal panels analogous to tracks on a multitrack tape. Audio can be represented in these panels in four display formats—Waveform, Bar (segment blocks), Text (list of edit events), and Frequency Analysis (frequency plot of an audio section). These formats can be mixed between panels.

The default display is Waveform and this can be zoomed in to sample resolution, or out to display the entire audio segment on the screen. The waveform display includes two scales a vertical scale representing amplitude and a horizontal scale representing time (decimal seconds, samples, or time code). The amplitude scale will vary relative to the loudest part of the waveform being displayed—thus when zooming in on a section, the display may rescale to provide a full eight waveforms for low-level program. This can cause some confusion at first, when very low-level sound appears to be at the same amplitude as full scale program.

On the left of each panel are several boxes that are used to control and indicate which track the panel is displaying (name and number), how that track is grouped with others, and to which channel on the mixing desk it is assigned. Tracks may be grouped together using Sync Groups of which



there are 32. These gang together functions such as Playback, Zoom, Move, and Edit. The system also includes two Edit Groups—Source and Destination. If the system is being used for stereo editing the default arrangement is four panels; the lower two assigned as Source and the upper two as Destination—stereo audio is initially placed in the bottom two panels and compiled to the top two. In addition, each pair will belong to a Sync Group. The first stage of editing is to place markers called Gates (displayed as vertical lines) in the waveform to identify the edit area. These Left and Right Gates frame a section of audio for editing as well as designating a playback field—a play command will cause playback from the Left Gate to the Right Gate (there are various options such as playing a segment around the Gates centre point—the system also operates with a number of different types of marker providing instant locate points). The framed areas can be zoomed and the segment 'rock and rolled' (Jog or Shuttle modes) with the mouse to precisely ▶



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define an edit point which is marked with an In point. A similar operation is then performed to position the Out point. The defined section (in the case of assembly edits) is then removed to the Destination panels. When inserting a section of audio into an existing section, a '3-Point Edit' is necessary. The source segment is marked out as described with In and Out points, and an In point is marked on the destination audio. If one or more of the points required to specify the edit are missing, the system will use the beginning and/or end of the panel as its reference. The user then has two choices, firstly a replacement insert that will drop-in the new section in place of the previous audio, or a displacement insert (Insert Ripple) that inserts the segment at the In point while shifting the rest of the audio to the right, thus lengthening the Destination audio. The same principle applies to Delete commands.

With Segment Editing, audio is treated as many self-contained pieces of sound with fades incorporated at the beginning and end. Segments may be selected and dragged to new positions in a panel even overlapping each other (only one overlap is permitted at one time). Cut, Copy and Paste commands may be used to move Segments from one panel to another.

Segment-based editing will often involve multiple panels, to simplify multitrack editing, the mixed and edited output can be routed back onto the hard disk (Captured), and work continued around the bounced tracks. Both Segments and audio positioned between In and Out points can be looped to create ambient backgrounds and so on, and segments or entire panels can have their gain changed (+24dB to minus infinity) in 0.1dB steps.

All edits can be undone by stopping back through them in order using the Undo Edit

command. Similarly edits can be restored using Redo Edit. The user can put a limit on the number of undo steps the system will allow. After working on an Edit List the results should be saved to disk.

Faders and crossfades

Every edit created on the system will either incorporate a fade or a crossfade—edits from or to silence have a single fade, and edits between pieces of audio have a crossfade. The parameters for fades-crossfades are adjustable from the Edit Fade window; this includes length (2.9ms–100s) shape (six curves based around Linear, Cosine, and Exponential), and positioning in relationship to the edit point. All fade parameters can be adjusted separately for each side of a crossfade and auditioned by playing back just one side of the fade or the other. Modified fades can be stored as Fade Templates along with the four system templates (Out Xfade, In Xfade, Fade To Black, and Fade From Black). Fades and crossfades are displayed in the panels by pink 'bow tie' markers, which will vary in size relative to the length of the fade. The position of an edit can also be modified from the Edit Fade window.

Archiving

A finished project is output from the *SonicStation II* to mediums such as DAT, Sony 1630 or CD-R, but this can also be stored as an Archive, which will enable all the Edit list, Sound Files, markers and so on to be stored on digital tape for reload into the system at a later date. The archiving facility can also be used to print out a log sheet of the project.

Time code and expansion

SonicStation II reads, generates and regenerates all time code formats. Time code is displayed by a Time Code Status window that shows values for both reader and generator to subframe accuracy. The Transport Panel will also display code for the current location. Time code can be used to trigger playback of an Edit List.

SonicStation II can be upgraded with any of the Sonic Solutions hardware-software options. These include machine control for two serially controlled tape decks, PQ editing, sample rate conversion-varispeed, TrackMaker (a simple sample rate converter and PQ encoder), CD Printer (double-speed CD printing), hardware mixer control panel (the Sonic Solutions version features eight P&G motorised faders, alternatively the MIDI controller from JL Cooper can also be interfaced), NoNoise, manual de-clicking, Time Twist (time compression-expansion), *SonicNet*, Sonic A-D and D-A converters, Sonic Optical Converter, Sonic Universal Clock Converter (synchronises the system to composite sync reference), and full automation. Sound-for-picture multitrack packages are also available, and an Autoconform option is currently being developed. Other new options include segment-based EQ and reverb processing. ■

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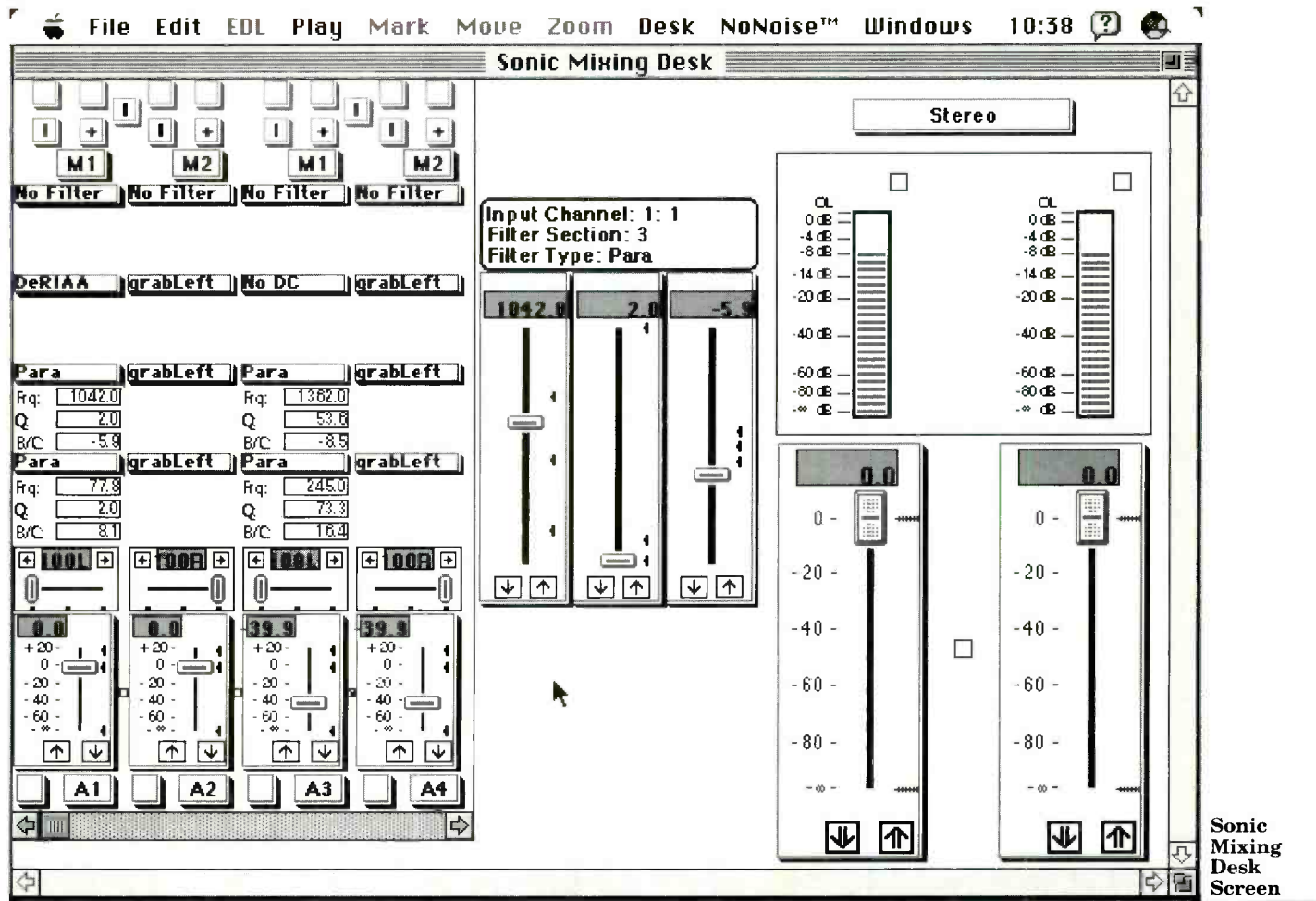
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TWO-TRACK REVOLUTION

The Berlin AES Convention was the first occasion on which Sony showed their new 2-track recording format—a format based around a custom optical disc—intended as the eventual replacement for the ageing tape-based CD mastering system. The first product to be shown in Sony's new range of digital disc recording equipment is the *PCM 9000*. This recorder is no half-way house between consumer and professional product, as many DAT recorders appeared to be, but is a fully professional recorder (with a fully professional price tag). It uses a 2-channel format, and has no pretensions to multichannel operation. The unusual thing about it is that it uses an entirely new optical disc format, provisionally called 'Master Disc' by Sony, which although physically resembling a conventional 5.25-inch optical cartridge is just a slightly different shape. The Master Disc is not a form of Compact Disc, and is not compatible with any type of CD-R machine on the market.

The launch of this format has some important implications for the professional digital recording market, which are assessed below.

The master disc format

Sony have opted not to use conventional ISO computer M-O (magneto-optical) cartridges in this

system, since they only offer a storage capacity of just over 600Mb in total and are double-sided. Instead, the Master Disc is single-sided and offers around 1.3Gb of storage on that single side, pointing to a considerably higher data density on the disc. The reason for adopting such a disc is clear when one realises that it can store up to 80 minutes of stereo audio at 20-bit resolution, using a 44.1kHz sampling rate. When the audio is sampled at 16 bits, the disc will store around 100 minutes of stereo, and at 24 bits will hold some 60 minutes. This degree of storage capacity makes it possible to master a complete CD on a single disc, and thus shows the format as directly aimed at the CD mastering market, in replacement for the combination of *PCM 1610* or *1630* and U-matic recorder which has now been with us for over ten years. In contrast to the older 16-bit, equipment, the new format allows mastering at 20-bit resolution, or even 24-bit if future applications require it.

Unlike most M-O discs, the Sony disc requires no erase pass before recording over old material. In this sense it is similar to the consumer MiniDisc, and indeed this format seems to owe a considerable amount to the MiniDisc, being in many ways like a larger version of the same disc (except that MiniDisc stores compressed audio data and Master Disc stores linear PCM). Since rerecording is achieved by direct overwriting of old material, recording requires no more disc activity

than replay, making possible various useful professional modes of operation such as read-after-write (confidence replay) and synchronous drop-in using read-write-read.

The blank discs are pregrooved, with fixed address marks for block sectoring. Within the format there is room for a certain amount of auxiliary data, including a time code channel which may be asynchronous with the audio sample rate if required, and it is thus possible to include PQ data for CD mastering either in a burst at the start of the recording (as with U-matic masters) or alongside the audio in real time (as on a consumer CD). ▶

Francis Rumsey assesses Sony's *PCM 9000* optical mastering system and wonders if there is a mastering revolution in the offing

Sony are not giving away much information about the nature of the disc format, but it seems to have been quite cleverly positioned in the market, appearing for all the world to be a dedicated audio recording format rather than a computer hard disk—but with many of the features of conventional computer hard disks. This will keep audio engineers happy who feel uncomfortable with computer technology, but will offer many of the operational advantages of that technology and perhaps some more.

PCM 9000 features

Like the disc format, the *PCM 9000* recorder is a clever balance between appearing to be a dedicated audio recorder while having the features of a conventional hard disk system. For example, the recorder has a SCSI interface, allowing for the transfer of audio and aux data between machines at over twice playing speed, since the disc drive is capable of faster than real time transfer (again, rather like MiniDisc). The SCSI interface, from the information that can be gleaned, is implemented in something of a custom fashion though, making it unlikely that the *PCM 9000* could be connected directly to a third-party editing system and treated as a disk drive (albeit a very expensive one!).

The *PCM 9000* will record at a selection of

People have waited
a long time for it,
wondering why
Sony have been so
late entering the
hard-disk
recording field

sampling rates (44.056kHz, 44.1kHz and 48kHz) and resolutions (16, 20 and 24 bits), and the normal digital inputs and a variety of sync inputs are provided. There is also the useful provision of AES-EBU insertion points, allowing digital effects units or mixing equipment to be inserted in the digital domain during recording or editing operations. It also offers varispeed $\pm 12.5\%$ of standard play speed in steps of 0.1%. Channels may be recorded independently, as may time code and aux information.

A number of optional cards are available to provide the machine with editing functions, and these possibilities seem very attractive since they include real 'jump editing' (the ability to skip over sections of unwanted material in real time), allowing material to be edited simply on a single machine by arranging the takes to be replayed in any order with a fixed crossfade or pause at the joins between sections. Again there are similarities with MiniDisc. Editing may be either destructive (altering the recorded material) or nondestructive (playing out recorded material in a predetermined order) and it is intended that a card will be provided to allow the *PCM 9000* to act as a player in a *DAE-3000* editing system. At the time of writing, Sony could not say whether or when the machine might be able to act as a

recorder in such a configuration, but a number of further products in this new line are planned which will open up editing possibilities not based around the old tape-based editor.

The optional control panel of the *PCM 9000* is detachable and may be mounted remotely from the machine, thus allowing many of the recording and editing functions to be carried out without resorting to the use of an additional controller. An important feature is that edit data may be dumped to the audio disc, allowing the disc to be carried to another machine and either played out in its edited form or further edited.

Implications for digital recording

The Sony system described above is the first major product from Sony in the professional 2-track field for a long time. People have waited a long time for it, wondering why Sony have been so late entering the hard-disk recording field. Clearly Sony have wanted to give people perceived value from their investment in U-matic technology, and have been watching developments in hard disk recording while developing their own disc recording products for both consumer and professional markets. It would have been foolish for Sony to have launched any disc-based product which did not allow continuous recording of a whole CD, since CD mastering is a vital market for the company, and removable disk technology has only just reached the point where sufficient storage can be obtained on a single-sided disc of moderate size with the possibility for direct overwrite and an adequately fast transfer rate and access time.

The important questions are, firstly whether it will be perceived that Sony have got it right, and secondly whether users of 2-track digital recording equipment will move to such a format in sufficient numbers to have made it worthwhile. The answers to both questions depend to some extent on the perceived cost-benefit ratio. Many engineers currently use DAT as the primary recording format for 2-track source material, copying the required takes to a disk-based editor for postproduction. Editing systems, such as the Sonic Solutions products, allow one-off CD-Rs of the edited material to be 'printed' and there is considerable effort to get CD mastering plants to accept such CD-Rs as the production master, the CD glass master then being made directly from the customer's CD. There are also quite a few organisations still recording on U-matic and *1630*, editing using the *DAE-3000*, and producing a U-matic master.

Benefits

The Master Disc format allows source recordings to be edited directly, without copying first, but this statement requires some qualification. Basic sequences of source material may be assembled using the jump editing option, either with a fixed crossfade or a pause between sections, whereas more complex music editing with variable edit parameters will require an external controller. This said, many operations will be possible using a single *PCM 9000* machine and a controller, rather than two transports, in the true spirit of nonlinear editing. There is potential for a certain amount of postproduction time-saving with the new format, and there is the added convenience of being able to carry half-edited discs between machines. Many aspects of the system have considerable promise in broadcast applications where simple disposal editing is commonly used, and where time ►

Australia:	Audio & Recording 006123169935
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Belgium:	Mills Music 003238289230
CIS:	Muiston Ltd
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spent in real-time copying is to be avoided.

Whether or not the final edited master will have to be copied in a linear form to a new disc depends on the application. In theory it is possible to store the edit commands on a disc with the raw source material, allowing a subsequent machine to replay the programme by performing 'soft edits' in real time, provided that the appropriate options are installed on the replay machine. This might be acceptable within a controlled operational environment, where the originator of the disc could be sure that the disc would be replayed correctly, with the right set of edit commands selected, but it would be potentially disastrous as a way of sending the disc to a third party such as a CD pressing plant, with plenty of scope for mistakes. In the latter case one might wish to make a contiguous copy of the edited material onto a fresh disc which could be played as a single 'linear' recording. Such a premastering process might be desirable in any case, since it is likely that source material will be recorded in 20-bit form, whereas a CD would be mastered in 16-bit form. The final process of producing a contiguous master disc would probably therefore involve a 20-16-bit conversion process such as Sony's Super Bit Mapping.

In the future it is expected that CD mastering plants will accept Master Discs as well as U-matic tapes and CD-Rs for glass mastering. Since Master Discs can be transferred at over twice play speed, pressing plants will see advantages in faster mastering of CDs, and Sony intend to work with them to make this possible. (MiniDiscs, of course, may already be glass-mastered in roughly 1/5th of the time of the equivalent CD due to the data reduction used.)

Costs

At the Berlin Convention, Sony were talking Deutschmark equivalents of roughly £17,000 for the basic *PCM 9000* recorder and around £100 for blank discs (£99.99 was mentioned as a proposed UK market price). Various options for the system (some of which will be almost unavoidable in typical installations) are a 20-bit A-D and D-A convertor (~£4,000), the control panel (~£2,600) and the jump editing board (~£4,000). At such price, a typically loaded *PCM 9000* seems priced comparably with the combination it replaces (a

... it is expected
that CD mastering
plants will accept
Master Discs ...

PCM 1630 and a *DMR-2000*), while offering considerably enhanced functionality. It is expensive, though, in comparison to even the most expensive professional DAT machine. It is therefore unlikely to woo those independent classical recording engineers who currently make all their session recordings on DAT, but will prove very attractive to larger studios, recording companies, CD plants and broadcasters which would previously have contemplated buying a full-blown CD mastering system (and there still seem to be quite a lot of those around).

Given that the *PCM 9000* offers a number of editing functions directly from its front panel, that it can be used in conjunction with existing *DAE-3000* editing systems, and that onboard jump editing can be performed using a single machine and a plug-in board, the package seems attractive. It will also appeal to markets other than those already addressed by the tape-based CD mastering system (such as radio broadcasting), although the cost is currently high compared with the technology to be replaced (the 1/4-inch tape machine and razor blade).

The feeling about the price of discs varies, though, and it is possible that this may be the sticking point for many would-be purchasers of the new system. In the music recording field it is rare for 2-track tape to be used more than once, and it is common for classical recording operations to keep all the source tapes from sessions. In other words, although the discs may be reused, it is unlikely that they will be in practice. With DAT tapes costing less than £10, and the longest U-matics normally no more than £40, the price of Master Discs will seem high. Of course, in independent operations the cost of recording media is something normally passed on to the client (plus the typical healthy profit margin), and possibly Sony are relying on this being a suitably

small proportion of the total costs involved in the typical recording project for people to switch to the new format because of its perceived operational benefits.

Certainly there are attractions, not least in the opportunity for 20-bit recording, and people may also feel that the improved data integrity of a noncontact disc medium is worth paying for. Furthermore, it has been suggested that users will not be paying the regular 1,000-hour maintenance costs of the U-matic machines, and that the optical disc recorder will require less maintenance. Only time will tell.

Time tends also to result in a drop in the cost of blank media, but this only happens as the quantity of production rises. Since the disc cartridge will not enjoy the economies of scale seen in the mass computer market, reductions in cost will depend upon the professional recording market adopting the format in a big way.

Conclusions

The *PCM 9000* is expected to be available in late Summer 1993, but what of the existing CD mastering system? Sony in the UK say that it intends to continue selling the tape-based CD mastering equipment as long as people want to buy it, but we should expect to see further products over the next year, in a full overhaul of Sony's 2-track digital mastering line. ■

UK: Sony Broadcast and Communications, Jays Close, Viables, Basingstoke RG22 4SB.

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Family affair—the DD1000s, DD1000i, DL1000 and DL600

DD1000

The DD1000 was the first tapeless system to offer optical-based recording at a relatively affordable price. Since then, the system has been developed in a variety of ways and, according to the controller used, can change its identity accordingly. The focus of this review is the broadcast applications of the DD1000 and DL600 controller. The software under review was a Beta Version 3.0.

In the pro audio industry, the name Akai has become synonymous with samplers and sequencers. Akai Professional was established around 10 years ago, although Akai itself have been in business for over 60 years. Akai Digital was formed in 1984 and offers a range of products aimed at the professional audio and broadcast markets. These include programmable patch bays, multitrack recorders and the DD1000 series of tapeless systems. The original DD1000 was launched in 1990 and has since been developed and enhanced. Controllers such as the DL1000, DDQMAC software and DL600 have been introduced and the 1993 product range includes

the DD1000i (which has slightly improved external interfaces to the DD1000) and DD1000s.

Hardware and operation

The complete system consists of a rackmount unit with front-panel control, built-in Sony SMO-501 optical drive and connectors at the rear—these include two analogue inputs, four analogue outputs, six selectable digital inputs (Dbus, SPDIF and AES-EBU), two stereo AES-EBU outputs, RS422 port, LTC interface, word clock-external sync input (including PAL-NTSC line as well as digital clock), three SCSI ports, MIDI In, Out and Thru ports, two GPI inputs and printer port.

For increased storage capacity, additional disc drives can be connected to a unit and up to seven units can be controlled by the DL1000 (which also generates time code). To avoid unnecessary duplication, the system is also available as the DD1000s without front-panel control.

The front panel sports the optical drive, level meter display, a medium-sized back-lit LCD window underneath which are six soft keys, a jog wheel, various dedicated function keys (which double up as alpha keys) and numeric keys. Operation consists of selecting a menu or mode with one of the soft keys, moving the cursor with cursor control keys, scrolling with the jog wheel, entering values-names and performing a function with one of the function keys.

Sampling rates of 32kHz, 44.056kHz, 44.1kHz and 48kHz are supported and the sample rate of a digital input is automatically converted to the chosen sampling rate of the DD1000. In addition, the record level of a digital input can be altered by ± 12 dB. The system can perform one recording at a time and this can be either a mono or a stereo take, with the latter consisting of a single phase-locked data stream.

At 44.1kHz, a single side of a 600MByte optical disc has a recording capacity of 30 stereo-minutes (or 60 mono-minutes) and, if multiple drives ►

Three years and three software versions old the DD1000 is reappraised by Yasmin Hashmi

Q-MAC III

QMAC III is a software package written to run on Apple *Macintosh* computers using *System 7*, *SE30* and above. It functions as an alternative user-interface for the Akai *DD1000* and allows control of up to six *DD1000*s. With reference to the original *QMAC*, *QMAC III* is a complete rewrite and is streets ahead of its predecessor in all respects.

Viewing, inputting and manipulating information is generally easier and more flexible with *QMAC III* than with direct operation of the *DD1000*. For instance, each main type of file has its own list window: Takes, QLists, Songs, Playsheets and Setups. Edit windows can be opened from a list window simply by double clicking on the relevant title. Up to 10 windows can be open simultaneously. Each can be sized and positioned anywhere on the screen thus allowing a broad overview of what you are dealing with. The standard *Mac* copy, cut and paste commands are fully implemented allowing the contents of most field types to be copied between windows. Most windows have a resizeable transport bar providing a much wider range of play from/to functions. Also, once learnt, the comprehensive set of *Mac* keyboard commands (alternatives to pointing and clicking) make for very speedy operation.

Probably the most impressive area of *QMAC III*, operationally, is the QLIST window which includes a graphical presentation (not unlike Steinberg's *Cubase*). There are many things you can do here that either cannot be done or are rather laborious on the *DD*. Groups of cues can be quickly selected according to various criteria and then edited simultaneously (for example all backing vocals can instantly be routed to output B). A series of cues can be butted together instantly; two groups of cues can be connected without effecting the relative timings within the group; a new cue (for example atmos) can be made to fit a gap between two cues; you can remove all the unwanted bits from a Take and create a new clean Take; you can store complex fade groups in a scratch pad QLIST ready to be pasted in when needed. Cues (seen graphically as oblong boxes) can be edited using graphical tools: scissors allow new cuts to be made; a pencil allows fades to be drawn and a resizer tool lets you move cue in-out points.

If you have a fairly powerful *Mac* with plenty of RAM, it is also worth noting that, under *System 7*, you can also simultaneously run other *Macintosh* programs and that certain *QMAC III* windows can be imported into word processor packages and edited-printed. Such centralised control offers obvious advantages.

Another advantage is that you can remotely mount your *DD1000*s thus avoiding the intrusive noise of the cooling fan. The disadvantages here concern changing discs and metering—it is very limited on *QMAC III*. While on a negative slant, jogging is also very poor using the mouse. It can be very significantly improved by the use of a JL Cooper *CS-1* controller with jog wheel, although it is still not as tight as the *DD*'s own wheel.

All in all, though, *QMAC III* does offer a wide range of significant benefits and can certainly be recommended. Be warned, though, it is addictive. ■

Jim Betteridge



DD1000s in use on BBC's Clothes Show Live

are connected, a continuous recording can be made across a maximum of four discs. Before a fresh optical disc can be used it must first be formatted, which takes around 10 seconds. Once a recording has been completed, the verify pass (which is strongly recommended) takes around 20 minutes for a full disc. A disc can, however, be reused without the need to reformat, simply by deleting unwanted takes and rerecording.

The system has several modes of recording, each with a dedicated key and set of default parameters (which can be changed). Recording can be triggered manually or by MIDI and, in order to avoid delays between the start of recording and hitting the RECORD key, a double keystroke will prime the key such that the RAM buffer is used to eliminate any delay. Takes can be given a default name and an autonaming function will automatically increment the take number.

The user can also assign which of the two pairs of outputs (A or B) the take will be replayed from or whether successive takes will be assigned alternately to A and B (a feature which is particularly useful for checkerboarding). Other assignable parameters include autoplay, which allows the system to operate as a simple lay-off device by remembering the external time code value corresponding to the beginning of a take, entering the value in an events list and replaying the take whenever the same time code is fed back to the *DD1000*. The take will be replayed in sync even if the time code value corresponds to a position after the event time.

The system will record and replay simultaneously and supports both nondestructive punch-in and overdub functions. The latter allows a play region to be defined as well as a record region and the overdub is stored as a separate take. Punch-ins, on the other hand, operate in conjunction with an events list (called the QLIST) and can be manual or automated, with one level of undo. After a punch-out, there is a small gap in the replay before it recommences (at the correct position) due to the managerial processing time required by the system.

The two GPIs can be assigned to any two keys in the record mode and all record parameters are saved with a take. This means that preferred setups can be quickly recalled by selecting an appropriate take.

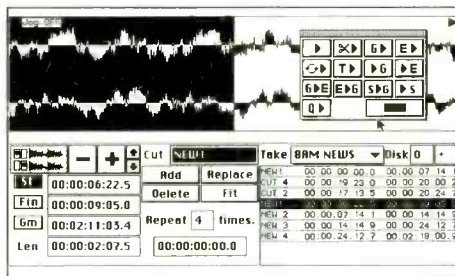
Editing

Once a take has been recorded, it is displayed as a waveform which can be sectioned into a maximum of 50 cuts. These appear as highlighted sections, each with an in and out point as well as an offset point which allows a cut to be referenced to a position other than the in point. The front panel does not provide standard transport controls, so points are found by marking on the fly, entering numeric values (timings can be displayed in time code, measure-beats, feet-frames or samples) or using the jog wheel for scrubbing-shuttling, with the ability to zoom in and out. Points can be checked by auditioning up to or away from a point or by auditioning just the cut itself. Alternatively, cuts can be automatically defined by a level threshold feature which can be selected prior to recording. Once a cut has been satisfactorily defined, it can be named and saved as a cue. Along with the name, the user can assign any letter of the alphabet for categorisation purposes.

In Edit mode, there are several ways of replaying cuts including looping, chain (or butt) replay in the order they were created and chain replay in time order. For simple deletion editing (for example, deleting unwanted hesitations in speech), the unwanted sections can be marked as cuts. The user can then elect to play only unmarked sections (which has the effect of cutting out the cuts) or muting the cuts (or even muting unmarked sections if appropriate).

A la mode

The *DD1000* can play two independent cues (mono or stereo) simultaneously and uses real-time



Q-MAC III Edit screen

fades. This means, for example, that either two stereo cues can replay simultaneously without crossfades or one stereo cue can be replayed crossfading into another. Crossfades are defined by assigning a fade in and fade out to the two cues involved. Fades are defined in the QLIST (which, along with cue names and event times, lists other parameters such as fades and output assignment) with a choice of two curves (fade to 10% or fade to zero) and two fade-types, namely start from the in-point and end at the end-point or end at the start-point and start from the end-point.

The QLIST can be used for altering the in and out times of cues and-or their event times, thus allowing cues to be overlapped (or play simultaneously). Event times can be referenced to internal or external timing and 'blank' event times can be grabbed on the fly and then assigned not only to cues, but to MIDI notes or program changes. In addition, a region of events can be selected and copied, deleted or moved as a block.

Song mode is similar to QLIST mode and has the same editable parameters, but is simplified for music applications such that cues are displayed in steps for chain sequencing.

DSP functions include time compression-expansion, varispeed, pitch change and EQ

Playsheet mode is used for manual triggering purposes and, as in recording, a Prime function loads the RAM buffer in order to ensure instant triggering. A playsheet can contain up to 256 items comprising individual cues or complete QLISTs. The items in the playsheet will appear in the sequential order in which they were entered. Alternatively, the playsheet can be sorted alphabetically or by category. An 'active window' highlights nine consecutive items in the list and automatically assigns each to a numeric key for manual triggering—the first item to Key 1, the last to Key 9. The assigned items can be changed by scrolling the window up and down the list, however, this method assumes that items which are required to be active for triggering are consecutive and are not spread around the list. In order to provide more flexibility, the DL600 or DDQMAC software is recommended. Alternatively, more than nine items can be active for triggering by assigning them to notes on a MIDI keyboard, for example.

Having selected which window of nine cues are available to be triggered, the user has several trigger options: 2-track allows only one cue to be played at a time, Sequence will chain replay cues in the order they were triggered, 4-track allows any two cues to be triggered simultaneously and 2+2 allows any two cues, one assigned to an odd key and the other to an even key, to be triggered simultaneously. In addition, the 2-track option has several modes of replay including playing the

cue for as long as the key is held, playing once completely, looping while the key is held and continually looping. Also available is the ability to retrigger and, using the 4-track option, the ability to play the same cue twice simultaneously. All setups are saved with the playsheet and up to 300 playsheets can be saved on one side of an optical disc. These appear in a list which can be scrolled through and in order to simplify playsheet selection, the user can assign a particular playsheet to precede the current playsheet and one to follow.

RS422 control


If the system is put in RS422 Master mode while in the QLIST, it can control the transport of an external VTR using soft controls which appear on the LCD. The VTR can also be jog-shuttled using the DD1000's jog wheel and, due to RS422 location interrogation, timings can effectively be grabbed while in freeze-frame. The user must then assign appropriate cues to these 'blank' events.

In order to shorten the track-laying process, RS422 controls are also available in Playsheet mode, such that cues can be manually triggered (either against moving picture or in freeze-frame) and the event as well as the associated cue will automatically be placed in the QLIST.

In RS422 Slave mode, the system can behave as the audio tracks of a VTR. It will 'eavesdrop' on commands sent to a master VTR by a video edit controller and provides two stereo tracks of recording with short handles. Outputs are assigned by selecting A1 and A2 or A3 and A4 on the video edit controller. In addition, the DD1000 provides a delay parameter which can be edited. This helps to counteract deliberately 'early' commands issued by the video edit controller in order to compensate for delayed VTR response.

DSP

DSP functions include time compression-expansion, varispeed, pitch change and EQ (consisting of four bands of parametric and two ►



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shelves). For time compression-expansion operations there are tens of algorithms to choose from (these can also be edited). The manual gives guidance on which algorithm(s) may be appropriate according to the type of sound involved and the user can choose to fix either the start or the end of a cue to its current position.

A Check function provides a rough real-time audition and the actual process is calculated much faster than in real time. The check function is also available for varispeed, pitch change and EQ (all of which are static).

DL600

The DL600 controller was specifically designed for cart replacement applications. It comprises a compact unit measuring approximately 12 x 10 inches and is slightly angled with a rest bar at the bottom. The surface is divided into two sections. The section on the left sports a vertically arranged back-lit LCD with four trigger keys either side, one side representing output A and the other output B. The section on the right has various function keys and a jog wheel.

The DL600 is independently powered and is connected to the DD1000 via a socket at the rear of the unit. MIDI In and Out ports are provided as well as a multipin connector so that the DL600 can receive fader open and close commands (from an external console) and/or send signals to external devices.

On power-up, the first playsheet in the DD1000 is automatically loaded in the DL600. At the top of the display, the name of the current playsheet is shown as well as the previous and following playsheet. The first eight cues of the playsheet are then displayed vertically and the keys either side of the display are staggered such that each cue is assigned to a key: four cues to side A and four cues to side B.

The DL600 offers the same playsheet selection and mode of operation (displayed at the bottom of the LCD) functions as the DD1000 on its own, but also allows any cue within the playsheet to be assigned to any trigger key. In addition, side A and side B can be operated and edited independently such that, for example, side B can be changed from 2+2 mode to Sequence mode while side A is playing.

The DL600 provides a number of helpful features for on-air playback. In Sequence mode for example, the key corresponding to the cue which is currently playing will be lit, while the key for the next cue will be flashing quickly and the key for the cue following that will be flashing slowly. For fader triggering from external consoles, a switch on the back panel provides a choice of fader modes. Cues can be triggered from a position other than the start and a TEST key allows a cue waiting to be fader started to be auditioned. In Auto mode using the 2+2 option, the playsheet can be organised into 128 cues per side, with the first key on each side being preloaded with a cue. Once these have been fader started, the keys will automatically be loaded with the next cues and so on, such that operation can be totally controlled from the external console. In addition, an Auto Random mode will randomly select the next cue for replay.

Since the system uses an optical disc, there is no need for additional archiving. However, given that optical discs can be a relatively expensive archiving medium, selective archiving to DAT is supported.



The DL600 facilitates control of the DL1000 as a cart machine

Akai intend to further develop RS422 functions and will introduce features such as recording longer handles in the Eavesdrop mode.

Conclusion

As a stand-alone device, the DD1000 provides many useful features for a variety of applications. For broadcast, these include automatic sample rate conversion, the various recording, triggering and sequencing modes, the RS422 modes and the advantages of using a removable medium. However, for intensive editing or live replay purposes, the front panel can provide an awkward control surface because it may be impractical to mount the unit at eye level (requiring the user to stoop in order to see the display). In addition, for intensive editing in particular, operation is restricted by the limited amount of information which can be displayed and therefore controlled.

The positioning problem can be solved by using the DL1000 remote, which has the same functions as the front panel (as well as output faders) but is a flat, angled surface which can be placed away from the unit. The more intensive editing requirements are addressed by the DDQMAC option (see side bar) and the DL600 offers straightforward and easy-to-understand control for cart replacement purposes.

Thus the DD1000, although offering many useful functions in its own right, must also be seen as a general workhorse which can be put to more specific use (and therefore appeal to particular markets) by the addition of the various optional controllers. ■

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Under the name Sypha, YASMIN HASHMI & STELLA PLUMBRIDGE operate a UK-based independent consultancy to manufacturers and users of disk-based audio-video editing and related systems. Sypha was established in 1988 and has published *The Tapeless Directory* and various market studies, as well as regularly contributing to *Studio Sound*.

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THE ABBEY HABIT



Portugal's first SSL desk at Studio Valentim de Carvalho, Studio A

In the '60s EMI's Abbey Road Studios spawned many imitators looking for the magic touch with the music they recorded and the studio rooms that were used. The music was successfully exported and so indeed was the room design expertise. The winning formula of Studio 2 found its way to Portugal, to Studio Valentim de Carvalho on the outskirts of Lisbon. Studio 2's look and measurements were copied and EMI tape recorders and engineers imported, all that was missing were the Portuguese version of the 'moptops'.

That was nearly 30 years ago when, as an EMI agent, Valentim de Carvalho recorded all the famous Portuguese bands and some famous EMI acts, Cliff Richard and The Shadows have recorded here and Julio Iglesias cut his first record here.

At the time Carvalho was equally well known for its record pressing plant, a mammoth Moorish castle in the hills of Paco d'Arcos, just a few miles from Lisbon. Today the Moorish record plant is the first building you see when you pull into the

studios. They have grown since the original EMI involvement, now the old Abbey Road lookalike studio has been joined by a new wing and surrounding open land.

Carvalho's 'Studio 2' was a huge success for many years but as bands got smaller, its size became a hindrance. Now it runs as an on-air television studio and was resplendent with comfy leather sofas and

In the 1960s Studio Valentim de Carvalho brought a little bit of Abbey Road to Portugal. Today the country's new broadcasting freedom provides the inspiration. Julian Mitchell reports on 'A Day in the Life'

subdued lighting for a regular chat show on the RTP channel when I visited. The old control room becomes the production gallery with video postproduction and off-line editing fitting in behind. They can also offer OB and ENG facilities.

Such diversification into video may have seemed excessive but the studio was covering itself with the knowledge that the country's only TV company RTP hadn't the facilities to cope with their output and that new private TV companies were on the way, (they have now arrived, newspaper backed SIC and the church backed TVI). Carvalho also bought out their main audio competitor, Angel 1 and 2 in Lisbon, to keep control and to have a price and equipment choice when bands and labels needed one.

New audio

Carvalho had not deserted their own audio production but wanted to move with the times and provide a smaller, more creative environment for bands and audio for video work. The new wing to the original building is visually striking and owes nothing to the Moors but maybe something to Frank Lloyd-Wright with its brute angles and glass bricks. Two audio studios and a digital mastering room take up the space with a large maintenance department on the ground floor.

The studio approached British studio designer Andy Munro for the bulk of the design work. Studio A is the main room and is fitted with Portugal's first SSL desk, a *SSL 4000 G series* with *E series* centre section, Studer analogue multitrack and a generously sized recording area with isolation booths off to one side. The performance area offers variable acoustics by means of movable wall panels on two walls. The rest of the area is wooden strips and red-coloured revac-backed slats. The control room is backed by a machine room overlooking a Carvalho-owned copse. The studio's plan to add a Studer digital recorder soon and as they are the main Portuguese Studer distributor, are looking forward to a nice discount.

Director Pedro Vasconcelos is happy with the result of the studio, 'We tried to do almost everything Andy said, even the air conditioning is two machines, one for this side one for the other side. It was a crazy project, we spent lots of money. We took this studio very seriously.'

The control room is traditionally laid out with outboard racks behind the desk.



An EMI museum piece

Outboard is still in short supply but it reflects what the market can afford. Monitoring is DynaudioAcoustic *M1* and *M4s* with the *NS10* as reference and a producers desk, behind the racks carries an Atari *ST* running sequencer software. Pedro Vasconcelos, 'I am not investing in the Portuguese market anymore, but if say the UK market demands something then I will get it. Hiring here is very difficult.'



The studios' replica of Abbey Road's Studio 2 now acts as the set for a chat show

DAT problems

Down the stairs from the main audio room is Studio B, a much smaller mixing-postproduction-editing room. The room has a 40-channel Harrison desk; JBL monitoring and tie lines to the Studer A800 multitrack. There is also a Studer *Dyaxis 2+2* hard disk editing machine used for commercials and track editing. Some of the Harrison channels were missing at the time of my visit as Vasconcelos had been recording a band in a farm near the town of Sintra, a few miles away.

Valentim de Carvalho takes the Abbey Road comparison even further with a digital premastering room next door to the smaller audio room. Pedro Vasconcelos however is unhappy at the increasing habit of mastering to DAT, 'Everybody here (in Portugal) is recording unbalanced with cheap converters, its



Huge maintenance areas

ridiculous. Nobody knows how long the tapes will last, we had reports from CBS telling us not to use DAT as a mastering tool because they were very afraid of one day everybody would be claiming to Sony that DAT was wrong to master on. We never know what we will find out in a few years time.'

Carvalhos' premastering room is one of the most profitable ones in the building with around two or three masters going through it every week. It has the Yamaha *DMP7D* digital desk and the Sony *DAE3000* digital editor and Lexicon *480* reverb. The success of this room reflects the lack of CD prepping rooms in Portugal and, in fact, Spain. Spanish companies were sending their masters to Abbey Road in London to be prepared and so Carvalho took a lot of that market. The system is not yet set up for PQ coding but that should be installed soon. Pedro Vasconcelos, 'We started getting tapes from EMI and CBS in DATs to make their local records in Portugal and one

out of ten is going back with drop outs. Of course, with copies it is nothing serious but it takes time, the releases are late one week because of it. It is not a good format, it is a cheap format.'

The impression you can arrive at from just a few hours at such a large recording studio complex will always be incomplete as opposed to being wrong. Valentim de Carvalho has a pedigree that speaks for itself to a certain extent but even if the place was one year old it would still impress with its professional attitude. It is a fact that EMI will usually set up their own subsidiary in foreign countries; in Portugal they trusted the studio to act for them. That alone speaks volumes for their integrity. Pedro Vasconcelos himself took a pro audio course in the UK to get up to speed on the technical world he knew he would have to live in; engineers have done the courses offered by manufacturers like SSL and their huge maintenance area is testimony to the studio's professional status.

The trend of studios in Portugal is towards semiprofessional equipment used in a professional environment. This leaves studios like Carvalho in a good position as an arbiter of quality. It should justify the investment in its audio facilities—helped in no small amount by the new TV work. Valentim de Carvalho has, it seems, cornered a burgeoning market just as it becomes meteoric in Portugal, and a busy future can be assured. ■

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THE IMPORTANCE OF PRODUCTION SOUND

During the planning stages of the 1984 film *Dune*, the producers assumed they would have to replace over 75% of the sound in postproduction. This is the way epic films have traditionally been made—it is so difficult to record ‘usable’ sound during the production stages, that it makes more sense to keep the film on schedule and fix sound problems in the studio. But Director David Lynch felt differently about *Dune*, and so did Nelson Stoll, who was the production sound mixer on the shoot. Together, they struggled with the problems that were supposed to keep them from getting good sound. It was not easy. And there were delays. But, ultimately, 75% of the sound was usable as it had been recorded in the field. The film was later to be nominated for an Academy Award for Sound.

Dune was Stoll’s first Oscar nomination. The 25-year veteran was nominated again for *Total Recall*, won an Emmy Award for the 1991 ABC miniseries *Son of the Morning Star*, and his other credits include *Basic Instinct* and *Raising Cain*. Currently working on *Mrs. Doubtfire* (starring Robin Williams and Sally Field), Stoll has carved a solid reputation with exceptional production tracks on his own films, and wages what amounts to an ongoing personal crusade for better sound in all films.

For him, sound is: ‘the heartbeat that continuously pumps the filmic lifeblood as we paste together little separate shots. From the subtle sounds of movement, to the roar of rage, it is the element that reassures our inner child that the film is not artifice, and opens our emotions.’

Stoll believes this holds true to an even greater degree for character-driven films: ‘In scenes that involve realistic character development, the goal is to make the audience believe they’re seeing a real person, so they’re affected emotionally. Sound is a major, integral part of that. In addition to the dialogue, there are thousands of other tiny sounds that correspond to physical movements of the body. Little rustlings of the shirt . . . soft exhales of anxiety . . . a leg brushing against a table, or some kind of nervous tic that is barely obvious but has a corresponding sound . . . All these things allow the viewer to be sucked into the scene, and believe it’s real.’

Yet most film-makers tend to think of image as the favourite child, and sound as a spoiled brat, always underfoot with unreasonable and unimportant demands. The common response to a production mixer with a problem is: ‘Just get it’. And, when that is not possible: ‘We’ll fix it in the mix’.



PHOTO: RALPH NELSON

Filming the notorious ‘interview’ scene from *Basic Instinct*

While this approach might save time and money during shooting, looped and dubbed sound is a poor substitute for the real thing. ‘Original sound defines an environment and locates a person in a given space,’ Stoll is quick to observe. ‘We hear not only their voice, but the acoustical environment that voice and body are in. So if you have to loop the sound, you also have to add other elements because the voice is there, but the stark, replacement sound lacks these other supporting details.’

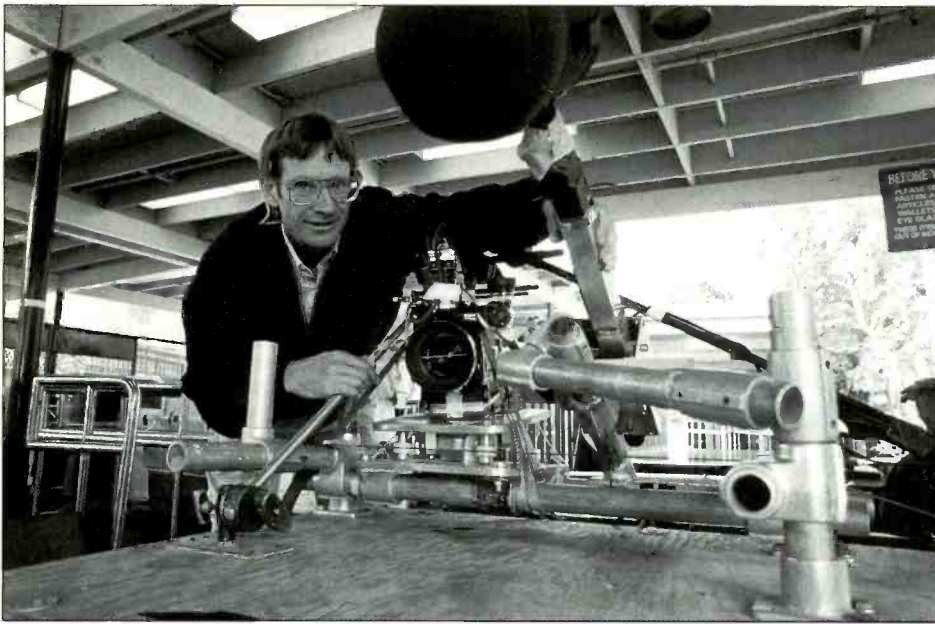
Phillip Seretti, a former production mixer who is now the lead rerecording mixer at Post Sound Corporation, a full-service postproduction sound studio in Los Angeles, believes looping is a process that essentially works against itself.

‘The director is not happy about doing it,’ he comments, ‘so his attitude’s not right. The producer is spending money again, so he’s not happy and wants to get it done as fast as possible. The actors’ state of mind may not be right because they’re on to other projects and playing other characters, and the timing required for them to lip sync the dialogue does not allow them to interact. It becomes more of a mechanical function than a performance.’

While some actors may not mind such restrictions because looping gives them the opportunity to ‘tweak’ their dialogue, many feel it is a barrier to spontaneity and improvisation. A

master at both, *Mrs. Doubtfire* star Robin Williams observes: ‘Sometimes you’re trying to get that one spontaneous moment, and there are things that are very difficult to duplicate, ▶’

As the film and video industries slowly become aware of the potential of audio, Cary Pepper talks to Hollywood sound man Nelson Stoll, and actor Robin Williams presents the case against too much sound replacement



Nelson Stoll and 'roller coaster' camera rig used in a BBC TV series

because it's not just the situation—it's the room, the people, and all the ambient elements [that affected you]. There's something very special about getting it at that moment, in that place, that's unique. Often [in performance] you're not worried about how it sounds. But when you're getting back into it again, it has to sound a particular way. So you're not really acting it, because you're worried about that.'

For director Paul Verhoeven (*Total Recall*, *Basic Instinct*, *RoboCop*), 'whatever can be achieved on the set is better than looping. You get such interesting acoustics, that are always artificial when you try to loop it.'

But getting sound on the set requires a commitment that many directors—and sound men—just don't have. Stoll has found that, 'film making is essentially not a particularly friendly process. You bring together so many people, ideas and elements, so much has to be coordinated, often the logistics of just getting the image on film is such a struggle, that it's very easy for people to not deal with sound.'

Verhoeven adds: 'We are accustomed to accepting delays the DP needs, but we are less inclined to accept delays from the sound engineer when he has a problem. But I have found that these delays are always worth waiting for. Because if he's good, he will give you an artistic diversity of sound that can in no way be imitated in the studio. The more I work on films, the more I feel that the sound I get on the set is the best I'll ever get.'

The seed for quality production sound is planted in preproduction.

'It's important that the sound department has a chance to read and break down the script early on,' Stoll says. 'The production mixer should be involved in location scouting to identify situations that will make recording difficult due to noise or acoustic problems. And key personnel from the camera, lighting, sound, and art departments should have the opportunity to discuss and flush out potential problems early enough to deal with them effectively.'

'If radio mics will be used, and the "look" requires a suit, the tie and jacket should not be made of hard, noisy material. An interior fireplace fuelled by propane so the fire is visually consistent might be fine in a boisterous party scene where the hiss of the gas won't be heard under the loud

party chatter, but in an intimate scene—like a couple talking in front of the fireplace—the burner, piping and valve arrangements have to be carefully thought out to make a quiet fire, especially if it's a large one.'

Yet production sound mixers are often denied the chance to give such input. On a recent film, when Stoll asked to go on the location scout he was told it wasn't necessary. 'Then I got out on the set, and found that things weren't thought about or dealt with in terms of how they were going to affect the sound.'

Because they often receive little support, the anticipation of fighting to make a contribution that is not accepted (if it is welcome at all) has discouraged many sound people making an effort over and above simply turning on their equipment. Instead of creating tension and resentment, it is easier to not make waves, let the situation go, and get along with the rest of the crew. And sound engineers who adopt it as a defence against indifferent producers or hostile directors pay the price by limiting their own technical development and artistic growth.

Directors like Paul Verhoeven and David Lynch reap the benefits of valuable creative input from their sound departments. Many film-makers, however, perceive sound as a shadowy technical realm they will not enter, and seek nothing more from their production mixer than guide tracks. In response, some sound people get lazy. Seretti has noticed that: 'a lot of them have their own chair, just like the director, that they sit in, and everybody else does the grunt work.'

Almost inevitably some become cynical, adopting a belief endemic to sound recordists that



On the set of *Axe Murderer*, starring Wayne's World's Mike Myers, which is to be released soon

goes something like: 'No matter how hard I try, they're gonna screw it up somewhere else anyway. Somewhere down the line the sound will be compromised because it's not transferred properly, or someone else doesn't care. So what's the difference?'

A self-fulfilling prophecy, but one kept alive by more than a little truth. Stoll recalls the time he did two television movies back-to-back with essentially the same equipment.

'When the films were aired, it was amazing to see the difference. On one, the sound was gorgeous—it had all the detail, and the soundtracks were something to be really proud of. The other, which had been sent to a different postproduction facility, was totally different. It was incredibly difficult to hear the dialogue, and the subtle details worked on, by knowledgeable people, all that additional information and beauty can just be lost.'

Under the best of circumstances, something is lost every time the sound is transferred. But, just as good production sound starts in preproduction, so, often, do the problems that show up after shooting stops. Post Sound's studio manager and

Robin Williams:
'Sometimes you're trying to get that one spontaneous moment, and there are things that are very difficult to duplicate . . . it's the room, the people, and all the ambient elements'

project supervisor, Janja Vujovich, comments: 'Sound is something that's greatly ignored when budgets are put together. But people can save themselves a lot of grief, surprise, and money at the end of their long journey by picking a good production sound mixer, and a postproduction facility that work in collaboration.'

Yet the drive to cut costs often leads producers through a maze of decisions which only compound the problems.

'I see producers try to save money on getting the lowest possible sound package they can,' Vujovich says, 'and they don't realise that they're talking about trying to get good tracks from someone who is not going to give them good tracks, and they're stunned when they find out how much it is going to cost to fix it on the back end.'

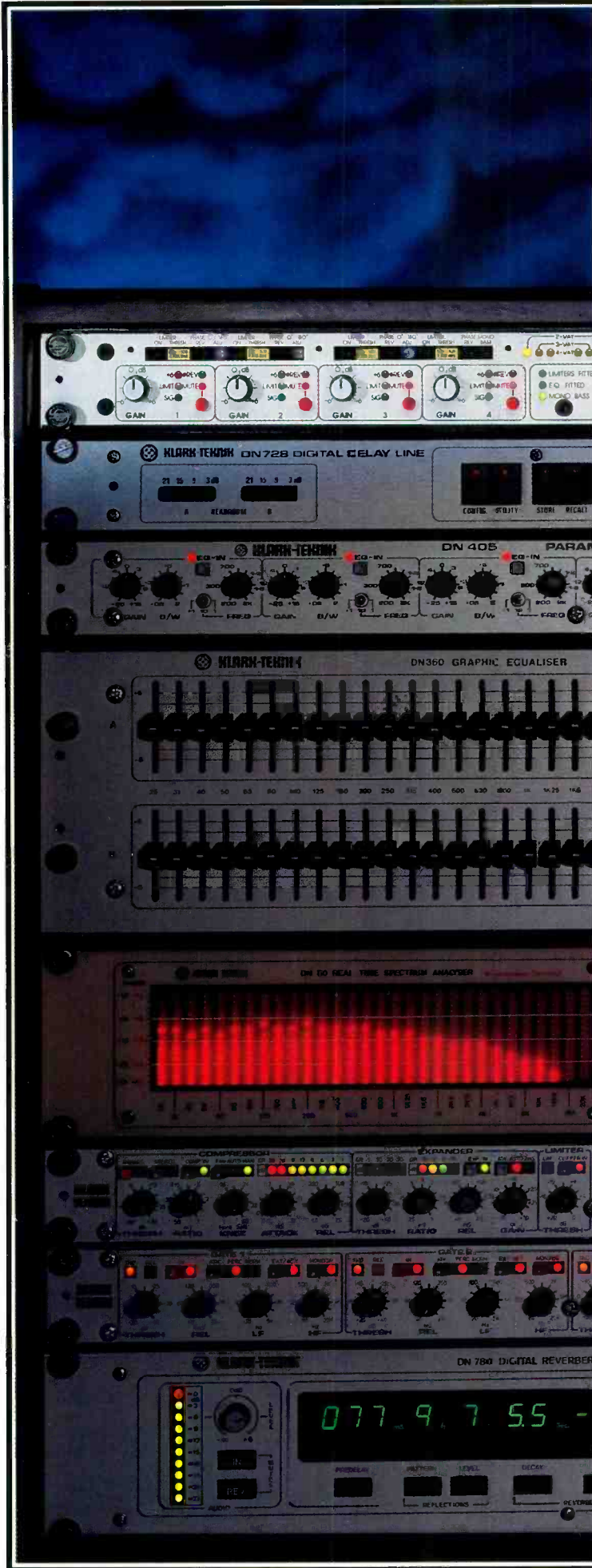
There's also the matter of knowing how to listen to a film.

'When film is out of focus, or the exposure is way off, or the colour rendition is shifted so that faces are green or red, it's obvious to everybody when they go to the screening room,' Stoll points out. 'But if the sound is distorted, some people may not even notice or know what to do about ►

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Production still from the Emmy-Award-winning *Son of the Morning Star*

it. Often, people assume that there's no problem with the soundtracks; it's the screening room. Which might be true. Many screening rooms have terrible sound systems, so it's hard to appreciate what's right or wrong, and a lot of bad tracks get by. Or the opposite can happen—people know something's wrong, so they just replace the sound, when in reality the original soundtracks could be very good.'

In such situations, sound is a double casualty. During production it is viewed as expendable because it is considered replaceable. Afterwards, it is often ignored or treated with false remedies because so few people understand its subtleties.

Vujovich feels it is important to: 'not only have a good sound mixer . . . but pay them for a day, pay them for a couple of days, in preproduction, and get their input. And pay them again, to stay on top of things in post.'

This may sound like an extra expense, but Stoll maintains that producers pay so much trying to fix problems created during production due to lack of such planning. The right planning streamlines the process and saves money, because a lot less has to be fixed or patched up later.

Stoll would like to see one person supervise the entire sound process.

'A sound supervisor, or sound designer, to ensure that the bridge, the connection between production sound and postproduction, the whole

process of transfer and the various stages of editing, are properly integrated throughout. To provide the structure for accountability and say, "This is where the quality is falling down, this is unacceptable." But I've worked on very few films where somebody has actually taken the interest in the original tracks to insure that the quality of my equipment is up to snuff, to make sure that the transfer of the original sound is as good as it can be, and that it is maintained all the way through. The sound is recorded in the field, the tapes get turned over, and there is no physical connection or communication connection between the production and the postproduction end. It just sort of falls into a void.

'Because sound is so abstract, and recording sound is such a fragmented process, the approach to sound is not whole or integrated as a unity. Someone taking responsibility for the sound of a film, the same way someone takes responsibility for the image, would help take the abstraction out of sound and make the dynamics of good sound more accessible.'

The sound designer (or a skilled, committed production mixer) can also let the director know what methods are available to help realise their artistic vision, suggest alternate approaches that utilise technologies the director might not know exist, and create new tools which expand everyone's technical and artistic capabilities.

Similarly, they should point out equipment limitations, thus eliminating unreal expectations and saving time by preventing the shoot from getting bogged down in a mire of false starts and wasted effort. In Stoll's words: 'what ends up on the screen is as powerful as it can be—and the fullest artistic expression of the collective ideas of everyone who can contribute.'

Stoll knows from experience that it can come together so neatly. On *Basic Instinct*, usable production sound was one of Verhoeven's stated goals from the beginning. Stoll had complete support, and less than 3% of the production sound had to be replaced.

'We're moving into an era where more people in general are becoming sensitive to sound,' he comments, 'and quality sound is appreciated by a growing number of people in the industry. Actors who have a hard time recreating complex emotions during looping because they're totally out of context. Directors who realise original sound is crucial to their character development scenes and makes action scenes more believable, and producers who are learning that quality production sound saves them quite a bit of money in postproduction. They can tell the difference, and they will not put up with shoddy production sound. This, in turn, will encourage the better sound men to make better use of their skills and tools.'

The cycle will still fuel itself, but in a positive direction.

These are some of the practical elements of this 'new era'. Stoll is also happy to point out its more abstract and aesthetic aspects: 'You can't beat the original sound, because what took place originally is the real thing. And once people have tasted that power of good production sound, seen it all the way through the mix, and seen how seamlessly it all goes together, they want more of it.'

'That powerful element of sound supporting the image in a complete, transparent way, with all the information there, is so natural, and full in its detail, it's like having a window in front of you, and leaping through it, and just falling into the scene. It takes the image and brings it to life.'

After all, what more could you ask of—or need from—a film soundtrack? ■

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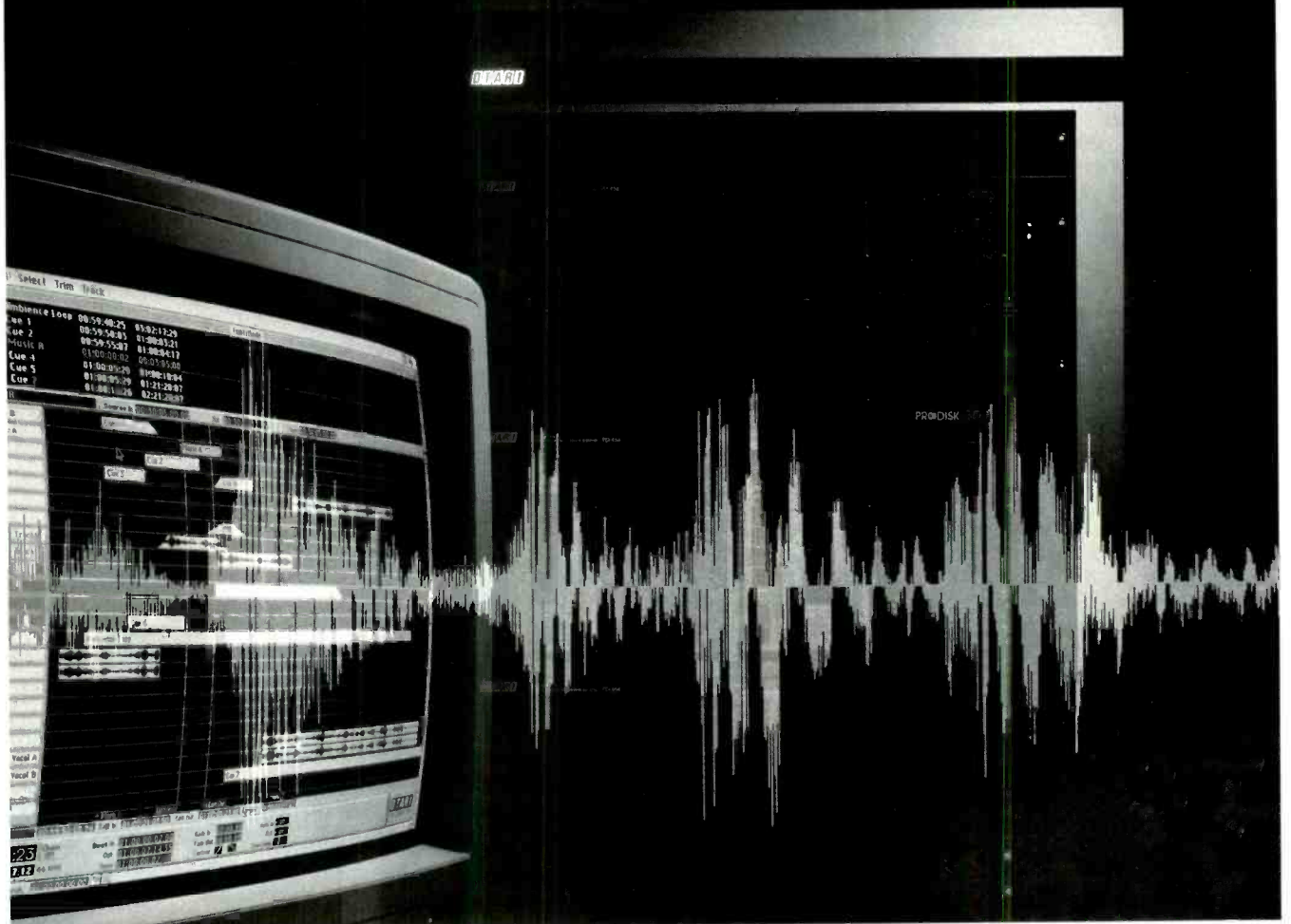


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Drawn a blank

Dear sir, working professionally for a company that hitherto bought and used several hundred CD-R blank disks at the official prices of up to 50 Swiss francs, Barry Fox aroused my interest when he took up this topic several months ago.

Because I have learnt that the questions posed are highly political, I preferred to go to a photo shop privately as an unknown customer and asked for a Kodak blank Photo CD as advertised in the newspapers at a retail price of 14 Swiss francs in November 1992. By pure chance I got one.

Of course, I was very keen to perform tests together with an audio engineer. We used a CD recorder Studer D740 fed in the digital domain by a Sony PCM-2500 DAT, both without any modifications. As I had expected from the specifications, the recording procedure worked perfectly. With the very same disc we tried all the cases that practically occur like stopping, removing the CD and adding another track before fix-up. The resulting audio CD has played faultlessly on any professional or consumer CD player that I could get hold of ever since. The next day I went back to the same shop and ordered a number of Photo CD blanks. When I wanted to fetch them I was told that the previous delivery had been a regrettable error and I got it in writing that Kodak's contract with the transfer centre strictly forbids them to sell such blanks.

When high-level managers spend time to give interviews to honest journalists, they usually do so in order to see those thoughts spread to the readers which they would like them to believe, as experience shows. In my opinion technical questions are a matter of facts and not of

beliefs. It may be very disappointing for some executives to hear now that the stories they keep on telling did not stand an easy and unmanipulated test. I know that the subject is not trivial and that there are many aspects involved. For instance I heard also the argument, that the manufacturing of CD-R blanks has less yield because of stricter quality controls in order to keep the statistical error rate lower compared with the 'cheap' Kodak Photo CD. If this is important, the system designers should better have introduced the audio CD-R from the beginning in a removable protective cassette that goes right into the recording machines as provided by some manufacturers even for CD players. This cassette could be removed after the fix-up and would keep the error rate of the recording more convincingly down than statistics that are no longer valid as soon as the blanks leave the clean air conditions of the CD factory and enter the less clinical environment of everyday life.

What really worries me is to see that a certain class of business people who otherwise like to be associated with what they call free trade, try to keep prices of plastic high by playing international monopoly. The managing director of a CD plant told me personally, that he considers the manufacturing of CD-R blanks in vast numbers possible at the pressing cost of an ordinary prerecorded CD in his own plant. Therefore I will keep my individually audio-recorded Photo CD as a valuable piece of evidence. It might even become a unique collector's item like the famous Mauritius because somebody could pretend my copy was the result of a defective stamper.
Urs Hagman, Sonnhaldenstrasse 43, CH-4600 Olten, Switzerland.

Conversion factor

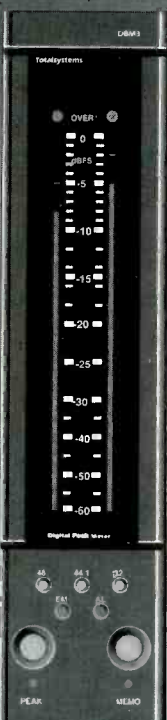
Dear sir, your comments regarding defining standards (*Studio Sound*, Editorial, April 1993) are equally applicable to product technical specifications. Adopting a defined set of test parameters would simplify product comparisons, with potential benefit to the reader. Such constraints would be prohibitive to the commendable investigative approach of reviewers, evident in the dCS 900B A-D converter review published last month. Nonetheless, to enable valid product comparisons, standard conditions must be considered. This presents nontrivial demands on the test equipment's calibration—hardware and software, both of which are documented by dCS in respect of our dCS 250 Converter Test Systems.

The dCS 900B specification quoted by dCS is based on tests carried out using the dCS 250. Review results found to be 'better than specified' are attributed to our continued product development. However, concern about conversion time has justifiably increased. In response the 900B group delay has been measured to be 570 ± 5µs, at the 48kHz sample frequency.


After such a complete review, the Summary highlighted significant features of the 900B not immediately apparent from the technical spec. Simple operation is one of the more subtle benefits which, combined with reliability, delivers long-term financial savings. A small price to pay for tomorrow's technology today? More importantly, I would maintain that all recordings contribute to our history—without exception—and will anything but the best do?

Paul Maddox, dCS Data Conversion Systems, Cambridge, UK. ■

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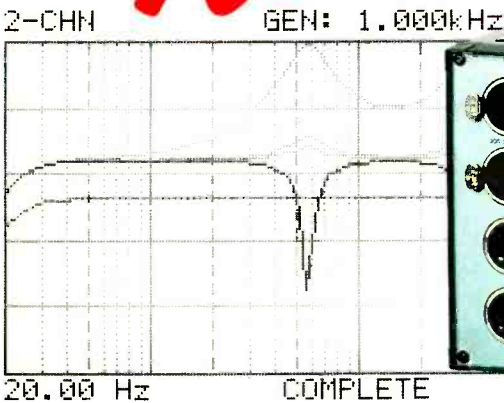
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 CONNECTING THE WORLD

I wonder what would have happened if Richard Branson had kept his money in music, and bought the time-warped EMI Records, instead of doing battle with British Airways over the airline business and selling Virgin to EMI?

My wondering is prompted by the flurry of hostile correspondence which followed my disclosure that EMI had gone back on its press-released promise to try and issue a 1933 recording by Sir Edward Elgar in true stereo. As reported (in 'Business', *Studio Sound*, January 1993), EMI's Reissues Manager, Richard Abram explained, 'We knew what the result would be, it would only be fake stereo'. As also reported, Abram took this decision because of a report written by ex-EMI engineer Anthony Griffith.

I had been referred to Abram by EMI's press office at the end of September, when the company won the Gramophone award for the first volume of its Elgar reissues. At the time EMI were still using the same May press release and promising that *Volume 3* would include the *Kingdom Prelude* in stereo, 'The result of a chance survival of two simultaneous takes at a session where two turntables with differently placed microphones which were set to record in parallel'.

Richard Abram now writes that he 'merely generalised' from Anthony Griffith's report and did not tell Griffith about our conversation. The peeved letters, lengthy phone conversations and surprisingly rude notes that followed distil down to

Barry Fox

EMI's controversial proto stereo recordings and MPEG compatibility with Dolby Surround Sound

one very simple point. Although EMI's own press release referred simplistically to 'differently placed microphones' both Abram and Griffith object to the press using any similarly simplistic reference.

Fred Gaisberg, who produced Sir Edward Elgar's recordings between 1928 and 1933, probably used several microphones, mixed into mono. He also used two cutting machines, for security. The issue—is there any way a stereo recording can be obtained from matching up the pairs of discs?

—boils down to a simple question. Did one mixer feed both cutting machines, or were the two cutters fed by separate microphone and mixer feeds? Both situations are equally likely. It would make sense to feed identical signals to both cutters. It would

also make sense to use different microphones as added security against possible electrical failure.

In cancelling EMI's plans to try and match two master discs, using digital synchronisation to remove phase errors, Richard Abram is working on the assumption that the disc pairs are identical, that is, fed from a single mixer. Abram declines to release the report on which he has based his decision, saying that if anyone releases the report it should be Griffith. And Anthony Griffith also declines to release his report. But Griffith has now synthesised his report. And I have to say that this actually makes it even more difficult to understand why EMI will not simply run a test with digital syncing and find out whether there really is a 'true stereo recording' locked in the mono pairs.

Griffith recalls that there were occasions when the engineers wanted to try out a new piece of equipment, such as a particular microphone. They would then use a completely separate microphone setup, mixer and cutting machine, in a separate room. So matched pairs of discs would in this case be different. But Griffith doubts that they would provide the possibility of stereo, because the two microphone setups would each be balanced about a centre line on the orchestra.

'No doubt with modern digital technology the question of synchronisation could be dealt with quite easily', adds Griffith.

EMI have the digital-equipment at Abbey Road, and EMI have matched pairs of Elgar's

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recordings—which, until recently, were sufficient to make EMI sufficiently confident of stereo content to promise, publicly, a stereo release of the *Kingdom Prelude*. Engineer Mike Dutton, has offered to do the work free, in his own time. One simple go-ahead would settle the issue and lay the ghost, once and for all. But EMI's heels are now dug in. At present, there will be no attempt at resolving this fascinating dispute.

I can well imagine the two words Richard Branson would use if someone presented him with the same situation: 'Try it'.

Around ten million people now own Dolby Pro Logic decoders. They use them in 'home cinema' or 'home theatre' systems to reproduce surround-sound from stereo broadcasts, video tapes and laser discs. And decoders are selling around two million units a year. More decoders are now being built into amplifiers, VCRs and TV sets. Meanwhile, the TV and video industries are forging ahead with plans to put movies on CD, using digital compression. The standard for full motion video at CD data rates (up to 1.5Mbits/s) is MPEG 1, set by the Motion Pictures Expert Group of the International Standards Organisation. MPEG 1 covers audio compression, too.

Would you believe it, no-one has yet thought to check whether MPEG 1 audio will handle matrixed Dolby Surround Sound. This is an

important issue. Any phase shifts introduced by the compression coding will make a Pro Logic decoder steer sounds in the wrong directions. This already happens when a Pro Logic system is fed by some satellite receivers. The fact that future FMV discs may use Dolby's digital multichannel system is not relevant. Owners of Pro Logic decoders will still want to be able to use them.

Over recent weeks I have variously spoken with Dolby Labs, Philips in the UK, Philips' Audio Division and researchers in Eindhoven, Philips CD-I Division (which will be selling FMV), Decca-Polygram and Philips' researchers at Redhill. I have even talked to members of the MPEG Technical Committee and engineers with C-Cube, the Silicon Valley computer chip company which leads the world in MPEG technology. I got a lot of different answers, all of which are the same.

'No, we have not tried decoding Dolby surround from an MPEG signal, using a Pro Logic decoder, but we are sure there will be no problem, and we are sure someone must have tried it'.

Unfortunately I can find no-one who has tried it—not even Dolby Surround with DCC—and a lot of the people giving the reassurances were video people who did not know enough about audio to understand why there *could* be a problem.

The MPEG audio standard is based on the Musicam system developed for digital audio broadcasting. The PASC compression system used by DCC is also derived from Musicam. But, in a

confused hierarchy of standards and sub-sets, MPEG audio is not the same as PASC.

PASC was developed exclusively for DCC and uses refinements (in bit allocation, for example) designed to push DCC sound quality well above DAB quality. The MPEG standard is broader in scope than the refined standard for PASC. The MPEG standard, for instance, only standardises the format in which the data is recorded or transmitted and the use of 32 sub-bands. It does not fully specify the coding process.

Whether an FMV decoder copes with Dolby Surround may thus well depend on the type of encoder used to make the source material, and whether the coding controls bit allocation in a way that ensures phase linearity. If no-one gets a grip on this situation, it may be pot luck whether FMV material decodes into accurate surround sound.

Because this matter is now getting aired, and Philips have (for quite different reasons) delayed the launch of FMV hardware and software until September, there is still time to catch any surround-sound 'nasties' that may be lurking undiscovered. Philips Labs at Redhill are now running MPEG surround tests.

But how odd it is that it takes questions from hack journalists to get the industry thinking about something so obviously important as the ability of a new movie carrier to carry the surround sound which is now an essential part of all modern movies. ■

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The middle of April signals only one thing to most audio practitioners in the United States—the return of the Tax Man. There is a range of tax obligations faced by any studio owner from both Federal and local sources, but a recent revision to enforcement of the US tax codes has made the activities of the Internal Revenue Service (IRS), especially onerous to those operating a personal or project studio. Based on a landmark January 1993 tax decision of the US Supreme Court, the likelihood of scrutiny for the operations of an audio business and/or audio studio in or in direct proximity to a residence has increased, while the options for deducting the expenses related to the space used by the home audio enterprise or studio have diminished.

The US Internal Revenue Code has always provided complete recognition of all legitimate operating expenses incurred in running a recording studio. This means that full deductibility exists for all costs related to the studio's physical space. These costs include land, structure construction—mortgage—additions, heating, cooling, telephone, power, security, cleaning and janitorial services and structure maintenance among others. That is, as long as the studio exists as a self-contained business and shows some profitability over what the IRS consider a reasonable time frame.

Now it seems that the definition of deductibility is being limited to those in the mainstream professional studio business and jeopardised if not completely eliminated for the operation of a studio that is not separate. The fly in the ointment appears when the studio is part of, or on, the owner's home. Then any 'expense' shared in some way with the residence can be called into question. In the past, the Tax Reform Act of 1976 has required that the 'home' studio space be the taxpayer's principal place of business and/or be used by both clients and customers in dealing with the taxpayer and/or be a separate studio structure not attached to the dwelling.

All of this takes on real importance when you consider that the personal and project studio equipment revolution has depended for much of its growth on tax advantages designed for the home office as an 'electronic cottage'. In other words, the transition from bands and musicians defining and refining their music in professional studios to the same process taking place in personal facilities has depended in good part on the tax incentives offered for such activities. And the impact of the US marketplace on the development of personal and project studio technology cannot be underestimated. The majority of such equipment is manufactured either in the US or in Japan. What is clear is that manufacturers in either marketplace could not afford to produce equipment without the US demand of 'home' users. Analysts estimate that for every unit of personal and project studio equipment sold elsewhere in the world, two to five units are sold in the American marketplace depending on the product category.

The spin that the US Supreme Court decision this year has thrown at the home studio taxpayer is that the old 'tests' concerning deductibility still apply, but the studio space must be the place where the taxpayer's most important business is

Martin Polon

Across America, the April arrival of the Tax Man is an unwelcome event—and recording studios have more to fear than most

conducted and it must be the place where the owner-operator spends a substantial amount of his or her working hours. The new guidelines will be utilised to assist 'examinations' (a term preferred by the IRS to audit), of those studio tax filings suspected of improper use of the home business deduction.

The new rules actually jeopardise the business of a successful artist with a home facility if any other sources of income and/or expenditure of time off-premises exist for the studio's owner-operator. The home studio's significant financial and operational viability must be proven in writing with copious records of all activities within and without the home studio being required—at least in theory. This will be the most difficult issue to overcome for the tens of thousands of home studio operators. And this is one of the categories the IRS are targeting. Further, the loss of the home studio space deduction complicates the deductibility of home studio equipment acquisitions and other related operating expenses. The IRS could argue, that these deductions are much harder to justify if the taxpayer cannot justify the priority of the studio space itself. Interestingly enough, the act of filing for the 'home office' deduction creates a double jeopardy for the personal and project studios operating illegally in residential neighbourhoods—even if they are not bringing in outside business.

The bottom line here is that the justification of the home studio space as a tax deduction will require that the income from the studio be the

The new guidelines will assist 'examinations', of those studio tax filings suspected of improper use of the home business deduction

most important element in the taxpayers' income flow. Unfortunately, most home facilities have evolved as personal musical creative environments. Unless the owner of the studio is independently wealthy—and few are—the other sources of income that support both the individual and his or her studio and music, will take precedence and could cause the disallowance of the home studio space and other deductions by the IRS. Even more ironic is the fact that the very elements which legitimise the home enterprise deduction on the Federal level—written proof of outside income and client activity in the residential studio—place the facility and its owner-operator at risk for local and/or state zoning violations. Clearly a case of 'the government giveth and the government taketh away'. In addition, a broad range of other taxes—such as blank media inventory taxes and value assessment taxes on the studio equipment that have been applied traditionally to mainstream studios—are now being considered by the various governmental tax collectors whenever they identify the existence of a 'home' studio.

Nor is it just the little guy with a studio who is being placed in jeopardy. A popular artist of some repute commented recently (and privately) that, 'I am now back in big studios since I can no longer gain access to my own studio. My accountant and my business manager forced me to convert my personal studio, which was always at a separate location, into a for-profit rental facility because of the potential negative tax consequences. The place was for me to create and experiment—to jam with my friends—but the tax problems were painted by my advisors as being so dire, that I had to convert the place into a client facility. Now, it is so busy that I cannot get enough time in there to use it properly and any profit I make is offset by my renting other studio space!'

For mainstream studio owners who believe that they have been subject to unfair and damaging competition over the past few years from the personal and project studio, the new tax twist might seem to be a form of justice. The argument of professional studio owners around the world has been the unfair advantage of the home for-profit studio operator. But for many legitimate musicians who own a facility for recording his or her own music, the tax changes will likely prevent further expansion in space, equipment or technology.

Even those studio practitioners reading this column in Britain and other EC countries cannot take too much comfort in the distance that the Atlantic affords between the Internal Revenue Service and the Inland Revenue or other tax collecting body. These tax changes apply to all home business activities in the US—not just the home studio sector. And as these changes raise additional revenues, they will be discussed at the regular gatherings of those who collect taxes and exchange methods and ideas. You certainly did not think that only audio people hold international conventions. There are AES meetings and there are Tax Collectors' meetings. The only difference is that those attending the Tax Collectors' conference smile a lot and do not require hearing aids. Isn't that a cheery thought! ■

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DAT TAPE TESTS

Since DAT made the transition from domestic to pro use, concern has been expressed about its suitability for professional applications. This bench test of the majority of leading DAT tapes will help users in their evaluation both of DAT technology and of DAT software.

Review
by Sam Wise



The questions raised about the reliability, durability, and storage life of DAT were an inevitable consequence of its introduction to any form of use—domestic recording, pro audio recording or computer data storage. DAT has one of the highest data storage densities of any tape storage medium, with very narrow tracks and very short recorded wavelengths. These facts, together with some user problems have led to questions regarding its suitability for very important recordings, and for archive use. This is the first of a pair of reviews of DAT tape, the first comparing the quality of presently available tapes, the second attempting to look at the issue of longer term storage reliability.

Manufacturers themselves have published data about the effects of ageing, temperature and so on, when they are launching a new product. These reports are useful in that they compare one manufacturer's tape with his old one. But how do tapes from different suppliers really compare? And, how are various tapes likely to maintain acceptable quality after storage for some time?

In order to evaluate tape differences and

archiving quality, we designed a DAT evaluation rig based on our Audio Precision *System One* audio measuring system and Tascam *DA30* DAT recorder. Our measurements really relate to one aspect of DAT performance, this is called Block Error Rate.

Performance measurements

All digital storage systems have one thing in common—once the analogue-to-digital conversion process has been accomplished, all of the signals which were once audio are now in the form of digital data. The purpose of the storage system, be it hard disk, DAT, Nagra *D*, or other digital storage medium is to accurately retain this digital data.

It is also true that none of these systems will always accurately maintain the original data. The truth about digital storage is that while 'perfect' storage will result in 'perfect' playback every time, imperfections in raw data, when they inevitably occur, are much more audibly irritating than ▶

Editor's Comment

This report on the performance of DAT tapes has not been easy to pull together. It was prompted in part by the increasing use of DAT recording in a role it was not intended to occupy (that of a professional recording format) and the attendant reservation of certain professionals in committing their masters to an unproven format, and in part by the efforts of various companies to establish DAT as a legitimate professional medium.

Each of the leading manufacturers in DAT tape was contacted and invited to supply tapes for assessment. Some participated readily; others have proven less forthcoming. It should be noted that all tapes tested have been supplied by the appropriate manufacturer, and the test results are drawn only from these samples. Due to the cost of the exercise, they were also invited to offer token financial support to the testing—not all parties obliged (those who did are acknowledged elsewhere in the text)—and this support is not necessarily reflected in the placement of various tapes in the test analyses. Correspondingly, certain of the better placed brands went unsupported by their manufacturer.

It should be noted that, unlike analogue recording, digital audio recording employs a system of error correction based on a Reed-Solomon generator. In effect, the system operated at three levels: at lower levels, this allows the presence of errors without their having any effect on the audio recovered from the tape, at interim levels errors are 'concealed' (audio is reproduced, but its quality is compromised), and in worst cases the audio is muted until the error level is reduced to a manageable level. It is not possible to readily define a level above which errors will consistently result in concealment or muting due to the inconsistency with which tape errors affect the recorded data—conversely, it is not possible to accurately define an 'acceptable' error level. How the levels of errors recorded here relate to the activity of the correction-concealment circuitry will be addressed as part of a second article—see below.

A further consideration (not investigated here) is pricing—which can dramatically affect the perceived value of a tape.

This series of tests will be published in two parts: this dealing with the initial performance of the tapes and a further part concerning their performance following 'ageing' tests. When completed, this further tests might show that tapes whose initial performance is good are ultimately outperformed by tapes whose initial performance is less impressive but whose ageing characteristics are better. (Although this is not to imply that this is necessarily the case with any tape brand.) This second article will also be accompanied by further information on the functioning of the error correction systems. ■

Tim Goodyer

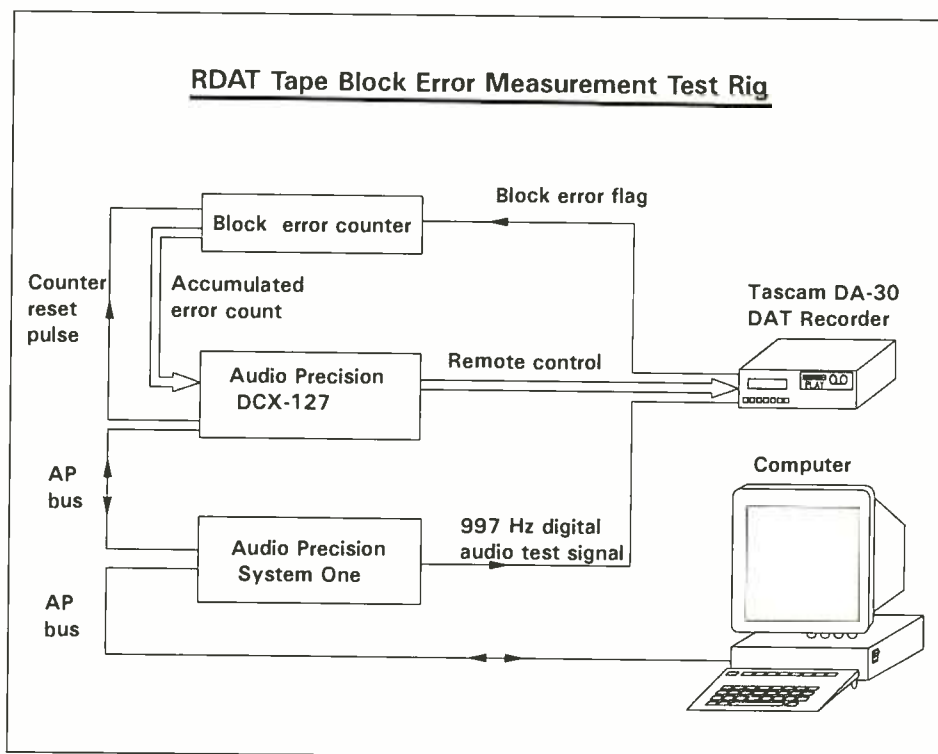


Fig.1: The test rig

the generally gentle deterioration of analogue storage. This means that to make digital audio acceptable, error detection and correction must be included in the storage system.

DAT error minimisation and correction is very sophisticated, and errors are a natural part of DAT operation, just like people! To give an idea of actual DAT error rate, we can quote the specification of one of the best performing tapes—the HHB brand. This specifies a block error rate of less than 5×10^{-4} . In other words, one in every two thousand blocks will contain an error. At a sampling rate of 48kHz on a stereo machine, this is tens of errors per second. This would certainly be audible without error correction.

Since error minimisation, correction and concealment are an innate part of DAT operation, all we are interested in when evaluating comparative DAT tape performance is the relative error rate between tapes. Wait, some of the more knowledgeable of you might say. What about deterioration of various kinds? What about dirty heads? What about ageing? As you will see, we have derived test methods to give us a good idea of these properties of different products while continuing to measure only error rate.

The test rig

Fig. 1 shows the test equipment setup used. It basically consists of an Audio Precision System One with DCX module. This system sends out a digital audio sine wave to the Tascam DA30 DAT machine. A frequency of 997Hz is used so that the sampling rate of 48kHz and the signal cannot be in synchronism, ensuring that the majority of digital states are exercised. The signal level used was -4dBFS, or 4dB below digital overload. The DA30 has an internal error flag test point

which gives out a pulse each time a block error is detected. This is connected to a counting system which will keep track of the total number of errors during the measurement. Once each tenth of a second, the count is sampled by the Audio

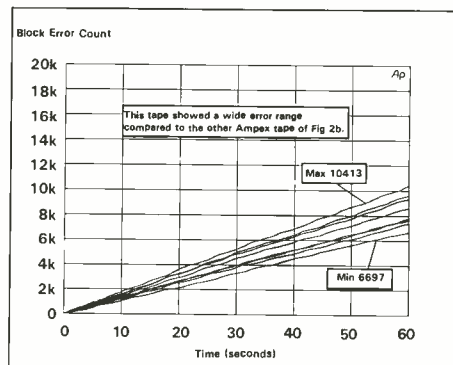


Fig.2a: Ampex 467 R-90, batch 92069, write once, read eight times

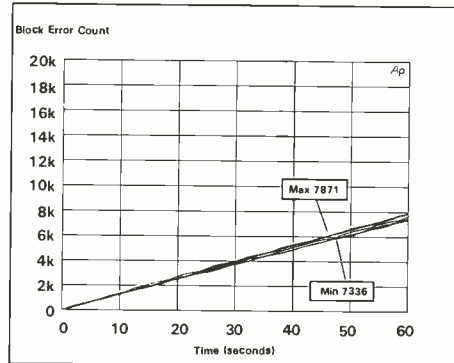


Fig.2b: Ampex R-90, batch 91305, write once, read eight times

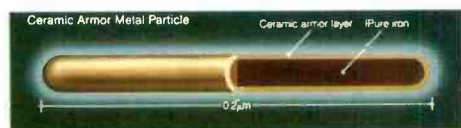
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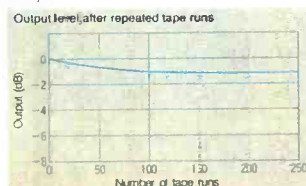
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TABLE 1

Manufacturer	Cal Error Rate	Initial Error Rate	Rank	Final Error Rate	Rank	Mean	Rank
AMPEX	3954	6697	7	10413	5	8555	6
APOGEE	3672	5717	5	8422	6	7070	5
BASF	3888	2854	4	4127	4	3491	4
HHB	3789	2539	2	3209	2	2874	2
MAXELL—Consumer	3691	1616	1	2539	1	2078	1
MAXELL—Professional	3902	2664	3	3985	3	3325	3
TDK	3973	6718	8	13966	8	10342	8
3M	3166	6149	6	12582	7	9366	7

Table 1: Minimum and maximum error rates for two different write-once-read-eight-times tapes from each manufacturer

Precision System One and interpreted as a number indicating the error count up to that point. The total measuring time is one minute, giving 600 measurements in the graph. The resulting graphs are shown in Figs. 2-10.

Each line or curve indicates a pass of the tape. Refer to Fig. 2a, this is the first of two AMPEX tapes recorded once and replayed eight times. Without cleaning the heads, a second tape from the same manufacturer of the same type is recorded once and played eight times. This is shown for AMPEX in Fig. 2b. If a curve is absolutely straight, then the errors are occurring at continuous intervals, probably making their correction relatively easy. Wiggles in the curve indicate periods of low errors (where the curve is horizontal) or a high burst of errors (the curve is more vertical). Bursts of errors are likely to be more difficult to correct. In DAT terms, 0.1s is a long time, so do not make too much of the wiggles in evaluating the tapes.

Test procedure

We wanted to see the effect on the tape of multiple passes over the same tape section. Time is limited for these tests, so a one minute test period was selected as suitable. To ensure that the same portion of tape was being exercised each time, the machine was fast-forwarded for a precise time period and a three-minute recording was made. The tape was then rewound to the beginning and fast-forwarded again to nearly the same starting point. Play commenced for one minute prior to the test, measurements taken for one minute, then play for an additional minute. This ensured that the measurement position error was irrelevant within the window of tape which had been recorded and played back. Had we had a time-code-based machine, time could have been saved because of assurable tape positioning.

Each manufacturer was asked to submit four tapes, two each of 90 and 120 minutes duration, preferably from different production batches. Tests were of two types: write once, read many times, and write-read many times. The first is likely to occur where a DAT is used for sound effects or mastering and is played back repeatedly from one original recording. The latter represents what might happen during a recording session, or when tapes are reused. As expected, the write-once-read-many-times cycle produced more deterioration since the tape not only would wear,

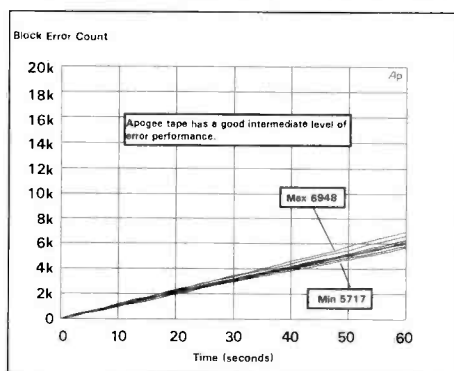


Fig.3a: Apogee KX120, batch A131EE3320, write once, read eight times

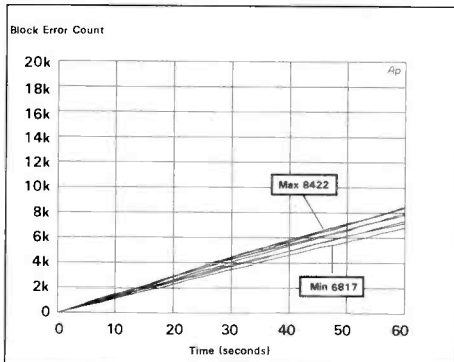
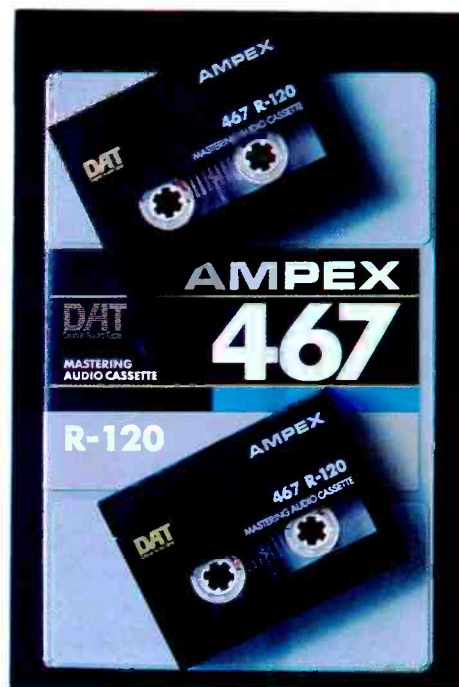


Fig.3b: Apogee KX90, batch A231EA3315, write once, read eight times



but it could damage the recording already in place. Therefore, in final tests, two different but nominally identical tapes were run through the write-read-many process, while one tape was run through the write-read many times process. One further tape was retained as a control copy in case something went wrong. A total of eight passes was made for each test, certainly not a 'worst case' but a reasonable number for a tape in professional use.

Measurement system QA

Another obvious requirement is that the DA30 must not deteriorate in its performance during testing. Before each manufacturer's three tapes were tested, a MAXELL dry-type DAT head-cleaning tape was run followed by an error test using a control tape. After each manufacturer's batch of tapes were tested, the control tape was run again before cleaning the heads. This control tape told us two things—if the before tapes were all consistent in error rate, then the measuring system including the DA30 was consistent, making the other DAT tape measurements comparable to one another. The difference between the before and after control measurements gives some idea of how much debris different manufacturer's tapes were ►

TABLE 2

Manufacturer	Initial Error Rate	Rank	Final Error Rate	Rank	Mean	Rank	Error Increase	Rank
AMPEX	4800	5	7925	5	6363	5	3125	5
APOGEE	8712	7	15179	6	11946	7	6467	6
BASF	3013	4	5962	4	4488	4	2949	4
HHB	2553	2	3588	2	3071	2	1053	2
MAXELL—Consumer	2516	1	3514	1	3015	1	998	1
MAXELL—Professional	2792	3	4558	3	3675	3	1766	3
TDK	10091	8	15667	8	12879	8	5576	7
3M	7114	6	15389	7	11252	6	8275	8

Table 2: Error Rates for one write-then-read-eight-times tape from each manufacturer

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leaving behind on the heads.

Fig. 10a shows the consistency of tape before control measurements, and Fig. 10b the much wider variation in after measurements. The average or mean measurement of before control tape errors was 3,706 in one minute, with a range of 248 counts. After thorough cleaning, our last calibration measurement was within 50 counts of the first measurement, indicating that the DA30 had not altered in quality during testing.

The results

The manufacturer's tapes are presented in alphabetical order. Each indication of quality which we derive from our measurements is given in a separate column in Table 1 with an adjacent RANK number giving the performance ranking on the column for that indicator. A number of 1 is the best performer, and 8 is the worst. The columns have the following definitions:

Cal error rate—this is the error rate produced by the control tape used to check that the measurement system quality is still okay.

Initial Error Rate—this is the error rate measured on the first pass of the best of the two manufacturer's tapes used for write-once-read-eight-times tests.

Final error rate—this is the final error rate of the worst of the two manufacturer's tapes

Mean—this is the average or mean value between the initial and final error rates.

It can be seen from these results that BASF, HHB and MAXELL tapes are clustered closely

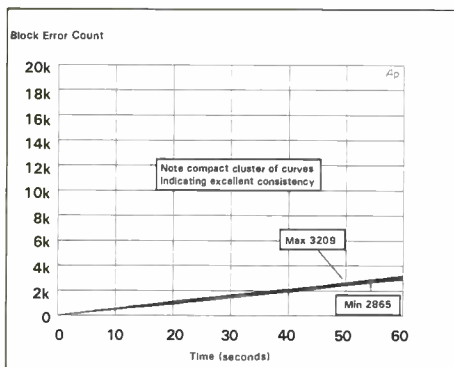


Fig.5a: HHB DAT122, batch 41812CP, write once, read eight times

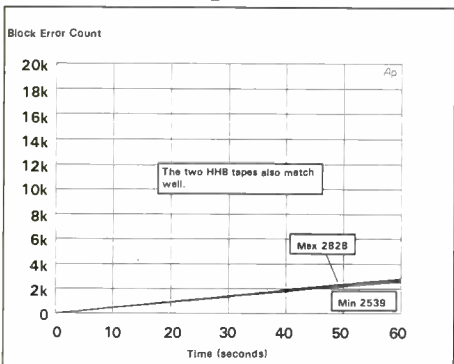


Fig.5b: HHB D92, batch 41712CP, write once, read eight times

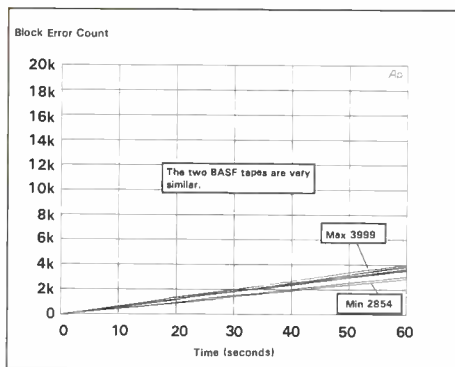


Fig.4a: BASF R120, batch J162 2W1E, write once, read eight times

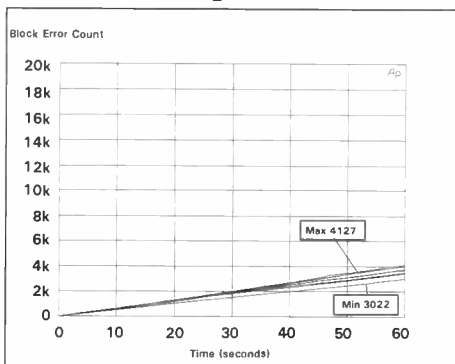


Fig.4b: BASF R90, batch J192 2K32, write once, read eight times

together within the band of measurement error. Though these are ranked numerically and remain consistent from initial to final error rates, it would be hard to statically prove which is really the best, though MAXELL consumer tape seems to be the winner in absolute errors. The HHB tape deserves a mention since it had the most consistent performance of any tape, changing very little with multiple passes.

Consistency

Tape-to-tape consistency within one manufacturer is a little harder to evaluate, especially with only two samples. We decided not to clean the transport between each tape, since we wanted to



see the deterioration over a reasonable period of use—in this case 76 minutes between cleaning. The better performing tapes—HHB, Maxell, and BASF gave very consistent results between the two tapes. The deterioration in performance was low within a tape on multiple passes. This indicates that these tapes ran clean.

On the APOGEE and AMPEX tapes, the two tapes gave a very similar mean error rate performance, though AMPEX had a spread between worst and best performance of 3,800 counts on one sample and only 520 on the second sample.

On the TDK tape, the second tape was better than the first by 5,000 error counts, spread was similar, and the calibration tape indicated some deposits on the heads. Overall, TDK was the loser in error performance.

3M provided the worst results in terms of apparent residue left behind on the heads, though it was only second worst on actual error rate.

Read-write performance

In order to check the effects on a tape which was reused, or rerecorded several times, we used a similar process to that described earlier, except that the tape was recorded, replayed, recorded, replayed and so on for eight cycles. The results are shown in Table 2.

In this test the results are much the same as in the write-once-read-eight-times test. HHB, ►

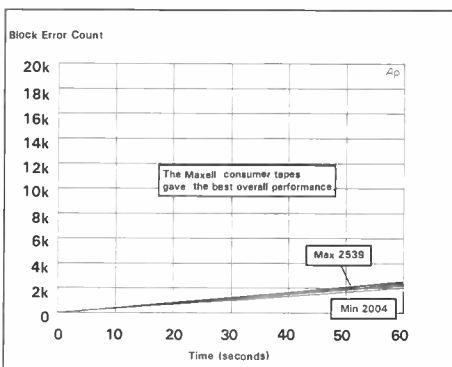


Fig.6a: Maxell Consumer DM120, batch R120 K212 2V4Y, write once, read eight times

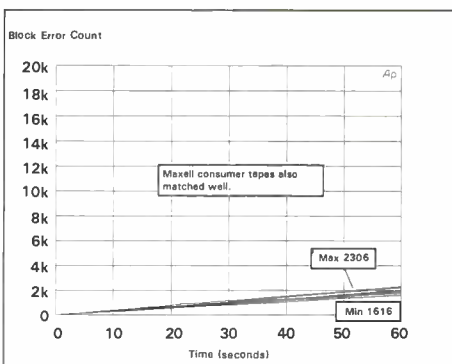


Fig.6b: Maxell Consumer DM90, batch G1320201, write once, read eight times

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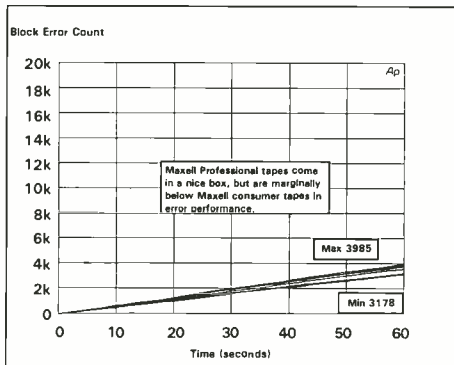


Fig.7a: Maxell Professional R-120DA, batch H0110101, write once, read eight times

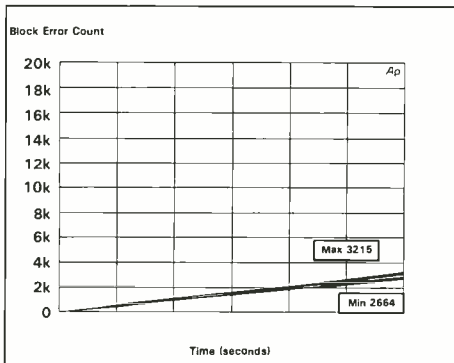


Fig.7b: Maxell Professional R-60DA, batch I0610111, write once, read eight times

MAXELL and BASF crowd together as performing well, with AMPEX, 3M and TDK following well behind. One could criticize the decision not to clean the heads before these tests, but look at the error increase column. The best tapes not only showed the lowest totals in this test, but the lowest Error Increase as well, with far fewer errors at the end than other tapes showed in earlier test stages. This confirms their overall better quality—at least when new.

Temperature cycling

Following the above tests, all of the tapes were put into our environmental test chamber and cycled between 0°C and 40°C at 40% humidity every 3 hours over a 24-hour period, making eight complete cycles. Following this all tapes were tested for error rate. There were no statistically relevant changes in error rate following this temperature cycling on either the write-once or write-many test tapes. Since this is roughly equivalent to leaving a DAT in your car for several days and nights, we can assume that most DAT tapes are robust enough to withstand this.

Archive life

Measurements were also made on a tape (whose manufacturer we will not mention here) which has been in our office for about a 18 months, still in its sealed wrapper. This tape left strong deposits on



the DAT head, and had rapidly deteriorating properties. It in addition had errors far exceeding those of any of the tapes officially tested.

Being metal, it is known that DAT tapes can corrode or rust. We have seen evidence of this ourselves, rendering some tapes unusable after a time. Maxell have made a feature out of their ceramic coating process, which aims to protect the tape particles without impairing their recording properties. Others may have similar techniques. This initial testing period has not yet examined these problems, but during the next month the tapes will be subjected to two seven-day periods of storage in our environmental chamber at 60°C and 90% humidity. Maxell state in their literature that seven days under these conditions is equivalent to

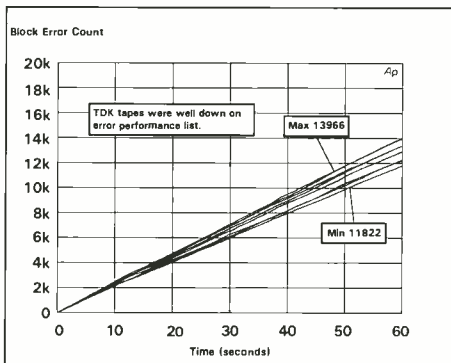


Fig.8a: TDK DA-R120, batch 120AQA327, write once, read eight times

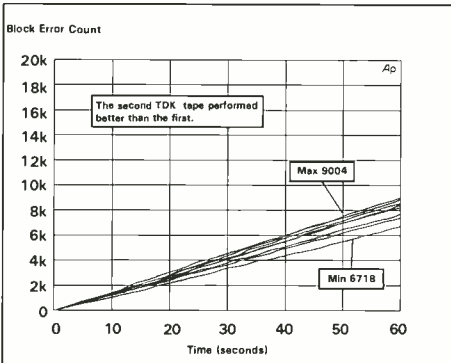


Fig.8b: TDK DA-R90, batch 090AQJ229, write once, read eight times

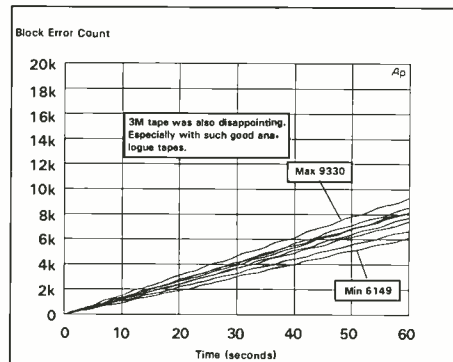


Fig.9a: 3M R90, batch 4A12911, write once, read eight times

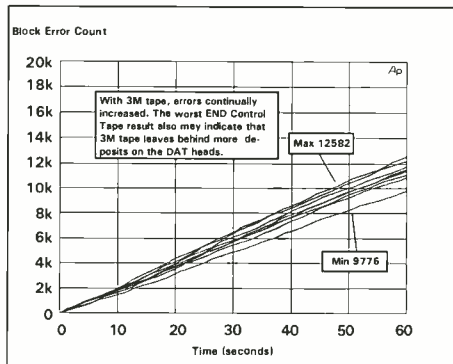


Fig.9b: 3M R120, batch 4110705, write once, read eight times

storage in office conditions for four years. After each of these periods, the tapes will be examined for corrosion and subjected to the same tests as before.

Nagra D comparison

We spent two long periods on the phone with the chief development engineer of the Nagra D, discussing how to compare between DAT and Nagra D error reporting methods. The subject is not an easy one. While DAT has a maximum of 16 bits per sample for stereo, the Nagra D provides up to 24 bits per sample and four channels. Tracks on the Nagra D are about five times the width of the DAT format, and recorded wavelengths along the tracks are at least double on the Nagra. An additional problem is that so far we have been unable to get a definition of block error rate from anyone within the DAT industry. This does not affect our comparison of DAT tapes, but does make it difficult to compare with another digital recording format.

One measurement that Nagra have provided indicates a Sync Block error rate of 5×10^{-4} errors/second. The block is 36 bits in length. If there was never more than one error per block (a conservative assumption) then there would be one error noted for every 72,000 bits recorded.

Let us compare this to the DAT system using the block error rate specified by HBB for their tape of 5×10^{-4} , apparently the same as the Nagra D. We measured about 2,500 block ▶



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errors on the HHB tape over a period of 60 seconds. During this time stereo audio at a 48kHz sampling rate with 16-bit resolution would have given 92,160,000 bits of audio data. Assuming that each block error was only one bit error (even more conservative than with the Nagra-D), this gives one error for every 36,864 audio bits. In fact, on a DAT tape, only 60% of the bits are audio data, so the bits recorded in 60 seconds are actually more like 153 million, giving one error for every 61,440 bits recorded—apparently very similar to the Nagra D bit error rate.

Mathematically, it is not possible to just compare the bits in a block and immediately relate this to the published block error rate information. In fact, Kudelski have a research project going on at a local technical university to determine exactly

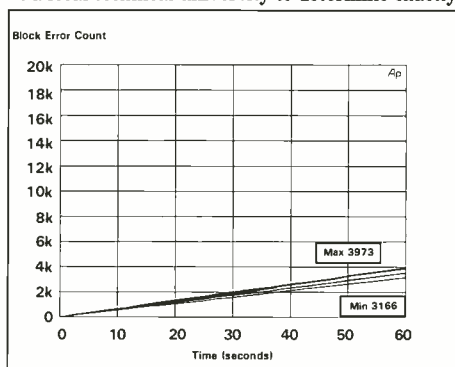


Fig.10a: Control tape. Write once, read once after head cleaning before each manufacturer's tape test. Consistency verifies measurement system quality. A BASF tape was used

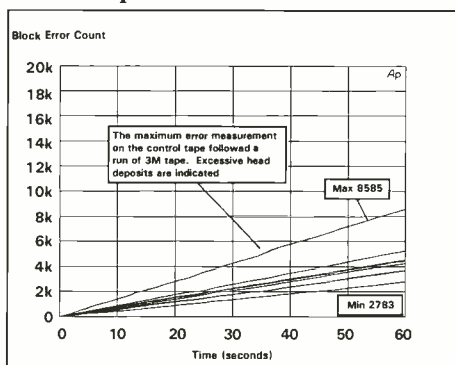


Fig.10b: Control tape. Measurements at the end of each manufacturer's tape error runs

what the relationship should be.

Reviewing the two books I have on the subject of DAT recording, there is certainly confusion, even among the learned writers, over the exact definition of the block size referred to in block error rate. The data rates given also appear to not accurately add up from the information presented. It does not affect this review, but we would be interested to obtain THE FACTS on this matter. Meanwhile, we have presented the question to DAT manufacturers to see if we can get a consistent reply.

When we evaluate the ECC error report on the NAGRA, we get hardly any errors at all—but this cannot be directly compared to counts of the error flag from the DAT machine. The Nagra tape will be going into the environmental test chamber along with the DAT tapes, so we should be able to see the relative differences in error increase between Nagra tapes on the Nagra and DAT tapes on the DAT over an estimated storage period.

Packaging and other matters

All of the tapes except the AMPEX 467, and MAXELL Professional were delivered in standard small plastic cases. Included in these is a set of paper labels, and an index card or box label.

The MAXELL Professional—R-60DA and R-120DA tapes were presented in a snap shut case made of what appears to be polypropylene. This means that they will withstand dropping without damaging the case, unlike the more brittle standard cases. It is also larger, more the size of a compact cassette case, possibly making for more reliable shelving.

The AMPEX 467 Mastering Audio Cassette also comes in a more flexible plastic box, this one of grey plastic about the size of a Betacam video cassette. This has room inside for two standard DAT tapes, including the standard plastic box.

All tapes were measured for operating length, and all were in excess of the nominal length. The HHB cassettes are somewhat extended, with the 120-minute size being advertised as 122 minutes, providing a useful buffer zone for the recordist.

Mechanics

Unlike compact cassettes, where the internal tape cassette mechanism differs widely, DAT cassette mechanisms are very similar. This is in part because in the DAT most of the tape handling is external to the cassette.

The BASF and MAXELL cassette housings appear to be identical, differing only in colour. The same is true of the 3M and AMPEX cassettes, which closely resemble the HHB housing, though these are not identical. The HHB is a revolting lavender colour, though this does not affect its performance.

Apogee and TDK cassettes differ from the others in the shape of the clear window, but not in any way which would appear to affect performance.

Tape length was investigated for potential

effects on either winding smoothness, speed or error rate. No ill effects were noted, and tapes showed little weave within the cassette and no evidence of binding during our testing.

Manufacturers claim improvements to their mechanisms, but tests to date do not point clearly to any important differences.

Summary

The tapes received for testing fell into two distinct categories of performance—MAXELL, BASF and HHB having similarly low error rates, with the AMPEX twice as high, and 3M, APOGEE and TDK tapes presenting error levels three to five times higher. While these results are not definitive over the longer term, they point to definite quality differences between tapes which purchasers should take note of. These differences in error rate may eventually lead to audible differences due to concealment techniques, and potentially muting when error levels get too high.

In the concluding part of this report we will report on the effects of ageing, and hope to point out the tape or tapes which are not only best at purchase, but over the life of the recording. ■

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Germany: BASF Magnetics GmbH, Dynamostrasse 3, Postfach 100452, 6800 Mannheim. Tel: +49 621 60 44340.

UK: BASF (UK), BASF House, 151 Wembley Park Drive, Wembley HA9 8JG. Tel: 081 908 3188.

UK: HHB Communications, 73-75 Scrubbs Lane, London NW10 6QU. Tel: 081 960 2144.

USA: HHB US-Independent Audio, 295 Forest Avenue, Suite 121, Portland, Maine 04 101-2000. Tel: +1 207 773 2424.

USA: Maxell Corporation, 22-08 Route 208, Fairlawn, NJ07410. Tel: +1 201 794 5900.

UK: Maxell (UK) Ltd, 3a High Street, Rickmansworth, Hertfordshire WD3 1HR. Tel: 0923 777171.

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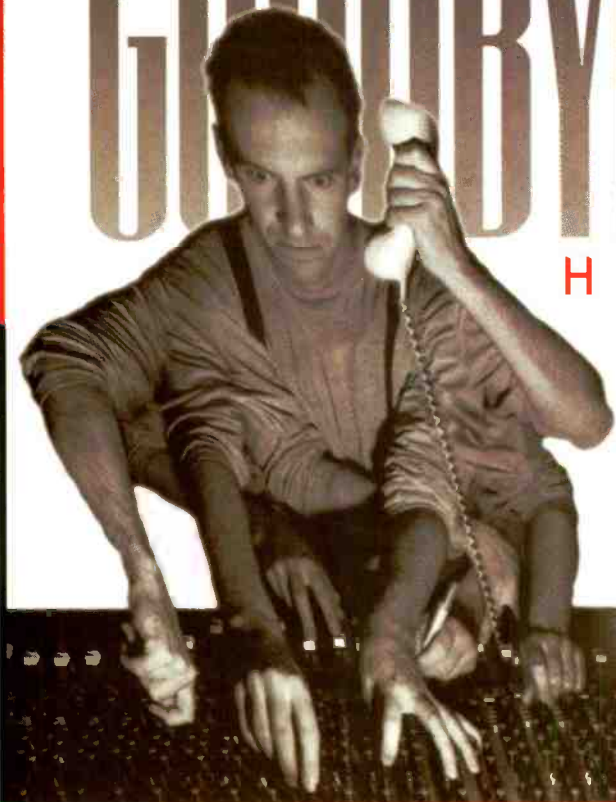
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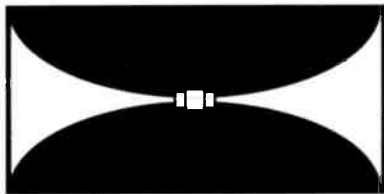
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It is one of the mysteries of our business that has endured for several decades: just what is the sculpted bit of foam provided with most microphones actually for?

The passage of air around a transducer has always been a source of problems and its effect on microphone transducers is all the more noticeable because the device is at the front end of a signal chain. There are ways of protecting microphones from the effects of wind—from the human voice to localised weather. It is also true that this is an area where published information is fairly thin on the ground. Apart from trawling the reference books I have not considered the fact that the vocalist can contribute to solving this problem by working on their mic technique.

What are we actually trying to do with a windshield? First, it is not a 'shield' or a 'screen' and although it is also referred to as a 'pop filter' in some applications, it is not selective as a filter is. Whatever device is used, it has to sit between fluctuations in air pressure or velocity and the capsule, reducing the effect of the earlier on the latter.

In the studio, you are only likely to come up against wind effects from the human voice. We are all familiar with the types of vocal sounds that produce the trouble—'P's, 'B's and 'T's generally—and there are just three options. The first is to position the singer further from the mic—frequently this is unacceptable due to the increase in room characteristic picked up. There is also the proximity effect that frequently forms part of the mic technique of many singers when using a cardioid mic. (If the problem is not extreme, you may try an omnidirectional microphone which is far less prone to breath effects.)

A second option is to place the microphone so that it points above the singer's mouth or, I think preferable, placed to the singer's side pointing at their mouth. The drawback is that most singers face the microphone and so the use of these techniques may prove to be less than effective.

Your final option rests with some device to shield the diaphragm from the full force of the air. Plastic foam windshields are one possibility but these bring other problems. First has to be the change in sound; there is no way that you can record through an inch of foam without affecting the sound. Some foam windshields are better than others but all have some



Keith Spencer-Allen

protecting your mic from wind sources is not the breeze you might have thought

impact on the sound irrespective of the cost of the mic. I would go as far as to say that some shields are more cosmetic than effective although the use of coloured shields does have the relative benefit of helping identify mics in a multiple mic setup.

Microphone textbooks stress the use of foam with large holes or a reticulated (net-like) foam, and then add that performance can deteriorate further if a shield not designed for that mic is used. Knowing the complex geometry employed by many mic manufacturers and how difficult it is to carve foam, making windshields yourself is not a possibility.

There is no alternative to the use of foam windshields with a hand held mic, and I think that any frequency aberrations caused are more acceptable than wind noises.

Another plus for foam windshields is the way that they protect a mic from dust and smoke (and rain) that otherwise end up on the diaphragm. In a practical way the *Engineering Handbook of the National Association of Broadcasters* (NAB) recommends regular washing of windshields in a non-detergent soap to remove deposits that can have further effects on frequency response and polar pattern. Add hygiene to that list.

A recently rediscovered technique is to use a thin mesh material such as silk or nylon placed between the singer and the microphone. This may

be held rigid across a solid frame (typically a coat hanger and stocking) or suspended by one edge, the effect is the same. That this works at all may be surprising, but the analogy of a net curtain over an open window reducing breezes is a good indication of its effectiveness. There are arguments for different materials, where the screen should be placed and how large it should be, but these are largely matters to suit the user.

If you are making your own, experiment with the materials. I found that an old anti-glare filter from a computer monitor worked very well. It was a nylon gauze held in a rectangular metal frame about 30cm x 25cm and looks made for the job. I cannot say that I can hear the screen and its size means that I can handle a more mobile vocalist than the small screens.

Screens are not a new idea, however—in the small museum at Neumann's Berlin offices there are all-enveloping silk 'balloons' to enclose unspecified mics over 40 years old. Such techniques are also to be found in the large windshields used for outside recording work—in particular those Zeppelin-shaped shields for rifle mics.

Another technique that you may care to try is the use of a pencil, or something similar, fixed just in front of the microphone, perpendicular to its axis. The idea is that this breaks the wind effect and I assume deflects

the problem. Some swear by the effectiveness of this technique. I am not so sure and it definitely depends greatly on the singer's technique.

We have only dealt with 'vocal wind problems'; the minute you take a mic outdoors you face a different set of problems and types of wind. I've used foam windshields of the best type I could find, but there are occasions when these is not good enough. The best information I have found on better methods and how to recognise your 'wind problem' is in *Sound Recording – From Microphone To Mastertape* by David Tombs (David & Charles, 1980, ISBN 0-7153-7954-2). Tombs calls upon experience gained from working with the BBC, and there is much based upon pioneering work in recording wildlife in stereo. He talks about a world most studio engineers never reach. For instance, I do not think that I would have considered that the frequency of the wind noise indicates the size of obstruction that is causing the problem; or that in sheltering from air velocity in the form of wind we are more likely to encounter low-frequency fluctuations in air pressure and hence maybe need a different type of mic.

Without a hesitation I bow to the superior knowledge of the location sound recordist in these matters. In the course of my research I found a short couple of paragraphs under the heading 'Wind and Rain' in *The Handbook of Sound Recording* by Paul M Honore (A S Barnes & Co, 1980, ISBN 0-498-02232-3). Mr Honore has considerable experience in motion picture sound where the sound recordist is frequently completely at the mercy of the elements in a major way. Such adversity generates practical techniques that are way beyond the more delicate needs of the studio engineer, and this book contains many examples.

Mr Honore lists two I have yet to experience. Firstly, for recording in rain, the mics are normally hung under an umbrella-like flocked screen that not only keeps the mics dry but breaks up the drops so they don't make any noise. Secondly, 'Condoms make excellent windscreens and indeed have been used as such for a good number of years. Be sure to ask for the non-lubricated types; the gel on the others will gum up your microphone'

A word of caution: condoms alter polar response! ■

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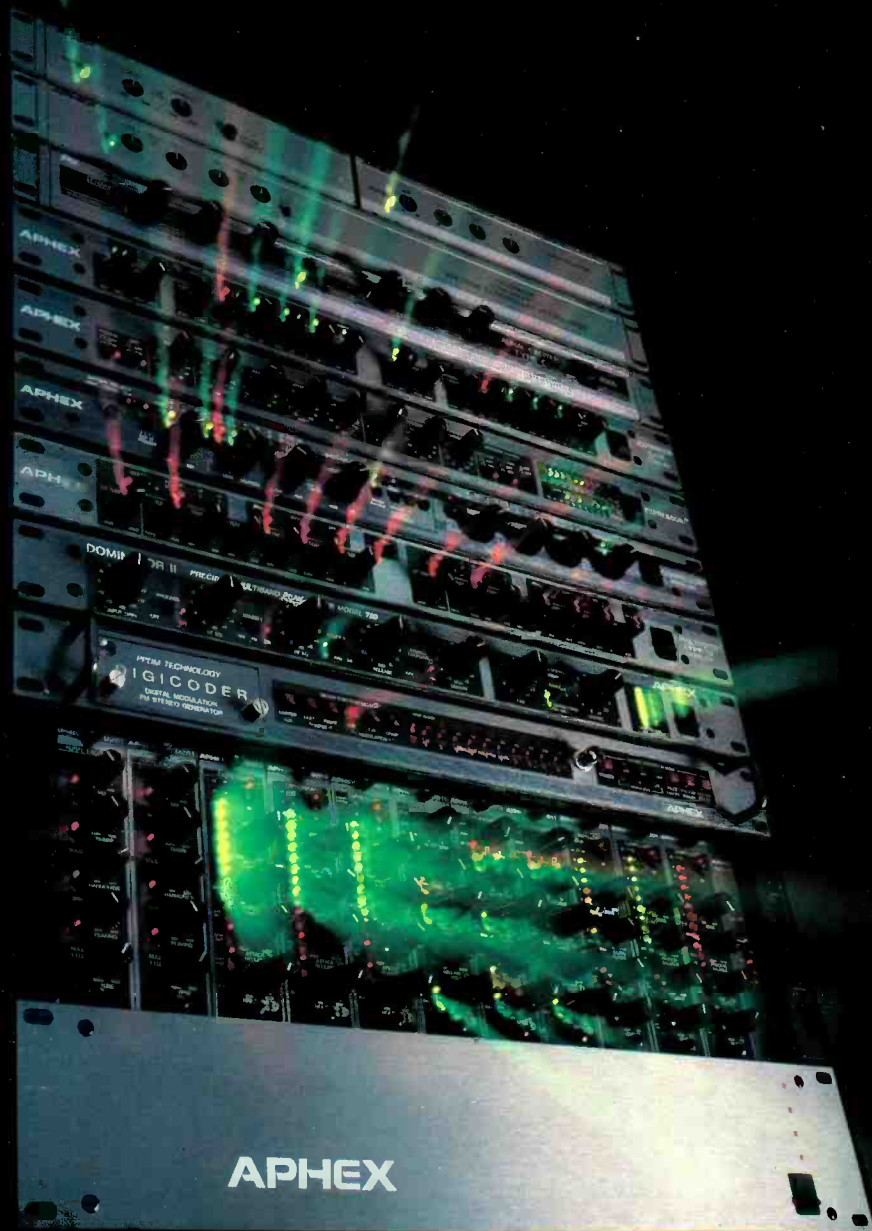
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