MAY 1994

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STUDIO SOUND

AND BROADCAST ENGINEERING

INTERNATIONAL PRO AUDIO AND POSTPRODUCTION MAGAZINE

DIGITAL AUDIO WORKSTATIONS

SoundStation Gold; Microsound; SADiE and Soundscape

Data storage

DAT roundup; Buried CD data

Music in the round

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Off the straight and narrow

linear *adj* **1.** of, in, along, or relating to a line. **2.** resembling, represented by or consisting of a line or lines. **3.** having one dimension. **4.** *Maths.* of or relating to the first degree: *a linear equation.* **5.** *Electronics.* a. having an output that is directly proportional to input: *linear amplifier.* b. having components arranged in a line.

We live fundamentally 'linear' lives, you and I. Everything we do or think happens in sequence. Cause and effect can be relied upon to provide most of the lessons we learn in life. Traditionally, only the inconvenience of memory complicates matters. At least, that was the way of things before technology spoiled it.

Technology has continually undermined our straightforward way of thinking—and it is recording, in its many and varied forms, that has done most of the damage. From the earliest painting and drawing materials, through still photography and sound recording to the recording of moving images, the innate order of our lives has been steadily disrupted. Only the realisation of time travel could disrupt it significantly further.

Adopting a 'linear approach' to a given subject has its advantages. Wherever it is applicable, it certainly offers the least complicated working principles (and most accurate mathematical models). For these reasons, we have preferred linear solutions to many of our problems. Nature in general, however, has not shared our preference and we are becoming increasingly aware that if we are to advance our understanding of our world, we must deal increasingly with nonlinear issues.

And so it is with pro-audio. Even if that number is presently large, the days of tape-based systems are numbered. In its place we can expect to see recording systems (of all kinds) employing technology which is free from the linear operational restrictions associated with magnetic tape. These systems do, however, require us to relearn some of the most fundamental lessons of our previous professional lives—and adapt some of those of our natural lives. But while nonlinear recorder-editor systems may not present a (conventionally) convenient way of thinking, they are certainly proving to be an effective way of working.

Nonlinearity is hardly a new issue within pro-audio; the recording characteristics of tape itself are notoriously nonlinear, and have been used to our advantage for years. That vinyl records display a nonlinear playback speed was recognised with very early 78s which played from the inside outwards to better accommodate the climax of a song —CDs, on the other hand, use a varying rotational speed to give linear track velocity. The nonlinear behaviour of loudspeaker drivers, meanwhile, continues to present us with problems. More recently, the nonlinear design principles employed in certain A–D convertors has caused considerable, and confrontational, debate. But this does not mean that it is not the way to advance our technology—after all, our hearing mechanism is itself nonlinear...

Progress on all fronts looks set to embrace nonlinear systems for the foreseeable future. Air turbulence, blood flow and money markets are all recognised as nonlinear phenomena—and the solutions to nonlinear problems are recognised as being considerably more elusive than those of linear problems. Some of these solutions are also recognised as likely to remain permanently unavailable to us. Progress in the recording studio and edit suite, however, is set to demand increasing levels of 'nonlinear' operational skill. New equipment, new operating principles, new possibilities and new styles of facility are all awaiting us. I wonder how these nonlinear disciplines will impact on our linear lives? ■

Tim Goodyer

Cover: DAR *Mix Controller* Photography: Nik Milner

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International News

In-brief

● Prism Sound on air

The British BBC Radio Production team have adopted the *Dream Series AD1 Classic* A–D convertor bringing UK users of the unit to 20 including Abbey Road Studios, Metropolis Mastering, Townhouse Mastering and Whitfield Studios (formerly the Hit Factory, London). The BBC are also evaluating the *MTR2024T* interface unit for the Tascam *DA-88* digital multitrack—which facilitates additional 20-bit and 24-bit recording and playback.

Prism Sound UK. Tel: +44 223 424988.
Sprocket Digital US.
Tel +1 818 566 7700.

● Precision Distribution

New UK distribution and servicing-calibration facilities have been announced by US test instrumentation manufacturer Audio Precision. Huntingdon-based Thurlby Thandar Instruments are AP's new representatives and will offer full sales, marketing and engineering support for the complete range of AP equipment. Servicing of AP units will be provided by MSL Calibration Centre of Hitchin in Hertfordshire—who certify work to NAMAS, ISO 9002 or BS5750 if required.

TTi. Tel: +44 480 412451.
MSL. Tel: +44 462 421234.
Audio Precision. Tel: +1 800 231 7350.

● Synclavier Co Russian in

The US Synclavier Company's *Synclavier* and *PostPro* digital audio workstations are to be distributed throughout the Commonwealth of Independent States by Moscow-based ISPA. The established broadcast and postpro distributors have taken delivery of a 48-voice, 64Mb, *Synclavier 9600TS* with 8-track *PostPro* for product demonstration and training.

The Synclavier Company.
Tel: +1 603 448 8887.

● Thear they go

UK service specialists Thear Technology Ltd have moved to new purpose-built premises at TTL House, Sheeptick End, Near Lidlington, Bedfordshire MK43 0SF.

Tel: +44 525 841 999.

● Conversion conference

UK:The second International Conference on *Advanced A–D and D–A Conversion Techniques and their Applications* is to be presented by the IEE between 6th–8th July at Robinson College, Cambridge. The conference is intended to provide a forum for the dissemination of knowledge and experience involved in convertor technology and will involve CERN, dCS, Feedback Instruments and the University of Wales among others.

IEE Conference Services.
Tel: +44 71 344 5478.

DISQ first

MCA Records have released the first record to be mixed on AT&T's *DISQ* Digital Mixer Core. The single, *Whenever You Come Around*, is by the Country Music Association's reigning Entertainer of the Year Vince Gill. It was mixed at Nashville's renowned recording and postproduction facility Masterfonics, who own the first operational DISQ system. John Guess engineered, and the Producer was MCA President Tony Brown, who said: 'With this system, digital sound becomes one step closer to being in the room with the artist and musicians. There's nothing between you and the music.'

AT&T Digital Studio Systems.
Tel: +1 910 279 6511.

Mladen Skalec of ATEA sitting at the console in Studio Hendrix recently completed for Radio Koper in Slovenia. See below.

Studios in Croatia

Two Croatian companies, ATEA and RAI, jointly design and produce professional yet inexpensive soundproof enclosures embodying full-range absorption. The success of a recently-completed job for Radio Koper in Slovenia led to a contract with Croatian Radio to build a broadcasting studio area to accommodate 54.

ATEA. Tel: +385 41 327 303.

Audix in Berlin

Audix Broadcast Ltd, formed in July 1993 as the result of a management buyout of the broadcast equipment division of Audix Ltd, have re-equipped the Berlin studio of the BBC World Service with their new *ALB Series* on-air consoles.

The new installation is a key element in the upgrading of the Berlin operation following the re-unification of Germany. Audix equipment was used in 1983 to equip the BBC's original 'correspondent studio', which was heavily used during the events that led up to the destruction of the Berlin Wall. Now that the strategic importance of Berlin has changed, the BBC have taken steps to upgrade their facilities, as well as equipping the London connection with stereo facilities.

The contract with Audix Broadcast is for a 'stereo self-operate' studio which can operate in several roles. The studio is designed to allow local staff to undertake general news, contribution inserts and full discussion-type programmes and the output can be routed via London direct to air.

The equipment is based round a 14-channel *ALB* console specifically configured for the World Service's operational and technical system requirements.

Audix Broadcast Ltd.
Tel: +44 799 542220.

Pro School pairing

Digidesign, the specialists in random-access digital audio workstations noted for *Pro Tools*, *Sound Tools II* and *Session 8* among other packages, have announced an agreement with the School of Audio Engineering designating the SAE as the exclusive provider of Digidesign Pro Schools worldwide (excluding the USA, Canada and Austria). Under the terms of the agreement Digidesign will provide the SAE with equipment and course materials for Pro School classes, and the SAE will provide Pro School style training seminars at many of their 18 locations throughout Europe and the Pacific rim. Guy Nicholson, Director of the SAE, and Doug Provisor, Digidesign's Vice President of International Sales, finalised the agreement at the Frankfurt Musik Messe.

Digidesign. Tel: +1 415 688 0600.

Sky decide on *Delta*

Digital Audio Research have announced the sale of a second DAR *Delta* workstation to Sky Television. The 8-track system has been installed in one of Sky's postproduction dubbing suites. DAR originally supplied Sky with its first *Delta* three years ago and both units are scheduled for upgrading to 16-track later this year. The systems are being used mainly for speech and SFX editing on the station's movie promos.

Both *Delta*s at Sky have a storage capacity of 20 hours and the station's dubbing suites currently produce over a hundred 30-second promos a week. The new unit also allows straightforward interchange of files between the two suites, with both *Delta*s being used for tracklaying and editing, and for compiling the station's own SFX libraries.

Digital Audio Research Ltd.
Tel: +44 372 742848.

Correction at Air

Air Lyndhurst have become the second major London studio to install the

The Canadian Broadcasting Corporation's Glenn Gould Studio hosted the first North American live concert digital audio broadcast. A DAB symposium held in Toronto provided the impetus for the demonstration of Eureka 147 DAB. The event used an AMS-Neve *Capricorn* console and the signal remained in the digital domain from recording to broadcast via the CN Tower.

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Sigtech *AEC1000* Acoustic Environment Correction System, a powerful digital filtering system designed to correct loudspeaker and room inaccuracies. This follows Abbey Road's purchase of the system for use in their Sonic Solutions *NoNoise* room. Dave Harries, Sales and Technical Director of Air Studios, comments that however good the acoustic treatment, there are some audible variations which cannot be controlled such as reflections off the console, and that there will be situations where the room itself cannot be fully treated to the fullest extent.

The TV Dubbing Suite at Air Lyndhurst is an example of both these cases; the room's plain acoustic treatment has left the room's bass irregular and the Sigtech system smooths this out. It also focuses the treble by removing the reflections off the glass voice-over booth and the tape storage area. According to Harries, the result is that Sigtech gives the engineer perfect listening conditions.

The Sigtech uses adaptive filter algorithms to model the response of the loudspeaker and room and then set up a correction filter. The process is fully automated with the resultant filter inserted into the monitor path correcting any loudspeaker anomalies and cancelling room reflections at the listening position.

Munro Associates.
Tel: +44 71 379 7600.

Midas on the road

Midas consoles will feature in the touring rigs of two forthcoming, but contrasting, major shows. Pink Floyd, touring with a stage 155 feet wide and 85 feet high, will be using four *XL3* consoles, one of which incorporates a specially developed quadraphonic panning device, while Phil Collins' Sound Engineer Cubby Colby will be using two *XL348CMMB* consoles FOH, one of which is fully moving-fader automated. Colby relies on the automation to co-ordinate the many intricate cues required in Collins' set, and makes use of the console's capability of mixing snapshot and dynamic scenes with MIDI events control to achieve consistent seamless mixes.

Klark Technic plc.
Tel: +44 562 741515.

Phil Collins is in preparation for his latest solo tour with that man with the *Midas* touch, Cubby Colby, as his FOH Sound Engineer who's mixing on two *XL348CMMB* automated consoles

The Lyon Opera House has recently been equipped with two *Megas* mixing consoles for in-house sound reinforcement. The consoles are sited in the Opera House's 200-seater underground amphitheatre and ballet rehearsal studios. Soundtracs. Tel: +44 81 399 3392.

Fostex and Backbeat

Production of *Backbeat*, the film about the early days of the Beatles, made extensive use of a variety of Fostex machines. While a *PD2* portable DAT was used for the location sound recording, an *R8* was used in a novel approach to music playback on set. The *R8* was playing tapes assembled from the original multitrack masters recorded for the film in the States.

This had several advantages over stereo playback, according to Chris Munro, who handled all location sound recording. When close-ups were being filmed he could boost the level of the appropriate track, or even play that track only, to help the actor concentrate on the right part. It helped with backing vocals in particular, where people tend to follow the lead vocal; this way, he says, lip sync is much more realistic.

During postproduction at Twickenham Sound Station the *PD2* time-code tapes were laid off to 35mm mag film from which an EDL was automatically generated following traditional film editing. One of the key elements in Twickenham's autoconform system is a Fostex *D20*, slaved to an edit controller that uses the EDL to automatically download all necessary sections of audio from DAT into a DAR *Sabre* workstation.

Fostex UK Ltd.
Tel: +44 81 893 5111.

APRS briefings

For the first time, APRS '94 will feature *The Briefings*, a series of workshops running throughout the show with the objective of providing visitors with the chance to update themselves on a variety of important issues and techniques. Open to all visitors, the sessions will be free. The sessions are divided into two main categories, one series focusing on issues of interest to sound recording studios, postproduction facilities, broadcast engineers and live sound engineers, while the other series is aimed at issues addressing the needs of the project studio.

Each briefing is being hosted by a leading industry expert, with support from all the major trade magazines. Generally lasting one hour, the seminars start at 11:00am on the first day and run throughout the period of the exhibition. Under the organisation of Gateway's Dave Ward, the line-up currently includes contributions from John Leonard on theatre SFX, Bill Foster on ISDN, Tim Frost and Andy Bereza on multi media, Paul White and Dave Ward on microphone techniques, Brian Copsey of ASPFM on radio frequency management, Jim Wilsher of EMI on 'Vinyl is not dead' and Mike Edwards of the IFPI on the SID code.

APRS. Tel: +44 734 756218.

Contracts

● SSL go Dutch

The Hilversum facilities of the Dutch NOB national broadcaster have been equipped with SSL *Scenaria*s for audio and video postproduction use. Postpro Manager Frits Paeper identified widespread use of *Scenaria* and its comprehensive integration of audio and video as significant factors in the purchase.

SSL. Tel: +44 865 842300.

● MTA and AK at DB Post

London's DB postproduction facility have recently invested in three Audio Kinetics *ES.Lock 1.11* and a *Penta* controller as well as an MTA *980 Series* console. The machine control is extended to Sony *9800* VCR, *PCM3324S* DASH machine *7030* DAT and several magnatech film machines.

AK. Tel: +44 81 953 8118.
MTA. Tel: +44 252 318700.

● Meyer Sound scores

Meyer Sound's high-definition *HD1* studio monitors have recently been purchased by Mike Oldfield, Sarm, Canegreen, Davy Spillane, Black Box, Hilton Sound and Dream Hire.

A 'substantial' system has also been supplied to Scotland's Edinburgh Empire Theatre which includes *UPA-1C* and *USW-1 UltraSeries* loudspeakers. Sound and Light have taken receipt of four *MPS-355 loudspeakers and* MPS-3 controllers.

Meyer Sound. Tel: +1 510 486 1166.

● Kremlin Records...

The contract for supplying equipment for a recording studio for the use of Russia's Presidential Orchestra has been won by Denis Tyler Ltd. The contract includes a Soundcraft *DC2000* console and three Tascam *DA-88* digital multitrack machines.

Denis Tyler Ltd. Tel: +44 494 866262.

● North American *Logic*

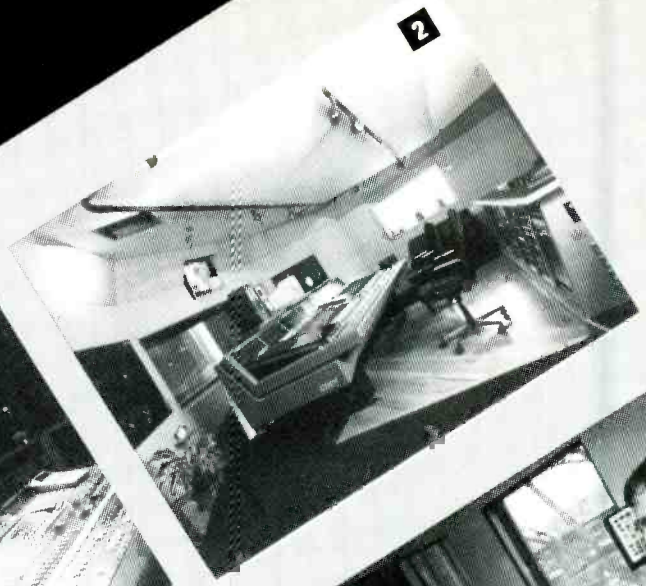
New York's Clack Studios have bought their first AMS-Neve *Logic 3* console; Washington's Soundwave Post have placed *Logic 3*s in three of their five audio postproduction rooms; Nashville's Scene 3 Video have purchased a *Logic 3* and NY's Servicesound have installed a second *Logic 1* and The Debbie Reynolds Hotel in Las Vegas have installed their first. Further American AMS-Neve sales include a *55 Series* console to Boston's WBZ-TV; 60-input *VR* consoles to NY's Daichi Kosho and Daddy's House of Music; 16-output *AudioFile spectras* to Orlando's Digitec Audio Post and North Ridge's Marquis Productions and Vancouver's CKNW/CFMI; a *66 Series* console to Fox TV in Hollywood; a *55 Series* console to Phoenix' KNXV-TV and a 48-input *V Series* with *Flying Faders* to Glendale's Milagro Sound Recorders.

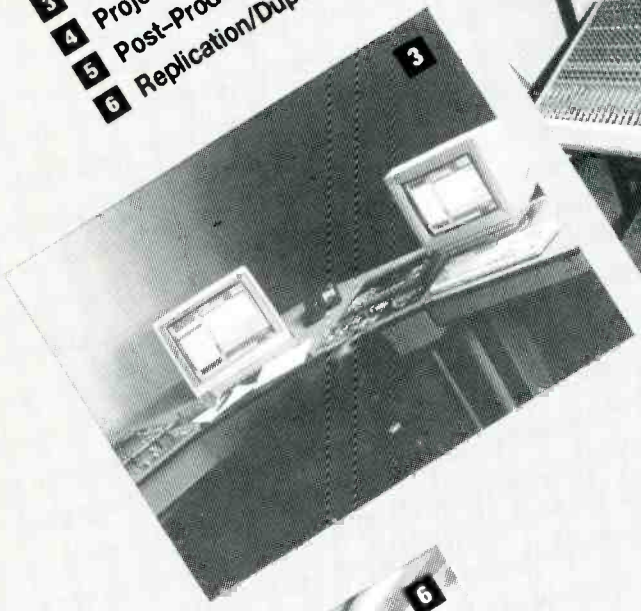
AMS-Neve. Tel: +44 282 457011.

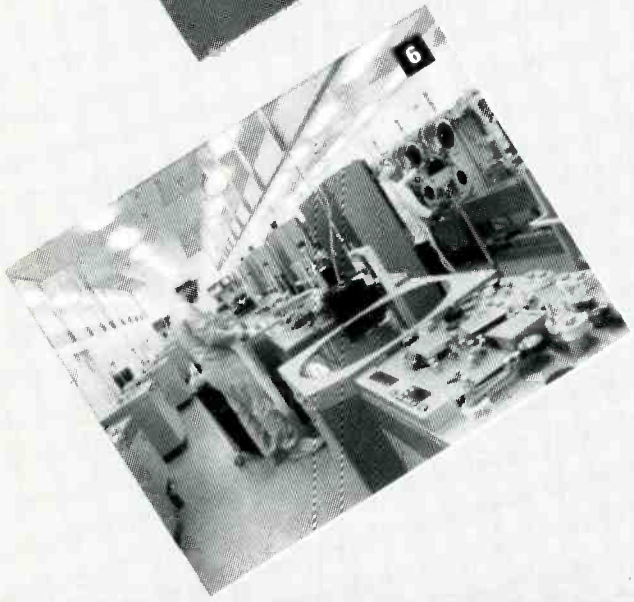
www.americanradiohistory.com

APRS 94

International Exhibition of
Professional Sound Equipment
Olympia 2, London
22-24 June 1994







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Steinberg *Audio Spector*

Masterlist CD

Digidesign's range of digital-audio processing systems recently saw the addition of *Masterlist CD*. The package allows CD masters encoded with complete PQ subcodes to be created using a number of affordable SCSI controlled CD recorders. The Red-Book-compatible masters generated can be accepted at duplication plants to directly cut the glass master, eliminating the necessity for *1610/1630* transfers and separate PQ code entry. This is expected to save the user duplication plant time, expense and possible errors.

Masterlist CD is used to arrange the CD by creating a master list of sound files, regions or playlists generated by Digidesign *Macintosh*-based hard-disk recording systems. Order, spacing and gain levels of the items may be nondestructively edited, with 18 RAM-based crossfades available.

The user can create 99 Tracks per CD, each with up to 100 Index points, optionally set using markers and region boundaries created in *Sound Designer II* files and playlists. Each CD track can have its own ISRC code, and editable emphasis, copy prohibit and SCMS flags. Begin and end access point offsets and Catalogue code can be specified for the CD. The program then transfers the information digitally via SCSI to a CD recorder or 8mm Exabyte drive, creating a Red-Book-compatible master on CD or 8mm tape in DDP format.

Masterlist CD supports CD recorders from Pinnacle Micro, JVC, Philips, Kodak and Sony, with further models scheduled for support in the near future.

Digidesign. Tel: +1 415 688 0600.
UK: Tel: +44 81 875 9977.

Sabine *FBX-901*

Sabine have announced the release of the newest version of their award-winning *FBX Feedback Exterminator*, the *FBX-901*, unveiled at the NSCA show. The *901*, which replaces the *FBX-900*, is a digital signal-processor-controlled filtering device that automatically senses feedback, determines its frequency, and places one of nine very narrow digital notch filters to cancel only the ringing frequency. The filters are ten times narrower than a third-octave EQ, minimising the effect on wanted signals.

The *FBX-901* is claimed to offer automatic feedback control without sound muffling, more gain before feedback, increased signal clarity, and speed and accuracy. Additional features on the new model include the option to lock the *901*'s filters to prevent them going deeper, and the facility to select the total number of filters to be activated, together with a more efficient design and a new algorithm which reduces the chance of mistaking music for feedback.

The *FBX* user-list includes the Vatican, the Olympic 2000 site in Sydney, IBM, the US Air Force Band, Vienna State Opera, NASA space centres and the Walt Disney company.

Sabine Inc. Tel: +1 904 371-3829.

Furman *PM-8E*

Furman's new power conditioner-monitor assists in monitoring AC line status by including an accurate AC voltameter (210V–255V) and an RMS-reading AC ammeter (0–10), both rows of ten LEDs. What is claimed to be the audio industry's most complete and effective conditioning circuitry provides clean, filtered power to ten IEC outlets on the back panel up to a total maximum of 10A, controlled by a lighted front-panel switch.

Furman Sound, Inc.
Tel: +1 415 927-1225

ARX *EQ60*

ARX Systems, the Australian-based pro-audio manufacturer, have announced the release of their *EQ60* 'Constant Q' Dual third-octave graphic equaliser.

Based on new low-noise circuit topology developed by ARX, the *EQ60* claims a S-N ratio of 94dB unweighted and a dynamic range of 118dB, together with distortion at 0.004%. The equaliser features switchable ±15dB or ±6dB of equalisation on centre grounding damped sliders, electronically balanced inputs and outputs, hardwire bypass, switchable high pass filter and input level controls with up to 6dB of gain.

ARX Systems. Tel: +61 3 555 7859.

Audio Spector

Steinberg move further into the field of audio, as opposed to MIDI, with the launch of the *Audio Spector* for the Atari *Falcon*. This is a complete audio measuring and calibration package which Steinberg say surpasses hardware solutions with its precision and flexibility. The main function of the package is a real-time 20-band spectrum analyser, with Hold and Freeze functions, which combines a precise analytical display and a professional measuring instrument for analogue and digital audio with direct SPDIF capability. It also offers a precision real-time Level Meter conforming to the standards of the world's major broadcasting organisations, a Frequency Domain Analyser, a Phase Correlator and a test-tone generator.

Steinberg. Tel: +49 40 21 15 94.
UK: Harman Audio.
Tel: +44 81 207 5050.

Megas Stage II

The *Megas Stage II* sound reinforcement console is the latest development from British console manufacturer Soundtracs. Launched at the Frankfurt Musik-Messe, it has been designed to be flexible, with four frame sizes, mono and stereo input modules, up to four matrix modules to provide an 11 x 8 matrix, and up to four dual group modules, allowing it to be configured to meet a variety of different specifications. Fitted as standard are six mute groups, input metering and full VU metering on groups and masters.

Soundtracs plc.
Tel: +44 81 399 3392.

SSL Worldnet

Following on from their pioneering *SoundNet* concept, Solid State Logic have exploited ISDN technology to extend their networking philosophy to enable separate facilities to pass data quickly and economically between each other. SSL *WorldNet* offers two systems: the first, *WorldNet-Project*, allows the transfer of entire projects, while the second, *WorldNet-Audio*, relays straight digital audio.

The first is specifically designed for use with SSL's own digital products, extending the concept of networking beyond the confines of a single building. Entire *ScreenSound* or *Scenaria* multitrack projects, complete with full-bandwidth audio and mix and project data, can be transferred quickly to any other suitably equipped facility to exactly recreate the project. The second aspect provides low-cost, real-time, digital-audio links between studios, allowing, say, voice-over contributions to be transmitted between towns or even countries, or completed mixes to be played to clients in their own offices, wherever they may be. *WorldNet-Audio* also supports time code, enabling machine transports at both ends of the link to synchronise.

Both utilities are available for outright purchase, without the ongoing cost of subscriptions.

Solid State Logic.
Tel: +44 865 842300.
US: Tel: +1 212 315 1111.
or +1 213 463 4444. ▶

Soundtracs *Megas Stage II* sound reinforcement console

www.americanradiohistory.com

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	AT4071	AT4073
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OPEN CIRCUIT OUTPUT VOLTAGE (1 Pa)	56mV (-25dB re 1V ± 1dB)	45mV (-27dB re 1V, -1dB)
IMPEDANCE	100 ohms	100 ohms
MAXIMUM INPUT SOUND LEVEL	127dB SPL, 1KHz at 1% T H D	129dB SPL, 1KHz at 1% T H D
NOISE (A-WEIGHTED)	14dB (Typ)	17dB (Typ)
DYNAMIC RANGE	>113 dB	>112 dB
SIGNAL TO-NOISE RATIO	80 dB	>77 dB
POWER ADJUSTMENT	12-48V DC	12-48V DC
WEIGHT	5.8oz (165g)	4.2oz (120g)
DIMENSIONS	15.55" Long Ø .83" Dia	9.13" Long Ø .83" Dia
ACCESSORIES FURNISHED	Model AT8405 Snap-in Clamp for standard 5/8" 27 threaded stands windscreen, protective carry-ing case	

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Cuepoint

JL Cooper have introduced *CuePoint*, an autolocator and remote control unit for professional tape recorders. It is claimed to be the first universal device available to fully support MIDI Machine Control (MMC) and is fully compatible with the *ADAT*, *DA-88* and many hard-disk recorders.

CuePoint is a compact remote control that can control up to four MMC-compatible tape recorders and software programs (sequencers or hard-disk editors) simultaneously. It offers conventional tape transport controls and a shuttle wheel, and incorporates track enable and track grouping functions. In addition, it provides quarter-frame accurate auto-punch in and out, and 99 locate-points. Locate-points can be captured 'on the fly' and then edited and recalled as necessary.

The optional dataCARD expansion card allows *CuePoint* to slave to the Alesis *ADAT* without tying up an audio track, and also of interest to *ADAT* users is the ability to synchronise machines with an offset, allowing cut-and-paste editing.

JL Cooper.
Tel: +1 310 306 4131.
UK: Sound Technology plc.
Tel: +44 462 480000.

NVision *Toolbox*

The NVision *Digital Audio Toolbox* has been developed as a unique solution to the types of interfacing and synchronisation problems that can beset video, broadcast and postproduction facilities. The system comprises three modules: the *NV1050* 4-channel sample-rate convertor, which accepts any AES-EBU format signal from 32kHz to 50kHz; the *NV1055* 4-channel digital audio mix-minus and routing module, which allows four channels of AES-EBU to be intermixed and phase inverted; and the *NV1060* digital audio delay compensator, which provides up to 20 video fields (330ms) of delay on two AES-format signals. There is also the *CP1055* remote controller for the *NV1055*.

Pointing out the problems in achieving clean, glitch-free digital transfers in the absence of a common reference, NVision note that some frequency locking of source and destination equipment may not always be possible; some equipment locks to video, some to audio, and some cannot lock to any external reference. In these circumstances, sample-rate conversion locked to video, AES3 or SDIF2 using the NVision units will, they claim, enable clean, high-quality digital transfers.

NVision. Tel: +1 916 265 1000.

ReporterSet RSD/64

Dubbing mixer David Humphries of DB Postproduction, with Audio Kinetics *ES.Lock 1.11 Penta* controller, seated at DB's new *980 Series* MTA mixing console

ReporterSet

During the Amsterdam AES the Dutch company You/Com Telecommunicatie BV launched their ISDN *ReporterSet RSD/64*. The *ReporterSet* affords reporters the opportunity to transmit their on-line contributions from location at high quality, and is a compact unit with a number of interesting functions, incorporating the results of close co-operation with the broadcasting associations in The Netherlands.

A reporter connected to the ISDN network via the *RSD/64* has at his or her disposal two communication channels which offer simultaneously a high-quality connection as well as a duplex voice-channel. A data channel is additionally available, and a number of functions can be remotely controlled for extra user facilities

You/Com Telecommunicatie BV.
Tel: +31 15 62 59 55.

Denon *DN-650F*

The Denon *DN-650F* is a new purpose-built, professional use CD player.

Following on from the success of the *DN-951/961* broadcast machines, it offers similar features in a more affordable, medium-duty, 2U-high rackmount package. As well as standard music replay, its combination of programmable controls and remote-circuit access allow the *DN-650F* to become part of simple or complex automated installations in theatres, museums, theme parks and so on. At a price midway between domestic players and more familiar professional products, its features include instant start (10ms from any cue point or track location), cue to audio on every track, ±8% variable speed, SPDIF output, circuit access for fader start, track search and automation, and 18-bit D–A convertors.

Denon Pro Audio.
Tel: +44 753 888 447.

Audio Kinetics

Independent machine control and synchronisation specialist Audio Kinetics UK Ltd have launched an important new software release for their *ESLock 1.11* system, enabling full 5-machine control from a single serial port. This opens up new control possibilities for several systems, notably the AMS-Neve *Capricorn* and SSL's *ScreenSound* and *Scenaria* systems. By using the new software, users can avoid the pitfalls of time code-slaving additional machines, previously the only method of achieving machine control from a single serial port. Up to five machines can be controlled over ESbus from a digital audio workstation or automation or editing system, creating a fully integrated multimachine installation.

There is an additional option of using the Audio Kinetics *Penta* controller to achieve full dual control. This provides a range of additional facilities including the selection of individual on and off-line, with access to each machine for search and cue, as well as Record Enablement and Track Record selection.

Audio Kinetics UK Ltd.
Tel: +44 81 953 8118. ■

Product News is compiled by Dave Foister

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Sennheiser UK Ltd, Freepost, Loudwater, High Wycombe, Buckinghamshire, HP10 8BR. Telephone 0628 850811. Fax 0628 850958

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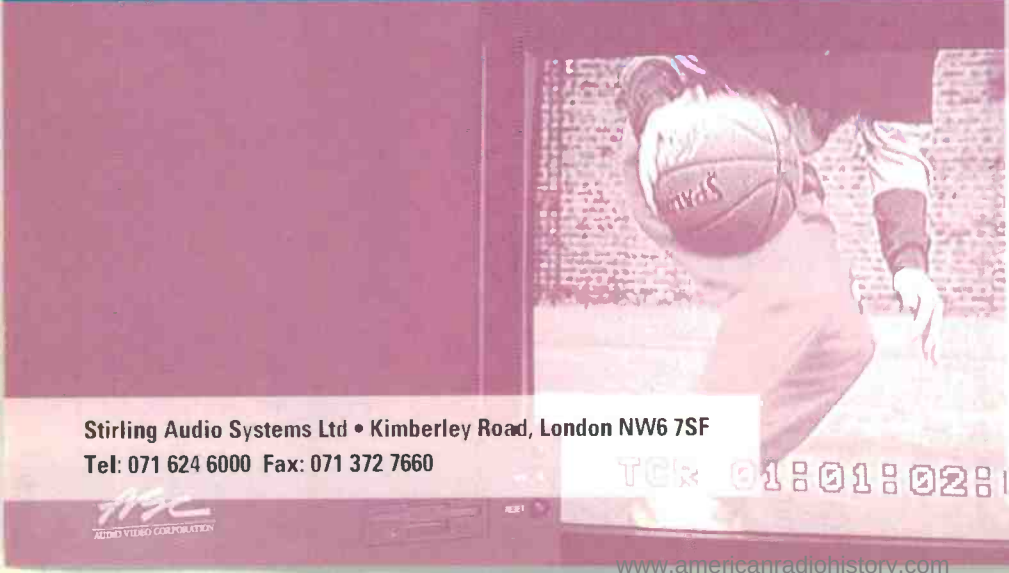

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SOUNDSTATION *GOLD*

The speed, flexibility and usefulness of digital audio workstations are now thoroughly proven and accepted. The concepts and the hardware continue to evolve. As more and more workstation developments emerge, the old distinctions between tape recorder, mixing console and processor rack blur still further.

Digital Audio Research, one of the pioneers of the workstation concept, have been designing digital audio systems for ten years, with the company's *Delta*, *Sigma* and *Sabre* used extensively for recording and editing in the television and film industries. Noted initially for their use of touchscreens—which provide a simple, natural and rapidly-understood operator interface—DAR recently took a further step with the *SoundStation* species in the form of the *SoundStation Gold*, a disk-based digital audio production centre. It is a step which continues their approach to the integration of capturing, manipulating and processing high-quality audio.

The proof of any new product is in the using, and the first *SoundStation Gold* is now in operation at Wild Tracks, one of London's premier audio postproduction houses. Wild Tracks' main area of business is broadcast and corporate, with recent programmes aired on terrestrial and satellite channels. This is supported by projects for large corporate customers, as well as radio and TV commercials. Paul Headland of Wild Tracks comments: 'Our decision to install the *SoundStation Gold* was a key part of our current expansion programme, which involves building a new studio and adding Digital *Betacam* and *D3* video facilities. We have experienced a steady increase in demand during the past year and will also shortly add a second *Gold*. Although the unit has only been installed for a few weeks, we are already impressed—the automation surface is a staggering achievement, especially as its from a company who have not produced a mixing console before.'

Operators often need more physical feedback than is possible from just an indicator on a screen and *Gold* achieves this through the inclusion of the *Mix Controller*—with a fully automated mixing surface, complete with motorised faders. The complete *Gold* package also includes a processing, storage and interface unit, together with a choice of two styles of edit controller—either DAR's established touchscreen unit or a compact console with monitor screen and pointing device. Both types of edit controller include dedicated hardware keys for a variety of functions, as well as a scrub-jog wheel. The *Mix Controller*'s automation can follow the scrub wheel, allowing complex fader moves to be built up at slow speeds and in either direction. Dynamic scrub automation is a significant development for postpro applications.

The critical factors behind DAR's approach would appear to be speed of operation, ease of use and minimal learning time. These factors are supported by the segment-based manner in which the units manipulate audio data. The 'bits of tape' metaphor is simple to grasp (literally so, with a touchscreen) and follows a very logical and rational pattern. This thinking is apparent throughout the whole system, being applied to EQ functions and beyond.

Although a conventional console's channel-located EQ section provides a thoroughly familiar way of working, it does not always represent the most convenient approach—anyone who has ever tried to squeeze different instruments onto the same tape track would agree. It is equally critical when dealing with a demanding dialogue and effects mix. What one really needs is the ability to glue the desired EQ setting to a particular sound, and have this setting follow the sound wherever it is placed.

The segment-based processing carries this philosophy to its logical conclusion, by enabling each segment to have its own settings for gain, EQ, aux sends and pan. The *Mix Controller* also provides an operator with two alternative EQ settings per segment—this enables A-B testing of EQ values and, for example, rapid switching between close-up/long-shot or interior-exterior scene changes.

The assignable EQ section is a 4-band, fully-parametric design, with extremely powerful and wide-ranging values, EQ settings can be retained as templates, to allow copying and repetition between segments. The position of a segment can be followed on the *Gold*'s automation surface, as each of the eight assignable channels can display either the channel number or the name of the segment present in that channel at a particular point. The result is a scribble strip with a difference—the required information appears automatically.

The *Mix Controller*— a new direction for DAR's product line

Paul Headland: 'We trade in a demanding, time-conscious and fast-moving environment. Our facilities have to provide 100% performance, 100% of the time and downtime is banned. Many of our sessions are booked back-to-back throughout the day and our clients depend on fast turnarounds.

'Our editors find the DARs very fast and tape-like. No-one was born with a mouse in their hand and it is this aspect of operator feedback that has so impressed us with the new *Gold*—our combination of touchscreen console, fader automation and segment displays provide excellent interfacing. The single-page screen of all the units also make for rapid and easy to follow editing. For our needs, the segment-based processing is quite significant. You can do even thoroughly wicked things with the EQ and it's still very clean. This would be impossible to achieve with either analogue EQ or even outboard digital devices. The ability to mix in slow motion, and even scrub edit in stop, is particularly useful. Perhaps the fact that DAR are not a mixer manufacturer, and therefore relatively free from preconceived notions, contributed to the design.'

The *Gold*'s eight assignable fader channels can each access up to four control layers, for handling 32 signals if required. Eight touch-sensitive channel faders and one master were deemed an appropriate number—less would be too limiting but you cannot control more with the same pair of hands. *Gold*'s automation has four operating modes: Record; Play; Update and Trim. Each channel can be quickly switched between modes, echoing DAR's philosophy of minimising the number of keystrokes per action.

While Wild Tracks' new facilities are being completed, the studio plans to run the *SoundStation Golds* alongside their existing analogue consoles, with the eventual objective being to dispense with the old mixers completely and add additional outboard gear to the *SoundStations*. Paul Headland is confident that they have made the right decision: 'However clever a piece of kit is, you still have to use your ears, hands and eyes—the final results depend on one's skill and experience, supported by informative, thoughtfully designed hardware. We know the value of the *SoundStation* approach—it has after all provided the backbone of Wild Tracks' operation for the past few years. And with *Gold*, we now have bought a proven concept which works totally reliably. What is new is the way in which DAR have continued to extend the system's power and facilities. It's a great concept.' ■

Andrew Sutcliffe

Digital Audio Research Ltd,
2 Silverglade Business Park,
Leatherhead Road, Chessington,
Surrey KT9 2QL, UK.
Tel: +44 372 742848.
Fax: +44 372 743532.

PHOTO: NIK MILNER

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Ground Control

Feet first—Digital Music Corporation's *Ground Control*

Guitarists and keyboard players should take note of Digital Music Corp's *Ground Control* MIDI pedalboard and *GCX Expander* audio switcher because while both can function as stand-alone devices, the way in which the two can interact adds up to a very simple, effective but most importantly affordable means of regaining control of your performance effects rig.

When the two are tied together you can access ten banks of ten presets of MIDI patch change to eight bits of outboard, two passive volume pedals' worth of continuous controller generation and eight gold-plated relay circuits' worth of loop and switch activation.

The *Ground Control* pedalboard has an external PSU for stand-alone use or can be powered over its MIDI Out when run with the *Expander*. In all cases the power sockets really ought to be the locking variety.

What you see is a large 12-segment LED display and two rows of six footswitches, two of which are dedicated to Bank selection. The remainder, with their own LEDs, are for preset selection within a bank. You've guessed it, these switches function in different ways depending on the operating mode.

Ground Control operates on three levels: the basic Setup mode in which you configure the system to your own rig; Program mode in which you define what happens MIDI-wise and expander-wise in a preset; and Preset mode in which you retrieve the presets that you have created.

Setup permits the connected outboard devices to be named and MIDI channel assigned, two expression pedals to be enabled and calibrated, and the *Expander* circuits to be recognised. You enter the mode by pressing both Setup footswitches simultaneously (as these are at each end of the top row its obviously something you're not going to be able to do with your feet unless you can Cossack dance with the best).

One of the useful features of *Ground Control* is that whenever you select a bank in Preset mode, the names of the ten presets within that bank scroll past in the LED window with LEDs below each of the footswitches blinking in time giving a quick indication of the geography of a bank. In the Utilities menu you can set the speed at which a names of the presets scroll by.

Program mode is where you set the patch changes you want to send, decide what the pedals will do and control the switches and audio loops on the *Expander*. It is all incredibly simple. To enter patch changes you scroll through the connected devices that you have already named in the setup menu and enter the patch change numbers as required on the stomp switches. Similarly, with the pedal assignment, you select the target device by name and decide he pedal's function by choosing from: off, pitch bend, aftertouch or continuous controllers 0–120. Switches are thrown within the *Expander* by scrolling to the Switches page and

THE PANASONIC SV3700 DAT RECORDER
NO LONGER AN ENDANGERED SPECIES

With uncompromising build quality, virtually transparent performance and all the right features, the Panasonic SV3700 continues to be America's hottest professional DAT recorder. Which makes Panasonic UK's decision to cease importing it all the more difficult to comprehend. But fear not, this universally acclaimed DAT recorder is now being distributed by HHB, thanks to a unique "factory direct" arrangement with Panasonic in Japan.

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then pressing any stomp switch from 1–8 to operate the relay. Simple. Finally, you enter a save routine that also permits the preset to be named with something meaningful.

Preset mode is the unit's 'performance' mode, and provided you have arranged your ten banks in a logical manner, you will be able to step through them and select from the ten presets (each of which is named) within it. Changing banks on the up-down switches gives a useful bank browse function by virtue of the scrolling display but no firm action is taken until you actually stomp on a footswitch. Alternatively, you can set a direct-access mode within the Setup menu which allows the presets to be recalled by entering two digits on the footswitches.

The *Expander* is an modest-looking rackmount with two front-panel, normalised, instrument jack-socket, buffered inputs and eight LEDs corresponding to the status of the eight loop-switch circuits on the rear panel. Here you find a MIDI In socket, which provides power to the *Ground Control* pedalboard (on the two unused pins), a MIDI Out which daisy-chains MIDI commands to connected devices, and two feed through outputs which offer the input to be split. These are low impedance connections and so can be split still further on leads if required.

Each of the eight loop-switch circuits has an input and output plus a send and return on standard jacks. The programmable switch nature of these means that effects loops can be switched in and out, two sources or two destinations can be A-B'd, sends to effects can be established and muted, and destinations can be paralleled all under command from the *Ground Control* pedalboard . Additionally, you can program a circuit to perform the function of a latching or momentary-type switch for flipping such things as reverbs.

You do not need to use the *Ground Control* to use the *Expander*'s circuits as loops-latched switches and momentary switches are thrown on MIDI channel 16 continuous controller 80–87 and 104–111 commands respectively. But you might as well because you will be needing a pedalboard at some stage.

In conclusion, I have to declare a strong suspicion that somebody has really thought about this package. It is so straightforward and operationally painless. There is nothing particularly deep about the menus but then it could be argued that what the *Ground Control-Expander* package is doing is not particularly clever these days. The concept of reconfiguring an entire rig at the press of a footswitch is well accepted, although I personally have not seen it done this elegantly and this cheaply before. The basic approach asks you to make the thing your own by customising it in the Setup menu, create the type of loops and switches you want using the *Expander*'s circuits, then combine and alter the lot via MIDI patch command and continuous controller data from within a preset. That is all there is to it—and in the majority of cases, it is all you will need.

It all works very well and sonically is up to the task, your guitar sound is not tampered with, and it's certainly rugged enough for the job aside from the nonlocking power connectors.

There is a slight ergonomic trade-off between the ease of programming and preset selection, the former being marginally better laid out than the latter. The reason is that because you are dealing with two rows of six footswitches the arrangement of the numbered switches 1–4 on the bottom row and 5–0 on the top is, perhaps, not the most logical for preset selection in performance but it certainly is the most convenient for programming purposes. Also, when selecting presets in the top row, you are required to stomp on the LED display and obscure the LEDs of the footswitches with your foot. However, if you have named your presets clearly there is generally enough display cutting through to tell you if you've got it wrong.

Other than that what can I say? Truly affordable? Depends where you're coming from. Value for money? Most certainly—and it is easy to get on with. Your search for a pedalboard-audio switcher should begin with this package. ■

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Music News is compiled by Zenon Schoepe

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LE STUDIO MOBILE

Patrick Stapley investigates an Anglo-French mobile recording project offering an attractive alternative to both conventional studios and mobiles

There must have been times in a lot of our professional lives where we've been sitting in a nondescript studio during a lull in the session, casually flicking through an audio magazine—you may be doing it now—when our attention has suddenly been drawn to a picture of the perfect studio location. This idyll may be the sun-drenched Mediterranean, the Alpine ski slopes, an isolated Caribbean island, an African game reserve, or simply the remote seclusion of an old country house—but whatever takes our fancy, there is the overriding feeling that we'd much rather be there than here, and the desire to be whisked away to recording paradise.

Over the last few years there appears to have been a resurgence of interest in recording away from conventional studio environments, and top producers such as Rupert Hine, Daniel Lanois, Trevor Horn and Hugh Padgham have all recently recorded major projects in unusual locations.

This trend has not gone unnoticed, and English engineer-producer Jonathon Miles and his French partner Christoph Barello, have responded by setting up a project they have called Le Studio Mobile.

'There are many artists and producers about who crave the concrete, the noise, and the general hubbub of places like New York and London,' says Miles, 'but there are others who prefer something a little more relaxed and green, and they are the ones we're aiming to appeal to. The idea is to take people out of the everyday studio environment and put them in surroundings that will not only be a pleasure to work in, but will also be creatively stimulating.'

Le Studio Mobile offer a complete service: they will provide the location from an impressive and rapidly expanding list of carefully vetted properties; supply all catering and domestic services, install a full set of recording equipment; and provide technical assistance. However, this is not a mobile in a sense of a truck full of gear as Jonathon Miles points out.

'We wanted to get away from the idea of using trucks: the thought of being cooped up in some sunless, claustrophobic vehicle for weeks on end has very little appeal and actually goes completely against what we were trying to achieve. So we thought about putting together a modular system that would be small and portable enough to be packed away in the back of a medium sized van, and could be set up *in situ* in no longer than 20 minutes.'

Miles drew up an equipment list based on personal preferences as well as feedback from other engineers and producers. Important considerations were that the gear should be operationally familiar, be capable of producing high-quality results and be easy to flight case—in fact the complete studio packs away into just ten cases.

'We opted for a mixture of what people may term as 'project' equipment and high-end equipment. So we have a 32-channel Mackie console and four Alesis *ADAT*s alongside gear such as Neve and Focusrite preamps. It's a combination that may initially take some people by surprise, but we feel we've included things that really add something useful to the recording process—and we purposefully haven't over cluttered it with gear which is more suited to mixing. It's a basic recording paintbox that any good engineer or producer with a definite idea of what they want, can achieve really good results with.'

Miles sees Le Studio Mobile appealing to people with a sense of the unorthodox who are prepared to be adventurous.

'I make the analogy that its a bit like going camping with your penknife and your tent—albeit you may be in a luxurious French chateau with a swimming pool—the idea is "here's what you've got, now go ahead and make an album". I think it inspires people to try out new ideas and be a bit more experimental take a few more risks than they would normally do in the studio.'

On location

There are currently just over 40 properties on Le Studio Mobile's books, ranging from palatial Moroccan houses to colonial-style Jamaican villas. But by far the largest number of locations are in France and the majority of these are lovely old country chateaux.

'Wealthy French people often live in Paris and have a chateau in the country which they use for a few days here and there,' explains Miles, 'so there are a lot of superbly located, furnished properties which are empty for a large portion of the year that can be rented out. They make ideal residential recording venues being good-sized buildings, usually in the middle of nowhere so you have total privacy as well as being away from aircraft flight paths and other external noise. We put a lot of effort into finding interestingly placed and constructed buildings which we feel would be good to work in—they must obviously have thick walls, plenty of good acoustic space and lots of bedrooms.'

Other buildings which Le Studio Mobile have already used, include an abandoned cinema, a private Paris townhouse, and hotels—because business is quite slack in the hotel business for the first three to four months of the year, hoteliers are often only too pleased to take on this kind of booking. In fact Le Studio mobile's latest client, producer Rupert Hine, has just finished recording the French band Les Negresses Vertes in a hotel near Toulouse.

Hine has been an exponent of this style of working for many years, having recorded numerous

Mobile recording without wheels —Le Studio Mobile in action

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Les Negresses Vertes gather for a play back

projects away from studios; such as Chris de Burgh in a house in Ireland, and Stevie Nicks at her mock Dutch castle in Hollywood. Hine also has a Spanish house in the Andalusian mountains that is prewired ready for mobile equipment to be brought in. Given the choice, he says his preference would always be to avoid conventional studio recording, but what are the advantages?

'The advantages are absolutely enormous in terms of atmosphere and spirit. When I'm recording people I want them to be passionate, yet remain as natural as possible, and these feelings are very hard to generate in the studio because it's such an unnatural environment.

'During the 1970s when a lot of the technology was new and exciting and people were referring to studios as looking like aircraft flight decks, there was an element of excitement that produced a certain amount of stimulus; but now even the young bands are really blasé about gear.

'OK, for a new band going into a major studio for the first time there is undoubtedly a buzz, but even then I don't necessarily think it will be the ideal place for them to make a record. So often you find with new bands that they play their best when you duplicate their rehearsal room situation where they do most of their writing and playing. By recreating this, with people sitting around facing each other in an intimate group, it can often inspire great performances in a totally natural way.'

Hine is a great believer in first finding 'a nice place to be that feels great to work in' and then thinking about the equipment. Having achieved the former, what did he make of the unusual selection of gear offered by Le Studio Mobile?

'The equipment is different in being around an essentially very economical console and multitrack setup. The coincidence was that I'd just ordered a Mackie console and a set of Alesis *ADAT*s to replace a Studer 24-track and Soundtracs console at my home studio—so it gave me a perfect opportunity to try out the combination.

'I suppose the thing that surprised me most was that I was expecting to find a selection of cheap Japanese outboard gear to go with the console and *ADAT*s, but instead there are top names like Focusrite, tc electronic, Eventide and Neve. So there's this curious imbalance where some of the individual pieces of outboard are actually worth more than the console itself, and this was certainly the first time I'd been in any studio setup where that could be said. However, the nice thing about it is that things actually compliment one another rather well, and the whole setup has the feeling of being well conceived and sensibly put together. The general standard of cabling and wiring, for example, are all impressive, and the whole thing pieces together very simply and quickly with the various racks, mic boxes and so on all interfacing to the console via single multicores.

'The Mackie console does an amazing amount of things for its size and price, and I think it sounds really good too. The engineer I work with a lot, Stephen Taylor, had been using two of the tiny little Mackies at his home, and he liked them so much that he'd been bringing them into studios for odd jobs here and there. I'm sure if you measured them up against a top-end music console the figures may not look so good, but if one's talking strictly from the point of view of using one's ears then subjectively they're excellent—the quality is excellent, the EQ is immensely useful and for its size the desk is incredibly flexible. Another nice touch that the mobile guys have included, is a full vertically mounted patch bay (6 x 96 bantam) built into the console base, which makes everything very easily accessible.'

Location sound

The hotel Hine was working in had been built 100 years ago as a casino. It contains a huge central area surrounded and overlooked by four floors, and covered by a large glass roof. Hine describes it as being 'fantastically reverberant' like a church acoustic producing a 'beautifully smooth and pure sound'. Obviously with a 9-piece line-up which included two percussionists and a drummer, a two-piece brass section, of acoustic guitars, flamenco guitars, accordion, zither and voices—an element of acoustic control was required.

'We hung some heavy drapes where the drums were to control things a bit, and we also used various mattresses, rugs and blankets as screens and acoustic dampeners. We also used other rooms in the hotel such as the official dining room, a grand salon, a marble hallway; so we ended up with various acoustic spaces permanently miked up that we could use as and when we wanted.

'The interesting thing was that because the acoustics in the building were so fantastic, we never had to use any of the outboard equipment to provide us with a reverb or ambient effect, it was all done using natural reverbs which we recorded to separate tracks. When we come to mix the album, our goal will be to try and exclusively work with these natural sounds without resorting to artificial reverb, although I suspect we may have to use something different on vocals.'

Overhead view of Mackie—ADAT-based recording system

With so many possible recording spaces within a building of this size, good foldback and closed-circuit video systems are obviously an important consideration. Le Studio Mobile provides a maximum of six discrete mono (three stereo) foldback systems, and a total of six Sony mobile cameras feeding to a 31cm monitor in the control room—camera selection is controlled by a video switching system built into the Mackie desk.

For his control room, Hine chose a large ground floor bedroom which was separated from the main recording area by two doors. All furniture was removed, but no attempt was made to acoustically treat the room.

'The acoustic was a little wacky if you used the big speakers,' admits Hine. 'It was OK for vibe but very loose ▶

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EQUIPMENT

1 Mackie 8-bus 32-channel console
1 Mackie 4-bus 16-channel console
1 Akai *DR4 210MG*
5 Alesis *ADAT* with *BRC*
Tannoy *System 12*/Quad *520*
Yamaha *NS10*/Quad *240*
2 Audio Technica *AT4033*
1 Beyerdynamic *M740 Mk II*
1 Beyerdynamic *M88TG*
1 Beyerdynamic *M160e*
2 B&K *4010*
1 Electrovoice *RE27*
1 Neumann TLM170
2 Neumann *U87*
1 Schoeps *CNC6/MK4*
1 Sennheiser *BF509*
2 Sennheiser *CK6*
4 Sennheiser *MD421*
2 Sennheiser *ME68*
4 Shure *SM57*
1 BBS *822A* stereo
2 dbx *166* stereo
1 Eventide *H3500 DFX*
2 Focusrite *ISA131*
2 Focusrite *ISA215*
1 Lexicon *LXP15*
2 Neve *Dual EQ*
1 Summit *DCI200* stereo
1 tc electronic *M5000*
1 Urei *1176*
1 Yamaha *SPX90*
Mogami, Switchcraft and Varelco cabling

on the bottom end as you'd expect in an untreated room. Rather than trying to do anything to the room itself, we decided to monitor on *NS10*s and refer to the big Tannoys only when we needed to gauge how much top and bottom we had around. If you're monitoring is technically not 100% it is at least going to be stable, and as long as you understand loosely what that curve is, then everything remains relative and in proportion. We were very careful, though, not to be exacting when EQing things, leaving those kind of decisions to the mix. We did make extensive use of outboard preamps and equalisers in particular the Focusrite units which are superb.'

Le Studio Mobile offer a selection of monitors—Tannoy *System 12* and Yamaha *NS10*s are supplied as standard, and the clients then has a third choice between Meyer *1000*, Genelec *1031* or DynaudioAcoustics *PPM2*. Jonathon Miles feels that providing a good selection of monitors is essential, and also encourages people to bring their own reference speakers, or alternatively they can be sourced for them. Miles is also investigating some form of portable acoustic system that could be installed in the control room to provide a degree of instant room treatment.

Apart from an assistant engineer supplied by Le Studio Mobile, Hine brought two British engineers with him: Stephen Taylor set everything up at the beginning and recorded the rhythm tracks over the first week, and from there on Jamie Cullum, from Metropolis Studios, took over and recorded the rest of the album in just under six weeks. Very little extra equipment was brought in apart from some favourite microphones and headphones, plus Taylor's Akai *DD1000* which was used in conjunction with Le Studio Mobile's Akai *DR4* to spin-in sections, move things around and compile vocals.

Both Hine and Les Negresses Vertes claimed to be 'delighted' with the results they achieved, and although some of the band had certain initial reservations about the method of working, they now all appear to be converts.

'I think the band were a little nervous at the beginning as both their previous albums had been recorded in conventional studios; but they were very happy with the way it worked out and found the experience both exhilarating and creatively refreshing. I'm so pleased with the way things went and would have no hesitation in working with Le Studio Mobile again, although it has crossed my mind to put together a similar system myself sometime in the future.'

The key question: what does it cost? As all the equipment is based in France, prices are worked out in francs: the daily rate for the equipment and an assistant engineer is 4800FF, and the cost for the premises and catering for up to ten people is roughly the same again. Obviously for long bookings the rate will reduce somewhat, and Miles quotes an all-in figure (exchange rates permitting) of £1,000 a day as a guide. There are also possible tax advantages, as he outlines.

'If a UK band is touring extensively out of the country, they could combine this with making an album abroad. This could easily mean they were out of the country for a year, and that would qualify the album as an offshore project thereby exempting all UK sales from tax. It's quite an incentive!'

Word seems to be spreading about Le Studio Mobile, and Miles reports an increasing number of enquiries including interest from influential names such as Lenny Kravitz and Duran Duran. Strangely enough there has also been a reciprocal situation in which the French artist Princess Erica wished to use the mobile to record in an English country house. With prospects looking good for the future, Miles is putting together a second full set of gear, plus a smaller system designed for home use. He has also come to an agreement with producer Mike Hedges (now resident in France) to use some of his vintage equipment including a 1970 EMI console from Abbey Road studios. ■

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SADIE UPDATE

***SADiE* Playlist Overview window**

British-based Studio Audio & Video have experienced an impressive level of growth since *Studio Sound* first looked at their *SADiE* disk editor nearly two years ago. Back then, the company had sold just 13 systems—now the total stands at over 450. In fact, last year's sales were more than treble those of 1992, and the forecast for this year suggests that they are at least set to double again.

David Mortimer, Studio Audio's Commercial Director, gives his account of the reasons for the company's success: 'Apart from producing a very good product at a highly competitive price,' he says, 'a lot of it is down to an attitude. We make a point of being as approachable and as open as possible —if someone has a problem with one of our systems, they can ring us and there will always be someone here who will do their utmost to help. By dealing direct with our customers rather than via distributors, we build up first-hand relationships which keep us very much in touch with what people want from our system as well as what they don't like about it. I think this personal—and dare I say it, caring—approach has been warmly welcomed.'

Another aspect that has made *SADiE* popular is Studio Audio's policy of offering a no-nonsense turnkey package. Sales Manager, Ted Heyton, explains: 'We found a lot of people got very confused by hard-disk editing systems that were presented in a modular fashion, and they weren't sure which options they really needed. By offering *SADiE* as a complete hardware and software package, the customer gets absolutely everything they need. When I tell people that our turnkey system costs just under £6,000 (UK price), they often say, "Sure, but how much is the computer going to cost?" When I explain that the price includes the computer they're pretty impressed.'

SADiE has sold well across a range of market sectors—broadcast, postproduction, mastering, education and so on—and it is also winning some prestigious clients such as the new '5-Star' mastering facility at London's Metropolis Studios (who have taken two systems), and the BBC (who currently own 90 systems including one for producing the UK's favourite radio soap, *The Archers*).

New features

Over the last couple of years an enormous number of additions and improvements have been made to *SADiE*. Major additions include DSP functions such as EQ, dynamics, compansion, and noise reduction; dynamic automation; bouncing; sample rate conversion and varispeed; punch-in and looping; ▶

Patrick Stapley revisits the *SADiE* hard-disk editor and finds a system much advanced from that reviewed in 1992

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autoconforming; 20 crossfade algorithms; PQ editing; CD-R support; machine control; 24-bit recording; enhanced operational displays; and help windows.

Many of these features were introduced in v2 software released at the end of last year, and further additions were made with the release of v2.1 in March this year. So far, all of Studio Audio's clients have received software revisions free of charge—the company's official policy of issuing free software for the first year only seems to have been rather generously ignored.

Hardware and user interface

SADiE runs on an IBM 486 under *Windows* 3.1. The computer must have a minimum of 4Mb RAM and will require a suitably sized SCSI drive for audio storage—the turnkey system provides a 1.2Gb drive giving an audio capacity of 1 hour 53 minutes of 16-bit stereo at 44.1kHz.

Into the computer are slotted two Studio Audio cards—the X-S processing card and the X-ACT analogue convertor and time-code interface card. The X-S card utilises the AT&T 32-bit floating point processor (50MHz), and supports AES-EBU and SPDIF I-Os, providing one stereo input and two stereo outputs. The X-ACT card provides analogue I-Os using 64 times oversampling delta-sigma convertors (16-bit), and supports SMPTE-EBU and MIDI time codes.

Connection to *SADiE* is via the Breakout Panel; this is a 1U-high mountable unit which connects directly to the cards providing I-Os for analogue and digital audio, LTC and MIDI time code, and MIDI.

The system's single operational screen splits into three main areas—a tool bar at the bottom to select regularly used functions; a menu bar at the top for selecting basic parameters; and a desktop working area in between, where the various operational windows are displayed. These windows can be placed anywhere in the central area, personalised screen layouts can be saved and recalled.

Visually the system makes good use of colour, with three-dimensional graphic controls and icons helping to give an intuitive and familiar feel to operation—for example, on-screen buttons appear 'pressed-in' once activated. The user interface is via a mouse although various functions can be executed using keyboard 'hot keys' whereby the user assigns functions to specific keys.

Operation

The system supports standard sample rates from 44.056kHz to 48kHz, and bit rates from 16 to 24. At 16-bit resolution the system can be used either in stereo or 4-channel output modes, but the higher rates restrict use to stereo only.

SADiE is capable of simultaneously playing back eight mono pieces of audio; thus in 8-Stream mode separate audio blocks will appear on each Stream, while in 4-Stream mode two blocks can overlap on each Stream. The latter method is analogous to traditional tape editing where two audio signals will crossfade over an edit point, and is more likely to be used for applications such as mastering; the 8-Stream mode is more suited to postproduction spot-type editing.

Once the Track has been loaded it can then be edited, and the resultant edit section(s)—or Clips in *SADiE* terminology—saved along with the original Track in a Clipstore. It is important to remember that Clips are merely edit instructions which tell the computer which part of the Track (hard disk) to replay.

Editing can be carried out in a number of different ways: for example, a series of Clips can be copied from the Clipstore and assembled in the Playlist, where they become known as EDL Entries; or a Track can be edited *in situ* within the Playlist to form the entries. Alternatively edits may be compiled in a textual off-line manner using the Text EDL facility. Whichever methods are used, *SADiE* maintains two on-line EDLs, thereby allowing the operator to try out different edits before committing them. The system also provides user-definable levels of Undo and Redo for correcting mistakes.

There are five areas within *SADiE* where editing can take place—the Playlist, Edit window, Trim window, Text EDL, and Clip Details window. The first three are used for graphical editing, and the last two for textual editing.

The Playlist is really the heart of the system, and EDL Entries may be inserted, deleted, moved and copied. Audio can be 'chopped up' in this display to form further Clips, and entries can be time-code locked and write protected to avoid inadvertent manipulation.

Points in the Playlist can be accessed and played in two ways: either using the system's transport windows which contain familiar tape-type transport buttons and autolocate memories, or by clicking the mouse directly in the Time Bar that runs across the top of the Playlist window —a single click will locate to point and a double click locate and start playback.

The Edit window and Trim window work in similar ways to each other and both utilise waveform displays which can be magnified to sample resolution. However, the major difference between the two is that the Edit window operates on a single Clip or EDL Entry, while the Trim Window is designed to manipulate two EDL Entries modifying their relationship with reference to other EDL Entries.

The Edit window shows a single, colour-coded waveform: the body of the Clip is coloured blue with the fade-in and out points being highlighted in a lighter blue. The waveform either side of the Clip is grey and this represents the Track outside the Clip boundaries. The Clip is edited by shifting its In and Out points, thus lengthening, shortening or moving the Clip relative to the source Track.

Another feature of the Edit window is the Hot Spot. This appears as a vertical red line which can be placed anywhere within the waveform display. It is used to mark an event within the Clip which may then be accurately positioned in the Playlist. For example, if *SADiE* is being used for drama production, there may be a point during a sound effect Clip that has to coincide with a piece of dialogue—by positioning the Hot Spot at the relevant position (either visually, or aurally using the scrub editing facility), the Clip can be precisely synced to the dialogue back in the Playlist.

The Trim window is used to adjust crossfades and the relative timings of two entries in the Playlist—they do not necessarily have to be adjacent or on the same Stream. The entries are displayed as two waveforms one above the other, and in the case of adjacent entries, the top waveform (coloured blue) plays up to the edit, and the bottom waveform (coloured green) plays away from the edit. Both waveforms also show the redundancy portions of the original recordings (after and before the edit) which are not currently being heard and these sections, as with the Edit window, are coloured grey. Also like the Edit window, the crossfaded areas are distinguished by different shades of blue and green.

Editing in the Trim window is performed by 'slipping' each waveform relevant to the edit point: thus unwanted audio is moved into the cut area, and-or wanted audio is brought back into the play area. Further to this, each display entry is sectionalised into three parts (fade in, body, and fade out), and this enables a section or sections to be independently selected and manipulated. For example, the fade out of the blue entry and the fade in of the green entry can be selected, and the edit point synchronously moved so that that one fade becomes longer while the other is shortened by the equivalent amount.

Once the two entries have been correctly adjusted and auditioned, they are written back into the Playlist, where existing entries (previous and-or subsequent) may be locked at their current EDL times, or allowed to shift relative to the position of the newly edited Clips.

The Text EDL lists all the entries for the current EDL by name in the order in which they appear. The display can be user-defined into a series of columns showing information such as start, end and Hot Spot times; fade durations; fade curve type; assigned playback Stream; source Track; write protect status and so on. The display allows an EDL Entry's details to be directly edited, and changes will be instantly mirrored in the Playlist —both Text EDL and Playlist can be viewed at the same time and are interactive (that is, selecting an EDL Entry in the Playlist will highlight the same entry and its details in the Text EDL).

The Clip Details window also interacts with the Playlist, and there is some operational overlap between it and the Text EDL. However, unlike the Text EDL, it functions for both EDL Entries and Clips. Apart from controlling fade times and shapes, overall durations and so on, the Clip Details Window also provides control over other aspects such as pan-balance, phase reversal, and reverse playback. It also allows overall level adjustment of individual Clips-EDL Entries to be made from a ▶

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pair of graphic faders, and these setting remain independent of the system's Levels window.

Levels and automation

The Levels window controls and displays output levels, and can be configured in different ways. Depending on whether 4 or 8-Stream modes are being used, the display will have either four or eight faders controlling the output of each Stream. These can feed directly to *SADiE*'s outputs or can be routed via two or four master output faders —thus offering a choice of 4:4, 4:2, 8:4, or 8:2 mixing. Output level meters are provided and all the faders are equipped with Mute, Solo, Pan, Disable (fixes level at unity gain), and Links which allow stereo gangs or groups to be created.

The Levels window includes dynamic automation for the faders, pans, mutes and solos. This operates using four main statuses—Overwrite (an absolute write mode, Offset Trim (relative update), Auto-Return (returns fader to previous level on release of fader at a user specified Glide rate), and Disconnect (Isolate). All automation data remains locked to time code and will not shift with an entry if it is moved.

DSP

The system offers a range of signal-processing facilities, which are accessible from the Processor window. The available functions are: Equalisation—3-band stereo (or dual mono) parametric with peak-shelf selection, and high-pass and low-pass filters; Dynamics—offering compression, expansion, and gating; Noise Reduction—a single ended system using three bands (100Hz, 1kHz and 10kHz) of frequency conscious expansion; Resampling—providing sample-rate conversion, digital varispeed, and subsample microtiming for correcting phase errors by minutely adjusting the timing of one side of a stereo pair; Timescrunch—compansion of audio without pitch change; Bounce which combines selected EDL Entries to a new Track on the disk in order to free up space on the disk or in the EDL.

Processing can be applied to a Clip, one or a group of EDL Entries, a Track or an entire EDL. Some processing operates faster than real time and some slower—Resampling, for example, is slower, and during varispeed auditioning glitches may be heard depending on the percentage of varispeed being applied—these artifacts will, of course, disappear once the signal has been processed in non-real time.

PQ and other facilities

SADiE now offers PQ editing. One of the great advantages of using a hard-disk editor to PQ masters, is that a certain amount of the work is already done for you. Given that an EDL exists, the PQ editor is able to automatically generate a PQ list by placing start and end indexes after and at the beginning of silences respectively. Additionally, all PQ flags can be seen in the Playlist in relation to the audio edits.

The PQ setup window allows the user to set values for Minimum Track Length (sections shorter than specified time are not treated as new tracks), and Minimum Gap Length (gaps shorter than specified time will be ignored). The window also allows offset values to be set for Start and End of CD, and Start and End of tracks.

Machine control for up to four machines via Sony 9-pin protocol is now possible. However, to implement this facility an RS422 interface will need to be added to the system, and Studio Audio can supply Quatech boards. If the facility is installed, a separate pop-up transport window will appear.

The system now offers three types of dither —Rectangular, Triangular and High-Pass Triangular. It is also expected that noise-shaped dither will be included in future software.

The future

Despite the large number of additions that have been made to *SADiE*, particularly over the last six months, and the fact that the system now appears to be competing head to head with the best of its competitors, there are no signs of complacency setting in at Studio Audio. In fact the small, but expanding, team seem as enthusiastic about developing *SADiE* as they did two years ago, and anyone who has recently visited the company's Cambridge base cannot have escaped noticing the air of dedication that permeates the building.

'We're certainly not resting on our laurels,' states David Mortimer, 'there are many exciting and innovative developments planned for *SADiE* in the future.' Exactly what these are remains securely under wraps for the time being; however, Mortimer is hoping, R&D times permitting, to be able to unveil some new features at next month's APRS. ■

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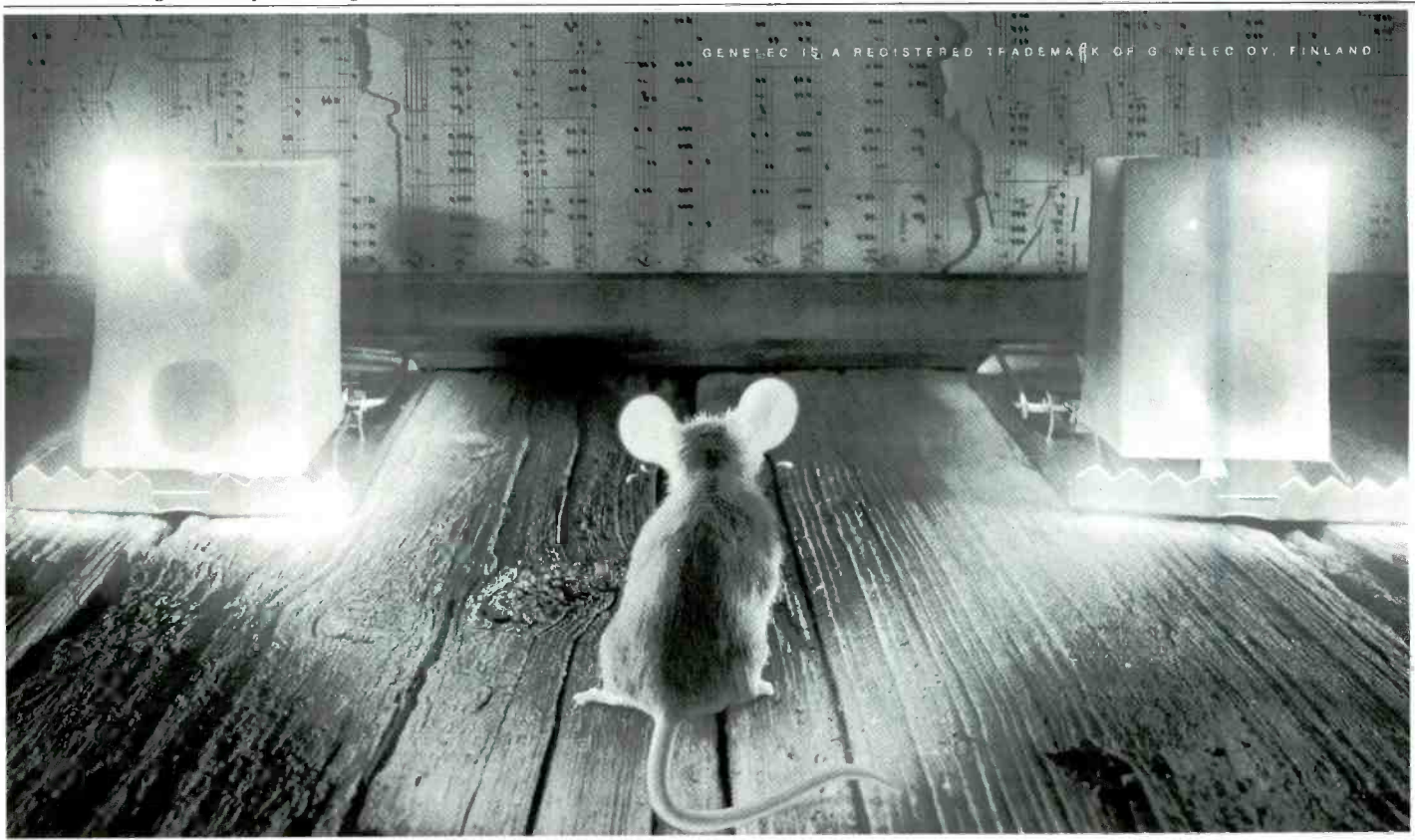

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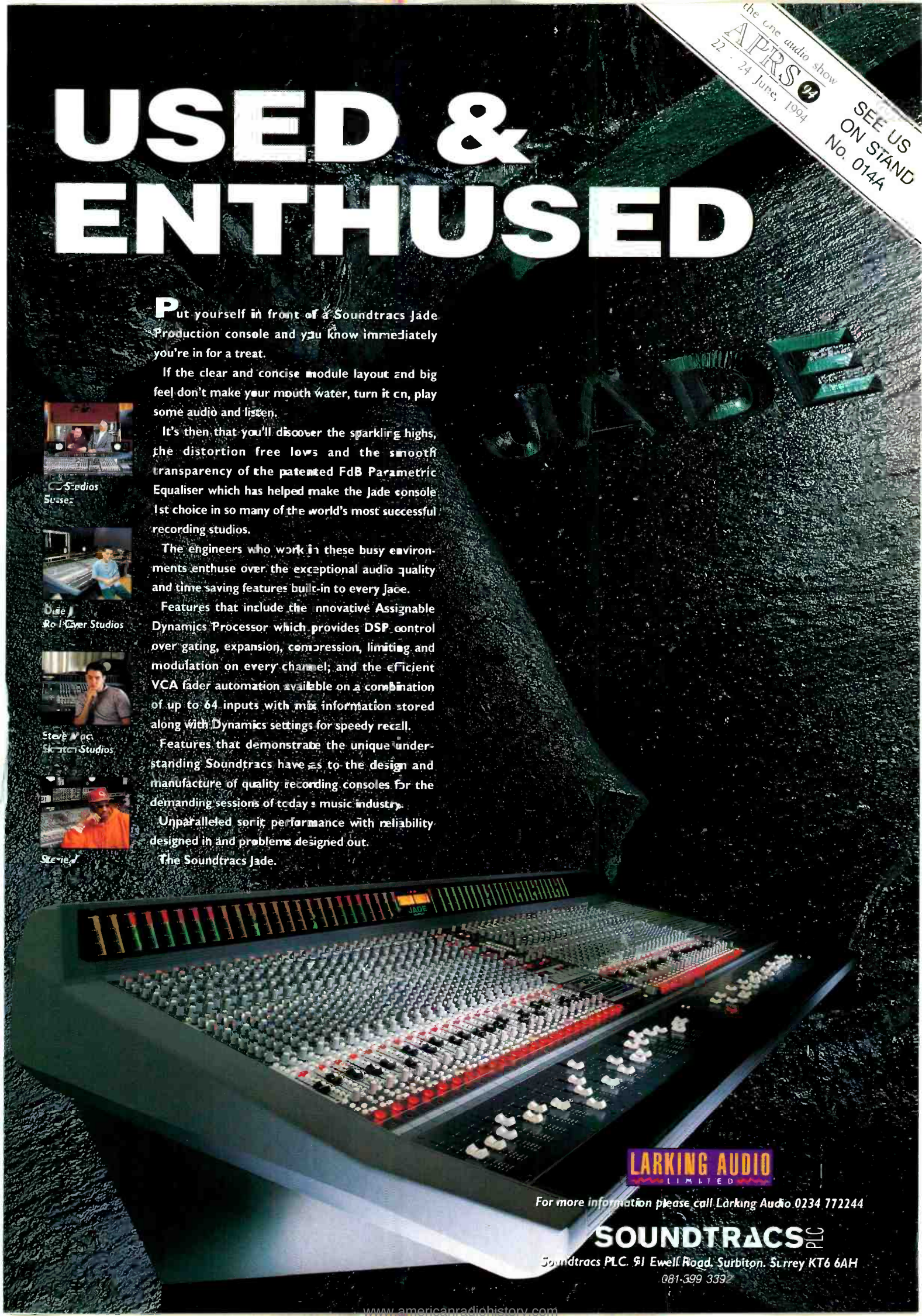
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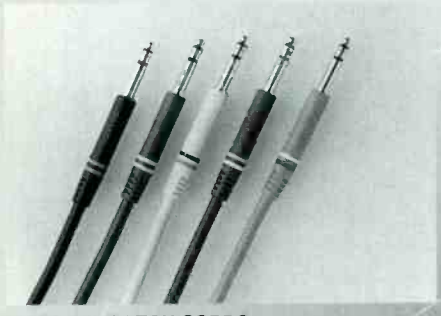

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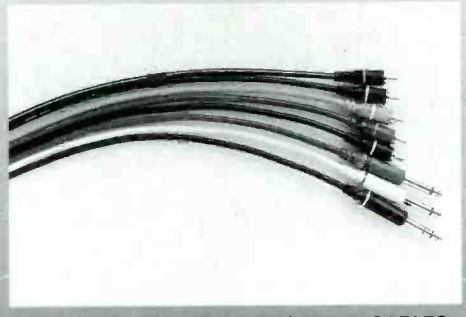

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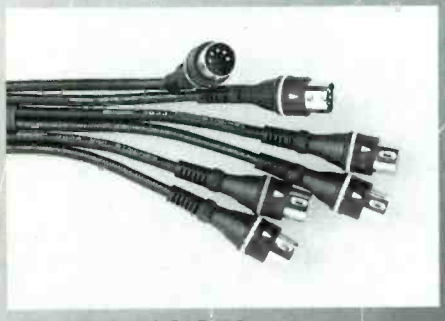

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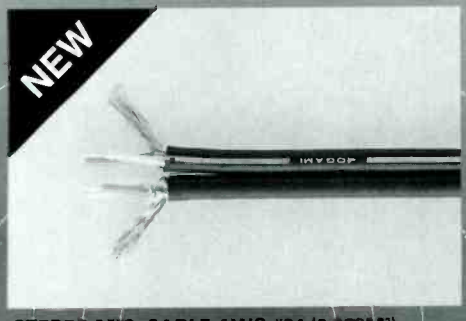

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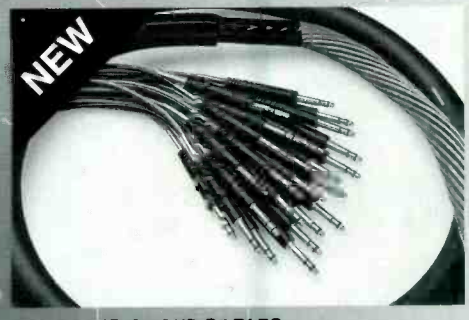

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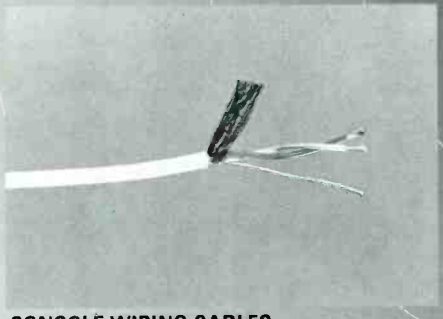

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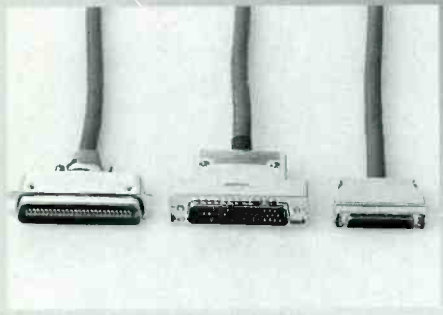

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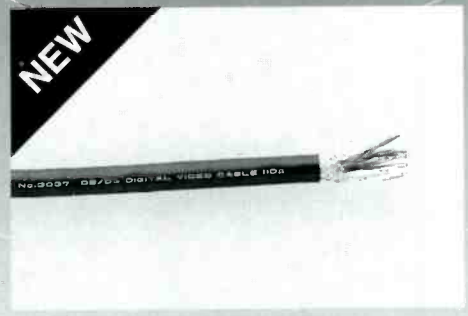

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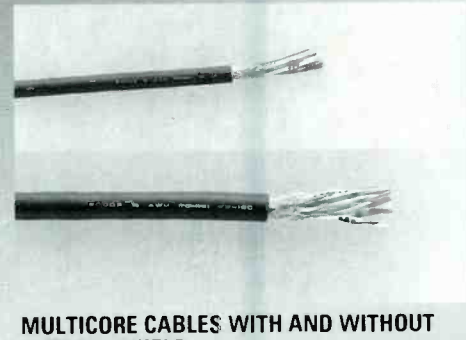

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PICTURES IN THE ROUND

Keith Emerson, Greg Lake, Carl Palmer and the production team at Goodnight LA

PHOTO: HENRY DILTZ

When Emerson, Lake & Palmer decided to add a newly-recorded studio version of their 1971 Newcastle City Hall interpretation of Mussorgsky's *Pictures at an Exhibition*, a fortuitous meeting with noted American Producer Keith Olsen led them to explore recording their music in Dolby Surround sound. The subsequent recording of *Pictures at an Exhibition* took place at Goodnight LA Studios in California on DASH multitrack and was mastered by Greg Fulginiti at Masterdisk. With the continuing acceptance of home theatre surround systems, as well as the Grand Alliance's adoption of Dolby's 5.1 5-channel, AC-3, discrete, digital audio format for American HDTV, the notion of popular music recorded in surround sound may soon be the rule rather than the exception. I met up with the band and Keith Olsen at Dolby's San Francisco headquarters to find out more.

'The whole thing with Dolby started last year,' Greg Lake recalls. 'We did a live radio broadcast in Dolby Surround, and everyone agreed it was a huge success. We had got to be friends with John Kellogg (Director of Marketing at Dolby Labs), who was a fan of the band, and in doing this live broadcast and we discussed something I've always wanted to do, which is record a studio version of *Pictures at an Exhibition*. We'd only ever done live versions, and then John and I started talking about the possibility of doing it in Dolby Surround. It just seemed an ideal vehicle—nice lengthy piece, dramatic, very dynamic, lots of colourful music.

'At the same time we decided to record *Pictures* in Dolby Surround, we met Keith Olsen, who was very keen to work with surround sound for music. We were halfway into putting together the *Return of the Manticore* CD boxed set and we were discussing actually making a new album when the idea came up to do *Pictures* in surround sound for the box set.'

What of the remaining ELP catalogue; was there any thought given to remixing any of the original ELP material for surround?

'It could have been done,' concedes Olsen, 'but there's a certain charm about the way we remember the old songs. You digitally remaster them just to enhance them a bit, but you want to keep that charm of the original recording.'

What of the format itself? Although Dolby Surround sound was developed specifically for cinema sound, multichannel audio systems have been in the minds of audio people since the early 1970s.

'As it stands right now, it is more of an environmental system.' Lake responds.'In terms of positioning instruments around the room, it's not that flexible. The Dolby 5.1 AC-3 format is where it's really going to be exciting from that point of view of total freedom to make the sound do whatever you can possibly imagine. The current matrixed surround sound is rather more limited —it's more of an effect. When you go ▶

Emerson, Lake & Palmer regroup to record a studio version of *Pictures at an Exhibition* in Dolby Surround sound. Corey Greenberg talks to Greg Lake and Keith Olsen in San Francisco

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DOLBY SURROUND SYSTEMS

● Dolby Surround sound
Dolby's cinema surround system allows four channels of audio to be matrix encoded onto a stereo pair by use of a matrix encoder. The speakers in a cinema installation are deployed as a stereo pair (L, R) plus a centre (C) 'dialogue' channel and a surround (S) channel (usually a number of pair of speakers). The centre channel is a mono feed added to both L and R channels 3dB down on the L and R programme allowing it to function as a phantom channel without a dedicated amplifier-speaker channel if required. The surround channel is essentially a difference channel, with the encoded signal having a 180° phase difference between the L and R channels. On decoding, the surround signal is recovered with a difference amplifier. The surround channel is also band limited (100Hz–7kHz), subjected to a delay (to distance it from the front stereo imaging) and encoded with a form of Dolby *B* noise reduction.

● *Pro-Logic*
The domestic version of Dolby's Surround sound system—known as *Pro-Logic*—appeared in 1987. It uses the same matrix-encoded LCRS programme incorporated into home cinema setups. *Pro-Logic*, however, uses active decoding to give better channel separation. As opposed to a phantom centre channel, a separate signal feed is provided, and adaptive matrix techniques are used to steer dominant signals between all four channels. The steering techniques have been developed with cinema ambience considerations in mind, and this along with the band limiting and delay applied to the surround channel mean that is is optimised for environmental situations rather than music reproduction. It does, however, offer a significantly more sophisticated sound stage than is available from a conventional stereo arrangement.

● Dolby Surround Digital (5.1)
Dolby Surround Digital (DSD) uses five channels plus up to six optional Low Frequency Effects (LFE) channels. It does this through the use of Dolby's AC-3 perceptual coding system, which allows each of the five main channels to remain discrete and have a 20Hz–20kHz bandwidth.

First commercial application is set to appear later this year in Pioneer's NTSC *Laser Digital* system which will substitute the AC-3 bitstream for one of the AFM channels. First broadcast use of DSD is expected to be the American coverage of the 1996 Winter Olympics.

Acceptance of a discrete surround format for home theatre use would offer unprecedented opportunities for sound in both picture-related and audio-only productions. ■

to hear music at your local cinema it's more of an environmental thing, but I think when 5.1 comes out it will radically change the way music is made.

'Rather in the same when as when music was all done in mono and stereo recording was introduced, people began to make music for stereo, I think people will make music for 5.1, because it's such a vivid listening medium.'

'What we did with the surround sound,' Olsen observes, 'is make it an environment where we would involve the listener a little more than just sitting down in front of a pair of speakers and concentrating on listening to an album—something which really isn't done that much anymore. So we created an environment—which is not utilising the surround channel for, say, putting the guitar back there. It's still a performance, and the stage is set in front, but it becomes part of you.'

'When the music becomes intense,' Lake continues, 'the surround channel starts to operate. But when, for example, there's solo voice and one guitar, there's no surround sound at all. And then as the music begins to grow and expand and become very dramatic, the surround sound comes into play. With stereo, all you can do is simply make things louder. With multichannel surround, you can totally change the dimension of the sound to suit the mood. It's a feeling of enveloping someone emotionally rather than them being an objective viewer of a piece of audio information. I think that's why in film sound it works very well.'

There is a growing consensus that music is losing out to video-related sound recording. Could the adoption of domestic multichannel systems for home theatre offer music the opportunity to reinstate itself in the consumers' awareness?

'I think music has become awfully homogenised, and market-led rather than art-led,' Lake observes. 'I was talking to someone the other day about the 1950s, when again it was all pop records made to a format. For whatever the reasons, there was the necessity to make new and original music. What we were all searching for was something new, and I think that one good things about surround sound—and especially Dolby 5.1, when it's available—is that it will change the way music is listened to. Obviously, it will change the way music is made. In the same way that stereo brought about a new freedom to paint with music, so I hope that 5.1 will. And I hope it brings about a whole new spurt of new and original music—not just from us, but I'd like to see young groups given the freedom to come out with something that's never been heard before.

> 'We did record *Brain Salad Surgery* in quad, but it was a futile exercise because nobody had a system... so we never released it.'

'What surround sound does—not only for me, but for all musicians—is that it gives us all brand new canvas on which to paint. I think it's an exciting new dimensional freedom for artists who really want to make music to communicate. And I think the future of it is tremendously exciting—and totally unexplored. Music has needed a boost like this for a long, long time.'

'One of the reasons I find it so interesting that ELP is getting involved with surround sound in 1994,' comments Olsen, 'is that 20 years ago, you guys were right there in the pit with the stillborn infant of surround—quadraphonic sound.'

'Yes,' Lake agrees. 'We did record *Brain Salad Surgery* in quad, but it was a futile exercise because nobody had a system... so we never released it. It sounded fantastic, but only in the studio!'

ELP were also known for mixing live concert sound in quad, however.

'And we loved it so much, we took it into the studio to make records with it,' continues Lake. 'It wasn't until later when we'd done it that we realised nobody wanted it!

'You were asking about whether we had some of that older material to include on the box set in surround sound, because that was one of the questions we face in putting the set together: should we include some of the *Brain Salad Surgery* material? But we finally decided to just do the new studio *Pictures*, and leave *Brain Salad Surgery* for possible release down the road. What we really want to do is do the next album all in Dolby Surround.'

So is mixing music for Dolby Surround sound is any different than doing straight stereo or even discrete multichannel work? The mixing of *Pictures at an Exhibition* was completed using a Dolby *Pro-Logic* decoder in the playback chain, so aside from the obvious issues of mixing to a centre-channel speaker as opposed to a phantom image between a pair of speakers there will have been momentary level changes in one or more of the channels due to the active logic steering—as there will be on similar playback systems.

'We were always listening to the output of the *Pro-Logic* decoder,' agrees Olsen, 'so basically we're mixing everything to four channels, feeding that to the Dolby Surround encoder, feeding its 2-channel output to the *Pro-Logic* decoder, and monitoring the sound on a home-theatre-type speaker system consisting of LCR, and two surround speakers which are fed the mono surround channel audio.

'I've found that with a system like this, the speakers work so much less to get the same volume, the same environment as when you're working with straight stereo. The first thing I noticed when I started switching the sound back and forth between surround and stereo was that the stereo speakers were working like crazy, but as soon as you switch to surround, everything clears up, because you have four separate fields and it starts spreading the load around.

'The next thing I found is that as we started getting into reverbs, when you have sound ▶

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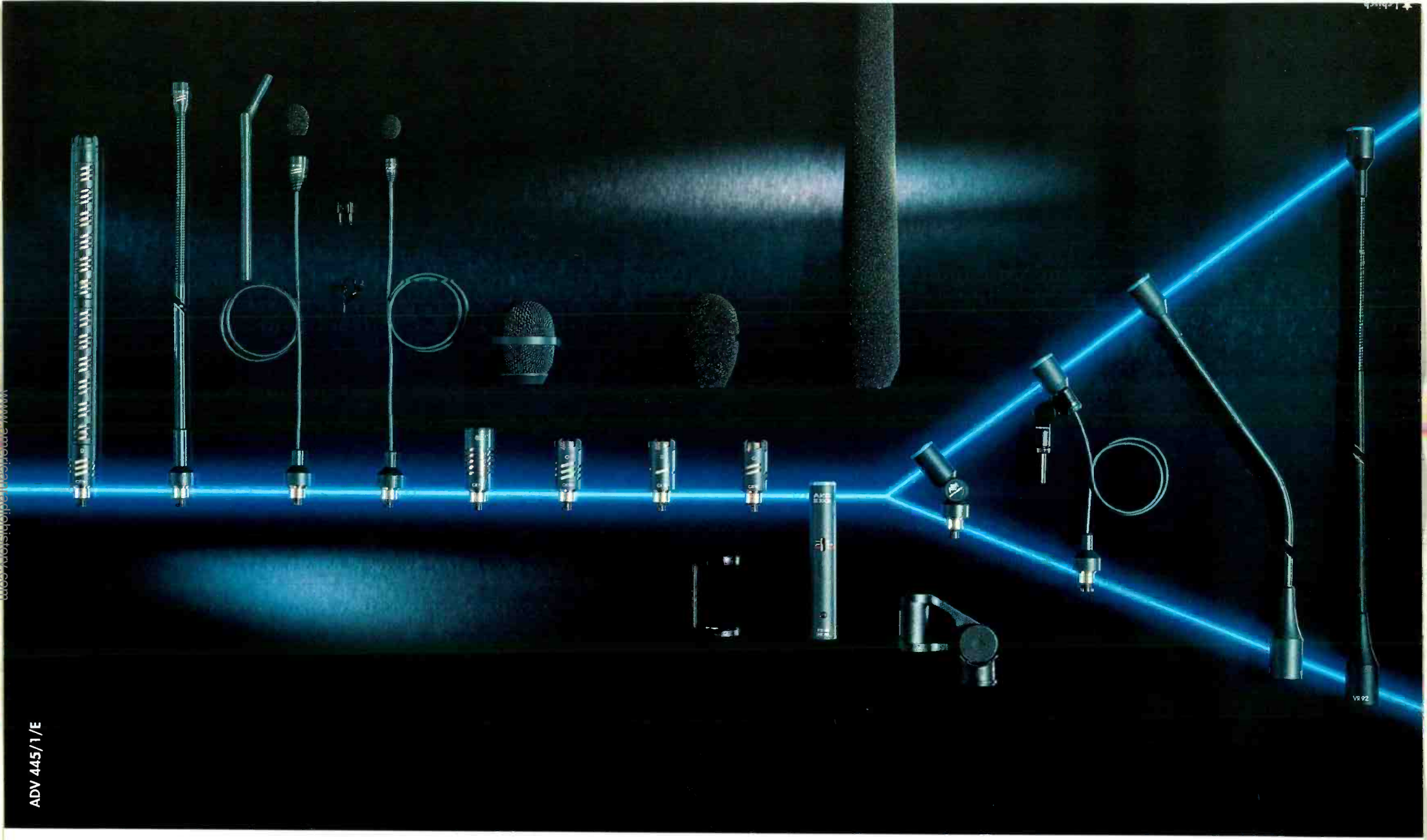

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spread out like you do in Dolby Surround you start really hearing the tails.'

'And it starts showing up the flaws in a lot of digital reverbs, which happen to be flawed,' Olsen interrupts. 'All of a sudden I started hooking up all the old analogue plate EMTs, because the analogue reverbs have great tails. And with the surround sound, you could hear them go all the way out.'

One of the problems afflicting early multichannel music recordings was the temptation they offered the artist and producer to indulge in novelty treatment of the soundstage.

'The danger we were aware of initially, having heard some of these other things that were recorded as surround demos, was just this "tricky" stuff,' Lake agrees. 'I mean, it's fun, but really, the far better use of surround sound is in the emotional use—where it's almost unconscious. John Kellogg played me some stuff where you've got this bloody saxophone player behind you! It was so bloody distracting. One becomes very conscious of the fact that gratuitous placement of things can be an irritant—musical, intelligent, thoughtful placement is something else. And so we decided to err on the side of caution.'

In the early days of stereo, engineers and producers would make sure their mixes were suitable for mono playback. Did Lake and Olsen have a similar concern about stereo compatibility?

'We did it for home theatre owners, because home theatre owners have fairly sophisticated playback systems—they're not using junk.'

'I didn't have to adjust a thing,' Olsen reports. 'We liked what the Dolby Surround encoding did even with straight stereo playback—the out-of-phase surround information reproduces as either an amorphous sound cloud around your head if you're sitting dead centre, and if you're a little bit off-centre, the surround information goes way off to the side, beyond the outside edges of the speaker you're closest to. Either way, it's a cool and interesting effect.'

Embarking on a surround mix in a studio equipped for conventional stereo working presented obvious problems

'Did I have to tear apart my studio, you mean?' Olsen counters. Yes! When it was time to do the surround mixes we tore everything down, and the Dolby people were nice enough to help us set up the whole surround encode-decode mixing chain.

'We set up five totally matched Yamaha *NS-10*s, which is a lot closer to what people are going to listen to the CD with in their home than if we'd used five giant studio monitoring speakers.

'We did it for home theatre owners, because home theatre owners have fairly sophisticated playback systems—they're not using junk. We wanted to give them something fun to listen to, instead of just Henry Mancini over and over again.'

'It stunned me to learn how many home theatre systems are out there now,' comments Lake. 'Kellogg was telling us there are ten million systems out there worldwide.'

'Seven million just in the US alone,' Olsen adds. 'And as we're working on writing for the new ELP album now, we're keeping all of this in mind—"we can do *this* in surround, and *this* in surround" —preparing at the outset to record specifically in surround sound. There's this audience that's hungry for well-produced rock music recorded in surround sound.' ■

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In spite of AMS-Neve's aim that the *Capricorn* should be distinguished from the *Logic* series through its application to multitrack recording, the console has proved popular with many broadcasters. Patrick Stapley investigates

Since the introduction of AMS-Neve's *Capricorn* in 1992, well over half of the 25 consoles sold have gone into the broadcast market. Looking further back to AMS-Neve's DSP consoles, broadcasters feature even more prominently accounting for the vast majority of sales. So what is it that makes AMS-Neve digital desks popular among broadcasters, and why is the sector seemingly more receptive to new technology than music recording studios?

To find out the answers to these questions and to discover how *Capricorn* has been faring generally, I spoke to three national broadcasters—BBC Television, Sudwestfunk in Germany, and CBC in Canada—all of which have installed *Capricorn* consoles last September. I also talked to *Capricorn* Product Manager Roger Cameron, who began to shed some light on the situation by outlining a couple of important differences between broadcasters and commercial music studios.

'The turnover of consoles in a large broadcast environment is generally much slower than in a commercial recording studio,' he comments. 'The commercial studio tends to change its console, not so much because it wears out, but to satisfy customer trends; whether or not the desk can physically do the job almost becomes secondary, the principle concern is to attract clients. Broadcasters on the other hand have only themselves to satisfy and are looking for a product that will do the job as efficiently as possible and for as long as possible.

'Another factor has been the proliferation of freelancers in music studios and their reluctance to embrace new technology. It's a vicious circle—the freelance engineer is only as good as his last job and so he won't risk showing himself up by working on a desk that he's unfamiliar with. Consequently a console like *Capricorn* is inevitably going to take longer to filter into the music market than it will into the broadcast market which relies on its own trained staff rather than freelancers.'

Budgets, of course, also play a crucial part in all this, and the hard fact is that broadcasters have more money to spend than the less buoyant music recording industry. Nevertheless, AMS-Neve claim they are now beginning to see *Capricorn* sales increase into music studios and are confident of the trend continuing.

BBC Television

The BBC have installed a 72-fader *Capricorn* in The Music Studio (TMS) at Television Centre, replacing a ten-year-old Neve *51 Series*. As would be expected the bulk of the work at TMS is in-house; however, in line with new BBC thinking, the studio is now available commercially and has undertaken a number of independent projects including work for rival networks. The studio has a capacity for 35 musicians and offers both analogue 24 track with Dolby *SR* and digital 48 track.

TMS's Sound Supervisor is Tony Philpot, and he explains a fundamental reason why assignable consoles like *Capricorn* are so attractive to broadcasters.

'There's a very good reason for buying a software-controlled desk for broadcast, and it is very largely financial. If you are building a television broadcast studio you can not longer afford to build it solely for one sort of work, it is simply not cost-effective. The software-

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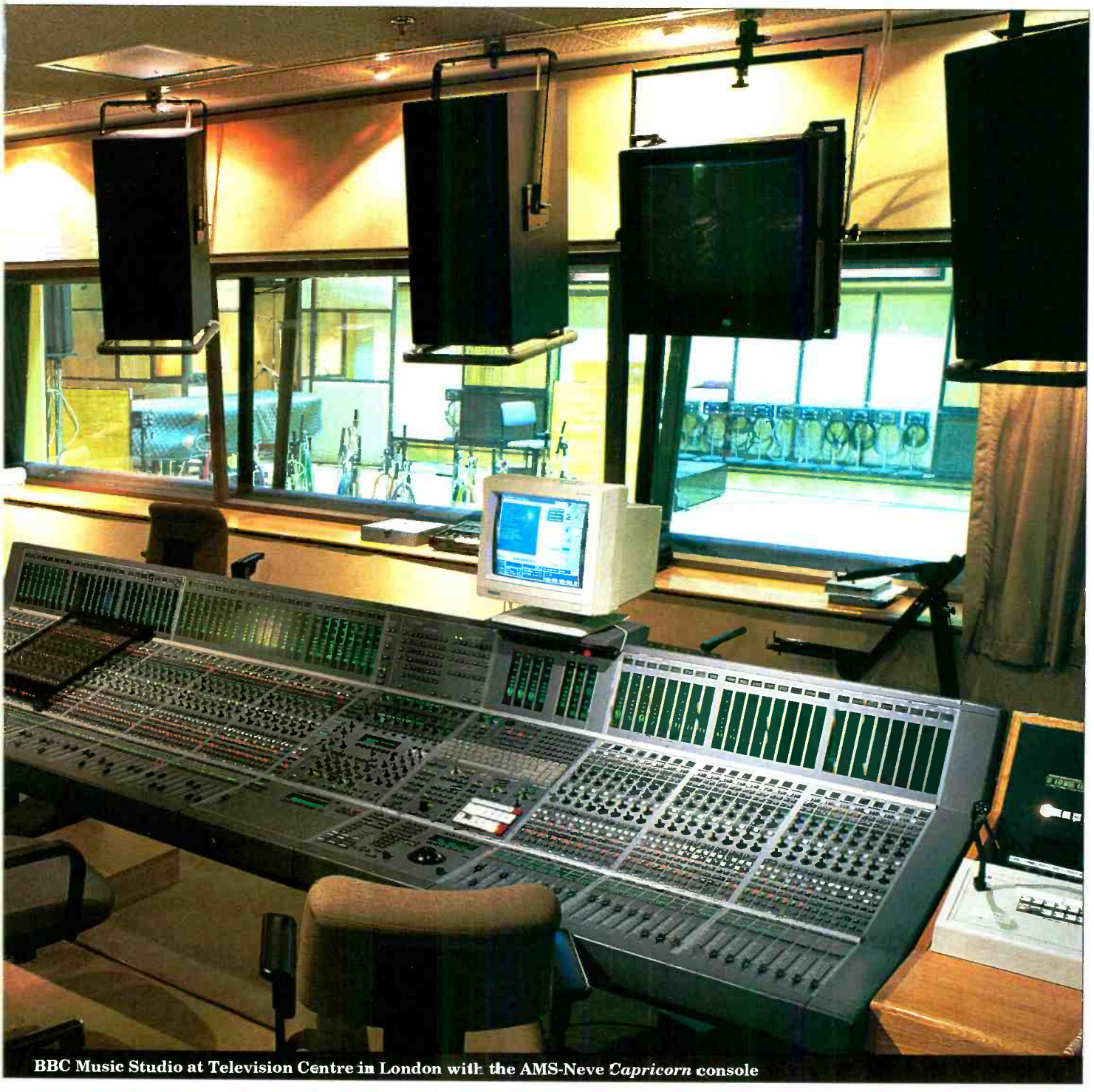

BBC Music Studio at Television Centre in London with the AMS-Neve *Capricorn* console

BROADCAST CAPRICORN

controlled console provides a dustbin full of processing that allows you to construct a console to suit the type of work you're doing. It also allows very quick changeovers from job to job, as well as permitting jobs to be slotted in with the least amount of disruption. It all comes down to maximum flexibility and that's really what broadcasters are looking for.'

Another point in the assignable console's favour is size, and as Philpot points out, 'If the analogue equivalent of *Capricorn* had been installed, we'd have needed a motorised stool to get from one end of it to the other!' That said, TMS did look seriously at analogue consoles before settling on the digital route, and Tony Philpot originally had his eye on the Neve *VRP Legend*.

'One of the things that swayed me quite early on was the observation that somebody made that if we were to buy an analogue desk now, how much work would we get though the door in five years' time?'

It was a sobering thought and one that prompted Philpot, a confirmed Neve user, to take a closer look at *Capricorn* and what it could offer him in terms of operational efficiency.

'The biggest operational advantage as far as I could see was the instant recall and automation, and this actually has proved to be the case. It works in both directions; apart from allowing me to return to a particular setup after a job has been done, I can also use it to prepare for a job that's about to ▶

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happen. For example, once I know the instrumentation for a session, I can configure the console accordingly and dump that into memory; on the morning of the session I just recall it and I'm ready to go. It saves about half an hour of button punching and routing before the start of a session.

'A lot of the work at TMS is repetitive because of all the series we do like *The House of Elliot* and *Last of the Summer Wine*. Ronnie Hazelhurst, who writes the music for *Summer Wine*, has got used over the years of seeing the band sit down, passing the parts around, and leaving me to get levels and sounds together. The second time he was in here after the installation of *Capricorn*, he was waiting for me to do that, but of course there was no need as the line-up was identical. It was simply a matter of repositioning the mics and recalling the store; the entire desk setup, including all my levels and EQs, were reset in a split second. It basically saves the client recording time, and Ronnie Hazelhurst was absolutely delighted as it meant he was able to record a couple of extra cues.'

Time is a critical factor in the broadcast studio, and far greater emphasis is placed on getting the job done in the allotted time than perhaps it is in the more laid-back music recording studio.

'All of us in BBC television sound have grown up in the programme making area,' says Philpot, 'and the way of working is very different from the recording industry. Time is much tighter and you are not thanked for spending days producing the perfect product, when it could and should have been finished in a matter of hours. The philosophy here is that you do the best you can, and better than anybody else can, in the time available. A console like *Capricorn* with functions such as instant reset, linked stereo pairs, copying of settings from channel to channel, and its comprehensive automation, does actually save a lot of time and is ideal for this kind of environment.

The console's efficiency and flexibility are obviously very important to TMS, but what of the sound? How important a consideration was that?

'Extremely important and very noticeable. OK the *51 Series* that *Capricorn* replaced was an old desk and its noise figures weren't up to today's standards, but the difference did surprise me. It was interesting how many clients commented on it too—during the first few weeks a lot of musicians came into the control room to listen to playbacks and most of them remarked on how clean the sound was. We did a series of recordings for the *Inspector Alleyn* series which is recorded to 24-track Dolby *SR* and then taken away by the composer Ray Russel to mix at his own studio. After the first set of sessions, I got a phone call from him saying that he'd never had such a clean recording and how knocked-out he was with it. So *Capricorn* is starting to win its admirers among our clients and I think we're now beginning to see work coming to the studio because of it.

'I wouldn't go as far as saying there was no contest between *Capricorn* and other consoles, but for the sort of work we do here, and the repetitive nature of a lot of it, I can't think of a console that would enable me to do the job better.'

Sudwestfunk

German broadcasters have historically been the largest buyers of AMS-Neve digital consoles, and already four major companies have purchased *Capricorn*s. One of these in Sudwestfunk, which reaches an audience of between 15 and 20 million in the south-west of the country. Based in Baden-Baden, SWF employ in the region of 3,000 people between its radio and television headquarters. SWF Radio have recently expanded its operation by building a multimillion pound all digital studio complex for drama and music. Into this has gone two *Capricorn* consoles—48-fader and 24-fader versions. Project Manager, Herr Hutt, explains why SWF chose *Capricorn*.

'The goal from the beginning was to use all digital equipment—we wanted to keep the whole chain digital right through to the transmitter. So there were two choices of digital console for us, *Logic 2* or *Capricorn*. We felt *Logic 2* was more for postproduction [SWF TV have installed three *Logic* consoles], and that *Capricorn* was better suited for our requirements.

'We also liked *Capricorn* because it was a standard, production-line console that did not require customisation which had caused us considerable extra expense in the past. The flexibility of the console and the fact that it is part of Siemens, who were responsible for technically fitting-out the new studios, were also factors.'

As with TMS, one of the major attractions of *Capricorn* has been its ability to instantly reconfigure setups between jobs. This has been particularly useful for drama projects which are often recorded in a disjointed fashion over a period of weeks. Drama production has also benefited from *Capricorn*'s automation system where having all console controls automated has opened up many new possibilities. However, Herr Hutt does not believe that *Capricorn* speeds up mixing time.

'To say that mixing with *Capricorn* is quicker is not necessarily true. There are so many things that we can now do to create the perfect mix that it is sometimes difficult to know when to stop. I would say that the time we save by using instant reset is probably used up with more elaborate mixing. ▶

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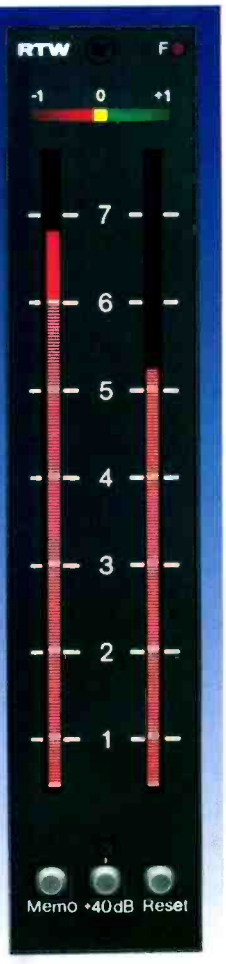

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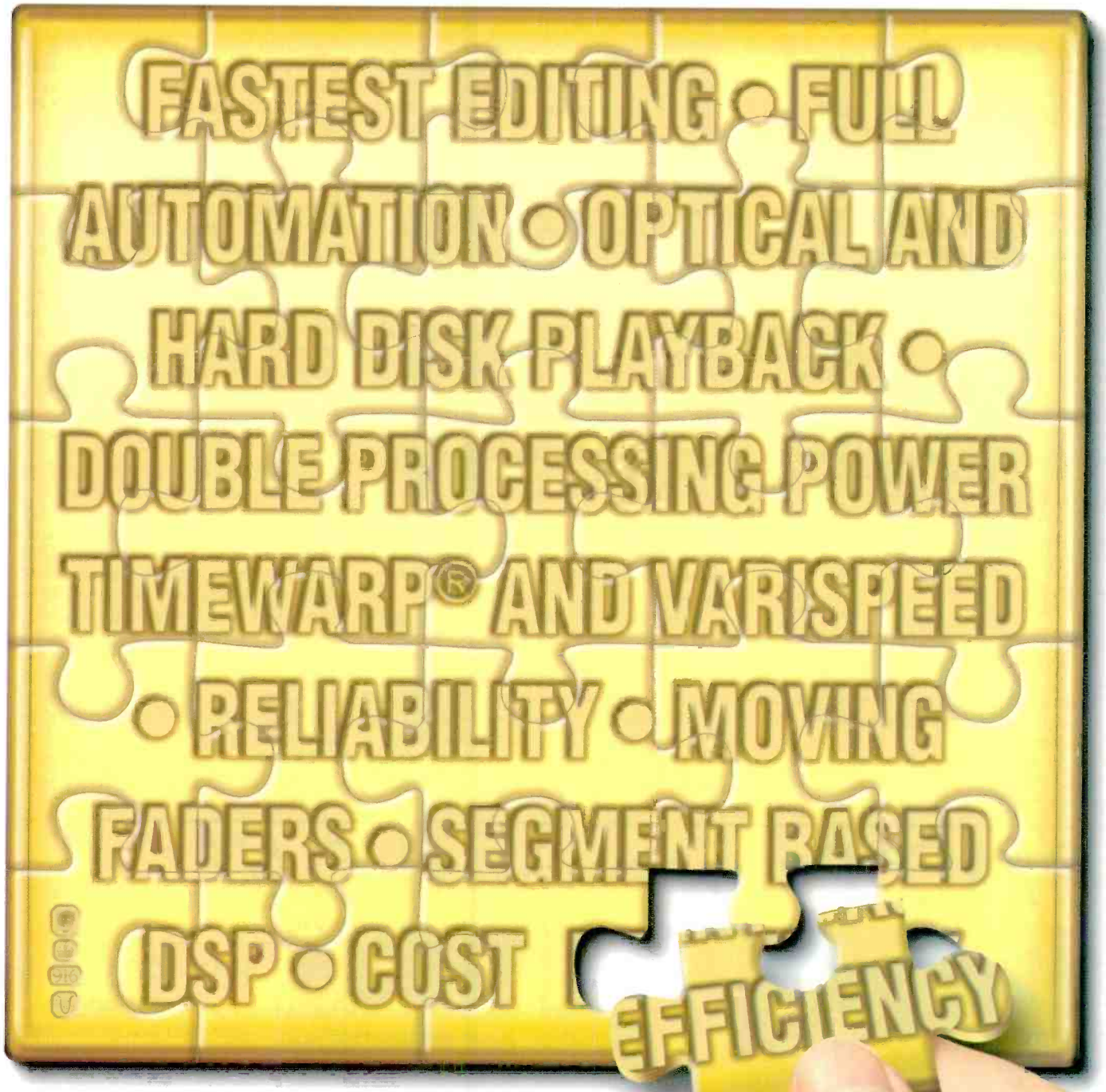

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However, we are producing better programmes because of it and we have recently won German Radio Drama of the Year.'

Having two *Capricorn* consoles at SWF has meant that work can easily be interchanged between the two studios—again maximising flexibility and the potential use of other digital equipment such as a MADI linked Otari *DTR-900*, an NED *Direct to Disc* system (used for drama production), a Synclavier and various digitally interfaced outboard. The all digital environment appears to be working smoothly, but how have SWF engineers adjusted?

'The transition from analogue to digital has not caused our engineers many problems, and all have adapted well to *Capricorn*. We think it takes one week to learn how to use the console and two weeks to learn the automation. The automation is really quite simple in its basic form, but to use and understand all the features takes longer. Also there have been some software problems, and we are waiting for v2 before we can really use the automation to its full capability.

'However, we remain excited about the console's potential and the many ways it will be able to improve our operation here at SWF.'

CBC

CBC have ordered a total of four *Capricorn* consoles for their new Broadcasting Centre in Toronto. The complex consolidates the English-speaking television and radio networks along with regional broadcasting which before were split over 25 locations.

So far just one 48-fader *Capricorn* is on line, and has been installed in the Glen Gould Studio (named after the Canadian classical pianist), which is a 350-seat live audience studio. The facility was conceived ostensibly for classical music productions for radio, but has so far been used for a much broader cross-section of work including music scoring for the award-winning Spielberg film *Schindler's List*.

The other *Capricorn*s will very shortly be operational and are installed into a pop-rock music studio (48-fader console), a mixdown room (24-fader), and a radio drama studio (24-fader). Apart from the drama studio, which is equipped with a networked 24-channel Sonic Solutions system, the other studios each contain MADI linked Sony *3348* digital multitracks.

CBC's Manager for Systems Engineering, Tom Holden, explains how the corporation went about choosing Capricorn for The Broadcast Centre.

'Firstly we went through the process of determining exactly what the operational requirements were for the different areas and drew up detailed specifications for each. At this stage we weren't saying that the consoles had to be digital, but it was essential for us to have a high level of automation in at least a couple of the facilities. With a facility like the Glen Gould Studio it wasn't essential to have mixdown automation, but it was advantageous to have instant reset to allow for rapid stage changes.

'Another important point was that we wanted a family of consoles rather than having brand A in one room and brand Z in another; we were looking for product continuity throughout the complex which we felt would be easier from the operational and maintenance standpoints, as well as allowing projects to move freely from one area to another.'

CBC already had a pretty clear idea of what the market place had to offer, having setup a special study group in the mid-1980s to investigate console design. Tom Holden explains.

'We put together a team made up of about half a dozen managers from various production and engineering backgrounds, to research consoles in preparation for The Broadcast Centre. One of the things they did was go over to the UK, which seemed to be the hot-bed of assignable control concepts and digital console development. There they visited various manufacturers, as well as the BBC and CTS Studios where they got some first hand experience with the original Neve *DSP-1*.

'Out of all this research came a report which was fed back to the manufacturers and this began a dialogue between ourselves and certain companies including AMS-Neve. It was very useful and kept us right up to date with new developments and concepts pretty well as they happened.'

Had this early association with AMS-Neve Digital directly involved CBC in the development of *Capricorn* and influenced their decision to buy the console?

'I wouldn't like to say we were directly involved, but we did pass back ideas and opinions to AMS-Neve during the development stages, and we were certainly very aware of the direction that AMS-Neve's digital project was taking. However, this didn't necessarily have a bearing on our decision to buy *Capricorn* as we were also in close contact with other leading mixing console manufacturers, all of which were invited to tender proposals. It was after careful analysis of these proposals that we chose *Capricorn* based on the facilities it offered, its all-round versatility and cost.'

A four-console order shows an extraordinary level of product commitment from CBC, but what of the people who will actually be working with *Capricorn*, how have they reacted to the choice?

'Actually we've had a mixed reaction. We had ▶

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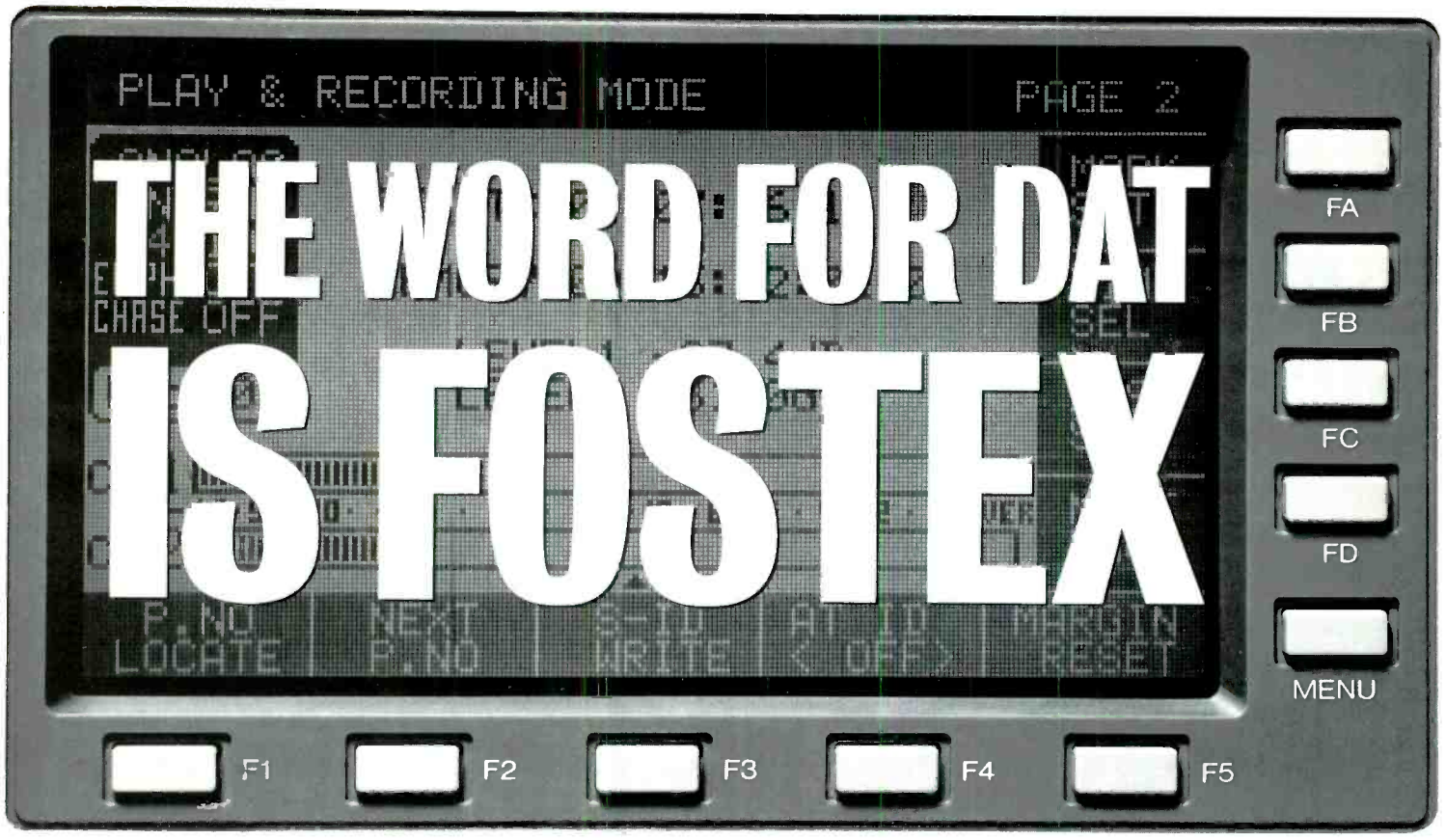

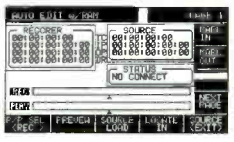

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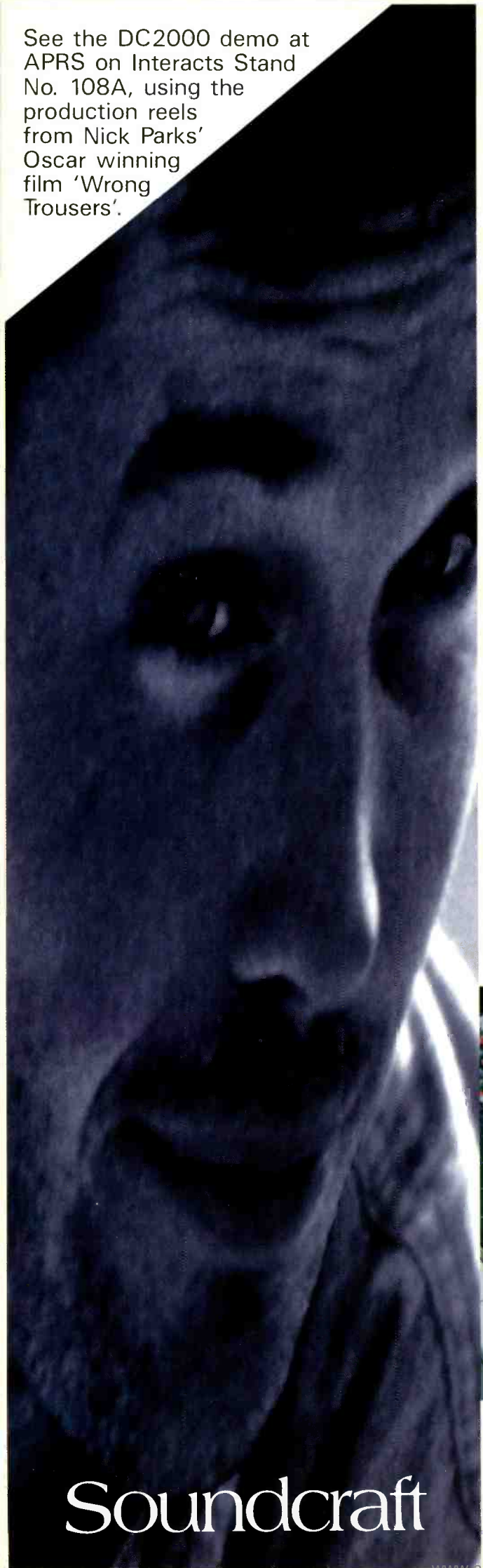

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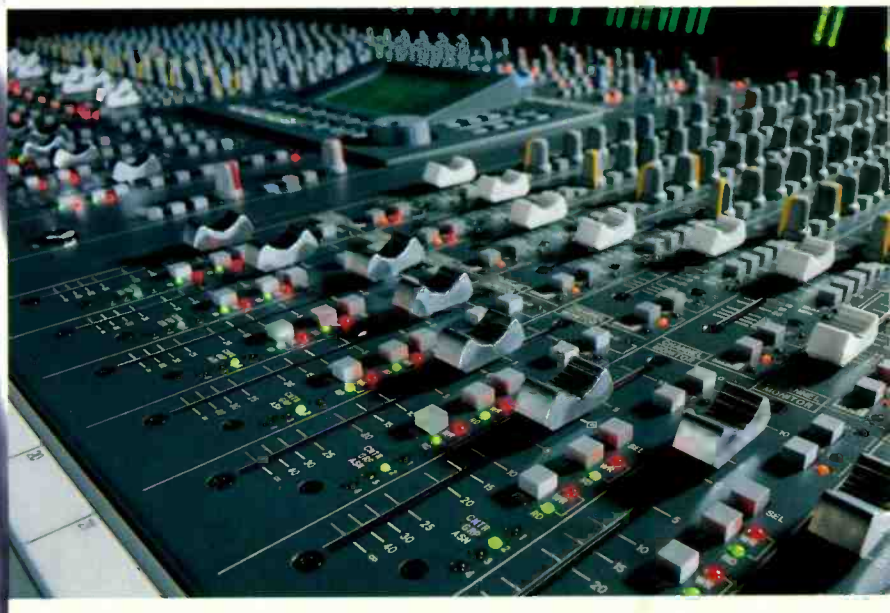

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a fairly intensive training session, which involved around 25 of our engineers over six weeks and it's fair to say some react adversely. Unfortunately in a few cases it appears that you can't teach an old dog new tricks, and I'm aware of one person who decided to retire early because he didn't feel capable of adjusting to the technology. On the other hand, a lot of staff have reacted very positively and are displaying great enthusiasm, finding things that they couldn't do before with our old SSL desks.'

Aspects of the software driven console that appeal to CBC's engineers include ease of configuration for different applications and preferred ways of working, and the systems inherent future proofing. However, the soft console also has its disadvantages, as Holden points out.

'*Capricorn* has had its fair share of teething problems mainly connected with automation bugs, which has caused us some nervousness. Bearing in mind that we have used and will be using the console for live broadcast, this has introduced a certain element of anxiety, although as yet we haven't experienced any hang-ups during a live situation. With the release of v2, I hope that a lot of these software issues will be resolved and we can all relax a little.'

'Having said that, we're pleased with *Capricorn* and the results from our Glen Gould Studio have been very good. We now just look forward to getting our other three consoles up and running.' ■

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Tel: +44 282 457 011. Fax: +44 282 39542.

CAPRICORN VERSION 2 UPDATES

AMS-Neve's latest major software revision for Capricorn was released to coincide with the Amsterdam AES at the end of February. Apart from 'bug fixes' v2 contains a host of new features and improvements. The following list represents the main changes.

● **Dynamics**
Noise Gates. The side chain of gates can now be triggered by the signal from a separate path, and this can be from an internal or external source. Additionally, the control voltage may be inverted enabling dynamic ducking.

● **Track returns**
Gain, Trim and Phase Reverse have been added to track return.

● **Copy and Link**
Copy and Link functions have been added to the Mic-Line Inputs, Track Returns, and Track Contribution.

● **Multi-man operation**
If more than one AFU (Assignable Facilities Unit) is specified, the additional AFU sections can be structured to operate independently with their own channel sections. This is a specific requirement for multi-operator mixing operations allowing each engineer the ability to function totally independently with real-time control of all processing parameters. A maximum of five AFUs can be provided.

● **LCR routing**
The original film routing system consisted of four fixed LCR film groups. Version 2 now supports a flexible system whereby an LCR film group can be selected for any three adjacent track sends. A 48-track send configuration will allow up to 16 LCR film groups to be created. Mono or stereo auxiliary feeds can now be routed directly to the track sends, thereby enabling an LCRS or LCR-LR surround system to be configured.

● **Metering**
Metering has been changed from Absolute to Modulation metering. This allows the analogue output gain structure of the console to be varied dependent on the specific requirement of the studio independently of the absolute reading on the console's meters.

● **Mute-switch actions**
Using the 'Quick Touch' facility, an additional function has been provided that allows inverse mute-switch links to operate.

● **Play Safe**
Play Safe mode is now available in addition to the standard Play mode during automation. All controls in Play may be switched to Play Safe using the dedicated PLAY SAFE button. The new mode allows all controls that are in Play to be moved at will, but neither the audio from the respective signal path through the console or the automation data to the DSP will be recognised. In addition controls can be moved to a new position while automation is running without affecting the audio. These controls may be dropped into the record at the desired point, thus allowing easy step changes to be made.

● **Touch Collect**
Touch Collect enables all controls that are on the AFU to be moved to a new position while automation is in Play mode—these moves will be audible but will not be written to automation at the desired point the AFU may be switched to Record mode and the data will be updated at that point.

● **Mix tree**
The indication for downloading mix passes has been improved. Progress is indicated on the screen, and the Play Pass number is indicated in red as the respective passes are being downloaded from disc.

The amount of data generated by moving controls under automation has been reduced by at least a factor of four, thus allowing much longer productions to be mixed under a single mix tree.

● **Capture time code**
The facility permits the absolute time-code value where the system is parked to be 'Captured'. This time-code period can then be used as an absolute starting point for precisely positioning automation data.

● **Cut solo**
A facility to link the Cut Solo mode (Solo-In-Place) between Input, Track Return and Group paths has been added. This enables any solo to mute all other paths included in the link apart from Isolated channels.

● **Dual AES-EBU I-O**
Port routing can now be connected to AES-EBU digital devices either as conventional stereo pairs, or as individual mono signals. This also applies to the multitrack send and returns that may be connected via the I-O rack.

● **Stores**
The number of stores that can be applied to configurations and titles has been increased from five to 100. ■

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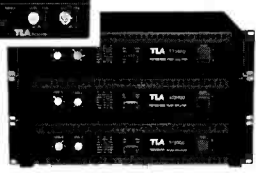

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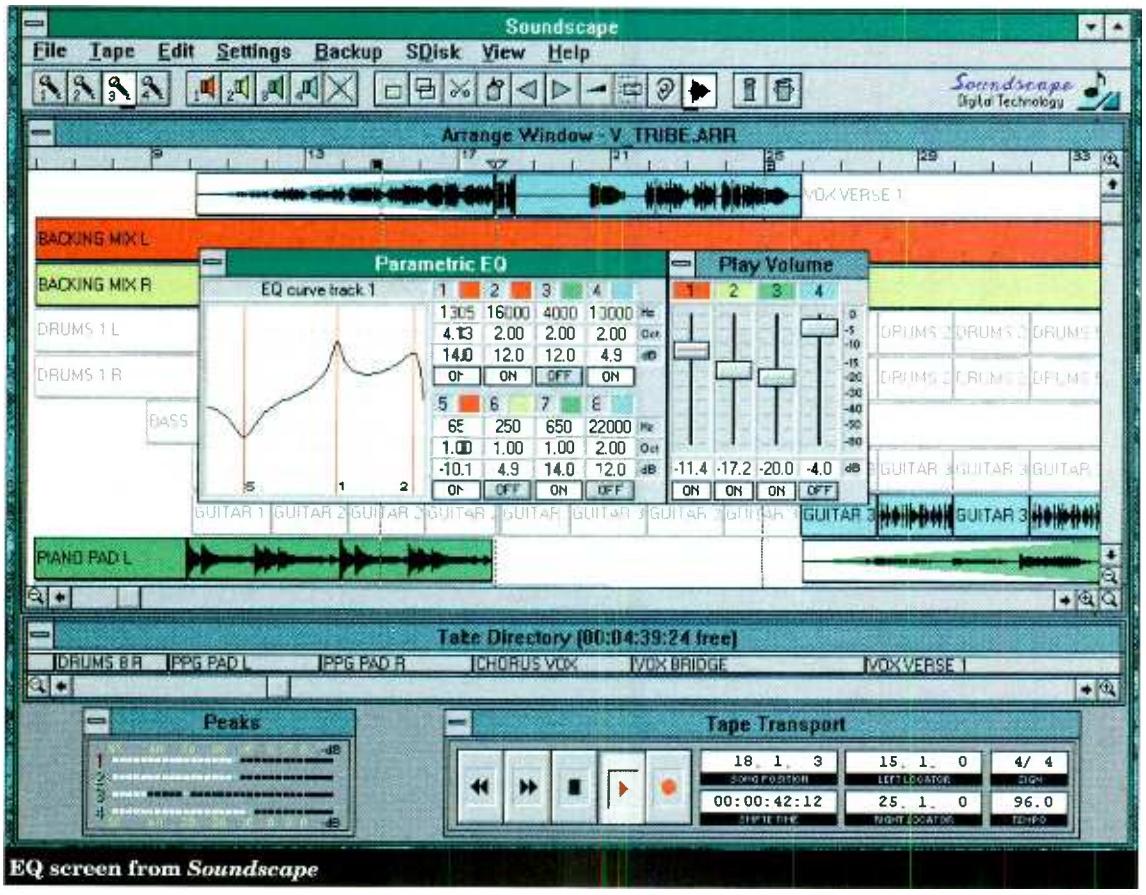
SOUNDSCAPE



EQ screen from *Soundscape*

Low-cost, professional, digital multitrack recording has been with us for a while now. Those of us in the market for this type of system face three options: a linear tape-based system (like the *ADAT* and Tascam *DA88*),a multitrack hard-disk system—or both.

My ideal hard-disk recorder would replace (or be used alongside) a traditional tape machine, be as familiar in concept and as simple to use but with the added editing freedom that hard-disk recording offers (nondestructive editing, digital effects and so on). It would have a minimum of eight individual tracks, be upgradable, and be able to sync to the outside world effortlessly. Most importantly, the sound quality would have to be as good as my Pro-DAT machine if not better.

The PC is becoming an increasingly popular computer platform with professional studios and musicians alike; indeed the PC version of Steinberg's *Cubase* sequencer is, apparently, the bestselling version. Coupled with the low cost of a powerful PC system, the machine's future in professional music seems assured.

The *Soundscape Multi-Track Hard Disk Recorder* is a PC-based, 8-track recording system and the first product from British company Soundscape Digital Technology based in Cardiff.

Hardware

The *Soundscape* hardware, unlike many systems, is all contained in a separate rack unit as opposed to siting inside the computer on a card. This has the advantage of eliminating possible interference from a noisy PC power supply or interface card like a VGA monitor card. The system takes the form of a 2U-high rackmounting unit housing the DSP, convertors, IDE Hard drive(s) and the audio and MIDI connections. This is connected to the PC via a ribbon cable which is attached to a half-length interface card that slots into the computer—this is purely a controller card; there is no audio link with the host computer.

Soundscape will run on any PC or compatible (386DX or better recommended, 286 possibly) running *Windows* v3.1. The computer is only needed as a user interface so all the hard work is done in the *Soundscape* rack—meaning that you are not reliant on the PC's processor for any of the recording, playback or DSP functions. The upshot of this is that you can run *Soundscape* and a sequencer and other software simultaneously on one computer. ▶

Andy Neve gets an advance session with the latest version of the British *Soundscape* disk-based recorder-editor

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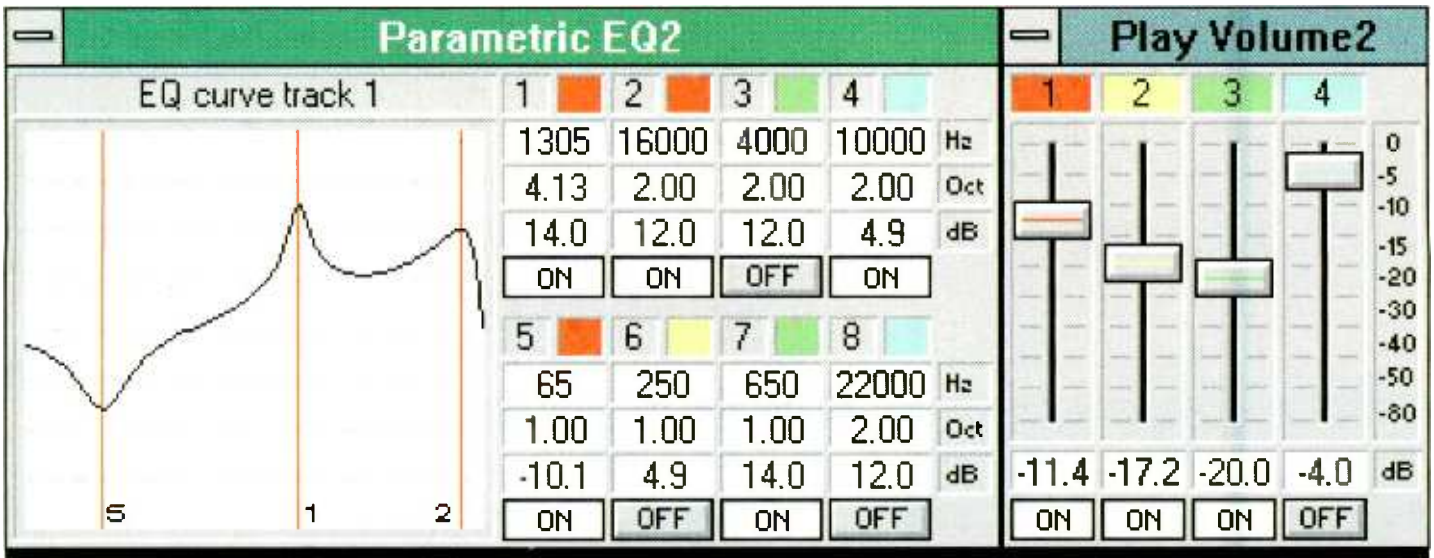

Parametric EQ window from *Soundscape*

Everything, apart from disk activity light and power switch, is situated on the back of the rack unit. Balanced (XLR) and unbalanced (gold-plated RCA-phono, cinch) audio connections are provided (two inputs/four outputs) along with AES-EBU (XLR) and SPDIF (RCA-phono, cinch) digital inputs and outputs (one input/two outputs) and MIDI In, Out and Thru. The unit is available at a lower cost without the balanced and AES-EBU connections.

Soundscape uses 16-bit sigma-delta 64 times oversampled A–Ds, and 18-bit sigma-delta 64 times oversampled D–As with signal-to-noise figures of 96dB and 116dB respectively. Internal processing is carried out to 24-bit resolution.

Each unit is capable of recording up to 64 virtual tracks; eight of these can be played back simultaneously and assigned to one of the four audio outputs. These can be configured as either four individual outputs with one track per output, or as two stereo pairs with panning between the outputs. The modular nature of the system allows expansion as required. You can connect up to 16 units together giving you a theoretical maximum of 1024 virtual tracks, 128 physical tracks and 64 separate outputs. And because each unit has its own DSP, adding more tracks doesn't slow the system. It is worth noting that each interface card can handle two units so the limiting factor is the number of free interface slots in the computer.

Installation of the interface card(s) is extremely simple. There are no IRQ or DMA settings to worry about and the default base-address of the card (250H) only has to be changed (a simple DIP switch arrangement) if there is conflict with another device (rare) or if you are installing multiple *Soundscape* cards. (For those unfamiliar with the PC, each interface card in the computer has to be set to a different base-address number).

Soundscape uses the IDE type of hard drive, up to two of which can be fitted inside the unit and are then treated as one drive. On the review machine, I had a 520Mb drive giving approximately 1 hour 37 minutes of total recording time at 44.1kHz. This can be used freely over any of the eight tracks but would work out at approximately 17 minutes per track on a linear tape machine. For 8-track playback a hard drive with an access time of 13ms or better with a 128K cache is recommended, although a slower drive of 18ms is acceptable for 4-track, 4-output mode. The difference between running eight tracks or four tracks on one unit needs further explanation—coming later.

Interface

This review is based around a single *Soundscape* unit running on a 486DX 33MHz PC with both *Cubase Score* for *Windows* and Microsoft *Word* loaded simultaneously.

The software comes on one floppy disk and takes up around 500K of memory. Installation is in the form of a simple batch file run from the DOS prompt or from the *Windows* run line. This batch file automatically creates program groups and icons within *Windows* that allow you to click on the configuration applicable to your system (the number of units you have).

The *Soundscape* software is definitely aimed at the musician and studio rather than the postproduction editor—it looks and feels remarkably similar to *Cubase*. As in *Cubase*, the arrange window in *Soundscape* represents your working area; a time axis runs at the top from left to right and is switchable between bars and SMPTE values.

At the very top of the page is a tool bar with buttons that correspond to the various recording and editing functions that are available. You can assign a different function to each of your mouse buttons —options include: track record selection, output assignment, moving, copying, cutting and pasting of parts, part fade in and out, part volume and digital merge, solo, waveform display, info and erase. Below this is an info line showing: mouse position with snap value, sync and sample rate settings.

Apart from the tool bar, pull-down menu titles and info line all other elements of *Soundscape* are represented as floating windows. These can be shown and hidden as you need them which is especially important if you only have a small computer monitor.

> The *Soundscape* software is definitely aimed at the musician and studio rather than the postproduction editor

Recording

Sampling rates are comprehensive with 22.05kHz, 32kHz, 44.056kHz, 44.1kHz 47.952kHz and 48kHz supported. There are two analogue inputs and these are switchable between -10dB and +4dB. Both input and output level meters are included with peak level hold.

To make a recording you simply set your left and right locators, choose which track you are going to record on from the tool bar, click on an empty space in the arrange window, hit RECORD and go. At the right locator point or when you press STOP, recording stops and you are asked whether or not you wish to keep the take. Clicking YES makes a box or 'part' appear in the Arrange window corresponding to the take that now on your hard disk. This is given a solid colour corresponding to the output-track assignment you have given it. This can be changed by selecting another output from the tool bar.

Like a sequencer, you can set a tempo and a time signature so that the bar lines in the time axis are relevant when editing, this allows parts to be 'snapped' to a particular value; however, at the moment you can only set one tempo and time signature per arrangement. This severely limits the use of the time axis and snapping in particular although I am told that a tempo-metre map is on its way in a future update.

A part is just a reference to a take on the hard disk and can be cut, moved and copied nondestructively. However, if you choose to delete a part you are given the option to delete the actual take as well. Parts can be named by clicking on the info tool and clicking on the relevant part. This opens the Info page where you can name parts, select takes, adjust time values and adjust fades and so on.

Assigning existing takes to a new arrangements is a slightly tortuous process at the moment. You have to create an empty part and then choose a take from the part Info box. Much better would be the facility to drag a take from the take directory and place it in the Arrange page.

Parts go together to form a virtual track of which you can have 64 per arrangement.

One powerful feature of *Soundscape* is its ability to loop record, allowing you to set up a loop between the locators and record up to nine takes ▶

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Soundscape automatically calculates and performs the crossfades necessary to give glitch-free editing

with *Soundscape* automatically dropping out of record and then starting again on the next track so that all the takes are kept and the best one may be chosen later. I was fortunate enough to be able to use the *Soundscape* review machine in anger on a documentary—I went out of the studio to get coffee and cake and let my sax player record nine different solos. Number eight was great.

Editing

Clicking on the waveform tool and then on the part, displays the waveform. You can zoom in and out as needed. Parts can be cut by selecting the scissors tool or pasted back together with the glue-pot tool. They can be moved or copied by simply clicking on the relevant tool, picking them up and placing them in the new position. They can be faded in and out by selecting the fade tool and their volume can be adjusted with the volume tool.

Soundscape automatically calculates and performs the crossfades necessary to give glitch-free editing. I tried hard to make it glitch but couldn't. Deglitching can be deselected if not required.

Mixing down or merging parts is a simple case of setting left and right locators, clicking on the merge tool and clicking on an empty space in the Arrange window. All active parts—those assigned to an output and not muted—are merged into one (mono) or two (stereo) parts with all their mixer settings recorded, and a new part with prefix 'M' is created. Merging is very quick on this system, quicker than real time; and if, while merging, you happen to push the levels too high, *Soundscape* will re-merge, adjusting the overall gain to prevent digital distortion. All the original unmerged parts remain intact and these can be muted, remixed or deleted later.

Editing is easy and immediate to the point that within 15 minutes of using it I was able to do most things quite quickly. However, I would recommend learning the keystrokes rather than doing everything with the mouse.

Playback

There are two modes of playback within *Soundscape* in the form of two separate software applications. The 4-track software allows playback of four tracks with each track having its own individual output. Four real-time output-volume sliders are included and these along with the four pan controls can be controlled via MIDI if need be. (The pan controls in 4-track mode are only used for mixing down internally in stereo). There are eight real-time parametric equalisers and these can be assigned to any of the outputs in any combination. Merging a part includes all the EQs, volumes and so on, so this will free them up for further work.

For this review I ran a test version of the new 8- track software allowing playback of eight tracks with the audio outs configured as two stereo pairs with real-time volume and panning between the outputs. Because of the strain running eight tracks simultaneously from one unit puts on the DSP, there is a limit to the number of real-time equalisers that can be used. Consequently, within this software is Preview mode which allows playback of only two tracks. Four real-time equalisers can be used on each track or eight on one track. When you leave Preview mode, *Soundscape* will either write the EQs to the selected take(s) or create a copy. Again, this is done faster than real time.

You can then go back to 8-track mode and run your eight tracks simultaneously with all the parts you have edited in Preview mode in the correct time positions and with their EQ added. This is a very clever way of getting as much out of the DSP as possible without sacrificing features.

In both modes *Soundscape* allows you to mix two external inputs with the hard-disk tracks. This allows mixing multiple *Soundscape* units down to stereo by daisy-chaining them; it also allows, for instance, linking the 2-track output of a mixing desk into *Soundscape* to mix *Soundscape* tracks with mixer tracks digitally, direct to DAT.

Sync and backup

Soundscape is not able to read SMPTE directly but reads MTC (MIDI Time Code) so some kind of SMPTE-to-MIDI convertor or a sequencer with this facility is required if you want to slave the recorder to an external source. SMPTE offsets can be set and all the usual frame rates are catered for with 30fps Drop Frame available in the next update. *Soundscape* as a master can transmit MTC or MIDI clock with Song Position Pointer).

Backing up to DAT is a straightforward and effortless operation that makes the disadvantages of fixed-media recording seem less of a problem. Alternatively backups can be made to any devices attached to removable hard drive or optical disc, or even to an internal drive if you have the space. You can also export and import takes as wave files. For those unfamiliar with the wave file format this is fast becoming the recognised standard for audio in PC programs and multimedia applications.

Conclusion

This review version of *Soundscape* should be available by the time you read this—the second major update since Christmas (and certainly not the last). With features like audio scrubbing, time stretch, reverb, chorus, compression, pitch shift, MIDI triggering to name but a few of the items scheduled for 1994, *Soundscape* seems to be going from strength to strength and is, even now, serious competition to systems costing twice the price. With its open-ended software structure and expandability it is an ideal multitrack hard-disk audio recorder.

Simply: *Soundscape* works quickly, is simple to learn, inexpensive to buy and, most importantly, it sounds good. ■

Soundscape Digital Technology Ltd, 26 Castle Coch View, Tongwynlais, Cardiff CF4 7LA, UK. Tel: +44 222 811512.

Andy Neve is a freelance TV and Radio composer based in Oxford. He owns his own music production studio which is centred around a 128 MIDI-channel *Cubase* system running on a PC. ■

HHB DAT TAPE

INTERNATIONAL DISTRIBUTORS

AUSTRALIA: AUDIO SERVICES CORP.
Tel: 02 901 4455 Fax: 02 901 4229
Contact: Geoff Grist

BELGIUM: AMPTEC BVBA
Tel: 011 281458 Fax: 011 281459
Contact: George Lemmens

CANADA: STUDER REVOX CANADA LTD
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Tel: 0221 709 1333 Fax: 0221 709 1332
Contact: Heike Klötsch / Rolf Kneisel

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ISRAEL: MORE AUDIO PROFESSIONAL STAGE SYSTEMS LTD
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Tel: 22 145460 Fax: 22 148259
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POLAND: STUDIO DAVE
Tel: 22 26 49 12 Fax: 2 635 5262
Contact: Bogdan Wojciechowski

PORTUGAL: AUDIO PRO
Tel: 1 692456 Fax: 1 690924
Contact: Paulo Ferreira

SINGAPORE, MALAYSIA & THAILAND: TEAM 108
Tel: 65 7489333 Fax: 65 7477273
Contact: Paulo Ferreira

SPAIN: KASH PRODUCTIONS SA
Tel: 91 367 5222 / 377 0068 Fax: 91 367 5209
Contact: Jim or Carmen

SWEDEN: INTERSONIC LEAB
Tel: 08 7445850 Fax: 08 184354
Contact: Mikael Sjostrand

USA: INDEPENDENT AUDIO
Tel: 207 773 2424 Fax: 207 773 2422
Contact: Fraser Jones

HHB Communications Limited

73-75 Scrubs Lane · London NW10 6QU
Tel: 081 960 2144 Fax: 081 960 1160 Telex: 923393

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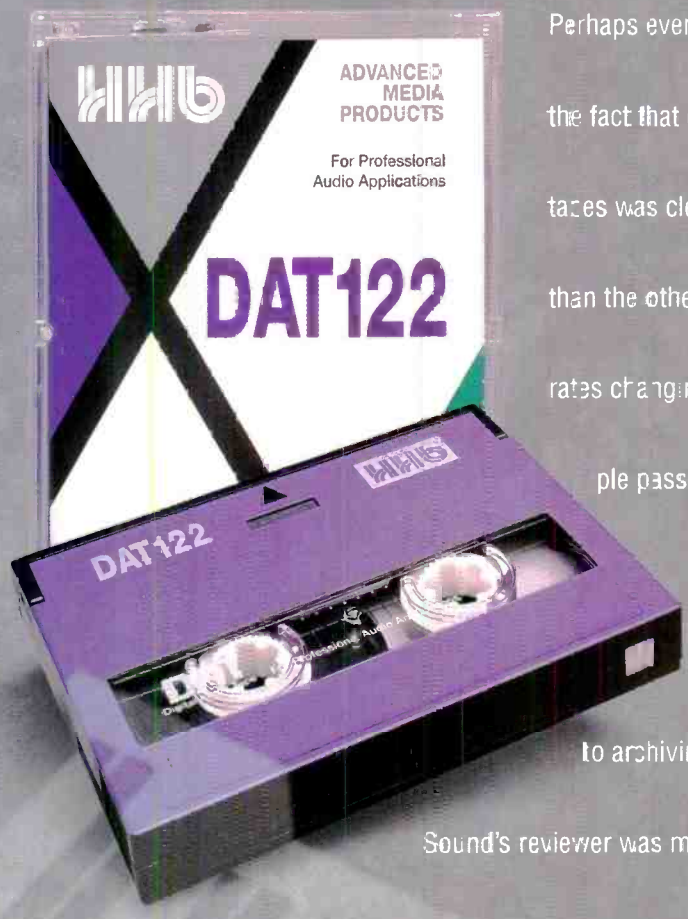
ALL DAT TAPES ARE NOT THE SAME BUT DON'T TAKE OUR WORD FOR IT

Ask Studio Sound, one of the world's most highly respected professional audio publications. They recently subjected eight leading DAT tape brands to an exhaustive series of tests and the results should be of interest to everyone serious about audio.



In the critical area of block errors, the tapes fell into two distinct categories of performance. Three exhibited similarly low error rates with the others presenting error levels considerably higher. HHB DAT Tape was one of the leading three.

Perhaps even more significant was the fact that one of these leading tapes was clearly more consistent than the others, with its low error rates changing very little over multiple passes. That tape was HHB.

And when it came to archiving stability, Studio Sound's reviewer was moved to write:

"If it were my recordings at risk, it is clear which choice I would make". His choice? You guessed it – HHB.

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DAT ROUNDUP

As the DAT format continues to gain acceptance in professional recording and mastering, *Studio Sound* offers a comprehensive listing of DAT tape products and contact details

ADTECH

R-15 (15 mins)
R-30 (30 mins)
R-46 (46 mins)
R-60 (60 mins)
R-90 (90 mins)
R-120 (120 mins)

ADTECH will make special length DAT tapes to order, subject to minimum quantities.

● ADTECH Audio Video Produkte, Papenstrasse 41, 2000 Hamburg 76, Germany.
Tel: +49 40 250 1055.
Fax: +49 40 25 65 31.

AMPEX

467-30 (30 mins/15m)
467-46 (46 mins/22.4m)
467-60 (60 mins/30m)
467-90 (90 mins/44.8m)
467-120 (120 mins/59.5m)

● Ampex Recording Media, 550 Broadway, Redwood City CA 94063, USA.
Tel +1 415 367 2011.

● Ampex Media Europe, Unit 3, Commerce Park, Theale, Reading, Berkshire RG7 4AB, UK.
Tel: +44 734 302208.
Fax: +44 734 302240.

APOGEE

AD15 (15 mins)
AD30 (30 mins)
AD60 (60 mins)
AD90 (90 mins)
AD120 (120 mins)
Master Pak (holds two tapes)
Project Pak (holds ten tapes

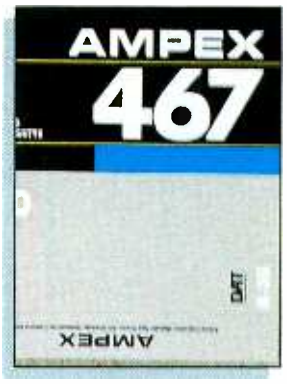
● Apogee Electronics Corporation, 3145 Douglas Loop South, Santa Monica, CA 90405, USA.
Tel: +1 310 915 1000.
Fax: +1 310 391 6262.

BASF

DAT Master 15 (15 mins)
DAT Master 30 (30 mins)
DAT Master 46 (46 mins)
DAT Master 60 (60 mins)
DAT Master 90 (90 mins)
DAT Master 120 (120 mins)

● BASF Magnetics GmbH, POB 10 04 52, D 68004 Mannheim, Germany.
Tel: +49 621 43 820.
Fax: +49 621 43 82 299.

● BASF plc, 151 Wembley Park Drive, Wembley, Middlesex HA9 8HQ, UK.
Tel: +44 81 908 3188.
Fax: +44 81 908 5866.



DIC

15MQ (15 mins/7.6m)
30MQ (30 mins/15.3m)
48MQ (48 mins/24.6m)
62MQ (62 mins/31.5m)
92MQ (92 mins/47m)
122MQ (122 mins/61m)
10HQ (10 mins/5.1m)
30HQ (30 mins/15.3m)
60HQ (60 mins/30.5m)
90HQ (90 mins/46m)
120HQ (120 mins/59m)

● Dic Digital, Glenpointe Centre West, 500 Frank W. Burr Boulevard, Teaneck, NJ 07666, USA.
Tel: +1 201 692 7700.
Fax: +1 201 692 7757.

ESTEMAC ELECTRONIC

R-15 (15 mins/7.7m)
R-30 (30 mins/15.5m)
R-46 (46 Mins/23.5m)
R-60 (60 mins/30.5m)
R-90 (90 mins/45m)
R-120 (120 mins/60m)

● Estemac Electronic GMBH, Alter Teichweg 67, D-22049 Hamburg, Germany.
Tel: +49 40 610609.
Fax: +49 40 610660.

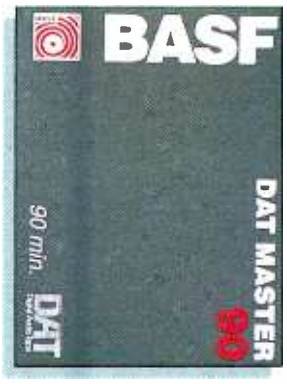
FUJI

R-46 (46 mins/23m)
R-60 (60 mins/30m)
R-90 (90 mins/45m)
R-120 (120 mins/60m)
Professional line:
R-30P (30 mins/15m)
R-46P (46 mins/ 23m)
R-60P (60 mins/30m)
R-90P (90 mins/45m)
R-120P (120 mins/60m)

● Fuji Photo Film Co Ltd, 2-26-30, Nishi Azabu, Minato-ku, Tokyo 106, Japan.

● Fuji Photo Film USA Inc, Magnetic Products Division, 555 Taxter Road, Elmsford, NY 10523, USA.

● Fuji Photo Film (UK) Ltd, 125 Finchley Road, Swiss Cottage, London NW3 6JH, UK.
Tel: +44 71 753 0601.



HHB

DAT 15 (15 mins/7.5m)
DAT 30 (30 mins/15m)
DAT 48 (48 mins/24m)
DAT 62 (62 mins/31m)
DAT 92 (92 mins/46m)
DAT 122 (122 mins/61m)

● HHB Communications Ltd, 73–75 Scrubbs Lane, London NW10 6QU, UK.

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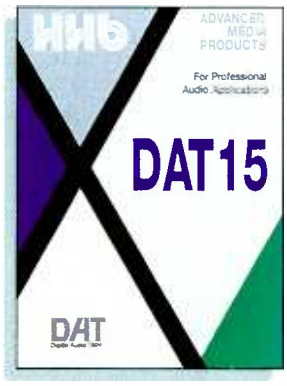
Tel: +44 81 960 2144.
Fax: +44 81 960 1160.

- **Independent Audio, 295 Forest Avenue, Suite 121, Portland, Maine 04101-2000, USA.**
Tel: +1 207 773 2424.
Fax: +1 207 773 2422.



KAO

Q15 (17 mins)
Q30 (32 mins)
Q60 (62 mins)
Q90 (92 mins)
Q120 (120 mins)
KD4 CL5 DAT cleaning cartridge.

- **Kao Corporation, 2606, Akabane, Ichikaimachi, Haga, Tochigi, 321-34, Japan.**
Tel: +81 285 83 7374.
Fax: +81 285 83 7690.

- **Kao Infosystems Company, 40 Grissom Road, Plymouth, MA 02360, USA.**
Tel: +1 508 747 5520.
Fax: +1 508 747 5521.

- **Kao Infosystems UK, Quay South, Salamander Quay, Park Lane, Harrefield, Middlesex UB9 6NY, UK.**
Tel: +44 895 824081.
Fax: +44 895 822322.

MAXELL

DAT-Standard:
DM-46 (46 mins/ 23.1+1-0m)
DM-60 (60 mins/30+1-0m)
DM-90 (90 mins/44.7+1-0m)
DM-120 (120 mins/59.5+1-0m)
DM-180 (180 mins/88.9+1-0m Available summer-autumn.)

DAT-Pro:
R-46DA (46 mins/23.1+1-0m)
R-60DA (60 mins/30+1-0m)
R-90DA (90 mins/44.7+1-0m)
R-120DA (120 mins/59.5+1-0m)
DAT-Pro Bulk:
R-5DA CN (5 mins/2.9+1-0m)
R-10DA (10 mins/5.4+1-0m)
CNR-15DA CN (15 mins/7.8+1-0m)
R-20DACN (20 mins/10.3+1-0m)
R-30DA CN (30 mins/15.2+1-0m)
R-46DA CN (46 mins/23.1+1-0m)
R-64DA CN (64 mins/31.9+1-0m)
R-90DA CN (90 mins/44.7+1-0m)
R-124DA CN (124 mins/61.4+1-0m)

- **Maxell UK, Apley, Telford, Shropshire TF6 6DA, UK.**
Tel: +44 952 251911.
Fax: +44 952 222658

- **Maxell Europe GmbH, Am Seestern 24, Dusseldorf 11, Germany.**
Tel: +49 211 59 51 129.
Fax: +49 211 59 38 67.

PANASONIC

RT-R46P (46 mins)
RT-R60P (60 mins)
RT-R90P (90 mins)
RT-R120P (120 mins)

- **Panasonic BTSC, 6550 Katella Avenue, Cypress, CA 90630, USA.**
Tel +1 714 373 7278.
Fax: +1 714 373 7903.

PMD

DAT 20 (20 mins/10m)
DAT 60 (60 mins/ 30m)
DAT 90 (90 mins/45m)
DAT 120 (120 mins/60m)

- **PMD Magnetics, Magnetics House, PO Box 19, Avenue Farm, Stratford upon Avon, Warwickshire CV37 0QJ, UK.**
Tel: +44 789 268579.
Fax: +44 789 414450.

SONY

PDP15 (15 mins/7.5m)
PDP34 (34 mins/17m)
PDP34 (34 mins/17m)
PDP48 (48mins/24m)
PDP64 (64 mins/32m)
PDP94 (94 mins/47m)
PDP124 (124 mins/62m)

- **Sony Broadcast and Professional UK, The Heights, Weybridge, Surrey KT13 0XW, UK.**
Tel +44 932 816300.
Fax: +44 932 817011.

3M

R-15 (16 mins/7.9m)
R-30 (31.1 mins/15.2m)
R-46 (47.2 mins/23.1m)
R-60 (61.3 mins/30m)
R-90 (91.5 mins/44.8m)
R-120 (121.5 mins/59.5m)

- **3M Audio and Video Markets Division, 3M Centre Building 223-5N-01, St Paul, MN 55144-1000, USA.**
Tel: +1 612 733 0660.
Fax: +1 612 736 1537.

- **The Professional Audio-Video Group, 3M United Kingdom, 3M House, PO Box 1, Bracknell, Berkshire RJ12 1JU, UK.**
Tel: +44 344 858385.
Fax: +44 344 858082.

TDK

DA-R60 (60 mins)
DA-R90 (90 mins)
DA-R120 (120 mins)
RCL-11 DAT head cleaner

- **TDK Electronics Corporation, Professional Products Division, 1411 West 190th Street, Suite 270, Gardena, CA 90248, USA.**
Tel: +1 213 538 5259.

- **TDK (UK), TDK House, 5–7 Queensway, Redhill, Surrey RH1 1YB, UK.**
Tel: +44 737 773773.

ZONAL

DAT 15 (15 mins)
DAT 30 (30 mins)
DAT 46 (46 mins)
DAT 60 (60 mins)
DAT 90 (90 mins)
DAT 120 (120 mins)

- **Zonal Ltd, Holmthorpe Avenue, Redhill, Surrey RH1 2NX, UK.**
Tel: +44 737 767171.

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MICROSOUND

Micro Technology Unlimited are based in Raleigh, North Carolina, USA and have been in business since 1977. Between 1981 and 1986, they were a computer company, producing disk-based digital audio products for scientific research using DEC, SUN, AT, *Mac* and MTU computer platforms. MTU have over ten years of experience using 16-bit convertor technology and introduced their first pro-audio product, the *DigiSound-16* in 1983. Production of the *MicroSound* digital audio workstation, with its *MicroEditor* software, commenced in December 1989.

There are two main features of the *MicroSound* system; the first is that although it appears to be a stereo/4-channel system, its internal mixing capabilities effectively make it a multitrack. It can currently mix down a maximum of five stereo segments at 48kHz (or more if a lower sampling rate is used) in real time, as well as up to 50 stereo virtual-tracks in non-real time. The second is that it has been designed to work with a range of existing PC and compatible hardware, which means that potential purchasers with older PCs are not necessarily obliged to upgrade. However, for optimum performance, obviously the latest high-speed drives and controllers are required.

Hard and soft

MicroSound consists of an adaptor card which inserts into a full-length spare slot of the PC, and an I-O unit, which is the size of a full-height disk drive. The recommended PC is any 386 with a coprocessor, or a 486DX—a fast SCSI drive is also recommended, although IBE drives are supported. For stereo output operation, a 20MHz processor will be adequate, however 4-channel output support will require a faster processor. Two optional cards are also available—the MicroSync card supports advanced synchronisation functions and the SMPTE-MIDI card supports simple trigger lock to LTC or MTC. The *MicroEditor* software under review, which runs under *Windows*, is v2.29.

Ins, outs and sync

The I-O unit supports both analogue and digital audio inputs and outputs, both of which are optional, available as two or four channels and accessed through mono jack-sockets. There is also an external sync connector for optionally referencing the sample rate clock (rather than using the internal crystal) and a connector for the MicroSync card (which will generate a 'super clock' from the external sync).

The MicroSync card—which MTU maintain has been designed to be extremely robust—will sync lock to video sync or LTC (even if the LTC has ±50% bit jitter), and will also lock to ±50% varispeed (although the system cannot exceed a sampling rate of 50kHz). This means that wow and flutter from tape can automatically be corrected by varying the sampling rate according to fluctuations in the incoming time code. On replay, the sampling rate is constant and there is therefore no pitch deviation.

The SMPTE-MIDI card provides simpler synchronisation by sending a trigger pulse (once valid time code has been recognised) which causes the system to sync to its internal crystal. As expected, over time this internal sync may drift from the actual incoming time code, so for arrangements which last longer than around ten minutes, the MicroSync card is recommended.

A rack I-O module is also available which has an output for interfacing with devices such as Marantz, Studer and Yamaha CD-R machines. According to MTU, this output can also be used for other applications and has for example, been used to control a Sony time-code DAT recorder, a telephone on-hook/off-hook (for autodialling and sending the same message, recorded within *MicroSound*, to a number of remote recording-message machines) and for lighting control.

System operation

Operation of *MicroSound* requires a colour monitor, mouse (or any *Windows*-compatible cursor controller) and an alphanumeric keyboard (mainly for titling). Work is organised in a 'project' which can contain up to 50 virtual tracks and up to 2,900 segments (or cues). Project creation and titling of projects and recordings conform to DOS practices (a default drive and directory can be set up and all names must be eight letters long with a file extension of up to three letters).

Operation is based around three main screens, one each for recording (Record screen), editing (Segment screen) and sequencing-project management (Project screen). Each screen has a bar at the top which displays a selection of pull-down menus, some of which may change according to which screen is currently active. When the *MicroSound* icon is activated under *Windows*, the Project screen is automatically displayed.

At the time of writing, it was possible to record two independent files simultaneously (two stereo or two mono files, not four mono), or simultaneously record a file while replaying another. However, the ability to record four independent files was imminent. To prepare for recording, a file name must be entered and various parameters selected (which can be saved as a default setup). The sampling rates supported range from 8kHz to 48kHz with 15 choices in between, and if required, the user can 'precreate' a file with a definable duration. This creates an empty file ready for recording and makes it easier for the system to record in case the disk has become fragmented.

If this feature is used, the drawbacks are that the recording cannot overrun the specified duration, and should the recording be shorter than specified, the remaining disk space will not be available for recording. It was pointed out, however, that in practice the need to precreate is rarely necessary. Alternatively, disk time can be 'reserved' (in which case any space left over will be available to append the existing recording or can be used by new recordings) or the user can simply specify no time, whereby all the remaining time left on disk will be available for recording.

The Record screen displays two horizontal bar graphs (one for each file) which represent either the time reserved (or precreated) or the time left on disk. As recording takes place, the graph is gradually filled with a solid block ►

Yasmin Hashmi evaluates a PC-based workstation from American developers Micro Technology Unlimited

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which represents the recording, and two real-time counters which appropriately increment and decrement respectively. Centrally positioned beneath the bar graphs are two peak meters, one for the input and output respectively. These display levels from -48dB to 0dB with stages in between highlighted in colour, and should the level clip during recording, a red indicator will be activated and remain so until recording recommences. In fact all real-time displays can be switched off in case the system is being stretched to its limits.

Beneath the meters are transport control buttons for FAST REWIND, FAST FORWARD, RECORD ENABLE, RECORD, STOP, PAUSE and PLAY. Recording can be triggered using the RECORD button, a SMPTE or MIDI time code, or a MIDI note. If the MicroSync card is installed and the system is recording while synchronised to an external reference, the background of the graph display will be highlighted white if the system is in sync. If it is tracking-varispeeding, the colour will change to yellow and if it is not in sync (freewheeling) it will change to red for a couple of seconds and then drop out of record. On the right of the screen is the replay section, which allows monitoring of the input to be switched on or off. There is also a MARKER button which allows up to 99 location marks to be made on the fly while recording, while in stop or during playback. These marks can be simultaneously made and labelled with a letter by pressing any alpha key on the keyboard.

Playback and editing

Once recording has stopped, a vertical 'playhead' marker appears at the end of the bar graph, and to play back the recording, the REWIND button is used to move this marker back through the bar graph as far as required. Again playback can be triggered in the same way as recording, and replay can be synchronised to all flavours of time code (including drop and non-drop). In addition, left and right channels can be controlled independently for panning and gain, and any channel can also be routed to any output. For example with a 4-output system, the left channel of a stereo recording can be routed to Output A and the right to Output B or both left and right to Output C and so on.

A project is first created by giving it a title and choosing a sampling rate (as expected, sound files with different sampling rates cannot be used within the same project). The 'create segment' option is then chosen and a list of sound files is displayed (a file's sampling rate and polyphony will be displayed if it is highlighted using the mouse). Once a sound file has been selected, the Segment screen automatically appears and a region of the sound file is represented in an editing window. This has vertical time divisions which can be changed, and up to ten seconds of a sound file can be displayed as a waveform, or any amount of the sound file can be displayed as a block.

Above this editing display is a bar graph which represents the entire length of the sound file. The region of the sound file currently represented in the editing window and the current position of the playhead marker are both indicated in the bar graph. By moving the mouse cursor into the bar graph, the current position of the cursor is displayed, and this time can be shown in samples, absolute time or time code. To move the playhead marker to this position, the right-hand mouse button is clicked, and to play from this position, the right-hand mouse button is depressed (replay will continue for as long as the button is held down, and replay at double speed can be performed by also holding down the left-hand mouse button).

For a video-style delete (effectively replacing the cut with silence), the delay should be equal to the skip duration

To place the editing window around the new position of the playhead marker, a MOVE button is pressed. Alternatively, the window can be moved backward or forward through the sound file by clicking on left and right buttons at either end of the bar graph, or by dragging the window using a combination of mouse and keyboard control. Furthermore, the amount of time represented by the window can be changed by dragging its right-hand edge back or forth.

The audio in the editing window itself can also be auditioned by clicking and holding anywhere in the waveform (or block). Buttons for GOTO LEFT or RIGHT will allow the user to successively step back or forth through location marks (or if no marks exist, they will jump to the beginning or end of the sound file). The display can be zoomed in or out horizontally, from sample resolution to hours, and can also be zoomed vertically (for amplitude). In terms of editing, the functions available are fairly limited, and basically consist of cutting and gain changing (there are no clipboard-style cut and paste functions). Edit points can be found in a number of ways. A scrub function, with a choice of pitch multipliers between 1 and $^1/_{16}$, allows scrubbing back and forth using the left and right mouse buttons. This, however, has a slow response and does not have the sensitivity for finding the start of an unwanted click for example (an alternative is to zoom in and find the click visually).

An area to be cut or gain adjusted can be highlighted using click-and-drag while in stop, or on the fly while playing. The highlighted region can then be exclusively auditioned, and-or the audio auditioned starting from the end of the highlighted region. These methods are useful, for example, for finding the unwanted part of the beginning of a recording and ensuring that the start of the required segment has been correctly located.

The two main ways of removing unwanted audio involve selecting a 'skip' region (using click-and-drag) or selecting an amount of time to be cut starting from the current position of the playhead marker. When the 'skip' command is activated, the duration of the region to be skipped (or cut) is displayed and the user can enter a delay time. If the delay time is zero, a film-style cut will be performed. For a video-style delete (effectively replacing the cut with silence), the delay should be equal to the skip duration—entering longer or shorter durations will accordingly increase or decrease the amount of silence. A fade-in and fade-out for the whole segment can be defined, as well as the fades for skip edit points, and although the UNDO button only reverses the last action, all edits are flagged and can individually be undone.

Sequencing

Once a segment has been edited, it is transferred to the Project screen where it and other segments can be sequenced. The Project screen basically uses the horizontal virtual track concept, however, track lines are not displayed (although an invisible delineation between tracks actually exists). A segment (whether it is mono or stereo) is represented as a block (with as much of the segment name displayed as possible) and can be easily renamed with up to 30 characters. Each segment is placed on its own track, can easily be positioned anywhere in time by dragging horizontally and can have its in and out points extended by dragging. When a segment is placed, the display will automatically be redrawn in chronological order so that the first segment in the sequence is at the top of the display, the next segment is in the track below, and so on.

Vertically, the display has room for up to eight tracks (but can be scrolled), however, horizontally it can display the whole duration of a sequence, no matter how long it is. Obviously, the longer the sequence, the correspondingly narrower the blocks. The display can also be zoomed down to millisecond level and again, a bar graph above indicates the relative position of the region of interest.

In terms of segment positioning, there are a number of useful features such as being able to 'snap to grid', split a segment across two tracks and append a segment (automatically chain the following segment to the end of the previous one). Segments can be muted, routed to any output and the sequence can again be triggered by time code, MTC or MIDI note (and chase locked to time code if the MicroSync card is fitted).

Segments can also be positioned to replay at the same time (or overlap for part of the time). In this case, if the channel capacity of the system is not exceeded, the system will perform a real-time mix and a waveform of the mix can be displayed. However, if the channel capacity is exceeded, audio will drop out (and there is no visual warning). To avoid this, a fast internal non-real-time mixdown can be selected (prior to which, the system will automatically save the current state of the project). The reason for the high speed of the mixdown is that it only mixes wherever the channel capacity is exceeded—a submix file is created for each case ▶

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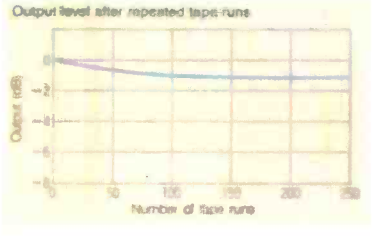

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Optional *MicroTools* signal-processing software can be used for non-real-time processes such as time compansion and noise removal

of excess, and random access is used to jump to these files as required on replay.

The Project screen can also be used for recording and for auto overdub and auto punch-in (with pre-roll and handles of up to ten seconds). A useful feature, particularly for synchronising effects sends, is the calibration function. This sends out a test signal, measures the delay in receiving the signal back via external devices and will appropriately offset the output.

DSP

If the host PC uses floating-point hardware, optional *MicroTools* signal-processing software can be used for non-real-time processes such as time compansion and noise removal. The latter process involves the user isolating a part of the recording which only contains the unwanted noise, the system then creates a filter and uses this to remove the noise from the rest of the recording.

Features and developments

In terms of file handling, *MicroSound* has various useful features including the ability to convert files as 8 or 16-bit .WAV files (for compatibility with any multimedia card), to save as a reversed file (for cassette duplication purposes), or to at least reverse a marked region. There is also an autosave function, which will regularly save the current status of a project at user-defined intervals.

Archiving to DAT is recommended—the system stores all information required to restore a project and will take real time or less (depending on the sampling rate used) for transfer.

MTU's development plans include support of eight real-time stereo cues with eight audio inputs and eight outputs, real-time gain change and phase linear parametric EQ. In terms of segment manipulation, planned software enhancements include the ability to randomly select segments, treat them as a group and edit as one segment. There is also to be a feature called 'collapse file' which copies only those parts of files which are used. This copy is then used for backup—the original source files can be discarded.

Configuration

Various configurations with digital and-or analogue I-O are available. Costs range from just under $3,000 US for the digital-only plug-in package with 2-channel AES-EBU I-O costing, to just under $7,000 US for a digital-only turnkey system with 50MHz PC and 525Mb hard disk. Micro Technology Unlimited have distributors in Hungary and Switzerland and are seeking distribution in Germany and the UK.

Conclusion

Since there is no distributor in the UK, the system was kindly demonstrated by Lloyd Stickells in London. Indeed, although it is somewhat refreshing to review a system with a user rather than a well-rehearsed product-specialist, it should be noted the circumstances were less than ideal for certain features (particularly synchronisation) to be tested. Nonetheless, these have, superficially at least, been seen working elsewhere.

As with many IBM-compatible-based systems, some knowledge of DOS-based file management is assumed in order to take full advantage of *MicroSound*'s file-handling features. The *Windows*-based screens are easy to understand (a help feature gives useful suggestions for certain functions), operation between screens is consistent and the system offers some remarkable features such as the ability to undo any edit at any time in the Segment screen.

There are, however, a number of basic functions which could be improved, particularly concerning editing in the Segment screen—for example, in many instances it would be quicker and simpler if the user could isolate the wanted part(s) of a recording rather than having to delete the unwanted parts. In addition, although manipulation of segments in the Project screen is straightforward, there is no way, for example, of quickly identifying the polyphony of a segment.

Given its mixdown and synchronisation capabilities and the attention which has been paid to accommodating both high performance and more limited PC platforms, the *MicroSound* represents good value for money and appears to be a robust and well-engineered system. ■

Micro Technology Unlimited, PO Box 21061, Raleigh, NC 27619 1061, USA.
Tel +1 919 870 0344. Fax +1 919 870 7163.

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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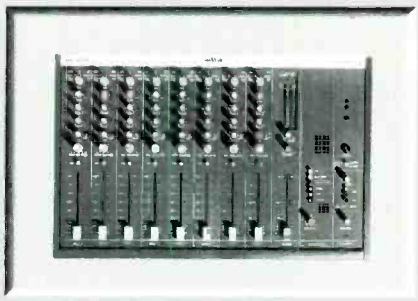

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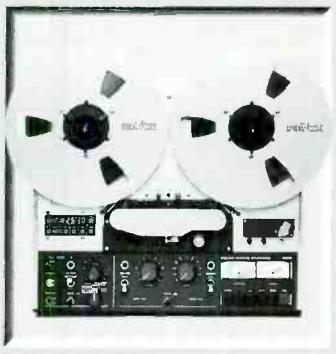

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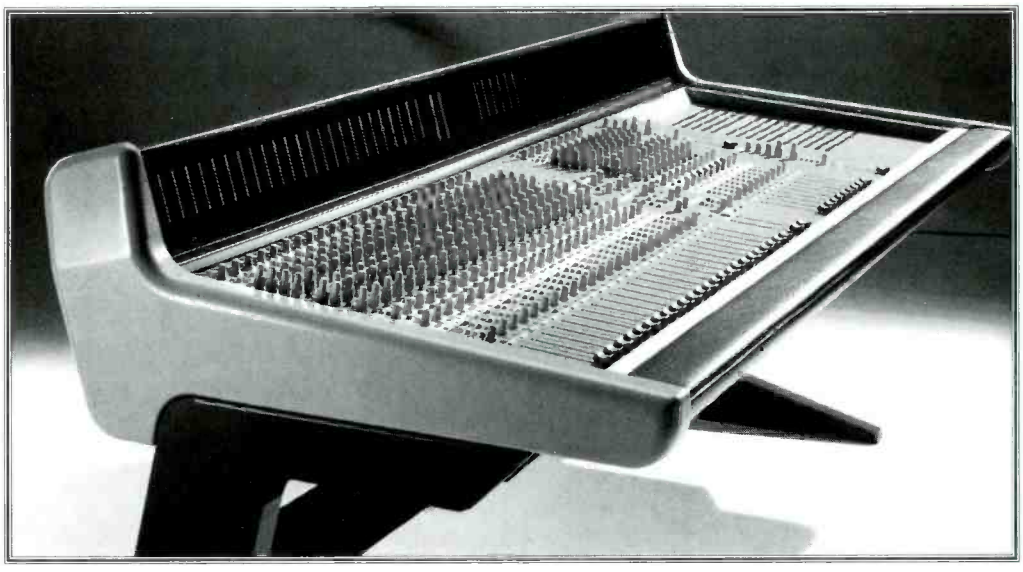

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Martin Polon

Taking the lead in raising the stakes

Nineteen-ninety-four heralds computing power only imagined in science-fiction novels. The debut of the Power PC chip from Apple, IBM and Motorola—with the almost simultaneous appearance of the Alpha chip from the Digital Equipment Company (DEC)—and the arrival of a plug-in heat and cost-reduced Pentium from Intel declaims computational speeds approaching or in excess of the 100MHz processor speed barrier, 64-bit computational pathways and instructions per second in the multimultimillion range. Whether this will make 1994 the most important year in the history of digital audio, since the inception of digitisation under the tutelage of Tom Stockham in the late 1970s remains to be seen.

The Power PC utilises a standard designed from input offered by Apple, IBM and Motorola. The standard specifies a common Instruction Set Architecture (ISA), which allows anyone to design and fabricate Power PC processors—which will all run the same code. This is based on Reduced Instruction-Set Computing (RISC), as opposed to the Complex Instruction-Set computing (CISC) of the Intel X86 chips that are the basis of the PC family, and the 68000-series processors of the *Macintosh* family. RISC chips move instructions at a faster rate than existing CISC processors by virtue of reduced instruction and a consequent reduction in programming complexity.

The Power PC will first appear as the '601' chip, from Motorola, in IBM and Apple computers to be sold during the first half of 1994. This chip will be clocked ostensibly at 66MHz, but advanced samples have indicated 80MHz options are available. The Power PC is based in part on IBM's Power Open architecture used in the *RS-6000* workstations and IBM will coproduce (with Motorola) the next generation '603' Power PC chip at it's 'captive' chip facility.

This 603 chip, which could be released as early as the autumn of 1994, will post similar performance ratings but with a reduced power draw, allowing use of the Power PC in portable equipment. These chips will run twice as fast as the Intel 66MHz 486 and can benchmark twice as fast as the Pentium. Manufacturers have expressed interest in the Power PC family due to the considerably lessened power draw and heat dissipation plus the fact that the Power PC chip costs equipment makers considerably less than the Pentium chip.

More advanced members of the Power PC family will utilise 64-bit data paths. This will take clock speed and performance to and beyond the 100MHz barrier. The 604 processor will be focused at high-end systems, while the 620 will drive workstations and Power PC 'mainframes'. Both the 604 and 620 could appear before the end of 1994.

One of the astonishing features of the Power PC is the diversity and range of operating systems that the chip family accommodates—either now or in the near future. The list includes (but is not limited to) Apple UNIX 'A-UX,' Apple *Macintosh* System 7.5 Power, IBM UNIX 'AIX 3.x', IBM Workplace OS 'Mach 3', Microsoft *Windows NT* and Chicago, NextStep, Novell Netware, Sunsoft Solaris, and Taligent 'Custom'.

The initial offering of 601-equipped machines will include a substantial range from Groupe Bull, IBM and Apple. Initial prices will be $2,000–$12,000; with the latter price for an advanced IBM Power PC portable workstation from IBM. The $5,000 range will represent the high end for most systems and applications. Initial indications are that the premiere offerings from Apple will include a model *6100-60* operating at 60MHz, and offering performance in the 'native' Power PC mode that will be two to four times as fast as the current top-of-the-line *Quadra* models popular in audio studios for desk-top editing. The next step up will be the *7100-66* operating at 66MHz and offering a 25% speed increase over the *6100*. The top-of-the-line will in all likelihood be represented by the *8100-80* whose 80MHz speed is bolstered by the presence of an 256K RAM cache. That gives the *8100* system an 200% edge over the entry-level *6100* machine.

It is important to remember that the Power PC chip is a new architecture with a new 'tool box' that must be used by application programmers to take advantage of its speed. This is being done by the software development community and there are reported to be nearly 50 software products available for use by the second quarter of 1994. All other applications will run at an acceptable emulation mode in the range of speed for a fast 68030 or a slower 68040—depending on the software application. By 1995, virtually all developers are expected to have ported their applications to the Power PC tool box.

Later implementations as early as the end of 1994 or the beginning of 1995, of Power PC systems utilising the 603, 604 and 620 chips are expected by most analysts. These systems will include the Fire Wire Apple/Texas Instruments replacement for the SCSI interface as well as for the serial and ADB (Apple Desktop Bus) ports on *Mac* systems. PCI (Personal Computer Interface) bus slots are also expected to replace NuBus options. Another expected option is the use of the MiniDisc format for floppy-disk-like optical storage of approximately 130Mb per $5 disc.

Mixing on a large physical mixing desk with a team remains desirable, no amount of 'virtual' mixing is likely to replace it

How does all of this translate to audio users? One way to measure the gain in speed and power is to use benchmark studies showing Beta-version Power PCs running 3-D modelling software that utilises the Power PC tool box. These machines operate at three to four times the speed of top-of-the-line current *Quadra* systems. Modelling software is strikingly similar to audio software in being very space and speed 'needy'. The promise of Power PC, seen in its initial implementation is to bring the studio-in-a-box to fruition in a way that will further empower the user. Mixing, postproduction, editing, sweetening, CD prep, commercial production, film work, scoring and so on all will benefit from the increase in processing speed and data throughout. The ability of the Power PC to move at speeds approaching and eventually eclipsing 100MHz obviates the need for onboard DSP chips, with audio and video functions possible via software implementation. Real audio power for the people.

Further, software written with code and calls appropriate to the Power PC and other new chip platforms will increase the speed of audio 'rendering' required for postpro-in-a-box.' The same could be said of original recording 'in the computer—in the box' and coupled with M-O recorders and gigabyte-sized hard drives.

More, and this may frighten many in audio, it will put professional quality video and audio into the same box for everything from hand camera postproduction, CD-ROM production and on-line animation to complete video-audio postpro sweetening suites.

Where will all of this lead the audio industry? The answer takes several directions as it becomes a series of additional questions:

Will users abandon traditional recording consoles? The modern recording console owes its genesis to the involvement of telephone companies, their involvement with audio as a part of telephony and the human engineering of their control components. That human engineering has continued to be in vogue into the 1990s and will most likely be in vogue into the next century. The task of original recording has a human component of controlling tens of microphones with hundreds of control parameters. To manipulate all of this solely in the confines on a computer screen demands more than human operators may be willing to concede. The creative edge of mixing on a large physical mixing desk with other members of the creative team remains a desirable mode and no amount of 'virtual' mixing is likely to replace it.

Does all of this computerisation replace tape? Consider this, the recording of one minute of video (or multitrack audio) on hard disk can cost as much as $100 per minute. Magnetic tape does the same job at about 10 cents per minute. So it is clear that form and function will continue to rule usage in audio in the same way that some economies of scale will do the same.

But the presence of 32 and 64-bit pathways at speeds 4, 8, 16 times those we have had to work with promises us that developers will produce audio applications only dreamed about in research labs just a few years ago. ■

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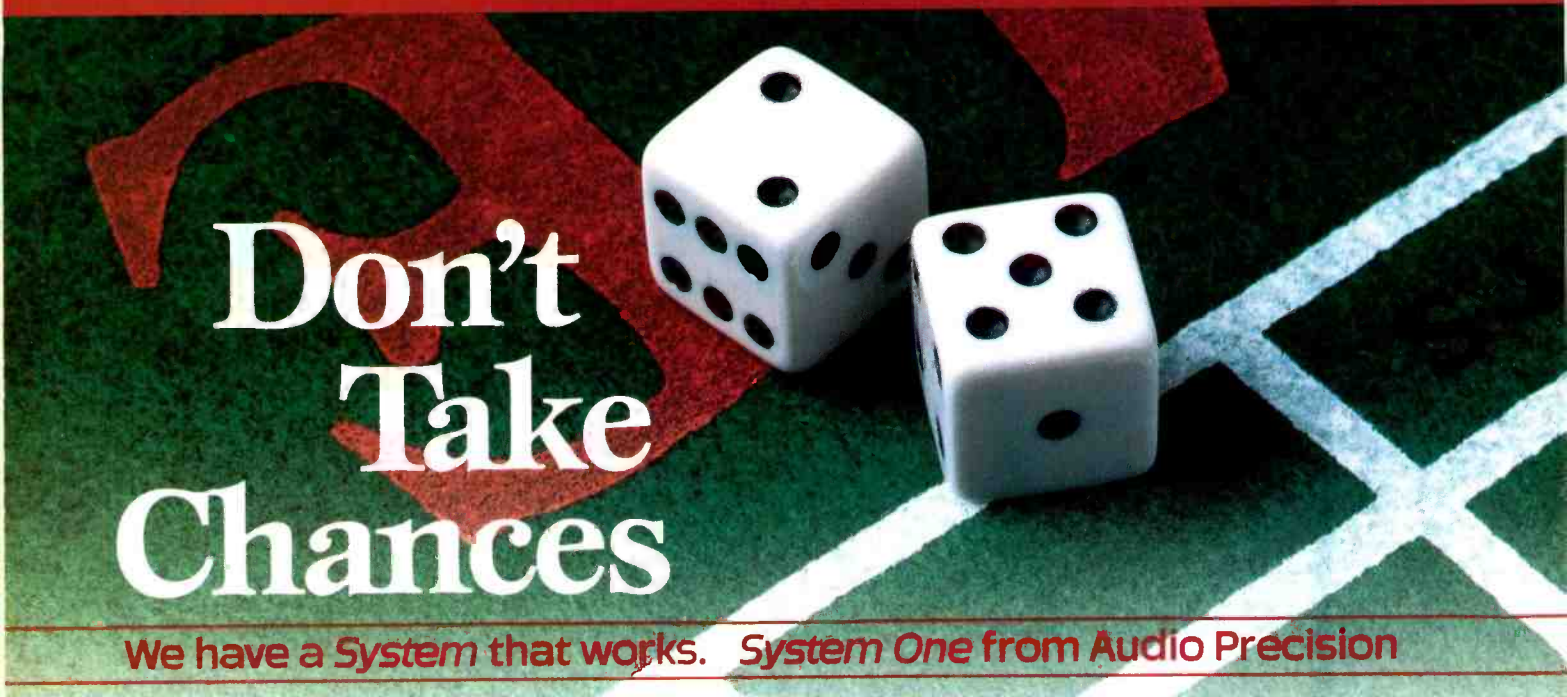

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BURIED TREASURE

Frances Rumsey presents the first of two articles explaining and examining the application of 'buried data' on compact disc

Interest in high resolution digital recording is growing. This includes recording at higher sampling rates (such as 96kHz) and greater numbers of bits (such as 20 or 24). High-resolution digital recording results in higher data rates than for 16-bit, 44.1kHz recording (the CD norm), and new equipment is appearing which is capable of recording and handling these signals. The majority of the interest in high-resolution recording is in the professional field, because it offers an opportunity for the professional to gain the edge over what can be achieved in the consumer market. Consequently, many companies are developing means by which some of the improvements in sound quality can be passed on to the consumer on prerecorded media (principally the CD). By using noise-shaping signal processors (and other means) in the transfer of the high-resolution recording to CD, the apparent dynamic range of the CD may be increased so that it is close to that of the high-resolution master.

The question now presents itself: do we need this additional dynamic range from consumer CDs, or would it be better to take advantage of techniques which extract more dynamic range out of a 16-bit medium to allow some of the audio data capacity of the CD to be used for other purposes? Recent research has shown that it is possible to include inaudible 'buried data' in the LSBs (Least Significant Bits) of the 16-bit audio data, which could be used for either audio or non-audio purposes. The potential capacity of such a buried data channel is actually quite high, and is much higher than the subcode capacity of the CD.

Research into data reduction is producing technology capable of coding audio at lower and lower bit rates while preserving varying degrees of sound quality. One result of this is the possibility for coding surround sound information at very low data rates. It turns out that the data rate available from a buried data channel would suit that required for surround sound almost perfectly. There are also a number of alternative applications for buried data which can be envisaged.

The first part of this article discusses methods for improving sound quality, while the second (to appear next issue) will look at ways of burying data inaudibly, introducing a number of applications for consumer media.

Trends in 'high-bit' mastering

There is an almost unstoppable bandwagon now moving in the direction of 20-bit master recording, particularly in the stereo classical-recording field but also gaining speed in other fields and extending to multitrack recording. A–D convertors are now available with sufficient performance to allow them to claim 20-bit resolution, although there is a strong need for greater clarity in the specification of convertors, as exemplified in the recent debates documented in these pages. Sony's new *PCM-9000 MSdisc* recorder can record up to 24 bits, as can the Nagra *D* format. Decca have now developed an optical disc recorder based on computer M-O cartridges capable of recording at 20-bit resolution, using lossless data compression, which it will use in its in-house operations in the future. ▶

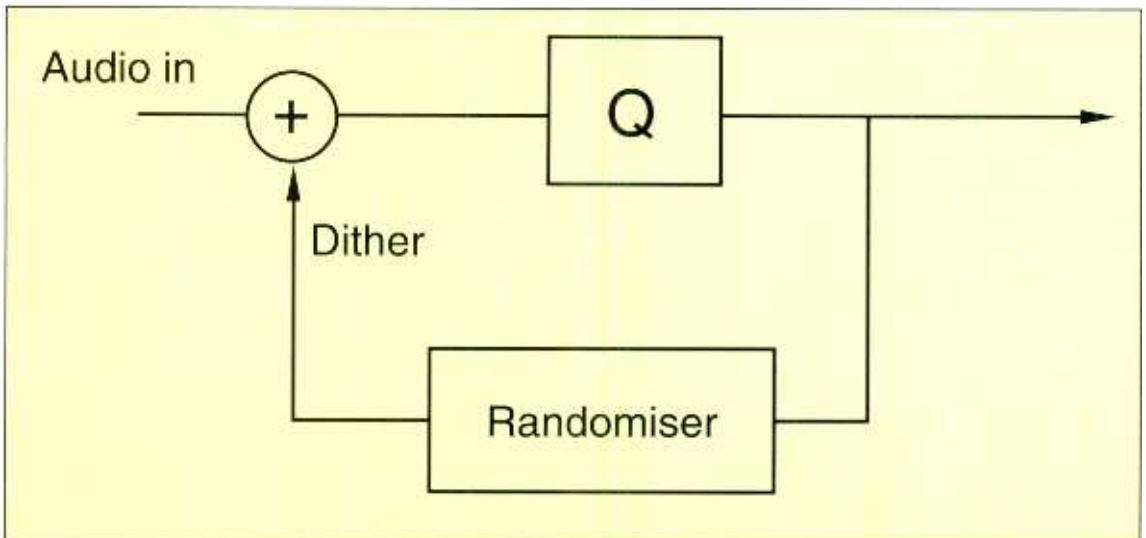

Fig.1: Autodither is generated by randomising the audio signal after the quantiser so that its acts as low-level noise, thus linearising the quantiser

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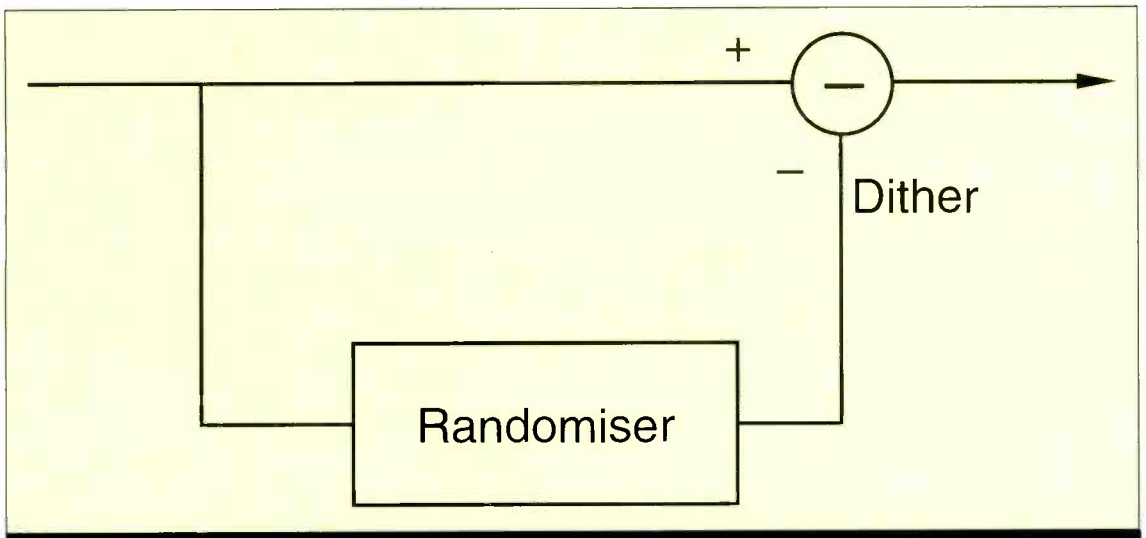

Fig.2: Autodither can be regenerated on replay and then subtracted from the audio signal, thereby reducing the noise floor, provided that the randomiser can be synchronised with the sequence used on encoding

The Mitsubishi *X-86* (now discontinued), has had a 20-bit option for a number of years. Although the ubiquitous DAT format is unable to store 20 bits in its basic form, there is now a modified version of Pioneer's 96kHz DAT machine (from UK company ADT) which allows the machine to record at 48kHz with 24-bit resolution. This machine will bring 24-bit recording to the low-cost end of the market, although the tapes will be incompatible with ordinary DAT machines.

There is no doubt that 20-bit recording has become popular with classical recording engineers and postproduction operations. To give some examples: Tony Faulkner has used *X-86*s for a number of years, Ben Turner at Finesplice also has some, and Floating Earth use them on occasions. Modus Music have recently bought a number of Nagra *D* machines, and DG used them before introducing Sony *PCM-9000* machines. Sony, Philips Classics and EMI make 20-bit recordings, and many operations also use Sonic Solutions editing equipment which is capable of handling 20-bit resolution.

So far as multitrack recording is concerned, there has been very little activity to date. Yamaha's *DMR-8* recorder is really the only format capable of storing 20-bit audio, and this is on a custom tape cartridge designed for low-cost work with limited playing time. Sony's *PCM-3324* and *3348* DASH machines both work at 16-bit resolution, and the Mitsubishi *X-850* and *880* are also 16-bit machines. Studer made waves at the recent AES Amsterdam Convention by announcing a version of the *D827* DASH format multitrack machine capable of running in a 24-bit mode. This machine, normally 48 tracks and 16 bits, can be made to record 24 tracks at 24 bits if required, while retaining full punch-in and out capability. The additional data is recorded on the second set of 24 tracks. Tapes are still replayable on 24-track DASH machines, but only the first 16 bits of audio are retrieved (resulting in straightforward truncation of the samples).

Because no suitable technology was available at the time, Deutsche Grammophon developed their own system for recording 24 bits on a 24-track Sony DASH machine, as described in a recent *Studio Sound* article (January 1994), which uses an external signal processor to split the 24-bit data between tracks, resulting in 16 tracks at 24 bits. This does not allow for punch-in operations, and the tapes are not compatible with conventional machines.

Why more bits?

It is generally agreed among professional engineers that 16-bit equipment, although adequate, requires very careful handling to obtain the best performance. Levels have to be carefully adjusted to peak near maximum, and good convertors are vital. Research carried out in the 1980s and 1990s suggests that in order to equal the dynamic range obtainable acoustically in good listening conditions, convertor resolution of around 18 bits is desirable. Interestingly, this even applies in many domestic living rooms, where the noise at middle to high frequencies is really much lower than people think. To give some freedom in level setting, and so that professional equipment has a suitable margin over consumer equipment, 20 bits is considered ideal. Whether or not there is any real need for 24 bits is a matter for considerable scepticism. (Many would even say that 20 bits is taking things a bit far, considering the ever-decreasing returns as resolution is improved.)

There is a very small minority of the public which appreciates the difference between 20-bit mastered CDs and 16-bit mastered CDs. Using techniques such as those described below, quite a lot of the 20-bit dynamic range can be passed on to the consumer, although the CD is still only a 16-bit medium. Although there is an audible difference on good hi-fi systems it must be agreed that it is a small one. As Barry Fox pointed out in his recent keynote speech to the AES, you have to hope that the audio industry can keep on persuading people to part with the money to make it worth making ever-smaller improvements to sound quality. What people really bought, he pointed out, was music.

Higher sampling rates

Alongside the quest for more dynamic range has recently come the quest for wider bandwidth. The most vigorously marketed incarnation of this in the last year has been Pioneer's 96kHz DAT machine, the *D-07*. In the so-called 'Wide Mode' of this DAT machine it offers a bandwidth twice that of the conventional DAT machine. In Pioneer's literature, they ask 'why high sampling not high bit?' Why indeed? The answer from Pioneer suggests that people who like listening to LPs and not CDs are missing the HF information above 20kHz which is present on some LPs. Their analysis of the spectral content of LPs suggests that there is information present at up to 40kHz–50kHz in some cases. They also show spectrum analyses of music and other live sounds which have spectral information up to around 40kHz, although at low level.

As with the difference between 16 and 20-bit recording, it is possible to detect a difference between 48kHz and 96kHz sampling rates on a high-quality system. In the case of some programme material the difference is quite marked, adding to the impression of depth and realism in the image. Having discussed this with a number of people, the views are mixed. Most trained listeners agree that there is a difference, but the more sceptical ones argue that the 96kHz convertor must be a better convertor in the first place, and therefore it may not just be the results of wider bandwidth that are improving the quality.

Many will argue that it is not worth reproducing information above the audio frequency range. The AF range is generally taken as extending to 20kHz, but, of course, one's ears do not have the response of a brick-wall filter at 20kHz. The ear is progressively less sensitive from about 4kHz upwards, and tails off rapidly above 20kHz. It is possible, though, that even low-level information above 20kHz may be perceived to some degree by the ear, and make a subtle difference to quality. Certainly there have been many attempts over the years to prove, using various tests, that it does matter—and these have been reacted to with either hostility or great joy by different parts of the audio community, depending, in the main, on vested interest.

Pioneer quote research performed by a Professor Ohashi into the spectrum of real sounds and their effects on people. Analyses of ethnic instruments and natural surroundings have shown that there is considerable information above 20kHz in real life. It is asserted that the human brain begins to produce 'alpha waves' after exposure to natural sounds having information above 26kHz for more than about 20 seconds. Alpha waves correspond to a state of relaxation in mind and body.

At a recent AES lecture given by Peter Craven on buried data (see the second part of this ▶

The human brain begins to produce 'alpha waves' after exposure to natural sounds having information above 26kHz for more than about 20 seconds

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article), Michael Gerzon pointed out that the thresholds of hearing of the human ear are not absolute but probabilistic. In other words, when trying to determine what can and cannot be perceived one is dealing with statistical likelihood of perception. This is important for any research which attempts to establish criteria for audibility. As Gerzon points out, there are certain sounds which, although as much as 10dB below the accepted thresholds, have a statistical likelihood of perception which may approach certainty in some cases.

Extra resolution

The compact disc is unstoppable as a prerecorded consumer replay format. No matter what comes out in the form of other discs or cassettes, the CD will win for the foreseeable future. There are all sorts of reasons for this, most of which would take too long to go into here, but are mainly to do with instinct. Since it is a 16-bit medium running at 44.1kHz, some easy and convenient means is necessary which will enable it to carry either an improved dynamic range or extended frequency response. The easier it is, the more likely it is that it will be adopted. The alternative is to attempt to market a prerecorded format with a higher inherent resolution. One further point is that any new format based on a 96kHz sampling rate will require roughly twice as much storage capacity per hour of music as one based on a conventional sampling rate. The equivalent is that a standard disk or tape would last half as long at 96kHz.

Noise shaping and redithering

There are a number of techniques available now which enable 20-bit masters to be converted to a 16-bit format for consumer distribution. The process involves noise shaping and redithering at the lower resolution, to avoid the distortion products which otherwise ensue if the 20-bit sample is simply truncated. ('You mean standard industry practice,' as a well-known hi-fi manufacturer, referring to truncation, said recently.) Among the offerings in this field are Sony's Super Bit Mapping (SBM); DG's Authentic Bit Imaging (not commercially available); a Meridian processor called the *618*, which offers various types of noise shaping and redithering; a Harmonia Mundi system and a Lexicon system. The noise-shaping systems generally work by redithering the signal appropriately for 16-bit resolution, together with using a noise-shaping filter that shifts the noise into inaudible parts of the spectrum (mostly at HF). Using such techniques it is possible to create the subjective equivalent of close to 20 bits dynamic range (whatever that means) from a 16-bit medium.

Any new format based on a 96kHz sampling rate will require roughly twice as much storage capacity per hour of music

The degree of noise shaping desirable is a point of debate. Depending on the filter characteristic, one can achieve up to around 19dB of noise reduction at a sampling frequency of 44.1kHz, and more if pre-emphasis is introduced into the process. (Although pre-emphasis is sometimes frowned upon in professional recording, it is often quite appropriate to use it in digital mastering, when it may be introduced in a controlled manner in the digital domain, offering an additional improvement in subjective noise floor.) The noise is consequently boosted at the high end of the audio spectrum by a corresponding amount, and people disagree over how much boost is acceptable here. Too much may cause digital level meters to show a signal when none is present, due to the high level of inaudible HF noise, for example.

Informal listening tests comparing various forms of noise shaping and redithering caused some listeners to comment that they preferred the version which was simply redithered, rather than that which was noise shaped. Tony Griffiths of Decca has suggested that the reason for this may be similar to the phenomenon experienced when Dolby noise reduction first came out. He points out that people complained that Dolby processed material sounded as if it lacked HF, but this was actually because it had less noise. If you play a listener Dolby processed material with noise added after decoding, so that the Dolby material has slightly more noise than the non-Dolby version, most listeners will then say that the Dolby processed version has more HF. The impression of HF content in the programme material is closely linked to the amount of audible noise in the programme.

It may be, though, that too much HF noise boost is undesirable because it creates a level of HF noise in the programme that is abnormal, and unusual in real life—even if it is theoretically below the hearing threshold. Apogee Electronics claim that noise shaping is bad because it may mask useful audio information which would otherwise be contributing to the overall sound. We come back ▶

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to Michael Gerzon's assertion about subliminal perception. Concerns about excessive noise shaping have led to suggestions that around 9dB of noise reduction forms a useful compromise.

Subtractive dither

Gerzon and Craven have suggested using what they call 'autodither' to improve digital linearity, by using a randomised version of the audio signal to dither a quantiser (**Fig.1**). They also suggest that this dither can be recreated when the signal is replayed (since it is based on the audio signal), and then subtracted from the signal before output, in order to remove the dither noise and improve dynamic range (**Fig.2**). Normally this requires a special subtractive dither processor in the CD player on replay, but their buried data application avoids the need for this and makes it work on an ordinary CD player. A process of subtractive dither can add just under 5dB to the dynamic range.

96kHz DAT

Pioneer want to get 96kHz recordings into the prerecorded market place. One way for them to do this is to persuade duplicators to use their DAT machine for real-time duplication, and for 96kHz versions of standard albums to be put on sale. They quote one Japanese label which has issued two versions of an album on DAT, with one at 96kHz and one at 44.1kHz. More titles will be issued soon. Even so, DAT is not a mainstream consumer format and never will be. There are quite a lot of consumer machines in Japan, but almost none in the UK and Europe, so it is likely that Pioneer are on to a loser here.

It may be possible, though, for Pioneer to get their extra bandwidth onto CD using a method similar to autodither. As suggested by Komomura, by encoding the extra bandwidth data into the LSB using ADPCM, and using a pseudorandom algorithm to make it act as autodither, the information could be compatibly included on conventional CDs. CD players with suitable decoders would extract the information correctly, while ordinary players would see the information simply as dither noise. This approach would still require CD manufacturers to consider it worthwhile to make CDs using this technique, and would also require a sufficient number of CD players capable of a wide bandwidth. Again, it will only work if the improvement is considered significant enough, and if the bandwagon begins to roll. Probably it will be a specialised market, rather as direct metal mastered LPs were.

UV22 Super CD Encoding

Apogee do not use noise shaping to get better sound quality out of CDs. Instead they use a unique technique which involves introducing a 'carrier' at half the sampling frequency (22kHz) which they liken to analogue tape bias. The company claim that the dynamic range of CDs is fine for most applications, and so they do not try to modify the noise floor. Instead the system carries the additional information below 16 bits on this inaudible carrier which has the effect of allowing signals to be reconstructed which are as much as 30dB into the noise. The effect is noticeable on normal CD players with no additional decoding required. Apogee quote listening tests by many well-known engineers who preferred the effect to noise-shaping processes for 20 to 16-bit mastering.

Conclusion

High bit and high sampling-rate techniques are increasing in popularity with engineers, and the extra resolution that they provide does have a positive effect on sound quality. This improvement can be carried through in various ways to the consumer, who may or may not appreciate what is being offered. The question remains—would it perhaps be better to use the low level information capacity on CD for other purposes? The second part of this article looks at ways of burying all sorts of data inaudibly in the LSBs of a CD audio data stream, with applications that may be considerably more useful than slightly improved sound quality on a medium which to most people sounds more than adequate anyway. ■

Part two next issue.

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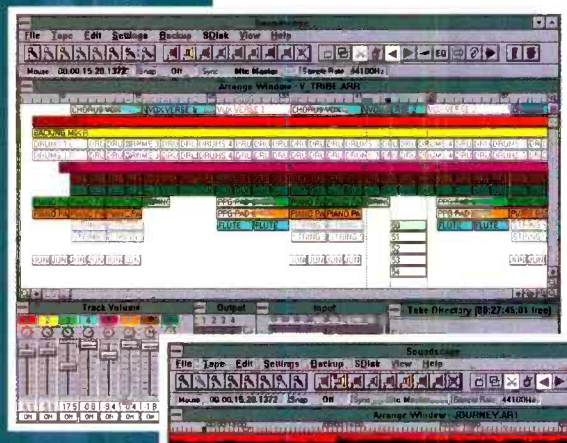

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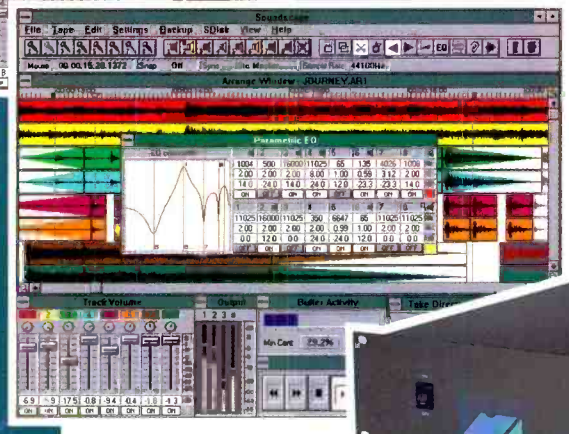

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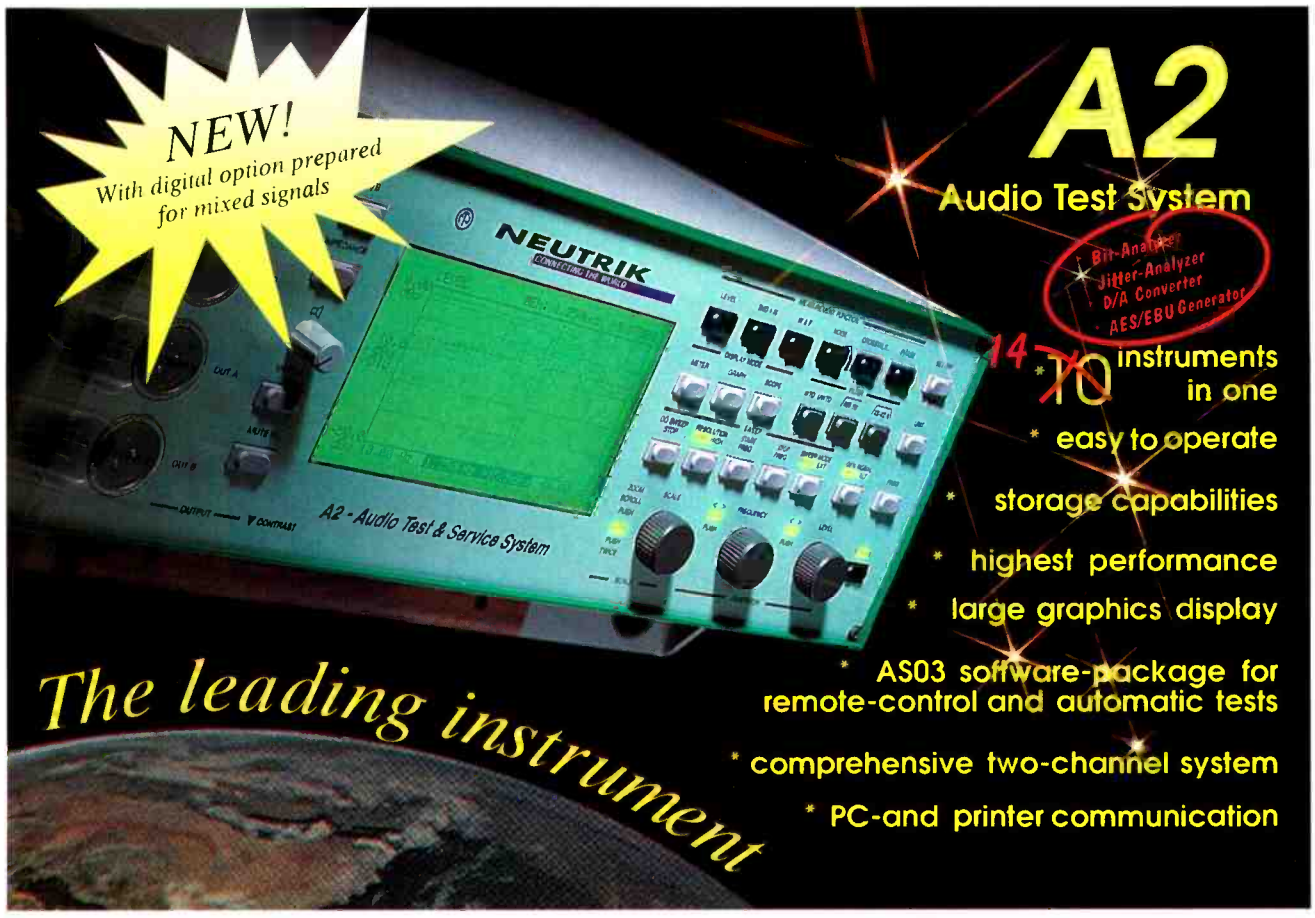

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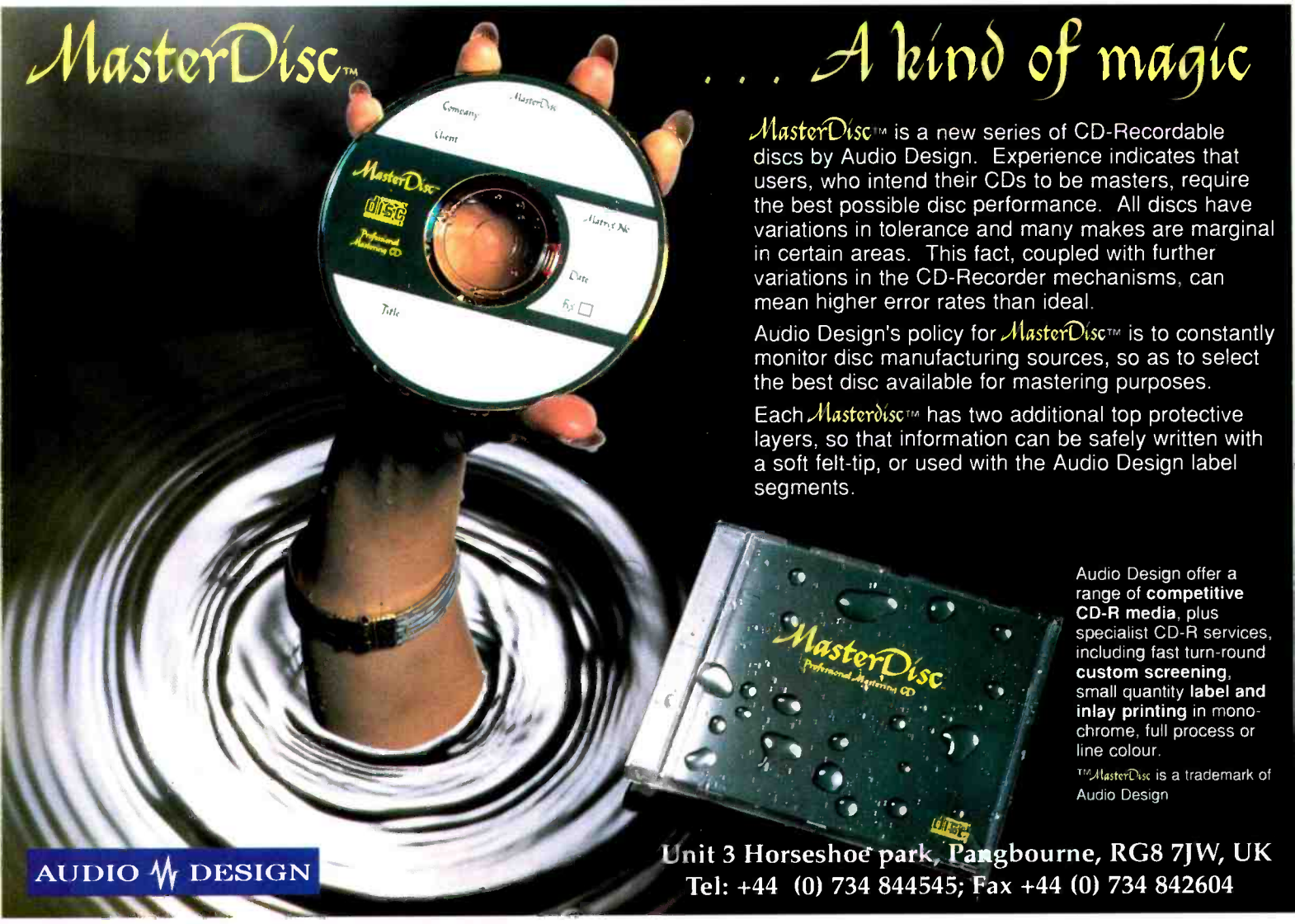

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Bayleys Plantation, St. Philip, Barbados, West Indies. (809) 423 6286; Fax: (809) 423 5154. Owner: E.M. Grant. **Studio/Bookings Manager:** P.A. Grant. **No. of studios & dimensions:** Studio 1: 35 x 36 ft. Control - 27 x 20 ft. **Mixing Consoles:** SSL SL 400E-52 Channels, Primary Computer with Remote, Total Recall and Plasma Metering. **Recorders:** 2 Otari MTR 90 MK11; 1 Tascam DA-88 8 Track Digital Recorder; 1 Ampex ATR 102 - ½ inch; 1 Ampex ATR 102 -¼inch. Digital Audio workstations, sound tools. **MIDI set-up:** Macintosh SE/30 with Performer 5.0; Motu Midi Time Piece; Akai Samplers/Drum Machines; Emax Keyboards & Sound Modules; Yamaha Keyboards & Sound Modules. **Monitors:** 1 Pr. JBL 4350; 1 Pr. Urei 809; 2 Prs. Yamaha NS10M; 1 Pr. Tannoys PSM 65; 1 Pr. Auratones. **Specified Outboard:** Yama Reverbs; Ams Reverbs, Ams Delays; Pultec Equalizers; Urei Compressors. **Specialised Services:** Accomodation, Catering, Satellite TV, Swimming Pool, Tennis Court.

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135 Long Circular Road, Maraval, Trinidad. (809) 628 6176-8; Fax: (809) 622 4064. Owner: Robert Amar. **Studio/Bookings Manager:** Sarah Mohammed. **No. of studios & dimensions:** Studio A - 60ft. x 70ft. x 18, Studio B - 35ft. x 28ft. x 10. **Mixing consoles:** SSL 4064G, Neve VR48 Flying-Faders. **Recorders:** Otari MTR90 -11(2). -Tascam Cassette Desks, Otari MTR 12½ inch and ¼inch - Mitsubishi x 880-32. JVC DAT Recorders with SMPTE Track - Akai MK1214 (12 tracks). **Digital audio workstations:** Otari DAR10, Protools 4 tracks. **MIDI set-up:** Akai S1100(2), Roland D50-D70-JX10P - U220-MK520 Akai S3000 Korg M1 T1, Kurzweil 250-2000, Atari Notator, Mac Q Base-Performer. **Monitors:** Myers HDI, Yamaha NS10, WestLake, Urei, BBSM-10-15. **Specified outboard:** Lexicon 480L (2), AMS DMX 15805, Qunatec ORSXL, Neve 2250-3 Comp. (2), Eventide H3000SE(2), Neve EQ(2), TC Electronic 2290(3), Tube Tech CL1B-PEIC(A). **A/V equipment:** JVC S-VHS VTR, Sony ¾inch Umatic. **Special Services:** Accommodations, Sailing, Sightseeing tours, Gym, Sauna.

COMFORT SOUND

26 Soho Street, Suite 390 Toronto, Ontario, Canada. 416 593 7992; Owner: Doug McClement. **No. of studios and dimensions:** 5 ton truck (26ft. x 8ft. Control Room). **Mixing consoles:** Neotek Elite (50 inputs). **Recorders:** Two Ampex MM1200 24 Track, 3 Tascam DA-83. **Monitors:** Tannoy NFM-8, Auratones. **Specified outboard:** Lexicon PCM70, PCM60, Eventide H3000, Yamaha 50X 900, 1500, Rev 7. **A/V equipment:** Closed circuit video of stage. **Special Services:** 24 track digital airpack can be flown anywhere in the world. **Association member:** AES, ITS.

FEEDBACK RECORDING

Recording
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Haraldsgade 27, 8260 Viby, Arhus. +86 11 52 00; Fax: +86 11 52 27. Owner: "Gnags" **Studio/Bookings Manager:** Henrik Kjaergaard. **No. of studios & dimensions:** Studio 1: 125sq. metres Studio 2: 50 sq. metres. **Mixing consoles:** Calrec A-8000; Amek 2500. **Recorders:** Otari MTR-100, Otari MTR 90, Otari MX-80. **Digital audio workstations:** Akai S-1100. **MIDI set-up:** Cubase. **Monitors:** Genelec 1033A, JBL, Dynaudio. **A/V equipment:** *Studio 1* - CONSOLE: Calrec A8000 56 ch. (64 frame), AMS mix automation, Custombuilt 24 ch effect return console. TAPEMACHINES: Otari MTR 100, Otari MX 80, Otari MTR 12½ inches master, Sony DTC 1000 (Pro Dat), Sony PCM F1, Aiwa cass. SPEAKERS: Genelec 1033A, JBL 4311b, JBL 4411 (backmonitor), Yamaha NS10, Aurotones, B&O blaster. EFFECTS: Lexicon 480, AMS RMX 16, AMS DMX, EMT 245, TC Electronic M 5000, EMT 140 (stereo tube), Eventide H 3000 SE, Lexicon LxP 1 & LxP5, Roland DEP 5, TC Electronic 2290, Bel delay, Roland 555, Roland Flanger, TC Electronic 1210, Audio Design Autopanner, Aphex. COMPRESSORS: Urei 1176 LN (2), dBx 165 (4), Drawmer 1960, dBx 900 (s-limiters, gates & compressors). GATES: Dynamite (2), Drawmer (2). EQUALIZERS: Tube Tec (2), K+H Universal tube eq. Klark DN 27 (2), Massenburg. MICROPHONES: Sanken, Neuman, AKG, B&K, Shure, Electrovoice. SYNC INSTRUMENTS: Timeline Lynx, Event controller, Akai Linn PCM 60, Atari/Steinberg, Kawai Grand Piano, Emulator. *Studio 2* - CONSOLE : Amek 2500, 36 ch. TAPEMACHINES: Otari MTR 90 Mk 2, Studer B67 ¼inch, Sony DTC 1000 DAT, Aiwa cass. SPEAKERS: DynAudio, JBL 4311b, Yamaha NS 10, Aurotones, B&O blaster. EFFECTS: Yamaha Rev 1, TC Electronic M 5000, Lexicon PCM 70, EMT 140 (stereo tube), Eventide H3000, Lexicon LxP1 & LxP5, Roland Dep 5, TC Electronic 2290, Bel BD 80. COMPRESSORS: Urei 1176 LN, dBx 903, dBx 902, Drawmer, Dynamite/Valley People. GATES: Dynamite, Drawmer, dBx 904, OT Lab (custombuilt) (13). EQUALIZERS: Focus Rite 115 HD, Neumann mic. pre amp & eq's (10), Klark DN27. MICROPHONES: Sanken, Neuman, AKG, Bruel & Kjaer, Shure & Electrovoice. SYNC: Timeline Lynx, Event controller. INSTRUMENTS: Akai Linn PCM 60, Atari/Steinberg, Emulator, Roland D550, D110 & JX8p, Yamaha TX 802 & Oberheim DPX1.

HANSA TONSTUDIOS GMBH

Kothener Str. 38, D-10963 Berlin, Germany. 030 261 1811; Fax: 030 262 8806. Owner: Thomas Meisel. **Studio/Bookings Manager:** Matthias Hartl. **No. of studios & dimensions:** Studio 1: 3 rooms covering 180 sqm/MIDI-studio: 70sqm. Concert Hall - 280 sqm for Stuido 1. **Mixing consoles:** Studio 1: SSL 4000 G-Series 64 Ch. Total Recall/Midi-Studio: ADT SMT 40CH. Sony 3348, 2 x Studer A820 Dolby SR, Studer 824. **Recorders:** DAT Sony 7010, Studer ½ inch 1¼ inch. **Digital audio workstations:** Spectral Synthesis. **MIDI set-up:** Atari Notator, Akai S1000 32 MB, Akai S1100 32 MB. **Monitors:** Quested 412B, DYN Audio, NS10 Yamaha, Auratones. **Specified outboard:** Lexicon 480, 224, 224 x L1 300, PCM 70 Eventide H3000, etc. **Special services:** Accomodation 4 rooms, restaurant etc.

HOWARD SCHWARTZ RECORDING INC.

420 Lexington Avenue, Ste 1934, New York, NY 10170, USA. (212) 687 4180; Fax: (212) 697 0536. Owner: Howard Schwartz. **Studio/Bookings Manager:** Beth Levy-Davis. **No. of studios & dimensions:** 9 Audio for Video Post Production Studios. **Mixing consoles:** 3 SSL; 4 Sony; Mackie. **Recorders:** Studer A827; Sony 3324 + 3348; Otari ATR 90, Sony 7030 DAT Panasonic 3700 DAT, etc. **Digital audio workstations:** 2 Siemens AudioFile; 5 SSL Screen Sound; 1 Synclavier Co. Post Pro 5D. **Monitors:** Urei; Yamaha; **Specified outboard:** Comprehensive Selection. **A/V equipment:** Video: 9 3/4 VTR's; 5 1 inch VTR's; BETA SP VTR; 2D-2 VTRs; 4VHS VTR's; 7 TimeLine and Adam Smith Lockup Systems. **Special Services:** IDB + ED net Digital Communications services; Video Fax; Des Audio Fax; Nagra + Mag XFGRS; Music Recording. Remote Recording, ADR Recording, Duplication and Trafficing. **Association member:** SPARS, AES, ITS

KIVA MEMPHIS

904 Rayner Street, Memphis, Tennessee 38114, USA. 818 990 1296; Fax: 818 990 3309. Owner: Gary R. Belz. **Studio/Bookings Manager:** Gary R. Belz & Vicki Seeger. **No. of studios & dimensions:** Studio A: 1350 Sq. ft. Control Room A: 550 sq. ft. ISO A: 302 sq. ft./Studio B: 210 sq. ft. Control Room: 440sqft. Studio C: Midi Room. **Mixing consoles:** SSL 4056G 48 x 32 with Total Recall automation & G Series computer/Westar 52 x 24 with Neve Flying Faders automation, API 16 x 4 discrete, Tascam M3000. **Recorders:** (2) Mitsubishi X-850

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32 trk. digital, Studer A-827 24 trk. analog Mitsubishi X-800 32 trk. digital, Studer A-800, 24 trk analog, TASCAM TSRS. **Digital audio workstations:** (2) Yamaha C300, (2) Nakamichi BX-300. **MIDI set-up:** Studio B: Midi productions/Studio C: midi and preproduction. **Monitors:** Studio A: TH Kinsohita 24Hz Studio B: JBL 4435 with T.A.D. components.

LION STUDIOS

115B Commonwealth Drive 02-00, Singapore 0314. (65) 4734527; Fax: (65) 4741273. Owner: Lion Studios PTE Ltd. **Studio/Bookings Manager:** John Herbert. **No. of studios & dimensions:** 2 Studios. Studio 1: Control = 60sq/m, Recording = 170sq/m, Studio 2: Control = 32sq/m. **Mixing consoles:** Studio 1: Polygram Custom 40/24/24 Studio 2: Studer 089 12/2/2. **Recorders:** Studer A80 24Trk + Dolby SR / A80 2Trk + Dolby-A/PCM1630 + DMR2000. **Digital audio workstations:** Studer "Dyaxis" - 1.3GB HD + System Synchroniser. **MIDI set-up:** AKAI S1000 + LIB./Yamaha SY77 + LIB./Oberheim Expander Yamaha DX7 + LIB./RTL "Event" SMPTE to MIDI synch. **Monitors:** Quested 212/JBL 4333A/Philips 587/NS 10Ms/Auratones. Hill, Harrison, Studer & Yamaha Amps. **Specified outboard:** EMT 140TS, Lexicon 200, Rev 7, Spx 1000, Spx 90, AMS 15-80s, Drawmer 500, Eventide H949, Ensoniq DP/4, Polygram Complimitors, Gates & De-essers etc. **Special Services:** Multitrack recording & Mixing, 2 trk digital editing, CD Tape mastering & PQ coding in house engineers. **Association member:** AES.

METROPOLIS RECORDING STUDIO

Via Carroccio, 5 - 20123 Milano - Italy. +39 2 89400452/34; Fax: +39 2 89400452. Owner: Company. **Studio/Bookings Manager:** Giovanna Seganini. **No. of studio & dimensions:** Studio 1 (SSL control room) Mq.40,
Studio 2 (Sapphyre control room) Mq.20 **Mixing consoles:** SSL 4056 G w/TR, Soundcraft Sapphyre 44ft. **Recorders:** Otari DTR 900 II - Studer A 800 III with Dolby SR. **Digital audio workstations:** Digidesign Pro Tools. **MIDI set-up:** Akai S-3200/Korg WS-AD/Prophet VS/Prophet T-8/Roland JV-80/Roland D-550/Korg EX-8000/Yamaha TX-816 etc. **Monitors:** Urei/Genelec/Yamaha **Specified outboard:** Lexicon 480L v4.0 + Classic cart. Lexicon 224XL/Lexicon 224/2 x Lexicon PCM 70/Lexicon Vortex/Ensoniq DP/4 / Yamaha FX-900 - REV 7-SPX 90/Roland Dimension D/ Lexicon 20/20 AD, etc. **A/V equipment:** U-Matic Sony 5850/Audio Kinetics ES1.11 & Motionworker/Sony monitors/Large SFX libraries Vintage Minimoog - Polymoog - Rhodes Mk.1 - TR-808 - Space echoes Digital mastering - editing/Sampling libraries.

SAWMILLS STUDIO

Golant, Fowey, Cornwall, PL23 1LP. 0726 833752; 0726 833338; Fax: 0726 832015. Owner: Dennis Smith. **Studio/bookings manager:** Ruth Taylor. **No. of studios & dimensions:** One Studio, 220sq. ft. + 600sq. ft. **Mixing consoles:** Trident 80B Castonised 54-24-24 Automated. **Recorders:** Otari MTR90 - Ampex ATR 102½ inch - Tascam DA88 Technics DAT Sony F1. **Digital audio workstations:** Sound Tools. **MIDI set-up** Cubase + Atari Mega 4's - S1000 + keyboards & outboards. **Monitors:** Quested 212's - Yamaha NS10. **Specified outboard:** Lexicon 480L & PCM 60+70 - BSS + Drawmer + Urei + Valley People + Aphex + Yamaha + loads more. **A/V equipment:** Synchronisers + bring your own Umatic etx. **Special services:** Fully inclusive residential rates with 24 hour maintenance. Most unique location in the UK.

SOETELIEVE STUDIOS

Goudsmidstraat 16, 5232 BP Hertogenbosch, The Netherlands. +31 73 408400; Fax: +31 73 424880. Owner: Paul Stienstra. **Studio/Bookings Manager:** Paul Stienstra/Daan Banaan. **No. of studios & dimensions:** 1 studio//floorspace 150m. **Mixing consoles:** Sony MXP 3056 VF. **Recorders:** Sony 3324 A, Studer A827, Sony 7030. **MIDI set-up**: Atari - & Apple Computers, various midi work systems. Akai S-1000, Korg OIR/w, Roland JD-800. **Monitors:** Quested 412, Genelec 1031A, ATC SCM-20, Yamaha NS 10, Tannoy Eclipse, Tannoy PBM 6.5. **Outboard:** AMS 15-80, AMS RMX 16, Lexicon 480L, Lexicon PCM 70, TC 2290, Eventide H 3000 SE, Yamaha SPX 1000, Yamaha REV 7, Sony DRE 2000A, Focusrite ISA 215, Tube-Tech Comp. EQ, Urei 1178/1176, Drawmer and DBX Gates. **Special services:** Accommodation, Catering, Satellite TV, Steinway Grand Piano, Hammond B3 + Leslie, Rodes Mark 1.

SOUNDMIRROR, INC.

76 Green Street, Jamaica Plain, MA 02130 USA. +1 617 522 1412; Fax: +1 617 524 8377. Owner: Soundmirror, Inc. **Studio/Bookings Manager:** John Newton (Boston); Henk Jansen (Holland). **Number of studios & dimensions:** 3 post-production studios; 1 24m recording room. **Mixing consoles:** (3) Studer analog mixing console - 42 total inputs; (1) Lexicon Opus digital console with automation (24 channel); (1) Benchmark 5 x 2 mixer. **Recorders:** (2) Sony 3324 with Apogee filters; (1) Mitsubishi X-86 2-track 20-bit digital recorder; (4) Sony 1630; (3) Sony DMR 4000; (3) Sony DMR 2000; (1) Studer A80 ¼inch analog with Dolby; (2) Sony PCM 7030 timecode DAT; (2) Sony PCM 2500 DAT; (2) Sony D3 portable DAT; (2) Sony DTC 700 DAT; (3) Nakamichi cassette deck 2. **Digital workstations:** (1) Lexicon Opus 24-track workstation with automation; (1) Sonic Solutions 24-track 20-bit digital workstation; (2) Sony DAE-3000, equipped for 2-track stereo editing, direct DAT editing, and 24-track digital editing. **Monitors:** B&W 801M; B&W 802M; B&W 803; B&W 805; B&W CM-½; Quad ESL 63. **Specified Outboard**: 50 assorted condenser microphones, including Neumann TLM-50, B&K 4006 and 4011, Sanken, and complete set of Schoeps KM 100 series; SigTech AEC-1000 acoustic correction filter; Lexicon 480L; Lexicon 300; Lexicon LFI-10; Sony DAL-1000 limiter/compressor; DCS-900B 20-bit multi-format AD convertor; Apogee AD500; Apogee DA1000; Apogee UV-1000; Soundmirror/Ultra Analog 20-bit AD convertor; Sony DFX-2400 sample rate convertor; Dolby and DBX. **A/V Equipment:** Sony BVU 800 video recorder; Adam-Smith Zeta 3; Mitsubishi 35 inch monitor; VHS and Beta machines; Opus and Sonic locked to picture. **Special services:** Multitrack location recording capabilities around the world. Offices in Holland and Boston. Digital post-production capabilities include 2 - to 24-track editing, 24-track fully automated mixing and CD mastering. A two-room audio/video production suite offers a voice over recording room with an adjoining control room/editing suite. A fully isolated machine room common to all studios allows complete flexibility. In-house engineers and producers. **Associate member:** AES.

SOUND ON SOUND RECORDING, INC.

322 West 45th Street, New York, N.Y. 10036. + 212 757 5300; Fax: + 212 757 5816. Owner: David Amlen. **Studio/bookings Manager:** Ann Selznick. **No. of studios & dimensions:** Studio A: 31ft. x 27ft., Control Room A: 20 ft. x 18 ft. Drum Iso: 15ft. x 12ft., Iso 1: 10 ft. x 6ft., Iso 2: 8ft. x 4ft. Studio B: 24ft. x 16ft. Control Room B: 21ft. x 17 ft., Iso 1: 15ft. x 8ft., Iso 2: 6ft. x 5ft. **Mixing consoles:** Neve VR60 Legend with Flying Faders, SSL 4064G+ with Ultimation. **Recorders:** Studer D820 48-track recorder, Studer A827 24-track recorders, Otari and Studer 2 and 4 track recorders, Panasonic DAT recorders. **Digital audio workstations:** Sonic Solutions. **MIDI set-up:** Yamaha DX7, Chroma Polaris, Prophet 600, Akai S900, Emu Systems SP12, Atari 1040ST with C-Lab Creator, Korg M1R music workstation. **Monitors:** Urei 813A, Genelec 1031A, Tannoy PBM 6.5, Yamaha NS10M, E-V Sentry 100A, JBL 440l, Auratone 5C, Bryston and Yamaha Amplifiers. **Specified outboard:** AMS, Aphex, dbx, Drawmer, EMT, Eventide, Lexicon, Pultec, t.c. electronic, Teletronix, TubeTech, Urei, Valley People, Yamaha. **A/V equipment:** JVC CR825OU ¾inch video recorder, Sony 27 inch and 20 inch monitors. TimeLine Lynx synchronizers with CCU/SSU machine control. **Special services:** Analog-Digital transfers, Studer compact disc recorder, staff engineers and in-house production, convenient mid-town Manhattan location, private lounges with kitchen, cable, video and catering. **Association member:** SPARS.

SOUNDVILLE RECORDING STUDIOS AG

Grimselweg 5, 6005 Lucerne, Switzerland. (041) 4498 44; Fax: (041) 44 98 42. Owner: Rene Zingg. **Studio/Bookings Manager:** Mr. Rene Zingg, Mrs. Renate Jauch-Wagner. **No. of studios & dimensions:** Studio A: 75m2 net, control-room 32 m2 net. Studio B: 20m2 net, control-room 27 m2 net. Studio C: copy room 6m2 net. Studio D: Mastering studio 21 m2 net. **Mixing console:** Westec LT 3000, Soundcraft 2400 with bargraph display. **Recorders: A**: Studer D 820-48 digital 48-track, Studer A 800 III, Studer A 820 2-track, Panasonic 3900 DAT-Recorder. **B**: Otari MTR 10 2-track, Otari MTR 90 II 24-track. **Digital audio work-stations:** Studer Dyaxis harddisk. **Midi set-up:** all usual pieces available. **Monitors: A:** Hidley/Kinoshito model 2.2, Westlake BBSM 4. **B:** Studer A 723 activ monitors, Yamaha NS 10 M. **Specified outboards: A:** Lexicon 480L/Lexicon 224 X/EMT 251, Tube-tec compressor CL 1A, Tube-tec programme equalizer PE 1B TC 2290 DDL 4 sec, AMS DM 20-2 tape phase simulator Kepex II, Gain brain II, Urei 1176 LN limiters, Aphex compellor Aphex II studio aural exciter, Aphex studio dominator, Aphex 612 expander/gate, SPL SX 2 psycho dynamic processor.
B: Yamaha REV/Ibanez SDR 1000/Alesis midiverb II Urei 1176 LN limiter, 4 Aphex EQF-2 equalizer, 2 Aphex CX-1 compressors/gates, Yamaha D 1500 digital delay. **A/V equipment:** U-Matic and S-VHS players; TV-monitors, synchronizers etc. **Special services:** Inhouse accomodations/accomodations in beautiful Lucerne can be arranged by the studio. Mastering/audio for video/film. **Association member:** AES (Audio Engineering Society).

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ILLUSTRATION: CARL FLINT

Barry Fox

Some heavy technology and a little light reading

Every time a record company uses 'gee whiz techobabble' to try and sell more records, they seem to come unstuck. The only question is how long they take to rediscover the fact of life that record-buyers are buying music, and do not give a fig for technology.

CD was slow to take off because it was launched as a laser miracle. The format started to move when people found out how gloriously convenient CDs are to use, as compared to LPs.

CBS failed to win acceptance for the CX noise reduction system for LPs, just as the earlier DBX disc system failed. People did not want to clutter their homes with more black boxes. CBS, EMI and RCA wasted a fortune on quadraphonics for the same reason. Even systems that do not need a black box fail. Whatever happened to Q Sound? And the whole record industry, through trade body the IFPI, made a fools of themselves over Copycode, the CBS technology that was supposed to end home taping.

Now we have a rash of new ideas for making CDs sound better, by making better use of the extra bits on greater-than-16-bit studio masters. So far at least, Sony have not fallen into the trap of trying to sell records on the back of Super Bit Mapping. But Deutsche Grammophon have spent the last year, and vast amounts of money, trying to publicise its use of 4D Audio Recording.

The idea of 4D, a marketing buzz word for making the digital chain as clean as possible and involving a process called Authentic Bit Imaging, was launched before the press in March 1993. It could and should have taken a couple of days for DG to answer the simple questions which were prompted by the technical information which DG put out to the press. Instead, DG let the whole business spiral into a vortex of confrontation and ill will.

I have deliberately written nothing about 4D in *Studio Sound* since my flippant piece last year (July 1993) provoked the quite vitriolic response from DG's Stefan Shibata which was subsequently published (August 1993) without comment from me.

Even though it was called at absurdly short notice, and the invitation list specifically excluded Engineer-Writer Tony Faulkner (who had also questioned DG's claims), I went to the round table meeting in August which DG's President Gianfranco Rebulla had suggested as a way of clearing the ever-thickening air. Unfortunately Rebulla did not attend his own meeting, so he did not see how Stefan Shibata took the interesting line that if I was not clever enough to understand how 4D worked, and differed from SBM, he was not going to explain it to me.

As the whole campaign of widely distributed press releases had been in preparation for an advertising campaign, I played fair and warned DG that if the adverts looked misleading, I would file a complaint with the Advertising Standards Authority. I suggested in advance of the round table that we should use it as an opportunity to talk about the adverts. DG refused, the adverts appeared in magazines and I complained to the ASA.

The gist of my the complaint was that even DG's own technical literature called into question the advertiser's claims to '21-bit conversion' and '100% error-free' signal processing. Common sense tells that if you are going to make technical claims, you steer clear of terms like '100%'.

At the round table Stefan Shibata had made clear that he respected the technical ability of one person present, reviewer and consultant Martin Colloms. Writing afterwards in US magazine *Stereophile* (November 1993), Colloms described DG's claims as 'misleading'.

The ASA have now published their comments. These encapsulate what I said a year ago, namely that the technical claims made in DG's press literature, adverts, sleeve notes and so on were 'inappropriate' because they were not explained.

For a few hours this looked like being the end of the matter. DG in the UK had promised an answer to the obvious question—what now happens about the adverts in other countries and the CD sleeve notes —as soon as the ASA had reported.

But no. DG have now issued a statement saying they will try and get the Audio Engineering Society in New York to discuss the questions of what can, and cannot, be reasonably described as 21-bit conversion.

This, of course, is exactly what I was trying to ask DG a year ago.

Surely this must finally, prompt DG's parent PolyGram to start asking a few questions. Such as how much have DG now spent on defending 4D against questions? How many extra records has this wholly unnecessary controversy sold to people who buy music because they like music, and have not the slightest interest in how many bits have been used to record it? Would it not have made more sense for DG's parent PolyGram to spend that money on priming the DCC market pump?

Need a nice light book that you can dib into on a plane journey, in between eating, drinking, sleeping and watching movies? Even if you are not a jazz buff, try *The Jazz Anthology* by Miles Kington (Harper Collins, £6.99).

Kington seems to have read every book on jazz, many of which are pretty tedious, and collected excerpts of the most entertaining bits of writing. Some excerpts are very short, like 'I arrived on the job in what I considered to be a perfect state of equilibrium, half man and half alcohol', from Eddie Condon's book, *We Called it Music*. Others like musician-architect Sandy Brown's description (from the *McJazz Manuscripts*) of how and why audio restorer John R T Davies 'left' his band, stretch for a page or two. Brown's description of Bleak House (Number 4 Fawley Road, just round the corner from Decca's old studios), is a gem. 'At one time 100 musicians would be living in West Hampstead, at least 50 of them seemingly at Fawley Road', wrote Brown.

I particularly liked Philip Larkin's description of how he 'listened in vain' for the 'powerhouse drumming' promised on the sleeve of recordings made by the Chick Webb Orchestra in 1934–5; 'Once I heard a noise like a couple of heavy suitcases being put down, but that was all.' This quote would have fitted nicely on the sleeve of a CD recently released by GRP. *Spinnin' the Webb* is a collection of 1930s recordings made by Chick Webb while working at the Savoy Ballroom. GRP used Sonic Solutions' *NoNoise* to clean up the sound and it could well make the best example yet of how computer technology, if carefully used, really can make music sound better. *NoNoise* has quite magically converted Chick Webb's suitcases into real drums. ■

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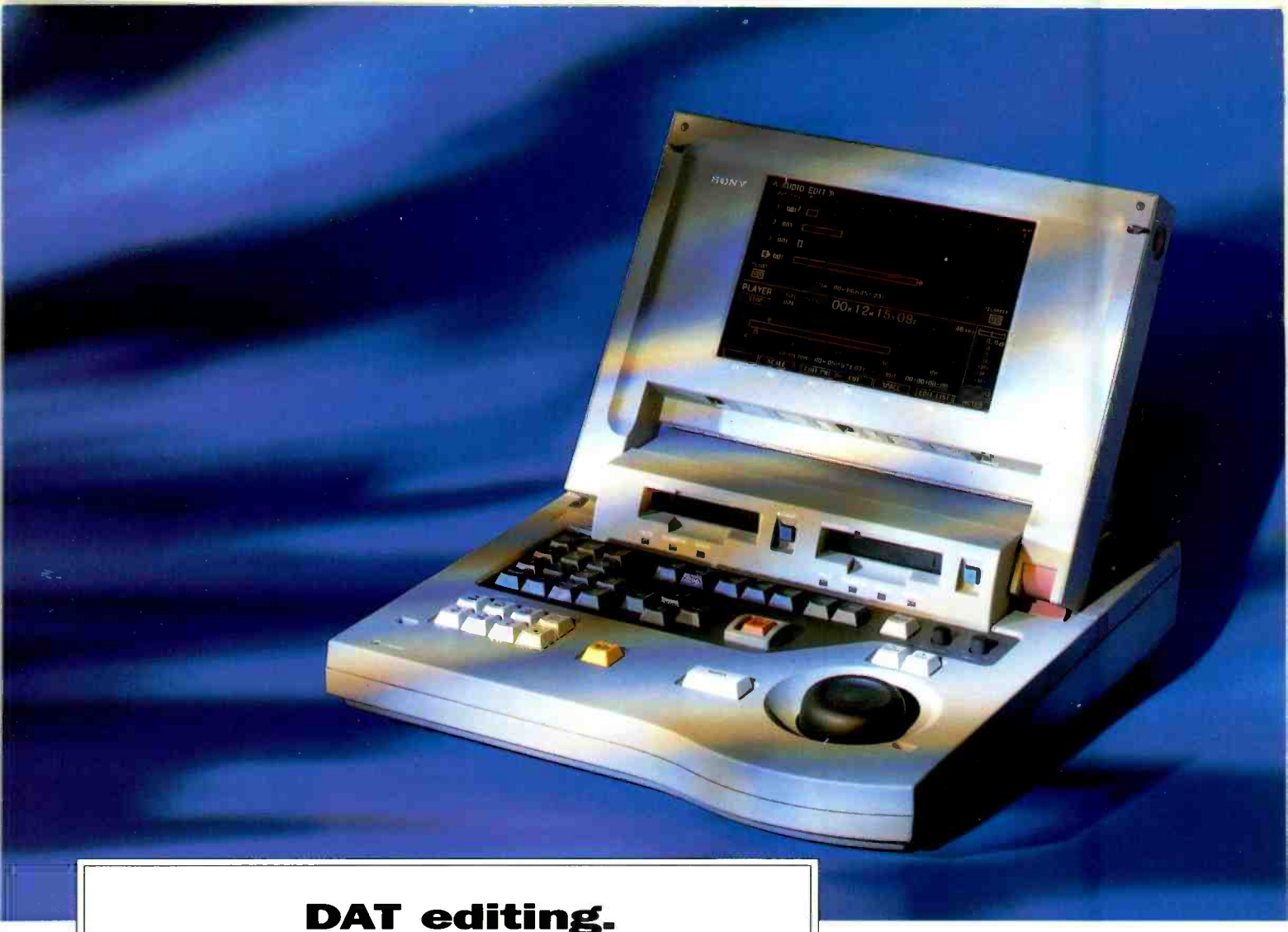

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