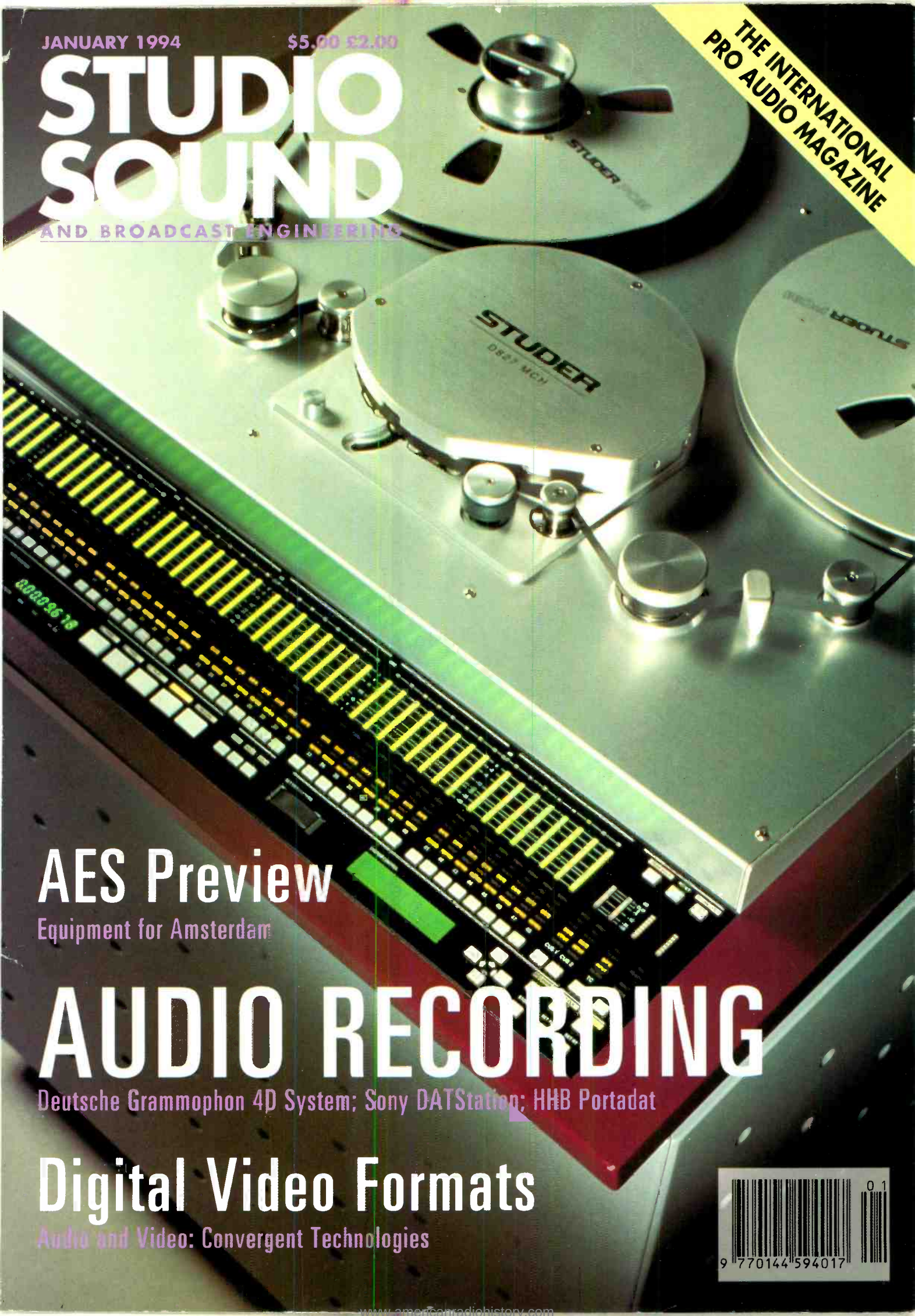

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Allen Sides, Ocean Way

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Allen Sides, Owner
Ocean Way, Los Angeles

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AND BROADCAST ENGINEERING

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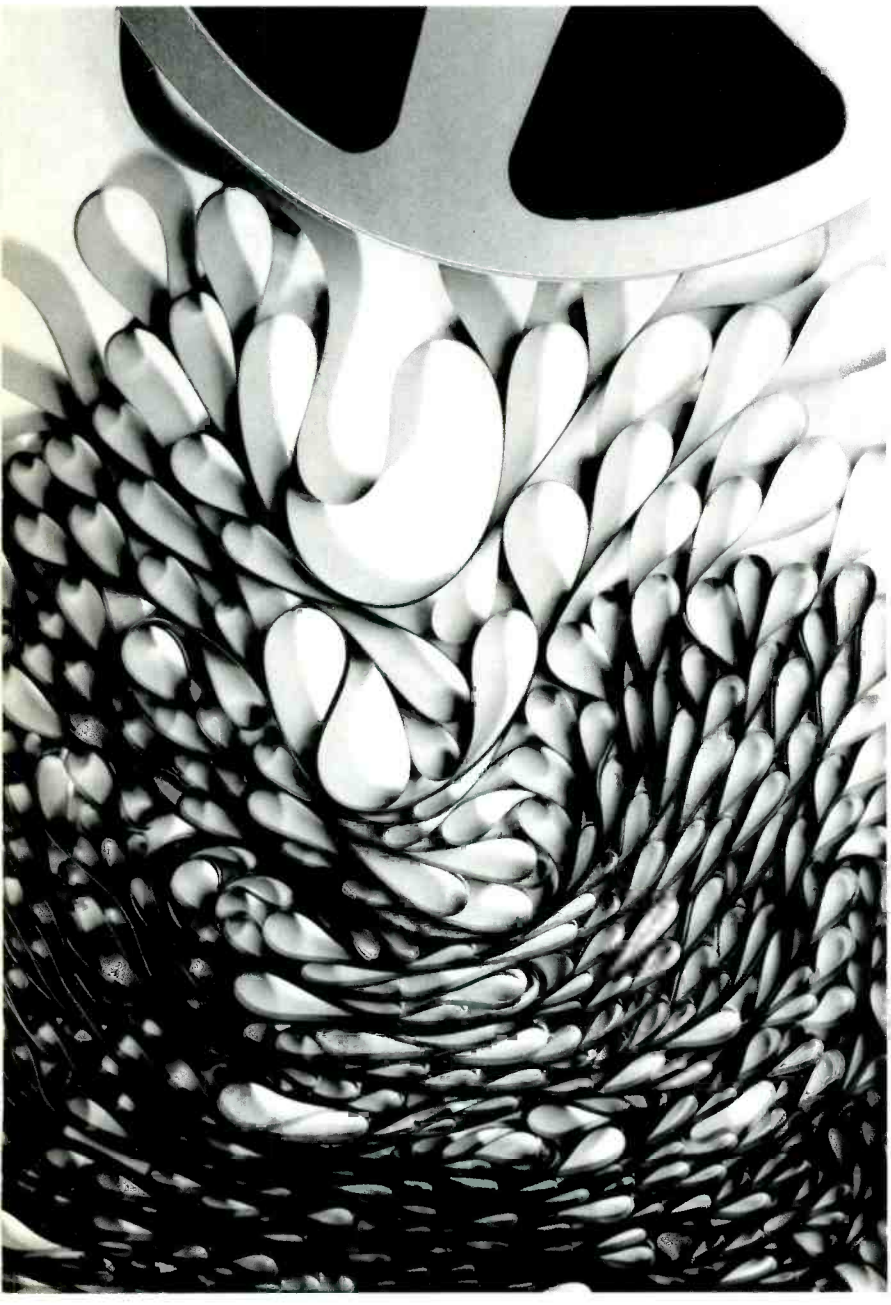
UNREEL



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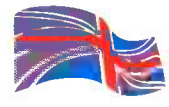

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Playing the game

What price freedom of choice? What cost economies of scale?

It is a constant anathema to me that an industry (music) which trades on its vitality (musical and technological) is actually very, very conservative. Traditionally, the popular music of the day—jazz, rock 'n roll, protest, punk, rap and so on—has provided one of the channels of youth rebellion. Yet the industry charged with the responsibility of disseminating the music has increasingly been dominated by those against whom the rebellion is directed.

Let us be clear about this: music was not created to serve the music or recording industries, our industries have evolved to serve the practical needs of music. I concede that it is unrealistic to expect a business to selflessly reflect such volatile and unpredictable forces as those behind popular music, but to oppose them is likely to prove a destructive policy.

The complications all seem to arise when business takes an interest in art. While the pro-audio industry has it within its means to influence (and consequently damage) the work of the artist, larger business interests have acquired similar power over both music and pro audio.

In the formative days of music recording, it was the ingenuity of a handful of inspired people which shaped the traditions you and I inherited. There was no prospect of big business politics then, only the desire to create the technology demanded by musical progress. In music itself, the same forces were at work: the names of Les Paul and Robert Moog sit in tandem with those of Alan Blumlein and Rupert Neve. As the music business grew in profile, however, their success made such innovators logical targets for business forces.

Today Robert Moog's company, along with its instruments, are part of music's history. And while Rupert Neve continues to make a valuable contribution to console design, the company that bears his name is owned by a massive Austrian conglomerate. The work of these pioneers has either been displaced by big business or assimilated into it. There are many other examples (some probably better) but Moog and Neve serve us well.

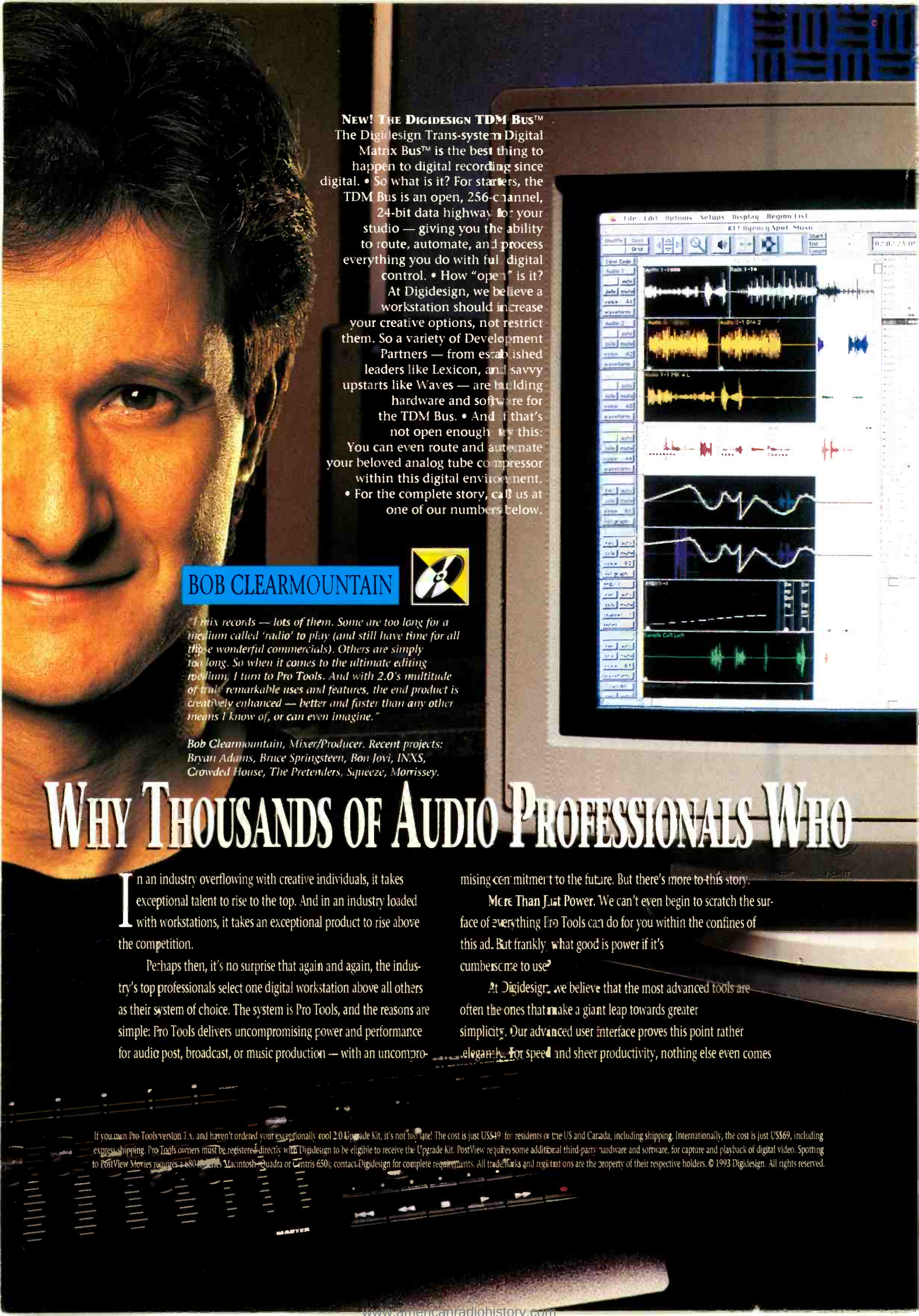
Big business has plenty to offer a small industry—especially in times of economic hardship. But one of the consequences of monopoly, or even near-monopoly, of design, manufacture or supply, is the loss of freedom of choice. Quite apart from the loss of individual alternatives, standardisation is one of necessary evils of large companies; the creative individuals (including those involved in audio recording) suffer in the interests of economies of scale and other business 'systems'. While we desperately seek it in certain areas of our activity, standardisation has its disadvantages too...

Yet it is hard to justify having freedom of choice when we so often make little of it. Take the example of analogue recording tape: why, when there are new formulations of tape being devised to reflect the performance of digital recording systems and media, are so many recordings made on tape largely designed 20 years ago? Why should a large company, making business decisions, continue to make considerable R&D investment to offer us alternatives if we fail to take them up?

If we are to make the best of an environment controlled by businessmen (and women), we need to learn a few of their rules. For without them we may see our right to choose take its place in history with Moog Music, the *Spruce Goose* and the wall drawings concealed in nautiliod caves of Lascaux. ■

Tim Goodyer

Cover: Studer *D827* digital multitrack recorder



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The Digidesign Trans-system Digital Matrix Bus™ is the best thing to happen to digital recording since digital. • So what is it? For starters, the TDM Bus is an open, 256-channel, 24-bit data highway for your studio — giving you the ability to route, automate, and process everything you do with full digital control. • How "open" is it? At Digidesign, we believe a workstation should increase your creative options, not restrict them. So a variety of Development Partners — from established leaders like Lexicon, and savvy upstarts like Waves — are building hardware and software for the TDM Bus. • And if that's not open enough, try this: You can even route and automate your beloved analog tube compressor within this digital environment. • For the complete story, call us at one of our numbers below.

BOB CLEARMOUNTAIN

"I mix records — lots of them. Some are too long for a medium called 'radio' to play (and still have time for all those wonderful commercials). Others are simply too long. So when it comes to the ultimate editing medium, I turn to Pro Tools. And with 2.0's multitude of truly remarkable uses and features, the end product is creatively enhanced — better and faster than any other means I know of, or can even imagine."

Bob Clearmountain, Mixer/Producer. Recent projects: Bryan Adams, Bruce Springsteen, Bon Jovi, INXS, Crowded House, The Pretenders, Squeeze, Morrissey.

WHY THOUSANDS OF AUDIO PROFESSIONALS WHO

In an industry overflowing with creative individuals, it takes exceptional talent to rise to the top. And in an industry loaded with workstations, it takes an exceptional product to rise above the competition.

Perhaps then, it's no surprise that again and again, the industry's top professionals select one digital workstation above all others as their system of choice. The system is Pro Tools, and the reasons are simple: Pro Tools delivers uncompromising power and performance for audio post, broadcast, or music production — with an uncompromising commitment to the future. But there's more to this story.

More Than Just Power. We can't even begin to scratch the surface of everything Pro Tools can do for you within the confines of this ad. But frankly, what good is power if it's cumbersome to use?

At Digidesign, we believe that the most advanced tools are often the ones that make a giant leap towards greater simplicity. Our advanced user interface proves this point rather elegantly. For speed and sheer productivity, nothing else even comes

If you own Pro Tools version 1.x, and haven't ordered your exceptionally cool 2.0 Upgrade Kit, it's not too late! The cost is just US$49 for residents of the US and Canada, including shipping. Internationally, the cost is just US$69, including express shipping. Pro Tools owners must be registered directly with Digidesign to be eligible to receive the Upgrade Kit. PostView requires some additional third-party hardware and software, for capture and playback of digital video. Spotting to PostView Movies requires a 680x0 series Macintosh (Quadra or Centris 650); contact Digidesign for complete requirements. All trademarks and registrations are the property of their respective holders. © 1993 Digidesign. All rights reserved.

PostView™: More Than A Pretty Picture

Welcome to the future of audio post-production. • Digidesign's new PostView option for Pro Tools delivers full-frame, fully-synchronized random-access video, to serve as a fast and easy reference for spotting sound to picture. You can even scrub your audio in frame-accurate sync with the PostView Movie on the same monitor screen as your Pro Tools session, or, if you like, on two separate screens. • PostView also includes VTR Control, an easy and effective transport control system for external video and audio transports which allows Pro Tools to serve as the control master. • PostView: Think of it as picture-perfect-audio-for-picture.

HARRY SNODGRASS

"Audio post-production for feature films is no picnic. With non-stop deadlines, I need a workstation that works as hard as I do — and that's Pro Tools. Sure, I've used other systems. But they don't offer the features and speed of Pro Tools, and they don't offer me the future I see with the TDM Bus and PostView. As for Pro Tools' quality, my clients couldn't be happier, and that's really what counts in this business."

Harry Snodgrass, Sound Designer. Recent projects: Aliens 3; Beverly Hillbillies; Robin Hood: Man in Tights; Hot Shots, Part Deux.

NEED THE RIGHT TOOLS TURN TO PRO TOOLS™

close. The result? More projects in less time, and an outstanding return on your investment.

More Than Just Today. You'll be glad to know that by investing in Pro Tools you are investing in a very bright future, as well. By developing key technologies, such as our new Digidesign TDM Bus, we're opening the door to a plethora of options, and a long life for your investment.

More Than Just Talk. Of course, you don't have to take our word for all of this. But maybe you *will* take the word of the gentlemen pictured above — just two of the many acclaimed professionals who swear by their Pro Tools systems. And if you're still unsure, do the smart thing. Check out any other competing system, at any price. Check the user interface for speed, ease, and flexibility. Check the sound for pure sonic performance. Check how open the system is for expansion today and tomorrow.

Then check out Pro Tools. We're confident that you'll find, just as Bob and Harry did, that when it comes to professional digital audio production tools, there's no substitute for Pro Tools.

PRO TOOLS

For more information about Pro Tools, the Digidesign TDM Bus, PostView, or any other Digidesign product, call one of the Digidesign Dealers listed below:

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- MR Music and Video - London 071-700 0600
- Sound Control - Glasgow 041-204 2774
- Sycon - London 071-625 6070
- Systems Workshop - Shropshire 0952-658550
- TSC Professional - London 071-724 8327
- Turnkey - London 071-379 5148
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International News

in-brief

● **New low-cost radio service starts**
On-Line Radio has launched a new low-cost service providing one-to-one interviews with radio stations throughout the UK from its studio in London. The company uses ISDN lines to provide broadcast-quality audio to radio stations who want the interviews.
On-Line Radio. Tel: 081 964 4720

● **Rob Castle moves up in Korg**
Rob Castle has been appointed Managing Director of Korg UK. 'A reflection of the progress made by the company since the transition from Rose Morris.' commented Korg President Seiki Kato. Paul Bundock has been promoted to Technical Services Manager.
Korg UK. Tel: 081 427 5377

● **Sonosax goes West**
Five months after the takeover of StellaVox, Sonosax have announced the completion of modifications on the *StellaDAT* and have started a USA branch of the company, Sonosax USA.
Sonosax USA, 5417 Cahuenga Boulevard, North Hollywood, CA 91691. Tel: +1 818 766 3137. Fax: +1 818 766 2859

● **Siemens man joins *DISQ* team**
Peter Kehoe, former Siemens Audio Eastern Region Manager, has joined AT&T Digital Studio Systems as Central-Eastern US Regional Manager.
AT&T. Tel: +1 212 765 3415

● **BSS expand commercial operation**
BSS have expanded the sales operation in the company's UK headquarters. The new Commercial Operations Group is headed by Roger Keenan; the sales division by Dave Haydon; Dave Neal has joined as Marketing Manager.

● **Control Sythesis for analogue**
Music Control, a leading European supplier of analogue synthesisers, has formed a new company to design and build professional analogue audio equipment. The first product, called *Deep Bass Nine*, is a MIDI-controlled analogue bass synthesiser, based on the sounds from Roland's *TB303*.
Music Control. Tel: 0270 883779

● **Mark Opitz moves to Capri**
Australian Producer Mark Opitz, who has worked with AC-DC and more recently produced INXS' last album, has relocated to Europe and will now act as Capri Digital Studio's consultant.

Capri Owner Carloquinto Talamona (left) and Producer Mark Opitz

Weiss takes over from Harmonia Mundi

From the 1st January 1994 the Harmonia Mundi Acustica *BW102* system as well as the *Penguin* and the *IBIS* will be distributed and serviced by the designer of the system, Daniel Weiss Engineering.

Harmonia Mundi Acustica is no longer responsible for any issues regarding the *BW102*, *Penguin* or *IBIS*. The system names will change to Weiss *102 Series*, Weiss *Penguin Series* and Weiss *IBIS Series*.

The reasons that led to the split are quoted as being to optimise business for lower overall costs; improvement of customer support in general and shortening of delivery times.

All enquiries should be directed to: Daniel Weiss Engineering Ltd, Florastrasse 10, 8610 Uster, Switzerland. Tel: +41 1 940 20 06. Fax: +41 1 940 22 14.

When dubbing mixer Hugh Mitchell-Dawson applied for freelance work at Oasis Television in London they didn't have a dubbing suite. Three months later he had built them one and started running it for them. The full story is in *Studio Sound* soon, but the picture above shows the dubbing suite with an *AudioFile* and the first AMS-Neve *Logic 3* installed in the UK.

Baccus to us

Our review of the *Francinstien* stereo enhancement system from Baccus professional in last month's issue has generated some very worthwhile enquiries. More worthwhile than normal perhaps as we printed the wrong telephone number by mistake. The correct one is 0234 840408.

Lucasfilm announces OMF support

Lucasfilm Ltd and Lucas Digital Ltd have announced that they have become official sponsors of the Open Media Framework (OMF) Interchange. On becoming sponsors, the Lucas companies, which include Industrial Light & Magic and Skywalker Sound, are solidifying their previously announced plans to develop all-digital postproduction environments within their facilities.

'Based on the Lucas companies' years of experience in the film, entertainment, visual effects and audio postproduction industries, we are well aware that one of the single biggest barriers to creating a seamless postproduction environment for artistic freedom lies in the current level of difficulty users encounter when trying to exchange digital media between proprietary applications and computer systems,' stated George Lucas. 'OMF provides the solution to this problem.'

Industrial Light & Magic, Skywalker Sound and LucasFilm Ltd, have identified projects in each facility where the implementation of OMF-compliant products will be tested. Following these tests, Lucas companies will begin actively encouraging vendors of additional products used in the facilities to integrate OMF support.

Lucasfilm Ltd.
Tel: +1 508 640 3158

Skywalker—part of Lucasfilm

More radio bands

Following many requests and after discussions with The Radiocommunications Agency an additional eight frequencies have been made available for use for radio microphones in the UK. The new frequencies are available at the same fee of £100 per year per frequency.

ASP Frequency Management Ltd. Tel: 0296 7704548.

EXISTING FREQUENCIES	
ML 14	854.900
ML 15	855.275
ML 16	855.900
ML 17	860.400
ML 18	860.900
ML 19	861.750

NEW FREQUENCIES	
ML 20	856.175
ML 21	856.575
ML 22	857.625
ML 23	857.950
ML 24	858.200
ML 25	858.650
ML 26	861.200
ML 27	861.550

Harman and AKG merge distribution

In order to strengthen the distribution of AKG, Harman have announced that they will be transferring several AKG group brands to their Borehamwood offices.

As from 1st January 1994, the distribution of AKG microphones and headphones, dbx signal processors and Orban broadcast products will be distributed directly by Harman from Borehamwood.

The announcement now confirms Harman Audio as the UK's largest professional audio distributor, with a portfolio encompassing; JBL, AKG, dbx, Orban, Allen & Heath, UREI, C-Audio, Steinberg, ART and Rivera.

There will be no change to the existing distribution of EdgeTech Group products, which include TurboSound sound reinforcement, Quested monitoring and BSS signal processing products.

Harman Audio, Unit 2, Borehamwood Industrial Park, Rowley Lane, Borehamwood, Herts. WD6 5PZ. Tel: 081 207 5050. Fax: 081 207 4572

Sinatra duets with dummy head

CRL's new *Sensaura* microphone system mirrors the human hearing process, uses DSP to encode the signal from a dummy-head 'binaural' microphone arrangement and enabling it to be replayed on normal stereo speakers. (See right.) The resultant recording presents a 3-D sound image.

The system has already been used on Frank Sinatra's *Duets* album and on Milla Jovovich's forthcoming album and in many experimental classical recordings at Abbey Road and Symphony Hall, Birmingham.

CRL's engineers have been making *Sensaura* recordings using Yamaha *AD8X* A–D convertors, to supply a 19-bit digital signal to the *Sensaura* multichannel signal processor, and the Yamaha *DRU8* 8-track 20-bit digital recorder.

Yamaha-Kemble UK Ltd. Tel: 0908 249194.

The aftermath of the fire at Studio Tivoli in Slovenia. The desk was an ancient (their own words) Soundcraft model. Master tapes from two recent productions were in the studio. A backup copy of one was stored in a metal box and was playable!

Help wanted! Disaster in Slovenia

Among the horrors of the war in former Yugoslavia comes a story of disaster and possible financial ruin for an owner of a recording studio.

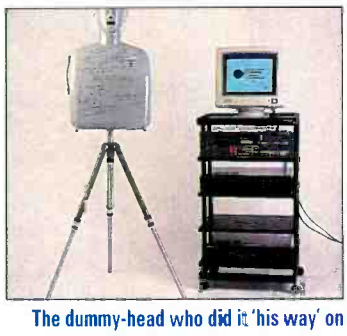
Tivoli Recording Studio started in 1979 in Ljubljana, the capital of Slovenia. Late last year it was burnt beyond recognition not by any act of war but by a fire starting in the cabinet housing main monitors, video monitor and power amplifiers.

The really bad news is that Aco Razbornik, the owner, had no insurance. He had not renewed his policy after the Croatian insurance company he was with had some organisational problems.

The studio is now asking for help in any form to put the studio back into shape.

Aco Razbornik will be at the AES in Amsterdam drumming up support or he can be contacted at:

Studio Tivoli, 61117 Ljubljana, Dolomitska 9, Slovenia. Tel-Fax: +38 61 574 850.



The dummy-head who did it 'his way' on Sinatra's last album *Duets*

Congratulations to Ken Townsend of Abbey Road on receiving his MBE from all at *Studio Sound*

Nimbus apply video squeeze

Nimbus Information Systems are the first CD-ROM replication house able to offer a MPEG-1 compression service in house allowing the transfer of up to 75 minutes of full motion, full screen video on to disc.

Emil Dudek, director of CD-ROM at Nimbus commented: 'Nimbus has invested in the compressing facility because we strongly believe that video on disc will have a firm foothold in the market.'

Multimedia developers can now include video on PC, Amiga CD^{32} or CD-I platforms.

NIS receives video material on *D1* digital tape for treatment. The video can be formatted for CD-K, or CD-I or CD-ROM. It is returned on CD-R with audio multiplexed or separated, for further work to be carried out by developers.

Nimbus Information Systems. Tel: 0633 867777.

Contracts

● **Euphonix UK—first sale of 1994**
Phil Manzanera, Producer, Guitarist and Songwriter with Roxy Music is taking delivery of his new Euphonix *CSII-CS2000* console for his new mixing facility within his Gallery Studio complex in Surrey, UK

● **Mobile decked out with a *Sequel***
ASP's Mobile based in Graz, Austria have recently fitted out their Mercedes truck with a Soundtracs *Sequel*, supplied by the company's Austrian distributor, Audiosales.

● ***M4*'s for London's Battery 4**
Battery Studios in London have installed *M4* main monitors by DynaudioAcoustics.

● **First B&Ks to Thailand**
A large order of B&K *4006s*, *4011s* and *4011s* have been ordered by Studio Concepts for a Bangkok recording studio. Also a package of 6 *4006s* and 12 *4011* mics have gone to two studios in Russia.

● **More *D/ESAM 800*s to Hollywood**
Graham-Patten Systems have now supplied a total of 10 *D/ESAM Series* digital edit suite audio mixers to Hollywood Digital.

● **Videolondon's *Synclavier* feast**
Over the last 15 months, Videolondon soundstudios have bought their fourth, fifth, and now sixth *PostPro* workstations to keep up with the new business they have gained.

● **dCS and the Masters**
Masterdisk, New York, have taken delivery of a dCS *900B* Reference A–D convertor. Bob Ludwig's Gateway Mastering have taken delivery of two dCS *980* SDIF-2 distribution boxes and a dCS *988* AES-EBU distribution box.

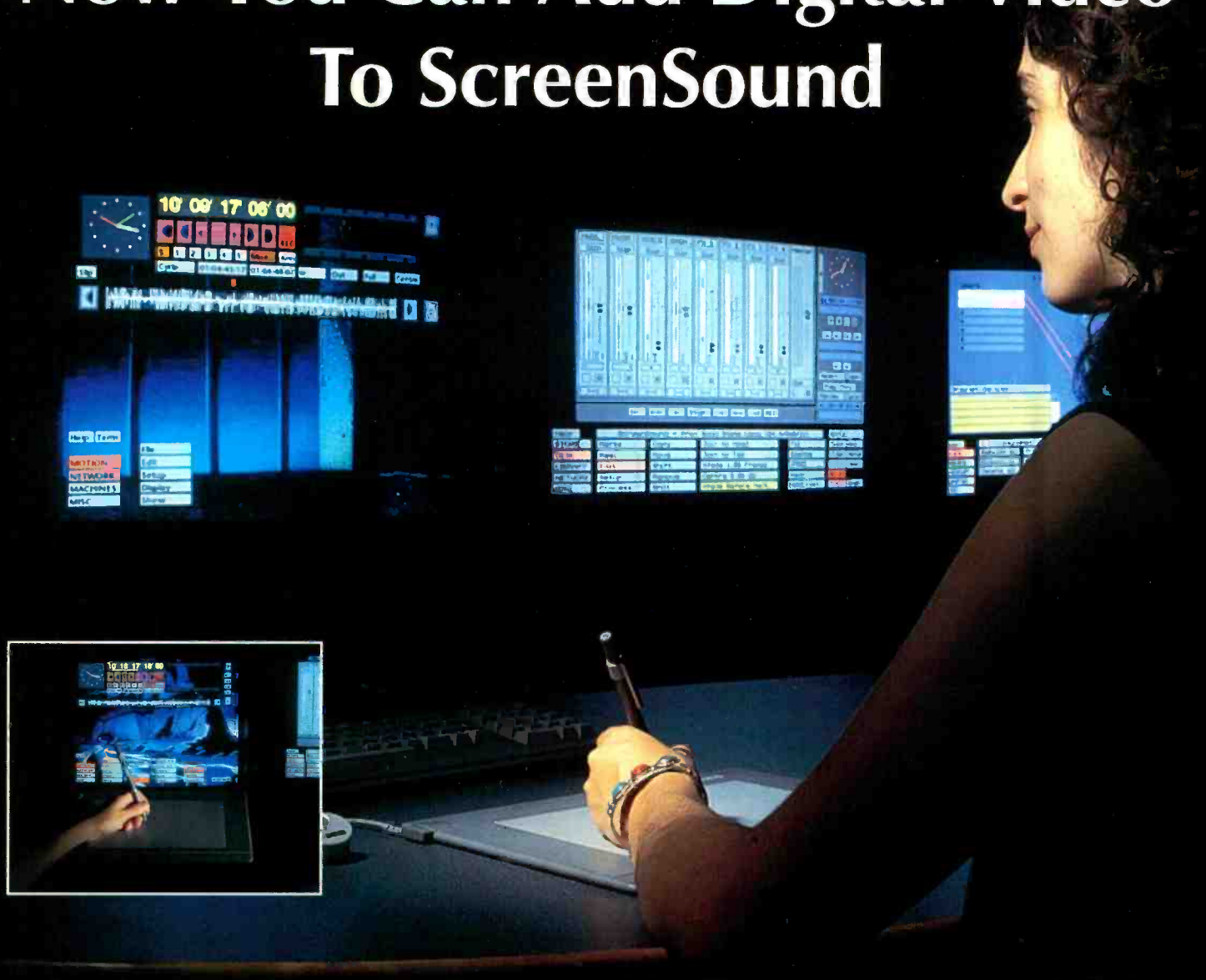
● **Radio Stations for UK and US**
Recent sales of the in-ear monitoring system from Garwood Communications include Michael Bolton with 4 systems; Lenny Kravitz, Luther Vandross; Deborah Harry; Tears for Fears; Depeche Mode; UB40 and DuranDuran.

● **A *Sapphyre* for a church**
The Metropolitan Church in Belfast has confirmed an order for a 52-channel Soundcraft *Sapphyre* console from Walker Audio.

● **Focusrite sign up for BearTracks**
Focusrite have announced the signing of a contract to supply a 72-input, *Studio* console to BearTracks, located in the country 30 minutes from Manhatten. The console will be the first in the US with *Flying Faders* automation.

● ***Iron Man* opens with Autograph**
Pete Townsend's new rock opera *The Iron Man* has opened in London with a sound system by Autograph Sound Recording featuring Meyer loudspeakers and a CADAC desk.

Now You Can Add Digital Video To ScreenSound



ScreenSound V5 combines a new faster processor with major operational advances, like internal reconform of your audio to EDLs. You can even add random-access video with SSL's VisionTrack.

Together, the new, faster ScreenSound and VisionTrack provide instant access to audio and picture at any cue or mark point. With spool time and machine lock-up problems eliminated, you can dramatically speed up your editing, voiceover and ADR sessions.

VisionTrack even comes with its own machine control port and audio recorder, allowing you to load both sound and picture off-line, saving valuable ScreenSound time.

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- Off-line loading of sound and picture
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New, Faster ScreenSound

More space for Wembley

Wembley Loudspeakers have announced the release of a sound processing system known as *3D Storm*. The full system comprises two products, both of which can operate as independent systems.

The first of these is the *BASE* processor which enhances the ambient acoustics present at the time of recording and has been on the market now for a number of years. The second part of the system has been developed by a company called Sound Dynamics who aim to provide a solution for all spatial sound scenarios. *3D Storm* is a package of hard and software that provides real-time control over the position and trajectory of sound in three dimensions.

As with the *BASE* processor when it is functioning independently, *3D Storm* can be installed at almost any point in the audio chain, making it equally suitable for both live and studio-based operations.

The package is composed of an Atari *ST* computer, the *3D Storm* software, and a 19-inch 1U rackmounted sound processing unit which provides the interface between the computer and the audio signal. Options are available to control either the trajectory and position of a mono source or else a complete stereo image may be manipulated in real time.

The software provides the user with a window on the computer screen which represents the sonnd positioning area. Next to it is a list of library moves which, when selected using the mouse, are loaded into the window. A 'tape deck' facility is provided beneath the window to control the BPM (beats per minute) of the component moves within the sound pattern described, and the movement of the sound may be started, paused and stopped at any time using the tape deck symbols on screen. You can also describe your own sound patterns in the window and save them to the library.

A PC version of the software is scheduled for completion in the next six months. The UK price includes installation and two days training.

***Monitor Ones* from Alesis**

Wembley Loudspeakers, Unit 4, Askew Crescent Workshops, London. W12 9DP.
Tel: 081 743 4567.
Fax: 081 749 7957.

JamMan from Lexicon

The *JamMan* digital sampler from Lexicon promises to provide an entirely new method for creating sampling effects. Extra features include echo and loop facilities.

In sampling mode, the sample record or playback can be controlled via tapping on a front panel switch, footswitch, or even by input level audio trigger. Foot pedal control of sample recording, playback and tempo allows you to 'play' *JamMan* like any other instrument.

In echo mode, the echo time can be easily set to match the tempo of the music played using the Tap Tempo feature, rather than having to set a delay time. The echo time can also be cut in half, third or quarter of the original time for quick, rhythmical changes while staying in time.

In the loop mode, the unit allows the creation of infinite repeat loops, with the ability to layer as much information as required on top of these loops, as well as being able to play over the top of them.

Lexicon, Inc, 100 Beaver Street, Waltham, MA 02154-8425.
Tel: +1 617 736 0300.
Fax: +1 617 891 0340.
UK: Stirling Audio, Kimberley Road, London. NW6 7SF, UK.
Tel: 071 624 6000. Fax: 071 372 6370.

Alesis Monitor One

Alesis have started shipping their *Monitor One* nearfield studio monitors. The speakers feature SuperPort venting technology, which avoids the 'choking' effect of a smaller, shorter port, for solid high-power bass transients and low-frequency response.

The LF 6.5-inch driver is a proprietary design with a mineral-filled polypropylene cone and a 6.5-inch voice-coil wound on a high-temperature Kapton former. The 1-inch silk-dome HF driver is ferrofluid cooled and fed by a crossover network at 2500 Hz. The *Monitor One* features high power handling (120W continuous program, 200W peak).

Alesis Corp, 3630 Holdredge Avenue, Los Angeles, CA 90016, USA. Tel: +1 310 558 4530.
UK: Sound Technology, Letchworth Point, Letchworth, Herts. SG6 1ND, UK. Tel: 0462 480000. ▶

Lexicon bring you the *JamMan*

In-brief

● Soundcraft monitors show
Soundcraft showed their new top-end stage monitor console, the *SM24*, at the Live Show in London. *SM24* features 8 mono plus 16 mono or stereo sends, and an additional dedicated stereo sidefill send, with logic controlled solo system.
Soundcraft. Tel: 0707 665000

The popular *SV3700* now available from HHB

▲ HHB secure *SV3700* supplies
HHB have secured UK distribution rights for Panasonic's *SV3700* DAT machine. HHB went direct to the manufacturer to keep supplies going. Engineered to fully professional standards, the machine features XLR analogue I-O with 1-bit A–D convertors, switchable sampling rates, AES-EBU digital I-O, a shuttle wheel and infra-red remote control.
HHB Communications.
Tel: 081 960 2144

● DDA introduce *microFILE*
DDA has introduced the *microFILE* VCA fader automation system designed for use with several DDA mixing consoles. The system consists of 8-channel VCA motherboards which link to an under-console-mounted proprietary computer via ribbon cables. It can be either factory-fit or field retrofit to DDA *QMR*, *DMR-12*, and *Forum Composer* consoles. **DDA.**
Tel: 081 570 7161

● SoundTech power amps
SoundTech has introduced a new range of power amplifiers called the *Power Source Series* that are based on digital switching power supply technology. First out is the *PS1300*, a stereo amplifier capable of 650W RMS into a 4Ω load.
SoundTech. Tel: 708 913 5511

● Koss introduce the Quiet Zone
The Quiet Zone noise reduction stereophone unit from Koss incorporates active technology. It reduces low frequency noise (down to 30Hz). The processor generates antinoise which counteracts the original sound. **Koss.**
Tel: +1 414 964 5000

The *d2d*, designed specifically for glassmastering direct from CD-R masters, without modification of the original system

d2d from StageTech

d2d, Disc-to-Disc mastering system, has been developed by StageTech for glassmastering directly from CD-R. It requires no hardware or software modifications of the existing glassmastering system.

The *d2d* simulates the VTR and the *PCM 1630*, which means that it monitors to the VTR remote and sends SMPTE, PQ-burst and SDIF 2.

Other features are continuous checking of the source-disk's error rate, and read-after-write. The system also generates a report on laser printer that contains information about the error rate, the number of tracks, subcode information, CD format, etc.

The first generation is designed for one-session CD Audio and CD-ROM. Other formats to be supported in the near future is CD-ROM XA, CD-I, PHOTO CD and multisession discs.

StageTech. Tel: +46 40 15 00 18. Fax: +46 40 15 00 19.

An Aachen Head

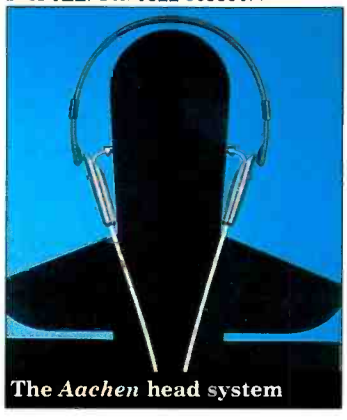
Head Acoustics in Germany have launched their Artificial Head Measurement System, Aachen Head, after extensive research in conjunction with scientific institutes, universities and research companies.

The device has already been used by major car manufacturers for noise reduction inside and outside cars. Binaural acoustic testing of crankshafts, engine enclosures, diesel-driven generator sets, tyres, air conditioners and new damping materials has become essential for modern manufacturers.

By developing head-related stereophony in studio conditions, Head acoustics are capable of integrating sound sources with spatial integrity resulting in faithful loudspeaker reproduction.

The system consists of the *BAS* —Binaural Analysis System, a 2-channel, human hearing equivalent acoustic measurement system for audio signals; the *HMS II* Head Measurement System, which is the artificial head, all binaural processing mechanisms as well as the effects of simultaneous, premasking and postmasking are taken in to account; the HEADphone Playback System *HPS III* is used to reproduce signals recorded with the artificial head; *BFS*, Binaural Filter System, allows simultaneous filtering of the right and left channels; *BHM*, Binaural Head Microphone constitutes a wearable binaural Head measuring device for locations; HEAD recording system, *HRS II*, allows live recording with loudspeaker compatibility provided by electronic equalisation; and the Binaural mixing console, BMC, allows conversion of mono signals into human hearing adapted spatial events.

HEAD Acoustics GmbH, Kopfbezogene Aufnahme-und, Wiedergabetechnik, Messtechnik, Kaiserstrasse 100. D-5120 Herzogenrath 3.
Tel: +49 2407 577 0.
Fax: +49 2407 57799.
UK: HEAD Acoustics UK Ltd, 4 St Martins Drive, Eynsford, Kent. DA4 0EZ. Tel: 0322 863350. ▶



The *Aachen* head system

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For the first time, there's an audio mastering system that incorporates the latest laser technology.

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It means a storage medium on ready-formatted, erasable magneto-optical disc, providing random access that's virtually instantaneous.

It means a pristine recording surface, untouched by any part of the record/playback mechanism.

And it means that a single unit for recording and simple editing can be all you need. Compatibility with current and future Sony editing systems is guaranteed.

The new PCM-9000 MSdisc recorder is exceptionally compact, and because it has a modular design, you pay only for the functions you need.

What's more, it offers 80 minutes of full 20-bit digital sound quality today, with 24-bit capability already built in for tomorrow.

Put it all together and one thing's clear.

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Sennheiser introduced the *K6* modular system to the replace the successful *K3* system

Sennheiser change *K3* range

Sennheiser UK has introduced a replacement for its *K3* modular condenser microphone system, a standard for theatre and A-V applications, and used extensively with OB and ENG units.

The *K6* system, like its predecessor, consists of a common power unit with a wide selection of interchangeable microphone heads.

New low noise electronics and microphone capsule designs have resulted in better quoted specifications, improved sound quality and greater operational versatility, with up to nine alternative capsules.

Changeable capsules include omnidirectional, cardioid, supercardioid, lobar and boundary microphones, as well as two new *MKE 102-60* tie-clip and *ME-65* vocal mic options.

Sennheiser Electronic, Postfach 10 02 24, 3002 Wedemark 2, Germany. Tel: +49 51 30 600 366. Fax: +49 51 30 6312.
UK: Sennheiser UK Ltd, B2 Knaves Beech Business Centre, Loudwater, High Wycombe, Buckinghamshire. HP10 9QY, UK. Tel: 0628 850811. Fax: 0628 850958.

Deltron multiple connectors

Deltron jack plugs

Deltron extend

Deltron Components have extended their DGS pro-audio range. New are the Universal Panel cut-out multiple (XLR) plugs and sockets and a series of professional ¼-inch jack plugs.

The multiple connectors are offered in 3, 4, and 5-way configuration either in satin nickel or black chrome finish, with contacts either silver plated or five microns gold plated. Deltron's colour coding system is incorporated in the design, and can be used when components are front mounted onto panel.
Deltron Components.
Tel: 081 965 5000. Fax: 081 965 6130.

Digital Audio Times

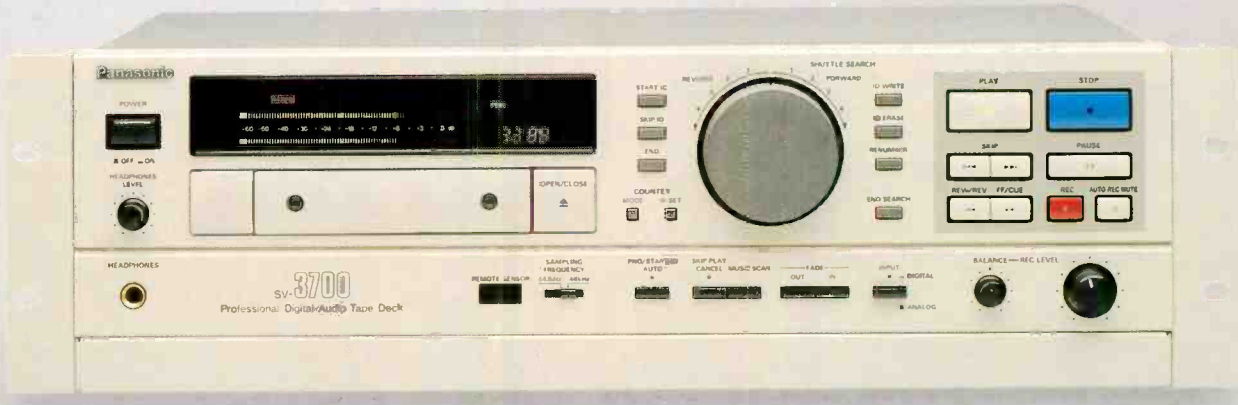
FOR THE LATEST IN DIGITAL AUDIO INFORMATION

WORLDWIDE DAT RECORDER SHORTAGE-BUT NOT AT HHB

When Panasonic UK decided to stop importing the excellent SV3700 Professional DAT Recorder into the UK, the world's leading independent supplier of DAT technology - HHB Communications - went direct to the manufacturers to secure ongoing supplies. As a result, we're pleased to announce our appointment as a key UK and European distributor of the DAT recorder that's already a firm favourite with US audio professionals - the Panasonic SV3700.

HHB also remains tireless in its search for the type of suitably featured consumer machines that offer exceptional value to professional users. Our latest discovery is Aiwa's superb XDS1100 - see below for full details.

HHB SECURES UK DISTRIBUTION OF PANASONIC SV3700 DAT RECORDER



The Panasonic SV3700 is a fully professional DAT recorder featuring high performance 1 bit A-D converters, switchable 44.1 / 48 kHz sampling rates, AES/EBU digital I/O, a shuttle wheel and infra-red remote control. Remember, this superb machine is exclusive to HHB and our authorised dealers. Call today for details of your nearest stockist.

BEWARE - ALL DAT TAPES ARE NOT THE SAME

Although priced competitively with conventional brands, HHB DAT Tape exhibits consistently lower block error rates. What's more, it's available in 6 lengths (15, 30, 48, 62, 92 and 122 mins). Call our mail order hotline on 081 960 2144 for details of prices and quantity discounts. All major credit cards accepted – 24 hour delivery.

AIWA XD-S1100: ANOTHER HHB EXCLUSIVE

With a highly reinforced double construction chassis, 3 motor drive mechanism, coaxial and optical digital interfaces and a wireless remote, Aiwa's superb XD-S1100 is perfectly configured for private studio use. And like everything we supply, it's fully backed by one of the most experienced and respected technical departments in the business.

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INTELLIGATE XR2000

The German Behringer company have been making determined efforts in recent months to raise their profile through prominent advertising, with the result that more people are probably aware of its existence than previously. Their products are still not among the most familiar, however, this is despite comprising of an extensive range of signal processors, most of which are of the dynamic or control variety.

One of the units they have been pushing hardest is the *Intelligate*, a flexible expander, gate and ducker with one or two novel aspects. This is a 2-channel stereo device, (apparently) designed quite specifically with corrective gating functions in mind, with the result that it has few frills and extras on it; it makes up for this, however, with an unusually comprehensive set of controls for its basic function, making it a more precise, flexible tool than most.

Perhaps the most obvious indication of this is that the unit makes no distinction between the roles of gating and expansion, in the sense that there is no switch to select between the functions. Rather, it acknowledges that, in a way, an expander is to a gate what a compressor is to a limiter. Just as a limiter is nothing more than a compressor working very hard, so a gate is an expander at its extreme settings. Thus the *Intelligate* provides, in addition to the usual Threshold and time constant controls, both Ratio and Range adjustments. A range control is not that unusual; several gates allow the available gain reduction to be restricted so that 'Closed' does not necessarily mean 'Silent'. Less familiar is the provision, alongside, of a control for the expansion ratio. For gentle expansion, this can go as low as 1.2:1, while the maximum of 30:1 gives, effectively, conventional open-and-shut gating.

The envelope controls provide wide and useful ranges of adjustment, with maximum Hold and Release times of 4s and 2s respectively. Behringer are particularly proud of their attack time, which goes down to 3µs, and go into some detail about their Class-A VCA. This, they claim, has particularly good control feedthrough characteristics, minimising breakthrough of control voltages into the audio path and thereby reducing the possibility of clicks at fast attack times. I had not heard this suggested as a problem before; it is common knowledge that too fast an attack time on a signal with significant low frequency components is likely to click as it cuts into a waveform, but the danger of fast-rising control voltages being audible was a new one on me. That said, the *Intelligate* does seem much less prone to clicks, and if they should be a problem the attack time does not seem to need so much backing off to eliminate them. This in turn means less damage to transients than is forced on you by some gates.

Some units attempt to compensate for the occasional slight softening of leading edges by adding a peak of extra gain as the gate opens. Since there seems less need for it, this is not really missed on the *Intelligate*, but it is noticeable that this and some other features found elsewhere are not offered, such as Masking between successive openings and Delay —never an audio delay but a pause between the signal crossing threshold and the gate actually opening. This kind of thing tends to be used for more aggressive, creative treatment, perhaps at the expense of the finer control necessary to deal with really difficult signals. The *Intelligate* obviously sees its role rather differently.

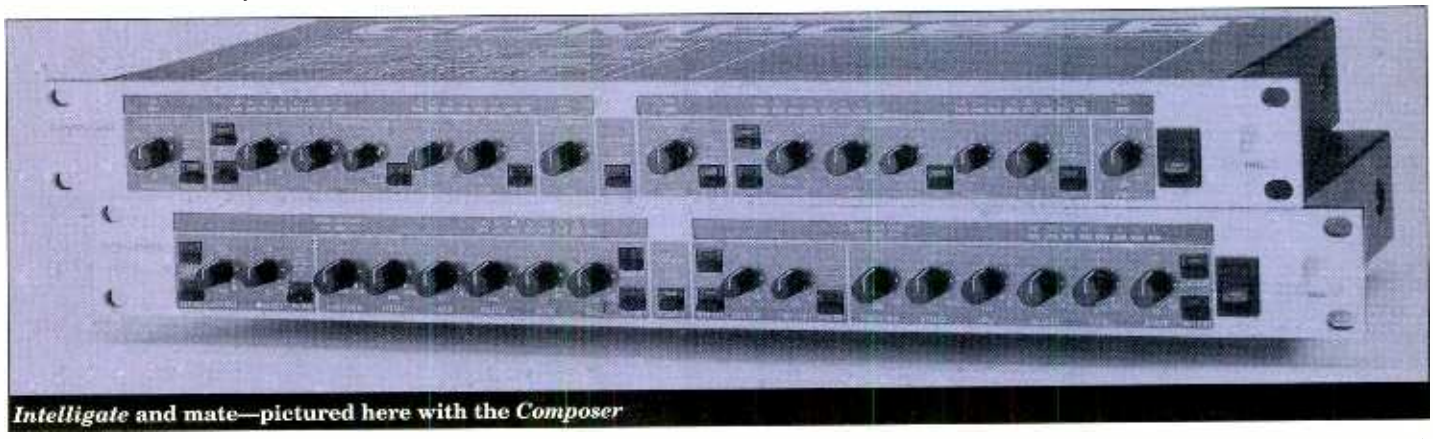
Of course, the facilities needed for delicate control are all there. Side-chain filters, at 12dB/octave and with a good range of overlap, allow frequency conscious gating, complete with a KEY LISTEN switch for tuning the filters to the wanted sound. Metering and indication is helpful, with an eight-segment LED gain reduction meter and a novel 3-colour 'traffic light' level indication. As the signal reaches the threshold, the central yellow 'Hold' LED lights; on either side, a red 'Below' arrow and a green 'Above' arrow show where it is in relation to the threshold. This all makes it unusually easy to make the gate do what you want it to do, perhaps helped by Behringer's 'Interactive Ratio Control' circuitry, which is what allows the suggestion in the name that it is somehow intelligent. The claim is that the ratio is automatically adjusted dependent on programme material, making the unit 'less critical of adjustment and... more tolerant in the presence of those signals which appear slightly above the noise floor.' The accompanying diagram makes it appear that this is in fact a gate's equivalent of a compressor's soft knee, where the transition from a linear transfer function to the processed slope is less abrupt. Whatever is actually happening, it certainly appears effective.

Side-chain insert jacks (selected on the front panel) allow additional processing to be used in adjusting the gate, or, of course, a separate key signal to control its function. These will obviously be used when operating the unit as a ducker, which it will become on pressing one switch. Stereo linking is likewise front-panel selectable, and in this mode channel 2's controls become inoperative, with channel 1 acting as master. It appears from the manual that in stereo mode, control is derived entirely from the signal on channel 1, with the other channel's signal having no influence, which seems a little curious; one would expect the inputs to be summed, or the higher of the two to take precedence.

Behringer are clearly keen that the *Intelligate* should be seen as a no-compromise unit. It only operates at +4dBm, balanced on XLRs and 3-pole jacks (although the key insert points are unbalanced), and the manual makes much of the circuit design features, including Behringer's own op-amps and high-tolerance components throughout. This seems to be borne out by the performance, which is exemplary in every way. Incidentally, although the review model did not use Deltron connectors on its rear panel, Behringer have recently opted to use these high quality British items exclusively on all units.

Like its stablemates, the *Intelligate* is distinctive without being gimmicky. Its capabilities and fine control are up there with the best of them, at a surprisingly reasonable price, and it deserves a wider audience. ■ **Dave Foister**

Behringer Specialised Studio Equipment Ltd, Otto-Brenner-Strausse 4, D-4156 Willich 1, Germany. Tel: +49 21 54 42 85 21. Fax: +49 21 54 42 85 23.
UK: Shuttlesound, 4 The Willows Centre, Willow Lane, Mitcham Surrey CR4 4NX. Tel: 081 640 9600. Fax: 081 640 0106.



Intelligate* and mate—pictured here with the *Composer

EAW—the visit

Fifteen years ago, EAW invited Tim Frost to visit their Massachusetts base to catch up on developments

In 1978, EAW cofounders Kenton Forsythe & Ken Berger, set out with no designs two weeks before that year's AES Show and still managed to launch seven products at the show. They have been pulling speakers out of the hat ever since and were celebrating their 15th anniversary at the recent New York AES.

Throughout this period, EAW have been working on two different fronts, producing sound reinforcement systems for general PA hire and installation, and providing a design-build capability for specific installations. This has culminated with the announcement that Siemens, the Austrian based multinational with its DM120m installation business, have taken on distribution of EAW for the German-speaking countries and several Eastern European centres.

For EAW, the Siemens tie-in gives the company access to some of the larger European installations. EAW President, Ken Berger, also sees it as an ideal opportunity to grow with the East European market.

'One of the visions we have achieved with Siemens, is to promote an educational programme for East and West Europe,' he states. 'In East Europe that will help increase the sophistication in the market and that will benefit us as a sophisticated product in the market and position us as a leader in that market place.'

Considering EAW have not had a particularly high public profile in Europe, that an 'institution' the size of Siemens have aligned themselves so closely with EAW may be a bit of surprise. However since their inception, EAW have been deeply involved in using factory-line techniques to produce both mass-produced systems and customised designs that address specific customer problems. A major client continues to be Disney, who repeatedly return to EAW for both off-the-shelf systems and small numbers of completely customised designs for their theme parks and other venues both in the US and in Europe.

According to Berger, EAW's ability to produce small runs of individualised products alongside their usual product line is something they learnt to do at a very early stage in the company's development.

'The phrase, "We've spent so much time doing so much with so little, that we can now do something with nothing." has a lot of truth in it around here. We now have three basic types of product. We do absolutely standard high volume product—all identical and put into stock.

'We have another set of special order products which are manufactured to a standard design but built only to order, and the last area is custom products where we will design and manufacture to meet a client's specific need.

'The way EAW works today we define as "Agile production". Everything is built in separate quality controlled stages, so we can have five or six products in production simultaneously.'

The speaker design and manufacturing owe a lot to the abilities of Kenton Forsythe, Vice President of engineering. With manufacturing geared up to deal with small runs, working in parallel with manufacturing standard stock products, Forsythe has in place the structure to let him produce runs of completely new designs ready for installation 20 days from the initial contact with the customer.

'We have put a lot of effort into the structure, this allows us to do these specialised jobs,' he explains, ' but I can guess now why other people don't do it. Having all the mass-production structure in place can definitely impede you in reacting to quickly in low-volume business.'

A lot of engineering effort is also going into research on basic product design and development—at the AES Show, the company announced several new products and techniques including the *AS943* ultra-high-power long-throw system and the *KF852 Stadium Array* system, which uses both new HF and LF drivers.

Heavily computerised, EAW have made a lot of effort to make as much of their product data freely available as possible. They are supporting all the current speaker system CAD packages, supplying speaker plots for all their products in each of the various CAD system formats. Although Berger believes these CAD packages still have some way to develop, at a meeting of journalists and users to celebrate the company's anniversary, he reiterated EAW's commitment to openness.

Kenton Forsythe (standing) and Ken Berger cofounders of EAW

'Some people were amazed that we would give out so much information about our product. We believe if is not directly related to our own specific product under development then our product specifications should be available openly. So we decided to support every software modelling system that would allow us to supply data to them.'

He adds that the their ability to develop new product and be competitive in the market had less to do the data itself, and more to do with the people generating the information and designs.

'We've put our investment in people. Our aim is that everything we do eventually flows out to become public knowledge, because what we think is special about us, is us.' ■

EAW, One Main Street, Whitinsville, MA 01588, USA.
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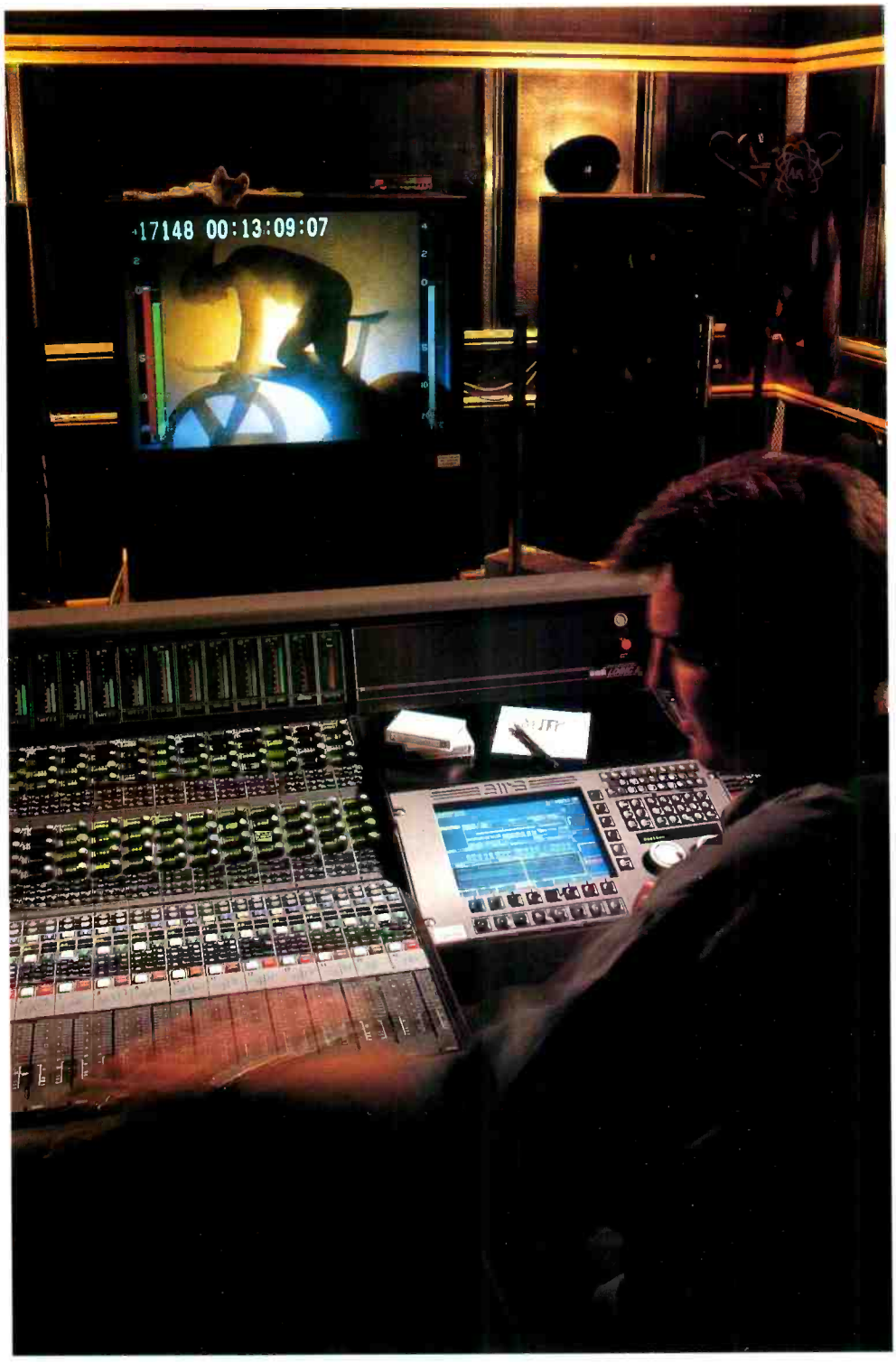
Fax: +1 508 234 8251.

AN AIR OF CONFIDENCE.



CLIFF JONES AT AIR STUDIOS

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"Of course, the assignable processing makes any layout you may prefer very easy to set up. The real difference is Dynamic Automation of the digital signal path – it's fast and flexible and means I can be more creative with changes in the mix.

"The integration with the AudioFile's Event Based Automation allows you to make changes to the edits, with the console automation following suit.

"I think the speed of it... the flexibility, is a standard I've come to expect now. I can sail through time consuming tasks and get on with the real business – getting a true feel for the mix.

"The on-board EDL conform allows greater control over source audio – saving on On-Line time – the system relays the tracks from first generation material.

"The sound? I love it. An acute lack of distortion.

"Essentially, Logic 2 is reliable and it's fast...and anything that makes me look the same, I want a piece of..."

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THE LOGIC 2

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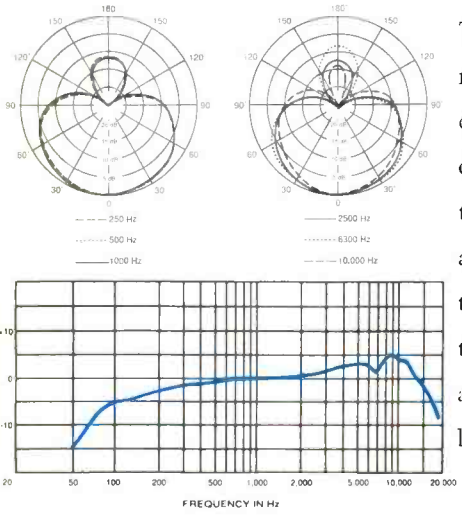

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DIGITECH *DHP55*

The latest piece of pitch-shifting outboard from DigiTech is aimed at instrument processing. The unit shares the outward appearance and livery of the *TSR24* reverb-multieffects unit: a 20 x 2 line LCD is bordered on one side by the preset number display followed by no less than 34 buttons, an alphadial and individual left and right-channel input and output pots for the standard jack connectors on the back. It responds to MIDI patch change and continuous controller to parameter value change data.

The *DHP55* has 75 mono factory presets, 25 stereo factory presets plus 140 user locations split equally into two banks. Presets are composed of configurations of the basic building effect blocks; these are fixed but offer 117 permutations of 16 effect types. The effect types include a 2-voice bass pitch shifter, chorus, chord shifter, distortion and speaker emulator, dynamic filter, 5-band mono EQ, 7-band stereo EQ, 31-band mono EQ, flange, multitap delay, 2-voice intelligent pitch shifter, 4-voice intelligent pitch shifter, sampler, stereo delay, string pad modulation, and 4-voice harmony pitch shift with regeneration.

For completion, the EQs are all fixed frequency, there is a fully adjustable compressor and noise gate patched by default onto each configuration and the pitch shifters vary considerably in their complexity and sophistication—the two need not be linked after all.

Editing on the *DHP55* could be regarded as tricky. You either create a preset from scratch in the Utilities menu or you call up a factory preset on a dial or on the program UP-DOWN buttons, edit and save it to a user memory. When working from scratch you are expected to identify the configuration you want from the list of 117, each of which has its effects sections represented as abbreviations—and to make life a little harder, the LCD flashes on and off irritatingly to make sure you do not get more than one second at a time to view it.

It is far easier to edit an existing preset. You scroll through the configuration of effect sections with the PREVIOUS and NEXT buttons until you get to the one you wish to doctor, press the EDIT button and then use the same two buttons to scroll through the effect's parameters entering values on the dial or with the parameter UP-DOWN buttons. Alternatively, you can access some sections directly using 11 dedicated effects buttons and alter them as above. Stepping back to the configuration page is achieved on the EXIT key.

Simple enough, you may think, but there can be a lot of parameters to get through (though they do slowly become familiar). The situation is compounded by the small size of all the *squidgey* front-panel keys (even the finger-tip recess in the large dial is too small for anything but a child's digit) and if you are a guitarist with good old-fashioned finger-pickin' fingernails on your dominant hand then you will learn to swear with renewed fluency before long.

It is not that the *DHP55* is difficult to learn—I dismissed the manual fairly early on as truly the worst I have ever seen—and still got to grips with the unit quickly; it is just that it is awkward to use. The attempt has clearly been made to accommodate the user, yet the implementation is somehow inelegant—there is almost too much here. I hasten to add that this is not my overriding initial impression of the *DHP55* because it is actually a fantastic-sounding unit. And it has not travelled the traditional route—there are no reverbs or super-drive tones in its factory presets for example, instead it has employed its considerable pitch shifting talents in ways that are unique. The *DHP* is a real processor that processes an instrument to extremes. There are sounds in here that I have never heard before, presets that make guitars sound like synths, splashes of pitch and haunting ethereal instruments that bear little resemblance to a six-string.

Pivotal to all pitch activity, of course, is the 'in-tuneness' of the incoming source, and the *DHP55* has a slick tuner built in and can alternatively be tuned to something else across a narrow range. The pitch shifting, which is not quite in *Eventide* territory, is nevertheless consistent and reliable, making it very playable. It is further mixed with regeneration, delays, modulation, panning, and an intelligent key awareness. Some of the pitch-shifting algorithms are intended for single-note processing and up to four harmonies while others concern themselves with chordal material. Add the other effect types and the power to transform the input source is awesome.

There are four distortion tones that do not spring into life until you add a rather good speaker simulator, but all work well across a wide input gain range. The *DHP* can give a great piano-wire *Strat* tone and super smooth sustain but many of the configurations do not use the distortion circuit and clean sounds are where it's at. The *DHP55* seems more geared towards the guitar than any other instrument but you can also achieve some pretty wild and tasteful results with keyboards.

It would be wrong to consider this device as only capable of oddball effects although the 'What the hell am I supposed to do with this?' feeling is strong on encountering certain patches for the first time and before you start to experiment with them. Much of this is down to the high profile of pitch shifting in the presets which can require a little thought but there are some fabulous arpeggios, shimmering choruses and a good selection of basic workable tones here as well.

I have not encountered a unit quite like this before; one that can change the fundamental qualities of the sound of a guitar so radically when it wants to. It can be pretty weird. There are some wonderful ambient-style totally engrossing presets which respond to attack velocity courtesy of the dynamic filter sections and some superb sparkling effects.

It is inspirational stuff which is really likely to get you playing again. The presets are brilliant leaving you in the quandary of how to program equally good ones of your own. The answer lies in experiment and allowing yourself to make mistakes as the results can be very unusual.

I do not believe this unit will appeal to everyone—not because of the fiddly switches and operational quirks, but because of the way it sounds. Anyone looking for a traditional guitar multieffects unit will feel less than gruntled 30 presets into the *DHP55*. On the other hand, anyone looking for some innovation and originality not to mention a wodge of out-of-sightness will be stunned. ■

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Music News is compiled by Zenon Schoepe

Brilliant presets... innovation and originality... the *DHP55*

Multitrack editing software

XTrack version 3 makes production a pleasure

XTrack is fast
All the edit functions (crossfade, merge, time stretch...) are directly accessible via the drop down menus

XTrack is simple
All user configuration data (2-16 tracks) is permanently maintained.

XTrack is comprehensive
Xtrack is also a post-production tool with LTC chase-lock and RS 422 capabilities. In addition, the catalogue supervises a veritable banquet of sound data to service your creativity.

XTrack is enjoyable
The track display is real-time and to aid user interface, sounds are displayed in curve or block mode.

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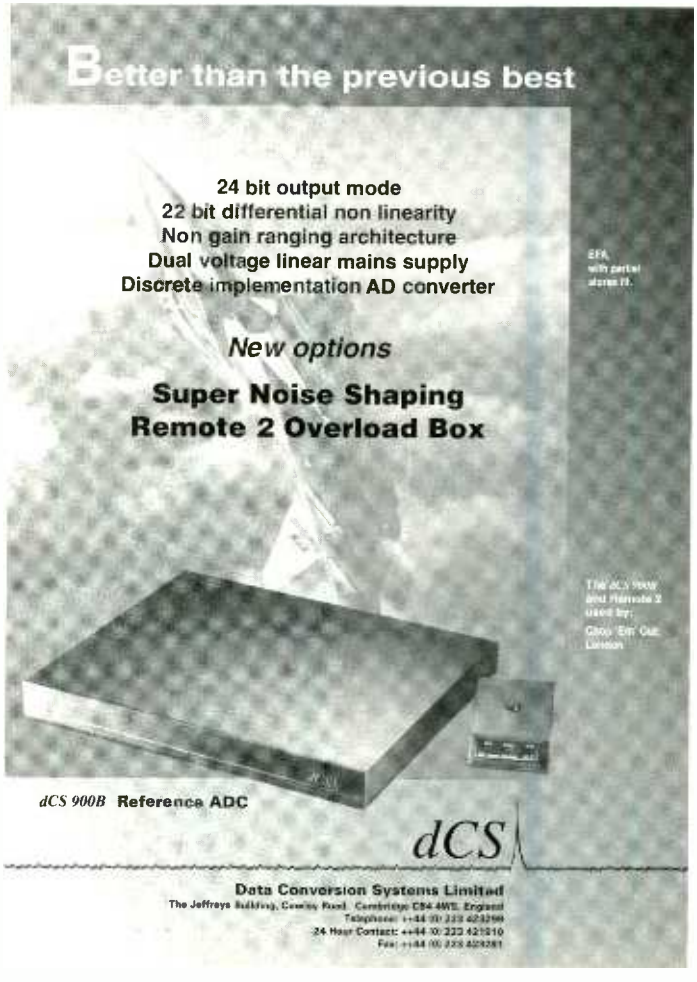

STATION TO STATION

The Sony *DATstation*: primarily intended for broadcast use but may have a variety of applications

I have to admit that when I first heard about Sony's laptop DAT editor, it conjured up images of a bleary-eyed producer flying Club Class compiling album running order; a radio journalist editing hot interviews in the back of a cab in the race back to the studio and a classical producer cosily piecing together takes at a weekend cottage. Just as the laptop computer created the portable office, so the laptop DAT editor looks set to produce the portable editing suite.

However, having spent some time with Sony's *PCM-E7700 DATStation*, I am not so sure that my original vision was a prophetic one. Firstly, the unit is not quite as portable as I had imagined—it certainly is not compact enough to slip into a briefcase, and the lack of internal batteries makes it unsuitable for 'remote' use unless there is a power supply to hand. Secondly, the system appears to have been designed with broadcasters in mind and certain tasks, including music editing, are not as straightforward or intuitive as they might be.

'The system is primarily aimed at the radio broadcast environment,' confirms Sony Audio Product Manager Phil Wilton. 'Having said that, because the *DATStation* is a unique all-in-one package, we fully expect there to be interest from other areas. Essentially anyone who uses DAT, and the number now is substantial, has a requirement to edit it. We're aware that, as the system stands, its use is reasonably market restricted but it is a new concept that has only just hit the streets, and depending on the feedback and reaction we get, we have the ability to evolve the product in a number of directions. In fact, one of the things we are currently investigating is the use of the system as an integral part of video postproduction for on-lining audio.'

A significant difference between the *DATStation* and previous Sony digital audio tape editors, like the *DAE-3000* and the *RMD-D7300*, is that it employs EDL-based auto-assemble editing rather than the assemble-insert 'record as you go'-type procedure. This has distinct advantages and disadvantages; on the plus side is that all the edits can be built-up into an EDL, further modified and then executed at double speed. On the minus side is that auditioning edits is slow, and noncontinuous due to locate and memory load procedures.

As mentioned, the unit resembles a laptop computer with a lift-up EL (Electro Luminescent) screen—similar, although considerably bigger than the type used in the *DAE-3000* editor. The unit houses a player and a recorder with shared transport controls including a sunken jog-shuttle wheel. Interaction with the various screen displays is again reminiscent of the *DAE-3000* with seven function keys accessing associated function boxes, and four cursor keys selecting items around the screen. ▶

Sony's *PCM-E7700 DATStation* represents a new step in the application of DAT technology. Initial reservations overcome, Patrick Stapley takes on this all-in-one editing package

The unit includes a small built-in loudspeaker, but a stereo headphone socket and unbalanced monitor output (on phonos) are also supplied. Analogue and digital (AES-EBU) inputs are provided, and an RS232C connector is included for future use. The *DATStation* measures 380 x 121 x 422mm (WxHxD) (15 x 5 x 16½ inches) and weighs 8kg (17lb 10oz).

Operation

Before editing can begin, the source DAT will require time code; if a prerecorded tape does not include time code, it may be dubbed on in real time using the systems Insert mode. Alternatively, a programme can be directly recorded into the system while fresh code is added. The system reads and generates all regularly used codes and will operate with Absolute Time (A-Time).

To begin editing, a time-coded source tape is placed in the player. The screen will have defaulted to the Audio Edit display where edits are displayed sequentially either as segment bars or as a list showing time-coded In-Out points, duration and any ID information —either way, the screen shows four edit sections at a time out of a possible hundred.

Edit points are entered either by locating the position on tape and then hitting the large MARK key, or by directly entering time-code points from the numeric keys. They can be 'Marked' on the fly as the tape is playing, or more precisely, to 1ms accuracy, by using the systems Jog facility which provides an instant, off-tape reel-rock facility. This is the first time such a function has been available for DAT, and Sony remain tight-lipped about how it has been implemented as patents are currently being applied for. A shuttle function is also included with a range from 1/5th normal speed to 32x normal speed.

Once the first In and Out points have been entered a horizontal bar will appear representing the length of Cut 1. The horizontal scaling can be changed from 4 minutes to 128 minutes to accommodate segment length—thus if working with a number of short edit sections the scaling would be set to a low value. The minimum length of a Cut is five frames.

As edit sections are built up, the screen will show a column of Cuts either as segment bars or time-code numbers depending on the selected display mode. These Cuts can be accessed by the cursor and modified in a variety of ways. For example, In and Out points can be moved by entering new time-code positions or by adding-subtracting time from existing positions; fade-in or fade-out times of up to 3s (1ms steps) may be independently added to each edit point; ID information (if it exists) can be altered; and the overall level and stereo balance of a segment can be adjusted. Although level is adjustable, there is currently no facility (other than crossfading) to dynamically level adjust a Cut—thus manual fades are not catered for.

Additionally Cuts can be Moved, Copied, Divided, Delete and Recovered—also new Cuts and Spaces (digital silence entered in seconds) may be Inserted into an existing EDL. All these functions are simply executed using the function and cursor keys. The current EDL is automatically backed up by the system's battery-powered memory, and will be reinstated at next power-up. Consequently before work can begin on a new EDL, the current list must either be saved to one of the unit's five memory locations or deleted.

Edits are auditioned prior to recording, using the Preview function. This operates by playing one side of the edit from the system's three-second memory while the other side is played off tape. Preview will begin from the edit point which is currently selected by the cursor, and will continue to the end of the edit list. The Preroll and Postroll times played before and after an edit can be set at 1–3s and 3–99s respectively—it is also possible to set the Postroll time to be the duration of the edit segment. Because the system has to locate, load, and locate again for each transition, the process is quite slow. Also there is no Repeat function to allow an edit to be played over and over again without first having to go through the data loading process—however, this limitation is something Sony are aware of and may change in the future.

Apart from adjusting edit points by keying-in new time-code values, they can be changed with the aid of the Locate function. Once an edit point has been located, the tape position display at the bottom part of the centre of an 8-minute bar; the operator may then advance or retard the tape using a combination of jog-shuttle and transport keys, and then re-mark the edit. A criticism here is that—apart from referring to the locate-point time-code read out—there is no precise indication of the edit's position. The scaling of the bar display is too coarse to show fine movement in certain applications. Also useful would be a 'Play From/Play To Edit' facility to monitor the exact position of an edit.

It is highly likely that an EDL will be built up from a number of different source tapes, and to cater for this, the *DATStation* logs a tape number against each Cut. The first tape to be loaded into the player is automatically labelled as Tape 1 and subsequent tape loading will cause a dialogue box to when using multiple tape sources to be

absolutely clear which tape is which—preferably by marking the number on the shell.

Once the EDL has been constructed to the user's satisfaction, automatic assembly can then take place by loading a tape into the recorder and hitting the AUTO RECORD key. This will bring up a setup box on the screen giving details of the Record Speed (x1 or x2); the Record Start Point which can be from the beginning of the tape, from the specified time code, or continue on from the current tape position; the time-code generator start value; the length of zero data to be recorded at the start of a tape; whether a prespecified run of test tones will be recorded; and whether an End ID is written after the programme has finished. These parameters may be adjusted before hitting AUTO RECORD again to execute auto-assembly.

The process will carry on uninterrupted until a tape change is encountered at which point the *DATStation* will ask for the appropriate tape number to be inserted into the player. Due to the recorder being a 4-head system, monitoring during recording is Read-After-Write (RAW).

As the edits are assembled the system keeps a record of any detected errors, which will appear in an Error List. This list shows all interpolation and mute errors for both player and recorder, along with their respective time code positions.

The review unit, used in conjunction with Sony *PDP-60* tape, displayed a very low incidence of errors in real-time recording, although a considerable increase of interpolation errors did occur during double-speed recording. However, these appeared to be small, inaudible corrections, and no mute errors were encountered. In addition to listing errors during recording, a prerecorded tape can also be error checked and a list produced—Error Lists may be saved to memory in the same way as EDLs.

Apart from the audio editing facilities described, the system also offers comprehensive control over IDs. Prerecorded tapes without ID information, can have Start, Skip, and End IDs registered onto them; and tapes with existing ID information can be edited—thus ID points may be moved or erased, ID types and program numbers changed, and program numbers that run out of sequence automatically renumbered. Start IDs can be set up to record automatically in gaps at a threshold of -40dB or -60dB, and End IDs may be set to record from 2s–99s after the programme—the system default being 30s.

Straightforward tape dubbing is also catered for, and as with editing, this can be performed at normal speed (with the benefit of RAW monitoring), or at double speed.

At the bottom right of the screen is a stereo-level meter with a balance offset indicator above it. The meter can be set to peak hold (Auto, 1.5s, or 4.0s), have its release time set to 40ms or 80ms, and its over level sensitivity set between 1–7 words (default 3 words). Below each tape deck are LED indicators for Mute and Interpolation errors, servo lock, and record inhibit (recorder only). The unit includes a number of setup pages where operating parameters can be changed to suit the user; personalised setups can then be stored in five memory slots and assigned as the default setup.

Alternatively the factory settings or the last active setup will be recalled on power-up.

Conclusion

Sony's *DATStation* offers a new approach to DAT editing both from an operational point of view by virtue of its integrated and portable design. Although conceived primarily for broadcast use, the unit potentially lends itself to a variety of applications, and it now remains to be seen how Sony will adapt the product in the future to suit other markets.

Apart from the adoption of EDL-style auto-assemble editing, other notable features include double speed edit and dub (a first for DAT audio), RAW monitoring, and a real-time off-tape Jog facility (another first for DAT).

The *DATStation* represents good value for money, taking into account the price of Sony's previous high-end DAT editing package, and has the obvious advantage of combining the three components—editor, player and recorder—into a single unit. This is a novel and intriguing product from Sony which is sure to attract strong interest from a wide cross-section of audio professionals. ■

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US: Sony Corporation of America, 3 Paragon Drive, Montvale, NJ 07645-1735. Tel: 201 930 1000. Fax: 201 930 4752.

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

NEW DIMENSIONS

The 4D audio recording system. Note the stageboxes in the centre at the rear

Francis Rumsey evaluates the Deutsche Grammophon 4D audio recording system which has been at the heart of recent debate

In recent months, considerable attention has been focused on Deutsche Grammophon's 4D Audio Recording system. The system is the result of a number of years of developmental work by the audio engineering department at DG, and the following article is a description of the system both as it is now and as it is intended to be in the near future. The description is based on discussions with DG engineers and recording staff at their centre in Hannover, which took place during a recent visit.

B4 4D (Before 4D)

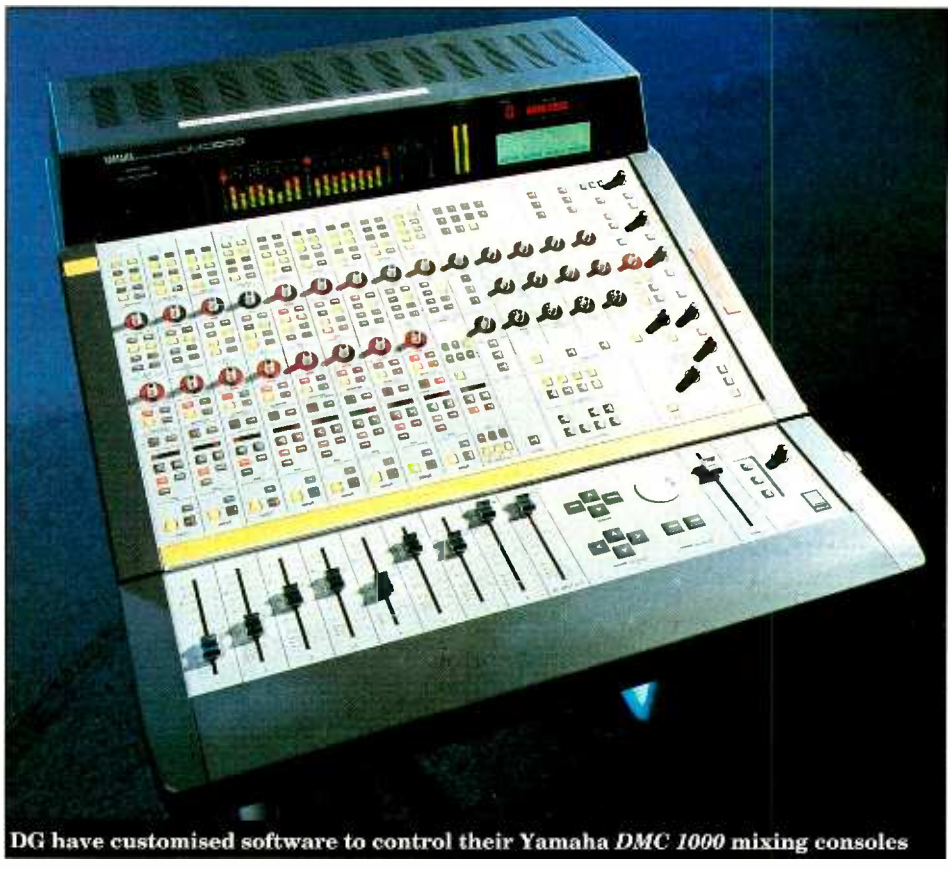
DG make all their classical recordings in the field, having no studios at its Hannover Recording Centre, and use locations around the world including London, Berlin and Vienna. For many years they have relied on established Sony CD-mastering equipment (*PCM 1630* and U-Matic recorders) and digital multitrack machines. In the early years of digital multitrack, the 3M format was used, and one machine is still kept in working order to replay and transfer old tapes, but more recently the majority of multitrack work has been recorded on the Sony *PCM 3324*. Editing has been handled using *DAE3000* units for stereo work, and a certain amount of editing is also carried out on the digital multitrack machines.

In common with the rest of the audio industry, DG have become increasingly aware of the need to make improvements to the digital signal chain, owing to the 16-bit limitations of established equipment. There is undoubtedly a desire amongst professional recording engineers to use digital equipment which 'has the edge' on consumer equipment in terms of performance, and this has led to a growth of interest in technology capable of handling more than 16 bits. Hand in hand with this has gone the development of processes designed to pass on as much as possible of the resulting sonic improvement to the consumer, through the medium of compact disc. The CD, though, as everyone should be aware, is only a 16-bit medium, and nothing except a genuine redesign of the format will make it anything other than this. Nonetheless, it is possible to improve the perceived dynamic range of the CD to give it a subjective performance which is close to that of the improved professional system.

4D, then, is the result of engineering developments at DG which combine commercially available digital audio equipment with in-house designs and systems integration. The intention is to ensure that the audio signal is carried through from microphone to the final mastering stage with as high a sound quality as possible. Where suitable commercial equipment has existed for this purpose it has been used unmodified, but modifications have been made in cases when certain features have not been deemed appropriate. Developments such as the noise-shaped requantisation used in 16-bit mastering were started quite a few years ago when commercial equipment did not have the performance required to meet the company's purposes, although today there are a number of systems which fulfil a broadly similar purpose. This is discussed in more detail below.

Audio performance and the bit budget

Digital audio is no longer as simple as it was ten years ago. Many improvements have been made to convertor designs among other things, and it is my view that the days in which one could ▶



DG have customised software to control their Yamaha *DMC 1000* mixing consoles

measure a system's performance simply in terms of the number of bits used are rapidly drawing to a close. In general, though, the more bits the better (unless you are in the business of selling data reduction systems!), but the old rule of thumb which multiplied the number of bits by 6dB to arrive at a figure for the dynamic range is far too simplistic for today's systems. For this reason a system's performance is far better judged on detailed measurements made both in the absence and in the presence of signals at various levels and frequencies and, of course, by critical listening tests. It is also important to note that with professional equipment convertor performance may well be poorer when a system is externally synchronised, owing to poorer clock stability.

For the very reason that performance is becoming more difficult to determine, the industry is in desperate need of a straightforward means by which similar digital audio equipment may be compared (particularly convertors). Manufacturers will often play games with specifications in order to show their equipment in a good light, but, as admirably displayed in the exchange of letters between Apogee and Lexicon in the July 1993 issue of *Studio Sound*, there is still wide disagreement about the best way to describe the specification of a convertor. Clearly, it is important to know how many bits of the signal carry useful information since it is otherwise difficult to decide what type of interface or storage to use. As a measure of performance, however, this is of limited value.

When considering the design of a complete digital recording system a number of 'bottlenecks' may be apparent. It is important to be aware of the capabilities of each stage of the system in terms of the number of bits stored or transferred.
The AES-EBU interface is capable of transferring up to 24 bits of audio information per sample.
The Sony interfaces are capable of transferring up to 20 bits; the Yamaha interfaces will carry at least 24 bits, and so on. This does not mean that all the bits will necessarily be used or implemented in every system. Recording and storage devices will only store a certain number of the bits arriving over a digital interface or supplied from a convertor. To date most recorders have stored only 16 bits, but a number of mixers and intermediate processors have been able to handle 20 or 24 bits. This has resulted in the use of 'intelligent' requantisation of the audio signal at the point where it is down-converted to 16 bits for storage. If an engineer is to record more than 16 bits, then there is currently a limited choice of machines available, but there are advantages to be had in leaving any requantisation until as late a point in the signal chain as possible, making it increasingly important to be able to record both stereo and multitrack material at resolutions up to 24 bits.

System overview

The 4D system consists of the following components: custom-made remote-controlled stageboxes housing special microphone preamps and A–D convertors; a number of Yamaha *DMC-1000* digital mixers, stereo or multitrack recorders (see below); a network of digital interconnects and a patchbay to handle distribution and synchronisation of all the digital signals; and DG's Authentic Bit Imaging processor for requantisation of the signal to 16 bits. There is also an in-house control system called Computer Aided Recording (CAR) which is based around an MS-DOS PC, designed to present system information to the operator in a useful manner, relying extensively on MIDI for communication with the *DMC-1000* mixers.

The resulting system allows conversion of audio signals to the digital domain close to the microphone, and from then on all interconnects and processing are handled digitally. A key feature of the system is that it is not a permanent installation, but can be transported in flightcases to location recording sites, and will make possible high-resolution stereo and multitrack recording virtually anywhere. The aim has been to strive towards the achievement of a 24-bit recording chain from start to finish, and the remainder of this article will concentrate on the methods being used to reach this goal.

Stageboxes

Deutsche Grammophon's Stageboxes consist of two main parts: 8-channel remote-controlled mic preamps and 8-channel A–D convertors. The mic preamps were designed in-house and use transformerless inputs to feed an amplifier which is made up of components individually selected for their noise and distortion performance.
The architectural specification was to construct a mic preamp which would complement the extremely low noise and distortion of the A–D convertors which followed them, while at the same time allowing remote control of the preamp gain.

In order to be able to achieve high audio specifications at the same time as using digital remote control it has been necessary to ensure that digital activity is restricted only to certain areas of the stagebox, and a 'sleep' mode has been incorporated which means that digital activity only takes place near to audio signals when the gain is changed, after which the control circuit returns to an inactive state. The mic preamp has a transformer-coupled analogue output in addition to the digital output in order to provide feeds to third parties, such as those required during simultaneous broadcasts of recording sessions.

The preamp outputs are fed to A–D convertors, which in their first incarnation were special versions of the Yamaha *AD8X*, but in a more ▶

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MIDI is used extensively in the automation of the mixer, and MIDI access has been provided to the tables which set up the EQ of each channel

recent version owe considerably more to DG's own design. The 'original' *AD8X Special* (now, incidentally, generally available through HHB) employs an interesting approach which extends the effective dynamic range through the use of two 18-bit convertors which operate at a gain offset of 18dB. The highest 18dB of the dynamic range is handled entirely by one convertor, and at levels below -18dB, the low-level convertor gradually takes over using dedicated DSP to crossfade between the two convertors. The crossfading and gain offset of the convertors are controlled such that excellent linearity is obtained over the whole dynamic range. The penalty is that the noise level increases slightly for audio signals which use the upper 18dB of the convertor, but the audible effect of this is minimised by the crossfader which introduces a gradual takeover of one convertor from the other.

In order to determine whether this dual-convertor approach is suitable for its purposes, DG performed a large number of listening tests and were unable to detect audible artifacts of the dual-stage crossfading process, leading the company to adopt this approach for all its stagebox convertors. The more recent *DG8X-/I* convertor employs the same DSP crossfading between convertors as before, but gives strikingly improved quiescent noise and harmonic distortion performance due principally to the incorporation of newer Crystal Semiconductors convertor ICs which have balanced analogue input circuitry.

Network system

The Digital Network System is the systems integration part of the 4D setup. Basically it involves the routing and synchronising of a number of stageboxes, mixers, a patchbay and the various recorders, as well as providing talkback and foldback to the studio floor. It is no small task (as anyone who has ever tried it will know) to put together a digital audio system consisting of equipment from a number of manufacturers located in different rooms, working in a variety of formats, and to ensure that they are all locked to a common clock. Cable lengths have been carefully controlled where bit synchronisation is considered important, and each of the multicore cables is terminated in robust multipin connectors designed for easy and reliable use in the field.

Digital mixers

The Yamaha *DMC-1000* is proving to be extremely popular as a cost-effective digital mixer which handles inputs and outputs in a variety of interface formats. It incorporates Yamaha's own digital I-O ICs which have very flexible clocking and buffering arrangements, allowing digital inputs to arrive in a variety of phase relationships and still be accepted (unlike earlier designs which required very tight relationships to be maintained between the word clock and the digital inputs). The *DMC-1000* is also capable of handling all 24 bits of digital inputs which carry them, and outputting wordlengths of up to 24 bits.

DG have adopted the *DMC-1000* with a number of custom software features and in order to obtain the required number of channels, use more than one mixer synchronised to a common word clock. Using format convertors it is also possible to connect multitrack machines to the mixers.

MIDI is used extensively in the automation of the mixer, and MIDI access has been provided to the tables which set up the EQ of each channel in order that precise EQ curves can be drawn and displayed using external software. One of DG's projects has been to develop external 'viewer' software for the *DMC-1000* which displays setup parameters on a PC so that the engineer can see more easily what is going on. It also allows off-line editing and storage of the mixer setup so that session configurations can be logged, and modified if necessary without needing to be near the mixer.

Stereo and multitrack recording

For stereo 4D recording in the field, DG are currently using the *Nagra-D* machine, which is an open-reel recorder capable of storing up to 24-bit wordlengths on up to four channels simultaneously. The company are also taking delivery of a number of the new Sony *PCM-9000* recorders, which use magneto-optical discs, and which are also switchable to record up to 24 bits. If DG choose to switch to M-O discs entirely, the cost of media will become an important consideration. DG currently reuse all of their session tapes once the edited master has been approved, but would need to consider whether they could afford to keep a library of expensive master discs in the same way as they now keep ▶

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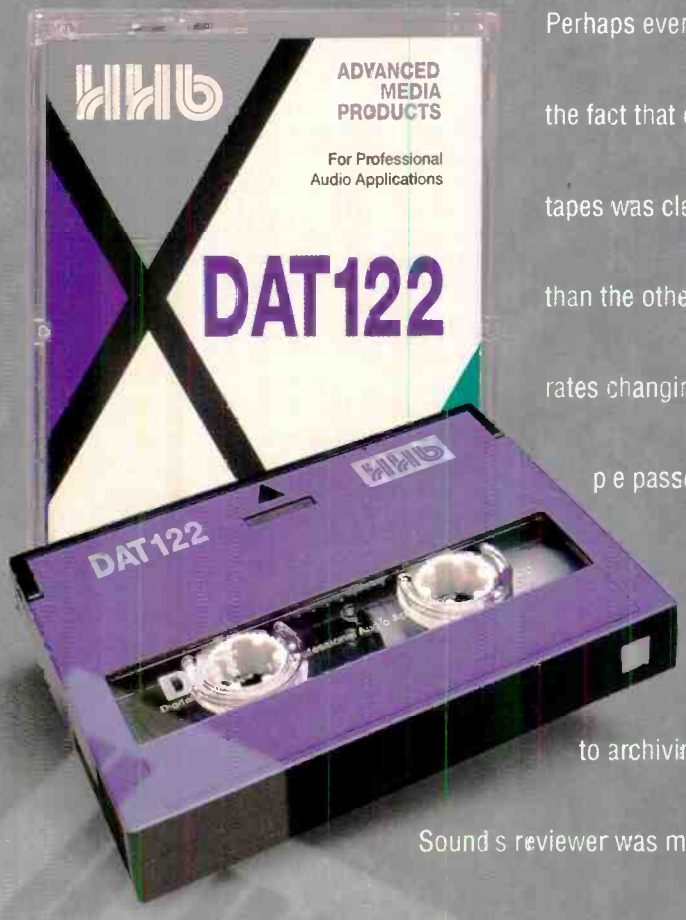

In the critical area of block errors, the tapes fell into two distinct categories of performance. Three exhibited similarly low error rates with the others presenting error levels considerably higher. HHB DAT Tape was one of the leading three.

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.

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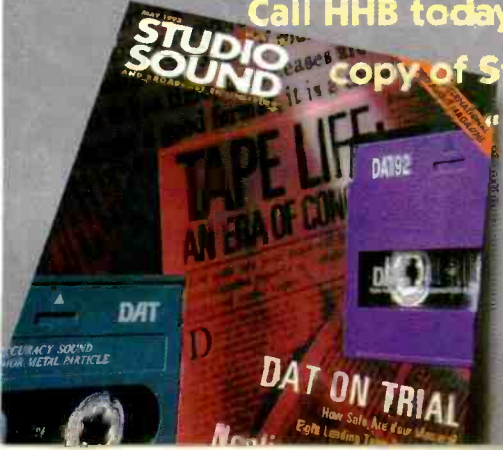

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Rear of stagebox showing mic head amps and A-D convertor

DG mic head amps and A-D convertor

a U-Matic library. For this reason they are currently actively involved in trying to find a suitable archival format for the tape library which will allow them to store future recordings in as cost-effective a manner as possible, preferably with a degree of automation and remote access.

At present, stereo editing is still performed on the Sony *PCM-1630/DAE-3000* system, which is definitely only 16-bit. This therefore requires the use of requantisation prior to editing, and the ABI process is currently employed at this point in the operation to reduce the high resolution Nagra master tape down to 16 bits while retaining optimum sound quality (see below). The Sony *MasterDisc* format would in future allow recordings to be edited directly at resolutions up to 24 bits without copying or requantisation.

Multitrack recording on Sony *PCM-3324S* is also only at 16-bit resolution at the time of writing (because that is all that the DASH format allows), and no requantisation is currently employed before recording, so the 16 most significant bits of the *DMC-1000* outputs are stored. This is only a temporary measure, though, because DG have nearly completed the design of an in-house multiplexer which will allow a *PCM-3324* to be used for 24-bit recording by sharing one channel's audio data across more than one track. A consequent reduction in the number of simultaneous audio channels will result, giving 16 audio channels at 24 bits from one machine. The multiplexer is an external device which does not require any modification to the *3324*, and therefore uses the *3324* simply as a data recorder.

Authentic bit imaging (ABI)

ABI is a requantisation process designed by DG to handle the mastering of high-resolution recordings at the CD resolution of 16 bits. It uses recognised techniques of redithering and noise shaping to shift the quantisation error energy into the least audible parts of the audio spectrum, thereby obtaining lower distortion and a better perceived dynamic range from the CD than would be obtained if the high resolution recording was simply truncated or rounded.

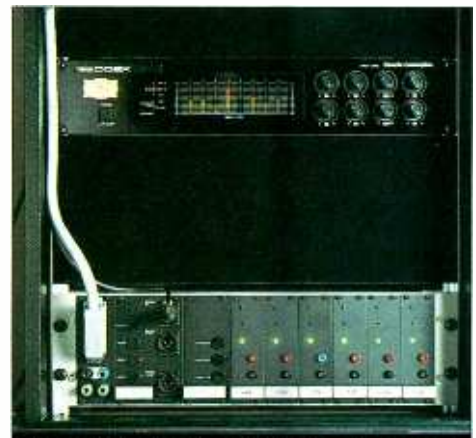
One of the most interesting aspects of ABI is that it employs switchable parameters in the requantisation process, allowing the operator to choose which version is most suited to the programme material. Unlike a number of researchers, DG have concluded that there is no one 'correct' set of conditions to be used in the process, but rather that the 16-bit sound can be improved by choosing the most appropriate parameters from a library of possibilities. In this way it is treating the process more as a creative tool than as an absolute set of conditions. The new ABI processor currently under development will offer up to 64 different requantisation programs, making possible a detailed assessment of which programs are aurally the most satisfying.

This is clearly an area which could form the topic of more detailed study by the audio community, since the process of noise-shaped redithering at lower resolutions will be used widely. Is such a process best treated as one controlled by subjective preference or should it be fixed by theory? Also, is one person's preference the same as another's?

4D in action

DG normally have up to six recording teams working in different places at the same time. A maximum of six complete 4D systems could therefore be in operation in any one week, and the ability to support this is really one of the principal achievements of the project. The investment in Yamaha *DMC-1000*s is quite monumental, since not only can there be four or five on one large session, there are also three in each postproduction suite at the Recording Centre.

Clearly, as each element of the signal chain is improved, the limitations of microphone design become apparent, following the old adage of 'the more you open the window the more the muck flies in'. Consequently, DG are currently working with a manufacturer on microphone designs which will complement the high specifications achieved in their preamps, in order that the self noise and distortion of the earliest stage in the chain does not unduly compromise the overall system performance. ■

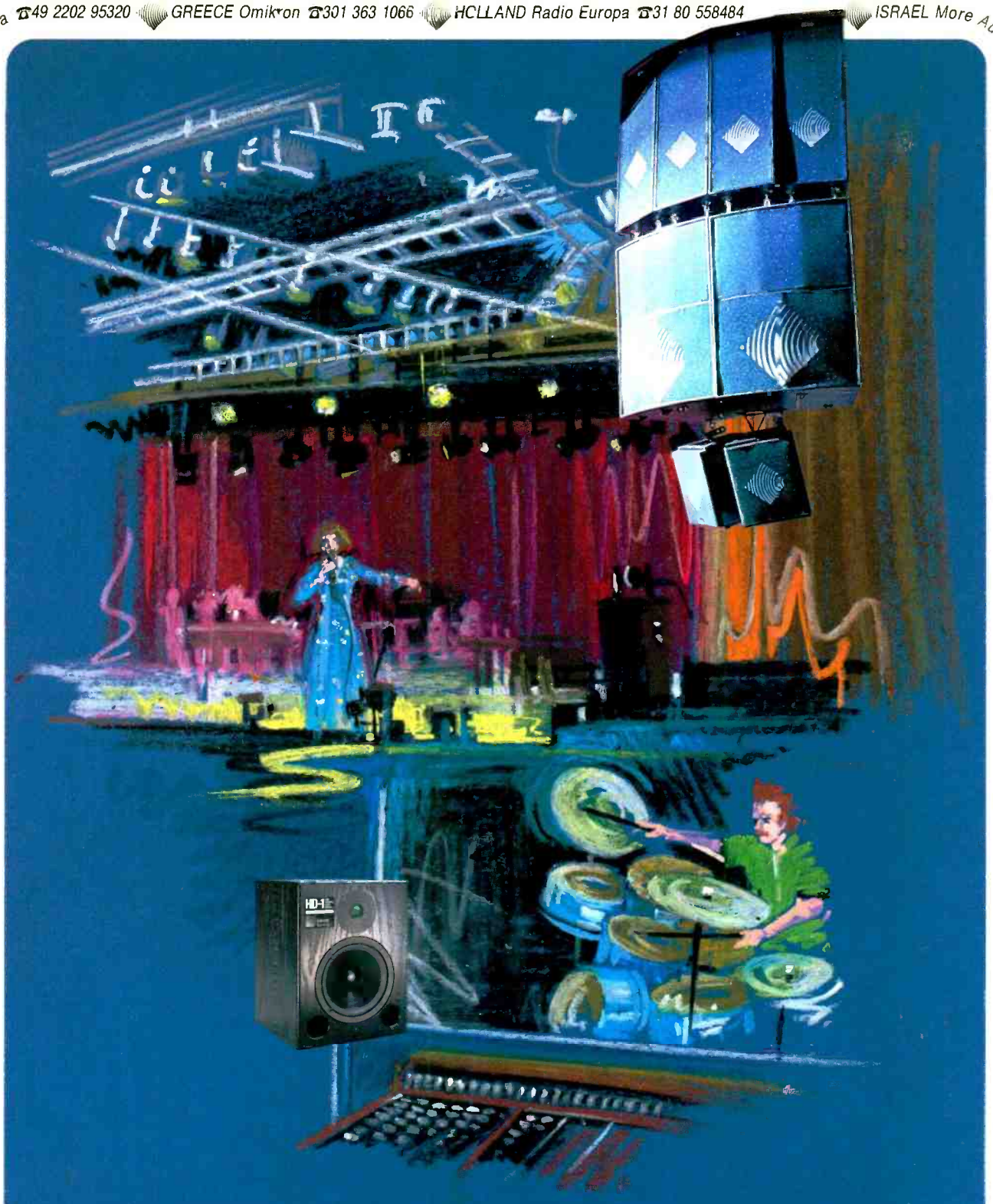


DG-Yamaha A-D convertors and power supply

Rear of stagebox showing power supply and multicore connections

Deutsche Grammophon Gesellschaft, Klusriede 26, D-3012 Langenhagen 1, Germany.

Dr FRANCIS RUMSEY is the past Chairman of the British Section of AES, and a lecturer on Surrey University's Tonmeister degree course in Music and Sound Recording. He is the author of numerous conference and convention papers for AES, the Institute of Acoustics and the Royal TV Society, and six books on audio technology including *Digital Audio Operations* and *MIDI Systems and Control*



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HHB PORTADAT

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London's HHB have been so heavily committed to DAT since its early days that one could be forgiven for assuming that they deal in nothing else. It is probably no exaggeration to say that HHB's enthusiastic espousal of the format was a factor in its early acceptance in the UK, and it was no surprise when they launched into manufacture. The *HHB 1 Pro* portable machine (designed and built in conjunction with Aiwa) was the first major venture and quickly became a very familiar sight indeed, while their 'own-brand' tapes are now highly respected, especially since the recent *Studio Sound* survey.

HHB's position as 'Europe's largest supplier of DAT technology' means they are ideally placed to evaluate the market and spot gaps in it, and it is the identification of such a gap that has led to the production of the *Portadat* machines. In HHB's own words, the new machines are designed to meet the need for 'professionally equipped, cost-efficient portable DAT recorders, designed and built without compromise to withstand the rigours of continuous location use'. Unlike the earlier model, there is no longer an Aiwa connection; there is, apparently, significant involvement from a major player, but HHB are not able to divulge who that may be.

DAT's combination of small size, long running time and high quality audio is obviously very appealing to the location recordist, but few machines have ever been produced with the special, punishing demands of this field in mind. Even now, the Fostex *PD-2* is probably the only serious choice in an area where the ruggedness of a tank is the main requirement, along with the ability to interface to, and synchronise with, a wide range of other equipment.

Into the fray come HHB's two models, the *PDR 1000* and the time-code-equipped version, the *PDR 1000TC*. Although the *TC* model looks like the other one with an extra lump bolted on (in best location tradition), this is not in fact the case. It is theoretically possible to upgrade the one to the other, but since it would involve the replacement of the entire main processing board it would not be an economic proposition.

Everything about these machines makes it clear that HHB are deadly serious in their intentions to make them roadworthy. They are understandably keen to point out that the transport is not a modified domestic unit, but derived from the DDS transports used for heavy-duty computer data backup, and that as far as they are aware no other audio machine uses such a transport. Four motors—one each for the head drum, the capstan and both reels—significantly reduce the mechanical complexity, and fewer cogs and rubber bands should, of course, mean higher reliability. It is housed in a solidly built chassis and case which manages to remain streamlined, small and light, at only 2.4kg plus battery for the larger version. Like any location recorder, it positively bristles with switches and controls, but they are all recessed out of the way of accidental operation or breakage. Sensibly, the 'back' panel—onto which the machine would fall if it were dropped—is a chunky resilient moulding with no connectors or controls on it at all, although it does house the battery compartment.

The battery itself is not a NiCad, but one of the new Nickel Metal Hydride rechargeables, which will apparently power the machine for up to two ▶

The patience of location recordists may just have been rewarded by the arrival of two new portable DAT recorders. Dave Foister gets an exclusive hands-on preview

hours. This is good news as far as I am concerned; personally I have had nothing but bad experiences with NiCads, from belt packs to camcorder batteries to rechargeable soldering irons. They are forever letting me down, and it amazes me that a technology which needs such mollycoddling in terms of charging and discharging cycles is still considered adequate for the busy professional. If these new batteries overcome some of the problems associated with NiCads, as claimed, without the size and weight of lead-acids, then I hope it will not be long before they are more widely available. The machines will run either from these or from an external 12-Volt supply via a standard 4- pin XLR—there is no dry cell option, not that there is room for them anyway. The supplied AC adaptor doubles as a charger.

The input side of the *PDR 1000* is typical of the way the machine addresses its specialised job. Analogue inputs are balanced, and are independently selectable between mic and line, with independent mic pads and high-pass filters. This would appear extravagant and unnecessary on a studio recorder, but in a situation where two independent mono sources might be involved—possibly even one at line level and one microphone—this versatility could remove the need for a separate mixer. Switchable phantom power is provided, along with a limiter for the mic inputs. On the other side, off-tape confidence monitoring is provided by the 4-head configuration and a built-in loudspeaker. The monitor level control, shared with the headphones socket, is of the push-button recessable variety, latching out of the way when not required.

Field work

Operationally, the design is once again geared quite specifically to its market. Loading a machine with features can all too often mean loading it with so many controls that the main functions get lost in a forest of switches, whereas location equipment traditionally has sparsely populated main control panels with big, unmissable knobs and buttons. With this in mind, the controls which stand out most on the *Portadat* machines are the large red RECORD knob (a slide rather than a push-button, requiring a more deliberate action), the large yellow PAUSE button, and the large black RECORD LEVEL controls. These are arranged so that they can be used as a single stereo thumb-wheel control (although the concentric rings obviously allow for independent level setting) and are lockable against accidental movement; in the same way, all the transport controls can be locked out if required. While these main transport functions appear on the 'front' panel (the visible top surface when slung over a shoulder) the remaining buttons are on the same main surface as the cassette compartment, where one's hand naturally falls, and are thoughtfully set out so that they can be used 'blind'—they are different shapes and sizes, and have prominent barrier ridges separating them.

The main display appears on the same surface as the primary controls, and is exceptionally informative, showing transport status, a choice of several time-counter read outs, signal levels, battery condition, IDs, input and sample rate selection and so on. Despite this, it still manages to convey the most important information—time and levels—prominently enough to avoid confusion.

As if there were not already enough controls on the machine, there are more hidden under the cassette compartment lid, covering input selection, digital formats and sampling frequencies (including 32kHz) and clock-calendar setting. SPDIF and AES-EBU ins and outs are provided alongside the analogue XLRs, and perhaps the only disappointment is the unbalanced phono analogue outputs, although since the machine is unlikely to be used primarily for playback this is perhaps not important.

Subcode implementation is surprisingly comprehensive compared with other portables (remember that it is not that long ago since many so-called pro portables did not even record A-Time),

and includes features still not common on studio machines. Time and date recording, as distinct from A-Time, is supported in the standard format—compatible with, for instance, current Sony machines—and Start and End IDs are dealt with (although not Skip IDs). Start IDs-Program Numbers can, in fact, be positioned manually with some accuracy using a 'Rehearse' function, which is still a comparative rarity even on mastering type machines where it would be even more useful than it is here. As an alternative, the usual Auto ID facility is provided.

The *PDR 1000TC* time-code-capable version looks, as has been noted, like the basic recorder with an extra box stuck on the bottom. I have heard this delivered as a criticism, although I can not imagine it troubling location recordists, who are used to carting around systems which look like the contents of a junk cupboard gaffer-taped together. Even if the time-code section was an add-on, it would follow in the fine tradition of, say, the Dolby *A* unit for the Nagra.

A moment's thought about what is involved in inserting time code into the subcode areas of a DAT recording is enough to explain why the time code option could never really have been a question of buying another box and fitting it on. The *TC* model is a quite distinct machine, although to all intents and purposes the upper half is identical to the basic *Portadat* version.

The extra facilities appear to cover just about everything that might be needed in terms of time code in the field. It can, of course, record incoming code, and also has its own generator with several operating modes. It can be jammed to supplied code, or left free-running; it can generate time-of-day code, presumably driven from the recorder's real-time clock; or it has the expected record run mode, where the end result is contiguous code however many times the recording is stopped and started. It can read and generate all the standard frame rates, and like certain other machines offers the surprisingly useful feature of converting A-Time to time code. The machine can be synchronised to incoming composite video (complete with a loop-through socket) or word sync and can also provide word sync for other equipment to slave to.

One thing which marks this system clearly as professional kit is the comprehensive handling of time-code user-bits, which can be set manually or left to automatically record the date; in addition, incoming user-bits can be recorded directly, or—and this could get confusing—the *PDR 1000*'s user-bits can record incoming time code while the main recorded code comes from the internal code generator.

One thing the machine cannot do is record code and audio separately from each other—tapes can not be either prestriped or poststriped. It also does not incorporate a chase synchroniser, but again, these features are hardly likely, by definition, to be required in the application for which it is designed. And that is perhaps typical of the concept; everything you are likely to need and very little that could be considered superfluous. Busy location people are not going to be impressed with functions they will never use and which will get in the way; neither will they be impressed by equipment which can not do what is needed or take the pace. HHB seem to have got the balance just about right. The machines I saw were prototypes, but looked, felt and behaved like the kind of grown-up machine you could depend on. Production units may be available from late January, and then we can start to find out whether they can deliver the goods in the field. At the moment they would appear to have no competition at the price, and will perhaps be seen as the machines this specialised market has been waiting for. ■

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AES AMSTERDAM PREVIEW

The Audio Engineering Society's 96th convention takes place in Amsterdam this year from February 26th—1st March 1994. The product highlights presented here are not intended to form an exhaustive listing of all products or exhibitors that will appear at the convention. In particular, there are a number of significant products on which details are embargoed until the convention opens. Further information will be given as it becomes available. Preview compiled by Simon Croft

◑ **AD Systeme:** F29. *Optifile Tetra* automation system with add-on for machine control, local status and other functions. *Optifile LC* entry level console automation. *Optiview* screen preview system. *Sound Performance Laboratory Optimizer*, *Vitalizer* and *Macrophone MP2* outboard. ◑ **AMS-Neve:** Stand No. unconfirmed. Highlighting the *Logic 3* at its first European AES showing. ◑ **AKG:** A25. *C12VR* reissue valve condenser, *C414B-TLII* vocal condenser with 'acoustic resistance slots', *C3000* large diaphragm condenser, *AS6* six-channel automatic mixer, *WMS* wireless microphone systems. ◑ **Audio Design:** G33. *A20D* 20-bit reference A–D convertor, *D20A* reference D–A convertor. *ProBox* digital tools including Masterclock, Error Reporter, CD-R machine and media, plus processors. ◑ **Audio Digital Technology:** Stand no. unconfirmed. Jim-Dowler-designed 24-bit, 48kHz resolution DAT recorder. Based on a Pioneer *D07* transport, the recorder uses no data compression. ◑ **Audio Engineering:** Stand No. unconfirmed. *Micron* radio microphone equipment for studio or OB. New *MDR* series of compact, true diversity main receivers. New *Micron* hand-held transmitters, with portable, switchable frequency transmitters and receivers. *Micron* multichannel receiver units. ◑ **Audio Follow:** D39. Two complete ranges of networked digital production equipment —DDO Broadcast and Contact—based on hard disk and MO storage, with dedicated controllers for broadcast and production. ◑ **Audio Kinetics:** G51. *ES.Lock* 1.11 system with latest software. Emulation of the Sony RS422 serial standard, as well as Adams Smith *Zeta Three* and *2600* synchronisers. Now capable of multiple machine control via a single RS422 port, supporting consoles including the AMS-Neve *Capricorn*. ◑ **Audiomation Systems:** D24. Displaying the *Uptown* range of motor fader automation systems. There are now three specialised packages of software which all run on the *Uptown* platform —music recording, audio-for-film and live sound. ◑ **Audio Processing Technology:** F24. Latest versions of compression technologies including *DSM100* digital audio transceiver, offering CD quality stereo over ISDN. ◑ **Apex:** B31. Line of graphic and parametric equalisers, plus *CDR40* CD recorder with new Digicon digital interface. *CDR40* is a stand-alone 19-inch unit that records CDs. Digicon interface offers functions including transfer of start IDs from DAT, variable delay of 10–640m/s and MIDI programme change. ◑ **Audix Broadcast:** D55. DTX digital phone-in system with digital telephone exchange. Maximum system configuration has 4 digital hybrids, 16 external lines, 4 studio interfaces and a pivotal control station. Also latest ABS consoles for radio stations. ◑ **Avid Technology:** C35. New Avid *AudioStation* cost-effective digital audio editing system, designed as transfer station for dialogue editing and other applications. Also: *AudioVision* with V2.5 software and *Media Composer* family of video editors.

◑ **Biamp Systems:** E55b. *Advantage DEQ282M* dual 1/3-octave digitally controlled equaliser, *DRC 4+4* digital remote control with audio level and mute functions. A further 4 channels of VCA control can be provided by the RCII unit. *SPM412* stereo preamp-mixer. *DDL11* with maximum delay of 1.023s, selectable in 1ms increments. ◑ **BSS:** Stand No. unconfirmed. Varicurve system and *FPC900* remote controller. ◑ **Cadac:** F63. New options for *J-Type* sound reinforcement console. Sub-matrix module with programmable mutes, as well as inserts on sub and matrix outputs. Motorised fader automation option with new Central Control Module. ◑ **Calrec:** D25. *T Series* digitally controlled analogue console for broadcast production, postproduction and recording. Maximum configuration 176 channels and 48 track sends. *Q Series* broadcast production console. *Compact* desk, *Minimixer* and *RX* range of outboard. ◑ **Canford Audio:** D01. Samples from biannual catalogue including *MS* microphone preamplifier, *Hagen* wireless earphones, headphone limiters, *RFS* slung microphone control and *Rockustics* loudspeakers. ◑ **CBT:** G-36. Turnkey service to broadcasters and equipment ▶

The large diaphragm for Amsterdam —AKG *C3000*

AMS-Neve *Logic 3*'s first European AES showing

including transmitters, ariels and antenna systems, studio units and radio automation technology. ◑ **Corporate Computer Systems Europe:** F33. Latest developments in codecs including *CDQ2001* stereo MUSICAM system with improved S/NO ratio, additional sample rate of 32kHz, scale-factor error correction and concealment and a bit rate error counter. ◑ **Crystal:** H30. Semiconductors including convertor chips. ◑ **Cyberlogic:** G02. Two 8-channel Power Systems now available, the *NC-807* delivers from 450W 8Ω to 900W 2Ω and *NC-812* delivers from 800W 8Ω to 1,400W 2Ω. Systems are modular with central power supply.

◑ **Dalet Digital Media:** D37. *On-Air Navigator* programme assist software and *Ednews* news editing system. ◑ **Danish Pro Audio:** Stand No. unconfirmed. New Brüel & Kjær *4035* omnidirectional headset microphone with 140dB SPL and 40Hz–40kHz frequency response. New *MSD550* master stereo display, level meter, correlation meter, sine generator and audio vector oscilloscope. B&K *4021* and *4022* musical instrument microphones. ◑ **DAS Audio:** H39. *Reference Series* trapezoidal enclosures with flying hardware. ◑ **Data Conversion Systems:** Stand No. unconfirmed. Convertors including new dCS *900b* A–D convertor with Super Noise Shaping option and *Remote2* overload box. ◑ **Dateq:** G35. New *BCS 50* on-air broadcast VCA-controlled modular console with a maximum of 16 channels connected to a motherboard through gold-plated connectors. Also *BCS200* and *BCS100* consoles. ◑ **Deltron Components:** Stand No. unconfirmed. Extension of their *DGS* pro-audio range, including universal panel cut-out multiple (XLR) plugs and sockets, and a series of professional ¼-inch jack plugs. ◑ **Dialog 4:** E31. *Layer III* PC card with digitising facilities and transmission via LAN, WAN or ISDN capabilities. ◑ **Digidesign:** D47. Motorised fader and touchscreen control surface for *Pro Tools* workstation. Digital audio interface between *ADAT* tape machines and *Pro Tools* or *Session 8*. TDM Bus for *Pro Tools* and the *MasterList* CD mastering program for Apple *Mac* computers. ◑ **Digigram:** D47. Digital audio cards for PCs including a range of MUSICAM solutions and V3 of the *Xtrack* postproduction system. ◑ **Digital Audio Research:** G21. New-look workstation with a hardware fader automation surface and-or touchscreen. Full colour graphics and second screen for track display option. Exabyte backup for both *Delta* and *Sigma*. *Sabre* optical disc and the *DASS 100* digital audio synchronising system. ◑ **Dolby:** F48. *AudioFax*, high quality ISDN system based on AC-2 coding. Can send full bandwidth PCM non-real-time. SR products, signal processing including the *Model 740 Spectral Processor* and *Model 5500 DSTL* digital studio to transmitter link. Demonstrating Dolby *Surround* and Dolby *AC-3* for HDTV at booth H40. ◑ **Dorroughs Electronics:** D51. Audio level meters which combine peak and average reading. New loudness meters for measuring AES-EBU audio in vertical and horizontal models. ◑ **Duran Audio:** G37. *Axys* self-powered sound reinforcement systems and studio monitors. Latest stage monitor *UFM-215* with 15-inch cone driver and a 2-inch compression driver. New DSP products: *DAS-1* is a dual-DSP-based digital audio station capable of processing two independent signals. *SD3002* delay line.

◑ **EAW:** F47. *CH Series* mid-high array modules with 'exceptional control' of horizontal coverage for improved speech articulation in reverberant environments. ◑ **Eela:** D27. *S440* Broadcast Control Centre and *S340* Broadcast Facility Desk in special split version, with Integrated Automation. New *S24 Reportophone Plus* ready for use with the Eela Audio ISDN codec if required. ◑ **Felixson:** A26. New *Broadwave* monitor system designed to produce loudspeaker stereo by wave synthesis and thereby avoid adverse effects of room on performance ◑ **Fidelipac:** F23. *Dynamax DCR1000* series digital cartridge machine, hard disk system, sample rate convertor, *MX Series* modular console. ◑ **FM Acoustics:** E37. *FM801A* power amplifier delivers 1,500W rms per channel into 1.5Ω. *ClassAmp M-1 REM* mic preamp. *Forceline 3* cable , with 0.66Ω per k/m resistance. *FM214/216* line driver/line level interface, *FM236 Series* of linear-phase 36dB/octave electronic crossovers. ◑ **Future Equipment Design:** F31. *Steenbeck/FED* film editing flatbed tables with digital audio recording on MO.

◑ **Geffen:** H52. *M&E Organizer* software demonstrating with three CD playing systems. The *M&E Organiser* locates sound effects from PC or *Mac*. *CDJ Pro* automated disc jockey system, CD Sound program for background music management. ◑ **Genelec:** A36/Rm R. Official launch of model *1030A* monitor, replacement for *1019A*. MDF cabinets have DCW design and house one 170mm woofer and one 19mm metal-dome tweeter. ◑ **Gold Line:** F52. A portable *Audio Test System* for less than $3,000: sine wave generator, dBm, frequency and impedance meters, a gated pink ▶

Under control—BSS *Varicurves* and remote unit

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noise source, a DSP-based 1/3-octave RTA, SPL meter and *RT60* meter. *APT* Phase Polarity tester. *MS-3* Multi/Send personal mix and headphone system. ◑ **Gorgy Timing:** H53. Silent timing devices for the broadcast market, with specialist facilities. Latest AES-EBU time-code generator. Also a new range of message display systems. ◑ **Gotham:** A22. Cables including new multipair with individual numerical coding to assist in identification. ◑ **Graff Electronic Machines:** C44. New GEM *Reformatter*, GEM 2-4-track cassette copier and duplicating centre.

H ◑ **Harmonia Mundi Acoustica:** H51. *PDAE* digital audio editor, designed to eliminate loading and backup times. Has four modules: *Organizer*, *AutoRemote*, *AutoSequencer* and *AutoCompiler*. Also showing *PQ Junior* and *PQ Senior* encoding systems. ◑ **Harris Allied:** D91. *Enco DAD 486x* cart replacement system; *Arrakis Digilink* modular studio system with simultaneous record-playback and *Arrakis TrackStar* recording and editing workstation. ◑ **Haufe:** D45. New transformerless output module and other active input and output modules. ◑ **HHB:** F-01. DAT recorders including *Portadat PDR1000* location recording unit and *PDR1000TC* time-code generator equipped version. Unspecified addition *CEDAR* range of audio restoration products, which includes *DC-1 Declicker* and the *CR-1 Decrackler*.

JK ◑ **JTM Productions:** H34. DCP system is designed to provide CD quality cart replacement from a MS-DOS-based computer. ◑ **Jünger:** E26. Range of outboard products including three digital dynamic range processors containing compressor, limiter and expander. Digital and analogue interfacing options. ◑ **Jutel:** E32. *Radioman* LAN-based station automation system and on-air mixing consoles. ◑ **Klark Teknik:** B33a. *DN3600* programmable graphic equaliser and recently launched *DN3601* slave, equalisers and other processors. *Midas XL3* in 48-channel version with stereo modules. ◑ **Koch Digitaldisc:** B55. New stamper analyser and remote player for *CD QC* system. *CDCS 4/SA* stamper analyser comes with a holder said to guarantee the flatness of the stamper and protect from damage. ◑ **KS-Cassetten:** B56. Demonstrating music duplication system, *SST* labelling device and *CLM* length verifier.

LM ◑ **Lab Gruppen:** F50. PC-based loudspeaker processor *DSP24*, includes the EQ and crossover designer software. *Measurement Aided System Designer* software enables creation of filters from acoustic analysis data. Also, three compact and lightweight power amplifiers. ◑ **Lawo:** H21. New *MC80* digital mixing console for broadcast use. Modular design and integral digital crossbar with up to 480 inputs and any number of outputs. Maximum configuration 120 input-channels, 32 aux sends and 32 masters. 18 and 20-bit convertors, 32-bit internal processing. ◑ **Lydcraft:** E54. New Tube-Tech *LCA 2A* stereo compressor-limiter: valve-based, separate compressor and limiter for each channel. Compressor section has choice of six attack-release presets to mimic the original *Fairchild 670* but also manual control, variable ratio from 1·6/1 to 20/1. Complete range of Tube-Tech valve-equipped compressors, mic preamps, equalisers and

On the slate— dCS convertors

headphone amplifiers as well. ◑ **Lyrec:** A52. Complete 100/1 duplication line with new generation Dolby *HX Pro* electronics including nonlinear rectifier. *Frida* and *Fred* portable tape machines. ◑ **3M:** G53. New digital open-reel tape, CDR blanks and S-VHS tape for *ADAT* format. Other tapes including *996* analogue mastering formulation. ◑ **Munro Associates:** C57. *System Z* modular acoustic system, *MLSSA* acoustic measurement system, *LMS* loudspeaker measurement system.

O ◑ **Onyx:** A16. AES-EBU digital headphone amplifier. AES-EBU D–A convertor. New intelligent modular active AES-EBU serial digital audio distribution system with clock recovery and jitter reduction. New, low-budget AES-EBU sample-rate convertor. ◑ **Orban:** A29. *Optimod* TV Digital *8282* processor for dynamic control. ◑ **Otari:** B41. New broadcast options for *Concept One* console including stereo input and output modules. First showing of *Series B-10* radio on-air and production console. New *Pro-MD* MiniDisc recorder and player for radio. New CD-Changer for 360 discs. *DTR-90* and *DTR-7* DAT machines, analogue open-reel tape machines and cart players. ◑ **Out Board Electronics:** D26. *SS2* theatre and live sound automation system with patented *MF Series* linear-motor moving faders and automated matrix. *SS2* can be used as a stand-alone, driven by PC or integrated into console including the Soundcraft *Europa* and Midas *XL3*.

P ◑ **Penny & Giles:** D34. New VCA Audio Control Module, a stand-alone system that can be controlled by MIDI or patched to P&G *MM16* MIDI controller. Each audio channel has independent inputs and outputs. ◑ **Philips:** C31. *DCC* mastering and duplication equipment. ◑ **Professional Monitor Company:** A10. Transmission line monitor systems, including new *TB1* Hi-Fi Monitor Loudspeaker, which uses hybrid line system 'Transflex loading', a truncated transmission line system tuned to 70Hz. ◑ **Prefer:** H27. *MBF-1* and *MBF-24* microphone preamp-mixers. *CAM-50* professional portable *ENG* minimixer with four balanced mic-line inputs, phantom supply, three-way parametric equaliser and two symmetrical outputs. Also on show: stereo power amplifier, announcement systems, cables, faders and microphones. ◑ **Professional Sound Corporation:** H15. Microphones, time-code devices and a solar rechargeable 12V power supply. ◑ **Pro-Bel:** H19. Routing and distribution equipment. *5023* sample-rate convertor and synchroniser enables signals to be reclocked as well as converting between two sample rates. Mini Digital Audio Mixer is configurable for six or 12 AES-EBU channels and offers PFL as well as main outputs. The system uses a standard electronics chassis but allows users to configure control panels. ◑ **Publison:** D21. *Infernal* Workstation with maximum capacity of 36 hours, latest time-code capabilities and new segment-based digital filtering function. *Oceane 2* 4-track optical-disc editing system with dedicated controller.

Q ◑ **Quad Electroacoustics:** F26. First of *200 Series* of 'intelligent' amplifiers. For use on DC supply , *Quad 255* is a 150W 100-70V line driver. Optional mains supply provides standby battery and charging facilities. Remote control facilities include level, thermal management, dynamic performance, source switching, security and performance logging. Established *240* amplifier and *ESL63* electrostatic speakers. ◑ **QSC:** F58. *QSControl MediaLink* connects *EX-Series* amplifiers for remote control and monitoring.

S ◑ **Sanken:** D54B. New *CSS-5* shotgun microphone with five rectangular capsules. Mono and stereo capabilities. ◑ **Sample Rate Systems:** G24. Digital transmission and crossover system for loudspeakers using a 20-bit sigma-delta convertor. Also showing stand-alone DSP module for prototyping and limited production runs, plus CAD service for designers. ◑ **Seem Audio:** F12. New digital synchroniser and convertor *DDC-1* , handling sampling frequencies from 27kHz–54kHz. Control over audio format, sampling rate, requantisation and synchronisation. Monitoring functions are incorporated in order to help find the best settings. Word length is 24-bit, I-O formats AES-EBU, SPDIF and optical. Level and noise shaping included. Also: expanded 12-channel frame for *Seeport* mixer. ◑ **Sennheiser:** G27. New *SKM5000* UHF hand-held radio mic with integrated antenna and 16 switchable transmission frequencies and new condenser system ▶

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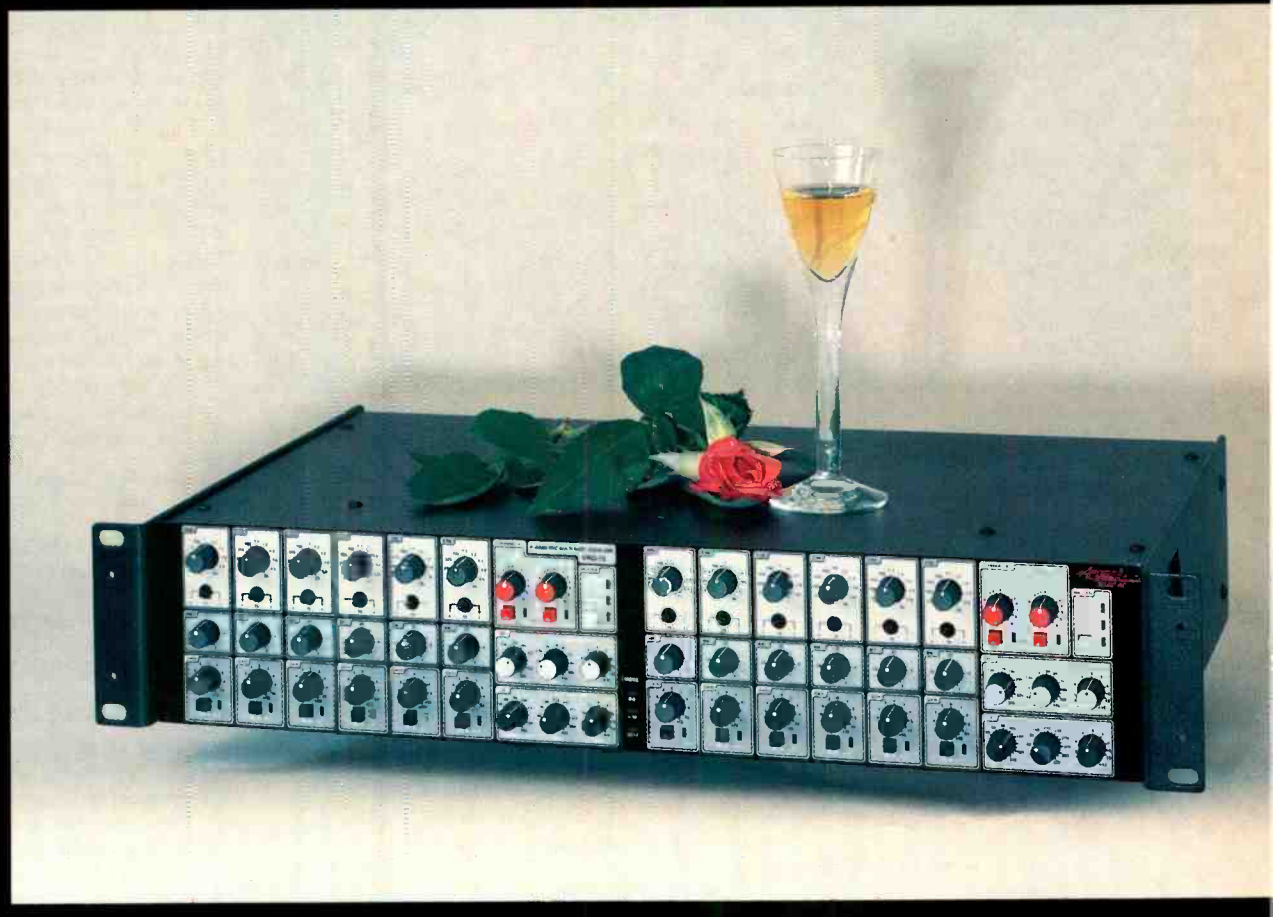
CEDAR's *CR1* keeping stand F-01 crackle free

changeable between omnidirectional and supercardioid capsules. For OB, new *EK4015* UHF pocket-sized true diversity receiver pack can be switched between 32 frequencies. Also promoting *EM1046* multichannel programmable switchable receiver system and range of microphones. ◑ **Shure:** B22. Wired and wireless microphones, plus compact mixers. ◑ **SigTech:** F28. *AEC1000* digital room acoustic and monitor processor. Device contains 25 processors, executing 250 million instructions per second. Continually measures room and creates corrective algorithms. ◑ **Solid State Logic:** A11. SSL's theme for this AES convention is the role of audio in multiformat programme production. Included are the *G Plus* console system; *Scenaria Omnimix*; *Screensound V.5* with *Visiontrack*; *SoundNet*; and *SL8000 GB* on-air production console. ◑ **Sonic Solutions:** B27. *DiscVideo* option for CD PreMastering System, allows the premastering and MPEG encoding of video and audio prior to recording to Karaoke CD, *CD-I FMV* (Full Motion Video) and CD Video. Now shipping *Media Net* in CDDI and FDDI versions. ◑ **Sonifex Broadcast:** C33. New *DPD2000* system stores as much as 14 hours of rolling programme. Access can be gained without interrupting recording. Also demonstrating *Sound Screen HDX2000* hard-disk-based workstation with networking, newsroom editing and CD jukebox facilities. Discart cart replacement system, *NAB* carts and players. ◑ **Sony Broadcast International:** G11. First European showing of *DAE-D5000* Digital Mastering System prototype. *PCM-9000* Digital MSdisc Recorder, 20-bit 2-channel random access record and playback. *MDS-B1* MiniDisc recorder-player and playback *MDS-B2P* for radio. *CDP-3100* Compact Disc replay systems and the *CDK-3600* auto disc loader. *DMX Series* consoles: *DMX-S6000*, *DMX-B4000* Radio On-Air Console, compact *DMX-E2000* and *DMX-E3000* 16-4 mixer. Sony *PCM-E7700* DATStation, 'all-in-one' editing system. Serial 9-pin remote option for the *PCM-3324S* and new meter unit *DMU-3024S*. ◑ **Soundcraft:** C21. Professional Division. New *SM24* stage monitor console with 8 mono plus 16 mono or 8 stereo sends, with logic controlled system New *Delta Theatre* with individual routing to the four group buses, 6 aux sends with pre-post switching and 6x4 matrix. Also: *Delta*, *Vienna II* and *SM16*. Broadcast Division: new *Series 10*s modular on-air self-op desk. New *BVE100*s audio-for-video editing console. Also *LM1*, *Series 30*. ◑ **Soundtracs:** E47



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TU◑ **Tandberg Data:** F14. *TDC9200* digital audio logging system storing 24 hours on one cartridge; *TDC 9300* playback, editing and on-air system; *TDC9400* archiving store with maximum 768-hour capacity. ◑ **TBS:** E36. *Comp-Air* digital radio system with centralised tapeless storage, networked workstations and on-air studio management. ◑ **Tektronix:** F44. Hand-held *AM70 Audio Pathfinder* for portable fault finding in analogue or digital installations. ◑ **Toa Electronics:** E53. Upgraded version of the *ix-11000* digital mixing system for broadcast and postproduction with new ergonomics and features. New Integrated DSP system providing more than 20 different types of signal processing for sound systems. New processor controlled speakers, *SR-F5* full range, *SR-L5* subwoofer and *AC-D5* processor. ◑ **Ultrasone:** F54. Headphones with 'in-front localisation and spatial hearing' including a 4-channel model for HDTV and Surround.

WY◑ **Weircliffe:** C56. Latest degaussing products for audio and video products. ◑ **Weiss Engineering:** D61. *102* digital system with modules for interfacing, equalisation, level, mixing and delay. *Penguin Series* controller. *IBIS* mixing desk with optional *GML* automation. *Gambit* noise shaping redither and sampling frequency convertor. ◑ **Yamaha:** D17. New *M2000* console in formats from 16 to 40 channels, with MIDI recall scene memories and mute patterns. *DMP9* digital mixer: 16 channels in 3-unit package. The mixer includes two internal multieffects processors. New stereo software package for *DMC1000* desk, with stereo channels and MS matrices for broadcast. Two new programmable digital equalisers, the *YDG2030* graphic and the *YDP2006* parametric. New computer controllable power amplifiers. ■

EXHIBITION TIMES

Saturday	11.00am to 6.00pm
Sunday	10.00am to 6.00pm
Monday	10.00am to 6.00pm
Tuesday	10.00am to 5.00pm

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SOUNDS PACIFIC

James Douglas turns the spotlight onto the American all-digital audio postproduction complex at Pacific Ocean Post

Throughout the video and film community, digital technology is opening up exciting new avenues of creativity. As recent blockbusters like *Jurassic Park* have demonstrated, digital scene composition and image manipulation can bring to the silver screen events that just a few years ago would literally have been impossible to achieve. And, as growing numbers of home viewers and movie audiences are beginning to appreciate, high-definition images need to be accompanied by high-definition sound.

Sky lights, trees, flagstones and river rock provide an airy ambience

In many respects, today's newer generation of all-digital facility have only become possible because of dramatic advances in signal-processing technologies, and the proliferation of talented design engineers who have been attracted to our sound community from the computer industries. Stir in a generous amount of R&D investment from well-heeled parent companies, and we now have available a wide selection of consoles, workstations and other components for the all-digital facility of just a handful of minutes into the future.

But selecting the hardware is just one facet of the decision-making process. Finding staff who can both design and install the hardware, and then use it in today's high-pressure, no-excuses postproduction environment, calls for strong nerves. One such West Coast facility that recently made a dramatic commitment to digital audio is Pacific Ocean Post, a video house which is not unfamiliar with leading-edge technologies.

Established in 1985 by video editor-director Alan Kozlowski, producer Sandra Hay (his wife) and partner Jerry Kramer, Santa-Monica-based Pacific Ocean Post has earned an enviable reputation for state-of-the-art video editing and special effects.

'We pride ourselves on actively responding to day-to-day technical and creative requirements of the video postproduction industry,' confides POP president Kozlowski. 'Our video facility currently includes 17 editing and post rooms, including a PAL-NTSC on-line component D1 bay [equipped with a Sony *Model 9100* editor with *Model 8000* switcher]; two on-line composite D2-D3 bays [Grass Valley *Model 151* editor with *Model 200* switcher]; an interformat bay [GVG *141* editor and *100* switcher]; three NTSC-PAL nonlinear bays [Avid *Model 2300 Media Composers* with *Quadra 950*s]; two digital telecine areas [Rank *Ursa* with DaVinci *Renaissance* colour correction]; two compositing environments [with Quantel *Flash Harry*s and *HAL*]; plus an integrated editing and compositing suite [Quantel *Henry*].'

Adding a dedicated audio-for-video/film facility implied the same level of commitment. As Kozlowski explains, the integration of sound had always been part of his company's master plan.

'The new sound facility has targeted a diverse client base in feature film, television and commercial markets, in addition to servicing our current clients. It was essential that our sound facility mirror the level of excellence that we've achieved in video postproduction. Within the last couple of years, all the critical elements converged—from recent advances in digital audio technology to the unique location of our new building. During the construction phase, we had the time to assemble a creative team based on long-standing relationships. It was a window of opportunity for POP to create on the digital audio front a sonically superior facility.'

Pet sounds

'What's unique about our new facility,' considers Marc Robertson, General Manager of POP's Sound Department, 'is that we can accommodate a broad client base from feature films through commercials, trailers and television shows. The design of the rooms, the equipment and the calibre of our engineering staff lets us provide, in one facility, the best postproduction sound quality for our client's specific needs.'

POP's new audio post division, referred to as POP Sound, is headed creatively by Bruce Botnick, a name that should need

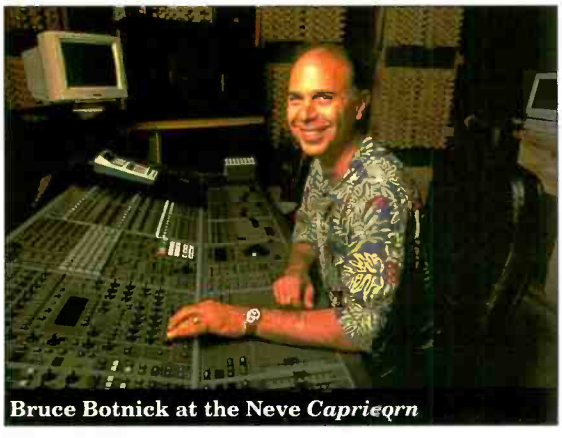
little introduction as a music producer and scoring mixer of international repute. Botnick's award-winning work can be heard on such films as *Aladdin*, *Beauty and the Beast*, *Basic Instinct* and *Total Recall*. Last year, the producer-mixer relocated his former Digital Magnetics production facility within Pacific Ocean Post's Santa Monica site. Now a partner in the resultant audio-video complex, Botnick masterminded the overall design and concept for POP's new state-of-the-art digital-audio facility.

Acoustic design was by Bret Thoeny of BOTO Design, Venice, CA, who also designed the new Radford Stage for Todd-AO and Prince's Paisley Park complex. Engineering design was handled in house by Tim McColm, POP Sound's Chief Engineer, and Ron Lagerlof, former VP of technical operations at Lucasfilm's Skywalker North facility, and now principal of his own company, Visioneering Design. Staff sound mixers include Jeff Payne, formerly of Waves; Peter Rincon, formerly of The LA Studios; plus Ted Hall and Tim Claman, both with POP.

Studio A is intended for larger film-style mixing and dubbing, or video sweetening and mix-to-picture

POP Sound's new 17,000-ft² facility currently includes five dedicated audio rooms, with additional Foley and ADR suites under completion. And state-of-the-art in technical hardware is mirrored by specific attention to the entire environment; after all, producers do like to take the occasional break from multihour sweetening sessions. Housed in a mid-1930s building located close to POP's existing digital video post facility, POP Sound is furnished in what might be referred to as Mediterranean style; a white stucco hacienda features wrought iron Palladian windows, a red Spanish-tile roof and juniper trees. The facility's interior has been laid out with varying levels of rooftop, plus multicoloured facades—all of which create the feeling of a small, intimate village beneath a 30-foot bow-truss beamed ceiling. Skylights, trees, flagstone and river rock have been included to provide an airy, outdoor ambience. Client lounges, a rooftop patio and an espresso bar are also available.

A fibre-optic cable running beneath the street links the two locations via eight digital audio tie-lines, *D2* serial composite video, master house sync, communications and machine control.


Bruce Botnick at the Neve *Capricorn*

'Our largest room, Studio A,' Bruce Botnick explains, 'measures around 30 x 25 feet, and is intended for larger film-style mixing and dubbing, or video sweetening and mix-to-picture. The room features a 108-input AMS-Neve *Capricorn* digital console—the first to be delivered to a US facility—equipped with eight monitor buses, LCRS panning, Dolby surround-sound switching, plus two Assignable Facilities Units. These dual AFUs allow system functions to be controlled from two independent operator positions.

'Just across the hall from Studio A is Studio B, a slightly smaller room that houses a 48-input AMS-Neve *Logic 2* digital console, fitted with a 24-track *AudioFile* hard-disk workstation. Studio B is designed for film and video sessions that can be handled by a single mix engineer, or for premixing music and effects stems, for example.'

Vocal/voice-over booths are located between Studio A and Studio B.

'We purposely designed each of the two larger rooms —Studio A and B—to handle different functions,' Botnick explains. 'Both rooms feature Apogee Sound THX monitoring systems, although all five of our current rooms are equipped for multichannel LCR monitoring, plus split surrounds. A and B are also of different sizes, to suit the requirements of medium-scale and large-scale mix-to-picture sessions. Clients have the option of predubbing in the smaller, mid-size room, and then moving the project into the bigger mix-to-picture suite. And with digital technology, there are no generational losses, frequency response compromises, noise build-up and the other problems we know all to well with analogue techniques. Our use of removable hard drives and magneto-optical storage within the disk-based editors means that projects can be moved on and off these systems very quickly.

'Studio C is designed primarily for commercials, ▶

Clients have the option of predubbing in the smaller Studio B and moving to Studio A for mix-to-picture

mix-to-picture, comedy shows, and the like. The room is designed around a 48-path, 12-fader AMS-Neve *Logic 1* digital console equipped with four rather than two layers of assignable functions—the first one in the USA. Four-layer assignability allows the board's channel-strip modules to be assigned to as many as 48 signal paths, routing to a total of two primary groups, stereo and four mono-stereo auxiliary outputs. Full left-centre-right panning is available from each signal path.

Linked directly to the *Logic 1* is a 24-track *Spectra* hard-disk workstation and random-access editor, equipped with two M-O drives and a conventional hard drive. Eight channels of digitised audio can be replayed from the M-O drives, plus 16 from hard disk. The *Logic 1* accommodates 48 analogue inputs routing to 28 analogue outputs; inputs can be selected from 12, 2-channel AES-EBU format ports, 48 analogue sources, or 24 internal links from the *Spectra* editor.

'As with the *Capricorn* console,' Botnick continues, 'each and every setting on the *Logic 1*'s control surface can be dynamically automated. Also, since our console and random-access editors are interlinked, in the near future we will be able to couple all of the dynamic automation data to, for example, sound cues in a time-code-referenced event list. If, during editing and soundtrack assembly, a particular sound cue is "moved" from one time-code location to another, all of the mix-level and processing information moves with it.

'Studio D is identical in equipment complement to Studio C; the room is slightly smaller in dimensions, but is designed to handle the same wide range of mix-to-picture and pre-lay assignments. In addition, Studio D also houses a full-function NED *Synclavier* and *Post Pro* system, which we use for more intricate sound design.

'Studio E, our final room, houses a bunch of equipment that I bought with me from my former Digital Magnetics facility. It currently offers an 8-channel Sony *K-1105* digital mixer, various time-code synchronisers and a DAR *DASS-100* digital sample-rate convertor. It is where we handle the more "difficult" digital audio mixes and transfers, including remixing for foreign-language versions, CD mastering, and other video-related sweetening projects.'

Apogee Sound *MPTS-1* monitor systems in Studios A and B are THX-approved, and feature Pacific Innovative Electronics power amplifiers driving left, centre, right speaker stacks, plus a dedicated subwoofer channel. Eight JBL *Model 8330* cabinets—four per side—handle surround outputs. Dolby *SEU-4 Encoder* and *SDU-4 Decoder* units handle LCRS to Left-Right transfers, and monitoring the effects of Dolby's 4:2:4 matrix-encoding process, now being used on an increasing number of video mixes for network and cable release. Studios C–E feature KRK monitors for LCR, plus JBL, Minimus or ADS surrounds, again powered by PIE MOSFET amplifiers.

'We have made such a major commitment to digital mixing and processing here at POP Sound,' Bruce Botnick concedes, 'simply because the technology offers full reset plus recall of each and every system function. All signal elements, including assignment and EQ parameters of the *Logic 1*, *Logic 2* and *Capricorn* boards, can be updated in just a few seconds, which saves a lot of time. It is not uncommon that we need to schedule pre-lay and mix-to-pix sessions one after the other; in the old days we could spend hours resetting the mixing console and reconfiguring the hardware. Now, it's just a matter of pushing a couple of buttons, and the engineer can begin almost instantly!

'And digital sounds so much better than analogue. Our engineers can perform impossible edits on these hard-disk systems. During a recent session for Disney's new *Pocahontas* [animated feature film], we had to replace some parts of a Mel Gibson song. Using the *AudioFile*, we were able to slip the lyrics word by word, in a remarkably short period of time.'

Central machine room

According to Chief Engineer Tim McColm, a decision was made early in the design of POP Sound to use sophisticated digital routing systems to interconnect each of the mix rooms to a central machine room, where the various processing racks, storage drives and reel-to-reel transports would reside. To an extent, he observes, that idea was only partially successful.

'Our initial problem,' the ex-BBC engineer confides, 'was that a full-function routing system that could handle SDIF2 signals —the standard I-O for *Capricorn*, *AudioFile* and various tape transports—would have costs us around $250,000! Instead, we decided to compromise to a certain degree, and restrict the amount of cross routing we could offer between rooms.

'In the end, we specified an NVision *NV-4000* 128-by-128 switcher/D–A that accommodates AES-EBU-format signals at the digital-video sample rate standard of 48kHz. The *NV-4000* is linked to a Vistek 48-by-48 video router, so that we can simultaneously switch audio and video sources. The routing system is controlled from each room via an Apple *Macintosh LC III* computer that runs custom-developed software written for us by Jonathan Egstad. We have lockouts to prevent people deselecting machines and sources during a session, and can even send EMail messages between staff members.'

The *Capricorn* room is assigned 16 AES-EBU-format inputs and 16 AES-EBU outputs (32 channels in each direction); Studios B, C and D each have 12 AES pairs; and Studio E currently offers eight I-Os to and from the central router. All digital sources and destinations to-from the routing system appear on a series of standard TT patch bays, for manual overpatching as required. Each room is also assigned four AES-EBU pairs as digital tie lines. This configuration allows, for example, a DAT machine in one studio to be accessed from another area via the machine room.

Other sources are assigned to various devices located in the machine room, including a Lexicon *LFI-10* digital format convertor (two other *LFI-10*s are permanently assigned to handling SDIF2 to AES-format conversions between a pair of Lexicon *480* digital reverbs). Also available: a Sony *DFX-2400 Sample Rate Convertor* (for 44.1/44.056kHz to 48kHz transfers and so on); a DAR *DASS-100 Sample Rate Convertor*; and two Sonic Systems *Format Convertors* assigned to Studio E.

The *DASS-100*s are particularly useful, McColm points out, during D1 transfers. The unit's 4-in/4-out format allows channels to be combined and even swapped around, as necessary, during digital dubs. 'The NVision routing system also lets us diagnose potential routing problems, by selecting any source or destination to a local monitoring point.'

Housed in the Terminal Room are the main processing racks for the *Capricorn*, *Logic 1* and *Logic 2* consoles. The central machine room contains a pair of Sony *PCM-3324* digital multitracks; a Sony *PCM-3348* 48-track; a Sony *PCM-3324A* ('better A–D convertors that the *3324*,' McColm points out, 'plus a single AES-EBU I-O pair'); a Sony *PCM-3324S* (with four channels of AES-EBU I-O, plus two SDIF2 ports); four *PCM-7030* time-code-capable DATs; Sondor mag transports; plus various analogue machines, including a Sony *APR-24*, Studer *A820* 24-track, Studer *A807* 4-track/ ►

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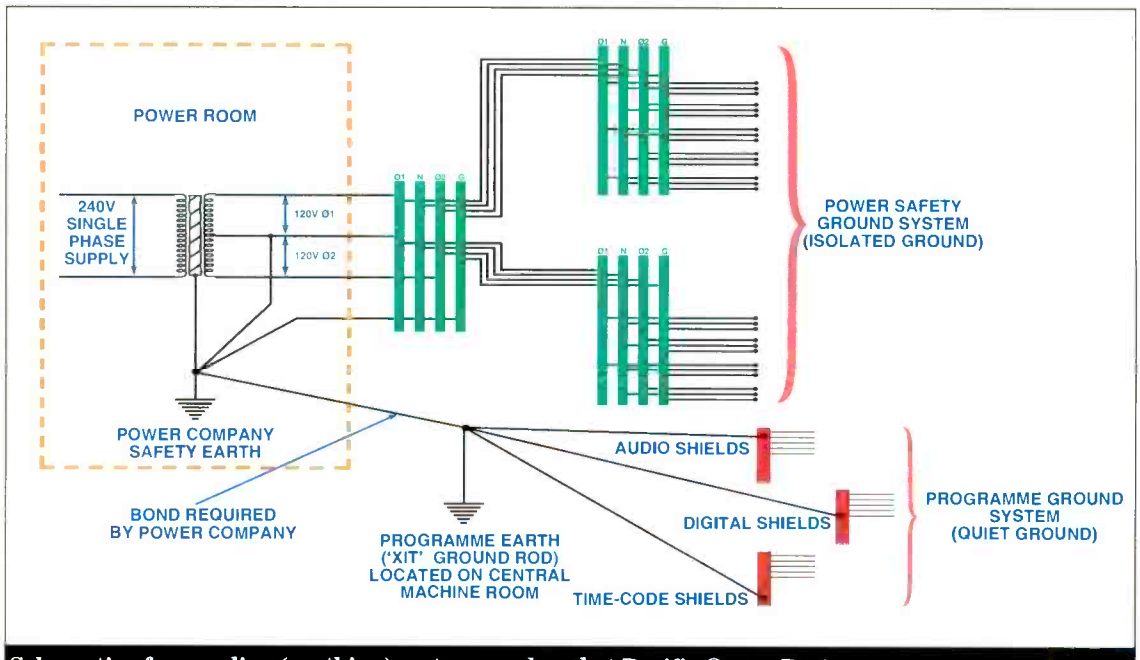


Schematic of grounding (earthing) system employed at Pacific Ocean Post

½-inch with time code, and a Studer *A810* ¼-inch with time code. Video decks include Sony *DVR-20* and *DVR-28* long-play D2 machines, Sony *DVR-1000* D1 decks, Panasonic *AJ-D350* D3 machines, plus various C-Format 1-inch analogue recorders with analogue-digital audio tracks.

'The *PCM-3348* and *3324S* machines,' McColm continues, 'are fitted with a MADI interface, which connects directly to the *Capricorn*—very handy. For added flexibility, we have installed a MADIX unit that converts SDIF2 format into MADI, for direct connection to the other, non-MADI Sony multitracks. The MADIX unit even handles A-Dub and B-Dub connections from Otari and Mitsubishi ProDigital-format machines, should we even need to interface to such a unit.'

To ensure click-free and glitch-free signal routing between hardware located within the machine room, an NVision *NV5500 Master Sync* accurately locks NTSC-PAL house sync to master digital word clock for both AES-format and SDIF2 digital interfaces. Routine A–D and D–A audio conversions are also handled via a series of patchable NVision *1000 Series* 18-bit codecs.

In addition, a system of multiway connectors is used to tie various audio-video transports to remote control units located in different studios. The Sony *PCM-Series* multitracks are accessed via a system of 50-pin D-Sub connectors, while conventional 9-pin serial interfaces handle directly compatible ATRs and VTRs, plus TimeLine *Lynx* protocols. In addition to *Lynx II* modules and *Master Controllers*, Alpha Audio *BOSS 2* time-code-based synchronisers are also available.

Gone to ground

If analogue was tricky, as anyone that has even dabbled with digital systems will know all too well, without a properly implemented grounding and interconnect scheme, eliminating clicks, pops and buzzes can be a nightmare. And with a 90dB+ noise floor available from current-generation digital recorders, mixers and editors, even the slightest amount of signal noise is going to show up in a mix. Fortunately, POP Sound were able to take advantage of a power system specified by the building's former tenants.

'The telephone company,' Tim McColm recalls, 'had installed a high-capacity, 240V single-phase supply. We were able to split this into two, 120-volt legs, which provided the flexibility to switch our system racks from one leg to the other to reduce phase anomalies and ground leakage. Although it involves a certain amount of trial and error to match loads on each leg—for example, the left-hand side of the *Capricorn* is on one leg, and the right-hand on the other—we now have a power-distribution and grounding system that is remarkably quiet and buzz-free.

'But a lot of facilities come to grief when the grounding scheme carries leakage currents because of incorrect use of the safety grounds. As is well known, the ▶

PACIFIC OCEAN DATALINKS NYPD BLUE

One of the hit US network TV programmes this summer has been *NYPD Blue*, a fast-paced cop series from Steven Bocho, whose *Hill Street Blues* and *LA Law* proved extremely popular around the world. Set in the Big Apple, *NYPD Blue* also attracted a great deal of preseason interest. Rumours were circulating throughout the industry that, because of certain 'adult situations', ABC Television would have trouble rating the show for a general audience. (As it turned out, with a few judicious cuts, the show passed the network's internal rating office. The publicity did not damage audience viewing figures.)

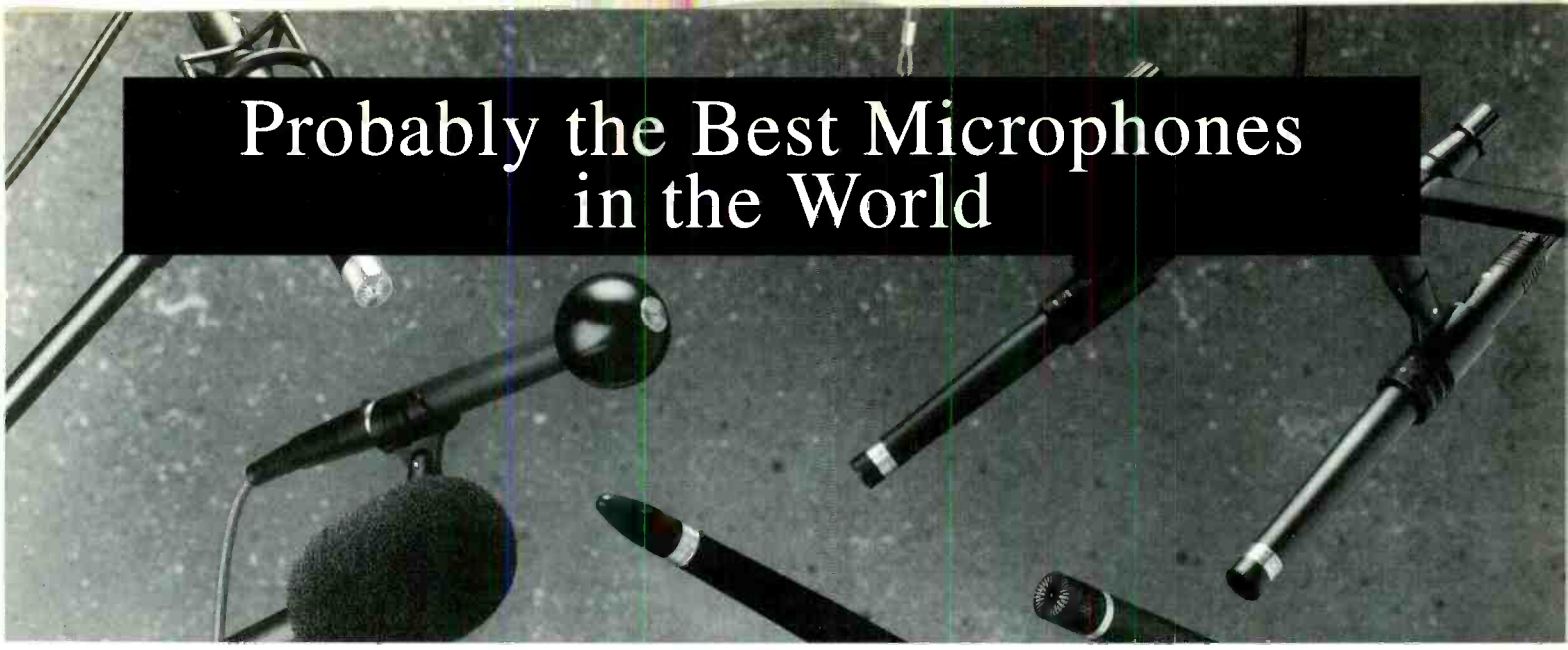
Such is the pace of the show's shooting, editing and postproduction schedule, that Bocho often cannot leave his suite of offices on the 20th Fox Picture lot in mid-town Los Angeles to travel the dozen-or-so miles to POP Sound in Santa Monica where the series is mixed in the *Capricorn*-equipped Studio A. Instead, courtesy of an all-digital audio link, the studio travels to Bocho.

A 256kbaud (kbits/second) EDnet link provided by San-Francisco-based Entertainment Digital Network is connected to Studio A's Dolby Surround Sound-encoded output. The 2-channel analogue mix is converted to digital and then passed through a Dolby AC-2 encoder. The 6:1 data-reduced information then travels via several GTE and Pacific Bell exchanges to the director's viewing room where the original Left-Right composite is decoded back to LCR and surround channels. Also provided on the digital link are an additional 128kbaud of information that carry conventional 9-pin serial commands via EDnet's ED100 machine-control interface, plus 2-way talkback.

A U-Matic video deck in Bocho's viewing room contains a video work print with time code which is locked to the record master in POP Sound's machine room using conventional Alpha Audio *BOSS* synchronisers. Because of inherent timing delays in the AC-2 encode-decode process, a 2-frame offset is dialled into the Sony edit controller at Bocho's location. With the audio now in frame-accurate sync with the picture, the director can offer constructive advice and feedback on the Surround Sound mix being prepared at POP Sound.

To date, *NYPD Blue* is the only network show to make use of such a system, although other TV producers are reported to be showing a great deal of interest in the concept.

What does such a system cost? Within larger metropolitan areas like LA, digital *T-1* services are readily available from the local telephone companies. In this case, says Entertainment Digital Network president Tom Kobayashi, a facility would pay between $500 and $1,000 per month for the leased line plus an additional $450 for interface hardware and audio codecs. The firm offers its online networking service for $100/hour; with time synchroniser interface this becomes $125/hour. ■



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Studio C—primarily for commercials

minimum requirements—and a legally required safety feature—for any facility to install power safety grounds to all equipment. In a regular installation, the power safety ground is bonded to building metalwork at multiple locations. Leakage currents in this scheme are not returned to the transformer in an orderly fashion, and will rise in level according to the number of circuits fed and the distance of the cable run. This is not satisfactory for an audio-video facility installation.

'In the isolated power ground scheme, ground connections on power outlets are isolated from metalwork and separate wires run back to isolated bus bars in the power panels in a star fashion, one wire per outlet. The individual panel bus bars are subsequently connected to another main isolated bus bar in the main panel. This isolated bus bar is then connected to a point in the power room near the power transformer, where the centre tap, electrical company ground and neutral join together.

'Now, since each outlet has a separate path back, leakage currents in this system can return to the transformer without affecting adjacent circuits.

'A second part of the system is the clean technical program [signal] ground. The programme ground path is kept free of leakage currents from the power ground system by being directly disconnected from it—we simply drop shields at appropriate places. An XIT rod is situated as near as possible to the patch bays and technical equipment in the central machine room, and extends outwards in a similar way to the safety ground through a series of isolated bus bars to patch bay shield and the technical ground terminals of our equipment.

'The XIT rod should never be subjected to AC leakage; it simply provides a quiet reference to the signal shields and equipment commons. By providing separate bus bars for the different types of signals, any digital noise, capacitively coupled audio band noise, time-code crosstalk and serial control noise drain back to the rod independently.

'We route the Audio Ground via series of bus bars to each equipment rack. We even went as far as establishing separate bus bars from the digital, analogue and time-code-serial communications racks, from which we star out to the individual equipment. We drop local shields at the point of entry into the patch bays, and then shield back to the bus-bar points. In this way, we establish an integral clean-programme shield from the XIT Rod through the rack to the point of entry; the short length of chassis ground carried from the equipment to the patch bay provides shielding up to that point. But, by ensuring that no power leakage currents can flow within our separate programme shields, we make sure that the systems is entirely quiet.

'We were again fortunate here at POP,' McColm adds, 'because we were able to literally gut the building of all power runs, and start from scratch. Studios often run into problems when they are forced to modify or add to an existing system for which wiring diagrams may no longer exist. In that case, a system that was well-behaved might suddenly start to pick up all sorts of outside interference whenever the new piece of hardware is connected or turned on. It can be a real nightmare.

'It was definitely worth the effort here, because we wanted to be able to add and remove equipment as necessary, without having to worry about upsetting the grounding schemes. Also, we were doubly fortunate in having access to a totally separate three-phase, 240V supply that we are able to use for all nontechnical needs, including air conditioning and other noise-producing devices!' ■

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James Douglas is a Los Angeles-based freelance writer and technical consultant

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1994
TBA

1993

1993
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24 Simultaneous Record
Equalisation
Digital Video Playback

1992

MFX2
16 tracks from one disk
Scrolling waveforms
Frequency Domain time compression
Gated Recording

1991

MFX
Hard Disk editing
8/16 track playback
Audio Freeze frame
16 Zoom scales

1990

Series III Rev 8
Dynamic Voice Allocation
8 track disk recorder

1988

Series III Rev 7
Fast disk transfer card
Caching of software display
32-bit processor added

1987

Series III Rev 6
Cue List timecode sequencer
CAPS music sequencer
Integrated mono disk recorder

1985

CMI Series III
First 16 bit sampler
16 Voices
Shared Memory Architecture

1982 3

CMI Series IIX
HiFi sampling
MIDI Implemented
Page R sequencer

1980

CMI Series II
First Real Time Graphics based Music Sequencer

1978

CMI Series I
First Sampling Digital Workstation
Waveform Editing

1976

QASAR
8 channel Fourier synthesis
Light pen interactive graphics
Dual CPU architecture

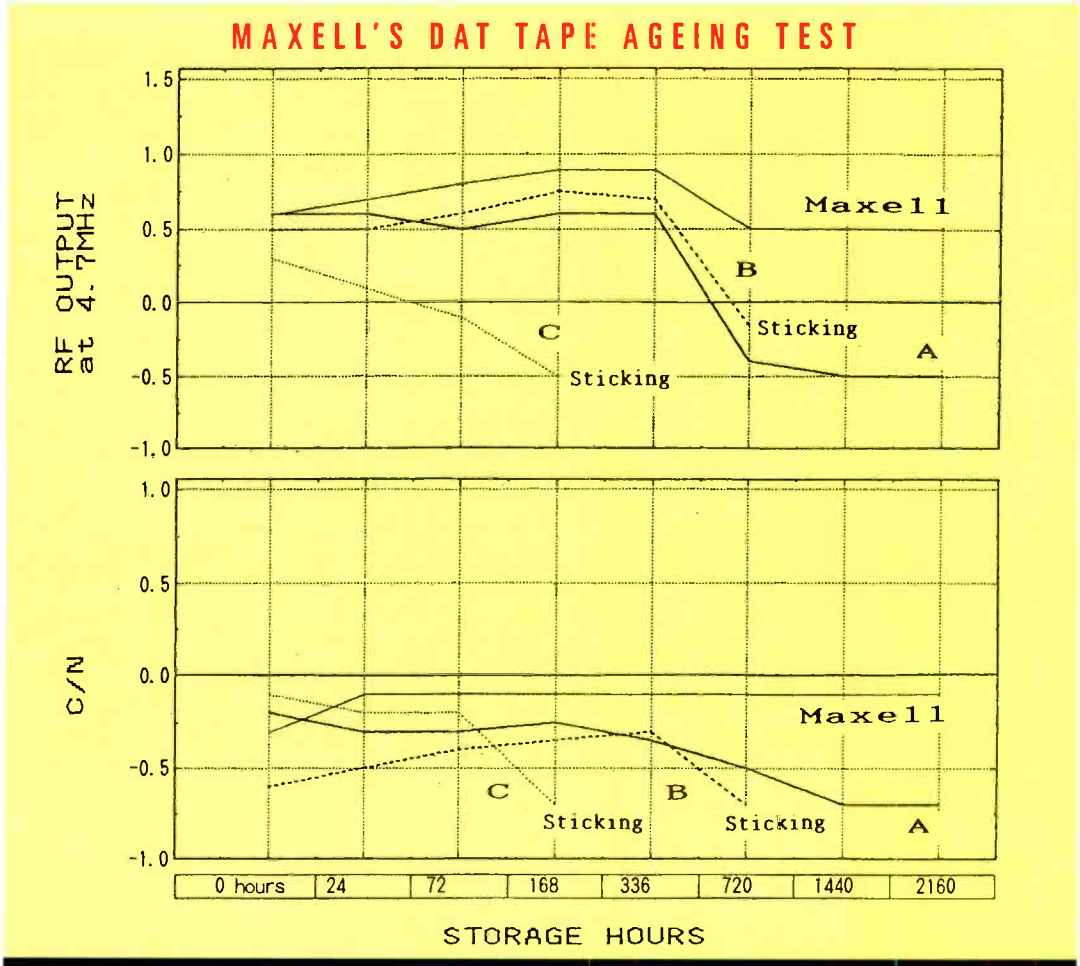

Fig.1: Changes of RF output and carrier to noise ratio (C/N) when DAT tapes are subjected to conditions of 60°C, 80%RH

DAT ageing

Dear sir, with regard to the test result revealed in 'DAT Tape Ageing Test', *Studio Sound*, September 1993, we are very concerned and disappointed that Maxell DAT tape achieved results that indicate that our product was the poorest quality when subjected to the accelerated storage test.

As you may be aware, Maxell has accumulated experience of more than 15 years with metal tapes. We have never seen or heard of the problem described in the test article, that Maxell metal tapes may have a corrosion problem and be unusable after a long storage period. We would like to present the following technical information indicating we have the confidence that Maxell metal tapes can never cause such a problem.

According to the article, the three Maxell products tested showed serious corrosion across the tape surface throughout its total length appearing as streaks on the edges and spots in the middle of the tape. In our opinion this is not corrosion.

After inspecting the samples which were used in the magazine test, we have concluded that the 'spots and streaks' materialised due to the following.

We presume that a lot of condensation must have accumulated on the tape surface under the accelerated test conditions of 60°C, 90%RH (Relative Humidity). In the case of heavy condensation, a chemical composition, one of additives in the back coating layer dissolved into water and deposited on to the tape surface, which resulted in a sticking phenomenon between tape layers. The sticking phenomenon usually produces streaks on tape edges owing to an excessive tape running tension.

Table 1 shows comparison of magnetic properties for the tested samples returned from the magazine and for new tapes taken from the same production batch as the tested samples. The degradation of maximum flux density 'Bm' of the tested samples is only 4% compared with Bm of the new tapes. If corrosion had occurred which as pointed out by the magazine, more serious degradation of Bm would have occurred.

Table 2 shows changes of relative humidity when the controlled temperature varies under the conditions of two factors of temperature and humidity. The conditions of 60°C, 90%RH easily cause condensation depending on control accuracy of temperature and humidity, in the chamber where samples are exposed and when the chamber's door is frequently opened during the test. In this case, it should be a waterproof test rather than the accelerated ageing test.

Maxell measure the characteristics at accelerated conditions of 60°C, 80%RH for 90 days (regarding the evaluation of corrosion and any practical problems, these conditions are approximately equivalent to more than 30 years in normal room conditions). **Figs.1 and 2** show the test result. In the figures, Maxell DAT tapes show equal quality level or better compared with competitors in the storage stability.

We have confidence that our DAT tapes do not incur any practical problems after the long storage period.

S. Ueda, Manager, QA Department, Magnetic Tape Division, Maxell, Kyoto, Japan. ▶

TABLE 1: MAGNETIC PROPERTIES OF MAXELL DAT TAPES

	After storage at 60°C, 90%RH for 28 days by *Studio Sound*	Before storage of new tapes from the same batch
Batch Number	DM-90 C03370-20	C03370-19
Coercivity Hc (Oe)	1565	1575
Retentivity Br(G)	2560	2605
Maximum Flux Density Bm(G)	2960	2990
Squareness Br/Bm	0.86	0.87
Batch number	DM-120 G10270-13	G10270-14
Hc (Oe)	1560	1555
Br (G)	2525	2630
Bm (G)	2900	3015
Br/Bm	0.87	0.87

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Kevin Hilton

Introducing a new column dedicated to broadcast issues

Radio is an immediate medium but this does not usually apply to the equipment. However, Birmingham independent station Buzz FM needed to move quickly at the end of last year to remain on air.

Muff Murfin, who used to run a jingle operation from The Basement Studio at 145 Wardour Street, Soho, bought the transmitter, licence and premises of the station, only to see the previous owner rip out and take away all the technical equipment on a local TV news programme.

Remaining calm, Murfin contacted Audio Systems Components (ASC) on Tuesday, 22nd November and ordered a system that could at least get the station back on the air. ASC put together a package of a Soundcraft MBI *Series 5* console, two CD players and a *DART* floppy disk cartridge machine, delivering it only 24 hours after receiving the order. Buzz FM went back on air on the afternoon of Thursday, 24th November.

Murfin commented that the basic setup was only a temporary arrangement but that it was good enough to keep the station running. The Buzz licence comes up for renewal by The Radio Authority at the end of April and it is intended to install a more elaborate studio if the reapplication is successful.

Some 20 years after they first started to appear, independent local radio stations (ILRs) are now beginning to live up to the second part of their name. With all the major regions and cities covered by at least one commercial operation, a new out of licences has been concentrating on smaller communities.

The latest to go on-air was Yorkshire Coast Radio (YCR), which started transmissions on the 7th November 1993. Based in the North Yorkshire seaside resort of Scarborough, the station's broadcast region is bounded by Whitby in the north and Bridlington in the south, going in-land as far as Malton. This gives the station what radio advertising people call a total survey area (TSA) of only around 76,000 adults.

'All the big ILRs are gone,' observes Len Lewis, Managing Director of Audio Systems Components (ASC), which supplied the equipment for YCR, 'and nowadays it's all smaller stations and a lot of colleges. We did about 20–30 studio packages during 1993, each costing between £8,000 and £9,000.' The YCR package was assembled at Aldermaston, transported to Scarborough and then installed in five days. This gave the station staff three weeks to work with the new equipment before going on-air.

The installation features an MBI *Series 5* desk in the commercial production studio and a *Series 10* in On-Air, with full racks, cabling, plus other equipment. An important aspect is the first UK use of the *Digilink* digital audio hard-disk system, a PC-based device which controls and programs the CD players and gives up to 16 hours recording time. 'Automation saves money because you don't need people, and the costs are actually coming down,' says Lewis.

Although people are essential for every radio station, when both your staff and broadcasting hours are restricted, automation can make life easier. 'Two hours a day are automatically triggered off the computer, including the links that we can record onto it,' explains YCR's station manager, Jerry Scott. 'The reason for it is our small TSA. It's the same as with any new business—you need to watch the costs and the ad revenue.'

YCR broadcasts 7am to 7pm Monday to Friday and on Sunday, while Saturday hours run from 7 to 10pm. The night time schedule is covered by opting in to YCR's parent station Minster FM, based in York. The rest of the time is a mix of presenters (Scott himself and Heather Ewing take the bulk of the shows) and sequences on *Digilink*.

With an Edison transmitter supplied and serviced by NTL, Scott reckons that the station has been well equipped for a good price. 'The rules on technical specifications have been relaxed now —before we would have had to have spent about half-a-million pounds but this cost us under £100,000. I hope this is the way radio will go —smaller stations.'

While this seems like a trend, the UK still has a long way to go to match the USA. The New Mexico town of Albuquerque, which has a TSA of 470,000, sustains 37 radio stations. A long way to go...

Audio Systems Components. Tel: 0734 811000.

This new generation of budget-conscious radio broadcaster is being targeted by transmission operation National Transcommunications Limited. Now with a new corporate identity and name, NTL, the company is starting to shed the elitist research-led image held when it was the engineering division of the IBA.

NTL have launched a new range of 'off-the-shelf' transmission systems, which are totally standardised and range from 20W single-ended to 500W fully-duplicated, all housed in 19-inch racks. Prices start at just under £5,000 and rise depending on system power.

Explaining the move, Mike Thorne, NTL's Radio Business Manager, says, 'The one-off hand-built system is getting harder and harder to sustain, especially for lower-budget stations. By using a standard design which is common to the whole range, we can offer what people want without any fuss and at a price they can afford.'

NTL no longer have a monopoly over transmission and while still the major provider for television and the larger ILRs, a number of new companies have appeared in the small radio station market. Most obvious are Phoenix Communications and Sound Broadcast Services (sbs), both of which have recently undertaken transmission contracts in the UK and abroad.

Acknowledging this, NTL's public relations manager Bruce Randall says, 'We are now looking at the community, smaller radio stations and in this we are getting a lot of competition from Phoenix and sbs and we can't let that go unchallenged.'

NTL. Tel: 0962 823434.

Twenty years after they first started to appear, independent local radio stations, (ILRs) are now beginning to live up to the second part of their name

Console manufacturer Soundcraft Electronics have long been successful in the recording and live sound markets. The broadcast market has not followed so readily, however, despite a number of offensives by the company, including the SAC range of radio desks towards the end of the 1980s.

Soundcraft Broadcast is a new attempt to capture the broadcast market. This new division will include the existing range of Soundcraft location recording, on-air and postproduction desks but is augmented by the radio and TV production consoles of MBI, which was acquired by Soundcraft's parent, the Harman group, in July 1991.

In charge of the new division is Adrian Curtis, who has been with Soundcraft for nine years. He is joined by head of UK sales Jon Ridel. To launch the operation, the company will be staging a series of open evenings at its factory during the early part of 1994.

The new division completes Soundcraft's programme of developing specific products and groups for its different consoles. Broadcast joins the established divisions of Professional (live and studio) and *Spirit*, which concentrates on budget boards for various markets.

Adrian Curtis acknowledges that Soundcraft were not well known for their broadcast products in the UK but added that it had a stronger profile internationally. 'We've customised many of our professional products for broadcast and now we are going to make this standard. We can also incorporate MBI and build on its profile,' he says.

Soundcraft Broadcast will focus on television, radio, location recording and audio-for-video applications, which is seen as the crossover between some of its postproduction desks. Curtis recently hinted that there was the possibility of new product launches at both AES and NAB this year.

Soundcraft Electronics. Tel: 0707 665000.■

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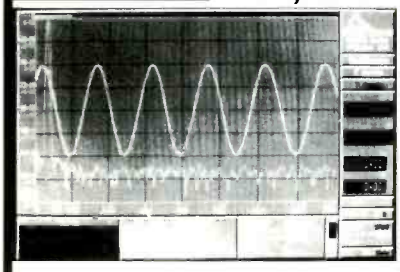

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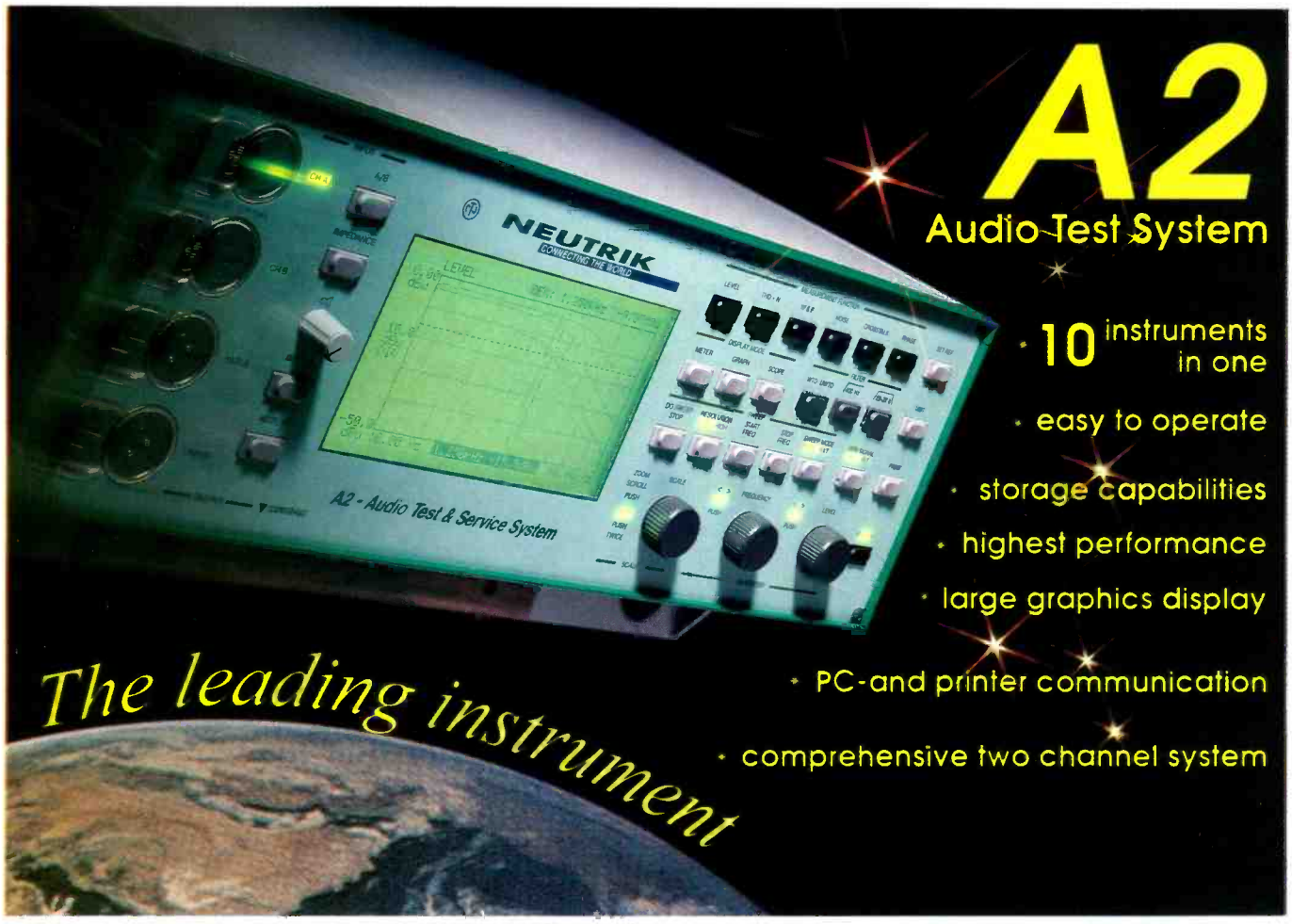

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NEUTRIK
CONNECTING THE WORLD

Martin Polon

Of quality, quality of product, and quality as product...

Throughout the world, members of the studio and audio business are now asking themselves, 'why doesn't our business match the excitement, the enthusiasm and the forward motion of five years or ten years ago?' If the audio industry actually is in a kind of 'spiritual' decline as many observers have suggested, it may be because of a loss of pride in our product—effectively a loss of concern for the end user of our product. Many people in audio have ceased to care about the quality of that product or have no financial incentive to care about it. Consequently, the real question in the audio business should be 'what is our product today?' And the answer must be—as it was in a GEC advertising campaign of a few years ago—that 'quality is our most important product.'

One attitude that has continually plagued the pro-audio industry for over 50 years is the loss of connection to the audio consumer. We have all talked to professional audio people who act as though their job is where the audio product starts and finishes. Yet it is clear that the consumer of audio via any number of different electronic entertainment mediums, is far less enthusiastic about recent so-called advances in audio recording and reproduction technology than the industry itself is. In many cases, the consumer cannot even hear the aural improvements. Consider then, the following examples of how quality makes all the difference to the audio product for the consumer.

In the theatre: live theatre has always suffered from the classic paradigm, 'the audio person is the last member of the theatre technical team to be involved in any new production.' Audio concerns are invariably secondary to those of lighting, staging and set construction. Yet there is no good reason that state-of-the-art technology cannot be used to enhance the live theatre experience for every seat in the house. Most theatre companies taking a show on the road travel with their own sound system. This eliminates the vagaries of having to use house sound installations. But the quality of what accompanies a show can vary wildly when the feet hit the street. For example, the road company of the theatrical and motion picture chestnut, *42nd Street*, travels with an adequate sound system. But what may be adequate for some houses may be barely acceptable in others. In Boston, the sound was acceptable to the main house, just barely tolerable in the mezzanine and totally inadequate in the oxygen-starved heights of the balcony. The speakers and their hanging trapeze and frame are the minimal package with which one can travel. Contrast this with the production of *My Secret Garden* who, in the same house, succeeded in providing sound that expanded the envelope of what theatre sound is supposed to be. The show carried the most elaborate sound mixing, equalisation, signal processing and wireless microphone matrix I have ever seen used on a production. The *My Secret Garden* system used a video-computer display of the operating parameters of each mic (and there were many). The sound consultant and the union audio operator constantly moved about the hall checking audio quality at a large number of different seat locations spread around the auditorium. The difference between the two shows is that one was on its way to Broadway and the other has long since closed.

In television broadcast: the desirability of stereo surround reproduction of television in the home is of particular importance to the present and future prosperity of the professional audio business, since public enthusiasm for the process can increase the acceptance of home video theatre installations and provide increased business activity for studios offering facilities for more elaborate stereo mixes in audio-for-video postproduction. Yet it is curious to note that that the syndicated *Star Trek; The Next Generation* and it's companion series *Star Trek: Deep Space Nine* (as yet available in the UK on video only), provide the highest quality of stereo surround mixes and accomplish virtually flawless distribution to the individual stations that use the show via satellite. It is no exaggeration to say that this is an example of the best sound on television and proves that satellite distribution can be used with virtually flawless results week after week.

It is equally curious to note that one of America's three major television networks could not get the audio feed to stay in-phase for a popular theatrical movie during a network run in the East. Regardless of whether it was due to stereo sensing amplifiers on line changing phase to create pseudo-stereo assuming (incorrectly) a monaural feed was being used, or whether it was due to satellite phase problems or other associated transmission phasing errors, the result was that of audio cancellation on home televisions—for a film which has one of the best theatrical Dolby Surround Sound mixes produced in recent memory (mine, at least).

In radio broadcast: the average FM radio station uses so many signal processing, companding, expanding and equalising devices that the sound begins to resemble the aural equivalent of baby food—note the recent unrest over compressed classical music broadcasting in the UK (and be prepared for it to spread to sound broadcast for television). The reality of FM radio listening still emphasises 'drive time' programming but with the migration of anything musical from AM radio looking likely to be complete during the 1990s, it is true to say that FM listeners will present an increasingly eclectic pattern than they did five or ten years ago. In addition to this, the quality of car audio systems is now such that even factory installed systems offer significant fidelity improvement over expensive custom systems which might have been considered above average as recently as five years ago.

> Outside of Los Angeles, which is a film studio 'company town', and New York City, movie theatres with state-of-the-art audio systems are the exception not the rule

In Motion Pictures: one of the most important places to provide positive audio, both to encourage more movie-going, and to provide a showcase for the glories of Dolby Surround Sound with the concomitant *de facto* pitch for expanding the home theatre installation base. Yet outside of Los Angeles, which is a film studio 'company town' and New York City, movie theatres with state-of-the-art audio systems are the exception not the rule. Theatre owners do not tend to buy speakers exclusively from *THX*-approved suppliers. Instead—and unsurprisingly—they tend to buy on price, and the low bid remains the province of many pecuniary theatre-chain owners. It is possible in Boise, Boston and Buffalo, for example, to view recent major releases like *Last Action Hero* and *The Fugitive* with mediocre monaural sound.

Worse than this, however, is the fact that the decision of whether or not you will see a film with the mix designed for that film is likely to depend upon the state-of-mind of an overworked projectionist responsible for between two and 14 theatres in a modern multiplex complex. Add to all this the consideration that the majority of projection booths are not equipped with acceptable stereo monitors (if they are equipped with any at all) and frequently utilise automation systems that default to ordinary monophonic sound far too readily. It becomes clear that good movie sound is actually achieved far too infrequently.

The point here is to suggest that we as members of the audio industry do everything in our power to give our 'public' the very best audio that we can. Economies made in the provision of audio as part of electronic entertainment serves both the public and the industry very badly. The corollary to this is to provide the best possible quality in production despite the problems in final reproduction. Too many theatre setups achieve only the minimum acceptable levels of sound reproduction because of 'bad house acoustics'. Too many network TV shows are mixed such that any stereo or surround information will not satisfactorily cancel out on mono TV sets. Even the elaborate mixes often produced for motion picture releases are frequently mixed to accommodate lowest common denominator—the ordinary multiplex theatre. I can not offer any simple solution to these perceived problems, but I am confident that if we each do our best as part of this important industry, we can surely 'improve the breed.' ■

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AUDIO AES

CLOSE TO THE EDIT

Pursuing an understanding of postproduction practices, Francis Rumsey offers an audio engineer's account of digital video tape formats

Last October I began an occasional series designed to introduce the audio engineer to 'peripheral technologies' such as video, computing and multimedia. I think it is vital for audio engineers to understand more about such fields, since the 'audio-only' business is increasingly difficult to survive in—requiring a diversification of one's business to embrace other types of production. To follow the explanation of digital video data reduction, I shall provide a summary of the essential features of the most recent professional digital video tape formats. It is especially timely because last autumn saw the introduction of two new component recording formats, namely Sony's *Digital Betacam* and the *D-5* from Panasonic.

Background

Commercially available digital video recorders appeared on the market slightly later than digital audio recorders, mainly because they are were more complicated and required technology to develop further before they became economically viable. Digital video recording was capable of offering the same advantages over analogue recording as in audio—namely no generation loss in copying, high signal integrity, ease of timebase and dropout correction, and direct interfacing with digital signal processing for effects purposes. The large number of generations through which a video signal typically passes in postproduction often exceeds the number encountered in a typical audio operation, and the quality loss that resulted with analogue recorders meant that postproduction flexibility was limited.

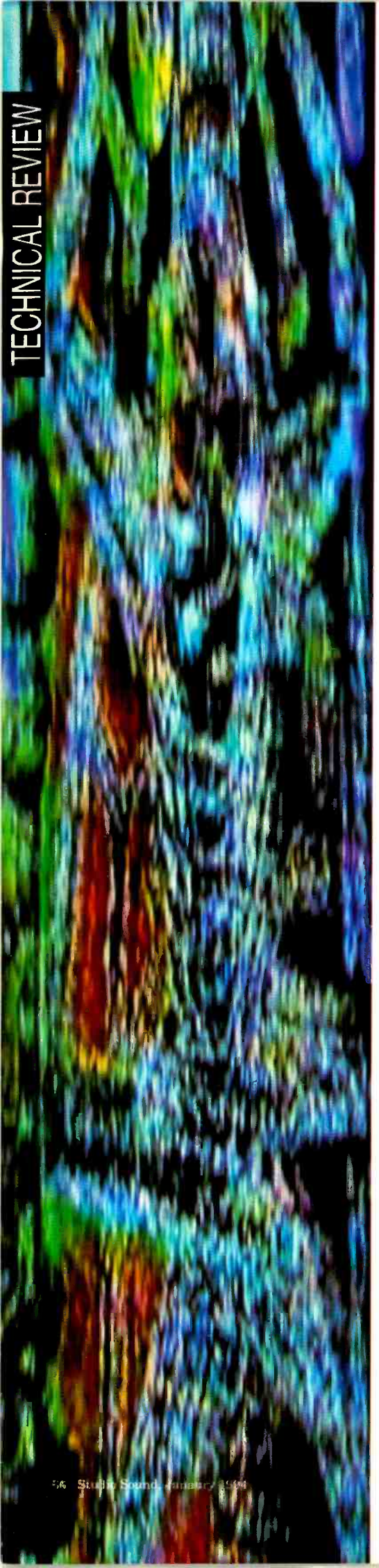
Video recording formats fall into two basic groups—those which store composite video and those which store component video. As introduced in 'Less is more', *Studio Sound*, October 1993, storing a video signal in 'component' form (consisting of a luminance and two colour difference signals) results in better picture quality than when it is stored in composite form (where the colour information is combined with the luminance), because the possibility for cross-modulation effects is reduced, among other things.

In the late 1970s and early 1980s, open-reel formats such as the composite 1-inch 'C' format were widely used in broadcast operations. These machines used digital timebase correction to restore the correct timing relationships of the video signal on replay, but were basically analogue recorders. U-Matic cassette machines, based on ¾-inch tapes were also used widely for applications which could tolerate a poorer picture quality and where the smaller machines were advantageous.

The analogue *Betacam* format was introduced by Sony in the early 1980s, and this brought component video recording within the reach of almost everyone in the professional video community, storing luminance and colour difference signals on a ½-inch Beta-style cassette. The *Betacam SP* format, introduced in 1987 improved on the specifications of Betacam, and prolonged its life in the face of competition from Panasonic which introduced the *M2* analogue component format at around the same time. Both the *M2* and *Betacam* formats were used widely in camcorders, and such camcorders have formed the mainstay of news-gathering operations around the world. To date, sales of *Betacam* have exceeded those of *M2* by a considerable margin, and the existence of this installed base is one of the key factors behind a number of Sony's decisions regarding *Digital Betacam*.

As far as audio is concerned, analogue video formats have provided a number of options. Both *Betacam* and *M2* offered two linear-analogue audio tracks, with switchable Dolby *C* noise reduction, plus a time-code track, and there were also machines which were capable of storing stereo audio in FM (frequency modulated) form in the same area of tape as the video (rather as in consumer 'hi-fi' VTRs). The FM tracks could only be recorded at the same time as the video, and thus were not particularly useful in editing operations. A digital audio option was also introduced for both formats which allowed two channels of digital audio to be recorded independently of the video, with independent editing capabilities, but one of the analogue linear tracks was sacrificed for this purpose. The result was a hybrid machine which stored analogue video and digital audio, but proved useful for the high quality audio applications associated with NICAM stereo TV broadcasts.

Since 1986, there has been steady growth in the development and use of digital VTRs, both component and composite, and it is likely that all future VTR formats will be digital for the simple reason that it is more cost-effective in a number of senses—manufacturing, maintenance, and operationally. ▶



First generation digital VTRs

The first commercial digital VTR format to be introduced was *D1*, which came a high cost, high specification machine designed to record component video to the CCIR 601 standard. (See *Studio Sound*, October 1993.) *D1* machines were switchable between 525/60 and 625/50 formats, and used a ¾-inch cassette available in three sizes, offering playing times up to 76 minutes. Video was coded to 8-bit accuracy, and because of the use of component recording this standard has been adopted principally by high-end postproduction houses where many generations of copying would be expected, and where it is most important to retain picture quality. Owing to the high cost of *D1* machines, though, the format did not find its way into many broadcasting establishments.

The *D2* format, which owed a lot to Ampex, was an attempt to produce a digital VTR with more mass-market appeal, and used composite recording in order that the machine could more realistically be used as a plug-in replacement for analogue composite VTR formats such as the *C* format. By using azimuth recording and a slower tape speed (similar to DAT audio machines) the *D2* format consumed less tape and thus could offer a longer playing time, providing over three hours of storage on the largest tape (which was also of the ¾-inch cassette type). Although portable *D2* machines are now available, camcorders were never produced in either *D1* or *D2* formats for the simple reason that they would be too bulky for even the meatiest shoulder! *D2* machines are considerably cheaper than *D1* machines, and thus have been more widely adopted in broadcasting.

Audio channels in digital VTRs

All of the digital VTR formats offer four independent digital audio tracks. These tracks are normally of 20-bit resolution (although this resolution may not be matched by the onboard convertors), and sampled at 48kHz. The rate of 48kHz has stuck in the video world, whereas 44.1kHz is used almost universally in the audio world, leading to difficulties in exchanging signals that can only be resolved using sample-rate conversion. Although the 48kHz rate is easy to handle in 625/50 systems, it is less easy in 525/60 systems (or more correctly 525/59.94) because there is not an integer multiple of samples per TV frame. This has led to considerable difficulties in synchronisation of digital audio, and there is currently a certain amount of debate surrounding the correct sync point between audio and video for standards purposes. It is not intended, though, to delve further into this problem here because it has been well documented and would require a whole article of its own.

The increased number of audio channels, compared with older formats, has arisen largely because of the demands of stereo television. Both Sony and Panasonic are offering four channels in the new ½-inch component formats (See below: '*D5* and digital *Betacam*'), and both suggest that more would be possible. It appears that Sony have left room in their format for eight linear audio channels, and Panasonic indicate that more audio channels would be possible using data reduction. Further audio features of the DVTR formats are described below.

Second generation DVTR formats

Adding to the collection of 'Ds', there are now *D3*, *D5* and *DCT* formats. *Digital Betacam* does not have a number or an abbreviation. Apart from *DCT*, the more recent DVTR formats all use ½-inch tape. This makes them very appealing from a tape cost point of view, and also because of the possibility for camcorders and portable machines. The move at the moment is distinctly in the direction of component digital systems, largely because there is now a straightforward means of interconnecting such signals digitally using a serial digital interface (SDI), thus simplifying system installations considerably. Until recently, digital component video signals could only be interconnected using a parallel interface which covered limited distances, but the new serial interface now carries either 8-bit or 10-bit video with an optional four channels of audio at a rate of 270Mbit/s over a single coaxial cable.

Apart from the *D3* format, which is a composite format introduced in 1990, these second-generation formats are all component. The Ampex DCT has been established and available for about a year, while D5 and *Digital Betacam* have only just been launched and are appearing on the market at this very moment. *D5* and *Digital Betacam* are competing head-on for the same market, but there are some interesting differences between them —which are promoted as either strengths or weaknesses depending on whose company you work for! The biggest controversy lies in the adoption or otherwise of data reduction techniques for the video signal.

Ampex DCT

DCT (Digital Component Technology) is an interesting format, based as it is on aspects of the *D2* format together with technology borrowed from Ampex' data storage technology (DST) used in computing fields. Significantly, Ampex refer to the machine as being a 'tape drive', very much in computing terms.

It is a ¾-inch cassette transport offering around three hours of recording time on the largest cassette, and is switchable between 525-line and 625-line formats. DCT uses mild video data reduction in order to make possible the recording of component video signals without compromising playing time, but this is not the same form of reduction as used by Sony in *Digital Betacam*. The format is clearly aimed at high end postproduction, and is part of a family of Ampex digital video products designed for studio work. Because of the ¾-inch cassette it is highly unlikely that the format will ever find its way into camcorder designs, but the wide track pitch is likely to result in good interchange capability between machines and a certain degree of robustness (although this is equally dependent on the error correction system).

Ampex make considerable capital of the responsiveness of the transport from a mechanical point of view, it having very fast acceleration and cueing capabilities.

D3

Panasonic's *D3* format is a composite format like *D2*, but uses ½-inch tape. This has made possible the development of portables and camcorders, as requested by the Japanese broadcaster NHK, ▶

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and the format has found favour with a number of broadcasters including the BBC. It uses very high density azimuth recording, and is capable of storing video on either 14µ or 11µ tape. Using the thinner tape, around four hours of storage time is available, or three hours with the thicker tape. Again, a number of cassette sizes are available.

D5 and digital *Betacam*

Sony and Panasonic had slightly different problems to contend with when they developed dissimilar ½-inch component formats. Sony had to consider a large installed base of analogue *Betacam* machines, whereas Panasonic had a rather lower, although still substantial number of analogue *M2* machines. Additionally, Panasonic already had *D3*, which is itself a ½-inch format. Both companies had to consider how they could introduce a new digital format without inflicting too much pain on their existing customers, and while at the same time leaving options open for the future.

The upshot has been that *Digital Betacam* retains replay compatibility with analogue *Betacam* tapes, whereas *D5* machines are replay compatible with *D3* tapes but not with analogue *M2* tapes. Analogue *Betacam* machines have also been introduced which have SDI capabilities to allow them to be integrated into component digital studios, and some *Digital Betacam* machines will replay analogue *Betacam* tapes via the SDI.

Both formats accept the full 10-bits of video information from the SDI, but the most important difference between the formats is that Panasonic record linear PCM while Sony use roughly 2:1 data reduction for the video (but not for the audio). This is really where the battleground will lie between the formats, because in a number of other respects there is very little to choose between them. They both offer roughly the same maximum recording time of around two hours (although the Panasonic machine only achieves this using the thinner 11µ tape), and the various jogging, cueing and slow motion facilities are similar. Although both formats include the promise of a camcorder in 1994, there are no camcorders in the first group of product releases.

Previously I described the various approaches to video data reduction which are used. Sony are using a form of reduction which is quite mild in comparison with what is possible, and it is based on JPEG-like principles in that it works only within single frames, rather than using any interframe prediction or motion compensation techniques. This is in order to make possible the freeze-frame and editing functions normally associated with VTRs. The very limited amount of data reduction is calculated to provide the benefits of low tape usage, long playing time and format ruggedness, and allows machines to retain replay compatibility with analogue tapes, while providing as near transparent recording quality as possible.

It is amusing to note that digital video recorders have been offering 20-bit audio for a number of years now, whereas audio formats have notably lagged behind

D5 machines, on the other hand, use no data reduction and record the full 10 bits of the component digital signal, thus offering a quality in excess of *D1* (which used eight bits). This is achieved by using mechanics of the same type as *D3*, but with a doubling of the linear tape-speed and the use of four recording heads instead of two. *D3* tapes can be replayed by halving the *D5* tape speed, and they may optionally be converted into a serial component format within the machine, allowing replay to be integrated within a component digital studio.

16:9 compatibility

A hot issue at the moment is the move towards 16:9 aspect ratio in television production, since many believe that wide-screen pictures are going to become more important in the near future. Both *D5* and *Digital Betacam* will operate in a 16:9 mode, because the CCIR-601 sampling structure can also be used for wide pictures without changing any of its sampling parameters. The penalty is a slight reduction in horizontal resolution because the same number of sampling points is spread over a greater line width.

Panasonic have taken the step of allowing a second 16:9 recording mode which does not compromise resolution, using a higher sampling rate of 18MHz (as opposed to the normal 13.5MHz), although this only operates to 8-bit resolution. This they call 'Extended CCIR-601', and they have incorporated an extended mode SDI operating at a data rate of 360Mbit/s to carry this wide-screen component signal.

High-definition recording

Panasonic have also retained the option of using the *D5* recorder for storing high definition video. Since no data reduction was employed for the storage of conventional definition pictures it would be possible to add processing around a normal *D5* machine to reduce the HDTV data rate by a factor of 4:1 and store the pictures without modification to the machine.

Audio features

Both formats offer a means of monitoring the selected digital audio track in jog mode, using DSP to simulate reel rocking, and both offer variable audio crossfade at the edit point. It is also possible to perform read-before-write recording of both audio and video for postproduction applications which might, for example, involve the addition of effects or subtitles. Using read before write, such operations could be performed on a single machine.

Sony have a useful optional board which acts to correctly pitch audio during varispeed play modes. Since it is possible to replay video at ±15% of standard play speed in order to shorten or lengthen programmes, audio would otherwise be slightly pitch shifted as a result.

Conclusions

There seems to me to be little doubt that the future of conventional definition TV installations lies with component digital recorders using the SDI for interconnection. ½-inch formats will allow an integrated system approach from camcorder through to postproduction. *Digital Betacam* has the advantage of compatibility with analogue *Betacam* recordings, and will thus prove attractive to the large number of users already committed to *Betacam* and who may want a slow changeover to digital component video. These people may have large libraries of existing *Betacam* tapes. *D5* on the other hand has a number of attractive features: namely the uncompressed 10-bit recording resolution, replay compatibility with *D3*, the enhanced 16:9 recording mode and the implied upgrade path to HDTV recording.

As a postscript, it is amusing to note that digital video recorders have been offering 20-bit audio for a number of years now, whereas audio formats have notably lagged behind. It is unusual for the video world to beat the audio world at its own game! So much for the poor relation. ■

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10. Raindirk Concord 2000 type 28 in-line console with 280 hole patch ..... offers
11. Trident Vector 56 channel 48 mono fitted with Evanix auto ..... offers
12. Soundcraft Reims new 32/24 with Midi Mutes ..... offers
13. Allen Heath Sigma 44 Input console with Midi Mutes, 2 years old ..... offers
14. Soundcraft Delta 24 channel 20 channels fitted as new 3200.00
15. Studiomaster Diamond 8 into 2 in portable case 250.00
16. Chiltern 12/4 mixer with Mic/line inputs ..... offers
17. Neve 5402 Broadcast desk 12 stereo channels four with balanced stereo mic inputs. lots of specifications to order by request ..... offers
18. Soundcraft 6000 32/16/16/2 no patch bay good condition ..... offers
19. Trident TSM 32.24.24. with Patchbay All cables include 14500.00
20. NEVE 8108 48 input console with Patch and GML Automation ..... P.O.A.
21. MCI 500 series 28 input ..... offers
22. AMEK Mozart 56 in line 56 MZ1100 modules fitted with Supatrue Automation, RH Patchbay 3 years old 41000.00

TAPE RECORDERS

Studer A820 Mk3 24 track, remote no locater No SR Dolby 18500.00
2xOtari MTR9011 24 track with locater and remote each 12500.00
Studer A80 MK111 24 track with autolocater and homemade rem 8750.00
Mitsibishi X850 32 track with locaters 4 years old 26000.00
Otari MX80 32/24 track recorder 13500.00
Sony 5001 2 track with centre track time code 2000.00
ATR 80 24 track with remote and autolocater ..... offers
Two Saturn 820 24 track machines complete The Pair 22000.00
Otari MTR MK I 24 track No remotes ..... offers
Soundcraft 762 24 track Mk3 with remote ..... offers
Ampex ATR 102 and 104 machines with lots of spares and headblocks
Tascam MS16 1" 16 track remote and Autolocater ..... offers

EFFECTS

1. Summit 200 Valve Compresser 750.00
2. AMS 1580S 6.5 X 1.6 stereo Harmoniser declitch 1650.00
3. Roland 808 Midi and 727 ..... offers
4. Urei LA4 Compressors 2 Units 515.00
5. Universal Audio LA4 Compressors 2 units 525.00
6. Yamaha SPX 1000 ..... 550.00
7. Auphex Dortunater ..... offers
8. Roland SBX 80 SMPTE Midi Synchronizer 625.00
9. Aphex Aural exiter 295.00
10. Roland SBX80 SMPTE MIDI Sync Box 495.00
11. Yamaha SPX 50 ..... offers
12. Roland Dimension "D" 525.00
13. Bel 2600s delay line and sampler 550.00
14. Auphex Compeller 600.00
15. Midi Verb ..... offers
16. Audio and Design Scamp rack with 4x gates 4x e/q and PSU 250.00
17. JBL/Urei Compressor 7110 ..... offers
18. 2 x BSS DPR 402 compressors limiter de-esser 550.00
19. AMS Tape phase simulater/chorus 275.00
20. Yamaha R100 2 units ..... offers
21. Akai S1100 10 meg + S1100 Ex 10meg + S1100 Ex mega ..... offers
22. Korg Sdd 3300 Triple delay 450.00
23. Drawmer 221 Compressers 2 units each 225.00
24. Drawmer 201 stereo gate 175.00
25. Alesis 16 way Graphic EQ ..... offers
26. Orban DE esser ..... offers
27. Audio and Design F769 Vocal streeers 2 units ..... offers
28. Korg Sdd 3000 delays 2 units ..... offers
29. MXR Pitch Changer ..... offers
30. Orban De esser 526A ..... offers

DIGITAL REVERBS

1. AMS RMX16 reverb 1950.00
2. Lexicon 480l 4500.00
3. Lexicon 224XL 3250.00
4. AMS RMX16 reverb 1850.00
5. Lexicon 300 ..... 3150.00
6. Lexicon PCM 70 ..... 1095.00
7. Lexicon 224 reverb 4.1 software 2150.00
8. Klark Teknik DN780 ..... 1695.00
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Barry Fox

Getting your head round holophonics and paying the piper on the data superhighway

It may seem like only yesterday that Hugo Zuccarelli was telling us how Holophonics would change the world but it is actually ten years ago. We now have a new dummy head, binaural system.

Holophonics, as the system was called, gave good binaural effects, thanks mainly to Zuccarelli's use of an early digital tape deck to preserve inter-ear phase relationships. The inventor got more than his fair share of publicity because he dressed the system up in a gabble of impressive pseudoscientific theory, and promised that it would soon work with headphones. It never did, and Holophonics ended up as a sound effects system used to add spice to a few pop records. The effects recording —only record released by CBS—sank almost immediately, although I did once see it in the 'Comedy' rack of a record shop.

The latest system is called *Sensaura*. It comes from Thorn-EMI's Central Research Laboratory (CRL) at Hayes in Middlesex, and is being used by EMI Records. For a (refreshing) change, CRL acknowledge that the idea is as old as the hills, and simply lay claim to the use of digital processing power to make it work better—and with loudspeakers.

In everyday life, the human head acts as a baffle. Sound has to travel around the head in order to reach both ears, producing a phase shift and level change between each ear. The brain decodes these differences in order to locate the sound source.

A binaural recording system uses a head or baffle, with ear microphones, to create this phase and level information. When replayed through headphones, the sound mimics the original field. The effect is lost when the signals are replayed through loudspeakers, because sound from each channel reaches both ears.

CRL have been using a B&K head, digital tape recorder and digital signal processing. The DSP flattens the mid-range hump, of around 15dB at 3–4kHz, caused by the well-known 'twice through the ear effect'. Sound passes through the resonant cavity of the ear in the head used during recording, and through the resonant cavity of the listener's ear during playback. The DSP can provide more accurate mirror image compensation than the analogue filter circuits previously used. But it was not easy to get right, and when CRL did get it right EMI Records said the recordings had to work when replayed through speakers as well as headphones.

So CRL used DSP to play another old trick. Sound from one channel is bled through to the other, in reverse phase, to cancel out the sound which leaks speaker to speaker. The sound from the bleed has to be stepped forward in time, because it must cancel leakage into the more direct sound path. So both channels are delayed. All this is easier with digital circuitry now that it was when JVC did it with analogue biphonics 20 years ago.

CRL also built an 8-channel mixer which can blend the sound from six mono spot mics into the binaural stereo feed.

EMI's first release with the '*Sensaura*—audio reality' logo was scheduled to be Frank Sinatra's *Duets* album, with 'Divine Comedy', a song album by actress Milla Jovovich, produced by Rupert Hine, pegged for January or February release. Both use only low-key binaural effects. Nine classical orchestral works in full-blown binaural follow some time later in 1994.

I heard demonstrations of several test recordings under domestic conditions. The stereo from loudspeakers is wide with no hole in the middle, and a spread well outside the speakers. Switching to mono revealed no obvious compatibility problems. But on headphones I thought the system was a big disappointment. The sound stayed firmly inside my head, creating an effect no better than listeners will get from an 'ordinary' stereo recording. Where the ordinary recording is made with a simple crossed pair or similar mic setup, *Sensaura* may well deliver less on headphones.

CRL have done a very good job of making binaural recordings play through speakers. But if the effect on headphones has to be sacrificed, then the question has to be asked is 'why bother?' With binaural stereo, as in life, there is no free lunch.

Keep an ear open for forthcoming full-blown releases and listen both on speakers and headphones.

In the USA the copyright agencies really do hang tough. The Harry Fox Agency, part of the National Music Publishers Association, are paying for music publisher Frank Music to pursue a test case through the Federal courts on behalf of over 140 other publishers. The publishers are using Compuserve, which describes itself as 'the world's most comprehensive computerised information services.' The claim is for $70 million in damages and costs for copyright infringement in just one song. If the publisher wins, the HFA, which represents 12,000 publishers and controls the licensing of 75% of all the music played in the US, will claim from any other electronic distribution system which carries music.

By suing Compuserve (as provider of the host computer on which the music material is temporarily stored) rather than individual users of the system, the music publishers are creating a precedent for the future. President Clinton plans an information superhighway which will let US citizens exchange electronic information by national data cable. If the HFA win their case against Compuserve, whatever government body controls the superhighway computer will be legally responsible for policing all data that passes through it.

Over a million owners of PCs around the world connect their computers to the phone line with a modem and use the Compuserve network to exchange electronic mail messages and access 1,700 different bulletin boards. Subscribers pay around $10 a month to post messages on the board service. The messages can then be read and replied to by other subscribers. Most of the messages are text—for instance, news and views on new technology. But one board, called the MIDI/Music Forum, allows subscribers to convert music into MIDI or WAV data files and exchange them. One subscriber deposits or uploads a file and any number of other subscribers download it to control a MIDI instrument or produce sound through a PC with sound card.

By logging use of the musical bulletin board, the HFA have been able to cite what they describe as 690 'wilful acts of infringement', involving more than 500 songs owned by some of the 12,000 music publishers it represents. The Agency claims to have tried talking to Compuserve, but to have received no 'meaningful response'. So the HFA have now backed a 'class action suit' in the Federal Court for the Southern District of New York. Class action cases must centre on one specific example of alleged infringement. The HFA chose 'Unchained Melody', written by composers Alex North and Hy Zaret and published by HFA member Frank Music. In the UK we remember (or try to forget) this as the song that went with Jimmy Young.

The publisher and HFA are claiming the maximum penalty of $100,000 for each of the 690 logged acts of infringement. In addition to the $69 million claimed in damages, the HFA are also asking Compuserve to desist from all further infringements and to pay all legal fees. If the 'Unchained Melody' case is successful, the HFA will sue any other electronic delivery service which carries copyright music.
'So this matter is not being taken or given lightly by either side', says Edward Murphy, Chief Executive Officer of the HFA and NMPA.

Murphy argues that it is the responsibility of any electronic delivery service to police the content of its host computer.

'If we can do it, they can do it', says Murphy. ■

ILLUSTRATION: CARL FLINT

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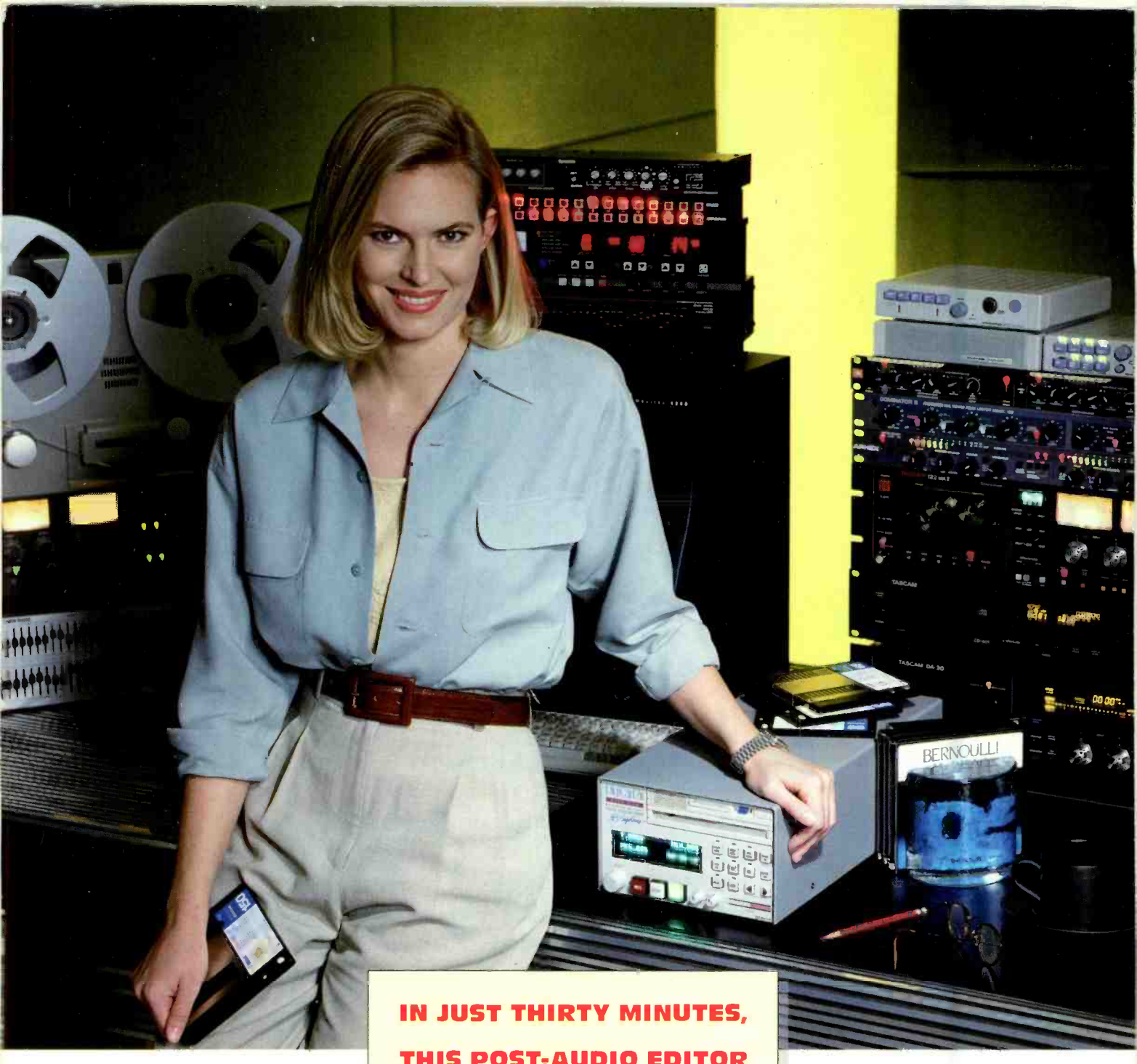

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