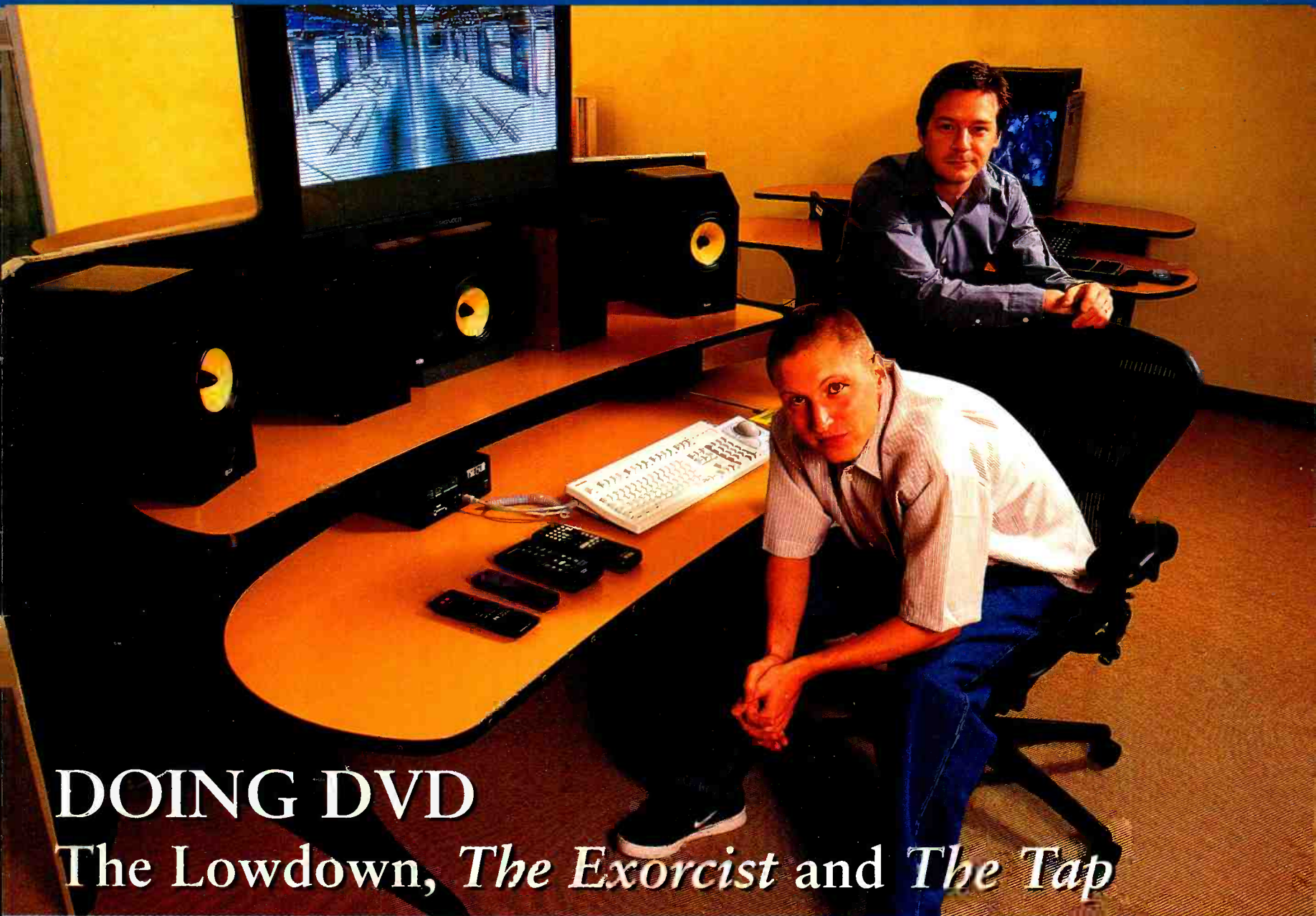


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### REVIEWS

- Audient ASP 510
- Universal Audio LA-2A
- Sound Devices MixPre
- Klein & Hummel 0198
- Aphex Model 1100
- Rode Classic II
- CEDAR DNS1000
- Goldline MK 10
- Avalon AD2022
- API 2500

**Bobby Owsinski: Mixing and monitoring for surround 5.1 Entertainment: Dedicated to the surround cause**  
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**AES 31: File interchange standard for audio workstations**



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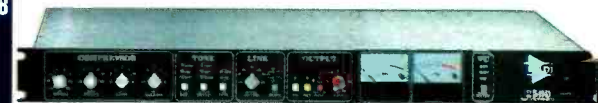
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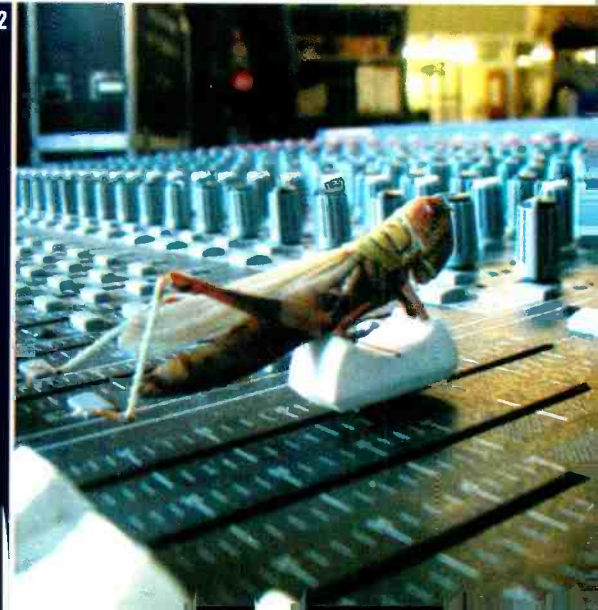
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# Burning bright

**B**ROADCAST COVERAGE and end of millennium wrap ups had a more compassionate slant towards the end of last year compared to the sensationalist count down to oblivion nonsense that accompanied the flip to the year 2000. Most poignant for me were the many looks at the impact that we have had on our environment. It is a sobering thought that man has probably had a more immediate and lasting influence on the earth in the last 50 years than he has in his entire existence on the planet and only the most doggedly bloodyminded can continue to blame the methane output of cattle for alterations in climate and seasonal patterns.

We have arrived at times where we may not be able to correct any damage that we may have already done but we will at least have to think about ways in which we can preserve and protect what we have left. At present when I walk away from my PC it will eventually go to sleep to conserve power. Few people would entertain the thought of leaving lights on in empty rooms purely for the fun of it yet equipment racks burn long and brightly in to the night regardless of whether the gear in them has been employed recently.

Power consumption, heat generation, efficiency and intelligent power management are not features that are likely to be spotted on the spec sheets of much audio equipment, yet I'll warrant that they will become issues of increasing importance in the not too distant



future. Expect legislation to force the implementation of such schemes in to the domestic environment with a corresponding hand-on implication for other electronics industries including our own. Expect advanced power management to be an integral part of ground up facility builds and refits and expect local soft standbys to appear on front panels.

Most importantly our attitudes will have to change and our priorities with them. It's perhaps not that serious yet but recent history does tend to suggest that in this particular case things rarely seem to improve in absolute terms.

**Zenon Schoepe, executive editor**

# Grace and danger

**W**ITH THE VIETNAM WAR only a few months old, controversial American poet Allen Ginsberg found himself at the centre of a gathering of Beat poets at London's Royal Albert Hall. Although initially a shambolic affair, the event caught the imagination of the local media and quickly became a major 'happening' of some appropriately ill defined description, attracting the enlightened from all over the UK. Almost inevitably, it ended in tears—alcohol, drugs, unrest in the audience and the arrival of the police, marred an otherwise remarkable evening. But it became a defining moment of 1965 alongside the conviction of Ian Brady and Myra Hindley, and Alexei Leonov's historic space walk.

A recent British television programme celebrated the events of the evening. Typically, accounts vary from the benignly vague to the unrepentantly confrontational. But after a considerable build-up, the stage welcomed its first performer and a condemnation of the American campaign in Vietnam that was unfamiliar to the majority of the audience. As he repeatedly requested, 'tell me lies about Vietnam', the modern documentary superimposed



images of napalm falling on oriental forests and images of a conflict that were to become depressingly familiar over the ensuing ten years.

Some 35 years later, as the words flowed and the bombs fell all over again, I couldn't help being drawn to both the power of the word and the power of the technology. Only a few days earlier I had held a Japanese katana and marvelled at the thousands of layers of steel that enabled a sword to change the course of history, and the ability of a samurai to deal death and poetry in equal measure. With the passing of the samurai, I am left with the conclusion that only pro audio finds art in technology and technology in equal measure.

I remember keeping the company of a Firestreak missile while waiting for an audience with Stock, Aitken & Waterman during the mid-eighties and considering the same issue back then. But while both studio and military technology have proliferated since, today, while the proud owners of home video editing systems have registered little impact on the Oscars, artists using home recording setups are notching up their Grammys.

**Tim Goodyer, editor**

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# The MT Digital Multitrack Console. Relax. It's an SSL.



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*Dana Jon Chappelle,  
Engineer / Mixer.*



"The MT's sonic warmth and purity, rock solid automation, and speed of operation sets a new standard in recording -- giving us the best of both the analogue and digital worlds."

*Martin Böhm,  
Owner / Chief Engineer,  
MG Sound, Vienna.*



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*Will Shapland,  
Senior Recording Engineer,  
Manor Mobiles.*

"...with the MT, at last there's a digital console for someone like me who truly loves music."

*Bruce Swedien,  
Engineer / Producer.*



"...the console's great. Not only does it provide outstanding automation but it sounds amazing - with a level of warmth not normally associated with digital."

*Patrick Mühren,  
Engineer / Mixer.*

"Nobody had to show me how it worked."

*Lou Gonzalez, Owner,  
Quad Recording Studio.*

"I can honestly say that I find the MT to be more transparent than an analogue console."

*Thierry Rogén, Owner,  
Mega Studios, Paris.*



"I loved the clarity of the overall sound and the separation of the stereo image. SSL know everything about ergonomics and for me, the MT is not the best digital console in the world, it's the BEST console in the world."

*Yves Jaget, Engineer,  
Le Voyageur Studios.*



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## CONTRACTS

**Seoul:** Korean artist Lee Seung Chul has commissioned designer Sam Toyashima to design a new facility to be built on the outskirts of Seoul. Enthused by his work in Los Angeles, Lee Seung Chul has chosen a 64-channel SSL SL9000j console as the focus of the facility which is ultimately intended to become a world-class commercial recording venue.  
SSL, UK. Tel: +44 1865 842300.

**Ghana:** Black City Studio is a new recording venue equipped with with Euphonix' CS3000 digitally-controlled analogue console and R-1 hard-disk recorder. The brainchild of Ghanaian musician, Ralph Casely-Hayford, Black City is located in Accra, the capital of Ghana and 'gateway to the wealth of West African musical talent'. The studio is also hoped to provide a boost for the thriving local music industry through providing a world-class recording facility.  
Euphonix, US. Tel: +1 650 846 1146.

**UK:** Sonifex has won a contract to supply the British Channel 4 television network with an upgraded automated announcement system for its presentation team. The upgrade facilitated a move to the Windows NT as well as enabling a move from apt-X to MPEG compression. The new HDX NT2000 software places announcements under RS422 control by taking information from the programming system and storing recordings on a daily basis depending on the playlist downloaded.  
Channel 4, UK. Tel: +44 20 7631 4444.  
Sonifex, UK. Tel: +44 1933 650700.

**US:** American Public Broadcasting Service has taken eight Apex Model 2020 dynamic processors for audio processing of four satellite uplink TV channels. PBS National Satellite Service, PBS Kids Channel, PBS-You and PBS National Satellite Service provide 24-hour service to member stations as well as cable outlets including DirecTV and Prime Star. The Alexandria, Virginia-based PBS is a non-profit media enterprise owned and operated by 348 public television stations.  
Apex, US. Tel: +1 818 767 2929.

**UK:** London's Mayfair Studios has installed a pair of DynaudioAcoustic M3A active main monitors for its Neve room. The system was supplied with two custom 15-inch sub woofers and Chord 1032 amps. Recent clients who have used the M3s include Paul Weller, Finley Quayle, Julian Lennon, and

## Studer leaves Harman

**US-Switzerland:** Harman International has sold Studer Professional Audio AG in a move which creates a new high-end broadcast systems aggregation, a new umbrella title for Studer and a new chapter in its 52-year history.

German systems company VCS Nachrichtentechnik GmbH has reached an agreement with Harman to acquire Studer and its six subsidiaries in Austria, Germany, UK, Canada, US and Japan. A holding company, Studersystems AG, is to be based at VCS's HQ in Bochum, Germany. The marriage of VCS and Studer is intended to form a powerful supply and service resource aimed at global digital broadcasting.

At the same time the move further distances Harman from the high-end broadcast field, and what it describes as 'the rapid growth of fully integrated computer-aided broadcasting systems, satellite data acquisition systems and webcasting'.

Philip Hart, president of Harman Professional Group International, commented, 'Bringing together VCS' skills in computer-aided broadcast systems with Studer's international broadcast systems ability will enhance the potential for both companies to provide customers with a complete turnkey solution in any scale of broadcast environment.'

Dr Klaus Meng, MD of VCS, said, 'Studersystems represents the merger of two highly innovative companies addressing similar markets, with highly complementary abilities and existing

customer relations. Studersystems will become the leading innovative and future oriented broadcast production service provider.'

Meng becomes chairman of the new board, while Studer's most familiar face on the European scene, Bruno Hochstrasse, becomes chief sales officer. In the split from Harman, he will leave the board of AKG.

Studersystems' business segments are described as Radio and TV Broadcasting Solutions, Post Production Solutions, and Satellite and Data Communications, and the products inherited and created by the fusion of the two companies will essentially marry professional studio technology and computer-assisted broadcasting.

Meanwhile Studer UK is leaving the Harman enclave in Borehamwood and relocating to Pinewood Studios, MD Andrew Hills, late of SSL, has also announced that the new Pinewood TV facility on the site—best known for its distinguished association with British movie-making—has installed a Studer D950 M2 console.  
VCS GmbH, Tel: +49 234 9258 0.  
Net: www.vcs.de.  
Studer Professional Audio AG, Tel: +41 1 870 7511. Net: www.studer.ch.

## Ringin' bells

**UK:** After 25 years on the shelf, the 4-channel mix of Mike Oldfield's classic *Tubular Bells* made by Philip Newell as a 'demonstration' for quadraphonic matrixing systems has resurfaced on SA-CD. 'It's so exposed,' said Newell, hearing the finished release at Sanctuary studios for the first time since finishing the mix. The occasion saw Newell breaking from studio building duties in Spain to

join fellow Manor Studios veteran Mick Glossop in accepting an invitation from the album's original producer and subsequent remastering engineer, Simon Heyworth, to audition Virgin Records' seminal album and debut SA-CD release. 'It was the first Virgin album, number V2001,' noted Newell, 'and it's going out in 2001'.

Playing back in Heyworth's mastering room, the recording recalled the summer of 1973 along with a host of anecdotes from its audience. The fact that Newell's mix was made on Ampex instrumentation tape—chosen at the time for making tape loops due to its resilience and low head wear—accounted for the lack of tape hiss. Heyworth further attributes the astounding imaging (part of the reason for leaving the mix at four rather than five channels) to the remarkable condition of the tape. The frank nature of the mix remains both a tribute to the music and the times. Where Newell had included the original hornpipe ending to Side Two (which had been discarded as out of keeping with the rest of the piece), Heyworth has chosen to preserve the 4-channel format, forsaking the centre and sub-bass channels offered by SA-CD, to remain true to



## Space truckin'

THE FIRST DIGITAL SURROUND MOBILE in Germany has been launched by B&R Medientechnik, a 15 year-old, K rten-based recording and production company with five trucks, live sound reinforcement services and in house audio and video post facilities. Mobile One is now the flagship vehicle, and features a 96-channel SSL Axiom-MT; Pro Tools 5.1 with 32 digital I/O and four 888 interfaces; Tascam DA-88 recorders; Miller & Kreisel MPS 1610s for surround monitoring; and Westlake BBSM-6s and Genelec 1019As for stereo. B&R founder Bernd Kugler spoke with *Studio Sound* at the Tonmeister exhibition in Hanover, where the truck was on display for the first time, in association with SSL's German distributor Digital Audio GmbH.

**Q:** Was the truck built from scratch as a surround mobile?

The truck is a former HDO mobile, and HDO—based in Oberhausen—built a couple of trucks for HDTV applications. Luckily it became available when HDTV died, and we stripped everything out and redesigned the whole thing.

Now there is a machine room, a control room specifically treated for surround acoustics, and a lounge area in the back.

**Q:** A lounge area on a mobile truck?

It's for the artists and producers. Given that DVD is going to

be a very video-orientated audio format, there is a large plasma screen installed in this area and the idea is that clients can come here after the performance, relax, have a drink, and review the footage and the sound.

The social aspect is very important. This is much nicer than an anonymous hotel room...

**Q:** Don't rock artists throw plasma screens out of windows?

We did our first gig in Berlin with the Belgian violinist Andre Rieu and a full orchestra and choir. The audio was used for both widescreen TV broadcast and for DVD production. The way this truck has been made, and the applications it is aimed at, are completely new on the market. It serves both live recording and broadcast for the 5.1 era. But yes, you can do whatever you want to do: this is a multipurpose room. It can also be used for overdubs and voiceovers, of course.

**Q:** Surely DA-88 is not the only digital recording format available, apart from Pro Tools?

No, the MADI routers are installed ready for the hire of any DASH machine, which can be rolled into the back of the truck on the ramp and positioned at the edge of the lounge area. Here, any machine is separated by a sliding plexiglass door, which means that DASH recording can be incorporated into the service with minimum disruption and cost.

B&R Medientechnik, Tel: +49 2268 3555.

Fax: +49 2268 3566.



**US:** General Motors has announced that it is incorporating NXT's flat panel loudspeaker speaker technology in its latest concept car. The Buick Bengal convertible has voice-activated controls and a joystick on the steering wheel allowing the entire dashboard to become one of five NXT speakers in the car's audio system. Buick's Roger W Adams commented, 'this design eliminates gauges and controls and allows the driver to concentrate on the road'. NXT CEO, David Pearson, added, 'Now that GM has joined DaimlerChrysler as an NXT Licensee we are confident that we have the right partners to move forward in the automotive sector.' As well as announcing net sales of US\$6.3bn for the 2000 financial year, TDK has announced that its US subsidiary has incorporated SurfaceSound technology in its first multimedia speaker systems. The Tremor satellite-sub systems will be launched at Winter CES 2001 and consist of three models targeting users of computer systems.

the spirit of the time. The result is expansive and involving, an obvious 'must' for Oldfield's fans for whom there is the encouraging prospect of Heyworth having already gathered the remainder of the classic Oldfield 4-channel masters in his London studio. For Viv Stanshall, master of *Tubular Bells*' ceremonies, somewhere in the Oxfordshire countryside it will always be 3 o'clock in the morning in 1973.

## Manor finds Sanctuary

**UK:** In the biggest ever change to the UK mobile recording industry, the Sanctuary Group—which runs Fleetwood Mobiles—has acquired Manor Mobiles from the EMI Group for an undisclosed sum. The move creates the UK's largest mobile recording fleet under the umbrella of the Sanctuary Group.

Under the terms of the new agreement, the three Manor vehicles will become part of a 5-truck fleet known collectively as Sanctuary Mobiles. While operating under the same banner with unifying livery and design, each truck within the fleet will retain its existing

equipment inventory to offer the widest possible range of mobile recording solutions so far, including Euphonix, Raindirk, SSL 4000 and SSL Axiom consoles.

The fusing of the two mobile operations creates a new team. The Manor team, headed by Will Shapland and Zoe Fawcett-Eustace, will join Tim Summerhayes, Ian Dyckhoff and the Fleetwood crew to exploit the combined experience of the engineers and staff of each fleet. The pooling of resources in this way is hoped to maximise flexibility, while allowing each outfit to continue recording in their specialised fields. Chris Jerome, CEO of Sanctuary Studios, comments, 'Sanctuary Mobiles will offer every kind of service from broadcast to rock 'n' roll, while maintaining the comprehensive client bases of Fleetwood and Manor. There will be one fleet of five Sanctuary trucks, representing the best mobile recording cache in the world.'

Sanctuary Mobiles operations manager Ian Dyckhoff adds, 'This move combines the resources of the two companies, representing an unbeatable and uniquely flexible package of crew and equipment unparalleled elsewhere in Europe. I believe the combination of Euphonix and SSL mixing platforms, combining analogue, digital and digitally

controlled analogue, will be unbeatable.' Sanctuary Mobiles, UK. Tel: +44 207 602 6351.

## SATIS-faction

**France:** The 6-9 November saw SATIS opening its doors at the Porte de Versailles exhibition complex in Paris. Once past the registration fiasco, Hall Four got you in business. SATIS has established itself as the major annual event for French-speaking countries for the AV industry and manages to cover pro audio, video, film, lighting, multi and e-media under one roof in a comprehensive manner. You have to dig around for homegrown specialities but anyone who has not had the opportunity to visit the AES or IBC can pretty much catch up on the major releases in Paris.

An excellent feature is a conference programme that always manages to give good coverage of the latest technical developments that need some deeper explanation. The list of subjects covered included Electronic Cinema/1080 24P, The Evolution of Compression Systems in Audio (MP3, MPEG-4, Dolby-E) and its Consequences and Audio on the Internet.

Also making its mark this year was the third Multichannel Forum and this event, co-sponsored by the SATIS and the CST plus industry sponsors, is well on the way to establishing itself as an annual meeting place for those interested in multichannel sound. Following the philosophy of two previous events, the third Forum was held at a broadcast organisation and this year it was the turn of Auditorium 1 at nearby France Television.

The event was opened by Alan Parsons who took a survey of the audience before introducing the technical heads of France Television: Francis Héricourt, Jean-Marc Philbert and



**UK:** Liverpool's LIPA has purchased four Marantz PMD650 portable MD recorders for its radio and video production facilities. The PMD650s will be used by students recording location interviews for radio and A-for-V. LIPA has also taken DAS Monitor 6 close-field monitor speakers for use throughout its five recording studios, Studio 2 being 5.1 capable.

LIPA, UK. Tel: +44 151 330 3060. Marantz, UK. Tel: +44 1753 686080. Sennheiser, UK. Tel: +44 1494 551531.

## CONTRACTS

Radiohead, London's Townhouse and Olympic, meanwhile, have invested in seven Empirical Labs' Distressor compressors. Mayfair, London. Tel: +44 20 7586 7746. Unity Audio, UK. Tel: +44 1440 785843. HHB, UK. Tel: +44 20 8962 5000.

**Japan:** Tokyo's Roppongi district recently saw Sony Music Entertainment order an SSL SL9072j console for a new studio complex that will consist of five music recording studios, two postproduction studios and a further 17 suites for CD mastering, DVD authoring and encoding. Design is by LA's studio bau:ton and the intention is to be a further world-class music recording facility. SSL, Japan. Tel: +81 3 5474 1144. Studio bau:ton, US. Tel: +1 213 251 9791.

**Germany:** Deutsche Telekom, Germany's largest network operator, has ordered 18 Orban Optimod-FM 8400 units for installation at its Westfunk group stations. Deutsche Telekom required a device that complies with ITU regulations for some time, the 8400 being the first FM processor to be compliant with the ITU 412-7 regulations. The 8400 will allow Deutsche Telekom to link up to 250 units and control them from a single location, updating the operating software as required over the Internet. Orban, US. Tel: +1 510 351 3500.

**Seoul:** The Seoul-based Korean Film Commission is to install a 48-fader, 96-channel SSL Avant to produce educational films for public viewing. The selection was based on audio quality, operational ease and readiness for multiformat working. SSL, UK. Tel: +44 1865 842300.

**UK:** The radio, television and multimedia production company, Somethin' Else, is expanding its facilities with a new multipurpose TV and radio studio, video and audio editing booths, and a purpose-built voice booth for production of online audio news bulletins. The construction work is being carried out by UK-based studio builders AVD. Up to six people can be accommodated in the new radio studio, which is based around a SADiE Radia, Yamaha 01V mixer and Dynaudio monitoring. A new online audio news booth will provide two (soon to be six) hourly news reports off a further SADiE system. The booth is also equipped with a Behringer mixer, beyer mic and Denon CD players and will provide up to 12

## CONTRACTS

bulletins per-hour. All the SADiE systems are now online, allowing audio to be integrated with web and WAP production.

SADiE, UK. Tel: +44 1353 648888.  
AVD, UK. Tel: +44 1760 441700.

**Germany:** OB operation Wige Media has announced a DM800,000 deal for Riedel's Artist M digital intercom system. Wige has ordered systems for its Ü5 and Ü6 vehicles; the Ü5 to be equipped with 40 key panels with another 12 key panels for the Ü6. Wige will also have eight duplex radio base stations with 30 radios and accessories installed in the Ü6 vehicle and a further six duplex Riface will be installed in Ü3.

Riedel, Germany. Tel: +49 202 270 370.

**Japan:** Tokyo Broadcasting System has raised its investment in DAR editing systems, running a total of three networked SoundStation STORMs and four OMR8s, making it the largest local DAR user. The STORMs are used at the Midoriyama Studio City facility for drama production and the OMR8s at the Broadcast Centre for general-purpose editing of drama, variety, music and news productions. TBS is one of Japan's four major commercial terrestrial networks but the only one providing both television and radio broadcasting services. Japan's New Sony Music Studios, meanwhile, has ordered 8 DK-Audio MSD 600M/SA stereo master meters further to an earlier purchase of 15 units. The order follows the discontinuation of Sony's LED-bargraph ppm DMU-30.

TBS, Japan. Tel: +81 45 963 6202.  
DAR, UK. Tel: +44 1372 742848.  
DK Audio, Denmark.  
Tel: +45 44 85 02 52.

**UK:** Chiswick's TWI studio complex has installed Trantec UHF radio mics and in-ear monitoring as part of a new £4m development. The order comprises 14 S5000L receivers, and 12 belt-pack and four handheld transmitters along with DPA 4060 lavaliers and 4065 headset mics. The new service involves conventional broadcast and Internet service and will be launched in Asia at the end of June to go global 'in the very near future'.

Trantec Systems, UK.  
Tel: +44 208 330 3111.

**France:** French radio network, Europe 2, is standardising its audio production suites on Soundcraft's Series 15 broadcast console. A subsidiary of the Europe Group, Europe 2 is



**UK:** London's Planet Audio Studios has been designed by Recording Architecture for industry veterans Rod and Helen Gammons. It offers a Neve VR Legend, Pro Tools with Apogee converters, extensive valve and mix outboard, and Dynaudio M4 monitors in Studio One, and a programming suite featuring a Mackie D8b, Pro Tools Mix Plus system and Dynaudio M2 monitoring. Studio director Helen Gammons said, 'We have established Planet Audio to be the best London studio for mixing digital Pro Tools/MIDI sessions whilst combining traditional analogue values with Otari multitrack tape machines and valve outboard'. The studio has already proved to be very popular with recent clients, The Lighthouse Family, Mark Morrison and Brian Harvey. Net: [www.planetaudiostudios.com](http://www.planetaudiostudios.com)

Christophe Scherer. These gentlemen welcomed the increasing interest in multichannel sound and took the opportunity to point out that commercials are now being produced in Dolby Stereo (4:2:4) for immediate stereo broadcast together with experimental programmes in 5.1. The keynote presentation was by David Griesinger, who took a hard look at the current technology in multichannel sound, its problems and future prospects. As usual, his talk was a technical marathon interspersed with humour and provocative comment. This was followed by system presentations from DTS, Dolby and SDDS.

The afternoon session, presided by Jorg Wuttke, dealt with multichannel sound for television, with presentations from France Television and the NHK. This ranged from drama to opera to popular music and underlined the need for picture and sound to work closely together in order to produce a coherent product. The Forum extended into the evening

with a special presentation of different programme material from the NHK and commented by Kimio Hamasaki.

Friday morning saw a continuation of Thursday's full house and moved into the world of film. John Rutledge gave a very well-researched historical overview of film sound from the inception of film through to the present day before moving onto an informal workshop debate with leading French engineers William Flageollet, Gérard Lamps and François Groult. Extracts from films were shown to illustrate various techniques. The afternoon, presided by Kimio Hamasaki, moved on to radio productions in 5.1—both music and drama—and presented by Radio France. The final session dealt with music in multichannel and was presented by Alan Parsons. An interesting aspect of his philosophy is to minimise the importance of the so-called 'sweet spot' and to emphasise this, the audience was invited to walk around the room while listening to various examples.

I think the third edition of the Multichannel Forum marked it as becoming the premier European event for multichannel sound and it looks all set to go from strength to strength. The sessions all featured a full house and the interaction with the audience was very lively. It is clear that multichannel sound arouses a lot of interest and that many misconceptions and doubts exist.

SATIS continues to hold its position as a major European event in the pro-media calendar and also has the considerable advantage of very rarely clashing with other exhibitions. However, it is to be hoped that the organisation will not repeat this year's confusion for access for the 2001 edition. Over to you, Hal.

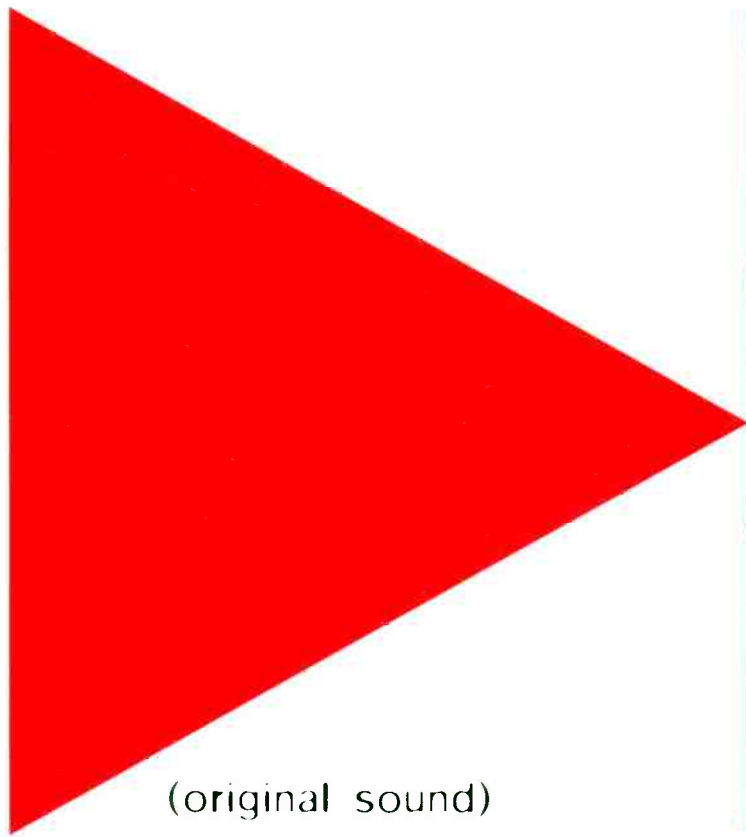
## Soho so good

UK: London post house Molinaire has installed two Soundtracs DPC-II consoles as part of the refurbishment of its main digital Dubbing A&B stages. Design work was by UK-based White Mark and the desks, one 96- and the other 48-fader setups, will run with AMS Neve AudioFile workstations serving film, TV and DVD projects. Both stages are using customised Martin Audio cinema Screen 4 main monitors with eight Effect 5s for surrounds. Chevin amplifiers and BSS Audio FDS-360 digital crossovers are in support. Soho's Lip Sync Post, meanwhile has opened a new facility offering 10 AMS Neve systems with sound suites also designed by White Mark and 5.1 conversant. Theatres 1 and 2 have full Dolby theatrical licences with surround EX and all the rooms are equipped with the same outboard gear to ensure simple project swapping. A new postproduction centre will be home to two DFCs, a Libra Post, a Logic 3 and six AudioFile SCs. The opening project was the animation, *Rugrats In Paris*.

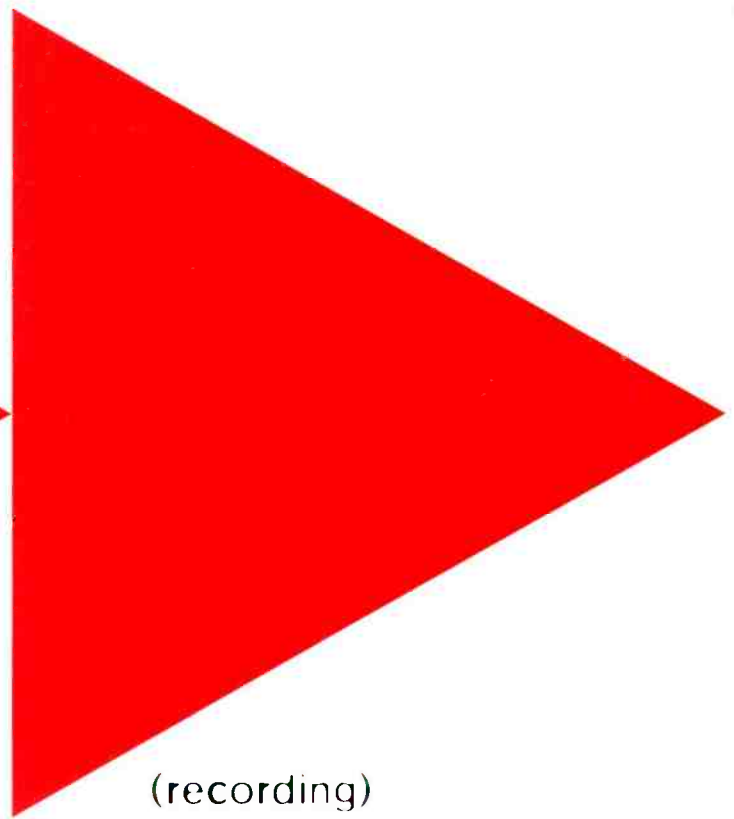
Molinaire, UK. Tel: +44 20 7478 7000.  
Soundtracs, UK. Tel: +44 1372 845600.  
White Mark, UK.  
Tel: +44 44 7071 222543.  
Lip Sync, UK. Tel: +44 20 83362277.  
AMS Neve, UK. Tel: +44 1282 417270.







(original sound)



(recording)

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## CONTRACTS

headquartered in Paris and will have its regional suites re-equipped with the Series 15 consoles over the next 10 months.

Soundcraft, UK. Tel: +44 1707 665 000.

**Sweden:** New 5-studio complex, Kitchen Recording in Sundsvall, has installed a vintage Neve V3 Necam 96 analogue console. Sourced by UK-based Funky Junk, the V3 was moved from one of Italy's Baby Records Milan studios on a tight deadline. Famed for Sinita's facile hit 'Boys Boys Boys', Baby boss Freddie Naggiar's move into TV production placed his recording equipment in Funky's hands and the desk in Kitchen's control room.

Funky Junk, UK.

Net: www.proaudioeurope.co.uk

**Australia:** National multicultural and multilingual radio and Television station, Special Broadcasting Services, is to install over 250 digital audio Netia workstations Broadcasting in 68 languages, the networked Sydney and Melbourne stations will be equipped with two Radio-Assist acquisition-to-broadcast systems. SBS journalists' workstations will be equipped with a combined iNEWS/NETIA interface allowing linking of text and sound files. NETIA has provided a unique server architecture for SBS on mirrored servers keeping the broadcasting network separate from the production operations in order to ensure data security. The systems are linked by the NETIA Media Management software, which is designed to send all ready-to-broadcast items to the broadcast system.

NETIA, Asia Pacific. Tel +852 29 14 14 49.

**US:** The Michigan studio of artist Richard Marx has seen the installation of a 36-channel Audient ASP8024 console. The recently completed state-of-the-art facility meets Marx' requirements both as a recording artist and as a producer, in which capacity he has worked with N'Sync, Vince Gill and Barbra Streisand, amongst others.

Audient, UK. Tel: +44 1923 252998.

**Italy:** X-Land Studios has taken a 64-fader Euphonix CS2000 desk. Set in the center of Zugliano, the studio has recently been refurbished and already operates a Euphonix R-1 digital recorder. X-Land is one of four or five independent Italian studios handling big recording productions. Recent work has included Verde. Rosso & Blu with Nek and Irene Grandi.

Euphonix, US. Tel: +1 650 846 1146.

## Wippit real good

**UK:** Founder of the UK's first free ISP, The X-Stream Network, Paul Myers, is offering a piracy 'solution' to the entertainment industry through an MP3 distribution device using P2P protocols for legal and approved material that retains all control and rights for the copyright holder. Wippit is claimed to 'take the newly established tradition of MP3 file swapping to the next level by adding in revenue streams that ensure artists, writers, publishers and copyright owners are fairly reimbursed for their investment'.

A former songwriter and record producer, Myers sympathises with the entertainment industry, and intends Wippit to offer something back to the music business. Wippit is now undergoing alpha testing and can be found at [www.wippit.com](http://www.wippit.com)

## Orgasms in the library

**Europe:** The Scottish-based Picardy Media Group has launched a new digital audio effects library, claimed to be the first of its kind in Europe. The ServerSound system, which can be accessed by the company's employees across offices in Edinburgh and Glasgow allows users to select from a library of around 80,000 entries—the largest SFX and music library outside of London—



**Italy:** Vetriolo Studios, a 5.1 sound for picture facility in Milan, has recently installed a 16-track DSP Postation to sit with its Yamaha 02R and DynaudioAcoustics monitoring system. Vetriolo serves major music and postproduction clients including Honda, Volvo and Cointreau. The studio also posts independent films and documentaries, and authors and masters DVDs.

## DVD on tap

DIGITAL AUDIO SERVICE and rental specialist Digital Audio Technology (DAT) launches a new high-end location recording package called Studiolab this month.

Three self-contained kits are available, each combining a 48-track Euphonix R-1 hard-disk system with Pro Tools, via a new Euphonix-built R-1/Pro Tools interface, and the supervision of DAT founder and renowned digital audio engineer Ian Silvester. Studiolab is being made available at £500 (UK) per day, and sessions recorded with it and returned to DAT's headquarters in Cricklewood, North London, are easily networked to the company's in-house DAT Media wing for DVD mastering. Silvester spoke exclusively to *Studio Sound*.

**Q:** What is Studiolab for?

Studiolab is intended to drive forward the DVD-A market, making convenient 5.1 multitrack recording and editing available to discerning music clients. At the same time I want to promote Pro Tools as a multitrack format, and by bolting on the R-1 we can provide a truly stable platform for any location.

**Q:** What's in the package, exactly?

We supply a 48-track R-1 with the Euphonix FC727 format converter: all the A-Ds and D-As; a 64-voice Pro Tools Mix+ system with three SampleCells and three 888 24s on board; a 24-fader ProMix with EditPack; and five Dynaudio Acoustics M2s on stands. All TDM plug-ins for Pro Tools are also included.

It's a plug-and-play rig, optimised for DVD-Audio projects.

**Q:** What else do you get?

DAT provides 24-hour technical support, and initially, at least, a DAT-recommended engineer will accompany every kit that goes

out on a session. If I'm available, it will be me. All you have to do is hire a house in the country, and as long as it's got a 13-amp mains plug, everything else is sorted.

**Q:** Doesn't this sort of portable thing work against recording studios?

Yes. But don't forget that we are a production company—we will book studios to put Studiolab in if that's what the session requires—but it's our decision. For instance, we've booked Abbey Road this month for a 5.1 recording with the Studiolab package.

We want to achieve the best possible recording for DVD use, and if we need Abbey Road's live room to do that, we'll book it.

**Q:** What is the future for studios?

The environment of a professional studio is absolutely still necessary, but many studios are too reliant on record companies for business. Record companies demand discount: they want credit; they dictate terms such as schedules, diary, equipment hire; and there is too much technical interference. We have a different relationship with our clients.

**Q:** What's different about the R-1?

I got fed up with low-cost systems which promise everything but won't work in anger. Version 'X' may eventually work but with the R-1 you know that it will work reliably, and, above all, digitally. I've used other hard-disk systems before, but never 100% digitally with success.

Common problems include clocking, digital transparency, minute timing problems, latency, sample delays, misleading VDUs, poor calibration, misleading warning lights, bit-shifting, bank-to-bank timing errors... I could go on.

**Q:** No, that's OK. Just give us a slogan.

Studiolab will kick start DVD-Audio.

DAT, Tel: +44 208 450 5665. Fax: +44 208 1979.

Web: [www.digitalaudiotech.com](http://www.digitalaudiotech.com).



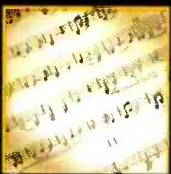
The R-1 was put through its paces at the 20,000 strong Elton John Concert in Madison Square Gardens this year. A host of other stars also appeared on stage...

...all still very much alive!



There were 80 tracks on two R-1's at 24bit 96kHz – nearly three hours of non-stop recording for two separate concerts without a hitch.

It makes you think!



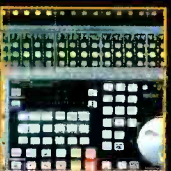
Tape-based recorders cannot keep up with today's demands for sound quality and speed.

The concerns of familiarity of traditional multitrack are addressed in the R-1.



Last year Euphonix Inc and Audio Export established Euphonix Europe to support Euphonix' many European users. We have built a team second to none to provide top level support to our customers.

So... you didn't die before you got old, now what ?



R-1 is available in 24 and 48 track versions. The unit is the perfect companion for the System 5 digital console.



R-1 can support hard drives of up to 100Gbyte capacity enabling the system to comfortably manage long-format recordings, and drives can even be hot-plugged.

Altogether a great new system!

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## APPOINTMENTS

**Universal Audio** has promoted D Dino Virella to vice president of sales and marketing, a move that will see him move from Miami to UA's Santa Cruz HQ. Prior to his time with UA, Virella worked with E-mu Systems, Akai-IMC and as director of Latin-American sales for Digidesign.

**SSL** has appointed Colin Pringle to the position of managing director effective from 1st January 2001. Pringle takes over from John Jeffery who held the post since 1991, having originally joined SSL in 1988 as marketing director. He rejoined SSL having been *Studio Sound's* publishing group as development director. Jeffery will continue on a consultancy basis.

**Autograph Sound Recording** has promoted Andy Brown to the post of operations manager. Brown has worked on West End projects including *Cats*, *Phantom of the Opera* and *The Lion King*, and most recently on the sound and comms system for *The Witches of Eastwick*.

**DPA Microphones** has recruited Mikkel Nymand to its sales force. A Tonmeister, Nymand comes to DPA as



an accomplished musician and composer having graduated from the Royal Danish Academy of Music.

**DSP Media** has named Benjamin Timpauer as western region sales manager. Most recently a product specialist with Roland in the US having previously worked as a studio technician at Sugiyama Music in Tokyo. Based at DSP's LA headquarters, Timpauer will be responsible for sales, installation and training for the Western US.

**Telex Communications** has named Mike O'Neill vice president and general manager for speakers world-wide and for amplifiers in the US. O'Neill brings more than 25 years of experience and is responsible for sales, marketing and development. Joel Johnson has been named general manager for wired and wireless microphones world wide while Ralph Strader moves to vice president and general manager, world wide, for intercoms.



**Korea:** One of the largest recording studios in Seoul officially opened for business last month. Booming Sound Company, owned by the Sori Network, has four recording studios in its Daechi-dong, Kangnam-gu, basement in the south of Seoul. The mainly pinewood-clad studio was designed by Choi Jong-ho, a Korean studio designer who has designed many major studios and spent more than 10 years working in Japan, and America. Says Kim Kook-hyun, president of Sori Network and director of the Sound Recording Technology Department at Seoul Jazz Academy, 'We have four recording studios. Studios A and B are for recording and mixing, while studios C and D are for dubbing. We will use them for dubbing vocals and recording guitar music, as well as doing ADR for postproduction. We have a Pro Tools system for studios C and D, while for Studios A and B we have a Euphonix CS 3000 console, with 56 faders and Pro Tools 5.1. Studio A is intended mostly to be used for postproduction work—films, animation and games.' Booming Sound, was founded in July 1999 by Kim, partner Chang Lim, and construction of the recording studios commenced three months later. The main studio can hold up to 30 musicians at one time. Unusually, the studio, which has two mixing rooms looking in, has four layers of glass in between the mixing rooms and the actual studio, 'because we are using one studio with two different control rooms,' says Kim. He explains, 'It gives us more flexibility. We may have different sounds going on in one control room from what is happening in the other control room, so this gives us greater isolation. So, if one control room is being used for a recording session, the other room can be doing mixing or dubbing.' Kim, who contributed to more than 50 albums last year, agrees that the design is unusual. 'Personally, I have never seen more than three layers of glass to isolate a recording studio from the mixing room. I've been going to America since 1984, but in all this time I have never seen a studio with four layers of glass.'

from Audiovision and Pro Tools systems. The libraries were recorded to ServerSound both as 44.1kHz uncompressed and at 4:1 MP3 files. The library covers requirements for commercial, web site, broadcast programme, CD-ROM, DVD or multimedia game applications. Using a search engine, users can locate and playback sound files in seconds. With requests for particular sounds sometimes being extremely obscure or specific, the resource contains entries as diverse as 'Train Station PA Announcement in Chinese', 'Small Group of French Children singing Happy Birthday', 'Deer Stag Bellowing' and 'Woman Screams—Having Orgasm'.

Waterfront Sound—Scotland's largest Independent Audio-Production facility, which has been part of PMG since December 1998—began the task of transferring the company's sound files onto a

digital database four months ago. In the past, PMG staff requiring a sound effect had to source the disc containing the sound which was frequently in another edit suite or even in another building. With the new technology, which was developed by Canadian firm mSoft, the programme makers' lives are made much easier.

## Pro Tools on European tour

**Europe:** Digidesign has launched DigiWorld Europe, a touring forum dedicated to the Digidesign Pro Tools user. The tour is scheduled to hit nine European cities over a four-week period extending early this year—Paris, 3rd February; Munich 6th February; Cologne 8th February; Eindhoven, 10th February;

Berlin, 14th February; Hamburg, 16th February; Vienna, 20th February; Rome, 24th February; London, 3rd March. Each one-day event will feature more than 10 demo stations focusing on various audio solutions, and a feature presentation of Digidesign's latest products and technology. This tour follows on the heels of the US DigiWorld, which visited LA, Nashville and New York.

DigiWorld Europe will also feature a touring Master Class session instructed by celebrated American engineer, Charles Dye. Tour dates will be further enhanced by an additional appearance of a guest engineer, producer or artist from each city visited. The event is free and only advance registration for the Master Class is required—online prior to the event. Digidesign: [www.digidesign.com](http://www.digidesign.com) for more information.

See events listing for further details.



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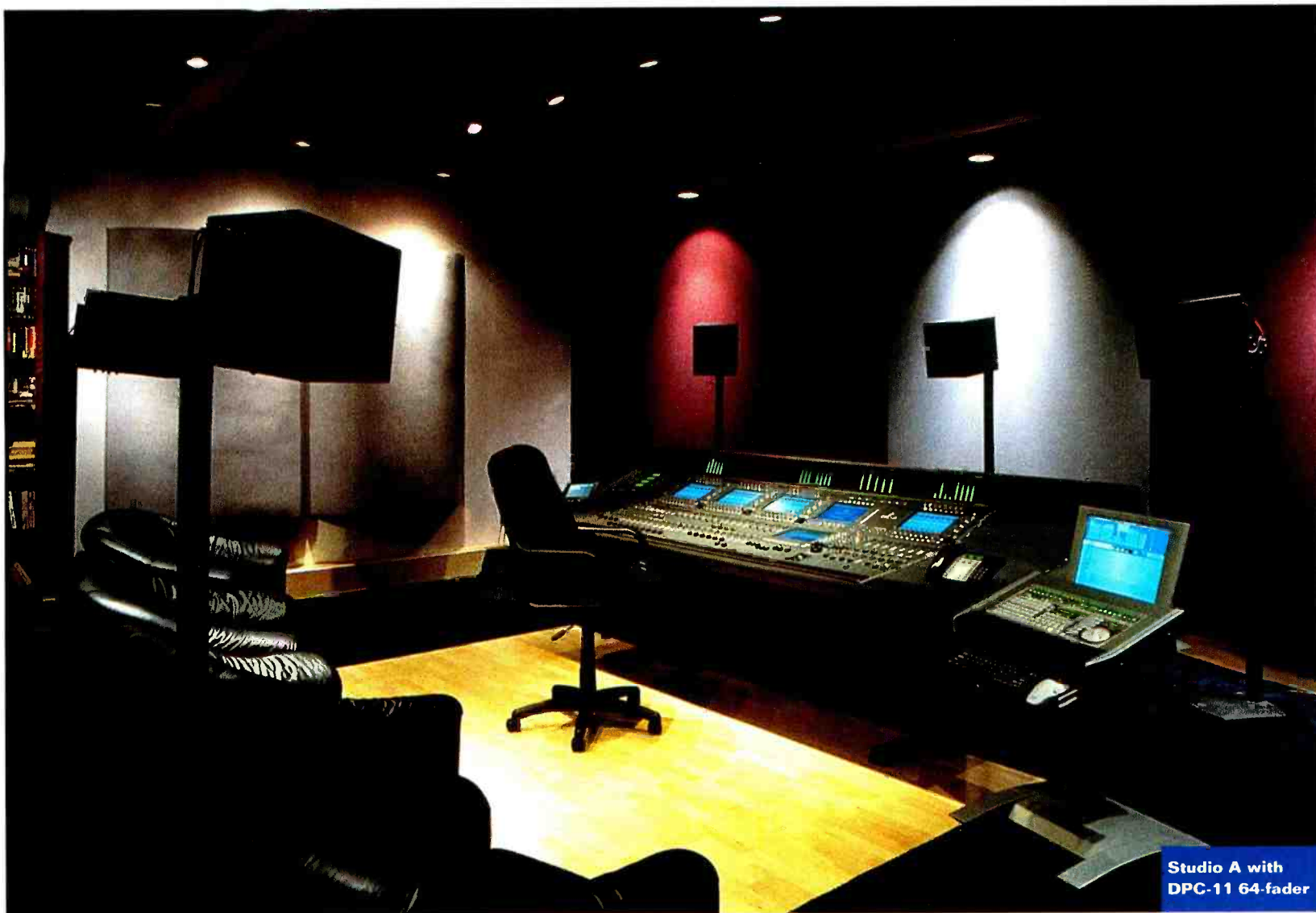
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Studio A with DPC-11 64-fader

# 5.1 ENTERTAINMENT

Rushing where the record majors fear to tread, LA-based 5.1 Entertainment licenses classic material and records new music for release on its own labels, delivering it all in surround. **Richard Buskin** talks with the men with sound and vision

**T**HE WHOLE IDEA of 5.1 sits best when music is discreet,' says Gary Lux. 'It's not front-loaded, not front-oriented. Concerts that play with picture are front-oriented and so you're watching the performance but I like mixing records that can be listened to in a traditional fashion with no visuals, where you can paint your own picture.'

The engineer of more than 300 5.1 surround mixes, Gary Lux is also vice president of audio production at 5.1 Entertainment, a Los Angeles facility that specializes in the recording and mixing of DVD music. Jointly owned by Ken Callait, Leo Rossi and John Trickett, 5.1 boasts 24-bit, 96kHz fidelity in the form of two studios equipped with Soundtracs DPC-11 consoles and Euphonix R-1 digital multitracks, and during the past year the company has fully immersed

itself in the surround market by licensing back-catalogue material from various record companies for 5.1 release on its own labels. What's more, it is signing artists and recording new material.

The genesis of the operation lies in 1993 when Ken Callait and Leo Rossi co-founded Highway One, which dealt with digital production for CD-ROMs. In May 1999 this evolved into 5.1 Audio and 5.1 Entertainment, at which point Englishman John Trickett came on board as the third partner and CEO. 'He's our equivalent of Richard Branson,' quips Ken Callait. 'He went from the airline business into the music business.'

Eighteen months later, 5.1 Entertainment is a thriving concern, with two state-of-the-art surround studios, a trio of record labels, an increasingly diverse catalogue of classic recordings and a growing roster of its

own artists. Callait and Lux take care of the mix assignments, yet they also involve themselves in design issues relating to the company.

'About two years ago we knew that 96k, 24-bit was going to be the standard, or at least that was the target that everybody wanted to hit,' says Callait, 5.1 Entertainment's president of digital production services. 'We learned that some people were cutting corners but we didn't want to do that, and so in October of '98 we began to look at how we could put together 96-24 and started researching the equipment that was available. We found that the only way to record 96-24 was to piece it all together, and our chief engineer Claus Trelby was really the guy who figured that out.'

Indeed, Trelby, a native of Denmark, had previously only been accustomed to the performing of sur-

round mixes in temporarily adapted stereo rooms. Now, however, as not only 5.1 Entertainment's chief engineer but also its technical supervisor, he had to design a pair of studios that would give proper consideration to the permanent installation of rear speakers. His solution amounted to what he describes as 'semi-absorbent rooms'.

'Each room has diffusing forms,' Trelby explains. 'These are round surfaces that vary in radius according to the size of the room, and they are neither hard nor soft. They have 1/2cm of highly-absorbent insulation on the outside, and then hard, curved pegboard with holes in it that sucks sound in, together with material on the inside, so it almost functions like a low-end trap.'

'Quite honestly, this was one big experiment. It was the first time I had helped design a surround sound room and so, with just stereo experience behind me, the only thing I could draw on was THX. That, of course, is for a movie theatre, which is a totally different environment to that which we were trying to achieve. We weren't trying to achieve a big room sound, so, after having had the rooms measured three times—once by THX and twice by private contractors—they are flat and extremely nice-sounding. In fact, THX even commented that they sound good, although they don't know why.'

'Actually, I veered away from some of THX' practices, because I wanted point-source speakers in the rear. I didn't want diffusion back there, but I wanted a clear phantom image between the side and rear speakers and that is often the hardest thing to achieve in a surround room. The fact that it has worked out is, I think—and I can't be sure without going back and retrofitting the room—down to the ratio between absorption and reflection. The absorption helps a lot, while the only true reflective surfaces in each of our rooms are the beams in the ceiling and the wooden floor that the console sits on. The walls are dry-wall [plasterboard] with third-of-a-circle diffusers on top, and the front and back walls are covered in cloth with varying amounts of absorption and diffusion behind that cloth.'

While THX and ITU each provide their own monitoring specifications, Trelby found that the requirements of his studio design didn't necessarily conform to either standard.

'We have a fairly wide front array,' he says. 'We like to use the centre speaker as both an effect and to stabilise the phantom image, enabling us to get away with a much wider image at the front. As for the rear spread, this is a little bit tighter than at the front by about 7° or 8°, and this was arrived at purely by experimentation.'

The speakers comprise M&K MPS 2510 main monitors and MPS 5000s LFEs. 'We tested 10 or 12 sets of speakers, and the M&Ks seemed to be the best all round for everything that we wanted to do,' says Callait.

It was Ken Callait who also spent time checking out different consoles for the new facility, before encountering the Soundtracs DPC-11 at a trade show. Claus Trelby took a look and quickly discovered that, at that time, it was the only 96k, 24-bit console and it was user-friendly to boot. What's more, it was also best complimented by the Euphonix R-1 multitrack.

'I was interested in ease of use,' explains Callait. 'I didn't really want to be in the computer world; I wanted this to be a recording studio. The R-1 looks like a standard piece of recording equipment and it functions that way. As a result I could bring in outside engineers and they wouldn't have to deal with rewind

time. It felt like a 30ips machine, so it was totally user-friendly. I didn't want to build something where, to work 96k, you had to be a computer nerd, and in that regard the Soundtracs console is also laid out really well. It's very intuitive and it sounds incredible.'

'So the Soundtracs and the R-1 talked well together and then we needed to get from analogue to digital and vice-versa, and that's where the Apogeos came in. We tested a lot of gear...'

And have continued testing. The 48-fader console in Studio A has recently been shifted to Studio B in order to make way for a 64-fader, while the 16-fader version that was in Studio B is now slated for possible use in the facility's proposed new mastering suite. That is, if Trelby and certain colleagues don't have the time to bring their own mastering console design to fruition.

After acquiring the right equipment, the facility's next task was to figure out how to bake old analogue tapes and find the right machines to handle the tapes gently while providing the most fidelity.

'That's always a moving target, because you never know what you're going to be working with,' says Callait. 'We've had anything from monos to original 2-track masters, 3-track, 4-track, 8-track, 16-track, the whole deal—you know, double 24-tracks with the slave reel missing. You become an audio sleuth...'

'I've heard that when some people couldn't find the second reel of the multitrack, many times they would just mix the first reel and not add the other parts. In some cases, they would also do a stereo extraction to try and duplicate something, or to keep their costs down they would make a copy of the original master on a 3348 in 20-bit and then they would

run it into a console and try to upsample it to 96k later on. We believe 100% that it's 96k all the way. We'll send an R-1 to whichever facility has those multi-tracks because I want 96k; I don't want somebody sending me a second generation of anything. If that's all there is left, then that's fine but that wouldn't be my choice for the best source.'

For the 5.1 team, the learning curve has been compressed into a relatively short space of time. Nevertheless, while often resorting to trial and error, things have also followed a logical progression.

'Once the tape was baked we transferred it into the R-1, and after we first did this we soon realised that, at that point, we picked up an extra track,' says Callait. 'That worked out really well and then we learned that we had to deal with drive space, drive management, backup management and all of the accompanying paperwork, because the R-1 does use hard drives and after a while you start to fill these things up. As a result we've now got colour-coded hard drives.'

'We would mix everything to a second R-1, again at 96k, and then we'd need to down-sample the 48k for AC3 and DTS, and that was a whole other procedure—learning the best way to down-sample. After that we'd encode into MLP, AC3 and DTS, test all that and figure out where mastering fit into the whole process, and eventually we came up with a pretty smooth operation.'

In terms of outboard, 5.1 Entertainment opted to remain mainly in the digital domain, installing te electronic M6000 reverb-effects-mastering units which are capable of working at 96k, M3000 effects units and D-2 digital delays (both of which operate at 48k)





in both studios.

'The other criterion for us was having total recall,' says Callait. 'We knew that once we had an artist's tape we wouldn't necessarily be able to get the artist or producer in here, and in that case we wanted to make sure that we could make changes to the mixes. Total recall was therefore extremely important to us, and again we were sometimes getting different sources. For that the Soundtracs is really good because it can take some sources at 48k, some at 96k—like the remix that we've recently done of Alice Cooper's *Welcome To My Nightmare*; one of the songs has got full-track flanging, and we were wondering how we could deal with that. We ended up laying it out to five tracks of a 24-track, we VSO'd it, and we were probably the first people to ever do that in 5.1.'

For the 5.1 remix of Fleetwood Mac's *Rumours* it was handy that Ken Callait himself had been the album's engineer the first time around. For *Welcome*

*To My Nightmare*, on the other hand, producer Bob Ezrin dropped by the 5.1 Entertainment facility to give some advice.

'When we first started doing this kind of work, once in a while we'd find the EQ charts for some of the songs,' says Callait. 'A chart would say that this was going out to a 1176 and that was going to a Pultec, and we'd bring some of that gear in but it wasn't the same animal any more. It might have been great if it was tied into an API console or whatever but working on a digital board at 96k, it turned out that our EQs and compressors sounded just as good or better.'

'Ken and I believe in staying extremely true to the original release and the integrity of the piece that we are working on,' adds Lux. 'Some of the material that we get is, of course, very old, and it can take some extreme finessing to make things sound good. However, for the most part the quality is very good.

We listen to the 2-track CD versions and we always A-B just to make sure that, say, the guitar and vocals are loud enough and that the backgrounds are true to balance. In many ways and in every way we make it much larger than life.

'In the past, movie consumers were accustomed to surround sound based on Pro Logic, where primarily echo-type effects would only be in the rear channels. However, Ken and I are extremely aggressive in terms of putting primary information in the rear speakers. There are no rules but we are always true to the music and we do what we feel is cohesive. That means we never make the music sound disjointed just by putting things in the rear. It's all down to synergy and blend.'

Indeed, Lux is well versed in the art of analysing the direction of each and every mix.

'If it's a piece for a feature film, I will be aggressive in all speakers including the centre channel,' he explains. 'That's one of the concerns that film people have; that there is information in the centre speaker. A lot of mixes out there don't trust how the consumers set up their gear and so they're very modest in terms of what they put in the centre channel but I'm aggressive in all channels. I feel that it's my responsibility to help with the perception of the sonic value on the part of consumers.'

As evidenced by a September recording session with Herbie Hancock and the London Philharmonic Orchestra (*Studio Sound*, December 2000) which made use of the new Soundfield surround microphone, 5.1 Entertainment continues to break new ground within its field of growing expertise. So, what's down the road for the company? A name change, perhaps, to 6.1 or 7.1 Entertainment? Ken Callait laughs at the suggestion.

'No, I don't think so,' he replies. 'The record labels are providing the main thrust for what happens right now. Not only are we licensing material but we're also signing new acts, so we're kind of the new young label on the block that pays more, does more and offers both stereo and 5.1 releases. In fact, Peter De Stefano from Porno For Piro's is signed to our label, and they're actually recording all new music and writing in the 5.1 idiom. We have also signed Dishwalla, which is a band that has already sold gold, and the up-and-coming LA group, Bird. So the future looks very exciting and I just can't wait to hear the stuff that's going to be coming out.'

## Labels and Licensing

WHILE THE MAJOR record companies are still often reluctant to invest either time or money in surround remixes of their back catalogue material, 5.1 Entertainment has stepped to the plate and launched three of its own labels for the licensing and release of said material in compilation form: the classical and jazz-based Silverline Records, the rock-orientated Immergent Records and the techno-based Electromatrix Records. Each are directly run by CEO John Trickett.

'Broadly speaking, Silverline Records specifically focuses on the DVD business in the form of 6-channel music,' he explains. 'Immergent and Electromatrix, on the other hand, use the same staff and are more like record labels in the traditional sense, signing new artists and releasing albums. Now, while the labels go out and do the licensing deals, 5.1 Entertainment's production services division actually produces the music: taking the original master recordings, mixing them in the 6-channel format, and doing everything right through to the artwork and pressing of the final discs. So, it's really a one-stop shop.'

'Right now there's a lot of content out there,' adds Ken Callait. 'and so we license stuff from the fifties, sixties, seventies, eighties and nineties. A year ago we felt that, when DVD audio really begins to hit, the consumers may well start by wanting to buy compilation albums. You know, *The Best of... Jazz*, *Women In Rock*, whatever. It was an opportune time for us to strike, and so that's what we've done, licensing content from a number of different sources

and putting these compilations together for release in 48k DVD: standard DVD video discs with no video necessarily, although we sometimes put visuals on them, in both Dolby Digital and DTS, and now we're re-formatting those to have DVD-A on the same disc. Our goal is really to have all three formats on any one disc—artists and politics permitting.'

Inevitably, once they feel that DVD audio has established a strong-enough base, the major record companies will decide to plunder their own wealth of goodies and jump feet-first onto the surround mix bandwagon. Nevertheless, neither Ken Callait or John Trickett are particularly concerned that this will interfere with the related activities of 5.1 Entertainment.

'The record companies are usually interested in 200,000 or 300,000-unit sales,' says Callait. 'I mean, a lot of companies come to us and say, "We'll hire you to mix for us." Then they look at the cost of the whole thing and realise that they don't know how to put the graphics together for DVD and that we can handle most of that background stuff. So, we then say, "Listen, we'll do it for nothing as long as we get a back-end piece of it, do it as a joint venture or put it out on our own label". Generally we get around to them liking that idea a lot.'

'Aside from licensing back catalogue material we're also signing artists and creating new music that is scheduled for release in the 6-channel sound format,' adds Trickett. 'So, from licensing existing content right through to creating new content, we're effectively only limited by the size of the world-wide market... and that's growing all the time.'

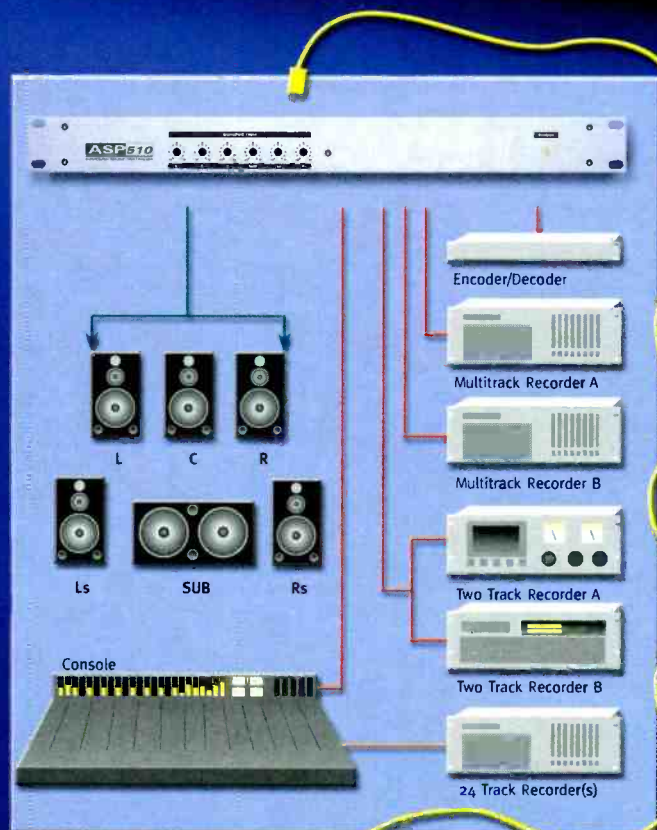
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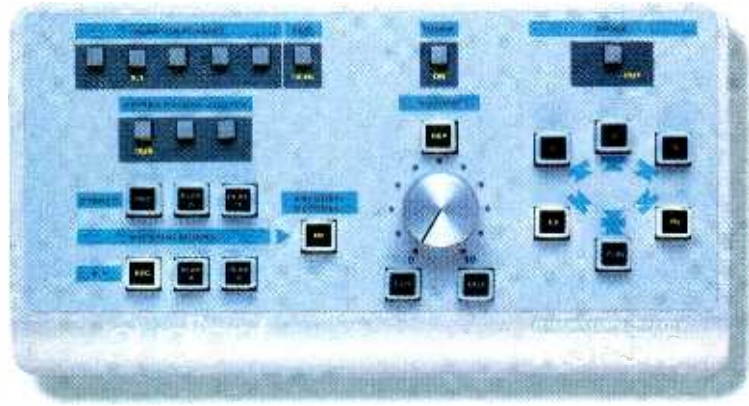
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EXPOTUS

# Audient ASP 510

Proving that its focus is not exclusively on retrospective analogue audio equipment, Audient has followed its successful analogue desk with a surround sound controller. **Rob James** finds its sweet spot



**A**LTHOUGH AUDIENT IS A RELATIVE newcomer to the scene, the names behind the company are familiar ones as David Dearden and Gareth Davies were the 'DD' in DDA. Between them the design team has 50 years experience; their ASP 8024 analogue recording console—although seen by some as a strange thing to have designed in this digital age—has garnered much admiration and many sales. It is now joined by the ASP 510 surround sound controller which embodies much of the same philosophy and 'look and feel' as the console.

At 230mm wide by 120mm deep, the remote control manages to appear uncluttered without using up too much precious real estate. The heavy alloy top plate curved downwards at the front is both aesthetically pleasing and practical for a free-standing unit. The curve might pose more of a problem if you wanted to build the unit into a console surface. Larger, internally illuminated keys deal with frequently accessed functions while smaller keys have illuminated legends when active. The volume control is a real pot with end stops as opposed to a shaft encoder whose position actually has some relevance and obviates the necessity for a numeric display. Personally, I would have liked a numeric level display and I understand this could be made an option if enough people feel the same way. Operation is almost self explanatory and so, ironically, the ASP 510 comes with an excellent, and comprehensive manual including helpful application diagrams and very clear pin-outs if you are making your own cables.

With a maximum of 5.1 monitoring the ASP 510 comes in below the middle of the price range and has obviously benefited from being a late entrant. It offers a sensible number of inputs with flexible configurations. There is a total of three 6-channel and three 2-channel sources, a 6-channel speaker output and 2-channel and 6-channel recorder outputs. After discussions with Audient it will now be possible to 'lock' a single surround source by simply holding the key down for a few seconds. This will allow, for example, a surround guide track to be heard when

monitoring recording or playback. It will also be possible to gang any two or even three surround keys in the same way so that if you switch from say, Surround Play A and B to a stereo source and back to surround Play A, surround Play B will still ganged with it.

There is now a considerable choice of surround monitor controllers at varying price points. These range from the very simple to the extremely complex capable of controlling

7.1 sources with fine control of downmix options, bass re-direction and multiple encoder-decoder switching. But all the things you need for everyday surround mixing are present on the 510 without over complicating the issue. Monitoring controls are among the busiest in the studio and need to be completely instinctive—and they are extremely personal things. One size doesn't fit all. I particularly liked the robust feel of the keys and the uncluttered appearance of the Audient unit. Best of all, for me at least, everything fell naturally to hand on first acquaintance. Performance figures for the console appear conservative and subjective audio quality reflects the designers' obsessions. I was unable to detect any artefacts. I believe the simple downmixing and absence of bass re-direction is appropriate for most likely applications. Where more comprehensive downmixing control is needed I remain to be convinced the monitor controller is the place to do it.

## Keystrokes

**BYPASS TOGGLES** between main LR console outputs direct to the left and right speakers and normal use of the ASP 510 functions. The 5.1 key has two functions; If the key is pressed normally it selects 5.1 monitoring. If the key is held for a few seconds, the legend flashes which indicates Film mode with a 3dB attenuation on the LR surround speaker outputs. Once engaged it remains in place when returning from other formats unless cancelled by a long press. The other format options are; LCRS, Stereo and Mono. Downmixing co-efficients are fixed in the factory. SUB introduces an 80Hz filter into the LFE speaker path. The central GUIDE key adds the stereo guide track input direct to the LR speaker outputs.

Three stereo record source keys offer a choice of stereo bus feed from the console, a downmix of the direct surround source or Lt, Rt (Left total, Right total) from the output of an encoder. The six monitor source keys allow selection of stereo record source, stereo play A or B, Surround record source

## The Processing Unit

**THE PROCESSING UNIT** is a 1U-high box. Six presets provide  $\pm 10$ dB trim to the speaker outputs. On the rear are 10 D-sub 25-pin connectors which mostly follow the Tascam D-88 convention for audio I-O. One connector carries control room LR and guide LR inputs, plus three opto-isolated GPIs for Dim, Solo and Talkback console sensing. Mains is unswitched with a voltage selector for 110V or 220V. The remote control connects via a Cat 5 ethernet cable.

All inputs and outputs are electronically balanced and the circuitry is designed to accommodate unbalanced working without problems. Relays are used for switching and DCAs (digitally controlled attenuators) provide the gain control elements.

Whether the requirement is for a stand alone monitor controller or a more comprehensive addition to a console's routing the ASP 510 has a lot to offer.

Audient have achieved an unusually good balance between sufficient inputs and facilities whilst retaining maximum clarity and simplicity. If you intend to work in surround a monitor controller is essential. Once auditioned, the ASP 510 may well become indispensable. □

## Contact

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**Worldwide distributor:** Expotus, 95 Grays Inn Road, London WC1X 8TX, UK  
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or Surround replay A or B.

DIM level is set by pressing the DIM key until it flashes, setting the desired level and pressing the key once more. Reference level is set in similar fashion. When active, the volume control is disabled. A 0dBu pink noise generator provides for speaker calibration. This is invoked by holding down the CUT and DIM keys together for a few seconds. The speaker feeds are all cut and may be unmuted using the individual keys.

These six keys are laid out in a logical pattern, resembling the speaker positions. The MODE key toggles the keys function between CUT and ISOLATE, which functions as an additive solo. Key selections are remembered when changing modes and CUT speakers remain CUT in ISOLATE.

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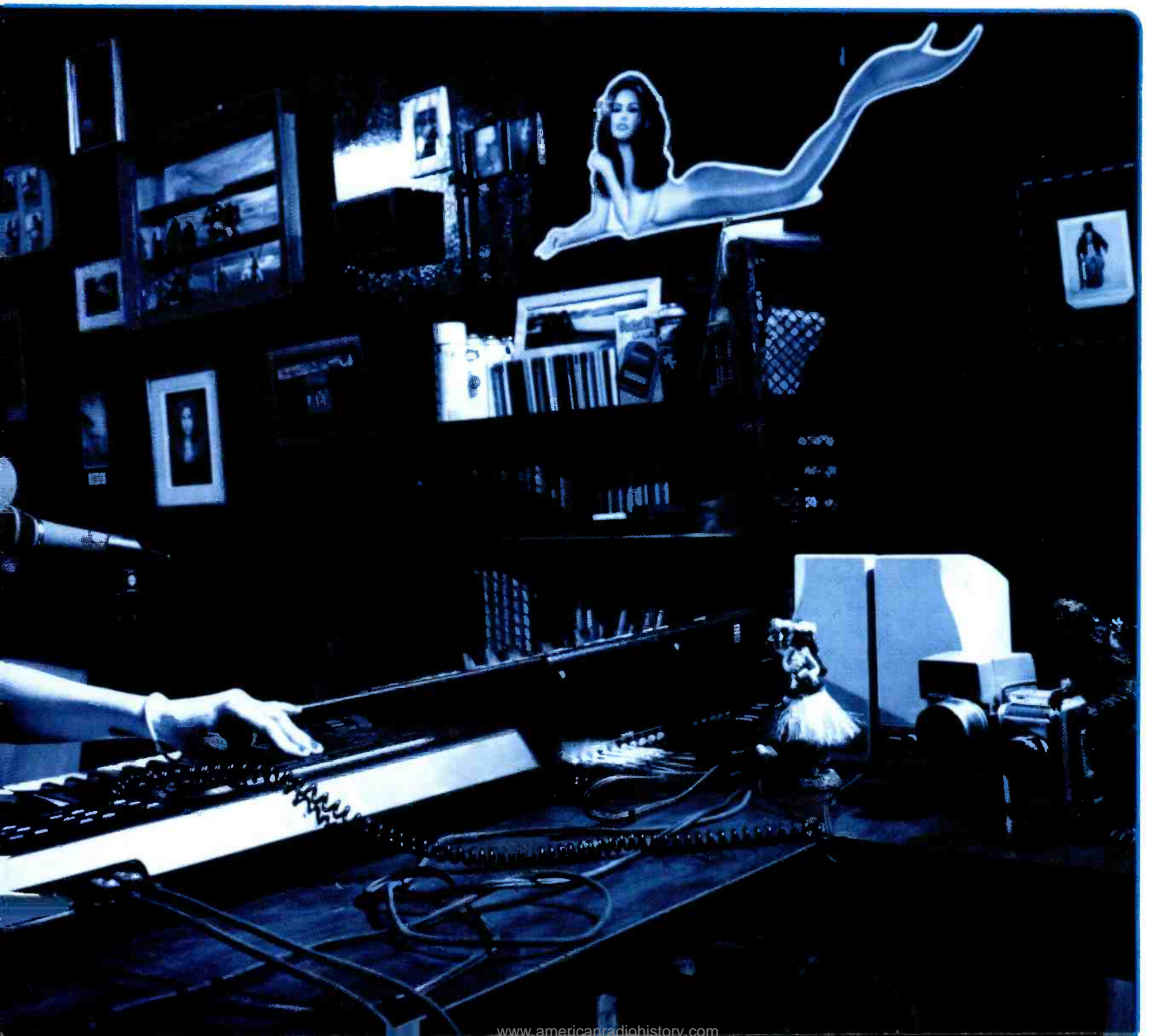
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# CEDAR DNS1000

In the war to rid the planet's recordings and film soundtracks of unwanted noise, CEDAR's Dynamic Noise Suppressor is the engineer's latest weapon. **Rob James** gauges its firepower

**C**EDAR IS IN SERIOUS DANGER of becoming a generic term like Hoover or Biro. Not only do the company's products dominate the field of 'clean up' tools for music recordings but the same hardware and software tools are being used in forensic audio and, on occasion, sound for picture. CEDAR's latest offering, the DNS1000 is aimed squarely at this market.

Based on my own experience and discussions with other mixers, I would say more time is spent on cleaning up location recordings than any other facet of sound for picture mixing. You might assume the quality of location dialogue recordings would have improved as technology has advanced. In fact, due to a combination of factors, if anything the average standard has deteriorated. Restricted budgets, traffic, aircraft, HMI lights which emit multifrequency whistles and noisy cameras in dodgy locations are constant irritants. In drama work, the continuing trend away from a trained, theatrical style of delivery exacerbates the problems. To all this can be added the dramatic increase in usable dynamic range from current theatre sound systems and DVD in the home. The increased dynamic range and resultant increase in SPL conspires to reveal far more of what used to be conveniently hidden. ADR is sometimes seen as one answer, especially for period drama. However, replacing dialogue is an expensive and time-consuming option. In documentary and other broadcast areas it is rarely even an option.

Sound mixers in all these fields have their own favourite weapons in the war against extraneous noise. Filters, expanders, gates, dynamic equalisers—the BSS 901 and devices based on companding noise reduction systems such as the Dolby Cat 43a (Dolby 'A') and Cat 430 (Dolby SR) noise reducers. The latter two devices have had this area to themselves for many years. French manufacturer Elison produced an ill-fated multiband version a few years ago. Perhaps this is not surprising since the size of the market is too small to interest many manufacturers. I believe a machine combining the same virtues of speed and convenience but with a more sophisticated approach

using digital DSP technology is long overdue.

With all such devices there is a balance to be struck between elimination of unwanted signal and limitation of damage to the programme material. The other requirement is speed and ease of use. In film mixing time is serious money and in live broadcast it is equally precious. This doesn't only apply to operating the device but also learning how to use it. Only occasionally does a control surface come along which immediately feels right. I found the DNS1000's very light action long-throw faders and positive click touch keys immediately satisfying to the touch. In this area of rabid individualists I have no doubt it won't suit everybody but...

As with any dynamic noise suppressor the first step in eliminating unwanted signal is to first identify and remove any dominant fundamental frequency(s) followed by objectionable harmonics using a notch filter, then to apply the DNS1000. Over use of filtering leads to objectionable artefacts. Human hearing is so adaptable it is possible to seriously degrade a signal without realising it. Therefore it is essential to continually check effects against the original to ensure the baby is not being thrown out with the bath water.

Adjusting the DNS1000 begins with all the faders down. The Level (left) fader is raised until the unwanted

signal disappears. If it doesn't, you should try another range, or two ranges together. If the unwanted signal is still present, select the full range using the left and right keys together. The next step is to either raise each of the other faders in turn, as far as possible, until the unwanted signal is heard alternatively you can start with all the band gain faders at zero and lower them until the unwanted signal disappears. CEDAR recommends the latter approach but I have always reckoned it is easier to hear something appear than disappear. In practice, the process is recursive so the level fader will probably benefit from tweaking once the band gain controls are set. All of this is a great deal easier and quicker to do than describe and, once I had my head around the ranges, completely intuitive.

I used a wide range of material in testing the DNS1000. The noise pollutants included projector noise, film camera noise, traffic and reverb. CEDAR supplied some sample material and I began with this. I am always a little cynical about material supplied by manufacturers but in this case, after testing with my own stuff, it seems pretty representative.

At first I was slightly disappointed by the processing artefacts. At least I was disappointed until I hit the BYPASS key and an astonishing level of rubbish was revealed. I moved on to try some examples of my own. Moderate levels of noise were almost completely eliminated with trivial degradation to the wanted signal. As a final test I used some material which I had spent several hours attempting to clean up using other tools. This was a mixed track with music and street sounds



## Table header

The table shows the centre frequencies of the bands affected by each band-gain fader of the DNS1000 in each of the operating ranges.

CENTRE OF BAND (Hz)	RANGE					
	Low	Mid	High	Low & Mid	Mid & High	Full
1	24	244	4370	28	261	30
2	40	445	5698	77	577	99
3	69	811	7431	209	1276	329
4	117	1479	9690	573	2822	1094
5	198	2695	12635	1568	6244	3632
6	335	4912	16476	4290	13814	12064

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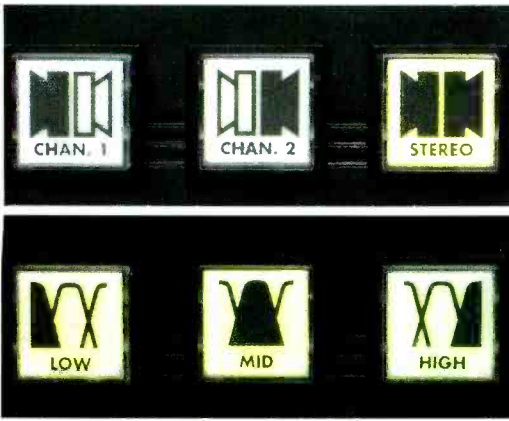


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# REVIEW



## Panel work

THE DNS1000 IS A COMPACT stand alone unit. On the gently sloping front panel seven faders, seven illuminated keys and 12 LEDs completely belie the power under the hood. The rear panel is simpler still, a pair of XLRs and a pair of phons cater for AES-EBU and SPDIF digital I-O, four LEDs indicate sampling rate and a combined IEC mains socket and switch complete the picture. Because some potential users will want to mount the unit in a console surface I suspect they would prefer an external power supply. I also think the option of analogue I-O would be desirable.

The three keys on the left simply determine whether the unit processes the left, right or both channels. On the right, the Bypass switch is essential for checking the effect. The remaining three keys determine the frequency range to be treated. Logically, the left-hand

key gives low, the middle key, mid and the right high. A wider spread can be obtained by using the keys in combination. Low and mid, mid and high or by pressing the left and right keys together, full range. CEDAR has cleverly arranged things so either pressing two keys together or pressing a second key while the first is flashing links ranges.

The left-hand fader is used to set the overall level of noise present in the input signal. The remaining six faders have a pair of LEDs which indicate the activity in each of the control bands. Dim green equals between 0.5dB and 3dB of cut, bright green, more than 3dB. The red LEDs indicate boost.

Latency is quoted as being below 10 samples or less than 1/200th of a frame, unnoticeable for practical purposes. Sampling rates are 32kHz, 44.1kHz or 48kHz with around 4% tolerance for varispeed. Both interfaces are 24-bit.

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best way to describe the effect is the room seems to shrink in size.

This deceptively simple control surface disguises a seriously complex process. Two 40-bit floating point Texas Instruments DSP chips are employed to provide, at present, 18 bands of adaptive dynamic filtering. The number of bands controlled by each fader is not fixed and the bandwidth of the filters is not the same as conventional third-octave types so centre frequencies do not necessarily indicate the frequency at which the greatest signal attenuation occurs. The bandwidth is varied to suit the selected range. The range of frequencies affected may therefore be either smaller or larger than the figures seem to suggest, depending upon the signal content.

This unit is a near perfect compromise between effectiveness, simplicity of operation and sufficient control over a complex process. The wish list is pretty short. Since virtually all film mixing is now done on fully automated consoles a way of interfacing it with automation systems would put the icing on the cake. It would probably also double the price...

When trying to make a silk purse out of a sow's ear, which is the raison d'être here, there is no such thing as perfection. By designing a tool which achieves results which are equal to or better than processes which either take ages to adjust or hours to crunch CEDAR has come remarkably close. Essential. □

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## SILK SOUND, SOHO, LONDON

- Robbie Weston

"Everything had to be capable of being networked and operating seamlessly between the four rooms, as well as offering us a secure future development path. DAR provided us with the right solution at the right time - we worked our way through everything out there and eliminated them one by one, leaving us with the STORM as our editor of choice."



## MERIDIAN BROADCASTING, UK

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"DAR's touchscreen interface has always been fast to operate, but the improvements with STORM are significant. The touchscreens are very responsive, with a high quality image,

and the networking facilities are efficient and highly convenient."

## TOKYO BROADCASTING SYSTEM, INC. (TBS)

Operating three SoundStation STORMs in Midoriyama Studio City for use with drama production, plus a further four DAR OMR8 disk editor/recorders deployed at the Broadcast Centre for general purpose editing, including drama, variety, music and news productions. Currently the largest DAR user in the region.

## THE EGYPTIAN RADIO AND TELEVISION UNION (ERTU), CAIRO

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# K&H 0198

Studio Sound's 'bench test' loudspeaker reviews continue with the K&H 0198. **Keith Holland** reports

THE K&H 0198 is a 3-way, active loudspeaker with built-in power amplifiers and crossover network. The drivers are a 200mm woofer, a 90mm soft-dome mid-range and a 28mm metal-dome tweeter radiating via a shallow, elliptical horn. The drive-units are arranged on the front panel such that the mid-range and tweeter are vertically aligned and mounted alongside the woofer; the loudspeaker is designed to



be used with its largest dimension horizontal (landscape). The cabinet has overall dimensions of 383mm wide by 250mm high by 300mm deep. The rear panel houses a heatsink with vertical fins, a balanced (XLR-type) input socket, an attenuation control continuously variable from 0dB to -28dB and a three-position low-frequency equalisation switch marked 'speaker stand', 'meter bridge' and 'meter bridge near wall'. An accompanying diagram suggests that the 'speaker stand' position gives zero attenuation, and that the 'meter bridge' and 'meter bridge near wall' settings reduce the level of low-frequency output in two steps. This review was conducted with the switch set to 'speaker stand'. No specifications regarding amplifier power or maximum output level were available at the time of the review.

The on-axis frequency response for the K&H 0198 is shown in Fig. 1. The response is seen to be remarkably flat with a very extended low-frequency response, lying between  $\pm 2$ dB limits from 40Hz to 20kHz, with a 3rd-order roll-off giving -10dB at about 30Hz; this is a very commendable result. Also shown on Fig. 1 is the harmonic distortion performance at an output level of 90dB SPL at 1m distance. The distortion at low frequencies is a little disappointing, peaking at -28dB (4%) at 50Hz for the 2nd harmonic, and -23dB (7%) for

the 3rd harmonic; however, levels are kept below -50dB (0.3%) for all frequencies above 100Hz. Figs. 5 and 6 show the off-axis responses in the horizontal and vertical planes respectively. There is some evidence of mid-range narrowing between 500Hz and 1kHz in the horizontal plane, which is probably due to the horizontal spacing of the woofer and mid-range drivers as it is not evident in the vertical plane, and the characteristic crossover notch, due to interference between the mid-range and tweeter, can be seen in the vertical plane at 30° both up and down.

The time-domain performance of the K&H 0198 is shown in Figs. 2, 3, 4 and 7 which show the step response, acoustic source position, power cepstrum and waterfall plots. The step response shows some time mis-alignment between the drivers, with the high frequencies peaking about 150  $\mu$ s before the mid-range, and the low frequencies peaking some 800  $\mu$ s later. The acoustic source position shifts to a maximum of 2m behind the loudspeaker at low frequencies which is typical for a 3rd-order system. As expected from the flat on-axis frequency response, the power cepstrum shows little sign of echoes except for some low-level activity at about 650  $\mu$ s. The waterfall plot is very clean with only a trace of ringing at about 160Hz and the low frequencies are seen to decay rapidly and smoothly.

Overall, the K&H 0198 is a fine performer. The on-axis frequency response is flat and extended, although the low-frequency harmonic distortion is quite high. K&H has clearly opted for a low-frequency cut-off coupled to a low-order roll-off, giving excellent low-frequency bandwidth and transient response, but this arrangement does compromise harmonic distortion at high levels compared to loudspeakers aligned with high-order roll-offs. Driver time alignment is not ideal, despite the use of a horn on the tweeter, which may cause some smearing of transient signals. This loudspeaker should find friends among those who desire an extended and accurate low-frequency response from a reasonably-sized box, but do not require low distortion at high levels. □

Since this test Klein & Hummel has superseded the 0198 with the 0300D model.

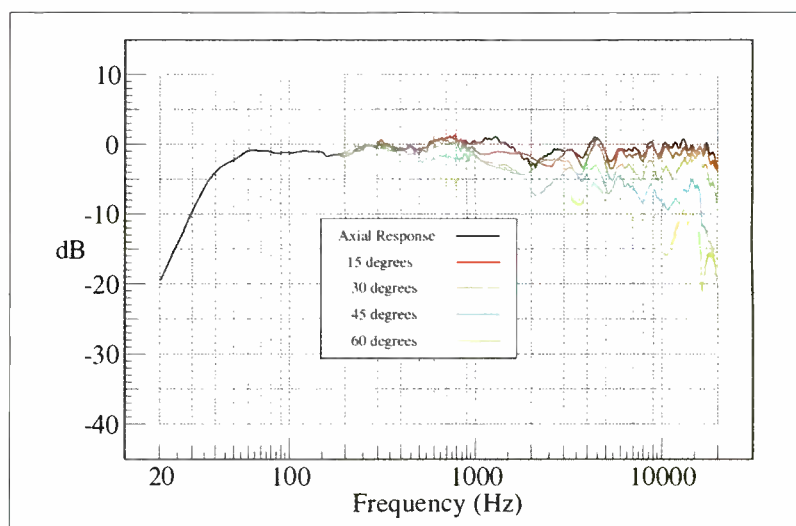


Fig.5: Horizontal Directivity

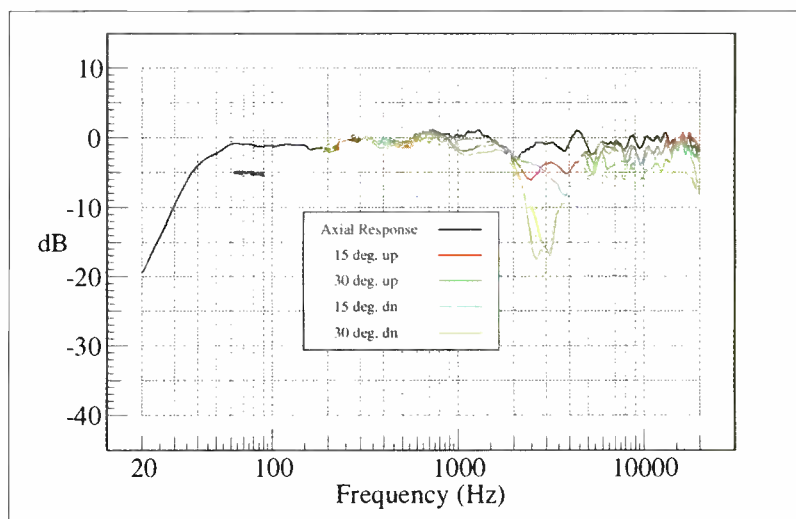


Fig.6: Vertical Directivity

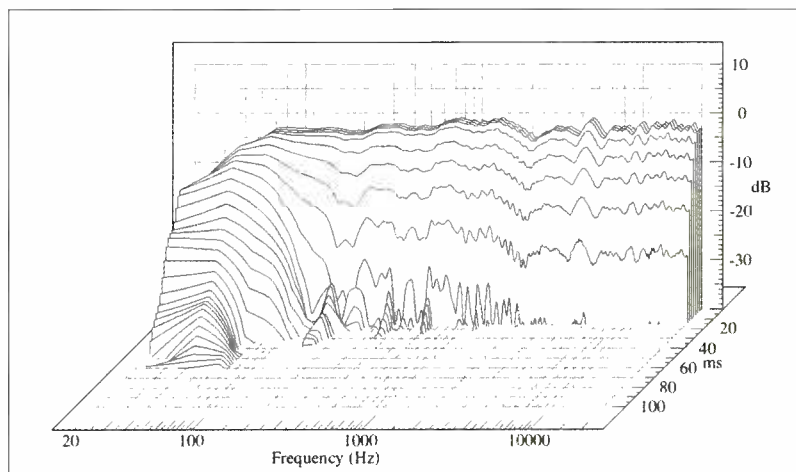


Fig.7: Waterfall

<b>Contact</b>	<b>Methodology</b>
<p><b>Klein &amp; Hummel</b>, Germany  <b>Tel:</b> +49 711 45 8930  <b>Fax:</b> +49 711 45 8935  <b>Net:</b> klein-hummel.de</p>	<p><b>Studio Sound</b>, April, page 14  <b>Net:</b> www.prostudio.com/studiosound/april98/r-tannoy.html</p>

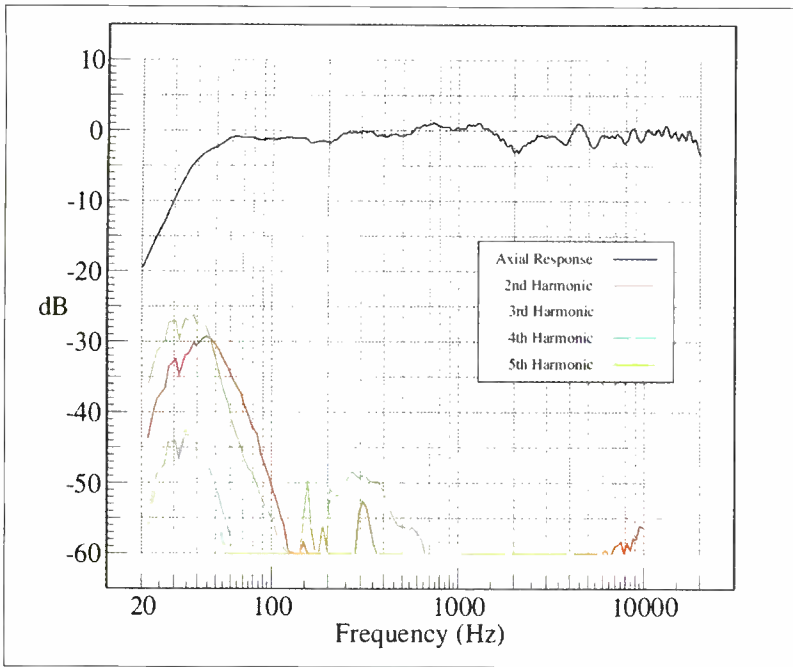


Fig. 1: On-axis Frequency Response and Distortion

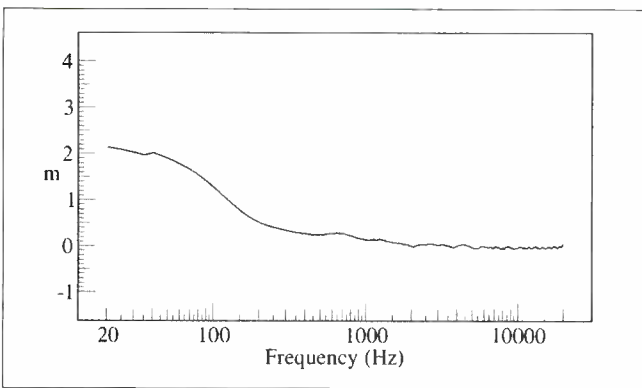


Fig. 2: Acoustic Source

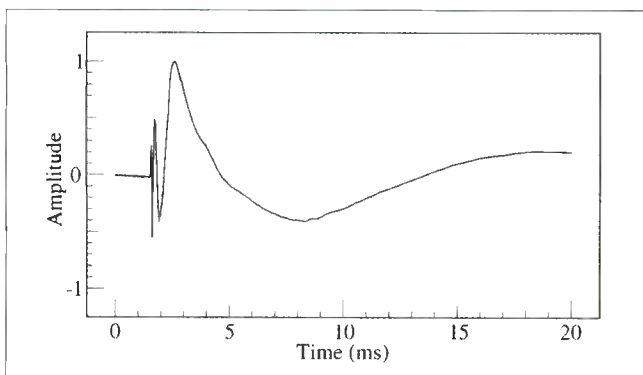


Fig. 3: Step Response

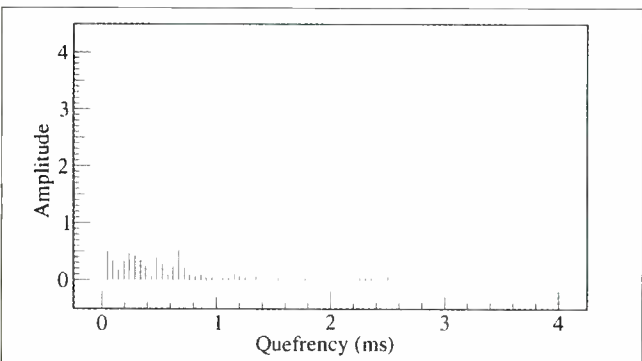


Fig. 4: Power Cepstrum

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# Avalon AD2022

Building on a reputation for sonic integrity and weight, Avalon has added a new mic preamp to its range. **Dave Foister** adjusts input impedance

If merit was proportional to weight, Avalon products would be the best in the business. The whole design philosophy that underlies the Avalon range makes every unit large and heavy, and the mechanical design does nothing to counter the tendency. Thus a purist dual microphone preamplifier with very simple facilities ends up as a 2U box that's as deep as it's wide, and that feels as though it should be put in a specially reinforced rack. And that's despite the fact that it has an outboard power supply.

The AD2022 is the latest in Avalon's acclaimed series of mic preamps, taking the building blocks of the M12, M22 and M15, and adding a couple of new features with flexibility and accuracy in mind. And despite the fact that it's all solid state, it's bigger and heavier than most valve models.

The design elements that conspire to produce this phenomenon are familiar to those who know what Avalon stands for. The circuitry is pure Class A, assembled entirely from discrete components, and the whole



thing is built without compromise. This extends notably to the input transformers, which Avalon describes as the most advanced available, and which are therefore large and heavy to avoid any danger of saturation effects. The specs claim a frequency response, limited only by this transformer, of 1Hz to 120kHz  $\pm 3$ dB, coupled with a bandwidth for the rest of the system of DC to 1MHz. Peering through the necessary ventilation slots in the top cover gives a glimpse of a beautifully built circuit board bristling with transistors in a way rarely seen today, and carrying an enormous metal can containing the transformer.

The front panel on any Avalon unit is necessarily sturdy and thick, and the controls on it are similarly chunky. Here there are only a few controls, and the panel focuses on two big VU meters set behind large oval cutouts. From certain angles you can see round the edges of the meter into the interior, which slightly undermines the generally sleek image. The meter range is complemented by a two colour LED showing green for signal present above 0dB and red above +20dB. Either side of it are the two major controls for each channel, for input and output gain. The input gain is switchable in 4dB steps, augmented by a 20dB pad on an illuminated switch; the output gain is continuously variable within the relatively small range of  $\pm 3$ dB. All this metering has to be taken in the context of the ridiculously high headroom of the amplifiers: Avalon claims an output capability of +36dB into all known loads, which should make it more than a match for anything that could be following it.

The other expected switches are below the main

level control knobs, one for reversing the signal polarity, one for phantom, and another for switching in the high pass filter, designed for minimum phase shift. A small rotary control selects the turnover frequency of the filter, with nine options ranging from the subtle to the extreme.

But there is one more control that places the AD2022 in a rather elite group: a switch for selecting the input impedance. The default 'mic' setting is 1.5k $\Omega$ , but three further settings are available to match the preamp to a wide range of real-world microphones. They go all the way down to 50 $\Omega$  for direct connection to ribbons, but the others can have some surprising applications. I have one particular Russian stereo microphone that sounds terrific, but presents serious problems to a lot of microphone preamps, even including some desk inputs. The symptom it presents is a strange instability that manifests itself as low frequency thumping or clicking. When I first plugged this into the Avalon, it did exactly the same thing, this time so low in frequency

as to be almost inaudible even though the meters were swinging violently from side to side. Dropping the input impedance to 600 $\Omega$  got rid of the phenomenon immediately. The verdict on the microphone remains that it must be out of normal spec, but the ability to make it work properly just by altering the input impedance is a real bonus that will no doubt solve similar problems elsewhere.

But the overriding consideration in a preamplifier in this league has to be the sound, and anybody who has used a previous Avalon design will know what to expect. There can't be many arguments against the idea that discrete components are likely to perform better than ICs, and there will be many people who will fly the flag for Class A as being the most musical and transparent way of amplifying any signal. Here we have two independent Class A amplifier stages in tandem, and the sonic end result is everything you could want from a preamp. The noise is insignificant, the frequency response is way beyond what any microphone can deliver or any recorder can record, the distortion is negligible; this is how microphone signals should be delivered to their final destinations. Avalon strikes again with its combination of real-world practicality and esoteric quality aspirations. □

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## NEW TECHNOLOGIES

### Audionics launches

The ADX digitally controlled assignable console is based on a central audio router and up to 64 sources are available on each channel and a clean feed mixer provides interlocked reverse cue feeds back to the source. User



programmable presets enable rapid reconfiguration while desk setup facilities are available through PC software. Also newly launched is the eMonitor remote system monitor. This 1U enables monitoring of a broadcast installation from a web browser for fault finding and restoration of programme feeds. Eight alarm inputs and eight analogue audio inputs are continually monitored with the status shown in an embedded web server. The system can be programmed to send an email when a fault occurs and switch one of the eight stereo analogue feeds to an alternative source. Users can also switch output status from a web browser as a means of remote transmission switching. The eXtender system consists of a pair of modules to interface RS232 serial communications to a LAN/WAN or the Internet. This removes the need for a PC to be dedicated to the equipment being controlled. One of the modules is connected to the RS232 port of a PC and a standard web browser is then used to tell the module the IP address of the remote eXtender module. All serial communications from the serial port are transmitted via the network to the remote module where they are presented again as a standard RS232 serial output. The eXtender system is said to be applicable to installations where several pieces of equipment require occasional control and this can now be performed from the desk top. Audionics, UK. Tel: +44 114 242 2333.

### K&H redefines range

Klein & Hummel has renamed its monitoring loudspeakers to provide a clearer product range and added a number of improvements and cosmetic changes. The MM201/TV, MM201D and 0104 are now known as the M50, M50D and 0100 respectively with no changes. The 0108/TV becomes the 0200 with standard painted or optional flocked cabinets while the 0198 becomes the 0300D and adds a digital input with improved amp power-performance, variable room equalisation and a separate input for external control. The 0106/TV becomes the 0400 in a standard painted finish while the 0818 active sub becomes the 0800 with no changes. The 0500C is an all new digital 3-way monitoring system with integrated FIR controller and will be available in the spring. Klein & Hummel, Germany. Tel: +49 711 45 8930.

### Soundscape's multi-DSP Mixpander Card

The Soundscape Mixpander PCI card provides a massive amount of additional DSP processing power for Soundscape R.Ed and SSHDR1-Plus systems. It connects to the 512-channel expansion bus port on the rear panel of Soundscape DAWs and integrates with the Soundscape Mixer taking advantage of all the real-time

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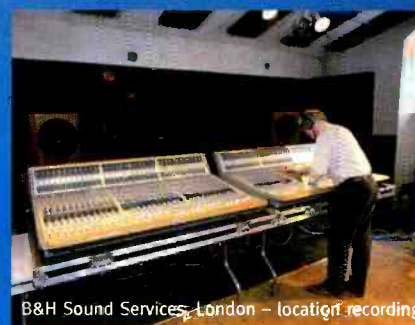
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# Aphex Model 1100

Latest in Aphex' line of innovative outboard is the Model 1100 microphone preamp.

**Dave Foister** finds its features and performance pushing the high-end higher

**W**E CAN'T GET ENOUGH microphone preamplifiers, it seems. Ten years ago the idea that every other manufacturer should have an outboard preamp in its range would have seemed ludicrous—most people never questioned the integrity of the microphone stages in their consoles, and any alternatives were specialised esoteric designs. The coming of DAW recording perhaps heralded a greater need for a couple of channels of high-quality front end, and if that showed up the shortcomings of a few consoles in

on the front panel allows calibration for the following equipment. But perhaps the most useful addition is what Aphex calls MicLim, a protective peak limiter that operates in an unusual way. Many preamps have limiters in their output stage, but the 1100 has a photo-electric limiter in the preamp stage itself, allowing peaks up to 20dB above the preamp's clip level to be controlled before they cause problems. The intention is that this should be so transparent that it can be left on all the time, even when it's not needed.



the process, we all learned from it.

Aphex jumped into all this more than five years ago with the Model 107 Tubessence twin-channel preamplifier. This was a hybrid solid-state valve model with surprisingly few pretensions other than an aspiration to high audio quality, which it achieved. Since then things have moved on; not only do we need the preamps, and not only are they likely to be built around a valve or two, but we expect a digital output so as to bypass the questionable converters in some of our digital recorders. This need and an evident wish to be up there with the fancy stuff has led Aphex (well actually it's now Aphex Thermionics) to bring us the 1100, offering all these facilities in a package that looks increasingly like standard fare, even though fairly recently it would have appeared outlandish.

The look of the 1100 is quite a departure for Aphex. It sets out to attract attention, not by being garish but by resembling a piece of high-end hi-fi rather than conventional studio equipment. Its controls and indicators are mounted on two recessed sections behind a beautifully-finished deep blue main front panel, and its silver controls and plethora of lights make it stand out in a rack.

Each window contains a long bright LED meter and a row of push switches for controlling the various features—and there are some unusual ones to control. All the obvious stuff is there—20dB pad, phase (sensibly marked POLARITY and accompanied by two LEDs to show its status), phantom and mute—but even these are not as straightforward as they would appear. The phantom power ramps slowly up and down to prevent thumps and protect microphones, and the Mute function is a soft switch with a rear-panel remote jack to allow the 'talent' to control it if desired. The manual no longer mentions the Grateful Dead in this context but it used to be said that this feature was originally fitted for their benefit.

The extra stuff includes a button for a built-in oscillator to help with analogue line-up. This has to be pressed for a full 1s before it activates to prevent accidental operation, and a screwdriver adjustment

The digital parameters are set here too, but all that's on offer is sample rate (up to 96kHz of course) and clock source. It's important to note that the 1100 always delivers a 24-bit output, so a 16-bit recorder will always be truncating unless a suitable device is put in the chain to dither it down. It only has AES-EBU outputs, alongside impedance-balanced analogue outputs and clock in and out BNCs. There are also rotary switches for gain (in 4dB steps) and low cut filtering with no less than 11 turnover frequencies.

Like the 107 before it, the 1100 is astonishingly unconcerned about what kind of valve is used in its Reflected Plate Amplifier circuit. The heater is run low, and the plate voltage is also low, and Aphex lists a whole range of valves that will work in it quite happily, although they may alter the character slightly—it seems experiment is encouraged.

As supplied (with either a Russian 6N1P or an American 6DJ8) its character is that of complete transparency. The 1100 is extremely quiet, and sounds to be completely flat and open right across the spectrum. This is perhaps even more important when the MicLim circuit is operating, as the overall gain can be set much higher which would bring forward any noise in the system. In use I found the feature to be as neutral as Aphex claims, and perfectly capable of handling unexpected peaks without any noticeable effects at all. This ability to have your cake and eat it, knowing you're safe from peaks without any downside, is a real bonus.

The 107 was quite a revelation when it appeared, offering real quality valve preamps in an unpretentious and affordable package. The 1100 takes it a stage further, upping the quality and features still further while delivering no-frills top-end sound. A good addition to the ever-increasing choice on offer. □

## Contact:

**Aphex Systems, US**  
Tel: +1 818 767 2929 Fax: +1 818 767 2641  
Net: www.aphex.com

## NEW TECHNOLOGIES

DSP effects plug-ins. The V3.0 Dynamic Mix Automation feature in the SSEditor software extends automatically to mixpander and external control of mixing and effects is provided through Soundscape's Console Manager.

Mixpander is designed to add serious amounts of additional DSP processing to cope with any size of mixing task and has the power and bussing structure that can be compared to that of top flight digital consoles, plus a rack of outboard effects processor units. Operation is 24-bit, 96kHz and it can run DSP based real-time plug-ins like the TC Reverb and TC Dynamizer plus other effects from Apogee, Aphex, Arboretum Systems, Wave Mechanics and Sonic Timeworks all at 96kHz. The mixpander/9 contains nine Motorola 563xx DSPs on both sides of a full length PCI card for more than 11 times the processing capability included inside the R.Ed unit and 15 times the processing power of an SSHDR1-Plus. One card can run ten TC Reverbs, plus a 32-channel, 32-bus, 5.1 surround mixer, with four master channels for simultaneous 5.1, LCRS, Dolby surround and stereo outputs. Four bands of fully parametric EQ, dynamics processing and eight sends can be added on every channel, together with Dolby Surround Encoder, two stereo Aphex Aural Exciters and an Aphex Big Bottom Pro, 24 stereo delay based effects (chorus, flangers, delays) and a TC Dynamizer on a stereo sub-mix. There are a total of 640 audio connections between the DSPs plus 32 channels of additional audio streaming from the PCI bus of the PC. Mixpander/9 list price is US\$2500 with US\$1800 for the Mixpander/5. Soundscape, UK. Tel: +44 1222 450120.

## Junger Orion

Junger unveiled an 8-channel dynamics processor at the Tonmeistertagung, with shipping expected in April. Orion hardware is based on the C8000 modular digital processing system and consists of a 3U system frame, C8800 sync and remote interface, C8000 input interface modules for up to 2x 8 input channels, and C8000 output interface modules with multiple parallel output possible. It employs adaptive algorithms from the Accent series of dynamics processors with expander, Multi-Loop compressor, distortion free brickwall limiter, channel delay and digital band filter. Operation is at 96kHz with remote



control, off line editing, configuration and set-up by PC software. Crucial to the product is the incorporation of Dynalink technology for dynamically linking the gain control of correlated audio channels with user defined adjustment of links between channels and between linked channels with definable link direction and ratio of link. Junger, Germany. Tel: +49 30 6777210.

## W&D's Trio and Symphony

The Symphony provides interference-free communication between the control room and the studio floor. It operates

# Goldline MK 10

This new high-spec low-cost omni mic from the States promises remarkable performance. **Dave Foister** assesses its delivery

**W**HEN B&K DECIDED to make studio omnidirectional microphones, encouraged by the fact that people were using the company's measurement microphones for recording, the designers deliberately restyled them to look slightly more conventional. Funny then that subsequent offerings from other companies have tried equally hard to look like B&K measurement microphones, presumably in a bid to lend themselves a bit of extra credibility.

The Goldline MK 10 is physically a clone of the standard probe-style omni. Its body section, making up about half its length, is a fairly standard 21mm diameter, and stuck on the end of that via tapered shoulders is the much more slender tube carrying the business end. The capsule is mounted directly on the tip of the tube, and is



so slim I had to take a ruler to it to check that it really is a half-inch diaphragm as described in the paperwork.

Even at \$250 (US), Goldline still manages to produce an individual frequency response plot for each microphone, and the one with the review sample was a good example of why this type of microphone is worth having. Its deviation from flat remains within little more than a dB for the entire bandwidth of the plot (100Hz-20kHz) and shows little trend to be falling off outside that range. The specifications show the response within normal limits to go considerably beyond, being only 2dB down at 10Hz. Coupled with the absence of proximity effect, this kind of performance makes the omni stand out for accurate recording and explains its prevalence in measurement.

A particular application I've been using omnis for is double bass in the context of a jazz quartet. Bass players

are generally averse to having their pickups used for recording, often with good reason, but miking up what is a surprisingly quiet instrument for its size is a problem, especially when it's usually standing next to the drums. You have to get in so close to get the spill down to acceptable levels that a cardioid will be tipping the bass end up considerably, which is the last thing you need. On the other hand, an omni can be thrust in much closer without the bass lift, paradoxically getting a more natural sound and less spill despite having no directional preferences. They even respond quite well to being wedged under the bridge with a roll of foam, placing them only a couple of inches from the front of the instrument.

I used the Goldline on a bass, although not shoved under the bridge, and it gave me clarity and a natural spectrum combined with the focus obtained by being so close. I used it on an oboe and violin among others, and again the sheer uncoloured sonic accuracy it provided was quite an eye-opener.

Noise always has to come into the discussion with an omni, but in the kind of applications I've described, the MK 10 remains as clean as a whistle. The danger perhaps comes with a spaced pair some distance from an ensemble but I got no impression that the Goldline would present any more problems than any other model.

The MK 10 is a very impressive microphone. It achieves the kind of performance its looks suggest it ought to have, but at a price that will allow anyone to get hold of one and find out what this type of microphone can do. Its performance comes across as a little different from the competition, so it's an excellent addition to the world of the true omni. □

## Contact

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## NEW TECHNOLOGIES



in duplex mode with single or dual aerial operation and can operate in 400-900MHz. There is a choice of 99 channels selectable from the front panel or via a 9-way ancillary connector. The Trio talkback transmitter offers the choice of transmit only complementing the Solo receive only unit. It offers 10 hours operation from two AA batteries with full duplex operation and operation in the 400-900MHz range. Features include four stored radio channels which can be reprogrammed with PC software.

Wood & Douglas. UK. Tel. +44 1189 811444.

## Masterflow convertor ships

Drawmer is now shipping the Masterflow DC2496 high resolution analogue to digital converter. Analogue (balanced XLR) and digital (AES-EBU, SPDIF, ADAT 8 channel light pipe and TDIF 8 channel) I/O is provided as standard. The convertors are 24-bit and the digital output can be 16, 18, 20, 22 or 24-bit at sample rates of up to 96kHz. Noise shaped dithering is included and Word Clock input and output is available. With built-in sample rate conversion, the DC2496 can output signals at 44.1, 48, 88.2 or 96kHz while implementing bit-rate reduction. A high quality D-A convertor is included for accurate monitoring of the digital signal and the facility is included to enable true 24-bit/96kHz audio to be recorded in stereo using 6 tracks of an ADAT, DA88 or other multitrack recorder using a compatible interface. These recordings may then be played back via the DC2496 to reconstitute the original 24-bit/96kHz signal.

Drawmer. UK. Tel: +44 1924 378669.

## Supertrue upgraded

Amek's Supertrue4 v2.2 automation software for the 9098i console provides extended capabilities including

**time**machine The Ultimate Clock, Time Code & Machine Control System  
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universal clock converter

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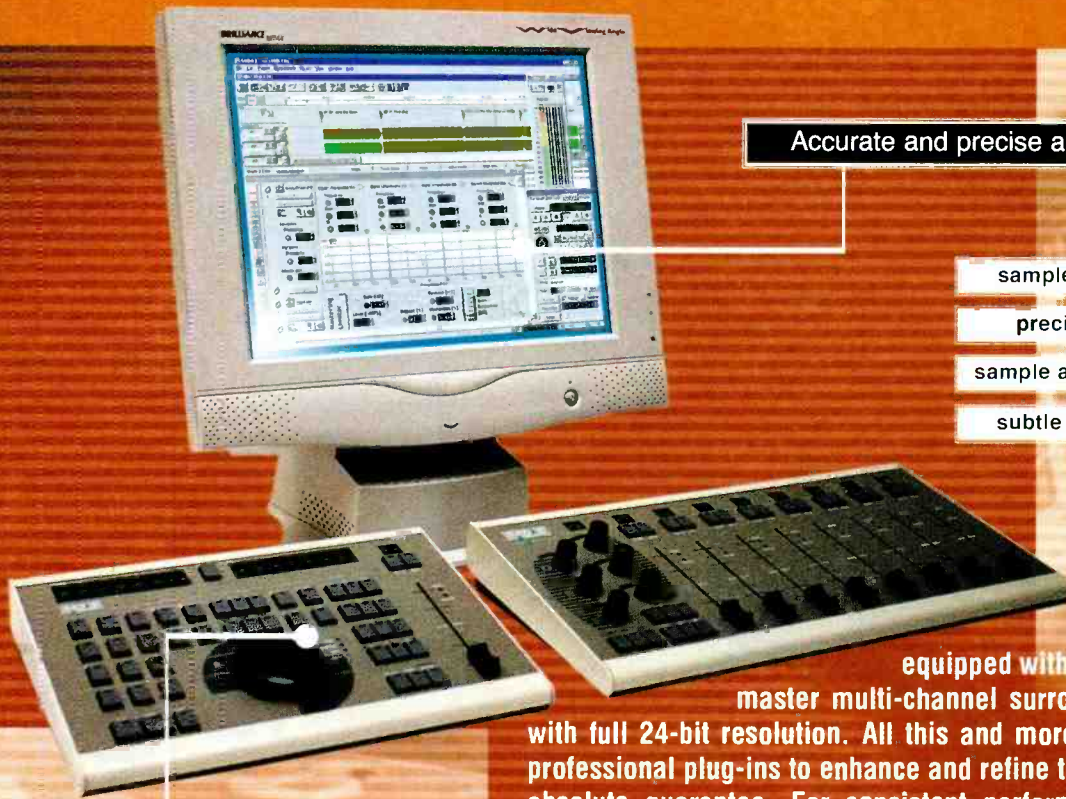
Software Version 1.1

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**SADiE**  
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# Sound Devices MixPre

Answering the most fundamental of sound recordists' wishes, this 2-channel mixer trades features and bulk in inverse proportion. **Neil Hillman** waxes lyrical

WHEN THE CELEBRATED biographer James Boswell opined in his 18th Century tome *Journal of a Tour to the Hebrides*, 'A page of my journal is like a cake of portable soup. A little may be diffused into a considerable portion', little could he know of the profound way in which he had captured the heart and mindset of the location sound recordist. The sense of satisfaction that can arise from a small offering exceeding a greedy expectation—be it a new piece of gear or location catering—is exceeded possibly only by the knowledge that a state broadcaster almost never fails to pay its invoices on time, and that the caterers have rustled-up a banoffi pie.

The Sound Devices MixPre is described by the company as a microphone pre-amplifier, although it is demonstrably rather more than a simple pre-amp, offer-

ing a full range of facilities that make it a very capable 2-channel, stereo, microphone mixer. In direct competition with the excellent Wendr-X2 mini-mixer, it has many similarities; not least of which are the bomb-proof extruded aluminium construction and impressively bright 7-segment GaN LED output meters. The footprint of these devices (imagine two Marlboro packers side-by-side) make them an ideal companion for separate DAT, hard disk or MD recorders, sitting nicely in the front pocket of a machine carry-case and providing the possibility of much more management and control of input signals than in general, the recorders themselves do.

The two 2kΩ XLR microphone inputs are Lundahl transformer balanced with a maximum gain of 66dB. Phantom powering is available either as 48V or 15V, with one switch for both inputs. Alongside the phantom selection switch are switches for engaging roll-off filters at 80Hz or 160Hz, with 6dB/octave slopes and the limiter. The input routing is selectable on the front panel for Left, Centre or Right output, with the channel separation stated as being greater than 80dB at 1kHz.

The threshold for the 2-stage opto-isolator may be adjusted for each input independently between +6 dBu and +18 dBu at a 10:1 ratio, providing what the manufacturers describe as an 'unclippable' peak limiter. I can only take this at face value as the daily midday cannon in Guernsey—a favourite of visiting holiday-

## NEW TECHNOLOGIES

additional Dynamics, AutoSave, Mute, Solo and Grouping functions. Dynamics are available on each of the console signal paths, with a choice of ten different processor



types, including compressors, gates, expanders and limiters. This latest release adds a new Gate-Compressor device, plus Pre-Post status switching for the Virtual Dynamics section that uses an Insert Return as a sidechain source. Settings can be cut and pasted between channels, saved in an 8x32 memory library for later recall, or saved as a Virtual Dynamics Snapshot that can be linked to the Recall system. The Dynamics on-off switching can also be automated. Supertrue supports 10 Fader Groups, with the ability to reassign the master if necessary without destroying the group. The grouping system includes a facility for slaves to follow a group master solo, and monitor channels can also be assigned



**NEW TECHNOLOGIES**

to groups. Two types of mute automation are available. All the automated functions can be write-enabled or disabled, or isolated from playback, and the console's joysticks can be assigned to channel levels. The mix memory can be handled in two ways: Linear Mode, where mixes move along when a new pass is made, with the earliest mix deleted, or Circular Mix Mode, in which the mixes are held in a circular buffer with one selected to be read from, and one to be written to. The off-line Events Editor enables editing (insert, delete, move or copy) of all automated events in the mix. Supertrue's new release also includes a New Mix option, which automatically writes the console's status to the mix snapshot during the first pass and enables full mixing to be carried out immediately. Amek, UK. Tel: +44 161 868 2400.

**PMC's launches TB2S.**

The TB2S 2-way nearfield monitor boasts a claimed frequency range of 40Hz-25kHz with a 170mm cast chassis bass driver and 25mm Ferrofluid cooled alloy HF unit. Developments in transmission line technology, cabinet design and build have increased the performance beyond the original TB1S, which this model replaces. Steel fittings at the rear of the cabinet allow the addition of Bryston PowerPac mono-block power amp modules. To keep pace with 5.1 surround mixes there is, as with all the PMC range, a shielded low-profile centre channel (TB2SM-C) and dedicated sub (XB1-A) for the .1 effects channel. Full range monitoring can also be achieved with the TB2S by the addition of an XB1-P which extends the usable frequency range down to 25Hz. PMC, UK. Tel: +44 1707 393002.

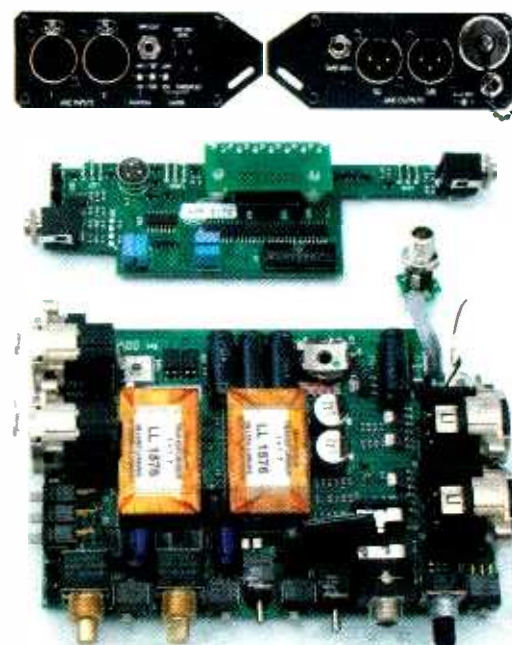
style programme directors—can claim to be a first for me. The immense sound pressure of the gun at close quarters tilted the pictures off the camcorder heads, leaving a black hole where sound and vision were previously contemplating marriage.

The dynamic range is impressively claimed as 10Hz-50kHz, with two discrete, 6-transistor balanced, 120Ω output drivers providing ample oomph for driving a long XLR cable run. An unbalanced tape-return input is also available, with a Left-Right preset adjustment for level, and may be selected on the front panel for in-out confidence checks through the high current headphone circuit. Overall monitoring level is adjusted on the uncluttered front panel, consisting of just three knobs—one of which adjusts the headphone feed, the other two being the sealed, conductive plastic, rotary input faders. Other facilities accessed on the front panel include a slate microphone, 1kHz tone generator and the selection switch for the sunlight-friendly, 3-level intensity, dual-row meters. The manufacturer's warning regarding prolonged exposure to the brightest setting should be heeded however; these tiny glass envelopes are unbelievably efficient.

Peak LEDs also operate on the inputs—two colour LEDs glow red 3dB before clipping and amber to indicate limiter activity; the headphone circuit LED similarly glows red 3dB before clipping of either channel of the headphone circuit or 3dB before clipping of the tape return signal.

Power is provided through either two AA 1.5V batteries or a threaded co-axial socket for an external 5V-14V DC supply. Voltages exceeding 14V will open an internal poly-fuse that resets when the power source is removed. The dry cells offer around six hours' worth of useful life; with care, that can mean a day's worth of filming.

One or two notable literary figures have shown to



possess insight into the sound recordist's lot. TS Elliot clearly did when he claimed, 'We know too much and are convinced of too little'. Be that as it may, I'm here to tell you that the Sound Devices MixPre 2-channel stereo mixer is definitely one of life's little pleasures. □

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# Universal Audio LA-2A

Not a reissue, not a resurrection, the UA LA-2A is a genuine reincarnation of the classic American valve compressor-limiter. **George Shilling** welcomes its release as the return of an old friend

**F**OLLOWING ITS EXTREMELY ACCURATE re-creation of Pop's 1176, the late Bill Putnam's boys have again delved back in time with this Teletronix LA-2A reissue. And again, all efforts to achieve accuracy have been made.

The whole thing is very convincing, with (just about) all the details reproduced. Teletronix issued the original in the 1960s as a broadcast compressor. The company was taken over by Babcock Electronics Corp, which was itself taken over by Bill Putnam's Studio Electronics Corp (which soon became UREI) in 1967. Production of the LA-2A ceased in 1969. The shal-



low case of the original has been retained, with valves and other bulky components protruding from the rear. This was a good idea: although the unit takes up 3U of rack space, no additional spaces for ventilation are needed. The original screw-tag connectors are retained on the rear along with new Neutrik XLRs and a fused IEC mains socket. These days the tags' multiple impedance options are redundant, but connectors provide a useful means of grouping units together for stereo operation. Missing from the rear is the large LIMIT-COMPRESS toggle switch, which has simply been turned around to appear more usefully on the front panel. This selects between theoretical compression ratios of 4:1 and 8:1.

Original units included thumbscrews to enable the front panel to be opened without the use of tools. Whilst the lower hinge on the front panel is retained, the thumbscrews are replaced on the reissue with conventional Philips screws, probably for reasons of safety. Opening the case reminded me of my passion for taking old radios apart in my youth...

There are no PCBs or solid-state chips in here. Just a bunch of hand-soldered discrete components on brown boards and tags. Construction is not dissimilar to Vic Keary's equally obsessive Thermionic Culture designs. The T4 photo-electric cell, HA-100X input transformer and A-24 output transformers are all either procured from original sources or remanufactured to the original specifications, and all valves are badged with the Teletronix logo.

The large PEAK REDUCTION knob drives the sidechain circuit and effectively lowers the threshold as it is raised. The other knob is simply a gain control, enabling output level to be set. Both knobs are undamped, and scaled from 0-100, which is fairly meaningless: indications in dBs might have been an improvement. The Precision Electronic Components' input potentiometer is 10% tolerance, compared to the original's Allen-Bradley 20% pot. The bulb-

illuminated meter is accompanied by a selector for it to indicate Gain Reduction or Output referenced to +4dB or +10dB. Even this is wired with a huge switched selector with hand-soldered resistors. Finally, a big toggle switch is provided for Power on-off. There is no means of bypassing the unit.

The compressor works on the optical principle. The T4 electro-optical cell contains an electro-luminescent panel (which is effectively a 'night-light'), that glows when the signal drives the 6AQ5 valve side-chain circuit, the gain of which is controlled by the Peak Reduction knob. The compression is controlled

by the receiving cadmium sulphide photo-electric cell. This cell's characteristics govern the compression character, and make the LA-2A the great tool that it is. The cell reacts quickly, in approximately 10ms, whilst its release time has a two-stage character. Approximately half the compression is released in 40-80ms, with the remainder taking 0.5s to 5s, depending on how bright and for how long the light has been shining. So this results in a pleasant 'auto-release'

character, the like of which cannot be replicated by other means. As a broadcast tool, the LA-2A included a pre-emphasis circuit to make the compressor more sensitive to high frequencies. This is normally now set flat for music use. For its time the LA-2A was remarkable for achieving gain reduction of up to 40dB, with distortion never greater than 0.5% THD. The result of all this is a very smooth yet effective control of dynamics, and I found it kept the wildest and most dynamic vocal performer under control (despite lapses in mic technique). On other instruments this unit performs beautifully. With its fixed settings it is an easy yes-or-no decision whether it suits, and it usually does. Bass guitar sounds smooth and satisfying, and compression applied to drums brings out the ambience beautifully. With its auto-release, it is never intrusive or unpleasant in character on any source, always smooth and huge sounding, without so much graininess as a Fairchild 660 set fast.

I was able to compare the sound of this reissue with two original units at Dave Gilmour's Astoria Studio. The first sounded obviously different, with more 'honk' on the vintage unit. However, I suspect this was due to alignment or component differences as the second unit was indistinguishable on vocals when set up with tones to the same levels and compression settings. To achieve the same level, the gain had to be set a little higher on the original units.

Each UA unit is hand built and therefore the LA-2A is not cheap. You might find an original for less than one of these but not necessarily in tip-top condition. Welcome, then, to the 21st Century, old friend... □

## Contact

**Universal Audio**, US  
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**Fax:** +1 831 454 0839  
**Net:** www.uaudio.com

## NEW TECHNOLOGIES

### QSC's processor

QSC has a new 2-channel digital signal processor in the DSP-3 which offers two channels of independent digital signal processing—including crossover filters, shelf filters, signal delay, compression, peak limiting, parametric filters—in a compact module that attaches to the back of most DataPort-equipped amplifiers. Configuration is made by drag-and-drop software and users can access a DSP toolbox with icons and simple drawing tools to configure processing functions and signal flow. Configurations can be saved and recalled for future use and the host interfaces via RS-232. QSC, US. Tel: +1 714 754 6175.

### Dalet integrates RealAudio

Dalet has integrated the RealAudio encoder into the Dalet5.1 Digital Audio System. This optional feature will provide webcasters with the ability to produce a RealAudio stream directly from a Dalet Broadcast workstation. Dalet5.1 is a production, scheduling, and broadcast system for broadcasters and webcasters who can now webcast their programming with no changes to their operations and at little cost. Dalet, US. Tel: +1 212 825 3322.

### TOA digital processor

TOA's DP-0206 computer-based digital processor facilitates simple signal flow configurations via multiple signal processing functions, each with a variety of parameter controls. The unit's on-board mixer makes the available I-O pattern configuration easier and in addition to the system's matrix function, processing includes filtering, crossovers, parametric EQ, compression, delay and noise gating. Software is provided for the input of all configurations and parameter settings from PC, and the processing unit is equipped with 16 on-board memories for the storage of set-ups. Preset memory recall can be carried out either from PC or via remote contact closures. One PC can control up to 30 digital control system units. TOA, UK. Tel: +44 208 337 2573.

### ART Tube pre

ART's Tube MP studio microphone preamp includes a VU meter for output level together with a limiter. It also functions as a direct box, with impedance matching and preamplification for line-level sources.

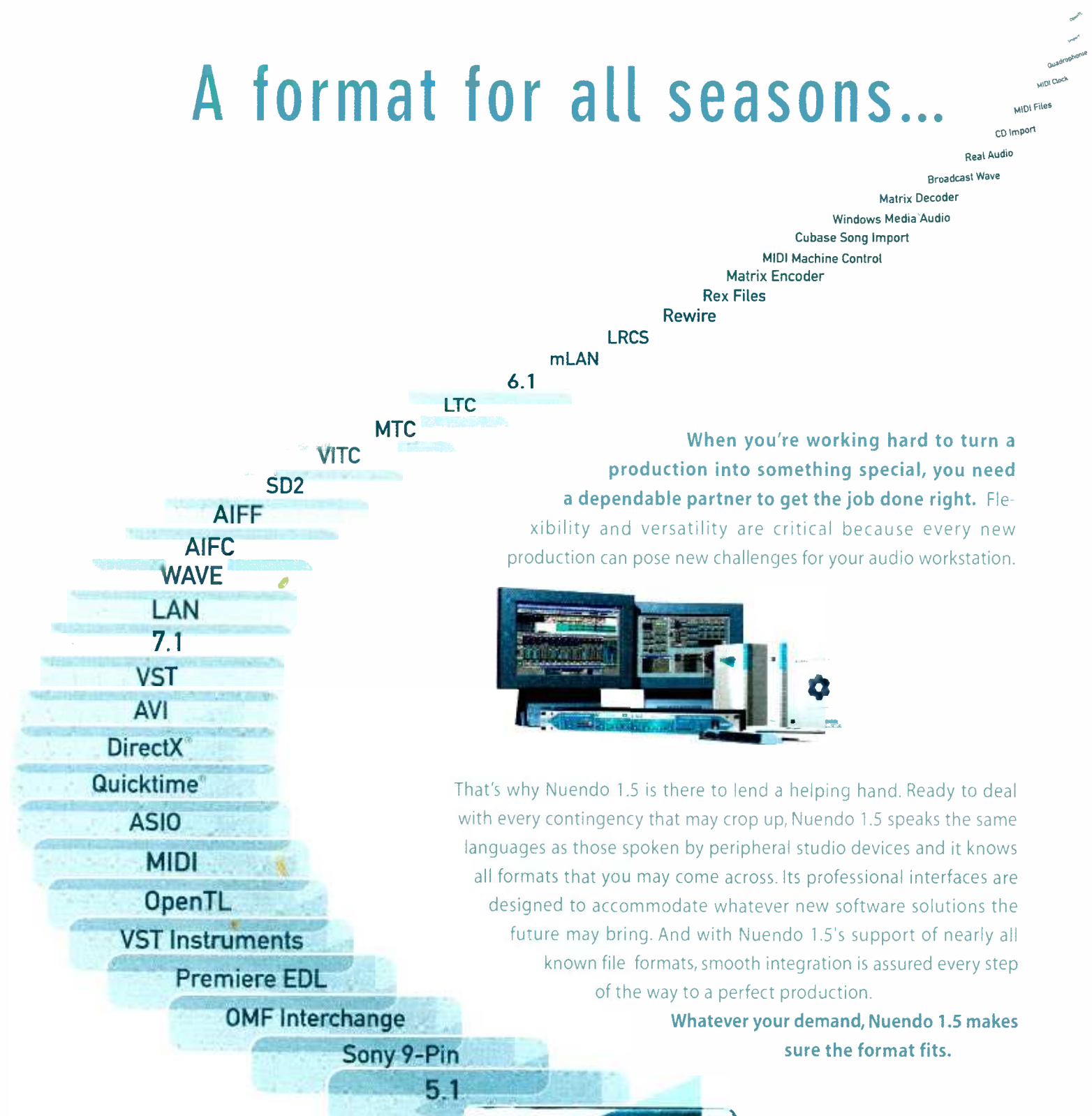
Suggested retail price is \$159.00. ART, US. Tel: +1 716 436 2720.



### SSL AudioBridge

SSL's AudioBridge interface extends the company's HiWay and Freeway multichannel networking technologies by providing full bandwidth digital audio distribution from room to room and city to city. Using standard (Cat 5) computer wiring and wide-area network data protocols to route full bandwidth digital audio over hardwired and virtual circuits, AudioBridge data is compatible with standard ATM switches and telecoms interfaces. Each AudioBridge 1U rackmounted unit provides an 8-channel, 2-way audio connection within a standard 25Mb/s data interface.

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# API 2500

Comfortable in the company of classic British analogue equipment, this American bus compressor is true to a real audio tradition. **George Shilling** explores a special relationship

I FELL IN LOVE with API some years ago, when using one of the desks at London's RAK Studios that dates from the mid-seventies. API has been operating since the late sixties and produces many designs that include the 2520 op-amp, which defines the API sound. The mic amps and EQs have always been of the highest quality—despite the limited EQ features (stepped frequencies, fixed Q) I have never been less than bowled over by their sound. And at RAK the API always successfully fended off any challenges when auditioning any onboard mic preamplifiers.

The new 2500 is targeted squarely at the area of stereo mix compression.

It includes some novel and unique features, while retaining the blue and black house design style, which has remained the same for many years.

The main compressor controls are grouped together on the left. There is no input gain control as such—the first knob is the continuously variable Threshold, which is accompanied by a red LED which lights when the threshold is crossed. The Ratio control is switched, providing settings of 1.5, 2, 3, 4, 6, 10 and 8:1. Attack times are switched from 0.03ms to 30ms. Unusually, there are two Release knobs: a switched knob ranges from .05s to 2s, then the seventh position selects a continuous control with a similar range, although it goes up to 3s. Designer Paul Wolff explains this as the 'Shelly' knob: it is useful if you like to fine-tune the release pumping with the tempo of the music, as celebrated engineer Shelly Yakus did on The Raspberries' superb *Go All The Way* to great effect with a Roger Mayer design. However, broadcasters and fans of recall will no doubt appreciate the stepped settings.

Next comes the unique Tone section. The first of these three pushbuttons selects the compression 'knee': Hard, Medium or Soft, which as one might expect affect the way the threshold is crossed. The settings are audibly very different, with the Soft setting sounding extremely smooth, and the Hard unsurprisingly the most audible effect. The unusual THRUST button introduces a sloping filter to the gain reduction sidechain, thus reducing the effect of bass frequencies on the compressor. In the Medium or Loud settings this results in a much punchier sound, as the compressor responds less to the low frequency energy, allowing more compression to take place less audibly. I found this feature extremely effective, and it was a revelation, bringing mixes a much greater level of excitement—they suddenly sounded like great records... The third button selects New or Old type compression. This varies between old-style feedback compression as used by Urei 1176 and Fairchild 660 units, or the harder feed-forward circuit found in most newer VCA-based units. The Old setting is smoother, as

effectively the ratio never gets much past about a 5:1 ratio. The new setting put me in mind of the dbx 160, with an effect that you might think involves a higher ratio than the one selected.

The Link section is another feature unique to this unit. A knob selects between six switched settings from Independent (dual mono) then 50% to 100% link between the two channels. There are also selectable high-pass, low-pass and band-pass filters. This allows selection of an appropriate setting to retain the stereo image, reducing high or low peaks from cross-linking



(or both). When linked, the control voltages from the two channels are summed, and the character of the compression is retained. This section is naturally dependent upon program material. I experimented with extreme situations, and the broad filters proved effective in keeping the image stable when percussive sounds punch out from one side of the stereo. This puts control in the hands of the user, and takes some fiddling-with to get used to—small changes are sometimes only audible on headphones. The mid setting of 70% link seemed to generally be about right in most situations I came across.

The Output section features both a compressor IN-OUT button and a hard-wired relay BYPASS switch, and both operate silently. Bypass acts automatically in the event of power loss, useful particularly in broadcast or live situations. However, momentary switches lose their settings. Make-Up gain is normally automatic, with OUTPUT always around +4dBu when the Threshold is wound up. However, by pushing the GAIN switch to Manual a pot becomes active allowing the user to set from zero to 24dB of make-up gain.

A pair of clear v.u meters is stuck on the front panel with a switch selecting Input or Output level display, along with Gain Reduction which unusually and helpfully uses an expanded scale ranging all the way across the meter—zero is at the far right (normally where +3dB is indicated).

The manual suggests putting all the controls at 12 o'clock as a starting point: sensible advice, and testimony to the good design and sensible choice of control ranges. Even when working hard, the 2500 boasts very low noise, thanks to four VCAs per channel. This is no one-trick pony—great variety is achievable with this truly professional tool. Thoroughly recommended. □

## Contact

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**Fax:** +1 708 665 4966  
**Funky Jack, UK**  
**Tel:** +44 020 7609 5479

## NEW TECHNOLOGIES

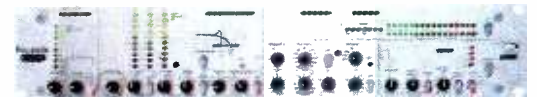
Where more than eight channels of audio are needed, multiple AudioBridge units may be aggregated via an ATM switch to increase capacity. Using standard data cabling, AudioBridge provides a convenient and cost-efficient means of constructing temporary circuits within an installation for cable runs of up to 100m. Alternatively, optical fibre may be used between switches to provide connections of up to 2km or more. Hardware and software upgrades for the Axiom MT include high quality Super-Pre mic preamps, ultra-fast NITECH converters, E and G Series EQ emulation and INFO Faders. SSL's NITECH (Nearly Instantaneous Technology) digital audio converters on the mic inputs and the foldback outputs allow very fast transition between analogue and digital domains, giving negligible latency in record and monitoring paths and an analogue insert point is included on each mic input immediately before the converter, with an engineer's headphone output provided for local monitoring of mic inputs or cue outputs. INFO (Intelligent Null Feedback Operation) digital linear motor faders will be fitted to Axiom MT as standard from spring 2001 and provide increased accuracy and tactile feedback at null points and level matches and feature a four-character LED display. SSL, UK. Tel: +44 1865 42300.

### Analogue sound converter

Crane Song's HEDD 192 is a 24-bit stereo A-D, D-A converter with DSP emulation of tube and tape sounds. With adjustable triode, pentode and tape sounds it claims the ability to sound less digital and more analogue. An analogue dither source has been added to the device and in the A-D mode the dithering options are 20 or 16 bits. In the digital I-O mode recitering to 16 or 20 bits can be accomplished by selecting the appropriate function. HEDD 192 will be upgradable to 192kHz when the components become available. Interface options include AES, SPDIF, Tos link and ADAT optical. HEDD 192 can be used as a word clock source or can sync to an external word clock. Crane Song, US. Tel: +1 715 398 3627.

### MixMaster digital card

The digital card for the Focusrite MixMaster stereo dynamics, EQ, and image processing unit is now shipping. The optional Digital Board allows A-D conversion of stereo signals before audio leaves the box.



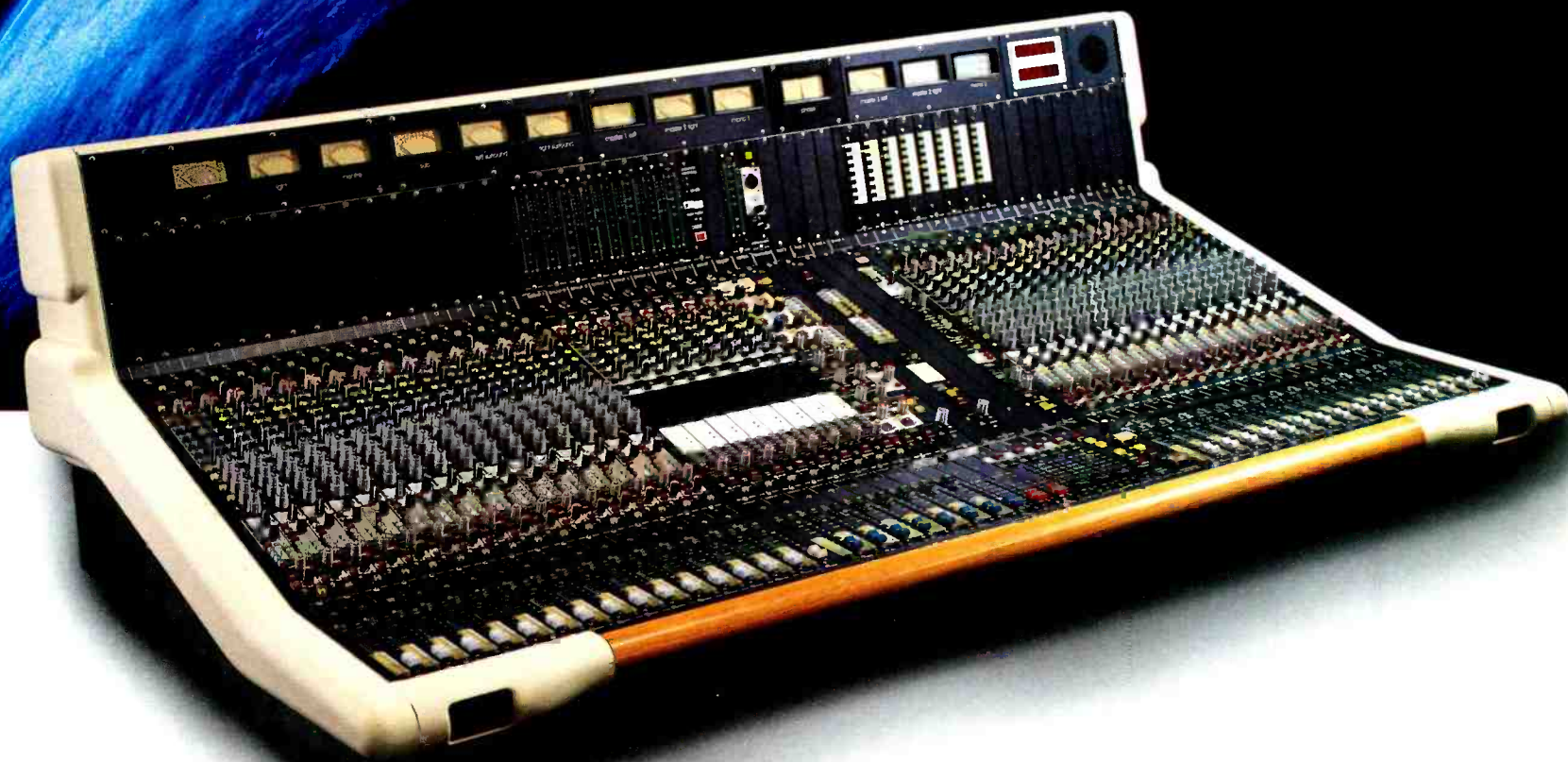
The board can be retrofitted by the customer without any soldering and offers 24-bit/96kHz 128 times oversampled operation. Focusrite, UK. Net: www.focusrite.com

### New cable

Cable manufacturer Reference Labs has added a new audio signal cable for the installation market to its catalogue. The RMIC-02 consists of two 0.22 conductors, insulated using dielectric polyethylene plus a stranded 0.22 ground drain wire (tinned copper) so as to be more compact. These are insulated using a semi-conductive jacket plus an additional red copper bundle screen to eliminate external noise signal from other lines such as UHF wireless microphones. An external PVC sheath encases the whole wiring (overall diameter is 4.70mm ±15%). Reference Labs, Italy. Tel: +39 071 720 2120.

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# Rode Classic II

Claiming 'classic' status for its first valve model, Rode has made its successor more retrospective still. **Dave Foister** steps back in time with a new mic

**R**ODE DIVED into the valve microphone market a few years ago while the revival was nearing its plateau. The single Rode valve model was the Classic, designed to emulate the particular character of certain vintage designs, and was an instant success, partly because it had the necessary character in spades and partly because it was a real bargain. Since then Rode has broadened its appeal considerably, and one of the additions is a refinement of that first valve design, the Classic II.

At first sight there is little to distinguish the II from the original. Some physical details and accessories have changed, but the overall image remains the same—a conscious hark back to the fifties combined with a style all of Rode's own. The main differences between the two models are internal, and perhaps the most important of these is a completely new capsule, a 1-inch edge-terminated design whose performance is a step up from the original centre-terminated one. Together with refinements to the supporting circuitry, the result is improved behaviour all round.

As befits a valve microphone, the whole kit comprises a big aluminium flight case containing the microphone, its power supply, two stand mounts and all the necessary cables. Many of the components appear identical to those supplied with the Classic, but some are clearly upgraded versions. The microphone body itself is virtually unchanged, its simple cylindrical form half taken up with the grille. The difference is that whereas the original was attached to the stand with a side-mounted swivel bracket, this has a choice of separate stand mounts, both attaching to the base and locked in place by the connector. One is a simple swivelling ring, while the other is a much more elaborate suspension mount, big and sturdy enough to support the weight even though it's nowhere near the centre of gravity. The means of fixing has pros and cons—on one hand, there's no separate locking ring to get lost but on the other, if you want to change mounts you have to remove the multicore, which means switching off the power supply and then waiting for it all to warm up again.

The multicore itself is new, a heavy-duty oxygen-free copper cable with custom connectors on both ends whose alignment marks and screw-down collars make for a positive and secure connection. The length is not generous but extensions are available and there's enough for a normal studio application. It's important that the power supply ends up accessible, as the microphone is completely controlled from here—there are no switches on the body itself.

The power supply is a new model specifically for the Classic II, although it's very similar to the original and carries the same set of controls. Power is indicated by the now-obligatory blue LED, and three rotary switches deal with the various adjustable parameters. There are two positions for both the pad (-10dB and -20dB) and the high-pass filter (no specs but one more severe than the other), and in the best traditions of vintage valve microphones there's a full set of nine polar patterns. With omni at one end, figure-of-eight at the other, cardioid in the middle and no less than three intermediate settings both sides, the directional

flexibility is considerable and repays a bit of experiment. Those who have never had the pleasure of using a C12 in any of its variants can look forward to having their eyes and ears opened.

The improvements in the new Classic are individually small but taken in sum amount to a distinct step forward. I've had an original Classic since the early days, and its one mechanical shortcoming is the inability of the mounting swivel to stay locked off if any leverage is applied to the main body. The new stand mounts remove this problem completely, as well as lending it the reassurance of a proper shock mount. But the sound too takes a step forward, or perhaps that would be better expressed as a step backward. The character of the original model's presence lift was so confidently expressed as to come across as a distinct colour on some sources, perhaps too much in some

instances; the Classic II retains the fundamental urgency but puts it across in a more restrained way. This gives it a home in areas where the original would have felt uncomfortable, such as classical violin; few would question the appeal of a real vintage valve in such an application but the Classic as it stood would have thrust it at you rather too strongly. The Classic II gives more of a smooth vintage flavour, bringing out all the sparkle of the instrument without losing the warmth or overdoing the impact that makes valves so good for vocals.

Rode is no longer a novelty name; its ever-increasing range has found it a home in a much wider range of applications than its early specialised efforts would have suggested. The Classic II reinforces a particularly successful branch of its endeavour, and once again offers real valve character, with even more smoothness, at an affordable price. □



## NEW TECHNOLOGIES

### DM100 Handheld bitstream analyser

Dolby's DM100 Handheld Bitstream Analyser is used for monitoring Dolby Digital, Dolby E, and PCM bitstreams and allows system integrators and service engineers to quickly test the integrity and composition of these bitstreams. The DM100 identifies the format of the input bitstream and decodes it appropriately. Through headphones, users can monitor individual channel pairs or a 2-channel downmix of any multichannel programme, while the sum of the two channels can be monitored through a small built-in speaker. Test bitstreams are stored in internal non-volatile RAM, and can be changed in the field via software update. A pass-through mode allows modification of the input signal's AES channel status bits before passing to the output connectors. A 2-line by 16-character LCD displays Dolby Digital and Dolby E metadata information.  
Dolby, UK. Tel: +44 1793 842100.

### Audio Ltd smalls

Audio Ltd has launched what it claims is the world's smallest multi-frequency, UHF, infra-red controlled diversity

receiver—the Envoy CxiR. The true diversity receiver is made



to interface with the Sony SX, Philips LDK120 and Ikegami HLV 77 cameras using their existing slots. A 6-pin Lemo adapter turns the Envoy CxiR into a stand-alone receiver, adding to the versatility of the unit. Measuring 98mm x 60mm x 18mm, features include 32 switchable UHF frequencies, LED indicators for no signal, diversity switching and low TX battery condition. With a claimed signal-to-noise ratio of over 104dB it is completely compatible with existing RMS2020 and RMS 2000 transmitters. For ease of use and reliability, all mechanical switching has been removed and is now handled by the tiny SWITCHiR infra-red controller. Small enough to fit on a key ring, features include the ability to change frequencies and levels, switch filters in and out, and remotely interrogate battery condition. The HxiR hand-held radio mic uses interchangeable capsules from Schoeps and an innovative suspension system developed in collaboration with Rycote. All mechanical switching has been removed and the unit is controlled by the SWITCHiR. The HxiR can be powered by a standard AA cell giving up to three hours of continuous use, or a lithium cell providing up to seven hours of use. Made from high quality aluminium, the HxiR is not only light but extremely rugged with the antenna is built into the casing making the mic even more durable.

Audio Ltd, UK. Tel: +44 1494 511711.

### One-to-one replicator

MediaFORM has introduced the Reflection one-to-one, manual CD-R duplication system. Notable benefits include Audio Track Extraction, which enables users to create their own compilation discs and BURN-Proof technology. BURN-Proof technology allows the recorder to resume the writing process in the event of a buffer under run; salvaging the CD-R and completing the writing process from where the error occurred. Housed in a self-contained desktop chassis with one-button menuing, Reflection can copy all audio and data CD formats including mini and business card CD-Rs. At 12X speed, the 1-drive unit burns from 8 to 70 CDs per hour depending on file size.

MediaFORM, US. Tel: +1 610 458 9200.

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Photo: See magazine by Peter Frensch and Studer

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The new Studer D950 M2 Digital Mixing System

# ENGINEERING TECHNIQUES

With DVD-A gathering momentum and the Super Audio CD lines getting busy, the requirement for surround music mixing is approaching critical mass. Bobby Owsinski shares philosophies with **Richard Buskin**



**I**HAVE A PHILOSOPHY that the music tells you what to do,' says surround mix expert Bobby Owsinski. 'When people ask, "What do you do with the sub-woofer? What do you do with the centre speaker? What do you put in the surrounds?", my answer is that the music will always tell you. In that sense it's no different to stereo. You pan things as the music suggests and that seems to work best.'

Originally a blues guitarist by trade, Owsinski spent numerous years playing in the studio and on the road, before his inherent fascination with technology—he has a degree in electronics—led him around to the other side of the console. Thereafter, Owsinski's 1995 entrée into the world of surround sound came about by

chance, but, as he himself now asserts, 'Once I heard it I was hooked forever and never wanted to go back to stereo.'

In 1998 Owsinski co-founded the Los Angeles-based production company Surround Associates, together with Mark Waldrep of the AIX Media Group and Eddie Schreyer of Oasis Mastering. The initial objective was to provide one-stop shopping for record labels dealing with catalogue; the mixing, mastering, graphics and authoring of product to DVD or any other multichannel delivery system. However, it soon became clear that many labels do a fair portion of this work in house, and so the one-stop shop approach has often taken a back seat while Surround Associates takes care of one or more of the aforementioned assign-

ments—Oasis' facility is utilised for the mastering, while AIX' is used for the graphics and authoring.

'Usually, if I get a surround project to mix, then it will also go to Oasis for mastering,' Owsinski explains. 'On the other hand, if a mastering job comes in where I'm not involved in mixing, I'm often still hired as the consultant, either to calibrate the system or simply make sure that everything is happening right. This is especially the case when someone's working with surround for the first time. Then again, there are also times when we're called upon to just deal with the DVD end of things—I'll act as the DVD producer and what we have to do is go out and produce the additional elements; interviews, graphics, things like that.'

Still, it is mixing which Bobbie Owsinski enjoys most, and about 99% of the work that he does in this regard is surround-orientated. At the same time, he has recently also been involved with a number of blues and classical projects that are recorded in surround at 96kHz sampling.

'With the classical surround recordings I've taken a different approach to that which the purists would take,' he says. 'In a quartet or quintet situation everybody is close miked, and when it's mixed you're in the middle of the players. Each instrument is panned off to its own separate speaker, and while the purists don't like that, most other people do because it's quite dramatic.'

*Do you think the sub-woofer is a necessary component of a surround system?*

Yes, I do, just as I believe that bass management is extremely necessary. In fact, there are so many things that you can't hear if you don't use it, you're running the risk of putting out some tracks that aren't as clean as you would like. You need the sub to provide bass extension for your main monitors. I always put in at least a little of the mix elements that contain low frequencies just to fill the mix out. But I've heard some mixes where the LFC was used extensively and they were very creative.

*How many super-high-resolution mixes have you done in multichannel?*

Seven or eight. I think we've done just over 70 titles during the past two years, although most of them have been for DVD video, so they haven't been 96k. Frankly, until recently the technology just hasn't been there, and the early ones that we tried to do about a year ago were fraught with problems. Mostly this concerned what we would mix to. Everything at 96k was very unstable—with two channels it would work great but as soon as there were six channels you'd have converters dropping out of sync or hiccups in the workstation that you'd be recording to. So, it's only been since the summer [of 2000] that we've had systems with which you can easily record 96k multichannel. All of a sudden, the Euphonix R-1 seems to be a *de facto* standard for that. I've been using it for a year and half, actually,

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## INTERVIEW

but now it appears that everyone has caught on, especially for 96k material. It's really easy to mix to, and then just pull the drive out and send it to wherever it has to go. All of the authoring houses that are doing DVD audio authoring now have those machines as well.

The facility that's kind of my home facility these days—Front Page Recorders—has three of them, and sometimes if we need a fourth one we've got to fight for it. There was a time when we couldn't even rent them, but now the rental houses are hip to them and so at least we can rent one if we need it. Again, that was the problem for the longest time; what do you mix to?



*Where is Front Page Recorders?*

Glendale, California. It has one of the only from-the-ground-up surround rooms in L.A.—there are only a handful of them—and it houses a Euphonix System 5, which is a wonderful machine and also works at 96k. So, that's the mix room, and then there's a Euphonix CS3000 in the second room, which again is set up for surround, while in the tracking room there's an SSL 4000 G-Plus.

*What monitors do you like for surround?*

Well, people send me a lot of different monitors to try out, and generally speaking there are two reference sets that I go back and forth between; a set of Tannoy AMS 800s and a set of Genelec 1031s. Then there are several other sets which we use as a check—including Yamaha MSP10s and Meyer HD1s—in the mix room there's a soft-fit-mounted set with Dual 15s.

*Do you prefer monitoring with the same sized speakers all around or are you happy with the kind of setup where there are, say, three big speakers at the front and two small ones at the rear?*

I like to use matching mid-fields; you know, mid-range speakers with 8 or 10 or 12-inch woofers, dual concentric. Actually, the 8s and 10s seem to be just fine, and again the whole secret is a sub-woofer with bass management. I'm really a big proponent of that. After all, I think anybody who has a home theatre system will understand the need for a bass manager—if you just run through your television channels and listen to all of the rumble and garbage that happens down low, which hasn't been eliminated because nobody heard it—that's the best reason I can think of for a bass manager.

I was doing some temp mixes recently for a Sandra Bullock movie, consisting of orchestral material

recorded at Capitol Studios [in Hollywood], and again the rumble was incredible. Everybody had missed it during recording, yet I heard it because I have a bass manager and therefore had that extension. If you hear it you can fix those things, and that just isn't possible without a bass manager. I think everybody's afraid of it because they don't know how to set up the sub-woofer.

*Why do you prefer mid-range speakers?*

You can have them close and you can get plenty of level, so why go to a larger speaker? The biggest problem has always been getting the level that you need but if you have a sub-woofer or two sub-woofers with a bass manager then you have plenty of level.

*What are the main calibration issues regarding a surround setup?*

The majority of the calibration problems have to do with the sub-woofer. Many engineers are confused by the whole issue of the LFE channel having 10dB more headroom, thinking 'How do you calibrate that?' The fact of the matter is that there are two signals going into the sub-woofer and they are calibrated differently. How to do that and stay calibrated with the rest of the system can be kind of tricky at first but it's absolutely critical to a successful surround setup.

Actually, doing it is easy. If you're using an SPL meter—and only an SPL meter, because it doesn't apply if you're using a real-time analyser—the LFE channel is 4dB above your reference level and the sub-woofer is 6dB below your reference level (c-weighted with the response on 'slow'). If you remember that, everything's going to be okay.

*What kind of rack gear do you think is well suited to DVD audio remixing?*

One of the big problems right now is that there's not enough multichannel outboard gear. I've been after numerous manufacturers to make multichannel compressor-limiters and so on to put across the surround bus, but unfortunately there's just not enough gear. Now, at last, there's gear for mastering that wasn't available a few months ago, and there are three surround reverbs that you can buy which are all pretty good, but we've made do with the normal stereo stuff only because we've had to. Still, in terms of outboard gear, I don't really vary things between surround and stereo work. You still have to process everything the same, but you can't really treat the surround bus the way everyone likes to in stereo at the moment.

*With regard to sound placement, you've said that you let the music suggest where things should go. However, is this purely a subjective process, or, even given the differing qualities of respective projects, are there certain rules that should generally be followed?*

I honestly think it's down to taste. When I started doing surround work, I would always get calls from A&R people saying, 'Now, don't go too crazy with the rear speakers'. They would primarily want a stereo mix at the front and ambience in the rear, so we would do one of those tame mixes and then we'd do one that was more aggressive where things wouldn't necessarily be flying around the room, but at least the soundscape would be larger. Well, 100% of the time that would be the one that would get picked. People do want to hear things that are more dramatic—although I'm not saying that things should be flying

### Learn how to calibrate your system.

'Learn how to calibrate your system. It's extremely important.'

'Use a bass manager. Since virtually all home theatre receivers incorporate one, it's the only way to be sure that you're hearing everything the consumer will eventually hear.'

'Learn how to deal with time code, because everything is time-stamped. Everything goes to picture eventually.'

'Put an audio slate identifying the tracks on every tape ("Channel 1—left front, Channel 2—right front," and so on). It will save everyone a lot of hassle downstream if any of the documentation is lost.'

'Talk to the authoring house to find out what delivery format they prefer before mixing. A little communication before you begin goes a long way to solving problems later.'

### Don't have a preconceived notion of what you should and shouldn't do.

'Don't have a preconceived notion of what you should and shouldn't do.'

'Don't have a preconceived notion of where to pan things.'

'Don't neglect the documentation. The more detail you provide, the smoother the project will go downstream.'

around the room or that the panning should be gratuitous. It's just nice to have elements that you can hear all around the room.

A lot of times, if I'm dealing with something sparse I'll have very wide soundscapes, where there are things happening between the centre speaker to the left rear and the centre speaker to the right rear. There will be a large, large pan—a large wash of sound—and I think people find that more dramatic and more attractive than when there are all of these things happening at the front and only ambience in the rear. That kind of placement is appropriate in certain cases—for some concert footage or classical things—but a lot of the things that I do demand a more aggressive approach.

*Which are the more challenging recordings to mix in that respect? Ones that are already busy or ones in which there isn't a whole lot going on?*

Probably the ones that don't have as much going on. For example, I just worked on a techno-industrial compilation record, and some of the mixes were so dense that I don't know how they did them in stereo. They were perfect for surround, because there'd be five loops going on, so you could put a loop in every speaker and there would still be enough room between the speakers to place other instruments. Surround is therefore perfect for something that's dense, whereas something that is sparser takes more time because you have to think about it a little bit more and work it a little harder.

*Is 5.1 as far as you would like to go? What do you think the optimum format would be?*

I think I'm a proponent of Tom Holman's 10.2, although I haven't done anything with that yet. You see, I've used all of the available surround micro-

phones and all of the different recording techniques but the surround microphone which I find really interesting—even though I've only experimented with it—is one called the Holophone. It's a 6.1 microphone with the sixth channel pointing straight up, and when we first got to try it I was astounded at how much that extra channel added. The Holophone has its own set of mic amps, and when we put a sixth speaker up in the air it was just amazing. With only a little bit of that sixth channel the sense of spaciousness and realism changed dramatically. Then again, the other thing that you can do is take that sixth channel and, if you only have five speakers, fold it in—once more, even with five speakers, the sense of realism is definitely expanded. So, I'm a big proponent of having a 'high'

channel. In fact, I'd actually like to see more channels everywhere.

I agree with Tom Holman's opinion that there's not a big difference until you get to 10 channels—the difference between five and six and seven is not that great, but when you get to 10 it's dramatic, with stereo high channels as well as stereo sub-woofers and a set of speakers on the side. Actually, I'd really like to have speakers on the side because sometimes you get a hole off to the side, and in certain rooms you can get rid of that hole and have a nice phantom centre from, say, left front to left rear. Then you go into another environment with a different speaker setup and now you have a hole there. So, I'd definitely like to have a set of speakers on the side to get away from that. □

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# Opportunity knocks

With the slow but steady uptake of the DVD format, audio has a welcome opportunity to shine.

Sonic Solutions' product marketing manager for new audio formats, **Yuki Miyamoto**, reports

**W**ITH THE LAUNCH of the DVD-A format, the DVD family offers two areas of potential opportunity for the professional audio community. Although DVD-A and DVD-V are both built on the DVD foundation, they were designed to serve the two different markets. The result is that while these are broadly similar, they are quite distinct in their details, including the specifics of their audio capabilities.

In both formats, the experience of the end-user, the viewer or listener results from the interaction of two types of data on the disc. Presentation data is that which is actually seen or heard: the video, audio, graphics and text. Logical data is information about the order and conditions under which presentation data is presented. Logical data defines the way the content is organised, and also the navigational flow through the material in response to user input with the remote control. The fundamental distinction between presentation and logical data is reflected in the way that work on DVD is organised. Presentation data is the daily focus of production professionals—the audio and video content on tape and hard drive. Logical data is the concern of DVD 'authors', the interactive multimedia specialists who integrate all various presentation elements and define the flow of program.

To keep our coverage of DVD manageable, we have organised it along the same lines as the format itself. Of the two articles that follow one concentrates on the presentation data of most concern to audio professionals, while the other looks at the logical capabilities offered by the DVD-A format, and at the authoring process that results in a finished title.

DVD is a new breed of delivery medium for entertainment and information. Like CD and VHS, both DVD-V and DVD-A were conceived of as consumer entertainment formats at heart. That means that high presentation value in the delivery of visual and auditory media was a top priority in the formats' design. Yet the way the formats are structured (the hierarchical rather than linear organisation of the material), as well as the way they are navigated by the end-user, owes more to computer-based interactive multimedia than to consumer formats of the past.

The process of putting together a finished DVD title reflects both the linear and the interactive sides of the DVD family tree. Preparation of audio and video presentation data draws heavily on production fields such as audio mastering and video post. Graphical elements, on the other hand, are generally pre-

pared similarly to computer graphics, and DVD authoring is a media-integration task rooted in computer multimedia.

DVD-A and DVD-V are different in many of their details but depending on the content of the DVD-Audio album, the typical production process for both formats may be quite similar. The procedure involves a series of stages most easily explained as a step-by-step progression. The actual order of production may vary, however, depending on the particular project and the production systems used. Because the DVD-A process resembles that of DVD-V, production strategies that have proven successful for DVD-V can be designed into DVD-A systems as well. For example, a modular system such as Sonic DVD Creator AV supports a workgroup-based approach, with multiple workstations linked together via a local area network (LAN). This allows production tasks to be performed in parallel, with multiple titles in production at the same time for maximum throughput. In low-volume settings, however, all production tasks may take place on a single workstation with a more linear workflow.

The first stage in DVD-A production is design and planning. Then the various media assets to be used in the album are captured, prepared and imported, and the flow of program playback is authored. The authored program is proofed, and then the final disc image is formatted and output to a master. Much of the process is iterative, with cycles of asset preparation, authoring and proofing followed by re-editing and/or re-authoring until all aspects of the project are approved.

Before planning a project, you have to know what the format you're working with can do. DVD-A is essentially two formats in one. It can be used exclusively as a 'pure audio' format, a carrier for very high-fidelity sound in a huge variety of resolutions (word lengths and sample rates) and channel configurations. (For details on the format's audio support, see Audio for DVD later on.) Or it can be used as a full-featured, menu-driven multimedia format, its high-quality audio supplemented by graphical presentations and text. Support for motion video is also included.

Despite its ability to handle multimedia, DVD-A does not force producers to actually use any particular media type other than audio. Unlike CDs, which all contain the same media type, DVD-A albums may be diverse; the specific combination of media employed can be determined on a project-by-project basis. Some producers will focus on pure audio, while others will target fans with the inclusion of photos, lyrics (or libretto), and music videos. Given this flexibility, DVD-A likely marks the end of standardised content in pre-recorded music product.

Probably the most widely used of DVD-A's multimedia features will be the 'slide show' capability for displaying photos and other graphics while music is playing. Browseable and set-duration modes are supported, each with sequential, random or shuffle display sequences. Lyrics may be overlaid with highlights for the current line, and links may be programmed to allow listeners to navigate to different parts of a song by clicking on words. To avoid interfering with audio playback, the graphical data for a track or set of tracks is preloaded into a player's memory (2Mb required) before playback of the corresponding audio begins. A silence of two seconds or more may occur while the graphical data is read from disc.

DVD-A's motion video support is similar to that of DVD-V, though some restrictions apply in terms of audio streams, multiple angles and complex interactivity. DVD-A also includes text support, allowing display of information such as song titles (Album Text) and lyrics (Real Time Text) on optional LCD screens built into the face of players.

Beyond what a DVD-A title can do in a player, the format offers additional possibilities in a computer-hosted DVD-ROM drive. Every DVD-A (and DVD-V) disc is fundamentally a DVD-ROM. The DVD-A content is stored in a special directory (AUDIO\_TS) that a DVD-A player is programmed to find when the disc is first inserted. The producer may choose to include added features outside this directory, such as



Metropolis DVD has operations in New York (pictured) and London with the combined goal of providing leading edge DVD design and production services. Seated is director of production services James Moorens and second from right is founding partner and president David Anthony

customised browsers that automatically link users to a Web site for the artist or the label. That opens up promotional and merchandising opportunities, with users listening to samples from other albums by the same artist, or ordering tickets for upcoming concerts.

The consumer audio market includes a broad range of price points and playback situations, from personal portables to auto systems, boom boxes, stereo hi-fi components and home theatre systems. To cover all these bases, the DVD-A specification envisions a few different player types (all of which will play audio CDs). Two are likely to dominate the market: 'audio-only' players, with no video outs, and Universal players that play DVD-V in addition to DVD-Audio.

To be sure that DVD-A covers the entire market, the simplest and cheapest of the audio-only players will be designed to support only linear, track-based navigation based on logical data that is analogous to the TOC (table of contents) file on a CD-A. More sophisticated audio-only players, as well as players with video outs (including Universal players), will be designed to use a more complex set of logical data that allows a producer to order the tracks on the disc into playlists called Groups.

Groups offer the listener a choice of up to nine different producer-defined paths through some or all of a disc's material. For example, an album with 20 songs might include one Group that plays all the material, a second that plays just seven ballads, and a third that plays 10 danceable tunes. When the title is played in all but the simplest players, these Groups would allow the producer to create different listening experiences, and the listener to select a playlist to fit their mood. The same system of logical data that enables Groups also

controls the navigation and display of a disc's multimedia extras when the disc is played on players with video outs. Every disc is required to include logical data for both track-based and Group-based players (with and without video outs), which ensures that multimedia discs will play back their audio content even on the simplest audio-only players.

Thorough title definition and planning ensures that before actual production begins everyone involved has a clear idea of exactly what the album is supposed to be. For successful project management, it is essential to develop a project plan, variously referred to as a template, flowchart or storyboard. This involves defining not only the main material that the disc is intended to present, but also the interface that the user will navigate when the disc is in a player with video output, including the number and content of the menus. The project plan serves as a blueprint to be referred to throughout the production process. Sonic's DVD Creator AV provides a built-in project planning assistant for developing this overview directly within the authoring environment, where it is used as a Project Template later in the



Teldec-Warner celebrated the release of its first DVD-A at the Tonmeistertagung exhibition in Germany recently. Seen on the MediArte-Sonic Solutions booth are (L to R) Johannes Muller (MediArte), Markus Hintz (MediArte), Friedemann Engelbrecht (Teldec-Warner) and Andreas Florczak (Teldec-Warner)

authoring process.

Once the project plan is complete, a list of required source assets may be derived. Assets will include audio sources, video sources, graphic files, text and subtitle files. Next comes asset preparation, which involves creating or obtaining all the individual media elements of a title that are specified on the asset list, and converting those elements into the form needed to integrate

## H-T SCORE AT WEMBLEY

**A**udio-Technica's AT895 microphone was among the winners as the last chapters in the 77 year sporting history of Wembley Stadium were being written. While Chelsea were beating Aston Villa 1-0 in the last F.A. Cup final to be played under the shadow of the famous Twin Towers, Audio-Technica's new array mic was ensuring that around 500 million people were receiving the best sound coverage possible.

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# DVD-AUTHORING

them into a DVD-A album.

In a typical scenario, production work on assets may be handled in several different facilities: sound is recorded and mixed in a studio, video is edited at a post house and graphics are designed by graphic designers. If the production professionals at each of these various facilities don't understand the DVD-specific requirements for the materials they prepare, significant time and money may be needed to redo elements that are not compatible with or optimised for inclusion on a DVD-A. (For details on the requirements for the various asset types see the book *DVD Production* from Focal Press.)

For obvious reasons, the most important asset preparation process for a DVD-A album relates to the audio program. As with a CD, the master mixes are sequenced and pre-mastered (levelling, EQ, dynamics) in preparation for inclusion on the album. To take full advantage of the format's new audio capabilities, however, you'll need a pre-mastering application such as SonicStudio HD that can work with high-resolution, multichannel sound. A networked con-figuration offers the most efficient workflow, allowing files prepared in SonicStudio HD to be directly imported into DVD Creator AV.

Video for DVD must be encoded into the MPEG format (normally MPEG2). The disc capacity and program length will determine whether to use constant (CBR) or variable bit-rate (VBR) encoding. Ideally, source video will be of master quality; the better the source, the easier it is to get good results from the encoding process. The source may be in a component broadcast videotape format such as D-1 or Digital Betacam, or it may be files prepared on a nonlinear editing (NLE) system. DVD Creator AV supports encoding from videotape and direct 'transcoding' of video files (and accompanying audio files) that have been prepared on popular NLE packages from Avid, Media 100, and QuickTime-based editing systems.

Graphics are generally created in programs such as Adobe Photoshop and include not only still images and menu backgrounds but also 'subpictures'. On menus, subpictures are overlaid on the background as part of the buttons for menu choices. They are also used during program playback to display synchronised text such as lyrics. Because the graphics are generally created on a computer but displayed on television, the artist must bear in mind considerations such as the NTSC safe area (no important picture elements in the outer 10% of the screen area), safe colours, and the effect of different pixel shapes (rectangular vs square) on output resolutions.

Authoring is a media-integration process, where the project's prepared assets are combined into a unified whole, and navigational pathways are defined that link the various parts. The greater the number of individual elements, and the more flexible the navigation between parts (the interactivity), the more

complex the authoring task.

In DVD-A, the simplest authoring jobs will be Pure Audio titles. Track and index information will be added to the pre-mastered audio, and Real Time Text elements (if any) will be synchronised. All elements, along with an authoring script, will then be transferred to a format server, where multiplexed streams and files will be generated to produce a finished disc image.

For multimedia discs, the prepared assets will first be imported into DVD Creator AV, where the basic units of presentation data—known as Audio Objects (AOBs) and Video Objects (VOBs)—are built up out of streams derived from the imported files. The defining media type of the object (either audio or video)

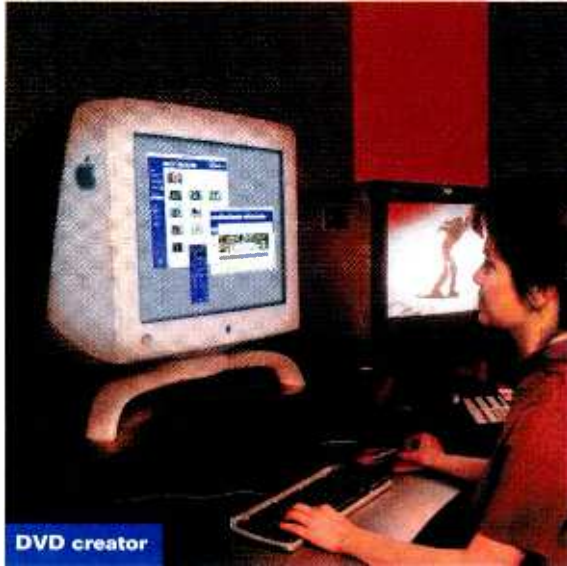
will appear on a timeline, against which additional streams—a series of still pictures in an AOB slide show, for instance—can be laid. At this point the streams are not yet multiplexed (interleaved) together, so the author can still freely modify the way in which the assets are assembled as the project evolves.

On menus, authoring involves defining the 'hotspot' areas for buttons, as well as the colour and transparency of subtitle overlays in each of three button states: unselected, selected, and activated (when the user pushes the ENTER key on the remote control). At the same time, you must define the action that is to occur when each button is activated, such as linking from the menu to a given Group.

Throughout the authoring process you will want to be previewing your work as you go to see if it looks, sounds and behaves as you intend it to. Called proofing, this process continues when all the elements are imported and the navigation is fully defined, because every part of the program—and every link between—should be double checked before the project is output.

When the cycle of authoring and proofing yields an approved title, the authoring program multiplexes together individual streams of presentation data (audio, video, subpictures) into AOBs and/or VOBs. And the menu structure, navigational links, and related information are all formatted into logical data files that the player will consult to know how to play back the disc. The end result is a new set of files which complies with the DVD-A format specification.

For output, the formatted files embodying the 'disc image' may be written to a DVD-Recordable, which can be used as a reference disc to thoroughly check the album in different models of DVD-A players. When the project is approved for replication, it will normally be sent to the DVD plant on a DLT tape, though we can expect that plants will soon be able to accept DVD-Rs as well. The plant may return a pressed check-disc to be tested again on various players, ensuring that the disc is correct before it is mass-produced. If it does what it's supposed to do, you're ready to release your new DVD-A album into the eagerly awaiting world.



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## Audio for DVD

FOR AN AUDIO PROFESSIONAL, the most remarkable thing about DVD is the sheer range of different variations of audio supported by the format, a range unprecedented in the history of consumer electronics for either audio or video formats. Of course, this bounty brings with it the seeds of possible confusion; it takes a while to get a handle on which potential combinations of encoding scheme, bit rate, word length, sample rate, and channel configuration are supported, and which are not. To add to the complexity, the answers to many audio questions vary depending on whether you are looking at DVD-V or DVD-A.

In DVD-V, the basic unit of presentation data is the Video Object, or VOB. In DVD-A it is the Audio Object or AOB, though DVD-A discs may also include VOBs. It's the way that VOBs and AOBs are defined in the DVD-V and DVD-A specifications that determines the attributes of the various media types (video, audio) supported by the two formats. In other words, to know how to prepare program for a given format, we need to look at how the specification defines the presentation data that a playback device for that format is required to handle.

The DVD-V specification allows the inclusion of up to eight independent mono, stereo, or surround sound audio programmes—referred to as 'streams'—to accompany the video program in each VOB. The

streams may be used for multiple languages or for extras such as director commentary.

The specification takes a sort of two-tiered approach to defining the format of the audio in a VOB. Dolby Digital (AC-3) and PCM audio are both supported by all players in regions using either the PAL or NTSC television systems. Player support for other formats such as MPEG Audio, DTS or SDDS is optional rather than required, though it is common for players in PAL regions to support MPEG. In practice, Dolby Digital seems to be the most popular format used world-wide for audio on DVD-V, with PCM in a secondary role.

In DVD-A, it's PCM that plays the dominant role. All players are required to support PCM. Dolby Digital support is required only on players with video output, while support for additional audio types such as DTS is optional on all players. As for the discs, every audio track on a DVD-A may offer up to two audio streams. The first stream is required to be PCM (stereo or multichannel), the optional second stream may be an optional audio type.

Dolby Digital supports channel configurations ranging from mono through 5.1 (LCR in front, LR in the rear, and an

LFE channel with limited frequency response). 5.1 mode is common for movies released recently enough to have had a 5.1-channel theatrical release, or for older movies whose soundtracks have been specially remastered for DVD release.

Dolby Digital 2.0 is used for stereo soundtracks (or 2-channel monaural), and also for movies that were released theatrically in Dolby Stereo, known to the home theatre market as Dolby Surround. In this approach, an analogue matrix system is used to encode four channels (LCRS) into a 2-channel Lt-Rt stereo signal. During playback, the Lt-Rt signal may be decoded by a Dolby Pro Logic decoder for surround sound, or listened to as is for stereo.

For DVD-V, an Lt-Rt source signal is commonly digitally encoded in the Dolby Digital 2.0 format, making it simultaneously Dolby Digital and Dolby Surround. During playback, the player's Dolby Digital decoder outputs the Dolby Surround signal, which may then be fed to an analogue Pro Logic decoder.

Sample Rate (kHz)	Word Length (bits)	CHANNELS							
		1	2	3	4	5	6	7	8
48	16	✓	✓	✓	✓	✓	✓	✓	✓
48	20	✓	✓	✓	✓	✓	✓		
48	24	✓	✓	✓	✓	✓			
96	16	✓	✓	✓	✓				
96	20	✓	✓	✓					
96	24	✓	✓						

Fig.1: PCM audio configurations in DVD-Video

## DVD V Authoring tools

WHILE DVD-A IS just getting off the ground, DVD-V is well-established, with a wide range of mature development tools available. During the run up to the format's 1997 launch, and for a year or more following, DVD-V tools were almost exclusively very expensive, high-end systems targeted toward the production of feature film titles for the home video market. Over the last couple of years, however, the vendors of DVD authoring tools have increasingly targeted new markets, broadening their product lines and bringing prices down within reach of those for whom DVD is not a full-time business.

The newest of markets for DVD tools is the home enthusiast sector. In the US, home computers are being aggressively promoted as editing devices for video shot on DV camcorders. The idea has naturally occurred that it would be nice to be able to output one's movies in a form viewable on TV. To date, the high cost of DVD-R drives has presented a huge barrier to using the format for that application. But an upgrade of the DVD-R specification to v2.0 means that existing authoring drives (635nm wavelength) will soon be joined by lower cost, consumer-orientated, general (650nm) drives. If the history of CD-R is any indication, demand for DVD-R will be brisk, and authoring vendors are positioning themselves for a piece of the action.

Among the new tools for this market is SpruceUp Personal DVD Authoring from Spruce Technologies. The \$129 Windows program includes page-layout-style menu design tools, unlimited still menus, and software-based simulation. Transcoding of video files to MPEG is not included; video must be in a DVD-compliant form when imported.

Another entry in this category is MyDVD (\$99), also for Windows, from Sonic Solutions. MyDVD features a simple drag-and-drop interface for selecting

video clips and images, building menus, and previewing. Finished DVD-compliant titles may be written not only to DVD-R but also to CD-R, playable with a software player that MyDVD automatically writes to the disc.

MyDVD is based on Sonic's DVDit! line, of which the company reports sales of 250,000 units. Many of these shipments represent bundling of the LE version with video cards from companies such as Matrox and Sigma Designs. LE includes real-time preview, and support for output to both DVD-R and CD-R, but allows only one menu, too few for all but the simplest of projects.

Entry-level products for undemanding corporate or professional videographer applications start in the \$500 range. For \$499, the SE version of DVDit! bumps the menu count up to ten, integrates automatic transcoding to MPEG, adds a chapter-point editor, and bundles DVD Player software for title playback from DVD, CD-R or hard disk. Up the tab to \$999 with PE, and you get 99 menus, plus Dolby Digital audio support and the capability to output to DLT, which is the master format accepted by most DVD plants.

Daikin US—the first company to commercialise a DVD authoring tool—addresses a similar sector with ReelDVD. Described as an entry-level tool, the program actually supports up to 999 tracks, which may be video programme or menus. Tracks may use up to three audio and subtitle streams, and 4:3 or 16:9 video in either NTSC or PAL. The company targets the \$980 tool to corporate, consumer multimedia, and video editing users.

Also aimed at the in house corporate and education market is Spruce DVDVirtuoso. The \$1495 Windows program includes support for 10 menus (still only), two audio and subtitle streams, and software-based simulation-emulation.

While some companies use different product lines

to address different segments, INTEC America takes a multi-tiered approach within its DVDAuthorQUICK software. The \$399 LE version is targeted toward small production houses and video-DVD enthusiasts, as well as the OEM and system-integrator markets. The \$2,500 Desktop version, meanwhile, is a mid-level tool for corporate applications such as kiosks, as well as prosumers. At the top of the line is the \$7,900 pro version, for postproduction facilities, the corporate presentation market, and karaoke authoring.

Daikin has a similar spread in its Scenarist NT line, though starting from a higher baseline. The \$6,450 Basic version is designed for corporate users who need direct control over DVD-Video capabilities such as interactive scripting. An off-line version of Scenarist NT Basic—similar to an off-line video editor—is available for \$1,495. The program lets you author projects off-line to be subsequently transferred to a full version of Scenarist NT for layout to DVD.

For \$14,950, the Advanced version of Scenarist NT is targeted toward general movie title developers, and includes both 16:9 support and copy-protection options. Scenarist NT Professional (\$21,950), meanwhile, is for Class A Hollywood titles, and supports nearly every feature of the DVD specification, including multi-angle video, high-definition audio, karaoke, and text extensions. Daikin also continues to serve existing customers in this segment with the original Scenarist SGI, but the company is not actively marketing that product or adding new features.

Also in the mid-to-high level category are a collection of systems from Spruce. Spruce DVDConductor (\$8,950) includes support for unlimited menus (motion and still), eight audio streams, 32 subpicture streams, two video streams (multi-angle), and hardware based simulation-emulation. With the addition of CBR and single-pass

To reduce bit-rate requirements, Dolby Digital is data-compressed using perceptual coding techniques that discard some information based on assumptions about how people hear. The bit-rate of a Dolby Digital 2.0 soundtrack is normally 192 kilobits per second. The bit-rate of a Dolby Digital 5.1 soundtrack ranges from 384–448kbps.

Unlike Dolby Digital, PCM audio is not data compressed, and therefore it uses a much higher bit-rate: 1.536 Mbps for two 16-bit channels at a 48kHz sample rate. In DVD-V, sample rates of both 48kHz and 96kHz are supported. Word lengths range from 16 up to 24 bits. Depending on the sample rate and word length, a PCM stream may deliver up to 8-channel sound.

Despite the DVD-V specification's impressive PCM support on paper, in reality there are a number of considerations that limit what you can reasonably expect to play back. First, total audio bandwidth is limited to 6.144Mbps, which imposes restrictions on the number of channels supported at the various sample rates and word lengths (Fig. 1).

Second, DVD-V is (naturally enough) a video-centric format, and any data bandwidth allocated to audio means less bandwidth is available for video. With that in mind, many DVD title publishers choose to devote the bulk of the available bit-rate to achieving the best possible video encoding, while using Dolby Digital audio tracks (which require much less bandwidth) rather than PCM.

Additionally, even though the DVD-Video format

VBR encoding from an YUV component-based real-time encoding card, the system costs \$12,950. For \$22,950 you get the same system with an SDI-based encoding card.

At the top of Spruce's line are the company's DVDMaestro systems. The \$24,950 authoring application builds on DVConductor's features with comprehensive support of the DVD-Video specification, including copy protection (digital and Macrovision), DVD-9 (dual-layer), parental rating, regional coding, command sequences, playlists, karaoke, 96kHz PCM, and DTS audio. The \$39,950 DVDMaestro Authoring-Encoding system includes the SDI-based real-time encoding card, with support for inverse telecine, two-pass VBR, and segment-based re-encoding.

Sonic's top products, meanwhile, are both based on the same core authoring technology, but are slanted toward two somewhat different markets. DVD Fusion, with video support emphasizing direct transcoding of digital video files, has been designed to integrate tightly with nonlinear video editing (NLE) systems from vendors such as Avid and Media100. The product starts at \$2,999, with a variety of authoring and encoding options available that add increasingly advanced capabilities.

For full-time DVD houses and high-end post facilities that are oriented toward capture and encoding from master-quality videotape sources, DVD Creator (\$14,999) is designed for high throughput. The system supports parallel workflow based on a modular, networked workgroup of encoding (CBR-VBR) and authoring stations, and provides for automated asset capture and formatting. DVD Creator offers complete specification support, including areas such as multiangle video, eight audio streams, 32 subtitles, dual-layer discs, regional coding, parental control, copy protection, and DTS audio.

allows multi-channel, high-resolution PCM audio on disc, players are not required to reproduce this audio at full resolution. The majority of DVD-V players on the market provide only two discrete audio outputs. Also, most DVD-V players decimate 96kHz audio to 48kHz prior to D-A conversion, and some players also truncate 20-bit and 24-bit samples to 16 bits. This means that while it is possible to create a DVD-V with high-resolution audio—including discrete multichannel surround sound—it is not possible to guarantee that the viewer will hear the sound at

Sample-rate	44.1 kHz Family			48 kHz Family		
	44.1 kHz	88.2 kHz	176.4 kHz	48 kHz	96 kHz	192 kHz
Maximum Channels	6	6	2	6	6	2

Fig.2: Sample-rate families in DVD-Audio

full resolution. In part, that's why DVD-A exists as a separate format from DVD-V.

Because DVD-A is an audio-centric format, support for high-resolution PCM audio is required for all players. For certain types of players—those with a video output—Dolby Digital is also required. Players may also, at the manufacturer's discretion, support optional audio formats such as DTS or others not yet defined.

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Supported PCM resolutions in DVD-A are divided into two sample-rate families. One is based on the standard audio-for-video rate of 48kHz, and also includes the multiples 96kHz and 192kHz. The other is based on the 44.1kHz rate of CD-A, and also includes 88.2kHz and 176.4kHz. 16-bit, 20-bit or 24-bit word lengths are allowed at every supported sample rate (Fig.2).

Within each sample-rate family, the highest sample-rate is supported for mono or 2-channel playback only. At the other rates, up to six channels are allowed. However, the format's maximum data-rate allocable to audio—9.6Mbps—places limits on the total data bandwidth available to spread among the channels. Six channels of 20-bit audio at either 88.2kHz or 96kHz, for instance, would substantially exceed the format's data-rate. The specification offers two complementary methods for dealing with this limitation. One is Meridian Lossless Packing (explained below), the other is mixed resolutions.

Mixed resolutions allow the producer to prioritise the allocation of bits among the channels in a given audio track. Each channel used in a given track is assigned to one of two Channel Groups. The resolution of Group 2 may be equal to or lower than that of Group 1. The sample rates used for all the channels in both groups must be from the same family.

Most of the reasonably foreseeable combinations of higher- and lower-resolution channels are defined in the format's 21 supported channel assignments (see Fig.3). You may decide, for example, to use 24-bit/96kHz resolution on the front left and right,

while using 16-bit/48kHz for centre, LR surrounds, and LFE. The number of channels, their assignment to the two Channel Groups (Fig.3), and the resolution of each Channel Group may be changed on a track-by-track basis (though players may mute briefly

	ch0	ch1	ch2	ch3	ch4	ch5
1	C					
2	L	R				
3	L	R	S			
4	L	R	Ls	Rs		
5	L	R	Lfe	S		
6	L	R	Lfe	Ls	Rs	
7	L	R	C			
8	L	R	C	S		
9	L	R	C	Ls	Rs	
10	L	R	C	Lfe		
11	L	R	C	Lfe	S	
12	L	R	C	Lfe	Ls	Rs
13	L	R	C	Lfe	Ls	Rs
14	L	R	C	S		
15	L	R	C	Ls	Rs	
16	L	R	C	Lfe		
17	L	R	C	Lfe	S	
18	L	R	C	Lfe	Ls	Rs
19	L	R	Ls	Rs	Lfe	
20	L	R	Ls	Rs	C	
21	L	R	Ls	Rs	C	Lfe
	Channel Group 1				Channel Group 2	

Key: C = centre, L = front left, R = front right, S = surround (front), LS = left surround, RS = right surround, Lfe = low frequency effects (subwoofer)

**Fig.3: Supported channel assignments for two DVD-Audio's 2-channel Groups**

during such changes).

Even with the Channel Group system, there are still many possible situations in which the bit-rate required for a high-resolution audio program would use too much bandwidth and/or leave too little playing time on the disc. So the DVD Forum's WG4,

which developed the DVD-A specification, adopted Meridian Lossless Packing (MLP), a completely lossless data-compression system in which the decoded datastream is bit-for-bit identical to the pre-encoded PCM source stream.

The efficiency of the MLP algorithm varies depending on program content, particularly for material at sample rates of 44.1kHz or 48kHz. But MLP has been demonstrated to reliably achieve a 45% reduction in bandwidth requirements for audio at higher sample-rates (88.2kHz, 96kHz, 176.4kHz and 192kHz). That allows a DVD-5 (single-sided, single-layer disc) to handle up to 74 minutes of program using six channels of 24-bit/96kHz audio. DVD-A discs are not required to use MLP, but decoding capability for MLP is mandated for all DVD-A players.

Players are also required to support SMART downmixing. Rather than forcing producers to include a separate stereo mix of multichannel material—which would cut into available playing time by using extra disc space—SMART allows them to choose to have their multichannel mixes automatically downmixed by the player. A SMART downmix of a given song will only be played if there is no two-channel mix of the song on the disc. The downmix is based on level, panning and phase coefficients defined by the producer during the mix. This system ensures that DVD-Audio discs, regardless of whether the available monitoring configuration is stereo or multichannel, meet one of the key requirements of any well-conceived consumer audio format: that audio will play back from every disc in any player. □

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# THE EXORCIST UNSEEN

Sound designer Steve Boeddeker and mixer Mike Minkler talk about the horror classic's theatrical re-release with a remastered soundtrack and previously-cut footage. **Richard Buskin** visits *The Exorcist*

‘ON THE DAY AFTER CHRISTMAS,’ commenced a 1974 Newsweek cover story, ‘a film called *The Exorcist* opened in 22 cities across America. Since then, all hell has broken loose.’ It was only a slight overstatement. The film version of William Peter Blatty’s best-selling novel about a priest’s attempts to confront the devil within a 12-year-old girl provoked widespread controversy when it was first released in late 1973. Starring Linda Blair, Jason Miller, Ellen Burstyn, Max von Sydow and Lee J Cobb, and directed by William Friedkin, the movie was heavily censored in certain quarters for its disturbing subject matter and diabolical images, yet it was also a commercial and critical smash, grossing upwards of \$150 in the US alone during its first run and garnering 10 Oscar nominations. Blatty scooped the award for Best Adapted Screenplay, while the picture also won the Golden Globe for Best Film (Drama), giving rise to a pair of sub-standard sequels and a host of imitations.

Now, more than a quarter of a century later, the granddaddy of all demonic horror movies has been resurrected in a highly embellished guise, both sonically and visually. *The Exorcist—The Version You’ve Never Seen* boasts a digitally remastered and remixed soundtrack that has been transformed from mono to 6-track surround, complete with additional effects and some new music. Furthermore, and in line with the aforementioned suffix to the title, this new version also incorporates more than a reel of footage that was excised prior to the film’s 1973 release. As such, it conforms to the author’s original vision, for as director William Friedkin recently admitted, ‘This is the version Bill Blatty always believed in, and it’s taken me 26 years to see why and finally agree with him.’

Blatty first saw the newly restored version when Friedkin screened it for him in a Manhattan office building at 666 Fifth Avenue. Nevertheless, in spite of the fiendish connotations, all went smoothly on this project.

‘Probably the scariest experience for me was screening the film with Billy Friedkin, Bill Blatty, Buzz Newton—who was the original sound mixer—and the current team all present,’ says Lucas Digital sound designer Steve Boeddeker, who was also involved with the Friedkin-directed *Rules of Engagement* while working on *The Exorcist*. ‘I’ve never been so nervous in my life. The thing I was most nervous about was stepping on the original version, but they liked it. Afterwards we were sitting there quietly and Buzz said, “There’s an awful lot of surround”, but that was it. I myself was worried about the content, not how much was in the surrounds.’

‘My job was to figure out what Billy Friedkin meant when he said “all-new”, because, although it was all-new, we didn’t want to mess up what was already one of the most experimental soundtracks ever in terms of dynamics and its blurring of the line between sound effects and

music. So, during the mix my job was to make sure that, when we were experimenting, we didn’t stray from the original idea. I would try to make the big things bigger and let the small things be smaller, while keeping the documentary-type elements as they were. You know, one of the things that I thought was so terrifying about the original movie was that it did have this documentary-type feel to it, so we wanted to maintain as much of that as we could.’

Another challenge for Boeddeker presented itself in the form of the additional music that William Friedkin requested, with the intention that said new elements would enhance the film while providing it with a slightly more contemporary feel. ‘That required a lot of

and that was my biggest concern—were low-end and high-frequency elements in the use of the surrounds,’ Boeddeker explains. ‘I therefore did some pretty atmospheric stuff with a sort of pulsating low-end that could sit in there and work well with the original music.’

‘There again, I didn’t want to screw with the signature-type things, such as the demon vocals and the dogfight. Those were the things that I remembered from the first time I ever saw the movie and we couldn’t mess with them, whereas with other things such as the exteriors it was a case of making them as full as we possibly could and then, when we got to the mix, deciding how big we wanted them to be.’

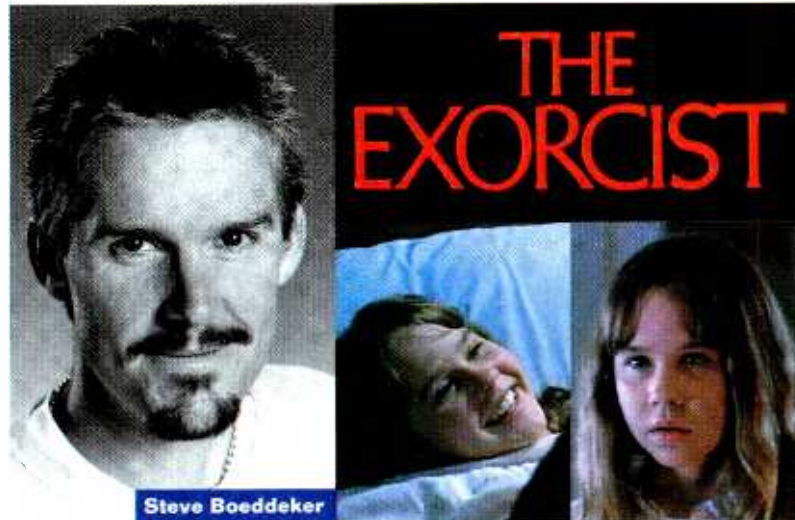
‘With Billy the approach was to put things in the surrounds and then let him say if he just wanted them in the front. He almost always wanted everything in the surrounds. In fact, so much stuff was in the surrounds that, for the stereo version on the DVD, they had to kind of remix some of the surround material into the front. I mean, there were music cues that virtually didn’t exist at all in the front. That helped us a lot as far as keeping the action in the front clear, retaining the stripped-down, documentary feel, because so much stuff was in the surrounds it was all around you. A lot of the new material is really removed from the screen. It is emotionally driving rather than tied to what you see, and I think that’s fun.’

Among the signature elements that required handling with care were the sounds of the rats in the attic, the hospital equipment, the demon’s voice, the girl’s bed bouncing around and her head going into its 360° routine.

‘We definitely played with that kind of stuff a little bit,’ says Boeddeker. ‘You know, “How can we accentuate this and make it bigger?”. In those particular cases we’d definitely be taking away from the documentary feel by having things go all around you, and so we stripped right back to what was on the screen, whereas in other sequences there’s an entire world around you. In fact, there’s so much stuff going on that, as it’s an EX mix, we’d joke that you could pretty much flip the front and the back and not notice the difference.’

‘As mixes go, this is probably one of the most dynamic that I’ve ever heard in terms of having tons of stuff in the surrounds and then nothing in the surrounds. The music and effects will be really, really loud and crazy, and then there’ll be dead quiet. In the desert it goes dead quiet. When the priest is walking around the jeep there’s no music, no wind, nothing but Foley, and that’s incredibly exciting... which might be surprising for a sound person to say, but it’s a great setup for what is to come.’

Mike Minkler mixed the dialogue at Todd West and, according to Boeddeker, ‘he did an amazing job, digging some bottom end out of this thing. It had the Academy filter on it and it was pretty brutal, but Mike



thought and effort,’ Boeddeker says, ‘augmenting the original musical pieces without distracting from them. I delivered my music from a Pro Tools system that I have at home, with all of the separate pieces unmixed, so that when we got to the stage we could decide how much we wanted to put in the surrounds, while adding parts, removing parts and layering things.’

‘All of the editorial work was done in Pro Tools. We loaded all of the original stems into Pro Tools and did as much cleaning up and editing as possible. We also edited new effects in Pro Tools sessions that went along with that stuff. The whole idea with Billy is to maintain as much flexibility as possible and at any moment be prepared to completely turn around what he’s said before and try something entirely new. If you’re prepared for that then it’s the most fun ever, whereas if you’re not prepared it can just be a nightmare.’

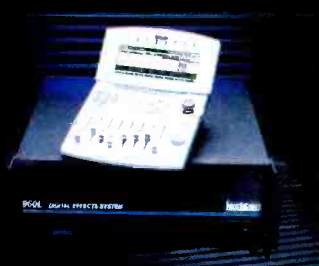
All that the sound team had to work with from the original movie were the mono stems. Much of the music was ultimately replaced with re-cut, re-synced stereo versions, yet the demon vocals—also mono, and married to the effects instead of the dialogue—were largely retained, as was the production dialogue.

‘When I first started working on the music, I realised that the things I could add which wouldn’t stick out—

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## POSTPRODUCTION

did really well getting it to sound good on its own.'

'All I had to work with was the mono dialogue master, as well as the two additional scenes for which I had the original material,' adds Minkler, who utilised an Otari Premier and Harrison Series 12 console on Todd West's Stage One, together with Pro Tools and MMRs. 'That required a lot of work, because technology was so



different 27 years ago. They were using Dolby noise reduction for the first time back then, and overall the sound had a distinct quality. Technically, by today's standards, the movie is not very good, whereas artistically it was phenomenal then and it's phenomenal now. There was a lot of unwanted noise that was tolerated then but can't be tolerated now; little hums, buzzes and snaps that were induced in production and during the mix, and so that had to be cleaned up. Then I added a massive amount of EQ to the voices just to warm them up and help things sound like a modern-day track.

'In terms of the effects, some signature sounds were enhanced in certain scenes and not in others where Billy Friedkin wanted to retain the original quality. For

instance, we just had a work track of Linda Blair screaming together with a lot of natural bed sounds. Well, in the first scene where she's thrashing about he liked the quality of that and didn't want it enhanced, whereas later on he did want it enhanced. The bed really starts rocking, she's throwing things around and they're flying all over the room. There again, the Iraqi scene at the beginning was completely enhanced; all of the traffic sounds had to be stripped out so that there were clean cars, clean Foley, but they also had to have a seventies quality. They couldn't sound too good because they wouldn't fit the image. The picture has a dated look and feel, so it wouldn't work if we went out to Wilshire Boulevard, recorded the traffic and struck it into the movie. Instead, we used good recordings that were made in, say, 1985 on SR mag.

'If you hear something like a door closing it has to fit the quality of the dialogue, and so the dialogue track dictates the quality of the sound effects that it accompanies. This is especially true in the girl's house and in the doctor's office. You can't have a beautiful, pristine sound effect that goes with a 27-year-old dialogue recording that's been processed.'

Nevertheless, many additional elements were new, and as such they required meticulous mixing and matching.

'In one sequence at the beginning of the movie, the cheering and yelling of the students was married to the dialogue stem, and we had to really, really work it,' asserts Steve Boeddeker. 'Not only did it sound pretty harsh, but we also had to tweak the new crowds that we were adding so that they matched and blended in and out, enabling the central dialogue to cut through. Then, another tough thing was one of the mixes for the bed bouncing around. We were adding a bunch of big, new, exciting elements, and we couldn't get it to feel real and

documentary-like in the way we wanted. Then we realised that the sounds that were in there were the real production sounds; the bed smashing around on the floor. When we stripped everything out it was, "That's it!". It was all there. That was the recording on the set—the poor girl just getting slammed around on the bed—and we couldn't do any better than that. So, we just fattened it up with EQ and that was it.'

Not so the vomiting of devilish bile, however, which is now laid thick upon the audience... in the metaphoric sense, at least. After all, actress Mercedes McCambridge gave a fine performance the first time around, providing the vocal effects that emanated from Linda Blair's mouth when Lucifer was having his say. Such effects now required more elements in order for the surround speakers to enter the fray, and so, without actually sticking a finger down his throat, Steve Boeddeker turned performer and came up with the goods.

'I made myself hoarse trying to make as many vomit sounds as possible,' he confesses, 'and then I pitched them and tweaked them and added them to her originals. The original vomit sounds are now on the front, while the new ones are coming out of the sides and a little bit into the surrounds. This is one of those cases where the whole thing is building and building...'

Yes, thanks for sharing that...

'...and it needs to be larger than life. Putting the same sound all around you wouldn't have nearly the same effect as having different sounds all around, kind of like in music where you double up a guitar to get a bigger effect. So, it's predominantly [McCambridge's] stuff up in front, along with these additional sounds that have some lower elements and disgusting, visceral qualities to them.'

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# ROCK FOLLIES

If the rock 'n' roll 'documentary' was fair game for Spinal Tap's eighties spoof, a DVD re-release promises yet more irreverence. **Kevin Hilton** is on the guest list

**I**T IS EASY TO CREATE A MYTH. When *This Is Spinal Tap* was first released in 1984, the story that it was a real 'rockumentary' about an almost forgotten but preserving British heavy rock band was perpetuated. It is easy to see how this was done: the jokes and scenarios are so close as to make the real inhabitants of Planet Rock very uncomfortable indeed.

The creation of comedy actors and satirists (and accomplished musicians) Michael McKean, Christopher Guest and Harry Shearer and actor-director Rob Reiner, *This Is Spinal Tap* is a genuine cult item and was re-released theatrically at the end of last year, pulling in a new audience. It has also appeared on DVD, a medium that it suits well; true fans knew that much more material was shot than appears in the film and the format's extra capacity offers it a good home.

While parodying the music business in general and heavy metal in particular, beneath the jokes there is a definite knowledge and feel for the music. Recording technology has moved on greatly since 1984 and the band was keen to rectify what they saw as some of its shortcomings. Harry Shearer, who plays bassist Derek Smalls, explains in near-Tap terms, 'We'd always felt that the technological limitations of the first release prevented the band from sounding as loud as it really is.'

Which was necessary to perpetuate Spinal Tap's reputation as England's loudest band. There was just one problem—the original recordings could not be found, something that is relatively common in film restorations and fits nicely with the thwarting bad luck that has dogged the hapless band. 'Unfortunately, we were unable,

despite heroic efforts, to locate the original 24-track masters of the soundtrack music, so we could only work with the stems from the original mix,' explains Shearer.

When MGM bought PolyGram last year it acquired the ownership of *This Is Spinal Tap*; searches were made for the various elements as the decision to remaster and remix the film got the go-ahead.

Gray Ainsworth, vice president of technical services for MGM, the group that supervised the digital transfer, worked with the band on the stereo and 5.1 re-mixes. 'We looked at the material that was delivered to us from PolyGram,' he says, 'and ended up going back to the stems, the raw material, which was held by Canal+'. This gave us the original stereo mix but the band didn't like that mix—their intention was to beef it up.' Harry Shearer confirms this objective: 'We basically retained the balances but tried to make the instrumental sound more vivid, more live, more loud.'

The soundtrack—music, dialogue and sound effects—was re-mixed at Chace Productions in Burbank. Its roots go back to 1981 when Rick Chace and Tommy Goodwin opened Goodwin-Chace Productions on Sunset Boulevard as a voice-over/radio production studio. Chace Productions was created when Chace and Goodwin parted company in 1984; the transition into the audio-for-video began at this stage, building on Chace's experience in the sound department at Modern Video Film.

Chace died in 1992; the facility's main dubbing theatre was dedicated to him in 1997. After several moves, Chace Productions relocated to Burbank, occupying a one-storey 7900ft<sup>2</sup>, custom-designed space that comprises 11 audio suites and administrative offices. In 1996 a neighbouring company, Director's Sound, was acquired and now houses an optical soundtrack department and the Rick Chace Theatre. The optical department includes the latest optical sound camera for 35mm mono, stereo and DTS work.

Lower-budget feature films, restoration projects and documentaries are mixed in the THX certified, 900ft<sup>2</sup> Rick Chace Theatre. It was here that Harry Shearer and Michael McKean (who plays one of the two founders and mainstays of Tap, David St Hubbins) supervised the sound mix. Asked why lead guitarist Nigel Tufnel, who was shown leaving the band acrimoniously in the film, did not attend the sessions, Derek Smalls, ever the diplomat, replies: 'Nigel was back at his farm.'



The new version of the soundtrack was mixed by John Blum, senior Chace Digital Stereo (CDS) product specialist. This may sound like a grand, non-engineering title but as well as offering traditional postproduction facilities, Chace Productions owns the patents on a range of digital processing hardware and software that is used for many of the sessions. 'I used the CDS to weld all the elements together, the mono channel and the original 4-track recordings,' explained Blum. 'The aim was to make for a consistent sound throughout.'

Chace's first digital unit was the Optical Sound Processor, a perspecta-style decoder card. The CDS is an enhancement of the patented Chace Surround Stereo Processor and is designed to create true directional 5.1 multichannel sound with stereo surrounds from mono sources. This is achieved by using DSP technology to process over 600 million instructions a second.

Blum comments that both Shearer and McKean are knowledgeable about new technology and knew exactly what they wanted to do. 'They supervised the sound mix and were really excited about getting the chance to give the live performance segments a real feel and dynamism,' he says. Shearer adds that he left the decisions regarding what to place in the surrounds to Blum, while he and McKean concentrated on the music. 'Michael and I were more concerned with the overall sound of the band—the crunchiness of the guitars, the inclusion of sub-woofer material, punching up the drums.'

To create the surround picture Blum analysed the original 4-track stems, which contained the effects and music I.C.R.s. 'Those were originally intended to be matrixed—sometimes they would be discreet, other times the loudness of the signal would throw things into the rear channels anyway,' Blum says. 'While I put drum slaps and reverb in the surrounds, I pretty much went



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# POSTPRODUCTION

with the original vibe of the LtRl mix. The crowd noise is back there but the surround is not that strong, it's predominantly LCR. I was concerned with fidelity and dynamic range because the original recording had been compressed for the optical print master.'

*This Is Spinal Tap* blurs the edges between fact and fiction; this slightly strange meeting between characters and their creators continued during the restoration and remix, down to Shearer and McKean overseeing the mix as Derek Smalls and David St Hubbins. The re-release has been accompanied by 'the band' appearing on television to update their story: they have comeback more times than they can remember and continue to tour Germany and Japan. They are also still angry at the man who made the original movie, Marty DiBergi, for what they regard as a hatchet job.

Consequently DiBergi—and Rob Reiner, who played him and directed the 'real' film—did not attend the sessions. His influence was still felt, however. 'Particularly



on the documentary portions, we took the mindset 'What would I do if I were Marty DiBergi?'," Blum says. "Those sequences are not in surround but we did a lot of dialogue finessing. This gave us the opportunity to very much improve a lot of the production sound, tweaking the EQ. Some of the lines that couldn't be heard that well the first time around are now very clear.'

Chace Productions opened its first NoNoise suite at the end of 1992 and a Sonic Solutions systems was used to remove some clicks and pops from the *Tap* soundtrack. The final mix stems that were used as the source material came off a 2-inch 16-track Dolby A master. From there everything was transferred to 2-inch SR and a DA-98, with an analogue protection master. Blum says there was no perceived need to go 24-bit.

The Sonic workstation was additionally used for some dialogue editing. The effects stems were recreated to playback through the matrix; some extra editorial took place to build up the effects and atmospheres from the live show sequences. Blum says the intention was not to resort to CD libraries. 'Apart from that it's a very purist restoration,' he adds.

Sessions took around three days in the Rick Chace Theatre. This room is centred around a 60-input Lafont Audio Labs Chroma 5.1 console with Uptown automation. Blum mixed to the suite's 18-foot wide, 10-foot high projection screen. The THX certified loudspeaker system consists of six JBL 4675-C-8LF's powered by 4000W of Bryston amplification. There are eight JBL 8340s surrounds. All monitoring formats are catered for, from mono to full discrete 5.1.

Despite the thought, voiced by David St Hubbins' girlfriend, that heavy metal should not be done in 'Dobly', surround encoding and decoding is performed by Dolby SEU-4 and SDU-4 units for LCRS to Lt/Rt matrixing. Further 'Dobly' comes in the shape of the 363 SR/A and CAT 43. Other outboard gear includes Hush and Dynafex noise reduction, Urei and dbx limiters, Urei and Orban equalisers, a Lexicon 480L and a Lexicon MXPI. Main recording formats are analogue multitrack, digital multitrack, and 6-track mag. Others

can be accommodated if requested.

Pictures are projected onto the Stewart screen by a 2100 ANSI lumens Sanyo LCD, with a Magnatech projector available for 35mm. All the major movie soundtrack formats are catered for: Ultra Stereo, Dolby Digital, SDDS, and DTS. Gray Ainsworth at MGM explains that the picture was re-timed and a new digital D1 video transfer made as the picture source.

DVD is not the only format to have offered extra capacity for deleted scenes in movies. The LaserDisc version released in 1995 contained outtakes but DVD gives the opportunity for so much more. Automat Pictures was contracted to assemble as much 'value added material' as it could find. This includes an hour of deleted scenes, a commentary featuring all the main characters, plus music videos, TV appearances and commercials.

There are some bizarre stories about the movie business. The cult horror film *The Wicker Man* is now only available in a butchered 84-minute version; the virgin

print negative was apparently buried underneath the M4 motorway in Britain. In a similar way, the original work print of *This Is Spinal Tap* was found in a salt mine in Utah. 'We found that and talked to the band about what elements they might have,' comments value-added producer Jeffrey Schwarz. 'The print gave us four hours of extra material - some of it was great, some of it was not meant to be seen. We cut it down to an hour to make it watchable and put it in a narrative order.'

This material includes sub-plots that were not followed and extended versions of scenes that made it to the final print. Like the movie itself, these are semi-scripted as the cast improvised from basic story outlines. Other gems include an Australian commercial for a meat product called Rock 'n' Roll and Tap appearing on a local New York talk show hosted by Joe Franklin. This was in 1984 and neither Franklin nor the other guests knew that the hairy 'British' monsters were in fact American comedians. Trailers, other TV spots and music videos make for a full extras section. 'We wanted to pack it with as much as we could because the movies is so well loved,' Schwarz says.

The commentary was recorded at POP Sound in Santa Monica and was performed in character. 'On the LaserDisc release the commentary was Rob Reiner explaining how the film was made,' says Schwarz. 'This time I wanted to continue the conceit that it was all real, so I got them to comment in character. They just sat there and winged it—that was an amazing experience.'

In their promotional appearances for the re-release, the band have not disguised their anger towards Marty DiBergi. It is obvious that it still rankles but Derek Smalls takes delight in how the director's career has faltered. 'Marty DiBergi hasn't been involved in a "real" film since *Tap*, he's been making industrial training films, for example *How To Make Kibble*. The band still resents him bitterly for the hatchet job.'

And on a final note Derek, the re-release is in 5.1 but should heavy metal be done in Dobly? 'It should have been done, of course, in 11.1.' Or is that too much perspective? □



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# GOING NATIVE

If Baaba Maal was at home recording in his native Senegal, John Leckie's equipment wasn't. **George Shilling** reports on hot nights and hot sessions

**J**OHN LECKIE IS FAMOUS for his work with British guitar bands Radiohead, Cast, Stone Roses and Muse, and more esoteric projects such as Dr John and Papa Wemba. He recently recorded an album with long established singer and guitarist Baaba Maal in a fishing village in his native Senegal, West Africa. There was no studio and no mains power, yet Leckie decided this was the ideal recording location, so with the help of FX Rentals and the assistance of engineer Ben Findlay, he put a temporary studio in place for four weeks.

*Why didn't you make a record in a studio in Europe?*

Because that was the brief — 'How would you like to record an album with Baaba Maal in a studio in Senegal?'. To which the answer was, 'Of course!' He's been making records for Island-Palm Pictures for about 12 years, so Jumbo Vanrenan his A&R man

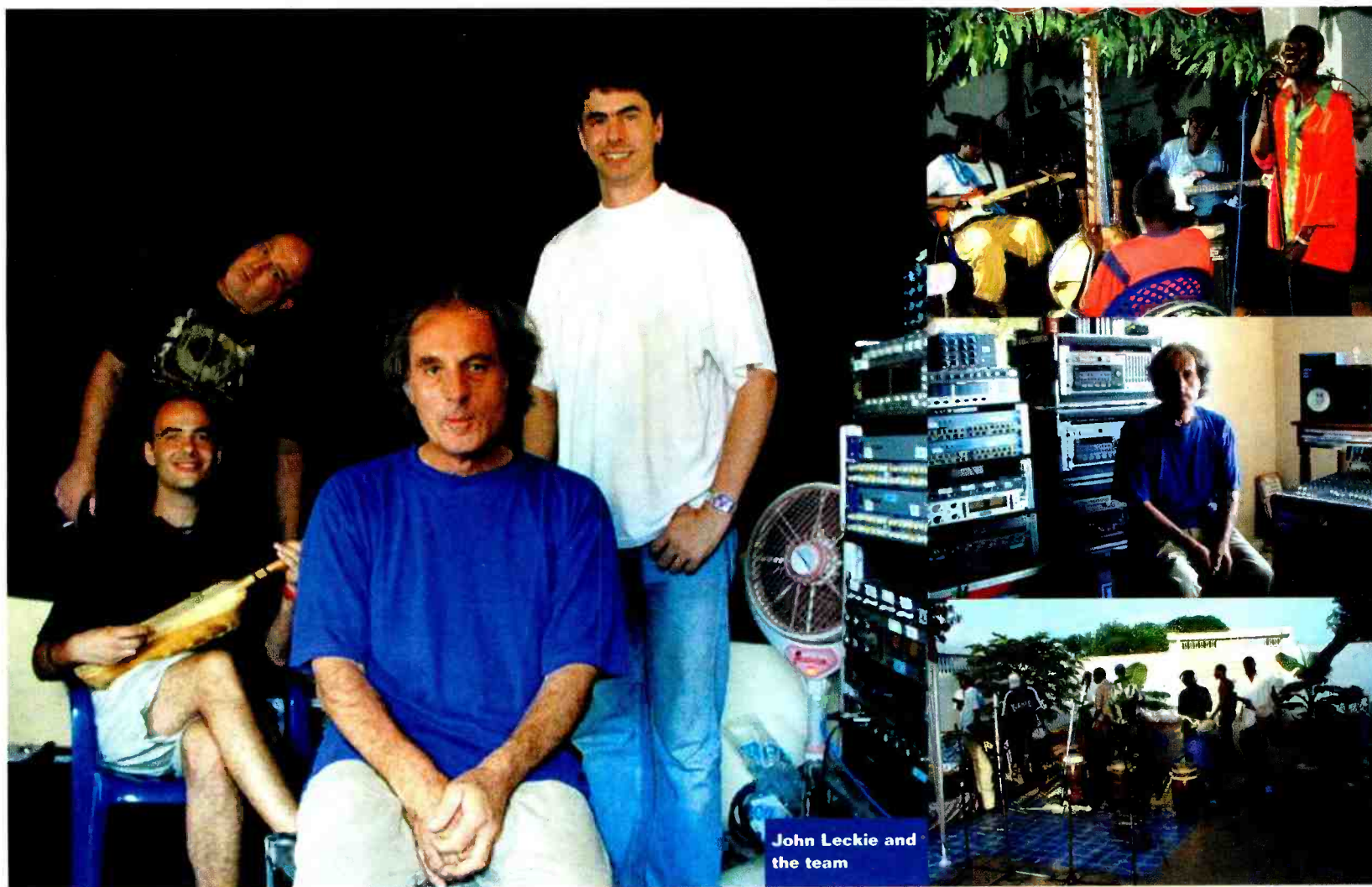
knows him really well. So I went out to Dakar to look at the studios. There were only two decent studios, one of which is owned by Youssou N'Dour. But Maal and N'Dour are effectively from different cultures—Maal is a Fulani, so that was out. The other studio, Studio 2000, had an Amek and air-conditioning, so we were considering that. Then they took me out one night to Mbunke, about 100 miles south of Dakar, and it was like a compound, farm buildings surrounded by a wall. And as soon as I got there I said 'Why can't we make the record here?'. So that's how it came about. He's done records in London, LA, Paris, New York, he's done the drum loop thing, and been with the LA Hollywood producer but they wanted to do a traditional record—acoustic, with just some saba drums, cora, no keyboards, drum kit or kitchen sink. And some of the songs were traditional West African songs, so as soon as the musicians heard them, they were happy and knew what to play.

*How did you choose the recording equipment?*

I chose the DA-88s although I wish I'd chosen the 24-bit ones. But I'd used them before and had good results from them mixing an album in Dublin, and with Dr John with a couple of DA-88s—also from FX—plugged into the back of the PA desk, and I just chose them for their reliability. I couldn't take an analogue tape machine because if it packed up we wouldn't be able to record. The thing with three of these, we'd have a backup. And in Dakar, demo studios and band members would have them—if anything went wrong, we wouldn't be stuck. For the first few mornings, when we turned them on we'd get a condensation warning, but after 20 minutes it went off. They were perfect really.

*How many machines did you take?*

The original idea was to work 16-track, with a



John Leckie and the team

third backup machine but inevitably it went 24 track, then 32 back in England.

*How did you deal with separation?*

The way it was recorded, everything started with an acoustic guitar. The music is modal—it could be a loop but it's repetitive riffs—so it was all overdubs. A couple of tracks were done live but most were done starting with acoustic guitar—no click, just rhythm, giving a signal to stop after five minutes. Then saba drums, which are like congas but they whack them with a stick, just cut off the tree. And they also slap them with their hand. We spent a lot of time trying to balance the two sounds.

*What was the recording chain?*

Four channels each of API and Focusrite mic amps and EQs, Urei 1178 compressor straight to tape. We took a dbx 160 and SSL compressor which never got turned on.

*What was the monitoring?*

We took Genelec 1030 self-powered monitors, which are quite flattering and good for the musicians to hear stuff back on. I'd never mix on them. And we took NS10s and a Samson amp as a backup. We took nine pairs of headphones, and sometimes we needed them all. We'd do the saba drums, and they'd turn up with nine drummers—they'd say 'tomorrow I bring my brothers' and they'd all fall out of the van with their drums, so I'd put up one U87, because working with outboard mic amps you haven't got a mixer. I

might do it in stereo and use two 87s and move them up and down to see how much boom you get. But the other thing is recording outside it is totally dead.

*It was all recorded outdoors?*

Until night-time, then you've got crickets and insects. There was a guy making a video so as soon as the lights went on, all the insects descended upon us—they were unbelievable actually, 6-inch locusts and blister beetles, which in Africa they call 'wanks'—little brown insects which spray you with acid inside your shirt. And if you kill them they've eaten locust eggs, so you get a plague of locusts. And the crickets were so loud, we'd sometimes move into a little room.

*What mics did you take?*

U87s, 414s, KM84s, 57s, 58s, D12. The 414s went noisy, and one of the 84s went because it got dropped in the sand. The band roadies were helping and kept pulling the mics apart. We took a valve 47—you have to—and it worked for a week then packed up. They sent us another but it turned out to be the power supply, which surprised me as it was a new one. So it was 87s all the way really.



*And you used a Mackie 32-channel desk for monitoring?*

Yes, the main problem with the Mackie was condensation in the carbon track faders—all the faders would be different, or go flat out until you got near the bottom.

*Why did you take Ben Findlay?*

They did expect me to do it all myself, but it was too much to keep in control. I knew Ben from Real World. He was there for the whole four weeks.

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# RECORDING

*What was the biggest difficulty?*

There was no separation between the recording area and the room with the gear, so I'd monitor on headphones, or just go for it really. There was no dilly-dallying around. We recorded about 22 songs, and whittled it down to 14.

*Were there any logistical problems?*

Just getting people together, travelling. I used to complain because they wouldn't arrive until about 4 o'clock, but I found out that the driver would start out at 10am, and pick up all the musicians from around Dakar, then drive them the 100 miles, then home



## Nick Harris, FX Rentals

**Q** *What was the most difficult thing about this job?*

Because it had to go out on a carnet, serial numbers had to be designated for particular items of equipment. So making sure those particular items stayed in the building was difficult—people kept pinching things for a day or two's hire.

**Q** *How was the shipping organised?*

Rocket Cargo did it—we use them fairly regularly, they take care of the carnets. Palm Pictures were originally going to take it as hand luggage, but there was too much to do that.

**Q** *How much needed repairing upon return?*

It all needed a very good dust down with the compressed air machine, to get the dust, sand and dead

again afterwards. A lot of them ended up sleeping outside, on the sand underneath a tree.

*Why did you use FX Rentals?*

I've always used them and been pleased with their service. If I've ever had a problem it's always sorted out straight away. Five years ago I set up a studio in a house in Manchester in a similar way with the Stone Roses, and we hired an MTR90, Focusrites and stuff, so I'd had experience of setting up a studio like this before, so I sort of knew what I was doing.

locusts off, which I think was John's little joke... That made us laugh.

**Q** *Did you help select the equipment?*

John came in and we talked things over, suggested compressors and EQs and we sent a lot of spares as well, and making sure the cabling was all right. We wanted to make sure we covered every eventuality.

**Q** *How was the dry run?*

That was mainly to try the generators out (they were great)—we like to think our gear is going to work! Then packing it—as few flightcases as possible, and plenty of bubble wrap. Then we delivered it to Rocket.

*How was power supplied?*

A little Honda 50i 1kW generator. I'd phoned Jerry Boys after his sessions in Cuba and Mali and he'd taken a much bigger 3kW unit but he said Honda was the only one to consider. I found this one that was specially stabilised for computer equipment. So we took two of those. We had a dry run at FX, and the generator never strained at all—they were great. We ran all the studio gear, laptops, phone chargers—even the poorest Africans seem to have mobile phones! □

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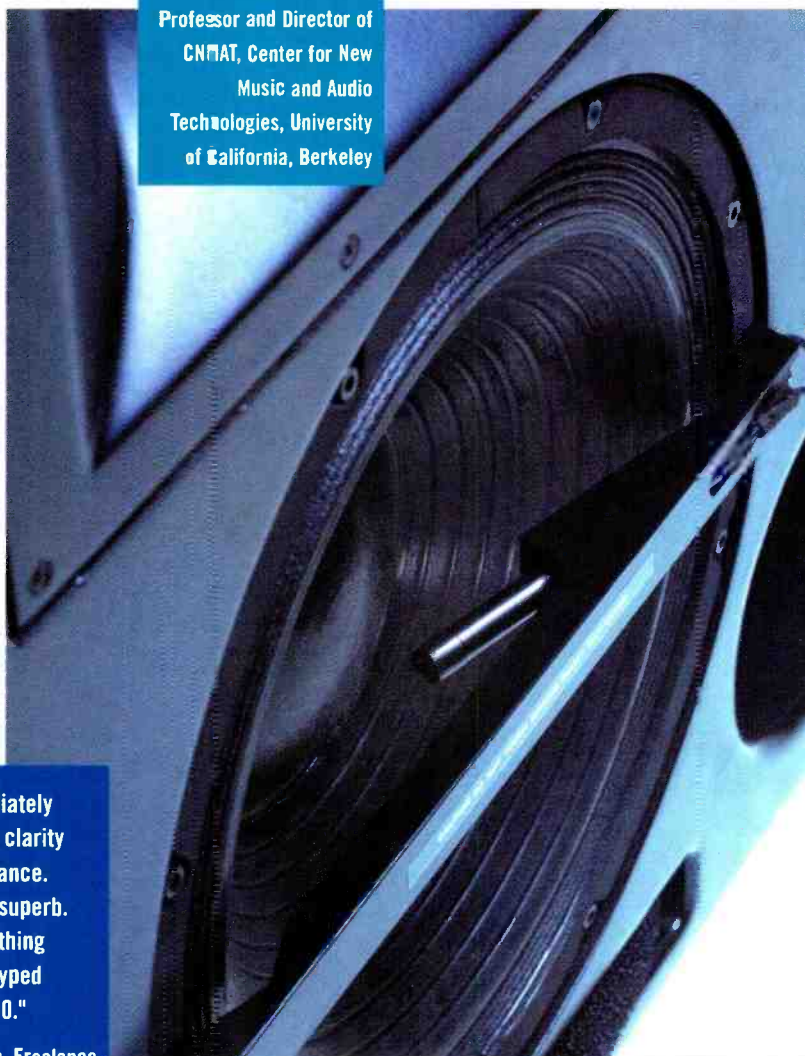
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# SINGLE FILE

The importance of a workable file interchange standard for digital workstations is signified by the tense politics that have delayed its appearance. **Rob James** brings news of AES 31

**I**F A WEEK IS A LONG TIME IN POLITICS, three years is certainly a long time in pro audio—perhaps though par for the course in the rarefied atmosphere of a learned AFS committee. In the September 1997 edition of *Studio Sound* I wrote about Professional Audio File Interchange (PAFI), heralding the creation of an AES sub-committee work group known by the catchy title of SC-06-01.

The standards committee of the AES had announced that its activity relating to computer-based audio had been re-structured in recognition of the number of important issues in this growing field. There were to be four new working groups under sub-committee 06 covering the topics of file interchange, networks, IEEE1394 (FireWire) and Internet technologies. It was proposed that AES 31 xxxx be extended to form a software interchange model for professional audio in four key stages. With the aim of guaranteeing basic audio interchange while providing appropriate sophistication for more complex processes. The key stages were identified as: the physical interchange medium; the soundfile format (to include relevant source data); an edit list structure (for simple project interchange); and an object-orientated project structure (represented by OMF).

The good news is there has been considerable progress. Physical media, soundfile and EDL exchange were demonstrated in a pretty convincing way at the last AES in LA. However, the only standard so far released (December 1999) is AES 31-3—the simple project interchange EDL format. Some would argue that until the second element, the soundfile format, is agreed and, to a lesser extent, the physical interchange medium, it is pointless implementing anything. I believe this is unnecessarily pessimistic. The soundfile format is likely to be a variation of Broadcast WAV and the physical interchange SCSI and these are what the early adopters are using. Because this area is dependent on rapidly changing IT technology, the target is a fast moving one. Progress may appear slow but drafting and ratifying credible standards which actually have some chance of being adopted is an incredibly tortuous process. To quote the legendary Richie Havens, 'The (eight day) mill, it might grind slow, but it grinds fine'. Progress is also dependent on the generosity of individuals and their employers to put in the necessary time and effort for no obvious financial reward.

If successful, the result will be a base standard with clear benefits for users and manufacturers which obviously increases the chance of broad acceptance.

It is important to realise AES 31 xxxx is not intended to replace proprietary formats. If this were the intention the result would probably be too limiting and almost certainly impossible to specify. The benefits to users of a simple audio interchange standard are not in doubt but the advantages to manufacturers may be less obvious. The most oft heard questions are, 'Why do we need yet another standard?' and 'Surely one of the existing proprietary standards could be generally adopted?'

Superficially the latter seems an attractive option—we could simply license a format which appears to fulfil all the desired criteria and the problem is solved. Sadly,

another problem. There is nothing to prevent the original developer radically altering the 'standard' to suit their own commercial and development aims. When this happens, and it does, other adopters are either obliged to spend yet more of their R&D budget to keep up or to place restrictions on what can and cannot be achieved. This all contributes to the morass of interchange problems that many users currently face on a daily basis. The aims of the people involved with AES 31 xxxx are entirely laudable. They are seeking to provide a rock solid, lowest common denominator standard which is extensible enough and flexible enough to allow it to be developed over time as requirements change. The KISS (Keep It Simple, Stupid) principle is essential here, not only to ensure solidity but also to keep the costs of implementation down.

After three years and with only the EDL component in place, the unavoidable question is, is it too little, too late?

Back in September 1997, 'audio only' interchange was a live issue and in some areas I believe it still is. Other 'standards' offering more all encompassing solutions suffer from the problems above (assuming they work in the first place). In any case, they are often massive overkill for the problems we are trying to solve. Simple audio only interchange is just as vital as it ever was in radio and film. In television and the Net (as broad-band becomes the norm) it may not be sufficient although the basic premise still holds good.

Simply recording sound (or data) onto a medium adds value to the medium, and if data about the data (metadata) is present, it adds further value. Metadata may be contained in the file header 'chunks', in a

separate EDL file or both. Still more value is added at each stage in the production process as decisions are made. In many cases this no longer involves re-recording audio. The further into the production chain you go the more desirable trouble free interchange becomes in order to retain as much as possible of the added value.

With any universal system of interchange, unless you know in advance what equipment the destination facility will be using, the amount of useful information is constrained by the lowest common denominators of DAWs—those functions of which even the most basic are capable. However, this is still considerably less limiting than making a 'hard copy' on a linear medium. If viable interchange is not available projects are transferred to linear media. When changes are required they are costly and

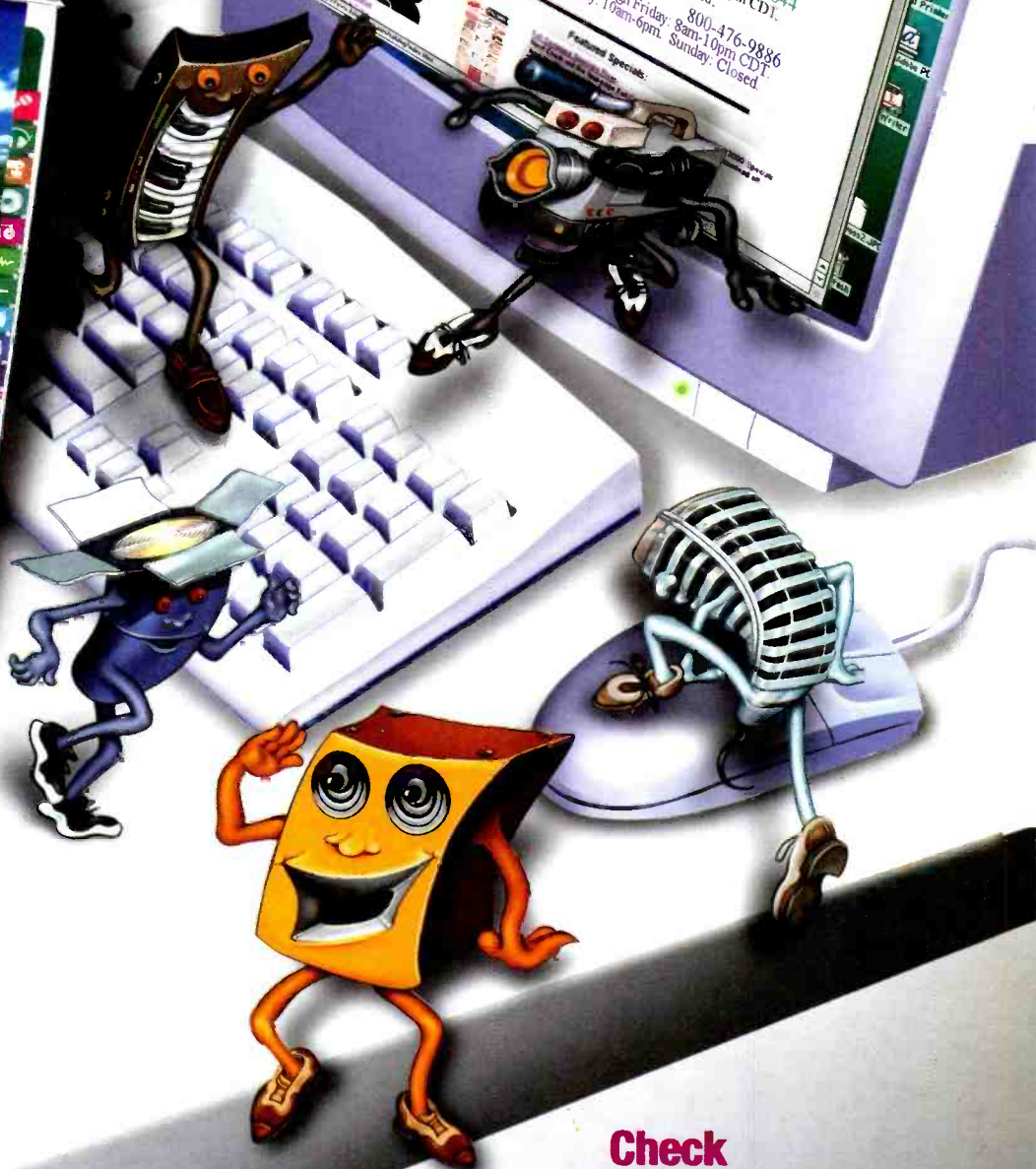


life isn't this simple. For one thing, manufacturers tend to guard their formats jealously, seeing them as a vital part of what makes their products uniquely desirable. Research and development is extremely expensive and there is some truth in the idea that a good deal of the intellectual property in a modern DAW resides in the file and EDL formats. Even when a manufacturer makes a format freely available there can be snags...

We have all smiled at the standards adages; 'I love standards, they pay the mortgage', 'Standards are good, that's why there are so many of them', and so on. Proprietary formats may be extremely complex to implement, requiring man years of effort, often quite beyond the means of many small pro-audio manufacturers. Even where resources do exist to follow this path there is

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# TECHNOLOGY

time consuming and compromises become inevitable. All of which strengthens the case for a 'bottom up' approach rather than another all singing, all dancing standard which would be extremely time consuming to agree and expensive to implement. So 'too little' doesn't apply to AES31 xxxx and in the absence of any viable alternative it cannot be said to be too late.

There are a couple of vital ingredients for success and AES 31-3 has them. The first is an absolute timing reference. All timing in AES 31 is based on sample count. Providing the sample rate is known, sync is guaranteed, regardless of how time is displayed. The second is an extensible EDL which is readable and editable using a simple text editor. Mark Yonge, Chair of the working group, charted recent progress for me.

'The critical core—AES31-3 Simple Project Interchange—was published as an AES standard in December 1999. Since then, several companies have been working to implement the standard. One goal of the implementers' group was the AES convention in Los Angeles. By then, implementation had gone so well that we elected to present a full-dress demonstration of interchange.'

From his notes and discussions with other people present, the display was convincing. A simple sequence of spoken numbers was recorded on a Zaxcom Deva location recorder, and a phone number culled from the audience. The recording was output as a Broadcast Wave file (BWF) onto Jaz disk for physical interchange. This BWF file was then played on a SADiE and edited to match the phone number. The Jaz disk with the original audio file and the ADL description of the edit were then passed to a DAR OMR-8 which replayed the edit faithfully.

A more realistic project with speech, sound effects and music was similarly successful. Some manufacturers offered their perspectives on the progress to date and future prospects.

AMS-Neve is cautiously optimistic. In addition to being the first to demonstrate successful OMF exchange between manufacturers, they have spent a good deal of time and effort on interchange with various other standards. In each case this has been driven by the production process requirements of their clients. When and if AES 31 xxxx becomes an issue for clients they will consider implementing it. DAR's Mike Parker sees the company at the forefront of the campaign for AES 31 having been probably the first company to implement it. 'We participated in the AES 31 event and there seemed to be a lot of interest and support. The event culminated in a suc-



cessful demonstration of a multichannel project moving between a DAR OMR 8 and a SADiE editor.'

Digidesign's response is similar. Cliff Smith, product specialist, says Pro Tools 5.1 supports Broadcast Wave natively on both Mac and NT platforms. Digidesign already supports the OMF format and sees the future of interchange encompassing AAF with the rich possibilities this offers for passing information about sound,

pictures, automation, graphics and so on. If enough of their client base need and request it, Digi may implement the AES 31 EDL format.

Fairlight is on board but sound a note of caution against seeing AES 31 xxxx as a panacea, Chas Rowden commented, 'As founder members of the File Exchange initiative, Fairlight continues to be deeply committed to the concepts and principles of free exchange of audio



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projects created by different digital audio workstations. Short-term solutions to cross-platform compatibility are being resolved by negotiating agreements with other manufacturers for the mutual exchange of file structure and playlist information.

'The universal adoption of a single native format seems inappropriate and unlikely, as the capabilities and architectures of DAWs are too different to be encapsulated in one structure. A far more likely solution is the refinement of a proper inter-format concept allowing transparent movement of audio and a subset of available edit information, which should be carried through within industry-wide forums and ultimately ratified by a relevant standards body focusing on the needs of the user rather than commercial advantage. Fairlight is committed to contributing to and subsequently to implementing such industry standards in a timely manner.'

SADiE managing director Joe Bull has invested considerable time and effort in the project and commented, 'I have a huge amount of faith in AES 31 as a standard and in my opinion it's a pretty good standard as things stand. We (the AES 31 committee) tried to design the standard to be as simple as possible for audio manufacturers to implement. The basic rationale behind the whole project was to have a standard interchange format that was (a) simple to implement (so that no manufacturer would be excluded by having insufficient development resources), (b) reliable (because an unreliable method of interchange is worse than useless), (c) extensible (so that we can accommodate changes as our industry progresses) and (d) nonproprietary (so that no single company can break the standard). There are obviously a few teething problems now that companies are starting their implementations but on the whole I think everyone is fairly pleased so far. At least, we managed to prove decisively during the AES convention in LA that it is possible for manufacturers to interchange material using AES 31 which was encouraging.

'Where do I see things going? One thing that most people fail to understand is how much it costs to develop software. There are obvious economies of scale if you are developing products for the mass consumer or business market (as Microsoft amply demonstrates) but for small niche industries such as ours it becomes expensive to develop software that only a few tens or hundreds of people are going to use in anger. Add to that, most pro-audio users can ill-afford the embarrassment of failing to read data once the session has begun. Avid established the OMF initiative many years ago in an attempt to plug this gap. However, as the Avid software has moved on there is a never-ending list of features that break the OMF specification. Thus an EDL imported into a DAW last week may not work next week.

'Additionally, OMF is a non-trivial feature for most audio developers to implement—one company I know spent over two man-years programming their OMF implementation (which still doesn't work reliably). Unfortunately, AAF will prove (because of its scope) to be equally difficult for audio manufacturers to develop.

'AES 31 has been designed to take a month or so to implement and currently covers the basics of media, file and EDL interchange. There is room within the spec to add features in the future whilst still maintaining backwards compatibility. For example, if in future it is decided to add full-level automation or equalisation data, the basic EDL interchange would still work with an older device. This is a very powerful feature of AES 31. Contrast this with the complexities of multimedia interchange. The interchange formats and proposed formats are object-orientated and fantastically complex to implement and support. While smaller manufacturers cannot

afford to ignore these all encompassing formats they need something more compact and cheaper.'

Readers will draw their own conclusions. My take on it is this that, in the three years since this began, the world has moved on. Despite the lack of any universal standard for audio interchange people's expectations of what a suitable standard should encompass have increased. If this standard succeeds, which it probably deserves to, it is likely to be relegated to a relatively tiny ghetto. As a *lingua franca* it will find a place but, almost by definition, it is not going to satisfy the needs of power users in film. Here, mix automation data and portable plug-in information is already a big issue.

In areas of sound for picture driven by the stock markets, TV and the impending explosion of broadband streaming, the big money is flowing into providing

complex multimedia tools. These help feed the insatiable appetite for ever more whizzy productions at lower cost. The interchange formats which will help facilitate this are beginning to appear and, of course, they include audio.

I hope, for all the reasons detailed here, digital audio workstation manufacturers will be encouraged by their users to implement AES 31 and soon. There are plenty of tasks for which it is eminently suited. It's simple, it's reliable and it works. Success or failure is now in the hands of the users. Despite the time it has taken to get to this point, if enough people are convinced of its advantages they will persuade manufacturers to support it. Given the relatively low cost of implementation and its undoubted virtues, it deserves to succeed. □



## Broadcast Content Management 2001

June 21-22, 2001, British Library, London

### A **TVB**Europe conference Managing media and assets through the broadcast process

**T**VBEurope presents the second annual European Broadcast Content Management conference. Chaired by Editorial Consultant George Jarrett and co-ordinated by Editor Fergal Ringrose, BCM 2001's rich media mix will examine such critical industry issues as repurposing content for different environments; file exchange formats; management software tools to achieve integrated content platforms; integration of broadcasting and webcasting; digital content archives; restructuring internal workflows; and how programme makers are going to engage with data models.

#### The Programme

BCM 2001 will show operations managers how to tackle both media management and digital asset management with its unique mix of industry expertise, experience and analysis. The main topics to be covered will be:

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  - The library — new heart of the facility
  - How to make material fit for its (re)purpose
  - Dare to Share: Moving material around
  - Movement of metadata through the chain
  - Storage formats — the 'digitise-once' dilemma
  - Search for content: Advances in archiving

- Copyright issues in the digital media age
- Any-in, every-out: Enterprise-wide management
- Workflow challenges for iTV content
- Metadata standards: Unmasking the acronyms

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- Web developers
- DVD authoring facilities
- Broadcast consultants
- Television training & education
- Broadcast equipment manufacturers and distributors

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- Chance to visit a great exhibition and take advantage of one-to-one demonstrations of new product

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# Hack in the US of A

The audio industry would do well to follow the fortunes of the video industry's efforts to make its programme material secure, writes **Barry Fox**

**T**HE SECURE DIGITAL MUSIC INITIATIVE is due to announce the results of its watermark hack challenge but there are some background issues that will get lost in the noise. On 15th September last year, the SDMI posted six music samples of watermarked audio on the Internet (later reduced to five) and gave anyone interested two weeks in which to disable the mark without spoiling the music. In all 447 people tried and Princeton University went public claiming success—waiving their eligibility to a cash prize of up to \$60,000 for the privilege. When Princeton spoke out, the SDMI said it was still considering the attempted hacks and would make a statement later. In early November, SDMI executive director Leonardo Chiariglione acknowledged successful attacks on two of the music samples. But only because we asked, we now know that this statistic does not include the Princeton hack.

Says the SDMI, 'Our definition of a successful attack is that the watermark is removed, the removal is done without substantially affecting the quality of the music,



the hacker provides a detailed description of how the hack was done and the hack is reproduced on more music samples'. The Princeton hackers refused to explain to the SDMI what they had done, and did not want to spend further time jumping through more hack test hoops.

'As the Princeton hackers have elected not to comply, the Princeton Group submission cannot be considered for successful attack', says the SDMI. 'We stand by our previous announcement that we were able to defeat the four watermarking technologies', says Edward Felten of the Department of Computer Science at Princeton University. 'We remain convinced that we were able and are able to defeat these four technologies. Our focus has always been on the scientific question of whether the SDMI's technologies, if deployed, could be defeated by pirates. We demonstrated that they could be defeated by making small modifications to the music files so that the watermarks were no longer detectable but the sound quality was still acceptable.

'Instead of the scientific question,' he continued,

'the SDMI has chosen to focus on who is eligible for the cash prize. Since we chose to forego the cash prize in order to retain our right to publish our results, we understand that the SDMI no longer considers us to be entrants in their contest. Their announcement regarding their contest does not invalidate our scientific results'.

After discounting some hacks, including Princeton's, the SDMI has confirmed that two marking systems were successfully hacked. Having in mind that the Verance system is now embedded in hardware chips inside the DVD-Audio players already on sale, and thus cannot be changed, it seems pretty important for the music and audio industry to know whether or not the Verance system was successfully hacked. The SDMI refuses to answer this key question and refers to Verance.

Says Jo Jo Platt of Verance: 'Verance has received a preliminary report from the SDMI testing committee which indicates that all 153 attacks that were submitted against Verance's watermarking technology have failed to meet SDMI's criteria for a successful attack. Verance has not been provided with any information regarding how other proposed technologies have fared in the Hack SDMI Challenge. However, SDMI's technology evaluation and selection process (which includes continued evaluation of the attacks submitted against other proposed technologies) is continuing according to its previously outlined schedule.' So we still do not know whether Princeton hacked the Verance system, because the SDMI has discounted all the Princeton hacks.

Unfortunately the real world works rather differently from the SDMI's rule world. Hackers who want to discredit or defeat audio watermarking will just go ahead and do it, either removing or distorting the mark so that it is undetectable. The video industry already has a good idea of what happens when copy control technology is rushed onto the market.

Panasonic's CSS encryption system, as used to protect DVD movies, was hacked, and DeCSS posted on the Internet. Regional Code Enhancement is a new system developed by Warner to stop American DVDs playing on European players that have been hacked to ignore regional coding. Columbia Tristar is the first company to use RCE, on *The Patriot* DVD which was released in the US at the end of October.

RCE is supposed to stop a disc playing on any player set to Region 0. I tried *The Patriot* on a Samsung DVD 709, set to Region 0 and it played perfectly. The same thing happens with the SMC DVD-330 (as sold by Maplin in the UK), when set to All-Region mode, which SMC calls Region 13. *The Patriot* even plays when the machine is set to Region 2!

A friend in the States ran the disc on four Region 1 players that can be set to Region 0, so that Americans can play European DVDs. *The Patriot* played perfectly on three out of four of the players when set to the supposedly forbidden Region 0. But the fourth player, an Apex 600 as sold by America's largest electronics chain Circuit City, would not play *The Patriot* when set to Region 1. It locks up on the main menu. So Warner and Columbia have succeeded in blocking sales of *The Patriot* to the hundred thousand or so people who have quite legitimately bought Apex players from Circuit City.

Nice one guys.

# Seductive reasoning

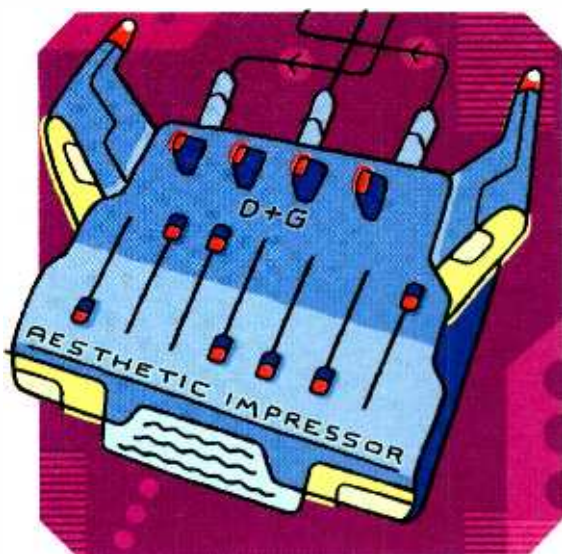
Where form once followed function, the aesthetics of marketing are flourishing; you are entering the era of beautiful audio, writes **Dan Daley**

**Y**OU MIGHT HAVE NOTICED recently that the world of professional audio has become a better-looking place. And I'm not necessarily talking about its citizens. The entertainment industry has always put a premium on good looks—how else can you explain Spice Girls, Shania Twain and David Cassidy? But in the past two or three years, the look of the equipment has gone from utilitarian Socialist Realism to Armani. Check out the DSP Media digital audio workstation, which is totally art troupe: curvilinearly eroded mouldings and a windswept surface. Oh, yes, it also processes signal. In fact, flipping through any trade magazine will produce any number of examples of how good the equipment has come to look.

Beneath the surfaces what we're really seeing is the natural evolution of markets at work. There is more gear than ever before, most of it now in price ranges and retail outlets that are as much or more consumer than professionally orientated. If there were only one type of automobile, there will be only one type of body style. One toaster; one toaster type. But as in the rest of life, pro audio now has a plethora of products, many of which within their respective categories do pretty much the same thing. How do manufacturers differentiate their product lines from those of their competitors in such a landscape? Seduction by aesthetic design.

This has nothing to do with the operational design, or functionality, although ergonomics is an integral part of both performance and aesthetics. But at a time when specifications are all but unseen anymore in pro audio product advertising (and if you're under 25 years old, trust me—there was a time when the spec sheet consumed much of an advertising page), they have been replaced with marketing visions of which the way a product looks is part of the overall vision to sell that product. You are, in the eyes of marketers, no longer engineers; you are consumers.

Thus, it's inevitable that design becomes a critical component in sales and marketing strategies under these circumstances. What starts as a utilitarian box designed solely for the purpose of holding the technology that is the object of the initial design (the typical black box) mutates naturally and progressively to one in which style and substance are balanced (the Sony Oxford, for instance), then to one in which the medium is the message (any Pro Tools plug-in). An environment in which—to use an old but visceral and very useful trope—a Cadillac's fins, not its mechanics, define its presence and desirability. This is eminently apparent in virtually every mature industrial sector, from automobiles to toasters, all of which have reached stages in which they have achieved 'collectable' status by virtue of their aesthetic design, not their



functionality—you don't pull the old Jag out of the garage to pick up groceries. And the hollow shells of 1950s-vintage Fender amps now adorn corporate waiting rooms and *Esquire* adverts.

The automotive trope is a subliminally pervasive one. As John East, a design engineer with Sony and a veteran of the Oxford project, told me once, 'We were conscious of [the Oxford's] aesthetics from the start... we wanted to make it pleasing to the eyes. It's actually like a car—you have to be taken to it by mere physical appeal. That's critical to selling it. Think about it: you may have driven to the studio in a Porsche or a Mercedes Benz, and the console itself is at the centre of a very expensive and often beautifully designed complex. In that kind of context, how do you say, "Buy me?" That's the same process that goes on mentally and emotionally with a fine car.'

At least half the products in this magazine have an obvious and purposeful aesthetic appeal: the PMC active monitor has a cool blue hue that's borderline day-glo; Trident's MTA Series console has a muscular Art Deco motif reminiscent of a streamlined locomotive or a Duesenberg fender; Focusrite's various series of signal processors use primary colours both to categorically segregate and to visually scintillate; XIX's processors have a post-modernist Pop Art look.

Even the products which have hewed to the more quotidian approach to industrial aesthetics have at least added features which have as much to do with appearance as performance, such as shaped plasma displays. And those which are still simple black boxes have at least adapted their advertising appearances. Under the right lighting, anyone can look good. (And we won't even get into why pretty girls are chosen to display microphones.)

This is marketing pure and simple, and the depth of its shadow is readily apparent—and will become more so as the business goes increasingly virtual—as more products have to be represented iconographically. Software simply doesn't lend itself to beauty shots. And beyond the icon is the brand; some companies occasionally eschew the product altogether and instead simply present the brand itself, like Neve's stylistic 'N', which has been appearing of late taking up an entire page.

There's nothing wrong with this new emphasis on aesthetics but it's useful to be aware that more than your mathematically inclined frontal lobes are being appealed to these days. You are being seduced by design. And like most seductions, it can be an enjoyable experience, if you keep your wits about you.

## Net working

Networking systems optimised for audio and AV use are not new, but it is only now that the technology and the willpower have found sync, writes **Kevin Hilton**

**T**IMING IS EVERYTHING. In high-tech it is crucial. Introduce something too soon and you could be superseded by faster, newer technologies. Come to market on the backs of others and, if your system is not substantially better and does not offer expanded features, then you are just going to get lost in the crowd.

In the last few months, a name has been cropping up in conversations I've been having about the potential of the Internet to connect production centres and create the so-called virtual studio. Rocket Network got a lot of coverage during the second half of last year but I and others were reminded of another earlier company that set out to do similar things.

SohoNet was established in 1996 by 11 central London postproduction facilities VTR, the Moving Picture Company, Cinesite, Smoke & Mirrors, Media Channel, The Tape Gallery, The Mill, Framestore, The Computer Film Company, SVC and Visiontext—with the aim of developing modern communications services to satisfy what were perceived as the constantly evolving demands of postproduction facilities, advertising agencies, film makers and video producers. The aim was an occasional, dial-up connection that was cheap, easy to use and enabled more to be done than just squirting a tape down the line. In 1992 soundtrack mixes were fed to studios in Los Angeles from the Skywalker Sound post facility in Northern California. Skywalker's general manager at that time, Tom Koybayashi, went on to found his own company, ednet, to develop these connections.

The intention was to build a world-wide private network but, judging from ednet's website, it is still confined to North America. Back in 1993-94, others experimenting with the new communications technology included producer Steven Bochco; *NYPD Blue* soundtracks were passed around using Dolby AC-2 on Pacific Bell's ABVS or T1 digital fibre.

Then there were attempts to form international networks based on ISDN. One-time *One to One* editor Bill Foster set up the Audio Exchange, linking a number of postproduction facilities in Europe. This was a direct precursor to SohoNet and similarly faded into the background. But the SohoNet name stuck in people's minds.

Rocket Network was founded in 1995 with more of a music bias, while SohoNet was always aimed at the video and film postproduction sector. Rocket Network is now looking at the audio post market and so stirred memories of SohoNet during its big publicity push during what laughably passed for the British summer last year. When Storm Telecommunications admitted that it had looked at SohoNet as a model for its own switched optical network and 'content warehouse' in Frankfurt, the name cropped up again.

Journalists and facility people discussing the subject mostly seemed to think that SohoNet had collapsed or just faded away. It certainly seemed that with Rocket's new profile (and the backing of Avid and Microsoft co-founder Paul Allen) and the emergence of broadband services from BT, Storm and other telcos

that SohoNet would be facing tough competition if it were still operational.

As is common in this kind of story, just when you think something is a dead-end, it suddenly comes back to life in your hands. SohoNet was still around but leaped back into the fray during November with the news that it had been acquired by telecoms provider Inter Digital Networks (IDN). Headed up by former UK government minister Lord Young and ex-BT executive John Wheeler, IDN is currently rolling its broadband network out of London to cover the rest of the UK.

SohoNet's low profile is apparently explained by a period of consolidation and investigation of other markets. Managing director Gareth Wredden says that the company considered its technology to be proven and wanted to turn it into a commercial viable venture. 'Our fundamental concern was to ensure that we were partners with a network provider that could give us the necessary backbone and shared our philosophy.' With 20 participating facilities in Soho, the company has been concentrating on the international market for the past 18 months but is now to roll out across the UK.

ISDN's national network is based on Dense Wavelength Division (DWDM) technology and is intended to give multiservice, terabit capacity. The company is specifically targeting the media and entertainment sector; as well as inter-studio connection and virtual studio working, it is looking to provide video and audio on demand services.

While some facilities are welcoming the services provided by such as Rocket and SohoNet, others appear happy with ISDN. Number 4 Sound Recording and Design, the audio post arm of Windmill Lane Pictures, is using the transfer of WAV files for demos and pre-mixes but, like many, does not yet feel the need for a virtual studio.

All of which is healthy. Technology should bring choice and technology providers should not expect instant approval. As the brief history of content exchange and on-line working proves, new technology takes time to consolidate, which can make life difficult for those companies that champion it. And just because the concept is now more widely accepted does not mean that life will get easier. For any of us.



# PRO TOOLS

The Earth cooled, dinosaurs came along... and then Digidesign started. For those with a deeper interest in how Pro Tools came about, Digidesign's **Cliff Smith** has a story to tell

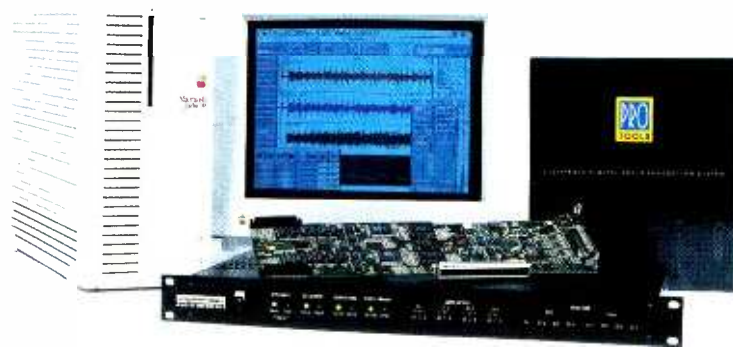
**H**ISTORY QUIZ: which was the first drum machine to playback 'real' 8-bit sampled sounds? For the younger reader, it was the Linn LMI and the classic combination of the LMI and the Fairlight Series IIx sampler were the mainstay of big money recording studios and producers throughout the late eighties. Other machines followed, the Drumulator from E-mu, Sequential Circuit's Drumtraks. All had one thing in common, they used EPROMS to store their sounds and these chips were mounted in ZIF (zero insertion force) sockets so that they could be changed. This gave these machines great flexibility and an industry was born—third-party companies producing sound library chips. It's late 1983 and

development as front end software for hard-disk recording that it will be best remembered.

It's 1988 and Digidesign introduces SoundTools 1, a 2-track hard disk recording system comprising a DSP card that fits into a Macintosh, an external AD In box (audio converters) and the Sound Designer software. It's worth looking at this configuration as the design of the system will still be with us 12 years later. First there's a card inside the computer that has all associated DSP, memory and I-O circuitry, second the audio converters are well away from the interference of the CPU and last, the front end software runs on the card itself. In 1988 CD mastering is expensive, you either need a Sony 1630 system with a bunch of turbocharged U-matic tape

an entire studio in a box. However something like this needs a sequencer to bring all the elements together, so in come the audio sequencers. Legend has it that a lunch between a Digidesign programmer and an Opcode programmer gives birth to an idea that culminates in Opcode's Studio Vision, its audio and MIDI sequencer package, and launches the audio sequencer idea.

It's 1991 and Pro Tools v1.0 is launched in Strongroom Studio in London. The system follows the tried and tested configuration of DSP card, external converter (4-channel analogue I-O with AES-EBU and SPDIF I-O) and the software. In this case there are two pieces of software, Pro Edit made by Digidesign and Pro Deck made by OSC. It records and plays back four



two smart guys from a university dorm, Peter Gotcher and Evan Brooks, introduce Digi Drums, a complete set of replacement chips offering some of the classic rock drum sounds for these machines—Digidesign's first product.

It's now 1987. Business is good and a small range of products is available: Qsheet, a MIDI-based event list that runs against time code, allows users to embrace the new-fangled world of MIDI and MIDI-based samplers and run them against a picture for adding sound effects. Softsynth, a software based additive and FM synthesis program is the forerunner of today's world of software based host synths.

Now lets take a look at the rest of the world. MIDI has arrived and with it low-end samplers that can send their 8-bit samples over MIDI to one another. The Macintosh is the choice for American users, but in Europe they are going wild over Atari STs and Cubase Pro 24, so Softsynth became available for Atari also, not a Windows machine in sight. Three years later Softsynth is joined by Turbosynth which did additive, subtractive, FM and even phase distortion synthesis. Another product Sound Designer is born during this time. This allows a sample to be downloaded from the sampler via MIDI sample dump or via SCSI which is native on all Macintoshes and some of the samplers. Sound Designer takes all of the difficult sample editing from the LCD of the samplers and onto the big screen of the Macintosh and Atari. It develops into a very powerful editing tool, and is available for a wide range of samplers but it will be for its

machines or a hard disk system such as Sonic Solutions, both costing around the price of a small house. Suddenly it all changes—Sound Tools arrives and the cost of hard disks started to drop.

We live in an age where drives are measured in gigabytes, but back then a 320Mb disk was expensive. By 1990, 660Mb disks have become cost effective if you call around £2000 (UK) cost-effective. Digidesign has introduced its own range of hard disks called Pro Store. The new bigger drives allow a whole CD to be mastered on one hard drive. A year earlier in 1989 the DAT I-O had been introduced to allow users full AES-EBU or SPDIF I-O to the system, advances in A-D and D-A technology now gave us 18-bit converters in the form of the Pro I-O. As I said before Macs in Europe are not popular, so Sound Tools is launched on the Atari Mega4 platform. More difficult to install than its Mac counterpart, which at this point was a Mac IIci, the Atari needs a DMA SCSI option to work but does offer two mouse buttons for editing and the ability to record to the new range of Sony 650Mb optical discs.

All this new hardware is aimed at people with a reasonable amount of money, however Digidesign introduces three products that together form what is marketed as Studio D. The Audiomedia I card is a 4-track, stereo analogue I-O card, the Samplecell I card, a 16-voice, 16Mb sample playback card and Mac Proteus, a fully-fledged E-mu Proteus on a Nubus card. Take these cards and put them in the three slots on a Mac IIci and you have

tracks of audio, you can do basic mixing (there are two sends per channel) and you can add two different EQ filters to each track. At the same time Sound Tools II ships with an updated DSP card and the same new 4-channel interface as Pro Tools. A year later a 20-bit audio interface called Pro Master 20 is introduced for Sound Tools II as the first affordable 2-track 20-bit editing system.

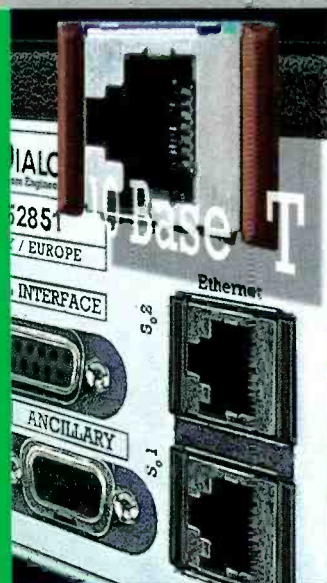
It's 1992 and the next upgrade for Pro Tools v2.0 is out. Pro Deck and Pro Edit get rolled into a single application and with the addition of a 4-channel upgrade you can record 8, 12 or 16 tracks of audio. The only problem is that you need some fast SCSI communication to transfer this amount of data and the onboard Mac SCSI can't handle it, so in steps the System Accelerator SCSI card developed for Pro Tools by Grey Matter Response. To get a system like this you need a 5-slot Mac, the king of these is the highly-prized Mac IIx which is then replaced by the Quadra 900 and shortly after by the Quadra 950.

Many people start to use Pro Tools alongside their multitracks so the SMPTE Slave Driver is introduced to compliment the Video Slave Driver from the year before. Under the bonnet other work is going on—the software gets ripped in half, the main application, Pro Tools, is the same but the engine or in this case the Digidesign Audio Engine (DAE) is separated to run underneath the main application. Why? Very simply, any other software manufacturer can now use a basic protocol to talk to the DAE and drive the Digidesign

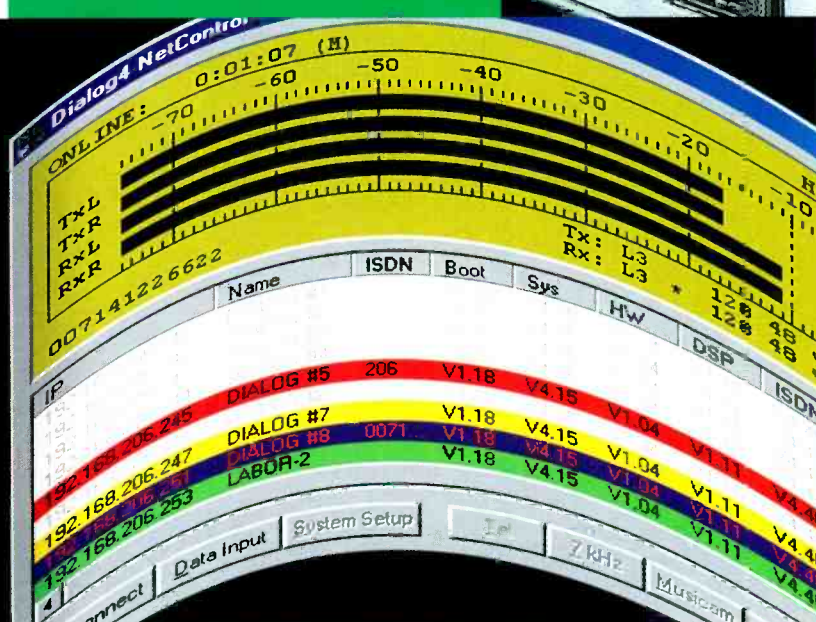
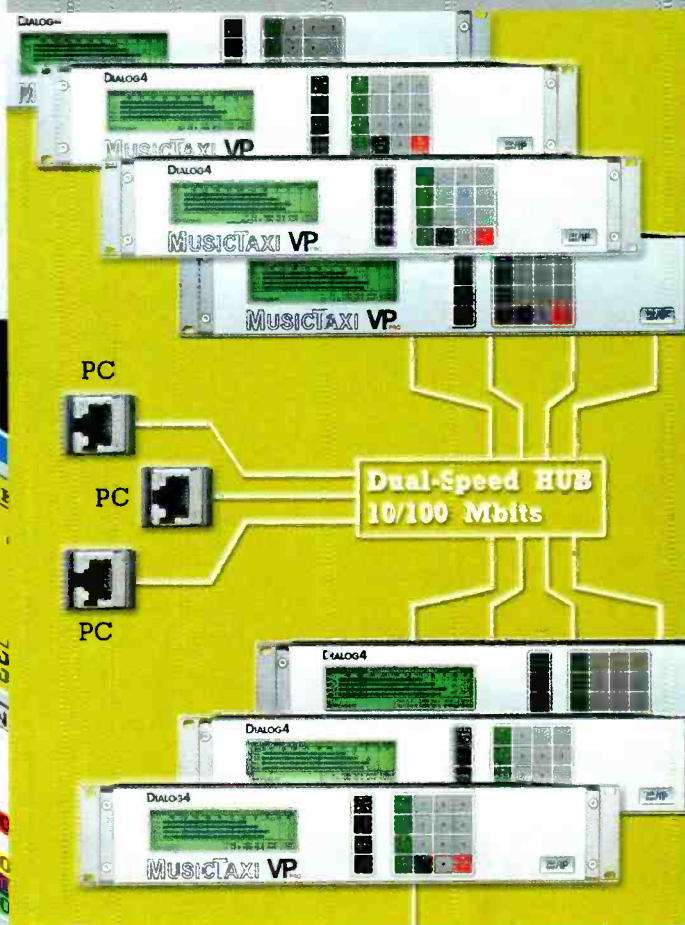


# AUDIO OVER IP

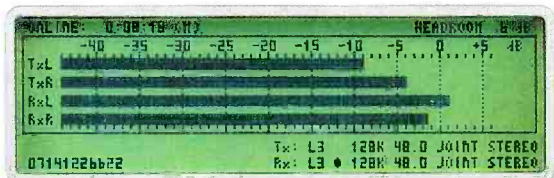
Join the Codec Connection and work with MusicTAXI VP-PRO TCP/UDP/IP - the first full duplex audio codec with ethernet access!



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hardware without worrying about DSP coding or programming. A new range of Audio sequencers were developed to use the DAE, Digital Performer, Cubase DAE and of course Studio Vision.

Those of us without a three-album deal see a new version of the Audiomedia board, now offering digital I-O and better quality converters. More importantly the first Windows product, Session 8 PC. Designed to be the all-in-one studio, it features a 3U-high interface that has mic amps, aux sends, cue outputs, and even tape returns. Coupled with the R1, a MIDI remote mixing surface, the Session 8 PC system is an 8-track digital personal studio strapped onto a PC. The software looks like and operates similarly to Pro Tools, even having a patchbay window for routing signals around your virtual studio.

It's 1994 and Digidesign UK opens offices in Putney. At a press event during the APRS exhibition Digidesign shows v2.5 of Pro Tools with extended DSP cards, complex mixing, routing and processing. More importantly the concept of plug-ins is unleashed. All this new processing is being offered by a new card; the DSP farm, rather than a single Motorola DSP chip as on all previous audio card cards, the DSP farm has four chips just for processing. The new DSP card connects to existing audio cards via a small ribbon cable using a protocol called TDM, or Time Division Multiplexing—a protocol was originally developed for the telecommunications industry.

If you have a full Pro Tools system, you're looking at finding a home for a lot of cards. A 16-track Pro Tools is comprised of five cards and each now has a piggyback board to connect to TDM, then three or four DSP farm cards to get a good level of mixing and then the Samplecell II card that is now upgraded to 32 voices and 32Mb of RAM can also be connected to TDM to allow any sample to be processed via the Pro Tools mixing environment with all of its associated Plug Ins. An Expansion chassis is introduced to house up to 13 cards. Another product is also shown: Post View, the forerunner of the AV option and AV XL option. This simple software addition gives you machine control via Sony 9-pin and the ability to import and playback QuickTime movies, frame accurate inside the Pro Tools session. Using QuickTime means that a range of qualified QuickTime cards can be added to Pro Tools (more cards) and composite or S video plays back at reasonable off-line quality.

The Pro Tool VIII system is getting large, with many connections, cards, piggy-back boards and is in some cases prone to heat problems and doesn't like to be moved. In VIII all that changes and, unlike all other versions, this is a hardware and software upgrade. The DSP farms stay but all four audio cards and the System Accelerator merge into a single card, the Disk I-O card. It doesn't just replace the 16-track system as up to three Disk I-O can be installed to give a 48-track system. Also comes the idea of upgrades, users are able to trade in their old cards and get money off the new hardware. They can even keep some of their old hardware and audio interfaces for extra I-O.

This new card needs interfaces: 16-bit 888 and 882 interfaces, and the ADAT interface—which gives full digital transfer (light pipe) and machine control of any ADAT with sample-accurate transfers and synch.

Software is coming thick and fast too, Masterlist CD allows users to burn CDs or DDP (8mm tapes) of Red Book standard CDs, Post Conform offers autoconform of standard CMX EDLs. Session 8 Mac is born, similar

to Session 8 PC again using a distilled version of Pro Tools software. More importantly, major manufacturers are starting to become interested in the future of plug-ins. Digidesign has released D Verb but by 1995 Drawmer and Dolby have released software plug-ins, CEDAR has a Nubus TDM card, and Lexicon has released the NuVerb card that again hooks into TDM.

Meanwhile, Apple have hit hard times, they have had several CEO changes, Windows is hitting the business market with Win NT, and they are expensive computers. Apple has to change and one thing it can easily do is streamline manufacturing and move from Texas Instruments NuBus technology to the newly-emerging PCI interface that is sweeping the PC business. Almost overnight all Macs become PCI machines, the old cards don't fit, so 1996 is really a year of releasing PCI versions of all current hardware. Pro Tools III PCI features an updated DSP farm that offers x1.5 the amount of DSP and the ability to add interfaces direct to the DSP Farm.

To my mind Pro Tools v4.0 was a real turning point in Digidesign's history as it laid down the foundation for making Pro Tools what it is today. As a single software release it enhanced virtually every area of the program, not only could you automate faders and pans, but any Plug Ins could be automated in real time, you could edit all of this automation on screen. The editing tools expanded, with the pencil tool, so that you could now draw the actual waveform on screen to remove clicks and pops. There was also the hint of what was to come—a prototype of a product that wouldn't be seen again two years—Pro Control.

It's 1997 and Digidesign released D24, a new audio card that offers 32 tracks of 24-bit record and playback and has it in the shops within two weeks. As well as D24 the 888 and the 882 gets new versions, the 888 24 is a redesign with new Crystal 24-bit A-Ds and D-As, while the 882 20 gets 20-bit converters and a redesign of its filter section.

The following year Digidesign releases more new hardware in the form of Mix cards. For the first time the Audio card and DSP are brought together in a single PCI card featuring six Motorola Onyx chips. These cards bring a massive increase in real-time 24-bit mixing DSP. But at the same AES show the key to Pro Tools mixing is shown—Pro Control.

Not forgetting the, not-so-flush people, Digidesign release Digi 001. This new product even has its own web site and stand at the AES show in 1999. A 24-track, 24-bit recording system in a box, it's a product that harks back to the very roots of products like Session 8 PC and early Pro Tools, but with modern manufacturing is available at a tenth of the price.

So here we are at the end of 2000, the world hasn't ended, computers haven't all failed and planes aren't dropping out of the sky any more often than usual. Digidesign is a wholly-owned subsidiary of Avid Technology, based in Palo Alto California, the technology heartland of America. The headquarters employs around 250 people and occupies the building where the female contraceptive pill was developed. Ironic really as any woman will tell you, give a chap a Pro Tools and you won't need to worry about contraception.

Pro Tools v5.1 is about to ship as a major software upgrade that takes it one step further to becoming a truly integrated production platform for music, radio or postproduction. □



# GAMMA

Given that CRTs are going to be around for a while yet, **John Watkinson** argues that it makes sense to understand something about them and how they relate to the subject of gamma

**W**HILE NEW AND EXCITING DISPLAY technologies emerge, the good old CRT ploughs on delivering more accurate colour, better signal-to-noise ratio and better motion portrayal than most, at a surprisingly low cost. The main drawback of the CRT is that it is heavy because it has to withstand the forces due to the internal vacuum. The CRT cathode is coated with a barium compound and contains an insulated heating element that raises its temperature. This heating causes the coating to emit electrons. The electrons have negative charge and so are attracted towards an anode that is supplied with a positive voltage. Between the cathode and the anode is a wire mesh grid. If this grid is held at a suitable negative voltage with respect to the cathode it will repel electrons from the cathode and they will be prevented from reaching the anode. If the grid voltage is reduced the effect diminishes and some electrons can pass. The voltage between the grid and the cathode controls the current.

The anode contains a hole through which the electrons emerge in a beam. They are further accelerated by more electrodes at successively higher voltages, the last of these being the EHT (extra high tension) electrode which runs at 15kV-25kV. The electron beam strikes the inside of the tube face, which is coated with material known as a phosphor. The impact of energetic electrons causes electrons in the phosphor to be driven to higher, unstable valence levels, and when they drop back, photons of a specific wavelength are released. By selecting phosphor materials white light or light of a primary colour can be obtained. The intensity of the light is effectively controlled by the intensity of the electron beam which is in turn controlled by the grid voltage.

The relationship between the tube drive voltage and the phosphor brightness is not linear but an exponential function where the power is known as gamma. The exponential power is the same for all CRTs as it is a function of the physics of the process and it has a value of around 2.8. Since all CRTs exhibit gamma, traditionally all video signals are pre-distorted by an inverse gamma, so that the overall transfer function between light entering the camera and light emitted by the CRT is more linear. Fig.1 shows the principle. It will be shown here that CRT gamma is not

a nuisance but is used to enhance the noise performance of a system.

CRT-based displays are nearly always fitted with two controls, typically (and erroneously) marked brightness and contrast. Fig.2a shows how the 'brightness' control works. When correctly set, the lowest drive voltage—blanking level—results in the electron beam being just cut off so that the CRT displays black.

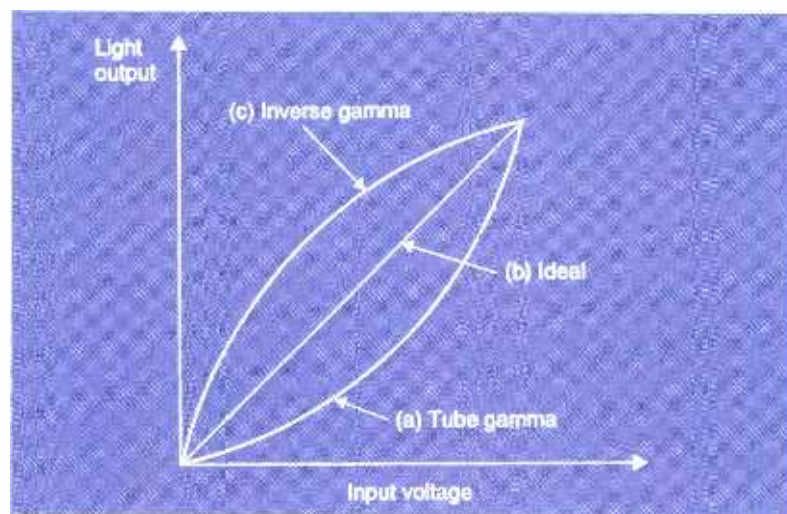
If the brightness is set too low, as in Fig.2b, the CRT cuts off prematurely and all inputs below a certain level are reproduced as black. The symptom is described as black crushing. If the control is set too high, as in Fig.2c, video blanking results in a substantial light output such that all displayed images are superimposed on a grey level.

It should be clear that there is only one correct setting for a brightness control and so its name is somewhat misleading. In fact it is a tube bias control. In order correctly to set a brightness control the grey stepped scale of a test card is used. The brightness control is advanced until the black part of the scale appears obviously grey, and then it is turned down until the black part of the scale is just displayed as truly black, but not so far that the darkest grey step next to it becomes black as well. Once set in this way the CRT is correctly biased and further adjustment will only be needed if component values drift.

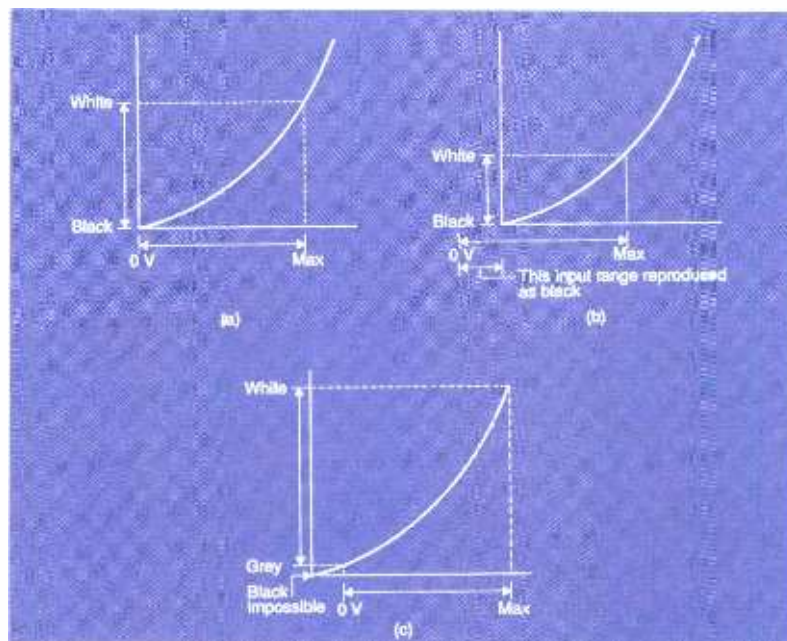
The action of the contrast control is shown in Fig.3. This has the effect of increasing the amplitude of white signals while leaving black level unchanged. Thus in order to increase the brightness of a correctly biased display, the contrast control should be advanced. If the contrast is excessive the electron beam becomes larger in diameter and the resolution of the display is reduced.

In practice, the contrast of a CRT is also affected quite badly by ambient lighting. With black input voltage cutting off the beam, the brightness of a CRT cannot fall below the brightness of reflected ambient light. Thus ambient light reduces contrast. For best results CRTs should be viewed in subdued lighting where the best combination of contrast and resolution will be obtained. Interestingly the subjective assessment of sharpness is a function of contrast. If the contrast is improved, the picture looks sharper. In early CRTs the space between the phosphor dots was grey. Later tubes replaced this with black in order to reduce reflection of ambient light and thereby increase contrast and apparent sharpness.

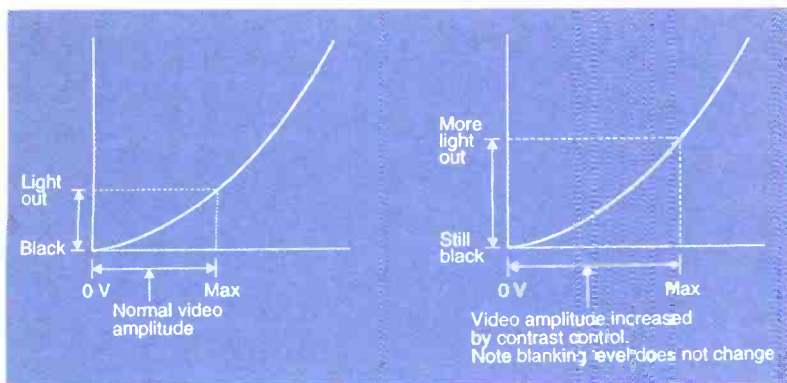
It is well worth spending a little time adjusting the controls of a CRT and ensuring that the ambient lighting is controlled. It's surprising how much difference this makes. The money spent on a grade one monitor



**Fig. 1: The nonlinear characteristic of tube (a) contrasted with the ideal response (b). Nonlinearity may be opposed by gamma correction with a response (c)**



**Fig. 2: (a) Correctly set brightness control cuts off the electron beam at blanking level. (b) Control set too low causes black crushing. (c) Control set too high causes grey pedestal on picture, spoiling contrast. Brightness control is a misnomer as it has only one correct setting**



**Fig.3: Action of contrast control. Paradoxically, the picture is made brighter by increasing contrast**

is effectively wasted if the quality is destroyed by poor adjustment or an unsuitable location.

The contrast sensitivity of the eye is defined as the smallest brightness difference which is visible. In fact the contrast sensitivity is not constant, but increases proportional to brightness. Thus whatever the brightness of an object, if that brightness changes by about 1% it will be equally detectable.

The true brightness of a television picture can be affected by electrical noise on the video signal. As contrast sensitivity is proportional to brightness, noise is more visible in dark picture areas than in bright areas. For economic reasons, video signals have to be made nonlinear to render noise less visible. An inverse gamma function is imposed at the camera so that the video signal is nonlinear for most of its journey. Fig.4 shows an inverse gamma function. As a true power function requires infinite gain near black, a linear segment is substituted. When this is done, it will be seen that con-

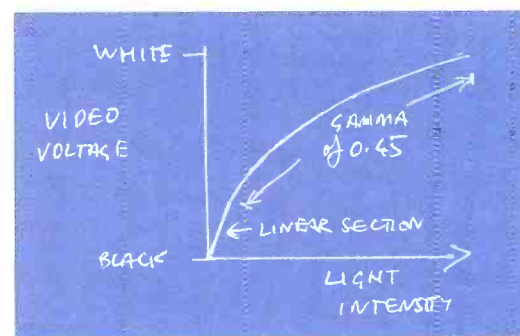
trast variations near black result in larger signal amplitude than variations near white. The desirable result is that noise picked up by the video signal has less effect on dark areas than bright areas. After the gamma of the CRT has acted, noise near black is compressed with respect to noise near white. Thus a video transmission system using gamma correction at source has a better perceived noise level than if

the gamma correction is performed near the display. In a conventional TV or video monitor, the gamma characteristic of the CRT is put to good use as a signal expander or lineariser. It is a happy but pure coincidence that the gamma function of a CRT follows roughly the same curve as human contrast sensitivity. It is widely thought that gamma is used in television simply because of the characteristics of the CRT but this is not the case. In fact it is used for noise reduction. Without gamma, vision signals would need around 30dB better signal-to-noise ratio for the same perceived quality and digital video samples would need five or six extra bits. Thus even if the CRT had turned out to be perfectly linear, inverse gamma would still be needed at the camera, but it would require to be removed just prior to the display. In fact, this is exactly what happens with some types of display.

In practice the system is not rendered perfectly lin-

ear by gamma correction and a slight overall exponential effect is usually retained in order to further reduce the effect of noise in darker parts of the picture. A gamma correction factor of 0.45 is commonly used in television to achieve this effect. Beware, however that in the computer industry there appears to be a widespread belief that gamma is an arbitrary variable. Some graphics packages assume bizarre values which need correction for proper display.

The presence of gamma correction makes all video nonlinear, yet most video processes assume it is linear. The result in theory is distortion, whereas in practice the problem is not as bad as might be expected. Whilst no-one could get away with this kind of thing in audio, in video it is the norm. One reason why it works is that in a typical video signal the amplitudes of high frequencies are quite small compared to the DC component or average brightness. Over a small range a curved transfer function is almost linear. However, for precision work it will always be better to return to the linear light domain. □



**Fig.4: Inverse gamma function with linear section near black**

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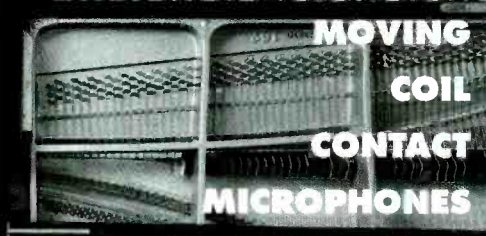
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13-16

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## Heated debate

SPECIALISING IN THE repair and restoration of valve microphones, I read with interest the article concerning the new Groove Tubes GT AM40 Valve microphone (*Studio Sound*, October 2000), looking very similar to the old AKG C28 series. However I should like to correct Mr Jon Thornton on a few aspects in his review.

Mr Thornton states that the valve used in the AM40 has a plate voltage of 6V. The 'plate' voltage is an American term for 'anode' and I fear that 6V would be of little use. However the valve 'Heather-Filament' could ideally require 6V.

With respect to 6V versus the more usual 12V. Well, some valves have a heater voltage of 6V (6.3), some at 12V (13), this often depends upon the wiring of the heaters for example series or parallel. There are numerous other values of heater voltages for other types of valves. So there is no real 'usual' voltage.

Mr Thornton appears to say that the 'thermal self noise' generated by a valve with a 6V heater, will be a half of, or less than that generated by one with a 12V heater, because it runs cooler. This is not correct. The 'thermal self noise' generated by a valve with a 6V heater will most likely be the same as that generated from a valve with a 12V heater.

Most valves that require 12V for the heaters are 'double triodes' which utilise two heaters, such as the 12AY7 used in the AKG C24, but only one of the sections is used per audio channel and the dissipation of the heater within that single section of the valve will be half of the total required by both. Therefore the level of 'thermal self noise' will be split equally between the two sections/audio channels. The same, 12AY7, valve is used in the original AKG C12, where only one half of the valve is used and only the respective heater is required. Therefore requiring only 6V. The 'thermal self noise' however, will be the same in the C12 as in the C24.

It's all down to 'cathode emission', the ability to move electrons from the skin of the cathode through to the anode, via the grid(s) that control the rate of flow. The design of the 'cathode' and the optimum heater 'wattage' will decide the actual 'thermal self noise' figure. If this was not the case, then valves would not operate correctly for example the EF14, VF14 and UF14 all have different heater voltages-current ratings, but all heaters have the same energy requirement that is 'wattage', to give the 'cathode' the correct rate of 'emission' thus allowing the electrical characteristics of the

valves to be the same, although their heater voltages are different.

Keep up the good work, as usual an excellent read.

**Ashley C Styles,  
Saturn Sound Recording  
Services, UK**

### Jon Thornton replies:

Mr Styles is quite correct—a plate voltage of 6V would be of little use to anybody—the reference should of course have been to the heater voltage. He is also rightly pointing out that the thermal self noise characteristics of a valve device are not simply a function of the heater voltage, but rather a combination of factors including the power consumption of the heater and the efficiency with which electrons can be moved from the cathode to the anode.

The particular device used in the AM40 microphone is based on a military spec version of the 5840 pentode valve—manufactured originally, I believe, by Mullard, and configured as a triode by connecting the second grid to the anode. The data sheets for the 5840 indicate a heater voltage of 6.3V with a current of 0.15A. The 12AY7 Mr Styles refers to indicates a heater voltage of 12.6V with a current of 0.15A, or 6.3A with a correspondingly higher current of 0.3A. In terms of heater 'wattage' then, the AM40 will run relatively cooler than might be the case with valves that have a higher power consumption for the heater—for example the 6AU6A used in Sony's C-800G, which unusually features a peltier effect cooling device to lower the ambient working temperature of the valve.

Clearly there are a host of other factors including the design of the envelope, efficiency of the cathode and anode design that might contribute to the overall noise characteristics of a microphone, which Mr Styles is absolutely right to make clear.

## We're gorgeous

JUST A QUICK NOTE to say that I think the new style *Studio Sound* looks absolutely gorgeous—well done. It gives a far better impression of the industry and I'm pleased to see that some advertisers are also producing more creative looking ads too. This overall facelift gives the magazine a 21st Century image that our business sector deserves. A comment about the variable and enjoyable content should also be made, not that there was very much wrong with it in the first place.

I shall look forward to receiving my monthly copy.

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# THE WISH LIST

< Continued from page 86

**EQs; 2 x Urei Notch filters; 6 x Vintage Pultec prog EQs; 6 x Manley prog EQs; 3 x Summit stereo prog EQs; 3 x Focusrite Blue ISA EQs; 2 x Klark-Teknik 361 stereo graphic EQs**

'Chiswick Reach is a small English company, and it makes a stereo valve compressor that goes to 11, so it's got to be good. I use it over my drums with a stereo valve equaliser as the sub-group mix.

'The Prism compressors—and also the EQs—are fantastic. They're generally used in mastering, and although their sound isn't that evident, if you remove them you suddenly become aware of what's missing. The EAR, on the other hand, is a really powerful, huge-arsed compressor that gives things character, while the Manley is also fantastic, with its own design, own character and a different sound to everything else. You see, all of the compressors that I've chosen do have a sound and a character to them.

'The EQs are all personal favourites: The Manley is a copy of the Pultec, and the closest one that there is, in my view; the

Summit is very warm, with a clear, bright top end; I like the Focusrite Blue because sometimes it's necessary to give a thing some "nutty wellie", where you can't be subtle about it; and the Klark-Teknik, like the Urei filter, is for correcting things.'

### Microphones:

**8 x Vintage Schoeps; Schoeps spherical dummy head stereo; 4 (to infinity) x Telefunken U47 valves; 6 x Manley valve ref mics in brass finish; 4 x Coles STC ribbons; 8 x Neumann U67 valves; 8 x U87 fets circa 1970-75; 4 x U84 fets circa 1970-75; 4 x KM84 fets circa 1970-75; 4 x Sennheiser 421s; 4 x 441s; 4 x Electrovoice RE20s; 6 x Shure SM57s circa mid-70s**

'I already have a collection of vintage Schoeps. They're great for cymbals, strings and also for bass guitars. The spherical mic is normally used for classical recordings, but I love it. I used one at Battery Studios and they were stunned that I wanted it for rock 'n' roll—placed right above the drummer I got his perspective of the kit, and it sounded terrific mixed in with everything else.

'The brass Manley looks great, costs

a fortune and sounds terrific. The Coles are fantastic for ambient things—for hooligan, bottom-end drum noises, where you compress the living shit out of something—and they sound really good a few feet away from speaker cabinets and drum kits. They just seem to add the roughage of the room—all of the horrible shit that a close mic doesn't—and guitar players seem to like that.

'The Neumanns speak for themselves; beautiful old mics that sound wonderful. As for the Sennheisers, I use the 421 on toms while the 441 is my snare mic, flat onto the skin. It gets you out of any trouble; if the snare is crap just put that mic on it and whistle. The RE20 is used as a backup for floor toms and bass drum; I normally use 47s for the bass drum, but, depending on who's playing, the RE20 might sound better. The 57s are just there for some guitars which need the colour of that mic. For a real guitar sound I start off with the valve mic, go to the fet mic if the sound is too powerful, and if it isn't right then it's down to the guitarist.'

### Reverbs/echo:

**6 x AMS stereo delays, 2 x stereo reverbs; 6 x Yamaha REV 500s; 2 x D5000s; 2 x Lexicon PCM70s; 2 x Alesis Midiverbs; 2 x Quadreverbs**

'My favourite reverbs are delayed echo plates with tape recorders. Still, having said that, moving an echo plate in a mobile situation is a big deal. I tend to like the REV 500, and the Midiverbs and Quadreverbs for guitars, because they're just naff enough to sound like a spring reverb, and I also like the unique character of the AMS reverbs and swear by the sound of the AMS delays.'

### Processors:

**DBX 120 boom box; 12 x Drawmer DF320 stereo noise filters; 12 x DS201 XLR stereo noise gates; 12 x DS404 quad noise gates; Eventide multiprocessor of the day; 2 x SPX 1000s; 2 x Yamaha SPX 990s; 2 x TC Electronics M2000s; Lovetone Meatball, Wobulator, Doppelganger,**

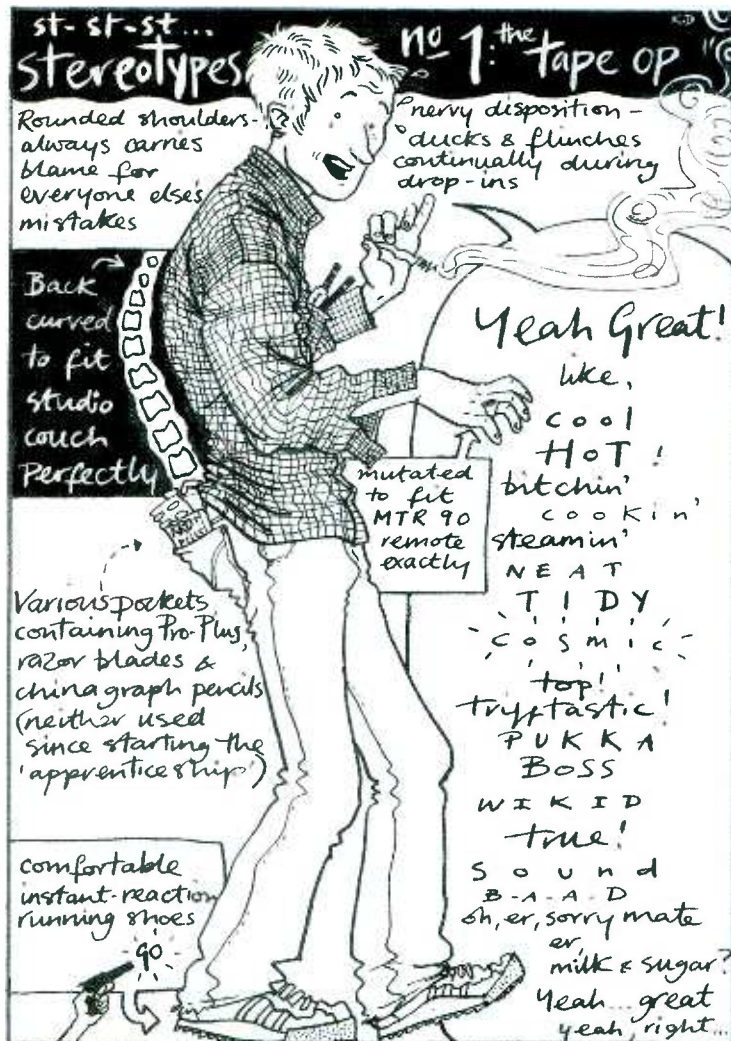
**THE BALANCE SHEET**  
Total expenditure?

Well, Chris should be able to come in under budget if he's lucky enough to get bulk discount on some of the rarer items which should leave him enough to invest in some fluffy dice for the van's driving compartment. With money left over I'd make sure we had some nice distractions for the musicians, he says. It's important for people to feel relaxed, so perhaps we'd have some computer games or even a fold-away bar.

**Ring Stinger, flanger; Roger Meyer Voodoo Vibe; Mutron Bi-Phase circa 1970; Micro Mutron circa 1970; Eventide Instant Phaser; Eventide Instant Flanger; Fender Rhodes suitcase piano; Leslie speaker; EMT echo plate**

'The Drawmers are there because the desk doesn't have any noise gates at all. We could have it customised to include them, but then the cost would go up.

'The Lovetones are my secret weapon. They just sound terrific. I use them—myself and my band—as parts of my effects board, and you can make some real loopy old noises with them. That's the whole idea; experimentation with something that's a bit silly, and things that you wouldn't normally do. □



## DOG TOP 10

- |   |                          |         |    |                        |           |
|---|--------------------------|---------|----|------------------------|-----------|
| 1 | I'm a Retriever          | ♠ † : ↑ | 6  | Grandma's Hounds       | ♠ † : ↑   |
| 2 | Rock 'n'Roll Dalmation   | * * ♠ ↩ | 7  | Corgi and Bess         | ♠ † : ↑   |
| 3 | Turning Pekinese         | ♠ † : ↓ | 8  | The Hound of Music     | * * ♠ ↩   |
| 4 | Good Collie, Miss Mollie | ♠ ↑     | 9  | Fly Like a Beagle      | ♠ ↩       |
| 5 | Switched On Bark         | ♠ ♠ * ↩ | 10 | Back On The Chien Gang | * * † : ↓ |



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## THE WISH LIST

# CHRIS TSANGARIDES' VALVE SETUP

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Thanks to work with artists such as Judas Priest, Black Sabbath, Ozzy Osbourne, Exodus, King Diamond, Helloween, Bruce Dickinson and Girlschool, Chris Tsangarides carved out a reputation during the 1980s as a producer and engineer of new wave Brit heavy metal. Nevertheless, additional credits like Thin Lizzy, Gary Moore, Joan Armatrading, Concrete Blonde, Depeche Mode, Sisters of Mercy, Billy Ocean and The Tragically Hip have also proved otherwise.

Starting as an assistant at London's Morgan Studios in 1975, Tsangarides was originally intent on becoming an engineer, but when Gary Moore asked him to produce his 1979 album, *Back On The Streets*, this led to production work in the heavy metal vein with Anvil, Loudness, Killer Dwarves, Anthem, Rock Goddess, Sledgehammer and Tigertailz. Aggressive guitar sounds and dynamic, explosive rhythm sections became Tsangarides' stock-in-trade, and he would continue down this road until the early nineties, since then things have somewhat calmed down for him in sonic terms. Tsangarides' recording of a concerto called *Millennium* featured guitarist Yngwie Malmsteen together with the Prague Symphony and a 140-voice choir, and while he has dedicated some of his time to composing film and commercial music, he has also performed with his own band, Pro-Z-ak, which specialises in dance music based around drum samples and heavy guitars.

Most recently, Chris Tsangarides has been back in the studio with Judas Priest and Gary Moore.

### Console:

#### TLA VTC Tsangarides signature model

The spec would be 24 output groups in the centre console, with four 16-channel buckets that would connect 32 channels on each side. There would be a separate patchbay, all channels would be automated, and the desk would have the capability of 128 channels on mix-down, all with EQs and sends. The signal could pass from either two, three or four valve stages, depending on the choice of routing.

In terms of it being a signature model, the existing phase switches would work in any mode. There would be phase reverse on the main and auxiliary speaker section. The VUs would follow the 2-track machine outputs, which they don't at present. There would be a master line and mic switch. The output groups would each have a 4-way switch — It's an 8-bus console, but I'd have them build me a 24-bus console, and therefore it would have more room for sends and returns. The

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mute buttons would also recall previous status if you switch the desk on and off, which it doesn't do at present. A basic computer system is currently being developed for things like cuts and fader moves. Also, because it would be such a large desk and need to fit inside a van, it would split into three.'

### Monitors:

#### Custom-built Quested 3-way system with Quested passive crossovers; Genelec 1031s

This would have 4 x 15 drivers for bass, softdome mids and highs with each stage driven by Manley 1k mono-block amps. I would use two 2k amps for the bass and 1k per side for the mid and high. Oh, what headroom! Back at Morgan, Roger Quested was the first studio manager I ever worked for, and he used to build our monitors there. Well, we once got to a point where he built these monitors with whopping great 4 x 15 drivers, and the softdome mid-range and tweeter-

er, and we would have so much power on the amplifier that we couldn't possibly distort the speaker.'

### Tape machines:

16-track Studer A80; 24-track A80; 2 x C37 1/4-inch; Lynx synchronisers; 2 x RADAR 1 synchronisers; Full Pro Tools system;

The A80s would be from the mid-seventies, with electronics modified by Manley to enable each track to be truly valved. When I worked at Jackson Browne's Groovemaster studio in Santa Monica, there was an A80 modified by David Manley with a valve part in each of the channels, and it sounded terrific. Meanwhile, 16-track is how I've always done my drums and bass.

The RADARs would be in case of digital requirements. With all of the valve stuff that I use, sometimes, depending on the programming that I'm doing, there can be too much valve, too much tape saturation, and it starts to be woolly and woofy. I mean, in the "good old days", they wouldn't have used this many valves anyway. And that's also the beauty of the TLA desk; you can choose how many valve stages the thing goes through. The C37s would be for delays.'

### Mixdown machines:

1-inch 2-track valve machine built by Tim de Paravacini; Ampex 1/2-inch machine; Sony DAT with Prism Dream A-D D-A converters

Tim de Paravacini designs esoteric audio equipment and he's a total valve boffin. He built this 1-inch valve 2-track machine for a classical engineer and it sounded

tremendous. The only trouble with it is that you've obviously got to take it with you to the cut; no other bugger's got one. So, it might be cool to do the work on that and then dump it over onto some kind of digital format—a Genex or some optical drive—for the mastering.

I use the Ampex 1/2-inch 2-track a lot at Metropolis with Ian Cooper, who is my main mastering engineer, and it's got two heads on it; one is a modified transistor head, and the other is a Manley valve head.'

### Outboard:

4 x Chiswick Reach stereo compressors; Vintage Fairchild stereo compressor; Prism Maselec stereo compressor; 4 x Urei 1176; 4 x Distressor; 4 x EAR mono compressors; 4 x Teletronix levelling amps; Rack of Kepex and Gain Brains; 4 x Tube Tech mono compressors; 4 x Manley stereo compressors; 2 x Prism Maselec stereo

Continued on page 84 >

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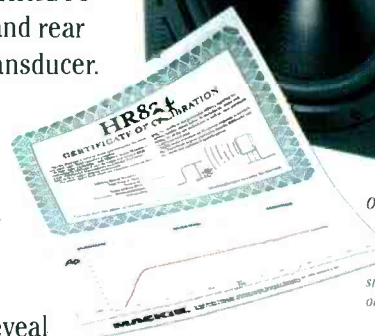
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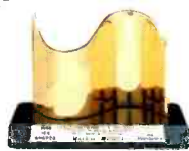
In just three years, it's become a trusted professional standard.

## What's the total value of everything in your recording studio?

*Only as much as your near field monitors cost.* Whether you buy HR824s or another respected brand of active monitors, you'll be making the most important investment in your studio.



Only HR824s come with a signed certification of flat response. We test each individual monitor and give you a signed Audio Precision™ print-out of its response characteristics.



1998 Mix Magazine TEC award winner for Technical Achievement

Yes, we think the HR824 is the finest eight-inch 2-way near field monitor in existence. And yes, we'd like you to own a pair.

But if you only leave this page understanding why you should use active monitors, our point will be made: *If your speakers aren't accurate, nothing else is either.*

## Hearing is believing.

To discover the details that passive monitors miss, bring a familiar CD or DAT mix into your nearest Mackie Dealer and hunker down for a serious HR824 listening session. We think you'll be pleasantly surprised.

\*By active, we mean a speaker design where each transducer constantly interacts with its own internal power amplifier...not a "powered" passive speaker with an external amp glued to its back.



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HR824s are made by Mackoids in scenic Woodinville, WA USA.

# Who Needs Another Mic Preamp?

"...the finest sounding preamp I've ever used...as close to being the perfect preamplifier as possible. It is made well and it sounds unbelievable."

*Russ Long, Nashville based producer/engineer,  
Pro Audio Review, June 2000*

"The 1100 is the sweetest, cleanest, warmest, most flattering preamplifier I've ever used."

*Jon Barry, Radio Personality, WMBX (FM), Richmond, VA*

"The Aphex Model 1100 is a good example of something different... A work of art...The results were astonishing, providing an awesome sound that was natural, dynamic and absolutely free of noise."

*George Petersen, Editor - Mix Magazine, April 2000*



**Model 1100**  
Discrete Class A  
2 Channel Tube Mic Preamp  
with 24-Bit 96kHz A to D  
from **Aphex Thermionics**

**Y**es, the Aphex Model 1100 Thermionic Preamp is different - it's a completely new design filled with Aphex proprietary circuitry. These inventions, combined with the absolute highest quality components, provide accuracy, clarity, detail, and depth that have never been available with any preamp, at any price.

The Reflected Plate Amplifier™ tube circuit imparts all the wonderful characteristics of a conventional tube circuit without any of the sonic drawbacks. The MicLim™ provides up to 20dB of limiting on the microphone output- before the preamp gain- allowing hot levels without fear of overloading. And the Drift Stabilized™ 24bit / 96kHz A to D converters make the transfer into the digital domain at the highest possible resolution. Specs? How about -135dBu EIN! This means that the Model 1100 adds less than 1dB of noise to the output of a microphone!

There are many mic preamps on the market, but if you're looking for something different, with awe-inspiring performance and unique features, you need another mic preamp—you need the Aphex Model 1100.

**APHEX**  
SYSTEMS

**Improving the way the world sounds<sup>SM</sup>**

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