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THIS EDITION'S CONTRIBUTORS

DAVE FOISTER runs the Guildhall School of Music and Drama's recording facilities in London. A Tonmeister involved in the music business for decades, Dave has been a *Studio Sound* contributor for more than ten years and reviews equipment in the setting of a professional working environment.

FRANCIS RUMSEY is a senior lecturer on the Music and Sound Recording course at the University of Surrey. He is a governor of the AES and a member of its working group on digital interface standards. He is also author of several books.

DAN DALEY covers the pro-audio industry worldwide as well as writing for publications like *USA Today* and *International Business*. His involvement in audio includes various successes as a composer, producer and studio owner.

Show stopper

IN THE LATE 1980s, a group of manufacturers got together in the UK with international intentions to represent the interests of exhibitors to the show organisers. Called the Pro Audio Exhibitors Group, this pressure group was formed in direct response to the rum deal audio manufacturers thought they were getting at the Montreux show in Switzerland. Underlying it was disgruntlement with the number and overlap of shows.

Following a flare of publicity, the most vocal participants seemed to be placated and we haven't really heard very much about the PAEG since—despite the fact that the number of shows has not really declined nor have overlaps or near overlaps been eradicated. The truth is that there will always be too many exhibitions for international manufacturers because emerging territories continually beckon and existing shows increase in importance due to technological evolution.

The irony is that for the visitor, the attendee, the humble punter for whom these great expensive extravaganzas are put on there can never be too many exhibitions. Despite the popularly-held belief that the keeper of the cheque books can travel freely to US and European AES Conventions, NAB, IBC, NAMM and Frankfurt plus the wealth of powerful shows establishing themselves in the Far East, the reality for most is that they hope to shop, or at least window shop, relatively locally. This is particularly the case when we get down to humble operator level, arguably the most quietly influential souls involved in the decision making process.

The requirements of the manufacturers and buyers are therefore fundamentally at odds but the objectives are conveniently aligned and that's why the international exhibition circuit is now as rigorous as it is. This is unlikely to change but there is a solution: attend your trade shows but use and read the press.

Zenon Schoepe **EXECUTIVE EDITOR**

Time bomb

The turn of the calendar from 1996 to 1997 saw the media in its traditional flurry of activity, celebrating achievements and predicting futures. Among the technically orientated crystal ball gazing exercises were those relating to the ' Millennium Bomb', or 'Year 2000 compliance'—that impending crisis of computers' inability to accommodate the advent of the year 2000.

The crux of the situation is that in its search for memory economy in the 1960s and 1970s, the fledgling computer industry opted to abbreviate the storage year dates into two digits rather than four. That 1997 follows 1996 presents no problem (96 giving way to 97), therefore, but the advent of the year 2000 gives rise to the ambiguous abbreviation 00. And while this is open to interpretation as 2000 or 1900 (some programs even regard it as representing 1980), it has also been used in certain program situations to signify invalid records or mark search ends. The situation is complicated by the fact that the problem can arise at three points within a computer system: in the software application, in the operating system (OS) supporting the application and in lower in the system hardware at the BIOS. One of the reports I read placed the Bomb fallout at as much as 80%–90% of computer systems currently in use around the world.

The implications of the Millennium Bomb are reckoned to concern a surprising variety of issues from business through finance to society itself—try insurance policies, air traffic control, payrolls, prison sentences and lift (elevator) systems for starters. And bear in mind that the problem is as international as the personal computer. Most agreement seems to centre on the size of the bill necessary to straighten things out. Most of the discord concerns what is to be done and by whom.

At the naive end of the spectrum there is something called 'the silver bullet'—a magical solution that has yet to be developed by the IT world. More practically there are a number of strategies which are being adopted, ranging from reappraisal and replacement of computer systems and software with Year 2000 compliant kit to line-by-line checking and correction of applications and data. The first can be passed off as timely modernisation; the second requires considerable expertise, time and cash. And for larger companies, the start date has already passed.

In the parochial world of pro-audio, the Millennium Bomb has two sites of impact: the business side of the biz and within the equipment. And it's in the latter that I found the first of the good news: the Mac, using a different line of chips, is Bomb proof. So whether you're driving a Pro Tools or Avid system at the turn of the millennium, you can organise your 2000 celebrations with impunity.

PC-based systems are obviously another story. Anyone with Award v4.5x BIOS in their computer, for instance, may find that the sympathetic ear in the bar belongs to a COBOL programmer. But to regard the non-dedicated computer as the only legitimate target is missing the point as many computer-based systems are more fundamental in their realisation. Tell me, what's at the heart of your console automation system? Maybe it's time we too took the Bomb seriously.

Tim Goodyer **EDITOR**

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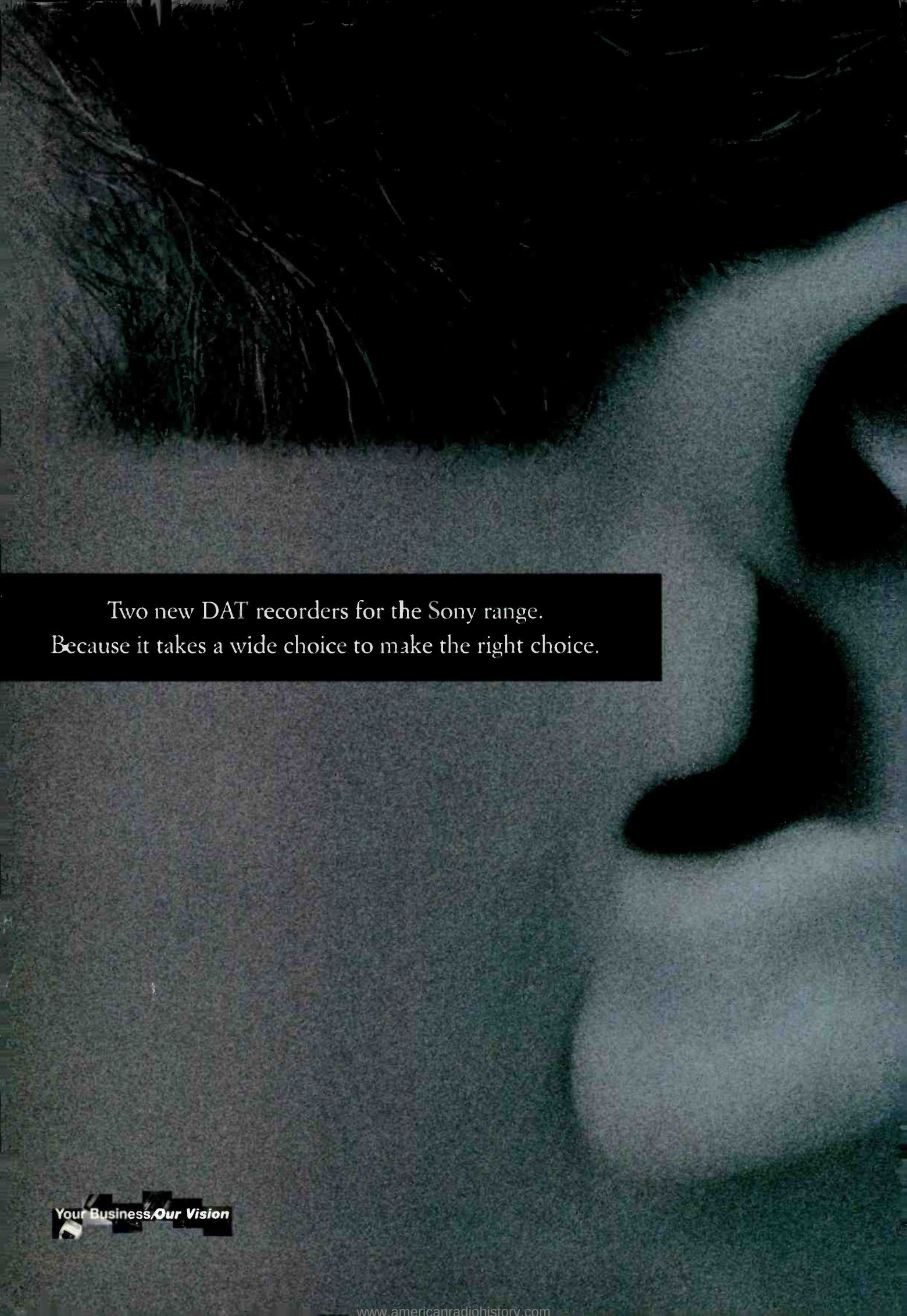

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Opting for an entry-level DAT recorder shouldn't mean settling for second best. So the new PCM-R500 offers Sony professional build quality in a low-cost unit. It also means professional features like a data/shuttle wheel for precise and easy control, a 4-motor direct drive for reliability, plus a full range of both consumer and professional inputs and outputs.

Uncompromisingly designed for high-end applications, the new PCM-7040 timecode recorder is fully specified as standard and brings you more features at a lower price for even greater flexibility. We have also added calendar recording, AES/EBU origin codes and the unique Sony ISR system for remote equipment monitoring and diagnosis.

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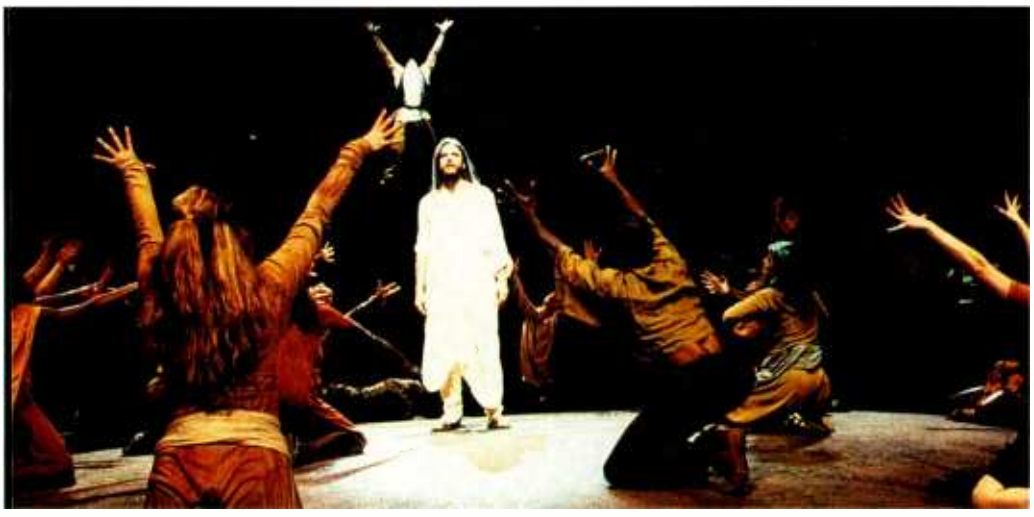

UK:The newly refurbished London Lyceum Theatre's current production of Jesus Christ Superstar marks the first concurrent use of Cadac J-type and F-type consoles. The 50-input J-type handles vocals while the 39-input F-type takes care of the band with sound reinforcement duties falling to an EAW speaker system. This show also marks the 25th anniversary of JC's première with sound design by Richard Ryan and production engineering in the hands of Mike Walker.

Record NAMM

US: The NAMM Convention, that took place from 16th–19th January in Anaheim, CA hit record numbers this year. More than 1,000 exhibitors and nearly 60,000 attendees converged and conversed in over 415,700 feet² of convention space.

NAMM-goers came to check out the newest and coolest in music-related equipment and found that a number of manufacturers were following current form with a combination of cost-effectiveness and improved performance. With this in mind, notable equipment introductions included Ensoniq's PARIS (Professional Audio Recording Integrated System) and Mackie's Digital 8 Bus console (More details can be found in this month's 'New Technologies' section). Also notable was Mackie's HUI, a digital audio workstation control surface for mixing with ProTools 4.0. This Human User-Interface will eventually be compatible with other Digidesign DAE compatible software, such as Opcode, and other DAW systems.

Alesis introduced its premier ambient effects processor, the Wedge Desktop Master Reverb with impulse audition, priced at $499. Its reverb algorithms include halls, room and offers reverb programs like Virtual Stereo rooms, flexible gated reverbs and effects specifically designed for postproduction and ADR. A total of 256 memories are available with 128 presets and 128 user programs. Following on the heels of last year's Studio 12R, Alesis introduced its affordable Studio 32 recording console. Retailing for $1,299, this 16-channel, 4-group, in-line monitor recording console, allows you to route 16 audio signals to multitrack and monitor 16 channels coming back from tape without repatching. Both new Alesis products are expected to ship in the spring.

Symetrix introduced the 606 Delay F/x Machine which expands the company's 600-series of Digital Productivity Tools and marks the first Symetrix venture into effects processing. Priced at $599, the unit boasts 24-bit internal processing, 20-bit A–D and D–A conversion, balanced inputs and outputs and an internal power supply.

Another highlight of the show was Allen & Heath's innovative DR128 24 bit, 12-input, 8-output digital audio mix processor created for the system designer. The unit is designed for sophisticated installations requiring full matrix mixing, processing and zoning. A&H developed the T-MIX ASIC that provides the interface between the unit's DSP and the input and output circuits. This single rack space unit retails for $2995 and will be available by the summer.

Hafler Professional, well known for its amplifiers, unveiled alpha versions of its impressive Transnova studio powered reference monitors. The monitors are biamplified, with a 75 watt Transnova channel running the tweeter, a 150W Transnova channel running the woofer, active crossover, dual clip lights, 1-inch tweeter with waveguide, an 8-inch woofer, and rear-mounted EQ adjustments for tailoring of room acoustics. Hafler notes that the new monitors' performance exceed current industry standards at half the price, selling at approximately $2,400 per pair.

NAMM will take a two-year hiatus from Anaheim [it has been held here for the past 20 years] while the Convention Centre undergoes renovations. The 1998 NAMM show is scheduled for 29th January–1st February, 1998 at the LA Convention Centre.

DEBRA PAGAN

UK: Sunday 26th January marked a significant 'first' in audio recording: the first 24-bit, 96kHz recording of a soundfield recording was made in the historical chapel of Cambridge's Queens College. The session required a Soundfield microphone, a pair of dCS 902 A–D convertors and a pair of synchronised Nagra-D recorders to capture the a short piece performed by the Gonville and Caius choir as a Ambisonic B-format recording. The session was organised by Canadian-based Steve Lee and Meridian's Bob Stuart, and was conducted by Lee with the assistance of Stuart, Soundfield microphone inventor Peter Craven, dCS convertor designer Mike Story and Nagra GB's John Ruddling. This considerable assembly of talent had two aims in common; the first was to provide a 24-bit, 96kHz recording for use in a presentation to be made by the Acoustic Renaissance for Audio (ARA) to various DVD technical committees in Japan and America beginning in May, the second was to provide research material for Craven and Stuart's research into lossless data reduction (or packing) also for presentation to the ARA and DVD authorities.

As well as being Chairman and Technical Director of Meridian Audio, Stuart is Chairman of the ARA, whose aim is to champion the cause of multichannel surround audio as we enter the next phase of carrier development. While it is now established that there is a need for a greater standard than that offered by the stereo 16-bit, 44.1kHz CD, the pressures from other parties' interests in defining the DVD (Digital Versatile Disc) standard demand that the audio community is properly represented if it is to be receive appropriate consideration.

dCS' Mike Story, meanwhile, had collaborated with Lee, who is President of Canorous Inc, on a pair of papers circulated at the Los Angeles AES Convention and which have just been reproduced in Nagra's own literature. Lee's contribution, entitled *24-bit Digital Recording —Why is it Necessary?*, addressed the recording engineer and producer's perspective while Storey's *96kHz Recording—A Door to the Future* presented an informed argument for the advantages of working to elevated technical standards.

'The next challenge is to design something to play it back,' said Stuart a few moments after the recording was complete. 'We took the B-format microphone feeds straight to the D–A convertors; so although we have the

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hardware, we don't have the software finished for the decode speaker feeds.' A full report on this session—along with the intended future for a recording nobody can play—will appear in next month's *Studio Sound*.

TIM GOODYER

EGYPT: A serious development of Egypt's claim to be the 'media centre of the Middle East and Arab world' unfolded recently in the form of a $314m (US) contract to build a facility dubbed Media Production City—which has already been alternatively termed Hollywood on the Nile. The Egyptian state broadcaster, ERTU, awarded the contract to a consortium of companies including Sony Broadcast and Kvaerner Construction, which will involve building a 420,000m² studio complex near Cairo to house future film, TV and video production and support. When complete, the complex will rank among the world's largest and is claimed to be the beginning of Egypt's push into modern media production.

The period to 1999 will involve the construction of six production studios—two 900m² and four more at 600m²—along with TV edit suites, workshops, OB vehicles and administration. Construction duties fall to Kvaerner, while essential equipment listing will revolve around Digital Betacam, Quantel and Cinetel systems, with SSL providing the core of the audio. SSL's contribution will see a SL8000GB consoles in each of four production studios, an SL4000-series in each of two sound recording studios and an Axiom system in each of two dubbing suites. The sound recording studios will use Sony 3324S DASH machines.

GERMANY: A recent German court judgement has found Behringer in breach of equipment design copyright held by Aphex Systems and AKG Acoustics. The ruling concerns Aphex' Aural Exciter and involves a settlement of $450,000 (US). The latest development follows a ruling made in 1992 on the suit—which was originally filed in 1987—that Behringer had infringed Aphex' copyright, but which had been challenged by Aphex over the size of the financial settlement. The appeal successfully saw the penalty raised, but not to the $910,000 sought by the US-based Aphex.

UK: Ten Years After guitarist Alvin Lee's old Buckingham studio has returned to commercial operation under the auspices of producer-engineer Stuart Epps. Wheeler End has been recently re-equipped with refurbished 42-channel MCI console and 24-track MCI and Otari multitracks previously used by Gus Dudgeon. The studio offers large control and live rooms and a wealth of classic keyboards and outboard equipment. Wheeler End Studios, UK. Tel: +44 1494 883671.

Contracts

◆ Burbank's EFX Systems complex has accepted a customised Neotek Essence postproduction console. The 4-channel, 28 monitor desk has been installed in the facility's ADR-Foley stage where it is to be used with a 24-track Fairlight MFX3 DAW in replacement dialogue and Foley generation. EFX handles a wide variety of television and film productions on America's west coast.
EFX Systems, US. Tel: +1 818 843 4762.
Neotek, US. Tel: +1 818 281 3555.
Martinsound International, UK.
Tel: +44 1763 262656.

◆ The Norwegian NRK Broadcasting outfit has become second taker for Soundcraft's Broadway digitally-controlled analogue console. The first is at an unidentified London theatre venue as part of the testing programme; the second will be installed in an OB vehicle whose duties include live concerts and 'events'.
Soundcraft, UK. Tel: +44 1707 668231.

◆ Spanish recording studio Magic & Sound has purchased an Akai DR16 fitted with a 2Mb Barracuda hard drive. The DR16 is expected to see the company of a DR8 shortly and a move to better premises are in hand. If successful, the redesigned facility will house the present D&R Orion console And four ADATs; Philip Newell has been named as designer.
Magic & Sound, Spain.
Tel: +34 52 803598.
Akai, UK. Tel +44 181 897 6388.

◆ Danish broadcaster Danmarks Radio has brought its commitment to SSL consoles to 23 with the purchase of an SL4044 and SL4032G Plus. Both consoles have been installed in mobile units; the first was fitted in Mobile 1 but required almost immediate replacement due to fire, while the second replaced a Neotek desk in Mobile 3.
Danmarks Radio, Denmark.
Tel: +45 31 35 0647.
Provideo, Denmark. Tel: +45 43 64 7800.
SSL, UK. Tel: +44 1865 824300.

◆ London's CTS and Lansdowne studios have jointly purchased two Studer A-827 2-inch, 24-track analogue machines to be shared between the the two facilities. The move follows rising demand for analogue recording from the film world with which the studios regularly work.
CTS, UK. Tel: +44 181 903 4611.
Studer Revox, Switzerland.
Tel: +41 1 870 75 11.

◆ Californian postpro facility Advantage Audio has replaced its quota of 24-track analogue machines with four Otari RADAR hard-disk machines. The facility was already familiar with nonlinear working through its use of Pro Tools, but had been reserved about the suitability of the technology to long-form projects prior to its commitment to RADAR. Advantage handles post work for numerous weekly animated TV series including *Spiderman*, *Jumanji*, *Aladdin* and *Pink Panther*.
Other Californian activity involves the first US installation of a DVD-equipped SSL SL9000j console. LA-based Pacifique Studios working in music tracking but expecting to move into DVD postproduction via other 6-channel postpro work in DTS, SDDS and Dolby Surround.
Otari, US. Tel: +1 415 341 5900.
SSL, US. Tel: +1 213 463 4444.

◆ British independent TV broadcaster Meridian Broadcasting, has recently equipped its ENG crews with Micron portable diversity radio mic systems. The new setup allows camera-mounting of mics alongside the use of lavalier and hand-held reporters' mics running on both UHF and VHF. The systems consist of SDR-570 receivers, TX501 belt transmitters and TX503 hand-held transmitters.
Meridian Broadcasting, UK.
Tel: +44 171 839 2255.
Audio Engineering, UK.
Tel: +44 171 254 5475.

◆ Rumanian television outfit, Pro TV, has equipped its new outside broadcast unit with a DDA QII 32:8:3 console and a selection of Klark Teknik outboard including DN500 comp-limiters, DN504 quad compressors and DN514 quad gates. The truck has been operating since November addressing Eastern Europe's reputation for old-fashioned equipment and practices.
Mark IV Pro Audio Group, UK.
Tel: +44 1562 741515.

◆ London's Gemini Audio Production has added a DAR Sabre Plus DAW system as part of a recent expansion. The new Sabre Plus-based track-laying suite located in the basement of Gemini's Soho-based facility follows the house policy of offering an all-digital solution to television documentary, feature and drama work. The forthcoming year promises extensive networking of Gemini's workstations via DAR's D-net.
Gemini Audio Production, UK.
Tel: +44 171 734 8962.
DAR, UK. Tel: +44 1372 742848.

◆ Germany's Audio Media Service music production and video post facility has installed a second Fairlight MFX3 DAW system. The Bielfield-based studio's new preproduction room is intended to support the main room which uses a 24:24 MFX3 and Euphonix setup. This is reflected in the choice of an 8:8 MFX3 and Yamaha 02R for the new room.
Fairlight, UK. Tel: +44 171 267 3323.
Yamaha-Kemble Music, UK.
Tel: +44 1908 366700.
Euphonix, Europe.
Tel: +44 171 602 4575.
Fax: +44 171 603 6775.

◆ Moscow and Azerbaijan are two of the BBC's World Service studios currently being refurbished by Audionics for commissioning later this year. Both installations require 'Audio Workshops' to provide a main preparation facility for recording and editing to digital format ready for broadcasting. Both projects will use Audionics ACE consoles, and the Moscow installation involves a custom routeing system giving access to Bush House programme material for Russian broadcast. Correspondingly, the Moscow facility can feed programme material to London.
World Service.
Tel: +44 171 257 2941.
Audionics, UK.
Tel: +44 114 242 2333.

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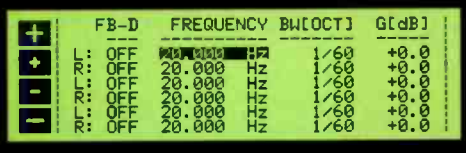

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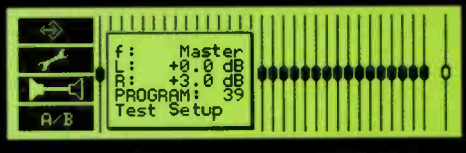

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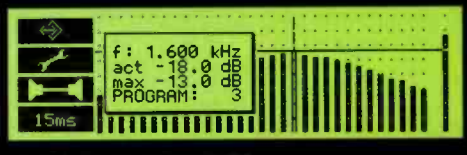

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Sound thinking

We spend a lot of time with sounds but how many of us pause to think what sound really is, or even to think whether sound might mean different things to different people asks **JOHN WATKINSON**

There is a Zen riddle which asks 'If a tree falls and there's no-one to hear it, does it make a sound?' And there are a number of answers which are quite different and give useful insight into the elusive nature of sound.

Obviously the impact will set up vibrations in the tree and the earth and these will disturb the equilibrium of the surrounding air. These disturbances travel outwards at the speed of sound. If we define sound as a vibratory disturbance to the equilibrium of air then the answer is clear. The falling tree does make a sound and physicists and acousticians can predict quite accurately how this sound will interact with other objects and diffract, reflect and refract until it finally decays.

Physics knows no parametric limits and the air disturbance can be analysed from 0Hz up to whatever frequency instruments allow, say 100kHz. Over that frequency range any level may be encountered and analysed. Enter a human observer who is to give an account of what was heard. Well, most falling trees produce frequencies within the range of human hearing, and if our observer is close enough he or his politically correct sister will say it made a sound.

Using genetic engineering I have succeeded in breeding a Fletcher-Munson tree which uses noise shaping so that when it falls over the spectrum of sound it makes has exactly the same shape as the threshold of human hearing. An unusual timbre, you might say. When such a tree fell over at a suitable distance from our observer he heard nothing at all, and said it fell without a sound.

Before the Fletcher-Munson tree was perfected, it had an annoying narrow spectral peak which rose above the hearing threshold. It's very hard to get rid of ringing in a tree. As a temporary solution the Zwicker tree was developed whose rustling leaves produced band-limited white noise covering the same frequency. When the Zwicker tree was rustling the early Fletcher-Munson tree didn't make a sound when it fell. Neither the Phantom of the Opera nor the Lone Ranger could hear it. Another success was the Haas tree which stopped making a noise just before the Fletcher-Munson tree fell and it still didn't appear to make a sound.

One of our test subjects, Vincent, had no hearing at all in one ear, but perfect hearing in the other ear. One day the Zwicker tree was off to one side of the Fletcher-Munson tree as it fell. The one-eared observer failed to hear it fall whereas a normally hearing colleague did. Again an argument ensued because apparently the falling tree simultaneously did and did not make a sound. The experiment was repeated except that the normally hearing observer put his finger in one ear. Now there was agreement; neither heard a sound. As can easily be demonstrated, masking doesn't work as well in stereo because the masker and the maskee can be in different locations. Most of the testing of compression algorithms was done in mono. As our local psychoacoustician put it: 'They did not listen, they did not know how, perhaps they'll listen now'.

ONE OF THE OBSERVERS

then got into an argument with the psychoacoustician who had shown him the inaudible sound that the microphones had picked up. The gist of the argument was that he was being shown instruments measuring sound he couldn't hear whereas he had read in a hi-fi magazine that people could hear things that instruments couldn't detect. The physicist shook his head wearily and said 'Well of course that's also true. The ear can equally make you think you heard sounds that don't exist. If you don't believe me, just give me a hand to get this equipment into that church over there.'

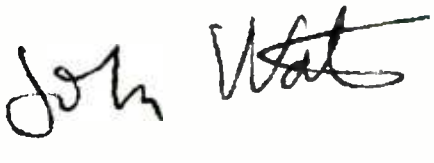
So off we went to the church to play the organ which had a stop which gave two off-tune pipes for each note. The result was a pleasing tremulant effect. The observer reckoned that the tremulant frequency was about 5Hz. 'So where is the 5Hz component on this spectrum analyser then?' said the psychoacoustician. 'I can see the two fundamentals from the two pipes, but the beat frequency you can hear isn't there.' 'But it must be, I can hear it!'. 'What you have to remember is that your ears aren't very accurate, they produce an illusion which is based on, but not faithful to, the original sound. Unfortunately there's no way of getting round the illusion.'

Then the psychoacoustician changed the time window on his analyser and made it shorter. Suddenly the two fundamentals merged into one which varied in amplitude at the beat frequency. 'How did you do that?' said the observer. 'Easy', came the reply, 'I just made the frequency discrimination of my analyser as bad as the human ear and now it can't tell the two tones apart so the amplitude is changing as they move in and out of phase'.

'So your spectrum analyser can be more accurate than my ears?' 'Well, your ears wouldn't be much use if they were this accurate'. 'Why?' 'Well, if your hearing had the frequency resolution needed to discriminate the two fundamentals in this organ stop, the Q factor of your basilar membrane would be so high that you would still be hearing it on the way home. Conversation would be impossible because the higher the frequency discrimination, the worse the time discrimination gets. Worse still, there would be no such thing as dissonance and the very foundations of music would crumble'.

Using genetic engineering I have succeeded in breeding a Fletcher-Munson tree which uses noise shaping so that when it falls over the spectrum of sound it makes has exactly the same shape as the threshold of human hearing

'So is there a name for this theory?' 'Yes, we had a group of musicians who were always complaining that the seventh harmonic was dissonant. When we found out why we called it the critical band theory'.



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Icons abound

There is more required of an audio engineer's talents than simply balancing sound. Maintaining a balanced view of the history of professional audio is an increasingly valuable skill writes **DAN DALEY**

Christmas is when the Christian church rolls out the big guns of its iconographic arsenal. The Church has saints for everything –policemen, firemen, cobblers, fishermen, politicians, medical miracles, the lack of medical miracles, malpractice, lawyers, lost souls, lost watches, lost causes. Professional audio too has its icons–some of which sometimes seem as old as the Church's.

The saints of professional audio are also a varied bunch, and there are certain self-appointed keepers of the eternal flame of sound, who are ready to retell yet again how the kick drum was miked on a session in early 1968 for the now-deceased drummer who was playing with a recording artist who is currently (your choice: equally deceased/long-retired/eligible for parole/attained fugitive status/cryogenically preserved (head only)/living in an affluent suburb of Nashville) but is otherwise eminently forgettable, except for the fact that the French have taken an interest in him recently.

On one hand, many of these ancient warriors of audio truly have things to tell us, some of which is particularly useful at a time when many engineers have have yet to mic a kick drum. They also remind us that much can be accomplished with the balance towards talent instead of technology. Every now and then we find a previously hidden gem–one of the ancients who has been overlooked and who brings new histories, new insights and new musician jokes to the archives–like Bob Heil, the godfather of modern live sound and the mixer for The Who, the Grateful Dead and Joe Walsh, who hid for 15 years, devising home theatre environments until he got tired of hearing how bad (in his opinion) live sound had become and decided to do something about it. And I reserve my highest praise for those woolies who continue to work the consoles themselves and create new things, incorporating new techniques and technologies with their vintage ones. You can talk to Al Schmitt for hours and never once hear him mention an artist he worked with more than three weeks earlier.

On the other hand, we have been and continue to be regaled by the hoary old war stories of the rest. We pore over each interview, desperate for a new nugget that tells us something we haven't heard before–but more often than not, we're disappointed. The best interviews, to me, are the ones that offer some new insight into the personalities of the artists and musicians and their times. But these are few and far between.

The apotheosis of all this was probably the recently released series of Beatles reissues. Initially, the recordings provided insights into the workings of a momentous collection of talents, both within the band and the technical and creative support team that assembled itself around them. And the journalism that accompanied that initial release was inspired, thanks to the unprecedented opportunity to plumb the archives of the period. By the second set of discs, however, the story had been told and was on the verge of shedding its compelling aspects in its retelling. The dropped stick at the drum kit had gone from an unexpected moment of intimacy to a boring delay in getting on to the next disinterred mix. By the arrival of the third 2-disc set, we were all Beatled out and desperate to return to the original mixes.

THE REAL ESTATE that the more senior members of the pro-audio corps get in trade publications is no longer commensurate with their contribution. This is not to say that their work should not be acknowledged but it is to assert that their presence is often at the expense of a new generation. A generation that has transgressed the axiom that you must first learn the rules of a profession before you break them, but that has, nonetheless, taken the license granted by personal recording technologies and built themselves their own culture with its own rules. Thus, the distorted lead vocal tracks of Cypress Hill, Beck and Soundgarden that would have been grounds for immediate expulsion from an earlier generation's pro-audio fraternity (ever notice how few women qualify as saints in this industry?) are now the hallmark of success in the context of today's music.

Of course, the current generation of home recordists are as prone to a more juvenile sort of old foggery as their elders –how often can we read about the intricacies of hooking up one sound generator after another and listen to spine-tingling accounts of how one prerecorded, pre-edited, pre-effected sound was chosen over 14,537 others?

In the US, the relationship between the elder statesmen of pro-audio and the current crop of recordists is at its most ambivalent. We lack the European tradition of implicit respect for our elders, but we tend to over-imbue them with sort of god-like qualities. It's fair to say that in the youth-oriented culture of the US, older engineers and producers fare far better than their contemporaries in the press. Or on The Simpsons.

The oldest person–let alone oldest engineer –I have ever interviewed is Aaron Shelton, who will be 87 years old this year and who, with two other equally vintage partners, founded the first commercial recording studio in Nashville in 1946

Perhaps, in the best Swiftian sense, we should require that each gets a pass at the press until such time as we have exhausted the current supply, at which time we can start all over again with the ones that are left. In the meantime, we should continue to broaden our reach to find the classics who have not yet shared their experiences with us. The oldest person–let alone oldest engineer–I have ever interviewed is Aaron Shelton, who will be 87 years old this year and who, with two other equally vintage partners, founded the first commercial recording studio in Nashville in 1946, The Castle. I recently had to go back to Mr Shelton to confirm some facts from an earlier interview and found, in speaking to his son, that I had to couch my inquiries carefully: the first was, 'Is, uh, Aaron, I mean, uh...' 'Yes,' came the patient reply, 'Aaron is still with us'.

Experience has much to offer but we have to balance its stories with the many new ones that are created every day in this extraordinarily robust business. And in addressing the vintage elements, we must not limit our enquiries to the small, vocal cadre that seems to dominate those sorts of stories. It's a big world out there; let's try to get more of it into our memories while we still have time.

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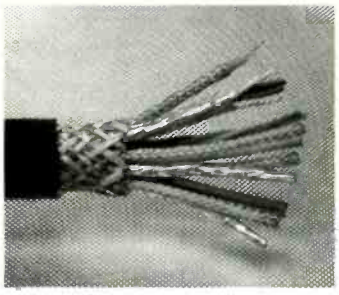
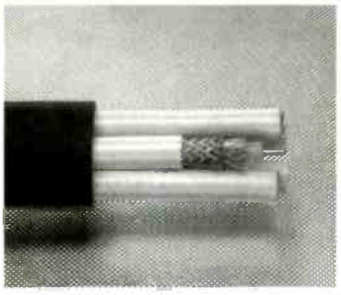
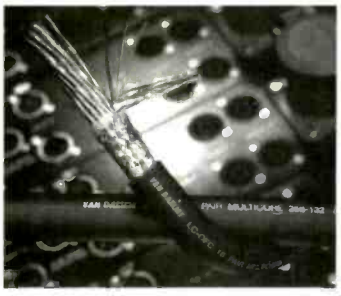


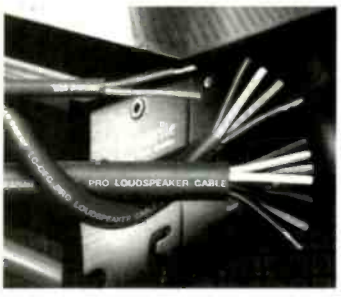
Van Damme camera cable



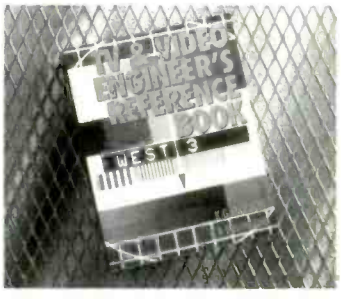
5 way video multi



Van Damme black series tour grade multi



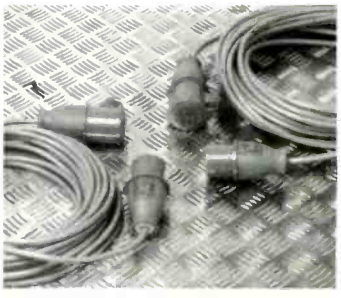
Van Damme speaker cables



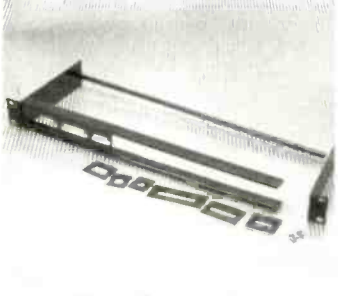
Educational books

New Neutrik mains connector

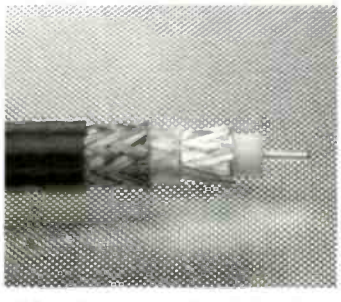
Loudspeaker looms



Ceeform assemblies

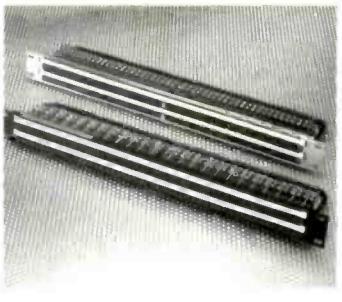


Hexadec system



Van Damme triaxial cable

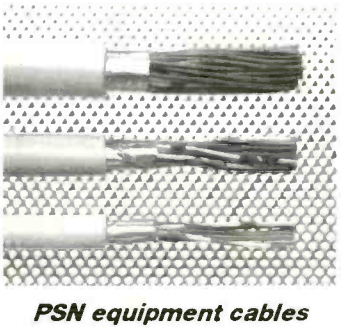
Rean 'A' gauge patch bay



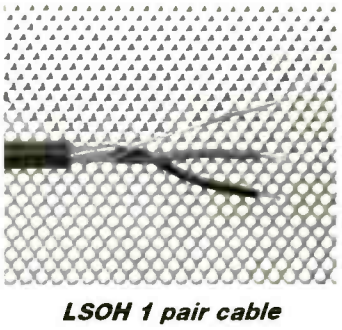
Rean Bantam patch bay

Triaxial connectors

Gaffer tape



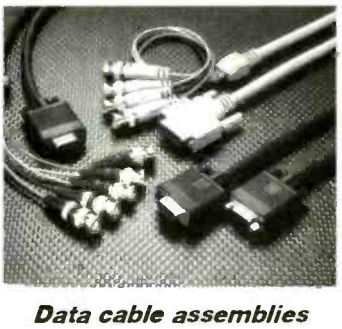
PSN equipment cables



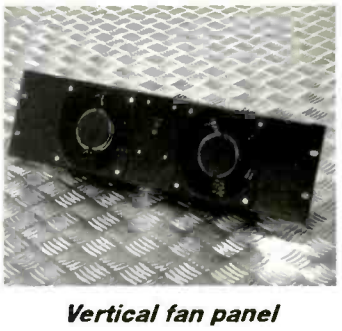
LSOH 1 pair cable

Brady markers

Hanser drums



Data cable assemblies



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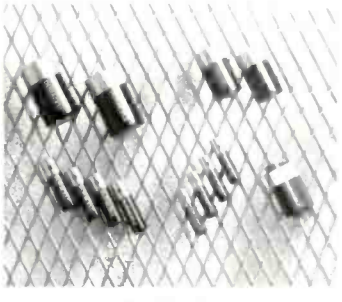
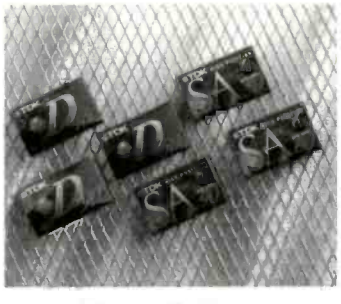


Batteries

Mag-lites

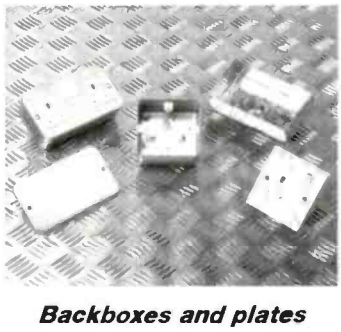


Magnetic tapes

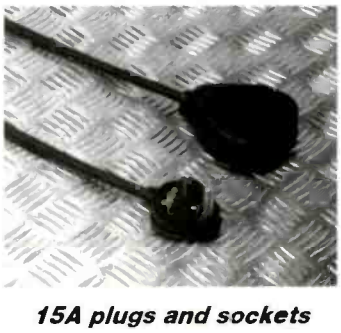
Van Damme hi-fi cables

EMO distros

Ceeform connectors



Backboxes and plates



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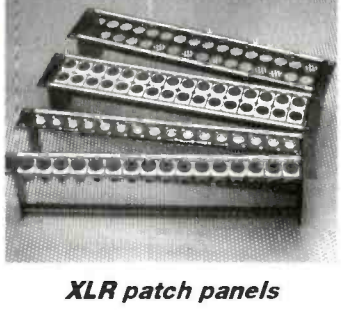
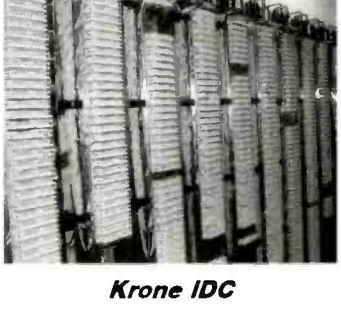
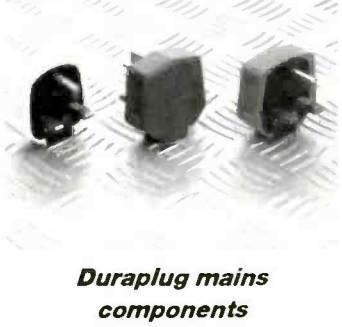


XLR patch panels

Veam multipins



Krone IDC



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Stand'ard and deliver

Recent developments in the fortunes of both DVD audio and DTS audio highlight the growing importance of carrier technology in the progress of bringing digital audio to a mass audience writes **BARRY FOX**

An International Steering Committee which represents the Recording Industry Association of America, the International Federation of the Phonographic Industry and the Recording Industry Association of Japan has for a year now been talking with the Audio Working Group of the DVD Consortium about an audio-only version of the disc. The Committee last met in late December and issued a progress report–although it might better be described as a non-progress report.

The ISC insists that DVD-Audio must use an Active Copy Management System to control not just home copying, but transmission by new digital services, such as the Internet and direct-to-home satellite links but there is no agreement on how to achieve this. It will be easier to meet the ISC's other requirement, that DVD Audio discs must be backwards-compatible with existing CD players. This can be achieved with double-layer discs that have a Red Book track at 1.2mm and a Super Audio track at 0.6mm. But the Audio Working Group of the DVD Consortium has not yet decided which of several different and competing audio coding technologies to use for the Super Audio track. It also has to settle the vexed question of whether the new disc should be of standard 5-inch size, or reduced to 3 inches for use in vest-pocket portables.

The late Michael Gerzon was first to warn that lossy compression would limit the potential of any new video system as a high-quality audio medium. The voluntary industry group, the Acoustic Renaissance for Audio, sounded the alarm that the DVD Consortium was using lossy systems for multichannel video. The Japan Audio Society came on board and involved its Advanced Digital Audio Conference. The ADA has so much clout that its recommendations will shape the future of hi-fi in the next century. Because the ARA is a lobby group, not a manufacturing company, it cannot formally propose a technology standard but the ARA's ideas conform closely to those of Pioneer.

Pioneer proposes an extension of the existing PCM system, as used for CD, but with the sound sampled at either 48kHz or 96kHz (rather than 44.1kHz) and coded in 18-bit, 20-bit or 24-bit words (instead of CD's 16 bits). Pioneer has been using a 3-inch disc, rather than the standard 5-inch. The DVD standard allows for this. But the ISC wants DVD-A to be a 5-inch format.

The main challenge to the Pioneer-ARA's approach comes from Sony, with the Direct Stream Digital system. Instead of fixed PCM word lengths, DSD uses a very rapid stream of single bits at 64x the CD sampling rate. Now Philips has backed Sony's DSD. So have Accuphase and Sharp. Matsushita (Panasonic-Technics) has proposed a system which splits the signal into two halves and then uses PCM for one and bitstream coding for the other.

JVC has proposed a lossless compression system which uses PCM and samples at twice or four times the CD rate, and codes in 24-bit words. Small wonder that in their joint pre-Christmas non-progress report on standards, the ISC and DVD-Audio Working Group admit that 'no firm timetable has been set for completion of the process'.

CALIFORNIAN Digital Theatre Systems hit a winning streak in 1993 when Universal Pictures chose DTS for Jurassic Park, instead of the Dolby Digital system which had been launched the year before. DTS takes the cinema full circle back to the earliest days of cinema sound, when the Vitaphone system synchronised a 16-inch disc, running at 33.3rpm, with a movie projector. DTS puts multichannel digital sound on a CD-ROM that is sync-locked to the film. The sound is compressed using the apt-X system from Belfast. If cinemas want to play a Universal picture in digital surround, they have to install DTS equipment. Otherwise they must make do with analogue Dolby surround.

Buoyed by the success this brought, DTS proposed a system variation (using modified compression) for use with CDs, Laser Disc and DVD, as an alternative to AC-3 and MPEG2 Musicam. But the DVD Consortium said no to DTS for the DVD-Movie standard; and AC-3 and Pro-Logic are well-established as the sound carriers for Laser Disc. It was hard to see where the company hoped to go next.

When I asked DTS for comment, head man Terry Beard got cross and threatened to come to England and do me no good. I asked Universal if this was the company's new PR policy. One of Beard's staff quickly apologised and asked me to write a letter to Universal saying I was happy with the apology. This reaffirmed how much DTS needs Universal's anti-Dolby commitment. Foolishly I obliged. Foolishly, because when I later asked DTS for an update on the company's consumer plans, I got no reply.

DTS turned up in Europe when the company set up a small stall at the giant electronics show in Berlin, some 18 months ago. But apart from that it looked as if the company had lost interest in Europe. Now, out of the blue, comes news that DTS has set up a European office in England. It's in Henley-on-Thames and what makes it interesting is that much-respected ex-Sony Broadcast man Chris Hollebone is head of European Operations. Another ex-Sony man, Andy Tait, is Technical Support Manager.

DTS now claims to have 2,250 decoders in cinemas across Europe. Although Dolby has 3,100 digital boxes and over 11,000 stereo systems, it is clear that Universal's DTS-only digital release policy continues to work. DTS also promises to licence its technology 'for a variety of home entertainment formats'. The European audio fraternity will not however take DTS seriously until DTS demonstrates a multichannel coder and decoder which work in real time at the standard AC-3 and MPEG2 Musicam multichannel rate of 384 kb/second. It will be interesting to see whether DTS' new European office can deliver on this, or cuts losses on consumer applications and sticks with cinema sound.

The DTS announcement coincided neatly with a seminar held by the British Film Institute at the National Film Theatre on London's South Bank. The theme was archiving, and the University of California's Film Department in Los Angeles told how it has been restoring 2,500 one reel Vitaphone shorts shot by Warner Bros in the 1920s.

The sound for these ten minute programme fillers was all on discs. One made in October 1926 shows Al Jolson talking and singing, a year before *The Jazz Singer*. It was suppressed by Warner Bros when the feature was released.

The disc had been broken in four places, and a collector had made a clumsy attempt at gluing it together with epoxy resin. Unfortunately they botched the job and misaligned the grooves. So the disc sounded like an MTV rap record. UCLA used heat to melt the glue, pulled the joints apart and reconstituted the disc. It was easier than using digital technology to cut and splice the rapidly switching sound segments back into their original order.

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Akai DD1500, DD8, DV1500

Akai's incursion into nonlinear audio-for-video post has proceeded steadily and efficiently and now offers a powerful and friendly option. ROB JAMES evaluates the system and its functionality in the front line

THE SOUND FOR PICTURE market has been almost completely converted to the use of DAWs, digital multitrack tape machines and, in many cases, digital or digitally-controlled analogue consoles. Even die-hard magnetic film fans have embraced the upstart digit and many facilities now have several years of experience with the technology. Many larger facilities employ workstations from different manufacturers because of their cost effectiveness with specific tasks, this despite the continued absence of practical and reliable data portability between systems.

Largely by virtue of utility, reliability and a shallow operator learning curve, Akai has carved itself a niche in this competitive market. Now the DD8, DV1500 and enhancements to the DD1500 look set to consolidate this position.

Manufacturers' key to success in this market is understanding working processes and contributing solutions to problems. Akai has listened carefully and brought innovations of its own.

One example of how this works in practice is a new development—Conform From Disk—for the D1500. Introduced this month in v2.2 software, this is a process for on-line VT where a low-cost machine is used in the studio gallery together with the usual VT machines to record audio with common time code (usually time of day). After the VT edit, which may be a combination of nonlinear off-line and final on-line, the resultant edit list is loaded into the DD1500 and autoconformed from the optical (or removable Winchester) disks in the DR8. This eliminates laborious conforming from the original video tapes. There is no need for a suitable (and expensive) broadcast video machine in the audio post suite and there's no need to get involved in the fraught area of media interchange between dissimilar systems. The Sound Supervisor has access to all the out-takes immediately and can adjust edits or substitute takes without having to search for tapes and transfer audio.

Conform From Disk can also be used to conform previously synchronised material to a nonlinear off-line EDL, again eliminating conforming from tape.

BUILDING ON the success of the DD1000 the DD1500 is a full-blown workstation with 16 tracks and numerous I-O options. The system consists of a neat hardware controller, the DL1500, and a selection of 19-inch rackmount units.

The maximum storage which can be on-line at any one time is currently a massive 99 hours. There may be up to 4000 audio 'recordings' per disk, a recent increase to accommodate large Winchester disks, and the number of 'cues' per project is limited only by available RAM.

The DD1500M houses the CPU and Akai's custom LSIs to handle audio data streams, the video inserter and synchroniser. This is also where most of the connectors and interfaces are located. All the usual ones are industry standard but there are some unusual extra interfaces and some Akai specific ones. The DD1500m can provide up to 12 channels of AES-EBU input and-or 16 channels of AES-EBU output. The mix outputs can be connected digitally via a D-connector to the DL1500 where two stereo D–A convertors are provided for monitoring.

Further D-connectors carry three programmable GPIs and four programmable GPOs to drive tally lamps (or similar) and biphase I-O. A pair of proprietary connectors go to the analogue interface(s). There is also a BNC connector for the AK-net link which communicates with the DL1500 hardware controller.

The DD1500A analogue audio interface takes a total of four 4-channel cards of 20-bit D–As with 8x oversampling and three 4-channel cards of 18-bit A–Ds with 64x oversampling. Fully populated, each DD1500A provides 12 analogue inputs and 16 analogue track outputs.

The DD1500X storage unit is connected via SCSI to the DD1500M. It can carry variety of storage options such as 2.6Gb M-O drive(s), fixed or removable Winchester drive(s), Exabyte or data DAT for back-up and Jaz. Akai will supply drives or advise on suitable units.

The DL1500 display has a standard VGA output. There is only one screen, no pages or nested information. The display driver uses a custom LSI to eliminate the processing overhead of waveform drawing and zooming from the CPU. I noticed that the horizontally scrolling video display seemed less smooth than it used to be when viewing 4s or less. Akai admit a bug crept in on a recent software update—the pest controllers will eradicate it on a subsequent release. The additional video inserter on the DM1500 can be set to add a time counter, DD1500 transport status and space free on disk to a video picture.

The solid and elegant DL1500 is standard 19-inch rack width and can be integrated into custom furniture or stand alone. The design imperative was to put the most commonly used functions on dedicated keys with the next most commonly used functions accessed via a SHIFT key. Only the housekeeping and less intensively used functions are on data entry keys and soft keys. One strange omission is that of a dedicated reverse play key, however pressing SHIFT and PLAY to sync reverse soon becomes second nature. In addition to the buttons, there is a smooth jog wheel, a long-throw fader for setting levels and a pan pot. Tracks are selected for recording, editing and replay with dedicated buttons on the small upstand which also houses the LCD, time-code display, meters and a 3½-inch floppy drive.

A standard computer keyboard can be connected to facilitate text entry.

INTUITIVE SOFTWARE contributes to the ease of learning the DD1500. When a choice is to be made the most likely alternative is highlighted on the LCD or a tally lamp flashes next to a key, inviting selection. In many circumstances 'in context' help is also displayed. If you get it wrong there are 20 levels of undo-redo.

In addition to the transport controls there is a comprehensive autolocator with 99 'grab markers' and 99 numbered locations. Recorded material is organised into Projects and Libraries. A Project carries audio, EDL or Qlist, DSP information and system settings. The latter makes operation considerably less stressful and less prone to finger trouble. Libraries are Project independent and are used to store material for many Projects. Libraries can be created of say, the sound effects for a series of programmes, with each programme an individual Project resulting in big savings in storage. Recordings can be made to Project and Library simultaneously—this gives one recording and two references to it both of which have to be deleted to erase the audio. In this way effects added during work on an individual episode can be made available for all future episodes.

Cut and paste editing is fast and simple. The Clipboard has ten locations which can be named. Clips can be taken of multiple cues or sections of cues and the Clip retains the attributes of the original Region. This can be useful if you wish to duplicate an effect which is made from a

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composite of edited material.

DSP allows fades to be added with three curves available, Linear, Log and Sine which provides an equal power curve fade suitable for crossfades. The current limitation is that crossfades within individual tracks are fixed at a few milliseconds, but software v2.5 (due in May) will allow long overlaps within a track (in real time), reduce the number of keystrokes required to perform trim operations, and generally improve the trim functions.

DSP gives mixing and panning in real time with non real-time functions including pitch shift-timestretch, reverse and EQ. These take around three times real time to execute. There are 16 preset sets of parameters for the time-domain functions, each with three variations which affect the way the material is analysed. Extreme shifts or stretches of more than say 10% can produce artifacts but the performance is as good or better than any comparable machine.

Off-line EQ provides high-pass and low-pass filters, high and low shelves and two bands of parametric with variable Q. It is not possible to alter parameters whilst listening to the material. The optional real-time EQ board, which will be enabled in software v2.2 will make all this far more usable in time critical situations.

From v2.1 the level and pan mixing functions can be controlled by Akai's neat MT8 mixing controller. A subsequent software release will add dynamic automation.

THE AUTOCONFORM utility is comprehensive and solid: variable handle lengths can be specified, sections of lists can be conformed and minimum gaps set. EDL analogue and digital audio commands can be mapped to DD1500 tracks and the EDL video commands can be mapped to a spare audio track, if so desired, to allow the picture edits to be viewed graphically.

Another v2.1 innovation is Rushes Record which allows recording of material from rushes tapes with time code discontinuities and speed variations. These are often present on analogue location recordings. The remaining snag is with digital rushes. Discontinuities in digital input, when sync'd to video, cause the DD1500 to drop out of record. If this is important to you it can be easily overcome by putting a simple AES-EBU synchroniser-rate convertor between the source machine and the DD1500.

The DD1500 can be an RS422 (Sony P2 9-pin protocol) master or slave, a time code master or slave (LTC, MTC, VITC) or a biphase master or slave (2, 4 or 10 cycles/frame). The unit can be synchronised to; wordclock,PAL-SECAM or NTSC video, digital audio or internal clock.

The DD8 is a professional version of the DR8. Akai has done its homework because, in addition to the obvious applications in music recording and audio post, the DD8 is tailored to film use in clever and subtle ways. It remembers its setup in flash memory, there is a preread output and the whole device has all the features of an 8-track mag recorder—and then some. Not for nothing does the word 'dubber' appear on the front panel.

First, the DD8 is a plug-compatible drop-in replacement for the justifiably popular Tascam DA-88. Second, every function you could wish for in a film dubber is here; reverse play, 'chatter' audio at up to five times play speed, track arming, seamless punch-in and out on the fly on all or any of the eight tracks and nudging of sync on individual tracks in frame, ½ frame, 1/10th frame or 'sprocket' increments (35mm film has four sprocket holes per frame). Functions can be remotely controlled via RS422 and or by optional programmable GPIs. A total of 12 GP inputs are available with 16 GP outputs to control tally lamps and so on. Akai has adopted a sensible approach to third-party control and have released its protocols to manufacturers of custom control devices such as Colin Broad.

The DD8 even has an output to drive a conventional film dubbing theatre preread display. Preread takes the form of a row of lights usually situated under the projection screen. An extra replay head is mounted on the magnetic film machine a in advance of the audio replay head. When audio is detected on a track a signal is sent to the display which lights up from left to right over the same time it takes the audio to arrive at the replay head. When the last lamp on the right illuminates audio will be present at the relevant fader on the mixing desk. Third, the transport will synchronise to a vast variety of sources: time code in various flavours, RS422 and, perhaps most importantly to some film users, biphase pulses.

Akai's DD1500, DV1500 and DD8: the building blocks for postpro

The film industry has used biphase for many years to synchronise magnetic film recorders, replays and in some cases projectors. It does not carry an absolute sync reference, as does time code, but it has served the film industry well and provides a painless way to integrate digital dubbers within a film environment.

There are a plethora of pull-ups and pull-downs available which allow the machine to be used on the most complex projects involving exotic frame and sampling rates and conversions. There is insufficient space to detail them all here, suffice to say if you have a problem with unusual sync requirements or conversions give Akai a call.

The icing on the cake is the optional AK-net board. Up to 16 Akai machines from the range can be connected to one DL1500 control surface. The DL1500 will control whatever facilities are available on a given machine plus enhance the capabilities of the DD8 to provide the same basic editing facilities as the DD1500. In the beta software I saw the notable missing component was actual machine to machine synchronisation which had to be achieved separately. Akai is expecting to ☞

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DD1500 SOFTWARE VERSIONS

VERSION 2.2
(February 1997)
MT8 support for real-time EQ board
Conform from disk

VERSION 2.1
(November 1996)
Support for MT8 controller provides control of level and pan for 16 tracks
Text entry simplified.
Maximum cues per disk now 4000
Rushes record.

VERSION 2.0
(May 1996)
Non-real time DSP functions added
Comprehensive Autoconform
Exabyte backup

VERSION 1.5
(August 1995)
Improvements to VGA layout: overview, 16 track status bars, autozoom (track(s) selected for editing automatically displayed
Biphase control improved
gearboxing between synchronising standards improved
RS422 control
Printing
MIDI

VERSION 1.3
(April 1995)
DD1000 disk compatibility

VERSION 1.0
(January 1995)
Multitrack record
Cut and paste editing
Comprehensive synchronisation functions

All software updates to date have been free of charge

introduce synchronisation across AK-net in a forthcoming software release so even this minor limitation will be removed.

Finally, a who has edited or mixed audio to U-matic or one of the lower priced Betacam video recorders should know about FED's V-MOD nonlinear video recorder. For a full rundown see *Studio Sound*, September 1995 but know this now—it offers instant access and the range of speeds over which it can provide stable picture and tight synchronism with no noise bar, break up and therefore far less eye strain is impressive. Pictures are not broadcast quality but neither is a 16mm slash dupe or Beta or U-matic off-line copy and I know which I would prefer to watch for 12 hours a day. Akai engineers have worked informally with the people responsible for the V-MOD to ensure seamless operation under Akai control and Akai anticipate bringing their own version to market this year designated DV1500.

THE SAME CORE CODE is used across the DR8, DR16, DD1500 and DD8 ensuring that when new product is brought to market any bugs will be minor and relatively easy to fix. In practice Akai is well aware of the importance of software and hardware reliability in a market which has considerable experience of being used as an extension of manufacturers R&D departments. A further advantage of this approach is any software development on one machine is applicable to the rest of the range provided the machine has the relevant hardware to support it.

The DD8 and DD1500 will perform bit transparent recording. What goes in the digital inputs is what will come out of the digital outputs unless the operator manipulates the audio using DSP functions.

Akai has been diligent in providing the means to enable its equipment to fit seamlessly into a wide variety of real world situations with the minimum of aggravation. The obligation this imposes on facility managers is to design complete processes with care in order to achieve the most cost effective solution.

The hardest thing to describe about this range of machines is the smoothness and speed they bring to the dubbing process. Transport ballistics have been carefully chosen and tare a pleasure to use. The highest compliment I can pay is that the feel is like that of a dubbing theatre with a well set up master pulse generator (biphase) driving top-of-the range magnetic film machines but with vastly improved sound quality and random access advantages. The reverse sync play which is common to all the range is seamless and as near instant as makes no difference. Incidentally reverse play has more uses than simply equalising as many feature film mixers do. It is also the quickest way to identify sync points and helps to establish a rhythm as you work.

All of this contributes to fluid operation which tape-based systems never managed to achieve and very few workstations approach. Add to this the interchangeability of disks between the systems. Whether you choose to use M-O, removable Winchesters or whatever, provided the machine is physically capable of accepting the disk you can load and instantly use the project. If a 16-track project is loaded on a DD8 any 8 tracks can be selected.

With the addition of the DD8 and DV1500 and the enhancements to the DD1500, Akai has the building blocks, apart from a heavyweight mixing desk, for the post process. The omission of a desk means, however, that Akai is happy to help users integrate third-party consoles. A real bonus is that a complete Akai system with well-specified DD1500, DD8 and DV1500 costs about the same as two 2-track 16mm high end mag machines.

I have concentrated on the sound for picture applications as these are amongst the most demanding but I should mention these machines are finding many applications and admirers in radio and music studios.

CONTACTS

UK: **Akai (UK) Ltd, Haslemere Heathrow Estate, Silver Jubilee Way, Parkway, Hounslow, Middlesex TW4 6NQ. Tel: +44 181 897 6388. Fax: +44 181 759 8268.**
US: **Akai-AMC, 1316 East Lancaster, Fort Worth, TX 76102. Tel: +1 817 336 5114. Fax: +1 817 870 1271.**

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SoundField SPS422

The latest variant of the notorious SoundField microphone has its sights firmly set on popularising a powerful but largely neglected area of microphone and associated technologies. DAVE FOISTER does a little fieldwork

WHEN IS A SOUNDFIELD not a SoundField? The answer, since the microphones and the associated technology were sold on to SoundField Research by AMS, is Never, since the whole family now carries the SoundField legend where previously only the top model with all the surround bells and whistles was strictly a SoundField.

AMS introduced a second model, the ST250, and SoundField Research took this 'poor man's SoundField' on as part of the package. This took the basic building blocks of the technology—the tetrahedral capsule assembly and the manipulation of B-Format signals—and used them to produce a much simpler stereo microphone with comprehensive XY and MS facilities in a package capable of being used on location, complete with battery power. While this is a splendid microphone, it has a couple of idiosyncratic features which SoundField feels have stood in the way of its becoming a familiar studio resident. Coupled with the image of the full-blown SoundField as an enthusiast's tool or even a nutter's toy, this prompted SoundField Research to develop a microphone whose function was clear and straightforward and which could be seen as the powerful stereo tool the microphones have always been. To this end the details of how the technology achieves its results have been played down somewhat, and some of the unique features of the technology have been deliberately omitted.

The SPS422 consists, like all SoundField microphones, of a microphone head and a dedicated control unit, linked by a multicore cable. The head is physically very similar to the other SoundField models, but is sufficiently different electronically to warrant a warning in the manual against attempting to use it with the other types of control unit. Inside the head is the essential array of four capsules together with the associated four channels of electronics, and as with the ST250 matching for individual capsules takes place here, unlike earlier SoundFields where heads and control units came in dedicated pairs as the first stage of the electronics was factory matched to the capsules.

Substantial screw-locked connectors terminate the multicore cable between head and control unit. While an ideal installation would have suitable multiway tie-lines installed, it is possible to use breakout boxes to link the microphone to the electronics via several XLR tie-lines. One or the other is advisable, as the microphone's full potential is realised with the control unit in the control room. Many microphones have controls on their power supplies for polar patterns and the like, which can reasonably be left in the studio, but there is so much more available on the SPS422 that treating it like that would not do it justice.

Those familiar with the SoundField concept of combining B-Format signals to create virtual microphones can skip the next bit, but for the rest a little background is in order. The four capsules are set on the faces of a regular tetrahedron, not, as some seem to think, facing front, back, left and right. Straightforward addition and subtraction of the four capsule outputs yields a set of signals known as B-Format, comprising three figure-of-eights facing forward, left and up (called X, Y and Z respectively) plus an omni called W. In other applications these signals can be manipulated in a variety of ways to give anything up to full Ambisonic periphony (surround sound with height) but familiarity with Ambisonics is quite unnecessary to get results from the SPS422. Here the use of the B-Format signals is restricted to the generation of a front-facing microphone with fully-variable polar pattern (mixing the X and W components) and using the Y signal as the side component of a conventional MS system. One further nicety is added by the presence of the vertical Z component, which can be swapped with the X to switch the microphone from side fire to end fire, and similarly the microphone can be operated upside down, with left and right still correct, in either end-fire or side-fire mode—not that the user needs to know what is what is happening, as like all the SPS422's functions both these are on clear front panel switches.

SPS422: 'There is nothing that I know of outside the SoundField range that provides this degree of control over stereo acoustic recording in such a convenient, readily adjustable form'

THE RESULT of all this is a particularly flexible MS microphone, with two straightforward controls to perform the usual adjustments to the M polar pattern and the stereo width, dictated by the amount of S signal mixed into the matrix. It is disappointing to see, however, that the manual's description of these controls perpetuates the confusion that surrounded the corresponding controls on the ST250 when it was launched. The first is labelled PATTERN and the second WIDTH which to those used to MS will immediately make perfect sense. For others, however, there will be a temptation to assume that the controls synthesise a crossed pair where both microphones have the polar pattern set by the first control and the angle between them is set by the second. This is not the case at all, although unfortunately the manual continues to suggest that it is. Since full-blown SoundField microphones ☞

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such as the current Mark V have controls that do exactly that, this confusion becomes even more of a problem. Taking the manual at face value could lead one to assume that the microphone was misbehaving, and two specific examples bear this out.

As the manual describes it, setting the polar pattern control to omni should give a mono output regardless of the setting of the width control, and it plainly doesn't—it gives a stereo signal which at maximum width is actually 180° cardioids, exactly as the MS devotee would expect. At the other extreme, a figure-of-eight polar pattern should give out-of-phase mono at maximum width (with complete cancellation when switched to mono) which again it doesn't; it gives the classic Blumlein configuration of 90° figure-of-eights, again as one would expect from an MS arrangement. This is not a criticism of the microphone in any way, which behaves exactly as it was designed to do, but a criticism of the manual which in a misguided attempt to simplify matters actually ends up being wrong and misleading.

In fact the facilities these two controls provide are hugely powerful in their own right and need no simplification. MS enthusiasts will know the consequences of changing the polar pattern of the front-facing M microphone and the corresponding X-Y results, and will appreciate the benefit of having a fully-variable M pattern. The point is that any conceivable X-Y array of standard first-order microphones can be produced in this way. The trick, as with any transition from X-Y to MS, is to learn the correlation between the two techniques, and in fact SoundField Research has produced a useful piece of graphic Windows software which shows more clearly than anything else I have seen how a given MS setting translates into X-Y. If ever anybody had it in their power to explain the relation between the two techniques and demystify the one to the adherents of the other it is SoundField, and it would be good to see the literature helping the cause a bit more.

Most potential purchasers of the SPS422 will care not a fig for what might have been, but will be looking at it as SoundField intend, as a supremely versatile stereo microphone. Judged like this there is no doubt that it has few if any peers

STILL, WHO READS MANUALS?

Given a modicum of common sense, operation is straightforward enough and yields the expected huge range of stereo pickup possibilities. There is nothing that I know of outside the SoundField range that provides this degree of control over stereo acoustic recording in such a convenient, readily-adjustable form. The SPS422 has all the stereo flexibility that any SoundField has ever had, albeit in a slightly different form and without the steering capabilities of rotation and tilt that the full-blown models possess. It also inherits the advantages of the near-perfect coincidence of the virtual microphones making up the array, with effectively no risk of arrival-time differences colouring the stereo picture or compromising mono compatibility. The resulting stereo image is as convincing as any you are likely to hear, with extraordinarily precise localisation and breathtaking depth.

The control unit is also the preamp, as the SPS422 delivers full line level from its balanced outputs. It has both coarse and fine input gain controls, giving more than a sufficient range for most conceivable uses, and has the huge plus of big LED meters on the front panel, carefully colour coded to show transitions through important level points and with additional fast overload LEDs. Next to the meters is a very bright indication as to whether the microphone is set to its usual X-Y configuration or is delivering raw MS signals to the outputs. For the first time on a SoundField, straight B-format is not available, and while I can understand SoundField's decision to remove the potential for intimidation of the uninitiated I am personally disappointed that one of the few remaining custodians of the best surround technology ever developed feel it necessary to play it down to this extent. The failure of Ambisonics to establish itself beyond its die-hard cult following and to hold its head up while consumer surround sound becomes ever more practical is a source of continuing frustration to those of us who know its capabilities.

But then most potential purchasers of the SPS422 will care not a fig for what might have been, but will be looking at it as SoundField intend, as a supremely versatile stereo microphone. Judged like this there is no doubt that it has few if any peers outside its own immediate family. The flexibility would be of little value if the sound was in any way substandard, but again the sonic qualities of the SPS422 take some beating, the outstanding natural musicality of the sound perfectly complementing the vividness of the stereo image.

The benefits of SoundField technology seem difficult to market properly, and certainly none of the previous owners of the system have been able to give it the presence it deserves. SoundField Research has adopted its own line, resulting in a stereo SoundField, uncompromised sonically, for about the price of a U87, and while I as an Ambisonics convert may regret one or two missed opportunities, if the SPS422 makes its mark and opens the door to further exploration by some of its users then it will serve an even higher purpose than simply being the best stereo microphone on the market.

CONTACT

SOUNDFIELD, Charlotte Street Business Centre, Charlotte Street, Wakefield, West Yorkshire WF1 1UH, UK. Tel: +44 1924 201089. Fax: +44 1924 201618. www.proaudio.co.uk/sndfield.htm

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Tel: 46 8 97 0920 Fax: 46 8 646 0925
Contact: Mats Mattsson

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Tel: 01 910 4141 Fax: 01 910 3544
Contact: Roland Bricchi

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Røde CLASSIC

Following the general philosophy behind the NT2, Røde's Classic microphone sets out to mix traditional with innovative design considerations. DAVE FOISTER tests a new valve mic that is certain to be a quality classic

WHEN RØDE LAUNCHED the NT2 it was clear that the previously unknown Australian company meant business. The blatant Neumann look-alike had a sound worth considerably more than its budget asking price, and its status as a desirable microphone in its own right was quickly established. The combination of technical excellence and evocative packaging made the prospect of a valve microphone from Røde particularly appealing, and the Classic was therefore eagerly awaited.

The Røde Classic is no less reticent about its inspiration than the NT2, but seizes the opportunity to borrow characteristics from more than one vintage model. The design of the body is unmistakably 1950s Neumann, and the swivelling trunnion mount is like the Neumann too, but the power supply and control unit offer a set of facilities remarkably similar to a vintage AKG.

Yet this is not intended to be a mere look-alike or even a sound-alike. Røde makes it clear in the literature that the idea was to create a new microphone embodying the perceived benefits of classic valve design with the advantages of modern technology, producing a sonic character all of its own. The attention to detail makes it plain that the company wants it to be considered on its own merits rather than simply seen as a cheap replica of a collector's item.

> If I were to accuse the Røde Classic of sounding transparently accurate I am sure its designers would take offense

To this end Røde managed to lay hands on large stocks of the obsolete 6072 valve on which so many classics were built, and had Jensen design a custom output transformer that, with the valve circuit and the specially-designed capsule, is intended to produce 'ultra low' distortion.

There is only one way to mount the microphone on a stand, and that is to use the attached swivel arm, giving very flexible control over position. The microphone can be swivelled head up or head down, although the connector fouls on the arm slightly, and the knurled nut is not quite big enough to lock it off positively. The only puzzle is working out which is the frontend, not helped by the fact that the photo on the instruction leaflet is actually a picture of the back. The main giveaway is a single gold screw in the front; there is no maker's badge, and, of course, no control switches as they are all on the power supply.

THE MICROPHONE connector is a small Tuchel multiway, and a special long and winding Røde cable is supplied as standard to connect it to the power supply. The cable, also custom made for the microphone, is remarkably chunky, and carries not only signals and supply rails but also switching lines. These are for the two pad positions, which reduce the gain within the microphone's onboard circuits by means of micro relays.

The switch for this is on the power supply, as is control for the low-cut filter and the polar pattern selection, all three being old-fashioned rotary pointer knobs. The polar pattern possibilities are exactly the same as on the AKG C12, with a 9-position switch marked omni and figure-of-eight at its ends with cardioid in the middle, and having three intermediate positions each side. No one would pretend, I am sure, that the polar patterns were accurate right across the range, but they are quite distinct, serving again as a reminder of how useful this extra degree of control can be in tailoring the behaviour to the situation. For instance, one notch tighter than cardioid can help a lot with spill without the restrictions imposed by going all the way to hypercardioid.

The most consistent pattern with frequency, according to the specs, is figure-of-eight, and this also gives the flattest published frequency response plot. Cardioid and omni curves show distinct deviations from flat, with a slight dip in the upper mid followed by a rise in the lower treble. This is no accident, but a clearly audible and undoubtedly deliberate characteristic of the microphone.

If I were to accuse the Røde Classic of sounding transparently accurate I am sure its designers would take offense. The microphone has a definite character, and one which often delivers just what is needed for vocals, horn lines and so on—all the applications where a tube is often first choice. The pronounced presence drives right through a mix, and the bottom end is big enough to stop it sounding hard. The curve is exaggerated enough to give problems on an already sibilant voice, but for the rest it does an excellent job of adding that certain something without reaching for the EQ.

It's yesterday once more with a Classic valve mic

It may well be that many people have a mental image of what a vintage microphone should sound like, even those who have never been fortunate enough to use one. It seems that what Røde has tried to do is to distil the elements of that image into the Classic, producing if you like a generic vintage microphone sound without sticking its neck out and claiming to be the 1990s' answer to the U47. It invites a wholly different kind of comparison, offering itself on its own terms as a microphone in its own right, and it stands up very well indeed.

CONTACT

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Manley VARIABLE MU

Claiming more of a historical heritage than many of the valve processors presently appearing on the market, Manley's Variable Mu comp-limiter is sure to attract attention. ROB JAMES puts it through its paces

THE COMPANY TELLS ME that David Manley designed the limiting circuitry in this device 30 years ago; this is perhaps five years before I first came across the concept. I remember studying the principles embodied in this unit when I was training at Woodnorton from where I have happy memories of lining up valve PPMs—which, if memory serves, also employed variable-mu valves. Later (though not for long) I used a similar unit before it was consigned to the scrap heap in the march of progress. It would be worth a fortune today...

The huge advantages of current valve designs—such as the unit on test—is their quietness and relative stability. Some of the older designs needed alignment on a daily basis even when the valves were young and at their best were decidedly hissy.

The manual suggests; 'good ventilation is definitely encouraged'. It's good advice as this baby runs hot, something for which I was very grateful in the absence of central heating with the temperature outside hovering around zero. It is a 2U-high box, but I would allow 4U in the rack for decent ventilation. I was delighted to see the manual provides instructions on setting up the device for such parameters as Meter Gain Reduction Accuracy and Zero although this requires the lid to be removed so should not be attempted by those without the knowledge or confidence to carry it out safely. Curiously the internal balance which adjusts the current draw of the variable-mu valves is available on the front panel together with the required test points to attach a multimeter. Curious because Manley reckons this adjustment is normally only required when the valves are changed. With normal use this should only be required once every four or five years.

The variable-mu valves fitted are now 5670s as the original 6386 is now in very short supply. These are not a direct swap without other component changes.

The construction is solid and seems meticulous. The circuit board is neatly laid out but the track widths are of necessity far more generous than is the case with the densely packed 'modern' digital cousins of the computer. There are a total of eight valves or tubes as they say in California.

THE LOOK and feel of the unit is interesting. At first glance it all harks back to an earlier age and inspires confidence. But when you examine it more closely the design is more subtle. The knobs are hewn out of solid metal—no bakelite here—the toggle switches are the modern dainty variety not the clunky great things on the device I remember. The panel legends and meters are large and clear enough for the most myopic engineer.

Manley's Variable Mu: classy looks and a 'real valve sound'

Controls are as you would expect on a device of this type, there is a hard wired IN-BYPASS which simply connects input to output, COMP-LIMIT which gives you 1.5:1 compression or limiting at 4:1 which these days I would class as compression although the ratio increases when limiting over 12dB up to 20:1 maximum. The knee is soft. Recovery times are selectable on a rotary switch with five steps between Very Slow at 8s/dB to Fast at 0.5s/dB. Threshold control is on a pot as is output attenuation and attack. DUAL INPUT sets input attenuation. The unit may be used twin channel or linked for stereo with the LINK switch which, in this unit, links the attack and release parameters so it is still necessary to match the other controls. The meters remain unlinked to facilitate threshold setting.

On the back panel are the necessary sockets with inputs and outputs provided on balanced XLRs. Unlike some of the other Manley units jacks are not provided.

There is also a mastering version available with ½dB THRESHOLD and OUTPUT controls, a 5-position INPUT preset switch and 12-position ATTACK control to enable accurate, repeatable settings. With transformers on input and output this machine has all the makings of a classic.

One point worth noting in this context is the the output impedance which is 600Ω and the input impedance which, at somewhere around 1kΩ, may give problems with semi-pro equipment expecting to see high impedance; 600Ω I-O used to be standard on all professional equipment but is now something of a rarity. The output impedance should not cause any problems. The unit will only give of its best when used with balanced sources and destinations.

Manley recommends allowing 15 to 20 minutes from power-up to let the circuitry stabilise. The first thing you notice is the gain reduction meters are right-hand zero and are held in this condition electrically so the needles move from left to right as the unit warms up. I was again reminded of the old valve PPMs where the same thing applies but with zero on the left. I remember being told this was because the spring 'return' of the meter needle was faster than the valve electronics could achieve.

This is not a 'brick wall' broadcast type limiter nor is it intended to be. While it is possible to provoke the machine into 'pumping' and transient distortion you have to want to do it as the control settings required are extreme. The Manley can also be used to give a smooth 'creme fraiche' valve distortion if you require it. The unit is at its best providing modest amounts of compression on a wide variety of instrumental sources. It is well suited to classical or acoustic work and will gently lift instruments or vocals out of the mix. It tightens politely, more lycra than whalebone, more affectionate squeeze than bear hug.

Another possible application would be in compressing dialogue tracks in sound for picture. I fondly remember using one of the Manley's predecessors for this purpose. It was always less obtrusive than the solid state alternatives. The Manley performs this task without you being aware any processing has occurred.

Push it harder and you get plenty of punch, subjectively far more than meters would indicate and the Manley begins to impress in a different way. Real valve sound without the sloppiness evident in some units. Drums take on real 'slam' and boring bass parts come to life.

CONTACT

MANLEY LABS, 13880 Magnolia Avenue, Chino, CA 91710, US.
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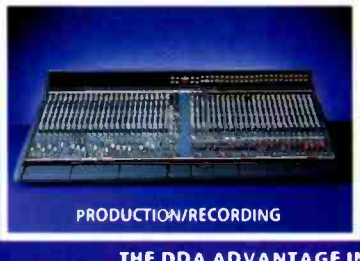

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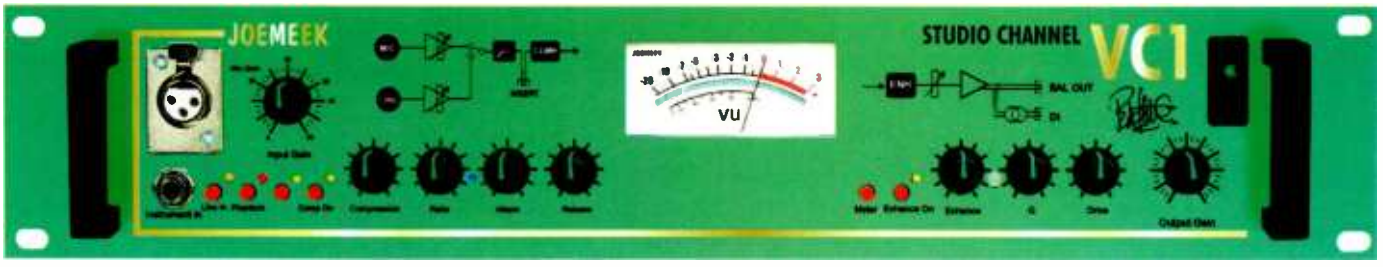
JoeMeek VC1

The legacy of British production legend Joe Meek lives on–in the popular press and in the equipment rack.

ZENON SCHOEPE evaluates the latest studio compressor starting with the paint job...



THE LATEST IN a Fletcher ElectroAcoustics range that also includes valve-based units is the VC1 Studio Channel. The unit is a single-channel preamp with a JoeMeek compressor and an enhancer. Needless to say it's still the characteristic shade of automotive paint green that has become the trademark of the JoeMeek stuff. How the colour came about is one of those marvellous accidents of happenstance that deserves to be told.

While working on an early prototype JoeMeek unit, designer Ted Fletcher decided its plain metal panel work needed painting and ran into a car accessories shop just prior to closing time asking vaguely for 'some paint'. The disinterested shop assistant reached out to the shelves of spray paint behind him without even looking and plonked a can on the counter. And that my friends is all there was to it. Bright green? Considering the selection process and what could have happened we got off fairly lightly.

Combined with a solid build quality, the colour contributes to a very impressive unit with the VC1 benefiting from rudimentary front panel legending of its circuit diagram. The back panel is similarly marked up and usefully ties the physical connectors into the diagram. In fact, it's a shame that you're unlikely to see it again once you've bolted the unit into your rack. However, it's here that you'll find the balanced line in, -10dB insert, an auxiliary input into the signal chain, paralleled balanced jack and XLR DI outputs and a balanced line output. There's also a ground-lift switch, a phono socket for stereo linking the compressor section to another unit, plus a mic input paralleled with that found on the front panel feeding the device's transformered preamp. The front panel also boasts an instrument level input so this box can handle any type of input you throw at it.

The 2U-high rackmount is dominated by a large mechanical vu meter which can be switched to read input gain or gain reduction. Operation is simple and concerns itself with sections for the preamp, compressor and enhancer. Some 60dB of gain is available on the mic input with -5dB to +30dB provided for line levels and this pot works in conjunction with a mic/line selector, phantom power switch, and 25Hz 12dB/octave high-pass filter all with LEDs.

We then hit the established photoelectric driven JoeMeek-style compressor although this one unlike some previous incarnations offers fully variable controls for Compression (essentially drive), Ratio (1.2:1 to 6:1), Attack (0.5ms to 6ms) and Release (250ms to 2.5s).

The enhancer section works by peeling off the upper end of the input signal, compressing and fiddling with it, and then mixing this back into the channel on an Enhance control. It's a principle that is similar to other so-called enhancers although the results are quite distinctive. For example, you can hear a subtle delay on the processed signal under certain conditions and I would say that the usable range of control available is extremely wide and is not just concentrated in quarter turns of the pots. Plus you've got DRIVE and Q pots to play with that alter the tone and high-frequency harmonics respectively. It amounts to a useful little section. An LED glows to tell you signal is getting into the section and turning the pots does make an audible difference which could described as a type of top end thickening. You can add presence with it and apparent brightness and providing the source is up to it can be pushed quite hard.

PUSHING HARD is what the JoeMeek compressor circuit is all about and the VC1 distinguishes itself from the partly preset original JoeMeek Compressor by being altogether more variable. The original box has a slightly slower maximum attack time and a tad more maximum ratio squeeze but this is academic as the end results are extremely similar with a highly characteristic squashed sound that the manufacturer has now made its own. It's an old fashioned compressor sound and if you haven't heard it already then you should.

The VC1 sounds superb; looks great

Not to be confused with limiters, this is all about using compression as an effect for its own sake while reducing dynamic range almost as an aside although it does do this extremely well.

The VC1 compressor scores on its variability and while it's still not lightning fast in the attack and release department, it's still smart enough to stay on top of things because of the comfortable and smooth way in which it does kick in when finally roused. The COMPRESSION pot is essential for ensuring that there is enough poke on any signal to make things happen. I really do love this type of compression because it's so relaxed and ultimately very expensive sounding. It's performance on vocals is price category leading.

It's a shame the box does not handle two channels, although the presence of an output level pot clearly aligns it with those seeking a direct-to-tape channel path of some flexibility. As with all the JoeMeek gear it's exceptionally quiet.

Mic preamp performance is very good but so are the results with instrument level sources. A bad attack of a recurring guitar fetish has caught me sticking a jack into just about anything that will take a guitar input and much gratification was found in the VC1. The compressor and enhancer really do work well and Fletcher ElectroAcoustics should contemplate applying itself to this application.

It all amounts to one very clever single channel processor, that looks great, is distinctive in operation, costs less than you'd think and sounds superb.

CONTACT

UK: Sound Valley Distribution, The Briars, North Road, Amersham, Bucks HP6 5NA. Tel: +44 1494 434738. Fax: +44 1494 727896.
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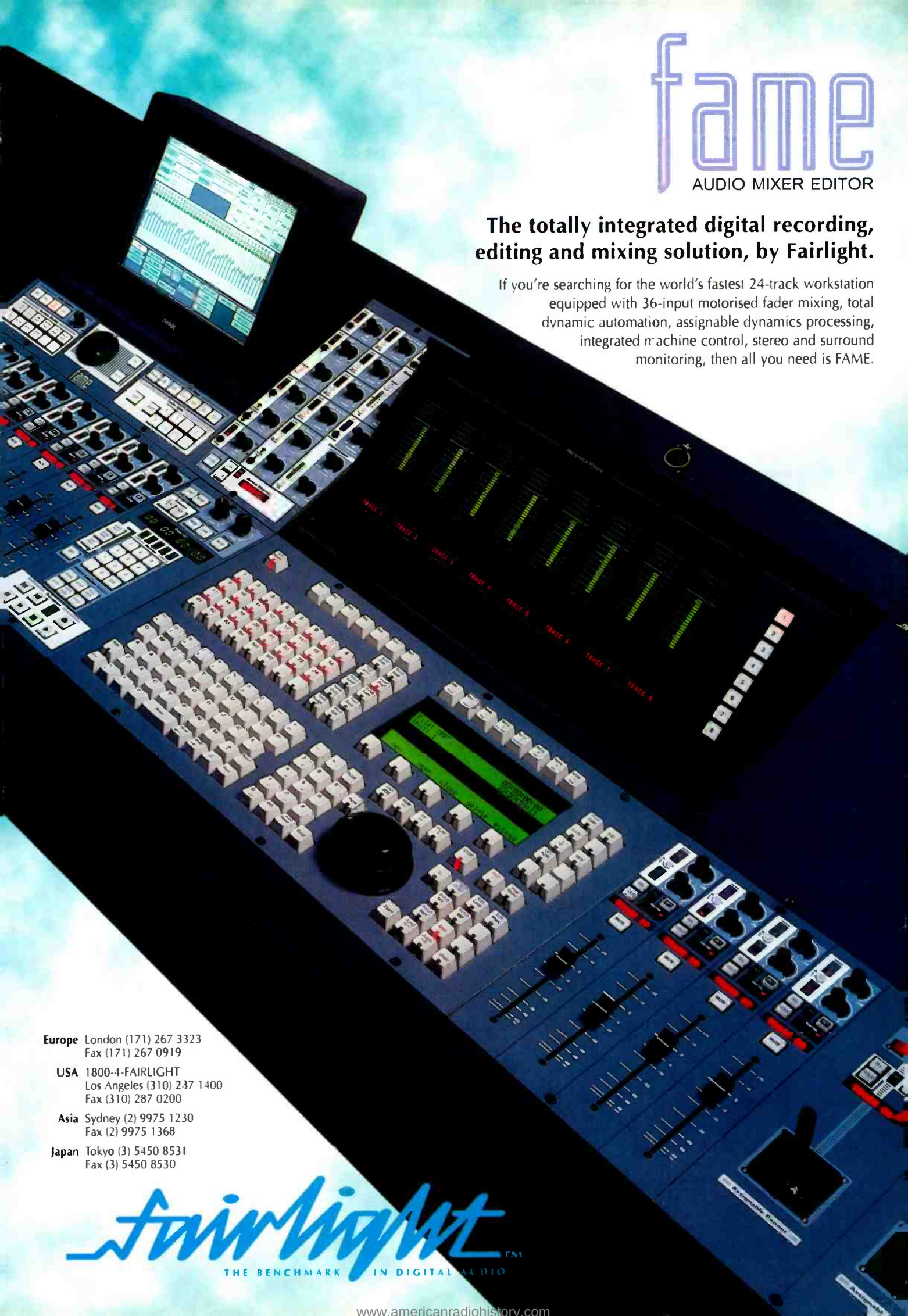

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Crane Song STC-8

Crane Song's new compressor-limiter competes well in today's design stakes but it's in the rack that it really delivers the goods. DAVE FOISTER enjoys a dose of alternative American dynamics processing

CRANE SONG aligns itself with the growing movement to apply audiophile approaches to professional equipment, challenging the view that pro kit is by definition superior to consumer systems and that the beliefs of the home audio enthusiast are little more than superstitions. The STC-8 is a twin-channel compressor-limiter which eschews any kind of integrated circuit VCA in favour of discrete class-A circuitry, pointing out that the disadvantages in terms of cost and heat generation are more than outweighed by the sonic benefits. Crane Song is not content to let it rest there, however, and adopts some proprietary approaches to the apparently simple matter of compression control itself.

It also adopts a cosmetic style all its own, combining a substantial laboratory-type aluminium panel, rudimentary black control labels and basic black toggle switches with peacock blue-green knobs which you'll either love or hate. The panel also features the illegibly-scrawled signature of the designer, whose name is revealed by the manual as being David Hill.

Operation of the compressors, while unconventional, is designed to be helpful and intuitive and to a large extent it succeeds. Most of the familiar controls are present, the notable exception being Ratio adjustment. This flags up the fact that this is essentially a soft-knee compressor, with a ratio which increases as the signal level rises further above threshold. The transfer function is adjusted by a SHAPE control, bending over the upper part of the curve to give more compression as the control is advanced. This makes it possible to be quite brutal without losing the benefits of a big soft knee.

The relationship between the compressor and the associated limiter is vital to the operation of the STC-8 and the two are integrated more than is usual. Both processes operate on the same gain reduction circuit, with an LED to show when the limiter takes over from the compressor. Overall gain reduction is shown on a usefully long LED bar graph, and this meter can also be switched to show output level or remaining headroom. Most importantly, the action of the limiter can be made to influence the effect of the compressor so as to reduce the effect of hard peak limiting on a dynamic signal. With Attack Modulation (A-Mod) enabled, the presence of over-threshold peaks shortens the attack time of the compressor so that the peaks don't get squared off and the processing is less obtrusive.

More than skin deep—the STC-8's looks are matched by its character

THE PRESENCE OF several unusual features makes experimenting with the STC-8 particularly interesting and rewarding, the results warranting the need to learn how the controls interact. For those who need it to get the job done more quickly, there is a selection of presets covering most requirements with the minimum of manual adjustment. These are provided by a 16-position rotary switch, which is divided into four quadrants for deciding whether to include programme-dependent release (PDR) and-or attack modulation. Within each quadrant there are four positions, one enabling all the manual controls and three giving preset values to the Attack, Release and Shape parameters of the compressor. The three presets are effectively the same in each quadrant, and are optimised for vocals, bass and general programme compression, although obviously they have applications far beyond these.

I found they worked well on a variety of signals, with the amount of compression set simply by the THRESHOLD control. Programme-dependent release is nothing new, but Crane Song's version of it works particularly well, and the difference introduced by the A-Mod function is also valuable in the appropriate circumstances, giving very smooth limiting even at extreme settings. An uncalibrated gain make-up control completes the chain.

Stereo operation links the two channels under the control of the Channel 1 knobs, with the exception of gain make-up, an annoying (but strangely common) omission since it necessitates careful checking of stereo balance every time the gain is changed. A final novelty is a switch, common to both channels, which decides on the type of distortion the unit will introduce.

Crane Song points out that compression by its very nature adds distortion, and that this is generally unmusical third harmonic distortion. The STC-8 therefore incorporates circuitry to convert this into second harmonic, which according to the manual adds warmth—it stops short of dropping the word valve into the description. Quite why this setting should be marked KI and the default transparent setting HARA is not clear, but the effect of switching to KI is subtle and satisfying, adding a thickness to the sound.

Access is provided to the side chain via a 15-pin D-connector giving balanced in and out for both channels' side chains, while the main ins and outs are electronically balanced on XLRs.

The STC-8 fulfils both its objectives of very high sonic quality and a different yet helpful approach to compression, and bodes well for further Crane Song developments. Perhaps cranes sing just before they start to fly.

CONTACT

CRANE SONG, 2117 E. 5th Street, Superior, Wisconsin 54880, US. Tel: +1 715 398 3627. Fax: +1 715 398 3279.
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Mr Kauko Lindfors - MD Kikeono Film Sound Oy.

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Pete Bellotte - Writer Producer.

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dbx 1066

The dbx legacy is set to make a renewed impact on the development of pro-audio dynamics processing. The overture to things to come takes the shape of a capable and friendly compressor as DAVE FOISTER discovers

IT'S SOBERING to realise how many pro-audio people may not know that dbx used to make noise reduction for old analogue tape recorders. True; opinions have always differed as to its merits and it never threatened Dolby's supremacy, but one spin-off we continue to benefit from is dbx's expertise in VCA design. Many's the console automation system that is proud to proclaim its use of dbx VCAs as the name qualifies among the very best OEM VCA manufacturers.

This trademark dbx feature places a sizeable soft knee curve across the threshold, smoothing the transition to compression in dbx' own inimitable way. A similar circuit controls the action of the expander, giving a curving transfer function all the way down from threshold

It is therefore hardly surprising that dbx' own current equipment range centres on dynamic processors, one of the latest of which is the 1066 2-channel compressor-limiter-gate. This 1U-high box, built round the latest V2 VCA, carries a fair sprinkling of controls and indicators, in marked contrast to one of dbx' earlier models which had a single slider marked Compression: More. In fact one of the distinctive features of the 1066, the OverEasy soft knee characteristic, is inherited from that and other preceding dbx compressors.

The collection of processes handled by the 1066 is familiar enough, as many boxes contain the same grouping, but it wouldn't be a dbx if it didn't have its own way of doing things. Thus the first stage is an expander with no attack or release controls but with fully variable ratio, allowing its use as a gate. The level of control this gives surpasses by a considerable margin the rudimentary gates fitted to some compressors, and makes it worth using on its own.

The compressor naturally follows this, and the usual complement of controls for time constants, threshold, ratio and gain adjustment is augmented by an automatic signal-dependent attack and release override and the aforementioned OverEasy function. This trademark dbx feature places a sizeable soft knee curve across the threshold, smoothing the transition to compression in dbx' own inimitable way. A similar circuit controls the action of the expander, giving a curving transfer function all the way down from threshold. The final nicety on the compressor is the CONTOUR switch, which reduces the LF in the side chain to avoid the effect of heavy bass punching holes in everything else.

The last step is the limiter, with a single control for threshold. Not content to be just a peak limiter, this features dbx's PeakStopPlus function, which reduces the overall gain of the system in the presence of extended high peaks so that the limiter needs to work less hard and so is less obtrusive. The limiter is therefore a 2-stage process, starting with the Instantaneous Transient Clamp circuit which keeps peaks to within 2dB of the threshold level and completed by Intelligent Predictive Limiting which kicks in after around 5ms of excess level to reduce the input gain. The time constants for this stage are programme dependent while the clamping circuit operates very quickly all the time, giving a good balance between protective hard limiting and the avoidance of the need to limit at all.

FOLLOWING the operation of the 1066 is made very easy by two meters and three threshold indicators. One meter shows gain reduction of all the processes while the other shows either input or output levels, and the threshold LEDs show the operation of all three processes. A nice touch on the compressor is the use of three LEDs for under threshold, over threshold, and somewhere in the OverEasy region when selected. All these displays operate in Bypass mode, making it possible to set the unit up off-line and switch it in when it's ready.

dbx' 1066: so well laid out it almost sets itself up

As might be expected, there is access to the side chain for external processing, and this allows not only frequency conscious compression (for de-essing and speaker array control) but also frequency conscious gating, further adding to the ability of an apparently simple gate to stand as a decent processor in its own right. Side chain connections are on unbalanced jacks, and they can be left permanently connected as they do not break the usual path unless enabled by a front panel switch. Setting up the external processing is helped by a side chain monitor switch, which like all the others is illuminated, adding even more to the clarity of presentation of the whole thing.

The 1066 slotted smoothly into my system, needing no learning effort at all and providing the expected range of processing intuitively—and quickly and sounding highly impressive into the bargain. The only difficulty I discovered was the old favourite of expecting the Auto time constants to deal with bass, acoustic or electric; few compressors have an automatic function that can handle this properly and the 1066 followed the trend, but manual setup is so easy as to make this not a significant problem.

In fact, very little is a problem with the 1066. It behaves exactly as one would expect under almost all circumstances, and is so well laid out as to almost set itself up. The typically American sprinkling of trademarked proprietary features has more significance than it often does, making the 1066 potentially one in the eye for the competition.

CONTACT

dbx, 8760 South Sandy Parkway, Sandy, Utah 84070, US.
Tel: +1 801 568 7660.
Fax: +1 801 566 3565.
UK: Arbiter Group, Wilberforce Road, London NW9 6AX.
Tel: +44 181 202 1199.
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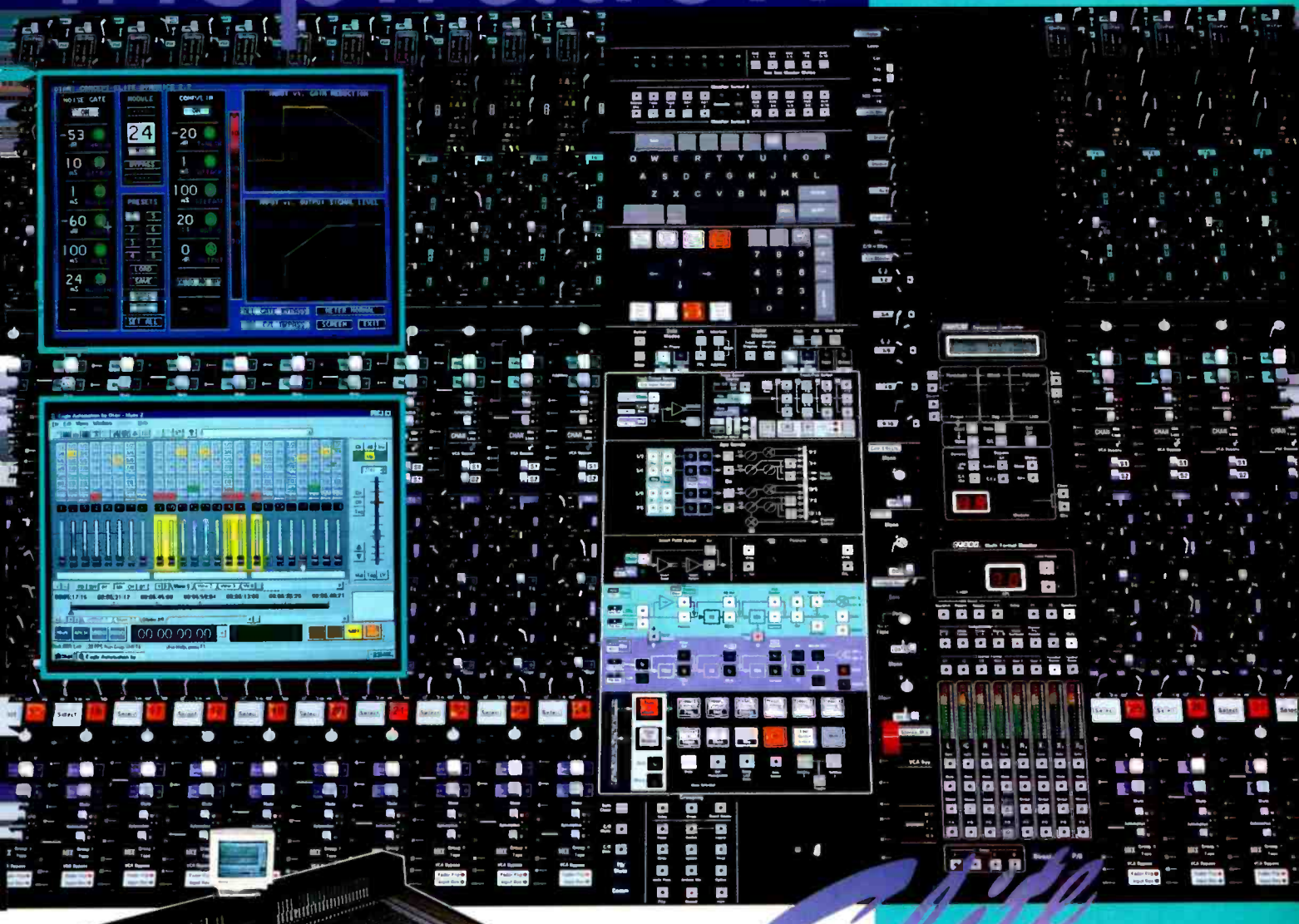

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New Technologies

Caught between the recent American NAMM show and the forthcoming European AES, **DAVE FOISTER** finds new equipment launches thick on the ground

Mackie digital 8-bus

Mackie previewed its long-awaited digital console at the recent NAMM show and aimed it squarely at the area of price expectation established by Yamaha's 02R. Configured as a 48:8:2, the desk is an impressive piece of real estate with an in-line assignable architecture, and an assignable rotary control per channel and 100mm touch-sensitive moving faders arranged to the left of a 'Fat channel strip' control section containing more channel hard controls plus transport keys for machines and automation.

The console will ship with 24 channels of analogue tape I-O with three 8-track optional digital interfaces for MDMs available. Twelve balanced mic-line channels are provided with direct outs plus 12 additional balanced line inputs, 12 auxes per channel, 4-band parametric EQ with switchable variable high-low shelving, and a sweepable high-pass filter, dynamics processing, and eight separate group bus outputs with fader and mute automation.

Convertors are 24-bit, 64 times oversampled D–As and 20-bit, 64 times oversampled A–Ds. 8Mbyte of RAM is standard as is a diskette drive, and 500Mbyte of hard disk for storage and retrieval of the fully dynamic UltraMix II automation data. A built-in modem permits DSP files and operating updates to be loaded.

Other points of note are a well equipped talkback section, built-in meter bridge with dynamics indication and a multilingual help function. You can even connect up an SVGA monitor to display automation and DSP parameters with additional control afforded by a mouse and keyboard.

Mackie Designs, US. Tel: +1 206 487 4333

Ensoniq PARIS

In a major new development that stole the show at NAMM, Ensoniq has launched a cross-platform recording, editing, mixing and processing environment known as PARIS (Professional Audio Recording Integrated System), capable of handling 128 tracks at 24 bits. The core of the system is the Ensoniq EDS-1000 PCI card together with a CD-ROM containing software for both Macintosh and Windows environments. The software's graphic interface controls the integral 128-track digital mixer with dynamics processing, 4-band parametric EQ, aux sends and real-time effects including reverb. Multiple cards can be supported to increase processing power and I-O capability, and plug-in software architecture allows third-party development of effects and features.

The card carries connectors for an Expandable Input-Output System and a dedicated hardware control surface, and can be augmented with an expandable modular mainframe. This allows wide flexibility, with support for analogue and digital I-O, word clock and video synchronisation, and forthcoming additions such as ADAT and Tascam TDIF interfaces plus time code. The hardware control surface has 16 channel faders, mutes and solos, a master stereo fader, and a full set of rotary controls for EQ, auxes, pans and monitor level, together with comprehensive transport controls including a jog-shuttle wheel.

PARIS is the result of a long-standing joint development programme between Ensoniq and Intelligent Devices, and relies on Ensoniq's new ESP-2 chip for its 24-bit capabilities and processing power.

Ensoniq, US. Tel: +1 610 647 3930.

NAMM Star: the new Digital 8-bus console from Mackie

New EM3000 series UHF receivers from Sennheise replace the older EM2004 model

tc electronic DBMax

The Danish tc electronic concern is addressing the broadcast market with its new ☞

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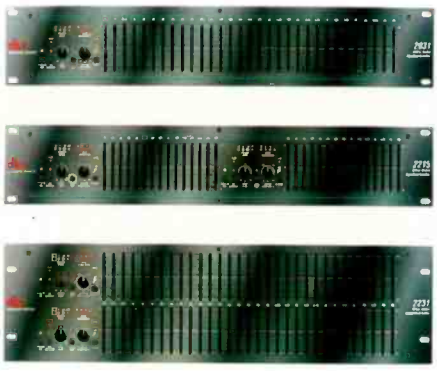

Three new graphic equalisers from dbx all offer the company's Type III noise reduction and PeakPlus limiting

DBMax Broadcast Maximizer. Following the style of the M2000 and the Finalizer, the DBMax offers a selection of appropriate processing functions in a 1U-high box with control screen and multiple meters. Included are EQ, stereo adjustment, automatic gain controller, and 3-band compressor, limiter and expander. All can be used simultaneously, and setup is helped by a wide selection of factory presets and a Wizard function for providing a starting configuration in response to a few questions. tc sees the unit as being valuable both on air and in production, producing a louder and punchier programme, and allowing monitoring of the end result as the audience will receive it.
tc electronic, Denmark. Tel: +45 86 262800.
tc electronic Inc. Tel: +1 805 373 1828.

Neutrik software and analyser

Neutrik's well-known A2/A2-D test systems can now be controlled from a Windows PC using the new AS04 remote control software. All generator and analyser settings are displayed permanently and on-screen buttons provide direct access to the most commonly used functions and commands. Displays include numerical read-outs, eight bar graphs and FFT spectrum analysis for suitably equipped A2s, and the software allows automated test procedures to be run for applications like quality control.

Also new from Neutrik is the NC10 hand-held psychoacoustic analyser, the first joint development between Neutrik and Cortex. As well as a precision sound-level meter and third-octave analyser it incorporates a psychoacoustic loudness analyser in accordance with DIN 45631, and has facilities for data logging, with a hard-disk sampling module optional. RS232 communication, a parallel printer port, and an SPDIF output for direct digital recording are also provided.
Neutrik, Liechtenstein. Tel: +41 75 232 9666.

dbx 20 Series EQ

dbx's latest EQ range comprises three graphics, offering single and dual third-octave and dual $^{2}/_{3}$-octave, all featuring additional functions besides the basic EQ role. dbx Type III noise reduction is included, giving over 20dB of noise reduction to prevent the noise increase that can occur with radical EQ, and overall gain control can be set with dbx's PeakPlus limiting. LEDs show levels, limiter operation and clipping, and further facilities include switchable slider range (±6 or 15dB), a low-cut filter and ground lift.
dbx, US. Tel: +1 801 568 7660.
UK: Arbiter Music Technology.
Tel: +44 181 202 1199.

Publison Totalstation

Publison is following up its Infernal Workstation with a new generation of systems beginning with the Totalstation. This is a dedicated hardware system comprising an electronics rack, a hard-disks rack, and a streamer-optical disc rack with a choice of screens and control surfaces, and gives 32-tracks recording at up to 24 bits. There is an additional track reserved for video integrated with the audio for full nonlinear working. Automated mixing is included, complete with 10-band parametric EQ, and can be controlled from dedicated mixer surfaces with motorised faders. Other remote-control options include a graphic tablet with wireless pen, and multiple control surfaces can be networked to the same Totalstation.

RAID technology aids true 32-track working and flexible copying, and an important feature is an 8mm tape backup system that operates in the background at 30x normal speed, giving 48 hours of 20-bit storage on each cassette. Full synchronisation facilities including bi-phase are fitted, and sound for pictures is further supported by off-line autoconforming and full 32-track reverse play.
Publison, France. Tel: +33 1 43 60 84 64.

ASC DAW Buddies

ASC's new Buddy range is designed to sit under a DAW monitor interfacing the system to the outside analogue audio world. The first model, the Buddy Junior, offers two switchable mic-line plus two stereo line balanced inputs, all with level control and PFL, and with monitoring either on local loudspeakers—for which it has a built-in 4W power amp—or headphones. LED PPMs are provided and there is a switchable peak limiter.DAW out puts can be connected directly to the unit for monitoring, and a clean feed output for use with a TBU or ISDN link is also provided.
ASC, UK. Tel: +44 1734 811000.

Maycom ISYS

Maycom Automation systems has introduced a windows ISDN audio application for live bidirectional communication. Known as ISYS, it uses MPEG2 Layer II audio compression and can be run on a standard Pentium PC (100MHz or higher). The system requires the ISYS software, an ISDN board, which is included in the price, and a Digigram PCX audio board type 9 or 11.

The window -user-interface means it can run on any suitable PC and interface with studio automation software to play audio direct from the computer's hard disk. It can also log incoming communication information such as receiving time and audio settings. The system is compatible with Telos Zephyr and CCS CDQ Prima codecs, and besides its flexibility, its main advantage is cited as its low cost compared with existing hardware codec systems.
Maycom, Netherlands. Tel: +31 481 377740.

TL Audio Crimson additions

TL Audio's Crimson range of processors, reviewed in December's *Studio Sound*, has expanded to six units with the addition of the 3051 voice processor and the 3013 stereo 4-band parametric EQ. The 3051 combines a mic preamp, compression and equaliser, and also has a line input allowing it to process any source. Phantom power, gain control, phase reverse and low cut filtering are

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available on the preamp, while the compressor has fully variable threshold, ratio and gain make-up with switchable fast and slow modes. EQ is 4-band, with switchable shelving on high and low bands and two fully variable mid bands.

The 3013 is the solid-state equivalent of the established EQ2 valve equaliser, with two channels of fully parametric EQ plus high-pass and low-pass filters and onboard mic preamps. Like the EQ2 it features line and instrument inputs, and a stereo mode where both channels are controlled by one set of knobs.

TL Audio, UK. Tel: +44 1462 490600.
US: Sascom Marketing Group.
Tel: +1 905 469 8080.

Audio Developments mixers

Audio Developments has two new models of mixer to follow the original Pico mixer. The AD144 is for studio and OB work, and comes in frame sizes from 12 to 24 channels with four outputs, four auxiliaries, extensive monitor facilities and an optional comms module. The smaller AD149 is intended for film and drama use, and replaces the AD062, adding more features in a smaller footprint. It can be configured with up to 12 channels, with comprehensive switched EQ, channel inserts and limiters, and has 2 outputs and 2 auxes.

Audio Developments, UK. Tel: +44 1543 375351.

Sonorus STUDI/O

STUDI/O is a PC card offering a 16-channel digital audio interface to Windows-95-based DAW software using two Alesis ADAT format optical I-Os. It is supplied with software drivers compatible with existing Windows audio devices to provide compatibility with most editors. The primary application is direct interface to a pair of ADAT machines for direct transfer of material digitally between tape and disk, and is also gives the option of using the ADATs' onboard convertors to save buying additional hardware to feed the DAW. There is an 18-bit stereo analogue monitor output, and for mastering one or both of the ADAT interfaces can be software reconfigured to deliver SPDIF, complete with sample-rate conversion.

Sonorus, US. Tel: +1 212 253 7700.

Symetrix 606

Symetrix has launched its first foray into effects processing with the 606 Delay F/x Machine. Designed to couple vintage controls with state-of-the-art features, the 606 has many more knobs than is usual for a modern effects box, allowing live-function adjustments without scrolling menus. In layout it resembles a classic DDL, with controls for delay time (up to 2.6 seconds depending on the mode), feedback and modulation for each of two independent delay lines. These can be used separately, ganged together in stereo, or placed in series for a variety of effects, and further parameters allow control over diffusion, filtering with modulation and room simulation. Six separate modulation sources can be used to control almost any parameter in the unit, and real time MIDI control is provided of all parameters including MIDI clock delay sync.

Symetrix, US. Tel: +1 206 787 3222.

In Brief

Sennheiser receivers; Neumann AK 20

Sennheiser's EM2004 UHF receivers are to be replaced by the EM3000 series, comprising an entirely new 16-channel selectable frequency receiver system in either single (EM3031) or dual (EM3032) channel configurations. The 1U-high facia features frequency select and set controls and a large backlit LCD screen simultaneously showing frequency, field strength, deviation and transmitter battery status.

The Neumann KM 100 modular microphone system has a new capsule in the form of the figure-of-eight AK 20. Unlike most studio figure-of-eights, the AK 20 achieves its polar pattern acoustically with a single diaphragm, and claims identical frequency response in the front and back lobes as a result, along with consistent polar pattern with frequency. Some new mounting hardware allows the AK 20 to be used in pairs for classic Blumlein techniques, or with an AK 40 cardioid capsule for MS recording.

Sennheiser, Germany. Tel: +49 51 30 600 366. Sennheiser, UK. Tel: +44 1494 551551. Sennheiser, US. Tel: +1 203 434 9190.

Groove Tubes upgrades

Groove Tubes' range of microphones, the MD1, MD2 and MD3, has been upgraded internally to create the A Rev series. A completely revised circuit topology, that GT claims has never been used before in a valve microphone, uses a selected 12AT7-M dual triode valve with newly designed electronics and output transformer to deliver a 10dB improvement in dynamic range and reduction of distortion by a factor of 10. The capsule mount is made from Sorbothane, described by GT as a miracle material, and internally adjustable polarisation voltages allow for precise matching of stereo pairs. The power supply has also been upgraded to improve hum and noise specifications, and the price remains the same as the original models. Existing GT microphones can be upgraded to the A Rev specification for a nominal charge.

Groove Tubes, US. Tel: +1 818 361 4500. Axis Audio Systems, UK. Tel: +44 161 474 7626.

Elation 201

The Russian tide continues to roll in. Newly available here is the Elation 201, a small studio condenser microphone that although only introduced this decade is already successful within Russia. Its claimed strengths are clarity and warmth coupled with impressive tolerance and low noise, making it suitable for a wide variety of applications. It comes as standard with a cardioid capsule, but in fact forms a modular range with hypercardioid, supercardioid and omni capsules are also available.

Mytex, UK. Tel: +44 171 486 6337.

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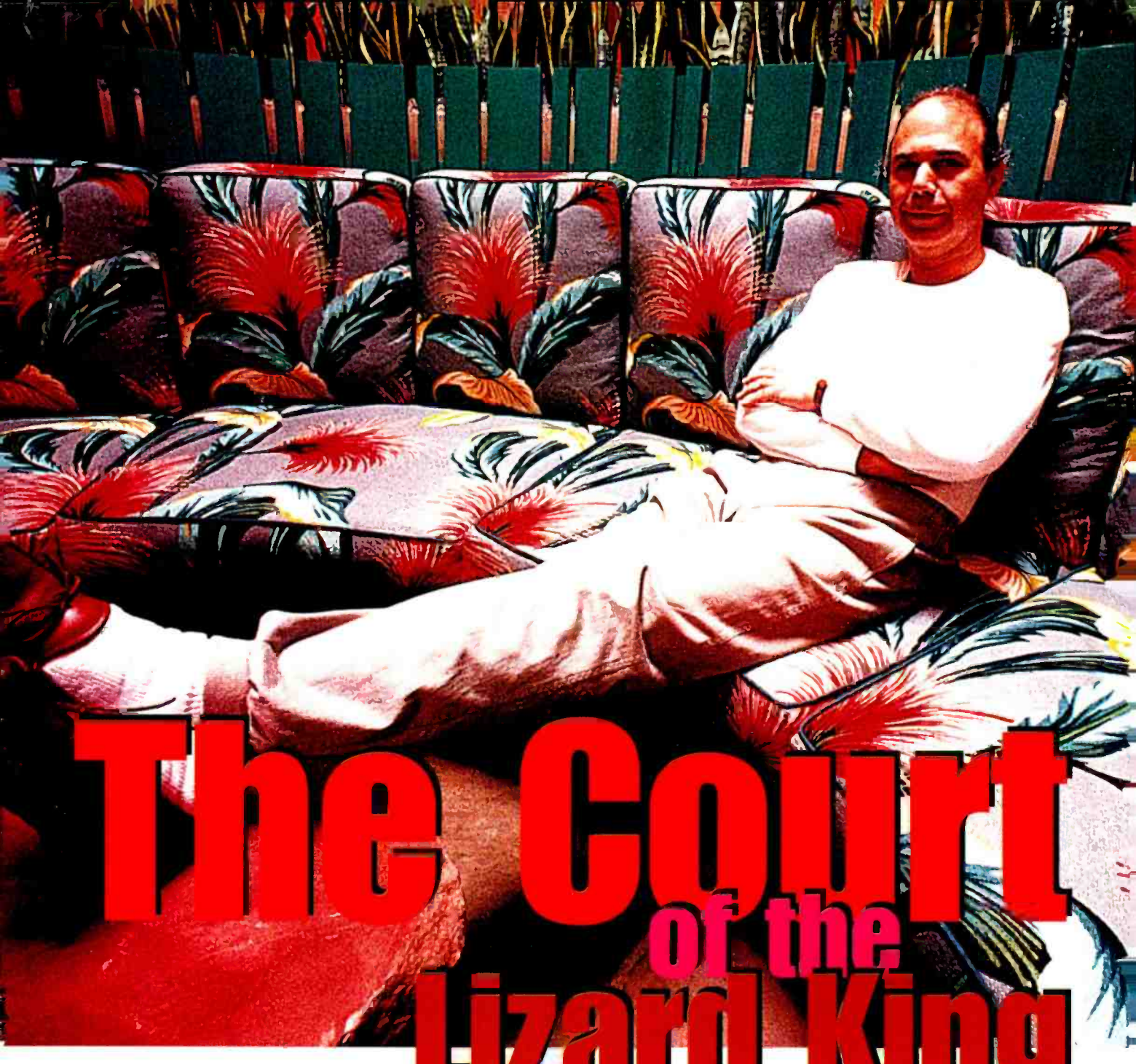

The Court of the Lizard King

A remarkable career has seen a remarkable producer make the successful transition from engineering seminal sessions for The Doors to present day feature-film production for Disney.

RICHARD BUSKIN

talks to Bruce Botnick

'I'VE GOT TO FIGURE that I've been very fortunate to work with a lot of great people over the years, that a lot of great music has gone under the bridge, and that I've been able to make something that people want to listen to.' It's a modest opener from a legendary producer and engineer, but one typical of Bruce Botnick. 'I don't know that I see the same colour red or colour blue as everybody else,' he continues, 'but it seems that I have been fortunate enough to be given a gift whereby what I hear is what a lot of people like to listen to.'

In its historical context, Botnick's career is certainly worth plotting for anyone who is interested in charting the course that sound recording has taken during the past four decades. For, while the soundtrack of Disney's animated feature, *The Hunchback of Notre Dame*, is among the most recent in a long line of film projects with which he has been involved, this man is clearly given to considerable understatement as far as his own talents are concerned. Just consider the variety and longevity of his career...

The year in which Botnick started out as an assistant engineer was 1961, the place was Liberty Records' studios in Hollywood, and the assignments included work with then-popular acts such as Johnny Burnett, Bobby Vee, The Ventures, Leon Russell and The Chipmunks.

'We worked 3-track, 2-track mono using Ampex 350s,' Botnick recalls. 'Ted Keep, who ran the studio, also had a Presto 4-track ½-inch, and that was unheard of at that time. It was the first 4-track that I'd ever seen, and for years it remained the only one in town.'

After Liberty closed its doors in 1963, Botnick then moved on to nearby Sunset Sound Recorders as an engineer, and during his four years there he worked on a lot of childrens' albums for Disney with Tutti Camarata, while also recording 'every kind of music known to man for the Musac company, ten hours a day for six months... It was the greatest learning experience I ever had.'

Mixed in among Botnick's assignments during the first half of the 1960s were some 'beach party' films starring Frankie Avalon and Annette Funicello. Those were the days of 3-track or 4-track recordings, and, as a forerunner of today's EDnet technology, equalised telephone lines running about ten miles down the street to a facility with 35mm mag machines.

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'We would do all of the recording and then call them up, and transfer everything over the phone lines,' Botnick explains. 'We'd just mix it mono and send it down the line. These days, of course, you can do more, and do everything more easily, but I still strongly doubt that we actually make a better sound with all of the modern equipment. I have recordings that I made all the way back on old Scotch 111 tape as well as old BASF and Agfa, and they're just as quiet as any Dolby SR or digital tape that I've ever heard, while also sounding bigger and more open.'

During the mid-1960s Botnick worked with Phil Spector's arranger, Jack Nitzsche, and as his reputation grew he soon found himself recording several of the tracks on The Beach Boys' legendary *Pet Sounds* album.

'We did those recordings at Sunset Sound,' he recalls. 'There was a custom analogue tube console with 14 microphone inputs and no onboard equalisation or limiting, so our equalisers were Pultec EQP1As and some Langevin passive EQs. The Langevins had a 17dB insertion loss but that didn't seem to matter because those boards were so hot. The compressors were tube Universal Audio 176s, Langevin and RCA, and we recorded on 3-track ½-inch using Ampex 200s that had been converted over to 3-track. Those machines had special EQs—you could have AME equalisation on the recording and NAB on the playback, so you could record with one EQ, and playback with another, and that was highly unusual because Ampex didn't do anything like that. We also had an Ampex 300 3-track.'

In addition to his work with The Beach Boys, Bruce Botnick's other mid-1960s credits included Love, Tim Buckley, The Turtles, Herb Albert, Captain Beefheart, Earth, Wind & Fire, and The Buffalo Springfield. After departing from Sunset in 1967 he joined Elektra Records as chief engineer, and this period saw him working with The Doors and MC5 as well as assisting on various tracks on The Rolling Stones' *Let It Bleed* album. When he left Elektra to go solo in 1970 Botnick then coproduced The Doors' *LA Woman*.

'JUST ANOTHER SESSION,' is how Botnick now describes the approach towards the recording of the band's eponymous 1967 release, The Doors. Indeed, as produced by the late Paul Rothchild, the album took just seven days to complete.

'The material, and the way in which they performed it, was wonderful,' Botnick says. 'I had an immediate affinity for it without anyone telling me, "Wow, this is heavy!" Everybody knew what to do and the whole thing was very, very simple. There were very few mics—for the most part it was all recorded live in the studio, with Jim [Morrison] in the vocal booth at Sunset Sound in order to keep the separation.

'In those days we still hadn't got to the point where the studio became the place in which to write. Everything was written, they had been playing it live, so when you rolled tape you got a performance. Maybe you'd overdub a few things to expand it and enhance what was there, but there wasn't too much of that. We recorded to 3 tracks of a 4-track machine, and the only overdubs that we did were some Fender bass with Larry Knechtel, and sometimes another vocal from Jim. Apart from that, the bass and drums were on one track, and the organ and guitar were on another track. Then, when we mixed it down, we had latitude. In fact, I've gone back to the tracks since then and found that I still have great latitude with just two tracks of information.'

'The Turtles had given me a mono acetate of *Sgt Pepper* about three months before it came out,' Botnick recalls. 'I listened to it; I played it for Paul [Rothchild]; I played it for The Doors; and we couldn't believe it.

Recently Bruce Botnick was involved with a new *Best of The Doors* release. This includes a version of 'The End' which, complete with jungle sound effects, was used in Francis Ford Coppola's 1979 Vietnam war film, *Apocalypse Now*, as well as a version of 'The Ghost Song' that was released after Morrison's death, on the 1978 album, *An American Prayer*.

'I used Sonic Solutions for mastering the *Best of...* album, but not for noise,' says Botnick. 'None of their albums are noisy. Go back and listen to any really old masters —especially in England, where they'd use BASF and cut +10. Tape hiss? What was that? You didn't hear it. It didn't exist! If you cut hot you cut cleanly.'

When listening to the Doors tapes again after the passage of nearly 30 years Botnick reckons that, in certain instances, it is just like starting afresh. 'That's especially true in the cases where we left off some of the words that were too colourful for the times,' he asserts. 'When you hear a song in its entirety it takes on a different light. Also, over the years the 2-track tapes have lost high-end, and so getting back to the first generation of multitrack is really quite something. When we did [Oliver Stone's 1991 movie] *The Doors* we went back to all of them and they were pretty impressive.'

A second album, *Strange Days*, was released in 1967, and while this was obviously intended to capitalise on the success of its predecessor, it was also heavily influenced—as was much else during that era—by The Beatles' *Sgt Pepper's Lonely Hearts Club Band*.

'The Turtles had given me a mono acetate of *Sgt Pepper* about three months before it came out,' Botnick recalls. 'I listened to it; I played it for Paul [Rothchild]; I played it for The Doors; and we couldn't believe it. I mean, the creativity, the experimentation, and the fact that they didn't stick to the norm was ground-breaking, and that really influenced us to let go and try new things. As a result I think *Strange Days* is pretty innovative.

'I got an 8-track machine—the first 3M 8-track that had been made, which I rented from Wally Heider. We were going to rent it for a few days and wound up keeping it for about four months. The first thing that I noticed was how noisy it was—much, much noisier than the 3-track and 4-track machines that I had been working on—but we figured out how to get around that, and now those tapes sound dead quiet. We recorded carefully, cutting as hot as we could without clipping, and basically giving it a good hand-job during the mix, as we like to say.

'We did some backwards things, we did forwards things, and we did sideways things. For instance, on 'When The Music's Over' I took Robbie [Krieger]'s guitar solo off the microphone, took it out of one mic preamp into a pot that was feeding another mic preamp, and then ran the knobs against one another until I got it to break up just right. I would literally overload the tubes and get them to glow, and while some studios at that ☞

The Doors' 1967 album, *The Doors*, was recorded live in seven days

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STORM IN A MICROPHONE

WIDELY REGARDED as one of The Doors' finest achievements, *LA Woman* spawned the classic 'Riders on the Storm', a track which amply displayed Jim Morrison's most haunting qualities as a singer.

'Depending on the situation I used either a Telefunken U47, a Shure SM57, an SM58, or an Electro-Voice on him,' Botnick recalls. 'He was a very easy person to record. He had a lot of presence, a big voice, and when you have somebody with a big voice it sounds full even when he gets soft. The Urei 176 tube and Fairchild limiters would grab the voice with grace, as would the 1176 when it came out.

'The more that Jim performed on the road the more that he really didn't want an expensive microphone. He'd literally hang on the microphone, with his foot on the base, and his hand pulling the mic down in front of him. After a while, when an expensive mic is being treated like that it becomes a problem.

I don't like the way that foam-rubber pop-filters sound, so we had to be careful, especially when Jim was inebriated, because if you get moisture on the capsule then the sound goes. I'd always ask him to perform a certain distance from the microphone. Then I started making pop-filters out of ladies' stockings glued over wire frames. However, when they were fresh he was then getting stoned off of the glue on the mic filters.'

time would have shut me down that was never the case at Sunset Sound.

'During that album we also had one of the first Moog synthesisers brought in, put Jim's voice in and he played it against his vocal. The keyboard would cause the envelope to open and close, and it was doing some really cool things. Then there was the 'farkle', which I came up with for The Doors–although Van Dyke Parks came up with the name –and which consisted of masking tape that was folded, and folded, and folded, so that it resembled a fan. It was maybe an eighth of an inch long and it would go around the capstan. This fan would cause a bouncing sensation, and so as the tape went through it would make a kind of gurgling sound. Using that on reverbs or vocals you could create some pretty wild sounds–After all, we didn't have the electronics back then so we had to use our hands.'

One track to benefit from the 'farkle' was 'Horse Latitudes', whose sonically innovative opening was the result of pink noise on a tape, running send-only into the chamber courtesy of Botnick's manual efforts, and then recorded back and inserted into the cut.

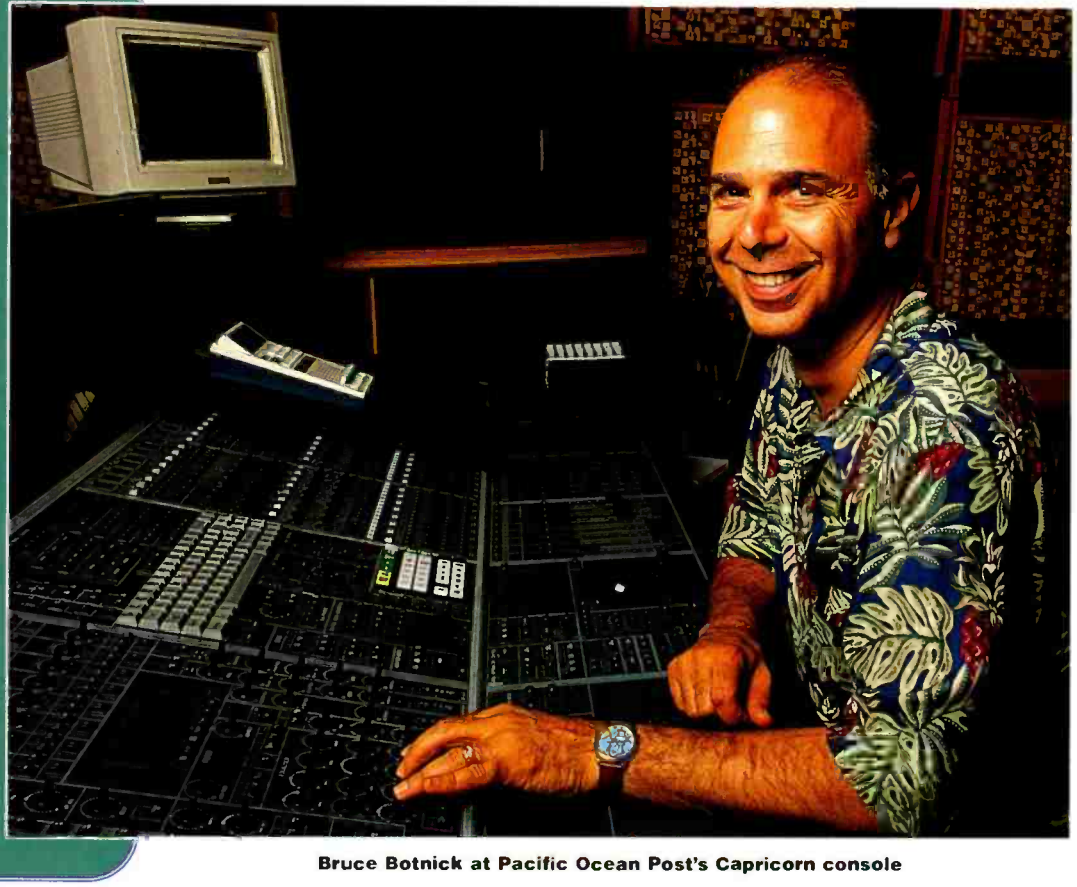
'A lot of people were doing similar things without anything being published or anybody talking to one another,' he says. 'It was a very, very creative time. However, I have to say that, even when we went to 8-track on *Strange Days*, the performance was still everything. Nothing was different as far as the approach was concerned, but having more tracks just allowed us to keep things separate while also allowing us a little more hindsight with regard to the mix, even though I now sometimes wonder how valid that was.'

> 'I got an 8-track machine–the first 3M 8-track that had been made, which I rented from Wally Heider. The first thing that I noticed was how noisy it was–much, much noisier than the 3-track and 4-track machines that I had been working. We recorded carefully, cutting as hot as we could without clipping'

THE DOORS' third album, *Waiting For The Sun*, was recorded in 1968 at a now-defunct studio called TTG–which, incidentally, stood for 'Two Terrible Guys'–otherwise known as Radio Recorders 10H, that housed a very large live area as well as a control room containing, to the best of Botnick's recollection, 'probably the most beautiful tube console that I've ever seen. Custom-built and all black.'

Thereafter, sessions for *The Soft Parade* (1969), and *Morrison Hotel* (1970), as well as the mix of *Absolutely Live* (1970), took place at Elektra Records' own new facility, that was equipped with an English 24-input solid-state desk that had 24 'half-moon' faders ('off' was up, 'on' was down).

Aside from the use of 16-track for the mix of the live album 8-track was still the format, as was the case in 1971 when



Bruce Botnick at Pacific Ocean Post's Capricorn console

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20 BIT A/D

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The Doors recorded *LA Woman* in their own production office. Morrison's indictment for 'indecent exposure, public intoxication and profane, lewd and lascivious conduct' at a concert in Miami in July of 1969 had caused legal problems that dogged the band for quite some while. Not as much material was being written, the cancellation of concerts meant that new compositions were no longer being rehearsed in a live situation, and so the studio became the place in which to create and refine.

The Beach Boys' classic *Pet Sounds* album was another Botnick landmark recording made on a custom console with no onboard EQ

'Most artists are limited by the fact that their fans like to hear the same guitar solos and so on, as on the records when they see them in concert,' says Botnick. 'However, The Doors had a lot of freedom because, although there was a framework, everybody knew that there was free expression within the band. So, they could extend a solo if they wanted, eliminate a solo or do whatever they wanted, and people would accept it. They were very fortunate in that respect. Very few bands could do anything like that.

'By the time that we went to make the *LA Woman* album both The Doors and myself really wanted to just throw off the shackles and get back to what we did originally; just be very primitive in our approach... very relaxed, get the performances down.... It worked out just fine.'

'Obviously, in the studio we were trying to make a better and better sound, and we did get to a point where it became too cerebral, so by the time that we went to make the *LA Woman* album both The Doors and myself really wanted to just throw off the shackles and get back to what we did originally; just be very primitive in our approach, very relaxed, get the performances down and if something didn't sound exactly right then that was okay... It worked out just fine.'

Ray Manzarek's Hammond B3 organ, John Densmore's drum kit, Robbie Krieger's guitar rig, Jerry Scheff's bass rig and Mark Beno's rhythm guitar setup were all crammed inside The Doors' tiny rehearsal space for the live takes, while Morrison stood in the doorway of an adjacent bathroom with a microphone in his hand and recorded his final performances with the band. Coproducer-engineer Bruce Botnick sat upstairs.

'I brought in a 3M 8-track machine and recorded on BASF tape at +8,' he somehow recalls. 'I was using an old Langevin 16-input analogue console, and I also had a bunch of old microphones that I'd got from Elektra's facility which was across the street. It was my concept to use their rehearsal room because that was where they felt very comfortable, and so the sessions didn't have that "back in the studio"-type of feel to them. As a result we did that album in ten days. The goal was to go in there and, if it was working, great; if it wasn't, we went home. We didn't sit there and try to beat it. We didn't do a hundred takes. Four takes were usually enough, sometimes two or even just one. We fixed things that were really obviously bad, but otherwise we just tried to keep a raw edge on it, relaxed, no pretension.'

IN 1975 Bruce Botnick joined Columbia Records as a staff producer. There, over the course of five years, he would produce artists such as Eddie Money, Kenny Loggins and Aerosmith's Joe Perry; as well as the first-ever digital recording of a film soundtrack, for *Star Trek–The Motion Picture*. However, after producing an album by Steve Perry, Botnick was, by his own admission, 'kind of going into overload–I was pretty close to burning out.' Work on the soundtracks of both *ET* and *Poltergeist* helped him realise just how much he enjoyed being part of the movie business, and so, without too much effort, he made a lateral move in that direction.

'All of a sudden I found myself not having to take work home and not having to serve as a full-time psychiatrist,' he now says, and the ensuing result has been a steady stream of film projects, including *Rambo*; *Indiana Jones and the Temple of Doom*; *Basic Instinct*; *Total Recall*; *Waterworld*; *The Ghost and the Darkness*; and Disney features *Beauty and the Beast*; *Aladdin*; *Pocahontas*; and *The Hunchback of Notre Dame*. In addition, together with composer Alan Menken he has coproduced the Broadway and world musical *Beauty and the Beast* as well as that of *A Christmas Carol* and, later this year, will work on *King David*.

'I've always been a fan of recording live in the studio, and one of the main things that I love about movie work is that, for the most part, it is still live,' he explains. 'In my mind that allows me to go back to the past and to review what I was doing. It's a great exercise and I plan to keep on doing it.'

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issue 1.

news'97

Soundscape™ Version 2.0

New product launch for '97

For all those who have visited recent shows and have kept their eyes on the press you will be aware that Soundscape Digital Technology have now launched the SSAC-1 and SS8IO-1 Audio Interface for the SSHDR1 Digital Audio Workstations.

The SSAC-1 Accelerator Card is designed in true Soundscape style, expanding and enhancing the existing unit instead of replacing it, and can be easily retro fitted to all existing units in the field.

The SSAC-1 is a plug in DSP card which fits into the SSHDR1 and gives several times the processing capability of the existing unit. The SSAC-1 also gives an extra 8 channels of I/O in the form of a TDIF port (Tascam Digital Interface), and is necessary for all existing customers who wish to upgrade to the new 32bit Version 2.0 software and expand the number of In's and Out's. Also available will be the SSHDR1Plus which will have the SSAC-1 fitted as standard. All upgraded systems will then have 10 inputs and 12 outputs when connected to a Tascam DA88 or Yamaha 02R / 03D console with no extra hardware required. Version 2.0 software allows up to 12 track playback per unit (with recommended drives).

The SSAC-1 also includes an Expansion Port which can connect to an external Expansion Chassis (available later in '97). This has a 512 channel audio bus and allows up to 14 cards to be plugged in for additional DSP (for real-time plug-in effects) and I/O capability. Multiple Soundscape SSHDR1 units can be connected to one Expansion Chassis and will be able to share disk space, I/O and processing.

For those customers who wish to expand the number of I/O with additional hardware, the SS8IO-1 is an 8 channel digital and analogue 19" 2U rack unit which connects to the SSAC-1 Accelerator Card via the TDIF connector. The SS8IO-1 has 8 inputs and 8 outputs with balanced XLR connectors, using 20 bit Crystal Semiconductor converters to provide superb quality A/D & D/A conversion. It also has an ADAT Optical Digital interface providing direct connection to ADAT via the ALESIS "Lightpipe".

Word/Super clock in and out and 8 x 10 segment LED level metering is provided as standard. The SS8IO-D is supplied without the analogue converters, for users who just wish to connect an ADAT directly and don't need the extra analogue channels.

Version 2.0 software allows up to 12 track playback per unit

Serafine adds further systems

Serafine FX, Venice, California has taken delivery of a further two Soundscape SSHDR1 systems expanding their audio to picture facilities.

"We now have six Soundscape systems at the studio," explains Frank "and we've used the SSHDR1 on almost every project that's come through the facility. Soundscape is fast becoming one of the top systems around in digital audio post production here as well as around the world."

Frank, whose credits include *Tron, Star Trek "The Motion Picture"* and *The Hunt for Red Oktober* is currently working on the CBSTV series *Orleans* starring Larry Hagman and a 3D IMAX feature.

Soundscape price restructure

Soundscape Digital Technology are pleased to announce a solid NEW and exciting pricing strategy for 1997 for the SSHDR1 range of Digital Audio Workstations. With the imminent release of the SSAC-1 accelerator card and the new 8 channel audio interfaces SDT have restructured pricing to provide products and features to meet the needs of specific users.

The price of the core 8 track SSHDR1 has been reduced, so making it easier for customers to 'get on board' with Soundscape at a lower price. This is called the SSHDR1FS (fixed software). Customers who purchase the SSHDR1FS will be supplied with V1.18 software, the Remote Control Software (RDC) for RS422/MMC control of DA88, ADAT and VCR's and the .AVI file player.

For many customers the existing features of the V1.18 software (which also includes lock up to VITC, support for video capture cards, Reverb and Time Module Plug-Ins) are more than adequate for their needs.

Continued on back page.

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- *CD Mastering*
- *Version 2.0*
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SSHDR1 *sales now exceed 3,500 systems*

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Sound *for* picture editing

Audio/Video *in sync.*

AV Master from Fast Electronic was the first audio video card to implement PCI bus mastering, a technological breakthrough for PC based digital video and multimedia. This well established card guarantees the superb video quality that until recently has only been achieved on expensive systems in TV studios. AV Master is fully compatible with the SSHDR1 hardware and together provide smaller and medium-sized video studios, businesses, agencies, multimedia producers and ambitious videographers the ability to process images digitally, with full frame accurate lock up to the audio from Soundscape - on the same PC at the same time. Full motion video playback through the V1.18 .AVI file player makes it possible to smoothly scrub audio and video together for accurate placement of sound effects, rushes and dialogue. With the AV Master, image quality and performance are enhanced by high quality filtering, 32bit capturing, graphics, accelerated video effects and comes complete with Media Studio 2.5VE for the latest in 32bit editing software.

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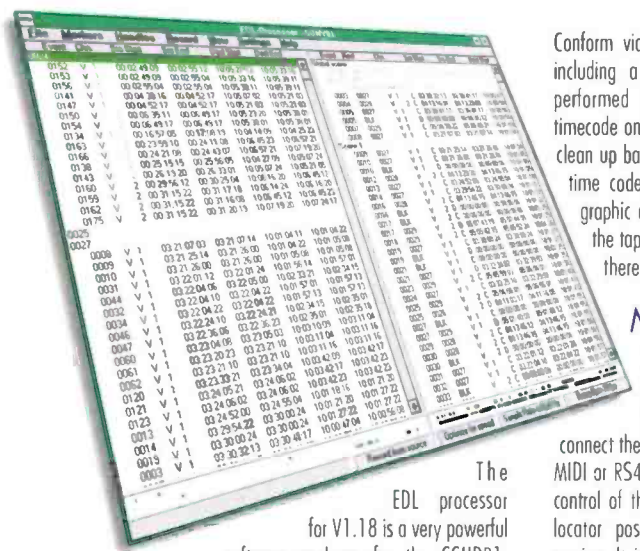
EDL Processing & Auto Conform



The EDL processor for V1.18 is a very powerful software package for the SSHDR1. It can read all common EDL formats (inc. CMX, GFG, SONY) and supports SONY 9-pin protocol for Auto Conform via RS422. There are many useful features including a manual conform facility which can be performed if there are rushes with discontinuous timecode on the tape. The software can also be used to clean up bad EDL's. Handles, fades, scene markers and time code offsets can be added or edited, with a graphic display of where the audio is positioned on the tape, and whether it is recorded on the disk - so there is no excuse for errors.

Machine Control

Included in V1.18 is the new remote control driver software (RDC) for ADAT, DA88 or VCR's. It is possible using this software to connect the PC to any of these devices using a standard MIDI or RS422 card, for total control of the tape transport, locator positions and track arming. It is also possible to jog and shuttle, and even eject the tape.

The Nutty Professor

Odin Benitez of Dimension Sound, Burbank, CA recently used Soundscape to cut sound on The Nutty Professor. "As feature film editors we work on one reel at a time. We save the edits of each reel as an arrangement on the SSHDR1. I was working with Pro Tools early on and still use Digidesign products. The main reason why we looked into the Soundscape system was that we were immediately attracted to both the interface and the software. The SSHDR1 is very quick to use, and it's got a very easy learning curve. In "Ace Ventura-When Nature Calls" I took a monkey scream and pitched it up to make it sound like a bat was screaming. Manipulating effects with software, as this system allows is very nice, in Pro Tools you would need to use Sound designer or Sample Cell".

Recent Customers

Clearcut Productions, *Soho, London have just finished the latest* ***McCain Oven Chips/National Lottery TV advert*** *to be shown this month on UK national television. Music, sound design and dubbing were completed using the SSHDR1. Recent projects also include a VW radio commercial and a major multimedia project for* ***Microsoft Networks starring Oz Clark.***

Kitefield Music Productions, London, UK *is one of London's major music for television production companies. Last year the company provided music and effects for* ***Dispatches, Equinox and Panorama*** *on the SSHDR1. They are currently producing a major documentary called* ***I Caesar*** *for* ***BBCTV and A&E (USA).***

Rare Ltd, *Twycross, England, one of the top video game production companies, has recently completed both the* ***Donkey Kong Country*** *and* ***Killer Instinct*** *series of video games on their SSHDR1's delivered last summer.*

CBC Toronto *took delivery of 12 x SSHDR1 systems for their Radio production departments. SDT Ltd. recently visited the company for two days of product training. Also in broadcast,* ***SABC South Africa*** *increased their number of SSHDR1 systems to 24 in December 1996.*

Broadcast Audio *have installed the first SSHDR1 system at their new production facilities in Birmingham, England. Ex-Central Television's* ***Jim Tetlow***, *who spent 6 years on* ***Spitting Image*** *and other major drama series for national television, invested in the SSHDR1 for their dubbing, track laying and CDR production suites.*

HDS Studios *in Middlesex, England hove installed a SSHDR1/Fast AV Master system for their Digital Betacam edit suite. This powerful audio/video setup is to be used in all areas of post production for several new programs to be broadcast on the forthcoming* ***Channel 5.***

Broadcaster ***Emperor Rosko*** *went digital last year and invested in the SSHDR1. Based just outside Los Angeles, Rosko is producing shows for* ***Virgin Radio, Europe 1, Radio Bahrain, Red Dragon, Red Rose and GWR.***

• Off - line editing • On - line editing • Auto Conform • Track Laying & Dubbing • ADR

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Music *recording* /CD mastering

S.D.T. & Emagic Partnership announced at NAMM

German company, Emagic, announced an extension for Logic Audio Windows with support for the Soundscape SSHDR1 hardware at the NAMM show in Los Angeles. This award winning software will combine the superb audio quality and powerful DSP processing of Logic Audio and the SSHDR1 hardware, providing the ultimate in audio/MIDI sequencing. As the SSHDR1 only uses the computer for display purposes, it is possible to run the SSHDR1 and Logic Audio Windows on a lower powered PC than is normally required, with a totally integrated user interface.

The SSHDR1 can also synchronize to hardware MIDI sequencers or software running on Atari computer. Cakewalk Pro Audio, also supports the SSHDR1.

Ooh! Aah! GINA G!

Steve Rodway (Motiv8) and his record label FX Music are currently riding high in the US charts with Gina G and "ooh, aah just a little bit" which was recorded and edited on the SSHDR1. The hit, which reached number one in the UK, is part of a long list of hits produced by the team of re-mixers and songwriters at their London, UK based studios. Other hits produced and re-mixed by Steve include : "Tell me what you want", The Spice Girls and "Addicted to Love", Robert Palmer. Steve is busy at the moment finishing Gina G's debut album and is re-mixing "A Red Letter Day" soon to be released by the Pet Shop Boys.

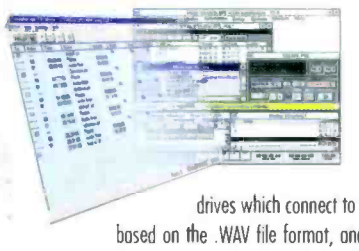
48 track systems in Warsaw & Lisbon

SDT distributors Trans European Music (Belgium) and Diapasao (Portugal) have installed 48 track systems into two major European studios.

Diamond Recording in Warsaw, Poland combined the 48 tracks of Hard Disk recording with a Soundtracs Jade 48PB console to provide 100 input channels at mix-down together with 48 direct output channels. Wladyslaw Bawiek, Diamond's president, comments "We use the SSHDR1 system extensively between 14 and 16 hours a day including weekends, and the system keeps running without any problems whatsoever. We have actually never been able to cause the system to hang."

Diapasao Instrumentos Musicais installed a 48 track system at EDIT Recording Studios in Amadora,Lisbon. Writer, producer and musician Ramiro Martins chose an SSHDR1 48 track system as the heart of his studio. The system which is synchronized with Steinberg's Cubase last year recorded and edited a live session featuring Acid Jazz star Pedro Abrunhosa which was broadcast on national radio.

New CDR Plug-in's



The PDAE CDR mastering software for the SSHDR1 is a professional CDR package for audio CDR machines. It provides THE total solution for music recording studios or radio stations regularly mastering CD's. There are two differing hardware options for CDR recording, SCSI type drives which connect to the PC and compile audio based on the .WAV file format, and Audio CDR's, which can also connect to the PC via the serial port, but send the audio data via the AES/EBU or SPDIF outputs on the SSHDR1. The main advantage of this type of CDR burning is the time factor. However, it is far less risky when the intention is to produce a Glass Master.

This month we will be launching a proprietary CDR compiler which is fully compatible with SCSI CDR software from German company PointCD. This software is a 'Plug-in" and is supplied as part of the SSHDR1 CDR package (it is already available for other editors and is commonly known as Red Roaster). The software works with Soundscape arrange files and allows PQ editing, crossfades, ISRC codes etc. and generates a merged file on the PC with a data file for PointCD, which burns the disk.

COMPACT disc Recordable

Recent Customers

Kasim Sultan former bassist with Todd Rundgren's Utopia, has recently taken delivery of an SSHDR1 system at his home studio in Staten Island, NY. Kasim who has recently returned from a ten month world tour with **Meatloaf**, managed to fit in time to perform on the latest album from **Celine Dion** and appear on **The Late Show with David Letterman**. The studio has been completely rebuilt around the SSHDR1, Tascam DA88 and Mackie equipment.

Former **Scorpions** guitarist and composer **Uli John Roth** added a further unit upgrading to 48 tracks at his studio in Tunbridge Wells, UK. Uli, who now has 6 systems is currently completing **"Requiem for an Angel"** a symphonic rock piece as part of his 'Symphonic Legends' series of CD's. The first CD in the collection entitled **"The Sky of Avalon"** is due to be released in the UK next month.

Robert Plant bassist **Charlie Jones** and engineer **Phil Andrews (Hugh Cornwall, "The Stranglers")** have recently completed a track soon to be released in the US. The track which was the first to be produced on their SSHDR1 system features **Robert Plant** and **Jimmy Page**. All the backing tracks were recorded directly onto hard disk and then transferred to 24 track tape to record Jimmy's guitar and Robert's vocals. All tracks were then transferred back to hard disk for the final mix. Charlie and Phil are now in production of their new album due for release in 1997.

Merseyside, England, is the home for new record label **'Loop'**. Owned by ex-Christions' members **Henry Priestman and Gary Christian, LLoyd Masset (OMC) and Pete Fullwell (The Christians),** the label is recording brand new artists from the area. "The aim of the label is to promote new artists who combine R&B with the Merseyside scene", explains Henry. 'Loop' now own five SSHDR1 systems.

SDT Ltd are pleased to announce **new distribution partners for Asia**. The SSHDR1 together with the new hardware options to be released this month were recently shown at the **Vietnam Film Festival** in **Ho Chi Minh City**. Distribution throughout Vietnam will be handled by O'Conners Singapore Pte. Ltd. Tel: (65) 4737944, Alpha International Tel: (822) 551 2776 have been appointed for South Korea. India is to be handled by ModiAuvi Coordinate Pte. Ltd. Tel: (91) 44 4994547 and distribution in Singapore continues via Auvi Pte Tel: (65) 2832544 with O'Conners being newly appointed as Soundscape resellers in Singapore.

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Email no@sscape.sydec.be

U.S. SALES CALL
Soundscape Digital Technology Inc.
4478 Market Street, Suite 704, Ventura, CA 93003
Tel: (805) 658 7375 Fax: (805)658 6395
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Soundscape price restructure

Continued from page 1.

V2.xx software will require the SSAC-1 and a software license (password) which will be provided free of charge to all existing customers who purchased their SSHDR1 at the original price. Nick Owen, Commercial Director for SDT says "One very important point that we have emphasised to customers since day one is that the value of their investment in Soundscape is not devalued by price decreases year by year or that the product is not replaced by 'the new model'. Our policy is one of expandability and upgradeability as well as giving value for money and this new policy means that although the pricing of individual components has changed the overall package price remains the same. Now we can bring the power of Soundscape to more users at a lower price with an upgrade program to our high end systems, whilst continuing to support all our existing customers".

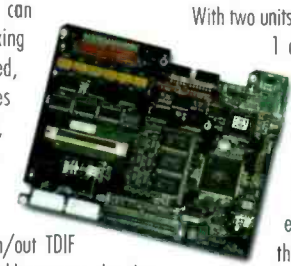
There is also no need to upgrade the computer to run any of the new software as is the case with many other systems. However, Windows '95 is required.

Soundscape™ Version 2.0

V2.xx is a brand new 32bit operating system which expands and enhances the SSHDR1 with state of the art software and DSP technology. The software currently runs under Windows '95, although it is planned that the system will run on Windows NT, but not in the first release version. As Windows NT separates the hardware and software layers, the SSHDR1 may also become cross-platform in the future.

V2.xx supports multiple units in one arrange window and uses a completely new disk format that supports two seporate drives per unit (ie. disk A, disk B) and has a sub-directory structure. Long take file names (64 character), a comment field (128 character), new attribute flags (archive, read-only etc.) and different kinds of files (eg. arrange files, presets for EQ, Reverb, etc.) can be stored on the disk. The Take Directory (renamed SFile Manager) is now more like the Windows 95 Explorer and files can be moved or copied easily between different units and drives.

The main change for V2.xx is that the SSAC-1 Accelerator Card is required and the number of playback tracks is increased to 12 per unit (with recommended drives). The new mixer page that supports the additional 8 inputs and outputs has a completely user definable routing/channel structure and presets for different configurations can be saved or loaded as required. Each channel can have any number of real-time processes running (eg. EQ, Compressor, Reverb, etc.) limited only by the available DSP processing power. In fact, you can have as many mixing channels as you need, with internal busses and effects processes, and external aux sends/receives using the original 2 in/4 out of the SSHDR1, plus the 8 in/out TDIF port on the SSAC-1 (this could be connected to the SS810-1 or to a DA88 or Yamaha 02R etc.).

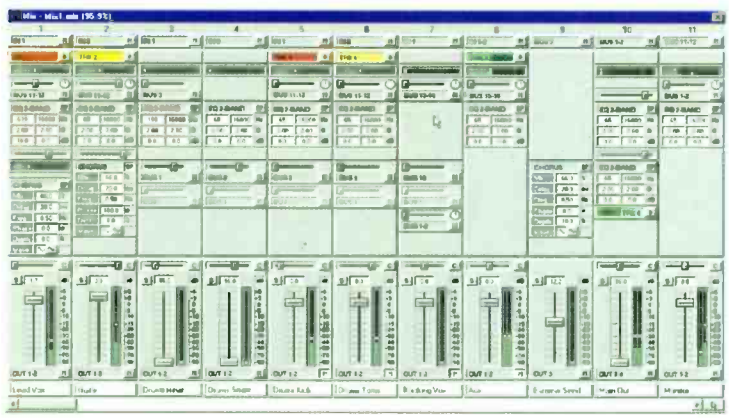


A typical use for a programmable mixer configuration could be when you have a final mixing situation with 8 tracks from Soundscape and 8 tracks from an ADAT or DA88. You could define a 24 channel mixer (with 12 for Soundscape tracks, 8 for digital tracks from the tape), with a stereo main output from digital OUT1/2 of the SSHDR1, analogue IN 1&2 as an auxiliary effects return or stereo input from a mix of MIDI instruments and as many auxiliary sends as required from the remaining outputs. A recording mixer could have a completely different configuration. Automation of the mixer is planned for a later release.

With two units, the TDIF connection on the SSAC-1 allows 8 channels of audio to be interconnected, so it's like having internal digital connections in the mixer. This means that you can route audio from one unit through real-time effects processes on the other and then back into the mix, making maximum use of both DSPs. New for '97 will be real-time effects algorithms from different 3rd party vendors which can be run simultaneously by the DSP on the SSAC-1.

The SSAC-1 also includes the Expansion Port which allows connection to a 512 channel external audio bus from the 3U Expansion Chassis. This allows playback/record tracks and inputs/outputs to become resources in the bus which can be routed where required. Connecting audio channels from one unit to input/outputs on another is then possible and multiple units can be connected together to form much larger systems. The Expansion Chassis will also allow multiple DSP and I/O cards to be installed for greatly increased mixing capability and virtually unlimited processing power for effects algorithms.

Punch in/out recording is included in the V2.xx DSP code, as are the MIDI tempo map and play looping requested by many users for music applications. There will be several other software releases to include general editing and user interface additions throughout 1997, many of which have been requested by existing users.



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Twenty-five years ago, Bernd Alois Zimmermann's *Die Soldaten* was intended to challenge established sound practices; today, technology is meeting that challenge. **KEVIN HILTON** enlists with the sound production crew

LIKE IT OR NOT, amplification is firmly established in musical theatre. While producers will now admit to the assistance of loudspeakers, it is a matter of pride that everything coming out of them is live. Just as with some of the big rock tours, this is not always true, but getting people to own up to it is a different matter. In this respect the post-war opera *Die Soldaten* (*Soldiers*) is unusual. Its composer, Bernd Alois Zimmermann (1918–70), wrote the 4-act work with the intention of breaking the traditional notions of form and continuity. Part of this involves the use of back-projected film inserts, and two major prerecorded audio sections, combining dialogue, sound effects and music.

Written between 1958 and 1960, *Die Soldaten*, based on the 1776 play by Jakob Lenz (1751–92), was scored to include taped sound effects, making Zimmermann his own sound designer at a time when the phrase meant little outside of the movie business. Today, sound designers are integral to the majority of productions, and will work closely with the composer, director and conductor to realise on stage what is represented on paper as dots and lines.

Die Soldaten is notorious among modern operas for its staging problems. The shows at the English National Opera's London Coliseum during November and December 1996 were the first ever British performances of the work, bringing the inherent headaches to a new set of musicians and technicians, although American soprano Lisa Saffer, who sang the central role of Marie, is a veteran of productions at New York City Opera and the Bastille.

Faced with not only providing sound reinforcement during the performance, but producing the complex prerecorded sequences was the audio design consultancy Sound Intermedia, fronted by trained musicians and composers David Sheppard and Ian Dearden. Both preprepared sequences occur during Act 4: Scene 1 and are totally sourced from hard disk and comprises the orchestra, chorus, soloists, a jazz band and tap dancers, with nothing performed live; Scene 3, the climax of the performance, has vocals mixed with various sound effects, including screams and characters achieving orgasm.

'In the score, Zimmermann wrote that Act 4 Scene 1 may be played back from tape,' Dearden says of a sequence where several events occur simultaneously, and images of violence are projected onto the stage as Marie is raped, triggering her decent into degradation. One of the reasons why this scene is usually prerecorded is that the lead soloist is called upon to deliver a string of top D notes throughout; a strain even for Lisa Saffer, who is considered the only performer capable of taking the part today. 'It's too much,' explains Dearden, 'so we decided to lay that down beforehand.'

Dearden and Sheppard opted to prepare their own segments for the ENO production, even though they were offered recordings from previous stagings. 'We chose to put together our own sequences', says Dearden, 'because the other material features different orchestras. An Akai DR16 was used to record and edit the preprepared performances and effects, while other sounds were played onto the hard disk from CD. These sessions would have turned out too big, in terms of the number of performers involved, and therefore too expensive to be held in a recording studio, and so were recorded at the ENO Works, the opera company's rehearsal venue in North London.'

Intermedia's Ian Dearden (left) and David Sheppard created complex prerecorded sequences for Act 4: Scene 1

This disused library has a central open space where the ENO Orchestra was recorded 'with as many mics as possible', according to Dearden. 'We used every Neumann we could get our hands on, as well as a SoundField. The orchestra was laid across as many tracks as possible, which gave us the opportunity to give good separation, and the ability to do the final mix in the theatre itself, so we would know exactly how it would sound to the audience, rather than trying to guess if we had done it in either of our home studios.'

Also at these sessions were percussionists, the jazz band, tap dancers, soloists and the chorus. As Zimmermann tightly scored *Die Soldaten*, even to the extent of notating the shouts and screams, a click meter was used so that the prerecorded musical and effects sequences would tie in exactly to the live performance.

The recordings were made in what Dearden describes as '2-bar or 3-bar chunks', rather than the straight to stereo approach that might have been expected of an orchestral opera session. 'We treated it more like rock and roll,' Dearden agrees. 'The emphasis was on getting bits right, after which we built up an array of the whole scene. It's a very complex sequence and we were able to build it up on the hard disk, recording three or four sessions with different people, but always with the click as the common thread. Sheppard adds that the use of a hard-disk recorder-player made the whole process easier because specific bars could be accessed.'

The second part of the sessions at the ENO Works were tracks for Act 4 Scene 3, the final five minutes of the opera where 12 scenes run concurrently, filmed sequences overlap the live performance, sound effects overlay the orchestra and, most extraordinarily, Marie disappears and a new central character emerges. Zimmermann was heavily influenced by the writings of James Joyce and Ezra Pound, injecting his work with the theory of the 'sphericity of time', the notion that past and present exist simultaneously.

'In the last scene the whole drama is effec-

Above: Revolutionary (for 1960) back projection helps characterise *Die Soldaten*
Right: The confines of the orchestra pit necessitated the use of the 'black store' back stage for the percussion section

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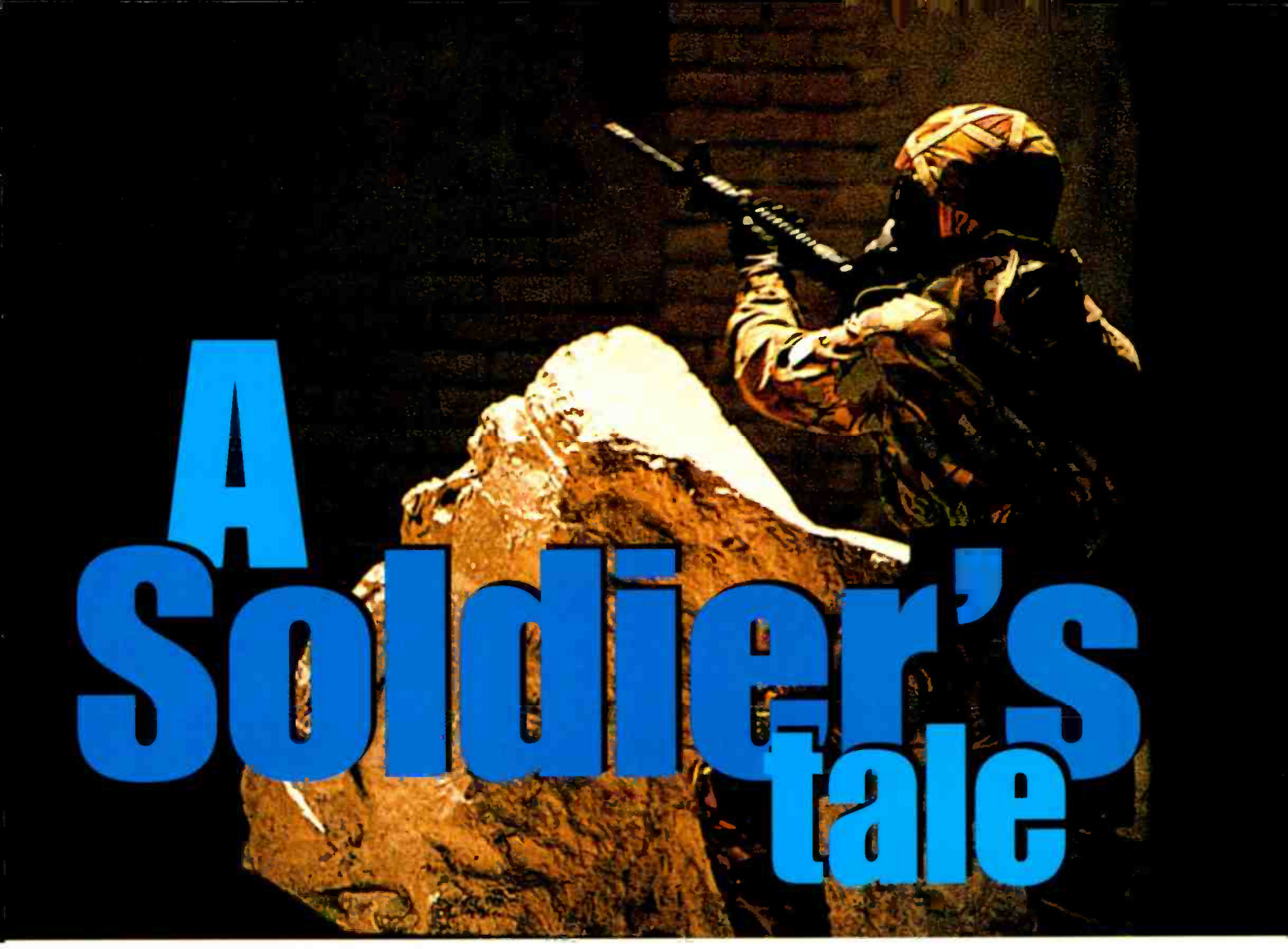

A Soldier's tale

tively taken over by sound effects,' Dearden says, explaining how the composer's aim is achieved through the use of audio clips. 'Zimmermann was very pedantic in what he wanted, and the score is clearly notated so that later productions could reconstruct his original sound effects, which include screams and military commands. We got most of the sounds we needed from the company, the performers, and purloined the rest from anywhere we could, mixed with some of the original effects Zimmermann himself put together. These were transferred onto CD from mono 1610 electronic tape.'

The sound effects for Act 4 Scene 3 were also recorded and edited on the DR16, but were then loaded onto an Akai S3000 sampler, controlled by a Mac PowerBook running a Performa sequence file. This gave extra flexibility, and the ability to change any sounds, given that the conductor, Elgar Howarth, and the director, David Freeman, had input as to what they thought worked or not. The assembled Performa file was triggered by Dearden hitting the D flat key on a standard keyboard.

'It felt quite odd to have gone through that whole production process and then end up just hitting a key,' he laughs. 'The sequence was assembled during rehearsals, but it was decided not to tie everything to time code and instead fly it in manually. I counted the number of beats, following the conductor and orchestra, rather than them being slaves to our system because Elgar took those 75 bars at a different tempo every night.'

> Zimmermann wrote that if the percussionists could not fit into the orchestra pit, then 'other possibilities should be used'. As the pit at the Coliseum is a relatively small one it was decided to locate the bulk of the percussion section in the 'black store'

UNLIKE the sequence for Act 4 Scene 1, the effects for the climax of the opera—which more or less envisages the end of the world—were mixed live by David Sheppard on the third of three Yamaha 02R digital consoles, which were used front-of-house during the shows to balance both the prerecorded segments, and elements of the live performance. Sound Intermedia has been using the 02R since the end of September 1996, when it was working with other orchestras. 'We could have done the show without this particular desk,' observes Dearden, 'for example we could have used ten Mackies, but we didn't want to.'

Aside from reducing the number of desks, the 02Rs offered Sound Intermedia snapshot memory recall, used for general mix balance changes, and real-time automated mix playback, which was used to control the balance between the amplified instruments, surround-sound effects and prerecorded segments. 'David controlled the mix in conjunction with the automated mix,' observes Dearden. 'Having it grouped in preset mix positions, but controlling the level, with the snapshot screen menus allowing us to switch between the mutes. In the live situation we didn't have to respond that much because we had already responded to any necessary changes and swapped things around during the rehearsals.'

Due to the repertory nature of the ENO, *Die Soldaten* alternated with performances of other operas (*Rigoletto*, *The Pearl Fishers* and *The Mikado*) during its short run. The need for the technical crew to get everything ☞

***Die Soldaten*'s stage 'jazz combo'**

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right was paramount, which, given the complexity of the piece, put the onus on the equipment. 'You've got to know that you're not the one holding up rehearsals,' says Dearden. 'It could be because one of the singers has got a cold, but we can't be the area that messes up. There were other operas going on at the same time, and the rig had to be struck each night—we also had to cater for the fact that the performances were going to change.'

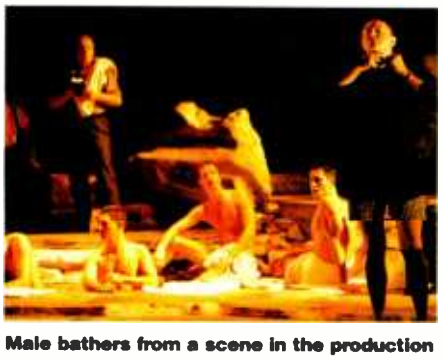
The three 02Rs were cascaded, with only the six auxiliary feeds on one desk remaining independent to supply feeds for the automated surround sound effects. Each desk was configured with a meter bridge and a MLA8 8-channel mic preamp, which were installed to supplement the amount of XLR microphone level inputs sent to the consoles. In all 40 balanced inputs were needed, in addition to the inputs from the DR16 and S3000.

This large number of ins only accounted for the substantial percussion section, two 'organs' (two DX7s), a harpsichord, piano, celeste and DI'd guitar. (The jazz combo, which appears live on stage during Act 2 Scene 1, used its own amplifiers rather than running through the main system.)

In realising the work, the task for the sound designer is to bring the percussionists into the house without drowning out either the singers or the rest of the orchestra. In his score, Zimmermann wrote that if the percussionists could not fit into the orchestra pit, then 'other possibilities should be used'. As the pit at the Coliseum is a relatively small one, and the dense scoring means that the rest of the performers could be swamped, it was decided to locate the bulk of the percussion section in the 'black store' (usually home to the theatres drapes), which is located some 47 feet above the stage.

Being so far away enabled proper isolation and balancing to be carried out, which was seen as a particular advantage for the tuned percussion instruments. There were 33-channels coming in from the dark store; in addition three percussion stations were dotted around the stage (one on the right, one on the left and one behind), as Zimmermann specified that certain sounds should appear to originate away from the action. Of these off-stage ensembles, only the timpani of each group was miked to enable an effect of the players hands being rubbed around the rim of the instrument to be heard.

The ENO has a house policy of using amplification sparingly and Sound Intermedia achieved this, despite their initial perceptions. 'We thought that we would have to amplify the singers,' says Dearden, 'but



Male bathers from a scene in the production

The back-stage percussion 'station'

there were no radio mics on the production. The percussion was so far away and isolated that we were able to control the balance so that the singers didn't have to fight against it. They were singing their hearts out—it was amazing projection.'

In keeping with the majority of musical theatre, the singers did not have any monitoring, but relied on what was coming from front of house. 'Opera singers are very used to hearing the sound of the orchestra from in front of them,' Dearden explains, 'so there's not the monitoring problem for them. The problem was making sure that the percussionists could hear the orchestra.'

Although the orchestra was not miked in the true sense of the word, microphones were placed in the pit, and then fed back to the black store so that the percussion section could monitor on small stand-mounted loudspeakers. Percussion feeds were brought down on line links and fed to the main body of players by a cluster of d&b audioteknik 902s slung above the pit. These were hired from rental company Hardware House, as were a number of small E3s, which were placed above the pit system to provide clarity for the conductor, and give a little more top end for the stalls. The ENO's own house rig, two Meyer UPAs left and right of the stage, were used for multitrack playback and the celeste.

A further six Meyer cabinets were placed around the lower part of the auditorium for the surround-sound effects. Again Zimmermann specified loudspeakers being placed around the audience (originally he had written the opera to take place on a circular stage with the audience in the middle, giving a whole new meaning to phrase surround sound). Only the surround effects were placed around these supporting loud-speakers, with the feeds coming from the six isolated auxes on the third 02R. This production of *Die Soldaten* saw the first ever public use of The Localizer, the surround-sound plug-in for the 02R Project Manager program, which ran in conjunction with the Mac PowerBook.

These first UK performances of *Die Soldaten* attracted much attention in the mainstream press, partly due to the debut, and partly because the original setting had been updated to make the opera's themes all the more relevant to today. Also highly praised was the staging, and although no critic specifically mentioned the sound, the overall technical production found favour. Perhaps the accolade most cherished by the sound crew was when an elderly woman made her way to the front-of-house desks to say Well done! Unfortunately everyone suspects that she mistook them for the lighting position...

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e-mail: 102763.3146@compuserve.com

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Fax: +358-9-525 93352
e-mail: jykri makinen@pp.inet.fi

FRANCE

Teac France
17, Rue Alexis de Tocqueville
CE005-92182 Antony Cedex
Contact: Christian Roy
Tel. + 33 - 1 - 4237 0102
Fax: + 33 - 1 - 4237 6545
e-mail: lminh@pratique.fr

GERMANY

Soundware Audio Team
Paul-Ehrlich Str, 28-30
63322 Rodermark
Contact: Arnd Kaiser
Tel: + 49 - 6074 - 89150
Fax: + 49 - 6074 - 98201
e-mail: Arnd.Kaiser@rodgau.netsurf.de

INDIA

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Contact: Amit Biswas
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Infinity Four Muzique
Kronehofstraat 30G
5622 AC Eindhoven
Contact Harold de Kinderen
Tel: +31 - 40 - 246 07 80
Fax: +31 - 40 - 246 08 16
e-mail. Harold@i4.nl

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Commercial

The project rooms that have supported Babyface's production successes with the likes of Whitney Houston, Madonna and Toni Braxton, as well as those as an artist, have given way to a new commercial studio. **ALAN DI PERNA** visits Brandon's Way in Hollywood, California

THE BUILDING doesn't have a sign out front. It's just an anonymous, yet sleek, single-storey structure on Hollywood's Highland Avenue, with silvery skim-coat concrete walls that glisten in the California sunshine. A post-modern sheet-metal gate rolls open and you're in the outer courtyard of Brandon's Way, the studio complex that multi platinum artist, producer, songwriter and record executive Kenny 'Babyface' Edmonds has just finished building for himself. Edmonds' chartbusting solo albums and productions for Whitney Houston, Madonna, Eric Clapton, Boyz II Men and Toni Braxton, among others, have made him a towering figure in mainstream pop and R&B. He has recently entered the world of feature films too, as producer and co-writer of the soundtrack for the box office smash *Waiting to Exhale*.

Brandon's Way was completed just in time for overdubs and mixes on Babyface's recent album, *The Day*. In fact, one of the first guest artists to record there was Stevie Wonder, who came in to duet with Babyface on The Day's single 'How Come, How Long'. The facility is also expected to play a role in the creation of music for *Soul Food*, the new film project that Babyface is producing in collaboration with his wife Tracey for their newly formed company, Edmonds Entertainment.

'This is the facility that I've always wanted to build,' he says. 'The look and feel of the rooms are done in mahogany wood, bird's eye maple and granite. It's extremely gorgeous. Most of our rooms, and particularly our SSL room, has more gear in it than I have ever seen in any room in the world.'

BRANDON'S WAY is the logical extension of Edmonds' MIDI-based approach to recording. 'Songwriting and production are so close these days,' he says. 'I like to build a song from the ground up, with the sounds and everything in place. As a songwriter, having all of today's sequencing and MIDI equipment, it's a lot easier to map out a song in a short amount of time and get a really good idea of how it is supposed to be.'

Most of Babyface's productions have started life as MIDI sequences created in various home studios. Prior to Brandon's Way, the producer had a studio at his home in Beverly Hills, and an identical setup at his retreat in Lake Tahoe.

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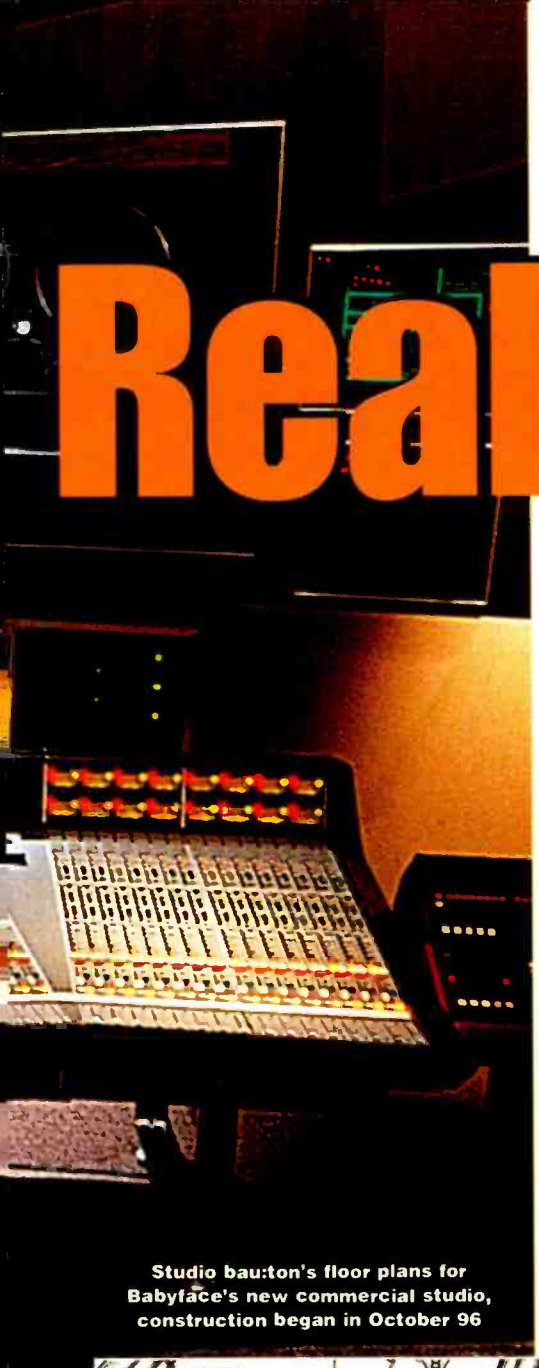
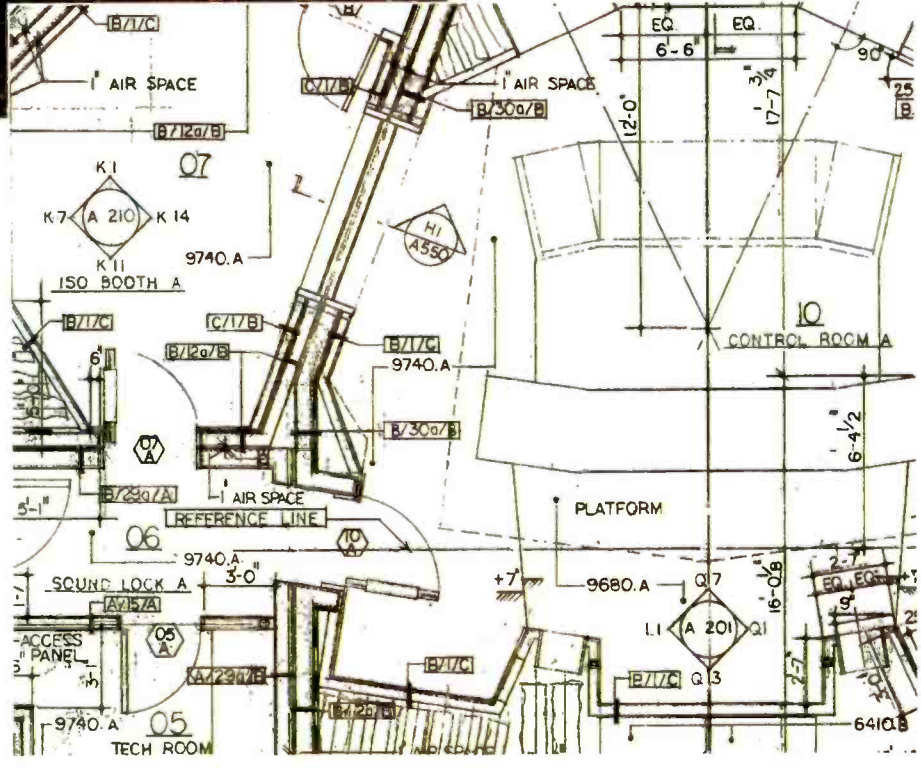
Reality



Studio bau:ton's floor plans for Babyface's new commercial studio, construction began in October 96



'Originally they were writing studios, but they escalated into other areas, explains Brad Gilderman, Edmonds' engineer for the past five years. 'For example, most of *Waiting to Exhale* was tracked at Kenny's home studio. And then we would go to the Record Plant and places like that for mixing and overdubs. But things reached a point where we wanted to have our own commercial-level facility.'

So Edmonds and his team began searching for a site on which to construct a new studio. They settled on Highland Avenue, a strip shared by some of the city's busiest postproduction houses, and some of its more unsavoury street life. Architectural design for the project fell to studio bau:ton, the firm that had designed Atlanta's LeCoco, the studio Babyface formerly shared with his former partner Antonio 'LA' Reid. Studio bau:ton principals Peter Maurer and Peter Grueneisen consulted with Edmonds on the design; the company's Clayt Hudson served as project architect. Wiring, monitor co-design and equipment supply for Brandon's way was handled by Bruce Millett's Burbank, CA firm, the Desk Doctor. Noted LA studio contractors Peterson-LaTouf were placed in charge of construction. Plans were drawn in late 1995 and early 1996. Construction began in February 1996 and was completed in October.

The location presented a textbook ensemble of urban-studio design problems. The neighbourhood demanded tight building security, and the site's close proximity to the heavily-travelled Highland Avenue called for thorough acoustical isolation. The existing structure was in poor condition, according to studio bau;ton chief Maurer: 'We ended up gutting it to the walls and rebuilding it completely.'

Space was at a premium. 'We were looking into adding a second story to a large portion of the building,' continues Maurer, 'to accommodate extra office space, but we couldn't do that because of city parking requirements. So we had to fit everything into what is basically a one story structure.'

The designers approached the 5,000-foot^2 space by creating a modular studio –a network of tie-lined rooms that can be made to serve whatever project is at hand. A large amount of the available space was dedicated to a spacious mixing suite, Control Room A. In addition, there are two smaller control rooms. One of these–Control Room B–is primarily set up for synth-based tracking and conventional overdubs; the other is a compact, synth-based writing room. For recording vocals and live instruments, there are two good-sized iso booths, one each next to control rooms A and B.

But the physical location of these rooms is less of an issue than it might be, as every room at Brandon's Way is linked to every other room via audio, video, computer and MIDI tie-lines. There are wall-mounted video cameras in each of the control rooms and iso booths, as well as video monitors. 'In other studios, if you're off in a remote place, there's often just headphones,' says Gilderman. 'Here, you've got 2-way visual contact as well.'

The studio's interconnectivity can support a variety of recording scenarios: 'If we're mixing in Studio A,' explains Gilderman, 'and Kenny needs to do a keyboard overdub, I just hit a button and the mix comes up on the Studio B monitors. All his keyboards are in there, so he can go in, add a keyboard part, and it goes right back to the mix in Studio A.'

According to Gilderman, the studio is equipped with '100 fibre-optic lines' to handle interconnectivity between rooms and with the outside world. The EDnet system is being used, as well as beta test systems from Kodak and Pacific Telesis. 'Pacific Bell just keeps giving us stuff,' Gilderman laughs. 'And we use the Kodak system so we can do video conferencing.'

The studio has a central tape machine room which serves all three control rooms. ☞

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The machine room has its own video camera, which is trained on the meter bridges of the facility's Sony 3348 digital 48-track, Studer A820 analogue 24-track, and two A827 analogue 24-tracks.

'We never know what combination of machines we're going to be using,' comments Gilderman, 'so we've got them all lined up in our machine room. It's just a quick patch to access anything we need.'

Remote machine control is handled by a Motionworks synchronisation system. Audio tie lines also link control rooms A and B with hi-fi playback systems in the studio's two principal lounges; 'The mix from any studio can be patched into any of the lounges,' says Gilderman. 'If you're working in control room A or B, and you want to hear what the mix sounds like in one of the lounges, you don't have to make a tape copy, just a patch.'

For all its ability to function as a single facility, Brandon's Way also divides nicely into two independent studios when the occasion demands. The Studio A control room, overdub booth and lounge are separated from the Studio B and C area by a 50-foot long, sunlit corridor decorated with Edmonds' sizable collection of platinum and gold records. This 'split' floor plan was purposefully designed to accommodate Edmonds' mix engineer John Gass, who will be working on his own projects at Brandon's Way when he's not mixing one of Babyface's productions.

Meanwhile, studios B and C are very much Edmonds' domain. The two rooms

Kenny 'Babyface' Edmonds, Brandon's Way mentor: Songwriting and production are so close these days

are linked by a common lounge area. The producer frequently moves between the two rooms, taking a song idea germinated in Studio C to the next stage in Studio B, or popping across the lounge to fine-tune part of an arrangement in C while overdub work proceeds in B under Gilderman's supervision. On days when outside artists are working with Edmonds in Studio B, the producer can retreat to his own private lounge—a low-ceilinged loft space located above Studio C. Affectionately dubbed 'the baby room' this space contains toys for Edmonds' son Brandon after whom the facility is named, and the studio's main office.

'So there's a private space for Kenny and the staff to hang,' says Gilderman. 'Because the B-C lounge is a place where the artists can hang. We kept enough space that nobody has to be on top of anybody else, if they don't want to be.'

Like a well-designed family dwelling, then, Brandon's way is a communal environment that still allows for individual privacy. Unlike the average home, however, Brandon's Way is stocked with some of the best recording gear and acoustically fine-tuned rooms anywhere on the planet.

Edmonds and Gass both had a lot of input on the design of the mixing room at Brandon's Way. The centrepiece of the studio is an 80-input SSL SL4080G Plus console with Ultimation. The 80 inputs are evenly divided between G-series and E-series modules.

'In terms of both sound and functionality, SSLs are integral to the way we work,' says Gilderman, who assisted Gass in mixing *Waiting to Exhale* on an SSL9000j. 'This console was one of the first, and easiest, choices we made in planning this facility.'

The control room's considerable size

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With the Euphonix, every keyboard is normalled into the board and available at the touch of a button.

(25-foot x 32-foot, with a 16-foot ceiling) proved a major acoustical issue in designing the room. Gass was accustomed to working in a much smaller control room at the Record Plant—another bau:ton room that had been patterned after a third LA studio, Summa Music, formerly owned by Record Plant chief Rick Stevens.

'John Gass really loved the Record Plant and wanted to have that same punchy sound at Brandon's way,' says Peter Maurer. But because the room at Brandon's Way is significantly bigger than the one at the Record Plant, he was a little concerned that he wouldn't be able to get that same punch.'

Edmonds' own sonic requirements for the room were along the same lines as Gass's. 'Acoustically, Kenny has a specific taste,' Maurer comments. 'He wants his rooms to have that very low-end response, and that 100Hz punch that he's very sensitive to. One of our concerns was how we could achieve that without subwoofers. Because subwoofers were out of the question. We were not even allowed to propose subwoofers.'

The designers responded by placing the mixing console closer to the front-wall monitors than usual. 'It's a real in-your-face' kind of setup,' Maurer comments. Also studio bau:ton designed an exceptionally powerful custom monitor system in conjunction with Bruce Millett of the Desk Doctor: a LCRS system, designed to accommodate Edmonds' growing involvement in film work. The 2-way enclosures employ a TAD 15-inch woofer and a driver on a Northwest horn, powered by Yamaha 4002 amplifiers.

'We've gone through a bunch of different amplifiers and we found those to be the most tasteful for us,' says Gilderman. 'Unfortunately, that model has been discontinued. But Bruce Millett was able to supply us with enough of them for our needs.'

Another prominent feature of Studio A is its ample selection of outboard gear —some 76 pieces in all. These include an exhaustive selection of digital effects processors from Lexicon, Roland, Sony, Yamaha, Eventide and tc electronic. Classic vintage gear such as Urei 1176s, Teltronix LA-2As, Pultec EQP-1As and an EQH-2, API. And Neve mic preamps and newer analogue processing gear from Avalon, Summit and Focusrite.

'We tried to build the room so that, when you come in here, you really don't need to rent anything,' says Brad Gilderman. 'In here, you should be able to find any piece of gear you could ever think of.'

All this processing power is housed in a massive 8-bay credenza with a black granite top that serves as a producer's desk. Attractive as it is, this surface posed another acoustical problem for the room's designers.

'The amount of equipment basically determined the size of the credenza,' says Maurer. 'And the higher you have to make the credenza, the more you're going to have to deal with rear reflections off that gigantic salad bar there.'

The solution to this problem was to locate the front-wall, high-frequency drivers a little lower than usual. 'We were able to do that,' Maurer adds, 'because there's no front control-room window.' In place of the traditional control room window there's a 53-inch rear-projection video monitor for viewing activities in other rooms. Four smaller video monitors, mounted to either side, display Ultimation mix data, security camera signals and any other video data required.

There are, however, two side windows, located adjacent to the console. The window on the mixer's right looks into the machine room, while the one on the left looks into Iso Booth A. To isolate the control room visually from either of these areas, panels are placed over the windows. 'When we do that, it just looks like the lights are off in the room,' says Gilderman. 'We can track a session in Iso Booth A while someone mixes a completely different project in Control Room A without one project disrupting the other in the slightest way.'

Acoustically, the room is finished in a combination of hard and soft surfaces, stained mahogany and stretched fabric. Aesthetically, the mahogany's dark, dramatic hue is relieved by bird's eye maple and aluminium trim. This combination of materials is used throughout Brandon's Way, as is the floor surfacing: black R-Dex concrete. This flooring was selected

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more for its aesthetic benefits than its acoustical properties, according to Peter Maurer: 'Hardwood floors start to look worn after a few years in most studios, particularly in the heavily used area right behind the mixing console.'

LOCATED OFF Control Room A is a 19-foot by 12-foot space that was originally designed as a vocal booth, but has become the *de facto* piano room, since a 7-foot Yamaha grand took up residence. The booth stands on a floating floor and is completely decoupled from the main building structure, which partially accounts for why you can hold a session in there while something completely different is going on in the control room. The walls of Iso Booth A are covered in absorptive stretched fabric. The ceiling is made of curvilinear mahogany panels set at varied heights—a design that has become known as the 'studio bau:ton cloud'.

'Instead of making the room totally dead, we put in those hard-surface ceiling panels, and also a hard R-Dex floor,' says Maurer. 'Because you can always put a rug over the floor to deaden it. So even though this and Iso Booth B were designed to be vocal overdub booths they do have low-tech variable acoustics.'

Control Room B is a 22-foot x 14-foot space primarily devoted to tracking. Architecturally, the construction of the room posed several problems. 'The walls had to be placed according to the structural conditions of the building,' says Maurer, 'which meant that the acoustics of the room had to be addressed very carefully. Also the room is located right next to Highland Avenue, which is a heavily travelled street where motorists ignore speed limits, so there's a lot of noise transmitted through the ground. But we were really successful eliminating that.'

The solution was to float the room completely, which brought the control room to an NC-20 level of acoustic isolation. 'It's literally a room within a room,' comments Maurer.

> 'We tried to build the room so that, when you come in here, you really don't need to rent anything', says Brad Gilderman. 'In here, you should be able to find any piece of gear you could ever think of'

Acoustic fine-tuning of control rooms B and A was done by Steve 'Coco' Brandon. Although Studio B isn't a large room, the available space is very economically used. The main monitors are custom Augspurgers, powered, again, by Yamaha 4002s. Unlike Control Room A, B does have a conventional front wall window, which looks into Iso Booth B, a 9½-foot x 14-foot space with acoustical treatment similar to Iso Booth A.

The console in Control Room B is a 72-channel Euphonix CS2000 with full dynamic, digitally controlled automation. 'The Euphonix really makes sense when you look at the size of this room,' says Gilderman. 'When we do our tracking sessions, we use a lot of keyboards. We don't have to patch each keyboard in and label it every time there's a session. With the Euphonix, every keyboard is normalled into the board and available at the touch of a button. The same goes for the tape machines. In this room, we're able to jump to any situation very quickly.'

The room's complement of outboard is primarily orientated toward tracking and is therefore more modest than that of Studio A. The main emphasis in B is on compressors, gates, mic preamps and other tracking-related pieces. Again, there's a mixture of vintage Urei, Pultec, Neve and API processing gear, as well as contemporary equipment such as the Avalon AD2055 EQ and 2044 compressor, GML 8200 EQ and Drawmer DS201 gates. Digital effects processors are far from neglected, however, with a Lexicon 480L and PCM70, Yamaha SPX100 and 990, a Sony D7, Eventide H3000D/SE and AMS rmx 16 all to hand. 'We feel that there are just enough effects for tracking in here,' says Gilderman. 'It's not an overkill situation.'

Behind the outboard equipment credenza lies Edmonds' MIDI area—MIDI tone modules are mounted in towering bays

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built into the rear wall with which the producer uses a variety of controller keyboards. His chosen controller generally sits atop the producer's desk–the black granite top of the outboard equipment credenza–and is stored in a closet at the rear of the room for non-keyboard tracking dates.

On a slide-out shelf to the producer's right is his Akai-Linn MPC3000–Edmonds has been dedicated to Akai-Linn hardware sequencers for years. A Mac PowerBook that generally sits nearby is used to record session data rather than MIDI sequences.

'That's where I'll keep information like the key and the tempo of the song, and what instruments I'm using.' Babyface explains. 'And also the lyrics to the songs. I'll take a computer on the plane when I'm travelling, along with a Walkman and a tape copy of whatever song I'm working on, and I'll write lyrics on the plane.'

The MIDI setup in Studio B was formerly in a room in Edmonds' Beverly Hills home. Among the tone modules it includes are a Korg Wavestation AD, M1Rs and SRs, Roland JV880s, Super JDs and U110s; E-mu Proteus 2s; Studio Electronics MIDI Mini rack mount Minimoogs; and Yamaha TX81Z modules.

'Once I get the basic keyboard sounds for a song, they're usually pretty permanent,' says Edmonds. 'I use the Proteus 2s and JX880s a lot. And the M1s have been favourites of mine for a long time.'

Across the lounge, Studio C contains a duplicate of the MIDI setup in Studio B. The Studio C rig was originally in Edmonds' Lake Tahoe home. Now it resides in a 15-foot x 10-foot studio that was added to Brandon's Way as an afterthought.

'It was originally supposed to be a producer's office,' recalls Maurer. 'Later on, when Kenny decided that he didn't want to keep his studio in Tahoe, that space was chosen to house the Tahoe studio. It was the only space available, really. Basically, Studio C is completely lead-lined for acoustic isolation purposes, because we didn't have the space to build secondary walls and float the room.'

The tiny room is dominated by massive, custom-designed Bruce Millett–Desk Doctor speaker enclosures, consisting of all TAD components with separate 15-inch subwoofers. The system, which is powered by BGW amps, was also at Edmonds' Lake Tahoe home. Studio C is equipped with a Euphonix CS2000 console which is identical to the one in Studio B, except that it only has 48 channels instead of 72.

'Since Kenny's only working with keyboards in here, that's all he needs,' Gilderman explains. 'When he's written something in Studio C, one of two things can happen. Studio C can be patched into Studio B to track the song, or Kenny can take a floppy disk from his sequencer, bring it into Studio B, pop it into the sequencer there and everything comes up exactly the same. Either way, he's able to stay focused on the creative process, rather than getting bogged down in technology.'

FOR ALL THE CONVENIENCE it presently provides, the ISDN network at Brandon's Way will also provide an important link to remote locations in years to come. 'Kenny is starting to get into movies,' Gilderman observes. 'So we can be tied into Lucasfilm, Paramount or other film facilities. They can send us their dailies and videos, and we can send them music, all at the same time. Because we have cameras in all the rooms, we're already set up to have 2-way visual communication with them.'

'The new Pacific Telesis system enables you to compress video and multitrack audio data over the same line,' Peter Maurer elaborates. 'So we've already moved beyond sending and receiving just stereo audio.'

'If Kenny is doing a live show at the LA Forum or someplace,' adds Gilderman, 'we can take all the feeds and do the mixing right here, live. We have that capability right now.'

As the future brings new entertainment media to the fore, the many talents of Kenny 'Babyface' Edmonds are likely to be a part of them. With his own studio as a high-tech power base, he's well equipped to launch a productive new phase of his multi-platinum career.

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Game, Set

Audio has traditionally come a poor third in the graphics-dominated games industry, but now a combination of technological advances and cultural changes is elevating the soundtrack to a new level of importance. **SIMON TRASK** plays the newest game in town

IT'S BEEN A LONG TIME coming, but the games industry is finally getting serious about music. Sony UK has been studiously cultivating a relationship with the underground dance music scene as part of its marketing of the Playstation games console, and the top-selling Psygnosis-Virgin Playstation game *Wipeout 2097* features in-game music from the likes of The Prodigy, Future Sound of London, the Chemical Brothers, Photek and Underworld—with, naturally, a compilation CD tie-in from Virgin. Not to be outdone, Sega UK has been busy courting hip London jungle label Suburban Base, with a compilation album of jungle and house tracks based around sound effects from Sega Saturn games due soon, while JVC UK has instigated jungle remixes of music from the soundtracks of *Tekken* and *Ridge Racer* for the Playstation.

Meanwhile, Virgin's *Broken Sword* for PC CD-ROM features a specially written soundtrack from top UK composer Barrington Pheloung, who wrote over three hours of music for the game, while Japanese games company Warp has commissioned Michael Nyman to write the soundtrack for its Sega Saturn game *EO*. UK games company Gremlin hired indie group Pop Will Eat Itself to provide the soundtrack for its Playstation game *Loaded*, while a tie-in with the Sheffield-based underground techno label Warp Records will see Warp artists such as Autechre and LFO providing the music for a forthcoming Gremlin PC CD-ROM game called *Hardwar*.

A scene from the *Surreal* game

On one level all this activity can simply be seen as so much clever cross-marketing. But it's also symptomatic of deeper changes and shifts occurring in the games-playing world. Driven by ever more powerful technology and changing cultural expectations, the logistics and economics of games production are becoming increasingly like those of film production, and the film world's 'blockbuster' mentality and associated emphasis on production values is taking hold. Video games are metamorphosing into 'interactive multimedia', complete with sophisticated production techniques like 3-D graphics rendering, motion capture and video compositing.

As with blockbuster films, best-selling games can yield phenomenal financial rewards in what is a multibillion dollar global industry that eclipses even the film industry in value. In this brave new world of multimedia games production, music sound effects are growing in importance, to the point where the technology, techniques and expertise of the audio postproduction world are becoming increasingly important. At the same time, the interactive, nonlinear nature of games is significantly different from the linear narrative structure of film, and this difference poses new challenges for musicians and sound designers.

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and Match

The Virtual Studios graphic facility

One company expanding its horizons to include games is Soho-based Horizontal Productions, a partnership of sound designer Peter Wielk and composer-programmer Mel Wesson, who between them have over 30 years experience working in music, film and TV. Working out of a small, but light and airy studio based around a Fairlight MFX digital audio workstation and a Yamaha 02R digital mixer, Horizontal Productions aims to provide 'innovative and excellent sound design, and original music for advertising, film, television and interactive multimedia'. The company is working with London-based games company Virtual Studios, providing sound design for Virtual's first game, an ambitious adventure game called *Melt* for Sony Playstation and PC CD-ROM.

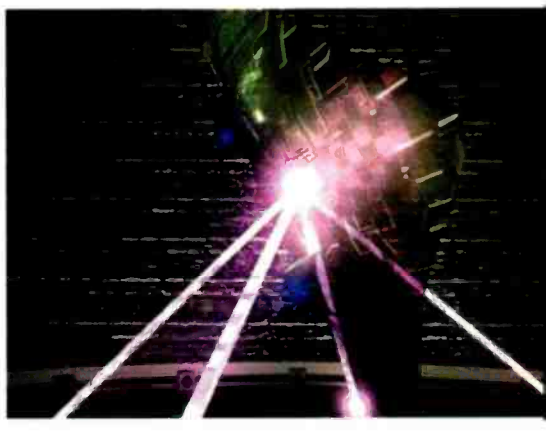
'These emerging technologies will become incredibly important in the next few years,' observes Wielk. 'One of the reasons we wanted to get involved with Virtual is that they're really cutting-edge and are privy to information that's two or three generations of machine away, which is mind-boggling. We felt it would be hugely advantageous to be around them to see what's going on.'

The duo's involvement in games work came about some six months ago when Virtual Studios needed some sound put to an early video sequence of *Melt*. As a Fairlight owner, Virtual cofounder and partner Peter Williams already knew Wielk and gave him a call. From there, Horizontal became involved as the official sound developers for the game. Although Virtual Studios has its own in-house, 24-track, recording studio, Williams, and fellow Virtual cofounder and partner, Ian Capon, decided that it was important to draw on the experience of outside audio professionals.

Williams: 'Having come from a postproduction background in music myself, I didn't see any reason why we should try and reinvent something that already worked very well in the advertising and broadcasting postproduction industry, which is that of sound-effect expertise and design creation. Why try and redo that here in a games company location when what we actually want is close-to-finished sounds that we can just tweak and put together, and place where we want them? So we're putting the effort in the hands of the industry that knows how to deal with it.

'I think that's something that most games companies have completely missed and are only gradually beginning to understand. Quite a few games companies have set up serious audio facilities of their own—Sony, Sega and companies like that have built pretty heavyweight studios with Euphonix desks and everything else in them. But what they don't have is a solid base of postproduction talent to draw on, and they don't have ten years of sound libraries, and all the links with all their mates they can just ring up and say "Look, I need such and such, can you get it for me?" Also, having that resource of sound design and library access through Horizontal, we can concentrate on using our studio for dubbing work, rather than spending 80% of our time searching for sounds on CDs and then ending up with something that isn't quite right anyway.'

Capon adds: 'In the past, most games companies would have had one guy sitting in a little back room with a Mac and a couple of keyboards, that was the music department, and it did all the sound effects for a title. They could get away with that because with the games machines of that time it didn't matter, but now it's getting a little different—especially as people are starting to integrate



their computer with their hi-fi systems or a decent home-cinema-type system, so more and more people will want more effects, whether it's 3-D sound or whether it's good music, and that is not going to go away.'

'Ultimately it will be like Skywalker Sound for games companies,' observes Williams, 'with proper dubbing theatres, and you put together your surround-sound effects and Dolby Pro-Logic encoding, and everything for it.'

'It won't be long before 3-D sound chips are in every PC that you buy,' Wielk adds. 'At the moment we're still making stereo mixes, but I think within months we're going to get heavily involved in surround sound. Eventually, taking all this stuff to its logical conclusion, rather than a conventional desk to create stuff you'll have some form of imaging headset and a control surface that ☞

The casual way to view *Melt*'s Vega world

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will be virtual, and you can just physically place things in space.'

Virtual Studios started out developing headset-based immersive VR applications before becoming involved in games production, and Williams and Capon talk of the latest military developments in retinal imaging headsets, which use lasers to project images directly onto the eyes. Total immersion in VR will require total immersion in 3D audio worlds, of course...

IN TRUE GAMES FASHION, *Melt* pits the player against an evil artificial lifeforce known as Eddie who is out to destroy the world. Your mission, should you choose to accept it, is to range through time and space battling through 15 levels against assorted enemies in an attempt to destroy the eleven 'pods' that give Eddie his power. 'Eddie' might not seem like a particularly villainous name, but fans of Iron Maiden

will recognise him as the evil figure on the rock group's album covers. In fact, in Virtual's own tie-in with the music industry, Melt has a hard rock soundtrack provided by Iron Maiden. Meanwhile, for the company's next game, *Surreal*, the music will be provided in-house by Peter Williams and his music production partner Clayton Moss, while future games will see Horizontal becoming involved in the music as well as the sound design side.

Williams plans to install a Fairlight MFX in the in-house studio to complement their Yamaha 02R mixing desk, so that Horizontal and Virtual will have the same setup. The two companies are also talking about establishing an ISDN link between them, so that sounds, mixes and images can be transferred to and fro digitally.

'At the moment we come down here to Virtual, go to meetings, look at storyboards, and talk through different cells that might be used for one particular character, or one particular background,' explains Wielk.

'Eventually we'll just be able to get some images piped down the line, and then sit down and work some sounds round that and pipe them back again.' The sophistication of today's games design is such that story-boarding is essential. Not only that, but "virtual set design" is a key element, as artists start by sketching out virtual worlds on paper or directly on screen. At Virtual Studios, sounds for characters and worlds are thought about from an early stage, too.

'The initial part of it is the key group of people on the game sitting around and saying, "Okay, these are the group of characters we're going to have in this scene so we're going to need to give sounds to these characters for the different animations",' Williams explains. 'With *Melt* the whole design thing has been going round in a loop all the time, because we've continually changed and decided, "Well, we don't want that character, we'll use this one instead", and sounds will be changed, and mixed, and matched, accordingly. So that's one reason why it's necessary for us to have an ongoing link between ourselves and a sound postproduction facility. We need to be able to say, "Actually, you know that dragon roar we wanted, well it's actually a pussycat now so can you give us two pussycats". That kind of flexibility is what's important.'

'Quite often we will go down to Virtual and have a look at work in progress,' says Wielk. 'It's almost like doing cartoons, you might see things in skeleton form before they've all been rendered, and we talk to people, because they've had meetings about the various levels of the games, and at that point they'll start mentioning the sounds that they'll need, so even before we've seen any computer-generated images you begin to get a feel for the game and also get a feel for the sounds that will be required. The graphics people work away on their SGIs and their Onyxes, and things, and they'll slowly come up with these images which they then output from their workstations into an Abekas video store, which holds about a minute or so of completely uncompressed, broadcast quality image. Then we might either work to that or, if we're working up at our studio, we'll just get a Betacam working tape of a particular scene or whatever, slot that in the machine and then start laying up the sounds.'

Wesson and Wielk provide multilayered 'sound beds' for scenes, together with

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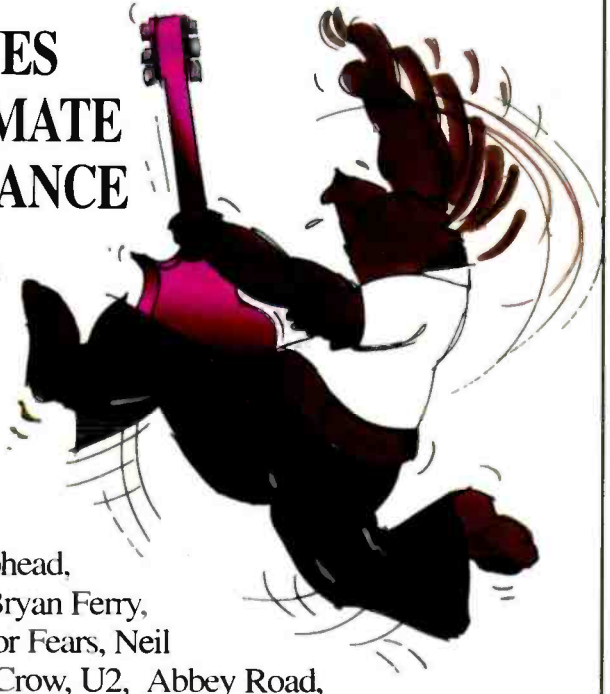

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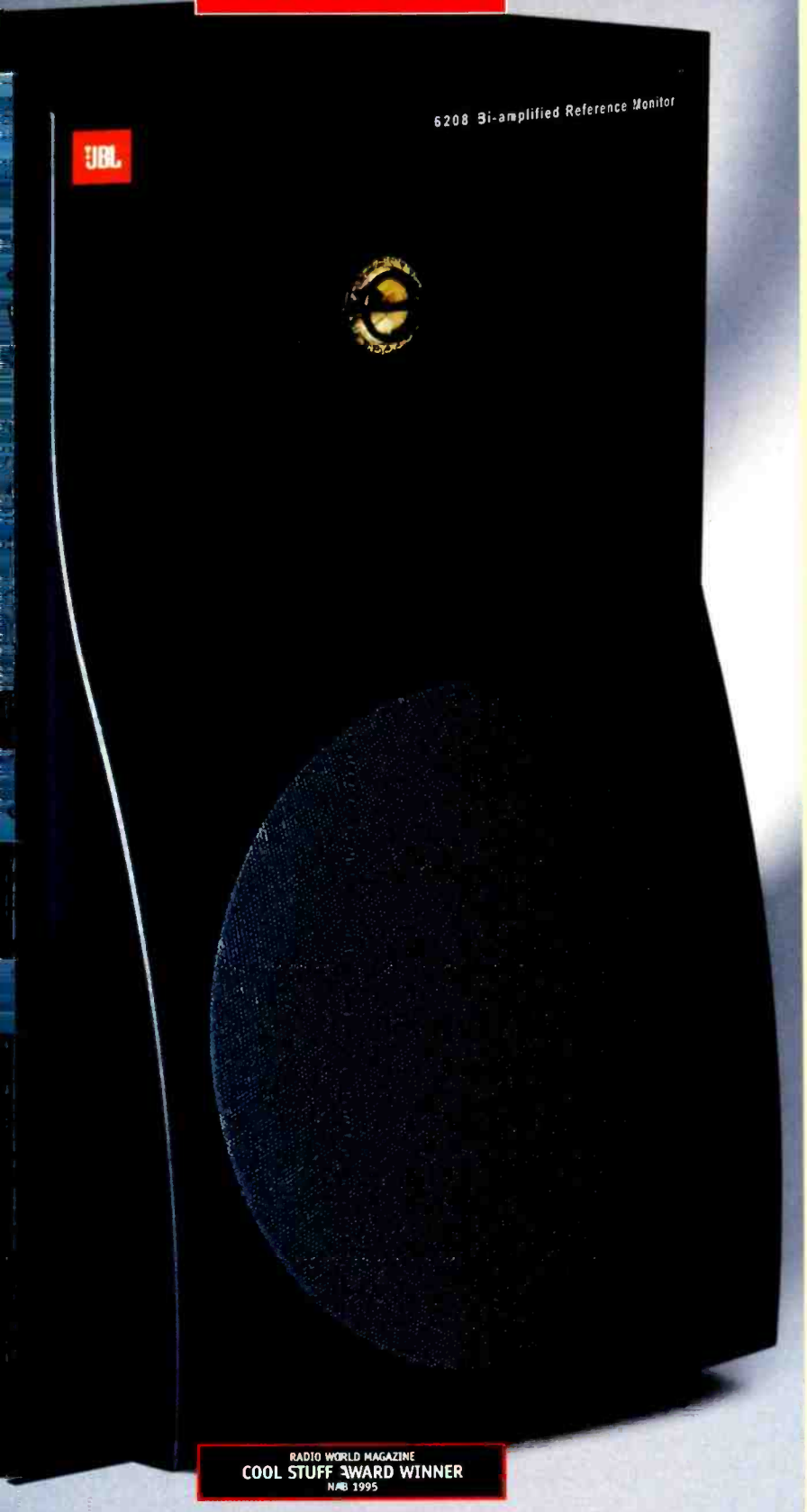

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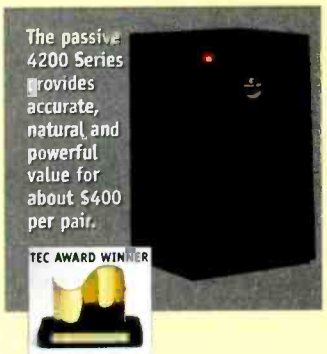

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individual sounds which will be triggered according to the live action gameplay, working to full audio bandwidth.

'What we'll do is give all these component sounds to Eamonn Flynn at Virtual, whose job it is to fit those sounds in with the game play itself,' explains Wielk. 'He's talking directly to the guys who are actually writing the game, about how the sounds will integrate physically into the thing, and then he's also talking to us saying, "Well, we need these particular types of sounds", so he's like the liaison officer between the two.'

It's also Flynn's job to compress Horizontal's full-bandwidth sounds so that they can fit into the game memory. Sounds have to be loaded off CD-ROM for each level of the game as it's called up, and on the Playstation these sounds have to fit into 512k of onboard RAM. Virtual Studios use scalable compression so that more prominent sounds can be assigned higher bandwidth priority. As Williams observes: 'People are critical of audio in a way that they're not critical of graphics that have been compressed, they're much more sensitive to it. They'll listen and say that the audio sounds dull, whereas they didn't notice that all of the reds were clamped down to a certain value in the graphics.'

Capon and Williams see audio assuming ever more importance in their future virtual gaming worlds, with sounds being attached to individual graphical elements and activated as players move around the world. 'If we have a fast enough disc, such as a DVD-ROM drive, then we'll be able to dynamically load sections of audio as we require them, and make a decision about what compression level we're going to play them back at each time we load them,' says Williams. 'So we load a certain sound and we compress it on the fly into a 22kHz bandwidth as opposed to 44.1kHz so that it can fit into that memory slot, and it's going to be played because we're heading over that way towards that hill and we're going to need that over there. So you have all the sounds placed in the environment as you would graphic objects. Then we're closer to the concept of audio rendering.

'We're looking at the idea of being able to resynthesise sections of audio or music so that we could just move crossfades between them, morphing from one section to another using an IFFT on the new Intel MMX system, which would be a neat solution. But there are problems with doing that in terms of the reference frames that you're using for the FFT, so it probably won't be glitch-free, but it could be an effective solution for certain things. Actually, to render audio properly is often thought to be more difficult than rendering graphics, because graphics is rigidly defined in terms of its mathematics, but the audio involves a lot of psychoacoustic phenomena which nobody fully understands.'

For the production duo, the technological behind-the-scenes stuff remains mercifully just that. For them, it's the creative challenges of the games medium which provide the attraction.

'Where it interests me is that working with games is closer to film than possibly any other medium, and it's getting closer,' says Wesson. 'I'm sure that in two or three years time, games are going to be like interactive movies in which you're a star player, and in that sense their sense of scale and dynamics is going to be bigger than your average television media, because they're looking for that wider audience and that larger-than-life big thrill.

'The ways in which we entertain ourselves are changing,' sums up Wielk. 'It used to be listening to pop music on the wireless, and now it's going into multimedia, and the industry is changing as well to accommodate this. Lots of studios, regardless of where they pitch themselves, are becoming acutely aware that even if they're not so much involved in multimedia or games, they're definitely getting involved in visually related things, because the two industries are converging at a very rapid rate. The technologies are crossing over so much that we have to be aware of what's happening with the latest visual mediums, and also thankfully the people that are creating the visual images are becoming more aware of where sound comes from and how to integrate it.'

Or, to put it another way: the barriers are simply melting away.

CONTACT

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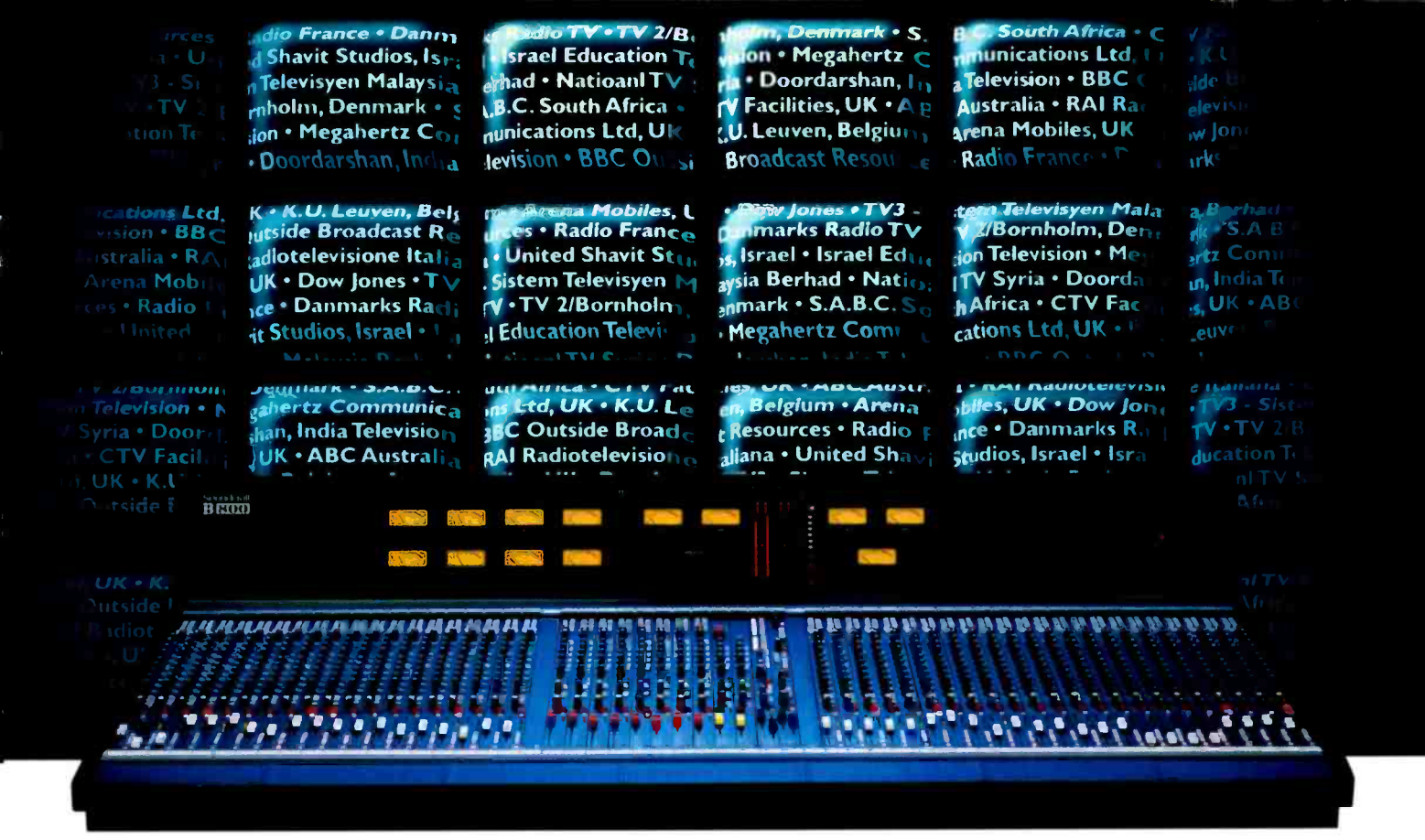

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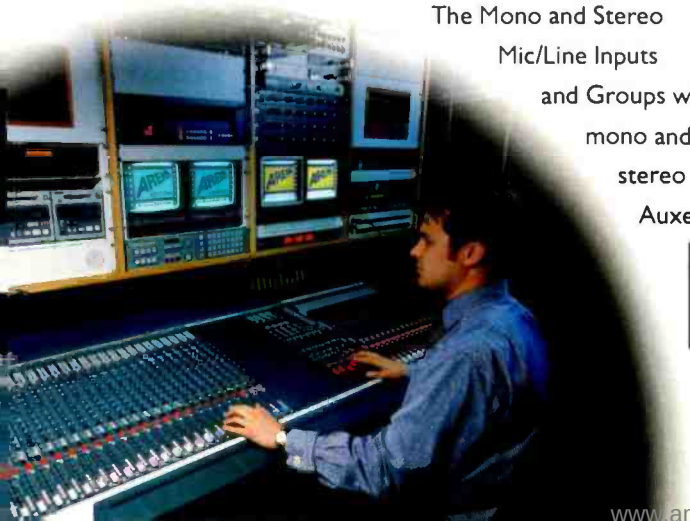

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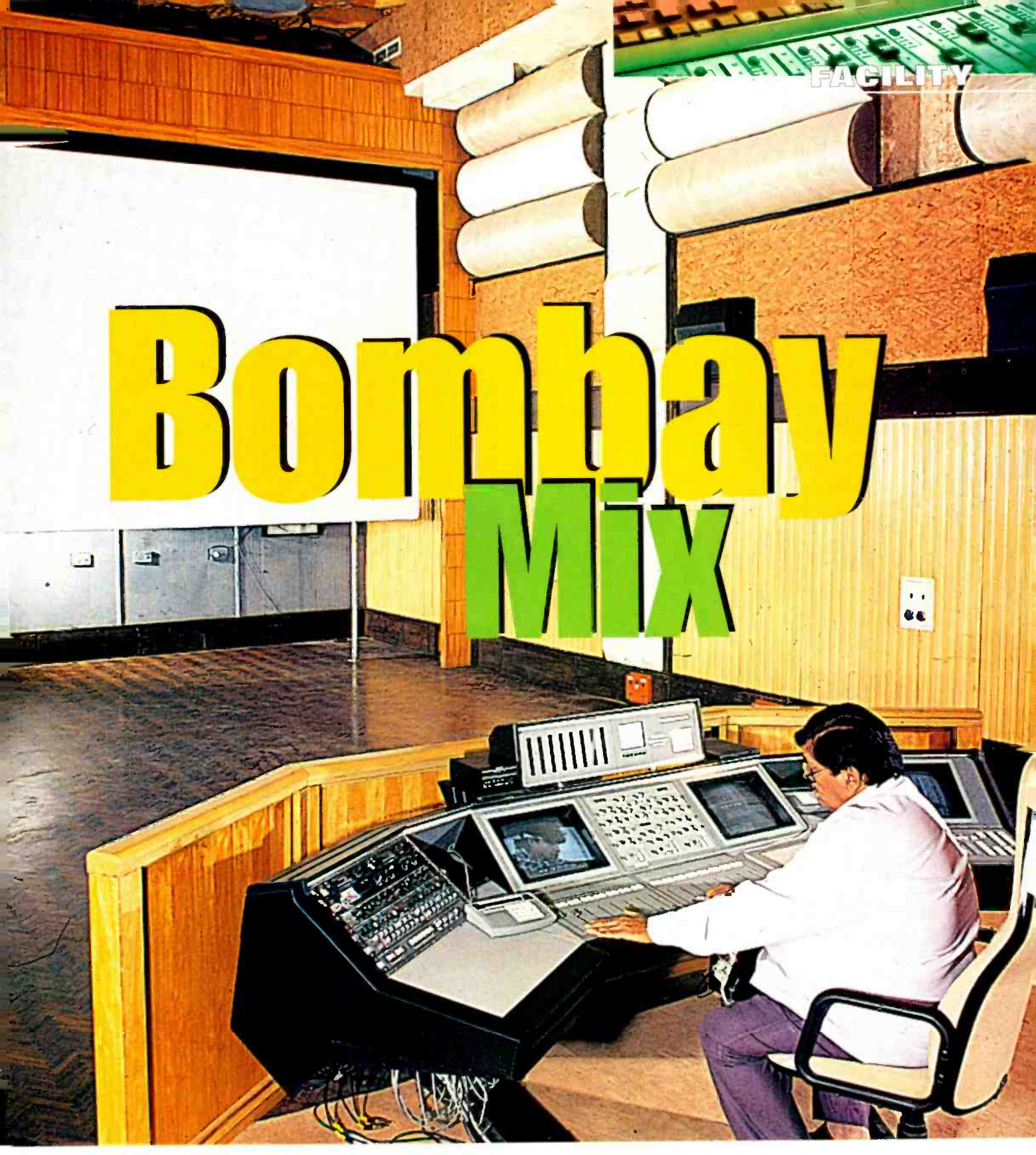

The largest film market in the world has yet to become the most sophisticated. So it is that India's insatiable appetite for cinema presents golden opportunities for advancement as **ZENON SCHOEPE** discovers on a visit to Mumbai's Sunny Super Sounds facility

MY DRIVER is a rather old to be captaining a taxi in Mumbai, but before long I realise that what he lacks in youthful exuberance and aggression he makes up for in hard experience and ice cold nerve. In Bombay, recently renamed Mumbai to shed yet another hangover from the British colonial days, you drive for your life steering your projectile at a gap in the traffic, and keeping calm and focused in order to reach it.

Car indicators long ago evolved into the car horn because indicators scare no one in a traffic etiquette that causes you to expect that all other road dwellers are about to collide with you. The horn reminds others of your presence. The sound is frenetic and deafening.

Watching a vehicle attempting to cross three lanes of oncoming traffic is a lesson in clutch control, and the importance of millimetre-perfect knowledge of a car's dimensions. My driver's style is unorthodox, but undeniably effective and because his engine won't idle, has no neutral gear, or because he is concerned about conserving fuel he switches off his engine with careful forward planning at every opportunity. At one with his machine he strikes the briefcase of one, and the carrier bag of another pedestrian foolish enough to stray in to his path.

They tell you that foreigners should expect, ☞

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to put it politely, 'digestion problems' when they come to India. The food and water is only part of the equation as a half-hour ride in a scooter-powered autorick-shaw can simulate all the symptoms of incontinence. I've been told that to ride pillion on a motorcycle is the definitive way to experience Mumbai traffic, but you'd have to pull a gun on me to get me to sit on one.

At last I feel prepared to cope with the very worst that any Neapolitan taxi diver could throw at me. In fact I would now laugh at his best attempts.

I barely avoid being catapulted forward to kiss the windscreen from the back seat on a last second emergency braking manoeuvre, I brace for impact, and concentrate on looking out of the side windows. So this is Mumbai, home to the Indian film industry, the brilliantly entitled Bollywood.

India is unlike anywhere else on earth. It is a combination of smells: low-grade diesel, 2-stroke oil due its continued manufacture and subscription to the scooter as a neat mode of transport; dust; and the smell of people. So many people, living by the side of the road, in ramshackle communes and more traditional residential areas, but wherever you are the poverty is never far away. No one needs to tell them they have problems because a population of some 1bn puts a strain on country. A revitalised economy, and an opening up of business also strains the support services with power cuts in Delhi, due to a shortfall in capacity, being a regular occurrence.

The electricity crisis is just one of many that has to be addressed if the country is to move on. The government still has credibility problems, and its coalition of 13 parties is not tipped to last long. However, retail confidence is increasing, although the real wave of big investment in the country is yet to happen.

FILM IS BIG IN INDIA. It's heavily censored for sexual content and violence, although it is the former that really gets hammered. Violence, on the other hand, is surprisingly earthy—less hand-to-hand than knife in the entrails on examples of action movies—peculiar given the nation's adeptness at reproduction. This sexual censorship is becoming something of an issue in the film industry with a number of well-known film makers having their product excluded from Festivals and awards.

There are some 14,000 cinemas across the country about 1,250 of which are found in the Mumbai region, and it remains the cheapest form of entertainment available to the populace. You can get a seat for 5 rupees—about eight British pence.

Films can take a long time to make due to the logistics of getting all the relevant parties together on one set at the same time. This is because the throughput of films is high and actors, directors, and producers have a lot of commitments to other projects. Rather than hinder a film's potential this is used to advantage and is milked for maximum effect by building up the hype and expectation of particular 'dream team' creative combinations and it can take three to five years for it to all finally happen.

The music composer and the lyricist

SSL's OmniMix—ahead of the game for India

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are critical to the decision process for a film because aside from the current heart-throb actors, songs can make a movie. Separate music sales on even a moderately successful film can cover 20% of the cost of a movie, and it's an openly admitted fact that wonderful songs can make a dull and ordinary film a box office hit. Indeed, the current record for music sales from a film stands at more than 70 million cassettes.

Part of the skill of film making is bringing together, and balancing complementary and current talent. While male actors can continue into their 40s, few women continue to work in to their 30s, but judging the all important composer and lyricist from the ever changing top ten elite is among the hardest decisions. Indian film making is all about formulas–a movie has to have five or six songs and all these are voiced by a *crème de la crème* of fewer than ten singers because the actors all mime to playback.

To give examples of the importance of the songs it is not unheard of for the soundtrack of a film to be released in advance to judge public reaction. If it hits then they'll go ahead with the film release assured that cinema-goers will flock to see the full-length video. Even better is the case of a film that was released with the requisite six songs and did wonders at the box office so the film makers edited in more songs and sent out a new print and scored to public acclaim again then repeated the process to a total of some 13 songs. Only in Bollywood...

The plots can be simple in the extreme–boy meets girl, boy loses girl, boy meets girl again–and in such cases serve only as a vehicle to get those songs in

The plots can be simple in the extreme –boy meets girl, boy loses girl, boy meets girl again–and in such cases serve only as a vehicle to get those songs in. However, this belies a well tuned and sophisticated marketing and production chain and anyone who dismisses Indian films as just 'masala movies' is missing the point, and in danger of being superior. It's as varied an art form as anyone else's, and can take in everything from dark issues through to the flippant, albeit in it's own way.

The most important observation is that India does actually have a film industry that is an 'industry'. The people involved in it are working flat out, producing films that the public is prepared to pay to see. The arrival of satellite may have dented the appeal of cinemas some years ago, but the Indian film business is back on-line, and doing what it does best. The fact is that 80% of films may not return their money, but the 20% that do in all probability will overcome the loses of the 80%. The whole system works on the principle that the more films you make the more the law of averages play in your favour.

Described as 'organised chaos' by some insiders the Indian film industry is actually extremely well run with well-defined levels of accountability resulting from many years of traditional film making processes. Musicians work within an established union system which provides a union representative to sit in on sessions to make sure that the correct amount of money for the correct number of hours is paid.

AGAINST THIS BACKGROUND the recent refurbishment of Sunny Super Sounds as India's most advanced film audio facility is all the more spectacular. Two SSL 4000Gs running with RADARs in music recording rooms are complemented by the only OmniMix between Istanbul and the Far East.

The volume of work is frightening, with average 10-hour shifts running around the clock, seven days a week. Before the advent of serious competition Sunny accounted for 90% of all Indian film scores, and new pretenders in the city include ☞

Kathuria—hundreds of movie credits

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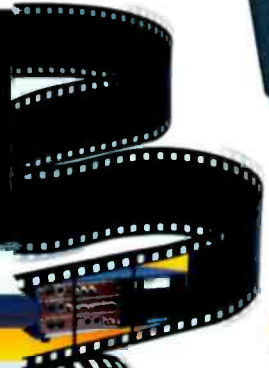

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One of Sunny Super Sounds' SL4000 consoles

Sahara Films and AG Films (both incidentally also with analogue SSL rooms, the former housing the first SSL to enter the country). However, it's Sunny's THX OmniMix surround theatre that sets it apart in a land that is still just getting beyond mono, and still boasts many antiquated studios.

Sunny Super Sounds was designed by chief recording engineer Suresh Kathuria and commissioned in 1985. Kathuria has literally hundreds of movie credits, and is among the most respected film-audio men in the country. He manages 20 technical staff housed in the original building that has been completely refurbished to accommodate the new boards.

'When we started we had no system for multitrack recording, and 100 musicians would come together and sit in the hall, we would rehearse, and then record in one go onto 35mm mag,' explains Kathuria. 'We got multitrack, and worked on 35mm mag, but found the number of tracks was not adequate for the demands of music directors. We updated the equipment by adding things like Dolby, but there came a stage where the option was either to update again or change the technology totally, which we did, and we went digital.'

All this despite the fact that there are still pockets of resistance to working digital audio in film that Kathuria explains away. 'Motion picture engineers are a very closed network, they are a totally different breed. Most of them have come up by apprenticeship, and when a man does that he learns to operate a certain type of equipment and any move to change that technology is resisted. But then people resisted the railways, but they didn't stop them.'

Kathuria claims he realised the future was digital in 1985 for no other reason than producers' desires to watch the pennies. He started learning about computers and to avoid spending too much money and risk regrets he installed a basic Pro Tools system that the studio still has for dialogue dubbing and this was used as the test bed to prove to themselves that there were practical advantages to digital.

Two Amek 1000 desks were used for music recording and film mixing, but an escalation in demand for music recording in 1991 caused both rooms to be dedicated purely to recording. However, this was not a long-term solution, and eventually the 4000Gs replaced the Ameks with the OmniMix reinstating mixing capability.

'When we went for the SSLs the cost of the equipment was high, but we increased our rates and instead of just having two music recording theatres we added a third for Dolby Digital and Dolby Stereo mixing,' says Kathuria. This involved increasing the size of the recording control rooms to accommodate the new desks, adding an acoustic area on the mezzanine, and taking over one of the original live areas to house the OmniMix theatre.

This 3-room plan made the whole complex more profitable although rates are still incredibly low by any standard. The recording rooms go out for the equivalent of around £40 per hour while the OmniMix asks a mere £67 per hour. The affordability of the facilities is not shied away from as Sunny argues that its film engineers are as competent as anywhere else in the world and they now use the same technology.

Kathuria is clear about why he chose ☞

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what he did. 'We had certain specifications in mind and we made enquiries with all the suppliers,' he explains. 'We wanted automation on the mixer, we wanted recall, about 32 tracks of recording, and dynamics on every channel because with multitrack recording if you compress only at the final stage you lose the balance of the song.

'I found that the SSL4000G was the most cost-effective analogue console if you went ±10% of the equivalent competing equipment,' he says.

A dilemma facing the OmniMix is that it could be considered a little ahead of the game with its multichannel mixing capability given the number of advanced cinema playback systems in the country. Kathuria estimates that some 350 cinemas have surround capability in whatever format, but says that others are being converted daily.

'In India we dub the whole movie. We never use a location track, not a single frame, everything is done in the studio under controlled conditions,' states Kathuria

'My prediction,' ventures Kathuria, 'is that by the end of 1998 all the major films will be released in surround, and mono will be a thing of the past.'

Sunny is also installing Dolby printing capability, and an optical recorder for all formats including SR.D transfers and intends to take advantage of what it considers to be the inevitable language dubbing opportunities offered by India's 14 official languages, and around 130 unofficial languages. Star actors are beginning to cross over cultural and language barriers.

'In India we dub the whole movie. We never use a location track, not a single frame, everything is done in the studio under controlled conditions,' states Kathuria. Atmos library tracks are manipulated on the Pro Tools which functions as a cost-effective alternative to tying up the Omni-Mix for mundane tasks.

'By the time the tracks come to the OmniMix they have no mechanical problems which means we can concentrate more on the creative side of the mix,' he says. However, he admits that Indian film is limited in its repertoire, but he sees new opportunities for it.

'There are certain movies that we cannot make in India because they will be banned,' he explains. 'We cannot make movies that touch on politics, we could not make a film like *Schindler's List*. We are left only with Shakespearean dramas.

'The success of Hollywood movies like *Independence Day* and *Twister* have given us the idea that we can go for special effects. The basic stories will remain the same, but the form will be different. I am expecting a lot of advancement in special effects in the next five years in India, and the sound will have to pursue it to keep pace with it.'

Kathuria is painfully aware that being first with technology has benefits and disadvantages. 'It always happens in India, when someone starts using one thing everyone else does the same. The disadvantage for us is that when others see the equipment being used successfully they'll want to go for the same. We were the first to import Sondor and Amek, and the rest followed.'

He says Sunny's rates will be increased by 10% to 12% a year, and adds that when others realise that clients are prepared to pay this amount these figures will make their own project reports feasible. However, the result will be an increase in quality across the board.

'Creative quality is a disputable thing, but technical quality is something that can be put on paper, and technical values will be pursued very formally in this country. To meet these requirements, producers will ask for more money and will get it, and that will lead to better equipment, and better sound quality,' he says adding that he expects that the demand for surround mixing will fully book the OmniMix in the not too distant future making another room a distinct possibility.

'When others see that this is profitable and that there is a lot of surplus work they are bound to come up with another set up like this,' he laughs. 'Anybody who makes another mixing theatre with this technology stands on our shoulders and learns from us.'

CONTACT

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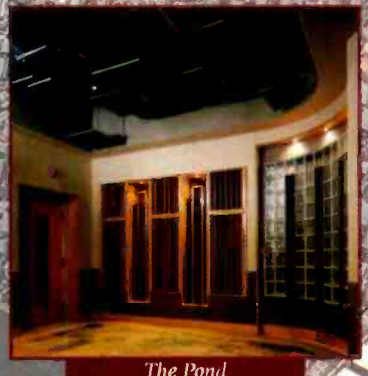

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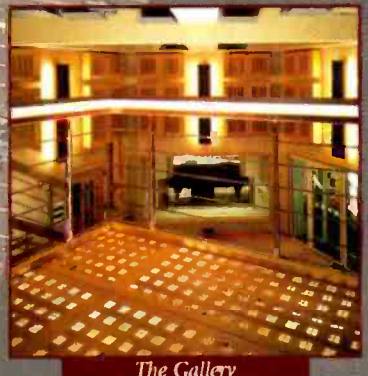

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Putting you in the picture

The broadcasting boom that's lurking just beyond the horizon has a secret weapon. It's called compression and, in the wrong hands, it's capable of bringing devastation in unprecedented measure writes **KEVIN HILTON**

Video and audio compression systems are seen as technological saviours; they are the reasons why we'll be able to receive so many channels on a single frequency. But like most things, this power comes with a certain amount of responsibility, namely how much compression should be used. This became an issue in Germany at the end of last year when viewers began to complain about the picture quality on a new satellite channel.

It is suspected that the service in question is cramming too many channels onto its transponder by using low bit-rates, with the result that the pictures look bad. Analogue pictures may not be great, but viewers are used to them, all that flicker and the sick-making effect you get when TV presenters (usually sports commentators) wear tweed jackets with a tight grid-like pattern. Show them something that looks worse than even PAL (Pictures At Last), or NTSC (Never Twice the Same Colour), and there's either confusion or outcry. Or both.

The problem is that although digital technology offers greater channel and service capacity, this capacity is still finite –which is where the financial imperatives come in. Broadcasters and media moguls (there is a difference if you think about it) are on the brink of a channel frenzy; the techies have told them that upwards of 200 channels are possible, so they're busy thinking of what material they have got kicking around to fill up the extra space.

We're already seeing the result of this: channels pumping out 20-year-old episodes of soap operas, reruns of game shows everybody would probably like to forget, and certain dubious entertainments revolving around Continental housewives and Mediterranean waters clothing.

This situation has been brilliantly summed up by actor-comedian Richard Belzer in the superb cop show *Homicide –Life On The Street* (available on terrestrial), in which he plays the tall, lanky, cynical, unlucky in love Detective Munch (a character I find myself empathising with): 'Soon, very soon, there's going to be like 500 channels. Besides the sports channel and the others, there will be the ballet channel, the dog food network, the all-Draylon network. There won't be any books or newspapers–we'll only be able to communicate with e-mail and QVC. We'll all be interactive. All we'll need to see and hear, and we'll see and hear without ever having to rise from our Seeley posturepeadic bed. I'm talking about high definition, I'm talking about virtual reality, I'm talking about living in the fast lane of the electronic superhighway. Better get ready, because it's coming.'

THE WAY we're going to get all this is through digital compression–lots of it. The European specifications have been set by the Digital Video Broadcasting (DVB) Project, and is based on MPEG2 (everybody's favourite abbreviation). In drawing this up, the Project was as broad as possible: 'It's a very wide standard,' explains Peter MacAvock of the DVB Project Office, 'covering everything, and is a tool-box from which manufacturers and systems designers can compile the tool that best suits their particular application.'

This shows foresight, given that different types of service, in both vision and audio, require differing bit rates. The problem is that operators could either think that the compression rate doesn't matter that much (let's give them the benefit here), or consciously set out to squidge in as much as possible. One of the leading manufacturers of compression equipment is Vistek and its MPEG systems project manager, Wynn Reese, comments, 'It's a potential danger. If it happened now, viewers would notice and say that digital is worse than analogue, because at lower bit-rates you can see the basic artefacts. What might happen is that broadcasters will start off at higher rates and then slowly reduce them, so that the viewers get used to it and extra capacity can be offered.'

This could happen in all areas of compression. Although there is no question of a degraded service, Music Choice Europe, the multichannel satellite-cable music supplier, is considering moving from its current rate of 256kb/s to 192kb/s as other services are already there and it would be a form of standardisation. MCE is now offering an Internet service and will use other rates for this; at IBC 96 an MPEG1-2 hybrid was shown with the intention of offering 'hi-fi' on the Net and work is continuing on MPEG4, a non-DCT-based format for telephone and conferencing applications.

As communication and entertainment continue to embrace the computer and telephone, people could get used to such lower-quality transmissions, which in turn would allow broadcasters to wind the dial further down. Even if this cynical scenario doesn't come to pass, there are fears from other quarters about low bit-rates. While it's dandy to squeeze a report back to the studio at whatever rate that works, there is the fear that it will be completely unusable for any future purpose.

> The irony is that compression is creating more channels... that may not be able to supply good quality copies because they were over-compressed in the first place

This fear is realised by a major archiving project, UNESCO's Memory of the World, whose consultant, George Boston, observes, 'Compression rates are a problem for archivists, especially if we're trying to store a last-minute news item that came down an inadequate line. We have to look at things as a future resource.'

The irony is that compression is creating more channels, which in turn demand more old programming from the archives, which may not be able to supply good quality copies because they were over compressed in the first place.

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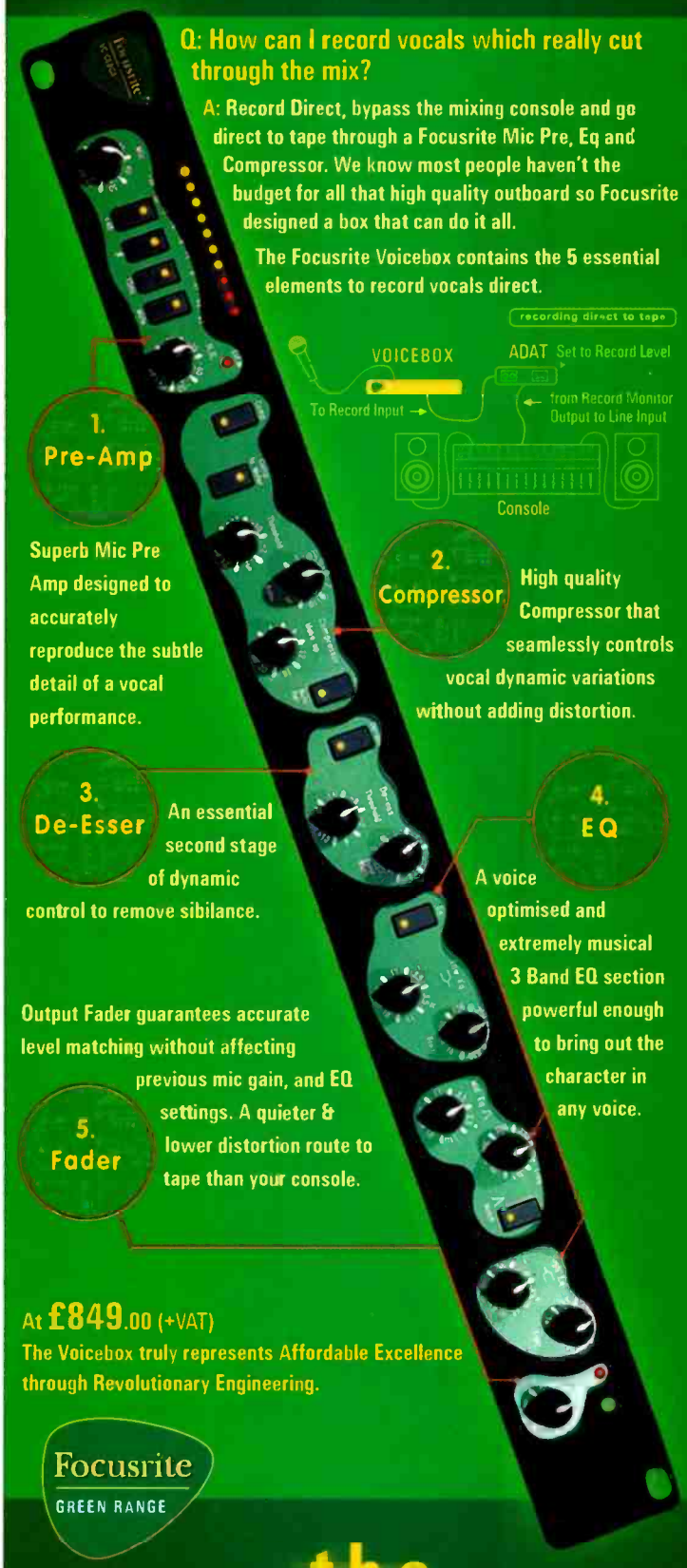

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Meter Measures

With 'overs' such an important aspect of digital recording systems, a good metering system is essential. **PAUL MAC** takes the measure of what is available

PICTURE THE COAL MINER who, through a misunderstanding, perches his canary on top of his helmet. While walking through tunnels, a sharp chirp means that he is running out of headroom, and a duck will soon be needed (they are shorter). Dropping the analogy in favour of the real topic, digital-audio metering does not provide any such warning, and so the continued need for peak programme metering, complete with warning zone, is confirmed. In fact, the need is greater, as the thin line between minimal quantisation error and tattered samples is only too happy to demonstrate.

The peak hold function, loudness or average metering, and phase correlation provide the shading in the visual medium, adding up to a 3-dimensional picture of the audio being scrutinised. The peak hold function is again especially useful in digital work, where the normalising of data is so crucial, and the ability to retrospectively check the highest peak, or to hold a high point for a period after its actual occurrence is such a boon.

That is is where needles leave us, and where LEDs, gas plasma displays, and digital metering come in. These offer attacks that keep up with samples, programmable ballistics, interchangeable scales, bit-stream analysis, the application of DSP to phase correlation, Gonio displays taken from the scope to the screen, and there's no conversion necessary if you start in the digital domain. Out on the sidelines, metering has been keeping up with everything audio technology has become.

The seven meters under review here represent a fair spread across the market, from the sophistication of 'workstation' meters to the informative simplicity of smaller analogue units. Ballistics, the information-effort ratio, scale options, and system options were the main areas considered, though comparison is difficult, most have their sights on a different application.

DK AUDIO MSD200 MASTER STEREO [illegible]

The MSD200's electrical gateway is a 25-way D-connector on the rear of the unit. Balanced analogue and digital I-O, DC power, and an RS232 port all appear here. The analogue inputs are dual transformer-coupled to ensure that the source won't suffer any ill effects that might invalidate the pictures, and the outputs are electronically balanced. The RS232 port is provided for easy software upgrades, which can either be supplied on diskette, or downloaded from DK Audio's web site.

The large electroluminescent display is easy to read from most angles, and from as far away as your eyes will accommodate. The orange graphics presented no real problem during the review, and are impressively fast, without a trace of ghosting or stutter. A phase correlation meter, audio vector oscilloscope and PPM meter share the default display.

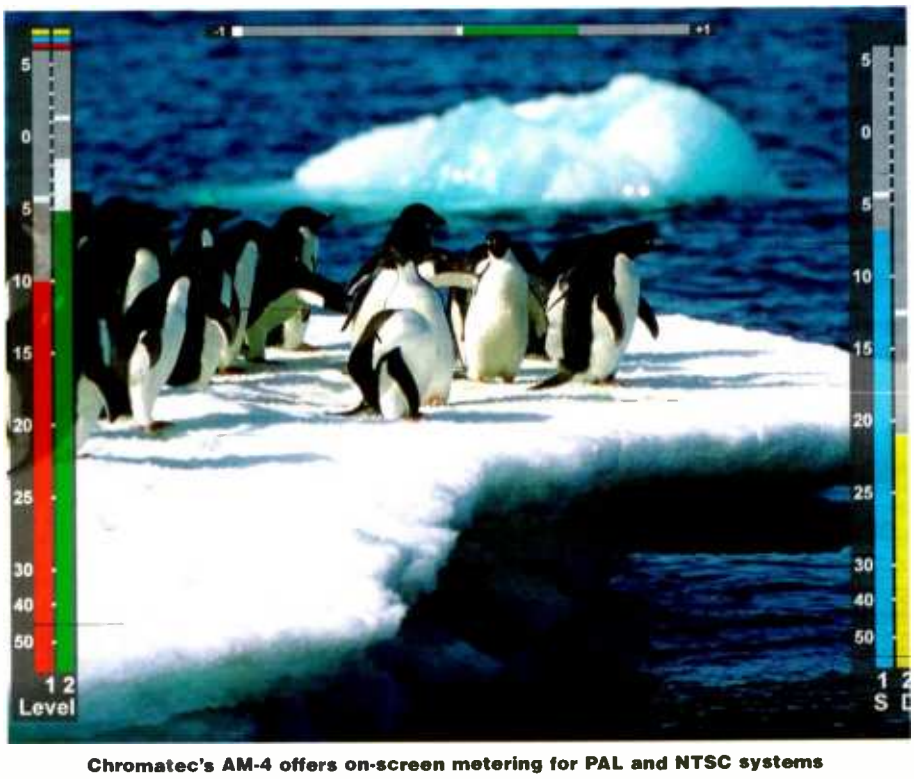
The phase correlation meter is centre zero (±1). No ballistic or scale adjustments are available. Consistent readings are smoothly 'ridden', while transient results prove that there is nothing lacking in reaction time. The addition of a peak hold function or memory function for negative readings would be useful.

The audio vector oscilloscope, or Gonio display occupies most of the main screen. A good display medium is essential to make this metering worthwhile, and the MSD200 certainly has that. The graphic is fast, without any juddering strobe effects, and even flashes of disjointed dots are easy to pick up. Like the phase meter, the AVO has no ballistic or scale adjustments.

The PPM meter takes up about quarter of the display's width, on the right-hand side. Scale is clearly displayed down the left-hand side, offering a choice from the following: Nordic (+12dB to -42dB linear) and EBU (+12dB to -12dB linear) BBC (1 to 7 linear, 4dB per unit above 2), DIN (-50dB to +5dB log), vu (-20dB to +3dB), Digital 1 (-48dB to +3dB linear), Digital 2 (-72dB to 0dB).

A peak hold function can be switched on or off, and between 3s and infinite hold. Fast mode sets the PPM integration time to zero allowing absolute peak level to be shown. Upon breaches of a scale's peak zone the level bars widen and appear 'forked'—obvious, but not disruptive.

The output of the MSD200 can either be ☞



Chromatec's AM-4 offers on-screen metering for PAL and NTSC systems

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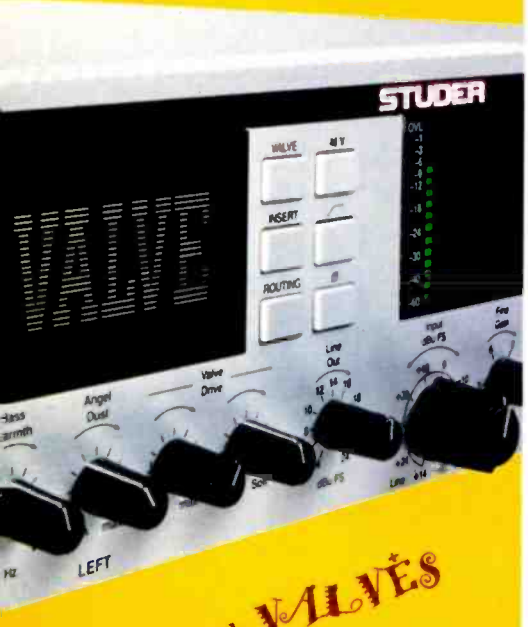

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METERING

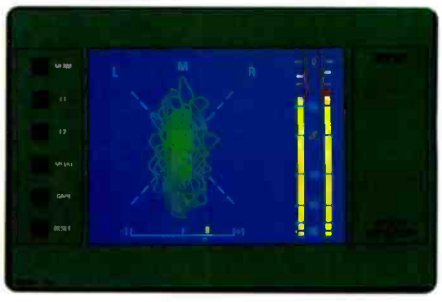
the meter's input, or one of a number of test tone choices: a sinusoidal tone (variable frequency and amplitude), white noise, pink noise, a THD test signal, cross modulation signal. For the digital inputs, a DATA button allows display of 11 status bits, and a time-code display shows hours, minutes, seconds and frames.

A spectrum analyser software option has 1024 frequency bands and a dynamic range of 80dB. Resolution dictates that all 1,024 cannot be displayed simultaneously, though every band can be selected by a cursor and displayed numerically at the bottom of the screen. Band levels can be normalised to the currently selected band, and curves can be captured and stored, in temporary or permanent memory, to be used as relative modifiers on the spectrum display. There is no freeze function for viewing discrete spectral moments.

Operation of the MSD200 is extremely simple, at the expense of peripheral features and options. Operationally this is a plus, but a few more bits and pieces could have been included without disrupting the uncluttered screen.

You can opt to use the RTW 1066 Multi Monitor either as a single unit, probably fitted into a console with connections made to the IDC connector at the rear, or in the purpose-built stand, which provides the more standard connections: analogue in, AES-EBU in and out, a D-type remote connector, and PAL video BNCs (in and out for screen to video or external video to screen).

This meter has many more assignable displays, ballistics, and control parameters than the DK Audio unit, most of which are accessed by a full-screen menu system where categories, and then parameters are selected. Eleven panel buttons have 'quick key' functions determined by the selected



RTW's 1066 Multi Monitor – a thoroughly professional and comprehensive package

screen, and an OPT button is assignable by the operator.

The screen itself is a colour LCD matrix with reasonable viewing angle and extremely good speed and definition, though can look a little faded at the edges. The default screen (Gonio) contains the three main metering components: Gonio (vector), PPM and centre-zero phase correlation. The Gonio meter has both range and ballistics adjustments, and coherent graphics– particularly easy on the eye. Four axis are available: L-R, M-S, cal 90, cal 20; the last two refer to a horizontal axis scale marked in degrees, with a choice of scale.

A twin-channel (left and right) display, or a 4-channel left-right plus sum and difference display can be chosen for the PPM display. The bar 'pairs' of the PPM meter are separated by the scale markings, and the peak zone of each scale is indicated both in the permanent scale and by alternate bar colour. While analogue mode is selected scale choices are as follows: DIN+10, DIN+5, Nordic, BRIIa (BBC), and BRIIb (EBU); see MSD200 section for details. If digital input is selected 0 to -20dBFS, or 0 to -60dBFS scales are available. Again, ballistics and display parameters, including fast mode, attack, and peak hold are definable. On the left-right bars, loudness indicator 'needles'

A selection of units from ATI's Nanoamp series

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In fact, the DN6000 is designed to conform to Type 1 specifications of IEC 804 and IEC 651 – the standards for integrating averaging sound level meters.

Thirty two memory positions are available to store spectrum analysis data and a further sixteen for LET/LEQ/RT60. Also, accumulation of measurements can be achieved to build up a composite average. It can automatically analyse a whole evening's or even a whole week's data.

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METERING

DK Audio's MSD 200 – favours operational case over extensive features

can be displayed. The phase correlation meter is horizontal, lined up with the Gonio display. The pointer and zero point are well defined, and response (ballistics) has fast and slow options.

The 'memo' function, available in the main screen is a welcome feature: Until a reset is performed, the unit stores PPM peak values, the most negative excursion of the phase meter, and (in digital mode) any digital errors that have occurred.

A real-time spectral analyser is standard on this unit and has a rather more sober 30 frequency bands than DK Audio's 1024 bands. Range, reference, input combination, peak hold, and ballistics are all definable by the user, and a memory for discrete spectral moments available for updating and display at any time. The selected PPM scale, as well as the absolute values are displayed at all times.

This unit has extensive digital input analysis including error display, status bits, and continuous audio data display. The menu system is well organised, and the quick keys are assigned eminently useful functions –a thoroughly professional and comprehensive package.

The RTW 11529D Peakmeter is a solely digital unit, and like the Multi Monitor can either be connected with an IDC connector at the rear, or with normal connectors on an RTW purpose-built case and power supply. With this, digital I-O, a D-type remote connector, four mode switches, and the IEC supply socket taken to the rear of the case.

Some adjustments are located inside the box on the PCB: four rotary switches, one row of dip switches, and a jumper connection. These internal adjustments include some ballistics adjustments the scale setting, input impedance, wordwidth, headroom and level settings, hence the 11529D is more suited to permanent installation.

The meter display is made up of two 127mm, 201-segment, gas plasma bar graphs. The meter shows average level (selectable) and the peak zone by brightening the orange display. Unfortunately, the contrast between bright and standard oranges is not great, so more than a quick glance is necessary to read the meter thoroughly. As well as the standard digital scale (-60dB to 0dB) a choice of IEC 286/10 (-50 to +5), Nordic and British scales can be set internally, and alternative adhesive facias allow vertical scale marks, for both standard and IEC 286/10 scales. The phase correlation meter is a centre zero type (±1) made up of 11 LEDs of three colours, red indicating negative swing. Both the integration time of the phase meter and the fall back time of the digital scale are set internally.

Out on the sidelines, metering has been keeping up with everything audio technology has become. The seven meters under review here represent a fair spread across the market

Although most system configuration is done either inside the unit or the rear panel, there are five controls on the front and several status LEDs. A memory function stores peak signal, the most negative phase swing, plus any overload, error, and gain LED indications. These can all be recalled with one momentary switch on the front panel, and a reset switch clears them, along with any infinite peak holds on the display. The GAIN button (again, momentary) boosts the input by 40dB, and a status LED reflects this. The loudness display, which is super imposed on the level meter, and the peak hold function can be enabled or

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disabled with front panel switches.

From the operator's point of view, the 11529 Peakmeter is straight-forward. Most peripheral functions are hidden, leaving only essentials up top. Movement (both transient and normal) and peaks on the plasma display are easy to read, though the loudness and peak zones are less so. This unit will fit well into facilities where configuration requirements are fairly stable.

[illegible] AM-4 ON-SCREEN AUDIO METER

The AM-4 displays its metering through a PAL or NTSC composite video monitor. It does generate its own black background when used alone or can superimpose itself on an incoming video signal, giving in-picture monitoring of audio. This unit can display up to four channels of audio, configurable in twos as digital inputs or analogue inputs, depending on the cards installed. Level, sum and difference, or difference only, can be displayed in the channel positions either side of the screen.

The unit itself has few front-panel controls, all of which are available on a remote connector at the rear. These consist of master display controls and cursor-style keys for navigating the on-screen menu. A lock control chooses

From the operator's point of view, the 11529 Peakmeter is straightforward. Most peripheral functions are hidden, leaving only essentials up top. Movement (both transient and normal) and peaks on the plasma display are easy to read, though the loudness and peak zones are less so

between normal operation (in which case it is a reset for peak hold, alarms, and so on), or menu mode, where a comprehensive set of configuration options reside.

On screen, the metering is arranged with two channels either side plus a horizontal phase correlation meter that can be positioned either top or bottom. Most colours can be defined in the menu system. The meters are extremely clear and simple to read, with the added benefit of the screen size and well-defined colours.

More scale choices are available than any of the other units in this roundup, though three are vu variations (including Ext vu: 80dB dynamic range). There are two digital scales: the standard 0dB to -60dB, and an extended one: 0dB to -80dB, both with 1.5s/20dB decay and single sample attack, giving a very 'reactive' overall ballistic. Nordic, DIN, and BBC PPM scales, the only omission being EBU ±12dB. Peak hold options are extensive, with nine hold-time options from off to infinite, and main scale over-ranges (peak zones) can be defined over a range of 20dB.

The centre zero (±1) phase correlation bar has no ballistics options and a value of 1s-half scale is set for attack and decay. This meter rides well, but, as with other units, an option for negative swing peak hold would be nice.

At the time of writing, various upgrades for this unit are pending, both, hardware and software, including improved PCB layout, filtered mains connection, a freeze function for the signal bars, an antiphase alarm output, an option to super impose vu on PPM bars, and menu reorganisation –all welcome improvements.

The AM-4 is an comprehensive metering tool. The range of options available to the user sets it apart from many other meters, making it as applicable to audio only work as it is to those working with picture.

DORROUGH [illegible] 40-A2

The Dorrough 40-A2, once you have deciphered the literature, actually turns out to be a good implementation of an idea that mainly higher priced units implement. This system manages to combine peak level, average level, and a picture of the audio's perceived loudness in one easy to read LED bar graph or, as the PR has it, 'This metering device is the first to indicate both the peak and quasi-average value of the composite waveform, relative to the effective loudness of the program material'.

The idea is relatively simple. The display is fed by two drivers, one taking care of the average signal level, and one taking care of the peak level. In this way one can build up a picture of program density, and perceived loudness, while still making sure that the ever important peak doesn't go over the edge. One way to visualise it is as an extremely fast PPM and a truthful vu sharing the same display.

The front panel of this meter consists entirely of an arc of 40 LEDs, each corresponding to a 1dB step from -25dB to +14dB. The colour coding and brightness of the panel legending (back lit), and the bar graph are both striking and intuitive. The 0dB mark can be calibrated to a level of your choice with the preset pots at the rear, though default is +4dBu. Also round the back are two balanced inputs, a row of micro switches, a 9-pin D, and a 3.5mm jack socket. The latter three exist to switch 'modes' (the jack socket can is provided for a switch) and to bring peak 'alarm' relays to the outside world. They all ensure that most custom mounting and interface needs will not be too arduous.

By manipulating the mode switches the display is set to read one of four possible sources, either left or right channels, a sum of the two, of the difference between the two. Therefore two meters are required to display left and right channels independently.

AUDIO [illegible] 'ATI' [illegible]

There are six units in the NANOAMP series, and two were supplied for review: The BGD200-VU-ø and the BGD400-PPM. Four and 2-channel versions of both vu and PPM meters are available (BGD400-200), and 2-channel units also have a phase indicator LED plus headphone monitor variation (-ø). All units are just 146mm wide, allowing up to three NANOAMPs to be fitted in a 19-inch rack space, using 'kits' supplied by ATI.

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An extensive range of the most desirable outboard is available from stock at Music Lab, including Roland 's SRV330 reverb and SDE330 delay, both units featuring Roland's 3D Spatial Simulator.

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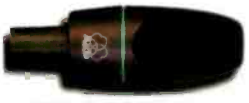

AKG C3000

More than £1,000 off Neumann M149 tube mic

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Sony TCD-D8 special

After negotiation with Sony, Music Lab is offering a special price of **£467 ex vat** on the TCD-D8 portable DAT recorder, replacement for the popular TCD-D7.

Recommended accessories are the mains power supply at **£23 ex vat** and the optical digital leads at **£67 ex vat**. As a further concession, Music Lab has bundled them with the TCD-8 at the special price of **£509 ex vat**, making both accessories just **£49 ex vat**.

The TCD-D8 records at 48kHz, 44.1kHz and 32kHz, from digital or analogue sources and comes with a protective cover.

Studio DAT recorders

Fostex D-30

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Sony DTC-A6

Tascam DA-20

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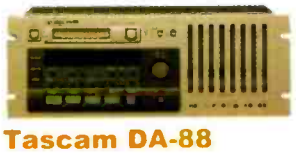

Tascam DA-88

Fostex D-80

Akai DR-16

Alesis ADAT XT

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Ballistics are set at PPM and vu standards (DIN 45406 and ANSI C165 respectively); peak hold is not an option. 0dB references can be set on internal jumpers to either -10dBu, +4dBu or +8dBu, and trim presets are inset on the front panel for fine calibration.

PPM metering in the ATI boxes is done on a -15dB to +12dB scale, with 10-segment bar graphs, or 3dB per LED, and two colours (red ≥3dB, green ≤0dB). The LEDs are extremely bright; there will be no mistaking an excursion into the peak zone. Among all the other boxes in our roundup, the ATIs do have a relatively low resolution, though they are obviously not intended to offer absolute, discrete readings, but rather an easy view of peak 'behaviour' and headroom—the two more important aspects of a meters responsibility.

The vu scales are again 10-segment, this time made up of three colours (0vu is yellow). Although the previous comments about resolution still apply, it is a little more difficult than with the PPM; the usual vu dance is slightly compounded by the meter's resolution.

The ATIs do have a relatively low resolution, though they are obviously not intended to offer absolute, discrete readings, but rather an easy view of peak 'behaviour'

A single bicolour LED provides phase correlation indication (green positive, red negative) on those units with a 'ø' in their title. By virtue of the timed ballistics on more sophisticated models, this one handles real time observation of transient negatives probably better than most of the other meters in the round up. The lingering effect of a bright LED colour allows you see even the most momentary jumps. The disadvantages are the lack of a magnitude reading —the only criteria available is the length of time a colour is illuminated, and the lack of a retrospective check for negative readings (a latching LED, for example).

ATI have stripped some of the 'luxuries' of metering and provided a capable range of units. The essential information (headroom, negative phase) is displayed on accurate scales, which is all that many operators want. However, the lack of a peak hold, and the low meter resolution might be thought of as significant negatives. Roving analogue recordists will probably have an ideal space left on one shoulder for the extremely bright lights of the BGD series. S

CONTACTS

CHROMATEC
Invicta Works, Elliot Road, Bromley, Kent BR2 9NT, UK.
Tel: +44 181 460 7299.
Fax: +44 181 460 0499.

US: Wohler Technologies, 713 Grandview Drive, South San Francisco, CA 94080.
Tel: +1 415 589 5676.
Fax: +1 415 589 1355.

ATI
328 West Maple Avenue, Horsham, PA 19044, UK. Tel: +1 800 959 0307.
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RTW
Elbealle 19, D-50765, Koln, Germany.
Tel: +49 709130. Fax: +49 221 709130

UK: Michael Stevens & Partners, Invicta Works, Elliot Road, Bromley, Kent BR2 9NT, UK.
Tel: +44 181 460 7299.
Fax: +44 181 460 0499.

DORROUGH ELECTRONICS
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DK AUDIO
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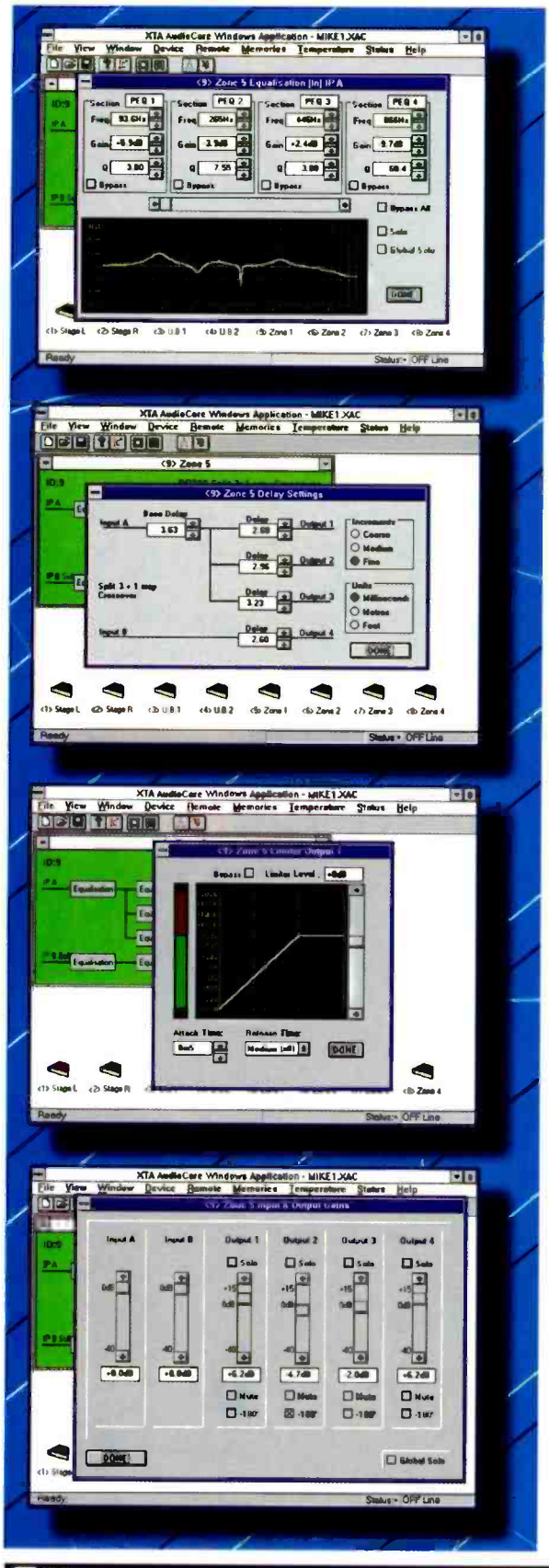

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Two new cost-effective serial interface standards—Fire Wire and USB—offer to overcome the shortcomings presented by existing wire and optical interfaces. **FRANCIS RUMSEY** assesses the state of audio interfacing and machine control in the multimedia era

Fire Wire and the Universal Serial Bus

IT IS COMMON KNOWLEDGE to all but the most blinkered of audio engineers today that professional audio is increasingly influenced by developments and technology from the computing and multimedia fields. There is also an increasing crossover between consumer and professional technology. The gradual acceptance of digital audio as the norm rather than the exception in many areas of studio and broadcast operation, and the use of computer workstations for audio editing, MIDI programming and numerous other tasks, has led to a widespread use of digital audio interfaces (such as those conforming to the AES-EBU professional and IEC958 consumer standards), MIDI for musical instrument control, as well as computer system interfaces such as SCSI and network standards such as Ethernet, FDDI and ATM. The degree of understanding of the differences between computer interfaces-networks, point-to-point audio interfaces and MIDI has varied widely in the audio industry.

But things never stand still, particularly in the rapid-turnover world of computing and consumer electronics, and we are soon to see widespread introduction of two new serial interfaces which are likely to revolutionise the way that interconnections are made between audio devices, computers, MIDI equipment and other multimedia systems. I am alluding here to the technology often referred to as 'Fire Wire', and to a slower (but still actually quite fast) system known as the Universal Serial Bus (USB), both of which have their origins in consumer electronics and multimedia computers, but which promise to be extremely useful for multipurpose interconnections between all sorts of devices, both consumer and 'professional'. Whether they will serve to replace the standard point-to-point interfaces we are familiar with at the moment is an issue requiring some discussion, because, although they are highly suitable in many ways, they have certain limitations for professional audio installations.

The appearance of these standards raises interesting questions about the current and future role of the professional audio industry in the making and controlling of its own fate, since it is increasingly obvious that decisions are being made about how audio should be handled by organisations that have little to do with studio and broadcast operations, and which are largely concerned with the computer industry and consumer electronics. Possibly this does not matter, and we should just take the cheap technology that results and say thank you, but we should most certainly be aware of what is going on and possibly (heaven forbid) be proactive in shaping the future of our industry in these important fields.

WHEN THE AES 2-channel interface was designed, the intention was that it would serve to replace the conventional analog audio cable between devices, carrying two channels of audio with an embedded clock at a rate directly locked to the sampling rate of the transmitting device. Alongside the audio data would be carried auxiliary information such as user bits and channel status bits, which could be used to indicate the vital statistics of the audio signal and transfer non-audio information at a modest rate. It was designed to operate over conventional audio cabling systems so that one could handle it like analogue audio, although many have discovered that this is not quite true in practice and that care is required in the choice of cable, largely because of the inadequacy of AES receiving devices to reject clock jitter resulting from the interface in their regeneration of a sample rate clock for subsequent D–A conversion.

The years have passed, and now we need to be able to transfer low-bit-rate audio (like MPEG), multichannel audio (say 5.1-channel surround) and high-bit-rate audio (say 96kHz, 24-bit). The AES interface, although remarkably successful as a standard, is beginning to look inadequate for these new needs, although certain adaptions are possible. It is ☞

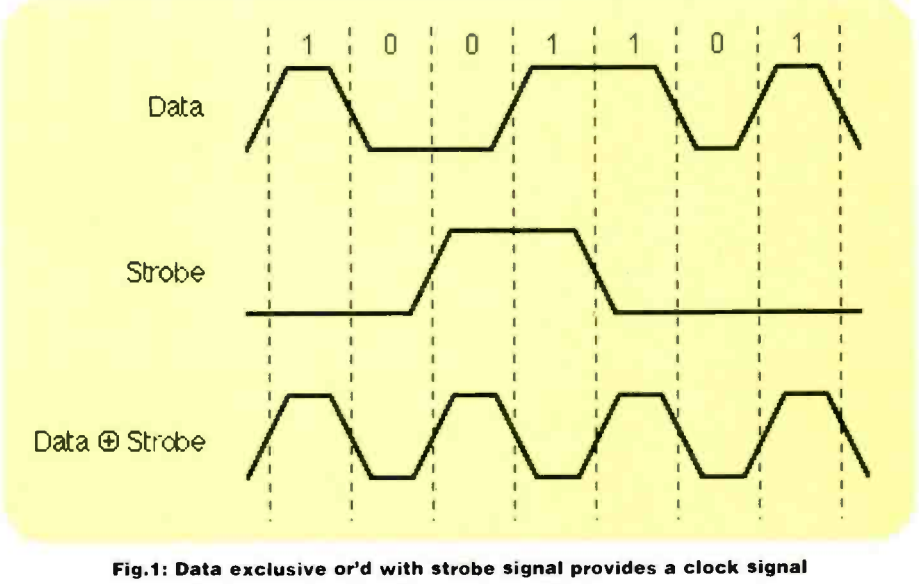

Fig.1: Data exclusive or'd with strobe signal provides a clock signal

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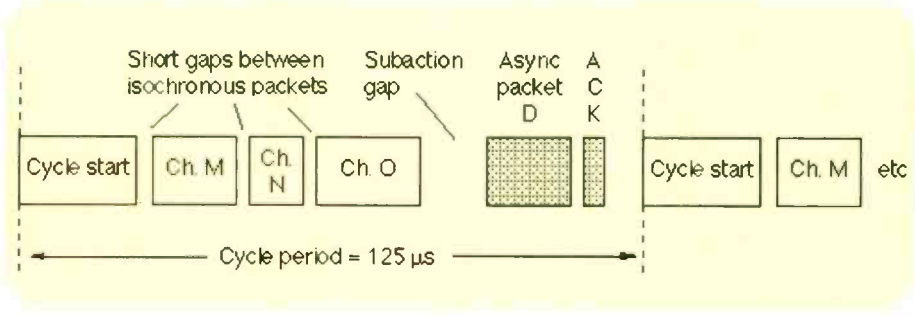

Fig.2: Simplified illustration of isochronous and asynchronous data packets within a single cycle, showing long subaction gap between the two types of data. The 'channels' (M, N, O, and so on) are packets from different nodes, whose channel numbers were previously assigned by a channel manager application

also fair to say that the relatively simple design of the AES-3 channel code has proved to give rise to noticeable difficulties with related audio quality in operation, although there is rampant misunderstanding in the industry over exactly when this is important and when it is not. An interface which did not couple clock and audio data so closely, or which decorrelated the interaction between the two, would be welcome.

The consumer equivalent to AES3, specified in IEC 958, is found on many items of consumer audio equipment, either terminating in phono connectors or TOSLink optical connectors, and this has much in common with the professional interface. Although many believed that an optical interface was immune from the problems of wire interfaces, and that optics would solve their concerns about the effects of interfaces, many of these cheap optical connections are poorer than their wire equivalents, owing to low bandwidth and increased resultant clock jitter upon decoding. Since many devices derive their D–A sample clocks directly from the embedded clock in the audio data, it is no wonder that questions over audio quality arise.

MADI, the multichannel AES interface specified in AES-10, was an admirable idea but only implemented in a very few high-end products to date. It carries up to 56 channels of audio data on either a copper co-ax cable (<50 m) or optical fibre (longer distances), but is criticised by many manufacturers as being over complicated and expensive to implement, especially because there has been a trend towards the use of modular digital multitrack equipment, either tape or disk-based, with only eight tracks. MADI represents complete overkill for such products, and will only be found on large digital mixers and DASH multitracks where it is an economically viable and convenient solution for connecting a tape machine to a desk without drowning under cables. Modular multitrack equipment has brought about the introduction of manufacturers own inter-faces which do not conform to the international standards, but which are widely used.

Audio workstations use the two channel interfaces widely for digital audio transfer to and from the outside world, and they increasingly offer support for high speed network transfer of audio files, edit lists and other information between workstations (much faster than real time in most cases). There is not space here to go into the major differences between different types of computer interconnection, but it is sufficient to say that they can be used between multiple devices, rather than just point-to-point, and have an extensive addressing structure for determining the destination for packets of data transmitted by any device. The data rates used during transfer are not usually directly locked to the audio sampling rate, and you can't treat computer network connections exactly like audio cables. ☞

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TALK OF FIRE WIRE, more correctly the IEEE 1394 high performance serial bus, has been around for some time. Apple was talking about it as a replacement for SCSI and various other local interfaces for the interconnection of computer peripherals some while ago. It is interesting because it seems able to serve a multiplicity of interconnection purposes and has a data rate high enough to handle real-time digital audio (many channels, linearly coded, high resolution), digital video (compressed, although perhaps uncompressed with faster versions), general purpose computer data and machine control information.

One of its first applications has been in consumer digital video products, specifically the HD Digital VCR standard which uses 6.3mm tape and is beginning to find its way into camcorders and other related products. The interface can be used both for controlling machines in a multi-device AV system, and it can be used for the transfer of media data such as audio and video. Over the next year, you can expect to find 1394 interfaces cropping up all over the place, on computer disk drives, scanners, printers, and in any place where local networking and data interconnections are required.

The interesting thing about 1394 is that it appears to combine aspects of both point-to-point interfacing with a fixed-rate clock, and asynchronous networking. This means that it can be used for time-critical data transfers, where real-time multimedia data has to be delivered within a specific time frame (such as would be needed for the equivalent of point-to-point audio or video cabling). It is not up to the job of networking a large office or university campus, since it is not designed as a local area network like Ethernet, but it has many of the features of such things. One may think of it as a very local area network, a 'desktop network' so to speak, for the interconnection of multiple digital devices which relate to each other in a multimedia system. And it is very fast in comparison with conventional Ethernet, or Localtalk, or AES3 for that matter.

It is worth outlining some of the key features of the IEEE1394 bus in order to provide some basis for comparison with other technology.

Firstly, and very importantly, it is relatively cheap to implement. Remember that MIDI became universally adopted primarily because of its simplicity and low cost of implementation. 1394 is claimed to be considerably cheaper than SCSI for example, but not as cheap as lower-end technology such as Apple Desktop Bus (ADB) or the newly introduced Universal Serial Bus (USB) for PCs, and not as cheap as MIDI. The 200 Mbit/s chip set is said to come in at around $50, for example, and costs as low as $15 to the user have been mentioned for simple implementations.

The cable version runs over copper wire on three twisted pairs, one for power, one for data and one for a strobe signal. The strobe signal is not exactly a clock, but when exclusive-Or'ed with the data a clock signal can be derived (see **Fig.1**). This is claimed to offer superior jitter performance and lower intersymbol interference compared with a number of other alternatives. The connectors are based on those used for the Game Boy systems, although apparently some differences are to be found in those used on Sony DVCRs. There is also a version of 1394 intended for use within computer systems and other hardware as an internal backplane–in other words for interconnection between the different boards or parts of the system, instead of a parallel backplane.

The link data rate in the first implementation of the interface is just under 100Mbit/s (98.304Mbit/s to be precise), and data can be transferred either in isochronous packets or asynchronously. Higher rates of 200 and 400Mbit/s are possible, and known as S100, S200 and S400 respectively. At the AES Convention in Los Angeles, presentations were given which promised data rates of 800Mbit/s in 1997 and a remarkable 3.2Gbit/s before too long! For those unfamiliar with the terminology, 'isochronous' means that data transmissions are related to a common clock period, whereas 'asynchronous' means that data transmissions have no specific timing relationship with a common clock. Isochronous packets would normally be used for the transfer of time critical or sample-rate-related data such as audio, and there is provision for connections with guaranteed latency and bandwidth, whereas asynchronous packets could be used for machine control commands, for example.

THE INTERFACE is half duplex, which means that communications in two directions are possible, but only one direction at a time. The 'direction' is determined by the current transmitter which will have arbitrated for

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access to the bus. Communications are established between logical addresses, and the end point of an isochronous stream is called a 'plug'. Logical connections between devices can be specified as either 'broadcast' or 'point-to-point'. In the broadcast case either the transmitting or receiving plug is defined, but not both, and broadcast connections are unprotected in that any device can start and stop them. Point-to-point connections are protected and can only be modified by the device or application which initiated them.

One device in the chain can act as a bus manager, handling arbitration for bandwidth and resources, although a feature of 1394 makes it possible for simple interconnections to be made without a bus manager, providing that only one device is doing the 'talking' and the others listen.

IEEE1394-based systems are dependent on one device acting as a 'cycle master'. This generates the cycle start packets which govern the transmission of isochronous packets (the nominal cycle time is 125µs). All devices which are transmitting isochronously can send packets in turn after the cycle start. Following the last of these there is a so-called 'subaction gap', during after which a device may begin an asynchronous transmission.

Data is transferred in the form of 'quadlets', which are groups of four bytes (32 bits). It is possible to 'time stamp' packets so that they can be compared with other time references for synchronisation purposes, and it is claimed that this allows for accurate referencing to sample rate clocks in receiving equipment. Packet headers contain data from a cycle time register which allows for sample accurate timing to be indicated. Resolutions down to about 40ns can be indicated.) In isochronous operation data blocks (contained in packets) can have a size from 1–256 quadlets (1024 bytes), and adding the packet header information to each CIP (common isochronous packet) makes possible a maximum transmission bandwidth of just over 65Mbit/s. A typical timing arrangement for packet transfer within defined clock periods is illustrated in **Fig.2**.

Interconnection is designed to be 'hot pluggable', allowing devices to be removed from or added to the system at will, the network reconfiguring itself and allocating physical addresses accordingly. This avoids the need for the messy setting of DIP switches or other 'hard' address configuration, such as encountered with SCSI. The topology is such that you cannot connect one end of the chain to the other. This is called 'non-cyclic' interconnection, but many other tree and branch topologies are possible, provided that no more than 16 'hops' exist between nodes. The 100Mbit/s link allows for cable lengths of up to 4.5m between hops, and distance is possibly one of the main limiting factors of this interface from a professional point of view, although it should be noted that NEC has recently described an optical fibre data link which improves the performance of 1394 connections, extending the distance which can be covered to around 70m per hop. Sixteen hops of 4.5m, though, would run to 72m, which is a useful total distance between first and last devices in a chain. A maximum of 63 nodes can be addressed on up to 1,024 separate buses.

Although many believed that an optical interface was immune from the problems of wire interfaces, and that optics would solve their concerns about the effects of interfaces, many of these cheap optical connections are poorer than their wire equivalents

Yamaha has taken the lead in work to define methods of transferring audio and performance data over IEEE1394 buses, and this looks most promising as a way of replacing the cable spaghetti that often exists in desktop digital audio and MIDI systems. These proposals are currently under review by the AV working group of the 1394 Trade Association. Yamaha has published a draft 'Audio and Music Protocol, version 0.32' in August 1996 which bears reading for those involved in digital interface standards.

As Yamaha engineers point out in a recent paper on the subject, modern music technology systems require many different kinds of interconnection, key among them being MIDI for general control purposes, SCSI for high speed transfer of audio data files, and standard digital audio interfaces for input and output. They propose the integration of all these functions, using 1394 connections to link computers,

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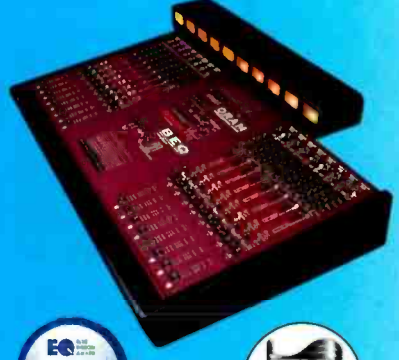

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samplers, disk drives, electronic music equipment and audio equipment in the digital domain. Their M-LAN proposals are designed to make possible the transfer of time critical data with time-code-like stamping for real-time data where appropriate, together with a means for low level clock offset indication which allows clear indication of the timing relationship between data packets and an audio sample clock. In this way it is claimed that D–A clocks in digital audio receivers can be accurately referenced. Within this proposal is the capability to carry audio data in the IEC958 or AES two channel formats, simply omitting the sync section at the start, then mapping bits 4–31 of the digital interface subframe onto bits 4–31 of an audio sample quadlet. In this way it would be possible to keep channel status and user data intact.

The Universal Serial Bus is not the same as IEEE1394, but it has some similar implications for desktop multimedia systems

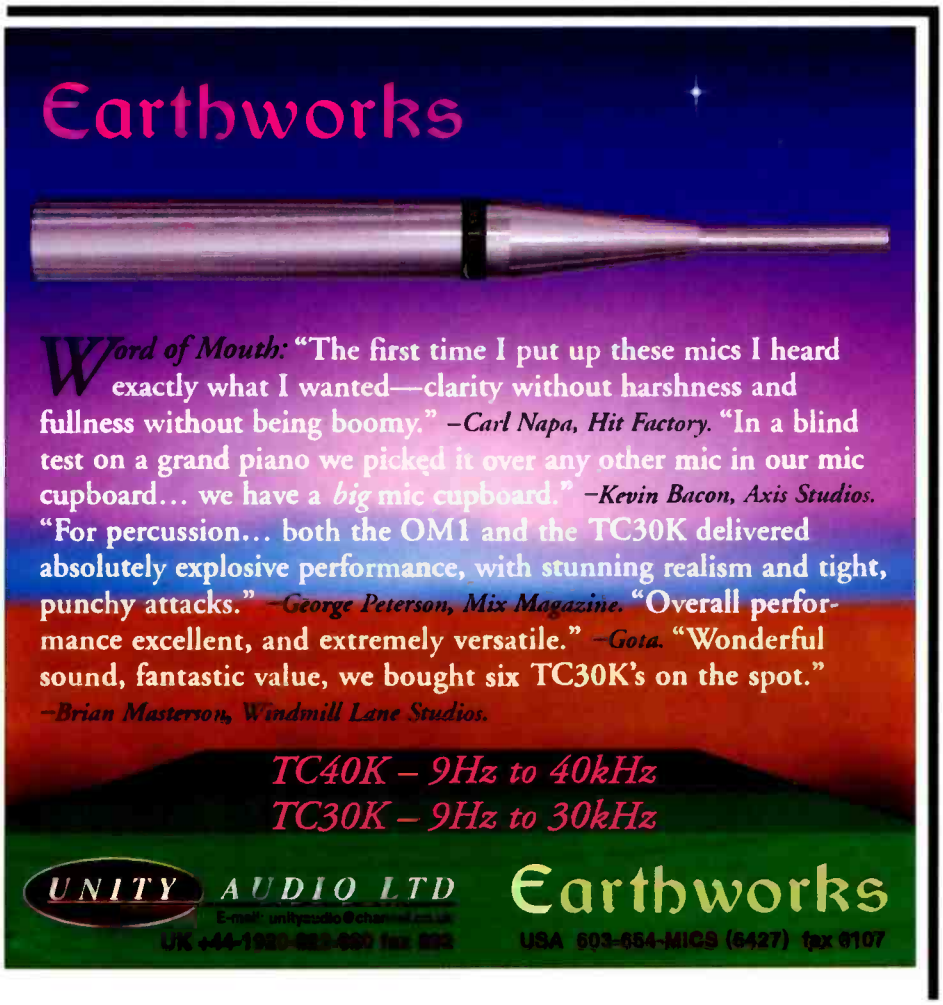
A SEPARATE GROUP—the Audio-Video Working Group of the 1394 Trade Association—has been defining a standard command protocol for controlling consumer AV equipment, known as the AV/C Digital Interface Command Set, Version 1.0 (September 1996). This uses asynchronous packets conforming to the FCP (Function Control Protocol) defined in the HDVCR conference, designed to control the various functions of audio-video equipment, and to set up routeings of signals from one device to another. It can be used for consumer and industrial editing control systems, for example, returning the responses from the controlled devices as appropriate.

The Universal Serial Bus is not the same as IEEE1394, but it has some similar implications for desktop multimedia systems, including audio peripherals. USB has been jointly supported by a number of manufacturers including Microsoft, Digital, IBM, NEC, Intel and Compaq. It runs at a lower speed than 1394 (12 Mbit/s) and is designed to act as a low cost connection for multiple input devices to computers such as joysticks, game controls, gloves and so on. For those familiar with Apple computers, it can be likened to a fast form of ADB (Apple Desktop Bus). The data rate is high enough for it to be used for A–D convertors and other audio peripherals if required, and it could be particularly useful for interconnection of equipment to ISDN lines and other telephony systems.

USB supports up to 127 devices for both isochronous and asynchronous communication and can carry data over distances of up to 5m per hop (similar to 1394). A hub structure is required for multiple connections to the host connector. It is cheaper to implement than 1394, so one might expect to encounter it in applications where the high data rates offered by 1394 are not needed, and where low cost is of the essence. Like 1394 it is hot pluggable and reconfigures the addressing structure automatically.

As serial buses like 1394 and USB gain more ground, owing to their incorporation in desktop systems, consumer electronics and the musical instrument market, the likelihood is that they will begin to find their way into other items of more specialised professional equipment. They have a lot of appropriate characteristics for audio purposes, and it appears that fewer problems conversion, leading to fewer quibbles about the 'sound quality' of digital interfaces.

The connectors and cables may not be as robust as XLR connectors and shielded professional audio cable, but there is certainly a need for flexible communications buses which will be able to handle the wide range of different digital data formats that we will need to handle over the coming years. Multichannel audio, high resolution audio, and data compressed audio, as mentioned earlier, are all with us and we are hard pressed to find ways of carrying them over the relatively inflexible interface structures available currently in professional audio. A bus which is able to combine the ability to provide point-to-point digital connections with network-like file transfer operations between multiple devices at low cost will be a very valuable asset.



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YAMAHA SITE: www.yamaha.co.jp/tech/1394m LAN

PUBLICATIONS

IEEE 1394-1995
Standard for a high performance serial bus

IEEE AV/C
Digital Interface Command Set
Version 1.0, September 1996.

1394 Trade Association
Audio and Music Protocol
Draft Version 0.32, August 1996.

Yamaha Corporation
T. Abe and J. Fujimori (1996).
Distributed connection management for electronic musical environment using IEEE 1394. Presented at 101st AES Convention, preprint 4347

J. Fujimori and Y. Osakabe (1996).
Digital audio and performance data transmission protocol over IEEE 1394. Presented at 101st AES Convention, preprint 4346

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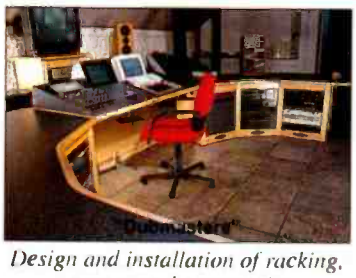

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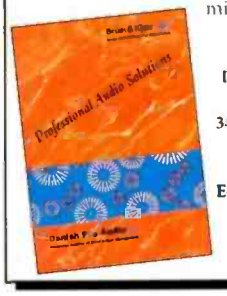

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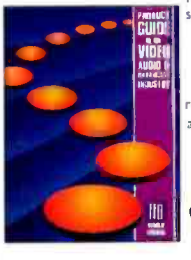

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◆ **February 22nd–25th**
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UK. Tel: +44 171 486 1951.

◆ **February 26th –March 2nd**
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March 1997

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◆ **March 13th–15th**
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◆ **March 22nd–25th**
102nd AES Convention
MOC Centre, Munich Germany.
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◆ **March 23rd–26th**
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April 1997

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◆ **April 5th–10th**
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◆ **April 23rd–28th**
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◆ **April 28th–29th**
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May 1997

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September 1997

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October 1997

◆ **October 2nd–5th**
18th Nordic Sound Symposium
Bolkesjø, Norway.
Seem Audio:
Tel: +47 66 98 27 00.
Fax: +47 66 84 55 40.
Email: soundsymp@nrk.no
Web: www.nrk.no/soundsymp/

◆ **October 16th–20th**
International Audio, Video, Broadcasting and Telecommunications Show (IBTS 97)
Milan Fair, Porta Metropolitana Pavilions, Milan, Italy.
Tel: +39 2 481 5541.
Fax: +39 2 49 80330.
Email: MC1703@MClink.IT

◆ **October 20th–22nd**
Asia Cable, Satellite & Broadcast 97 (ACSB 97)
Putra World Trade Centre, Kuala Lumpur, Malaysia.
Tel: +6 03 264 5663.
Fax: +6 03 264 5660.
Email: acsb@mfsb.po.my

◆ **October 29th–30th**
22nd Sound Broadcasting Equipment Show (SBES) Cancelled.
Tel: +44 1491 838575.
Email: dmcv@pointproms.co.uk

November 1997

◆ **November 4th–6th**
Vision & Audio 97
Earls Court 2, London, UK.
Tel: +44 118 975 6218.
Fax: +44 118 975 6216.
Email: info@aprs.co.uk
Web: www.aprs.co.uk

◆ **November 18th–20th**
Digital Media World 97
Earls Court 2, London, UK.
Tel: +44 181 995 3632.
Fax: +44 181 995 3633.
Email: dlgimedia@atlas.co.uk
Web: www.digmedia.co.uk

May 1998

104th AES Convention
RAI Conference Centre, Amsterdam, The Netherlands.
Tel/Fax: +31 35 541 1892.
Email: 104th_chairman @aes.org.
Web: www.aes.org

June 1998

◆ **June 2nd–5th**
Broadcast Asia 98
World Trade Centre, Singapore.
Tel: +65 338 4747.
Fax: +65 339 5651.

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Miller Freeman plc, 8 Montague Close, London Bridge, London SE1 9UR, UK. Tel: +44 171 620 3636. Fax: +44 171 401 8036. E-Mail: cz73@cityscape.co.uk

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The Theory of Sound

Studio control rooms have long been a contentious design study and remain the theatre of war in an escalating conflict between their designers. **FRANCIS DANIEL** takes arms on the side of Tom Hidley and Philip Newell in their pursuit of the ideal acoustic design for the modern studio

AT THE RISK of interrupting the volley between Philip Newell, Andy Munro and Tom Hidley, I would like to contribute my two cents' worth. But before diving in, let me announce that I am by no means a disinterested party. I have had lengthy and exhilarating discussions with Philip Newell on nonenvironment design concepts, as well as contributing (said he modestly) ideas that I have uncovered lurking in various academic sources. This does not mean that I consider it the only way to design a room,

What has not been clearly stated is that there are two design criteria for the nonenvironmental design: spectrally flat absorption over area wide frequency range and complete control over early reflections

but I took Newell's advice upon a recent opportunity to build a small-scale nonenvironment room, and it is this room which I have studied and taken extensive measurements.

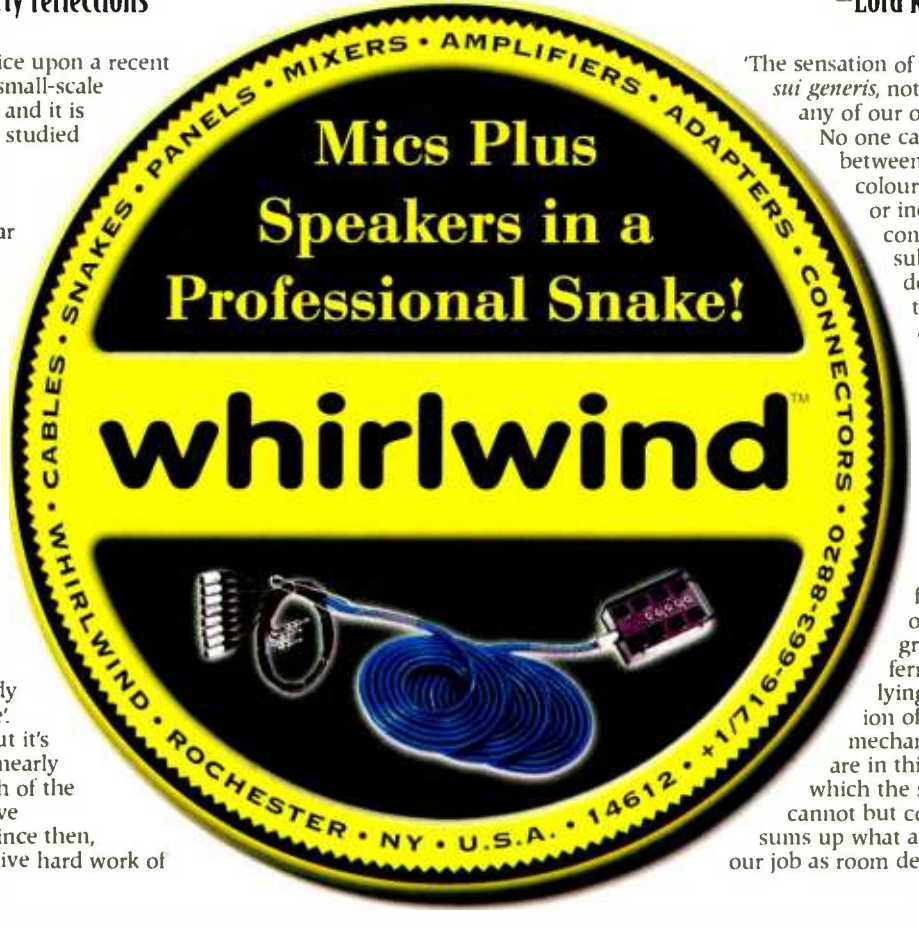
What has not in fact been clearly stated so far is that there are two design criteria for the nonenvironmental design: spectrally flat absorption over area wide frequency range and complete control over early reflections. The second is a fundamental tenet of almost any modern design. My reason for bringing this to the fore is that another of the common criticisms of this approach is along the lines of 'we had absorptive rooms 20 years ago and nobody liked them after a while'. This is perfectly true, but it's also perfectly true that nearly all of them ignored both of the above items. Things have progressed somewhat since then, thanks to the investigative hard work of Tom Hidley, Philip Newell, *et alii*, as well as all those who have developed the concepts of early reflection control.

To take on the issue of why such rooms are desirable, it has become ever more ludicrous to suggest that there is any such things as an average listening environment which a studio should try to approximate: headphones, automobiles, mono TV audio, home stereo, home theatre, the next studio in which some more work on the tracks will be done... If any statistical distribution indicated the 'fallacy of the average', that is to say finding a supposed average without stating what the spread around the average is, this situation should make that fallacy clear. The issue cannot be, therefore, finding an environment which is average, but rather finding one which produces a product translatable into all these very nonaverage environments. It certainly does not seem unreasonable to get rid of the monitoring environment rather than introduce acoustical room clutter and calling it an average.

Does it work? Examples can be found of people that are unhappy with the results, I have no doubt. But so far at least the clients I know of (few to date, but growing) and the clients that Hidley-Newell know of (many) seem to be a uniformly happy lot. These are people who are in the business of turning out as it is so charmingly called 'product', which has to sell or they and ultimately we are in trouble. If rooms like this can help them do it then as Lord Rayleigh, the founder of modern acoustics, said a century ago, in the introduction to *The Theory of Sound*:

'The sensation of sound is a thing *sui generis*, not comparable with any of our other sensations. No one can express the relation between a sound and a colour or a smell'
–Lord Rayleigh

'The sensation of sound is a thing *sui generis*, not comparable with any of our other sensations. No one can express the relation between a sound and a colour or a smell. Directly or indirectly, all questions connected with this subject must come for decision to the ear, as the organ of hearing; and from it there can be no appeal. But we are not therefore to infer that all acoustical investigations are conducted with the unassisted ear. When once we have discovered the physical phenomena which constitute the foundation of sound, our explorations are in great measure transferred to another field lying within the dominion of the principles of mechanics. Important laws are in this way arrived at, to which the sensations of the ear cannot but conform.' That, I think, sums up what applied acoustics, and our job as room designers, is all about.



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[1] except RCA tape jacks, headphone jack & inserts.

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