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STUDIO SOUND

AND BROADCAST ENGINEERING

INTERNATIONAL PRO AUDIO
AND POSTPRODUCTION MAGAZINE

APRS PREVIEW

SPARS

Postpro conference

The Oscars

The sound of the spectacle

Reviews

AKG C12VR; Studer D827;

Amek System 9098 EQ;

Cubase Audio Falcon

Facilities

AIR Studios; Finnish Opera House



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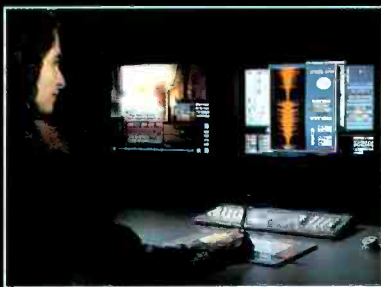
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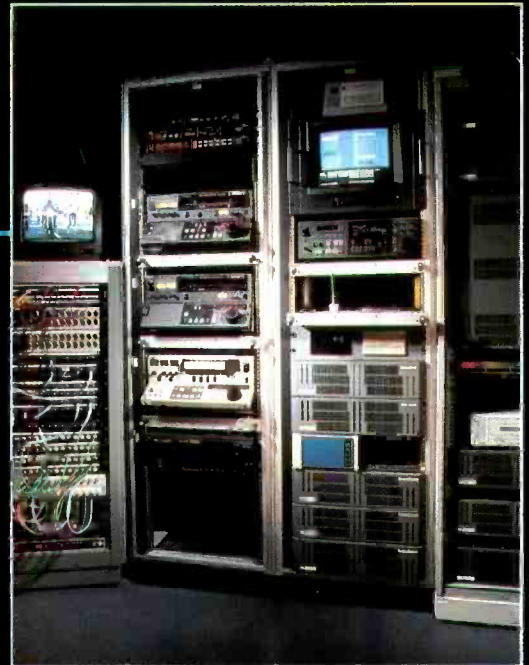
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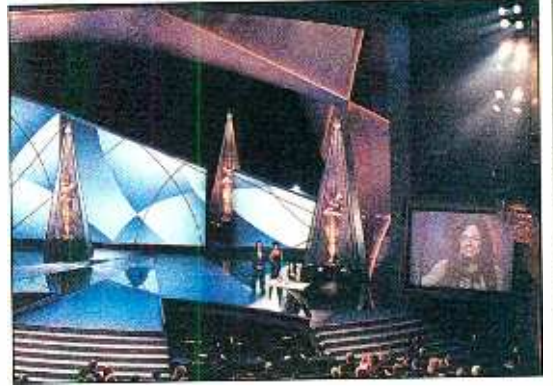
Solid State Logic

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174**

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Power play

There was a time—not so very long ago—when it was fashionable to associate technical power with visible evidence of complexity. Or even with apparent evidence of complexity. Vast mixing consoles, towers of outboard equipment and acres of patchbay were the (confident) order of the day. And if big was regarded as being best, bigger was certainly better.

But times change. Technology helps change them.

Today, microprocessor-based systems can come in almost laughably unimpressive packages while offering audio and video facilities unimaginable 20 years ago. 'Multiple page' systems permit considerably reduced operator interfaces to offer considerably increased functions over the dedicated hardware of years gone by. Computer-based systems, meanwhile, suffer the further indignity of having their individuality confined to screen design, the host machine attempting to keep its current application secret from the casual observer. The 'bedroom' studio can happily be sited in a bedroom; the DAT editing can be done on your lap...

The practical benefits of such progress are there, of course—not the least of which concern the physical problems for the engineer who has to manage that huge console and the acoustic profile such a desk offers to a monitoring system. These benefits are readily recognised and appropriately exploited. There are, however, other matters more closely associated with the psychology of power association that bear consideration.

A whole subculture grew up around 1960s and 1970s visual associations of power and the counterpoints that could be offered against them. Who can not have appreciated the elegance of spoofs such as Napoleon Solo's *UNCLE* headquarters being located beneath a modest tailor's shop and Captain Scarlet's SPVs lurking in farmyard buildings, patiently waiting to display their power and sophistication to the local yokels? Such concepts were certainly appreciated by the studio designers who were looking to play off the necessary technical elements of a studio with other design considerations. The appeal of hi-tech decor alongside hi-tech equipment quickly wore thin, and the chase was then on to find more ingenious ways of creating a suitable working environment. The acoustic properties of certain materials brought them to the fore in certain places—stone drum booths, for example. Technological counterpoints offer designers another approach. Exposed pipes and metalwork are more common than the missiles and other machineries of war that litter Pete Waterman's PWL studio complex, but the theme is essentially the same. Art obviously presents attractive associations and has appeared in many guises, though few as inescapable as Jamie Reid's mural work at London's Strongroom studios. But the challenge to studio designers to continue to be innovative is becoming a particularly stiff one.

We have become capable of associating high levels of technology with just about anything. The exclusivity once represented by the recording studios' fields of knobs and buttons, and miles of cabling has deserted the elitists. High gloss no longer readily equates to hi-tech, and the best non-tech counterpoints to the technical workplace are becoming very tired. It is time for us to start asking some old questions again: What kind of surroundings do we want around us when we are working? What kind of surroundings will contribute to the best work, given the emergent trends in working methods? What kind of appearance should the equipment that populates a studio have? And what kind of equipment and surroundings will bring the clients in? ■

Tim Goodyer

Cover: AKG C12VR

Photography: Nik Milner



Shattering convention

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Pro Mix 01 is the world's first affordable digital mixing console and it brings you:

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And as for its suggested selling price of just **£1,899** including VAT, well that's a minor miracle.



YAMAHA

Pro Mix 01

Yamaha-Kemble (UK) Limited Professional Music Division

In-brief

Screaming with the DA-88 ●

Primal Scream are using two Tascam DA-88 digital recorders on their current European tour promoting their latest Creation album *Give Out But Don't Give Up*. The machines are being used to augment the band's live sound, and the DA-88's flexibility allows the band freedom to change the order of the set with ease.

TEAC UK Ltd. Tel: +44 923 819630.

HBB DAT goes global ●

HBB's Professional DAT tape is now available in all five continents following the appointment of a series of new distributors around the world. The new outlets are Johannesburg's New Nation Tape and Media Productions for South Africa, Audio Services Australia in Sydney, and Team 108 in Singapore, who will handle sales of all HBB products in Singapore, Malaysia and Thailand.

HBB Communications Ltd.

Tel: +44 81 960 2144.

Sabine FBX at**Mandela inauguration** ●

Nelson Mandela's historic inauguration was kept free of feedback by the Sabine FBX Feedback Exterminator. FBX-900s were installed throughout the sound system at the ceremony, according to Prosound Pty, Sabine's South African distributor. There was 'not a squeak of feedback,' said Simon Oates, Prosound's Director, who engineered the system for the ceremony.

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

Fairlight Canadian link ●

OLE Canada Inc have announced the addition of Fairlight audio products to their digital production and postproduction line. The announcement comes after Fairlight's successful showing at the Las Vegas NAB, and the MF3 digital audio workstation joins OLE's existing range of high-end products including AATON cameras and Lightworks editing technology.

Fairlight DSG. Tel: +1 213 460 4884.

UK representation for RPG ●

European Acoustic Repertoire, formed by Douglas Floyd-Douglass, have recently been appointed to represent RPG Acoustical Products, manufacturers of the RPG Diffusor System, in the UK. This is seen as a complement to the HEAD Acoustics Pro-Audio agency which specialises in binaural recording and room acoustics analysis.

European Acoustic Repertoire.

Tel: +44 732 763 046.

Postpro pros choose G Plus ●

At the Third Annual Professional's Choice Awards Ceremony, recently held at NAB '94, Solid State Logic's *G Plus Console System* was named Audio Console of the Year.

SSL UK. Tel: +44 865 842 300.

SSL US. Tel: +1 212 315 1111.

International News

Pro-Bel HD at the Games

Pro-Bel are supplying an HD audio and video routing system to the Broadcast Engineering Department of British Columbia Telephone (BC Tel) who will handle all the feeds from some dozen venues at this year's Commonwealth Games, to be held in Victoria, Canada in August. The Pro-Bel router will be housed at the International Broadcasting Centre in Victoria, British Columbia, and will be used both as a monitoring device and to switch feeds to the numerous broadcasters covering the Games including the BBC, CBC, Television New Zealand, and the Australian Broadcasting Corporation.

Pro-Bel Ltd. Tel: +44 734 866123.

Subsidies for Indonesia

The Department of Trade and Industry recently announced that financial subsidies will be available to British companies looking to exhibit at Broadcast Technology Indonesia 1995. Financial assistance under the Trade Fair Support Scheme will mean substantial savings on exhibiting costs and a travel grant of £790 per person for two personnel to attend the exhibition. The sponsoring association will be the Federation of the Electronics Industry. In the light of the current privatisation programme and heavy investment within Indonesia's broadcasting market, it is hoped that this will make it easier for UK companies to gain a foothold in this vast market.

Further details of Broadcast Technology Indonesia 1995, set to take place from 26th-29th April 1995 in Jakarta, are available from the organisers' worldwide agents, Overseas Exhibition Services Ltd.

Overseas Exhibition Services Ltd. Tel: +44 71 486 1951.

Wild go Gold

The SoundStation Gold in Wild Tracks' newly opened Studio 3.

As featured in *Studio Sound's* May issue, the first DAR SoundStation Gold—Digital Audio Research's new disk-based digital audio production centre—has recently been installed at



Avid go Naked—The Avid Film Composer nonlinear editing system was most recently used in the production of the third *Naked Gun* movie—*The Final Insult*. Starring the inimitable Leslie Neilson and, Precilla Presley and Playboy model Anne Nicole Smith (as Tanya), *The Final Insult* follows the established format of pun and counter pun into the realms of farce. Having been persuaded to use the Avid system for the first time, Coproducer Robert Weiss said, 'I will use the Film Composer system on all my future productions.'

Avid Technology Inc. Tel: +1 508 6406789. Avid Technology Europe. Tel: +44 75 365 5999.

Avid Japan KK. Tel: +81 33 505 7937.

Wild Tracks Audio Studios in London, and will be followed by a second installation during June. The purchases form part of a major investment and refurbishment programme at Wild Tracks, which is also introducing Digital Betacam and D3 facilities. The two new DAR systems will complement the existing pair of SoundStation Deltas, making Wild Tracks one of the largest private users of DAR systems in the UK.

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

AES UK Seminar

The AES UK section is holding a full day seminar on the subject of grounding, shielding and interference control at Kensington Town Hall in

London on 15 July 1994. The seminar will be given by Ralph Morrison who has considerable experience in this field and was one of the panelists at the well-attended workshop on this subject at the AES 95th Convention in New York in October 1993.

The topics include: *The Semantics Problem. What is Ground and Earth? Utility Power Character. The Need to Use Physics to Explain System Behaviour. The Basic Electrical and Magnetic Field. How All Power and Signals are Transported. The Basic Tools that are Available to Control Interference. Balancing and Common Mode Rejection. The Impact of Digital Processes Embedded in Circuits. Cables and Shield Terminations. Radiation and Susceptibility.*

The AES point out that the increasing use of digital audio

equipment capable of 20-bit (or better) resolution places exceptionally stringent requirements on associated analogue systems. Success in assembling complete analogue and digital systems is a challenge best met with a clear understanding of how to predictably ensure noise-free analogue and digital system performance. This seminar aims to address these issues and is of relevance to component and system manufacturers, system installers and users.

AES Secretariat.

Tel: +44 628 663725.

Radio opts for NTL

All five of the new UK independent regional radio licensees have awarded eight-year transmission contracts to NTL. The new regional services will broadcast to largely urban populations in the West Country and South Wales (Galaxy Radio), Central Scotland (Scot FM), North-East England (Century Radio), North-West England (JFM 100.4), and the West Midlands (Heart FM). In providing suitable transmission facilities, NTL have had to design seven new transmitter installations and five antenna systems conforming to stringent Radio Authority coverage requirements. All the stations have opted for Total Broadcast Contracts in which they are leased a complete transmission package with NTL bearing all the operational, maintenance and ownership responsibilities.

NTL. Tel: +44 962 822582.

Uptown Agreement

Audimation Systems have entered an agreement with Studer who will now install the *Uptown* motorised fader system in their new console, the Studer 980. Available later this year, the package will automate faders and channel switching functions. Studer Executive Vice-President Bruno Hochstrasser said: 'Uptown's system matches our philosophy and requirements admirably. It's exceptionally easy to use from an operational perspective and easy to install at our factory.' Audimation Systems' Marketing Director David Pope said: 'Studer have already developed their own motor fader system which is integrated with their advanced 990 console. They've chosen



Tati in colour with DAR—a DAR Delta workstation has recently been supplied to Son Pour Son, the brand new facility founded by Sophie Tattishef, daughter of Jacques Tati. Their first major project involves a hitherto unseen colour version of Tati's film *Jour de Fete* which was shot at the same time as the black and white version on experimental film in 1947. Until now it has not been possible to process the film and a painstaking restoration has had to be employed to produce a screenable result, using trichromatic filters and the originally-specified optical system. Son Pour Son's input involves taking the soundtrack from the original black and white version of the film and synchronising the voice, music and effects to the colour version. The result will be used as the opening material for the 1995 celebrations marking the centenary of film, screened simultaneously in Berlin, Barcelona, London and Rome, after which it is anticipated that it will be issued on general release.

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

Uptown so that motor faders can now be offered on Studer's full range of consoles.' Manufacturers already factory fitting the *Uptown* system include Focusrite, API, Neotek, La Font, DDA and Soundcraft.

**Audimation Systems Ltd.
Tel: +44 207 282880.**

BSS for ENO

The English National Opera have recently purchased six BSS *Varicurve* dual equaliser-analyser systems from Autograph Sales, complete with the *FPC-900* Remote Controller. The units comprise an *FCS-926* master and five *FCS-920* slave units, rackmounted to work with ENO's Meyer *UPAI* stereo systems, for any application from front-of-house to on-stage effects. Philip Ashley, Head of Sound at ENO, cites *Varicurve's* ability to memorise up to 50 EQ curve settings as one prime reason for the choice. As the requirements vary so much, the ease with which settings for equalising sounds from, say, a thunderclap effect to vocal corrections or front-of-house can be recalled is paramount, and he says *Varicurve* is the perfect solution. By contrast, the same system joins a long list of other BSS equipment supplied by Britannia Row for Pink Floyd's massive world tour.

BSS Audio Ltd. Tel: +44 727 845242.

Four Nagras for Blue Chips

Forthcoming film *Blue Chips*, featuring basketball star Shaquille O'Neal, made use of the multimachine sync facility of the *Nagra D* to help place the audience right at the centre of the action on court. 'To capture the emotion of the games, we needed to record as many separate basketball game sounds as we could,' explains supervising sound editor Paul Huntsman. 'Three locked up *Nagra Ds* gave us 12 simultaneous channels of digital audio, and with an additional stereo analogue *Nagra* we had a total of 14 channels of audio.' Production Mixer Kirk Francis, who has used the *Nagra D* extensively in the past, assigned separate tracks to actors portraying the coaches and referees, and to the PA and radio announcers. The rest of the *Nagra* channels were divided among camera positions and the crowd, allowing access to unprecedented amounts of source material, subsequently mixed in 6-track DTS (Digital Theatre Sound).

Nagra Kudelski SA.

Tel: +41 21 732 010.

Nagra Kudelski (GB) Ltd.

Tel: +44 727 810002. ■

Contracts

● **Soundcraft and Tascam Russian in** Soundcraft's *DC2000* console and Tascam's *DA-88* digital 8-track have been chosen by the Presidential Orchestra of the Russian Federation for use in producing exclusive recordings for visiting heads of state. The recordings will be made primarily in the Kremlin's 6,000-seat Congress Hall for the entertainment of high-ranking visitors who will be presented with a commemorative CD afterwards.

Soundcraft Electronics.

Tel: +44 707 665000.

Tascam UK. Tel: +44 923 225235.

● **Calrec into Europe**

Recent Calrec console sales include three *T-Series*, to Central Television's The Television House (96 channels), Radio France (48 channels), and Sueddeutscher Rundfunk (56 mono and 8 stereo channels, with a total of 400 inputs). The BBC have placed orders for two *Q-Series* desks, one at the Open University and the other at Pebble Mill, the 12th *Q-Series* to be purchased by BBC TV in recent years.

Calrec Audio Ltd. Tel: +44 422 842159.

● **Warner Bros Distripalyze**

Warner Bros recently took delivery of eight new *SR-15+ Distripalyzers* from Brainstorm Electronics, bringing the total to 19 units at the Burbank studios. Both a time-code distributor-reshaper and a pilot tone stripper, the *SR-15+* identifies the format, stability and frame rate of incoming time code, monitors its synchronisation with video (phase and colour field alignment) and reports time-code errors.

● **Otari consoles for broadcast music**

Recent sales of Otari *Concept 1* recording consoles include two into the broadcast market, at jingle specialists Jeff Arthur Productions in Clearwater, Florida and at independent Producer-Composer Jim Johnston's private facility in Riverside, Connecticut.

Otari. Tel: +49 21 59 1778

● **Fox makes it four**

Hollywood's Fox Tape, producing over 450 promos a week for the Fox Broadcasting Company, have become the world's largest SSL *Scenaria* installation with the purchase of their third and fourth systems. The facility also has three *ScreenSound* editors linked via *SoundNet*.

SSL. Tel: +44 865 842300

● **Sequel to Dutch Story**

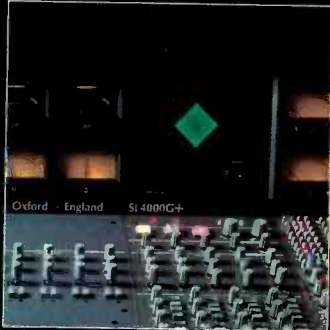
The first of Soundtracs' new *Sequel II* sound reinforcement consoles to reach the Netherlands was sold to hire company Story Sound in Alphenby Soundtracs' Dutch distributor lemke Roos Audio BV. Story Sound uses Soundtracs consoles only.

Soundtracs. Tel: +44 81 399 3392

G PLUS CONSOLE SYSTEMS



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**IMPROVED SPECIFICATION
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Yamaha Pro Mix 01

This year's APRS sees the introduction of Yamaha's radical new *Pro Mix 01*, a digital programmable mixer aimed at the mass market while employing high-end technology. The *Pro Mix 01* features 18 inputs with 20-bit A-D conversion (16 balanced line-mic, eight with phantom, and a dedicated stereo input) and stereo digital and analogue (20-bit D-As) outputs. Internal processing is at least 24-bit, with three-band parametric EQ on all 18 channels employing 36-bit processing.

A familiar console layout, with motorised channel faders, is combined with a large LCD—graphically displaying everything from EQ curves to effects parameter settings—along with a large data entry wheel and dedicated parameter access keys. The system provides total instant recall and full dynamic automation capability; 50 programmable memories allow all digital mixing parameters to be recalled instantly, and all parameters can be automated using any MIDI sequencing software.

Yamaha-Kemble UK Ltd.

Tel: +44 908 249 194.

Yamaha Corporation of America.

Tel: +1 714 522 9011.

Troisi DC20 A-D convertor

Troisi Incorporated of Westford, Massachusetts have announced what they call the first high-quality, affordable 20-bit A-D convertor. The new convertor joins what the company call the Digital Companion series of A-D and D-A convertors.

The *DC20 AD* is available as a new stand-alone unit with improved signal path integrity and grounding, and can also be purchased as a plug-in module to upgrade existing 16 or 18-bit convertors at a price comparable with the older units. A new 20-bit D-A convertor, the *DC20 DA*, is also available to give full 20-bit monitoring capabilities.

The new D-A has already been put to the test in a major remastering project at Vanguard Classics in New York, who had recently acquired almost one hundred 3-track masters from the old Everest catalogue,



Yamaha Pro Mix 01

including historic performances by Stokowski, Boult, the LPO and the Pittsburgh Symphony, among others. The recordings were made between 1958 and 1960 on a Westrex 35mm magnetic film recorder. Vanguard mixed and transferred the originals to a Sony *PCM-9000* via the Troisi 20-bit convertors, and the results will be edited and mastered 20-bit on Sonic Solutions before transfer to 16 bits using Sony SBM. The finished CDs should be available later in the year.

Troisi Design, Ltd.

Tel: +1 508 692 7768.

Weircliffe degausser

Weircliffe International Ltd have released their latest shielded degausser, the *BTE220*. Based on the successful *BTE200* range, the *BTE220* incorporates a more powerful erase coil, enabling Hi-8 and 8mm cassettes to be erased at a rate of six per operation, while maintaining the capability to erase VHS, S-VHS and audio cassettes and carts.

The *BTE220* forms part of the range of Shielded degaussers from Weircliffe, all of which are within the recommended field emission levels

currently in the proposed EC Physical Agents Directive.

This is Weircliffe's 30th year of manufacturing degaussers, and they have launched a search for the oldest machine still in operation. If you think you have a unit which may qualify, contact Weircliffe before September.

Weircliffe International Ltd.

Tel: +44 392 72132.

Crookwood Paintpot remote

Crookwood are to debut the new remote controller for the *Paintpot* microphone preamplifier at the APRS. The *Control Pot* can be rackmounted or laid on a flat surface and can assignably control up to 16 *Paintpots* via Crookwood's communication link, *Pot-Net*. All the familiar *Paintpot* controls are duplicated on the front panel, but with additions, such as 1dB gain increments and remote control of M-S width or stereo balance.

The control surface is assigned to a particular *Paintpot* via an LCD screen which also allows the user to store and recall any *Paintpot* setting from the *Control Pot's* internal memory. Each store can be given an alphanumeric ▶

In brief

● **Sennheiser radio microphone**
Radio mic experts Sennheiser have launched a new hand-held transmitter system, the *SKM 5000*. The system incorporates switchable frequencies and changeable capsules, with a range of polar pattern, condenser and dynamic options.

Sennheiser Electronic.

Tel: +49 51 30 600 366

Sennheiser Electronic Corporation.

Tel: +1 203 434 9190.

Sennheiser UK Ltd.

Tel: +44 628 850811.

● **Focusrite mastering equaliser**

Focusrite's Blue range of processors is joined by the *ISA 315*, a 2-channel mastering equaliser with all the usual rotary controls being implemented with multiposition precision rotary switches, allowing accurate channel-to-channel matching and recall of previous settings. The *ISA 315* uses the same circuits and components as the renowned *ISA 110* equaliser module at the heart of the Focusrite *Studio Console*.

Focusrite Audio Engineering Ltd.

Tel: +44 628 819 456.

● **Audio Design Masterdisc**

Following the launch of the high quality *MasterDisc* series of CD-R blanks, Audio Design have now released the *MasterDisc CDR-80*, the first recordable disc to provide 80 minutes of recording time. The new discs are packaged in the same green and grey livery as the other *MasterDiscs* but feature the *CDR-80* symbol in red to enable easy identification.

Audio Design Ltd.

Tel: +44 734 844545.

● **Belden digital cables**

Belden have announced a new series of *Brilliance* video and audio cables designed for use in the latest digital broadcast technologies. The line includes cables that meet the latest AES-EBU requirements, as well as the requirements of the new and emerging serial digital video technologies such as Component Widescreen and HDTV.

Belden (GB) Ltd.

Tel: +44 483 726818.

● **Otari MD recorder**

Otari have announced the introduction of the *MR-10 MD* ▶



Otari MR-10

label, and is organised in terms of sessions and takes. The *Control Pot* itself can be remotely controlled via the rear panel MIDI, RS322 or *BrickNet* connectors; the latter will allow control from Crookwood's forthcoming *Console Bricks*.
Crookwood. Tel: +44 628 528 026

Denon MD cart machines

Intended to replace NAB cart players, open-reel recorders, and in some instances DAT recorders, the new Denon MD Cart machines use the MD format to bring the benefits of



Denon DN-980F MD cart player and DN-990R MD cart recorder

fast access digital recording and playback to broadcast, SFX, postproduction, theatre, PA, installations, AV and so on.

Up to 255 jingles, commercials or effects can be recorded on one disc. Editing is simple and tracks can be renumbered or re-ordered at will, while alphanumeric titling makes access straightforward. Control layout and operation are based on the *DN-951* CD cart player, and the compact design is small enough to allow three machines to be mounted in a 19-inch rack. Comprehensive serial and parallel ports are provided plus a photo coupler-CMOS command input, making full automation possible for both machines. The *DN-990R* is the fully-featured record-playback model, while the *DN-980F* is a playback-only version.
Denon Pro Audio.
Tel: +44 753 888447.

Soundscape 8-track software

Soundscape Digital have now officially launched v1.14 software for their *SSHDR-1* hard disk recording system, reviewed in May's *Studio Sound*. The new software includes 8-track playback from disk, real-time mixing to 1 or 2 stereo pairs, 8 real-time controllable faders and pans with full automation via MIDI and 8 real-time fully parametric EQ modules. Other features include real-time mixing through the stereo inputs with eight tracks from disk, and 8-track merging to mono or stereo. The new Append Arrangement facility allows multiple arrangements to be loaded in one after the other to allow easy compiling to a finished DAT master.

The software is free of charge to

existing users, to whom it will be sent directly; all new Soundscape purchases by the time this goes to press will include the upgrade.
Soundscape Digital Technology Ltd. Tel: +44 222 450120.

Et Cetera Note-1

The *Note-1* is a portable MIDI interface for all IBM compatible notebook, laptop and desktop PCs. Using proprietary *MIDIEngine* technology, the *Note-1*'s high-performance MIDI port offers FIFO data buffering, data compression, and message filtering to efficiently drive a full 16 MIDI channels. The unit's small size and light weight make it highly portable, and its features include channel remapping on input and output, an exclusive multi-client *Windows* driver, diagnostic software for quick system checkout, and the ability to obtain power from the printer port in most systems.

Et Cetera Distribution.
Tel: +44 706 228 039.

SWA Retriever

Broadcast distribution specialist, SWA, have announced *Retriever for Windows*, an entry-level CD juke box automation system. *Retriever* uses two Denon *1200F* Juke Boxes and UK-produced software to reduce the costs of on-air automation and control of music.

Designed for use by radio stations, OB units, stores, night clubs and so on, *Retriever* gives a 400 CD capability using two juke boxes. Programmes can be built using a wide range of selection commands, as an on-air assist, cueing, fader starting, or programming for overnight unattended automation.
SWA. Tel: +44 635 873309. ■

Recorder-Player series, featuring a large alphanumeric LCD, SPDIF and analogue I-Os, time code display, and optional RS-422 for integration into existing automation systems.

Otari Deutschland GmbH.
Tel: +49 21 59 50861-3.
● tc electronic dynamics

processing
 The latest software release for tc electronic's *M5000* digital audio mainframe introduces a digital compression and dynamics system. The MD2 multiband digital mastering dynamics package offers 3-band operation, with fully-featured compression, limiting and expander algorithms.

tc electronic. Tel: +45 86262800



Crest Audio CA12 amplifier

● Crest power amplifier

Crest Audio have introduced the top-of-the-line *CA12* amplifier, which provides 1200W per channel into 4Ω in 3U of rack space, joining the 2U-high *CA9* and *CA6* launched in March of this year.

Crest Audio Inc.
Tel: +1 201 909 8700.
Crest Audio Europe.
Tel: +44 273 325840.
Crest Audio Asia.
Tel: +1 65 295 2328.

● Akai CD3000 hardware upgrade

Akai are introducing analogue inputs to the *CD3000* CD-ROM sample player, and adding two new CD-ROMs featuring the sound libraries from the *S1000* and *S1100*. From August, all *CD3000s* will be supplied fitted with the new inputs, and the option is available to existing owners.

Akai (UK) Ltd. Tel: +44 81 897 6388
Akai-AMC (US). Tel: +1 817 336 5114.

● Nagra D software update

The latest software release for the *Nagra D* finally sees the arrival of the Directories facility, allowing the recording and recall of information concerning takes, dropouts and overloads. Information in the directories can be accessed for detailed analysis from an on-line PC equipped with the NADCOM software. Besides diagnostic aids, the information recorded includes timing and status information and 16-character take titles, and brings the Skip and Go To End features into their own.

Nagra Kudelski (GB) Ltd.
Tel: +44 727 810002.



Sennheiser SKM5000

The PRM™ Phased Reference Monitors From Peavey Audio Media Research.



Take Them For Granite

The PRM™ 26i, 28i and 308Si
THE ALL NEW PHASE REFERENCE MONITORS BUILT ON THE PRM™ 308 LEGACY

The original, highly praised Peavey PRM 308 studio monitor had a specific sound because, unlike its competition, it stayed linear. The transition from the woofer to the mid-range to the tweeter was precisely controlled – gradual with definite shape. The newest Peavey PRMs offer the same excellence...and more. The smooth phase response of the PRM Phase Referenced Monitors provides a consistent, cohesive sound character across the entire frequency spectrum. By carefully matching the crossover to the

speakers, Peavey's net result was exceptional clarity and definition, with the ability to hear deep into the mix. The frequency response of these monitors is so smooth, you can almost draw it with a ruler.

The PRM Series, the ultimate in phase reference/ near-field monitors, gives you control of your mix by allowing you to hear it uncolored... with all the subtleties. And cosmetically, the granite-look covering makes them the perfect addition to every studio. The Peavey PRM Reference Monitors... take them for granite!

· 3/4" sturdy non-resonant core cabinet with granite-look laminate for stiffness and to eliminate "box talk"

· Premium components & polypropylene capacitors

· Reference/EQ switch on the PRM™ enclosures optimize tracking and "real world" playback environments.

· 5-way, gold-plated binding post

· Magnetically shielded drivers on the PRM 26i and 28i for use in close proximity to electronically sensitive equipment

Audio Media Research™

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PEAVEY®

Sony HR-GP5 Half-Rack Processor

No doubt re-employing the technology pressed into service in its current series of pro-effects processors, Sony's neat half-rack HR-GP5 processor represents the company's entry into the MI market. As such, it is an admirable attempt—we should look at this unit as something of a pointer to what can now be achieved in the otherwise cluttered front-panel world of multieffects processors, because this device achieves a level of simplicity that could teach other manufacturers a thing or two. I offer this in the full knowledge that there are already a number of highly-accessible units of this type on the market.

Excellent graphics on a large LCD, a wodge of soft buttons and super dials combine to speed the user through minimal layers of well-constructed menus. It is an object exercise in illustrating what is now possible at this sort of price (£500 in the UK), and that digital processing for *musos* need not be basically presented nor cryptically involved. I believe the stakes have now been raised.

At work

The HR-GP5 can run seven effects modules simultaneously: a compressor, distortion, EQ, an amp simulator, two so-called modulation modules and reverb. The compressor includes limiter functions, the distortion sets the basic tone from seven distortion types while the EQ can function as an exciter, wah and 2-band swept peaking plus swept shelf EQ. The two modulation blocks offer a choice from 30 types including flanges, chorus, delays, pitch shifting, rotary speaker and amplitude modulation. The reverb module offers nine options including four reverbs (almost too good for guitar but underlining the device's ability to function as a stand-alone desk processor) and five additional delays.

Combinations of these effects, called Structures, can be picked from a list of 38 on-screen flow diagrams allowing the order of effects modules to be altered and these can be saved in 100 user memories complementing

the 100 factory presets.

The rear panel has a low impedance input in addition to the front panel guitar input, stereo output, MIDI In and Out (the unit supports the usual dump routines and can be real-time controlled via MIDI), plus a standard swell pedal input for assigning parameter control. A remote socket permits the optional HR-RC5 pedalboard to be connected.

However, it is the front panel that is really clever. Centred around a large display, this presents the user with six soft function buttons and a page scroll-edit switch along the bottom, and EXIT, SAVE and SYSTEM buttons up the right-hand side. Preset selection and parameter adjustment is made on a dual-concentric dial for coarse and fine adjustment.

While most LCDs on this sort of unit content themselves with minor changes of a standard layout, the one on the HR-GP5 transforms dramatically according to the what the unit is being asked to do. Thus the Play mode screen includes icons (including what I can only describe as artists' impressions of a young Rory Gallagher and The Supremes) to tag each patch, the patch's name and above the function buttons the patch's component effect modules which can be switched in and out individually if desired.

Entering Edit mode on the PAGE-EDIT button changes the display to present icons above the effect module blocks; pressing any of the function buttons accesses the relevant module's parameters for programming. The PAGE-EDIT button is used to scroll through a module's Parameter pages while an informative ident at the top right-hand corner of the display tells you how many pages there are and what page you're on. You select the parameter you want to alter by pressing the relevant function button and tweak it with the dials.

A thoughtful inclusion is that if you decide to change the structure of a patch after having tweaked a particular module these changes are retained in structures that contain that module. I don't know why I think this is such a

big deal, maybe it's because I am used to operational obstructions.

Sounds

The sound creation potential on this unit is huge. Others may offer more effects types and the ability to string more modules together simultaneously, but I cannot think of one that wears its abilities so clearly on its sleeve.

All the true effects types are of a very high quality but if I have a criticism it is that the distortion character tones are not as reactive to playing style as they perhaps could be. Lead line sounds do not respond that well to decreases in guitar volume for less distorted chordal work, for example. They start to sound a little lifeless as opposed to just slightly restrained. Consequently it is better to program a separate patch for a chordal variation of the lead sound by altering the values in the distortion module.

However, there are seven distortion tones to choose from and these cover well the ground from ice-clean through jazz combo and on to the stud-leather of beyond. There's also an excellent amp simulator which really ought to be in-circuit most of the time unless you do want the HR-GP5 to sound like the box it is. Basic guitar tones can get a little muddled in comparison to some other units where the differences between, say, a *Strat* and a *Tele* are maintained no matter what you do in a patch.

Creamy, sustained lead sounds are undoubtedly the unit's strong point, followed closely by a competence for creating resonant clean tones aimed ultimately at making you sound expensive. There is a finished quality to a lot of the factory presets that is not dissimilar in ethos to the top-end Zoom units, but they do not sound the same.

There are superb pitch shifters in monophonic and polyphonic versions with tight and consistent tracking all across the fat strings offering the sound of a thousand soundtracks.

There is a tad too much compression on many of the presets and there is also an inequality in gain

structure. Without touching the guitar, some presets barely make the input LED indicator flash red while others will initiate audible clipping. Consequently, you have to touch the input level pot more often than you would wish, and care has to be taken when programming to avoid this. Thankfully output levels are programmable and even across the presets. A foolproof tuner is included.

Conclusion

You can sound very impressive with this handsome Sony which can muster up just about anything you ask of it once you get acquainted and that will be quickly because the accessibility is perfect. The user-interface is very well designed, you get loads of information and programming is obvious.

The unit basically takes well-accepted multieffects processor principles and extends them in a manner that someone should have been implemented done a long time ago.

Because you can get to the effects modules quickly and turn them on and off on a single button you can build your sound up as you would do with a whole string of effects pedals and that, after all, is the sort of simplicity that all guitar effects processors should aspire to.


As a first attempt at this sort of box, the HR-GP5 is an excellent offering. In my book, it slots in immediately alongside the other established names in this area. There is a new big kid on the block and surprisingly it's a Sony. Whatever next? ■

UK: Sony Broadcast & Professional UK, The Heights, Brooklands, Weybridge, Surrey KT13 0XW. Tel: +44 932 816000.

Fax: +44 932 817011.

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

Music News is compiled
by Zenon Schoepe



**'We've been using
Sony DASH for ten years,
and look forward to the
next ten.'**

**Martin Benge, Managing Director,
EMI Music Studios UK**

The Manor, Oxfordshire, UK.



'Ever since we bought our first Sony DASH recorder for Abbey Road Studios in 1984, we've been keen supporters.

'Superbly engineered, easy to use, transparent sound – over the years our Producers and international clients alike have all appreciated what DASH has done for them.

'Our studio group now includes The Town House, Town House III, Olympic, The Manor and Manor Mobiles as well as

Abbey Road. Each has its own distinct appeal for recording artists, but all offer DASH.

'More and more artists will now record only on DASH. That's why we decided to invest in some extra PCM-3348s. In virtually constant use since the day they were installed, they are giving our clients the sound quality they need and bringing in more business.

'For us, Sony DASH has been a big success story. Long may it continue.'

SONY

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Cubase Audio Falcon 16

If not the most popular music sequencer, Steinberg's *Cubase* is certainly a program that is held in high regard by professional musicians. There are as many reasons for this as people you ask, but suffice to say that user-friendliness is likely to be towards the top of the list.

Unfortunately, the same cannot be said of Atari's *Falcon* computer. The first consumer machine with in-built DSP (although *NeXT* might attempt to lay claim to that particular title), its emergence into the digital audio world has been slow to say the least. The *Falcon* has been largely ignored as a professional platform for reasons of instability, but much of this can be solved through a couple of hardware modifications. Those who have considered it underpowered with a 16MHz 68030 processor should bear in mind that the open nature of its operating system allows programmers to pull incredible strokes. From experience, an Apple *Macintosh* with a 50MHz 68030 suffers from far slower screen redraws.

Steinberg's launch of its 8-track direct-to-disk version of *Cubase* gave *Falcon* sales a much needed boost. The integration of MIDI and digital audio is seamless—a simple mouse double-click on an audio track brings up an Editing window from which

the waveform can be cut, copied and pasted in a non-destructive manner. Additionally, a cut-down version of *Time Bandit*, the *Macintosh* time-correction software, is included as standard and audio can be mixed down in the digital domain, including effects and EQ.

Most retailers now sell the machine with the microphone-level inputs converted to line level and the headphones bass-lift defeated, but this still leaves the *Falcon* with three inherent problems: the limitation of eight tracks, poor quality digital-to-analogue converters on the *Falcon*, and no digital I-O.

All three of these shortcomings have now been solved. By the use of some clever assembly coding, Steinberg have managed to squeeze 16 tracks of digital audio into (and out of) the *Falcon*, without the need for any additional hardware.

Cubase Audio Falcon 16 has all of the standard *Cubase* features, along with two digital audio modes. The first of these offers the usual eight tracks of digital audio along with reverb, chorus, flanger and a brand new, 10-band graphic equaliser. However, the second mode gives you 16 digital audio tracks—but without the digital effects as this mode requires

maximum processing power.

While many believed that such a feat was impossible, including Atari themselves, Karl Steinberg has employed very fast DSP code and a compression technique for writing data to hard disk to reduce the data flow. Files are then unpacked on the fly just before being passed to the D-A converters. The result is the same sampling rate—which now ranges between 16.49kHz and 48kHz including the industry-standard 44.1kHz—but a slight loss in resolution giving a subjective audio quality comparable with that of Philips' DCC or Sony's MD.

In addition, Steinberg have also announced a multiple-port output box (with an expected UK price of around £500). The *FA-8* has eight independent outputs, utilising D-A converters of the quality found in consumer CD players, making it possible to route each audio track to its own individual output if in 8-track mode. Also included are various new Mixer Maps (on-screen representations of a mixing panel), for routing audio tracks to the relevant *FA-8*'s outputs along with two auxiliary outs. These can be routed to either the *Falcon*'s audio outs or the *FA-8*'s outputs seven and eight, depending on the mode being used.

A recent hardware addition is the *Falcon* Digital Interface (FDI), offering SPDIF coaxial and optical I-O, along with the relevant software

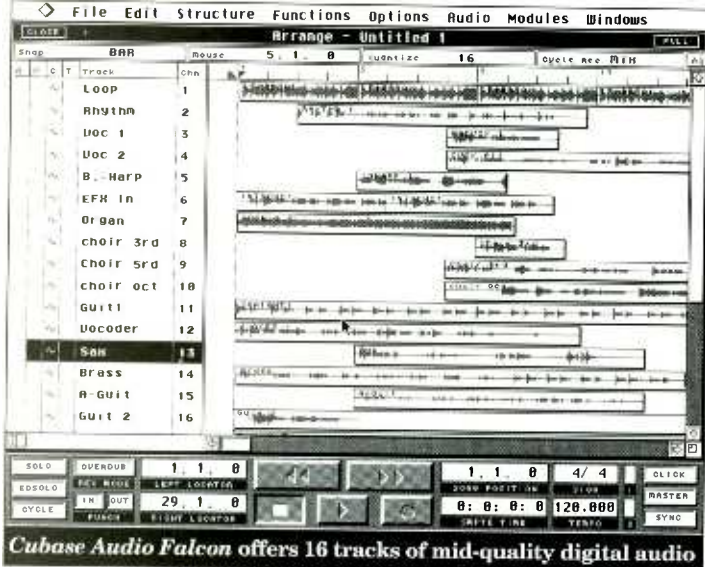
for backing up a hard disk to a DAT machine. When used in conjunction with the *FA-8*, the sum total is a 16-track direct-to-disk recorder with digital input and output, coupled with a 16:8 mixing desk. If the *FA-8* and FDI are used in tandem, the *FA-8*'s first stereo bus is replicated at the digital output of the FDI, giving a 2-track master for direct recording to DAT.

The price for such a system makes them tempting. A 14Mb *Falcon*, 1Gb SCSI hard disk, *Cubase Audio Falcon 16*, FDI and *FA-8* are likely to cost around £3,500 (UK)—a price that no other 16-track system on the market can remotely approach. While the audio quality will not be on a par with Yamaha's *CBX-D5* 4-track recorder, which can be used with *Cubase Audio* via a direct SCSI connection, the 16-track aspect will appeal to anyone whose requirements are not of the highest order.

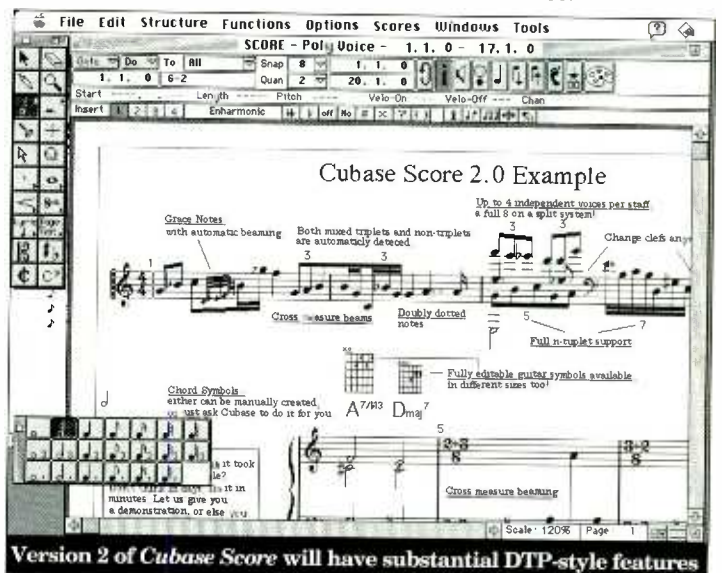
Steinberg is continuing to develop *Cubase*. *Cubase Score 2.0* is on the horizon and offers full music DTP-style facilities; a combination of this and digital audio creates a highly potent workstation. All that is needed now is a stable *Falcon* platform on which the program may perform. ■

Vic Lennard

Steinberg Soft-Und Hardware GmbH, Eiffestrasse 596, 2000 Hamburg 26, Tel: + 49 40 21 15 94. Fax: +49 40 21 15 98.



Cubase Audio Falcon offers 16 tracks of mid-quality digital audio



Version 2 of Cubase Score will have substantial DTP-style features

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Our worldwide force of Audio Precision representatives will be pleased to provide further information and an onsite demonstration.



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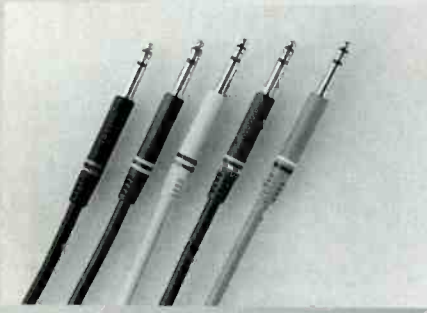
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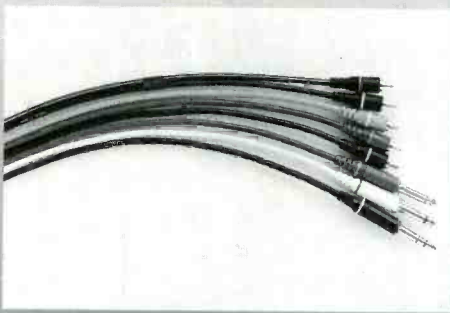
MOGAMI



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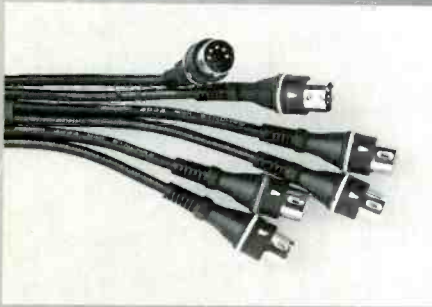
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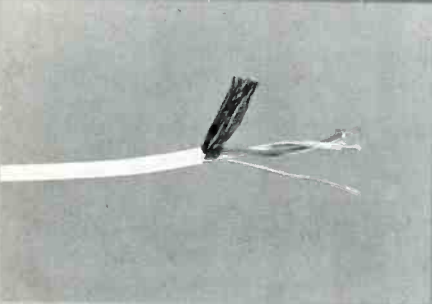
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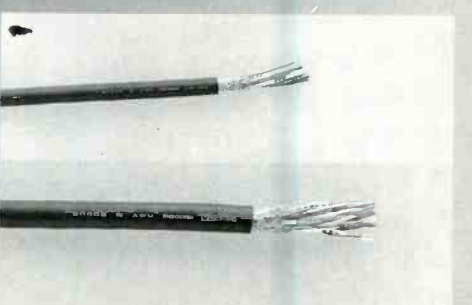
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Sixth Annual SPARS Conference

The Society of Professional Audio Recording Services (SPARS) functions as the US equivalent to Europe's APRS. In addition to providing a useful forum for the exchange of information about recording and production facilities, emergent technologies, plus other peripheral services, SPARS organise a yearly conference on workstations entitled *Audio Workstations: The Audio Solution of Video Postproduction*. During this unique 2-day event, industry professionals can hear a sales pitch from each of the attending companies and then compare fact with fiction during a series of active hands-on demonstrations.

This year the conference was held at the Beverly Garland's Holiday Inn, North Hollywood from May 21st-22nd. The event attracted some 150 individuals who gathered to listen to a dozen manufacturers of digital audio workstations.

The first day comprised a series of 20-minute product summaries from each company; the remainder of the day being devoted to hands-on demos.

The second day started with a fascinating session devoted to opportunities for audio facilities on the coming 'Information Superhighway.' This presentation and discussion was followed by yet more opportunities for one-on-one product demos.

The main topics of discussion from the manufacturers were networking and data exchange; more users are looking at ways of transporting projects from one system to another. The advantages are obvious. A series of editorial rooms or preproduction rooms based, for example, on an 8-track Digidesign *Pro Tools* or Studer Editech *Dyaxis II* systems, could be used to generate edited sound files for direct use via a local network or removable optical media by, let us say, an multichannel Otari *ProDisk 464* or AMS-Neve *AudioFile* in a central mix-to-picture suite.

As representatives from several companies reported, Open Media Framework (OMF) allows EDLs, digitised audio, digitised video, digitised still frames and project data to be moved from one platform to another. On paper, OMF allows both the content and descriptions of edited audio material to be shared,

exchanged and augmented. A series of APIs (Application Programming Interfaces) translate the file structures used by one system's proprietary format to one that is readable by other OMF-compatible devices. 'Ingredients' are the digitised media files for a designated project, while programme descriptions of the way in which sound files are laid out and intermixed, edited and processed form the 'Recipes'. OMF Ingredients range from animation frames to digitised audio, while Recipes would list time-code-based data relating to edit points, crossfade profiles, multitrack source-destinations and processing data.

AMS-Neve demonstrated spotlighting cross-platform OMF compatibility between their proprietary CPU—an *AudioFile* plus *Logic* series mixer—and *Macintosh*-based platforms, including Avid and Studer systems. *AudioFile* hard-disk systems can now read OMF files directly from M-O disc, without a translation process between formats. Avid Technology are also extending the operating system of their *AudioVision*, *AudioStation* and related products to handle Native OMF structure. At the current time, these systems can directly accept audio files from other manufacturers; in the near future, this function will also be extended to OMF Compositions, a development that will allow complete audio-for-video projects to be imported and exported.

Avid also demonstrated a new SCSI Farm that enables 49 hard disks, M-Os and other fast SCSI-capable devices to be linked to *AudioVision* by means of balanced SCSI connections. Currently, up to four systems can be interlinked via 80-foot cables, and simultaneously access data from any of the drives. Direct recording onto a single drive is also offered.

Networking also figured prominently during the SPARS presentations. Avid are offering ATM (Asynchronous Transfer Mode) functionality for their *AvidNet* system, which offers theoretical data throughput of up to 1Gb/s. When implemented, ATM will allow simultaneous transmission of multiple digital video and audio

channels via a single fibre-optic or similar network.

In addition to announcing that their Sonic System software will be ported to run on both Silicon Graphics and Apple Power PC systems, Sonic Solutions showed the new *MediaNet* Server and Client cards for the *Macintosh*. As well as FDDI (Fibre Distributed Data Interface) and CDDI (Copper Distributed Data Interface), a twisted-pair version FDDI species of *MediaNet*—providing a 12Mb/s throughput—also under development is an ATM-compatible version that will allow real-time access of multiple digital video and audio files from interconnected systems.

On a related tack, Studer Editech's *Dyaxis II*—now available with the new *Multi Desk* hardware controller—offers direct compatibility not only with the form's proprietary MultiMix and MacMix file formats, but with *Sound Designer II*, OMF, AIFF (Audio Interchange File Format) plus *Lightworks*. Also available: Ethernet and FDDI-based networks, plus direct data storage-retrieval from M-O drives, using a choice of either noncompressed format on 5¼-inch media, or data-reduced (Dolby AC-2) for 3¼-inch drives.

Briefly: Digidesign showed the enhanced v2.5 software for *Pro Tools*, which now offers full TDM (Trans-system Digital Matrix bus) support. TDM allows plug-in cards and processing functions to be controlled directly from *Pro Tools*, including a host of DSP capabilities. V2.5 also adds extra OMF and external synchronisation functions. Fairlight ESP spotlighted new *MFX3* features, including 24 channels of playback from a single hard disk, high-speed 40-bit DSP architecture (now offering real-time EQ, pitch shift and other functions), and digital I-O card. Micro Technology Unlimited

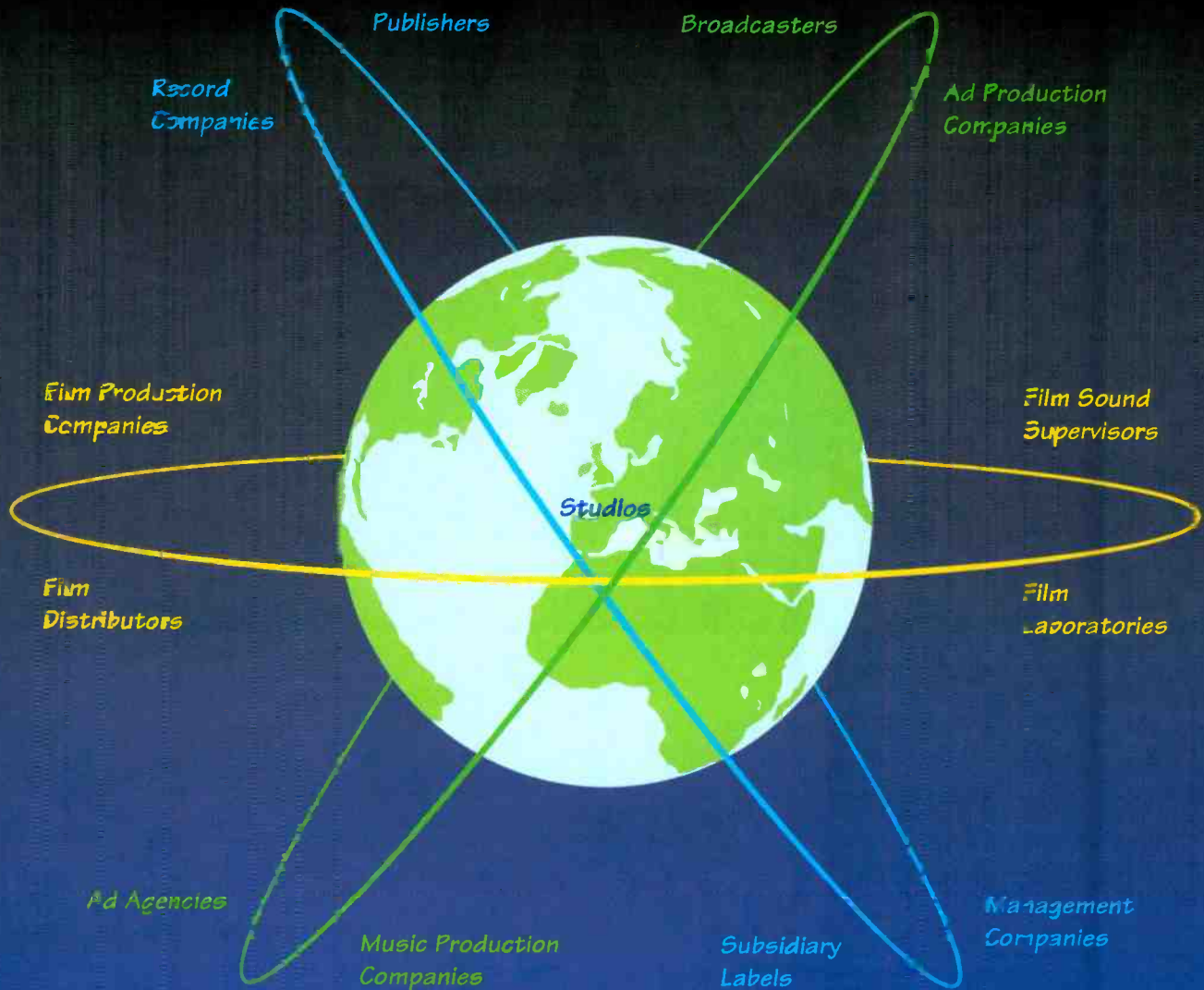
showed the *MicroStation* system, a series of PC-compatible digitising and playback cards, plus time-code sync cards that can replay multiple disk tracks. Orban showed new v4.0 software features for the *DSE-7000*, including enhanced library search-sort, meter displays, storage-recall of systems functions, and a new Disk Cache that accelerates disk transfers between the RAM-based editor. Otari showed a production version of *RADAR*, which consists of a 'digital 24-track recorder-player,' complete with remote control and autolocator, plus the *ProDisk 464*, which now offers integrated, nonlinear video playback, LTC-VITC sync, support for external M-Os and CMX-compatible autoconform functions. Roland Pro-Audio showed v2.0 firmware software, which features waveform display via the remote panel, 40 edit markers, autotrim mode, group faders, plus back-timing functions. TimeLine Vista showed their new *Studioframe DAW-80* workstation, now available with v6.0 *Windows*-based software that offers improved editing functions, floating toolbars and other features; planned enhancements include 32 tracks of simultaneous track replay, and Lyrinx-Micro *Lynx* machine control. ■

James Douglas



Otari's ProDisk 464—suitable for LAN connection in a mix-to-picture suite

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ST MATTHEW PASSION

An ambitious simultaneous TV recording and audio recording of Bach's *St Matthew Passion* was recently undertaken for the BBC. Patrick Stapley reports on the project's problems and triumphs

If you were among the millions sheltering from the appalling British weather this Easter, you may very well have seen a production of the *St Matthew Passion* broadcast on BBC2 on Good Friday. Directed by Jonathan Miller, the 2½-hour epic mixed together the traditional with the untraditional: German score and Baroque instruments along with performers dressed in street clothes (Jesus in check shirt and jeans) and itinerant instrumentalists taking cameo parts.

The approach was certainly unusual, but so was the way the production was recorded: combining TV programme-making and CD recording in one true 'multimedia' exercise.

Concept and background

The original idea came from Executive Producer Ron Consalves, who felt that the way the work had been performed in the past lacked the expression that it deserved.

'I've had the idea for a very long time, and it basically came out of my ►





frustration of going to 25 years of *St Matthew Passions* all of which were approached in a very traditional, and to a large extent, stilted way. It seemed extraordinary to me that with a story that's 2,000 years old and with music that is so fantastically dramatic that the sense of drama didn't exist in any of the performances I'd seen.'

This view was shared by Director Jonathan Miller who saw the work's dramatic potential as having been 'immobilised and paralysed by years and years of standardised performance'. In an attempt to break away from the formalised and regimented, Consalves and Miller adopted a fresh approach in which they involved musicians and singers in a process of 'inspired storytelling' resulting in what Miller describes as 'a sort of musical last supper in which the act of making music becomes a kind of sacrament.'

'Rather than organising musicians into serried ranks with instrumentalists and singers being apart from one another, we've brought them together,' says Miller. 'This has resulted in all sorts of episodes where soloists will come to and sit beside their obligato instrument—rather like Ella Fitzgerald and Louis Armstrong playing together. The exciting thing about it is that singers and instrumentalists have rethought their parts precisely because they're interacting and performing with one another. It brings out an enormous intensity of performance and there's something very ardent about it.'

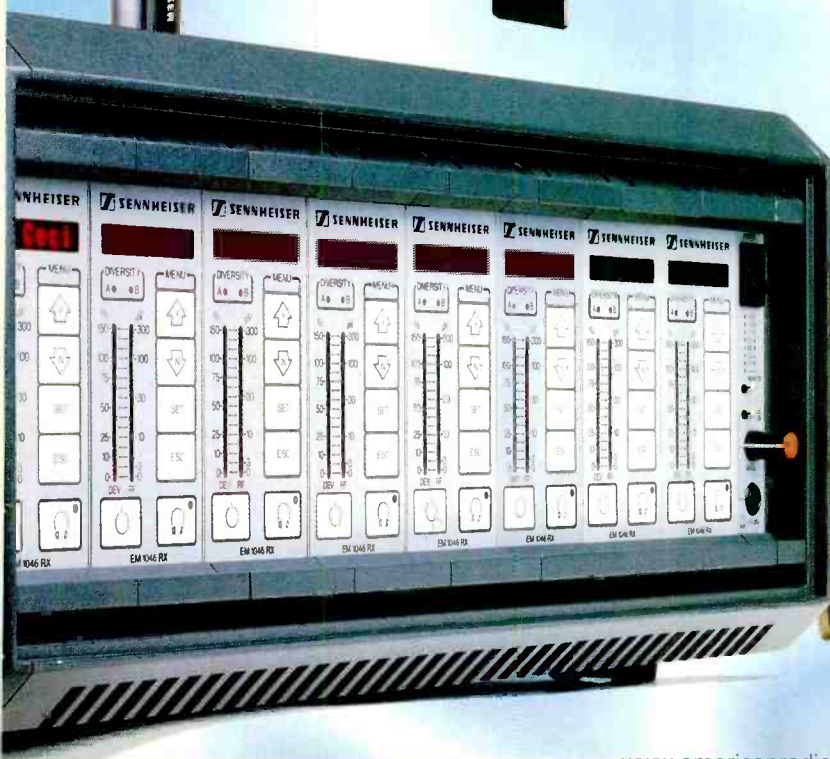
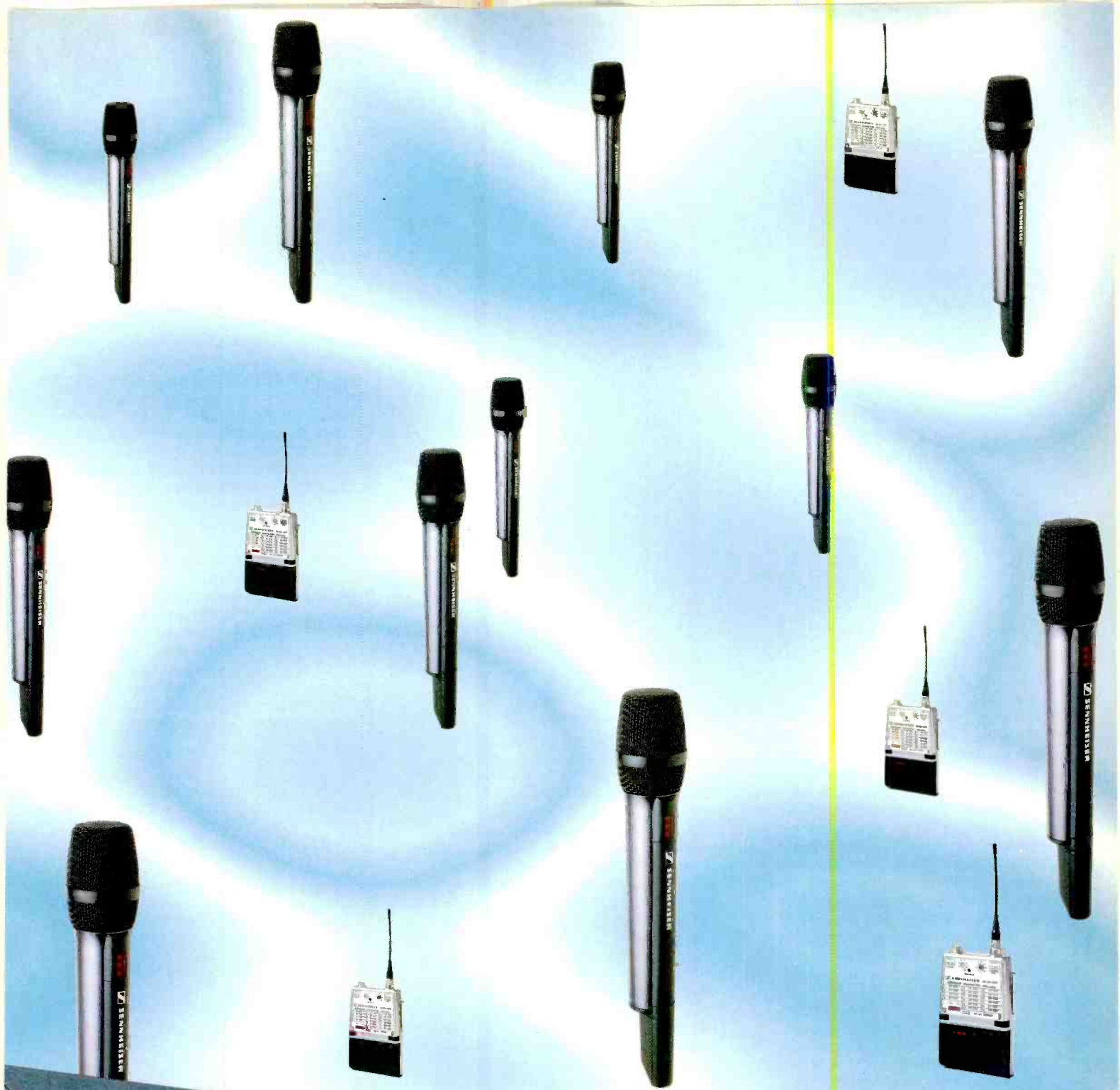
Traditionally, the piece has been performed and recorded using large orchestras and choirs with the soloists lined up front of stage. The new production uses much smaller groups of musicians, as Bach would have done, and sets them out in the round so that two orchestras (13 in each) and two choirs (12 in each) face each other with much of the solo action taking place in the centre of the circle. Again, the circular arrangement creates a sense of communion with people playing to each other, and has links with the way Bach originally performed the piece

with two choirs facing each other from opposing choir lofts. The juxtaposition of new and old ideas required a conductor who could combine a deep understanding of the work along with the flair to carry off its dramatic interpretation—a modern traditionalist. Finding the right person was essential and Consalves spent considerable time searching before he came into contact with Paul Goodwin. Goodwin, had already gained a reputation as one of the UK's finest baroque oboe players, and came highly recommended to Consalves for his burgeoning talent as a conductor. The two met, and it very soon became clear that they had many ideas in common—one in particular was that the work should be performed using old instruments.

'Baroque instruments have a far more interesting sound and there are many more possibilities with them,' says Goodwin. 'They produce more incision and stylistically they suit a theoretical way of playing which goes very well with how we thought the work should be performed. Bach had in mind various instruments that don't exist now, like the oboe *da caccia* (oboe of the chase or hunting oboe) which is used in various symbolic places to completely change the colour. It produces a haunting, unworldly sound that would be impossible to recreate using modern instruments.'

Having decided upon 18th century instruments, the next step was to find people who could play them in the baroque style. Paul Goodwin already knew many of the top players, but apart from ►

**'Bach had in
mind various
instruments that
don't exist now,
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their musical ability, Goodwin was also looking for people who could perform.

'We were after people with a lot of enthusiasm who were not set in their ways, people who could become totally immersed in the production almost like actors. We wanted individuals, and particularly with the choir I tried to put together a group of individual voices rather than a cohesive sounding church choir. As we were using small forces, people would obviously be noticed as individuals in a crowd so I also wanted to be able to hear them as such. The effect is to produce a much richer and varied sound which goes completely against conceived ideas but actually complements what we're doing very well.'

The preparation work for the *St Matthew Passion* started nearly three years ago, and culminated in four London stage performances last year. According to Consalves, the production was a 'sensation', selling out almost immediately. Its success quickly prompted him to investigate televising the production and making a CD.

'We had meetings with the BBC who were very interested and eventually agreed to do it, and we also talked to all the majors record companies who on the whole were pretty disinterested—they saw us as too small an outfit and the production didn't have the big names which they felt would sell it. However, Alan Booth at Conifer records was very enthusiastic, and when he left last year to start his own classical label, United Recording Company, he had no hesitation in signing us.'

Location

By the time deals had been finalised, time was already pressing to meet the proposed Easter screening and simultaneous CD and video (BBC Enterprises) releases. In an attempt to maximise on time and budgets, it was decided to make the programme and the CD at the same time. This, of course, required a suitable location and Paul Goodwin set out immediately to find one.

'Being a religious work, I was ideally looking for a church—and one with a warm acoustic. It was very frustrating; all the available churches with the right acoustic didn't have sufficient floor space and the churches with the space had the wrong acoustic. I went all over the place until finally I came across St. George's in Tufnell Park (North London), which had been deconsecrated in the 1970s and turned into an Elizabethan playhouse. The building had all the ingredients we were looking for plus an added bonus—it was round which, of course, fitted perfectly with the concept.'

The 85-foot diameter auditorium with its 50-foot ceiling offered the warm acoustic Goodwin was after, although he felt that the reverb time was a little short. The building was also reasonably isolated from external noise (apart from the occasional motorbike or police car), and because it had been converted into a theatre, it already offered suitable power and lighting facilities.

The church was booked just four weeks before the scheduled broadcast, which meant a lot of work had to be done in a very short period of time.

Recording

St George's was transformed into a TV studio with Lillyville Productions looking after the video side, and the BBC Transcription Service taking care of the audio. In charge of recording sound for both picture and CD was BBC Engineer Gareth Watson. Watson has worked with the Transcription mobile since 1970 and although his main speciality is recording live rock concerts he sees himself as a bit of an all-rounder. However this project was a first for him.

'As far as I'm aware this is the first time anyone has attempted to produce a CD and shoot a programme at the same time. Logistically it presents all kinds of problems. In fact I'd go as far as saying it's a complete nightmare. There's a continual trade-off between getting the sound perspectives and images right to match the shots, while recording something that is not going to

totally screw up the CD.

'Consequently we've had to adopt a half-way position—for instance, in TV terms if someone is right at the back of the shot you can allow them to go right off mic, in CD terms that's not acceptable so we have to compromise and try and get something that works equally well for both.

'Stereo-wise it's horrendous. Because it's shot in the round there is a 360° layout which means there are times when you get reverse camera angles, and there are a lot of times where the stereo doesn't make a lot of sense with the picture. Also, because the video reference I'm watching is merely a guide being switched between the four cameras, I'm continually having to make guesses at what I think will be the most suitable perspective and imaging to suit a particular section.'

Although the sound was simultaneously being recorded to 16-track digital (two Tascam *DA-88s*), and three Fostex *D20B* time-coded DATs (two 16-bit, and one with a 20-bit Prism Sound *AD-1* convertor using the DRE system), things had to be right first time round as the multitrack was only serving as an emergency backup. Due to time ►

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and budget constraints, no time had been allocated to mixing and all postproduction would be from the source DATs.

Yet another concern was that although an outline of the action had roughly been worked out allowing camera moves, mic positions and so on to be roughly plotted, in reality much of the direction evolved from take to take with Miller improvising as he went.

'We have the added problem of cutting between takes made at different times,' says Watson. 'Although the work is being recorded in sequence, we've also recorded the rehearsals, and editing between that and the following days may prove very tricky—we're only really going to know when Ben comes to edit it.'

Accompanying Watson in the truck was freelance Record Producer and Managing Director of London's Finesplice Mastering, Ben Turner. Although sympathetic to Watson's problems, Turner tended to take a more philosophical view of things.

'Garth has the impossible task of matching the sound as best he can to the pictures he thinks they'll use, while also bearing in mind how this will affect the CD. However, I think one has to take an intelligently relaxed attitude to it and not worry overduly about details, because I do believe that in the end the eye and the ear are more forgiving than theory might suggest.

'I think one has to take an intelligently relaxed attitude and not worry overduly about details'

'The thing that has really saved our skins is working with two highly-skilled boom operators. They've played a major part in the recording and I'm unbelievably impressed. I've had no previous experience of working with booms, but it's incredible in a situation like this where soloists and instrumentalists are moving around, how consistent they can make things.'

The two boom operators remained in constant contact with the truck, with Watson giving direction about coverage and perspectives where

necessary. For the two ex-BBC operators, John Hurley and John Hayes, the experience was also novel, but not that far removed from what they were used to.

'It's not really much different from doing a TV drama,' comments Hurley. 'What we did on the first two days though was quite nerve racking because we ran through the complete work virtually unrehearsed. Luckily it didn't present too many problems because the action is relatively slow—John and I being experienced sitcom boom operators are quite used to moving very quickly, and in the end I think we only missed a couple of small cues.'

The boom mics were mixed together with the other fixed microphones, and despite that fact that this should have theoretically caused all kinds of image mismatches, Watson had very little difficulty in blending in the moving pairs.

'On the whole they mixed in very well. It should have adversely affected the rest of the ensemble, but in most cases the pickup was so small that it rarely caused any interference. I was continually adjusting the stereo width of the booms to fit the overall stereo picture, but there were only a few instances where I had to completely collapse them to mono to prevent imaging clashes.'

Mics on the booms were MS pairs (M-component, Schoeps cardioid; S-component, AKG C460). ▶

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The 22 fixed mics were a mixture of B&K and Schoeps, with all the drop mics being either B&K 4006 omnis or 4011 cardioids, with the exception of

two Schoeps stereo pairs for each chorus and a single Schoeps cardioid covering the centre of the round. Two Schoeps PZMs were also used to bolster

the bases and cellos.

'For a classical recording like this, one is looking for mics that will give you total accuracy,' says Watson, 'and in my opinion the flatter the mic the better it is. One of the aspects I particularly like about B&K apart from their very even, transparent response, is the very smooth off-axis response they produce, which is critical when multimiking an orchestra.'

To accommodate the cameras the microphones had to be positioned out of shot, but this did not seriously compromise Watson's efforts. In fact, there was a general attitude of cooperation between both audio and video crews to try and make things work as smoothly as possible. I asked Ben Turner how the video aspect had affected the way he was working?

'It's a completely different experience. In a straight CD recording you obviously only have the sound to worry about, but although in this situation everyone thinks the sound is important, there isn't the time to focus on it to the same degree. Having said that, it does create some good disciplines—both for us to get our act together and for the musicians to know they're not going to be edited every other bar.'

'There was one wonderful example during a particularly difficult solo violin passage where we only had time for two takes. On the first take ►

Words are not enough...

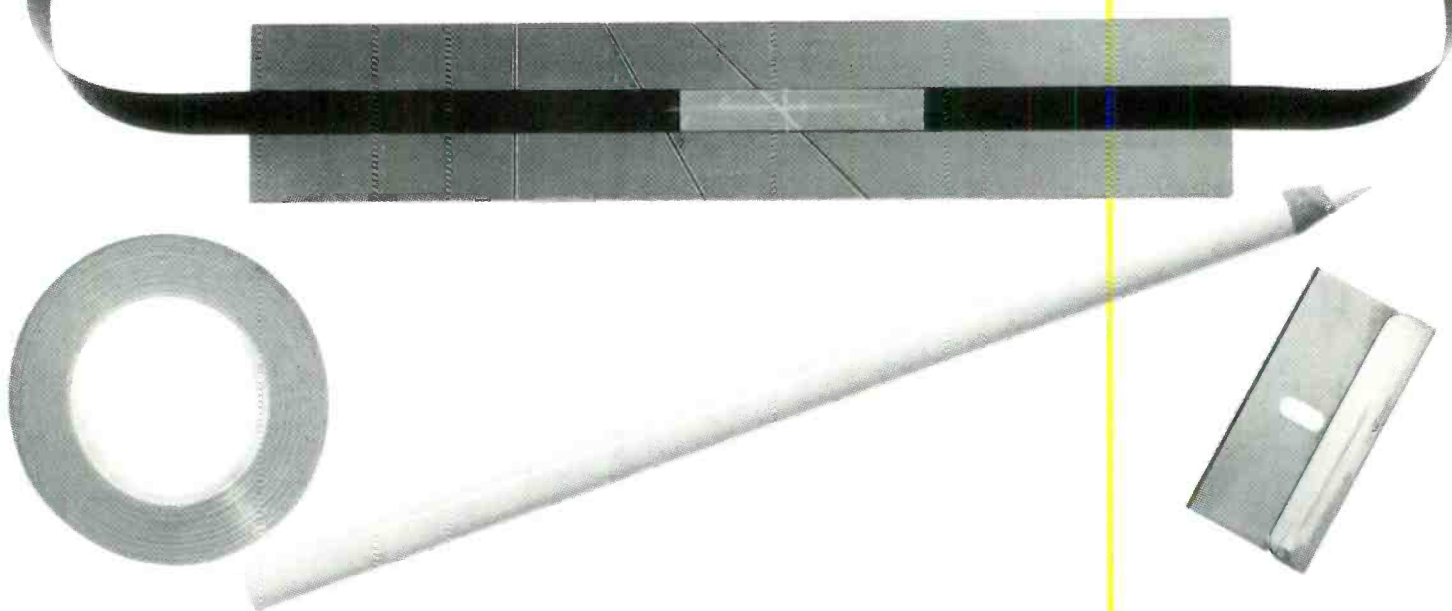


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'I think the gods were really smiling on us, and I would say that about 90% of the edits went together without a hitch'

the soloist got eight bars and I was literally on my knees praying that she'd get it right—and she played it absolutely perfectly. I spoke to her afterwards to say well done, and she gave me this anguished look and said that it was only sheer terror that had got her through it. That sort of thing just never happens in a straight CD recording because there will generally always be enough time to do another take, plus there's the

reassurance that the thing can be put together using masses of edits.'

One of the original concepts of the project was to use longer takes both for video and sound to try to bring out the feeling of the drama. Turner believes this has helped give the work a greater sense of continuity, but had there been occasions where takes had to be made specifically for audio only or video only?

'There was only one occasion where I insisted that we had a different sound for the CD, and that's where Jesus was on the floor singing into the ground—without the picture it sounded very odd, so we recorded a CD version with him standing.'

The *St. Matthew Passion* was made in four days, and only one overtime session was required to complete what in both television and CD terms should have taken considerably longer.

Postproduction

From the recording stage the project went straight into postproduction, with the CD being put together at Finesplice using 20-bit Prism Sound DATs, while the video was edited at London's JCA TV Facilities by Video Editor Tim Hart using the 16-bit DATs.

Turner had the choice of using Sonic Solutions or Sony DAE-3000 editors, but plumped for the latter

which he felt would be quicker to use bearing in mind the stereo image changes he was expecting between takes.

'Fiddling around with stereo balances and widths is probably about three times quicker on the 3000. However, in the end I didn't need to change things nearly as much as I'd imagined, which was really surprising, and even slotting-in takes from the rehearsal recordings worked well. I was expecting to be lucky about 50% of the time, but I think the gods were really smiling on us, and I would say that about 90% of the edits went together without a hitch. Actually what this really points to was how well the whole thing had been recorded.

'There were a few occasions between edits where the chorus was standing on one side of the edit and sitting on the other, which resulted in a bright sound going into a dull sound, and we managed to sort that out with a little bit of digital EQ here and there. I also added some reverb to some of the chorus sections to help them a little bit, but all the solo parts were left as Gareth had recorded them.'

Tim Hart received the DAT tapes about a week after the video tapes, and this meant that he edits the first half of the work by laying down the guide audio from the Betacams to off-line tapes, cutting pictures to that and then conforming onto D3. Once the DAT tapes arrived they were laid back to D3 replacing the guide tracks, and having already ►

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**Alan Parsons and
the new AT4050/CM5**



Alan Parsons will be using Audio-Technica microphones exclusively on his upcoming world tour to promote his latest Arista Records release "Try Anything Once." (CD 07822-18741-2)

'At perhaps the most crucial point in the recording, the Evangelist had sung two words round the wrong way!'

together from takes that I would have preferred not to have used, but it managed to solve the problem. The only other problem I had was from kamikaze files: the recording had been plagued by flies bouncing off microphones, so I had to spend quite a bit of time editing around all these "plops".'

Both the audio and video postproduction were turned around extremely quickly as deadlines loomed alarmingly near. However, just as Ben Turner was breathing a heavy sigh of relief believing everything was finished, he received a phone call from an agitated Paul Goodwin.

'Paul had just listened back to a copy of what we thought was the master, and had spotted that at perhaps the most crucial point in the recording, the Evangelist had sung two words round the wrong way! Nobody had noticed this at the time and there were only two alternative takes covering the section—one of these had a huge noise across the relevant passage where something had dropped off a camera, and the other contained just one usable bar—it got quite critical but with a lot of juggling we managed to patch it up, and the tapes were sent off literally at the eleventh hour.'

Conclusions

Now that the work is finished, and Ben Turner has had time to stand back and reflect, what are his

feelings and impressions?

'I'm not sure it's an exercise I'd like to repeat, although I'm amazed at how well it turned out,' he says. 'I think the CD will stand comparison with the other studio recorded versions, which I wouldn't have believed possible if someone had asked me beforehand. Bearing in mind the way it was recorded and how little time we had to do it, I think the results are exceptional. What I don't know, being so close to it, is whether the feeling of performance and drama comes across. Although I'm certainly aware of it myself, I'll be very interested to know if someone hearing it for the first time can sense that energy and excitement. If they can it will be a great tribute to everybody who has been involved.'

Jonathan Miller gives this view in the CDs sleeve notes; 'It would be wrong to describe this as a record of a dramatised version of the *St. Matthew Passion*, and still left accurate to talk of it as something semi-staged; it is a complete version of what ever it is. Dramatic without being conventionally dramatised, and at the same time musical without being in any sense a traditional recycle. I hope that it lets Bach tell the story in a somewhat more vivid way than a tradition performance allows.' ■

built the off-line list for part two, Hart could then directly conform from the DAT tapes onto the D3.

The audio and pictures generally matched very well apart from one instance as Tim Hart explains.

'There was one place where there had been bit of a mix up. It was during a solo passage leading up to a chorale where the camera perspective and the sound perspective just didn't match at all—it was unfortunately a case of having to piece something

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THE FINAL MOVEMENT

After two and a half years, nearly £17m and a host of constructional conquests, Air Lyndhurst Studios' Technical Manager, Dave Harries' major worries now include wildlife infiltration in the big hall studio. 'We've already had a squirrel in there and a butterfly'—not a small problem when the acoustics can turn a butterfly's gossamer-like flutter into a sound like a spinnaker unfurling in Cowes Week. London's prestigious Air Lyndhurst complex is, we are told, just about—makes-no-odds—finished. *Studio Sound* magazine has followed the move from the Oxford Circus site to Hampstead, we've shared in the frustrations and now rejoice in a great recording facility for the 1990s and beyond.

Hindsight

Whomever you may ask at Air, they will tell you that given the same opportunity to move to Lyndhurst Hall they would have done the same thing all over again. The financial hurdles that were faced and defeated mostly came about as a result of a deepening recession and the perceived shrinking value of the music industry. With hindsight, Studio Manager Malcolm Aitken reviews the decisions made at the outset.

'If we were given more time to actually devote to the project,' he reflects, 'we would have had more time to correlate the facilities to each room more precisely. You can always make it better, and in a huge place like this there are always things that you do as a result of having done something else previously. When we first started here we had different views on what digital machines we would require; we had different views on equipment in general, the original budgets of four years ago only bear some resemblance to what is going in today. What seemed important then doesn't seem that important now, I mean we had a Mitsubishi machine on the first budget—now we would probably be buying some ADAT machines instead.'

'Certainly, areas like postproduction have come on more strongly than we originally envisaged. We're now looking for three rooms by the end of the year. The business plan changes quite dramatically when you view just what type of work you're going for.'

Studio 1

Artists like Elton John were quickly attracted to recording in Air's new rock 'n' roll room. With building delays he had to be appeased and was offered the Great Hall to write and record; he accepted and is still there. Studio One

Julian Mitchell files a report on the final phase of construction at Air Lyndhurst

is now up and running offering about the same amount of space as its counterpart at Oxford Circus. The control room features one of the *Montserrat* Neve consoles especially designed for George Martin by Rupert Neve—the other two ended up at A&M Studios in LA and Bryan Adams' private studio in Vancouver.

The desk has been meticulously put back together with the added benefit of GML automation, which has proved very tricky to install.

Aitken: 'There were only ever three desks built like that, basically it was the front-panel design of the 8078 that they were producing in the late 1970s and they took that as their starting point, but we ended up putting a split-rail supply in it using the brand new audio chip out at the time which was the Signetex 5534 chip with Rupert's own design of transformer, the sound was unique and amazing which is why we've hung on to it for so long. We liked it so much that in 1987 we asked Rupert to build another 16 channels to turn it into a 72-channel console and come 1992 we started a refurbishment programme, which really is pots and switches—a horrendous task—and to put Massenburg's automation on it across all 72 channels. Its going into a Surround sound room so we're installing some extra facilities on the monitor section.'

'One of our young technicians here, Dave Nally, using the *AutoCAD* designed us a couple of boards to go into the switch module so that we're actually automating all the auxiliary sends. He's done a fantastic job. Its still a one-off because although the Massenburg system software supported eight switches, Massenburg themselves had only ever written and made hardware for four. This is the first time anyone has automated all the functions available on the Massenburg system, which is quite a feat.'

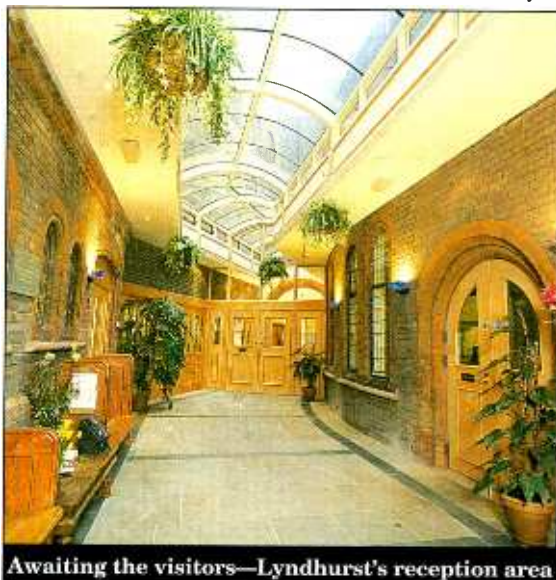
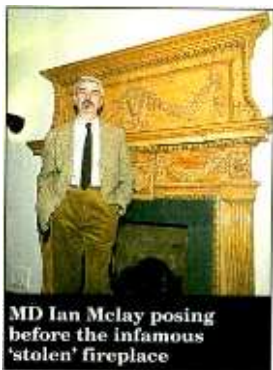
Only rock 'n' roll

Air Oxford Circus was a rock 'n' roll studio—but with the best will in the world you could not describe Lyndhurst in the same 1970s and 1980s way. The new MD Ian Mclay comes

from the world of international orchestra brokerage and agents. He has never worked for a studio before and was head-hunted by Air. The classical world is obviously being courted by the studio in a big way.

One of the original concepts of Lyndhurst was to become a multimedia complex and indeed observers of its creation whispered behind hands that they would be surprised if any music was ever recorded there. Of course this is unfair, and the Oxford Circus legacy is alive and well, but you've got to pay the rent by following the market.

Aitken: 'There is increasingly crossover work between what would





Studio 3 with Logic 2 console

traditionally be in a dub suite and what could just as easily work as a mastering room, it just needs a couple of extra machines and another piece of software, PQ encoding that kind of thing. So the distinctions are getting more and more blurred and you're going to end up with a universal workstation in a matchbox that does everything.

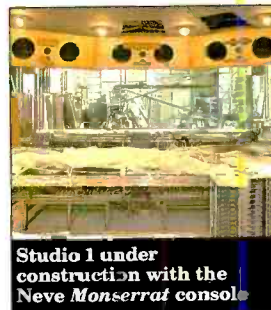
It's true to say that the first generation of any new industry does see incredible innovation, you only have to look at the printing press at the beginning of the 15th century, or the film industry when it first started out. Then methods fixed people's

minds and, certainly, if you look at the film business, there are lots of editors out there who don't understand synchronisation that doesn't use holes down the side of a piece of film. Those methods work and are cost-effective, but you couldn't say they are cutting-edge technology. We might find that we never do make it 100% into the digital domain because there are still an awful lot of people out there who think differently.

'If digital technology had taken off when it was first rumoured in the early 1970s when the first digital delay lines came out and CDs were ten years earlier, you wouldn't have all this talk about analogue, it would have been seriously cost effective to develop digital then. You're finding now that people are balking against the price of digital technology as well as its perceived advantages.'

The key to Air's continued survival and maybe the survival of other such studios is diversification. They must become an audio one-stop-shop and sell their expertise not just their rooms. What does come through when you visit the place and something that must be there is the enthusiasm and the hunger to do well and succeed in a market that will recognise reputations but will never totally adhere to them. ■

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FINNISH FIRST



The auditorium

Zenon Schoepe visits Helsinki —the home of the Finnish National Opera and the world's most sophisticated opera facility

The opening of the brand new Finnish National Opera in Helsinki at the end of November last year

represented something of a triumph for the country—it gave the Finns a showcase centre on which to focus their attentions in a country that boasts at least one sizable public cultural centre in each of their main cities and it has put the country on the audio map technologically. Indeed, if opera sound is

your passion then it is to Helsinki you must go, to see the world's most advanced opera house.

At a total cost of some £125m, the construction and planning has been ongoing since the middle of 1980s in the fashionable and arty waterside region of this handsome city. Architectural designs were first formulated as long as ten years ago and the completed complex is beautiful to behold. The building and the interiors show the characteristic design sense of space, attention to detail and the use of natural materials that has made the Nordic look popular throughout the world.

As is now accepted in such large emporia aimed at attracting paying customers to sit and watch, the sound installation was not a major consideration for the designers on a project of this scale. It is, therefore, a testament to the skill and ingenuity of the audio team at the FNO and Finnish pro-audio company MS Audiotron (who supplied the audio equipment, much of the lighting, and effectively had to design the installation in order to be able to quote for it accurately) that the complex turned out as well as it has.

The £2m investment in audio

equipment pales in comparison to the building's total cost, yet it remains the largest pro-audio installation in Finnish history—and it is very advanced. Two 32-strip AMS *Logic 2* consoles reside in the Opera: one in the unusual role of FOH desk for the 1400-seater horseshoe-shaped main auditorium armed with a specially written snapshot automation ▶





The opera studio

package, the other in a large studio room in the basement surrounded by a 5-channel monitoring system designed to mimic the one in the main auditorium for the creation of sound effects for productions as well as general recording duties.

Head of Sound at the FNO, Kari Tiitinen, is enthusiastic about his choice: 'Once in a lifetime you have an opportunity to buy technology that is leading edge and the *Logic 2* consoles were it,' he says. 'They are the heart and set the quality for the whole system.'

Tiitinen does not consider the FOH use of one of the *Logic 2s* as peculiar, instead he believes it has abilities that make it ideal for this purpose especially as engineers and rehearsals work in shifts that do not always coincide.

'The desk can be instantly reset,' he explains. 'The beauty of the *Logic 2* is that the sound can be balanced in rehearsal, then a completely different rehearsal can be handled, and then the settings from the first rehearsal can be used again for a performance in the evening. Nothing is wasted. With an analogue desk, it is almost not worth bothering too much in rehearsal unless you're prepared to physically switch desks with another one—that's actually what we used to do in the old opera house because it was quicker than resetting them manually.'

Another important benefit is one of consistency—once a sound designer creates a feel for the performance the basic settings can be stored in the *Logic* and give repeatable results for as Tiitinen believes, 'in real terms the difference between operators is greater than the difference between performances.'

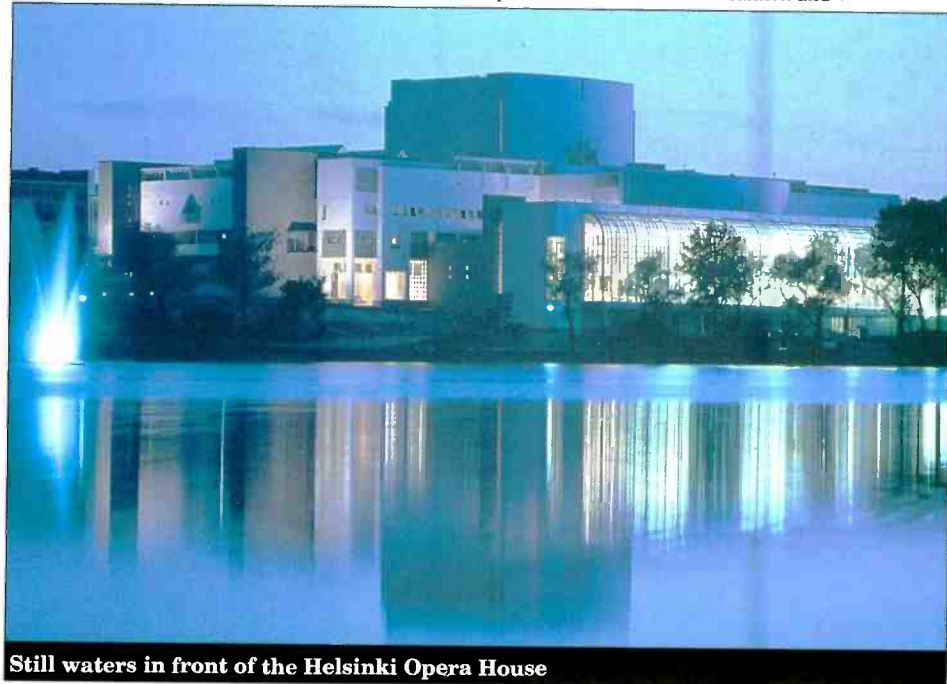
'The *Logic* also has the ability to be different

things for different productions,' he continues. 'We can use all four layers of the 32 channel strips for 128 inputs on a really big project, but it's just as easy to configure it as a 1:1 if that's all you need.'

'And the sound is something else,' he adds. 'I'm 50, I started with valves, and all my life I have been fighting for headroom and against tape noise, and this digital thing is the solution. I'm delighted with 16-bit and the *Logic* is 20-bit capable. This is

the breakthrough; the mixing console has always been the problem.'

The main house system is a 35kW 5-channel LCR and stereo Surround ElectroVoice *MT4* system chosen not for continuous high SPL capability, but for the headroom and extreme dynamics demanded by the variety of material likely to be encountered—from opera through ballet and on to modern pieces with the occasional cannon and ▶



Still waters in front of the Helsinki Opera House

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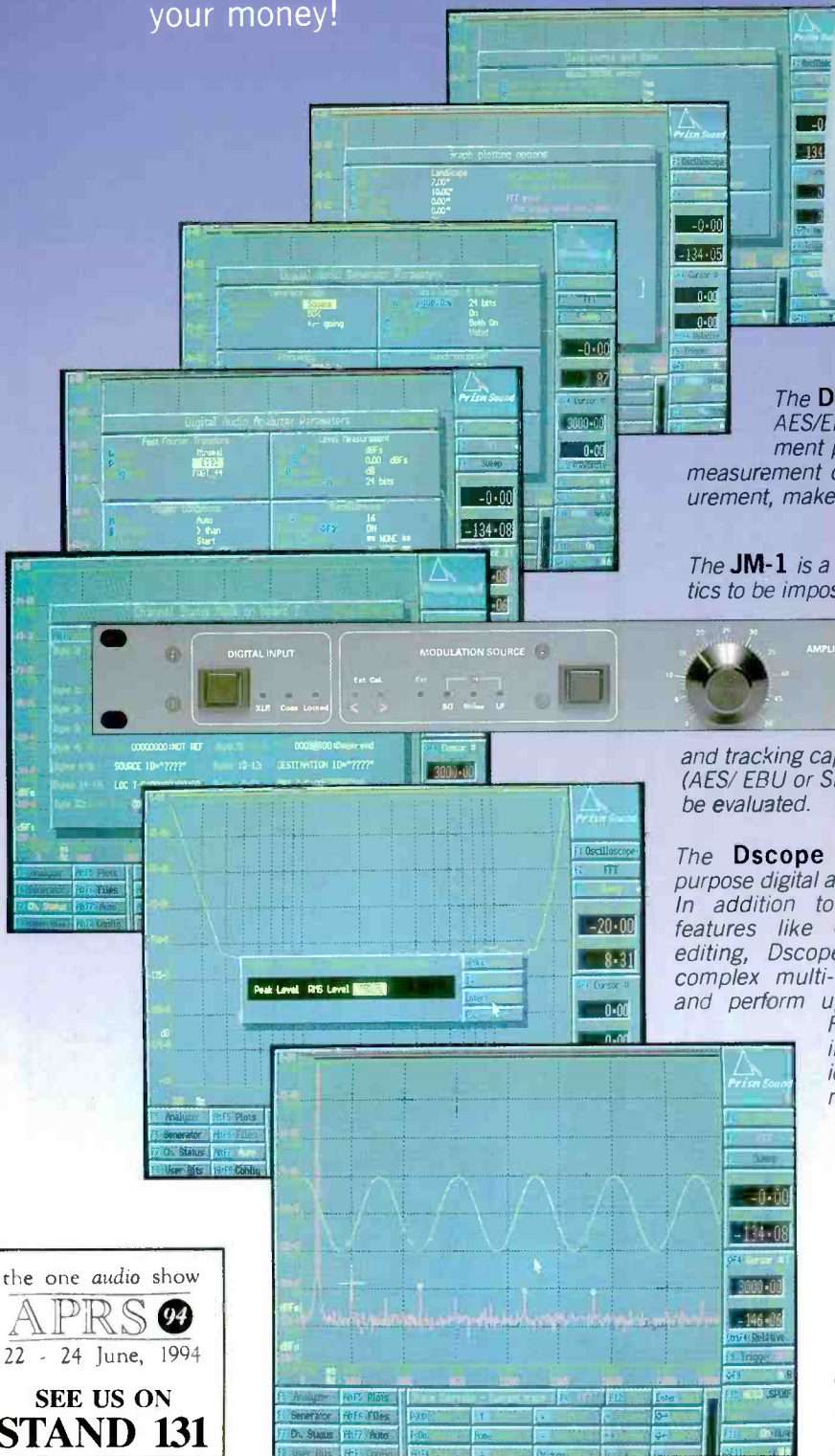
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thunderclap thrown in for good measure.

Tiitinen stresses that flexibility is the overriding concern and he points out that the FOH *Logic* can be wheeled out into the auditorium if needed.

The studio

Apart from recording performances from the main auditorium, the *Logic 2*-equipped studio in the basement can also be used for the preparation of rehearsal tapes for artists with audio and video duplication facilities on the premises. Tied as it is to an adjacent, large, orchestrally-proportioned live area of its own and tie-lined to numerous other rehearsal rooms throughout the complex the studio is pivotal in making the FNO self-sufficient in providing for the needs of performers.

The use of Akai *S3200* samplers and *DD1000* magneto-optical recorder-editors has revolutionised the way the sound engineers at the FNO work, according to Tiitinen. In addition to triggering both remotely for sound effects from the stage manager's box using an MS-Audiotron-designed cueing software package, *DD1000*s are used to create performance playback CD-Rs for touring ballet troupes recorded to their precise requirements using the Opera House orchestra. Tiitinen recalls an instance where a leading ballerina was taken ill and replaced at short notice by another, slightly



The orchestral recording area linked to the studio's *Logic 2*

larger and slower, ballerina with a different style. To accommodate this, Tiitinen re-tempo-mapped the whole piece using time stretch.

The *Logic* studio is also used for sound design in

an environment that duplicates that of the main hall and this side steps the problem of occupying the main auditorium for something so trivial when it could be used for rehearsals.

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Antti Murto, freelance Sound Designer at the opera working on an *avant garde* audience interactive production in the complex's smaller 550-seater theatre featuring—and I kid ye not—seven *Macintosh* computers, ten female fashion models, five Dalmatian dogs and hypnosis in the plot, bears out this approach: 'In a production like that I find that I am constantly needing new sample sound effects for the *DD1000*,' he says. 'I can take my M-O disc to the studio, sort it out and come back with a finished product. It saves me so much time and saves the inconvenience of doing it in the theatre.'

The basement studio is large and, without the financial means to change its height or the walls, the FNO audio team were faced with the problem of how to make it work as a control room. The solution came from Andy Munro and the *System Z* modular acoustic system with Munro designing the room acoustically and visually and installing DynaudioAcoustics *M4s* at the front of the 5-channel system and *C2s* and *PPM* at the rear. Tiitinen is delighted with the result particularly as a 'true acoustician', as he puts it, was involved for the price they could afford and in the time they had available.

A *Soundfield* mic and a total of five Quatec *Room Simulators* are used for creating multichannel effects and while there is talk of a Sony *DASH* multitrack machine in the near future



Sound Engineer Tommi Issakainen at the *Logic 2* front-of-house console

at present most of the stereo single-take recordings are performed either to *DAT* or *DD1000* with units stacked when more tracks are needed. This is a state of affairs of which Tiitinen is justifiably proud.

'The intention throughout is that we convert a sound source once to digital and once back into audio for the audience. Everything else in between is digital,' he says, in conclusion. ■

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VINTAGE REVIVALISM

Dave Foister traces the history of the classic AKG *C12* valve mic and takes an exclusive, in-depth look, at the revived 1994 version—the *C12VR*

The number of pieces of equipment that can safely be called legendary is fairly small, but somewhere on the list is a place for the AKG *C12*.

It may not be the first classic microphone to spring to mind—for many people that position perhaps belongs to the Neumann *U47*—but among its converts it is revered even more highly than its erstwhile rival for its combination of warmth and presence, and its ability to help vocals in particular cut naturally through a mix.

The couple of thousand *C12*s that were manufactured up to the mid-1960s now change hands for very high prices indeed, prices that perhaps indicate a misty-eyed optimism more than hard business decisions; even when new, the *C12*'s sound was quite a variable commodity, and age hasn't tightened the tolerances any. A good one will be worth the asking price, but there is a risk of shelling out for a specimen which has not survived the passing of the years as well as one would have liked. Even fans who own several have their distinct favourites, a fact which was to prove useful when AKG decided to respond to mounting pressure to recreate the classic *C12* sound. The history of the microphone, culminating in the recent launch of the *C12VR* (Vintage Revival), goes back to AKG's earliest involvement with condenser microphones in 1953.

Even as AKG's first condenser model—the imaginatively-named *C1*—was being shipped to South America



Back in fashion and in production—the classic *C12* revived

(of all places), work was already in progress on the development of the *C12*, which was to be the world's first multipattern condenser microphone. The original model incorporated the *CK12* large dual-diaphragm capsule assembly which was to stay with it throughout its life, and the circuitry was built around a 12AY7 valve. The *C12* arrived on the market in 1955, but it was not until 1960 that the version which was to become a classic appeared. Its redesigned electronics incorporated a different valve, the General Electric 6072 double triode, which was the most

suitable device for the job even though only one of the triodes was actually used. These models, by dint of what would now be called badge engineering, also appeared in various other guises, including the Telefunken *ELA M250* and *M251* and the Siemens *SM203*.

In 1962 AKG introduced the *C12A*, which replaced the *C12*'s valve with a nuvistor as a means of reducing the physical size of the microphone—the *C12* is not exactly easy to hide or to squeeze into tight corners. Unfortunately the *C12A* was not well received—the new electronics were ▶

By 1992 it was recognised that the C12's character came primarily from its capsule assembly, and the pressure was on to recreate the original CK12

felt to compromise the characteristic sound too much. Production of the C12 ceased a couple of years later.

The CK12 capsule lived on, however, in the C12A and later the C12B and C412; eventually, in 1971, it formed the basis of the first C414, the *Combo*, which was essentially an FET development of the C12A. It remained at the heart of the various versions of the 414 for many years, and even appeared briefly in a very large figure-8 screw-on capsule for the ubiquitous C451.

By the late 1970s there was growing feedback to AKG that the 414 was felt to be not as smooth-sounding as some of its direct competitors, that perhaps it was a little over-bright, and the decision was taken to redesign the 25-year-old CK12 capsule. The revised version made use of new developments in materials and manufacturing techniques, notably the previously-impossible production of an extremely fine mesh grille to form the acoustic friction element between the two capacitors, and the use of Teflon for the capsule surround and the leadout wire insulation in order to minimise the possibility of condensation forming an unwanted path for the polarising voltages and generally affecting the performance. The result was indeed a smoother, flatter, more transparent microphone, the C414 P48, which with the later addition of the Ultra Linear electronics introduced in the C460 series eventually became the C414B-ULS.

Tube nostalgia

No-one could fail to be aware during this period of the growing hankering after the old valve days. AKG were as conscious as anyone that there was a large body of opinion which held that whatever the capsule, solid-state electronics were no match for what was perceived as the musicality of a valve microphone. They had noted (and were slightly alarmed by) the burgeoning trade in vintage C12s, and in 1983, encouraged by the enthusiasts' desire to see another valve AKG, they launched *The Tube*.

The Tube combined the later version of the CK12 capsule (which had by now completely replaced the original) with the old C12 valve electronics, albeit with modern components and an up-to-date PCB layout. At this point AKG had to deal with a slightly unusual permutation of the problem faced by every manufacturer who tries to reproduce an old design—finding supplies of the original central components. The 6072, in common with other valves, has its manufacturer's specifications quoted in the context of a known standard circuit which bears no relation to its use in the C12. The principal difference is the enormous impedances involved; where the spec assumes a grid resistor of a megohm, the C12 circuit uses gigohms, and under these conditions the manufacturer's specs, and more importantly their QA, become meaningless. In the early days of *The Tube*, AKG were rejecting around 95% of the supplied valves, which is an expensive way of sourcing components. Since then, valve selection to meet the specific requirements of the microphone circuit has been taken on by the suppliers.

The housing was very familiar, but even though the physical resemblance was very strong AKG were careful not to push *The Tube* as a revived C12, knowing that to C12 cognoscenti the personality of the microphone was very different. Despite this, the timing was good and the model has done well.

By 1992 it was recognised that the C12's character came primarily from its capsule assembly, and the pressure was on to recreate the original CK12 so that a true reconstruction of the C12 could be produced. This is where the enthusiasts and collectors came in; investigations and listening tests with a variety of borrowed original C12s and noting owners' and other people's preferences enabled AKG to quantify the factors which gave the microphone its distinctive sound. Examination showed that the critical extra presence of the microphone came from the laminated construction of the capsule support assembly, and that variations in this assembly were giving rise to the variations in the perceived quality of the various specimens.

Perforations in the laminated layers, deliberately misaligned so as to produce a convoluted acoustic path through the structure, formed the friction element between the back plates—precisely the component which had been replaced by the fine wire mesh in the later CK12. The staggering of these holes between successive layers of laminate provided the necessary acoustic resistance required for correct cardioid operation of the two transducers, but at the same time formed a series of tiny resonant cavities. These were producing a distinctive double-humped presence boost from about 3kHz upwards, with a significant peak at about 4kHz and a second slightly larger one at around 8kHz.

The comparatively crude manufacturing tolerances of the early 1960s meant that no two sets of laminations were the same. The perforations were not a constant size, the alignment between them varied from one capsule to another, and the resulting resonances were sufficiently different to produce a significant ▶

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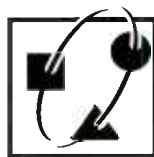
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variation among the microphones' frequency responses. The task now was to produce a capsule which would reliably provide a resonant network between the backplates similar to that in the best-liked of the available *C12*s.

A return to the original method of construction was out of the question—it would now be prohibitively expensive and the problems of predictability and consistent performance remained. The same acoustic effect had to be obtained a different way, and it was the eventual development of a method of achieving this—the details of which AKG are keeping secret—which led to the creation of the third version of the *CK12* capsule.

Capsule recovery

The new capsule first appeared in a special version of the *414* in order to gauge users' reactions to it in the real world. Distinguished by its golden grille and engraving, the *C414B-TL II* is specifically targeted at the vocal-

recording market where the old *C12* is held in such high regard, and has already been enthusiastically received in these and other quarters.

The logical next step was to mate the new *CK12* capsule with the modern valve electronics from *The Tube* to produce something which could genuinely be seen as a re-creation of the classic original, and the result is the *C12VR*, launched at the Amsterdam AES and unashamedly presented as a revived *C12*. The housing of the microphone is, of course, the same shape as the original, but it now has an eye-catching golden grille contrasting with a distinctive yet restrained bottle-green body. The whole thing is beautifully finished, as befits its price and pedigree, and it is no surprise that it is assembled almost entirely by hand. Indeed, most of AKG's microphones are still built this way, as a recent visit to the new factory on the outskirts of Vienna showed; it almost seems incongruous in such high-tech surroundings to see small groups of workers assembling the components of, say, a *414* manually, but it is clearly the only approach when such precision is required in what is comparatively very low volume production.

The new microphone retains *The Tube*'s electronics intact, complete with the modification which allows the second, previously unused, triode



AKG *C414*s being assembled

to provide an extra 10dB of gain. This is for the benefit of those who need more level out of what is by nature not a very sensitive design, but since it is a departure from the original circuitry the relevant switches are board-mounted inside the microphone. My only beef with this is that it is not possible to tell by looking whether a particular microphone is set up as an 'authentic' *C12* or has its extra gain switched in. The only accessible control on the body is a recessed pad switch which can attenuate the output by 10dB or 20dB; polar patterns and bass cuts are dealt with remotely at the power supply.

The body has, of course, the same kind of substantial weight as the original, and despite its obvious solidity the presence of a vacuum-filled glass envelope inside it could be a worry. With this in mind, the valve is supported at its base with a spring suspension and at the other end with a rubber cone; this should not only protect against shocks but avoid any risk of the valve's own possible microphonic effects becoming a problem. Even with all this protection, AKG still take the trouble to point out that a shock could cause the valve's heater filament to fail and advise careful handling—as if anyone could bring themselves to treat the thing any other way. ▶

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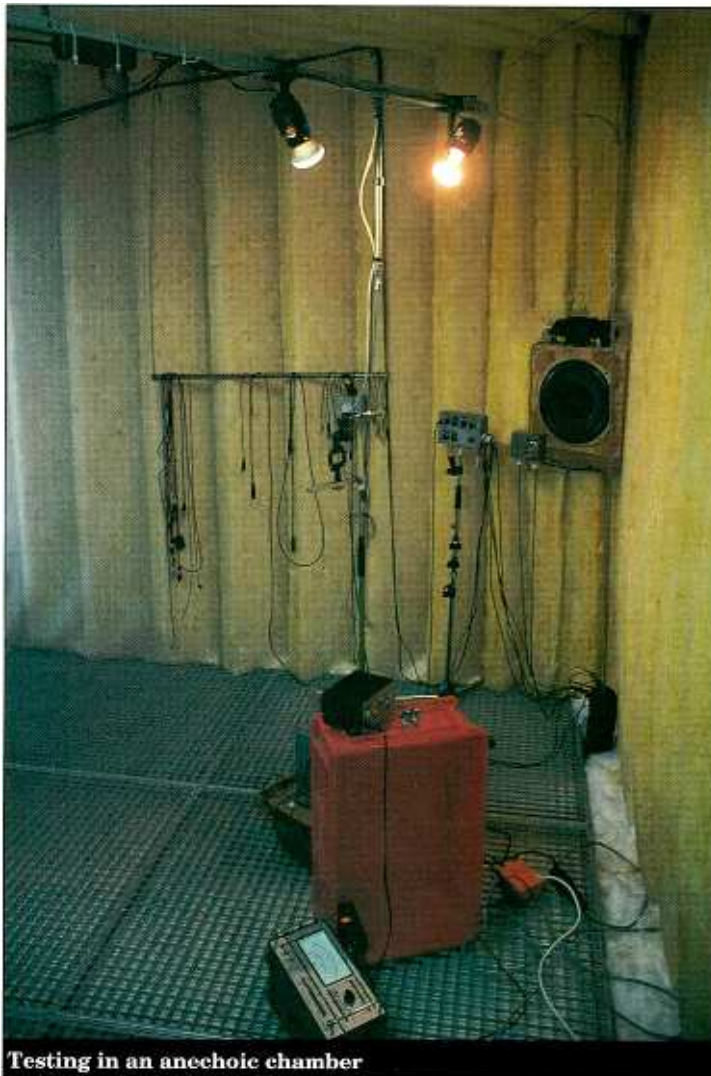
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A simple elastic suspension is the only means of mounting the C12VR on a stand. This has the familiar AKG 4-pointed knob on its swivel for locking it off so is not prone to the droop like some I could mention; on the other hand, for a microphone this big and heavy a suspension which clamped it in two places rather than just the one might have been more appropriate, and would have avoided the slight flopping about which can happen if you do not get the clamping band near enough to the centre of gravity.

Ten metres of decent-looking multicore link the 12-pin Tuchel connector at the base of the microphone to the power supply, carrying audio to it and capsule polarising voltages, controlling the polar patterns, from it in the usual way. At this point any surface resemblance to the original C12 ends. The old power supply looked like a refugee from a battleship's radio room, all Bakelite and metal corners, but the current version is much more in the style of AKG's other remote boxes. It still carries the enormously versatile 9-position polar pattern switch, ranging from omni to figure-8 with cardioid in the middle but offering six further intermediate positions as well. The flexibility these subtle variations on subcardioid and hypercardioid can offer in terms of balancing



Testing in an anechoic chamber

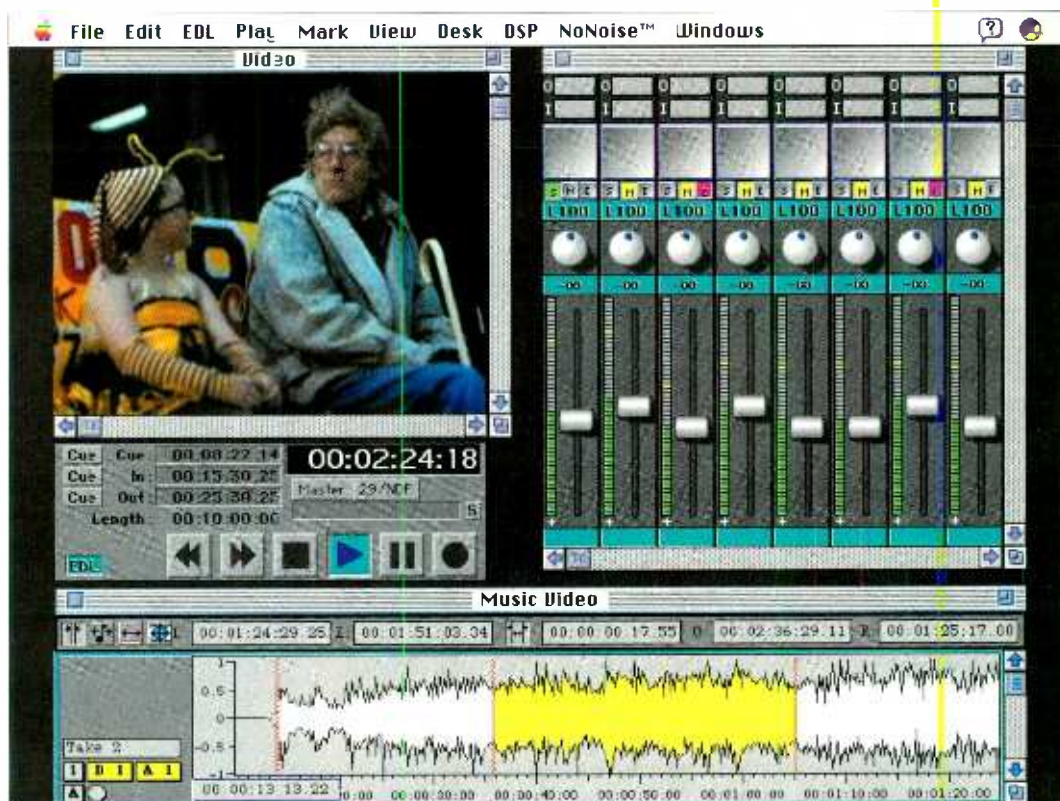
direct and ambient pickup is a luxury often forgotten these days, although it used to be far more common—there was once even a remote-controlled 414 with the same selection of patterns.

There is also an LF switch which instead of having two cutoff frequencies offers a choice between gentle roll-off and a steeper slope at a similar (sadly unspecified) frequency. These filter settings are very useable and usefully distinct from each other, but clearly meant for subtle correction—the turnover frequency is too low to have much effect on serious LF problems. The box's front panel carries these two controls plus the power switch and associated LED, while the final output (at microphone level of course) appears at a male XLR on the rear alongside the Tuchel multiway and the captive mains lead—an increasingly rare sight.

The package is completed by a foam windshield, which is lightweight enough to have virtually no effect on the sound but effective enough to deal with a close breathy voice. All these accessories are supplied as standard—there are no optional extras—and come fitted in a proper chunky aluminium flight case complete with shoulder strap and the microphone's name and logo in huge black letters on the side. You might say that at this price you're entitled to expect all the bits and pieces thrown in, but since there are, apparently, some manufacturers who would disagree with ▶

The old power supply looked like a refugee from a battleship's radio room, all Bakelite and metal corners

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STUDER D827



Studer's digital multitrack machine with its remote

The overall presentation of Studer's *D827* is quite a departure from the traditional 'built like a battleship' look that we have become accustomed to. As intended, the light grey and wine red livery with curved edge-pieces underlines the new attitudes presently being expressed by Studer. For anyone used to the previous Studer digital machines (such as the *D820-48*), the *D827* is considerably smaller and lighter—a step in the right direction for those studios where space is at a premium.

Though their market presence up until now may belie the fact, Studer have been among the front runners in digital recorders. I recall using one of the very first machines on a mobile (!) recording at the Willisau Jazz Festival back in the early 1980s. This was an 8-track project and, from the start, the

audio quality was superb. As often happens with small to medium-sized companies, the effort and investment required in sustaining aggressive R&D proved to be a considerable drain on Studer's resources and this explains, in part, the delayed commercialisation of the company's digital recorders. The *D827*, however, succeeds in putting Studer back in the front line, and though the machine owes a lot to the *D820-48*, it

can be considered as a completely new machine rather than a derivative.

The main contribution from its predecessor is the tape transport and, though further refined, this forms the mechanical basis of the machine. Swiss high-precision mechanical engineering is presented in its best tradition and offers extremely high speeds coupled with very gentle tape handling.

The other basic characteristic of the

Launched last year, the Studer *D827* digital multitrack is now available as a production unit. Terry Nelson visits Studer's Regensdorf headquarters for a hands-on session and an update on the machine's 24-bit status



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Mike Spike Drake (producer):

"I use 996 all the time for mixing, running '1/2" at 30ips without noise reduction. It just sounds really nice - especially good at the bottom end and with no apparent noise. Projects always sound more like a finished album when they're coming back off 996."

John Leckie (producer):

"996 impressed me the first time I heard it and I've been using it ever since. The amazing lack of hiss enables me to work without noise reduction and the tape is remarkably free of compression effects. And much material sounds almost better on replay than it did going down!"

Avi Landenberg (Chop Em Out):

"We use 3M AUD cassettes in our mastering suites - their very low error rates provide us with extremely reliable and cost-effective performance. The 20 bit technology used in our High Resolution Mastering demands the utmost consistency - we get this quality from the 275LE open reel tapes, which we use for our archive safety copies."

Tom Fredrickse (producer):

"996 gives you the kind of punch you just can't get from digital. I use the tape to the full, often slamming the levels very hard indeed but it all comes back sounding good. I used to think that to record ballads you needed digital but with the lack of hiss on 996 I don't have that restriction any more"

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and AUTO MUTE.

The upper panel is divided into two sections and houses all transport commands, together with autolocator controls and two alphanumeric readouts, to the left and centre with the right end containing the controls for the Sound Memory.

The top of the panel has LED readouts showing the general status of the machine (Record mode, sampling rate, TC status and so on) while below are the alphanumeric readouts for the actual tape position and cue positions, keypads for programming the autolocator, varispeed, pre and postroll values, together with the main transport keys.

Memories are made of this

The Sound Memory provides a selection of useful functions and these can be grouped into three areas: track slipping, sampler and track bouncing. These allow such functions as editing, copying sections (such as choruses) to various tape locations and flying in parts. The basic capacity of the Sound Memory is 45s mono or 11s per track. However, this can be optionally expanded to 180s mono.

In Track Slipping mode, all tracks are synced to the reference track and the Sound Memory allows up to four tracks to be delayed and copied to other tracks.

A digital delay allows the different 'tracks' of the Sound Memory to be offset against the principal signals on tape and the delay time is displayed in the alphanumeric display at the top right corner (this displays either delay time or memory length).

The Sampler mode allows segments of up to four of any of the 48 tracks to be sampled and copied to any other track. The facility has a loop function which means that segments can be repeated as required.

Track bouncing allows four tracks to be copied simultaneously to other track locations.

Operation of the remote control falls into the category of Options on the D827 and we can now look at the various possibilities that are available.

The Remote Level Display is a high-resolution remote meter assembly for the easy monitoring of recording levels.

The SetupHandler program runs on Apple Mac computers and allows all machine parameters to be accessed and stored or recalled, thus providing an easy and efficient way of storing information for different sessions and allowing different setups to be recalled at a moments notice.

As the SetupHandler provides full display of all 48 tracks, it also extends the possibilities for track bouncing. Ping Pong allows one track to be copied to as many other tracks as required and bounce mode allows up to all 48 tracks to be bounced together—that is, 48 to 48.

Options and additions

In addition to the audio interfaces of the standard machine, an SDIF2 interface is available as an option in order to cover all eventualities. In the same vein, the machine can be supplied with optional very-high quality A-D and D-A

convertors for when the machine is going to be used in a mixed analogue and digital installation.

A further option to accompany the A-D convertors is a noise-shaper board which effectively provides a subjective 18-bit performance from the 16-bit format.

The Parallel Audio Interface option allows the machine to be controlled from a mixing console for such functions as Track Ready, Track Record and so on.

The new record head option is recommended for users requiring a write-read-write format. This allows operations such as tape-source monitoring (New Rec mode), electronic editing in Assemble mode or the standard operation Insert Record mode (read before write).

One of the most significant options for the D827—as well as the latest—is the expansion to 24-bit operation. This option is fully retrofittable and means that the machine is 'future proof'—with the move towards 18 and 20-bit digital audio, the D827 can be expanded as required. The actual expansion boards will be available from November this year but all machines are 24-bit ready.

Conclusion

The D827 is an innovative machine that is a worthy successor to the Studer line of tape recorders. The System Core approach provides an economical way of providing high-quality multitrack digital recording that can be then tailored to individual requirements without paying for features that may not be required.

The machine is very much 'upwardly expandable' and can be supplied as a 24-track machine ready for future expansion to 48. In terms of economics, if 48 tracks are likely to be required in the foreseeable future, then it is better to have the machine supplied with the 48-track heads from the outset. This will avoid expensive head replacement costs. The machine can also be expanded by eight tracks at a time, rather than going immediately to 48.

Lastly, the 24-bit capability means that the machine is likely to be around for a long time to come and be compatible with future digital audio standards.

Operationally, anyone used to digital recording will have no trouble at all in getting to grips with the machine as it is very user-friendly. Studios upgrading to digital multitrack from analogue should again have no problems though first-time users will need to brush up their digital applications for the proper use of recording modes, formatting and so on in order to avoid frustration.

However, the proof of any pudding is in the eating, and I found the Studer D827 a most enjoyable machine to work on. ■

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The attention lavished on the American film industry's Academy Awards is second to none. James Douglas discovers how the live sound system is handled

Few of us are immune to the magic of the movies. And when the motion-picture industry gathers to award themselves the highest accolades, a television audience numbering in the hundreds of millions avidly await each Oscar announcement. The annual event, carried live to many countries around the world, also attracts a large audience in the Dorothy Chandler Pavilion, which forms part of LA's famed Music Centre, downtown. Here, several thousand of the world's most famous faces gather to pay tribute to their peers, in the form of the *Annual Academy Awards*.

Handling live sound for the Dorothy Chandler Pavilion is not without its difficulties. Designed primarily for classical music concerts (and, incidentally, serving as the winter home of the Los Angeles Philharmonic Orchestra; the summer is spent at the Hollywood Bowl), the venue features a permanent sound-reinforcement system, but one that is considered far too modest for the Oscar ceremonies. Particularly the live performance of nominated Best Song, which this year included Bruce Springsteen's *Streets of Philadelphia*, Neil Young's *Philadelphia*, Janet Jackson's *Again*, a duet of *The Day I Fall In Love*, by Dolly Parton and James Ingram, plus Keith Carradine's *A Wink and a Smile*.

Each year the Academy of Motion Picture Arts and Sciences prepares a technical specification for the assignment, and seeks bids from competent sound companies. Last March, for the sixth

consecutive year, the contract for the *66th Academy Awards* was awarded to Burns Audio, a sound-equipment rental firm based in Sun Valley, California, and who have also handled similar duties for previous Grammy awards and similar events. All loudspeaker components for the custom-designed sound rig were supplied by Apogee Sound. System design was by Patrick Baltzell, a leading freelance Sound Mixer who specialises in live, televised events such as the Oscar ceremonies.

Commenting on the choice of loudspeaker systems for his rental inventory, Bruce Burns, President of Burns Audio, offers that his main criteria are the 'exceptional sonic quality, ruggedness and predictability of the Apogee line. All of the different Apogee speaker models can be used together in different areas of the house, and the result is one large, integrated system.

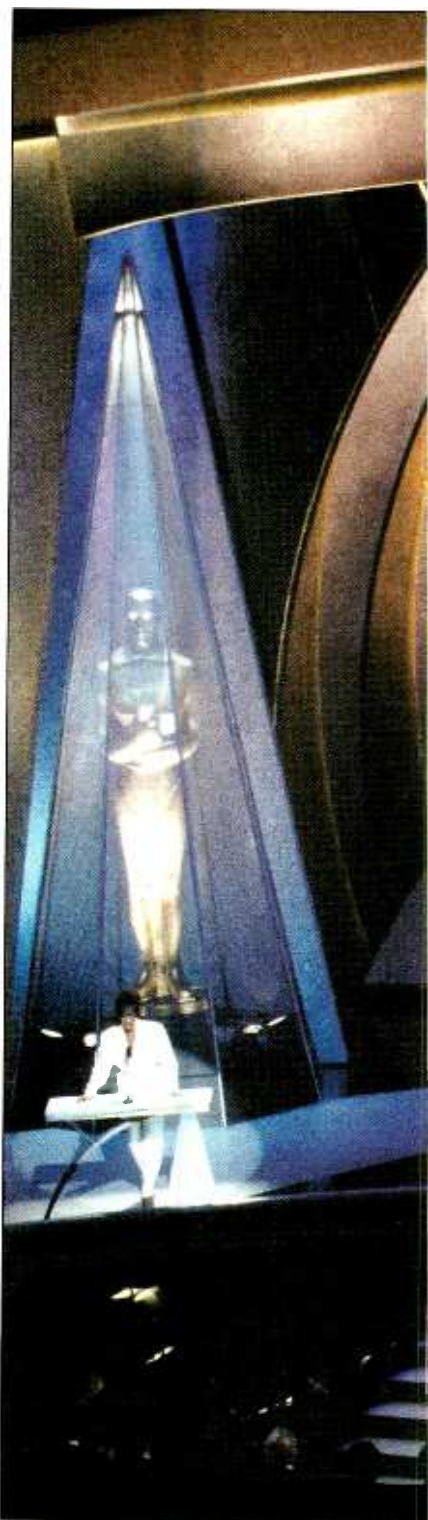
'We also use Apogee speakers for theatres, sports arenas and outdoor shows,' Burns continues. 'The results are uniformly excellent.'

The Dorothy Chandler Pavilion

As can be seen from the diagram, the speaker system consisted of a pair of stacks flown either side of the stage area, each array comprising four, tri-amped, 3-way 3X3S2 concert loudspeakers for main left and right, front-of-house sound. Eight 2-way AE-3S2 loudspeakers were provided for front fill, while an additional pair of AE-3s and five wide angle AE-2S2 loudspeakers were used for under-balcony fill. Four bi-amped, 2-way AE-5 units covered the first and second balconies, while five AE-5NC (Narrow Conical) loudspeakers covered the top balcony.

For on-stage monitoring, four additional 3X3s were used for side fill, while eight bi-amped, 2-way AE-6B monitors and eight 2-way AE-3MS2 monitors provided foldback for the performers. A mixture of Apogee and Crest amplifiers powered the custom system.

Both Gamble and Soundcraft consoles



Sound Mixer Patrick Baltzell (left) at the helm



Whitney Houston addresses the audience of the 1994 Academy Awards

THE ACADEMY AWARDS

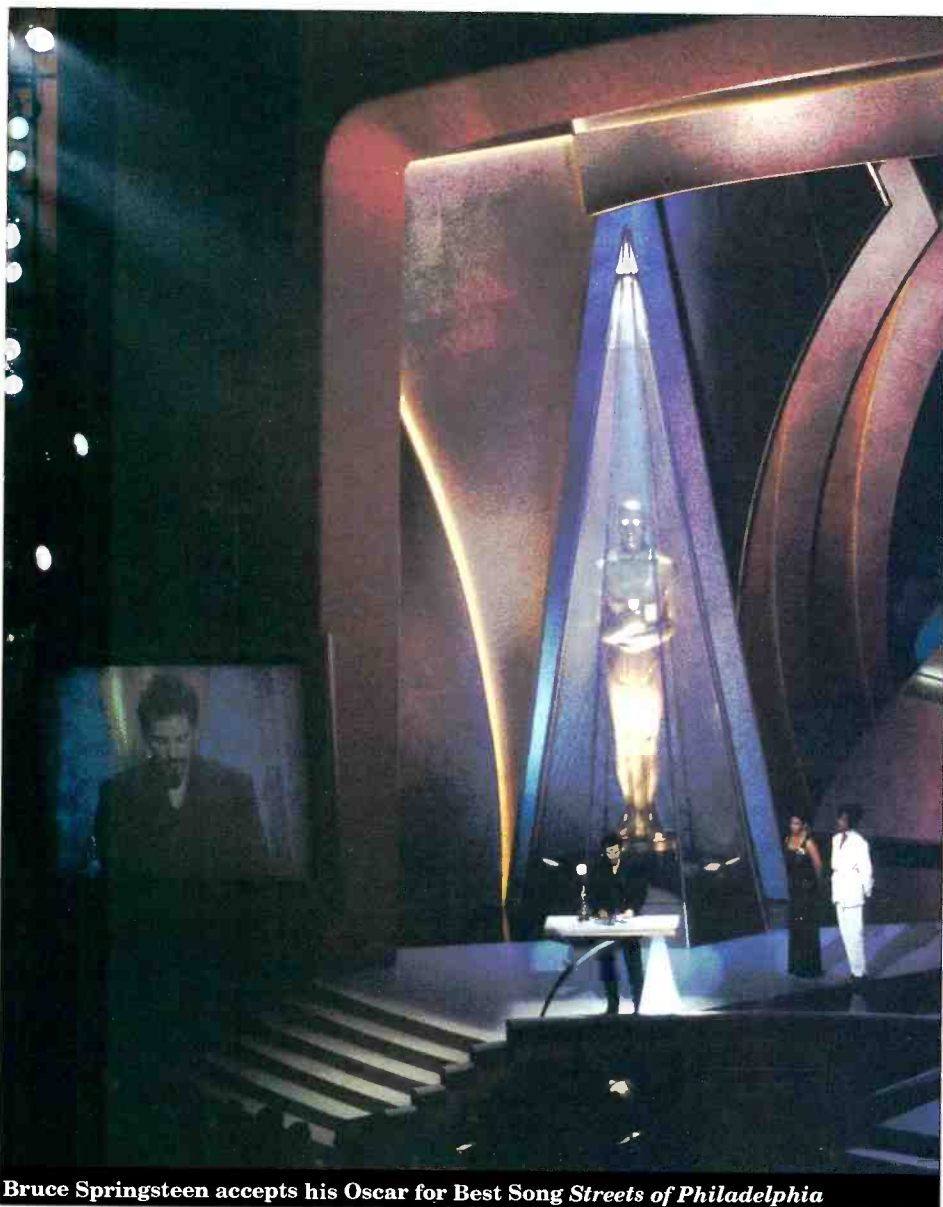
across the truck, and enjoy far greater room in which to work than would be available from a conventional design. The live TV mix was handled by Paul Sandweiss, with orchestra submixing by Lee de Carlo.

According to Sound Mixer Patrick Baltzell, the main 56-input Gamble *EX Series* console, located in the centre of the Founder's Circle, was set up with eight main matrix outputs, plus three auxiliaries. 'I assigned Matrix 1 to the left-outside 3X3 cabinets; Matrix 2 to the

left-inside 3X3s; Matrix 3 and Matrix 4 to right-inside and outside 3X3s; Matrix 5 to the centre AE-5 located on the top of the proscenium; Matrix 6 to the AE-5s located on the sides to cover the first and second balconies; Matrix 7 to the AE-5NCs up in the third balcony; and Matrix 8 to the under-balcony AE-2 and AE-3 cabinets. Aux 1 was assigned to the front-fill AE-3s; Aux 2 to the [self-powered] Fostex minispeakers [arranged along the back of the third balcony]; and Aux 3 to the subwoofers.

Room EQ

Like most venues, the Dorothy Chandler Pavilion presents an interesting technical challenge. While the shell design may prove more than adequate for classical music concerts, for events such as the Oscars, a multichannel sound reinforcement system is essential. Covering various areas of the well-heeled audience areas means that the main sound system must be augmented with additional side and rear-fill ►



Bruce Springsteen accepts his Oscar for Best Song *Streets of Philadelphia*

subsystems, coordinated from the primary mix position in the centre of the Founder's Circle. But multiple sound sources can cause additional equalisation problems, as the contributions from multiple speakers interact with the room acoustics and combine at the audience position.

The responsibility for bringing some much-needed science to the art of sound reinforcement fell to Apogee Sound President, Ken DeLoria, using the firm's *CORREQT* (Computer Optimised Room Resonant Equalization Technique). As DeLoria explains, '*CORREQT* was developed during the past six years in response to a requirement from sound designers and consultants who wanted to minimise the contribution of a room's acoustic characteristics. Because of the linear response of our loudspeakers, it became relatively easy to identify the secondary characteristics of the acoustic environment as representing the greatest variable, and the largest contribution to overall system nonlinearity.'

CORREQT comprises a set of calibrated B&K

microphones (normally Model 4007 or 4011s); a dual-channel FFT spectrum analyser (normally a Hewlett-Packard 35665A); a signal router for accessing the various system I-Os (the Apogee unit handles six microphones and six equaliser channels, and is expandable); a high-quality digital delay unit; plus a computer controller running the custom-developed EQ software, and which interfaces to the spectrum analyser via its HPIB port.

Utilising a test signal that Hewlett-Packard refer to as 'periodic noise', or the show's programme material itself, overall system response of a venue can be quickly assessed. EQ curves implemented with the firm's *CRQ-12* multimode parametric equaliser can readily subtract much of the room's undesirable acoustical characteristics.

'Because the Dorothy Chandler Pavilion is basically symmetrical,' DeLoria recalls, 'for the Oscars I first positioned my six microphones on the left-hand side of the audience area, within the first third of the hall — the "expensive seats"! Having ▶

OSCAR CEREMONIES LOUDSPEAKER SYSTEMS



Apogee AE-2S2

- The *3X3S2* is a 3-way loudspeaker for applications requiring very high power response in a fully horn-loaded and arrayable trapezoid enclosure; components comprise two 15-inch LF drivers, a 2-inch MF driver and a 1-inch HF tweeter.

Dimensions: 31 x 30 x 45 inches; 275 lbs.

- The *AE-2S2* is a wide-angle, low-profile 'under balcony' loudspeaker designed for front audience-fill applications; components comprise dual 8-inch LF drivers and dual horn-loaded HF compression drivers.

Dimensions: 13 x 12 x 34 inches; 40 lbs.

- The *AE-3S2* is a small, versatile high-power loudspeaker; components comprise a 10-inch LF driver and a horn-loaded HF compression driver.

Dimensions: 11 x 13 x 16 inches; 37 lbs.



Apogee AE-5

- The *AE-5* is a 2-way, trapezoid, fully arrayable bi-amped loudspeaker designed as a modular unit for music and speech systems; components comprise a 12-inch LF driver, and a 1-inch throat horn-driver.

Dimensions: 14 x 17 x 23 inches; 80 lbs.

- The *AE-5NC* is a 2-way, trapezoid, bi-amped loudspeaker featuring a Narrow Conical horn for long-throw applications; components comprises a 12-inch LF driver, and a 1-inch throat horn-driver.

Dimensions: 14 x 17 x 23 inches; 80 lbs. ■

The desk with a high EQ

62 four band swept Equalisers on the standard 32 input frame size to be exact!

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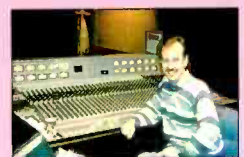
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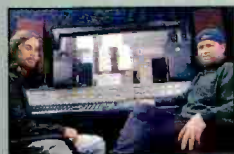
Mike Picking & Peter Day. Mike Stock's Studio
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GRAMMY AWARDS LOUDSPEAKER SYSTEMS



The Apogee 3X3S2

For the sixth consecutive year, the recent *Annual Grammy Awards* utilised an all-Apogee Speaker System. Held at Radio City Music Hall, New York, the event places a high demand on the installed sound system and mixing crew. This year the front-of-house system consisted of 22 Apogee 3X3S2 concert loudspeakers and 12 AE-5 NC loudspeakers. Twelve AE-3S2 loudspeakers were used for front fill. Also featured were eight Apogee AE-15 subwoofers. Identical in size to the 3X3S2, AE-15s provides extended bass with a fast transient response time, adding 'punch' to the music without muddying up the bottom end, according to Apogee. The AE-15 employs four fluid-cooled 15-inch drivers in an articulated baffle arrangement, yielding exceptional mutual driver-loading properties.

Stage monitoring consisted of 16 AE-6 and AE-6B wedges, with 12 of the new 2-way AE-8B wedges. The AE-6 and AE-6B employ a 12-inch LF driver and a 1-inch horn, while the AE-8B utilises a 15-inch LF unit and a 2-inch throat driver. Side fill monitoring was achieved with four 3X3s located in the wings.

The custom system was designed by Patrick Baltzell, who also mixed the show's music. 'The new AE-15 subwoofers provided us with all the low-end punch that we needed,' he recalls, 'without producing the low frequency 'mud' usually experienced in the Radio City Music Hall.'

Burns Audio, with sub-contracted assistance from Muse Productions of Birmingham, Alabama, provided the all-Apogee Sound system. According to Murray Allen, Senior Sound Designer for all of the show's audio requirements, 'several pro sound engineers in the audience stated they thought it was the best sound ever heard in Radio City Music Hall. The system, especially the bass, was focused, defined and transparent. The overall audience opinion was that the sound was fantastic!'



Apogee AE-3S2

One major advantage of **CORREQT** is that fine adjustments can be made continually during a performance, compensating for acoustical changes

averaged the pickups from the B&K mics, and measured the room response, I took that EQ curve, inverted it, applied it to the feeds to the left-hand house system, copied it and then also applied it—because of the room symmetry—to the feeds to the right-hand house system.

'We then repositioned the B&K measurement mics into the centre of the main audience area, and checked the overall left-right response, and made some further, minor adjustments to the EQ curves. We try and maintain the same corrections, where possible, to the left and right stacks, to ensure an even response across the auditorium.'

'Having adjusted the main house system, we moved the mics into the back of the auditorium, and began to equalise the system response in those rear areas. Having first measured the response from the main left and right stacks, we then loaded an inverse of the EQ curve into the equalisers feeding the four rear-fill AE-2s and pair of AE-3s under the balcony. We then moved onto the Founder's Circle, repeating the procedure for the pair of side-fill AE-5s, and then the AE-5NCs for the top balcony. Because of their distance from the main systems, we equalised by ear the array of self-powered Fostex monitors located in the far back of the top balcony. Finally we adjusted the subwoofer feeds.'

'All in all, the process took just under half a day, and allowed the sound crew to begin sound checks and other duties well in advance of the dress rehearsals and run-throughs prior to the live broadcasts.'

Because the rack of equalisers was located close to the mix position, during the rehearsals we could also make minor adjustments to the stored EQ curves. In general, however, once the curves had been taken and stored in the computer, they remained pretty stable for the entire event. One major advantage of **CORREQT**, however, is that fine adjustments can be made continually during a performance, compensating for acoustical changes that occur when the audience is present.

Sue Arrington, ABC Television's On-site Technical Manager for the Oscars, was enthusiastic about the results in the auditorium. 'I'm extremely pleased with the excellent sound quality throughout the house,' she says. 'From an audio standpoint, the event was a major success.'

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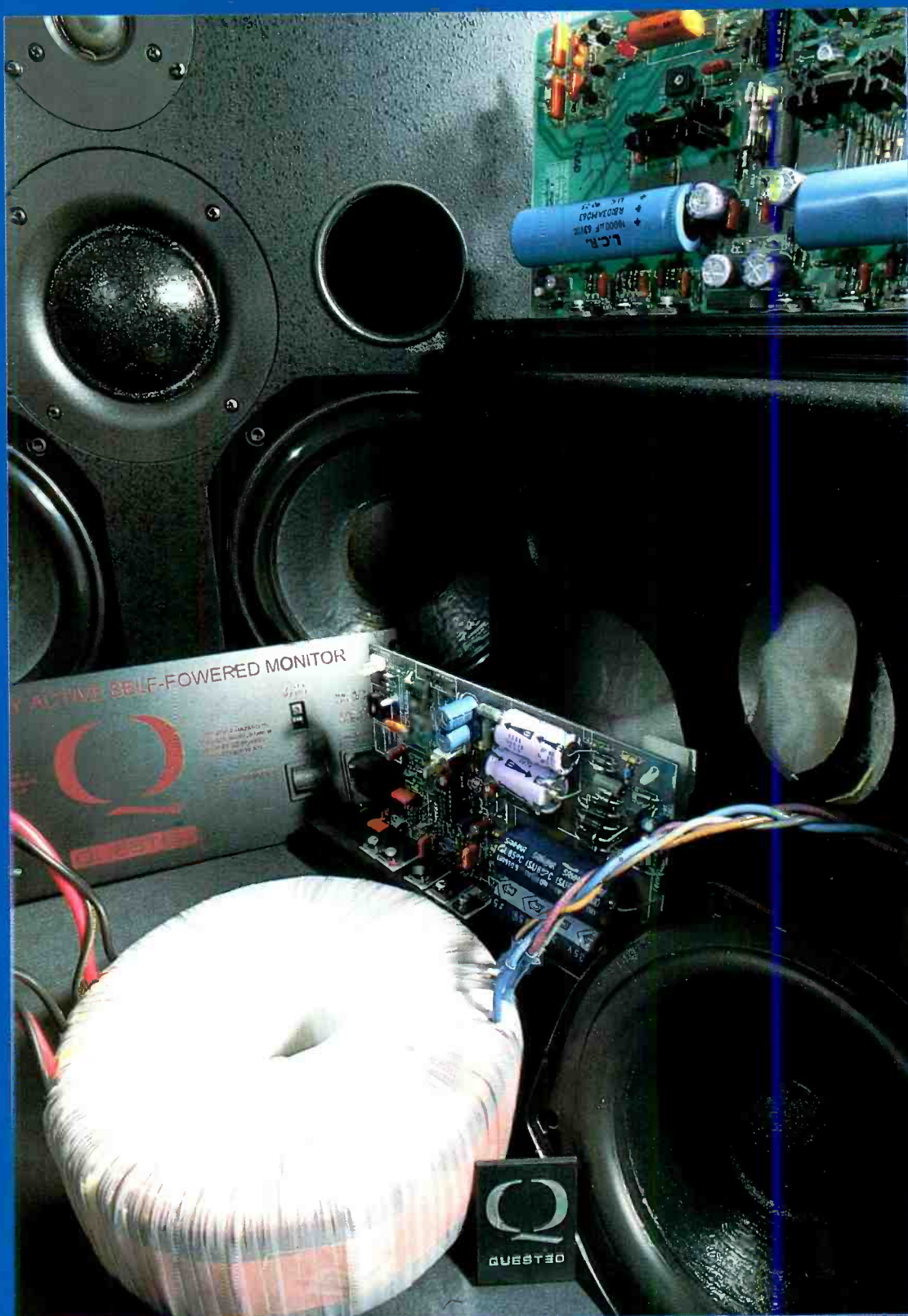
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AMEK SYSTEM 9098



Exceptional EQ—Rupert Neve's System 9098

It was at last year's APRS show that Amek announced their intention to build a top-end Rupert-Neve-designed console; and to prove it they exhibited a channel strip along with the respected Mr Neve on their stand. A year on, the promised 9093 console has now just reached the production stage, with the first orders going to Lisa Stansfield, and Canadian broadcaster CBC. However, at this year's APRS, Amek will be debuting another product that has come out of the 9098 research programme—the System 9098 EQ unit.

As would be expected with a unit that carries Rupert Neve's name, and has evolved directly from what many consider may well be the last all-analogue 'super console' to be designed from the ground up; the 9098 EQ has a pedigree steeped in the best traditions of English audio engineering. However, although it incorporates cherished design concepts, the unit should not be viewed simply as vintage circuitry rehased.

'It's the best of both worlds,' confirms Rupert Neve. 'We have left behind cumbersome and expensive hand cabling, noisy connectors, heavy separate power supplies and outdated assembly techniques which contribute nothing but nostalgia, and have taken advantage of new amplifying devices and better quality components.'

'People regularly tell me that the sound quality of my old designs is better than anything they can buy today. Now, there are reasons for it but they're not tied up with what people think—and quite honestly there's been an awful lot of codswallop talked. To give you an example, someone actually wrote an article which analysed the quality of wire used in some of my original designs and said how wonderful it was. Well in those days, when we were a three-man band, we used to buy our cable from a scrap merchant in the Caledonian Road because it was the cheapest place we could get it, and that's the "wonderful" stuff that has so many qualities attributed to it today!'

The question of why his old designs have become so prized and sought after, has long puzzled Neve, and to try and make sense of it, as well as to incorporate the 'magic' ingredient back into his modern designs, Neve has spent a great deal of time testing the old circuits.

'I've done endless listening tests and taken endless measurements to shed some light on this, and the conclusion I've come to is that the whole thing lies in the actual amplifiers themselves and has absolutely nothing to do with the peripherals.'

'The amplifiers for all the older consoles were Class A designs up until the mid-1970s; we then started using Class AB amplifiers for the output stage because they were more efficient. At the time we didn't consider there was any deterioration in the sound and in fact some people actually said they thought it was better.'

'However, there is now a fairly broad consensus among the people who really know the old consoles that the old Class A designs sound better. So, on the 9098 equaliser, and indeed on the console, I've returned to that and produced a Quasi Class A performance. Although we're using ICs I've used biasing that takes them away from there Class B operation, so there working slightly asymmetrically, and up to about +4dBu they're working as Class A single sided amplifiers. I've purposefully used ICs that avoid crossover distortion and it's now so low that it's actually quite hard to measure and identify. The results are an equaliser with Class A performance but with improved efficiency and without the cost, heat and weight penalties.'

As with previous Amek products that Rupert Neve has had a hand in designing, such as the *Medici* Equaliser, the System 9098 EQ makes use of TLA (Transformer Like Amplifier) circuitry. Although Neve has long been an advocate of transformers, he admits they have certain disadvantages.

'Apart from the cost and size of transformers, there are quite a number of disadvantages. Output transformers are not a problem because their

performance is integrated with the circuit driving them and basically you can make them do what you want them to. With the input transformer, though, you don't have control over how it's driven—it might be from a 50Ω source which is fine, but if it is a low impedance source the performance will change particularly in the high end causing ringing; if the source impedance is too high, the low frequency distortion rises and can make the signal sound muddy.'

'The TLA has all the advantages of a transformer without the penalties. It is not dependent on the source impedance, it provides excellent rejection of interference such as RF and hum, and it can handle very high levels without distortion. The net result is a mic amp with an exceptionally wide variation in input sensitivity (will accept up to +25dBu without overload), combined with very low noise and distortion.'

The 9098 EQ remains identical both in terms of circuitry and sonic performance to the 9098 console, apart from a couple of small differences to frequency ranges and the inclusion of continuous rather than stepped HF and LF selection. From the inception of the 9098 equaliser, Amek wanted to make the unit affordable, and a lot of effort has gone into keeping costs as low as possible while at the same time keeping quality high. At a competitive £900 (UK price), the unit represents the most affordable piece of Rupert-Neve-designed outboard to have appeared in recent years. ▶

From the R&D that has produced the mighty Rupert Neve 9098 console, Amek have derived a top-class EQ. Patrick Stapley discovers that all EQs are not equal

The unit

The *System 9098 EQ* is a mono unit that combines a mic preamp, filters and 4-band parametric equaliser into a standard 1U frame. The front panel control are arranged into six sections—Input, Filters, LF, LMF, HMF, and HF—which are each distinguished by the rather insipid light blue and grey colour scheme.

The Input Section contains MIC-LINE switching, phase several reversal (acting for both Mic and Line), and 48V phantom power. There are two gain controls: a stepped mic level control operating from 0dB to 66dB in 6dB steps, and a continuous Trim control. The centre detented Trim provides ± 6 dB of adjustment for mic inputs thus allowing continuous level adjustment between stepped positions; and -6dB to +12dB for line inputs thereby accommodating low level sources such as domestic equipment.

The Filter section contains high and low-pass circuits each operating at 18dB per octave. These continuously swept filters have a range of 20Hz to 300Hz, and 4.5kHz to 30kHz respectively. The extended range of the low-pass filter well above the threshold of hearing is very much in keeping with Rupert Neve's belief that out-of-band frequencies have an important bearing on the way sound is perceived, and indeed this is further illustrated by the unit's frequency response which is flat up to 200kHz.

"It all comes back to the question of whether or not sound outside of the 20kHz band affects the way we hear?" says Neve. "There is an increasing amount of evidence that it does, and the Japanese in particular have conducted research that suggests that if you cleanly amplify your signals up to 100kHz you can hear a difference in musical quality that is more satisfying; thus if you add any "dirt" from 20kHz upwards, which can be distortion, modulation, switching transients, noise shaping and so on, it can adversely affect the way we perceive the sound. Consequently I've extended the low-pass filter above the conventional audio band to deal with this—ideally I would have liked to have had a band that went right up to 100kHz, but it would have significantly added to the cost of the unit."

The four swept EQ bands—LF: 30Hz-300Hz, LMF: 100Hz-1kHz, HMF: 500Hz-4.5kHz, and HF: 2kHz-21kHz (again notice the unusually high frequency)—have gain-boost of ± 18 dB, although each band can be separately switched to a ± 9 dB resolution. This fine level setting or 'zooming' as Rupert Neve refers to it, can be extremely useful for setting up very precise sounds as well as for returning to previous settings very accurately.

The low and high-frequency bands are each selectable between Peak and Shelf and include Glow and Sheen controls respectively which alter the shape of the curve. Rupert Neve explains.

"Traditionally, my EQ curves have been fairly steep sided and in this unit they are just over 6dB per octave. The Glow and Sheen controls broaden the curve in the LF and HF so that in a peak response it's rather like having a very low Q, in the shelf position it produces a gentle rising curve that goes slowly up to the shelf and then keeps on going."

The effect is to accentuate the top and/or bottom bands providing extra lift or dip without adjusting the gain. It has the added advantage of broadening the effect of an EQ setting without changing its overall characteristic.

The two mid bands are peak with adjustable Q,

and these can be independently switched to function as notch filters providing up to 25dB or very narrow bandwidth attenuation. The Q control still functions during Notch mode, but operates over a much tighter width.

Notch filtering was tested by introducing a sine wave oscillator into programme material at various frequencies and at varying levels. The unit was then used to reduce the tones, with as little degradation to the original programme as possible. In all cases the unit managed to precisely reduce the tone without leaving noticeable holes in the programme, and in cases where the level at the sine wave was not over obtrusive in the first place, the unit managed to reduce it far enough to be inaudible.

The *9098 EQ* is well equipped with bypass switching allowing the Filters, Mid Frequency bands, and LF and HF bands to be each sectionally switched in and out of circuit. There is also an overall EQ in-out switch that affects all four bands but not the filters. This switching capability, apart from providing a useful facility for A-B-ing the component parts of the equaliser, of course also enables the removal of unused circuitry from the signal path, thus keeping noise to the bare minimum. Incidentally, the unit is already remarkably quiet, and with all EQ in circuit but set flat, the noise floor is 95dB down.

Also included is an Overload LED which lights when output levels reach 6dB below clipping (although this can be set internally to suit the user). No input indicator is included.

While on the front panel, one small criticism is that the graphic scales for line gain and notch attenuation are quite hard to read having been printed in a light blue that does not stand out against its background.

At the back of the unit are four balanced XLR connectors for Mic and Line Inputs, and Microphone Amplifier and Equaliser Outputs. By providing discrete outputs for the mic amp and equaliser stages, the unit can be used for both functions separately and simultaneously.

Conclusion

The *System 9098 EQ* is a top quality piece of equipment that has blended together the best of old and new design to produce a very satisfactory result. The unit offers high precision, exceptional sonic quality, impressive noise figures and a well thought out range of features. In fact it is very hard to fault it, and without digging up all the tired old descriptive clichés—suffice to say that if you are a fan of previous Rupert Neve-designed equalisers, you will not be disappointed. The attention to out-of-band frequencies also make this unit unusual and is bound to generate some interesting user response

With a price tag that is very reasonable for a Rupert Neve designed piece of equipment, the *9098 EQ* is destined to be a successful product taking its place with the very best mic preamps/equalisers available—including, of course, others by Rupert Neve.

This unit is a pleasure to use and comes highly recommended. ■

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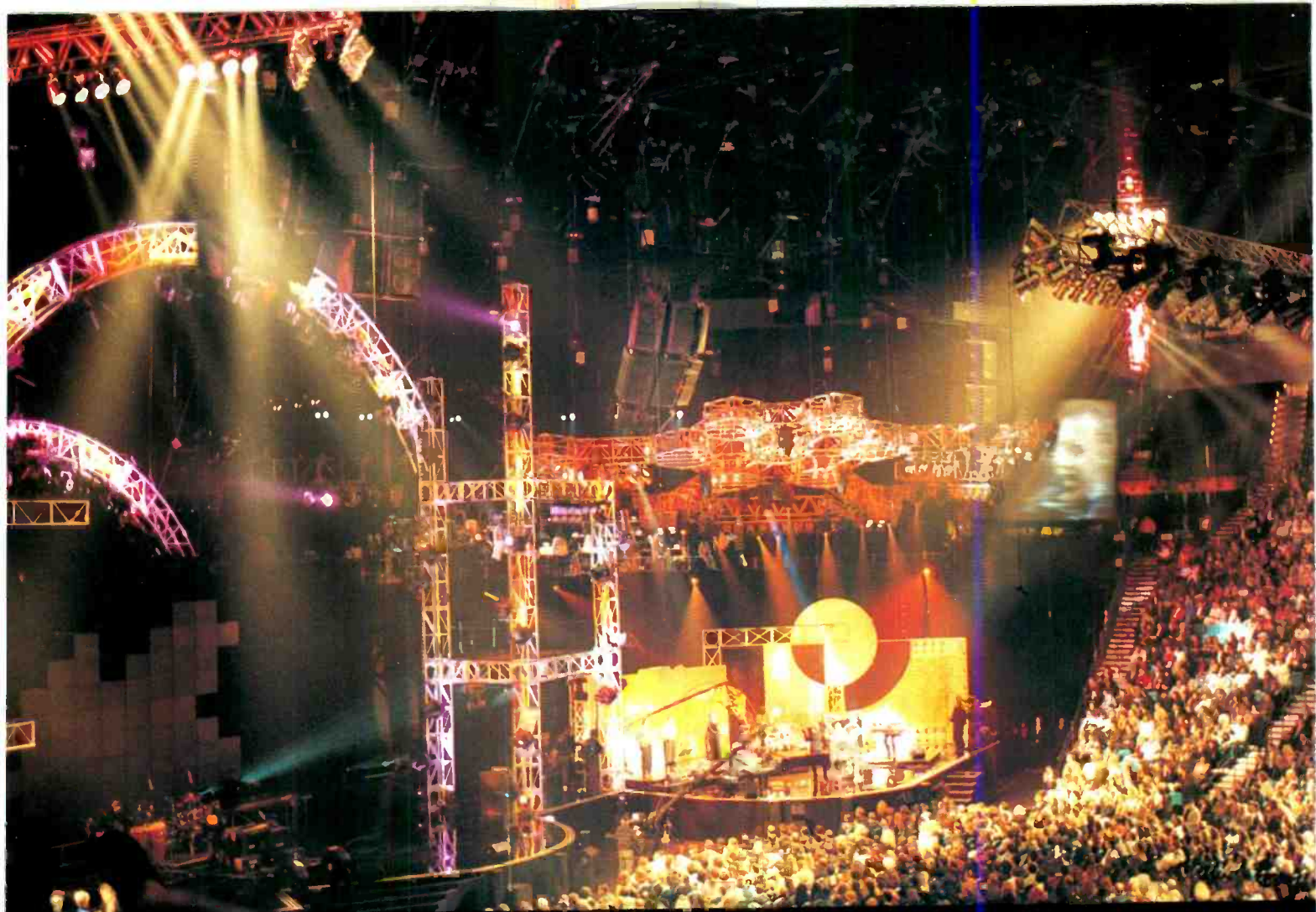
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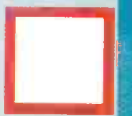
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APRS LONDON PREVIEW

Studio Sound's guide to the 27th APRS Exhibition 22nd-24th June 1994 to be held in Olympia 2, London

The 1994 APRS Exhibition is a celebration of the best in the professional audio industry, bringing together the many diverse elements which now constitute our industry in Europe and internationally. Celebrating its 27th year, the Exhibition has always been a focal point for the newest and finest in audio technology and services—and this year is no exception. The mood of optimism in the industry, which returned to last year's show after a long absence, is steadily growing, albeit balanced with a healthy degree of realism. This new mood is reflected in the size and scope of APRS 94, underlining the continuing relevance of Europe's only complete pro-audio event.

The last decade has been one of fundamental changes in the industry, which have resulted in a great broadening of the overall skills and product base. This continuing evolution is evident in the many different types of specialist products and services on show this year—covering the traditional recording, mastering and replication disciplines, as well as post-production technology, broadcast products and services, and the expanding live music sector. The APRS Exhibition is also an evolving entity—the fact that it has spanned 27 successful years speaks for itself. And in line with the 'new' market environment, we



Studio Sound beckons at the APRS 1977

wanted to take a proactive stance this year and focus on a range of innovations for the show.

A number of issues are affecting our industry and bringing about irreversible changes. In many instances, the traditionally strict boundaries between products are fading, transforming many familiar techniques and generating the need to develop new skills. For example, in terms of studio hardware, the old distinctions between tape recorder, mixing console and outboard rack are becoming progressively blurred. At the same time, the variety of storage formats and types of equipment that have to communicate with each other continues to increase rapidly. The ability to absorb these changes is a rationale in itself for a single event within which they can be seen, explored, discussed and evaluated.

Further technological changes are having their effect on live sound situations. Whether in stadium rock concerts, theatre musicals or small clubs, audience expectations have changed drastically over recent years. The emergence of CD and other digital formats, together with better quality television sound, has led to an increasing demand for studio-quality audio at concerts and shows everywhere. This has in turn helped to raise the profile of sound in this context—from the system design through to the equipment itself—creating a new level of professionalism.

On a more fundamental level, one should never ignore the importance of high quality audio in all aspects of our day to day lives. The areas of entertainment, communication, education and information all depend on it for their success at some time, and it is a key element in the expanding multimedia scene. The quality of the original audio source, the transmission method and the final delivery system all have a significant part to play.

With the APRS Exhibition, our aim is to provide the optimum opportunity to examine the technology used in each part of this chain, also enabling a lively exchange of knowledge and expertise.

The rise of the project studio as an industry force in its own right is reflected in the musical and technological subculture which has grown up around it. Developments in this part of the market are matched by the changing role of the full-service multitrack recording studio, encompassing sound to picture, multimedia and the huge potential of ISDN. APRS 94 is a genuine and appreciated opportunity for keeping abreast of these developments, as well as offering many manufacturers and distributors a valuable platform at the mid-year point for new product launches.

The APRS Exhibition has many facets. In addition to successfully providing a wide range of companies with a sales platform for their products and services, it also has a broader function as a purveyor of valuable, state-of-the-art information. This aspect provides a strong educational benefit for everyone involved in the industry, whatever their background—exhibitors as well as visitors.



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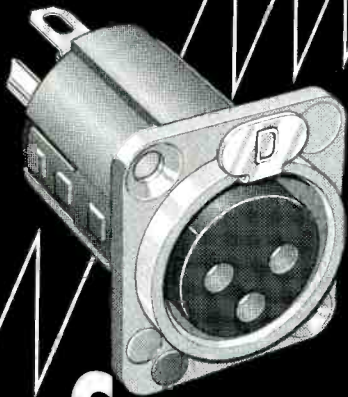
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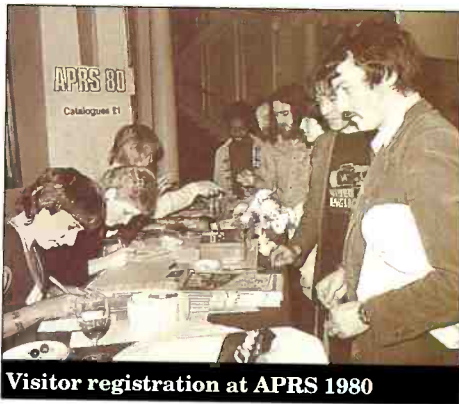
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Visitor registration at APRS 1980

Europe, the Far East and the USA. And we are confident in our claim that the APRS Exhibition is the only event in Europe which covers such a broad range of audio applications under one roof.

One of the key differences of APRS 94 is the introduction of industry Briefings. Aimed at giving show visitors even greater value from their visit, this programme of workshops and forums takes a close look at the latest and most critical industry topics. The Briefings programme is designed to offer a relatively informal framework for the highly useful series of presentations and discussions. We have deliberately avoided the dissemination of purely technical papers, preferring to offer visitors to the show the simplest and most effective way to assimilate the practical effect of the trends and innovations being studied.

While the APRS Exhibition has always provided a prime focal point for the industry, the Briefings programme will enable healthy debate and discussion on a much wider, and far more public, scale. One series of Briefings is focusing on issues of interest to recording studios, broadcast and live sound engineers, and postproduction facilities. There is a parallel series, which addresses various needs of the project studio.

Each Briefing is hosted by a leading industry expert, with support from the major trade journals. Generally lasting one hour, the seminars begin at 10.30am on the first day of APRS 94 and run throughout the period of the exhibition. ■

Philip Vaughan, APRS Exhibition Organiser

Exhibitors

A ● ACME Stand 133. ● Acoustics Design Group Stand 016. Advice on and examples of acoustic design, with details about recent installations worldwide. ● AKG-Harman Audio Stand 001A. Latest condenser microphones including C12VR Vintage Revival model designed to sound like 1950s CK12 and C414B-TLII with acoustic slots for vocal range resonance. Also AKG3000 lower-priced unit with a large diaphragm and 2-way switchable polar response, plus WMS wireless microphone systems. ● Amek Technology Group Stand 007A. 9098 console by Rupert Neve in demonstrator version. Three module types are mono input, dual monitor channel and stereo channel. Multimode panning for multichannel formats and extensive automation is standard. This includes Amek Supermove

moving faders with Supertrue mix computer, Recall, Virtual Dynamics and Superloc machine controller. New version of Recall By Langley automated sound-reinforcement console with redesigned cosmetics, snapshot and MIDI automation plus Virtual Dynamics. New 501 'cut-down' version of Recall. New System 9098 EQ by Rupert Neve with mic amp. ● Ampex Media Europa Stand 010A. Latest magnetic media formulations including 499 Grand Master Gold. digital and analogue open-reel mastering tape, as well as DATs and U-matic format. ● AMS-Neve Stand 004. Latest developments in AudioFile, Logic digital consoles, Capricorn digital consoles and 55 Series broadcast desks. Logics now have refined Copy and Automation Editing functions. Logic 1 can be fitted with twin joysticks and eight way monitoring. Logic 3 has VCA-style ganging, MS metering, phase error indication and enhanced monitoring. AudioFile has a new buffer card for better edit density and startup time. Also: feet and frames display, Cue Directory Structure with subdirectory capability, a new waveform display and Loop Editing. Capricorn has v2 software including Touch Collect to switch several controls simultaneously from playback to record. Several Assignable Facilities Units can now operate independently for dialogue, music and effects style mixing. ● Audio Design Stand X12. Additions to DSP Reference series include AD20D 20-bit A-D convertor and D20A 20-bit D-A convertor. Also ProBox Digital Tools, including 18-bit A-D, 18-bit D-A, 20-bit sample rate convertor, MasterClock and digital distribution amplifiers. SCMS stripping CopyRite and the SmartBox. DAT Error Reporter software package for PCs and Sony recorders. AD CD-Recorder with SmartBox interface and a range of CD-R media. ● Audio Developments Stand 010. Latest location and ENG mixers in durable plastic casings with prolonged battery life and parametric EQs. Debut showing of AD066-12 line-level MS matrix. ● Audio Engineering Society Stand 113. ● Audio Limited Stand 145. UK launch of StellaDAT ● Audio Precision Stand 150. Test equipment including System One and Portable One in latest versions. ● Audio Processing Technology Stand 008A. Range of codecs based on Apt compression technology for ISDN and other audio applications. ● Audio Systems Components Stand 025A. Radio station audio and automation equipment including DART cart replacement equipment. ● Audio Technica Stand 102. Microphones including recording studio and broadcast quality condenser models. ● Autograph Sales Stand 029A. Installation sound equipment including that from ►



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Clear-Com, Cyberlogic, Meyer Sound, Micron and Milab. UK debuts of Clear-Com *Matrix Plus II* intercom system, Cyberlogic *NC-800* power amplifier series and Meyer *MSW-2* subwoofer and Milab *LSR 1000* mic. ● **Avcom Systems** Stand 015. ● **Avid Technology** Stand 144A.

AudioStation nonlinear audio workstation, *AudioVision* digital audio workstation with nonlinear video with latest software. Recent features include time compression, pitch shifting and waveform editing, as well as multichannel off-speed playback during scrub and shuttle. Also demonstrating *Media Composer* nonlinear film and video editing workstations.

BC ● **BASF Aktiengesellschaft** Stand 004a. Latest audio and digital magnetic media products, including *Digital Master 931*, *CD-R Master* discs, *MOD* master, *DAT Master*, plus new 8-track formats. ● **BBC Wood Norton** Stand 189. Details of training courses in technical and creative skills. Introductory, intermediate and advanced courses are available. ● **Beyerdynamic** Stand 015A. Microphone systems including new *NE700* 2-channel UHF diversity receiver, plus new *TG-X* hand-held and head-worn vocal units with increased feedback resistance. Soundtracs *Topaz*



Hughes & Kettner Linear Pro series

recording console in 24 and 32-channel sizes for less than £3,000. Omniphonics amplifiers, including *Link Series*; SPL processors including *Vitalizers* and new *Optimizer* parametric equaliser. ASL *Basic Series* communications equipment.

● **Calrec Audio** Stand 137. Digitally controlled analogue *T-Series* broadcast production console. Assignable architecture allows as many as 176 channels with 48 track-sends, 8 stereo groups and 16 auxes. Also: *Q-Series* broadcast production console and *Compact* general purpose console, along with *Minimixer* and *RQ* outboard processors.

● **Canadian Instruments and Electronics** Stand 169. Latest test and measurement equipment. ● **Canford Audio** Stand 002A. Large

selection from current catalogue including communications, test, connection and monitoring equipment, as well as studio furniture, accessories, headphones and mics. ● **Clive Green & Co** Stand 104. Cadac *Concert* live sound mixer with switch reset, centrally assigned switching and control setting recall. Cadac *J-Type* console with latest motorised fader automation and Central Control Module. ● **Crookwood** Stand 100. *Paintpot* microphone preamplifiers, which can be placed near to mic to optimise signal quality. ● **CTL Components** Stand 165. Now sole UK agent for US made Clarostat potentiometers. 310-page catalogue available. ● **Cunnings Recording Associates** Stand 182. Distributor of professional audio equipment.

D ● **dCS** Stand 100. First showing of *dCS 950* D-A convertor. Also *dCS 900B* reference A-D, *dCS 902* high-speed A-D, master clock, AES-EBU and SDIF2 word clock distribution units. ● **Deltron Components** Stand 013. Large selection of professional connectors. ● **Denon** Stand 153. Selection of professional CD players, cassette machines including first UK showing of *DN-990R* and *DN-980F* MD cart machines. ● **Dolby Laboratories** Stand 011A. Demonstration of *AudioFax* ISDN system using *Dolby 501/2* ▶

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Nagra D

AC-2 encoder and decoder units. Dolby SR Spectral Processor, SR noise-reduction systems.

● **Drawer Distribution** Stand 018A. New 1961 valve equaliser designed to complement the 1960 valve mic preamp-compressor. The stereo unit has four main equaliser sections with six switchable, overlapping frequencies, variable bandwidth from third octave to three octaves and $\pm 18\text{dB}$ of boost and cut; plus variable high pass and low pass filter sections with 12dB/oct roll-off. Also: established dynamic processors. ● **DynaudioAcoustics** Stand X25A. BM10 cost-effective 2-way closefield monitor, the M1, M2, M3 and M4 range of monitors, the C2 and C3 high-accuracy reference

monitors and PPM range of nearfield monitors. A range of complementary amplifiers including Chord pro series.

EF ● **Edge Technology Group** Stand 028A. ● **EMO Systems** Stand 007. DI and interfacing products.

● **Fairlight** Stand 150A. MFX3 workstation, available in three configurations with up to 24 independent tracks. MFX Mainframe is the largest system, MFX Tower offers the same features for a lower price and MFX MINI can have up to eight tracks. ● **Filmtech TFE** Stand 181. LSP4 location mixer with four inputs, four direct output and main stereo output. MS processing is provided at four different points within the signal chain.

Active input gains. ● **Focusrite Audio Engineering** Stand 012. New additions to Red range of processors. Red 4 Precision Stereo Preamplifier for as many as seven stereo sources, with transformer coupling and -10dB or +4dB operating level. Red 5 Stereo Power Amplifier offering 250w RMS 8 Ω . ● **Formula Sound** Stand 009. System 2000 modular production mixer, AMX6 6-channel mixer for installation, PM-90 modular DJ mixer, AVC2 automatic volume control unit.

● **Fostex** Stand 118A. Foundation 2000 workstation with v2.0 software. Event-based

editing creates mono or stereo events in record; enhanced library, audition and screen features; multitrack emulation mode. ● **Future Film Developments** Stand 019. Cables, connectors, patchbays and accessories.

GH ● **Ghielmetti Communications** Stand N.A. Audio and video patching systems.

● **Graff Electronic Machines** Stand 142. Latest in-cassette duplicating systems. ● **Hayden Laboratories** Stand 153. Denon DN-5951/961 broadcast CD players and new affordable DN-650F for medium duty use, with instant start and cue to audio, end monitor and varipitch of $\pm 8\%$. XLR analogue and SPDIF outputs.

● **HHB Communications** Stand 006A. Portadat recorders with 4-head, 4-motor transport, plus analogue and digital I-O. Portadat PDR1000 is a location DAT recorder. PDR1000TC can record and generate time code in all standards, plus jam sync. The Advanced Media HHB DAT tape, plus other DAT recorders from Sony, Aiwa and JVC. CEDAR AZ-1 Azimuth Corrector. CD-1 DeClicker, CR-1 DeCrackler, with the CEDAR II production system. HHB CDR Indexer operating with Marantz CDR610 CD recorder. ATC monitors and Coles microphones. ● **Hilton Sound** Stand 144. ▶

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*SSL.4056G. 56 MONO, 2 STEREO CHANNELS. VU METERING. TOTAL/RECALL G.SERIES COMPUTER. PHONE FOR FULL DETAILS/PRICE.

*SSL.4048G SERIES PLUS. VU METERING. LEFHAND PATCHBAY. RIGHTHAND PRODUCERS DESK. TOTAL/RECALL. PHONE FOR FULL DETAILS/PRICE.

*API.MODEL 2488. CONFIGURED 24/8/24 PATCHBAY. PHONE FOR FULL DETAILS/PRICE.

*HARRISON.MR2. 48 FRAME. FITTED 32 CHANNELS (MORE AVAILABLE). PPM METERING SWITCHABLE. RIGHTHAND PATCHBAY MASTERMIX AUTOMATION. PHONE FOR FULL DETAILS/PRICE.

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*MCT.SERIES 636. 36 CHANNELS PLASMA METERING. RIGHTHAND PATCHBAY. VCA FADERS. PHONE FOR FULL DETAILS/PRICE.

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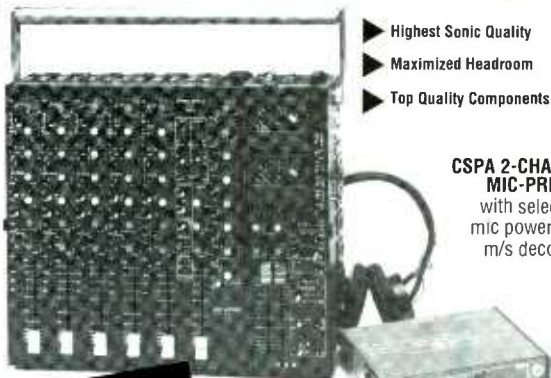
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THE BRIEFINGS

A SUMMARY OF KEY EVENTS

Creating Sound Effects for the Theatre

Sound Designer John Leonard

The Potential and Implications of ISDN

Bill Foster of The Audio Exchange,
on behalf of Studio Sound

Multimedia

An in-depth look at multimedia with Journalist Tim Frost discussing its significance, and Andy Bereza of BWG examining its applications

Microphone Techniques

Paul White and Dave Ward

Radio Frequency Management

Brian Copsey of ASPFM Ltd

Vinyl is Not Dead!

Jim Wilsher of the PAD group

High Resolution Mastering and Recording

Bill Foster, on behalf of Pro Sound News, directs a panel of manufacturers and users to look at the implications and applications of top-end recording technology

DAT: Are You Getting the Best Out of It?

Phil Wilton of Sony

Radio Microphones

A team of experts discuss the uses and abuses of radio mics

Other subjects in the schedule include:

Standards for Audio and Video Network Control.

Protecting your CDs against Counterfeiting.

The Creative Use of Automation and Gain Structures — Keeping Noise and Distortion out of your System.

A daily Broadcast Forum, hosted by the Institute of Broadcast Sound, will address current broadcast topics. *Creating the Perfect Mix*, will present a different mix each day.

Details of hire inventory including Studer D827 48-track DASH recorders and special *a la carte* location studio service, including booking of prestige accommodation and supply of equipment.

IJK

Industrial Acoustics Company

Stand X14. Acoustic treatment systems and consultancy. ● **IBS-Line Up** Stand X17A.

● **John Hornby Skewes & Co.** Stand 162-3. Range of equipment including latest Digitech signal processors. CAD mics, Hughes & Kettner speakers and Chiyaio radio mic systems. ● **Kelsey Acoustics** Stand 141. Cables, connectors, stage-boxes and cable drums. ● **Klark Teknik** Stand 012A. New DN320 dual-channel 16-band preset equaliser and DN330 single-channel 30-band preset equaliser in 1U casing, with rotary pots for installation use. DN3600 programmable graphic equaliser with new software and DN3601 slave unit. Midas XL3 live console with new stereo modules.

LMN

Lyrec UK

Stand 121. Tape recording and

editing equipment including the FRED and FREDa portable machines. High-speed cassette duplicating equipment. ● **Malcolm Hill** Stand X10A. Latest additions to the Chameleon line of 1U-high power amplifiers: 1100S and 1800S. The 1100S delivers 250W/channel RMS at 8Ω and the 1800S gives 600W RMS at 4Ω. ● **Malcolm Toft Associates** Stand X14A. Latest 980 Series mixing console developments. ● **MCPS** Stand 006. ● **Media Directories International** Stand 173/A

Demonstrating the AudioNet on-line international equipment brokerage and the Russian Dragon timing device for musicians and synchronisation measurement. ● **Michael Stevens & Partners** Stand 107. Latest products including Chromatec in-picture video monitors, Bel digital processors, Rogers monitors, Zip Audio Technology ADAT AES-EBU interface and Audioscope analysers-test sets. ● **Munro Associates** Stand X25A. Acoustic consultancy and various product distribution including System Z modular acoustic system and Sigtech acoustic correction system. ● **Nagra Kudelski GB** Stand 186. Latest developments and accessories for the Nagra-D 4-track, open-reel, 18-20-bit, digital location recorder. ● **National Music Day** Stand 146. ● **Neutrik Marketing** Stand 024. Complete range of connectors including new MiniCon with as many as 12 pins. v2.0 software for A2 measurement system adds amplitude, time and table sweeps, plus extra storage capacity. ● **Nicral** Stand 014. ISDN products for broadcasters, including Remote Controller for ISDN terminal adaptors, allowing configuration and dialling from the studio or other location. SEEM digital format converter; CCS codecs; Nicral RePORT portable ISDN. ● **Normetex/DIC** Digital Stand 172. Magnetic recording media including DIC DAT tapes in several different lengths.

OP

Otari Deutschland

Stand 140A. Latest additions to Concept One series of digitally-controlled analogue consoles, which includes stereo modules for broadcast use. B10 console for broadcast production in 14 and 24-input frame sizes. RADAR random access system from Digital Creation Technologies, operates with the Otari MTR-90. Professional MiniDisc recorder MR-10. Updates to ProDisk workstation, including M-O support, linear time-compression and Digital Video Integration. ● **PAD Group** Stand 119. ● **PCX Solutions** Stand 101. Digigram digital audio boards for PCs and new audio card for Apple Mac, including an enlarged range of products with MUSICAM (ISO-MPEG Audio) compression. Version 3.2 Xtrack recording and editing system for PC, now with complete compatibility with other systems of the MusiFile standard and the ability to control a VTR via RS232. PXCKit v4 developers kit, MUSICAM codec card, transmission software. ● **Peavey Electronics** Stand 141A. Complete range of audio equipment including mixing consoles, amplifiers, monitors and processors. ● **Penny & Giles Studio Equipment** Stand 001. MM16 MIDI Management System and VCA16 Audio Control Module. PGF800 and PGF3000 fader ranges. ● **Preco Broadcast Systems** Stand 129. Range of products including cart replacement equipment from 360 Systems and on-air mixers from D&R. ● **Prism Sound** Stand 131. Digital solutions including Dream AD-1 20-bit A-D converter, DSA-1 hand-held digital audio interface analyser and DScope PC-based audio analyser. ● **Pro Sound News International** Stand 156. ● **Professional Monitor Company** Stand 124. Range of transmission-line monitor systems ▶

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RED 1: four channels of the best mic-preamplifier money can buy; **RED 2,** two channels of the renowned, Rupert Neve designed, parametric equaliser; **RED 3,** a two channel compressor with following limiter switchable to stereo operation for the mix.

New to the range, **RED 4** is a precision Studio Preamplifier designed to interface up to 7 stereo sources (tape, DAT, CD, etc) at either -10dB or $+4\text{dB}$ (individually switchable) into the console or direct to the monitoring amplifiers.

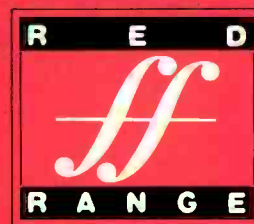
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RED 5 is a stereo monitoring amplifier rated at 250 watts RMS per channel continuous, with peak transient output of up to 800 watts into any load. The high crest factor, over 3 times the continuous rating, contributes to the astonishing sound quality delivered. Simply compare it with your present amp to be amazed how good your speakers can sound.

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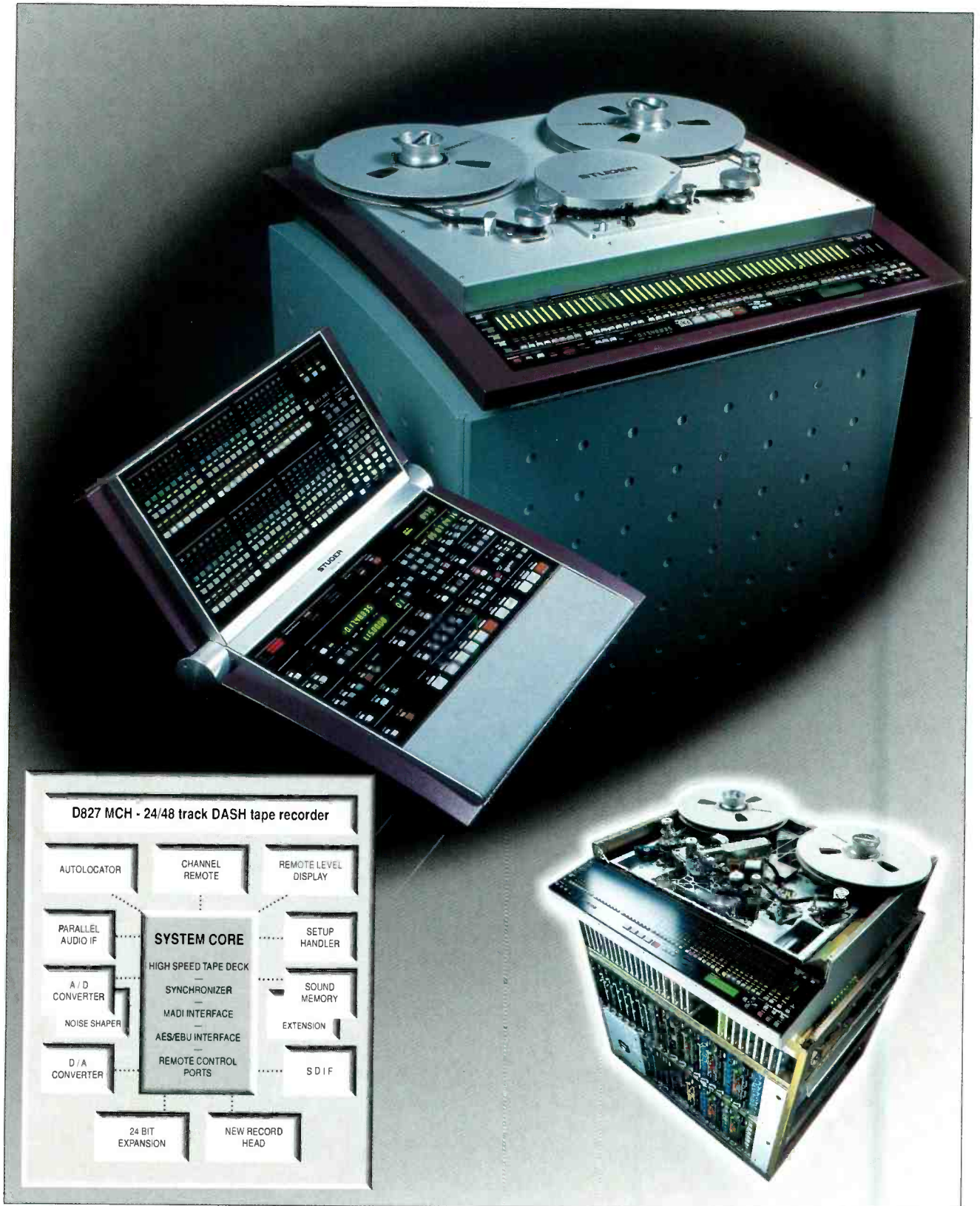


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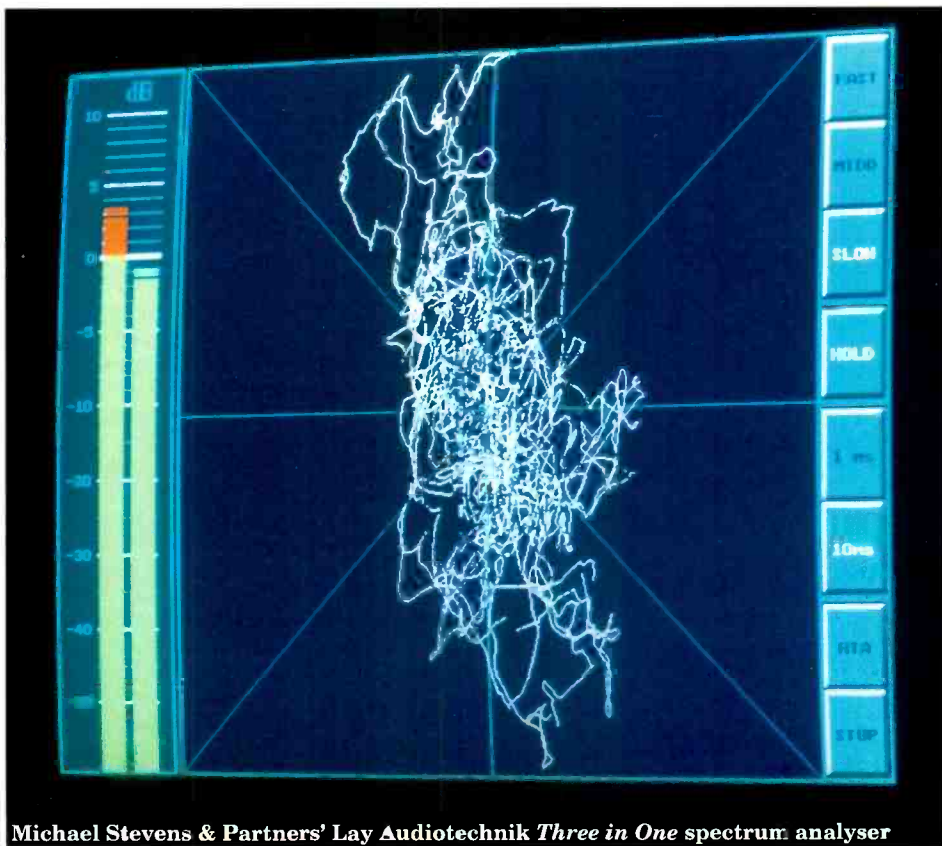


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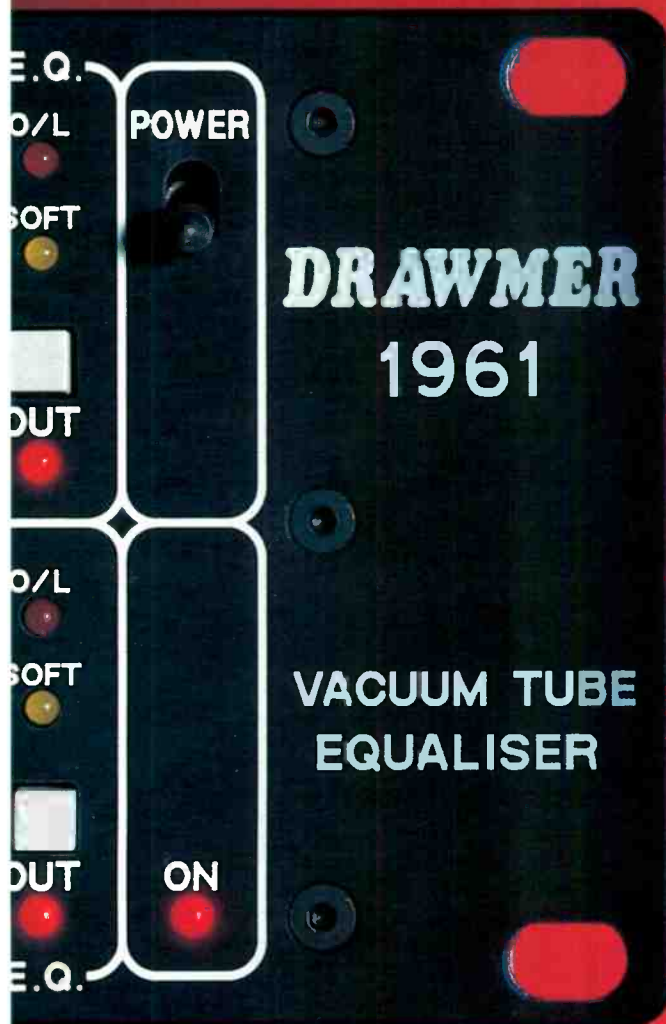
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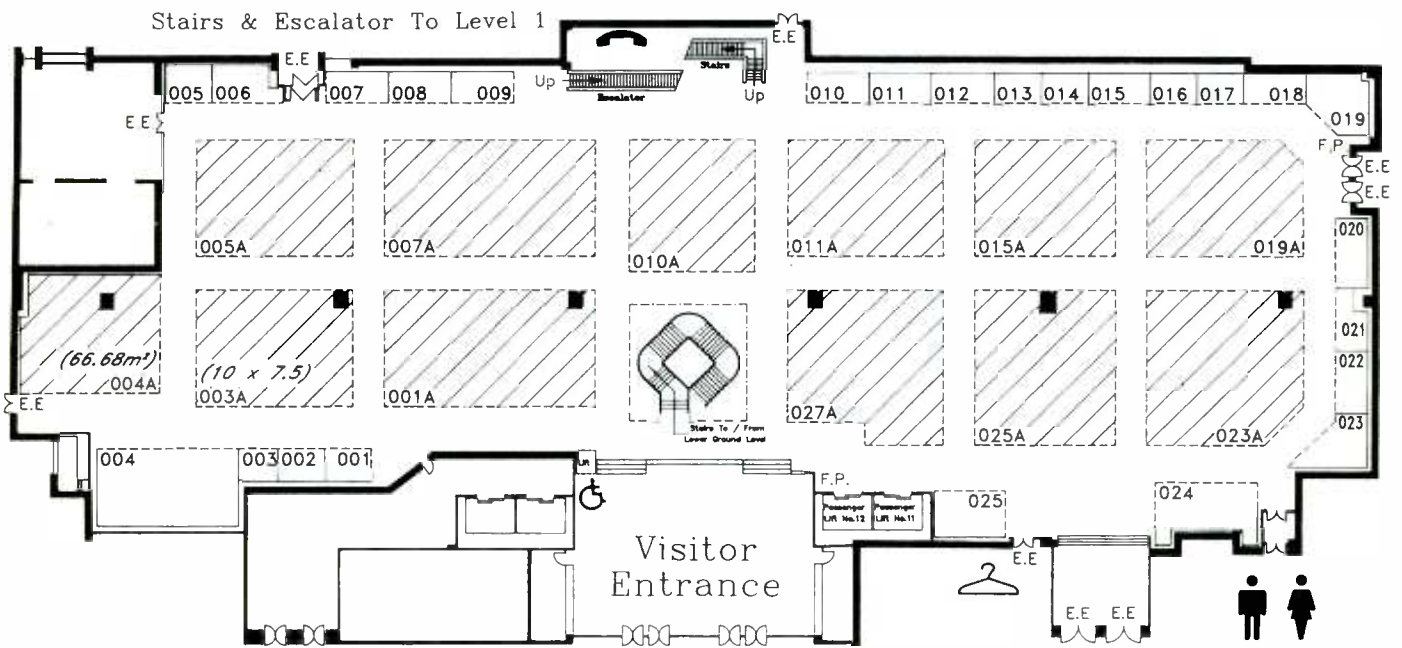
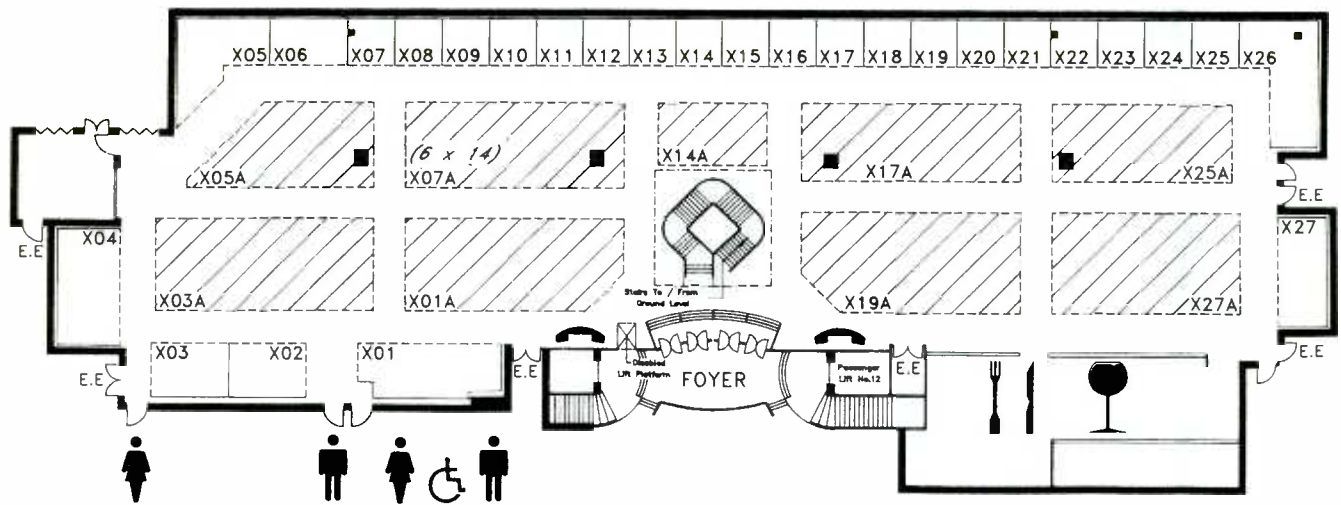
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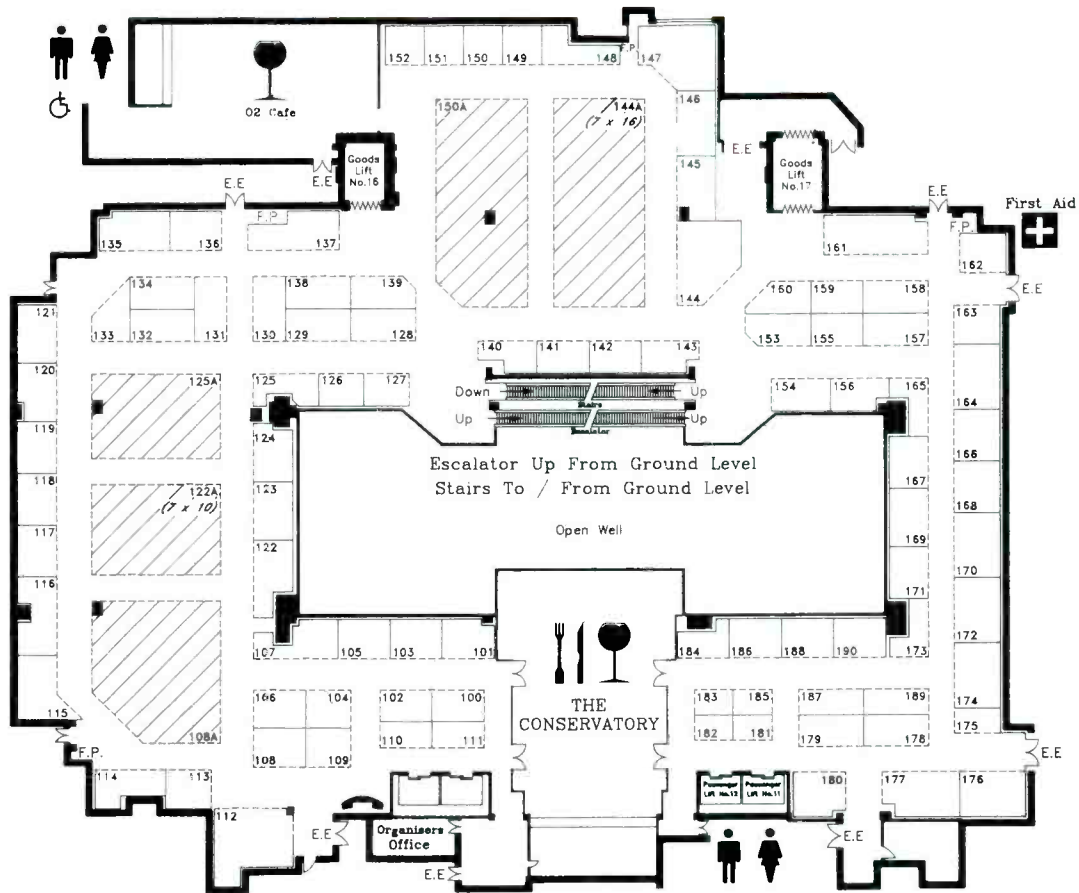
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KRAMER vs KRAMER

It happened at about 10.30am in early April 1976. Paul Laurence was asleep and would usually have ignored the telephone, but in a reflex action he lurched out of bed to answer it.

'Hello, Paul? This is Eddie Kramer. I'm in town mixing the soundtrack for the Led Zeppelin movie. Why don't you come on down to the studio?'

Eddie Kramer. Jimi Hendrix's Engineer-Producer. He mixed *Led Zeppelin II* and recorded most of *Houses of the Holy*. Engineered the *Woodstock* albums. Cut three Stones and two Beatles tracks. That Eddie Kramer?

Laurence first wrote to Kramer in 1974 care of his old stomping grounds, Electric Lady Studios on West 8th Street in New York to propose an interview. He knew little about him except what his ears had told him: that he was a very creative audio engineer. He had never read an article or even seen a photo of him. As Hendrix' right-hand man, however, he had excellent access to publicity, so the dearth of literature could not have been an accident. The letter prompted nothing. Follow-ups fared no better.

In late 1975 Laurence happened upon *Guitar Player's* first special issue on Hendrix, alighting immediately upon Kramer's polite refusal to grant an interview.¹ Citing both philosophical and professional grounds, he wanted the mystique to remain undisturbed. The journalist resolved to try one more time.

Eighteen months later, he sent a note in which he poked gentle fun at Kramer's image as a mystery man. Laurence still harboured no hope of hearing from Kramer.

'Your letter,' said the voice on the phone, 'it was so funny that I just had to call you.'

Paul Laurence was to meet Kramer at Todd AO studio in South Central Hollywood. John Bonham's drum solo was being mixed as he entered the dubbing room. It sounded thunderous—and most impressive. Over the next few days Laurence saw much of *The Song Remains the Same*, out of sequence, backward, forward... The interview, however, remained up in the air. Eventually Kramer queried Laurence: Just what did he have in mind? How did he plan to present him? How much did he want to know about Jimi? What did he think of John Bonham as a drummer? How about Mitch Mitchell?



Eddie Kramer salutes the Jimi Hendrix Experience in 1976

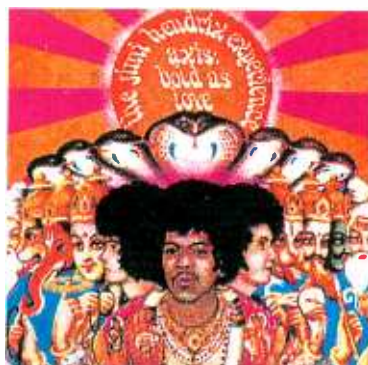
The outcome, apparently, lay less with the answers to these questions than with a series of table tennis matches the pair were about to play...

Although Kramer has worked with many top acts, he is best known for the records he engineered for the late Jimi Hendrix. The quality of the records, the Hendrix legacy, and Kramer's reluctance to comment have all been factors in making him the subject of greatest speculation yet least known, engineer-producers in the business. He has an active following among his peers who follow his work and glean titbits of second-hand and third-hand information on 'how he did it.' Ultimately Edwin H 'Eddie' Kramer is among an elite group of individuals who truly can be said to have an engineering or technical mystique.² Unschooled in audio, Kramer received extensive training in music. At five he began music lessons, studying piano, violin, and cello, and later attended the South African College of Music. As a result, he approaches recording from a musical, rather than technical, vantage point. A key concept in discussing Kramer's work is space. He likes a lot of space on his records, and much of his style of recording is based on capturing it. He prefers to get this space at the

time of recording, rather than add it later with signal processing. Whenever possible, he records in houses instead of studios, where he uses the different rooms for their particular acoustical characteristics.

At the heart of this sound is mic technique. Compared to the average engineer, he uses more mics, more distant mics, and more mic perspectives. In the current classical recording style he often records a given instrument or sound source—even a monophonic one—in stereo, sometimes treating each of its channels differently. ▶

Eddie Kramer, famed for being 'Hendrix' Producer' has a secret—in 1976 he gave an exclusive interview to Journalist Paul Lawrence. Since then the enigmatic Engineer has blocked its publication... until now



Two of Kramer's specialties are distant drums and complicated mixes.³ The Hendrix mixes are legendary for being both complex and dynamic. Many were third-hand and 4-hand mixes, as Hendrix had a flair for mixing and often assisted Kramer in this phase of the record making process. Together they explored uncharted sonic realms.

Kramer continues to work, adding not just rock acts but classical, jazz, and pop artists to his credits: Angel, the Animals, Bad Company, Brownsville Station, Cactus, Sammy Davis Junior, Dokken, Peter Frampton, Lena Horne,

the Kinks, Kiss, Mott the Hoople, Santana, Carly Simon, the Spencer Davis Group, Spooky Tooth, Traffic, Joan Baez, Canned Heat; Joe Cocker; Country Joe and the Fish, CSN&Y, Jefferson Airplane, Sly and the Family Stone; Ten Years After; and the Who.

When it happened, the interview soaked up approximately six hours of tape recorded in two interview sessions. We began on April 14th 1976 at my place in Los Angeles, and finished with a 45-minute phone call to his suite at the Beverly Wilshire Hotel in Beverly Hills on November 28th of that same year.

Later Laurence twice asked Kramer if he could release this interview. Each time Kramer requested that Laurence wait until the book he was writing had been published. That book, *Jimi Hendrix: Setting the Record Straight*, was ultimately cowritten with John McDermott and appeared in the summer of 1992, hence the publication now of this vintage material.

So, let us turn back the clock, to a decidedly kinder and gentler time... The year is 1976, the US president is a

courtly Southerner named Jimmy Carter, Linda Ronstadt is the reigning queen of the AM airwaves and a classic Micromoog synthesiser costs about \$550 (£450 in the UK). The stage set, we proceed to the Fairfax district of Los Angeles, California where what Laurence believes will be Kramer's first major interview is about to begin.⁴ Laurence checks the microphones one more time and starts the Revox

Tim Goodyer

Born in South Africa of an English mother, Kramer moved to England in 1949, staying for just a year before returning. The exercise was repeated in 1956 after which time the family remained in South Africa for four years.

'In 1960, politically, everybody had a rude awakening,' Kramer recalls. 'The country was in a state of change. There were black demonstrations which were very heavy. My parents said "We're gettin' out." I stayed on to finish college'

Had you been involved in recording in South Africa?

'I was always into playing records and fiddling about with the gramophone—as we called it. By the time I was about two or three, I was identifying 78s by the label and my father taught me

how to put them on the automatic changer. It was an *Ultramar* radiogram; I was always twiddling the knobs and fiddling with the sound.

'From that point on, I was fascinated with radio because we didn't have any other forms of entertainment. I had to have my parents come into the room at night and ask me to turn it off, 'cause I had my ear glued to the thing!'

What sorts of records did you get down there?

'It was all the Elvis things—the Top 50 American records came to South Africa.'

What about black music?

'Not too much of it, for obvious reasons. Chuck Berry of course, later on, and things like that, but the radio is controlled by the government there. You have Springbok Radio—which is the only commercial station—and Lorenzo Marks, which used to transmit commercial programmes. I was very influenced by jazz in the late 1950s, early 1960s to the point where I went from going to jazz clubs to wanting to play jazz piano. As a result, my studies really suffered.

'When I came to England in December 1960, my father said, "You've got to get into advertising. It's the only thing that will save you." So I became a messenger boy for this fashion publication firm. On the same floor there was this TV production house, and they had a projection booth which had double projectors—two different theatres, but a central projection booth. And I used to hang out in there all the time.

'At this point, I was making my own hi-fi amplifiers and selling them to friends, and I bought my own tape machine. I knew nothing about the electronics, I just knew what it could do for me.

'But I was getting frustrated, and I said, "I want to do something that has electronics and that has music in it". And I picked up the *TV Yearbook* and I said, "I want to be where there's music and electronics, and that's a studio". So I got to the studio pages and picked out half a dozen names, wrote a letter off to six studios, and a couple of weeks later I



SHURE GENIUS

got a few replies. I went for a couple of interviews and got a job immediately. Actually it was the first studio I went to—it was Advision. This was 1962.’

‘I started right from the bottom—sweeping the floors, running messages, making the tea, mono and 2-track recording and a lot of film work. I learned how to cut discs, but they would never let me touch the board.

‘I became very friendly with all the young *avant-garde* musicians at the time, and I used to record them at home. I had a little system there, and speakers, and all that. I never had enough money really to have good equipment, and so I used to bring them into the studio and say to the people, “Look, I’m gonna fool around this weekend. Is that all right?” They’d say, “As long as you use gash tape.”

What kinds of mics were you using then?

‘They had beautiful old Altec mics which you can still find—the old rocket-shaped Altecs—and a couple of old 47s, which if you can get hold of them, are gold today. Generally the older style of condenser mics and some of the very, very old BBC-type ribbons, old 44BX RCAs—things like that.



‘I got pissed off at Advision and I went to Pye. This is 1963, and Pye Records had just opened their studio. It was the newest, the best. Bob Auger was the engineer who was running the place and put it together. Bob’s influence is really quite important, because the studio was virtually all-American in that all the gear they had was Ampex. He was a freak for Ampex gear. Big old 300 tape machines—that was when I first worked on 3-track. In fact, the 3-track was only there for a very short while because 4-track came in about six months later. All his classical stuff was done 3-track, straight into the machine, maybe with a small mixer there as well. I learned a lot of classical techniques from Bob, and since I was into classical music, I went out on live recording dates with him.

‘To me, live recording is still where it’s at. I think studio recording leaves a lot to be desired, in terms of feel and in terms of spacious-sounding records, which is why I love recording drums in

an open room or a whole band together instead of multitracking. I’d rather have the leakage and a bit of spillage; I’ll have some splash, because it helps the overall impact of the music. There’s an old phrase that another engineer who was influenced by Bob Auger—a guy by the name of Keith Grant, who runs Olympic Sound Studios and was a big influence on me too—uses, and it holds true today: “Distance makes depth.” If you’re into a very up-front, *present* sound, it’s fine for certain things, but it doesn’t always work. And unfortunately, most of the engineers today—the guys who have come up in the last couple of years—have had no formal training in classical recording.’

Were there any specific records that influenced you?

‘Every one of them, whether it was bad, good, indifferent. Classical, rock, jazz, early Elizabethan music, Georgian chants, you name it. Records didn’t influence me, the music that came out of the records influenced me, and the sound of each individual record I treated as a whole, as a unit. I didn’t say, “I’m gonna get that sound”. I get different sounds by collecting all the little things that turn me on and storing them up, and then bringing them out when I need them.

‘I don’t try to approach my engineering as a technical exercise. I like to try and use the tools at my disposal to achieve a certain sound. If I hear a group for the first time, I can see in my head what they could possibly sound like, then I keep that frame of reference all the way through to the final mixdown. Beyond that even, to the final disc mastering. The same way a painter conceives of a scene, the same way a cinematographer conceives of a shot—that’s what I think it’s all about. Instead of segmenting it into little boxes: separate each instrument, sound traps and all that.’

Were you at all frustrated back in the 2-track, 3-track, and 4-track days when perhaps you didn’t have total track placement freedom?

‘The whole thing with those early 4-track days was that you conceived the mix right then and there, and that was it. There was very little you could do afterwards; your stereo mix was locked in as you did it.

‘It was very strange in those days. One mic on top—the overhead—and one bass drum mic, that’s it for the drums. Mic in front of the bass amplifier, mic over



there, and the singer standing there in the studio singing live, chuggin’ away. And then they’d overdub a few more voices, and then—if the guy got really fancy—you’d take a 4-track machine and another 4-track machine and mix it down to two and leave two tracks open. Called 4-to-4.

‘Most of the sessions were done straight 4-track. They’d put the band down on one, another thing down on another track and then you’d have a couple of tracks to play with. And then they’d put background voices and maybe strings and horns and that’s it. ►



Albums were made in two days and less! Look at what happened to the Animals, when they went in and cut in half an hour—cost them some ridiculous figure like £12, £15—a million-seller. You know, you just go in—boom!—nine in the morning, do it.'

KPS

'At Pye, once again I got very unhappy. I wasn't doing what I wanted to do—I wasn't able to engineer and stuff. People didn't want to take the time and trouble to show me how the board was patched and all that, so I had to sort of guess it. It was a fairly complex board. It was an old Telefunken or Neumann board that started off as a classical console—three outputs, expanded to four, expanded to this, and to that, and it was eventually thrown out.

'I left there and met this guy who was working for ATV as a Video Engineer—Ron Pickup, if you can believe the name. He was a singer part-time and was interested in electronics and I said to him, "What do you think about opening up a studio?" He said, "Sure", so I went to my uncle and he put in £300 and he put in my share—he loaned me £300—and Ron put in £300, and we started a studio called KPS Sound Studios. We begged, borrowed, and stole equipment. An Ampex 2-track machine, a Revox, an 8-channel tube mixer with

'Records didn't influence me, the music that came out of the records influenced me'

two outputs, and I had two very nice Tannoy monitors, which I bought from Pye. We bought some microphones and discounting equipment secondhand from some weird guy up north—old 78-rpm cutting gear which we modified to 45 rpm with different pulleys.

'We found this building in the back of a travel agency. The door was so narrow that you couldn't get an organ through there, you had to have an upright piano. Below us was a photographer—he used to bang on the ceiling when we got too loud—and behind us was a playground full of kids! My uncle's company used to display work for big exhibitions, so he and his carpenters came in and we redid the place a bit.

'We did some great demos there. The Kinks came in, cut some stuff, and John Mayall, and Zoot

Money and His Big Roll Band—that's the sort of group that was coming in to us. I was really proud of it—we got a really nice little sound out of that joint. This is the whole year of 1965, and towards the end I just couldn't hold it together 'cause I was doing everything—engineering, the books, and all that, and I was terrible at the books. I was paying myself about £7 a week. It was nothing, just existing. We had a lot of ups and downs, and towards the end of it, my uncle got very pissed off and he said, "Okay, these things don't make any money, you've taken money from my pocket". We were breaking even—barely. So we had to sell it. We put the word about and one day we had a call from a guy at Regent Sound. Regent Sound is in Tin Pan Alley—Tin Pan Alley being Denmark Street, Denmark Street being the street where all the publishers are. Regent Sound was owned by a Lord Baring, who was a gentleman studio owner, and he had this faggot, and this big burly guy used to run the studio for him. And they were doing the Stones' early records. I think the most important early stuff was done at Regent Sound.

Regent and Olympic

'The Regent Sound stuff was very interesting because it was all mono, and mono overdubs. In other words, record on one machine mono, and ►

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SOUNDSCAPE

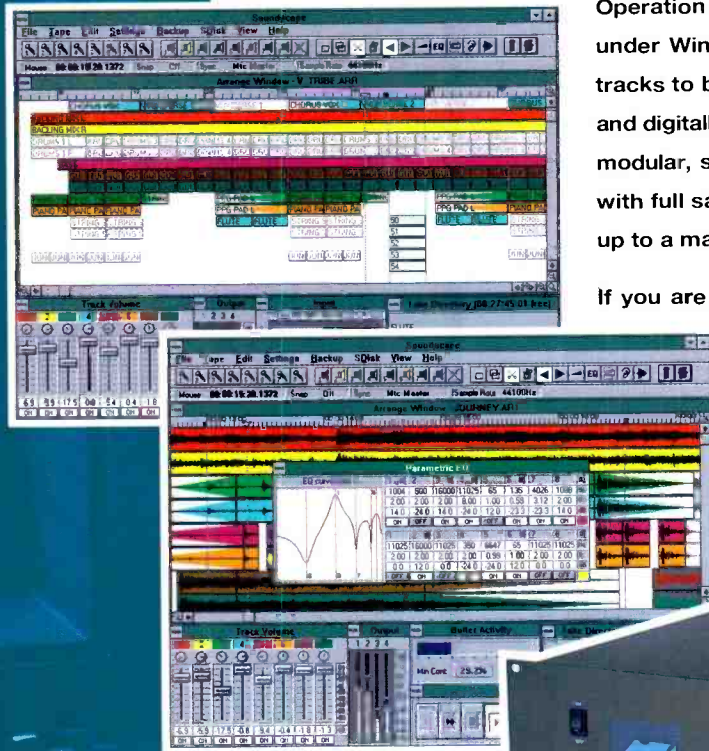
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then overlay. It was a good rough studio, that—a really a good demo studio. Anyway, they started making a fortune, Regent Sound, because they were doing the Rolling Stones, and everybody wanted to go and get that sound. We're talking late 1965, early 1966. It was all mono in those days, had no 2-track. All the big studios were 3-track, but the smaller guys were just mono and 2-track.

'So Regent Sound came up and said, "We hear that you're for sale. Let me take a tape back and we'll listen to it". So we get a call back the following day, guy comes up with a check—"I'm gonna buy your studio"—wrote out a check then and there. Sold the whole place lock, stock, and barrel, and we

got back all the money we had spent. He said, "I like the sound you guys are getting here, how'd you like to build us a new studio?"

'The upshot was that Ron and I were hired to run and build the new Regent Sound Studios on Tottenham Court Road. "She'll have a brand new 4-track Studer machine and a new transistorised board", which was the biggest piece of rubbish I ever saw. After six months of working there, I couldn't handle Lord Baring. He was overbearing. He just didn't know what was going on.

'At the time, I was pretty friendly with most of the studios in London. I knew Landsdowne and I knew Olympic, and I knew the people who ran

'I was the last one there, cutting the umbilical cord from that console'

NEWS FROM TUBE-TECH LCA 2B



The new TUBE-TECH LCA 2B stereo compressor/limiter is based on the very successful LCA 2A (released April-93). The LCA 2B features output level control and limiter on/off switch.

them. One day, I got a call from Keith Grant at Olympic. He said, "I'd like you to come over. I want to show you something." He took me down to Barnes, to this really dilapidated-looking building, and we went through the front door and there's this most incredible studio being built! The main room was about 70ft by 50ft by about 30ft high—it was a big room. You can hold about 90 people in there, although we actually had about 110 in there, I think, at one point when we did a big film date.

'I said, "Holy..." And he said, "Well, you've got the job" because Terry Brown had left and he needed a new engineer.

'I started there in 1966. Carton Street—the old Olympic—was in an old church which was a synagogue many, many years ago, and it's a haunted place. Great sound came out of that studio. The control room was upstairs and you looked down over the studio. We had to move out of the building because it was going to be knocked down, and I remember I was the last one there, cutting the umbilical cord from that console.

'When Olympic Sound Studios opened in Barnes in late 1966, it was the finest studio in the whole of the world, I think. There were several factors involved. Firstly, the room is great. I mean, there's nothing you can't do in there. Number two, the board is fantastic. For years it was the leader. Every module broke down into further modules inside, and it's very flexible. You can get an incredible rhythm section sound, you can get anything from a big orchestral sound to a terrific rock sound. Quite often one studio gets one sound, and that's it—that's all they get. What the Record Plant has tried to do and what Westlake tried to do is make a happy medium, where most of the stuff that comes out is fairly good, which is nice, I guess. Whereas at Olympic, you can get anything from terrifyingly bad to brilliant, depending on who the engineer is. Now here's the tertiary factor: not only good acoustics in the room, the board was terrific and the engineers were terrific.'

Who were the first engineers at the new Olympic?

'Keith Grant, of course, and myself, and Glyn Johns, though he wasn't a resident engineer there—he was totally independent.

'There was a great spirit that existed in the early days of Olympic—something which will change inevitably in any given situation. It happened at Pye, it happened at Olympic, it happened at ►

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Electric Lady. It's a spirit, a camaraderie, a genuine belief in what you are doing, and for the fun and sheer hell of doing it. Everything was new in those days. Four-track was new, the board was new, the sound that we were getting was new, everything we tried was new. That console that Dick Swettenham built was fantastic because it showed people what could be done with a very intelligently laid-out board. He had the board so laid out that you could do panning and equalisation and changing levels all within a very small framework, right here. Right in front of you. You hardly have to move your hands further than nine inches to get anything done. Dick Swettenham is a brilliant Engineer—a Designer. All the sort of things that you see today in consoles I can almost attribute to that man—things like modular, transistorised consoles in England were his concept. He was the one who first did it.

Did I hear Andy Johns say he seconded for you at Olympic?

'All the time. I had other tape operators, but he was certainly one of the first I had. I used to be a tape operator for his brother—for Glyn—and then when I became a Senior Engineer, he was second for me, and so on and so forth.

'He had his problems in the beginning. Like any young person starting off trying to be an engineer, it's hard—it's really tough. I'm a very demanding

'Four-track was new, the board was new, the sound was new'

person. Glyn gave me the runaround and I, of course, gave everyone else the runaround correspondingly. But I think it is part of the thing that you have to go through in order to learn.'

Do you use second engineers now?

'I've found a couple of really good assistants who can engineer for me—once I set the sound up, I leave them to it to ride the gain and generally look after things. That frees my time more effectively—I can go in the studio and work out with the musicians, which is what I like to do.'

When did you come to America?

'I worked with the Animals—with Tom Wilson—and he said, "There's this friend of mine who's putting this studio together in New York, and I want you to come over to the States." It took them six months to get a visa for me. They had to fly a

lawyer into England, and had to go and talk to the American Embassy and all that crap. Eventually they got me a visa, and I came over and started the Record Plant.' ■

To be concluded in the next issue.

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 2. Other members of this elite group might include Roy Thomas Baker, Bob Clearmountain, Tom Dowd, Geoff Emerick, Andy Johns, Glyn Johns, George Martin, George Massenburg, Roger Nichols, Hugh Padgham, Jimmy Page, Alan Parsons, Les Paul, Phil Ramone, Bill Schnee, Phil Spector, Bruce Swedien, and Brian Wilson.
 3. Richard Trubo and Richard Cole. *Stairway to Heaven: Led Zeppelin Uncensored*, 1992. Harper Collins (10 E. 53rd St., New York, NY, USA 10022). Page 84.
 4. The book by former Led Zeppelin road manager Richard Cole mentions one of Kramer's greatest mixes: 'A lot of the effects in "Whole Lotta Love" and the rest of the album emerged from pure experimentation. Jimmy [Page] would sit down in the control room with the engineer on that second album, and they'd literally start playing with the dials, turning them one way, then the other, seeing what kinds of sounds they could create. For "Whole Lotta Love," they produced a dizzying onslaught of screams, screeches, squeals and squalls.'
 4. Howard Cummings. "The World of Engineer-Producer Eddie Kramer." *Recording Engineer-Producer*. December 1978. Page 17. (PO Box 2449, Hollywood, CA, USA 90028).
- Two years later he granted a long interview to *Recording Engineer-Producer's* Howard Cummings.



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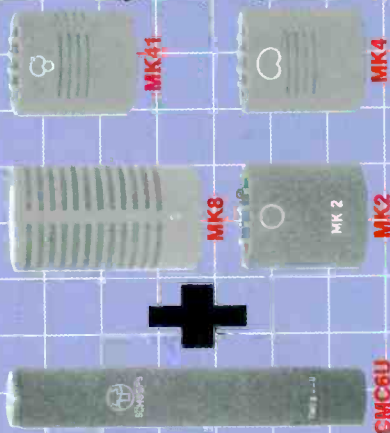
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Since the middle of January, Los Angeles has had over 2,000 earthquakes of varying magnitude, with far too many registering over 3.0 on the Richter scale. The 'killer' quake of January registered at about 6.8—this is an approximation since the quake introduced elements of sharp vertical motion previously little experienced during Southern California tumbler. In fact, this quake was the result of geomorphology—the upwards thrusting of a foot and half or so of relatively young (geologically speaking) mountain ranges bisecting and surrounding Los Angeles—the San Gabriels and the Santa Monicas.

LA is home to more than 2,000 major-league and project recording studios, mastering facilities, postproduction houses, audio equipment manufacturers, recording equipment dealers, film sound contractors and vendors of various natures, all providing services for record production, advertising, motion picture and television, syndication, satellite distribution, multimedia, mastering and so on. If there is a capital of the world's electronic entertainment industry, LA with better than 15,000 inhabitants employed in some branch of the audio business alone is it. It is estimated that LA in its Hollywood guise produces over half of all film, television and music consumed in the world today.

The January earthquake and subsequent severe shocks caused damage of varying levels to about a quarter of all these concerns. We all knew from the beginning that the 'biz' had taken a hit. One of the earliest images shown by the television news teams trying to capture the devastation was the third floor recording or post facility with its innards hanging out over generic Hollywood. The image of a studio with its racks and tape machines hanging into space where the quake had peeled off a side wall and part of a roof was graphic evidence of the power of Mother Nature in Southern California.

Initially, both to avoid losing both 'face' and business, many facilities pronounced how fortunate they were to have survived with little damage or loss of life. It was indeed fortuitous that the quake arrived so early in the morning that most were still home asleep. Three months after the initial quake, insurance claims for electronic entertainment facility damage have risen to a considerable level. That is not surprising, since insurance filings in LA of all kinds will make this the second most expensive natural disaster in the history of the US.

The kind of catastrophe that has challenged the survival of the entire city of Los Angeles, let alone the audio business, has not been limited to Southern California. Weather and-or nature in 1993 seem to have challenged audio industry facilities all over the US at a greater level than at any time in recent memory. Lessons have been learned from the recent calamities and it might serve us all well to analyse them.

1. The height of the equipment base as well as its construction is more important than had been previously assumed.
2. Bracing of equipment and the use of equipment mounting strategies in a consistent way is equally important. There is no question

Martin Polon

The San Andreas fault— or how live and die in LA

that from the standpoint of quakes or any other movement oriented phenomenon, mounting the heaviest equipment at the bottom of the rack significantly increases the options for staying vertical and in place. Equally, the process of using as many rackmounting screws with associated cups and washers increases the probability of equipment staying in the rack.

3. Adding physical support for equipment modules, plug-ins and accessories is a must. In many studios, 'upgrades' are frequently 'secured' with the actual wiring needed for interconnection or the *sine qua non* of studio construction—gaffa tape.

4. The use of natural gas within the studio premises has to be viewed as a marginal energy source in the face of the LA experience, where severed gas lines caused hundreds of fires. The use of electricity would guarantee freedom from the gas hazard, albeit it at a higher cost for heating and air conditioning.

5. The use of sprinkler systems turned out to be a double-edged sword—a valuable commodity in those spaces where there was no electronic equipment, but a disaster where electronics were present. There are systems that use gases to suppress fire; such systems cost more than water sprinklers, but in any kind of natural disaster, the water sprinklers are frequently 'tripped', with irreparable damage to studio equipment as a consequence.

6. Physical space construction and bracing becomes perhaps the most important consideration for audio production technical spaces. The use of structural steel and even steel 'umbrellas' over technical areas is one way to guarantee technical area survival during a calamity.

A studio with its racks and tape machines hanging into space was graphic evidence of the power of Mother Nature in Southern California

7. To protect from the movement associated with an earthquake, the size of wiring ducts and the provision of extra 'slack' in wiring systems could provide continuity of connection with various spaces in the audio studio complex.

8. One caveat is the practice, common in the US of citing small business facilities including recording studios, in , at or near river 'bottoms' or flood plains as reclaimed land. This yields large amounts of space away from urban density and usually offers a less expensive real estate expense than that found in most urban settings. Aside from the obvious risk of flooding, such areas are usually alluvial or river deposited in terms of the geology—and turn to jelly in an earthquake, magnifying the force of the quake many times.

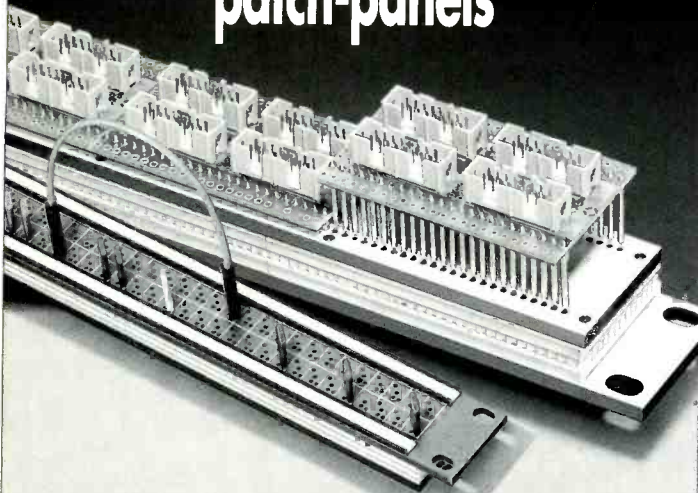
9. It is a curious fact in the 1990s, but many recording studios, postproduction facilities still occupy structures that were formerly in use as radio studios, warehouses, manufacturing plants, industrial, 'park' structures and motion picture studios—some major and some not so major. The problem with all the above categories is that without the internal support necessary to withstand a major earthquake, these older structures can turn into death traps.

10. Another curiosity of the LA quake was the incredible destruction and hazard to human health from shelving loaded with audio tape, video tape, audio accessories, audio and video parts in the repair shop and so on which became airborne. One way to deal with shelf contents is to use rubber straps of 'bungee' cords to secure the contents of each individual shelf in place.

The bottom line for the recording industry has less to do with the damage done by this or that disaster and more to do with insuring against future disasters. One LA studio 'owner' recently put the whole thing into context: "The earthquake insurance that one could purchase before the January 1994 quake had 10% to 20% deductibles. That meant that the average mainstream LA recording studio in a built-to-order facility with two big rooms using state-of-the-art SSL consoles; 48-track tape; two editing rooms; a mastering suite and a postproduction facility could have have in excess of 10 million dollars invested. After the much-anticipated 'killer quake' with the deductible of 10% to 20%, total replacement would still require the owner of a studio to ante up anywhere from 1.4 million dollars to 2.8 million dollars after the quake—assuming recovering from a total wipeout. Nobody can afford that kind of self-insurance.

'Now, insurance is frequently quoted for quake protection at deductible levels ranging from 20% to 50%. Those are just impossible figures. And what about your principal investors or the banks? Do you think that they will want to own something that could have as much as half of it is total value eliminated by a little rocking and rolling?' ■

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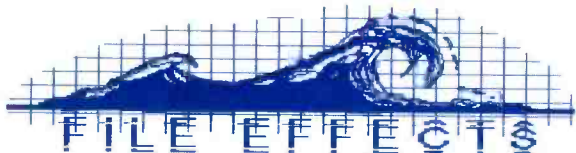
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Like any other developing technology, satellite broadcasting has had several distinct periods in its evolution, but almost uniquely each step has brought the serious hardware closer to the domestic end-user. As the former BSB discovered much too late, if the consumer is unable to pick you up because they either cannot buy or cannot afford the wherewithal, then you fail.

This scuffle over receiver equipment happened during satellite's second phase, the introduction of the high-power geostationaries, making direct broadcasting by satellite (DBS) a viable reality. Although take-up has been steady rather than explosive since the launch of the first Astra in 1988, parent company SES has stuck with the project and is due to launch its fourth bird, 1D, in the autumn.

The satellite TV channels have had to exhibit similar forbearance, waiting for a growing audience to re-pay their massive investment, but there are those who are convinced that they will be rewarded. 'It's mind-boggling the amount of money these people are going to make,' says Alan Sugar, who dubs 'these people'—Murdoch, Turner, Kirch, Berlusconi *et al*—the new media moguls, the natural successors to Hollywood bosses like Goldwyn and the Warners, the former press barons Beaverbrook and Hearst, and early commercial TV giants like Lord Grade.

Although more concerned with the consumer market than professional hardware or the provision of programmes, Sugar is also a mogul. Just look at the portfolios: Murdoch owns 50% of BSkyB, Fox TV, 35% of the UK's national press and other publishing interests around the world; political pretender Berlusconi controls three Italian TV channels, the *Il Giornale* newspaper and AC Milan football club; Sugar is chairman of both Amstrad, the computer-consumer electronics group that has brought once specialist items (including satellite receivers) down to an affordable price, and Tottenham Hotspur FC.

Despite rumours that Amstrad were to pull out of satellite, the company have recommitted to the area with a new range of receivers that have been designed to receive 1D signals as well as the existing Astra channels, causing as little inconvenience to the end-user as possible. During the press launch, Sugar pontificated on the current state of satellite television and speculated about the future. While conventional wisdom may balk at this—a TV salesman commenting on professional technology and scheduling—it is a sign that the present trend for convergence is going beyond the hardware and is bringing whole markets closer together.

It is also relevant, because potential satellite viewers have to be convinced about the programming before they go out and buy Sugar's enabling equipment. 'Satellite is a forever moving target of new services and countries,' he says. 'We pride ourselves on forward-thinking.' Amstrad formed an alliance with Sky Television in the nascent stages of Astra and is still looking to work in conjunction with either the service providers or SES to capture the 2–3 million, by his calculations, potential audience. 'Sky is very, very concerned

Kevin Hilton

A new broadcasting bird and a new home for C4

that this 2–3 million is able to see 1D as soon as possible,' he states.

There is no doubt that Astra 1D will be one of the pivotal events in the development of satellite broadcasting. It will have the capacity for digital transmission with wide-screen pictures, already recognised by both satellite and terrestrial stations as the future. Even more important is the ability of 1D to cope with the latest digital compression techniques, which will increase the channel capacity of each transponder by at least the power of ten.

But it is the question of what this greater number of channels will be carrying that worries some observers. Current tests of interactive systems in the US show that while it has the potential for information, business and medical applications, it could end up being merely a high-tech video phone or an overly-clever TV. The father of the geostationary satellite, Arthur C Clarke, said in a recent interview that he saw satellites as being more important for telephony and data rather than television and entertainment.

However, it is the more frivolous aspect that continues to get the coverage. Following the launch of 1D, Eutelsat's Hot Bird will go into orbit later this year, to be joined at 13° East, the principal position for DBS, cable and TV community services, by another Eutelsat bird next summer. Astra 1E is scheduled to follow towards the end of 1995. While this smacks of Bruce Springsteen's prophecy of '57 channels and nuthin' on', there is the realisation that to grab the audiences away from terrestrial services, genuine alternatives need to be offered.

'The way to attract new viewers to satellite is with a new package,' says Alan Sugar. 'The stations need to get the lawyers, stockbrokers and journalists as viewers—they've already got the truck driver and his wife. This means offering data services, stock details, teletext, interactive TV—things that can be interrogated. They also need to get the single homes, and commission programmes like *World in Action* and *Panorama*. *The Simpsons* has not done the trick in the stockbroker belt.'

For all the TV salesman soundbites, Sugar may have a point. After all, as the old-style newspaper magnates used to say, 'I know what people want to read because I used to sell papers on street corners.'

The phrase 'end of an era' is an over-used one—but it is relevant in this case. Summer approaches, the season if not the weather, and Channel 4, the UK's second independent television network, are due to move into their new headquarters. An era is closing because media types will no longer be able to talk about Charlotte Street in relation to the station, which, in their near 12 years on air, has established

a solid reputation for intelligent programming and pioneering technology, including stereo and surround sound, and wide-screen transmissions.

From now on the name to remember is Horseferry Road, the site of C4's new premises in the Westminster area of London, getting away from numerous cramped buildings around the West End. 'From an operational point of view, we needed substantial room for expansion over the next ten years,' explains Martin Connolly, C4's Deputy Chief Engineer, who is in charge of the technical move. 'There was also the need to update our technology.'

With the luxury of a greenfield site and a purpose-built HQ, C4 have been able to carefully arrange its technical areas. The finished grey stone and glass building has two separate wings, connected by a central area housing a 2,500ft² control room and a self-contained studio. Although C4 are largely publisher-contractors, screening bought-in and independently produced programmes, they do make a small amount of their own output. The studio will be equipped with BTS cameras capable of both conventional 4:3 and wide-screen 16:9 pictures.

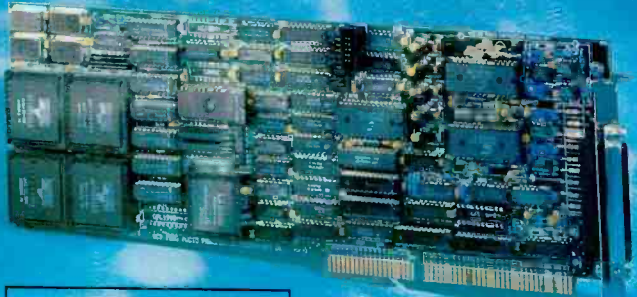
In the wings are the transmission area and the postproduction department. There are two presentation suites, one on either side of the master control room, with two announcement booths, one with in-vision capability, edit room and an announcer's room. Programmes are played in on either a multicartridge system or stand-alone VTRs. Postproduction houses two edit suites, sound dubbing, two telecines for film-to-tape transfer and facilities for the preparation of bought-in programmes. Equipment here includes DAR *SoundStation*, *CEDAR* audio reconstruction units, subtitlers and colour correctors.

Each area has its own serial digital router for both audio and vision, with a total of 40 Pro-Bel matrices. This makes C4 the UK's first fully-serial digital component broadcaster. 'The edit suites will be component throughout,' says Connolly. 'On the audio side we used NICAM extensively and we already have a number of films produced in Dolby Surround, which we can transmit with no trouble. We're already digital to the transmitter, but it's not up to us, it's down to the transmission being converted.'

The main play-in and acquisition format is D5, which was chosen due to the amount of PAL programming C4 hold in their library. 'We feel it's best to archive on D3, which can be replayed on D5. It's the sort of compatibility that we want,' says Connolly. There is also a large stock of Super 16 programming, whose 15:9 aspect ratio makes it eminently suitable for the increasing move towards the proposed 16:9 HDTV wide-screen standard. Audio is totally AES-EBU digital, with several hours of programming each evening going out in NICAM stereo.

I've always had a quiet admiration for Channel 4, mainly due to their diverse programming and commitment to uncut movies in their original aspect ratios. Now it is clear that the station are making a sizable commitment to the latest technology, which will future-proof both its library and output. I'm still going to miss Charlotte Street, though. ■

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BURIED TREASURE 2

The first part of this article outlined ways in which digital sound quality was being improved, and described some ways in which that improved quality could be carried through to the consumer on CD. The second part, rather perversely it may seem, describes how the additional dynamic range gained for CD using noise shaping, pre-emphasis and subtractive dither, can be sacrificed to make space for additional data. This additional data can be carried within the audio sample channels of a conventional CD in an inaudible manner, and may be decoded in an appropriately designed CD player so as to extract the 'buried data'. Ordinary CD players would play such CDs quite happily, thus extending the applications of the conventional audio CD. It is nonetheless clear that any usage of buried data on CD-Audio would require some standardisation in order to avoid potential chaos among manufacturers of both CDs and players.

Clearing space

As Peter Craven suggested in his recent AES lecture on the subject, it is possible to improve the dynamic range obtainable from CD, lowering the perceived noise floor by a conservative estimate of 17dB compared with that obtained from straightforward, conventionally dithered 16-bit linear conversion. This is made up of 9dB from noise shaping, 4.7dB from subtractive dither and 3.3dB from pre-emphasis. (Noise shaping could offer a greater degree of noise reduction than 9dB, but, as mentioned in the first part of this article, there are good arguments for not pushing it as far as the current theoretical limits would suggest.) These processes could be applied in postproduction, during the CD mastering stage of 20-bit recordings, for example.

Having lowered the perceived noise floor of the 16-bit digital audio, it is then possible to add a data signal in the LSBs of the audio sample. Simple replacement of the audio LSBs by a data signal would be clearly audible, and is not proposed. Rather, it is suggested that the additional data signal is randomised using a pseudo-randomising process in order to make its spectrum equivalent to that of a noise signal, and then using it as dither for the audio information. This process is described excellently by

Gerzon and Craven.¹ In such a way, using the additional data as subtractive dither, it would be possible to include a buried data channel having a capacity of roughly 2.5 bits per channel. The consequence of this would be a worsening of the noise floor by around 15dB, which approximately cancels out the improvements obtained from the methods described earlier. The result is a CD with no poorer audible performance than that currently available from 16-bit conversion, offering additional data carrying capacity of around 220 kbit/s when the two audio channels are combined.

Clearly, the capacity available for buried data based on subtractive dither depends on how much one is prepared to sacrifice dynamic range. It would be possible to have a rather higher audio performance and a lower buried data rate, or a poorer audio performance and a higher data rate. If one was prepared to use the more extreme noise-shaping curves it would be possible to accommodate a fixed data rate higher than the 220 kbit/s indicated above. Even allowing for a modest improvement over 16-bit audio performance, the available data rate would still be higher than the total conventional subcode data rate available from CD, and is substantial enough to be useful for a wide range of purposes, such as outlined below.

Increasing the data rate

Researchers at Philips² have proposed a method of increasing the data rate available from a buried data channel by exploiting the now popular principles of psychoacoustic masking. This is to some extent a more risky approach since it requires users to accept the existence of a data signal which hides at variable level under the audio masking threshold rather than remaining at a fixed noise level which has been acceptable for some time. In the variable rate approach, to put it crudely, the available capacity for buried data could be greater in the loud sections of the audio programme.

The techniques used in the Philips proposal were alluded

to by Gerzon and Craven, and allow the noise-shaper characteristic to be adjusted according to the masking characteristic of the programme material. The number of bits of buried data allowed is then adjusted so that the resulting noise remains below the masking threshold. The data rate available from the buried channel using such an approach is clearly going to vary depending on the audio signal, but tests on a wide range of music have suggested that an average capacity of around 5–6 bits per audio sample is feasible, corresponding to a data rate of roughly 500 kbit/s for two audio channels combined.

Because the data rate varies in this approach, and is not entirely controllable, there may be applications for which it is less suitable than the fixed rate approach. Nonetheless, buffering may be used to even out the data rate of the variable channel in the long term, provided that a certain delay is acceptable.

Audiophile applications

It might reasonably be suggested that to look for audiophile applications of buried data would be a contradiction, since the process is one which reduces the potential for high audio quality! Nonetheless, one key suggestion is that the additional data capacity could be used for the purpose of carrying extended audio bandwidth information. As mentioned in Part 1, Komamura of Pioneer³ has proposed original sampling of the audio signal at 96kHz, followed by a band splitting and decimation process which results in two sub-bands—one from DC to 24kHz and the other from 24kHz–36kHz. The lower sub-band is coded to 15-bit resolution, using noise shaping and dithering to preserve ►

Francis Rumsey presents the second part of his study of 'buried' CD data. What can be added to a CD, how can it be accommodated and what are its likely uses?

sound quality, while the upper sub-band is coded in the 1 remaining bit of the 16-bit audio sample using 2-bit ADPCM. (two successive audio samples carry 1 bit each of the ADPCM word.)

A suitable decoder would separate the 1 LSB from the 16-bit audio sample word and subject it to ADPCM decoding. The lower and upper sub-bands could then be upsampled by interpolation and recombined to form an extended bandwidth Extendedsignal at 96kHz samp

Extended applications

Surround sound

The most obvious extended audio use for a buried data channel is that of carrying multichannel surround sound information. Given that a fixed data rate of over 200kbit/s may be obtained without the need to exploit the masking effects of the audio programme it might be suggested that at least three additional audio channels could be carried here in a data reduced form, extending the total number of channels to the SMPTE-recommended 5-channel format.

The multichannel data reduction schemes currently being proposed for MPEG-2, and that used in Dolby's AC-3, can code the full 5.1 channels of surround sound at data rates between about 256kbit/s and 384kbit/s. This is slightly too high for a fixed-rate buried data channel using modest noise shaping, but is certainly well within the scope of a variable rate channel. It would be within the scope of a fixed-rate channel if one of the more extreme forms of noise shaping curve were adopted. It should be noted, though, that the main left and right channels would already be carried in linear PCM form in the normal CD audio data, allowing the buried data channel to be used entirely for the remaining centre and stereo surround data.

The implications here are that, no matter precisely how the surround information is data-reduced and coded, the opportunity exists for a conventional audio CD to carry a multichannel surround mix in a fully-compatible form. The advantages of this from an economic point of view are clear, since CD manufacturers would only have to produce one CD which would work in both conventional players and newer players with surround decoders. Those who might groan and remember the bad old days of supposedly

compatible quadraphonic LPs, which were intended to replay well in both 2-channel stereo and in quad, can rest assured that no such horrors would lurk in the surround-compatible CD. Analogue matrixes were used to code and decode the compatible stereo mix for the old quadraphonic LPs, and the sound was reproduced from vinyl using analogue pickups with all the crosstalk and distortion of that medium. Using digital techniques it is possible to matrix surround audio in a much less problematical fashion, and it has already been explained that the buried data method of encoding the additional surround information can be made inaudible.

As will be explained in a future article, the time is almost right for a revitalisation of interest in surround sound for audio only purposes, riding on the back of the growth in surround audio for pictures. Provided that a standard can be agreed for encoding multichannel data on CD there is considerable commercial potential here.

AM airplay mixes

It has been suggested that the special mixes required for AM radio, known as AM airplay mixes, could be encoded using data reduction in the buried data channel. Again the CD would be compatible with replay on a normal CD player, but a suitable decoder could extract the airplay mix for broadcasting purposes.

Non-audio applications

It can easily be envisaged that there are many non-audio applications for buried data. JPEG-compressed video image data could be stored at a rate of approximately one high-quality still image per second, and low-quality moving video could also be encoded.

Musical applications also recommend themselves. For example, MIDI data could be carried for controlling General MIDI-compatible sound generators, and it might be possible to incorporate score printing information so that a musical score of the audio programme material could be displayed or printed. This opens up interesting new publishing opportunities.

The rather mundane but nonetheless very useful data form of text is also a highly desirable use for the buried data channel. The complete programme notes for an album, together with other publishable material, could be included on the audio disk, either for printing by the user or for display on a monitor.

It can also be suggested that the use of such a channel for SMPTE-EBU time code would be very valuable in professional circles, where recordable CDs are used widely. Time code only requires a data rate of 2400bit/s and is therefore a small-time potential user of a channel with a much greater capacity, but no-one has really developed an alternative means of storing such data on a CD.

Standards

The buried data approach is a good one for carrying additional information on audio CDs for the very reason that the CDs remain compatible with the millions of ordinary CD players throughout the world. It is true, though, that some agreement over standardisation of approach is required. Such standardisation will probably be application specific, rather than general, although it is possible that the industry could reach agreement over a method of encoding and decoding (which is fairly consistent amongst those who have worked on the topic), and the framing format of the data. Standardisation could include some flexibility in the specification of the precise rate of the buried data channel, leaving it open to the application to determine how many bits may be stolen from the LSBs and thus what will be the resulting compromise in audio quality. As the Philips proposal suggests, the buried data channel could be split into a fixed rate channel of two bits per sample, and an optional variable rate extension to that. Side information in the fixed channel would indicate the number of bits in total 'stolen' from the audio sample.

It would be open to the manufacturers of CD players either to incorporate devices such as surround decoders within the CD players themselves, or to bring the buried data channel, once decoded, out to a back panel connector. External processors could then be manufactured which would access the data from this connector and subject it to whatever application-specific data processing was required.

For the publishers of CDs it would be necessary to determine what applications might suitably enhance the appeal of their products. Sales of surround CDs would have to be coordinated with the sale of surround-compatible CD players or separate decoders, as would any application involving video or text. It is possible that the extra information would be perceived by the consumer as adding value to the product, provided that it was relatively straightforward to access that information. To avoid confusion it would be reasonable to suggest that a limited number of applications (perhaps only one) should be implemented well and in a straightforward manner for the consumer, rather than there being a multiplicity of badly targeted ideas. Remember that a large proportion of people with video recorders cannot even set the clock or program recordings! ■

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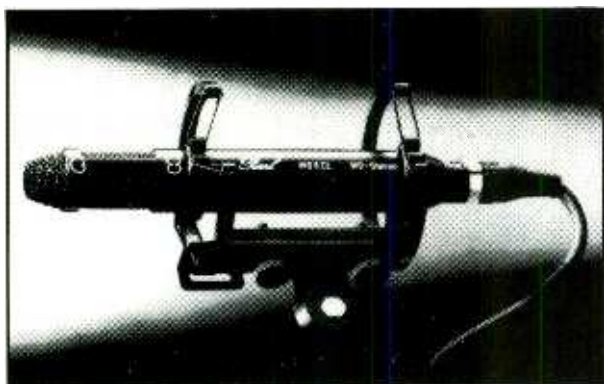
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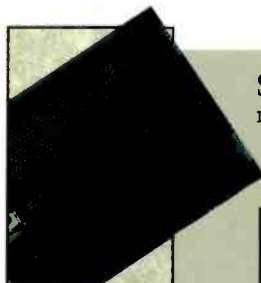
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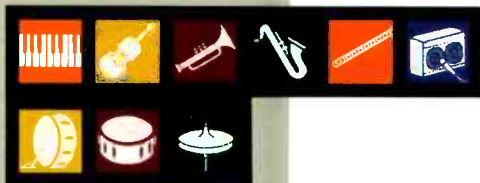
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