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AND BROADCAST ENGINEERING

INTERNATIONAL PRO AUDIO AND POSTPRODUCTION MAGAZINE

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A night at the opera. David Hockney's impressive set for the Mexican Operalia event. See page 46

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True Lies

We are probably all familiar with the use of 'truth' as a term of qualitative assessment of sound. Yet, were there some truly objective means of determining our use of the word, we would discover that this particular 'truth' has as many meanings as users.

The dictionary associates the word with terms such as 'actual', 'genuine' and 'proven or verified facts'. All of which are perfectly valid as long as we can agree on the reference points with give these terms their validity—but only if this is so. In the absence of such a reference, truth begins to degenerate into a subjective term. In spite of its regular real-world presence, subjective truth, however, is not something we tend readily to acknowledge.

Scientists are possibly the most familiar genre to accept that frames of reference can be changed in pursuit of 'dictionary definition truth', even if the acceptance of one new truth pushes other, earlier truths into the wastepaper bin. For the rest of us, truth is something that props up our mathematics, legal systems and ability to work with sound with equal merit.

Of these, only mathematics escapes criticism; a mathematical truth being built purely on proof within a system safe from the vagaries of the real world. Truth is, in fact, one of mathematics' beauties; our ability to interpret and apply it, is a sound indication of where the trouble starts. Back in the real world, things are less straightforward. Police studies, for example, have long shown that observers of an incident often recall its details differently—details with we would accept as being either truths or lies. In different witnesses minds, people change age, hair colour, clothes and even races, while events appear, disappear and change sequence with a consistency that threatens to defy belief. American author Don Delillo goes further, proposing that every time a new account of anything is generated, a new 'truth' makes its way into the world. Repeated attempts to uncover the 'truth' of a real-world event, therefore, introduce ever more alternative truths and threaten to further distance us from what we seek.

And if truth can prove so elusive in the tangible world, how does it behave in a world of pressure waves, phase relationships, sampling rates and psychoacoustics?

Obviously, it is impossible to assess a piece of equipment or a recording in terms of its 'acoustical truth' without a properly-established reference —usually the source of the sound to be reproduced. In some cases, there is no such truth and so the task of making any valid judgment becomes impossible; music assembled from samples and synthesised sound, for example, defies comparison with any acoustic source. Even where there is an opportunity to make a comparison, choosing an appropriate reference point can be difficult—when restoring a soundtrack, the film industry use the characteristics of the original recording as a reference rather than pursuing the 'truth' of, say, the original orchestral sound.

Perhaps all that I have identified is a semantic anomaly. On the other hand, this discrepancy between our language and our expectations may be symptomatic of a failing in our whole approach to audio. Accepting that we are pursuing something that cannot ever be achieved should not dissuade us from seeking improvements in sonic performance that can be made or from operational improvements. On the other hand, it may be time to overtly adopt— and to talk in terms of—another kind of truth in sound recording.

Ultimately, the only truths we have to deal with are those that we accept for ourselves. In this way, the 'truth' of a recording medium, or any piece of recording or reproduction equipment is beyond criticism. All we have to do is to convince the rest of the audio world that we are right. ■

Tim Goodyer

Cover: Studio 1 at the New York Hit Factory showing full-scale diffractal rear wall

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EVENTS CALENDAR

November 1994

● November 3rd–4th, **Magnetic & Optical Media Seminar**, Nikko Hotel, Atlanta, Georgia, USA. ● November 3rd–6th, **Reproduced Sound 10**, Hydro Hotel, Wyndermere, UK. ● November 10th–11th, **SBES**, Metropole Hotel, Birmingham, UK. ● November 9th–11th, **Inter BEE**, Makuhari, Japan. ● November 10th–13th, **97th AES Convention**, Moscone Center, San Francisco, USA. ● November 15th–18th, **Tonmeistertagung**, Stadthalle, Karlsruhe, Germay. ● November 22nd, **UK AES Lecture: Surround Sound for Music and Home Theatre**, Imperial College, London, UK.

December 1994

● December 1st–4th, **13th Int AES Conference**, Dallas, Texas, USA. ● December 4th–7th, **5th World CD-i & Video-CD Conference**, Düsseldorf, Germany. ● December 13th, **UK AES Lecture: PA Systems - Do They Get a Fair Hearing?**, Imperial College, London, UK.

January 1995

● January 5th–7th, **Showbiz Expo East**, New York, USA. ● January 24nd–27th, **ITA Information SuperHighway '95 Conference & Exhibition**, Santa Clara Convention Center, USA. ● January 27th–29th, **JTS Conference: Preserving Our A-V Heritage Conference**, NFT, London, UK. ● January 30th–February 3rd, **Midem**, Palais des Festivals, Cannes, France.

February 1995

● February 7th–9th, **ISDN User Show**, Olympia 2, London, UK. ● February 28th–March 3rd, **98th AES Convention**, Palais de Congrés, Paris, France.

March 1995

● March 8th–12th, **Frankfurt Pro Light & Sound**, Messe Frankfurt, Germany. ● March 8th–12th, **ITA Seminar: The Converging World of Entertainment, Information and Delivery Systems**, Weslin Mission Hills Resort, Rancho Mirage, California, USA. ● March 25th–27th, **The Pro Audio Show**, Karachi, Pakistan.

April 1995

● April 4th–6th, **REPLItech Europe**, Austria Center, Vienna, Austria. ● April 26th–29th, **Broadcast Technology Indonesia**, Jakarta, Indonesia. ● April 26th–28th, **5th Australian Regional AES Convention**, Sydney Exhibition Centre, Sydney, Australia.

May 1995

● May 5th–7th, **Theatre World**, Business Design Centre, London, UK. ● May 23rd–25th, **Midem Asia**, Hong Kong. ● May 9th–12th, **Pro Audio, Light & Music China '95**, Beijing Exhibition Centre, People's Republic of China.

June 1995

● June 10th–12th, **12th ShowBiz Expo**, Los Angeles, USA. ● June 13th–15th, **REPLItech International**, Santa Clara Convention Center, Santa Clara, USA.

July 1995

● July 12th–14th, **Pro Audio & Light '95**, World Trade Centre, Singapore.

August 1995

● August 25th–28th, **Beijing International Radio & TV Broadcasting Equipment Exhibition '95**, World Trade Centre, Beijing, People's Republic of China.

September 1995

● September 14th–18th, **IBC 95**, RAI Centre, Amsterdam, Holland.

October 1995

● October 5th–8th, **99th AES Convention**, Jacob K Javits Center, New York, USA. ● October 17th–19th, **Vision '95**, Olympia, London, UK. ● October 24th–26th, **REPLItech Asia**, Singapore International Convention & Exhibition Centre, Singapore. ● October 25th–28th, **Broadcast Cable and Satellite India '95**, Pragati Maidan, New Delhi, India.

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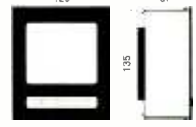

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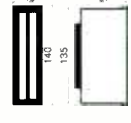

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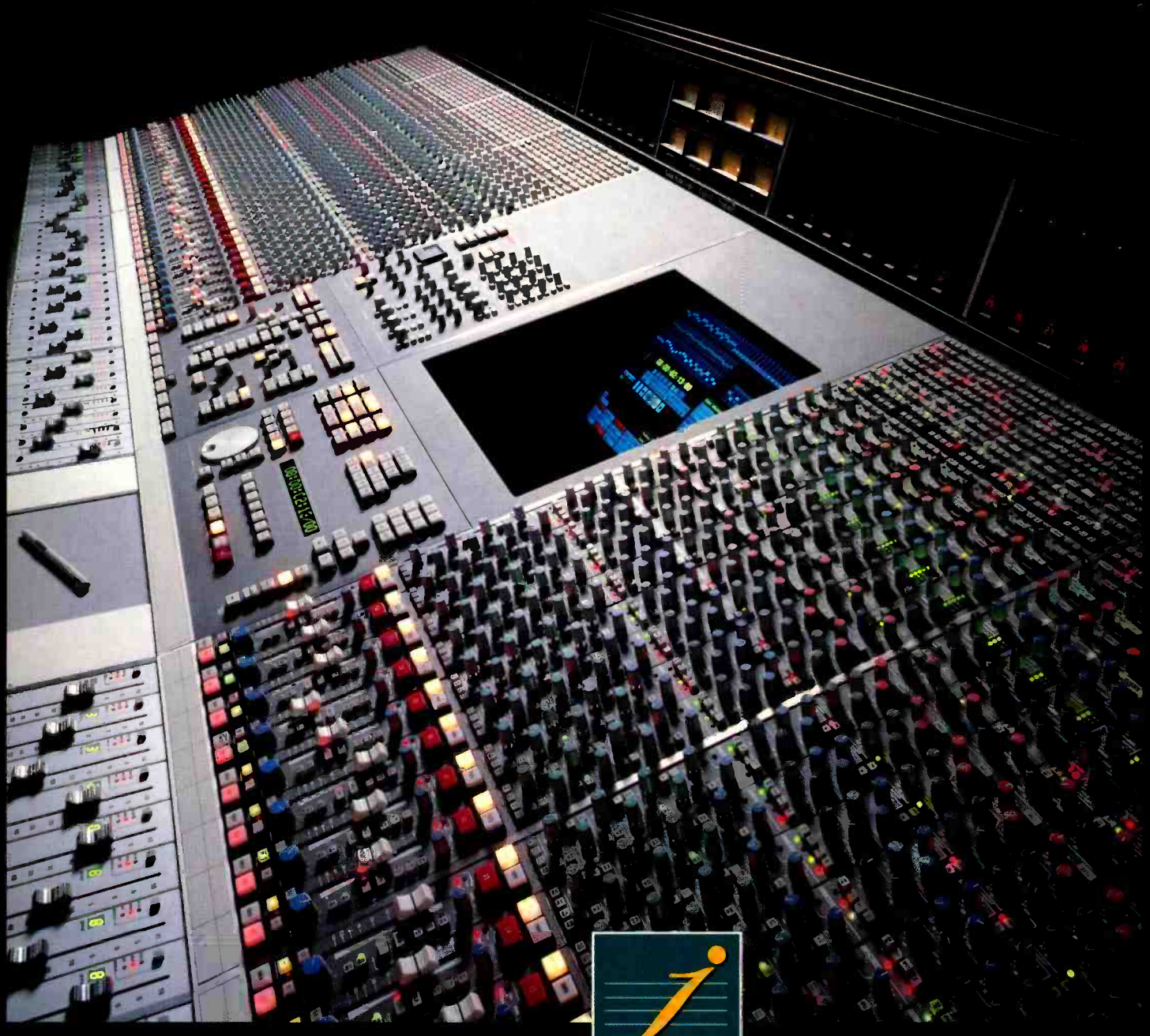

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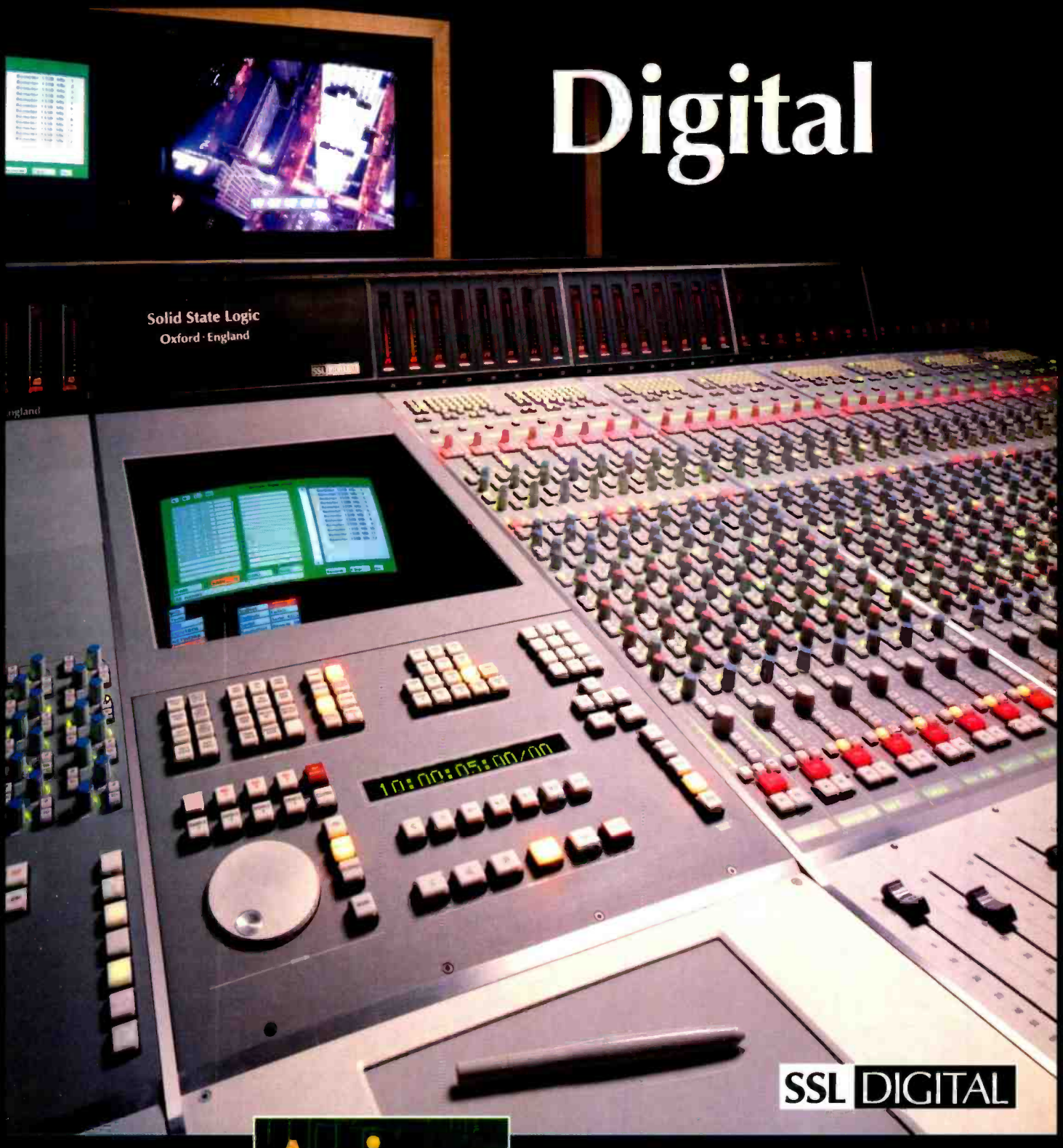

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International News

In-brief

● **Polydax**

Polydax Speaker Corporation have appointed Matt Daigler as West Coast Project Manager, responsible for customer and technical support of the Audax product line. Daigler comes from six years as Production Manager at Westlake Audio Inc.

Polydax Speaker Corporation. Tel: +1 508 658 0700.

● **Studer UK move**

Studer UK Ltd have moved; as from October sales, customer support and service activity have been managed from the Soundcraft premises at Potters Bar. Studer sales and distribution personnel are working alongside Adrian Curtis, head of Soundcraft Broadcast, while the service department have been integrated with the Soundcraft team. Despite the change of address, Studer UK will maintain its autonomy and identity, and Soundcraft Broadcast's operations remain unaffected by the move. The new address is Studer UK, Cranborne House, Cranborne Industrial Estate, Cranborne Road, Potters Bar, Herts EN6 3JN. At the time of writing there was not yet a direct telephone line, so the team can be contacted via the Soundcraft main switchboard.

Studer UK. Tel: +44 1707 665000.

● **Euphonix European office**

Euphonix have opened a new office in the UK which serves the whole of Europe. The new headquarters, in Hammersmith, London, includes a fully-equipped purpose built demonstration studio, complete with a 56-fader *CS2000* and service centre. This is the fourth satellite sales office for the company with others already established in Los Angeles, New York and Nashville. Dave Powell, until recently Head of Sales at SSL, becomes European Operations Director, while UK sales are handled by Steve Levine, who has worked with Euphonix in the UK for over a year. The address of the new office is

Euphonix, 6 Berghem Mews, Blythe Road, London W14 0HN. Tel: +44 171 602 4575.

● **Take That take Yamaha**

Take That's current large-scale tour is carrying large amounts of Yamaha gear, from guitars, synthesisers and digital pianos to Yamaha's latest sound equipment. Of particular interest is the first stage use of the *Pro Mix 01* digital mixer; MD-keyboard player has one to mix his rig, which includes a *VL1*, a *PFP100* piano and an *SY85*, while drummer and percussionist Fergus Durant has another to mix acoustic and electronic sounds with triggered samples, using the digital EQ to enhance the sample sounds.

Yamaha-Kemble Music (UK) Ltd. Tel: +44 1908 366700.

ITS and FEITIS liaise at IBC

During IBC 1994 in Amsterdam the first meeting took place between representatives of the ITS (International Teleproduction Society), with a membership of over 350 facilities companies and manufacturers around the world, and technical representatives of FEITIS (Federation Europeenne de Industries Techniques de l'Image at du Son), incorporating membership from nine European countries.

Both organisations represent the same businesses, and have the same problems and the same outlook. Based on this, it was agreed to help each other attain the following common goals over the next six months: to promote the technical and artistic talent within the industry; recognition by political bodies within each member country of the size and importance of this industry; forging a regular dialogue with suppliers and equipment manufacturers; and ensuring the media have a better understanding of the industry's problems and importance.

ITS (UK Chapter) Ltd. Tel: +44 1707 260216.

Sony Czech in

Sony Broadcast and Professional Europe are opening a new branch office in Prague, commemorating the event with a major exhibition at the new premises in the International Business Centre. The new operation will allow Sony to get closer to their existing market and to develop a deeper understanding of their customers' needs. It will build on the direct partnerships Sony have already established with national broadcasters while offering local support to independent production houses—a major growth area in the Czech Republic today.

Besides its normal commercial activities, the Prague office will coordinate service, organise technical training and run seminars to explore new products and applications, and also provide a national information service. The new team has already been at work building a new CZK20 million TV and postproduction studio for Matilda TV, supported throughout by Sony Systems Integration, one of Europe's largest broadcast contract engineering organisations.

Sony Broadcast & Professional Europe. Tel: +44 1256 483366.

Avid merge with Digidesign

A merger between US companies Avid Technology and Digidesign Inc was announced on 26th October–on the eve of the San Francisco AES.

The arrangement follows the existing incorporation of various of Digidesign's products and technology into Avid systems–Avid currently being Digidesign's largest customer.

The merger is being viewed by Avid President and CEO, Curt Rawley, as 'a marriage of the leading company in digital video with the leading company in digital audio'. He goes on to say 'We believe that it moves us closer to being able to meet our customers' demands for tightly integrated, all-digital processes for media creation, capture and distribution whether in independent postproduction houses, Hollywood, broadcast or the corporate world.'

The share arrangement cementing the merger will give Digidesign holders 0.79 shares of Avid Common Stock for each of their own Common Stack. Completion is anticipated within 2-3 months, subject to the approval of both sets of shareholders.

Avid Technology Inc. Tel: +1 508 640 3158.

Wembley Storm

London-based Wembley Loudspeaker, in conjunction with Sound Kinetics, have announced the sale of the first *3D Storm* sound processing system, voted one of the year's best new products at the recent PLASA show. ACR Lasers based near Cologne had purchased a package including eight Spyder Compact Loudspeaker systems, six 2820 subs, the *3D Storm* system and a *BASE* processor.

Developed by Sound Kinetics, *3D Storm* is a package of hard- and software that provides real time control over the position and trajectory of sound in three dimensions (x, y and time). Designed to be used with the *BASE* processor, although it can function perfectly well without it, *3D Storm* can be installed at almost any point in the audio chain, making it equally suitable for live and studio-oriented applications. The package comprises an Atari *ST* computer, the *3D Storm* software, and a 19-inch 1U-high processing unit which provides the interface between

Jamaica Studio 2. ARCoustics and Shen Milsom & Wilke have announced the completion of a major suite of studios on the island of Jamaica with the opening of the third and largest of three studios for Music Works. Studio 2, as it is known, has the largest control room on the island, and has several other unique features. The room itself is over 11,000ft³ in size with a 29-foot long rear wall diffractal diffusing system, from RPG. The monitoring loudspeakers were created specially for the extraordinary low-frequency demands imposed by the combination of reggae music and a large room. The system, known as the State of the Art Electronik Model 4000, was developed at ARCoustics and Shen Milsom & Wilke's instigation from what had previously been the Canadian company's largest system. Along with two separately mounted and powered subwoofers, the system boasts a total of ten 18-inch woofers, capable of generating more than 130dB SPL of low distortion bass. Total amplifier power available is about 10,000 Watts continuously. ARCoustics Inc. Tel: +1 212 727 9645.

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New Swedish Opera House. On 1st October 1994 the King of Sweden formally opened the Goteborgsoperan, the first major new venue of its kind to be built in Sweden this century. The sound system installation was handled by local company Tal & Ton AB, and incorporates major contributions from Cadac and Meyer. The console chosen is a 48-input Cadac J-Type, fitted with motorised faders and comprehensive automation facilities. The console is sited at the rear of the auditorium within the control room; it was the first in the world to be fitted with Cadac's motorised fader system, and is mounted on a specially designed hydraulic table, allowing operators to adjust the desk's height very quickly and easily. The J-Type will be used on a wide range of different production types, from ballet and classical opera to large orchestral concerts, experimental theatre and popular music events. Meyer's SIM System II acoustic analyser is also being used at Goteborgsoperan for final optimisation of the configuration.
Clive Green & Co Ltd. Tel: +44 1582 404202. Meyer Sound Europe. Tel: +44 1273 441200.

the computer and the audio signal. Options are available to control either the trajectory and position of a mono source or the manipulation of a complete stereo image.
Wembley Loudspeaker.
Tel: +44 181 743 4567.

Battery recharged

New York's Battery Studios have completed a major refurbishment by UK studio designers Harris Grant Associates. Visitors to the Manhattan facility since the reshape include Vanessa Williams, Tony Toni Tone, R Kelly and Naughty By Nature.

HGA's design team of Neil Grant, Derek Buckingham and David Bell provided a radical revamp of the existing acoustic environment in Control Room K2 and its associated studio area—the job included a partial reconstruction of the existing isolation shell, as well as specification and installation of RPG acoustic treatment products.

Hardware in K2 includes an SSL *4064 G-Series* console, teamed with a pair of Studer *A827* multitracks under control of a Motionworker sync package. In keeping with HGA's preference for natural textures and materials, K2's floor and equipment rack work tops are surfaced with a green Kirkstone slate imported specially from the UK. Back wall Diffusors and other RPG products have been specified in a variety of custom hardwoods.

In the process, Battery have become the first customer for the latest generation of Neil Grant and Matt Dobson-designed *Boxer T5* monitor system by Coastal Acoustics Ltd. The new K2 monitors provide 1.5kW of amplification per side and feature all-new midrange and high frequency drivers plus striking new facia cosmetics in a hand-lapped piano black finish.

HGA's activities extend to ancillary areas within the complex including machine rooms, reception areas, lounges and corridors. Custom furniture, lighting and surface finishes have all been specified by the team.
Battery Studios.
Tel: +1 212 627 8200.
Harris, Grant Associates.
Tel: +44 1753 631022.

CTS *Capricorn*

London's CTS Studios have purchased a 48-fader, 160-channel Neve *Capricorn* console—the fourth UK sale to date. The all-digital desk will go into either Studio 2 or 3, depending on the refurbishment which is already underway with acoustic designers, Recording Architecture.

The console will replace a classic 32-channel Neve desk which has been in Studio 2 for over 18 years and already has a number of potential buyers. With industry criticism of the *Capricorn* circulating since its introduction in Abbey Road's Penthouse Suite a couple of years ago, and perceived competition with AMS Neve's own *Logic 2*, the console has had a cautious reception to date but CTS' Adrian Kerridge has wanted one since the launch and has spoken at length with AMS Neve's Mark Crabtree before making the purchase.

'*Capricorn* addresses an entirely different market from the *Logic*,' says Kerridge. 'We wanted a multiformat desk that would address not only our current requirements but also the multimedia demands of the future. Given our long association with *Capricorn*'s design engineers, we are confident that this console is a secure choice.'

Kerridge has bought 12 Neve desks over the years, including the first all-digital console in the world—the ill-fated *DSP*. But nostalgia did not push him towards the *Capricorn*. 'The convertors on this desk are incredibly good,' he claims, 'and the EQ has all the hallmarks of the classic Neve sound.'

The most obvious way in which CTS will be using the new console is in Dolby digital surround mixes for film, which has always been a vital part of CTS' work. Kerridge is convinced that other types of work will be forthcoming and will tie-line it to the larger studios—as has been done at Abbey Road. Rates for the desk are unlikely to be significantly different from other major-league mixing and recording rooms. Refurbishment should be complete by the new year.
CTS. Tel: +44 181 903 4611.

Contracts

● **DNA Symons for Belgian broadcast**

Belgian broadcast company BRT have placed an order for ten DNA *Symon* distribution amplifiers, to add to the 16 they already have in use.
DNA. Tel: +31 5270 20060.

● **AMS Logic sales**

Santa Monica facility Pacific Ocean Post have added to their complement of AMS Neve *Logic* consoles with a $3.5m order, increasing the number of *Logic* systems to three *Logic 2*s, one *Logic 1* and three *Logic 3*s, each with a 24-track *AudioFile*, plus an eighth 24-track *AudioFile* in the ADR-Foley room. Further orders have come from Henninger Digital Audio in Arlington, Virginia, whose expansion includes two *Logic 2*s each fitted with a 24-output *AudioFile Spectra*, with four 8-output *AudioFile Spectra*s to follow.
AMS Neve plc. Tel: +44 1282 457011.
Siemens Audio Inc.
Tel: +1 212 949 2324.

● **SSL sales to broadcasters**

ABC TV in Australia have installed a 48-channel *SL 4000 G+*, with a 40-channel console going to Telemetropole in Montreal; Austria's ORF have upgraded their *Scenaria* to full OmniMix standard; NOB Audio in Holland have installed *Scenaria* at their Hilversum headquarters; Italian satellite TV company Orbit have two *Scenaria* systems at their postproduction facility in Rome; NHK have installed an *OmniMix* in Hiroshima; consoles have gone to KBS in Korea (an 80-channel *SL 8000 G+*), Swedish National Radio (four *SL 4000*s for use in mobiles), Taiwan TV (40-channel *SL4000 G+*), United Arab Emirates Radio and CBS TV. Radio Television Luxembourg and Nickelodeon in the States have both installed *ScreenSound* and *SoundNet*.
Solid State Logic.
Tel: +44 1865 842300.
SSL (US). Tel: +1 212 315 1111
and +1 213 463 4444.

● **Optifile Tetra for Moles**

Bath Studio Moles have installed a 64-channel Optifile *Tetra* with local status controls and the new remote control option, which allows Moles to have all the major *Tetra* controls fitted into the centre section of their console.
Home Service. Tel: +44 181 943 4949.

● **Mozart in Denver**

The Rocky Mountain Recorders studio complex in Denver, Colorado, have installed two Amek *Mozart RN* Series mixing consoles, both fitted with 40 Rupert Neve-designed input modules and the 486-based Amek *Supertrue* VCA fader and switch automation.
Amek. Tel: +44 161 834 6747.
Amek US Operations Inc.
Tel: +1 215 968 2059.

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SSL integration

SSL is to launch analogue and digital consoles integrated with random access multitrack at the San Francisco AES in a move that is likely to redress expectations in high-end production. The *DiskTrack* random-access system, which is standard in the *Axiom* digital console and an option in the *SL9000* analogue desk, is central to affairs and includes Resource Management as a means of allocating I-O capability and allowing the system to be shared between control rooms.

DiskTrack offers up to 95 concurrent access tracks—technology that allows a disk to be read and written to at the same time and permits drop ins to be performed on the same track. Most spectacularly a 48-track, 18-track-hour, system is expected to command in the region of $82,000 (£55,000, UK) which compares extremely favourably with open-reel digital.

The fact that this random-access audio can be mated to analogue or digital console surfaces is significant as SSL have long maintained the right of the user to choose.

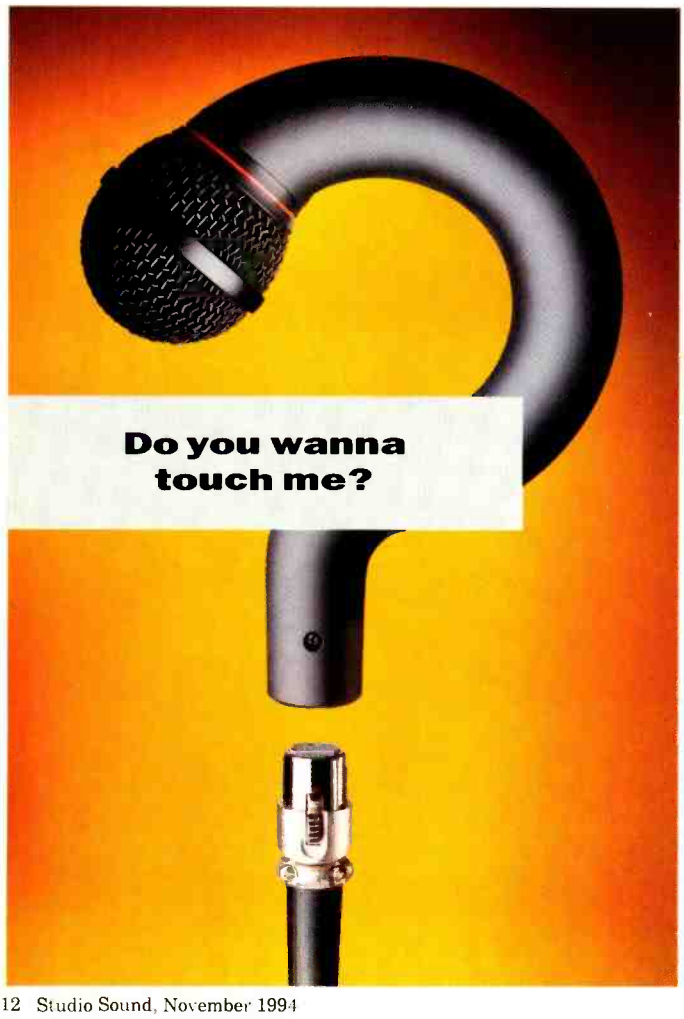
The *SL9000* is said to be familiar is ergonomics to the *4000* but has been significantly enhanced in terms of automation and features. A *J-series* computer has improved versions of *Ultimation* and *Total Recall* (imports *G-series* and *G+* mixes) with automated long and short faders, channel switches and left-right, front-back panning in sizes of up to 120 channels. Mix buses are balanced and the desk has all-new electronic design with 48-track bussing, six mono and one stereo aux sends, switchable *E-series* or *G-series* EQ on each channel, four additional stereo mix buses, LCRS bus access from long and short faders at all times and dynamics on each channel. This and the *Axiom* can be integrated with SSL's *VisionTrack* random-access picture source.

Axiom is the first 'one knob per function' digital console and comes with up to 96 channels, full dynamic automation and resetability. The surround-sound capable desk has integrated EQ, dynamics and reverb effects and a what the company describes as a 'uniform extremely low' processing delay regardless of the amount of processing going on.

Shipping is slated for February with an *SL9000* with *Ultimation* and *Total Recall* as standard weighing in at around 10% more than a similarly spec'd *SL8000*. An *SL9000* with *DiskTrack* will be comparable in cost to an *Axiom*.

Throughout this the 'package' concept of the new generation of SSL products is the most noteworthy and looks set to have a profound effect on the decision process of those looking to upgrade a high-end system.

SSL. Tel: +44 1865 842300.
USA. Tel: +1 212 315 1111.
Japan. Tel: +1 3 5474 1144.



Gotham cables

Gotham Switzerland have announced a new range of multipair AES-E BU 110Ω digital audio cables. Four different multipair types are available: *GAC-4, 8, 10* and *12* (numbers indicate numbers of pairs). The basis for the cables is the *GAC-2/1* AES-EBU cable which guarantees a constant impedance of 110Ω over the whole run of the cable. Screening comprises Gotham's exclusive double Reussen shield, featuring two opposing, spiral-wound, bare, copper shields, which helps the cable achieve very good flexibility with tight electrical performance tolerances. Constant impedance is achieved by means of two nonconducting strands in the core, which maintain the correct geometrical position of the two conductors even when the cable is bent or kinked.

Other new products from Gotham include a new *Star Quad* cable, *GAC-4/1*, which Gotham regard as their most advanced microphone cable. It also employs the double Reussen shield, and has an ultra-flexible jacket and low capacitive PE insulation.

Gotham AG. Tel: +41 1 840 0144.

In brief

● Weiss launches

Weiss Engineering are showing various new products at AES and Tonmeistertagung: a two-channel, stand-alone, A–D convertor claimed to be 'state of the art'; 'the best of both redithering worlds'—Advanced Noise-shaping Redither (ANR) and Apogee *UV22* in a single unit; the low-cost Clockwork unit for effective jitter reduction on AES-EBU or SPDIF links; new *De-Esser* software for the *102 Series*, with *102 Series* modules working at up to 96kHz; a stand-alone *De-Esser*, and the *Over Eliminator*.'

Daniel Weiss Engineering Ltd.
Tel: +41 1 940 20 06.

● JRF replacement head for Studer *A80* and *A800*

JRF Magnetic Sciences have introduced new *PLX-S24* replacement heads for 24-track Studer *A80* and *A800* series recorders. Designed as direct replacements, the new *PLX* heads are manufactured from extremely hard materials to offer greatly extended wear. Low-frequency response is said to be exceptionally smooth, and specially designed shielding has been incorporated in the record head to substantially improve adjacent-channel sync-to-record crosstalk. Setup for the new *PLX* heads is virtually identical to that for equivalent Studer-supplied heads.

JRF Magnetic Sciences.
Tel: +1 201 579 5773.

● RPG PilloBaffle*

RPG Diffuser Systems have introduced the *PilloBaffle*, a new affordable, hanging, sound-absorbent baffle which provides uniform broad bandwidth absorption for less than $4/Sabin. *PilloBaffles* are designed for easy installation, simply hanging in a daisy-chain array to suspend from the ceiling or spaced from a wall with standard hardware. Fabrics are available in seven standard colours along with a silk-screening service for school or company logos.

RPG Diffuser Systems Inc.
Tel: +1 301 249 5647.

● Digidesign *D-Verb*

Digidesign's *D-Verb*, a software reverberation-ambience plug-in for *Pro Tools*, is now available. Using the company's TDM bus and the Digidesign DSP Farm card, *D-Verb* allows the addition of reverberation to single or multiple tracks, with on-screen editing and program storage. It uses 24-bit resolution, and has the ability to run multiple reverb processors.

Digidesign. Tel: +1 415 688 0600.
Digidesign UK.
Tel: +44 181 875 9977.

www.americanradiohistory.com

NOW WE'RE MOVING THEM.

You can move them on Stand No. 834 97th AES Convention November 10 - 13, 1994 Moscone Center, San Fransisco

Soundtracs have earned a reputation for introducing mixing consoles which continually set new industry standards for quality, innovation and value.

A reputation our competitors would die for.

Last year we sent them reeling with the stunning, high-end Jade Production console.

And if Jade turned them green with envy the new mid-range Solitaire is set to give them the blues.

Awash with features and function, the Solitaire Production Console combines the finest audio quality with DSP multi-processor control including the option of motorised faders.

Like someone once said - "Innovative in design, dynamic in operation".

Present on every channel the unique FdB Parametric Equaliser™ overcomes the problems of non-linearity in music and the ear providing precise control of all frequencies in the audio spectrum.

In addition, all monitors have a 2-band equaliser plus access to the FdB Parametric Equaliser™.

The on-board ADP, (Assignable Dynamics Processor), provides a comprehensive range of gating, compression, expansion, limiting, modulation and auto-pan functions on each channel.

Plus there's the precision automation, in motorised fader or VCA flavours.

Quite a specification. - Quite a console.

Solitaire - much more than moving faders.

SOUNDTRACS

SOLITAIRE

Soundtracs PLC, 91 Ewell Road, Surbiton, Surrey KT6 6AH, England. Tel: 081 399 3392. Fax: 081 399 6281

www.americanradiohistory.com

Hard drives

Micropolis have announced two new 3½-inch Fast SCSI-2 hard disk drives, the *Capricorn Model 3243* (4.29Gb) and *Taurus Model 4221* (2.1Gb). Providing improvements in data literacy and a reduction in seek times over conventional industry hard disks, both the drives will also be available in A-V optimised versions to support the growing demand for real-time digital data storage.

The *Capricorn* and *Taurus* drives offer an enhanced 7200rpm spindle speed allowing for a 33% improvement in data literacy and an 11% reduction in seek times. Available with a Fast SCSI-2 or a Fast Wide SCSI-2 interface, both drives provide up to a 20Mb/s data transfer rate. The drives have a high-performance SCSI2 controller providing internal data rates of up to 49–81Mbits/s and 8.9ms seek time.

The A-V versions have been optimised for real-time data storage applications, and offer a 38% performance improvement over 5400rpm drives. They are performance tuned for continuous throughput and maximum bandwidth, offering the uninterrupted data rates required for digital media in applications such as multimedia, desktop publishing, digital video and video servers. In addition, both drives provide a lower power consumption over previous drives of similar capacities through the use of Micropolis' patented Power Management System.

Micropolis. Tel: +44 1734 751315.

Clean power from Equi=Tech

Equi=Tech

Equi=Tech Corporation have introduced a new line of rackmountable isolated power systems designed specifically for operation with sensitive electronics. The systems reduce the levels of AC-related noise in audio and video equipment by utilising a balanced voltage output (129/60V US or 240/120V UK). The rackmount units provide balanced power to equipment avoiding the need for extensive AC rewiring. Three models are available with load capacities of 2000W, 3000W and 5000W.

Equi=Tech. Tel: +1 503 597 4448.

BEC network

At AES in San Francisco BEC Technologies will be introducing a series of self-contained modules constituting a complete fibre-optic audio and data-networking system, allowing any configuration from a simple 2-channel, point-to-point, linkup to a full 64 audio plus two slow-scan data channel network. The system uses 20-bit A–D and D–A conversion and can be assembled in two channel increments. Modules can be placed up to 2 miles/3km apart and provide the system designer with the ability to add into, replace or drop from the network at each of the locations in either analogue or AES-EBU digital formats. The two slow-scan data channels can handle data rates up to 512kbits/s each and can be physically configured as RS232, RS422, RS485, 20mA current loop or MIDI compatible. The fibre interface communicates at a frequency of 147.456Mbits/s into standard multimode fibre, terminated with industry standard SC connectors.

BEC Technologies Inc.
Tel: +1 407 855 8181.

● **DAR Videola**

At IBC DAR announced the new *Videola* facility, an advanced audio to video sync system providing exceptionally smooth and tight 'all speed' lock, enabling the highest quality multichannel audio scrub, locked to picture with full bidirectional varispeed. Demonstrated at IBC on *SoundStation Gold*, in conjunction with a Lightworks *Digistation*, *Videola* is compatible with a range of digital and analogue video sources. DAR say it represents a unique facility for extremely accurate rock editing, especially if the programme material requires complex audio changes to take place across only a few frames.

DAR. Tel: +44 1372 742848.

● **Symetrix**

Symetrix have introduced the *488 DYNA-Squeeze*, an 8-channel compressor-interface for use with *ADAT* and *DA-88*-type digital recorders. Symetrix describe it as the missing link between analogue consoles and digital recorders, and say it provides eight channels of level matching interface from +4dBu to -10dBu. No details are given about the characteristics of the compression system other than maximum compression of 38dB, but the unit clearly aims to keep high level signals under control to avoid clipping. Newer still is the *Model 620* 20-bit A–D convertor, which features selectable output word size, selectable dither and noise shaping, and AES-EBU and SPDIF in and out. For multimedia production houses, the *Model 620* sample-rate converts from 44.1kHz to 22.05kHz and bit-rate converts from 16 to 8 bits.

Symetrix Inc. Tel: +1 206 787 3222.

● **B&K 4040 microphone**

To be premiered at the AES is the *4040* mic from Bruel & Kjaer. Designed for vocal recording and featuring, both valve and FET preamplifiers are in fact fitted. Combined with a precision 1-inch diaphragm to deliver an extended frequency response, the *4040* offers a typical noise floor of 9dB(A).

The *4040* produces two simultaneous in-phase preamplifier outputs, one from a conventional FET and one from a superior grade valve, and the line amplifier supplied provides line-level outputs from each of the preamps so that they can be combined or switched at the console. Frequency response has a slight presence boost at 8kHz and is flat to well past 20kHz.

Danish Pro Audio.
Tel: +45 4814 2828.

www.americanradiohistory.com

“The engineers love it, the A&R men love it, and my accountant almost broke into a smile”

The DC2000 breaks new ground for in-line recording by offering moving fader technology at a price that you can afford.

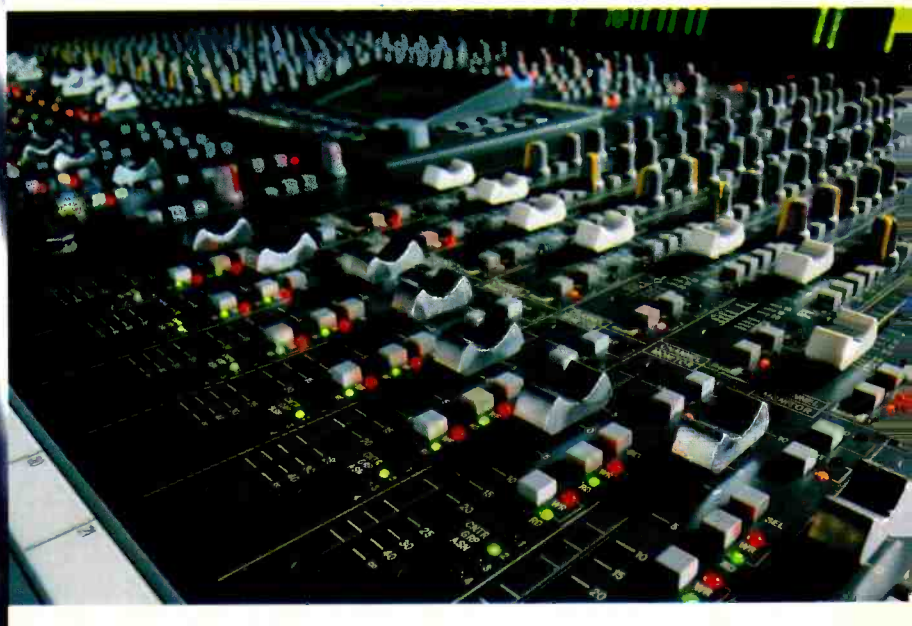
As a complete integrated workstation, the DC2000 has in-built computer control and requires no additional PC. Through its moving fader technology, the DC2000 provides an accurate and intuitive approach to sound recording, that would be almost impossible to achieve manually.

With advanced project management capabilities, mixes can now be created faster and more effectively by utilising the DC2000's advanced on-board touch screen computer, dedicated software package and hard disk storage...

and as the DC2000 comes from Soundcraft, you can trust them to deliver a product that is produced to the highest standards of manufacture and service.

So why not make the next move and call your nearest authorised DC2000 dealer. It could make you, and your accountant, extremely happy.

MOVING FADER



Harman International Industries Ltd., Cranborne House, Cranborne Industrial Estate, Cranborne Rd., Potters Bar, Herts EN6 3JN, England. Tel: +44 (0) 707 665000. Fax: +44 (0) 707 660482

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DC 2000

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NTI EQ^3

In an industry that has become top-heavy with large corporate entities with well-funded R & D departments, it is increasingly difficult to find the occasional independent innovation of the sort that got the business started in the first place. Life among the SSLs and Yamahas, nice as it is, can obscure the humble origins of many things we now take for granted.

So it is refreshing to not only see a new face but also to have a look from whence it came. The EQ^3 is precisely such a unit from precisely such a newcomer. Rather than offering a variation on some established approach to equalisation, this box tackles some of the fundamental underlying problems that characterise this type of signal processing and in doing so, finds a new niche as well as a opening a few ears.

The problem regarding equalisation is phase shifting or distortion; variable frequency centres and adjustable bandwidths inherently produce distortion when they overlap in an asymmetrical manner.

The issue is so implicit in the conventional EQ process and as a result so ingrained in our aural sensibilities that it generally passes unnoticed except by the few true audio purists out there. Nonetheless, the removal of phase anomalies from the process can produce an aural epiphany, indeed, with an additional clarity and coherency that ranges from mildly remarkable to astonished, depending upon the density of the programme material.

I got to listen to the EQ^3 a few months ago at Georgetown Masters, one of several Nashville studios responsible for investing the necessary $4,300 (US) in the EQ^3 and Night Technologies International —the developers based in Provo, Utah. According to Richard Zimmerman, the south-east region of the US was the initial target market because of the number of studios in Nashville, Atlanta and Dallas, and because the team had several personal contacts there. The first were Producer-Engineers Ed Seay and Paul Worley, partners of sorts in Nashville's *The Money Pit*. Their response was to immediately bring the unit to Denny Purcell at Georgetown, who was equally impressed and held a demonstration reception for it.

EQ^3—adopting a new approach to equalisation

The EQ^3 is simple in layout and design, lacking even a power button. The 2U-high unit has six dual-function controls for each channel. The outer knob of each is for coarse EQ cut and boost: the inner knob is for fine adjustments. Each channel has a bypass LED. The first five bands are set at 10Hz (sub), 40Hz, 160Hz, 650Hz and 2.5kHz, with bandwidths around 2.5 octaves. The sixth band is labelled AIR, and is a high-frequency shelving EQ that can only boost. Air shelves from 6kHz to 10kHz and the boost extends to an almost incredible 330kHz at 3dB. The back panel is similarly simple, with balanced XLR inputs and a pair of unbalanced $^1/_4$-inch jack outputs.

Used in a mastering applications, the EQ^3 avoids the pitfalls of phase distortion through the overlapping bands and centred frequency choices, claims Cliff Maag, codeveloper of the unit and now Vice President of R & D for NTI. 'The overlap of the lower band negates the phase shift of an upper band,' he explains, 'so where the bands overlap, they cancel their own phase shift.'

As simple as the description is, the EQ^3 works, subtly but with definition. Purcell demonstrated the transparent gradient that the cut and boost produces by playing some recently mastered mixes through it. The Air band is a sort of super presence control, and it does breathe some new life into mid-range heavy mixes by accentuating the upper octaves.

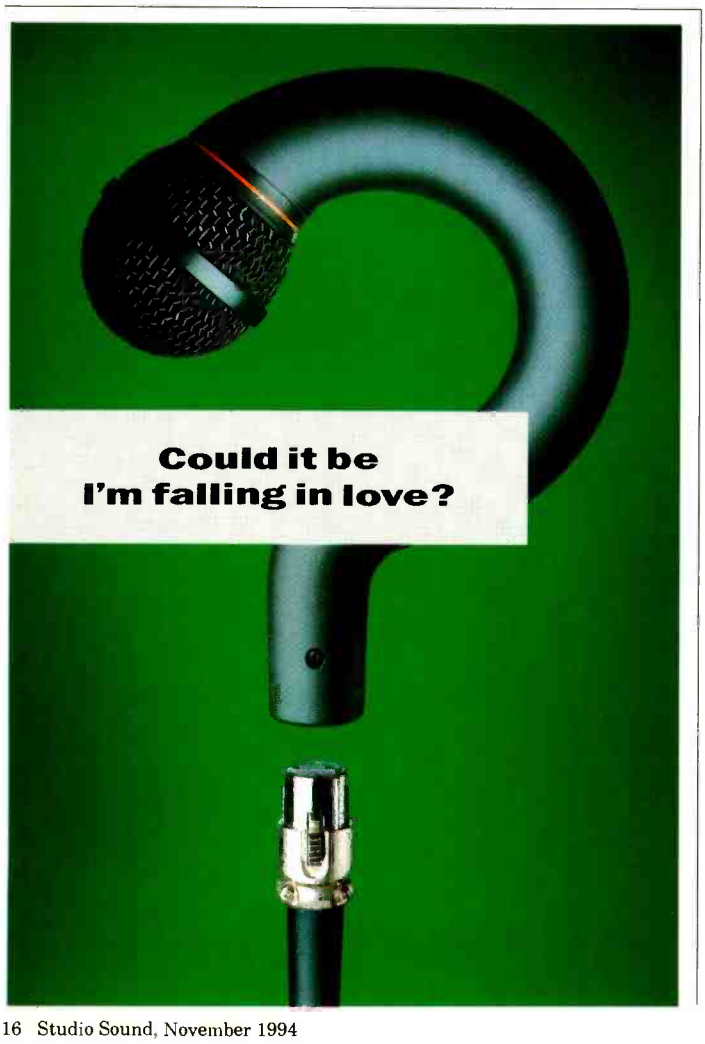
Last year, after 16 years of development by Maag and his wiring genius, Lance Parker, the EQ^3 appeared. In remote Provo, in the north-central part of the western state, they had built a recording studio, Record Lab, that any number of recording artists, from Tanya Tucker to the Osmonds to Bob Hope have found their way to over the last two decades. Significantly, these artists were attracted by the pair's affinity for building their own equipment—from consoles to compressors. 'Provo couldn't support new AMS Neve consoles and things like that back then,' says Maag. So the pair kept developing homemade responses to the evolutionary path of music technology. The built-by-hand approach, as well as some personal sparks of insight into what makes things sound good, led to a number of outboard pieces, none of which were ever heard beyond the walls of the studio. Until a preamp's EQ sounded so good that they began to look for a way to get it to market, less the preamp. Enter a fairly large—and growing—number of investors and independent marketing people that are now collectively known as NTI, avoiding the conventional route of selling via an established major manufacturer. 'We knew we had something unique,' says Maag. 'We decided we wanted to try to market the product the same way we had originally developed it—our way.'

The EQ^3 has made serious inroads throughout the US. A&M Records in Hollywood, Sterling Sound in Burbank, California, and Master Disc in New York have bought in, as have a number of high-profile recording and mastering facilities in Atlanta and Nashville. The initial responses have prompted NTI to both gear up for a UK release sometime in the near future, and to ready a second product for release, a preamp like the one the EQ^3 was originally based on, that reportedly will maintain a >0.024dB THD+n, regardless of whether it sees high or low-level input signals.

While the big audio manufacturers have their appeal, it pays to keep an ear out for whatever may be wandering around in the desert. Particularly around places like Provo. ■

Dan Daley

Night Technologies International (NTI), 1680 West, 820 North, Provo, Utah 84601, USA. Tel: +1 801 375 9288.



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In art and technology the wildest imagination of the past becomes the reality of today. Sennheiser's 16 channel switchable frequency radio systems bring complete artistic freedom to theatre, stage, and broadcast.

No constraint in performance. No compromise in style. Our transmitters and receivers set new standards in the interaction between computerised mixing and RF technologies. With supreme sound quality and total reliability.

Realistically Sennheiser radio systems are the ultimate choice. Surrealistically of course, they're a fish.

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

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TLA Valve Compressor

Tony Larking Audio's commitment to valves (or tubes) continues apace. Only a couple of months ago we saw the launch of two valve-based mixers, the smaller of which was reviewed in *Studio Sound*; we expected a valve compressor to follow shortly, joining the established Valve EQ, and indeed production units are now available.

Called simply the *Valve Compressor*, the unit is in fact considerably more than that, as suggested by the front panel legending and a few additional controls. The central function is of course a stereo/2-channel compressor, but several input options give away its second role as a preamplifier. It has conventional line-level audio ins and outs (on XLRs and unbalanced jacks) for insertion into a console channel path, but also incorporates a microphone preamp complete with switchable phantom power, allowing the unit to be used as a complete signal chain into a tape-machine line input, bypassing the console altogether. As if that were not enough, the front panel carries a pair of 2-pole jacks for connecting musical instruments directly into the compressor. There is even a switch for selecting guitar or keyboard level matching and a gain control dedicated to these auxiliary inputs.

The selected source passes through a solid-state input amplifier, with a single continuously-variable gain control and a high-pass filter, and then into a valve voltage amplifier stage—all before the signal reaches the compressor. With the compressor switched to bypass, the result is two channels of complete and versatile valve preamp for those who value such things.

The compressor follows, and is also built round a valve stage. It has the usual set of control parameters, but all controls are continuously variable pots with minimal calibration, apparently because many aspects have an element of programme dependence built in. Thus the Threshold control runs from +20 to -20dB with no intervening markings, the Ratio from 1:1.5 to 1:30, and both Attack and Release are simply labelled from Fast to Slow. The manual gives nominal figures of 0.5ms to 50ms for the attack and 40ms to 4s for the release, and goes on to explain circumstances where the programme will affect the values—time constants are reduced when very short transients occur, and the release setting may be extended by a slow attack setting.

A pair of illuminated VU meters shows either signal levels or gain reduction, and complement the style of the decidedly retro front panel. The case is battleship grey, and the simple, unpretentious knobs sit beneath a perforated grille as featured on TLA's valve EQ. Presumably we are supposed to think this is for ventilation, but as there are no grilles in the top or bottom panels it is hard to escape the conclusion that its main purpose is to allow us to see the valves glowing inside. As an aesthetic exercise I'm not sure about it—some will love it, but it perhaps lends a certain home-made feel to the whole thing. It is always amusing to see LEDs on a piece of kit with 'vintage' connotations, but perhaps fitting big unreliable filament indicators would be taking authenticity a tad too far. Several indicators are provided, showing whether phantom is on, whether the compressors are on, whether the channels are stereo linked and what the meters are doing.

The manual clearly states that the intention of the compressor is to allow unobtrusive compression to be applied to virtually any audio signal, and in this aim it succeeds admirably. It is rare to hear any identifiable side-effects of the compression, and with the controls set for subtle processing the only evidence of it working is the occasional meter movement. The compressor is capable of more drastic action, but perhaps not as violent as some; generally speaking, its forte is unobtrusive control rather than deliberate creative effect.

It is hard to identify any aspect of the compressor's performance which can be readily attributed to the presence of the valve, unless it is responsible for the very smoothness and transparency which characterises the unit. For once, this review is not going to describe the sound of a valve device as warm, as 'the valve sound' is not conspicuous as such.

Surprisingly, the same applies to the preamplifier section. I have to say that if there is a difference in performance, it is difficult to detect under normal operating conditions. In order to put this impression to the test, I split the feed from an AKG *C-414* between the TLA mic input and my normal console input, and could detect no significant difference either by ear or by measurement. Obviously the valve nature shows when the preamp is overdriven, but the resulting distortion, while clearly softer than a solid-state equivalent, is not sufficiently characterful to be exploited as an overdrive effect on a guitar in my view—or in the view of the guitarist who tried it out with me. For the musician, the unit would be enormously useful as an unusually high quality preamp, allowing studio-quality compression before feeding line level signals into a further processing rack.

In the studio, this is a compressor I would find myself using on many sources as a first choice, thanks to its ability to produce good, unobtrusive control quickly and without fuss. It has its appeal as a complete interface between microphone and multitrack, possibly providing a cleaner signal path than some console channels. Its attraction for the valve brigade hangs solely on the character of its compression, which in fairness should appeal to everybody; as a means of introducing 'the valve sound' it is perhaps less effective than, say, TLA's mixers with their rounded, warm valve EQ. The up side is that those who find no appeal in the idea of valves for the sake of valves should not be put off this compressor, as its performance commends itself quite regardless of the technology it has chosen to use to achieve it.

Dave Foister

Tony Larking Audio, Norton Mill House, Nortonbury Lane, Nr Baldock, Herts SG6 1AN, UK.
Tel: +44 1462 490600.
Fax: +44 1462 490700.
US: Sascom Marketing Group.
Tel: +1 905 420 3946.
Fax: +1 905 420 0718.

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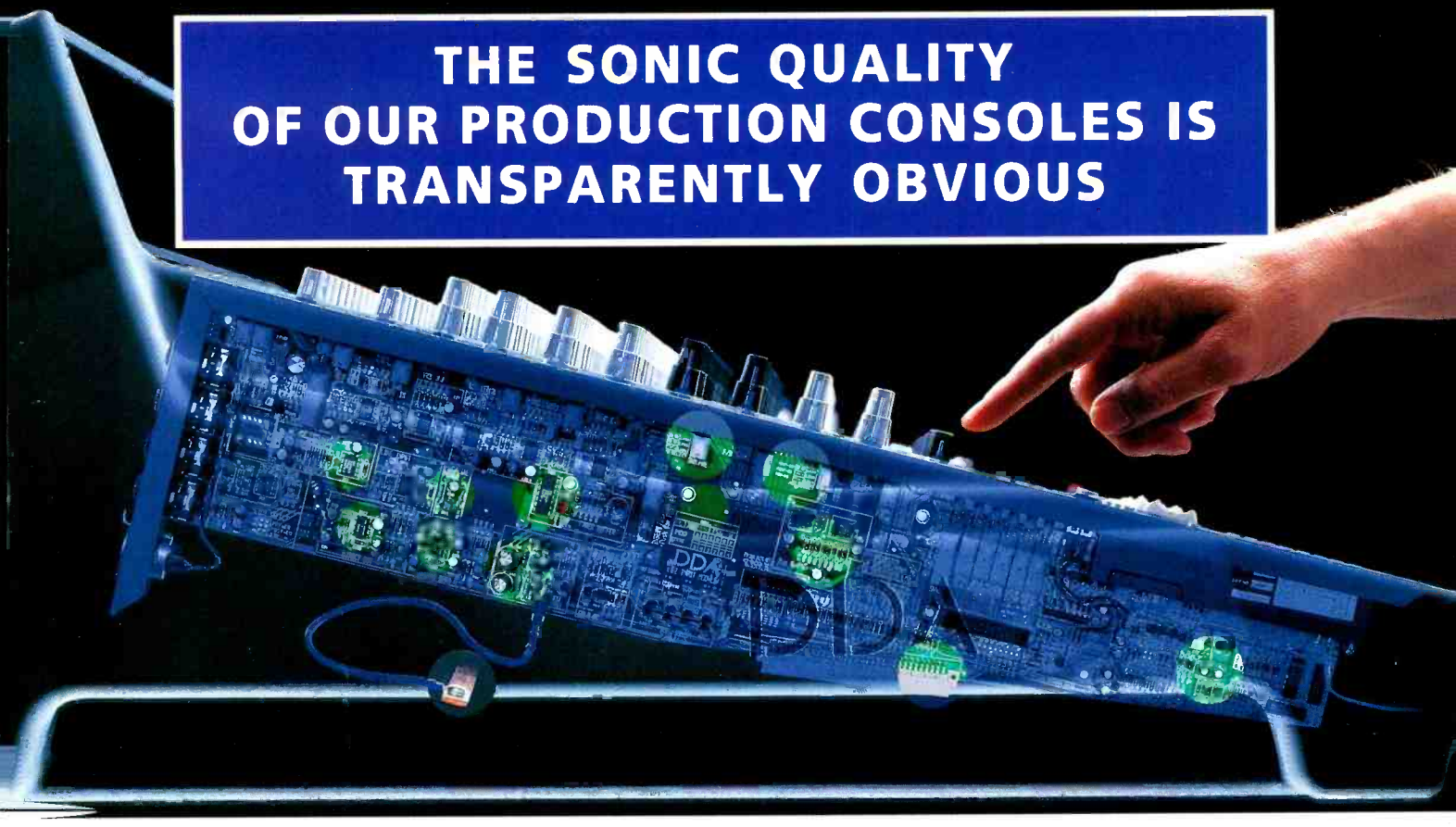
THE SONIC QUALITY OF OUR PRODUCTION CONSOLES IS TRANSPARENTLY OBVIOUS



DDA's approach to console design is simple.

We believe that where audio electronics are concerned, less is definitely more. The less we put in the way of your signal, the more your mix will shine through.

FMR

But making this concept practical is quite a design feat.

With so much demanded of a production console, most tend to fall short of one major quality.

Transparency.

At DDA we put a lot of thought into making our electronics sound less. (Even while our facilities give you far more.)

The entire audio path gives you the freedom of an elegant gain structure with over 22dB of headroom throughout and a low noise floor.

Our minimal signal path topology, where unused circuit blocks are completely by-passed, and state-of-the-art *Analog Devices chips are two more keys to accurate audio.

High quality controls and switches, distributed decoupling and gold plated connectors subtly improve signal integrity.

Meanwhile, everything *around* the signal path is designed to protect that quality throughout the desk.

A full-length copper earth bar, balanced line level interconnects and ground-planed PCBs improve noise, RF immunity and crosstalk.

So while we broaden your creative horizons, you'll hear virtually nothing from our electronics.

You'll find all these attributes in the FMR production console's Forum Standard Input and Master modules and its new Bus/Tape Monitor module

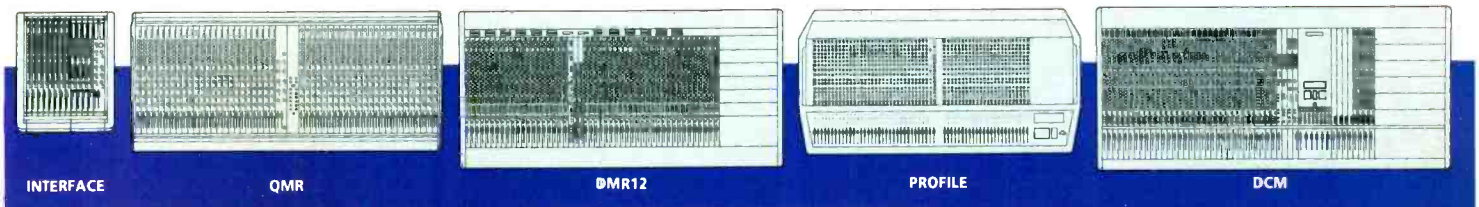
They also draw on the legandary AMR24's overall >100dB dynamic range and incredibly low noise floor. Along with more intelligent features like 4-band EQ and complete aux, solo and mute facilities.

DDA's range of production consoles include the Interface, QMR, DMR12, Profile and DCM232 desks.

As for their sonic quality, we know that as soon as you work with a DDA you'll agree with us: It's transparently obvious.

DDA
a MARK IV company
PRODUCTION CONSOLES
BETTER BY DESIGN

* Registered trade mark.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Tektronix *AM700*

Tektronix *AM700*—compares favourably with other high-end test sets

Tektronix, perhaps better known for their oscilloscopes and video test equipment, have been steadily moving into analogue and digital-audio systems. At the last AES Convention I was very impressed by a prototype of the new *AM700* audio test set which operates in both the analogue and digital domains, and I have now managed to get my hands on one for a few days. This really is a remarkable piece of equipment, with a well-designed user-interface, capable of carrying out not only measurement operations on both analogue and digital audio signals, but also analysis of the digital-interface signal itself.

The *AM700* is an all-in-one test set with a moderately-sized touchscreen for display. (An optional VGA monitor may also be attached.) It is 'luggable' as opposed to portable, rather like a large scope. It has been designed from the bottom up as both an analogue and a digital measurement set, and to this end it incorporates some impressive signal-processing power. It will handle inputs and outputs in balanced analogue and serial digital audio, to AES, consumer copper (IEC 958 Type II) and consumer optical standards. The consumer copper format has been converted to BNC connectors for better security, and there is an AES sync reference input and output. There are also a number of remote interfaces including GPIB, a DSP port and a printer port.

The device has a number of internal software programs that load from ROM, turning the *AM700* into one of a number of different pieces of test equipment. One of the most interesting and useful is the digital interface tester which allows the display of the 'eye pattern' of the incoming data, together with an analysis of the peak-to-peak jitter of the signal and the phase difference between the incoming signal and the AES sync reference. The signal generator can be configured to produce a prejittered digital-audio signal for which the jitter voltage and frequency may be varied, allowing simulation of various different types of poor signal condition, and the generator output may also be preconditioned with a 'long cable simulator' (although quite how long this is it doesn't say!). This feature will be of particular value to manufacturers wanting to determine the robustness of their digital-audio interfaces, and also when attempting to determine the effect of interface jitter on subsequent conversion stages. The analyser is also capable of displaying the jitter spectrum of the incoming data, and it offers a full breakdown of channel-status data complete with 'English' interpretation if required.

The analogue side of the *AM700* can be operated in either 'high bandwidth' or 'high resolution' modes. The high bandwidth convertors operate up to 80kHz but have a poorer dynamic range than the high resolution convertors (which are roughly equivalent to 18-bit resolution). The FFT section of the analyser allows spectral analysis of audio signals, and is exceptionally flexible because of the internal DSP. Unlike most FFT analysers that I have seen, the display can be zoomed into a certain region by pointing a finger at the area concerned and winding the 'expand' control up. Remarkably, the frequency resolution adapts automatically to the displayed view, so that very fine detail is available even with small portions of the spectrum. The FFT is very fast in full bandwidth display, and is even quite respectable when highly zoomed.

A number of different generator modes are available including sweeps, a 'chirp' signal for fast testing of frequency response, noise signals, multitone signal and so forth. It is not possible to list everything here. The generator controls are easily accessible, and can either be shown in a small portion of the analyser display, or can fill the whole window. Physical front-panel controls can be assigned to output frequency and level of either the analogue or digital signals. Unlike many devices the generator and analyser sections can be assigned different sampling frequencies, allowing measurement of sample-rate convertors.

The Audio Analyser module allows a number of different types of measurement to be assigned to up to four different 'views' which may be displayed concurrently in any combination. These include THD+n, frequency response and amplitude sweeps. Any of the displays may be printed or saved as TIFF or Postscript files for dumping to other software, and there is a built-in disk drive for this purpose.

I was particularly interested in the user interface of the *AM700* which is a combination of touchscreen and dedicated controls. Although I have a natural aversion to touchscreens I quite liked this one. Nonetheless there arose the occasional frustration of pressing the wrong button or missing the right area. A calibration screen is available to optimise positioning and avoid parallax errors. It is possible to point at the axes of a graph and turn the rotary control, which smoothly expands or contracts the scale. Pointing at the axis label (such as dBFS) allows you to change the measurement scale. I found that it was not always clear when the device had registered my command because some mode changes took quite some time, and there was no 'working' indication to show that it was doing anything, leading me to press buttons more than once on a number of occasions. This aside, the user-interface is well designed. Clearly, when a test set contains so many functions it will take some time to find your way around.

The *AM700* is not cheap at around (£15,822 plus VAT in the UK), but when you consider that absolutely everything is standard rather than optional, and all in one box, it seems more reasonable. The price compares favourably with other high-end test sets such as AP and Rhode & Schwarz. The advantage of the total integration between analogue and digital measurements, together with the interface-analysis functions, DSP and a very flexible signal generator, make this an attractive package. ■

Francis Rumsey

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Out and about

As reported last month in *Studio Sound*, the 1994 Montreux Jazz Festival rig featured a Crest *NexSys* installation so this need not be discussed again. The second leg of the Montreux Jazz Festival in the Stravinsky Auditorium saw Meyer Sound Laboratories as one of the official sponsors of the festival and some changes compared to last years setup. The FOH position saw some changes as well, with long-time stalwart Chris Ridgway being away on tour with The Pretenders and replaced by Steve Levitt. Monitors were under the auspices of Steve Thorneycroft as usual, although he is at present enjoying a career resurgence as a drummer.

The house-control setup was provided by Wigwam and consisted of a Yamaha *PM4000* console with a suitable amount of outboard equipment.

The house-speaker installation consisted of left and right *flown* clusters comprised of three Meyer *MSL5*s, four *DS2* low-mid bins and two *MSL2* front fills, a centre fill consisting of one *MSL2* and a delay system of left, centre, right (Meyer *MSL2*s) placed just forward of the rear balcony. Sub-bass was provided by five 650SW cabinets per side stacked in columns of three and two.

The Stravinsky Auditorium has been designed as a symphony concert hall and is therefore not ideal for amplified performances. As with the 1993 Festival, acoustic treatment was applied to the hall in the form of drapes and Mark Johnson comments that the hall is 'deader this year, with hardly any slapback echo to the stage which was a problem in 1993.'

Describing the system, Johnson continues, 'One of our aims this year was to open out the stereo field—or at least, the impression. This has been achieved by running only the inner *MSL5*s in stereo with the two outers in mono. All fills are mono as well. The other area where there has been a definite improvement is in the subwoofers—we have been able to array them so that they sound better rather than looking pretty. This has enabled us to put a bass tilt on the response and they are working very well.'

As usual, Jamie from Meyer was on hand with his *SIM System II* analysis system to tune the installation for a smooth line response.

'We leave Steve free to configure how he wants to run things,' comments Johnson, 'while we tune the system. This is not always easy as we find that mix engineers do not always understand what *SIM* and linear response are really about. As it is, most EQ ends up by being done on the console though scratchpad third-octave graphics are available if anybody really wants to alter things.'

In addition to the Stravinsky, Meyer supplied speakers for the (renamed) Miles Davis Hall, the outside stage the Jazz Cafe. The outside stage saw a new configuration with two *MSL2*s per side plus four MSW new 18-inch subwoofers while the Cafe featured *UPA*s and the powered UPLs.

The Meyer staff consider the sponsorship as 'an expensive exercise, even if we do manage to sell off the equipment afterwards at a good price to local dealers'. What it does provide, however, is real-world contact with mixers and artists which the team find very positive. It also allows promotion of the sometimes difficult concept of *SIM*.

The Montreux festival is also a field demo where dealers and customers can come and listen to the system and discuss any points that they feel necessary.

The Bryan Adams tour proved—yet again—that good live bands are what rock 'n' roll is really all about and also provided an interesting look at the in-house system provided by Jason Sound Industries of North Vancouver, Canada.

It appears that in spite of the appearance of viable 'packaged' systems on the market, there will always be those who want to go it alone and Jason Sound are definitely in the latter category.

The rig for the Adams tour comprised the *J60* 3-cabinet system plus *J23-J31* front fills and *J17* wedges. The FOH console was a Soundcraft *Europa* (40 mic + 4 stereo line) with Lexicon and BSS processing (including the *FPC-900 Varicurve* remote controller) and a Midas *XL3* for monitors. Key crew members were Jody Perpick (FOH), Glen Collette (Monitors), Dean Roney (Chief Tech) and Craig Finley (Rig Master).

The *J60* system includes the *J63* mid-high cabinet, the *J62* bass enclosure and *J61* subwoofer. JBL components are used throughout.

The *J63* speaker has a bandwidth of 170 Hz–20 kHz and features four 2202 12-inch speakers loaded with a proprietary high compression midrange horn, an array of three 2380 90° x 40° horns with 2445 drivers and four 2402-2405 tweeters. The cabinet design is such that units can be stacked or flown with 90° x 40° or 40° x 90° dispersion characteristics. In Phase vertical tilt is available in flown units.

The *J62* bass loudspeaker covers the 70Hz–170Hz bandwidth and features a compact, medium-compression horn loaded with two 2241 18-inch speakers. Directivity is quoted as being 90° x 90°.

The *J63* subwoofer houses two 2241 drivers in a push-pull configuration for minimum distortion and features full power down to 35Hz.

Advantages of the *J60* system are claimed to be extremely high output, low distortion and smooth power response for a clear-sounding reverberant field, powerful and clean-bass response and high-density truck-pack.

The *J23* trapezoidal loudspeaker (either 2-way or 3-way) finds applications in stage monitoring or as front-medium fills and arrays. Drivers are one 2202 for lows and mids, 2380 horn with 2446 compression driver and optional 2402-2405 tweeter.

Complementary to the *J23* is the *J31* subwoofer which again uses two 2241 drivers in a push-pull configuration. However, the frequency range is 45Hz–400Hz and two tuning options are available, one for maximum output in the 55Hz–75Hz band and the other for lowest cutoff frequency.

The *J17* wedge monitor has been the subject of extensive research and features two 2202 12-inch speakers plus horn with 2446 2-inch driver. The enclosure has been optimised to minimise diffraction effects that tend to smear clarity in the upper mids and the low profile (12¼-inch) reduces floor reflection effects from the woofers. The woofers and horn are tightly spaced for optimum directionality at the crossover frequency.

No special processors are used with the system, crossover-limiting functions being carried out by BSS *MCS-FDS* and Klark Teknik *DN800* crossovers. Amplifiers are Carver *PM1200-1201* for low mids to highs and *PT2400* for bass and subwoofers.

The Bryan Adams tour configuration consisted of (per side) 18 *J63*s in three vertical columns, 18 *J62*s in three vertical columns, 18 *J61*s on the ground under the stage plus front fills of 22 *J23*s and 14 *J31*s. A total of 24 J17 wedges was used.

The concert ended with an unusual encore, where BA and band played on a small stage in the middle of the audience and a good 30–35 metres in front of the main stacks. However, delay effects did not appear to cause any trouble. ■

Live Sound is compiled by Terry Nelson

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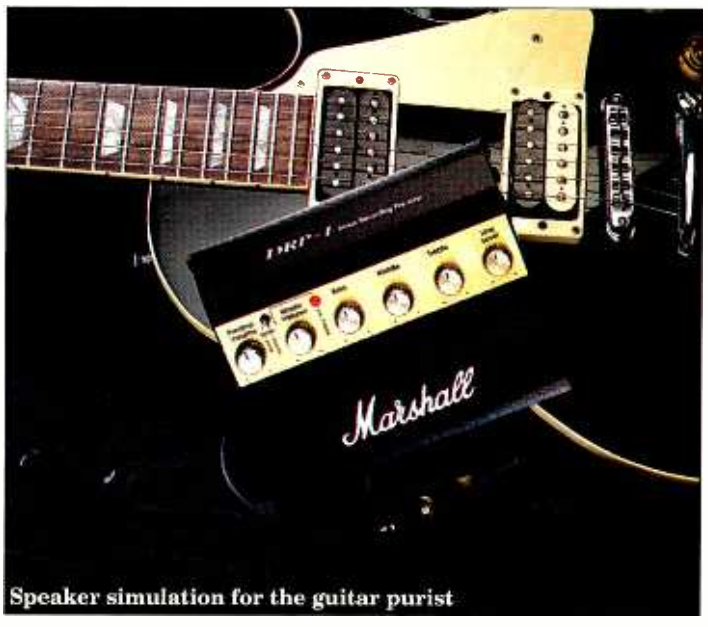
Marshall DRP-1



Speaker simulation for the guitar purist

Following on from the Marshall *SE100* speaker emulator and the *PB100* power brake comes the *DRP-1* direct recording preamp. The unit is intended to offer true simulation of a Marshall stack for recording or practice, along with preamp facilities for driving a power amp-cab setup—and all without a valve in sight. The *DRP-1* has been produced by the same design team that produced the *JCM900*, *Anniversary* and *Valvestate* ranges.

This unassuming little box has no stomp switch on it for it to be used as a floor pedal and is too light to be set in among other gear without some form of physical restraint. For such a compact unit (5 x 6 inches) the back panel has a good helping of connectors—six in all. Power comes up through an external 9V DC or a 9V internal battery (the top panel 2-position GAIN switch also has a momentary battery check with LED function) and there is also a mini, stereo-jack, headphones output. Aside from the instrument input, there is also a preamp output, which as it isn't filtered doubles as a clean output, plus a filtered output and an effects input on a stereo jack. This input allows stereo effects driven by the filtered output to be inserted into the headphones monitoring chain.

Potentiometer-wise the *DRP-1* boasts a PREAMP VOLUME working in conjunction with a 2-position NORMAL-BOOST gain switch for classic and contemporary Marshall approximations, a MASTER VOLUME, and a LINE LEVEL control for all the outputs. Tone is handled by passive MIDDLE and TREBLE pot-types (similar to those found on Marshall amps but with wider sweeps) and an active BASS pot.

First impressions centre around how unbelievably quiet the *DRP-1* is and how dry the signal is—it positively cries out for a bit of 'room' reverb to be added. Even the merest touch of ambience opens the sound up considerably and makes it much more believable.

The unit is essentially two separate elements in one as the dramatic increase in gain achieved at the flick of the BOOST switch changes the entire character of the controls and how they interact with each other. For example, I found the TREBLE pot almost unusable past the 12 o'clock position even for my tired HF-free ears (and even before a *Tele* back pickup) on the extreme gain settings on the boost channel, yet the same pot takes on a completely different complexion and character on the Normal gain channel. Consequently, the GAIN switch does not perform as a makeshift solo boost, but it does double the palette of sounds from this little box—and the value of this should not be underestimated.

The Normal channel takes you from acoustic-jazz clean to Bluesbreaker and the Boost takes you from a graunchy clean to end-stop turbo. In between you can access just about any custom blend assuming that you are prepared to reset preamp, master and EQ levels as everything is surprisingly interactive. The bass boost is a bit overpowering when everything else is flat out but peculiarly in other circumstances gives the impression of adding bass when wound back slightly. Still, it certainly does a very realistic simulation of bottom-end cab thump. If it's hot sounds you want then this mini-Marshall will give you them as well if not better than the majority of fancy guitar-effects processors and pedalboards.

I have to admire the clean sounds as it is here that the *DRP-1* sounds most valve-like with plenty of resonance and a glassy, harmonically-rich texture to the fore. It is also damn good at retaining guitar and pickup character—the *DRP-1* suggests that maybe it was a good idea to fit a 5-way selector switch to your *Strat* after all.

All this is available for a little more than £100 (UK). Sure, it appears a little insignificant and difficult to place conveniently in a studio or live situation but as a personal and affordable tone box, it has all the trappings of the cult status enjoyed by the *Pignose* and the Award *Sessionmaster* preamp which it gets closest to in principle and performance.

Affordability can be good again. Nice one. ■

Marshall Amplification, Denbigh Road, Bletchley, Milton Keynes MK1 1DQ. Tel: +44 1908 375411.

Music News is compiled by Zenon Schoepe

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Alexander Yuill Thornton II "Thorny",
Sound Designer for Luciano Pavarotti,
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Placido Domingo and José Carreras.

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Orris Henry, Front of House Engineer
for KISS and Lita Ford

" The MSL-5/DS-2 system used at the 28th Montreux Jazz Festival was capable of providing incredible power and punch for nights when we had rock acts, to grace and nuance for an acoustic ensemble or orchestra. It remains one of the most flexible systems I have ever used, and I will certainly consider specifying it for all my future jobs."

Steve Levitt, Front of House Engineer , 28th
Montreux Jazz Festival, Lisa Stansfield,
Level 42

Photo: Montreux Jazz Festival main system (left).

Meyer Sound

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THE HIT FACTORY

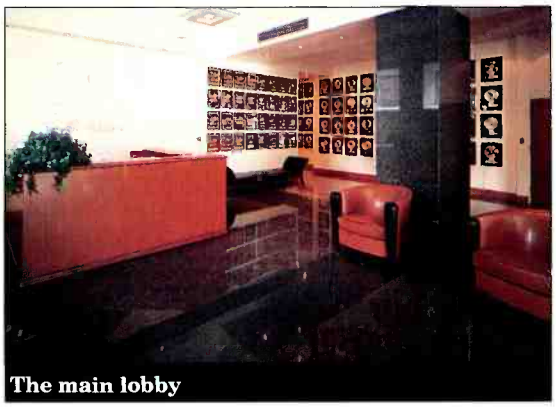
The second Hit Factory features the largest US East Coast film-scoring room and is openly intended to bring the motion-picture industry back to New York. Opened last year, it already encompasses some of rock music's history

The walls of Ed Germano's reception area at the Hit Factory Digital Recording Studios are lined with gold and platinum reminders of the albums recorded at the studios. As founder, President and Chief Executive Officer, Germano has been directly involved in the making of a string of contemporary classics. The list of performers reads like a Who's Who in modern music—Mariah Carey, Paul Simon, Whitney Houston, Michael Jackson, Madonna, Bruce Springsteen, John Lennon, Eric Clapton and the Rolling Stones to name but a few. Twenty years ago, Stevie Wonder's *Songs in the Key of Life* was the first ever album recorded at the Hit Factory.

'Wonder needed a studio for three days,' recalls Germano. 'He wound up staying six months to record an album which sold over four million copies.'

This past year alone, 41 of the Grammy nominations were either recorded, mixed or mastered at this state-of-the-art New York City facility—including Whitney Houston's *The Bodyguard*, Billy Joel's *River of Dreams* and Donald Fagen's *Kamakiriad*, all of which were up for Album of the Year.

Ed Germano's rise to the top reads like a modern fairy tale: after the tenth grade he dropped out of school to pursue a singing career. 'Ever since I can remember I wanted to be in show business,' he explains. So he began driving a cement truck during the day to fund his musical career, but after nine years he permanently parked his truck in order to move his family to Manhattan where he could better realise his dream.



The main lobby

Germano made eight singles for MGM, RCA and United Artists. He also gained crucial experience producing other artists. Germano found himself having to choose between regularly working on the road as an artist and devoting himself to the careers of other artists. His choice was to buy into the legendary New York Record Plant studio with a group of 18 partners. Less than two years later, in 1975, Germano risked everything to buy the first Hit Factory studio on West 48th Street. Word spread quickly and the Hit Factory began to live up to its name.

In 1981, Germano moved to larger quarters on West 54th Street where he could offer new and improved facilities and in

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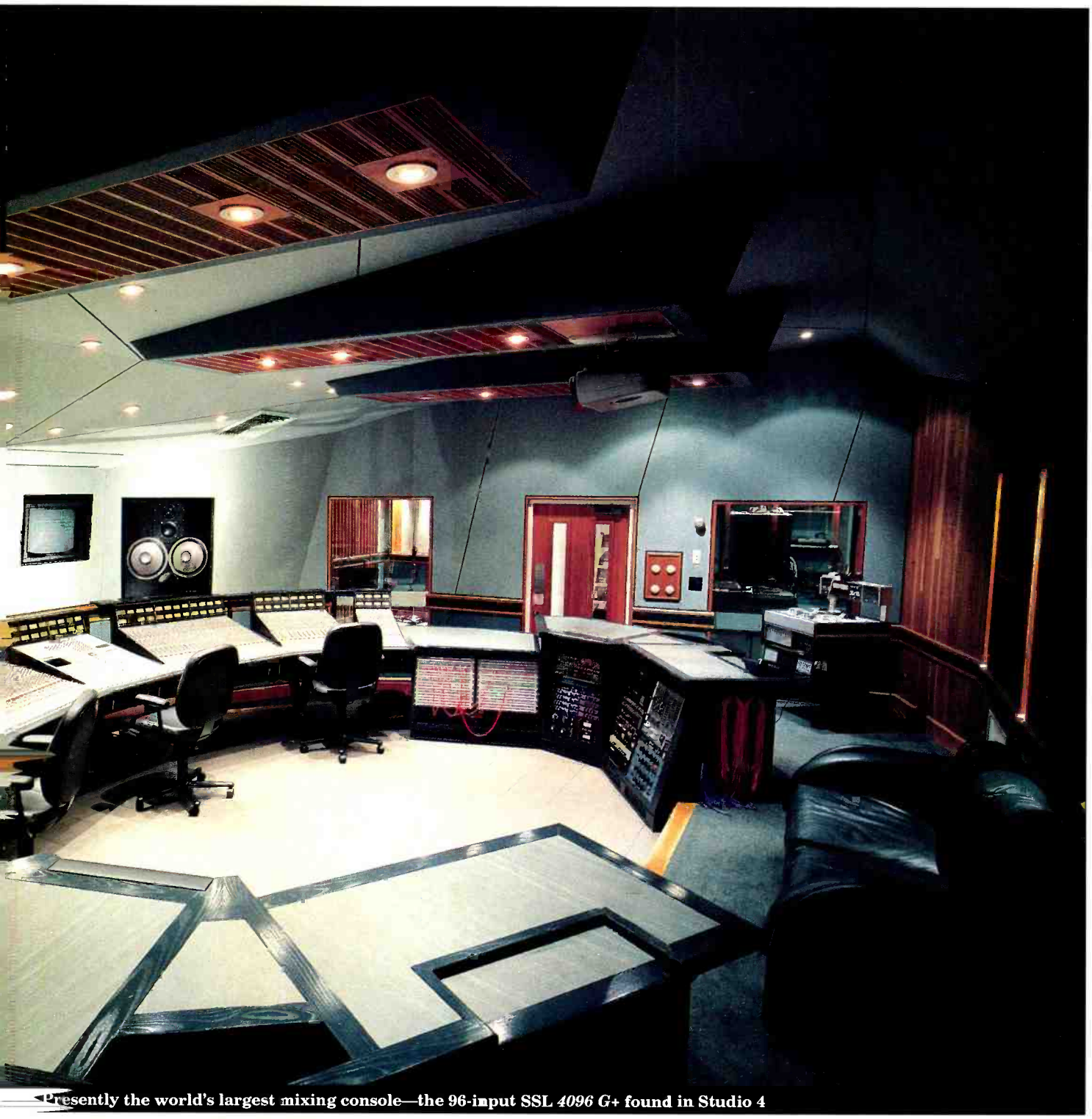

Presently the world's largest mixing console—the 96-input SSL *4096 G+* found in Studio 4

June 1993 he unveiled a 7-floor, 100,000ft² studio complex —the world's largest all-digital recording studio. The new Hit Factory is located in the former 20th Century Fox warehouse. Here, Harris Grant Associates' Neil Grant, Ed Germano, and son, Troy, had collaborated to design the four recording studios and five mastering suites. The project had taken two years and an industry-estimated $35m for construction and renovation of the building. Its aim was to offer excellence in recording and to expand the studios clientele in all areas of music including film scoring, cast recording, rock, pop, jazz, rap and classical. 'Many studios specialise in one or two areas of music but we are happy to work with a variety of artists,' comments Troy Germano. 'We don't like to limit ourselves or our studios.'

'We always wanted to build our own facility that would be open to all genres of music,' adds Ed Germano. 'I also wanted to give something special back to the industry and the artists who made it all possible for us to be where we are today. With this in mind I wanted to bring scoring for the motion picture industry back to New York City.

Layout

Although each of the Hit Factory's studio control rooms has its own individual character, they have aspects of their equipment in common. Custom models of HGA's *Boxer 5* monitors, for example, are common as are projection screens —all of which which can be electrically raised into the ceiling when not in use. Six-channel Dolby Surround is also provided in Studios 1, 3 and 4. All studios are lavishly equipped with a wide range of outboard gear which encompasses everything from classic valve gear to state-of-the-art digital processors and samplers. Each studio has its own 48-track Sony DASH machine and two Studer *A800* analogue machines.

Studio 1 is a full-floor rooftop soundstage used primarily for film scoring and 'cast' albums and is the only East Coast ▶

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EQUIPMENT

Neve *VRSP Legend* (72-input) w/Flying Faders, Dynamic Metering, Scoring Panel
Studer *A800 Mk III*
Studer *A820* w/Dolby *SR*
Audio Kinetics *ES 1.11* w/Motion Worker (2)
Custom 6-speaker monitoring system
Dolby Surround encoder-decoder
Sony *BVU-800*

GML Mic Preamp
GML Stereo EQ
Lexicon *480L*
Lexicon *PCM70*
Lexicon *PCM42* (4)
Neve *33609*
Pultec *EQH-2*
Pultec *EQP-1S* (2)
Pultec *MEQ-5*
Quantec *QRS*
SSL Stereo compressor
tc electronic *2290*
Yamaha *Rev 5*

Neve *8068* (72-input) w/Flying Faders
Studer *A800 Mk III*
Studer *A80* w/Dolby *363 SR*
Audio Kinetics *ES 1.11* w/*Motion Worker* (2)
***Boxer 5* (custom) monitoring**
Sony *BVU-800*

GML *8200* Stereo EQ
Lexicon *480L*
Lexicon *PCM70*
Lexicon *PCM42* (4)
Neve *32264A* Comp-lim (8)
Neve *33609* Comp
Pultec *EQH-2*
Pultec *EQP-1S* (2)
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tc electronic *2290*
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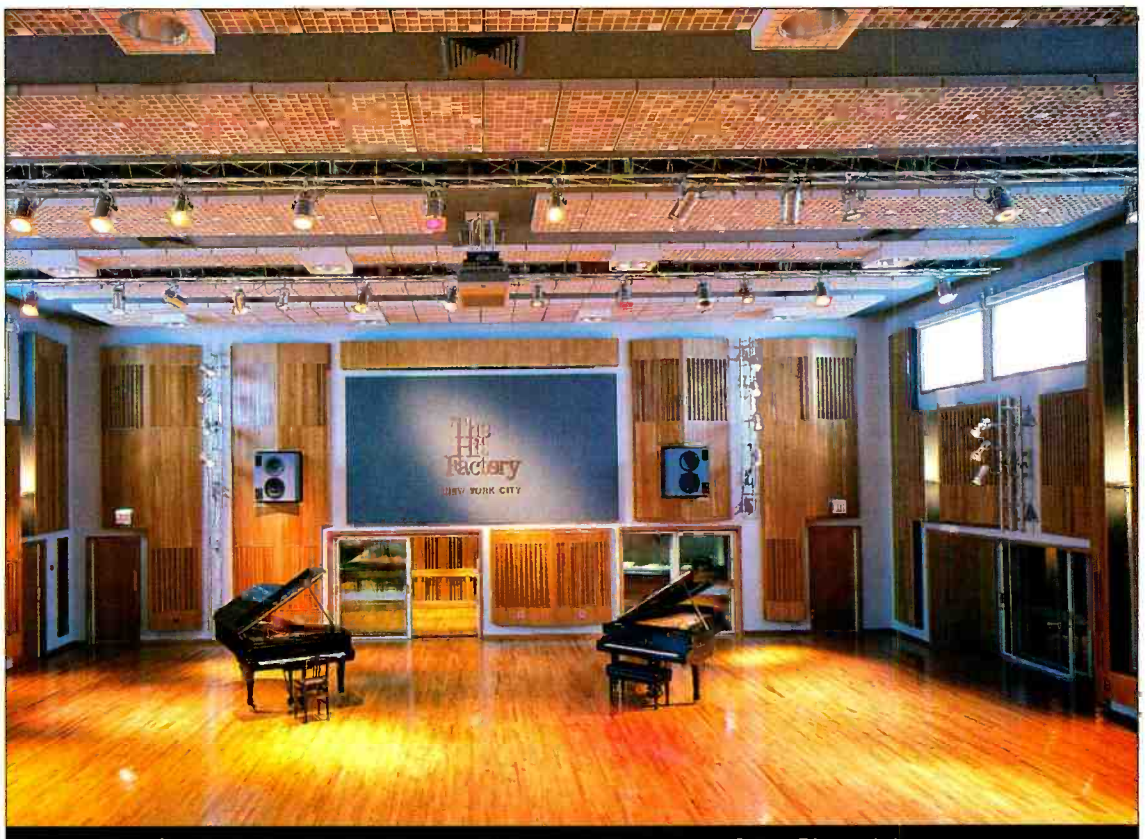

The Studio 1 Soundstage with its 35-foot headroom will accommodate 150 musicians

room suitable for this use. It will accommodate up to 150 musicians and the construction involved raising the height of the roof of the room to 35ft. The Control Room is equipped with a unique 72-channel, 8-bus Neve *VRSP Legend* complete with Flying Faders, dynamic metering and scoring panel. The central area is surrounded by four isolation booths and a viewing room. Among recent projects scored here are *Interview with the Vampire*, *Wolf*, *Carlito's Way*, *Age of Innocence*,and *It Could Happen to You*.

Studio 2 features two vintage Neve *8068* consoles (one on which John Lennon's *Double Fantasy* album was made, the other known for Bruce Springsteen's *Born in the USA*) joined in a single frame to form a 72-input desk with 89 channels of *Flying Faders*. Producer-Engineer Jay Healy comments, 'It is unique to find a console of this vintage that is big enough to accommodate most of the music recorded these days'. The Studio consists of four separate rooms treated to give distinct acoustic environments—one is deadened with carpet, another is particularly live with a stone floor and cherry wood walls, the third is cherry wood throughout for a warm acoustic sound and the fourth uses a combination of materials to provide its own distinct character.

'This room is extremely versatile,' Troy Germano points out, 'because you can create different sounds within the one studio setting.'

Studio 3 houses a 80-input SSL *G-4080* console with *Ultimation* and features an African slate floor used for acoustics. This room is commonly used for recording and mixing projects.

Studio 4 houses what is presently the world's largest console—a custom designed (and patented) 96-input *4096 G+* SSL with 112 channels of *Ultimation* and both G-series and E-series EQ. Its semicircular shape is an unusual alternative to the familiar straight or 'winged' SSL formats.

Some 27 miles of Mogami cable wind their way through the complex, linking studios and allowing flexibility in the use of the tape machines. In this way a recording project may be conducted entirely in either the analogue or digital domains, or as a hybrid of both formats.

The Broadway location contains custom SSL *G-4080* and *G-4056* boards both with *Ultimation* and 60-input Neve *VR* and *VRP* desks in its five rooms. The Studio D mixing suite was recently renovated and now houses an 80-input *G-series* SSL desk with *Ultimation*. This Studio features a preproduction room, lounge and bedroom for visiting clients and is used for mixing projects. The main monitors in Broadway Studios A, B, C and D have recently been changed to George Augspurger custom monitors. This facility works in tandem with the new Hit Factory. Certain artists regularly ▶

The Mastering Division lobby

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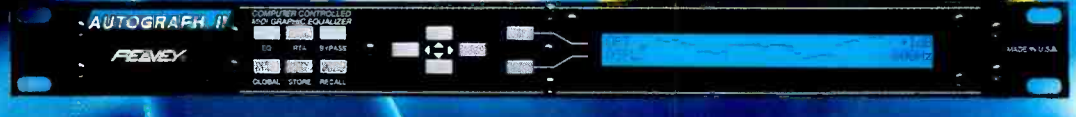

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EQUIPMENT

STUDIO 2

- SSL *G-series 4080* (80-input) w/*Ultimation* (32 E-EQ)
- Studer *A800 Mk III*
- Studer *A80* w/Dolby *363 SR*
- Audio Kinetics *ES 1.11* w/*Motion Worker* (2)

Outboard gear includes:

- Focusrite *85110* (4)
- Lexicon *480L*
- Lexicon *PCM70*
- Lexicon *PCM60*
- Lexicon *PCM42* (4)
- Neve *33609*
- Pultec *EQH-2*
- Pultec *EQP-1A* (2)
- Pultec *MEQ-5*
- Pultec *HLF-3C*
- Publison *90*
- tc electronic *2290*
- Yamaha *Rev 5*

STUDIO 4

- SSL *G+ 4096* (96-input) w/*Ultimation* (72 E EQ, 24 G EQ)
- Studer *A800 Mk III*
- Studer *A80* w/Dolby *363 SR*
- Audio Kinetics *ES 1.11* w/*Motion Worker* (2)
- Custom 6-speaker monitoring
- Dolby Surround encoder-decoder
- Sony *BVU-800*

Outboard gear includes:

- API *550* (4)
- GML *8200*
- Focusrite *85110* (4)
- Lexicon *480L*
- Lexicon *PCM70*
- Lexicon *PCM60*
- Lexicon *PCM42* (4)
- Neve *33609* Comp
- Pultec *EQH-2*
- Pultec *EQP-1A* (2)
- Pultec *MEQ-5*
- Pultec *HLF-3C*
- Yamaha *Rev 5*

Studio 2 with its two Neve *8068*s joined as a single 72-input console

request their favourite rooms,' says Danielle Germano, 'however, many projects use both facilities.'

Located on a floor of its own is the Hit Factory Mastering division. A staff of renowned Mastering Engineers preside over their own individual rooms, each of which is equipped to the specific requirements of the Engineer. Each room can accommodate equipment for CD, cassette, vinyl, copper and 20-bit mastering for public consumption.

'These are actually "their rooms",' says Troy Germano of Engineers Herb Powers, Chris Gehringer, Carlton Batts and Roger Talkoff. 'It's not like a recording studio where outside engineers come in to work,' Troy adds: 'Only our engineers use these rooms.'

The formula is proven successful not only by the quantity of work that the Hit Factory Mastering attracts but by its variety. 'It is one of the most successful mastering facilities in the US,' asserts Troy Germano.

One of the mastering rooms features one of the largest Sonic Solutions systems in the country. It is used for digital editing, mastering and catalogue reissues.

'The combination of recording and mastering under one roof contributes to the synergy between the clients and staff,' Ed Germano observes.

Interior design was undertaken by Stephen Wang of Proctor and Wang, and follows Ed Germano's philosophy of providing 'a haven for artistic creativity'. In addition to catering to the technical needs of a client, the Hit Factory offers executive offices faxes, modems and administrative personnel to help with the 'business' of music making. There are nine lounges for artists, producers and engineers—all stocked with food and drink and equipped with monitor speakers for playback listening.

'The artist needs a place to get away, even during the actual recording process,' explains Ed Germano. 'We wanted the artists to be at their best, their most creative, and that means making them as comfortable as possible.'

In the interests of comfort, then, the facility also includes a 24-hour gym, steam room, and a 2-bedroom apartment for ▶

> 'It is unique to find a console of this vintage [Studio 2's Neve *8068*] that is big enough to accommodate most of the music recorded these days'

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STUDIO DESIGN AND CONSTRUCTION

In late-1989 the Germano family flew to London to look over the CBS Studio facility, recently purchased by Sony Music. Studio 3 —the Rooftop—had been extensively refurbished in 1987 by Neil Grant of Harris, Grant Associates and as a result of listening to this room and the *Boxer Four* monitor installation, HGA were asked to take on the design of all technical and acoustical spaces, technical systems and monitoring installations of the new 80,000ft² Hit Factory building in Manhattan's Hell's Kitchen area the following year.

Working closely with New York architects and construction crews, two years of design development led to the completion of what is now arguably the world's most successful multiple studio installation. Three of the four main control rooms are designed to monitor in multiple stereo and surround-sound formats and all of the technical spaces can be quickly and simply interfaced by patching from the machine rooms, enabling dubbing from all of the stages to all of the control rooms along with rapid up-link via ISDN lines to the rest of the world.

Grant had commented that too many facilities appear to fail to integrate the independent engineering of the mixing console with the room environment and racking systems, and with the cooperation of SSL, the principal Studio 4's *4096G+* console had its framing, cabling and interfaces redesigned to integrate the entire mixing surface with the racking, work tops and finishes. Because of the exceptional size of the working area, a speaker railway was designed to enable engineers to readily move the close-field monitors to any position on the meter bridge as work patterns require. The first session in this room was a 96-track mixdown to picture for a Bon Jovi MTV special, using two Sony *3348* DASH machines in lock—proving that the commercial requirement for such facilities does indeed exist.

The Neve *VRSP Legend*-equipped Studio 1 also features the installation of the first full-scale diffractal rear wall in the New York recording industry. This provides low-frequency diffusion and control to below 40Hz within this exceptionally large (8m ceiling height, 4,500-ft² stage) room.

Studio 2 is a more conventional tracking room, though its layout is unusual. Instead of a simple Studio and Booth arrangement in front of the Control Room, there are four small studios nested around it with glass windows through to each. From the 72-input Neve *8086*, it is possible to see directly into each room and be seen by the artists in each room. It is also possible to remove the sliding doors between each area to connect the four spaces physically.

Isolation within the building was a priority—the studio facilities are split on the first, third and sixth floors to provide neutral area between critical spaces. All technical areas are floating shells on independently decoupled cast in situ concrete floors. These shells, contrary to conventional American practice, are fabricated with wooden structural members and not the lightweight metal studs favoured in the US. Grant believes firmly that the lower Q, greater structural stiffness and highly-damped resonances of a timber framed shell results in substantial isolation and low-frequency performance advantages.

Building components and finishes were sourced from all over the world; English magnetically-sealed doors finished in American cherry, Italian ceramic floor tiles, African slate floor tiles, English joinery work and outboard racks, English fabrics and fabric installation systems, German machine room racking, Lake District green slate tiling and work tops. HGA checked, accepted and consolidated all the materials, technical components, racks, monitors, cabling and connectors into 40-foot articulated trucks at their premises at Pinewood in the UK, then flew three weeks later to break the seals on the same containers, accepting the goods on behalf of their clients on the studio site.

Arguably one of the most complex installations to have been attempted by the Discrete Research Group of companies, it is felt that the success of the Hit Factory New York is a vindication of the integrated systems approach taken by all of the companies within the group, working hand in hand on every one of the complexities of the modern, multiple-purpose recording facility. ■

HIT FACTORY BROADWAY EQUIPMENT

Neve *VR* (60-input) w/*Flying Faders*
Studer *A800 Mk III*
Studer *A820*
Audio Kinetics *ES 1.11* w/*Motion Worker* (2)
Custom Augspurger monitoring
Yamaha *NS10M*
EV *Sentry 100*

Drawmer *1960*
Eventide *H3000 SE* w/update
GML *8200*
Lang *PEQ2*
Lexicon *224XL*
Lexicon *PCM70*
Lexicon *PCM42* (2)
Lexicon *PCM41*
Pultec *MEQ-5*
Smart-SSL Stereo compressor
Tube-Tech *PE-1B*
Tube-Tech *ME-1A*
Urei *1176* (2)
Yamaha *Rev 7*

SSL *G-series 4056* (56-input) w/*Ultimation* (16 E-EQ)
Studer *A800 Mk III*
Studer *A820*
Audio Kinetics *ES 1.11* (2)
Custom Augspurger monitoring
Yamaha *NS10M*
EV *Sentry 100*

Eventide *H910*
GML *8200*
Lang *PEQ2*
Lexicon *224XL*
Lexicon *PCM70*
Lexicon *PCM42* (2)
Lexicon *PCM41*
Pultec *HLF-3C*
Pultec *MEQ-5*
Tube-Tech *PE-1C* (2)
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Neve *VRP* (60-input) w/*Flying Faders*
Studer *A800 Mk III*
Studer *A80*
Audio Kinetics *ES 1.11* (2)
Custom Augspurger monitoring
Yamaha *NS10M*
EV *Sentry 100*

Eventide *H3000*
Lang *PEQ-2*
Lexicon *224XL*
Lexicon *PCM70*
Lexicon *PCM42* (2)
Lexicon *PCM41*
Smart-SSL Stereo compressor
Tube-Tech *PE-1B* (2)
Tube-Tech *ME-1A*
Urei *1176* (3)
Yamaha *Rev 7*

SSL *G-series 4080* (80-input) w/*Ultimation* (32 E-EQ)
Studer *A827*
Studer *A80*
Audio Kinetics *ES 1.11* (2)
Custom Augspurger monitoring
Yamaha *NS10M*
EV *Sentry 100*

Eventide *H910*
Eventide *H3000 SE* w/update
Lang *PEQ-2*
Lexicon *224XL*
Lexicon *PCM70*
Lexicon *PCM42* (2)
Lexicon *PCM41*
Pultec *HLF-3C*
Pultec *MEQ-5*
Trident Stereo compressor
Tube-Tech *PE-1C* (2)
Urei *1176* (3)
Yamaha *Rev 7*

MACHINE CONTROL AT THE HIT FACTORY

The Hit Factory elected to replace its machine control system in the summer of 1993, installing the *ES.Lock 1.11* from UK manufacturer Audio Kinetics. The decision was made after extensive tests, based on the studios' demanding requirements for fast, effective multiroom machine control. Since installation, maintenance time associated with machine control and synchronisation problems has reduced from 30% to nearly 0%.

The setup involves a combination of *Motionworker-ES.Lock 1.11* modules, installed in eight of the Hit Factory's rooms. A total of 21 *ES.Lock 1.11* synchroniser modules are in operation, integrating a wide range of transports—from the Sony *3348* digital multitrack, to Studer *A800* and *A827*s, Mitsubishi *X880*s and Sony *BVU 800* VCRs.

The system is playing a particularly important role in the studios' use of EDNet—a method used with impressive results by Producer Phil Ramone on Frank Sinatra's *Duets* album and Gloria Estefan's *This is Christmas*. Lock times of typically just over one second were achieved on these projects, linking locations in New York, Los Angeles and Miami.

The Sinatra project involved sending the mix with time code out to remote locations, where mostly vocal tracks were then recorded. The process was remotely monitored by Phil Ramone from The Hit Factory studios, arriving at a composite result which was then sent back down the line. This track, with its appropriate time code, was then fed into one *ES.Lock 1.11* module, which acted as the master and slaved all the other modules to it. This routine was practised on a daily basis, maximising use of the EDNet link and performing faultlessly throughout.

Troy Germano highlighted some of the demands they have been making of their system: 'A recent project for *Phantom of the Opera* involved working with two tapes of differing frame code (25fps and 30fps). The *ES.Lock 1.11*s locked them without any difficulty, something which previously would have presented a number of problems. Another complex application involves much of our film work, where we are frequency shifting digital multitracks down by 0.1%. The *ES.Lock 1.11* system has proved itself many times over since the installation—the modules are working beyond our expectations.' So much so, in fact, that the Hit Factory have received compliments from its clients for the efficiency of its machine control system—not something one generally expects to hear about.

ES.Lock

First introduced in 1989, the *ES.Lock* system fully implements the ATR dialect of the ESbus remote communications standard—which Audio Kinetics played a key part in developing. Unique features of the *ES.Lock* system include full emulation of the Sony RS422 serial interface, as well as emulation of Adams-Smith *Zeta-Three* and *System 2600* products. In addition, Audio Kinetics have developed the Serial Share multiporting facility, enabling a single serial port to control up to five *ES.Lock* modules—particularly relevant for *Capricorn* owners. Currently, the system offers operating protocols to support over 120 different machine types, including the SSL *ScreenSound* and *Scenaria* systems, the DAR *SoundStation* and AMS Neve units.

The *1.11* module is the building block of any *ES.Lock* network. Its internal format means that it can be freely configured for any number of alternative machines and system arrangements, with one *ES.Lock 1.11* required for each synchronous machine in a network. A unique feature is the provision of twin control buses, which allows patch-free machine assignment to create two separate machine control systems (for example, a machine room serving Control Room A and B). An additional benefit of two buses is the ability to control several machines from a single serial port, using Emulation mode on Bus A and controlling slave modules on Bus B. Up to 256 machines can be connected on the ESbus in this way.

Synchronisation is accurate to $^1/_{100}$th frame and lock-up speed is only limited by machine-servo response. Exceptionally fast performance can therefore be achieved, particularly for Play-Lock and Wind-Lock operations, across all the slave machines in the system. ■

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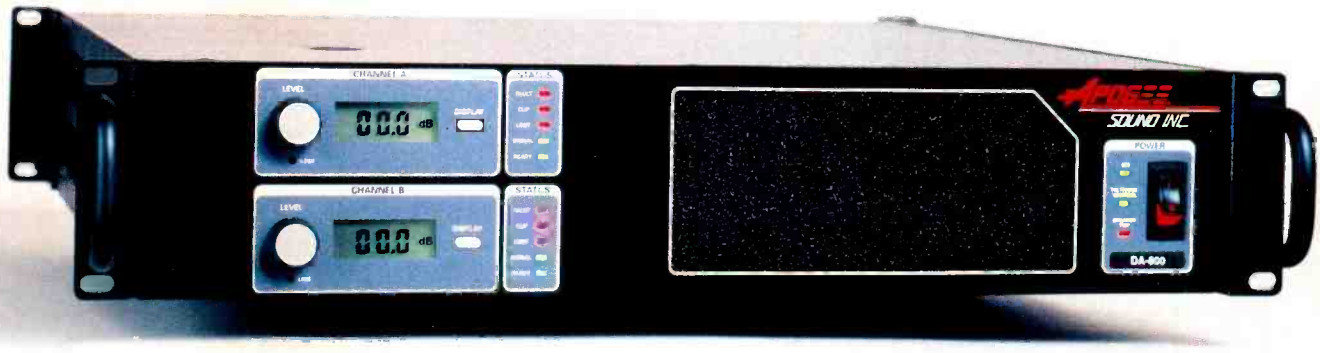

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Apogee's revolutionary DA-800 brings the power of intelligent digital control to a rugged professional amplifier.

Featuring a large LCD display and a continuous-turn shaft encoder for each channel, the DA-800 offers powerful control and monitoring features when used as a stand-alone product, while multiple units may be interfaced to a host computer via the MediaLink® network.

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The DA-800 offers a lot more than just advanced digital control; at the heart of the design is an ultra-quiet, low distortion, very high power linear amplifier, expertly engineered for reliability and sonic purity.

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visiting clients.

The welcoming atmosphere that pervades the Hit Factory is another deliberate 'service' and is undoubtedly a direct consequence of the extensive involvement of the Germano family in the running of the complex. Ed Germano's wife Janice is the the Chief Financial Officer while his mother Ann assists in the book-keeping department. Daughter Danielle is the Vice President supervising the studio's daily 'traffic' and scheduling as well as 'interfacing' with the clients. Son Troy, as Executive Vice President, oversees the daily operations of the recording and mastering studios. Along with their father, Troy and Danielle are constantly planning for future growth of the company.

'Without this family unit working as hard as they have, the Hit Factory wouldn't be what it is today,' Ed Germano concedes.

Features

There are aspects of the Hit Factory which help set it apart from other studios. Although the practice of allocating tape machines, machine control and other hardware to a separate room is common in European studios, it is still unusual in the US.

'By putting our machinery which can be activated by remote control in a separate room, it enables each of our control rooms to be spacious, uncluttered and silent,' says Barry Bongiovi, General Manager. 'As an added bonus most of the high-volume rental equipment has been built in our rooms as a standard feature at no charge.'

Much attention has also been paid to film sound and its various formats. From behind Studio 1's Neve *VRSP Legend*, Engineer Carl Glanville observes that, 'You can handle any of the current film formats easily with this desk because of its unique custom scoring panel. Ed Evans Director of Technical Operations adds, 'Studio 1 offers mixing with the ability to accommodate multiple film formats.'

One of the mastering rooms features one of the largest Sonic Solutions systems in the country

There are three monitor speakers located across the front of the Control Room with three additional monitors in the ceiling to accommodate Dolby Surround, 6-channel discrete and Sony SDDS multichannel formats.

As with music recording aspects of the Hit Factory, considerations toward the film clients have played a major role in defining the nature of the studio. The new provision of three lounges in Studio 1 is no accident—the Musicians' Lounge can be used for rest and relaxation, the Producers' Lounge-Office contains all office necessities including a large-format photocopier for copying the score manuscript, while the artists' lounge allows for privacy.

'At the Hit Factory, the music and the musicians always come first,' concludes Ed Germano. 'That's why we've been so careful to create the kind of recording studio that fulfils their every artistic need. In the end, that's what we're all about.' ■

The Hit Factory Digital Recording Studios, 421 West 54th Street, New York City, NY10019, USA. Tel: +1 212 664 1000.

The Hit Factory Broadway, 237 West 54th Street, New York City, NY 10019, USA. Tel: +1 212 489 2300.

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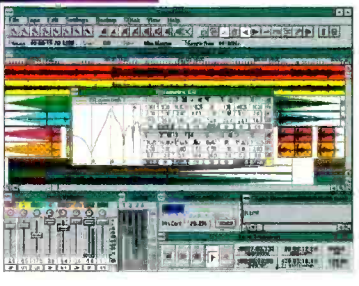

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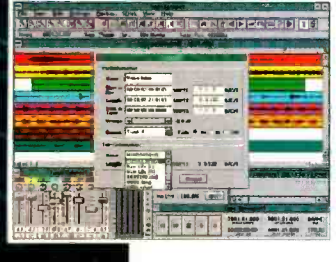

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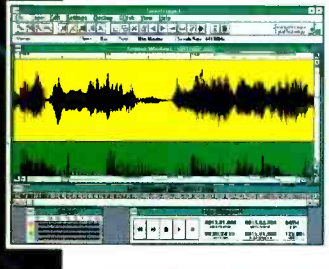

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AT&T DISQ

The AT&T *DISQ* Digital Mixer Core rewrites the rule book on digital consoles. James Douglas reports

The AT&T *DISQ* Digital Mixer Core is a remarkable, albeit expensive, device. Jointly developed by AT&T Bell Laboratories, G Prime and George Massenburg Labs, *DISQ* comprises a tall, 19-inch rack unit packed with high-speed parallel processors that have been programmed to emulate the myriad functions of a multichannel mixing console. And, being entirely digital, there are dramatic reductions in the types of signal degradations that plague complex analogue designs, including noise and hiss, crosstalk, distortion, plus nonlinear frequency response.

Yet, as we all know, the recording community is remarkably conservative. Despite the acknowledged sonic advantages offered by digital technology—witness the wide-scale acceptance of DASH and PD-format multitracks, not to mention DAT machines—most of us are reluctant to change the way we work to accommodate a new type of operation. The *DISQ* topology squarely addresses the major question facing both facility owners and recording-production engineers: How much time will it take for potential users to learn the intricacies of a new console's control surface? The key to *DISQ*'s uniqueness is that there is, in fact, nothing new to learn; the digital processing rack is designed specifically to retrieve commands from an automated Solid State Logic, AMS-Neve or Harrison by GLW console, and produce the required EQ, dynamics, level adjust and mixing functions. The Digital Mixer Core simply connects to an existing *VR* or *SL-Series* board—plus, soon, the Harrison *Series 12*; more on this development later—and operates in a way that is completely transparent to the user.

Box clever— the heart of the *DISQ* system

In essence, a highly innovative scanning computer samples the various switches, shaft and linear encoders fitted to the console's front-panel controls. This information is then digitised—together with dynamic fader-level, EQ, solo and mute status produced by the SSL *Studio Computer*, AMS-Neve *Flying Faders* or GML *2000* automation system— and connected via a high-speed Ethernet link to the *DISQ* processing rack. Here, the digital equivalent of signal-processing blocks are recreated from a series of complex algorithms that provide a real-time, 64-channel mixing system. As the user adjusts the various gain, EQ, aux send, channel and other digitised controls on the AMS-Neve or SSL console, these parameters are used to model a high-speed, virtual mixer that is recreating the time-dependent level, signal-processing and routeing combinations necessary to create the final mix. Aside from conventional control-room monitoring, no audio signals pass through the SSL or AMS-Neve console's analogue sections. Simplicity personified.

Currently, five *DISQ* remix systems have been installed in recording facilities around the world. The first delivery was at Masterfonics, Nashville, linked to an SSL *SL4064E-G*; followed by SEDIC, Tokyo, in conjunction with an SSL *SL4060G*; Crescent Moon, Miami (Gloria Estefan's personal-use facility), linked to an SSL *SL8064G*; Conway, Los Angeles, to a AMS-Neve *VR-72*; and Right Track, New York, to an SSL *SL4084G*.

The AMS-Neve-SSL control surface is only used to derive digital control signals from its automated front-panel controls and switches. AT&T has modified and enhanced the speed at which each front-panel switch or control element digitises the control information and passes the resultant multiplexed data to the *DISQ* Digital Mixer Core. Dynamic automation, snapshot recall and mix-level data is handled by the existing automation computer (SSL *Studio Computer*, AMS-Neve *Flying Faders* or GML *2000*).

System prices begin at around $350,000 (US). AT&T are responsible for ongoing software development and product-specific customer support. Marketing and distribution of the new Digital Mixer Core is being handled by AT&T Digital Studio Systems, based in Greensboro, North Carolina.

System components

At the heart of *DISQ* are a number of interconnected modules mounted within a standard 19-inch rack system; a 64-channel device occupies some 30 units of rack space. At its heart is the AT&T DSP3 parallel processor, developed originally for the high-power data processing in such applications as radar and sonar, signal-recognition, speech analysis and image processing. Up to eight separate DSP3 processor-boards can be interlinked to provide a total capacity of 64 audio channels.

The DSP3's power and flexibility result from the use of multiple AT&T DSP32C programmable DSP ICs. An ultra-high-speed, internode, processing network links as many as 128 individual DSP32Cs operating at up 40MHz. Each processing element consists of an AT&T DSP32C, and ASIC (Application Specific Integrated Circuit), and 256Kb of memory, and is responsible for providing a block of EQ processing, a block of dynamics processing, two inputs (Channel IN, plus INSERT) and two outputs (RETURN plus Direct OUT). Eight, interconnected DSP3 boards can provide astonishing amount of DSP power: up to 2.5 Gigaflops (floating-point operations) per second required to model a real-time 64-channel mixing system.

Each DSP3 rack includes three functional subsystems:
1. The RTH (Real-Time Host), a Motorola MC-68030-based processor board that functions as the DSP3's control centre for software applications.
2. The I-O subsystem, which supports a number of standard low-speed and

STUDIOS EQUIPPED WITH THE *DISQ*

Conway Studios, Miami
AMS Neve *VR-72*,
Buddy Brundo,owner.
Tel: +1 213 463 2175

Crescent Moon, Miami
SSL *SL-8064G*
Eric Schilling, Chief Engineer.
Tel:+1 305 663 8924

Masterfonics, Nashville
SSL *SL-4064E/G*
Glenn Meadows, owner.
+1 615 327 4533

Right Track Studios, New York
SSL *SL-4080G*
Simon Andrews, owner.
Tel:+1 212 944 5770

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The *DISQ* installation at Masterfonics

custom high-speed interfaces between the RTH and processor node subsystem, plus outside peripherals. Within its current incarnation, the DSP3 communicates with the scanning computer via a standard Ethernet network connection, running a relatively simple TCP-IP command protocol to define the time-dependent characteristics of each signal path.
3. The digital processor system, which comprises eight, individual boards capable of handling the parallel processing tasks required to implement a multichannel, audio, mixing system. The 16 DSP32Cs per board are 32-bit, floating-point, signal-processing devices operating at a 40MHz clock speed, offering a throughput per card of 320 Mflops. To form dedicated computing nodes, each DSP32C is combined with an AT&T Communication ASIC and 256 Kbytes of high-speed memory.

At the DSP3 level, all digital I-O ports are 32 bits wide. To accommodate practical digital formats, the dedicated digital-audio interface section currently provides connection between SDIF-compatible systems (such as digital multitracks and digital reverbs). Other formats, including AES-EBU and MADI, can be accommodated via format-conversion units. The DAI handles all data passing into and out of the DSP3, apart from the final stereo mix, stereo monitor and eight auxiliary outputs, which pass through a separate Harmonia Mundi *hw-102* D–A interface system.

The digital-audio interface consists of an input section with three interfaces to external equipment, and two to the DSP3 board. A companion output section provides three interfaces to external equipment, and two from the DSP3. A crosspoint matrix controls the mapping of various channels within the system's input and output sections.

For simplicity, all digital I-Os from and to the *DISQ* Digital Mixer Core are SDIF format. All analogue sources ▶

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and destinations—mic-level and line-level inputs from the studio, plus control-room monitoring and connections to nondigital outboards—pass through a companion rack system that houses a variety of NVision *NV1000 Series* 20-bit A–D and 20-bit D–A Convertors. Normal conversion is to AES-EBU format digital signals; additional NVision digital-format convertors and Distribution Amplifiers handle translation between AES-EBU and SDIF formats for connection to other *DISQ* system components. An NVision *NV-5500* Master Clock provides a crystal-referenced reference ▶

HANDS-ON AT MASTERFONICS IN NASHVILLE

During a recent visit to Masterfonics Studio, I had the opportunity for a hands-on session with the AT&T *DISQ* Digital Mixer Core in the mix room, and to interview various producers that have spent many hours with the system.

John Guess

John Guess, Producer-Engineer for Michelle Wright and Suzy Bogguss; Remix Engineer Vince Gill (a *Billboard*' No1 in the States with 'Whenever You Come Around'), Sammy Kershaw, Patty Loveless, George Strait and Tanya Tucker; and Grammy Award-winner for 'Does He Love You,' with Reba McEntire and Linda Davis:

'For me, there is major difference between the way an analogue board sounds and the *DISQ* here at Masterfonics. Strings, in particular, sound more 'open,' and live. They take on a thicker, brighter sound that is more like the way they sounded in the studio. Analogue consoles tend to dull the sound, and take away a lot of the air and energy that I find brings the track to life.

'On an upcoming Willie Nelson project, which I plan to mix at Masterfonics from tracks that were recorded at Capitol Studios [in Los Angeles] by Al Schmitt on a [Sony PCM-3348 digital] 48-track, I want to use a total digital signal path—no analogue gear allowed! We will use Lexicon 480XL and EMT 248 reverbs, for example, so that the signal always remains in the digital domain from microphone to the stereo mix.

'But even on projects where, for choice, I am using analogue outboard gear, the *DISQ* is dramatically quiet—there is no hiss from the monitors when you open up all of the faders. (Try that on a conventional board!) On the latest Vince Gill album that I mixed on the Masterfonics *DISQ* for Tony Brown [Producer and President of MCA Nashville], we produced a clean, transparent sound that I could not have achieved with analogue.

'Interestingly, the fact that DISQ retains an analogue console [as control surface] saved us on an early project. On a recent Reba McEntire album, we had attempted to use the *DISQ* for mixing but ran into automation problems—the computer eventually crashed on us. We simply patched around the *DISQ* I-Os, and continued on the SSL. So, even though the sound wasn't as good as we might have achieved with the Digital Mixer Core, we could continue with the project. It's a great comfort factor—just in case!

'I like the digital EQ very much; it sounds a lot better that the analogue EQ its modelled on. We can choose either [software generated] SSL *E-Series* or *G-Series* EQ, or even AMS-Neve *VR* if we want to, simply by pressing a couple of buttons. We can even call up a totally digital EQ sound, which doesn't emulate the Neve or SSL circuits. The dynamics section behaves very well, but without the pumping you get from analogue VCA circuits. It's a remarkably flexible system. The 32-bit floating-point systems have no overload—you cannot crunch it even when using the maximum amount of boost. There is no slew-rate distortion and no pumping at all.

'All signal paths within the Digital Audio Interface are 24-bits wide, and are redithered at the output to either 16 or 20-bits, depending upon the mastering resolution. Masterfonics also has an Apogee *UV-22* if we want to go that route to a 16-bit DAT master.

'To me, digital mixes from *DISQ* sound wider and 'deeper' that analogue, with more perspective. I suppose that the lack of analogue-based distortion and softening makes digital sound more life-like. It is very difficult to go back to mixing with analogue boards; I immediately miss the high-end response, and the openness of the mix.

'What don't I like? Not much, really. The EQ scanning can be slow if you leave it in the default mode—it takes a few milliseconds for the scanning computer to notice that you have changed a control, and then communicate that change to the DSP racks. But, if you select a faster response mode using a simple function-key command on the computer, then the EQ takes priority over the channel faders, and responds much more quickly to changes. And you can flip back to fader priority just as easily.

'All in all, the *DISQ* is a dramatic improvement over analogue. And it's as easy to use as an SSL.' ■

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HANDS-ON

Mike Clute, Coproducer-Engineer for Diamond Rio and Michelle Wright:
'Sonically, the *DISQ* is spectacular! Separation and imaging is superb—just what you would expect from digital. All functions, including EQ and dynamics, are very easy to work with; it's a remarkably easy—and enjoyable!—transition to make. I find that the lack of analogue crosstalk tightens up the imaging a great deal. We can also save multiple A–D stages; all convertors sound different.

'All the artists and producers we've worked with at Masterfonics have noticed the differences. Often, they are not certain of what they're hearing—for example, when Monty Powell [Diamond Rio Producer] first listened to board, it was the first time that he could clearly hear the subtle differences in the types of special effects I was using. It's very revealing!' ■

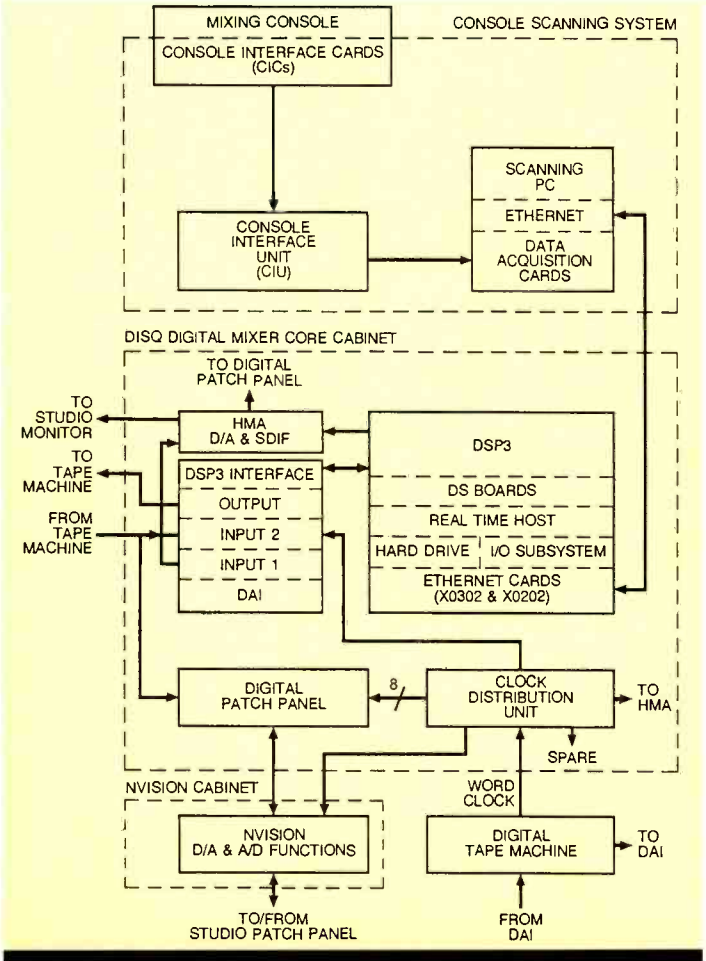
signal for the *DISQ* rack; the entire system can be locked to an external source—video house sync, for example, or a dedicated DARS signal—or from the NVision clock.

The digital-audio interface can also be synchronised to external word-clock, allowing the entire system to bit-phase locked to a single source—a studio's DARS (Digital Audio Reference Signal) or a multitrack—running at rates between 32kHz and 54kHz. In this way, *DISQ* will run in full varispeed mode.

In a typical configuration, the Digital Mixer Core might be configured to handle 48 SDIF2 tape-machine inputs; 16 SDIF1 compatible auxiliary returns from outboard digital delays and reverbs (with clock-slew compensation); 64 SDIF1 'mic-line' inputs to replace tape machine sources (from external A–Ds connected to mic preamps, analogue tape machine and other sources); 64 SDIF1 channel inserts; 64 SDIF1 channel returns; 48 SDIF2 tape-machine direct outs; 48 SDIF1 auxiliary bus outs; 64 channel inputs; 64 channel outputs; and up to 32 optional 'bus' outputs.

In remix mode these available I-O channels might be assigned as 48 direct SDIF2 inputs from a DASH-format multitrack, plus additional auxiliary inputs, routeing to four auxiliary, two stereo, two monitor and six mono mix outputs.

During system setup, each input channel is assigned a channel fader; high-pass and low-pass filters; a 4-band parametric EQ section; limiter-compressor, expander-gate; and up to eight auxiliary sends. All channel functions are addressable using a simple 4-byte command from the system's QPort serial-interface protocol.



Block diagram of the *DISQ* system—SSL console

Centre frequency of each low and high-pass filter is continuously adjustable from 7.5kHz through 18kHz and 31.5Hz through 315Hz, respectively; adjustment slopes are 12dB/octave. Infinite Impulse Response (IIR) filters provide four overlapping parametric bands of EQ, with ±18dB adjustment per section. The LF section is switchable peak/shelf, centred between 33Hz and 370Hz; the HF section is identical in function, but with 1.5kHz to 17kHz adjustment. Two mid-frequency bands are centred between 800Hz and 8.7kHz, and 190Hz and 2.0kHz, respectively, with bandwidth continuously adjustable between 0.5 and 9.

The centre frequency, boost-cut, and bandwidth settings used to model the IIR filter coefficients within the corresponding DSP3 are selected from precalculated look-up tables that occupy 3Mb of RAM. The precise filter coefficients were selected by AT&T to accurately model either AMS-Neve or SSL *E/G-series* equaliser settings. Other programmable coefficients can be used to produce custom curves for specific equaliser types—each band, in theory, is fully sweepable from 20Hz to 20kHz—along with special applications such as noise filtering and de-essing. All level, EQ and routeing changes are made via a specially developed ramping function, that ensures click-free changes as controls are altered in real-time on the companion control surface.

The expander-gate section offers controls for threshold, depth (up to 50dB), hysteresis (up to 25dB), attack (0.1ms to 1ms) and release time (30µs to 3 ms); expansion ratio is 2:1. The ▶

HANDS-ON

Eric Schilling, Chief Engineer and Studio Manager of Crescent Moon Studios, Miami:
'We have a new, 64-input SSL *SL8064G* console with *Ultimation* [moving-fader automation] linked to *DISQ*. Aside from serving as a semiprivate facility for Gloria's [Estefan] albums and our Crescent Moon label projects, we are also open for outside sessions; I would guess that 65% of bookings will be for in-house projects and the remainder for out-of-house.

'Since the *DISQ* was installed in March of this year, we have mixed the soundtrack for *The Specialist* with Gloria, plus mixing Frank Sinatra's new *Duets II* album.

'The *Duets II* tracks were recorded on Sony [*PCM-3348*] 48-track at Capital, LA, by Al Schmitt. The result we heard here was a more transparent sound. We needed to add less high-frequency EQ to the tracks, to recover that 'air loss' you often experience with analogue consoles. There is more detail in the tracks, with less smearing.

'We have also found that the console recall is more accurate when we go back and retouch tracks. We did some submixing of drums, piano and strings, which we flew off to an Akai *DR-1200* 12-track within the digital domain. We had to make some small changes, and so rebuilt the mix from the automation data. The match to our first transfer was remarkably accurate. We have also mixed to 20-bit Sonic Solutions, and 16-bit masters via Apogee UV-22.

'In the near future we will have *SnapShot Recall* for the *DISQ* master controller, which will eliminate the SSL *Total Recall*. During touch-ups, we have to reset console controls using *Total Recall*; soon we will be able to use stored *DISQ* values, which will be more accurate, and quicker! We realise that the [SSL console's] front-panel controls will not match their original settings, but for touch-ups that won't be a major problem!

'The *DISQ* is very easy to use, with virtually no learning curve—if you can run an SSL, the setup is a snap! We can also freely cross-patch input channels, which means that I can mix from the centre of the board—a great improvement from having to move off-axis to adjust a couple of tracks!' ■

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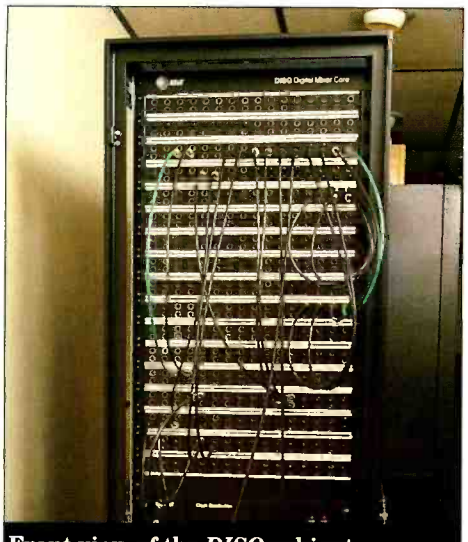


Front view of the *DISQ* cabinet

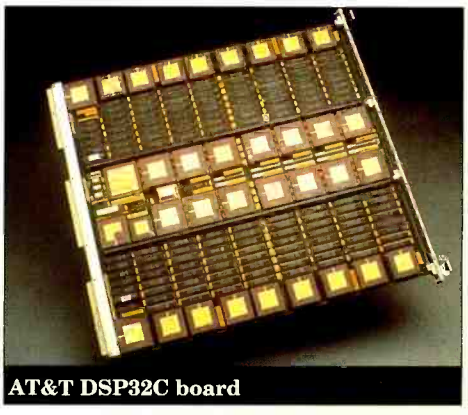
Rear view of the *DISQ* cabinet

limiter-compressor section offers threshold, ratio (1:1 to limiting), attack (0.1ms to 1ms), release (30µs to 3ms) and gain make-up (up to 30dB). A new function controlled from the console's scanning computer is used to derive a channel delay per input of ±30ms, allowing multimic sources, for example, to be brought into phase coincidence with one another.

System automation is handled by a modified GML Series 2000. In addition to the familiar channel-level, mutes, solos and EQ in-out functions provided by a standard *Series 2000*, the system interfaces directly with the control elements fitted to the analogue console. An entire control surface can be scanned within a single video frame. The *Series 2000* offers 0.1dB fader reset and quarter-frame switching accuracy, plus full serial control of external tape machines and time-code synchronisation systems.

The bottom line

By all accounts, the AT&T *DISQ* Digital Mixer Core is a remarkable development. It offers full digital signal-processing for a 64-channel 'virtual mixer,' controlled from a familiar user-interface. What remains to be addressed, however, are the inherent processing delays involved in certain all-digital designs. For tracking and overdubs, the finite amount of time it takes to model a mixing amp, EQ section or dynamics module means that there might be too much delay in the cue-headphone feeds for musicians to handle. And during overdubs, the need to quickly turn around from a rehearsal to a punch-in on a designated track, with full off-tape monitoring, can also mean some gymnastics on the control surface.



AT&T DSP32C board

At Masterfonics, there is talk of using a custom-designed hard-disk systems to hold the overdubbed tracks, so that they can be slipped against a master time-code source to bring them into accurate sync with live tracks from the studio floor.

Certainly, the era of all-digital mixing and postproduction is definitely upon us. Siemens are reported to have shipped some 100 AMS-Neve *Logic Series* console, and 40 AMS Neve *Capricorns*, while Solid State Logic have sold 85 *OmniMix* and *Scenaria* systems.

AT&T are to be applauded for extending the potential of digital to analogue-equipped studios that feel the need to offer a hybrid approach, and one that capitalises upon the ready familiarity of current user-interfaces. ■

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HANDS-ON

Masterfonics owner and Producer Glenn Meadows has also used the *DISQ* Digital Mixer Core on several projects. He also plans to install a Harrison by GLW *Series 12* console in Studio Six, and hook it up to the facility's *DISQ* system:

'During August, we replaced an SSL *SL4048* in Studio Six with the *Series 12*, which we have here for evaluation [as an alternative control surface for the *DISQ* Digital Mixer Core]. Harrison by GLW have been working closely with AT&T to implement the *DISQ* control protocol. All of which means that we can—in theory, at least —replace the SSL control surface with the *Series 12*. But conceptually, the *Series 12* is closer in topology to the *DISQ* design. It features a microprocessor-based control surface that connects via Ethernet to an outboard tower that holds the analogue circuit functions. By splicing the Ethernet connection to our *DISQ* Digital Mixer Core, we should be able to take advantage of the *Series 12*'s extended functions.

'The advantages are pretty exciting. We will have 96 inputs on the *Series 12*—48 channel-modules each have A and B inputs, and two independent fader paths—plus access to 16 aux sends. And there is programmable EQ and dynamics on each input. Aside from the operational features, the *Series 12* presents less of a technical challenge. We expect the scanning speed to be dramatically increased—after all, the control surface is designed to generate these commands, rather that having to add another scanning computer to the automation system, which is the case with SSL and AMS-Neve boards.

'The Harrison automation system will also be fully integrated with the *DISQ* front end, which will provide touch-screen routing for insert points, with storage of system settings along with the other session data. Also, all controls will be dynamically automated against time code, which will be a dramatic improvement over our current snapshot automation of everything but channel levels and mutes.

Glenn Meadows of Masterfonics

'There is a growing desire from our clients to move beyond Neve and SSL. We have seen Harrison make tremendous strides in the film and video market, and the firm now seem to be back on track with product for the music industry. So, we plan to check out the alternatives, and give the *Series 12* a serious evaluation session with the *DISQ* Digital Mixer Core. We are always looking for new capabilities, but they must have a simple learning curve. We will see if the *Series 12* offers that opportunity.' ■

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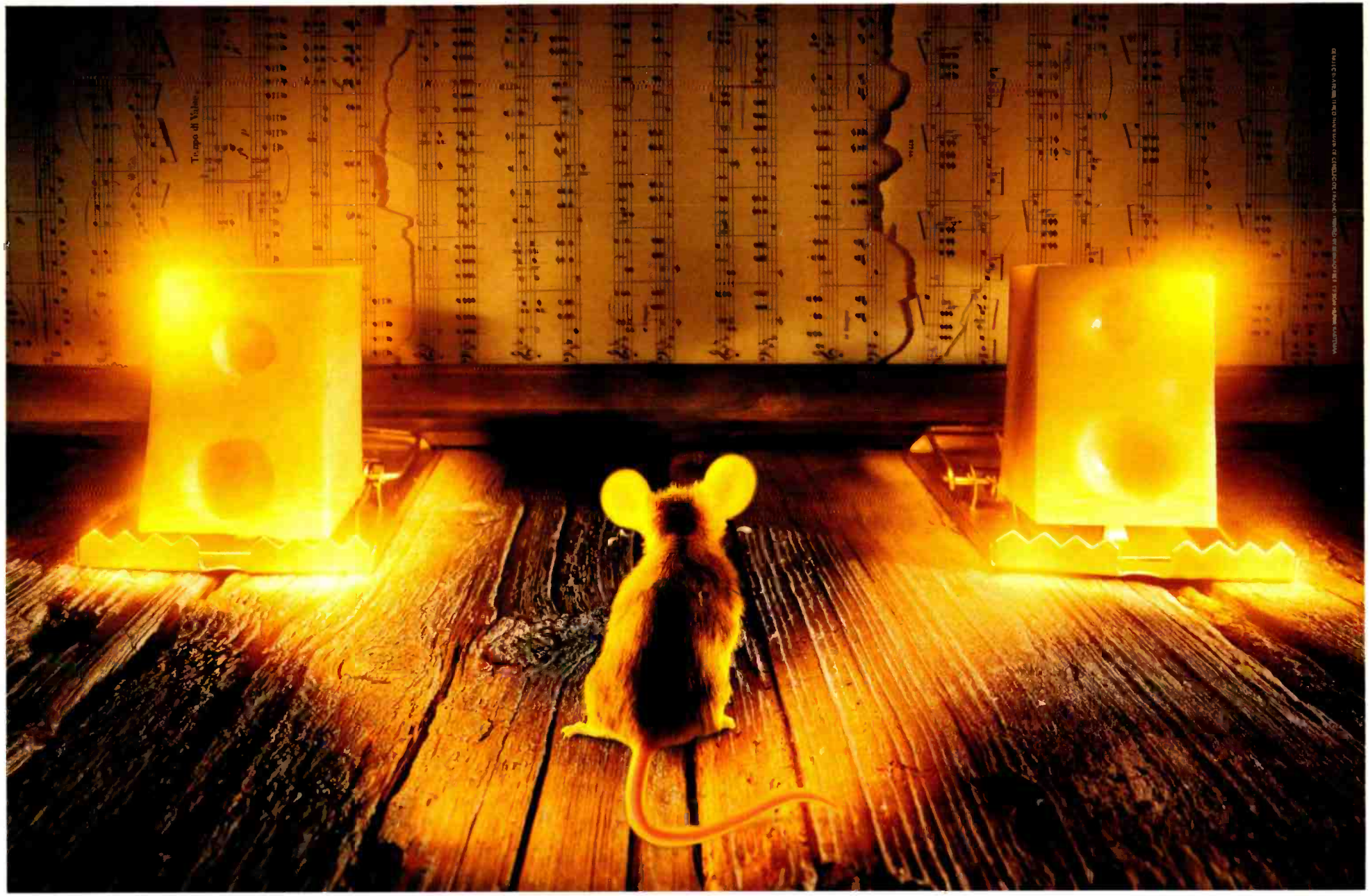

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OPERALIA '94

Intended by its Mexican hosts to become the world's major annual classical broadcast event, Operalia '94 presented a breathtaking—and risk-taking—taste of what is to come. Mike Lethby reports

On first sight, you could have mistaken this for the plush interior of a small, prestigious opera house anywhere in Europe. The royal-red carpets and walls, the smartly-garlanded tiers of private boxes, the uniformed attendants proffering lavishly detailed programmes, the orchestra's tuning making an agreeable hum from the softly up-lit floor.

But as a few hundred VIPs settled into their seats you might have looked up and appreciated the artifice that had transformed the stark Studio 5 at Televisa's Mexico City San Angel complex into a highly impressive recreation of the interior of a classic European opera house, including the building of a foyer and tiers of royal boxes.

This, then, was the finals of Operalia '94, ambitiously launched in June 1993 by Placido Domingo and Emilio Azcarraga, President of Mexican broadcast giant Televisa, as the world's first global opera-talent competition.

Studio 5 as a 'classic European opera house'

Their aim was to help encourage the next generation of world-class classical talent—and on September 17th 1994, Televisa's San Angel studios in Mexico City hosted the finals and award ceremony of the project.

The audio production was a complex job, with broadcast and live sound handled as an integrated project. A major factor was the decision by Broadcast Audio Producer Toby Alington and Live Sound Designer Derrick Zieba to use Dolby Surround—the first live "global" classical broadcast to feature the *Pro Logic*-compatible technology.

Likewise, the audio control room was built from scratch for Operalia—one of the impressive aspects of the TV facility's provisions—and swiftly fitted a new Euphonix *CS2000* production console, supplied and installed by Steve Thompson's location studio rentals operation, The Clubhouse, in LA.

A new concept?

Televisa brought in a big-league production team to aid its own staff, many from the 1994 Brit Awards in London. Producer Andy Ward, Director David Mallet and a live sound crew from London's Dimension Audio headed by Derrick Zieba were joined by Audio Producer-Music Mixer Toby Alington with Doug Bennet and Carden Taft. Working for the first time in television, artist David Hockney designed the stage sets.

Ward and Mallet had decided on a live format in agreement with US network Fox. Ward: 'We are seeking to present cultural events on television in a new and more exciting way; and we decided to broadcast it live to keep the edge of excitement and drama.' Set-building delays had cut rehearsals short and the production team made editing decisions on-the-fly as the 2-hour show unfolded. David Mallet commented afterwards: 'That's live broadcasting for you—and the broadcasters loved it.'

Televisa's sales arm Protele, headed by Pedro Font, placed the live broadcast with 72 stations worldwide including BSkyB. And with Fox syndicating to 52 US network stations the live audience totalled 600m. Another 100m are scheduled to watch the edited version in November.

Ward: 'As an international classical event a large cultural gap was bridged, because Televisa's working practices meant they were used to producing quick-fire drama. So this was almost a case of starting from scratch—there was a vast learning curve. We didn't realise just how wide the cultural divide was because they were so helpful—we brought in some of the world's top people in the field and Televisa were very cooperative. But they acquired a lot of know-how and will be able to plan more carefully for next year's event.

The *'Three Tenors* [Ward was a consultant producer to this year's *Encore* pre-World Cup Final extravaganza at the Pasadena Rose Bowl] represented a whole spectrum of popular international classical music.

'For me, *Operalia* is exciting because of the limitations on what you can do with classical music for a mass audience, in order to continue the process of reaching a bigger audience.

'Classical music has been slow to learn from pop's selling techniques; on the other hand, some of the biggest selling classical albums have been less about top-quality musical and production values than top-quality, aggressive marketing. Record companies and promoters on both sides of the Atlantic have squandered millions on promoting classical music and then not selling it.

'We're concentrating on producing a portfolio of events under this banner. The format, with a contest fronted by Placido, is unique and exciting for the audience, and it has great potential.'

He adds: 'Placido's determination to make it work resulted in a brilliant programme. The production team at Televisa are determined not only to improve the show as a TV event, but to make the worldwide marketing more impactful.'

Broadcast and production

Toby Alington, Broadcast Sound Producer, notes: 'I started working with Televisa back in July to devise the logistical and technical ways of doing the sound for *Operalia*—the idea being that a British team would come over and lend their experience to the Televisa team. They have vast experience in television

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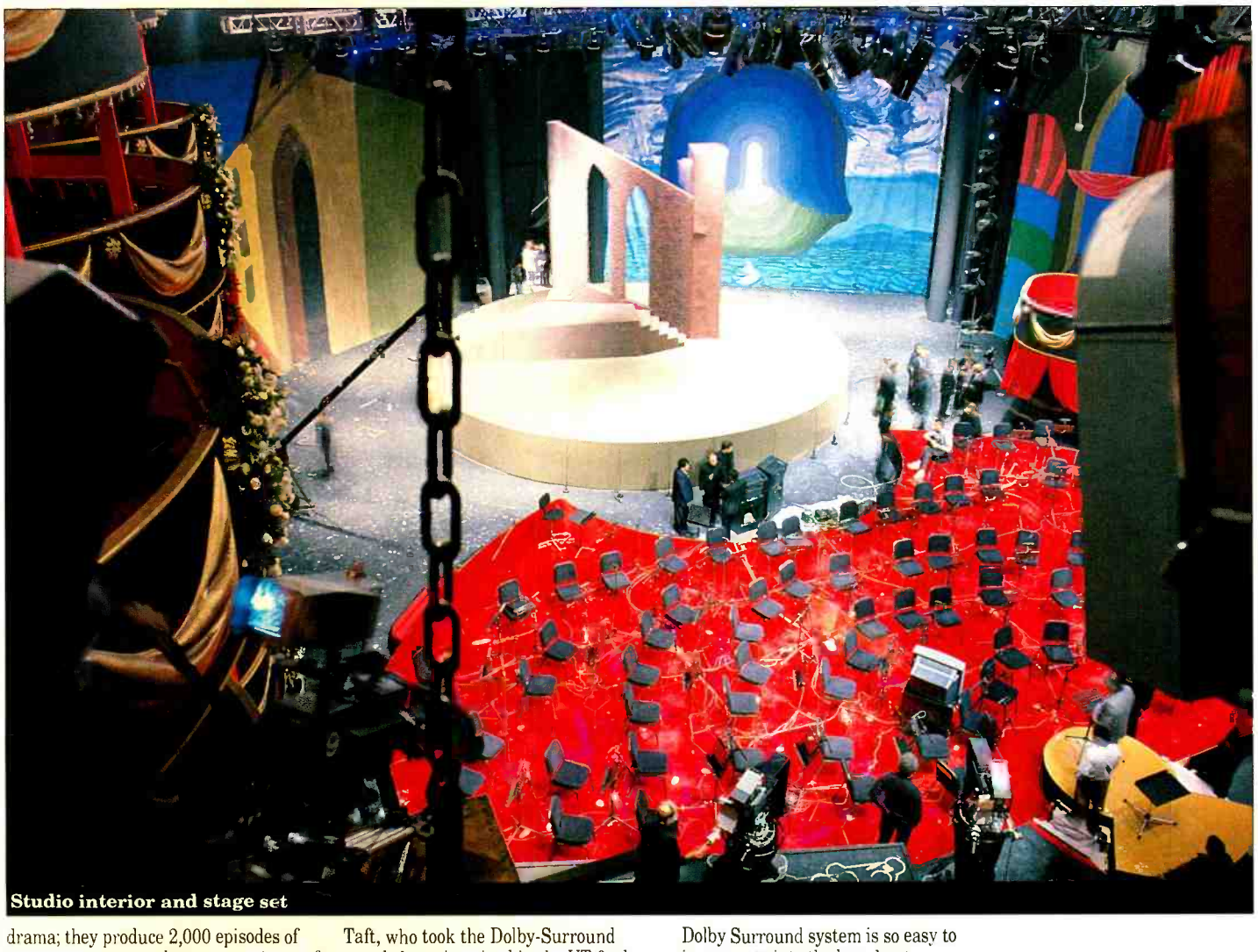

Studio interior and stage set

drama; they produce 2,000 episodes of soap operas a year—but no experience of live classical music broadcast.

'The visual aspect of *Operalia* was always a major part of it, with Hockney's set design and Mallet's visual direction. One of the important things for us was that viewers shouldn't to be able to see any technical aspects of the sound—microphones and so on. So we opted for close-miking on the orchestra and the singers with a mixture of radio and float microphones.

'And with a set like this and Allen Branton's lighting rig, including 150 *VariLite* luminaires, an overhead camera track, plus other mechanical aspects and motor drives around the set—and the film-studio air-conditioning—there was an awful lot of ambient noise. So close-miking helped enormously.'

In the audio control room the Euphonix *CS2000* took pride of place as the 'music desk' carrying the orchestral, singers' and audience mics—mixed by Toby Alington. Right behind it was a Yamaha *PM4000*, piloted by Carden Taft, who took the Dolby-Surround encoded music; mixed in the VT feeds and presenters and provided three stereo outputs—English, Spanish and an international clean feed—to Televisa's satellite station at Chapultapec via a microwave link.

It is rare indeed on a broadcast event to see music and final output desks in the same control room; but this was the way Alington had wanted it, and it offered interesting action, watching from the back of the control room as the broadcast unfolded.

Alington: 'It meant we had a very immediate, high level of communication, and were both able to listen to the same Dolby Surround sound monitoring.

'When I first heard that we had to create an opera house from a dry film studio, my first thought was "what a great gig for Dolby Surround. I rigged some ambience mics specifically for the broadcast surround, so I wouldn't cancel any other signals in a mono listening environment".

'For this kind of show, I think it's great to add the third dimension to audio. The Dolby Surround system is so easy to incorporate into the broadcast environment, and I've never had a single problem with the encoder or decoders —you can set them up and leave them.'

The Clubhouse: on location

Since Televisa's equipment is based around drama-sound recording and postproduction, Alington sought a US or Mexico-based company to provide more specialised music-mixing technology for the recording and broadcast tasks.

'I contacted Steve Thomson at The Clubhouse in LA,' he recalls. 'He had just purchased a new Euphonix *CS2000* console; he could also supply the Sony *3324S* multitracks along with the control room monitoring and other accessories I wanted.'

The Clubhouse is the US West Coast's leading exponent of location-studio recording—that is to say, installing all the expected components of a conventional recording studio into ▶

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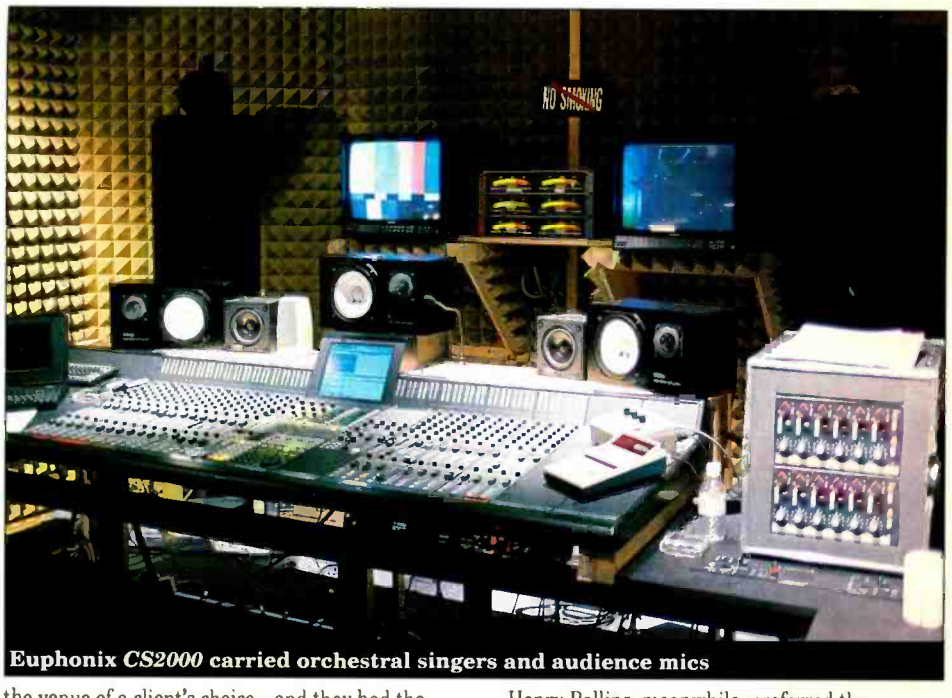

Euphonix *CS2000* carried orchestral singers and audience mics

the venue of a client's choice—and they had the essential expertise and resources to create *Operalia*'s brief but critical installation.

Owner (and roving location consultant to his clients) Steve Thompson says the original idea for his location-recording operation, 'ditching the whole idea that you have to record in a studio', came from Daniel Lanois, a friend from his own home town, in the early 1980s. 'It began with U2 recording *The Unforgettable Fire* in Slane Castle,' he says, 'and progressed to 'why not record wherever an artist feels comfortable?'

Burbank, California, is The Clubhouse's base, embracing their (firmly-grounded) recording studio with its 60-channel Neve desk, acquired from Abbey Road, and the location recording equipment warehouse.

Thompson: 'We match our hardware, whatever the location, to what the client wants—an old Neve, an SSL, an Amek; we just make it happen for them. Now everything we stock is fitted with Edac connectors and housed in road cases so it's simple to just set it all up in any room and start work straight away.'

Steve recalls some of his notable location clients. The Red Hot Chilli Peppers' 4-million-selling album, *Blood Sugar Sex Magic*, was recorded in 'a deserted old mansion in Hollywood with a couple of ghosts for company', while a brand new house in Bel Air 'with a THX theatre system and all the home comforts' served for Counting Crows.

Of the more intriguing location he's unearthed for clients, two have since been adopted into The Clubhouse fold—each a spectacular home with a compelling ambience. 'One of the best locations we've ever found,' says Thompson, 'is a glorious Spanish monastery-style house near Santa Barbara, once owned by Dean Martin and set in 45 acres of grounds.' Another gem, 'Shangri-La' on Malibu beach, The Band's former hang-out, has hosted sessions by Eric Clapton, Bonnie Raitt, Neil Young and Robbie Robertson.

Henry Rollins, meanwhile, preferred the exclusion of a forest cabin up by Lake Tahoe —where Thompson has recently added a 'temporary' ballroom extension (complete with arched roof, double French windows and chandeliers) to the 5,000ft² Tudor-style house he's owned there for two years. This glorious location has hosted three album recordings including a Nitzer Ebb album produced by Flood. Thompson: 'We could have built it like a proper studio, but everyone—clients and ourselves—preferred the vibe of an extension to the original house.'

Euphonix in action

'The Euphonix made sense for a number of reasons,' says Alington. 'It has snapshot capability, so I could store the entire desk for each piece of music and recall it instantly during the show. It is also much more transportable than the equivalent AMS-Neve or SSL desks, which were my other options.

'It behaved perfectly on-site, even though the main audio tower had taken an almighty bash on its journey from LA.

'There were two other clinching factors. It has a very clean sound, and I'm happier working with analogue (or in this case, digitally-controlled analogue) than all-digital for this kind of live broadcast—just because of the reliability factor.

'Euphonix were very excited about the project and sent down one of their own technicians for the duration of the project; so the odd problem that did appear during installation was instantly sorted out by them. And with Steve Thompson himself working alongside me it was an excellent arrangement all round.'

Postproduction sweetening at London's Audio Edit cleaned up the edited version (for TV and CD) further.

'It was frustrating having lost so much rehearsal time beforehand,' comments Alington, apropos of pre-show construction delays, 'but in the end the technical quality of the show was extremely high.'

The live sound

Within Televisa's Studio 5 and its replica opera-house interior, FOH Sound Designer Zieba was tasked with emulating the acoustics of a real opera auditorium for the live audience, which included the competition judges, and the performers.

'My principal brief,' he explains, 'was to create an acoustic environment within the studio space which would mirror that of an opera auditorium—to provide the best possible acoustic for the audience and the performers without the rigours of a dry, unpleasant and uncooperative space.

'Of the many options open to me, instead of going for assisted resonance systems or a computer-based system to provide an artificial acoustic, I opted for the Dolby Surround system. Having had previous experience of it from the Docklands Arena shows with the LCO, I felt I could control it accurately enough to provide an identical acoustic environment both during rehearsals in an empty auditorium—and in live performance in a full one.'

The *raison d'etre* of the Dolby Surround concept is to create a 360° spatial experience, but without requiring listeners to be seated dead-centre in a four-corner pseudo-quadraphonic sound stage. In a live situation, this demands a distributed speaker system with enough sound sources to recreate a plausible ambience throughout the room.

Yamaha *PM4000* handled Dolby-Surround encoded music

Zieba: 'We distributed 32 JBL *Control 1* speakers [supplied by Dimension Audio] around the auditorium. Meyer *UPM-1* wedge monitor speakers were suspended around the grid, feeding artificial reverberation from a Lexicon *480L* via the Dolby Surround decoder.

'The front source for the sound was a ▶

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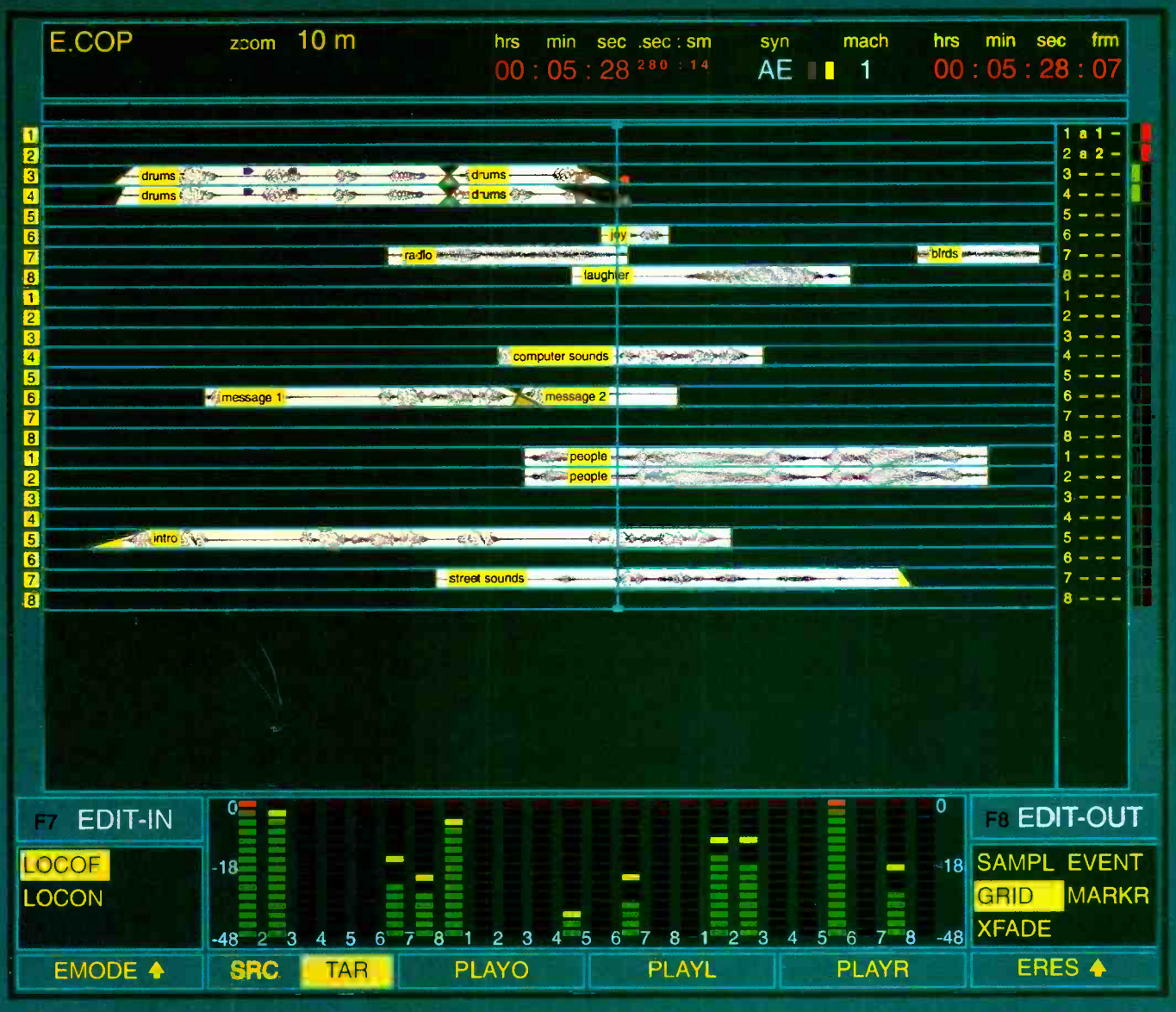

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Toby Alington at the *CS2000*

standard left-centre-right array of *UPM-1*s, reinforcing the individually miked orchestra and singers, rebalancing as required to give clear vocal projection. We also time delayed the surround speakers with five Klark Teknik *DN716*s to aid the impression of a larger space.'

All house amplifiers, consoles and processing were provided by Televisa, with two Yamaha *PM4000* consoles, one for an orchestral sub-mix, the other taking the orchestra submix feeds plus individual singers' and presenters' mics, VT feeds and FX returns.

Settings on the *480L* and the compressors were aligned to match identical items being used in the broadcast mix. The aim was to avoid incongruous reverberation from the PA being picked up by ambient mics on the broadcast sound. Such attention to detail proved well worth the effort in clarifying a complex mix.

Microphones for the orchestra and singers —and eight AKG *C-460*s in a 'float mic' configuration along the front edge of the revolve —came from Dimension Audio. Televisa provided rifle mics for broadcast ambience and the Sennheiser radio mics, using *MKE-2 Red Dot* microphone capsules, worn by each of the singers as the principal vocal source. Alington notes that the float mics were important for the CD post-production; because while radio mics suffice for broadcast, their bandwidth and dynamic range are too limited for CD-standard expectations.

It also became apparent that Mexican radio microphones are not subject to the same rigorous regulations as their UK counterparts. Quality control on the airwaves was matched only by the mains power—which swung from 123V to below 100V, requiring Zieba to reboot his Lexicon before and during the show.

A Mexican drama

Operalia '94 was a production which had all kinds of great things going for it and which bode rather well for its future as a major event on both the classical and broadcast worlds' calendars.

Having covered the production of all manner of high pressure, high profile, big budget shows I can say—without a flicker of hyperbole—that *Operalia '94* was the most nail-bitingly fraught venture I've ever witnessed. Lengthy delays in the preproduction build-up were one of the major factors, leading to one-and-a-half key production and rehearsal weeks being shoe-horned into a few nerve-wracking days.

Crucially, two rehearsal days were lost, an omission from which the presenters, Domingo and Ross, never quite retrieved their poise. And, with so little rehearsal time to cue the brief lead-ins, things got progressively more dangerous as the live programme progressed.

David Hockney's sets, erected on a revolving stage and consisting of starkly simple but highly effective props in exaggerated perspective—a staircase here, a garret there—and painted backdrops looked extraordinary enough in the ▶

A scene from Operalia '94

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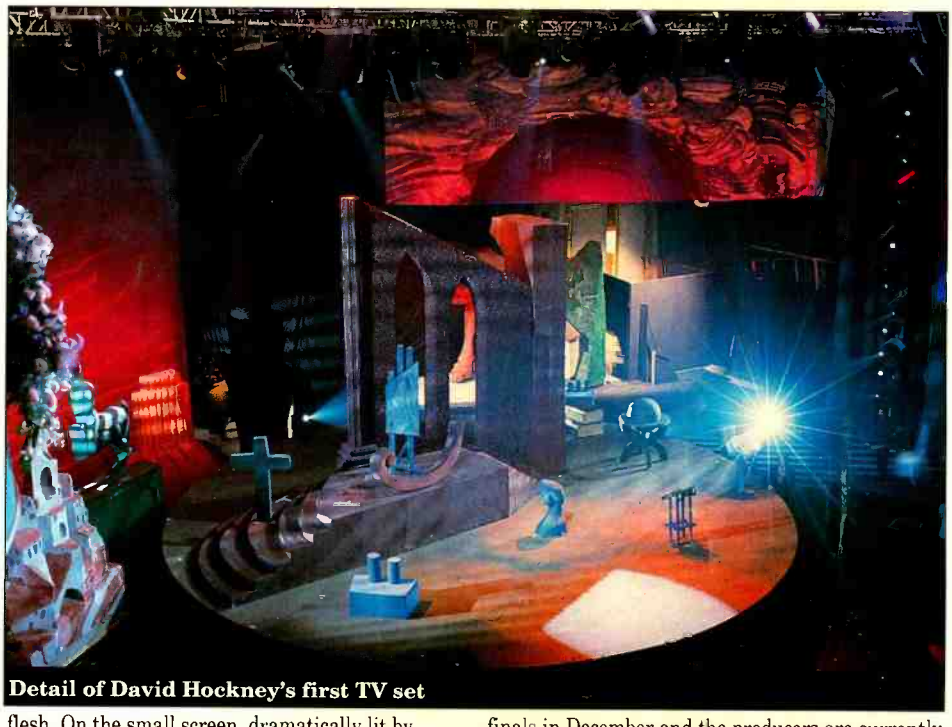


Detail of David Hockney's first TV set

flesh. On the small screen, dramatically lit by Allen Branton's huge *VariLite* lighting system and framed by David Mallet's cameras, they made for superb TV.

The custom-built 'opera house' was mightily engineered, and fitted out by an army of carpenters, welders, electricians, carpet-layers, riggers and painters, beavering away at sets, flats, balconies and an elaborate new foyer. The final touches of paint were added just minutes before transmission—and the whole edifice would be torn down again in a few days to accommodate the next week's production.

But the live package that I witnessed was compromised by an over-run that had built up to a huge 12 minutes as the finale approached. The chief culprit for this, it transpired, was the orchestra which had been playing at a tempo some ten percent slower than it should. This caught Ward and Mallet betwixt rock and hard place—a brick-wall finish time on the live satellite slots and a script with very little fat to cut on the fly. As the show progressed and the delay built up Ward found himself making cut decisions which slashed whole chunks of prerecorded or live sequences from the running order.

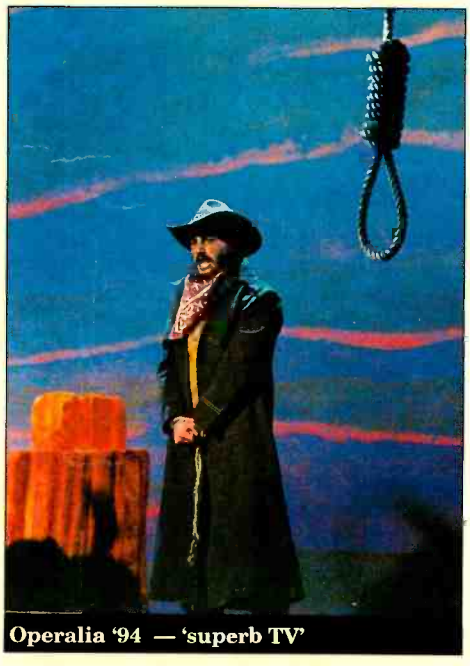
There were fluffs and flounders from the rostrum; but while the production team occasionally covered their eyes the major network broadcasters—including Fox TV—relished the live-and-dangerous element of the programme.

The following day saw the production team crowded around a tiny bar at Mexico airport, discussing the first reports which come in of enthusiastic receptions from overseas territories.

Andy Ward commented: 'In effect this was a very successful dry run for next year and subsequent years. Televisa intend *Operalia* to become the world's major "annual" classical-broadcast event.' Next year's semi finals will be held in Seville in September with the Mexico City finals in December and the producers are currently considering offers from potential sponsors.

After the show was over, American tenor Bruce Fowler, from Manhattan (at 33 the oldest prizewinner in a field ranging from 21 years) summed up the finalists' view: 'The quality in *Operalia* has been higher than in any competition I've ever done. Placido's support makes it something every singer will naturally want to go for.'

David Mallet took a sip from his beer, looked round at me and said: 'We were really delighted with the results we were able to achieve in Mexico. Really delighted.' He added, *sotto voce*: 'And that one's for the record.' ■



Operalia '94 — 'superb TV'

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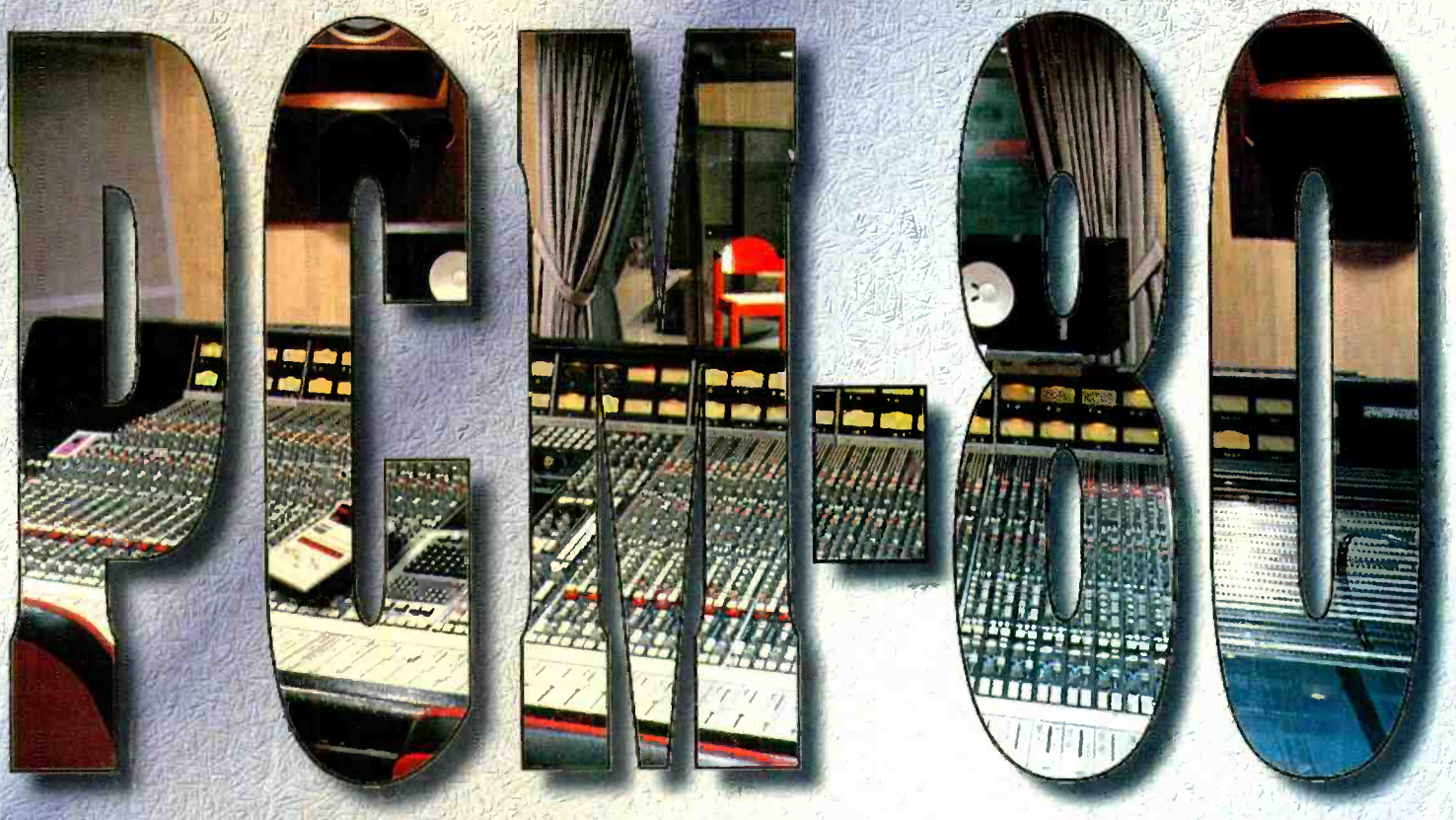

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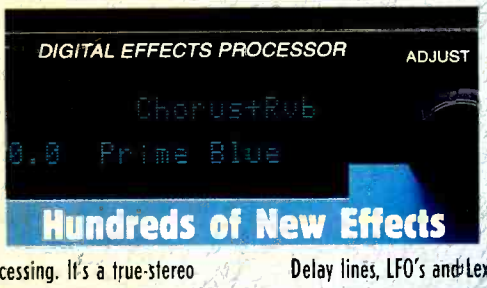

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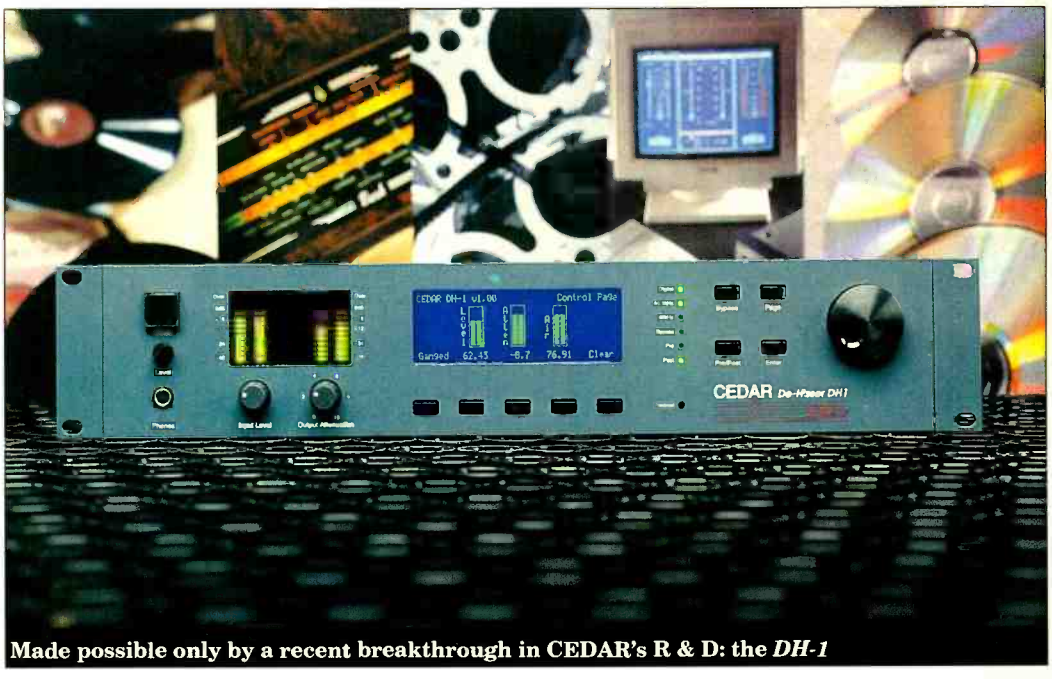

Made possible only by a recent breakthrough in CEDAR's R & D: the *DH-1*

It will not have escaped the attention of the observant *Studio Sound* reader that audio restoration specialists CEDAR Audio have, over the past couple of years, been packaging elements of their large computer-based restoration system into independent 2U-high rackmount modules. They began with the *DC-1 DeClicker*, followed it with the *CR-1 DeCrackler*, and startled a bemused world with the *AZ-1 Azimuth Corrector*. Most recently, the re-engineering introduced with the *AZ-1* was applied to the other two models to create the Series 2 range. The apparent irony was that the task which first put CEDAR's technology in the public eye looked as though it would defeat any attempts to put it in a box like the others—that task was, of course, the removal of hiss, or more accurately broadband noise.

CEDAR's heavy dependence on raw digital-processing power has meant that their product development has been a clear indicator of how far DSP technology has progressed. The early systems were non-real-time number crunchers; dehissing required substantial operator input, noise spectrum fingerprints had to be taken, and then the computer was left for some considerable time to do the job. Carrying out dehissing in real time was a major breakthrough, but happened a while ago now; the image of the original system lingered, however, and CEDAR are still occasionally finding, to their dismay, that people do not realise that the current system and the stand-alone processors all operate in real time. Further developments in DSP power led to the original *DC-1* and *CR-1*, but even then the fundamental job of hiss reduction was beyond the scope of a rackmount box.

The computer system has been further refined over the years, such that it has acquired an upgraded algorithm, Hiss-2, to reduce noise; even so, Hiss-2 still requires a noise fingerprint and a fair amount of setting up, and much of CEDAR's R & D effort over the last five years has been directed at simplifying the procedure. This involved a slight change of approach in the way the system sets about doing its job. Hiss-2 works hard to identify the nature of the noise as precisely as possible, making it comparatively easy to remove hiss. It was realised that it would be much simpler to operate a system which does its hardest work on the business of actually removing what it perceives to be noise, lessening the importance of critical analysis of the noise. The result, made possible by further advances in DSP, is the *DH-1 DeHisser*, cosmetically, functionally and in every other way a member of the *Series 2* family of stand-alone processors.

The look of the CEDAR processors has become very familiar, with its deliberate uniformity across the range. With the units switched off, the only clue as to their disparate functions is the front panel legending; when on, the prominent central display takes a different form for each process. The common thread is an extreme simplicity of operation, which always comes as something of a surprise in view of the tasks these boxes are being asked to perform.

True to form, the *DH-1* allows all its primary operation to be carried out from one screen. There are only three variables in the process, with dedicated keys to select a parameter for adjustment and one large rotary knob to alter its value. The rest of the panel is taken up with the usual set of mode switches—pre-post monitoring, bypass and so on—and indicators for sample rate, error status and the like, and with the meter panel with its input and output bargraphs. A level control is provided for use with the analogue inputs, alongside a digital output attenuator which is available whatever the source. Both SPDIF and AES-EBU inputs and outputs are provided, with the latter handling the full 24 bits. Internal processing uses twin 32-bit floating point processors, and the 18-bit convertors are quoted as having specs of >103dB for the A–D convertors and >93dB for the D–As. Along with a handful of other global parameters, input selection is controlled from further pages of the main screen.

It must be emphasised, in case it is not already clear, that the CEDAR noise reduction process is quite unlike any other single-ended system. There is no low-pass filtering, dynamic or otherwise, with its unavoidable side effects of losing elements of the wanted signal, and there is no expansion, which has different but equally objectionable drawbacks. The aim is to reduce or remove the noise without any noticeable effect on the wanted signal, and it does this by means of complex analysis algorithms and powerful, digital, ▶

Long awaited and much requested, CEDAR's dehiss processing now stands alone. Review by Dave Foister

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signal processing. It is important to take on board that this process is specifically designed to deal with broadband noise which remains reasonably steady; although the software is re-evaluating the distinction between signal and noise 44 times per second, more variable effects such as whiffles and crackles are strictly the domain of the *CR-1*.

The procedure for setting up the dehissing process is quite similar to setting up that of the decrackler, although what the *DH-1* does with the information given to it is obviously very different. Under some circumstances, the *DH-1* software is intelligent enough to identify the wanted signal, as against the noise, without too much help from the user. All the user then needs to do is decide how much the noise as identified will be attenuated, with a maximum attenuation of 40dB. Much of the time, however, the distinction between wanted and unwanted sounds is less clear, and the user must then help out by suggesting to the system where to draw the line. The first control on the screen is simply called LEVEL, and must be adjusted much like the similar control on the *DeCrackler*; with the noise attenuation at maximum, the Level is advanced until the noise effectively disappears, regardless of the side effects this may create. The user has now effectively told the software 'this is what I perceive to be my wanted signal; base any difficult decisions on that'. It is important to note that the process is not dumbly driven by this adjustment, but simply uses it as assistance when it has a dilemma—it attempts to find its own solution where possible. The Attenuation is then adjusted to give the required reduction in noise. As can be imagined, these two parameters interact significantly, with the LEVEL control having quite a critical area, on the edge of the disappearance of the noise, where side effects take on a distinctive if subtle form, with a hint of phasiness and wavering. Pushing it a little further gets rid of this, but too much more and the signal takes on a watery, bubbly sound; the 'correct' setting for a given source is much more critical, and has a much smaller band of tolerance than the other CEDAR processes, but finding it is made easier by a clever variable-speed response on the rotary control.

There will be times when the noise in the source is so severe as to require processing which risks leaving significant artefacts, particularly affecting the low-level detail and ambience. For this reason a final control, labelled AMB, allows any missing information of this kind to be restored. This must be used with care, but works well.

It quickly emerges when using the *DH-1* that the optimum setting for a given source is much more subjective and less clear-cut as a 'right or wrong' decision than is the case with CEDAR's other corrective treatments. Clicks and crackles are either present or absent, and the side effects of the processing are readily apparent in the unlikely event that it is being overdone. Similarly, an azimuth error has either been corrected or not, and indeed the *AZ-1* normally needs no user input whatever. Removing hiss and evaluating whether or not undesirable side effects have been introduced is a less obvious matter. How much hiss should be removed? If complete removal of severe hiss is required, is any trade-off in terms of side effects, however subtle—which may or may not be apparent without reference to the original—acceptable? It became evident early on that the CEDAR person demonstrating the unit to me was being more cautious than I would have been, and aiming to reduce hiss to an 'acceptable' level rather than to remove it altogether. It is well known that many people find a completely noise-free signal uncomfortable to listen to, and will assume that there must be undesirable side effects to such a drastic process whether they are there or not, and it can therefore be advisable to err on the side of caution when deciding how far to go with the *DH-1*. My own feeling was that with most of the trial material it was possible to go further and virtually eliminate the noise without any indication that anything had been done, but I had to admit that the effects of overprocessing were so subtle as to require a certain learning period in order to be able to look out for them and recognise them.

The crunch, of course, is how good is it at getting rid of the hiss? The answer, based on hearing it at work on a wide variety of sources from full orchestra to solo classical guitar, taking in a jazz singer along the way, is VGI (Very Good Indeed), to the extent of being uncanny from time to time. The examples had varying amounts of hiss, all sounding pretty much like various colours of tape noise, which, of course, is the primary target of the *DH-1*. In all cases it was very straightforward to substantially reduce the noise, and with a bit more juggling to effectively eliminate it. While it was possible to introduce side effects, it was much easier to produce a result which, if it did have any side effects, had such subtle ones that they paled into insignificance beside the improvement in the noise floor. The restored signal was remarkable for its retention of low-level detail, which obviously would be the first thing to suffer if the *DH-1* was not doing its job properly, and the whole process was completely free of any hint of noise breathing, pumping or any kind of noise modulation.

It is a fact of life, for good or ill, that opinions will differ as to how best to use a facility like the *DH-1*. CEDAR are perhaps taking a risk in making the process available in this form, as material will undoubtedly appear on which it has been used less than judiciously, and the performance of the unit will then be judged on that basis, as has happened before with the main system. My view is that although it requires a little more care in setting up and a little more thought as to what one is trying to achieve, the *DH-1* is every bit as effective as its stablemates, and will be a highly desirable addition to the armoury of broadcasters and anyone involved in mastering, particularly of older analogue sources. ■

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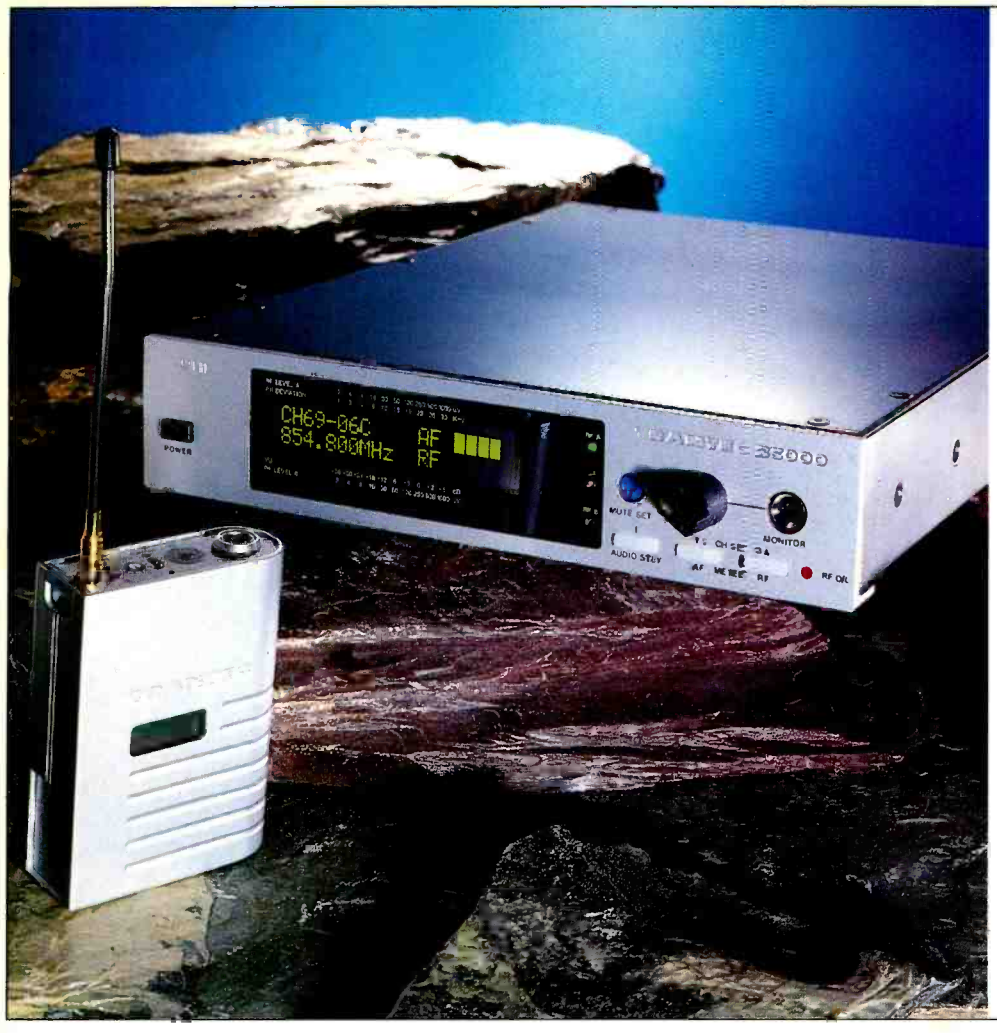

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LISA STANSFIELD

Take one singer, a 10-piece band, a 40-piece orchestra and an audience—place in a highly ambient venue and record. Simon Croft reports on the result from the Fleetwood Mobile

Compared to months of tracking within the cosy confines of the studio, live recording can be a difficult business. There are no retakes, no second chances and only a limited amount of time in which to get the tape rolling.

Recorded on 96 tracks of DASH, the Lisa Stansfield concert at London's Royal Albert Hall this September was technically interesting for a number of reasons. Stansfield was working with The London Philharmonic Orchestra as well as a 10-piece band. In addition, the Albert Hall is known for its challenging acoustics, which can prove alarmingly reverberant for contemporary music.

Staged as a benefit for the Nordoff Robbins Music Therapy Centre, the concert is destined to be televised in a number of countries and will be available on video. It is not certain whether the concert will be released as a commercial CD but if the quality of the performance and the recording are anything to go by, it ought to be in the shops by Christmas.

Capturing the magic on stage to multitrack was Tim Summerhayes, in the Fleetwood mobile. Following a brief arrangement whereby Hilton Sound handled bookings, Fleetwood Mobiles is now independently run as a partnership between Summerhayes and Fleetwood founder Michelle Reynolds. Supplementing the two on site were Chief Technician Steve Crawley and Assistant Technician Paul Tibbles.

As far as Fleetwood were concerned, the Thursday technical rehearsal, followed by the full rehearsal and performance on the Friday were the culmination of many weeks of careful preparation.

The job actually came to Fleetwood from television Producer Marion Waldorf, with whom the team had worked previously. Once the contract was confirmed, Fleetwood liaised with Stansfield's management and the FOH mix PA engineer. 'In this case it was Steve Levitt, who was incredibly helpful,' says Summerhayes. 'We've worked with him before as well.'

Levitt responded with his microphone list and the two teams agreed a cooperative strategy that was a far cry from the completely separate systems sometimes found on live recordings.

'On this particular one they asked us to be solely responsible for the orchestra and to provide the PA with submixes,' Summerhayes explains. 'At the front end were BSS active splitters and that conditioned everything before it came in. We were totally isolated from the PA system. Even the feeds we sent them went through buffers, so there was no risk of a hum loop.'

Routine aspects of the job were sorted out at the production meeting. This included parking, power and the audio cable runs, a particular bugbear at the Albert Hall. Before its acoustics were partially tamed in the 1960s, the venue's extended RT60 led to the tag, 'the best place to hear good music twice'.

'It's the worst place to rig, I can tell you that,' Michelle Reynolds responds. 'We were told they had improved the cable run but it is absolutely dreadful.' ▶

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She has fallen foul of the building's layout in the past. 'I came in to check something and they'd locked the door, There was two minutes to go. I've never run so fast in my life. The only place I could get in was the other side of the building—but it keeps me in exercise.'

Reynolds, who has rigged venues from Russia to Rio de Janeiro in the recent past, rates the Albert Hall's cable run as distinctly ropey. Involving a tour of the low-ceilinged boiler room, she compared it to 'going down into the sewers' but her concern was more practical than personal. Although the truck was parked about 16m from the stage, the actual cable run was nearer to 65m, a factor exacerbated by the number of lines required.

'We had four cables in there,' Summerhayes points out. 'A 15-pair feeding the PA system with our submixes and three 27-pairs to pick up the orchestra and the band. Two of those were located by the monitor desk where the PA gave us passive splits of their microphones. The third one was situated in the middle of the orchestra.'

A belt-and-braces approach was taken to the power requirements, with Fleetwood and the television company, Visions Mobiles, who brought along their own generator. 'In fact the BBC had installed a new power distribution system for their OBs with finely-tuned RCBs set to trip at 30mA—and I think they had some problems with them,' says Summerhayes. 'We all ran separate tails to the standby generator, so if the power tripped at any time it was just a case of switching to the generator as quickly as we could. But that wasn't necessary.'

The Fleetwood mobile

Other factors to be decided included the recording format, in this case 48-track DASH, using a Studer *D827-48* and a Sony *PCM-3348* hired from Hilton Sound. One machine was primarily for backup and there was also a Fostex *D20B* DAT recorder to provide an instant reference mix.

During the production meeting, Summerhayes also made a hasty plan on the venue's layout, with the position of the band, orchestra, FOH desk and monitors. Considering his previous career as a draughtsman, the end result looked disarmingly like a spider's web but it sufficed to fine tune the details.

'I was more than happy with Steve's choice of microphones; it was all first-rate stuff,' says Summerhayes. 'He actually tuned the little limiters in the vocal mics, the Shure *Beta 87*s. In fact he had two, one he used on the rehearsal and one he brought in for the main show, which had been adjusted slightly differently. Actually, we both agreed during the rehearsal on show day that it wasn't quite as good as the one we were using on the Thursday, so we reverted to that. It sounded fantastic.'

Unusually, Summerhayes was able to take the feed from Stansfield's mic and print it to tape without any sort of compression or limiting.

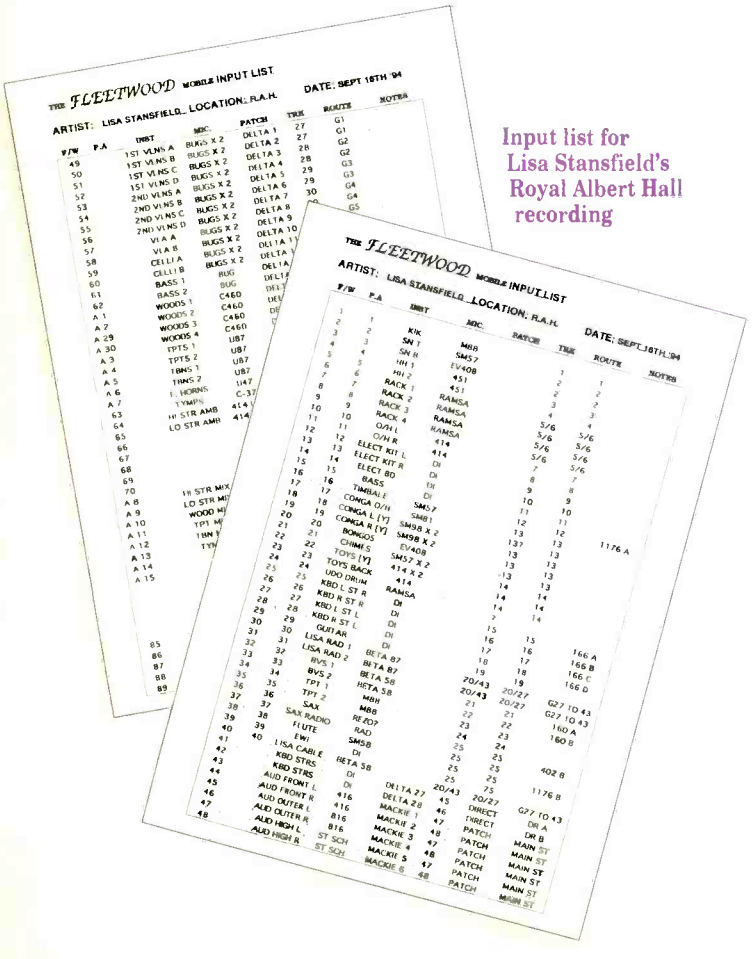
'We had two tracks,' he explains. 'One I had going straight through our desk with a sensible amount of EQ just to sweeten it slightly. That went to tape and was monitored—and it sounded very good. For an option, we had the microphone at source split into a Massenburg mic-line amp and that went straight to tape, untreated, untouched by human hand.

'I had a limiter patched on the insert should the need arise but she was so controlled. She really sounded sweet. It's nice to work with someone like that.'

There was 'a bit of soft compression' applied to the backing vocals with dbx *160*s but these singers also exhibited good control and little treatment was needed.

'Yeah it was fine,' Summerhayes agrees, 'Apart from the normal scenario where the artist comes on and gives an extra 10dB compared to the rehearsal!'

Keyboard player and Managing Director Dave Collard and keyboard player-guitarist Ian Devaney provided their own stereo submixes to the FOH and the recording desk. The only minor complication was the decision to remove any synthesised string parts from the mix and to ▶


THE FLEETWOOD MOBILE INPUT LIST

ARTIST: LISA STANSFIELD LOCATION: R.A.H. DATE: SEPT 16TH '94

Input list for Lisa Stansfield's Royal Albert Hall recording

SYNCHRONISATION

The Fleetwood mobile received a black and burst synchronisation feed from the television truck. This went to an ROH distribution unit before going to the two DASH multitracks and the DAT machine.

The television truck also provided three video feeds: two from the vision mixer and one wide-angle shot of the venue as an aid to coordination.

The drummer played to a click track, which meant that in postproduction there would be the option of dropping in orchestral parts from the rehearsal if required. ■

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track them separately, so that the decision as to whether these should be included with the real strings could be taken in postproduction.

'Generally I put a bit of soft limiting across stereo keyboard feeds. Experience shows they tend to be a little unpredictable in places,' says Summerhayes. 'The touch sensitivity can be a little bit over the top but there was nothing serious on this occasion. I also tend to put a bit of soft limiting on the bass as a matter of course and normally it's an *1176*. It just seems to level it out. The band was fantastic.'

While miking on the orchestra was orthodox in the main, the strings were picked up by individual Barcus Berry bugs, the only solution that Summerhayes has found totally workable in a rock 'n' roll environment.

'I always get them from Mick Anderson at Concert Sound, who is the only person I know that has a complete set. He uses them specifically for the Eric Clapton orchestral concerts. We have used them a number of times and they have always been excellent.

'There are three types. The viola and violin mics clip across the strings slightly behind the bridge. The only comment from a few violinists has been that the mics tend to slightly damp the acoustic sound of the instrument, which I can accept because a violin mute actually clips onto the bridge. But the advantage—there is no comparison. It's just a very clean sound.

'The other two types are the cellos and the basses. They actually screw across the hole in the side of the bridge. They all go to their own preamps and power packs, then down the line to us.'

Summerhayes considers Sennheiser *MK2*s to be a 'useful alternative' although they are 'very open'. He has also used Sony *ECM50*s but finds that they are prone to picking up the on-stage monitors.

With so many string mics, Summerhayes chose a 24:8 Soundcraft *Delta* for submixes, a Mackie 16:2 for submixing the ambience mics.Summerhayes rates it 'an incredibly quiet desk'.

'We had two stereo Schoeps plus two *816*s and two *416*s. These were submixed down to a stereo pair.'

The main Fleetwood desk is 'the one and only' Raindirk *Quantum* ever made. 'The only original thing on it is the deck plate, says Summerhayes. 'It's been rebuilt totally by Hilton Sound; they pulled the whole thing apart. It's got 3-band EQ which even Raindirk admit is better than their new *Symphony* EQ: it's lovely, even though its sounds are limited.'

Perhaps surprisingly, the other console of which Summerhayes is particularly fond is the digitally-controlled Euphonix *CS2000* he uses when working at the studio owned by Status Quo's Francis Rossi. In fact, Fleetwood Mobiles now offer packages whereby mixing and postproduction are carried out at Rossi's facility.

Summerhayes says he would also like to try using the assignable Euphonix on a location recording, although he observes, 'On a job like this we'd be pushing it'.

Perhaps so. After all, the 40-piece orchestra eventually accounted for 19 tracks. Of an entire 48-tracks of digital tape—only track 44 was left spare. The FOH Yamaha *PM4* had to cope with a mere 40-odd channels, thanks to the submixes. ■

Fleetwood Mobile, 8 Sterling Way, Beddington Farm Road, Croden Surrey CR0 4XB, UK. Tel: 0181 665 1000. Fax: 0181 665 5466. Mobile Tel: 0865 559219.

TIM SUMMERHAYES

'I've worked in all the English trucks apart from the Manor,' Summerhayes reckons. He started with the RAK mobile as general assistant in the mid-1970s and ended up running it. RAK then built their studios, where Summerhayes was able to expand his experience.

He went on to run the Island Mobile, which eventually became the Advision Mobile. For Summerhayes, he majority of the 1980s were spent in studios, until he met up with Michelle Reynolds and her husband Nick around 1989. (Nick Reynolds now runs Fleetwood Transport, which specialises in trucking to Russia and China.)

'I was with Fleetwood for three years from 1989 to 1992,' Summerhayes recalls. 'As most people know, the firm went horribly wrong about that time and that is when I moved down the road to [Francis] Rossi's place—by mistake really. We'd just finished building it when he wanted to start recording and I was there for almost two years.'

Now Summerhayes is back with Fleetwood. As well as engineering he has an HGV2 licence and drives the truck to venues.

'I was always in touch with Fleetwood and Mich, and we decided to go into partnership and make a serious attempt to get it up and running. It's going to be a lot of hard work.' ■

FLEETWOOD: THE BIOGRAPHY

Fleetwood Mobiles grew out of the Fleetwood Mac organisation around 11 years ago and was run for the best part of around a decade by Nick and Michelle Reynolds.

While the main truck is the same super-hardy Ford Transcontinental that Michelle saw fitted out when the operation began, she said the market had changed.

'It was a fairly steady business because there were very few mobiles but there are a lot more European trucks now, although it is much more expensive to get them over here. We like to think that our prices are really competitive in Europe as well.'

The business is also seasonal, with the start of the year traditionally very quiet. Then there are the longer cycles caused by the musical trends. Interestingly, one superstar tradition could be making a comeback.

'We've recently had a lot of enquiries from people who want to go back to they way they used to make albums—in country mansions,'

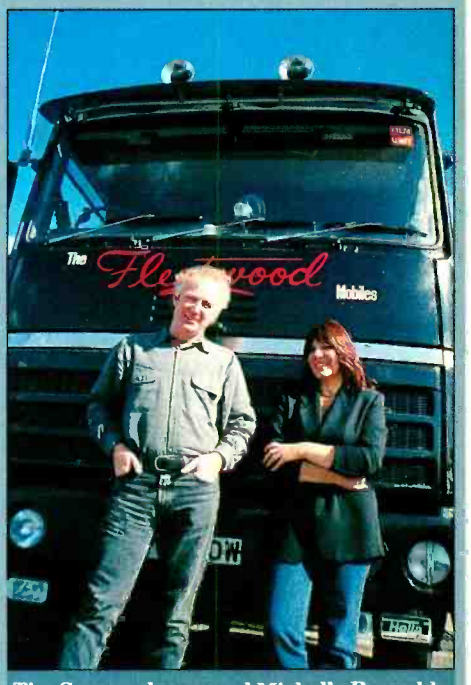
The Fleetwood Mobiles service is not just the truck. In addition to a mixing package with Francis Rossi's studio, to company has on a number of occasions put together flightcased packages for assembly on site. This includes one which reached its Venetian location by canal boat.

As for the truck, Reynolds pointed out that the mileage it undertakes is minimal compared to most commercial vehicles. The Raindirk desk inside is a one-off.

'Yes, that was a prototype. It was built specially for the truck and it's a favourite with an awful lot of people. Status Quo won't use anything else. Tim is the magic fingers but the desk in itself has a reputation I think.

'I tend to take care of all the bookings and I tape-op. We all rig. Because we've all done it for so long, it's second nature really. We are adaptable and if the client asks for it you can hire it in. Earlier this week we did 24-track analogue.

'We did the *The Three Tenors* in Rome and we did them in Russia, which was really exciting for us. I've been to Russia 25-odd times now. We did *Poverty in the Park* on that terrible rainy day. We've played every major city in Europe. It's more interesting in a mobile.'



Tim Summerhayes and Michelle Reynolds

The rig

The sound-reinforcement rig was supplied by Canegreen and was based on Meyer speakers. The centre cluster was ten enclosures wide and two deep. Meyer *DS2*s were used in the centre and there were also some Meyer *UPA*s. Crest amplifiers were supplied, although Canegreen are starting to use Lab Gruppen units on monitor. FOH board was a Yamaha *PM4* with a Midas *XL3* on monitor, equipped with a 16-channel stretch. ■

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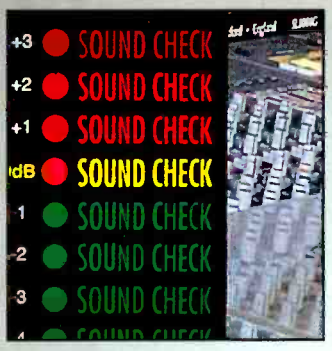

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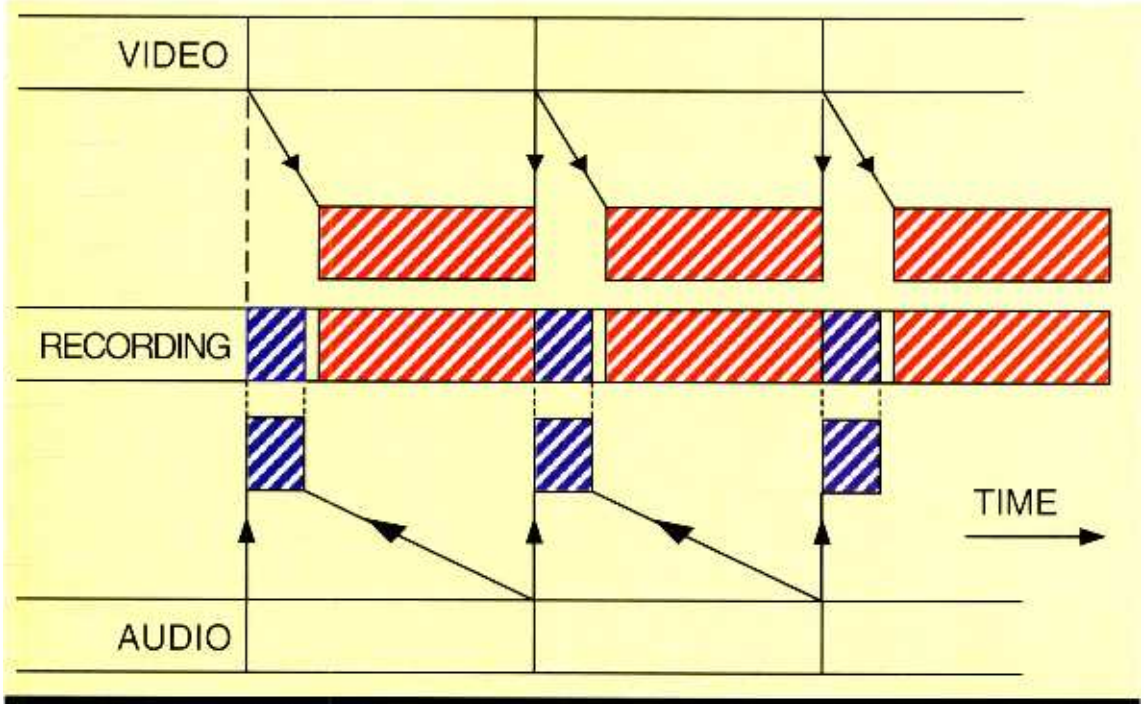

Fig.1: The video data are mildly time compressed to open spaces in the recording. Heavy compression raises the audio data rate to that of the video, so the same systems can be used to record both

The audio performance of analogue VTRs has never been much to get excited about. The linear speed is relatively low by audio standards and the tape is optimised for video recording, not audio. The rotary heads cause flutter. The requirement for lip-sync dictate that the same head has to be used for recording and playback and crosstalk within the head is a problem, particularly breakthrough from the time-code track.

The adoption of digital techniques essentially removes these problems at a stroke. Once the audio is in numerical form, wow, flutter and channel-phase errors can be eliminated by time-base correction; crosstalk ceases to have any effect and, provided a suitable error correction strategy is employed, the only degradation of the signal will be due to the A–D convertor. The one of the most significant advantages of digital recording is that there is essentially no restriction on the number of generations of rerecording which can be used.

DVTRs have rotary heads in order to allow 'stunt' modes such as picture in shuttle as well as to support the substantial data-rate. The presence of several channels of digital audio causes an increase in data rate of only a few percent, and it is universal practice to record the audio with the same heads as the video by allocating small audio blocks at specified places along the main recorded tracks. This simplifies the construction of the machine tremendously, since there are no separate audio heads, and the same RF and coding circuitry is time-shared between audio and video, along with part of the error-correction circuitry.

While audio and video after conversion are both data, one difference is that a high-quality digital-audio channel will require only 1Mbit/s, which is over a hundred times less than the data rates which are necessary for video. All production DVTRs have four independent audio channels, except for some HDTV machines which have eight. Although the frequency range of audio is much less than that of video, the dynamic range is much greater, and sample wordlengths up to 20 bits will be found. While the audio community uses 32kHz, 44.1kHz and 48kHz as required, unfortunately today's DVTRs only offer 48kHz. As a DVTR is only a DAT machine on steroids, there is no technical reason why all three rates could not be supported. This is an oversight which causes practical difficulties in mixed audio and video installations.

Fig.1 shows that substantial time compression is used to raise the data rate of the audio up to the same rate as the video data. One consequence of this approach is that the audio and video data rates must be locked. Consequently digital audio to be recorded on a ▶

The Digital VTR has now essentially obsoleted its analogue predecessor for production purposes, recording both video and audio as data. John Watkinson shows that some of the issues which affect audio in DVTRs have no parallel in audio-only recording

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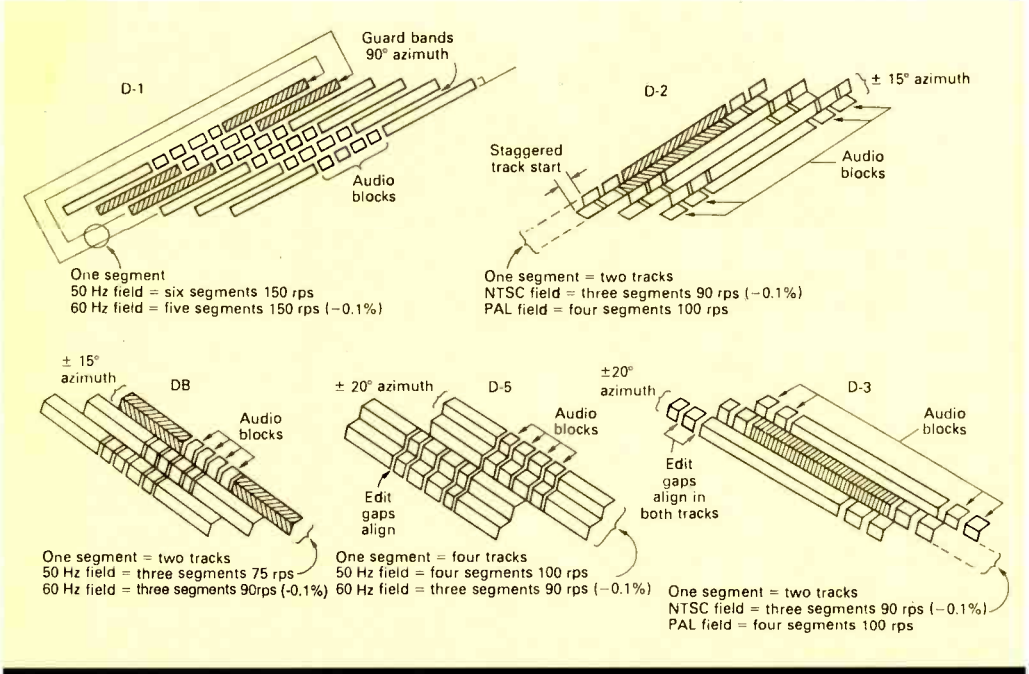

Fig.2: In D-1 audio blocks were central. D-2 and D-3 tried audio blocks at the ends of the tracks, but subsequent formats returned to the central audio location. (DB= Digital Betacam)

DVTR must be supplied from a source which is genlocked to an audio sampling-rate reference which is video synchronous. A number of manufacturers produce 'black boxes' which accept a video reference and output synchronous 48kHz DARS (Digital Audio Reference Signal). With 625-50 machines, the sampling rate of 48kHz results in exactly 960 audio samples in every field.

For use on 525-60, it must be recalled that the 60Hz is actually 59.94Hz. As this is slightly slow, it will be found that in 60 fields, exactly 48,048 audio samples will be necessary. Unfortunately 60 will not divide into 48,048 without a remainder. The largest number which will divide 60 and 48,048 is 12; thus in 60/12=5 fields there will be 48,048/12=4,004 samples. Over a five-field sequence the fields contain 801, 801, 801, 801 and 800 samples respectively, adding up to 4,004 samples.

Another important difference between audio and video samples is the tolerance to errors. The acuity of the ear means that uncorrected audio samples must not occur more than once every few hours. There is little redundancy in sound when compared to video, and concealment of errors is not desirable on a routine basis. In video, the samples are highly redundant, and concealment can be effected using samples from previous or subsequent lines or, with care, from the previous frame.

While we require greater data reliability in the audio samples, audio data form a small fraction of the overall data and it is difficult to protect them with an extensive interleave while still permitting independent editing. For these reasons major differences can be expected between the ways that audio and video samples are handled in a digital video recorder. One such difference is that the error-correction strategy for audio samples uses a greater amount of redundancy. While this would cause a serious playing time penalty in an audio recorder, even doubling the audio data-rate in a video recorder only raises the overall data-rate by a few percent. The arrangement of the audio blocks is also designed to maximise data integrity in the presence of tape defects and head clogs.

The audio blocks of DVTRs are found in various places along the track as shown in **Fig.2**. In D-1, audio blocks were placed centrally as this is where tracking error is the least. In D-2 and D-3 the audio blocks were relegated to the ends of the tracks, the argument being that the adoption of azimuth recording allowed greater tracking errors to be absorbed. Experience has shown that this idea was not a good one, and in subsequent formats (such as D-5, Digital *Betacam* and DCT) the audio blocks have gone to the track centre once more.

It is universal to use some form of Reed-Solomon product code for audio blocks. In this respect the principle is virtually identical to the approach used in DAT. The fundamental restriction of all product codes is that they cannot be edited except by a read-modify-write process. The product code is read from tape, error corrected and de-interleaved. The edit is then performed to sample accuracy in memory followed by the re-interleave and calculation of a new product code which is written back to the same place on the tape.

In DVTR formats attempts have been made to avoid the use of read-modify-write, for example by restricting editing to product code boundaries. Clearly this could result in an audible click. In D-1 this was avoided by having two copies of all audio data recorded different places. During an edit only one copy was updated initially, and a few blocks later the second copy was also updated. In between these two points both old and new recordings existed and a cross-fade could be made between them to eliminate the click. Unfortunately D-1 used the double recording technique as a fallback. In the case where the error-correction system was unable to cope with errors on one of the copies, data from the other could be used. Clearly during an edit of the kind described above, this protection was not available and difficulties were experienced.

D-2 used almost the same audio system as D-1 including the double recording. However, in order to overcome the vulnerability of the audio during crossfades, the crossfade edit mode was replaced by a Vee-edit which caused the audio to fade out then in again at an edit. This was not acceptable for many purposes and proper crossfade edits could only be done with read-modify-write. Despite the fact that the two copies of the audio are never different in D-2, double recording was retained when it would have been much more robust to use the tape area for an increased interleave and a larger product code. Thus the audio system of D-2 is suboptimal. It was not until D-3 that the double recording principle was abandoned for good and the corresponding tape area was used for single recording with a large interleave and high redundancy. Thus D-3 is probably the first DVTR format to have robust audio. Clearly with a large interleave read-modify-write recording is mandatory for production purposes.

Virtually all DVTRs have AES-EBU inputs and outputs for digital-audio signals, and increasingly machines are available in which the four audio channels are multiplexed into the blanking periods of the Serial Digital Interface (SDI) signal which carries the digital video. Again some caution is required because not all of the content of the AES-EBU signal is carried in SDI and not all of what remains is recorded by DVTRs. Most DVTRs offer audio wordlengths up to 20 bits, but in many cases 20-bit recording is obtained by ditching other parts of the AES-EBU signal which can be carried alongside a 16-bit recording.

While theoretically a DVTR should have great sound quality, this is not always the case in practice. DVTRs contain servo-motor amplifiers and high-frequency digital processing logic and this is not a good environment in which to mount A–D convertors, especially when the clock jitter tolerance of audio is so unforgiving. If in doubt, test it! ■

John Watkinson is an independent consultant in digital audio, video and data technology and is the author of seven books on the subject, including *The Art of Digital Audio*, acclaimed as the definitive work on the subject. He is a Fellow of the Audio Engineering Society and is listed in *Who's Who in the World*. He regularly presents papers at conventions of learned societies and has presented training courses for studios, broadcasters and facilities around the world. His latest book is *The Digital Video Tape Recorder*. ■

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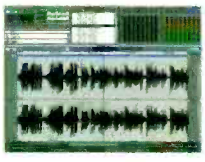

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MTA 900

This month sees the release of Malcolm Toft Associates' second console, the *Series 900*. The design is based on MTA's debut *980* (see review, *Studio Sound* July 1993) desk which was launched last year.

The *Series 900* is a 24-bus, budget console aimed predominantly at the small-project studio market with prices in the UK starting at under £16k for a 24-input board. Bearing in mind that the *Series 980* is itself an affordable console, the question why Malcolm Toft had taken this route rather than focusing his energies on the high-end market quickly arises.

'With the *Series 980* we identified a gap in the market between £20,000 and £30,000 and that has proved very successful,' says Toft in response, 'but I think at the moment if you go much above that the market becomes much more difficult. However, we also identified a gap between £15,000 and £20,000 for a serious console that could offer fully-balanced, discrete 24-bus routeing. The consoles currently available in this price range tend to have 8, 12 or 16 groups that split to 24, but none offer what I consider to be "proper" bussing.

'Another reason for taking the low-cost route,' he continues, 'was that it enabled us to put a new console together very quickly as it effectively meant scaling down the *980*.'

Since founding Trident Audio in the early 1970s, Toft has consistently enjoyed a reputation for designing quality into his consoles. The *980* has already been highly acclaimed for its build and sonic performance, and indeed Toft has said that this would have been the successor to the Trident *Series 80*, had he remained with the company. The *Series 900* shares these attributes, offering the same level of performance with identical technical specifications. It also offers the same traditional split-monitor architecture that Toft has always favoured for its flexibility and operational simplicity. Where cost cutting has taken place is in the careful rationalisation of some facilities, and by offering certain *980* standard features as options—for example Penny & Giles faders as an alternative to ALPs.

The *900* can be supplied in three frame-sizes housing 24, 32, 40 or 48 Input modules, 12 Dual-Monitor modules, three Dual-Return modules and a Master module. Unlike the *980*, the *Series 900* modules now incorporate faders which before were positioned in a separate fader tray to allow for easy retrofit of most automation systems. The all-in-one module design has resulted in the depth of the console being reduced slightly by a few inches, but all other dimensions remain identical to those of the *980*. And optional 19-inch end section can also be supplied for mounting a patchbay, and various alternatives are available including a full Mosses & Mitchell bantam bay.

The modules

The input stage is the same as the *980*, sourcing between one of three inputs —Mic, Line 1, and Line 2—with phase reversal and 48V phantom power. Mic and Line 1 have separate gain controls, but if Line 2 is selected the mic input will pad down to provide a ±20dB line level control in contrast to Line 1's ±10dB. Additionally, Line 2 can be used during mixdown to provide a second independent channel input. This is achieved by selecting the DIRect button adjacent to Aux 7-8 which routes the Line 2 signal through Aux 7-8 level and pan controls to the mix bus. This facility effectively doubles the input capability of the Input module during mixdown, and means that a 32-input console can provide an impressive total of 94 inputs (taking into account Monitor and Return modules). A 48-channel console will provide 126 inputs.

The equaliser is a 4-band ±15dB swept design, with generously overlapping bands which have fixed Qs. Also included is a 50Hz switchable high-pass filter. The EQ is identical to the *980* and has been based on a long tradition of Toft designs going right back to the early days of Trident.

'The curve shapes are all very similar to the dear old Trident equalisers,' confirms Toft. 'They're different, of course, in that they're fully swept, rather than being switch selectable high and low, and I think that this has opened things up quite a lot. For example, we start our EQ off at 40Hz which is fairly unusual, and this ▶

Simplicity, professionality and cost-effectiveness are the key issues with Malcolm Toft's new mixing console. Patrick Stapley reports

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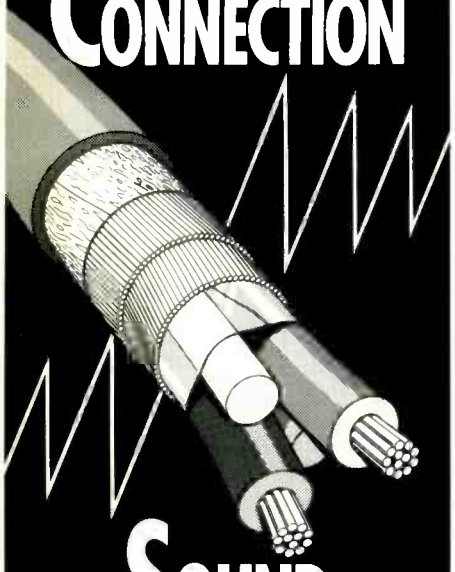

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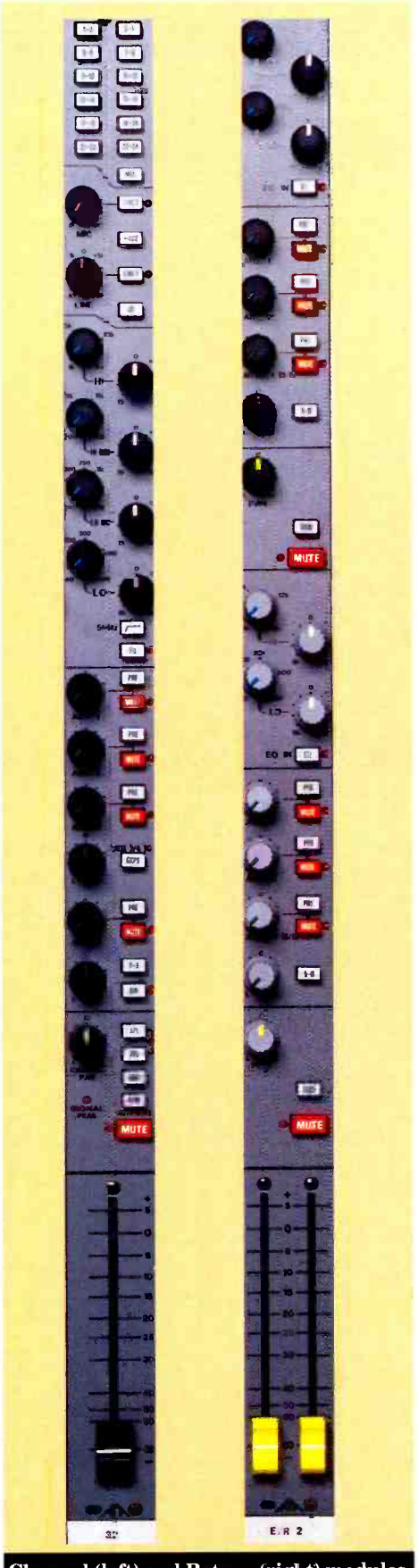

Channel (left) and Return (right) modules

really seems to have caught on with people who have been using the *980* console for dance music and remixing.

'When you're designing EQ, I think you really have to ask yourself the question "what do people actually want from a console equaliser?" In my view it should be a musically creative tool that enhances the signal, and I think this is where a lot of manufacturers go wrong these days by designing equalisers that act as repair tools rather than musical enhancers. My philosophy is that if you need an equaliser to precisely correct something, you should plug in an outboard unit like a graphic. Interestingly I was talking to Rupert Neve last year and he was saying that in his experience most people find a broad bandwidth equaliser more musically satisfying than a sharper one, and that's basically the view I've adopted since the early Trident days.'

> 'When you're designing EQ, I think you really have to ask yourself the question: "what do people actually want from a console equaliser?"'

As with the *980*, there are eight aux buses arranged as four mono and two stereo sends, each with pre-post switching and mute. However the arrangement of the controls is slightly different in that Aux 5-6 and Aux 7-8 are switched between one set of level and pan controls—thus a maximum of six (rather than eight) sends can be active from the channel at one time. Aux 3-4 can also be disconnected from the Aux bus to the Group bus, thus providing an additional 24 sends during mixdown.

At the bottom of the module are pan, AFL, PFL, Solo (in place), large MUTE button, and an AUTO MUTE button for group muting—the difference here is that the *980* has three mute groups. LEDs are included for the mute and AFL-PFL, and additionally there is a signal-peak indicator that gets progressively brighter in the range to +18dB. The module finishes with the 100mm fader below which is a scribble pad complete with the channel ID number.

Going back to the top of the module, there are 12, paired, track-routeing selectors and a mixed bus routing button—associated LEDs have been ▶

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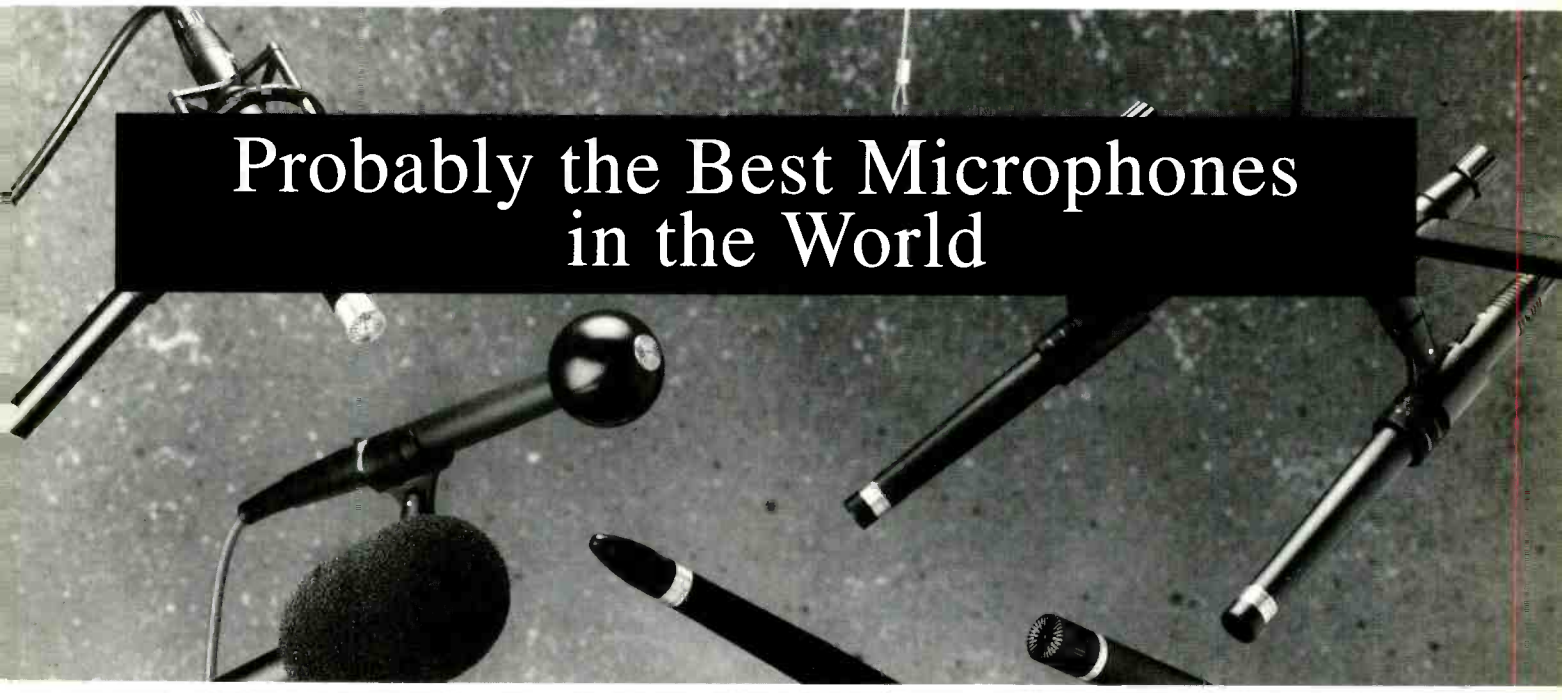

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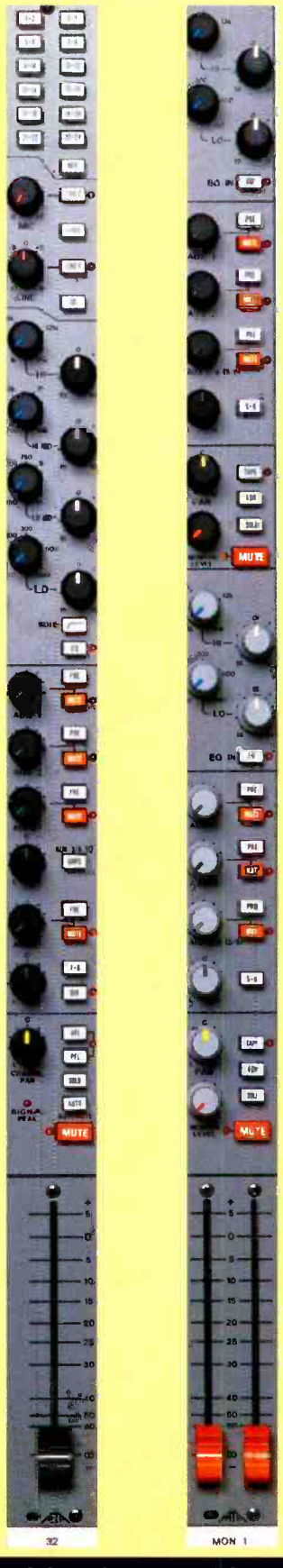


Master (left) and Monitor (right) modules

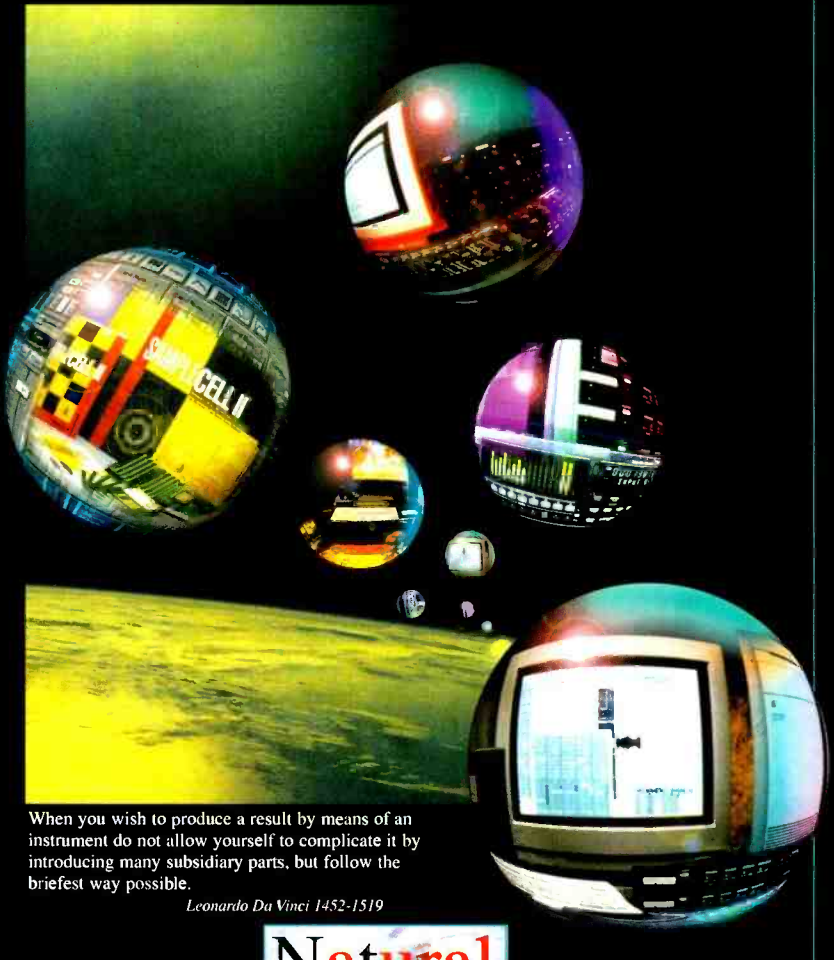
removed from these switches.

Each Monitor module contains two identical sections which have been distinguished by colouring the control knobs black for the upper section, and light grey for the lower section; this clearly differentiates between monitors 1–12 (the top row) and 13–24 (bottom row). Monitor levels are controlled from pots rather than faders although a local Fader Reverse facility switches control to the long-throw group faders at the base of the module. A stereo AFL and the same large MUTE button used in the input module are also included here.

The EQ section has been simplified to 2-band swept (4-band on *980*), but like the *980* the auxiliaries have been reduced to six sends with 3-4 and 5-6 sharing controls. Also simplified is group-tape monitoring which operates purely as a local function—the *980* features global override switching for tape and group monitoring.

Three Echo Return modules are fitted which again are divided into two identical sections, thereby providing a total of six returns feeding into the mix bus. The EQ and auxiliary sections are the same as in the Monitor module, as too are the Mute and Solo. Levels are controlled by two 100mm faders placed side by side at the bottom of the module. ▶

Digital audio comes down to earth



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The *900* console benefits from a long design pedigree, and features all the component quality and sonic performance of the MTA *Series 980*

The Master module contains the eight auxiliary masters, each containing a SOLO and MUTE button; the Solo Master which controls monitoring level for both the AFL and PFL circuits; and the Automute master which activates the Input modules' mute group.

Source monitoring is controlled from four switches: MIX switches control room monitoring from the 24 groups to the stereo mix output, while three 2-TRACK buttons select external stereo sources. A Studio Playback feed is provided with independent level control and ON-OFF switch, which can either follow the control room source, or be switched between Aux 5-6 or 7-8.

An alternative loudspeaker circuit is included with separate level control and an ON-OFF button (the *980* incorporates two Alt circuits). Main and alternative speaker feeds can be active simultaneously, but there is no provision for intercancelling switching (where selection of one switch disables the other) to allow easy swapping between large and nearfield speakers. Both speaker circuits are affected equally by Dim, Mute and Mono switching.

Talkback is from a high-quality electret which feeds six push-button destinations via a level control—Aux 1, Aux 2, Aux 5-6, Aux 7-8, the 24 groups and Mix bus, and the studio playback speakers. All selections dim the control-room loudspeakers to avoid feedback.

A 3-frequency oscillator (offering 50Hz, 1kHz and 10kHz) is also provided which feeds the Group and Mix buses, as well as an oscillator patch point. The module finishes with a single, main, stereo-output fader.

Metering and automation

Metering for the *Series 900* is all via 12-segment PPM bargraphs, which provide 24 tape-group meters and a pair of stereo output meters. Mechanical VUs can optionally be fitted to match the *980* console. Also housed in the console's meter bridge is an AFL-PFL warning indicator and power rail indicators.

The desk has been designed to accept Optifile *Tetra* VCA automation, and mounting facilities are included within the fader assembly to accommodate the associated electronics; also an AUTOMATION STATUS button is included as standard above the faders ready for retrofit of the system. There are additional plans to offer a low-cost moving fader system, and MTA will be demonstrating this at the forthcoming San Francisco AES.

Connections and construction

As mentioned a patchbay is optional, but although a useful addition it is by no means essential. A mixture of XLR and 1/4-inch jack sockets at the rear of console provide full interconnection, including inserts for the input channels, groups and main mix, and direct outputs for the channels.

Mechanical construction is identical to the *980* console, employing a system of welded steel boxes designed to give the chassis maximum strength. Modules have been made from a light-weight aluminium alloy and are fitted with gold plated connectors. The console can be supplied with optional heavy-duty stands, or it can be left to the customer to make his own arrangements.

Conclusion

The *Series 900* is probably one of the simplest professional consoles you could hope to operate. The very clear layout of controls and the nature of the split architecture, makes it a 'breeze' to use.

The console benefits from a long design pedigree, and features all the component quality and sonic performance of the MTA *Series 980*. Where facilities have been scaled down to reduce costs, it has been achieved without under-featuring, or adversely affecting the overall functionality of the desk. Also by presenting the customer with a number of upgrade options, it allows costs to be kept low, while keeping facility horizons high.

Malcolm Toft's latest console offers the preproduction or smaller studio a thoroughbred desk with plenty of good traditional design principles executed in an up-to-date manner. Considering the high standards and professionalism that have been adopted throughout, the *900* console represents very good value for money. ■

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VKP-1 VALVE PREAMP

The digital revolution is carrying in its wake a serious revival in analogue technologies. Gordon Reid evaluates a new British valve line preamp

The resurgence of interest in analogue electronics has stimulated a degree of interest in valves that may have seemed unlikely when digits were first paraded as the panacea for all studio ills. Even in these days of relative financial straits, studios continue to invest in £2,000 valve preamplifiers because they are perceived as magic boxes that add class to otherwise lacklustre recordings. And, as long as the acquisition of a £2,000 box pulls in customers more effectively than an unknown £500 box, this will continue to be the case—provided, of course, that the money is available to invest. But the signal processors that top studios can afford are out of the reach of most small and project studios. So what the financially challenged need is a small studio processor (cheap) that offers a big studio sound (expensive).

The *VKP-1* is a 2-channel valve preamp mounted in a 1U-high rackmount box whose external features are limited to unbalanced I-O on four 1/4-inch jacks, and six chunky knobs plus three switches on the front panel. No screens, no 'soft-keys', no MIDI, and definitely no computer interface. The channels offer identical signal paths, each having four valve stages. Input signals are first buffered, then fed to a Presence stage. On early models this added a maximum of approximately +6dB at 1.5kHz, but following comments from users this has been lifted to +14dB at 8kHz, adding far more definition and 'cut' to the signal. The third stage adds distortion (or harmonic enrichment) and the fourth acts as the final level control and output buffer. Finally, each channel has its own switch to bypass the valve circuitry. Surprisingly, the front-panel controls do not echo the signal path: the GAIN and PRESENCE controls have been reversed. In practice, however, this does not lead to any difficulties—the *VKP-1* is so simple to operate that knob twiddling takes precedence over any serious analysis of the process.

Another result of customer feedback is the recent addition of a Warmth function which was conceived during discussions regarding the possible desirability of a speaker simulator to reduce the harshness or 'grittiness' produced at extreme drive levels. Eventually implemented as a gentle low-pass filter shelving at 300Hz, and rolling off at less than 3dB/octave, a number of users have reported that they are very pleased with this filter 'because it imparts an additional warmth to the output and increases the range of signals that can be processed'. Consequently, Energy Technology are notifying all existing owners about the Presence and Warmth upgrades so, by the time that you read this, all *VKP-1*s may have been modified to perform at the new specifications.

Technicalities

The *VKP-1* is impressively quiet for a processor which boasts four valves—the valve circuitry is all Class A, giving rise to as little unwanted distortion as could be expected at the price. This may seem strange in what is, after all, a distortion unit, but it specifically emphasises the second and other even harmonics. Tests show that, at moderate and higher drive levels, the third harmonic is also present in small amounts, but Energy Technology clearly have firm ideas about what constitutes desirable, or undesirable, distortion. Hum has also been minimised by employing regulated power supplies for both the heaters and the HT. Amazingly, there were no PCBs in the early *VKP-1*s, all circuitry being hand-soldered onto tag-strips or directly to the components themselves. More recent units have had the power supplies mounted on PCBs, and Energy Technology state that, at some point in the future, the tag strips will be completely replaced by printed circuits. Nevertheless, current units, while looking decidedly 'cottage industry', have suitably firm connections, the mountings are robust, and the noise figures speak for themselves.

Most valve failures occur at the moment of power-up, so Energy Technology have endowed the *VKP-1* with a 'Soft Start' feature. This works as follows: firstly, the heater filaments are gently ramped up to their optimum operating temperature, and the HT is applied on a second ramp only after the heaters have reached this optimum. The times allowed (30s for the heaters and 5s for the HT) considerably reduces the thermal shocks that the valves experience, especially when compared to those of valves mounted in conventional circuitry. Since, if there are no shocks to cause failure, pre amplifier valves can continue to operate for years or even decades, Energy Technology's claim that Soft Start extends the valves' life by more than five times seems quite credible.

Another cause of permanent valve failure can be the stripping of the cathode if HT is applied when the heater has failed. Of course, this could mean that the valve is already dead, but it could also be due to a simple electrical failure in the solid-state circuitry. In this case cathode stripping will render useless an otherwise good valve. Energy Technology have planned for this by ensuring that HT is only applied once the heaters have reached their working temperatures.

The bakelite mounts so commonly employed can often allow electrical arcing, leading to extensive charring around the valve bases. The capped valves in the *VKP-1* are very firmly mounted to ceramic bases that are screwed directly to a mounting plate which is itself bolted to the chassis of the unit. No flexing or movement is possible between valve and base, removing yet another potential cause of failure. Indeed, Energy Technology

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claim that no *VKP-1* has suffered a valve failure in the 18 months since units started being shipped.

The valves are sourced in China and Russia, though not necessarily simultaneously. As Dave Kenny, founder and Chief Engineer of Energy Technology told me, 'you get what you can whilst sustaining quality'. Each *VKP-1* is given a 57-point test after completion. These tests are designed not only to detect faults, but also to ensure that the valves and the circuitry within which they are mounted do not stray outside of established functional limits. Valves that do not conform to specification are rejected, thus ensuring consistency between completed units. The review model included four double-triode valves: two E81CCs, one E83CC, and one E88CC, all made by Golden Dragon in China.

The sound

The *VKP-1*, in undriven mode, and with Warmth off, offers a fairly flat frequency response up to and beyond 25kHz, suggesting that a range of instruments and acoustic sources can be treated without adding undesired coloration. Thanks to this wide, flat response, processing (which, at low drive levels, can be described as 'clean, but valvey', adding warmth and bottom end even when not perceptibly 'distorting' the signal) is quite suitable for vocals (particularly in blues and rock music) and also benefits drums and percussion. Acoustic guitar also benefits from minimal processing. Unfortunately, Energy Technology have designed the *VKP-1* to be used exclusively at line levels; either in-line, within an 'insert' loop, or connected to an effects send. Consequently, the I-O is optimised for line-level signals, with High-Z inputs (>1MΩ), and Low-Z outputs (not particularly low at <1kΩ). The virgin output from a microphone or transducer is not ideal for driving the unit and, perversely, clean preamplification is needed to bring the output up to a suitable level for the *VKP-1* to give best results.

Raising the drive into its middle regions invites the introduction of grittiness—the *raison d'être* of the *VKP-1*. Any organ-like patch benefits from this, and used with a Dynacord *CLS222* or Korg *G4* Leslie-effect processor, the results are almost indistinguishable from those obtained from a genuine *Leslie*. Many other instruments and keyboard patches also benefit from processing at medium drives—the result being added weight and depth without degradation of the sound itself.

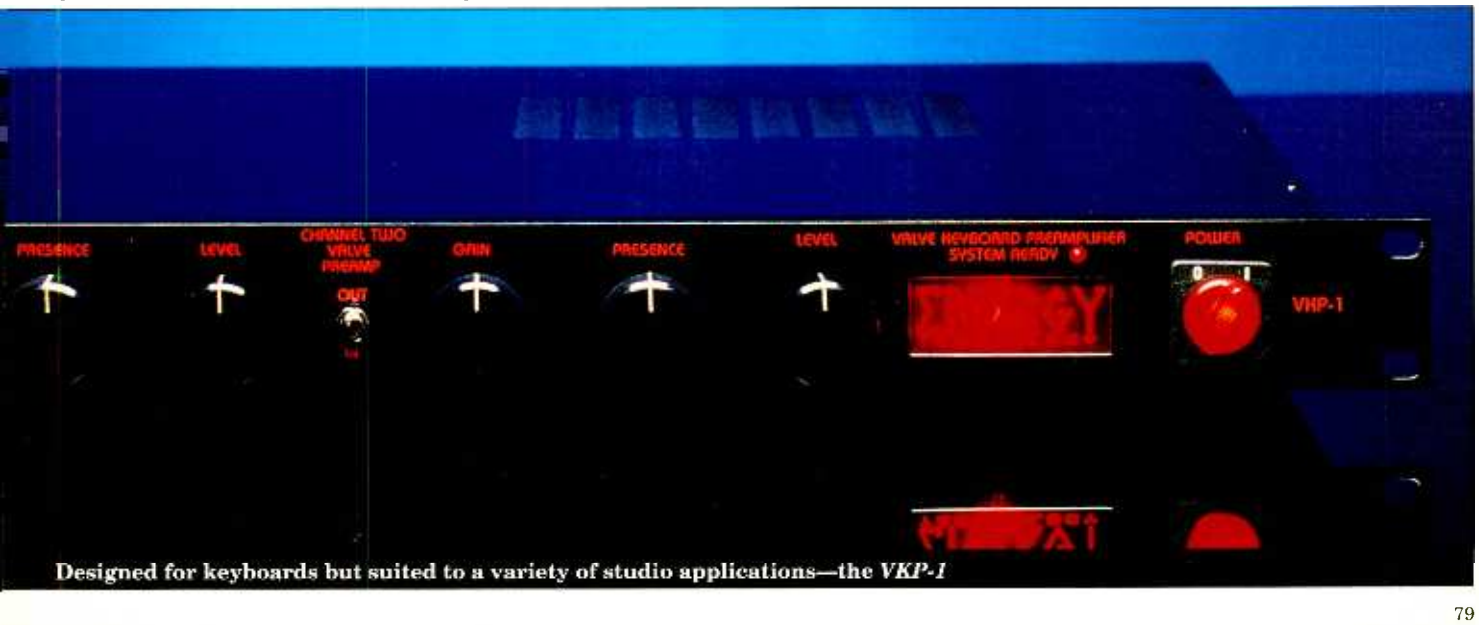
Interchannel crosstalk begins to become noticeable as you approach maximum drive levels. Fortunately, bearing in mind the applications to which the *VKP-1* is likely to be put, crosstalk is not often going to be a problem. Nevertheless, it is conceivable that in critical mixes you may need to restrict processing to mono only. On the other hand, if you are seeking a heavily distorted sound, there is a final configuration in which the *VKP-1* really excels: feed the output of Channel 1 into Channel 2, and set both to maximum drive. The result is truly horrible, distorting the signal almost beyond recognition and will, no doubt, appeal to many. Unfortunately, it doesn't work well on electric guitars because the wide bandwidth—so valuable in other situations - is quite different from the narrow, peaky characteristic of guitar amplifiers and processors. On the other hand, guitar samples (already suitably limited) come up a treat.

Used judiciously, the overall effect of the *VKP-1* is best described as one of added sparkle, warmth, and depth. Well set-up, a *VKP-1* can add perspective to the sounds it is processing and, whilst it adds nothing desirable if applied to a whole mix, it makes individual channels sound more 'produced'. Like a good reverb, or delicate use of a psycho-acoustic enhancer, it can increase the perceived quality of a rather mediocre original signal. Nevertheless, while many sounds benefit from such processing, others become less palatable and, while there appear to be no rules for success, experience will give you a feel for which instruments are going to benefit, and which are not.

Conclusion

The *VKP-1* was originally designed for, and in association with, keyboard players (its very name is an abbreviation of Valve Keyboard Preamplifier) and thus far it has been marketed almost exclusively to musicians. This may have been a mistake. The noise performance is more than acceptable for demanding studio requirements, and the unit lends itself to a wide range of applications. It is therefore well suited to the studio —whether small, newly completed, and without any existing valve equipment, or large, hugely well-endowed, yet requiring additional valve processors. At around £200 (UK) per channel for high quality, relatively noise-free, and controllable valve enhancement, the *VKP-1* even provides good value for money. ■

Energy Technology, 10 Barley Mow Passage, Chiswick, London W4 4PH, UK. Tel: +44 181 994 6477.



Designed for keyboards but suited to a variety of studio applications—the *VKP-1*

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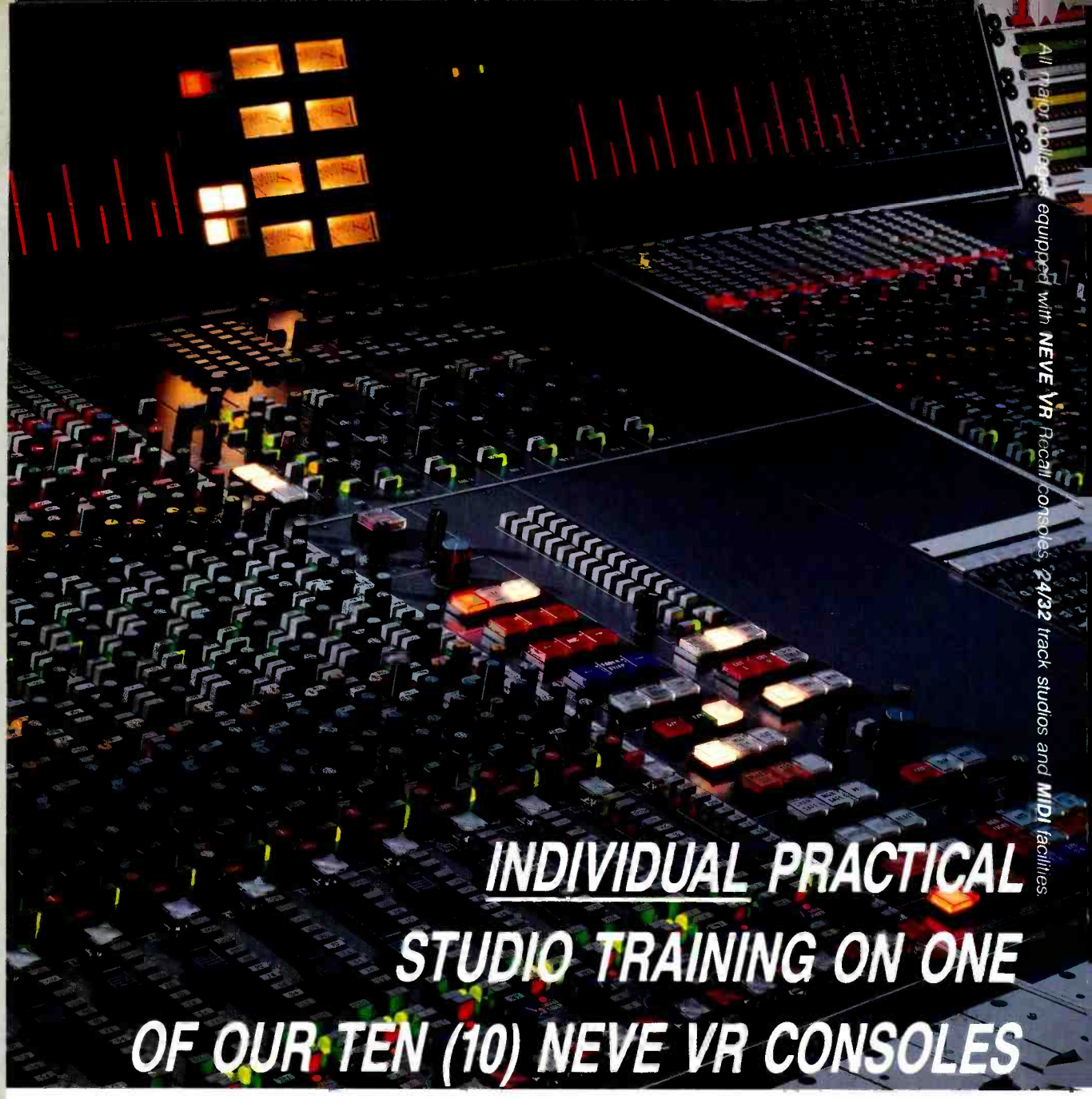

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A question: How many audio engineers does it take to change a light bulb?
Answer 1: What is a light bulb?
Answer 2: One—it's in the manual. Did you read the manual?

Answer 3: Three—one to change it and two to complain how bad the electricity company customer support is.

Answer 4: None—that's what video engineers are for.

Answer 5: One—if you turn the other dimmers down a bit, the client won't notice one has gone out.

Answer 6: None—there is no demonstrable scientific evidence that there is any difference between your old light bulb and a new one.

Answer 7: Four to make the decision whether or not to change the bulb. This requires a committee. It will take roughly two months to decide who will be 'seated'. One of these persons will have excellent communications skills, since a 'position' paper will have to be presented on *The Acoustical Phasing Changes in the Monitoring Environment Caused by Precipitous Light Source Extinguishment*. Of course, this paper will be offered for consideration.

Answer 8: Five—one to change the light bulb while telling the other four that his way is the only way to do it.

Answer 9: Three—to set up numerous double blind tests to determine whether or not anyone really will notice the bulb's state as significant to nonlistening issues (such as vision) in the listening space.

Answer 10: Six—ideally, a side-by-side comparison of light bulbs will take place before a panel of audio engineering 'experts'. One must consider spectral emissions and foot-candle data, while measuring all to confirm manufacturers' claims. The type of gas filling the glass bulb and material used for the filament must also be examined as this can influence the quality of lamp performance, and how the psychological effects colour distribution from the lamp can influence the perception of sound within the lamp's light field.

Answer 11: Two—one to operate the dimmer and one to say 'a little too bright. . .turn it down'.

Answer 12: None—if you carefully engineer the use of 150Ω, centre-tapped, transformer-balanced lines in your lamp feeds, you can go for generations without changing a lamp.

Answer 13: Two—one to screw in the lamp while the other reads the applicable standard aloud. However, we have to decide if the bulb socket is wired base-hot or thread-hot. No standard has yet been established for this industry practice despite the fact that lamps have been in use sine the origin of the audio business. Three-way lamp wiring is still under study by a separate working group.

Answer 14: First we need to need to evaluate how it will affect the artistic integrity of the piece to be recorded in the dark or in the light.

Answer 15: Three—if the bulb has poor off-axis response.

Answer 16: Light bulb—you're still using those?

Answer 17: Testing—one, two, three, four. . . Is this thing on?

Answer 18: None—they'll fix it in the mix.

Answer 19: It depends on how much you want to spend.

Answer 20: Get the lead singer to do it—she holds the bulb and world revolves around her.

Another question: How many light bulbs does it take to change an audio engineer?

Answer: Just one—the little red one over the track module where you think that you have just recorded the perfect vocal.

Martin Polon

Analogue versus digital. Why the war must stop!

The point is to illustrate the diversity of style and intent when it comes to audio engineering. After attending yet another public meeting on the subject of analogue versus digital sometime in the last six months and having suffered a miasma of emotionally charged telephone calls from those who felt duty bound to expound on the subject, I must venture that the ruck between the maniacs (digital) and the Luddites (analogue) has reached a turning point. We have met the enemy, and they are us.

Each side is convinced of the superiority of its approach; the digital-audio camp argue that analogue recording is disappearing while the analogue camp claim unequivocally that they represent the last hope for 'pure' audio —uncompromised and able to survive into the next century. Yet the reality is that both sides have maintained a balance. At least, to date.

It is true that about half of all music on recent release has been recorded using an analogue signal path throughout. What is also true —according to several well-respected audio industry sources—is that the 'hot' formats for tape transports sold new are 48-track digital and 16-track analogue. Half-inch tape is also a favourite of many analogue studios. The demand for new and old analogue equipment for 'exclusively' analogue studios has never been stronger. Witness the demand for 'mint condition' and rebuilt, vintage, multitrack machines for use in analogue 'boutique' studios. Some owners are even recreating 1950s studios complete down to the Electrovoice, RCA and Shure microphones, and Ampex *350* and *300* tape machines—to better serve rock 'n' roll clients who want to get back to their roots.

More interesting still is the emergence of the hybrid valve digital studio. Specific compressors and-or limiters and equalisers (such as the old valve Pultecs and their Finnish copies) have never commanded higher prices. Some mint condition examples of these units have even been sold at auction. Monitors in such studios are even driven by high-end consumer valve amps which cost considerably more than their solid-state studio counterparts. Then there is the emergence (or is it return?) of a premium valve industry to service the demands of high-end audio enthusiasts, analogue valve recording studios and valve musical instrument electronics.

Project facilities often favour cheaper consumer DAT equipment

However, each side has must also concede to some level of practicality—analogue tape machine transports require daily alignment; valve units require periodic maintenance including valve checking, electrolytic capacitor checks, volume control cleaning and so on.

Digital-audio recording is worrisome to many due to the potentially irrevocable loss of crucial cues, soundfield information, nonlinear distortion and concerns over the faithfulness of workstation editors. More, and what many in pro audio may not recognise, is the common use of DAT in analogue recording houses as the digital-transfer medium. What is beginning to concern studio and premastering personnel alike is the quality and reliability of the A–D and D–A convertors in the DAT machines used for such purposes.

The DAT phenomenon is even more of a concern in the project suites. Where most mainstream studios respect the *Red Book* standard—through the use of *U-matic* mastering or professionally spec'd DAT machines—project facilities often favour cheaper consumer DAT equipment.

The digital mixing consoles and 'budget' digital multitrack tape formats offer good performance for their cost, yet many lower-end studios discard much of this quality through cheap convertors in cheap DAT machines. Worse even for mainstream studios, consumer DAT machines have become a *de facto* standard for making working copies of recording projects—which subsequently have been used for making CD masters.

Further, the unease over digital-workstation editing (common to recordings made by both analogue and digital camps) extends throughout audio recording, postproduction, editing, transmission, distribution... Anywhere, in fact, where the audio waveform is reduced in complexity to allow more efficient storage. or transmission in the digital domain.

The bottom line here is that the silliness with which I opened this column describes the extremes of opinion at large in pro-audio rather well. Nothing indicates more strongly the overall health of the recording universe than the various niches which have been defined between the analogue and digital extremes. And one can argue that the controversy over analogue and digital has been consistent since the late-1970s. But now we are entering a time when standards have to be established for any area in which the signal integrity is challenged. Too many forces are at work to allow nonestablishment of such standards—just like the light bulb problem.

If we are to maintain the quality of professionally-recorded audio, there need to be fewer compromises—whether they are made in the interests of commercial expediency, technical convenience or studio eccentricity. ■

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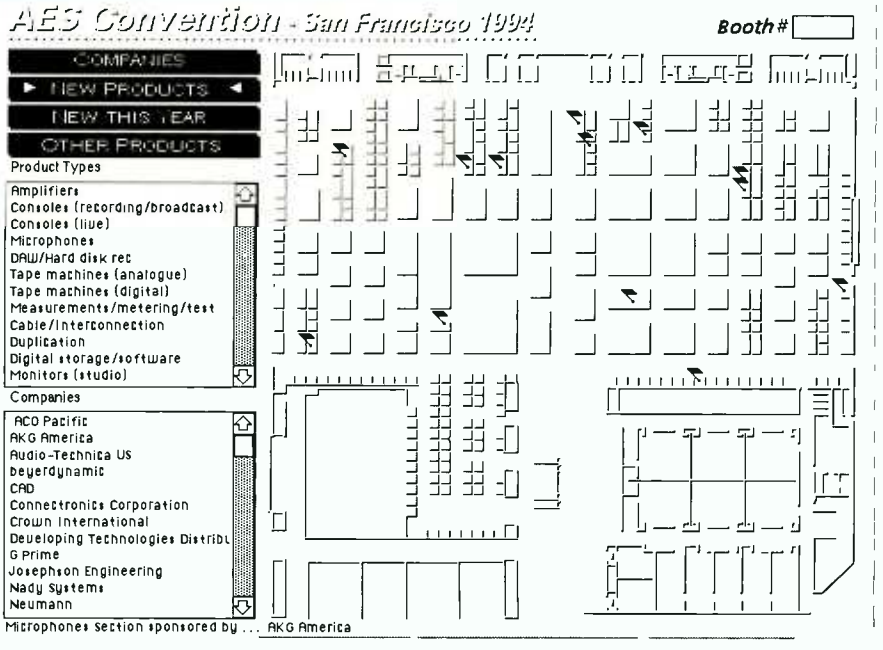
Product Directory Interactive: how to make the disk work for you

After 35 years of leading the way for pro audio magazine titles Studio Sound takes the industry into the 21st century.



Published free with this month's issue of Studio Sound is Product Directory Interactive (PDI), a full colour floppy disk that gives you both a comprehensive exhibitor guide to November's AES convention in San Francisco and a totally unique data base of the world's top professional audio companies that includes their recent clients, products and international contacts.

As you will see when you open up the program, PDI gives you details on all new product introductions at the show, plus full listings of all relevant product introductions of the past 12 months, other significant product lines along with corporate contacts.

Many exhibitors have chosen to give you the opportunity to find out more about their companies in the additional information section of the disk, so always open up the Additional Information section to gain further details on individual companies.

HOW TO START UP YOUR PDI PROGRAM

These instructions are for running PDI on a Windows PC. We have made it simple and most of the work will be done for the user automatically. A Help screen is available.

1. Go into the File Manager and select Run from the File pull down menu.

2. Type:

a:\install c:

This will install the file to your c: drive in a new directory called 'SSAES'. (You may install to another drive if that is more convenient, by submitting 'c:' with another drive identifier.)

3. Now open the new directory SSAES, and double click the .exe file 'SSAES. EXE", to run the Studio Sound interactive guide to the AES and beyond.

AT LEAST ONE PERSON IN EACH COMPANY WILL RECEIVE A PDI DISK-SO PLEASE COPY IT AND PASS IT ON.....

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PC AND MAC VERSIONS OF THE DISK.....

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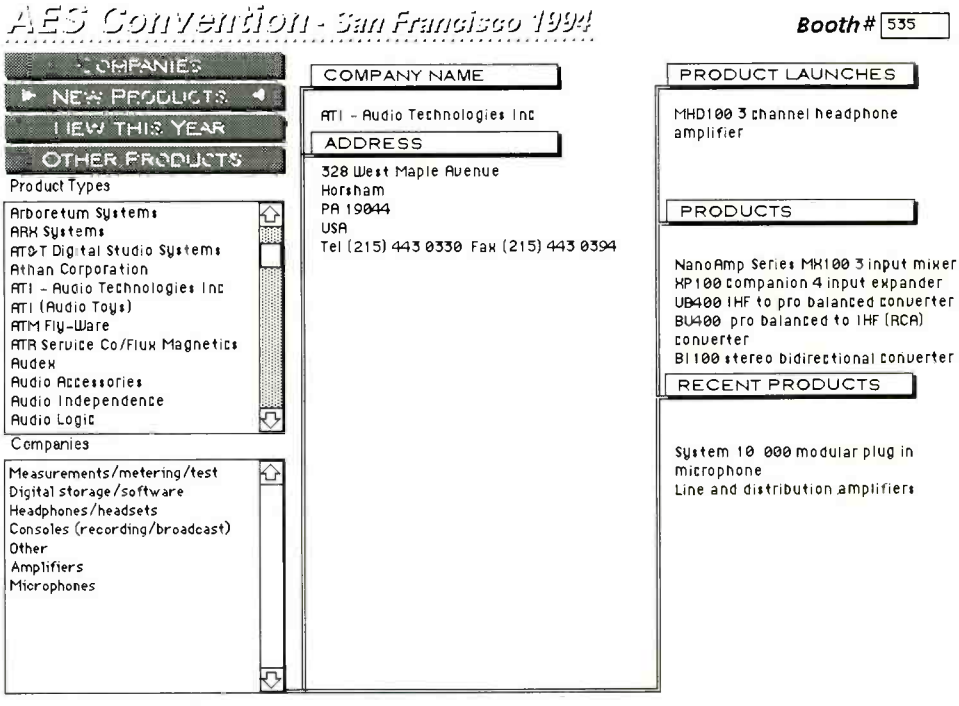

PDI uses PKZIP data compression

Today, the vast amount of information available can be a boon to business by increasing people's knowledge and providing the means for gaining a competitive edge, but it also brings problems. One of these is data storage, not just the logistics of disks, but the costs. Data compression can go a long way towards increasing the amount of disk space and reducing costs. There is one product now available on a wide range of systems, which has become effectively the industry standard. That product is PKZIP.

PKZIP and its companion program PKUNZIP provide two distinct functions that allow companies to have more control over large volumes of computer generated data. Firstly the program creates files called "archives" that consist of one or more other files. Typically companies might keep a series of graphic images in one archive – much as computer users keep related files in a subdirectory. Secondly, when creating archives, PKZIP is able to compress the files, as they are added to an archive.

This second function is perhaps the better known portion of PKZIP's functionality. However, by storing the compressed data in archives, the program is able to password protect archives, store the path ('s) of the archived data files, file attributes and perform a 32bit CRC check. This last point ensures that when files are extracted they are exactly the same as when they were stored – a vital function for spreadsheet and financial data.

By convention, archives have the file extension 'ZIP'. This archive format is probably the most widely used archive/compression format in the world. Most files on online services such as CompuServe are compressed using PKZIP and it is the de-facto standard.

Originally developed for MS-DOS, PKZIP is now available for the majority of UNIX operating systems, DECs VMS, Apple MacIntosh, IBMs AS/400 and mainframes operating MVS. Cross platform compatibility not only increases disk space but reduces networking costs. Priced at £29 for the DOS version and from £119 for the UNIX versions, (prices exclusive of delivery and VAT) PKZIP can be considered a serious contender for a solution to storage problems and transferring data between unlike systems. PKZIP is available from Atlantic Coast plc. Tel + 44 (0)297 552222 or fax: +44 (0)297 553366 for enquiries.

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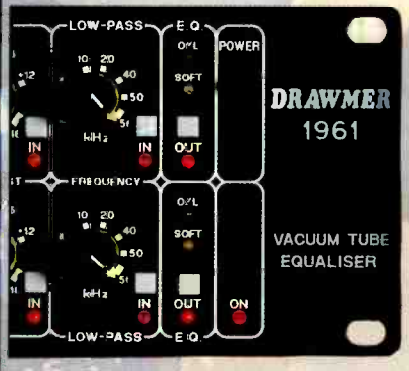

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Kevin Hilton

Trendsetting at the IBC

Maybe it is because it had such a big build-up, with the use of such phrases as 'the gloves have come off now', that the 1994 International Broadcasting Convention (IBC) was something of an anticlimax. It was certainly a huge show, with massive halls packed full of stands of increasing size and complexity, but in real terms it only showed a consolidation in broadcasting technology. There was very little that was brand spanking new, although much that has been discussed in recent years was there in finished or near-finished form.

What was significant was the amount of end-user equipment, which verged on the domestic. The buzz-phrases were Pay-Per-View-TV, near-instant-video-on-demand, PALplus and wide-screen (which we already knew about, but it was reassuring to see it confirmed on such a grand scale); the emergent technologies of past shows—including digital in its many forms—have become supporting players, which is perhaps the way it should be. If there was a trend at IBC '94, it was that we are finally getting away from technology for its own sake—now it is starting to support and inspire applications.

IBC had already become the forum to reflect such changes and advances; its move to Amsterdam has given it a more mature look, with the RAI Centre proving to a convenient and well-equipped exhibition venue. While we may enjoy the memories of Brighton, who really relished the thought of walking between the different sites in driving rain? Now that the show is established in Amsterdam, it is ready for its move to annual status, which is when the real fun starts: 1995 will have to sustain both the IBC and the International Television Symposium (ITS) in Montreux, with each organisation claiming that its own show is the natural choice for broadcasters.

Despite broadening the range of exhibitors, with a high attendance from computer companies, the IBC has been accused of upsetting the balance that existed between the two events; there was the unwritten arrangement that they would take turns, working on a biennial basis to be the focus for the broadcasting equipment market, albeit with the emphasis on television. The IBC bullishly took the lead; now the ITS has picked up the challenge, restructuring its management team and hiring a high-profile corporate public relations company to spread its message in the UK.

Philipe Guillemin, formerly with both the Swiss Broadcasting Corporation and Sony, has become a director of the ITS, with a brief to direct the Montreux show and 'other media-based festivals'. Exhibition Director Xavier Kempf has been joined by Reinier Westpalm van Hoorn, who will assist in 'reinforcing [the] service to exhibitors, particularly in the coordination area'. Nick Boakes of Ludgate Communications told me that 'there was no indication that ITS '95 would any different to previous years, but they have taken previous criticisms on board'. He confirmed that next year's event already has 165 registered exhibitors.

This year's IBC attracted just under 25,000 visitors from 96 countries, although Publicity Director Tony Lawes admitted that the show's biggest problem was registration. He confirmed that at the close of business on Tuesday, 20th September, 225 exhibitors had signed up for 1995, although the 'Big Five', including Sony and Panasonic, have underlined their earlier stance of nonattendance, pledging support for the ITS. However, some companies, notably Rank Cintel, have changed their position and will be at IBC '95.

While this is unlikely to change the minds of the Big Five, it is equally unlikely that IBC will be totally bereft of their influence, even if it is just huge numbers of monitors and VTRs on other people's stands. Everyone knows that 1995 is going to be a street-fight; the two organisations had been calling each other out even before the IBC made its announcement and insiders within each admit that next year will be 'bloody'.

This, however, is just a distraction: the broadcasting industry should be looking towards 1997, the second clash between the two exhibitions and a time when things should have settled down. By then the IBC and ITS could have repositioned themselves—it might be the only way for the two to survive in the conflicting years.

Aside from the political aspects, IBC highlighted four distinct areas: the increasing use and acceptance of digital audio; fully integrated sound and vision postproduction equipment; the influence of telecommunications and computing technologies; and the development of high-tech delivery systems, including digital compression, Pay-Per-View, near-instant-video-on-demand, PALplus and wide-screen. Despite only making a flying trip to Amsterdam, I still came back with a bag so full of bumph that I still list to port even now and will be able to stock up at least the next *On Air* column with goodies from IBC.

The IBC management had already put its hands up to the low profile that audio has had at previous shows, and this year tried to rectify the situation by creating a dedicated area. While this ghetto-isation could work against both IBC and the sound companies that go into it, the reaction to the initiative was positive, although a few exhibitors decided to take their chances out in the more vision-orientated halls.

Digital is no longer a novelty and is fast becoming the mainstay for postproduction. DAR celebrated their tenth birthday during IBC '94 with a slight departure, the *SoundStation Gold*. This is the company's first complete, integrated audio production centre, featuring a built-in optical-disc system allowing 8-channel playback, editing, direct recording and on-line libraries, four analogue inputs, eight or 16 analogue outputs and eight AES-EBU digital ins and outs, all of which can be sync-locked to standard studio reference signals.

Digital is no longer a novelty and is fast becoming the mainstay for postproduction

Best known for MI products, Akai introduced the *DD1500*, their first unit specifically designed for postproduction, which uses advanced M-O drives to give 8-track operation on a single removable disc. Also new from Akai is the *DR8* hard-disk recorder, featuring an Alesis digital I-O board and third-party software.

Calrec introduced their *T-series* digitally-controlled audio console, which now houses the audio-circuit cards within its frame. Featuring 16 auxiliaries, 48-track optional recording outputs and multitrack in-line replay, the *T-series* also comes with motorised faders, four main stereo outputs and eight stereo groups, plus VCA faders. Memories are contained on a Flash ROM, or can be stored on a MS-DOS compatible $3^1/_2$-inch disk.

On the totally digital side, the Graham-Patten *D-ESAM* range of digital, edit-suite audio mixers advances the virtual approach by keeping the majority of sound feeds out of the desk, instead storing and processing them in an outboard, rackmounting unit. The new *820* features 24 digital inputs, a revised master processor board, and an audio output module.

AMS Neve's *Logic 3*, now features expanded surround-sound facilities, with full panning by means of an optional dual joy-stick controls. Also new was v1.60 *Logic* software, giving a whole range of new features and upgrades for the *Logic 3*. These include Turbo Allocation, which gives instant access to the console's mixing facilities, and enhancements to the Event-Based Automation, dynamic-key inputs and side-chain equalisation monitoring.

Switching and storage is increasingly the most important area for digital, and servers and routers were in abundance. Even within this sector, however, manufacturers are showing scope for branching out. Pro-Bel have made a move towards processing and mixing work, producing a multichannel interface based around the MADI standard, which has already been picked up by postproduction houses and studios in the US, Germany and the UK. Another departure is a small audio-mixer panel, which uses established DSP components and is designed for video environments where basic level adjustment in needed during assembly.

If sound-for-picture engineers feel under-served by IBC, then radio is positively disenfranchised. The most startling launch in this field came from ABC-Digital, the off-shoot of the Australian Broadcasting Corporation, who made their move into product design and manufacture with the *D-CART*. Their latest, *D-RADIO*, builds upon this technology to produce a virtual digital on-air desk, controlled by a PC. 'With Digital Audio Broadcasting becoming a reality within the next few years, we wanted to produce an on-air system that would take broadcasters into the next millennium,' said R&D Manager Spencer Lieng.

All of which builds nicely for DAB to make its full appearance in *On Air* next month. This could run and run... ■

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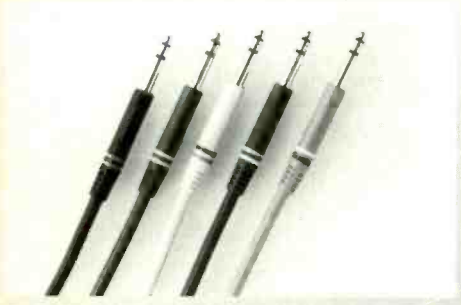

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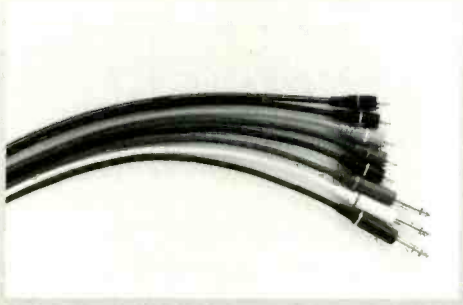

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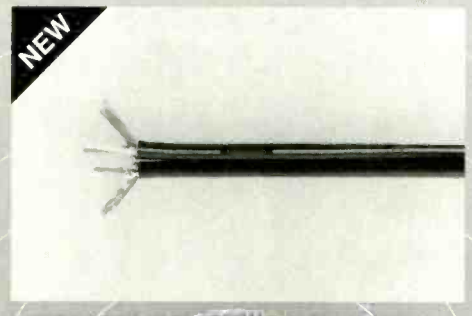

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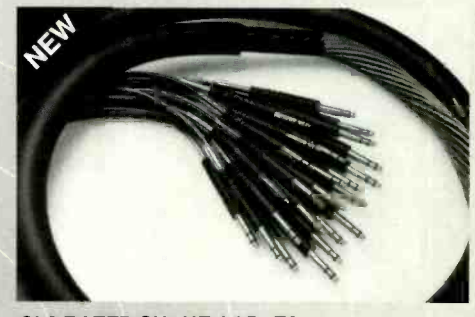

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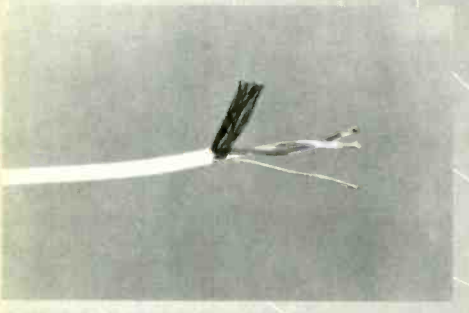

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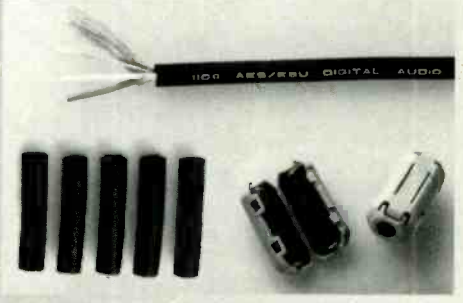

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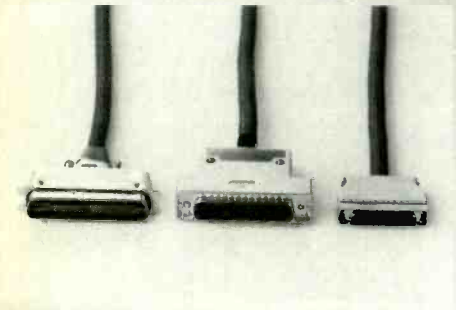

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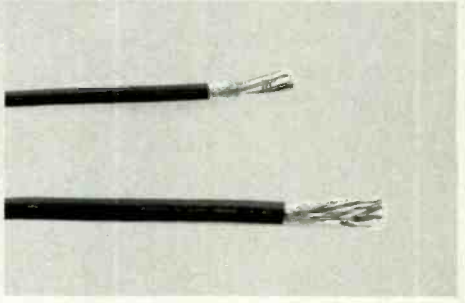

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GREEN NEW WORLD?

EMC: green new world or European economic catastrophe? When the forthcoming EMC regulations take effect, their impact on equipment manufacture and sales will be dramatic. Status viewpoints researched by Ben Duncan

How many readers are aware that on 1st January 1996, across the European Community—the world's biggest 'united states'—it will be illegal to sell or import just about every existing electronic product unless it has passed complex checks on its ability to be friendly in the electromagnetic environment? These checks refer to EMC or ElectroMagnetic Compatibility. As this was first mooted in 1988, you might imagine that most makers selling in or into Western Europe have suitable revamped products designed to appear soon. In fact, virtually every maker has dragged their heels.

Most designers in audio electronics accept that the legislation is mostly well meaning. It is meant to facilitate the free movement of technical goods across the EEC's former interstate customs posts. Any equipment manufacturer who has not been paid because their £100,000 shipment is held in limbo at some Ruritanian (Central European shall we say) customs post because of some technicality about the use of IEC cables or the size of the legend on a PCB, will welcome anything that harmonises standards. But as we shall see, the rate of introduction is regarded by many as too fast (despite a two-year remission), and in places the requirements too tough, and many practical, legal and commercial, as well as technical ramifications have clearly not been thought through. In an article of this kind, a number of new acronyms will need digesting. Most are decoded in the sidebar.

The timetable and the standard's writers' penultimate draft regulations for 'PAVI' (which includes pro-audio equipment) are supposed to be published by January 1995. In theory, this will give just under 12 months for makers worldwide to perform redesigning and testing of every product they are presently selling, or are about to launch, in Europe.

John Bowsher, who is the APRS representative on EMC for BSI, and also convener of the CENELEC working group (see **Fig.1**) feels sure that the EEC's catch-all EMC legislation is justified. This is on the basis of the explosion in communications equipment using RF, notably mobile phones, and the general deluge of electronic apparatus. He cites off-hand the Andrew Lloyd-Webber production which was delayed for several months due to an RFI problem in the theatre and the broadcast studio in Germany brought down by RFI during a live show. Readers will have heard of industrial robots going berserk due to RF interference, and 'murdering' production-line workers. And many electronic engineers still feel uneasy about ABS brakes—being electronically controlled, one can never feel 100% certain they will not fail in a high RF field. Bowsher explains his authority as CENELEC convener: 'Members of working groups do not represent organisations or member states; they are experts charged to produce standards which will satisfy the requirements of manufacturers and users as well as meet the legal obligations in the EEC directive. Although experts, we rely on receiving practical experience and data—and after two-and-a-half years of asking for it, this is where the [audio] industry has been so lacking.' Meanwhile, 'the standards are arriving late because people—like myself—involved in the committees, have full diaries. Then the committees have to canvass opinion.'

In the last round, response on the earlier draft of the regulations from the few makers who commented was positive, but the committee members tore the draft apart. If this happens with the January 1995 draft, then the standards may not exist before EMC regulations become law.

'If this happens,' Bowsher continues, 'the generic, default, standards will have to apply—even if testing to some of these (involving applying excessive voltages to sensitive inputs) could destroy the equipment being tested.'

Additionally, the generic standards, largely originating from telecoms, are not optimal for much audio equipment—as outlined later. At this juncture, other authorities disagree.

Chris Marshman from the York EMC Centre emphasises pragmatism: 'The regulations at heart say that equipment need only be fit for the function in which it's intended. So makers can adjust the generic standard to fit their situation provided they can justify their actions. Not all test houses are so pragmatic. If this occurs, manufacturers should find one which is.'

There is some misapprehension among manufacturers—especially those outside the UK—that if they already meet the toughest existing European-World RF Emission specifications, such as VDE 0871, then they have little to do. Quad's Alan Mornington-West (representing AES on the BSI Panel which initiated the draft standards, prior to their adoption into the CENELEC process) stresses that this is not quite the case. The proposed EMC standard for radiation may be based on this VDE spec, with some changes to ranges and limits. But the EMC remit is far broader, principally as it involves equipment's immunity to RF, including mains disturbances and fast transients—not just preventing excessive radiation.

John Bowsher adds something that many of *Studio Sound*'s UK and EEC-based readers, let alone those in ▶

ACRONYMS

BSI (or BS): British Standards Institute.
CENELEC: A European organisation. Sets up electronic ('Electro-technical') standards for the EC and EFTA countries. As far as possible it does not generate new standards, but locates and edits suitable existing ones, then reissues them.
DIN: German standards institute, like BSI.
DTI: Dept. Of Trade AND Industry, a UK Government department responsible for regulating EMC conformance and equally, assisting UK companies in EMC and other regulatory areas.
EEC: European Economic Community in size of population is roughly twice as big as the US, and today comprises Germany, France, United Kingdom of Great Britain & Northern Ireland, Italy, Spain, Netherlands (Holland), Portugal, Belgium, Denmark, Greece and Eire (Ireland). Within five years, Norway, Hungary, Czech Republic, Poland, Slovakia, Bulgaria and the new Baltic states and even the CIS (Russia) and Ukraine are set to become part or full members, potentially leaving just Switzerland, Sweden and Finland as independent, sovereign states in central Europe.
EFTA: European Free Trade Association. Essentially, comprises all the countries that aren't in the EC, nor former members of the 'East Block'—Norway, Sweden, Finland, Switzerland.
EMC: Electromagnetic Compatibility, which broadly means equipment using electronics or that's electrically powered should be able to operate without being interfered with, or interfering with, other, usually neighbouring equipment. 'Interference' is solely anything conveyed anywhere in the entire low-end of the electromagnetic spectrum from 1Hz (below AC power frequencies) to above 1000GHz (where microwave radio merges into heat waves) and may be conducted (like audio signals) or radiated (like radio waves). See **Fig.1**.▶

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ACRONYMS

EMI: Electromagnetic Interference, alias 'RFI' or 'RF' or 'induced noise'. In sensitive and-or badly designed nonaudio equipment, EMI can cause malfunction, such as computer-assisted craft can crash or loose control. EMC aims to prevent this ever happening.
EU: European Union. The 2-year-old 'new' name for the EEC.
LV Directive: New rules for 'Low Voltage' equipment, and users' safety.
IEC: International Electrotechnical Commission. A global electrical and electronic standards body.
PAVI: Professional Audio, Video and Lighting Industries. An almost ad-hoc, grouping for the purpose of creating audio-video-friendly standards that would be apposite. 'Professional' means any equipment that is meant for professional trades and which is not intended for sale to the general public. The group includes all audio gear from intercoms upwards, and studio equipment including lighting dimmers, and 'studio related' gear like ENG cameras, but excludes CCTV or telephones.
PFC: Power Factor Correction. A way of smoothing out cyclic irregularities and adverse phase angles in equipment's current draw, so the capacity of the electrical distribution system is fully utilised. *En masse*, this can reduce the amount of cabling and pylons needed to distribute power, which in turn avoids further environmental damage and rises in electricity supply tariffs.
TCF: Technical Construction File. Formal notes by the designer to demonstrate (by calculations, measurements, and so on) that the equipment meets the standards by design. The TCF must still be submitted to a 'competent body', usually a test house, for verification.
V/m: Radio Frequency field strength, in volts, millivolts or microvolts per metre. Typically, a national MW or LW transmitter has a field strength of a few microvolts/metre. Fields above 1V/m are so high that they are only encountered very near a powerful antennae. Such fields may even be hazardous to health, so pro-audio equipment is unlikely to sited in them! ■

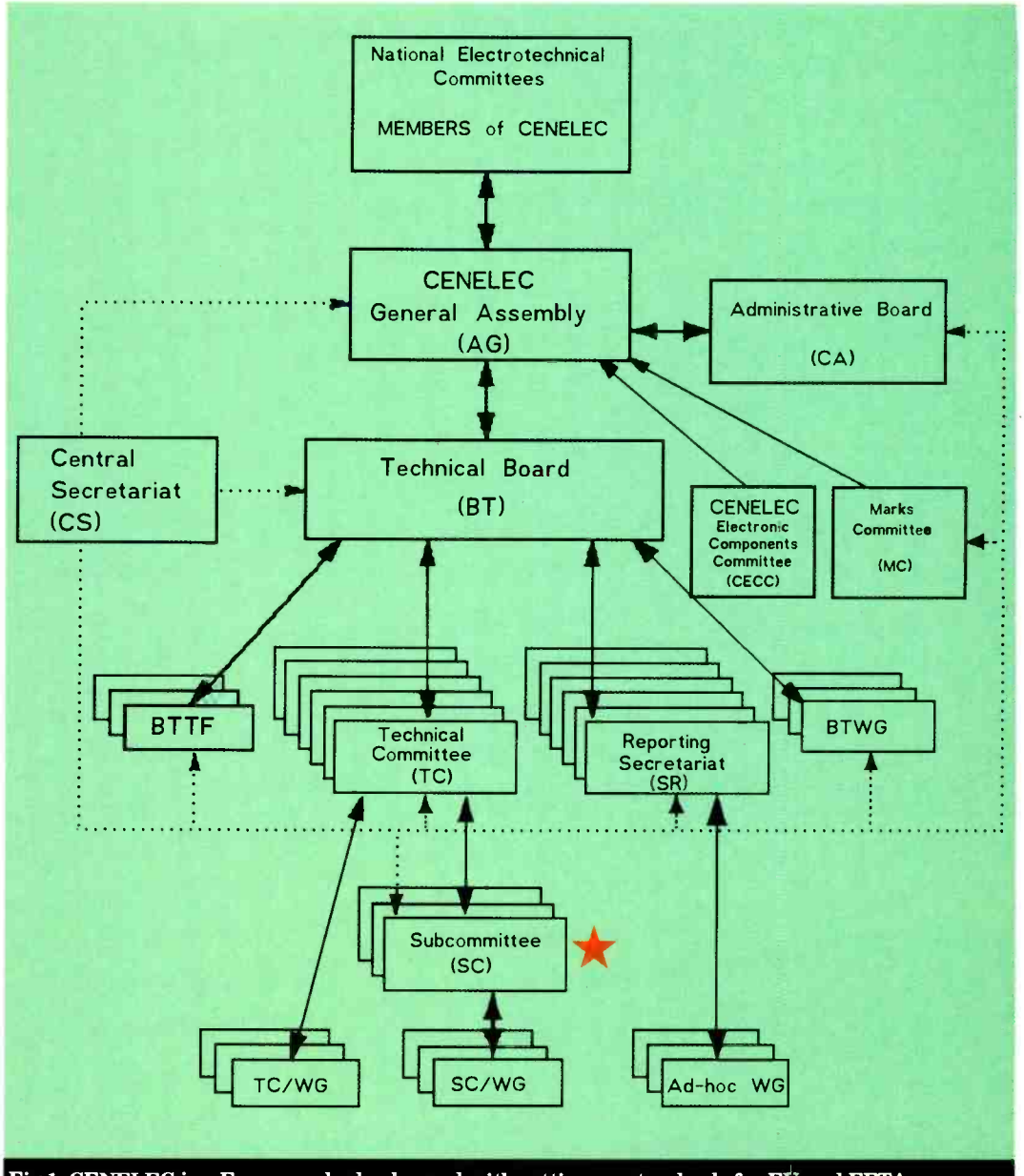

Fig.1: CENELEC is a European body charged with setting up standards for EU and EFTA countries, that is. Western Europe. Technical committee TC110 deals with EMC. Dr Bowsher is convener to subcommittee SC.110a.(WG=Working Group. ★ SC110a for pro-audio interests is here)

North America, Asia, the Orient and the Antipodes, may not realise: 'We work in close co-operation with IEC and the intention is that the draft standards (on EMC) will be applicable worldwide as quickly as possible.

'While the working group always has the best interests of the makers and users at heart, the problem with the CENELEC national committees is mainly that they are not used to dealing with professional apparatus which is often made in small quantities. They do not understand the responsibility and freedom that's granted to manufacturers in the proposed standards.'

The designers

The following viewpoints are from some seasoned audio design and production engineers working for long established manufacturers.

Chris Hales, Production Engineer at C-Audio. Previously design and development engineer at Neve, before then Harrison, he has debated these matters on SCIF's panel, and had a lot to say, beginning with a clear outline of the technical requirements: 'The European directive broadly states, in plain language, that: "No equipment shall emit excessive interference, and no equipment shall be unduly susceptible to interference". Makers are given a number of ways to demonstrate compliance. First, testing to a standard: either in-house, or using an external test house. Second, composing a technical Construction File. Third, there's a common-sense option. This is Historical Proof: an item of equipment has been manufactured and sold for some time, and no problems have been experienced. Logically, this may be held to be proof of compliance. Certainly EMC consultants and test houses are unlikely to draw makers' attention to this approach, as it takes away most of their opportunity to do business. ▶

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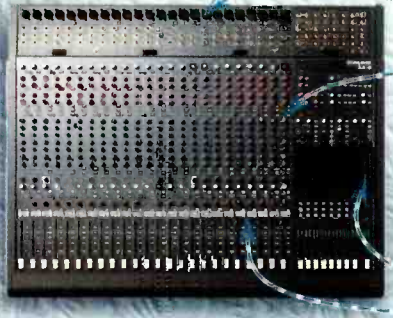

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EMC REGULATIONS

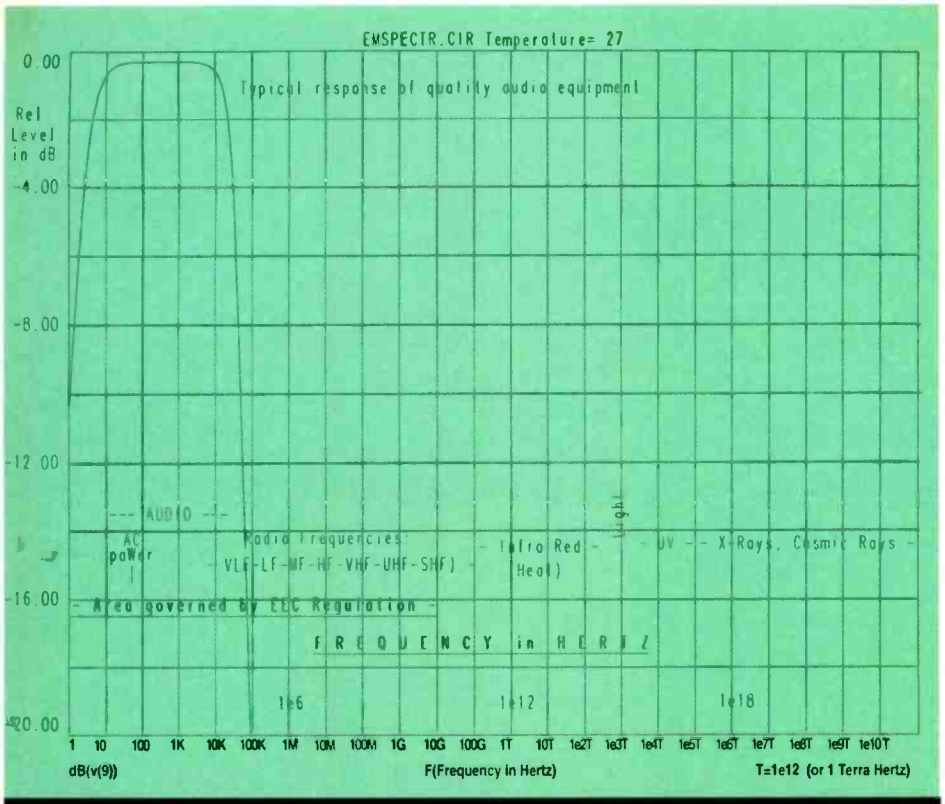

Fig.2: The Electromagnetic spectrum, showing audio's part in perspective. The EEC EMC regulations are so wide in scope (from 10 Hertz to several GHz, plus infrared signalling frequencies around 300 TeraHertz), that the only E-M emissions to wholly escape EEC legislation are cosmic rays

Chris Marshman adds: 'Some test houses would accept this as partial proof of compliance. If some measurements were also made and put into a TCF, along with a historical record demonstrating a nil or very low number of RFI complaints, then a magistrate would likely accept that the spirit of the regulations had been met.'

'The UK's DTI have made it clear that where an EMI problem exists, they will contact the maker and it's up to them to solve the problem. In extreme cases, where matters are not resolved, legal action may be taken. Moreover, this is irrespective of whether the unit has been successfully EMC tested. On this basis, it is better for makers to save spending the £5,000–£100,000 per product that EMC testing costs. When or if a problem eventually crops up, the maker can have money saved ready to provide a serious budget for some good EMC troubleshooting.'

Chris Marshman's organisation has already tested equipment to those EMC standards that exist, and he suggests an average of three days for most products at typically £650 per day, while a typical TCF costs £5,000–£9,000 all told. A 48 or 96-channel console would certainly cost over £100,000 to test, and this must be seen alongside the very small numbers made.

'The DTI have also stated that they expect manufacturers to test competitors equipment and expose anything that does not seem to meet the regulations or if "problems" occur. At the same time, the present, provisional standards allow makers to define their own pass-fail bench-mark, so without detailed knowledge of anothers' criteria [which in theory the maker has to state in the EMC spec, which must be supplied to the user and the test house], it will always be possible to devise a test that the competitors' product will fail. This threatens to open a can of worms. The DTI even indicated that it would purchase and test CE marked equipment—a gargantuan task seeming unlikely to get far.

'West Yorkshire trading standards officers confess they have no money for this. Still, if any EMC-defective product is reported to them, they say they'd rather encourage and educate the wayward maker.

'The standards are in a mess. Distinction is made between professional and domestic' environments, but it's unclear to me how one decides which is most appropriate. Second, the standards are still in a state of flux. It's not clear which of the many standards one should test to. One could logically test to today's standard, pass and duly CE mark, but not meet the additional requirements of tomorrow's standards. The legal position is unclear, but if retesting to the new standard is required, this is only going to encourage manufacturers to hang on until the standards have stabilised. This is likely to be doubly bad news, as it seems unlikely that the standards will have stabilised before the 1st January 1996—and of course, EMC test houses will be inundated with work just prior to that date.'

Marshman confesses there is something in ▶

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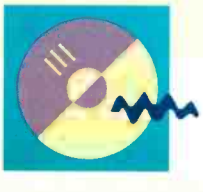

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this, 'But CENELEC are introducing a 5-year period after which retesting to the latest standard is required. This won't affect the majority of consumer and hi-tech equipment which isn't made (without changes which would themselves trigger retesting) for longer than five years.'

Hales continues: 'The standards themselves have been cobbled together out of existing, often inappropriate ones. As a result, none of the standards are fully appropriate to anyone. The proposed EMC generic and even PAVI standards fail audio equipment in a more important respect. When testing susceptibility, the level of interference is set and the result (degradation in noise performance, or whatever) is measured. An unmodified mixing console might develop a +20dBu demodulated output when subjected to a 3V/m (very close, powerful) AM radio-transmitter field. But even with heavy modification, the recovered level might typically drop 40dB, to just -20dBu. So for all the filtering, the gear is no more usable in this kind of outrageously high RF field. This will force makers to set pass-fail limits ridiculously high. Ultimately this helps no-one. Besides, what the user really needs to know is whether the equipment will work in their environment, which in nearly every case is likely to have an RF field strength of below 3V/m. It is far more to the point for a maker to simply work to minimise RF incursion without undue compromise elsewhere, then state: 'This equipment will function to specification in fields up to 0.5mV/m.

'This will allow purchasers whose installation is close to a transmitting aerial, for example, to measure their local RF field, then chose appropriately-rated equipment. This approach also allows manufacturers to choose which market they wish to operate in and forfeit EMC performance for lower price, if they so chose, misleading no-one. This ultimately benefits both sides.'

Marshman adds: 'The standards do allow the maker to choose limits and which tests you want to omit, provided you have justification.'

Hales continues: 'Should a maker want to achieve "compliance" with the presently proposed interference levels, the following measures are likely to be needed:
(i) All existing XLRs will become useless, as their RF shielding is so poor. Plastic types have no shielding at all, while Neutrik's' popular blackened metal type have nonconductive shells. (ii) The present convention of Pin 1 being shield will have to be abandoned. Cable shields will have to be terminated onto the shell, and over 360°—as in BNC connectors used in video. If an 0V connection is needed (in unbalanced systems), a third conductor in the shielded cable will need to be used. Such tri-ax cabling is presently scarce and expensive.
(iii) All inputs and outputs (even 0Vs) will have to be decoupled to chassis at their point of entry, and input and output filters are likely to be required on even moderately sensitive equipment. This will degrade bandwidth and hence audio quality (a number of so-called experts still assert that a brick wall at 20kHz will not alter audio quality). ▶

APRS ACTIVITY

Representing not just studios, but also manufacturers and dealers, the APRS have been looking into EMC problems for members since 1989. APRS have since retained the services of John Bowsher—an electroacoustics consultant with experience of committee work—and funded his appointment as convener of the CENELEC SC-110a subcommittee. This work goes on, despite the fact that the reaction from APRS members over the development of the standards to be ultimately applied to pro-audio, is virtually nil. Focusrite's Richard Salter counters that 'Most audio manufacturers are very small. They just cannot afford for 5% or 10% of their workforce to be nearly permanently engaged for several years on EMC committees, performing research and so on.' ■

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TABLE 1

	Telecom	Broadcast	Music Recording
Bandwidth	300Hz–3.4k	40Hz–15k	10Hz–40kHz
THD	< 5%	<0.2%	<0.05%
Signal-Noise	-30	-60	-80 dB
Crosstalk	-30dB	-80dB	-80dB
Quality	Intelligible	High	Beyond reproach

This may be particularly problematic in mixers where the same signal is routed through the console several times (record, bounce, mixdown) and degrade CMRR in the audio band—they're more likely to cause real problems than eliminate potential ones.

(iv) Active power-factor correction for high power units, mainly console power supplies and larger power amplifiers. With presently proposed limits, active PFC would be required along with a switching power supply. This is ridiculous, as it just moves the EMC problem up to a different area of the spectrum.

'All of these things cost, cost, cost—denying consumers choice and inflating prices—to no noticeable advantage. Cost of testing is not small, either, adding at least £5,000 to the design of modest, simple equipment. It will cripple many smaller companies. In turn, it seems plausible that many small companies may begin to stipulate outrageous provisos for the use of their equipment, for example "Only to be used with external power-factor corrector" or "Only to be used in screened environments"—knowing that users and installers will ignore this while the maker retains a safety net if problems arise. Summing up, if the proposed standards are implemented in their present form or close to it, the effects will be:

(i) Loss of audio quality.

(ii) Increased prices to the consumer

(iii) Reduced choice to the consumer

(iv) Radical change to wiring conventions and hardware.

For audio equipment, the emission standards are reasonable enough and mostly implementable. But I suggest there is no reason to attempt to implement the wholly inappropriate and unreasonable susceptibility standards.'

Martin Reynolds, Analogue R&D Manager at Soundcraft Electronics and previously at Neve offered the following synopsis.

'The audio industry has been exhorted for the last few years to get involved in forming product-specific EMC standards with a view to manipulating the resulting standards for commercial advantage. Unfortunately, it is now clear that most of the test conditions being applied are thoroughly entrenched and are unlikely to be changed regardless of how many organisations contest them. These conditions originated in the telecom and power industries, where long transmission lines pose a doubled-edged EMC hazard (lots of aerial to radiate and pickup). There's a world of difference between hundreds of kilometres of transmission line and a 3m audio lead. Consider the differences in performance requirements between telecom, broadcast and music media in **Table 1**.

On this scale, professional audio is so far removed from telephone standards that it's inappropriate to apply the same tests.

Experience with two major mixer manufacturers indicates that serious EMC immunity problems ▶

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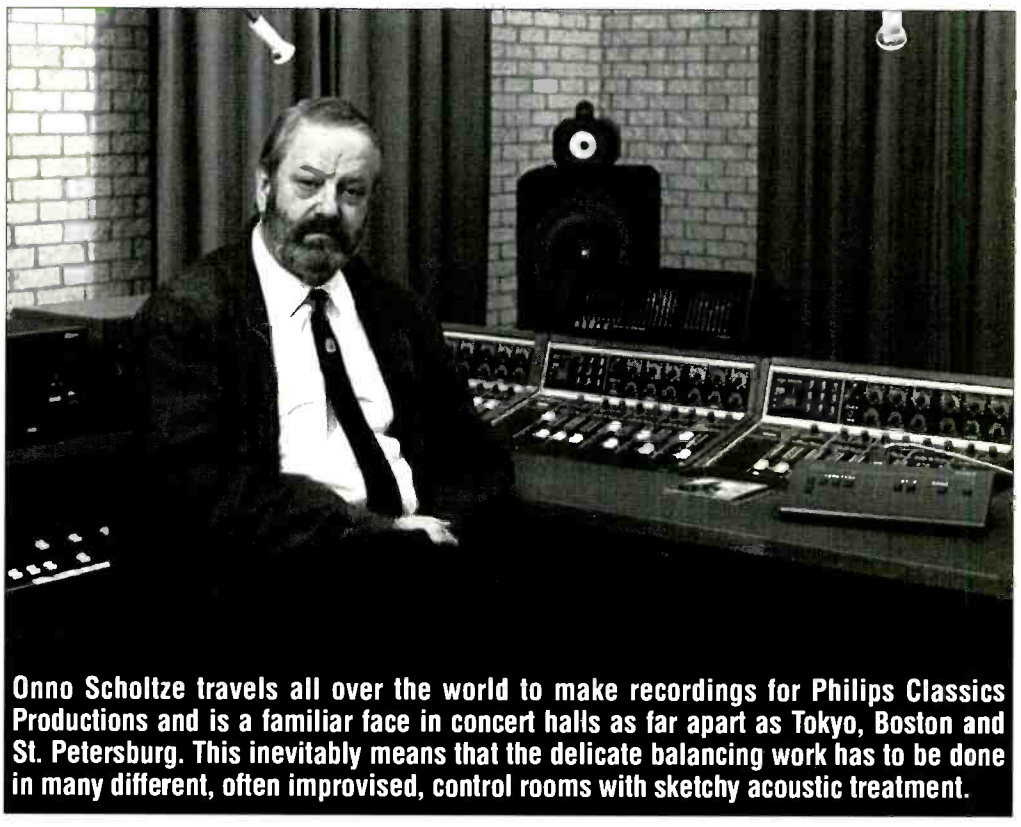

Onno Scholtze travels all over the world to make recordings for Philips Classics Productions and is a familiar face in concert halls as far apart as Tokyo, Boston and St. Petersburg. This inevitably means that the delicate balancing work has to be done in many different, often improvised, control rooms with sketchy acoustic treatment.

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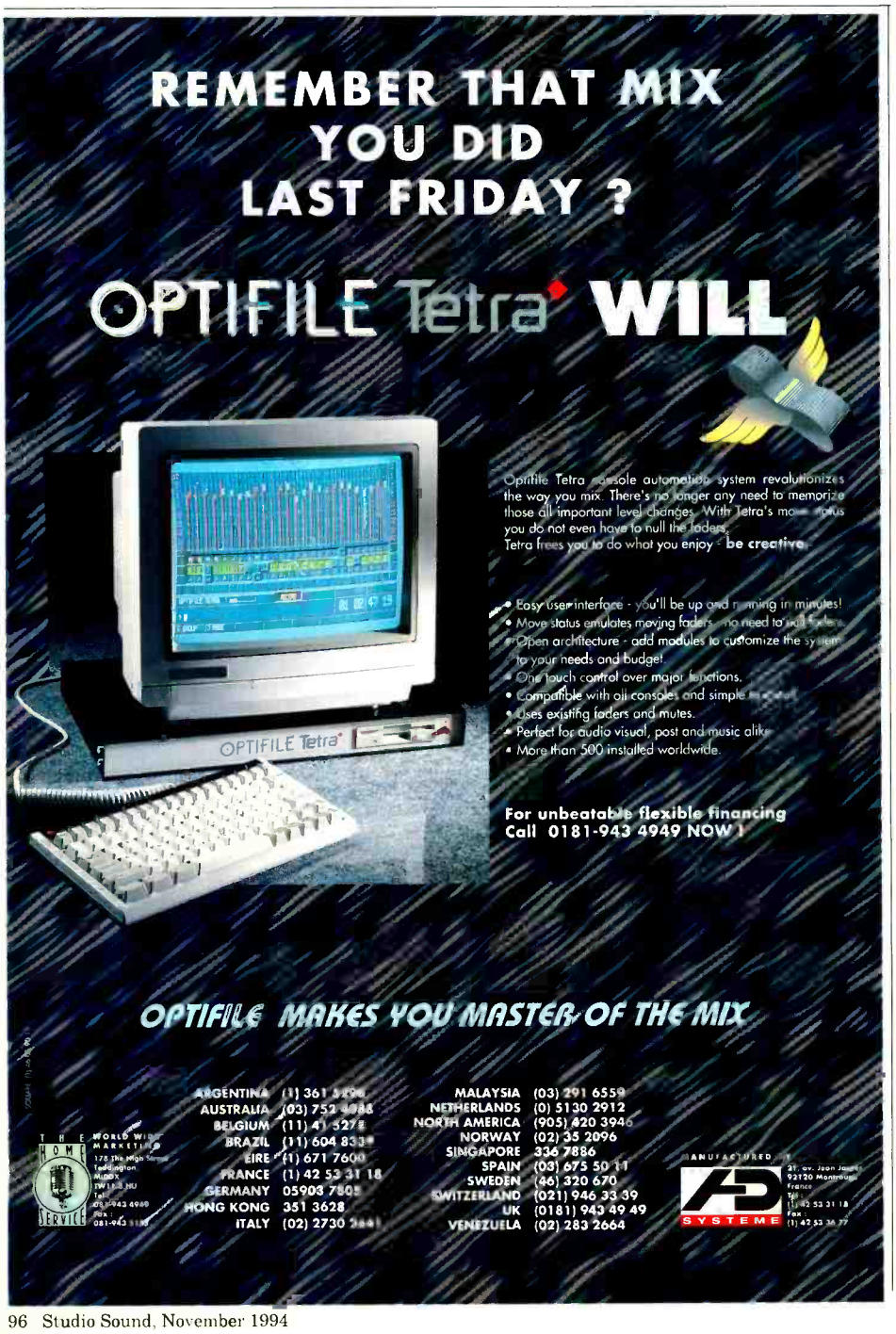
with analogue mixing consoles occur at the rate of one or two per decade per company. (This has been dubbed the 'One percent rule'. These are generally caused by:
(i) Unreasonably high RF field strengths due to proximity to a powerful transmitter, or
(ii) Unreasonably high line-frequency magnetic fields due to multiple earth systems or neutral to earth short circuits.

Such situations can be resolved fairly easily by reflecting the RF energy away or sanitising the earth system. On this basis, there can be no justification for scrapping existing concepts and developing new ranges of products based on 'RF proof boxes'.

Richard Salter, Technical Director of Focusrite does not mince his words on the subject: 'The QANGOs responsible (BS, DIN, CENELEC, IEC) have contorted relationships, and the final say is with an EEC bureaucrat who is answerable to no-one. The most galling aspect of the regulations is that the monopoly corporations that are the biggest sources of RFI across Europe are completely exempt from EMC legislation. For example, in the UK, British Telecom System-X telephone exchanges have standards, and shouldn't, but can radiate so much RFI that the best VHF/FM broadcast receiver even with a highly directional aerial is unusable in homes several hundred metres away. Similarly, in the UK, British Rail [Railtrack, InterCity and Regional Railways plcs], and the AC power generating and distribution utilities (PowerGen, National Power, National Grid and Nuclear Electric) are free to use or rent out their networks for signalling and comms with effective immunity from action if these should interfere.'[1]

One may then ask what point there is in EMC. After the affected population have already been forced to pay out millions to enjoy an interference-free existence, much of the environment remains EMI pollutable by ▶



PROBLEM AREAS

Pro-audio designers have raised a number of test-case difficulties that have not been unequivocally answered. For example:
i) What happens with old (classic valve) designs in current manufacture—wherein even modest changes to circuitry will defeat their retro and sonic *raison d'etre*? John Bowsher and Chris Marshman stated that such products should be capable of readily passing the proposed PAVI tests with minimal change provided (Bowsher) 'the power supply was well designed'. While seemingly requiring just a mild redesign effort, this is not encouraging in a recession, especially if the maker has invested in stocks of parts that are unusable in the design that meets standards, aspects that may never be needed. Worse, the redesign may alter the sonics of the unit in unpredicted ways, and the compulsory inclusion of parts that were never present in the 1945–65 era may also damage the rosy 'time warp' perception that attracts buyers.
ii) Do the regulations encompass or affect those making bespoke (one off) equipment, or one-off or small quantity custom modifications to previously CE-marked equipment? Where is the line drawn? are Tech Construction Files to be used on the back of another maker's CE mark? Chris Marshman suggests that this approach is feasible so long as the installation practice is consistent and that EMC compliance can be proven on a typical instance of modified equipment. But how many owners can afford the delay for EMC certification, let alone the £650 per day for testing and the £1,000-plus cost for a TCF—that may not even be binding —for some small (but crucial) mods to a mix console or FX unit? Marshman suggests a careful reading Clause 88 the UK EMC Regulations: '. . .in proceeding against any person for an (EMC) offence. . . it shall be a defence for that person to show that he (she) took all reasonable steps and exercised all due diligence to avoid committing the offence'. Marshman translates this as 'Commercial reality prevails.'
iii) Where is the line drawn between an installer and a maker? If a studio installer mounts three DI boxes in a rack case with a power supply, in his workshops, is he a manufacturer? ■

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statutory or monopoly utility companies.

The swift, brutal EMC timetable is alarming experienced designers in industry. Salter continues: 'In other instances of major, global legislation (for example in car manufacture), a Grandfather period is allowed. This means an existing product can continue to be made, on the basis that it will fade away or die in due course; or at the very least, existing products can continue to be made to their existing specification for X years. It is normally only new products launched after the date of the legislation that have to conform. Instead, though, the present status of EMC is that every electronic product sold as new has to conform. Only second-hand goods are excepted. If this approach persists, then we can expect the majority of innovative and niche products from smaller makers, particularly retro devices like valve equalisers, to vanish from the new goods market.'

Chris Marshman rebuts this: 'As soon as possible all makers need to do some precompliance testing and talk to a competent body, to see if there is a problem. If so, the maker has to do something. The authorities will be lenient if some effort has been made. In reality, the eventual standards that are as yet unsettled are all based on existing ones and they won't have changed much. So makers have had plenty of time.'

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It is also authoritatively reported that some famous Japanese brands will simply be pulled from Europe if the EU's council of ministers do not adjust their technical edicts in line with commercial reality

Legal risks of manufacture

Yet another serious obstacle to continued manufacture of anything remotely technological for sale in Europe after 1995 is the nature of the legal responsibility, which is as much personal as it is corporate. This hits big and small companies just as hard, if they perform any part of the EMC testing or approval process. In other areas of design responsibility, such as an architect 'signing off' the plans for a suspension bridge, to say it is safe to build, the architect can get professional indemnity insurance. But certainly in the UK (let alone in the US) insurance companies cannot yet offer this for any qualified electronic design or production engineer who wants to certify that the gear the company have designed meets the EMC regulations. Without this insurance, anyone signing certification is going to have potentially sleepless nights for the rest of their career, particularly if their company makes many products and-or is always creating new ones; or if the company has unpleasant competitors who may blow the whistle on a technicality.

Conclusion

At best, the standards jointly developed for the EU by CENELEC and IEC will be accepted across the world, even if begrudgingly. Artificial economic growth is particularly stimulated as North America and Japan follow the EU. RF susceptibility regulates itself out of existence, as every radiation is tightly controlled. After five years, death by runaway robots, ABS brake failures or ▶

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computer-piloted planes rises, but with an exponential growth in RF fields, the underlying rate is well below what would have been the case. Rates of cancer and chronic illness are also seen to begin reducing among workers in intensive electronic environments, which in 200, is most people who still have jobs. And by some miracle, blind-eye or derogation, bespoke installers, classic designs and small manufacturers survive.

Alternatively, many companies in rest of world will not be bothered with EC standards. With isolationism, prices of their imports into Europe will rise and volume will fall off, or product importation and even manufacture will cease.

Many European makers including 22% of UK electronics manufacturing companies and 2% of Italian ones are likely to accept they cannot meet the regulations on January 1st 1996, as the PAVI standards may only be finalised by November 1995, yet a minimum of six months is needed to re-design and produce to these standards, or at least retest and modify equipment to PAVI, even if the equipment has previously been tested to and met the generic standards. Many may cease trading as they cannot legally ship product and-or the cost of redesign and approval requires too much investment which their bankers or backers can't cope with. Equally, studio owners and the installation-refit business may be hampered by difficulty of getting equipment customised or finding anyone able to quote for bespoke units.

In both instances, the ultimate effect looks set to be less choice of models and makers for users, and higher prices. The EU's LV directive (thankfully outside the scope of this article) is regarded by some as far more onerous. Another apocryphal report concerns TV infrared zappers: A standard for working in worst case conditions (like off-axis in bright sunlight) has been set that even the best controller in world, made by a Danish maker renowned for aesthetic and ergonomic domestic audio, cannot meet nor is attainable by presently foreseeable technology! It is also authoritatively reported that some famous Japanese brands (for example. the *de facto* name in TV receivers) will simply be pulled from Europe if the EU's council of ministers do not adjust their technical edicts in line with commercial reality. ■

CRITICAL TIMETABLE AND LEGALITIES

- The raw, generic EMC regulations have been available since October 92. EMC compliance is all-round compulsory on 1st January 1996
- After 31st December 1995, all electronic and audio equipment (but not components or consumables, such as drums of wire, or recording media) sold as new in (or imported into) the EEC has to bear a 'CE' mark with a designation such as '89/336/EEC' to indicate that is complies with the EMC and other specific, relevant directives.
- If equipment bearing a CE Mark is found to not meet the regulations, or if any aspect of CE marking is out-of-order, the authorities can apply for an EEC-wide ban on the guilty product. The directors of the manufacturing company, or if outside the EEC, their EEC-based agents or importers, can be fined and-or imprisoned. ■

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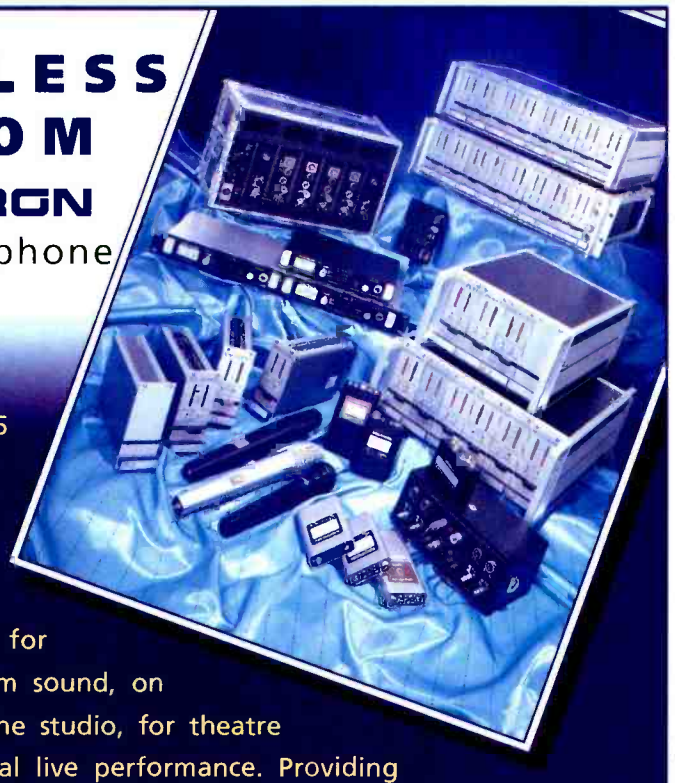

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References

1. Barry Fox, 'British Rail Signals Disaster', *Studio Sound*, June 1992.

Further Reading

DTI Literature.

The reading list begins with the UK Act of Parliament: *The Electromagnetic Compatibility Regulations, Statutory Instrument*, No.2372, HMSO, 1992.

The UK's DTI appear to have done a good job of producing diverse, slightly in-depth, free booklets about EMC: *Business in Europe—Products Standards—EMC*, UK regulations, 1993 (DTI). *Minimising the cost of meeting the EC directive on EMC*, 1993 (DTI). *EMC—background notes*, 1993 (DTI). *EMC—EC guidelines on*, 1993 (DTI). *EMC—Guidance on the preparation of a technical construction file*, 1992 (DTI).

A.Mornington-West, *EMC and the Professional Audio, Video and Lighting Industries*, proc. SCIF, May 1994.

K.Dibble & A. Mornington-West. 'Power, Performance & EMC', *Lighting & Sound International* (PLASA journal), September and October 1994.

Will you be legal? AES conference on EMC, London, March 1991. In UK, available price £10 from AES Ltd, Lent Rise Road, Burnham, Slough, SL1 7NY. UK. In other territories, contact the local secretariat for price and availability.

Chris Marshman. *The guide to the EMC directive*, EPA Press, ISBN 0951 736 23X.

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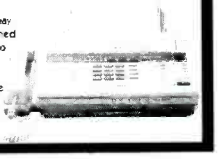

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Barry Fox

The origins of FFRR and the problems with CD-ROM

For public domain reissues some record labels simply rustle up a few old 78rpm shellac pressings, dub them onto DAT and press low-cost CDs, complete with hiss, snap, crackle and pop. The big name labels dress up their reissues with fancy packaging and justify high price tags, by squirting the sound through as much expensive digital clean-up circuitry as they can lay their hands on.

Some critics argue that digital hiss reduction does more harm than good. With a little help from analogue filtering, the human brain and ear eliminate any steady random noise, whereas splitting the signal into digital bins, can suck out some of the musical information and add phase shifts.

What the ear and brain cannot do is eliminate the intermittent transient noise of surface clicks and pops. Two specialist labels, Parrot and CDS are now putting out CDs with some labels emphasising the fact that digital technology (in these cases, CEDAR) is used for de-clicking only.

Some of the titles were recorded by Decca in West Hampstead and the 50-year copyright rule means that tracks date from the 1940s. By then Decca's Head of Recording, Arthur Haddy, had developed his FFRR (Full Frequency Range Recording) system.

During the war, Haddy was paid by Decca, but he was on call to the RAF and had to go down to West Kingsdown in Kent where a staff of around 300 Czech and German WAAFS were listening to radios tuned to the German night fighter frequencies. The RAF laid on raids especially to get the Germans talking about what was happening, where and when. This gave the code breakers key words to cross check with what the pilots said in code. Everything had to be recorded nonstop, on two sets of equipment. They cut around 100 wax discs during each raid. These discs were then taken back to the Decca studios, and dubbed through filters to get rid of beat frequencies whistles. The disc dubs then went to the RAF for decoding. Obviously recording quality had to be as good as possible.

There were two other reasons why Decca developed hi-fi disc recording for the military. British planes carried a device called IFF (Identification Friend or Foe), which generated and transmitted a complex audio waveform as they returned to base. The idea was that this sound could not be copied, so British gunners would know which planes to avoid. But first the gunners had to learn to recognise the sound. So Decca dubbed the sound onto high quality discs for training.

When Coastal Command spotter planes flew out over the Atlantic, they would drop a triangle of three sonar radio buoys around any suspected submarine. Each buoy had an underwater microphone and short-wave radio transmitter so the crew in the aircraft could listen to the sound of the submarine under water. By dropping more buoys in ever tighter triangles they narrowed the position of the submarine for bombing.

The risk was that coastal command would bomb British submarines by mistake. The only difference was in the sound of the water flow from the submarine's propeller. Once a pilot had heard the two different sounds, he could always distinguish between British and German submarines. So discs were used for training.

The difficulty was that the sound of the water flow had high frequency content. Haddy and his engineers built a disc cutter that could record up to around 16kHz. They used this to record the sound of a captured German submarine, as well as a British submarine. Bomber crews were trained wearing headphones and listening to the discs.

The same cutter heads were used after the war to record Decca's artists. One of the originals went to the Science Museum in London. Decca pushed the frequency range ever wider, and made experimental stereo recordings, by multiplexing one channel at low frequency and the other at high frequency. Although this system was proposed as a world standard for LP stereo recording, in 1958 the RIAA chose the Westrex 45/45 system, which was actually Alan Blumlein's 1930s system under an American label. The rest is history.

Market analysts BIS assure me that people who use multimedia home computers in Europe buy an average of 14 CD-ROM titles in the first year, and some up to 60. How long they go depends on their practical experience.

At first it obviously looks sensible to buy an encyclopedia on a single CD, for under £100, instead of paying many hundreds for a shelf-full of books. It is only later that the user finds it is a lot easier to refer to a book for a quick fact than fire up a PC, load *Windows*, load a CD, and cope with any error messages that fly up on screen.

But some material cries out for the multimedia treatment. The multimedia version of the diaries of H R Haldeman, released in the US at the same time as the book, contains home movies and snapshots taken by the White House Chief of Staff at the time of Watergate.

What a pity the disc is giving problems on some PCs. It displays error messages instead of the pictures. The electronic publisher has a telephone helpline in the US which quickly tells users a few cryptic commands which, when keyed into a PC, effect a cure.

'You sound as if you already know the problem,' said one caller.

'Oh yes,' said the helpful man on the help line, 'it affects around 25% of all PCs.'

So why wasn't such an obvious fault spotted and corrected before the ROM disc was released?

'Simple,' admitted the helper cheerfully. 'Richard Nixon died suddenly so we had to rush it out before all the testing was done.'

I tried phoning Groves recently about industry rumours of plans to release an electronic version of the definitive 21-volume encyclopedia of music. Groves referred me to Macmillians where a circular succession of people all referred me to someone else. But finally I did get confirmation that a CD-ROM version is in the pipeline.

I shall be watching with special interest to see whether one entry in the current edition, will also be included in the next.

If you have a copy of Groves handy, look up Dag Henrik Esrum-Hellerup on page 252. He is listed as a 19th century Danish flautist, conductor and composer. A lengthy biography tells the family history, lists his musical achievements and explains how he translated the famous Quantz's treatise on flute-playing.

It all rings true, a specialist in old music told me when I asked him about the Esrum-Hellerup entry, except for one minor detail. There is no translation of Quantz into Danish. Nor could the specialist find anything about Dag Henrik in any of his other reference books.

Someone else thought that he remembered once taking a train from a Scandinavian station called Hellerup. And then when we ran a check through the recently computerised index of international composers compiled by the Performing Rights Society, it came up with a blank under Esrum-Hellerup.

I can't wait for the electronic version of Groves to see whether Mr. Esrum-Hellerup is still listed, and if so what music, pictures and manuscripts are used to illustrate the entry. ■

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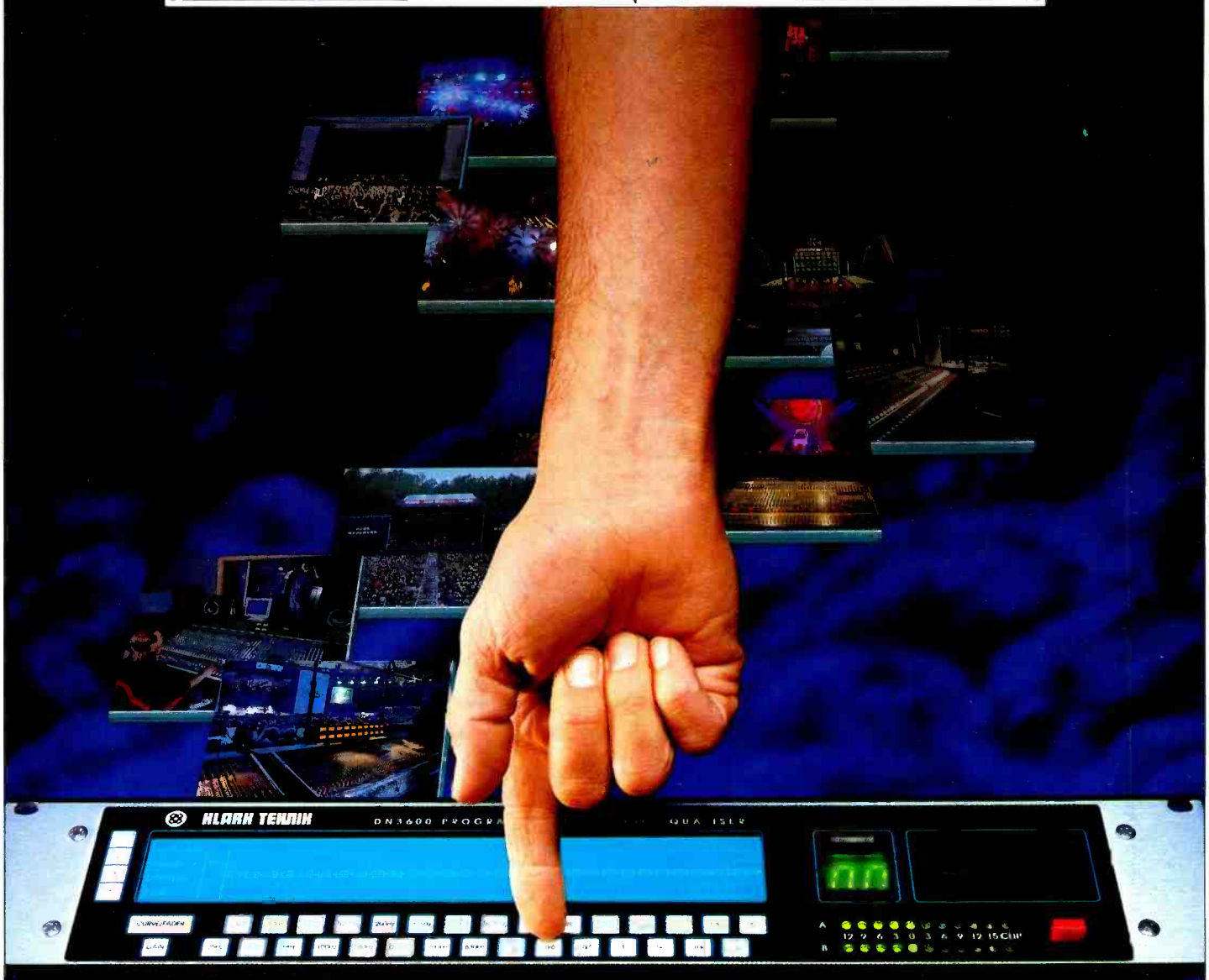

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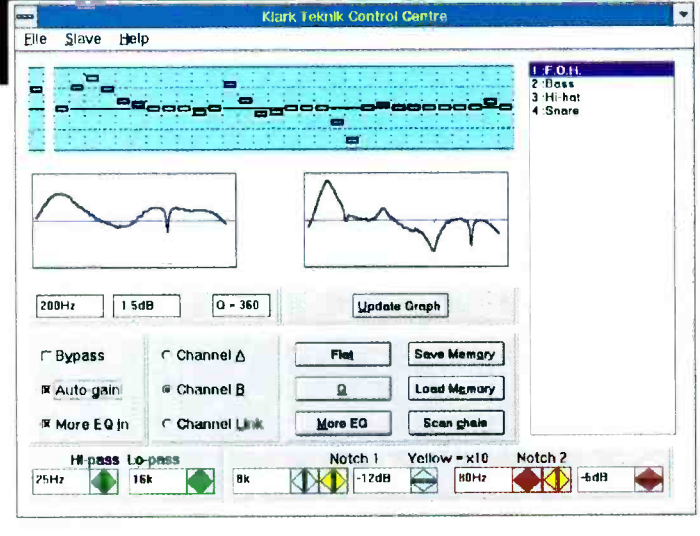

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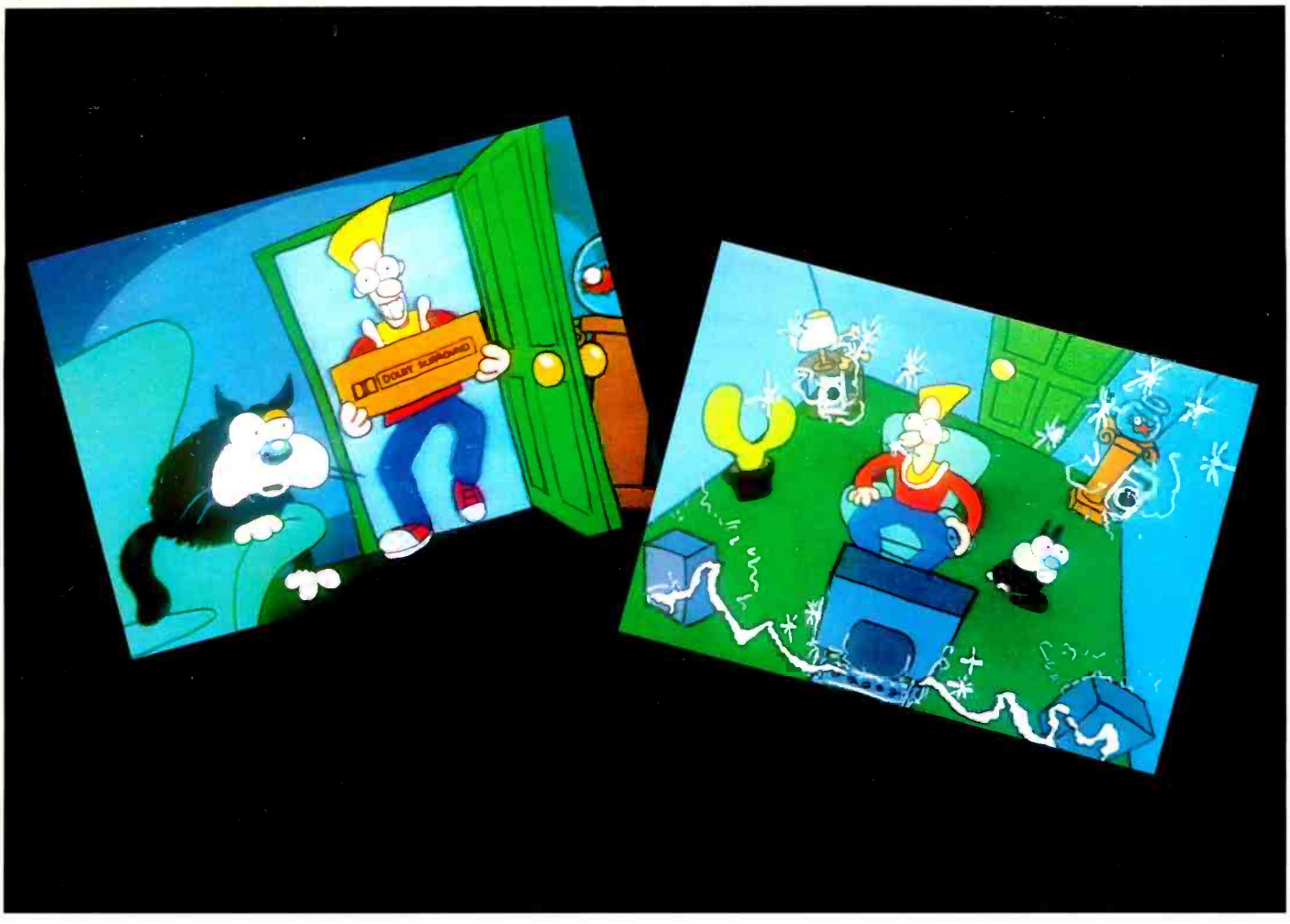

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