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THE INTERNATIONAL PROFESSIONAL AUDIO MAGAZINE
FOR RECORDING, POSTPRODUCTION AND BROADCAST

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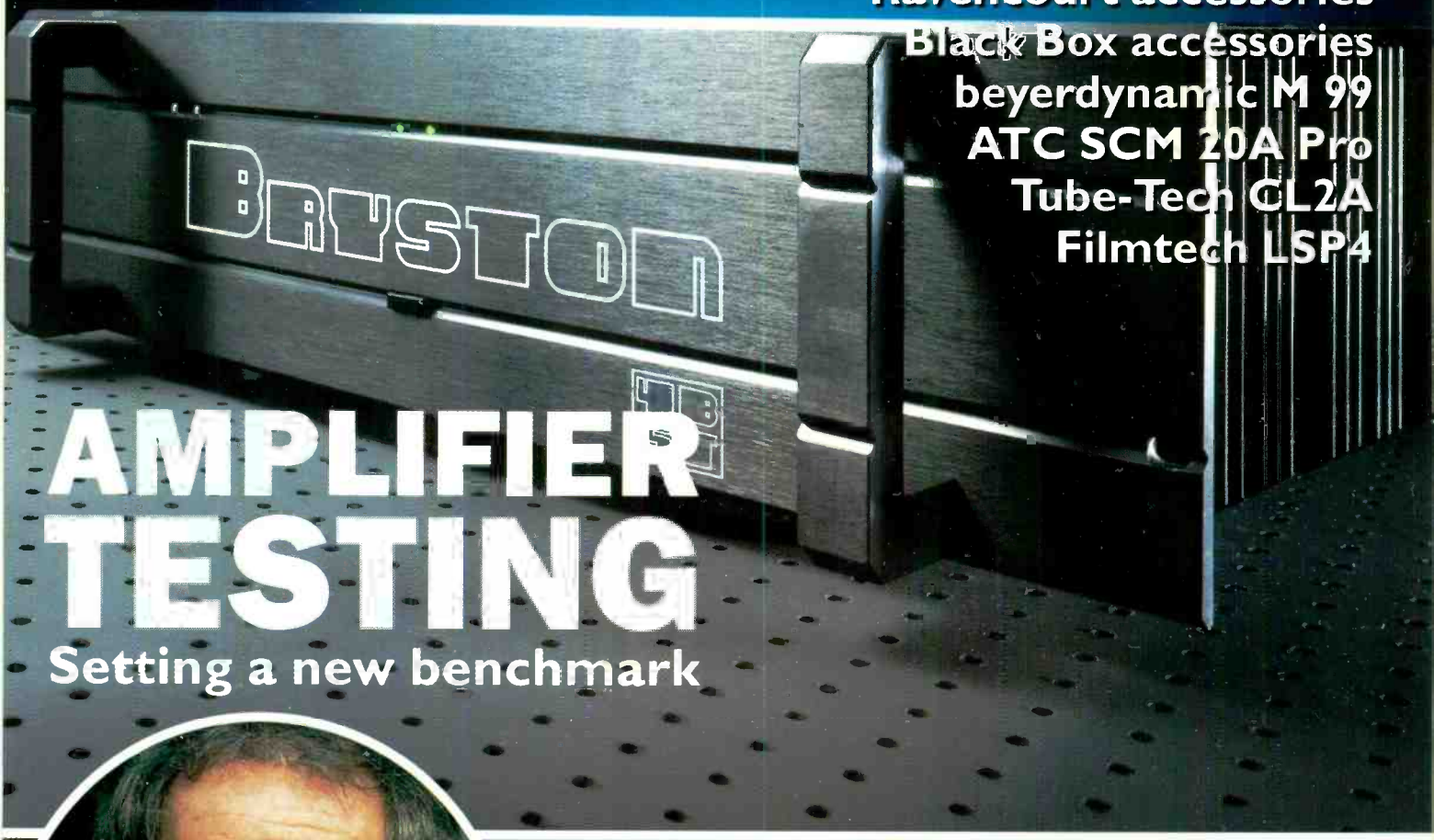

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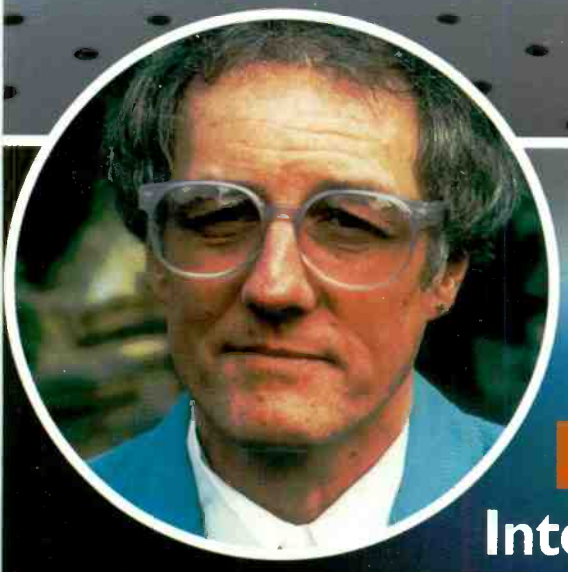

The GUS DUDGEON Interview

POSTING DREAMS WITH THE MATRIX
THE HISTORY OF RECORDING MEDIA
DEFINING BROADCAST AT NBC
SSAIRAs AWARDS WINNERS
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"Right Track pioneered the use of digital consoles in high end studios. We were the first facility in New York to install a Capricorn. Today we have the bookings, client list and Grammy-nominated projects to confirm our decision."

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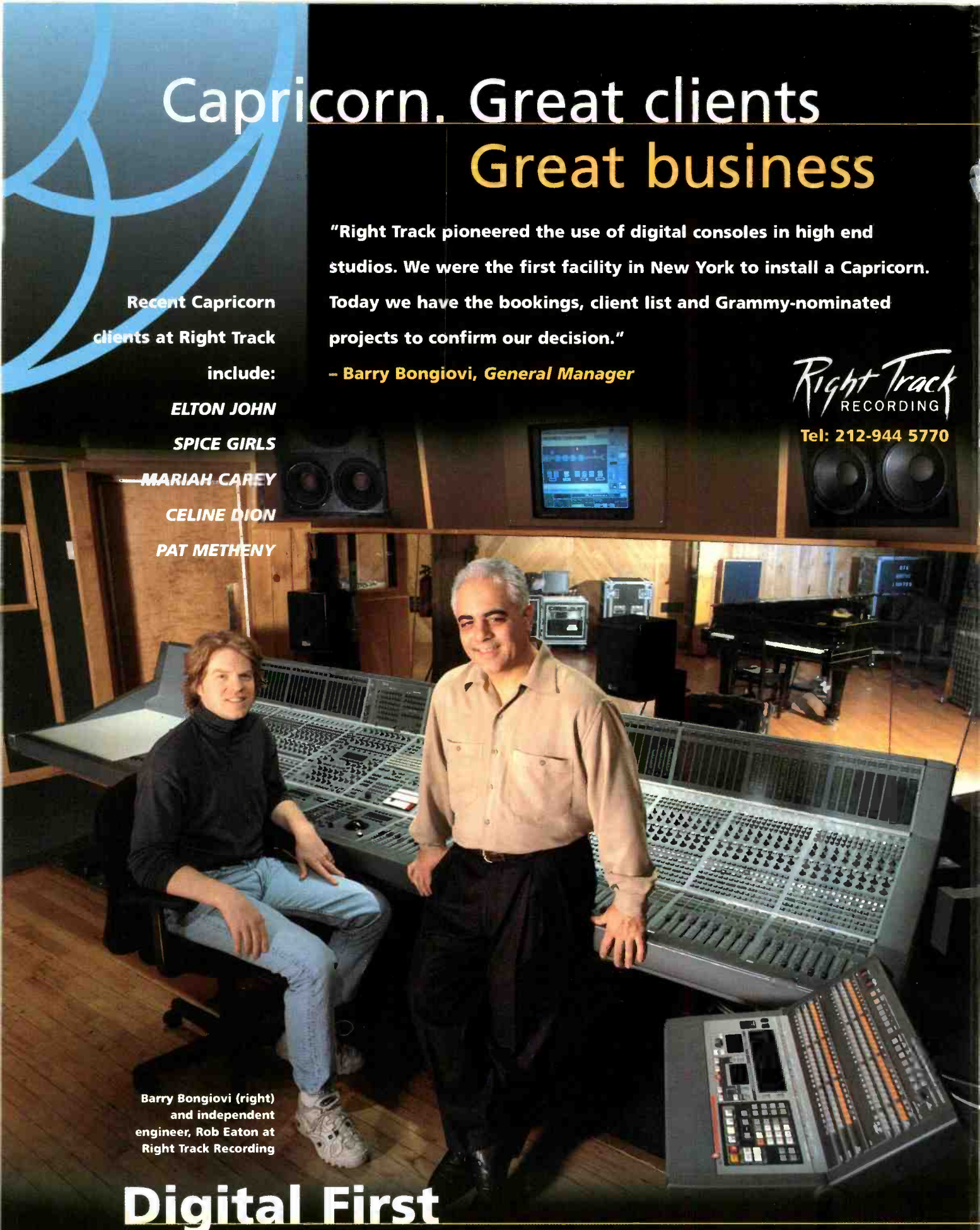

Barry Bongiovi (right) and independent engineer, Rob Eaton at Right Track Recording

Digital First

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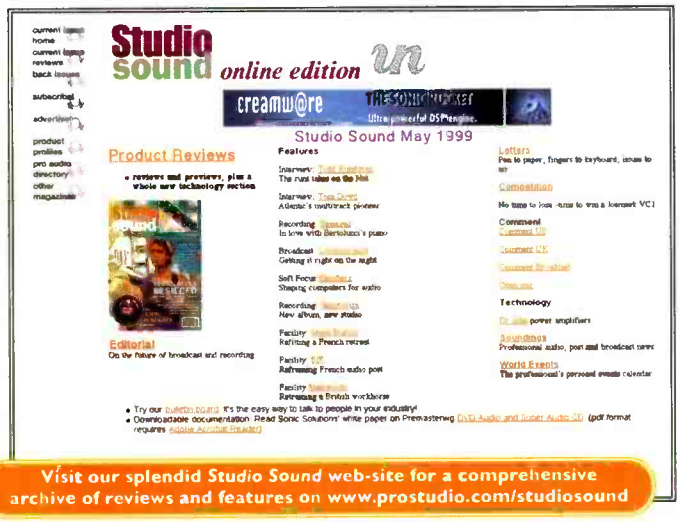
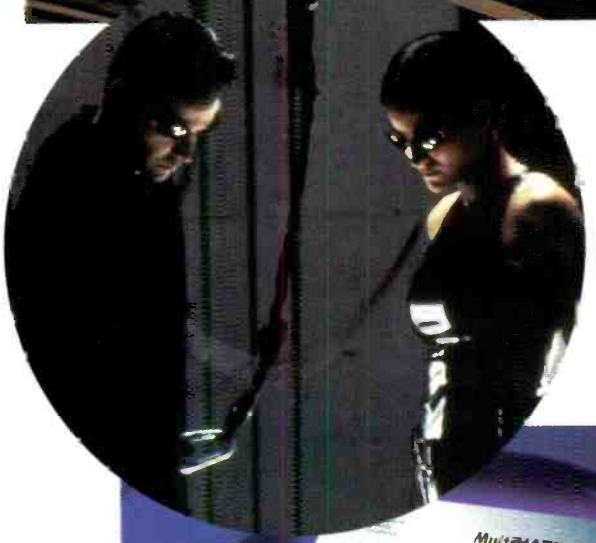
CONTENTS





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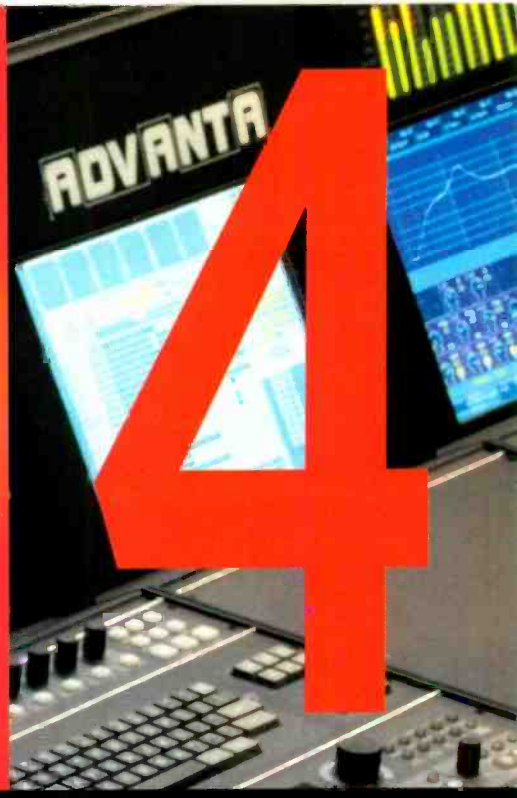

ADVANTA is targeted at a wide spectrum of applications – from music recording, through broadcast production, to film and TV post.

Novastar Studios, Los Angeles

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Same as it ever was

WANDER AROUND ANY LARGE EXHIBITION and you will be impressed by the scale and diversity on display. Mostly big and small desks, racks, and boxes, and while within each category type they perform functions that are largely similar and can be compared, there is an element of originality and personal appeal in nearly all the gear we use.

However, there are those who will tell you to look around and enjoy the view because everything will change so dramatically and so quickly that the substance of a typical audio trade show will be unrecognisable. The reason is that computers are really coming, and while their potential has threatened consistently, they'll tell you that their power is now close to the stage where their impact will be truly monumental. They tell us that PCI cards are already available that finally lay to rest any semi-pro or not quite good enough stigma and that there are many more on the way. They tell us that it will all now happen very quickly and that manufacturers will have no choice but to adopt this processing technology for reasons of pure economics.

I am inclined to believe a lot of this, but with qualification. I think it is important to separate previous initial experiences with PCs from what may happen this time. Computers were embraced in the first instance as hosts within which audio related applications were run. They looked and behaved the way they did because cost was an overriding consideration. This time we are talking about the processing power of a PC and harnessing that to audio ends. Early digital systems were expensive because the processing was expensive, as it had to be cobbled together specifically, and because digital control was expensive, which it still largely is.

Trade shows of the future may indeed look different but there will surely always be a need for physical control interfaces that reflect the products that the processing aims to provide. We may indeed be entering an era in which manufacturers will be able to indulge in the creation of better interfaces and the diversity that we have become accustomed to will simply move up to the next game level. **Zenon Schoepe, executive editor**

Conventional wisdom

IT BEGAN WITH A SERVIETTE. Having accepted the challenge of a Lufthansa roll (no relation to Immelmann), it was clear that without a serviette I would be wearing more of it than I'd eaten. I should come clean (eventually) and admit that I wore a Bloody Mary on Chinos into Los Angeles for last year's American AES Convention and that wearing salad dressing on black into Munich for this year's European AES could have been regarded as next to inevitable.

But as it turned out, the elusive serviette also proved to be an icebreaker as it opened conversation with an Englishman sitting to my left. He seemed a decent enough chap and I'd no reason to assume he knew anything about mixing Bloody Marys with your wardrobe. So when we were able to develop a conversation from sartorial necessity through this departure from German efficiency to the benefits of travel and the intrigue of art and philosophy, I was pleased enough. Certainly, the journey was more rewarding for it and I was quietly disappointed that what was likely to be one of the more wide-ranging and comfortable conversations of the trip was soon to be over.

The announcement of our approach into Munich prompted a more mundane turn—I was going to a trade show, so was he. Against the odds, it was the same damned show. My resignation to the limits that a show places on you had begun to lift. A more formal introduction seemed in order—except that we'd done it some years ago under different circumstances. While our earlier discourse on loudspeaker design had been good, I couldn't help but think that it would have been altogether better if the parameters had been wider ranging. All that is necessary, it seems, is to break with convention...

Coming back, I found my next-door neighbour on the same flight home from Munich airport. She confided in me that everyone should be their own best doctor. But that's another story... **Tim Goodyer, editor**

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Perfect for Post...

Avant

Saunders + Gordon, one of Europe's leading audio postproduction facilities, works mainly within the advertising industry with such prestigious clients as Procter & Gamble, Eurostar, Kelloggs and Ikea. Additionally, the company is also active in the broadcast arena where it has recently completed a major international television series for Polygram.

As an ongoing investment in digital technology, Saunders + Gordon recently installed a 32 fader, 64-channel Avant console with 32 mix and 24 pre-dub buses.

Avant's knob-per-function control surface means fast and intuitive access to a host of potent features which - coupled with SSL's proprietary and proven digital processing - makes mixing a dream.

Using Avant's powerful 64 x 8 monitor matrix, mixing simultaneously in surround and stereo is easily achieved, thus eliminating the need for separate remixes for cinema and television.

"We chose Avant for its excellent automation and outstanding flexibility. We can work with - and mix to - any current or envisaged surround sound format."

Tim Lofts, Director, Saunders + Gordon.

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■ Burbank-based Blue Nile Recording has installed a 96-fader Euphonix console running v3.2 software to run alongside an Avid video editing system for post, recording and mixing, serving clients such as HBO and CBS. Currently, the studio is mixing *Touched by an Angel* for CBS.

■ Japanese national broadcaster NHK has taken one of the first five Amek 9098i analogue consoles to be shipped to be installed at its recording facilities in Tokyo. One of the national facility's adjacent studios already houses a 9098 console.

Amek, UK. Tel: +44 161 868 2400.

■ Welsh national television broadcaster HTV has ordered an Amptec Stone-D001 digital console to be used in its production unit at the National Assembly of Wales at Cardiff Bay. The unit will handle the production and transmission of live and recorded political programmes, news inserts, and so on.

HTV, Wales. Tel: +44 222 590590.
Amptec, Belgium.
Tel: +32 11 281458.

■ London's Olympic Studios is the site of the first installation of Genelec's new 1036A monitoring system. Located in producer Spike Stent's mixing room, the 1036A delivers the lowest frequencies of the Genelec range for Stent's work with the likes of Massive Attack and Texas.

Olympic, UK. Tel: 181 748 7961.
Genelec, Finland.
Tel: +358 17 813311.

■ French broadcast facility, Studio 107, has installed a Sony OXF-R3 digital console for use in audio and video television post. Elsewhere in France, three SSL Avant digital consoles have been put into service at Jack-Son, Dubbing Brothers and SIS serving surround work on original film, language dubs and commercials.

Sony, France.
Tel: +33 1 49 45 40 24.
SSL, UK. Tel: +44 1865 842300.

■ Beijing's Film Academy has ordered two D&R Octagon film consoles. Marking the largest Asian film institution's move beyond mono, the initiative is part of an overall upgrade that includes the installation of three Avid workstations and Dolby SR and SR.D systems.

D&R Electronica,
The Netherlands.
Tel: +31 294 41 8014.

■ Belgian national broadcaster VRT has installed a number of 360 Systems' DigiCart II Plus and Short/Cut systems in its Brussels television facility. The move follows successful use of DigiCart for jingles, leaders and music beds and will serve prerecorded audio and SFX. Belgian Outside Broadcast has ordered a second Amptec Boulder OB1 analogue broadcast console for its 8-camera OB van while fellow Belgian OB operation Videohouse has taken a third OB1 console for its 6-camera OB van.

360 Systems, US.
Tel: +1 818 991 0360.
Amptec, Belgium.
Tel: +32 11 28 14 58.

■ Spanish television facility Antenna 3 has purchased over 100 Sony wireless mic systems for ENG use. Spanish recording studios, meanwhile, have been picking up on the D&R Octagon console. Areamaster Estudios and Tabalet Estudios both recently installing Octagons for uses including music recording, mixing, dubbing and postproduction. Tabalet has taken an 80-input desk with dynamics along with Quested monitors and a SADiE system as part of a complete facility upgrade while Areamasters' 80-input desk replaces a D&R Orion and forms part of an update designed by Philip Newell.

D&R, The Netherlands.
Tel: +31 294 41 8014.

■ American recording legend Capitol Record has installed a Hafler TRM6-TRM10 Trans-ana monitoring system along with its established TRM8 system in Hollywood. Already counting the new setup in their realisation are the soundtracks to *There's Something About Mary* and *At First Sight* as well as FatBoy Slim, Van Morrison and Placido Domingo.

Hafler, US. Tel: +1 888 423 5371.

■ Hire companies acquisitions include Wired For Sound, UK-based specialists in radio OB engineering and pro-audio equipment rental, doubling their hire stock by adding more Telos Zephyr and Zephyr Express ISDN codecs, SADiE 24-96 and 360 Systems' Shortcut and Instant Replay. Meanwhile London-based FX Rentals, Europe's largest pro-audio rental company, has taken delivery of a Mackie Digital 8-bus console (v2.0). The console joins FX' Mackie fleet which includes 32:8s, 1604s and 1202s. British-based Electrotech-Audiolease have purchased 25 Crown MA 5000VZ power amplifiers for their hire stock. Electrotech's tours lined up for the summer include Bob Dylan, Lennie Kravitz and M People. Bravos Sound, a major rental company in Thessaloniki, Greece has complimented their PA system with a XL200 console while Scottish-based EFX Audio has taken the first Midas Heritage 3000 console to add to its rental stock.

■ Recent BBC purchases include a further three Yamaha 03D digital consoles for varied use including trailers and education, and a D&R Airmix modular broadcast console for use in Radio Continuity.

Yamaha, UK. Tel: +44 1908 366700.
D&R Electronica,
The Netherlands.
Tel: +31 294 41 8014.

■ Austrian state broadcaster ORF has invested in eight SSL Aysis Air consoles for regional production facilities in Linz, Graz, Innsbruck, Salzburg, Einstadt, Dornbirn, St Polton and Vienna. The Austrian capital will also host an Axiom-MT at MG Sound alongside an existing SL9000j console.

SSL, UK. Tel: +44 1865 8423000.

▲ **US: Formerly Radio Recorders and LA's oldest studio, Studio 56 has installed an Otari RADAR II hard-disk recorder in its Studio E. The room was designed by Vincent Van Haaff and hosts a vintage Neve 8028 console—CEO Paul Schwartz calls it a 'match made in heaven'.**

AES Munich

Europe: The recent European AES Convention in Munich saw the presentation of the AES Awards. The Publications Award was given to Michael Gerzon (posthumously) and Peter Craven for the paper 'A High-Rate Buried-Data Channel for Audio CD', (JAES, vol.43, No.1/2, 1995). Lorin Maazel was made an Honourary Member, for advancing the course of audio arts in recording while Ferenc Takacs received a citation for his dedicated service to the Society in establishing the Hungarian section. The board of governors Award, given for outstanding contributions to the AES, was presented to Han Tendeloo, for chairmanship of the 104th convention in Amsterdam, 1998, and to Jan Voetmann for chairmanship of the AES 15th International Conference in Copenhagen, 1998. The Fellowship Award was given to Christer Grewin for important contributions to development of international standards in coding digital audio for broadcasting and Diemer de Vries in recognition of his contributions to the implementation of wave field synthesis.

Meanwhile the C Heyser Memorial Lecture is to become a regular event at future Conventions following agreement between the AES and a scholarship fund established in memory of the past AES president elect Richard C Heyser who died in 1987. Lec-

▲ **UK: In *Remembering Peter Sellers*, fellow British comedian and close friend, Graham Stark relates the story of the great Peter Sellers. Having common interests in film making and shared billing on 13 films, Stark was in a unique position to describe Sellers achievements and exploits until his death in 1980. This he did in the comfort of his home to recordist David Sanders who used an Audio-Technica AT4030 mic, Behringer compressor and Mackie desk before editing the monologue on a Sound Forge system. Accompanying the cassette release is a charming pictorial record of aspects of Sellers' life. Right Recordings, UK. Tel: +44 181 961 3889.**

tures will start at the 107th AES in New York later this year and will be given by a distinguished presenter and leading pro-audio light who has contributed significantly to the professional audio industry. Heyser was an active member of the AES for almost three decades and served as governor for the Society from 1983 to 1984 and was prominent in numerous Society activities. At various times he held all of the elected positions of the LA Section.

Information exchange

World: Providing an international exchange for information and ideas, *Studio Sound*'s bulletin board now offers a Q&A service on all subjects related to professional audio. Check the Web at http://www.prostudio.com/studiosound

▲ Germany: Production duo Toni Cottura (left) and Bülent Aris, founders of Booya Music have purchased Europe's first Amek 9098i for their in-house Hamburg facility. Cottura is a former member of German band Fun Factory and together with Aris, has worked with international artists including Backstreet Boys, Marky Mark and Boyz II Men.

▲ Norway: DAR's TheatrePlay has pa d its way in the Trondheim production of the musical, *Rent*. Three of the sound-effects editing systems have been networked around a DAR Axis Audio-Server in the Trondelag Teater complex, representing one of the world's first digitally networked effects creation and multi-point replay setups. Sound design is by the Teater's Mikael Gullikstad for the production's 8-channel surround sound system.

▼ Belgium: National broadcaster VRT has bought four Otari Advanta digital desks as the first sales of the company's flagship console in Europe. Three of the desk will be installed in VRT's studios 1, 3 and 5 while the fourth will be located in the American Theatre outside broadcast facility used for major live events. Otari Europe: +49 2159 50861.

Transmission down under

Australia: Responsibility for operating the National Transmission Network of Australia has fallen to UK-based NTL. Following its successful bid for ownership and operation of the 561 transmission sites carrying television and radio services for ABC, SBS, regional broadcasters and mobile telephony, NTL intends to play a key role in moving broadcasting onto a digital platform and also to offer integrated TV, Internet and data communications. Back in Britain, NTL has secured contract with the ITV companies and Channel 4 to cover the remainder of the analogue broadcasting era—at least 2012. Turkish broadcaster EKOTV, meanwhile, has placed an order worth around DM5m with Rohde & Schwarz for 52 analogue UHF transmitters ranging from 100W to 10kW in power to complete the territory's nationwide TV coverage.

Summit Audio Presents:

element 78

Designed By Mr. Rupert Neve

The **Element 78** series from Summit Audio, designed by Mr. Rupert Neve, presents to the user a unique combination of "Class A," discrete and solid state, plus transformer coupled designs. Digital implementation of storage and reset capabilities enables comparison of 25 memory settings, copying of settings between units and MIDI control.

Two independent paths with transformer coupled output stages are provided in each of two channels, comprised of:

1. A high performance **microphone amplifier** with superb high and low pass filter sections.
2. A comprehensive **four band equalizer**.

Back lit rotary displays are enhanced by miniature LCD select/controls for an accurate status readout ...
... truly unique.

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www.summitaudio.com
email: sound@summitaudio.com

◀ **UK: Reopening after several months closure, London's Soho Recording Studios now offers a 64-channel SSL SL4000 G+ and Genelec 1034A main monitoring in Studio 1, and twin Yamaha 02R consoles and extensive MIDI facilities in Studio 2. Pictured at the SL4000 are senior resident engineer Alan Mawdsley and studio manager Dominic Enhaus-Sanders. Meanwhile, London's Sound Store has equipped its latest studio with London's first v2 Fairlight FAME in line with the two 24-track MFX3plus systems in the facility's other suites. The Sound Store focuses on documentary and current affairs programming for networks including the BBC, Channel 4 and The Discovery Channel. Also in London, Wise Buddah has added two new studios based around Pro Tools-ProControl setups. Primarily intended for radio production, the new rooms bring sound-to-picture dubbing to Wise Buddah for the first time.**

Ice T and MP3

US: Ice T has signed with US-based MP3.com for the release of his forthcoming CD, *7th Deadly Sin* on Coroner Records. As releasing well advance singles, the rapper will offer personal recommendations of rap and hip hop releases and chat with the online community through http://www.mp3.com. Using its DAM (Digital Automatic Music) label program, MP3.com reckons to welcome some 300,000 visitors daily to a site carrying tens of millions of songs, and more than 7,500 artists.

1999 SSAIRA RESULTS

THE SECOND SSAIRAs again produced some delightful surprises and some predictable placings courtesy of the valued readership of *Studio Sound*. The 106th AES Convention in Munich saw the introduction of the results from *Studio Sound*'s Audio Industry Recognition Awards—the SSAIRAs—at an exclusive presentation dinner held at the Paulaner Brauhaus.

The SSAIRAs were instigated after numerous requests for *Studio Sound* to place its weight and integrity behind an independent awards scheme that would be judged by the magazine's qualified readership. The SSAIRAs are a celebration of the unique relationship between *Studio Sound* and its readership—a relationship that now spans 40 years.

To recap on the selection process, nominations were invited at the beginning of the year for a number of categories and everyone was free to nominate a product providing it shipped for the first time after the European AES in Amsterdam last year. Products that failed to ship within the allotted timescale may be renominated for next year's SSAIRAs. Following the nominations, we progressed to the voting stage of the exercise with only readers, not manufacturer-associated personnel, qualifying to cast actual votes. To vote, readers had to quote their unique reader identification number from the label on their personal copy of the magazine. Because *Studio Sound* has a fully audited circulation, it was possible to weed out manufacturing-base 'infiltrators' attempting to influence the results. Nonqualifying votes, votes without unique reader registration numbers and duplicates were binned. Readers voted by fax, mail, or via an interactive form on the *Studio Sound* web-site at www.prostudio.com.

In each of the 15 categories, we have announced a winner and commended product —both judged by the *Studio Sound* readership, its editorial team and its contributors to be worthy of special recognition. Winners and commendeds received official SSAIRAs certificates and SSAIRAs logo artwork that they will be free to use on their letterheads and promotional material.

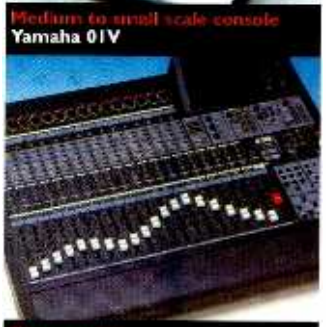
There will be no official recognition of products that have been nominated because of the nature of the nomination process.These are exclusive awards that aim to give praise only where praise is due.The SSAIRAs logo represents official recognition by the world's leading audio title. By definition this readership is sophisticated and knowledgeable and judged purely as a market research exercise, the results of the SSAIRAs are as strong an indication as you can get of the type of products that end-users want. Winners and commendeds are all judged to be doing something right.

The SSAIRAs presentation dinner will be held each year during the European AES Convention. ■

Low-cost console
Solid State Logic Axiom-MT

Commended
D&R Octagon

Medium to small scale console
Yamaha 01V



Commended
Panasonic WR-DA7

Special category
Akai S6000

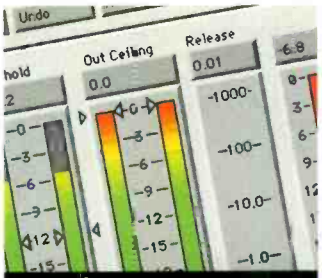
Outboard Processor
tc electronic Finalizer Express

Commended
Dolby DP569

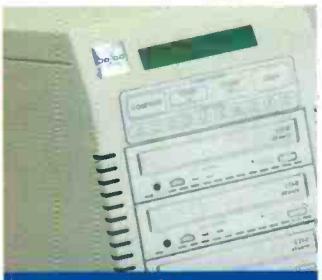
Commended
SPL Transient Designer

Outboard preamp
CLM Dynamics DB200S

Combined outboard device
Focusrite Platinum Voicemaster



Converters
Waves L2



Desktop duplication
Mediaform 5900

Commended
Neotek MicMax

Commended
Lexicon PCM 81

Commended
Lucid AD9624/DA9624

Commended
TrakData TraxCopier

Outboard equaliser
Manley Massive Passive stereo tube EQ

Monitors
Spendor SA300

Audio editor
Studio Audio & Video SADiE 24-96

Location portable equipment
Soncsax Stelladat II

Commended
BSS Opal DPR944

Commended
Studer A5

Commended
Roland VS1680

Commended
Filmtech LSP4

Outboard reverb
tc electronic M3000

Microphones
Brauer Valvet

Audio recorder
Tascam DA-45HR

Plug-ins
tc electronic Unity

Commended
Lexicon PCM91

Commended
Neumann TLM103

Commended
HHB CDR850

Commended
Waves Renaissance EQ

June

1–3
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Fax: +44 1628 667002.
Email: uk@aes.org

10–15
Montreux International Television Symposium and Exhibition
Montreux, Switzerland.
Contact: WHD PR.
Tel: +44 171 799 3100.
Email: news@whdpr.com
Net: www.montreux.ch/symposia

22-24
ICCE 1999: International Conference on Consumer Electronics
Los Angeles Airport Marriott, 5855 West Century Boulevard, Los Angeles, California, USA.
Contact: Diane D Williams, Institute of Electrical and Electronics Engineers.
Tel: +1 716 392 3862.
Email: d.williams@ieee.org
Net: www.icce.org

22-25
CommunicAsia 99
Singapore Expo, Singapore.
Contact: Overseas Exhibition Services.
Tel: +44 171 862 2080.
Email: singapore.oes@dail.pipex.com
Net: www.montnet

July

8–10
11th PALA 99
Singapore International Convention and Exhibition Centre (SICEC),
Contact: Ann Tan,
IIR Exhibitions.
Tel: +65 227 0688.
Email: ann@iirx.com.sg

26–28
Conference: Advanced A–D and D–A Conversion Techniques and their Applications
University of Strathclyde, Glasgow, UK.
Contact: ADDA99 Secretariat.
Tel: +44 171 344 5472.
Email: adda99@iee.org.uk
Net: www.iee.org.uk/Conf/

30–1
ABC 99
Rajah Muthiah and Rani Meyyamai Halls, Egmore, Chennia (Madras), India.
Contact: Exicom
Tel: +91 22 641 2519.
Fax: +91 22 641 2522
Email: exicom@bom.2.vsnl.net.in
Net: www.exicomindia.com

September

2–5
AES UK Conference: High Quality Audio Coding
Florence, Italy.
Contact: AES.
Tel: +44 1628 663725.
Fax: +44 1628 667002.
Email: uk@aes.org

5–8
Plasa 1999
Earls Court, London, UK.
Contact: P&O events.
Tel: +44 171 370 8228.
Email: sophie.matthews@eco.co.uk
Net: www.plasa.org

10–14
IBC 99
Bolkesjø Mountain Hotel, Amsterdam, Netherlands.
Contact: Gina Christison
Tel: +44 171 240 3839.
Email: show@ibc.org.uk
Net: www.ibc.org.uk/ibc/

23–26
Nordic Sound Symposium
Bolkesjø Mountain Hotel, Bolkesjø, Norway.
Contact: Richard Andersen
Tel: +47 67 54 14 83.
Email: riander@online.no

24–27
107th AES Convention
Jacob K Javits Convention Centre, New York, USA.
Contact: Chris Plunkett, AES.
Tel: +1 212 661 8528.
Email: 107th_exhibits@aes.org

October

8–17
Telecom 99
Palexpo, Geneva, Switzerland.
Tel: +41 22 730 5969.

November

2-3
24th Sound Broadcasting Equipment Show
NEC, Birmingham
Contact: Point Promotions.
Tel: +44 1398 323 700.
Email: info@pointproms.co.uk
Net: www.i-way.co.uk/~dmcv/sbes.htm

22-24
Messe Frankfurt
Trade exhibition and convention for audiovisual system installation
CMF, Ludwig-Erhard-Anlage
160327 Frankfurt
Contact: Metin Ergül
Tel: +49 69 7575 6130.
Email: metin.ergul@messefrankfurt.com

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- Vocal Specific Adaptive Lo-cut filter
- 96 kHz, 88.2 kHz, 48 kHz and 44.1 kHz compatible on digital and analog I/O's
- Wordclock Input for external clock synchronization
- Fully integrated industry standard connectivity: AES/EBU, S/PDIF & ADAT digital I/O's
- ADIOS™ (Analog Dual I/O's) configuration enables simultaneous recording of processed and un-processed vocal
- Full MIDI automation makes correlation to external reference-signal a breeze
- Audio-to-MIDI conversion allows tracking of correction history
- Easy Edit user interface with dedicated chromatic front panel controls and Alpha dial control
- High resolution display provides instant visual feedback of intonation and corrective action

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EMAIL: TCUK@TCELECTRONIC.COM • WEBSITE: WWW.TCELECTRONIC.COM

Damp squib

THE LOTTERY WINNER who wrote the letter in your April 1999 issue of *Studio Sound* is severely misguided in wanting to build a recording studio in a submarine. I speak from experience on the subject, after losing a great deal of money on a similar project in the boom years of the 1980s.

The studio project was to record several top 80s bands such as Wet Wet Wet and The Tubes, with Tony Hatch producing the albums. However we soon ran into problems with tape saturation, surface noise, and lack of headroom.

The sound from the monitors lacked depth, and the whole environment was definitely sub-standard. In fact it was a bit of a dive, and nobody could fathom out why it all went wrong.

Perry Scope, RN (submerged).

Stomach pains

I HAVE JUST received my April 1999 *Studio Sound* and must take issue with producer Ralph Holm-Meyde's letter; 'A Producer Replies'.

It is precisely because of enterprises like Holm-Meyde's productions that the location sound recordist, and I have been one for over 25 years here in Toronto, has no time for breakfast at home. We are asked to work 14 to 16 hours a day on a flat rate. Can he really expect us to have time to go home, make supper, grab 6 hours sleep and then make breakfast before returning to work? No! Most of us barely have time to drag our weary bodies out of bed, pack up our sound equipment and return to set in time for call.

If he doesn't have the budget to pay the crew more, then he would be well advised to allocate funds to provide the crew with coffee, snacks, crisps and biscuits not just for the afternoon but for the whole working day!

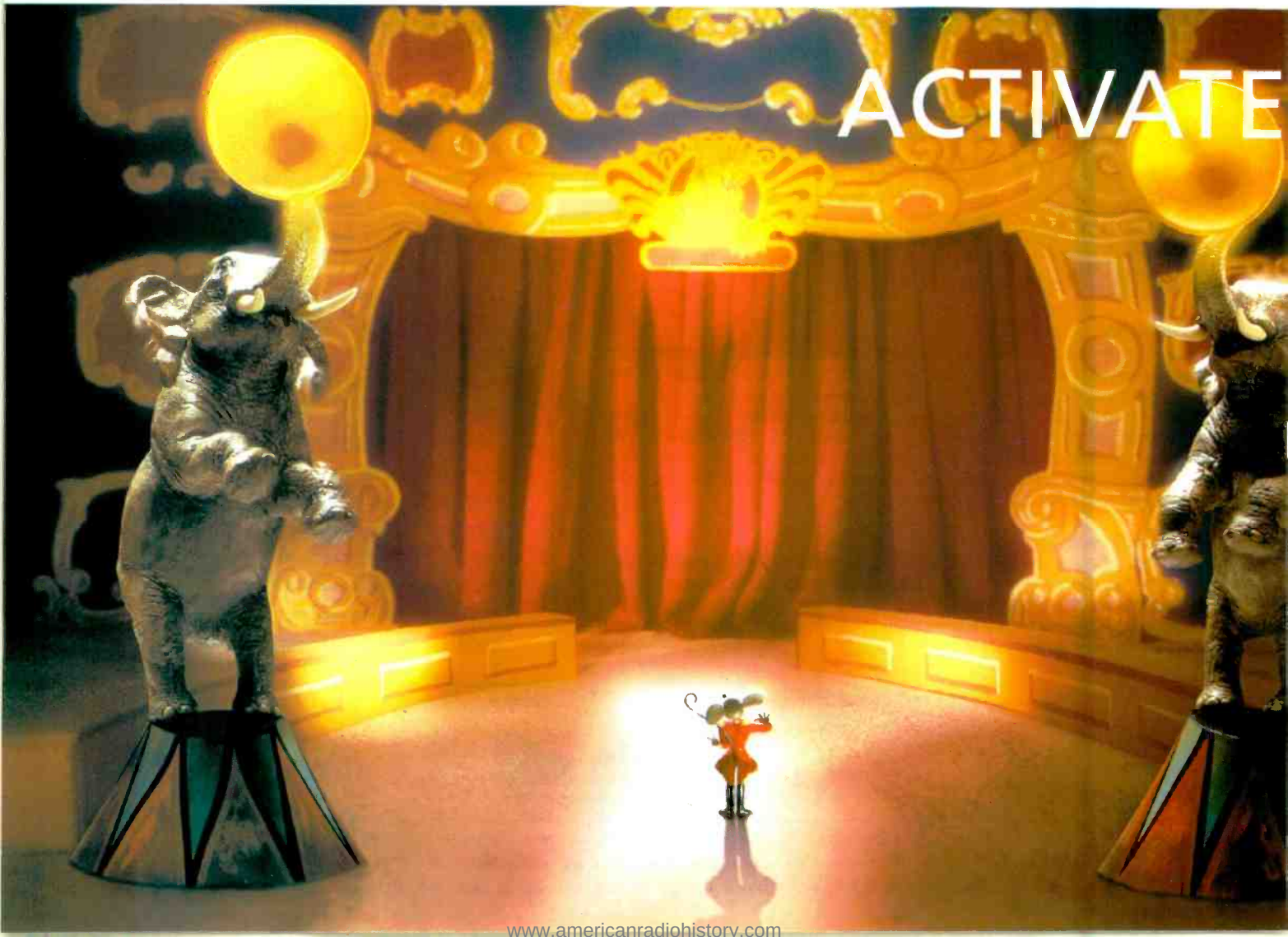
Just as an army marches on it's stomach, so does a film crew. I look forward one day to working on one of Ralph's productions so I too may enjoy Holm-Meyde biscuits.

Thomas Hidderley, SoundTeck Productions, Canada

Condensed history

PIETER BOLLEN'S ARTICLE 'Cupboard Love' (*Studio Sound*, April 1999) contains much good and interesting information. However, his coverage of developments in America is woefully incomplete. He mentions several manufacturers, but ignores Electro-Voice, which began making condenser and ribbon mics the 1920s. And, although he mentions Bell, Berliner and Edison, he leaves out EC Wente, the real father of the condenser mic, whose development work at Western Electric produced the first working model, made for measurement purposes, as well as the first ones to be used in radio, film and recording studios, starting in 1925. Wente's 394 condenser was a specified element of the first electrical disc recording system: the Victor Orthophonic.

I realise the article was not intended as a comprehensive history of the development of the microphone, but hopefully, someday, such a history will be



written, and will include an objective overview of all developments on both sides of the Atlantic (and Pacific).

Doug Pomeroy, Pomeroy Audio, New York, US.

Close call

I WAS EXTREMELY interested to read Simon Croft's article (*Studio Sound*, April 1999) on the use of miniature capsules inside stringed instruments as my firm specialises in manufacturing close-miking systems for acoustic musical instruments.

Simon raises some interesting issues with regard to placing miniature capsules inside an instrument—for instance, the question of resonant standing waves that are produced inside the cavity which will require selective equalisation. Furthermore capsules in this position are not only shielded from the monitor speakers, thus reducing feedback, but also from high-frequency sound waves radiated directly from the strings. These latter frequencies are important in the characteristic sound of stringed instruments and the soundboard is too heavy to reproduce them.

It is also of interest to note that a number of firms have attempted to make systems to mount inside flutes, but apparently without success, even beyer used to market a system with a very sophisticated technique incorporating a mica window covering the capsule, presumably to acoustically isolate it from the shock waves produced every time the keys are closed. This is now not available, presumably either because it was too expensive, or it did not work satisfactorily.

Our standard systems using omni-directional capsules are in regular use by many orchestras and smaller groups in TV broadcasts. Some 90 microphones are currently on hire with John Pellowe in Modena for Pavarotti's birthday and in Cardiff for the Welsh Assembly concert with Tom Jones and Shirley Bassey. Where ambient sound levels are such that even the use of feedback eliminators fails to cope with possible feedback, then it may be necessary to resort to the use of a special strip contact microphone that we manufacture. This was developed for the Stranglers' Albert Hall concert in June 1997 and is mounted on the body of the instrument by a special technique that does not damage in any way the varnish of even the highest quality instrument. Some of these are now on tour with Skunk Anansie. It is also possible to combine a capsule with a contact mic and if a Range SP 13 microphone preamplifier is used, the monitors can be fed from the contact mic and the front of house can be fed with a mix. By using the contact mic feedback does not occur until the sound board of the instrument is resonating and this will be at a very high sound-pressure level.

It is also possible, as many groups now do, to use in-ear monitoring, although this can be expensive and not all musicians like to use it.

Griff Jones, Accusound, UK.

COMPETITION

RUBY REWARDS

STUDIO SOUND'S 40TH ANNIVERSARY party continues with three prize AKG microphones seizing the spotlight. As you can see from the accompanying listing of equipment, many of pro-audio's top manufacturers have conspired to make the event a winner by building a one-off custom model. As a unique Studio Sound Ruby issue, every unit is destined to become a collector's item, not to mention being a talking point in your studio for years to come. In each issue of the magazine until the end of the year you will have the chance to win a further selection from the Studio Sound Ruby series. In this second installment, no less than three AKG mics are up for grabs—the 535, C1000S, and C3000 microphones. The 535 is the stage mic of choice for many professionals, the C1000S represents an update on the popular all-rounder while the C3000 represents the top of AKG's electret condenser line.

Studio Sound

ALL YOU HAVE to do to WIN these delectable AKG treasures is to correctly answer the questions below and say your magic word.

THE QUESTIONS

Q1 What do the initials AKG stand for?

Q2 List the three microphones in the order in which they were released.

Q3 Name any artist who has used the 535.

CLOSING DATE: FRIDAY 3RD SEPTEMBER 1999

TO ENTER, you can either email your answers to ruby.competition@unmf.com, fax them (to +44 171 407 7102) or send them on a postcard to Ruby Competition, *Studio Sound*, Miller Freeman Entertainment, 8 Montague Close, London SE1 9UR, UK.

As long as you are a registered *Studio Sound* reader you may enter any number of installments of the competition as long as you do so separately (multiple entries, as ever, will be treated with contempt—those of you who tried it on last month have not escaped our scrutiny), and ...

...induce your Unique Reader Identification Number.

The Unique Reader Identification Number is the 9-digit number located in the middle of the top row of your *Studio Sound* address label.

REWARDING RUBY PRIZES

AKG 535 stage condenser, C1000, and C3000 microphones

A&H 32-channel GS3000 console

CEDAR Series-X DHX Dehisser

Drawmer DS201 dual gate

EMO E520 Single DI box; E445 cable tester; E325 3-way mic splitter

Genelec 1029 monitors

Joemeek VC1 compressor

KT graphic DN-360 graphic

Marantz CDR640 CD recorder

TL Audio C1 Classic compressor

Purple Audio MC76 compressor

Ongoing thanks are due to all those who have so readily contributed equipment, time and advice in the preparation of this competition.

the installed DPC-II

Digital Production Console

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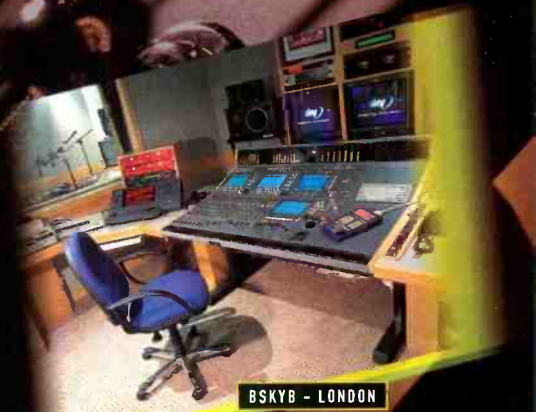
- 96kHz operation
- Stereo, LCRS, 5.1, 7.1



BSKYB - LONDON

ASTRALTECH - MONTREAL

M2 - LONDON

THE FARM - DUBLIN

SOUND LOUNGE - NEW YORK

POST PRODUCTION

MUSIC RECORDING

FILM SOUNDTRACK

THE WORLD'S LEADING FACILITIES ARE STAYING AHEAD..

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..staying ahead

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Digital Audio Research Storm; OMR-8

A change of ownership, a new overcoat and refined digital audio objectives have rejuvenated DAR. **Rob James** previews its next generation workstation

FOR THE BENEFIT of anyone who has not been reading the news section diligently, Digital Audio Research is now part of the huge Harman Group. This follows a period during which the company, previously in the Carlton portfolio, was owned by its founder, managing director Mike Parker.

This new development is reflected in new colour options for the big hardware console. Previously, DAR loosely followed Henry Ford's noted dictum in that you could have any colour you liked as long as it was either charcoal grey or dark blue and any touchscreen colour as long as it was orange. Consequently, the larger of the Storm control surfaces now sports an excellent, wide viewing angle, TFT colour screen and, apart from the range of colours and designs in the photographs, the console can be finished in almost any colour or design you can think of. Parker's justification for this exuberance is that it enables the controller to blend in with exotic studio designs. The designs and quality of finish now are reminiscent of the better examples of custom car artwork and we can look forward to seeing some seriously wacky designs over the next few months. Perhaps there should be a new award for 'most original artwork on a DAW'.

The new Storm workstation is both a departure and a logical development of what has gone before. Retained is the physical shape of the user-interfaces from the Soundstation and Sabre, but the core architecture is brand new. The orthogonal core design allows a data rate equivalent to over one thousand channels of audio. This is used between any combination of storage devices, network or real time I-O for recording, editing or project transfers. The DSP engine is also new enabling one card to carry the equivalent power of 16 of the earlier boards. The declared objective was to provide a single working environment with a consistent feel and quality across the full range of storage media.

A Storm system comes in 32 'track' increments. In other words, the entry-level systems can now handle 64 simultaneous audio streams at a time allowing crossfades limited only by the length of the audio clips.

Parker clearly regards Storm as a completely new editing platform, but one that retains strong links with its predecessors. In this respect, a lot of the code and a lot of the software is carried over from the earlier Genesis. The new hardware core facilitates machines with a minimum of 32 channels and up to 128 channels while new graphics provide powerful means of managing them. Like the OMR-8, Storm can show waveforms on tracks and give visible indications of fades. One of the things DAR has obviously realised is that, as soon as you are working with a large number of tracks, you have to provide versatile ways of moving through them. The old system had a maximum of 16 tracks, eight of which could display at any time, the remainder being paged to with a keypress. Storm's display is continuously expandable top and bottom, and scrollable. Parker is also happy to reveal that DAR is still playing with ideas like the marble-effect desktop.

> Improvements often appear on one platform then the other team find ways of making them better still. At the time of the SAM review I thought the networking impressive. Not because of the technology employed (100Mbit ethernet), but because of the thought that had obviously gone into how it would be used. This has developed further in the interim

Certainly, the scrolling is very smooth and the whole appearance of the screens is less industrial and easier on the eye than before. Waveforms can be displayed all the time if you wish. The machine also feels much faster in operation than its predecessors, a factor partly attributable the new processor board with its five Motorola 56303 DSP chips—as opposed to Analogue Devices SHARC chips.

The board does all the DSP processing for that and parametric EQ on all streams and it will have dynamics as well. It has the reserve power for it. Parker regards the Motorola chips to be more powerful, but more difficult to 'cement together' where the SHARCs bolt more or less straight together but use a lot of the silicon and the internal processing power to move stuff between them. DAR's choice was to use the more powerful chip, and then put in extra hardware to let numbers of them communicate effectively together. All this power is used to good effect already and it is reassuring to know there is more available for future developments such as dynamics processing. The parametric EQ not only sounds good, but has the highest Q, depth of boost and cut I have come across on a DAW outside of highly specialised plug-ins.

Storm will be available in two rack sizes. One will take two processor cards for a maximum of 64 channels and the other will take four for the full 128 channels. It also has more space for physical I-O than Genesis as one of the things DAR's R&D has established is that the provision of a lot of tracks does not necessarily create the requirement for a lot of outputs because it can be counter-productive to have to route large numbers of outputs around. What is required instead is sufficient busing—giving a different internal structure of machine. Rather than having a purely track-based editing machine that goes one-to-one with desk inputs, you have say 12 bus outputs, and a 32:12 bus structure, and take the resulting 12 outputs to a desk.

A lot of the clever stuff will be largely invisible to the users, except, perhaps, the increased speed. For example, if the user is auditioning sounds on a remote disk before physically copying the audio to the local drive, Storm checks to make sure it does not already have it. Every recording is automatically stamped with a unique identity label. This is absolutely essential, as others have discovered, to avoid unpleasantnesses when you have access to many machines—think how many bits of audio there must be labelled 'dialogue take 1' or 'wild track birdies'.

The last DAR product reviewed, the Scalable Audio Multitrack (*Studio Sound*, August 1998) gave some insight into where the company was heading and Mike Parker and his team have been far from idle in the intervening period. The OMR-8 now has the promised editing facilities and no conversion process will be required when moving material to and from Storm systems. Sophisticated CD writing software has been developed and the already good graphics further improved. Apparently there is (mostly) good-hearted competition between the Windows design team on

the OMR-8 and the RMX-based Storm team to come up with the most innovative and useful features and the prettiest graphics. Mike Parker sees this as healthy and a way of pushing ideas forward as the teams try to outdo one another.

'We now offer a lot of tracks in one box with Storm or a lot of tracks, but still with sample accurate sync, distributed over several OMR-8 units. The choice is simply down to which is more appropriate for the user's particular situation'.

Improvements often appear on one platform then the other team find ways of making them better still. At the time of the SAM review I thought the networking impressive. Not because of the technology employed (100Mbit ethernet), but because of the thought that had obviously gone into how it would be used. This has developed further in the interim. Genesis allows reels from several storage devices to be used in the same playsheet with crossfades between them if required. The network is rightly seen as essentially a means of auditioning material in real time without copying to local storage and as a non-real-time transfer medium. Similarly it is possible to play CDs as if they were on optical or hard disk. Once material is selected, copying to local is done at several times faster than real time. Additionally, 16-bit and 24-bit material may be freely mixed for auditioning purposes—for a CD, sample-rate conversion is done 'on the fly'. If the material is copied to local storage a higher quality conversion is performed, transparent to the user, while the copy is taking place.

The good news for existing users is that upgrades from Genesis to Storm are available and will be less problematic than those experienced by people moving onto Genesis in the first place. According to Mike Parker, the take-up is already high. 'It's the most sought after upgrade I have ever known,' he comments. 'We have orders for it, we have people desperate for it, and the reason is it is such a tangible gain. If you have an 8-track or 16-track machine and we take it away and return it with a 32 or 64 tracks, that is something the clients can see and will be aware of. People have got to the stage where they need that now.'

Since Storm uses the Genesis platform no conversions will be required. The hardware upgrade does involve returning equipment to the factory, but it should be pain free.

The real story is this—in the early days of the DAW, off-the-shelf PC hardware and software was not powerful enough to be useful. Designers were therefore obliged to come up with ingenious and often expensive proprietary solutions to get the required performance. However, mainstream PC hardware has developed at a meteoric rate and it is now at the point where it would seem perverse to design a DAW without making use of it.

The same applies to file formats. The Microsoft-IBM WAV format is now almost universal outside the Mac arena. This is not to say PC technology is ideal for all aspects of DAW design, but the .WAV file format has been extended into BWAV (Broadcast WAV) and the putative AES 'standard' to cover present and future needs. PC hardware is now fast enough to cope with the data storage and handling requirements. DSP and the user-interface are different matters. For DAR the process began with the introduction of the Genesis Platform. The OMR-8 was their Trojan Horse providing essential practical experience of PC hardware. Now the trick is being repeated with the Storm, culminating in a modern state of the art DAW.

Mike Parker's DAR appears to have a clear vision of where the market is going and a good, pragmatic understanding of real-world production processes. With the unique choice of touchscreen hardware console or small console and mouse-driven interface I think this is the most exciting range of workstations and, above all, complete multi-user solutions I have seen in a very long time. If the promise is fulfilled it should do very well in a wide variety of applications.

The pricing of the new systems can only be described as 'aggressive'. Particularly when you consider one of the early 4-track machines would have cost you around £75,000 (UK). This has been achieved by the economies of scale in producing in greater volume, and by the use of computing industry standard parts where appropriate. The new pricing strategy is designed to put DAR systems in front of operators for whom the company's equipment has been out of reach.

Storm takes DAR confidently into the next millennium. It is a great deal more than a simple upgrade to an existing machine. I think the company has managed the incredibly difficult trick of reinventing a range of established equipment while retaining the best features of the earlier range, thus keeping the faith with existing users. It has also managed to navigate its way through a stormy sea that would have sunk many others. ■

Contact

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2 Silverglade Business Park,
Leatherhead Road, Chessington,
Surrey KT9 2QL, UK.
Tel: +44 1372 742848.
Fax: +44 1372 743532.
Net: www.dar.uk.com

REVIEW

Filmtech LSP4

With a well-established place in a well-defined application, a genuinely new location mixer is a rare treat. **Neil Hillman** shoulders Filmtech's latest 4-channel location mixer

THE SAD TALE of the professor who cloned himself, but found that his new version would only shout obscenities, is a salutary lesson for all audio manufacturers seeking to emulate rival products with their own. Such was the disruption caused by his copy, that the professor had no option other than to kill the clone; which he did by pushing him over the white cliffs of Dover. Unfortunately for the professor, the presiding judge at the subsequent murder trial was unsympathetic, and sentenced the academic to life imprisonment for the heinous crime of making an obscene clone-fall. Which just goes to show how careful you must be when creating a 4-channel location mixer.

Filmtech, with the Location Sound Processor 4, has steered well clear of any accusations of plagiarism through some unique features arranged in a highly original fashion. The LSP4 is a 4-channel portable mixer with several features in addition to the usual facilities on this type of mixer. Slightly larger than some of the other units on the market and with a design philosophy that sees many of the controls on the front panel for ease of use, the unit is built into an aluminium enclosure that ensures that the mixer is robust enough to cope with the harshest of treatments on the road.

The Filmtech LSP4 stands head-to-head with the Audio Developments AD261 and the SQN 4-S; these being the main rivals for the now surely defunct title Industry Standard. With the freelance nature of the television industry in Britain, recordists that perhaps previously worked for large organisations that supplied time and again the same mixer, are now choosing very carefully indeed where they place their hard-earned cash; and what went before is now no longer necessarily a recordist's first choice.

The four inputs are on female XLR sockets, mounted in line across the full width of the left-hand side panel, with Channel 1 furthest away from the operator. The inputs are transformer balanced with an input attenuator knob mounted directly above each XLR socket to allow selection between Mic (at -80dB), -15dB, -30dB and Line. The input impedance is given as being greater than 1.5kΩ for the microphone stage and 10kΩ for the line input. Above each attenuator knob is a MIC POWER 3-position toggle-switch that selects between T12 Tonader power, Off and P48 phantom power for each input respectively. In between the XLR sockets for Channels 1 & 2, and 3 & 4 is a toggle-switch that changes the phase of Channels 2 & 4 between Normal and Reversed for M+S operation when a pole operator chooses to switch between working from above with a stereo mic to underneath.

The Filmtech LSP4 stands head-to-head with the Audio Developments AD261 and the SQN 4-S; these being the main rivals for the now surely defunct title Industry Standard

The front face of the mixer has been designed with the operator very much in mind. Furthest left is a row of three pots, the top two being the main outputs, the second of which may be turned fully anticlockwise to 'gang' the outputs.

Below these is the headphone monitor level pot. As with the SQN, the two PPMs are on the left of this face. Below the two meters are the switches for Power—a 3-position switch offering Internal, Off and External sources. The internal cells are designed to be a stop-gap while an NP-1 type battery or similar is plugged-in to the external socket. The current consumption appears to bear this out by having only about 20 minutes of life from the internal cells when running at full load. This is certainly much higher than the meagre consumption of the SQN, or even the Audio Developments AD261. A Battery warning LED illuminates when the voltage falls to 10V, a default figure that may be factory adjusted. Alongside the battery warning LED and still underneath the meters are the toggle switches for Slate mic off/Meter Lamp; Tone —either Continuous 1kHz for mono/off/or a broken left leg for Stereo; Limiter—Off or On and next to this a Limiter-Link —again allowing either Off or On. The monitor strip runs down the side of the second meter, with the rotary selector switching between Mono, Stereo, M+S and LR which by means of a further toggle-switch puts either the left or right output into both sides of the recordist's cans. Below the selector is the grille for the slate microphone and the toggle-switch that enables the recordist to monitor the outputs either directly or off-tape while recording. Each individual channel has its own rotary routeing selector that makes the output of that channel either Off, Left, Left + Right, Right, Mono or Pan—where a further, smaller knob alongside the router places the signal in to the stereo image. The rotary channel fader is set just below the routeing and pan knobs, and Channels 2 & 4 may >

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valve warmth

users

C-1
dual valve compressor

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PA-1
dual pentode valve preamp

Each Valve Classics product now utilises US General Electric military specification ECC83 valves running at 250v DC for an even smoother, fatter sound - and the combination of tough steel chassis, 6mm milled aluminium front panel and gold plated ceramic valve bases means the units positively relish being bounced from one session or concert to the next.

EQ-2
dual parametric valve equaliser

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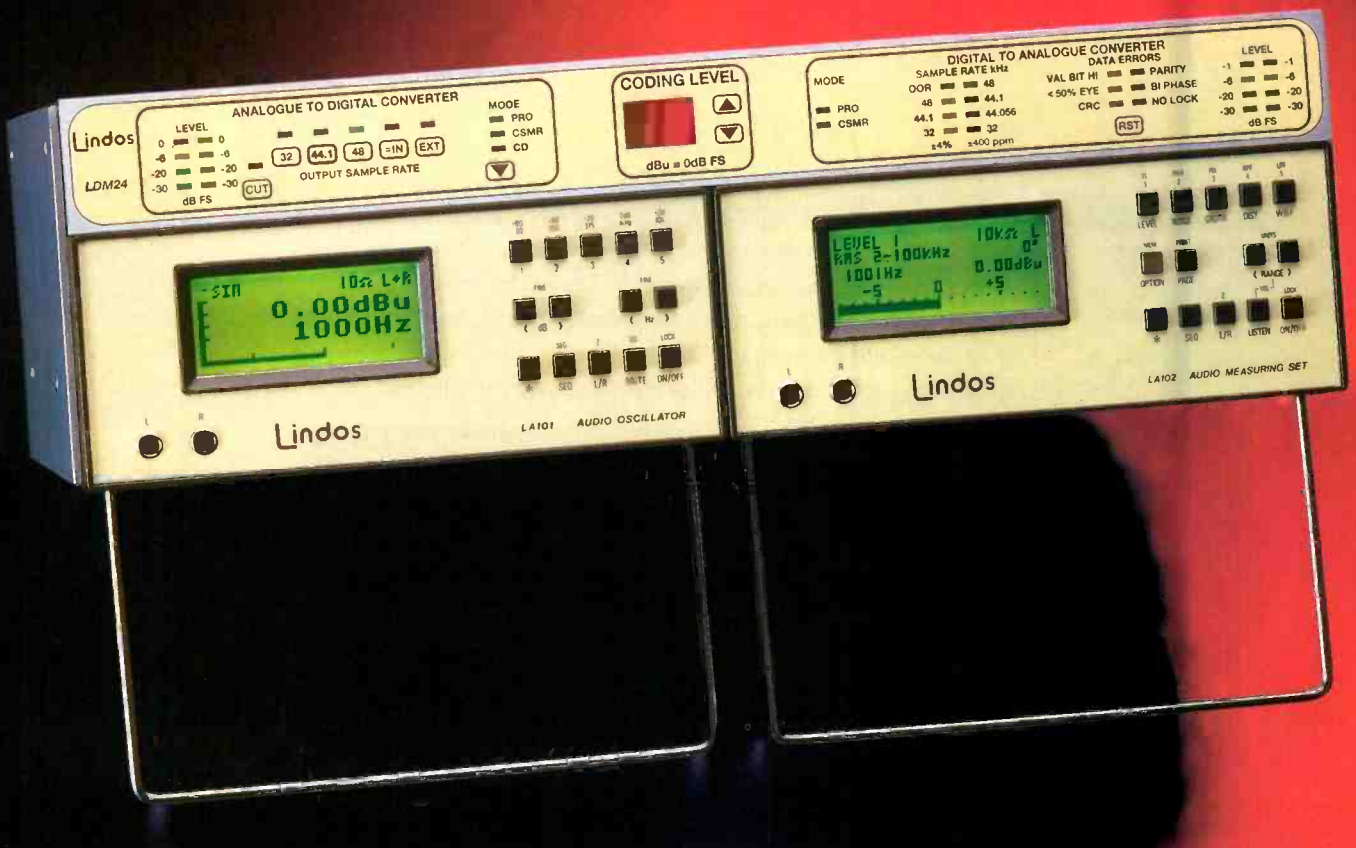

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After fade listen is provided for all four channels, acting as a 'solo' function by selecting the output of one particular channel to the headphones; they are 'solo-safe' too, so a hole is not punched into the mix by selection of the AFL

be turned fully anticlockwise to the Gang position where from then on either Channels 1 or 3 control the gain of their respective gang-pair. Below each of the channel's rotary gain pots, is the 3-position LF Cut switch offering 6dB/octave slope filters rolling over at either 60Hz, 180Hz, or flat. After fade listen is provided for all four channels, acting as a 'solo' function by selecting the output of one particular channel to the headphones; they are 'solo-safe' too, so a hole is not punched into the mix by selection of the AFL.

The right-hand side panel of the mixer is positively awash with input and output connections, neatly and logically positioned. From left to right—nearest to the operator—are the monitor headphone sockets available on a 3.5mm socket above a ¼-inch socket. Next to the smaller headphone socket are the main Left and Right outputs, transformer balanced, on male XLR connectors. These outputs are also available on a conventional 10-pole Hirose socket, labelled MULTI.1 and mounted alongside the XLRs. Both the XLR outputs and the Hirose multi-way may be switched between line and mic (-50dB), by means of two recessed switches, actuated by a small screwdriver or similar in the top face; or a factory set modification can keep the Hirose multiway at line-level while the attenuator switches affect only the XLR outputs. Directly below the 10-pole Hirose socket is a 12-pole Hirose socket—labelled unsurprisingly as MULTI.2—that carries the electronically balanced clean feed from each channel. Also available on this panel is a stereo unbalanced line output on a 3-pole Lemo connector, a mono unbalanced microphone level output on a 2-pole Lemo connector, a 5-pin Lemo connector to cascade two mixers together and a 6-pole Lemo connector for the boom-pole handle mounted '1/2 Remote' gain control of Channels 1 & 2. This is actually a parallel of the main gain controls for Channels 1 & 2, so that with the rotary fader 2 in the Gang position, the remote fader 1 controls the level of both Channels 1 & 2—all while the operator's arms remain comfortably above their head as they operate the boom microphone. Two further controls inhabit this right-hand panel—the preset pot to adjust the tape return level is set beneath the 4-pin Power in Cannon plug accepting 10–18V DC, and the toggle-switch that enables the Output MS matrix. What puzzled me somewhat was why this matrix was inserted after the line-up oscillator which, in accordance with the handbook, meant that I had to keep switching the matrix out every time I offered line-up tone to a camcorder while recording in M+S mode, unless I wanted to send M+S encoded tone; an inconvenience at best—a fundamental error if forgotten to reset at worst.

I lied about all controls being available while the mixer is being worn—Harry Houdini might well have managed to contort sufficiently to reach the bottom face of the device and connect into the 12-pole female multiway socket that accepts the optional fader module of four long-throw faders working in parallel with the rotary faders on the mixer itself, but it is unlikely that this would be used except on a trolley. Also sited in this bottom face are the two nicely engineered pull out cartridges that each accept four 1.5V AA emergency cells.

Contact
Filmtech TFE, UK.
Tel: +44 1222 342907.
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This is a serious mixer, with many nice touches like the ability to use the long-throw fader module and a boom-mounted gain control. What I did find irritating though was getting my fingers stuck in between the channel gain knobs and the routeing pots, too light ganging switches which are easily dislodged, resetting the M+S encoder each time we lined-up a new tape in the camera and the non-brickwall nature of the limiter that required care not to be driven too hard.

Overall these are minor quibbles that might well be forgiven as idiosyncrasies after some time together. It would be fair to say that its simple looks are deceptive—for this a wolf in a non-cloned sheep's clothing. ■

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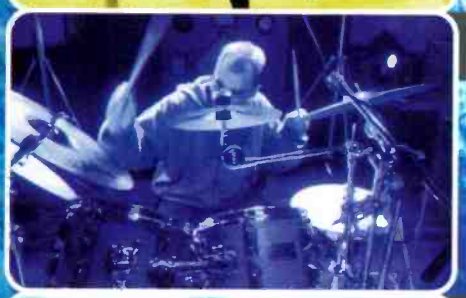

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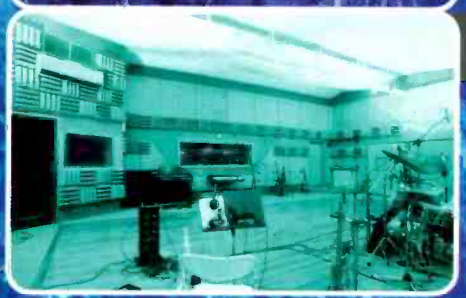

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Bryston 4B ST

Introducing Studio Sound's regular amplifier bench tests, **Paul Miller** assesses Bryston's 4B ST

FEW COMPANIES attempt to straddle domestic and professional markets with, ostensibly, the same products, but Bryston is one of the more successful examples. Bryston sees itself as a purist company, catering for the sonic expectations of the hi-fi market while maintaining the rugged build and bomb-proof reliability demanded by the professional sector. It is distributed in the UK through PMC Ltd who implement Bryston's 20-year warranty. By all accounts, its most popular product is the 4B ST power amplifier, a '250W' model that's sandwiched between the budget 3B and rather more substantial 7B/8B models. And at just £1,495 (UK, ex-VAT), the 4B clearly services an important sector of the pro market.

A 17-inch domestic version is provided without handles while the Professional iteration of the 4B is distinguished by two silver trimpots mounted alongside a pair of dual-colour LEDs on the fascia. The latter flash red if the amp is driven hard into clipping (they remained resolutely 'green' during my power tests to 1% THD) while the former are provided to trim gain and balance. Turned fully >

Power Amplifier: Bryston 4B ST (Rated Spec. in brackets where given):

	20Hz	1kHz	20kHz
Max Continuous Power Output,			
1% THD into 8ohm (one channel)	300W	305W	275W
1% THD into 8ohm (two channels)	295W	300W (250W)	270W
1% THD into 4ohm (two channels)	425W	430W (400W)	400W
Frequency Response @ 0dBW	0.0dB	0.0dB	-0.1dB
Dynamic Headroom (IHF)		+1.0dB	
Maximum Current (5msec, 1% THD)		29.6A	
Output Impedance	0.0137ohm		
Damping Factor	583.6 (>500)		
Unbalanced Input			
Stereo Separation (1kHz)	89dB		
(20kHz)	74dB		
Channel Balance, 1kHz (0dBW)	0.04dB		
Total Harmonic Distortion			
(0dBW, 1kHz/20kHz)	-97dB / -89dB		
(2/3 power, 1kHz/20kHz)	-99dB / -90dB (-95dB / -90dB)		

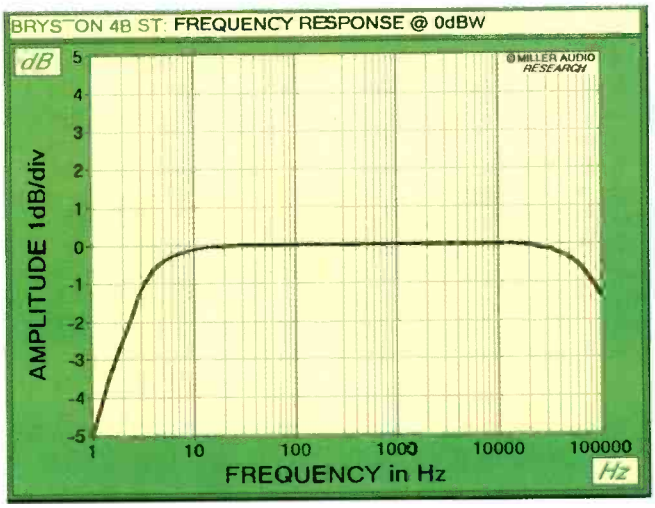

Fig.1: Frequency response

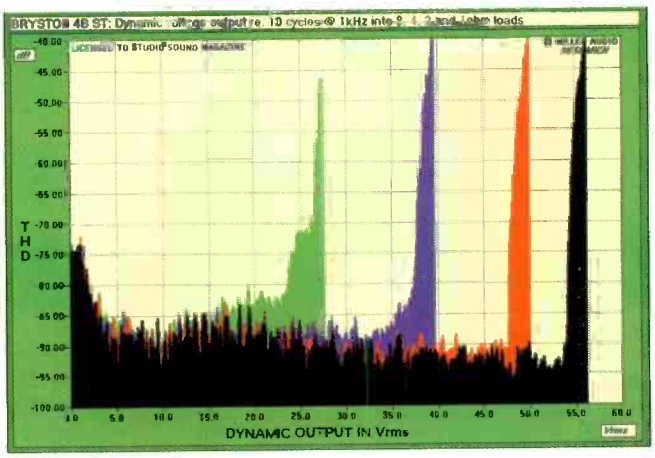

Fig.2: Dynamic voltage output

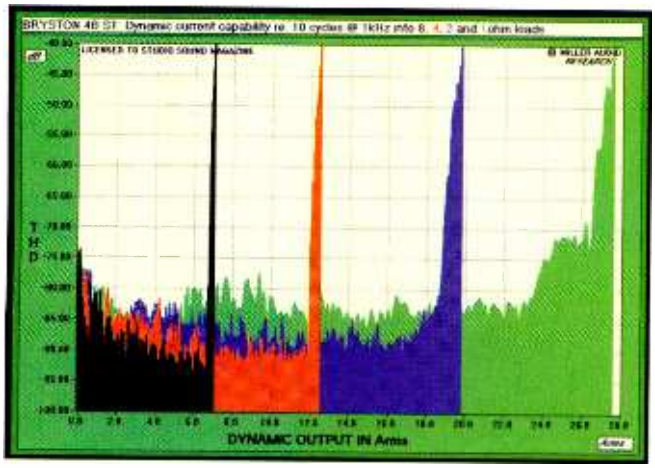

Fig.3: Dynamic current capability

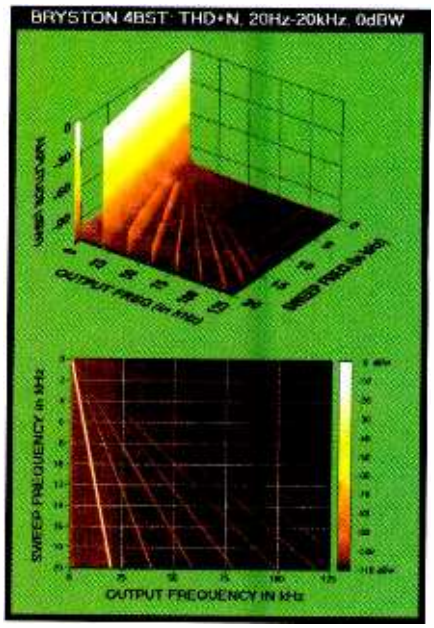

Fig.4: THD+N

< clockwise, the 4B's full +29.3dB of gain is realised, falling to +16dB if the pots are reversed anticlockwise. This trim is independent of whether the unbalanced (RCA) or balanced (Neutrik) inputs are deployed. The 4B is also available in a 'THX version' that features remote power-up triggering. This might be employed to stagger the switch-on times of a multi-unit 4B rack, for example.

Bryston uses a dual-mono construction, right down to the use of separate toroidal mains transformers for each channel and, indeed, the 'sag' from 305W to 300W (one channel versus two channels/8Ω) is minimal. This said, a stereo separation of 74dB (re. 20kHz), while perfectly adequate, still implies a degree of coupling somewhere along the line. Meanwhile, the two-channel 4Ω power output is equally generous at 430W, clearly besting its 400W rating. Do note, however, that full power at 20kHz drops by 0.9dB (8Ω) and 0.6dB (4Ω) though its *response* (Fig.1) stretches from 3Hz–80kHz (-1dB) at a nominal 0dBW (1W/8Ω). Incidentally, where available I have noted Bryston's own specification in brackets alongside its measured performance through the Test Table. In all respects, save input sensitivity, the 4B is seen to meet or exceed its minimum performance levels.

Under dynamic conditions, the 4B is capable of sustaining 395W, 625W, 784W (19.8A) and 762W (27.6A) into 8Ω, 4Ω, 2Ω and 1Ω loads, respectively, with one channel driven. Into 8Ω, this is equivalent to an 1HF headroom of +1.0dB. The *voltage* profile (Fig.2) provides a measure of the 4B's load tolerance. In a perfect world, the 56Vrms output achieved across 8Ω (black trace) would be sustained across 4Ω, 2Ω and 1Ω (red, blue and green traces, respectively). The gradual relaxation in voltage witnessed here is preferable to an abrupt collapse in the regulation of the PSU into 2Ω or 1Ω.

This is further reflected in the almost uniform increase in current available into 8Ω, 4Ω, 2Ω and 1Ω loads (Fig. 3, black, red, blue and green traces, respectively). The 28A maximum (29.6A over 5ms) is comfortably accommodated by Bryston's quad-complementary output stage, comprising some eight TO3-style bipolar devices per channel mounted on 3200cm² of heatsinking. As a result, there's no need for internal fan cooling nor, if the amplifier is mounted in a 19-inch rack bay, is it strictly necessary to use external air-conditioning. Control cupboards might be a different issue, however. Otherwise, and aside from an excusable loss in composure above 24Arms, the highly consistent distortion profile of the 4B demonstrates little or no progressive VI-limiting. This, together with the low 0.014Ω output impedance, suggests the 4B will behave very consistently with all manner of speaker loads, assuming a decent gauge of cable is employed.

Distortion, too, remains exceptionally low under these taxing conditions and is very close to the limit of measurement (~-90dB) using a Short-Term Fourier Transform and just 10ms of data! Under *continuous* conditions, THD hovers around 0.0013% midband and 0.003% at HF across 90% of the amplifier's dynamic range. The increase from mid-to-high frequencies is visible on the 3D plot (Fig.4) beyond 5kHz, but is primarily composed of innocuous 2nd and 3rd harmonics. The higher 4th–9th harmonics are indicative of crossover distortion, but, at typically <0.001%, are of little issue. Indeed, Bryston prides itself on the linearity of its amplifiers, specifying IM products at <0.0009%. This is confirmed by Fig.5 where both 2nd-order (1kHz) and 3rd-order (18kHz and 21kHz) products are at or below -100dB.

Fig.5 also highlights some PSU residual (an earth-lift is provided), but the A-wtd S/N ratio of 88.6dB (re 0dBW) is still 1dB or 2dB above average for a product in this class. Relative to two-thirds output, a figure of 110dB suggests the 4B will not prove the limiting noise factor in a typical rig! All in all, the Bryston 4B ST emerges with a clean bill of health—a powerful, value-oriented amplifier with no significant flaws and, significantly, the reassurance of a 20-year warranty. ■

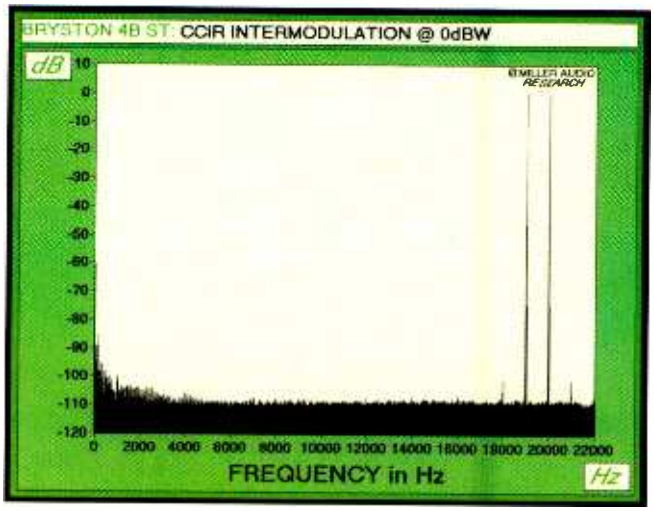

Fig.5: CCIR intermodulation

Total Harmonic Distortion	
(0dBW, 1kHz/20kHz)	-97dB / -89dB
(2/3 power, 1kHz/20kHz)	-99dB / -90dB
CCIR Intermodulation Distortion	
(0dBW)	-100dB
(2/3 power)	-103dB
Noise (A wtd, re 0dBW)	-88.6dB
(re 2/3 power)	-110.0dB
Residual noise (unwtd)	-75.4dBV
Input Sensitivity (for 0dBW)	97mV
(for full output)	1706mV
Input loading	49kohm / 20pF
DC offset, left/right	+2mV / +4mV
Serial Number	448225
Retail Price	£1495 (ex-VAT)

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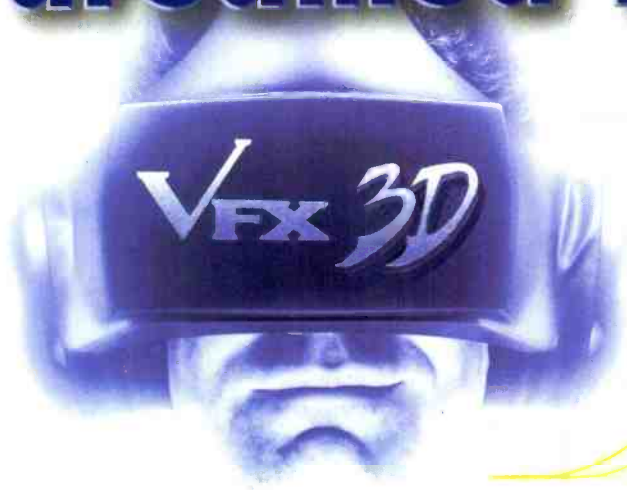

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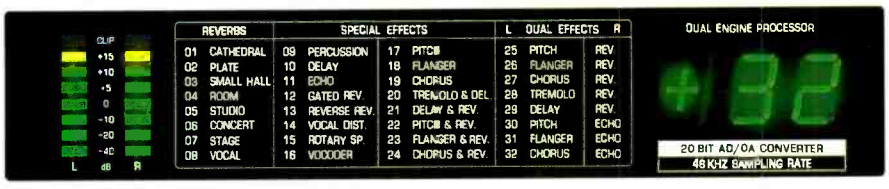

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Martinsound MultiMAX

The advent of practical surround-sound working has prompted the launch of numerous multiformat monitor control systems. **Rob James** checks MultiMAX

SURROUND IS HERE to stay. Any movie intended for mass distribution is now produced in one or more flavours of surround encoding, and television is not too far behind. With glimmers of hope for agreement on a standard or standards for DVD-Audio, surround is unlikely to go away this time. Any sound studio looking to a profitable future should be taking notice.

Despite the availability of relatively low-priced mixers and recorders capable of working in surround, to date none of these adequately solve the problem of monitoring. The Martinsound MultiMAX directly addresses this inadequacy. It is intended to be a one-stop solution to the problems posed by the increasingly complex monitoring, routeing and encoder-decoder requirements for surround mixing. In particular, in the context of adding these capabilities to existing music consoles, Martinsound has a good deal of experience in custom film monitoring systems, even manufacturing a recordist's monitor unit(Sound Camera).

MultiMAX was developed by a division of the company with a name that may be rather more familiar to some, Neotek. Neotek was acquired by Martinsound in 1987, and has a considerable reputation as a console manufacturer. The Encore film console and the Elite and Elan designs spring to mind.

This combination of expertise has resulted in a somewhat different monitor control product from the burgeoning competition. MultiMAX is built into a 1U-high rackmounting system unit with an optional compact remote control panel. The main unit has more audio I-O than I have ever seen in 1U. This is achieved by the liberal use of sub-D 25-pin connectors, 12 of them. The multichannel I-Os, WIDE in MultiMAX parlance, follow the Tascam wiring conventions. Other I-Os will require custom cables or patching. A 9-pin sub-D connects data and power to the remote. A combined IEC mains socket and switch unit completes the socketry.

A couple of cautions. Firstly, with this many multicore connections, the heavy external cabling will require some proper support to avoid bending the rack-mount ears or worse and secondly, at least in my setup, switching the unit on with the monitors already powered produces very big splats.

The appearance of the front panel and the remote is an interesting departure from the majority of pro-audio kit and I do not simply refer to the colour scheme. Martinsound has eschewed the garish in favour of a light grey, monochrome approach. The only colour comes from the internal illumination of the small square switches and the pale green glow of the LCD.

The most unusual aspect is the buttons on the remote which are mounted almost flush with the panel. With one exception, the controls on the remote exactly duplicate the front panel. On the remote there are two rotary encoders, on the main unit only one. The extra one is dedicated to production audio level while the other, apart from normal duties controlling main monitoring level, is used for adjusting the various trim levels and selection of setup parameters. The controls are loosely divided into six sections. These divisions are indicated by the panel graphics that also use arrows to give some indication of signal flow. The WIDE inputs block is a unity gain mixer for five inputs, each up to 8 channels wide depending on the chosen format. Any or all of Premix Inputs 1, 2 and 3 may be combined with either Direct or Playback which toggle. The Premix inputs would be particularly useful when versioning, (producing alternative or foreign language versions of previously completed material) The DIR-PB key adds whichever is selected to the chosen Premix

inputs. This nomenclature is a source of potential confusion if you do not read the manual. Depending on the particular application, this may not necessarily be the place where you do PEC-Direct (tape-source) switching.

The output of this block directly feeds the WIDE sends external output connector that would typically be used as the source for an encoder-decoder such as Dolby Digital, DTS or SDDS. It also feeds the 4:2:4 sends connector using downmixing parameters. This, as the name implies, is used as the source for a Dolby Surround or Ultra Stereo encoder-decoder. The output of the WIDE inputs block also appears as an input in the Monitor Source area. The top row of four keys deals with direct sources, and the bottom row returns. WIDE Input mix is above WIDE Return. The WIDE Return is used to return the output of an external processor or as a replay return from a recorder. So this pairing can also be used for PEC-Direct switching.

The other direct source options are Downmix, Mono and Console. The first two are derived from the WIDE Inputs mix and the last is an external input for the mixing consoles monitor outputs in either stereo or LCRS formats. On the bottom row the remaining alternatives are Stereo Return which picks up an external input, for example the Lt and Rt (Left total and Right total) outputs of an external decoder; Mono which is simply the stereo return summed, and Production. This is a further reference-only external input that may be added to the monitor source. The Monitor System block selects which speaker system or combination of systems will be used.

MAIN FRONT-ALT selects between the primary wide format front speakers. This might be used for two different sets of house speakers or if a visiting engineer prefers to bring their own LCR monitors. Surround and 'Inners in 7.1 formats remain the same, however it is possible to invoke another set of surrounds with the ALT LS-RS key. This allows for the alternative point source and diffuse surrounds specified by different proprietary encoding systems. The other options are a close-field stereo pair and a SMALL MONO option that might be used to check sound on a internal TV speaker. The SOURCE ON section provides keys that select and indicate the monitor status of channels of the Monitor Source. In effect these are used as individual speaker mutes, but it is important to realise that here they act on sources to avoid interfering with the bass redirection functions. The function of these channel keys is changed to solo with the SOLO MODE key.

All gain control is carried out by DCAs (Digitally Controlled Attenuators) which are >

< physically controlled by the rotary encoder on the system unit or the two encoders on the remote along with the MUTE and DIM keys.

The final section is where the fun starts. Pressing ENTER opens the Setup Directory on the clear, backlit LCD. Navigation and selection are achieved with a combination of repeated presses of the ENTER key and the main rotary encoder which functions as a selector once a menu is entered. EXIT takes you back to the normal operational display. Given the number of possible parameters this works reasonably well, although there are occasional confusions until sufficient familiarity is gained.

Top level options cover Formats, Downmix parameters, LFE filter, Bass Redirection Main and ALT, Trim, External Control parameters, Other and Noise. Formats enables the WIDE Inputs, WIDE Return and Main monitors to be set to the required format(s) —7.1, 5.1 or LCRS. Additionally the surrounds may be set level or to the film industry -3dB standard. This attenuation is used because the surround information is typically low level and dropping the surround monitor level results in a hotter level to tape and thus reduced noise. Downmix and 4:2:4 send levels are automatically compensated when this option is chosen. The pink-noise generator is a useful feature. There is also a BP bandpass filtered option with 500Hz and 3kHz cutoff level corrected to help set up limited bandwidth speakers. Obviously not the subwoofers. The noise is applied to the WIDE sends, the 4:2:4 and Downmix outputs to help check continuity and alignment. The pink and BP filtered noise are also two of the three source options used in conjunction with Trim to align the speaker outputs to an accuracy of 0.1dB. This is also the means of calibrating the SPL read-out.

Alternatively, the external inputs may be used to source noise from a console or tape machine. To protect ears, sanity and speakers, MUTE and DIM are automatically engaged when noise is applied to the outputs and should be defeated with caution... Downmix level options mirror those allowed in DVD production. Centre may be set to -3dB, -4.5dB, -6dB or Off and surround to -3dB or -6dB. Similarly the LFE Filter option is set at 80Hz to simulate the '.1' filtering which occurs in some bitstream compression encoders. External Control sets the options for control over Mute, Dim and Solo. Dim and Mute are self-explanatory, but Solo is a little more complex. In this context Solo means an external Solo command will force the unit to switch its monitor source to Console in either LCRS or Mono downmixed modes. Although this is fine if you have a 4-bus console it might prove limiting with an 8-bus. I would have liked to have seen provision for external PEC-Direct switching. The enigmatically named 'Other' parameters are display contrast, DIM level and Production level. These may also be adjusted from the panel without using the menus by turning the knob while pressing and holding the relevant key. DIM level ranges from -5dB to -30dB. Bass Redirection allows for monitor systems without full range speakers and for checking the effect of decoder bass redirection on systems with satellite speakers which cannot handle full range audio. Bass is redirected to other speakers that can cope—small surrounds may have the bass redirected to the LR fronts or the sub.

The display—which is identical on the main unit and remote—is large enough to provide a graphic showing the format of the WIDE inputs and both a numeric and graphical read- out of main and production SPL.

Unlike the units I have previously seen, MultiMax also provides an eight wide meter output. This is not, of course, affected by the speaker trim controls, but does follow the source switching. In an ideal world, you would have the same switching options for metering as for speakers, but under independent control. However, this would probably result in the cost of the unit becoming unrealistic. As it is, this provision is most welcome.

The MultiMAX approach is rather different from the other multichannel monitor processors. It offers the means to extend monitor and control of sources considerably beyond the capabilities of the consoles it is likely to be partnered with. The downmixing options are particularly comprehensive and allow for all the current surround formats.

If there is a downside it is in the way some of this is presented. The menu system is not bad, yet could be better. I am aware of the argument that says 'speaker amps should always be powered up last', but after consulting a number of practitioners the verdict was unanimous; powering up a monitor unit should not produce big splats on the speakers. MultiMAX wakes up with Direct and Console selected. I would rather have it in the state it was when turned off—with one exception, it should always wake up with the output muted. The PEC-Direct switching can be somewhat confusing. I think this arises precisely because the unit offers rather more than some of the competition, but also because it seems to be aimed particularly at consoles with a restricted number of buses—the Console input is only four channels wide (LCRS). For example, if you are using an 8-bus console with the bus monitor outputs feeding the REC input and an external processor to monitor the effect on the mix you can connect a wide recorder return either to the playback input in the wide inputs section or to the surround processor itself which would then have to be used for PEC-Direct switching. An alternative might be to use the automatic E-to-E switching switching of a recorder where its input is connected to the console bus outs and the recorder's analogue output is connected to the Direct input for monitoring purposes.

Once a suitable way of working is established none of the foregoing will be a problem and there are a lot of possibilities once you get into MultiMAX. With the well thought through and particularly generous provision for external processing and downmixing, MultiMAX should be a strong contender for mastering and versioning as well as surround origination. ■

Contact

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Monitor Control Systems

The growing requirement for surround-sound monitoring is leading manufacturers to develop add-on controllers for desks with standard busing arrangements. **Rob James** rounds up the li'l' critters.

STAND-ALONE MONITOR controllers have been around a long time, but until recently these were high-cost custom or semi-custom affairs, tailored to specific clients needs. Most recently, a number of manufacturers have realised there is now a requirement for relatively low cost 'off the shelf' monitor controllers to complement the new consoles. Over the last few months I have examined a number of these in detail.

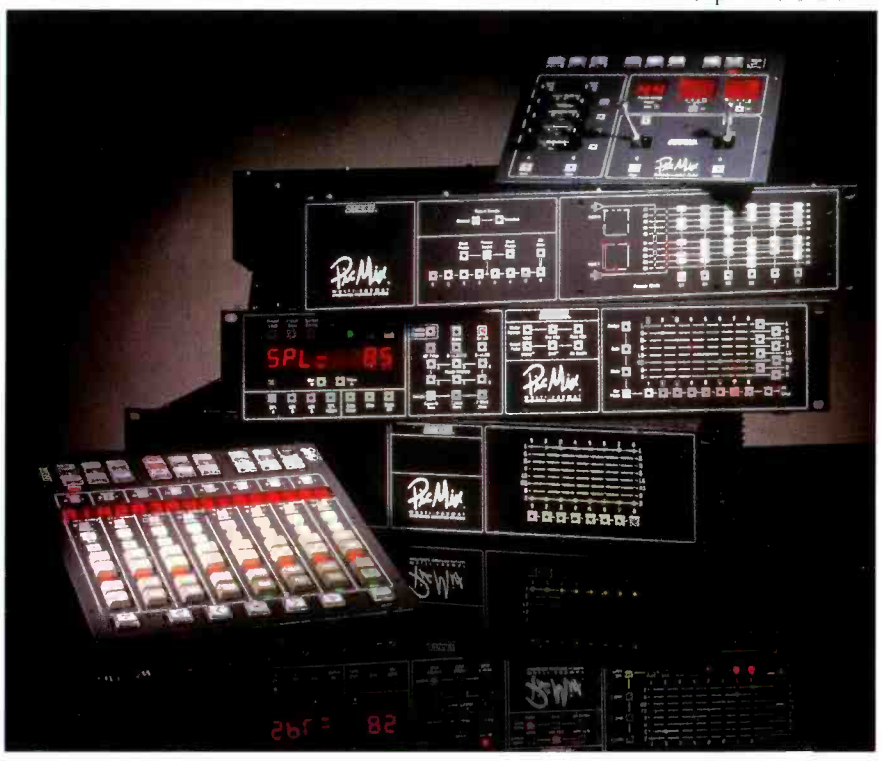
The first observation to make is the diversity in design philosophy and price. There is now something available to suit nearly everybody. However, this does not mean there is no room for improvement or for another manufacturer to build a 'better mousetrap'.

Deciding which of the available models will best suit a particular application may not be easy as all have strengths and weaknesses. The one depressing feature was that three of the four models, as supplied for review, put splats on the monitors when powered up. Surely with monitors capable of producing target SPLs as high as 90dB per channel, this should be a basic consideration. Perhaps unsurprisingly, it was the most expensive unit best addressed the problem. This aside, construction standards are universally high and I have no reliability worries about any of them. The other manufacturers have all said they are 'looking at the problem'.

For a reasonably simple and straightforward solution at a very keen price the Studio Technologies StudioComm Model 68/69 has much to commend it. For many applications this will be all that is required. The largest format accommodated is 5.1 and with relatively limited inputs the Model 68/69 (*Studio Sound*, October 1998) would be ideal for a setup where 8-track recording is used for up to 6-channel surround. The extra tracks can be used for a stereo reduction M&E or whatever and the LR bypass input and remote bypass function enables easy coexistence with the monitoring on a stereo console.

With very little work and wiring the 68/69 can be integrated into an existing studio without changing the way stereo monitoring is done. The ergonomics are good and the learning curve shallow.

The middle ground separating the contenders is a little more difficult to navigate. The Magtrax MusicBox (*Studio Sound*, January 1999) caters for a variety of formats up to 7.1 Discrete LCRS, matrix LCRS, 5.1, 7.1 and virtual 7.1. It is also possible to store up to four setups for future use. Again the number of inputs is somewhat limited, but for most people this should not be too much of a handicap. The 5.1 and



Otari PicMix

Adgil Director

7.1 modes allow the user to specify whether Subwoofer, Centre and Inner LR speakers are physically present. Where they are not, the unit provides an approximation by downmixing onto the available speakers. In all modes, with virtual or physical speakers, it is possible to 'collapse' or downmix to mono or stereo to check compatibility at the press of a single key. Ergonomics are reasonable and the menu system can be worked out without recourse to the manual.

The more costly Martinsound MultiMAX (reviewed on page 31) also caters for formats up to 7.1 channels. It has more multichannel inputs than either of the above units, but these may be of limited use to many people. For conventional film-style mixing the PEC-Direct control may be confusing. MultiMax' forte is in dealing with multiple formats. Two codecs can be connected simultaneously and there are numerous down-mixing options, but no means of storing complete setups. It is the only unit in the group with the considerable bonus of separate meter outputs.

The ergonomics are also reasonable, but with a slightly less obvious menu system than some. I think the choice between the middle two comes down to a relatively simple system for mixing or a more complex one with more options such as meter outputs which will be particularly appropriate in mastering or versioning.

The remaining system is the Adgil Director (*Studio Sound*, March 1999). This carries a hefty price premium over the others for a fully featured unit. But this is a modular design. It is possible to start with a comparatively modest set of modules and expand the system as the studio requirements change. Director supports all formats up to 5.1 and various codecs. A fully expanded system with the 9840 remote offers up to 80 inputs with two 8-channel outs plus one stereo. A subsystem is also available that can work in tandem with a Director system or function as a stand-alone format selection matrix and or third-octave speaker equaliser. The Adgil feels closer—and indeed is closer—to a full-blown custom solution. However, once you get into this price region there are other contenders from Studio Technologies and MagTrax, Otari with its PicMix system and several others.

The bottom line is that if you are serious about surround work, then you need a separate monitoring controller unless you are fortunate enough to own one of the few consoles with an adequate built in provision. Once the requirement for a controller is established, the actual choice of unit depends on what you want to do, now and in the future and, of course, what you can afford. ■

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ATC SCM20A Pro

For methodology see Studio Sound, April 1998, page 14.
See it on the Internet website:
www.prostudio.com/studiosound/apr198/r_tannoy.html

Studio Sound's 'bench test' loudspeaker reviews continue with the SCM20A. **Keith Holland** reports

THE ATC SCM20A Pro is a 2-way active loudspeaker with a built-in amplifier and crossover package. The low frequencies are handled by a nominally 200mm diameter cone driver and the high frequencies by a 30mm soft-dome tweeter that fires through a shallow horn wave guide. The cabinet is a sealed-back (infinite baffle) design of cast aluminium construction with an unusual shape, having a plan view that is best described as the shape of a lady's fingernail, with the drivers mounted at the cuticle! The rear panel has a large cast heatsink with vertical fins, an IEC-type mains socket, an XLR-type input socket and switch, and a control marked BASS EQ that has 5 steps from 0dB to +6dB. The measurements presented in this review were carried out with the Bass EQ control set to 0dB ref. Also on the back panel is a sensitivity trim control accessible with a small screwdriver through a hole. The cabinet has external dimensions of approximately 430mm high by 265mm wide by 312mm deep, and, despite its reasonable size, weighs in at approximately 30kg per cabinet; monitor bridge mounting is definitely not recommended.

The on-axis frequency response (Fig.1) lies within ±2dB from 70Hz to 20kHz; a commendable result. The low-frequency response is smooth and extended, being 10dB down at 40Hz and only 20dB down at 20Hz. The acoustic centre result (Fig.2) confirms this gentle roll-off with the low frequencies suffering a group delay that corresponds to a shift of only about 1.5m relative to the high frequencies. The harmonic distortion results shows levels below -40dB (1%) at all frequencies above 80Hz for the 2nd harmonic, and above 60Hz for the 3rd harmonic. The horizontal directivity (Fig.5) is well controlled with hardly any narrowing in the upper frequency range of the woofer, and a smoothly narrowing high-frequency response. The vertical directivity (Fig.6) is similar except for the inevitable dip at the crossover frequency due to the physical spacing of the drive-units. The step response of the loudspeaker (Fig.3) shows good time-alignment with a high frequency rise occurring only about 0.5ms earlier than the main response. The power cepstrum (Fig.4) shows hardly any evidence of echoes; cabinet edge diffraction problems appear to be kept to a low level by the adoption of rounded baffle edges and the short tweeter horn—a result that is confirmed by the smooth on-axis frequency response. Fig.7 shows the waterfall plot for the SCM20A Pro. An impressive low-frequency time-domain performance is evident from the rapid decay at low frequencies; the response falls to -40dB after less than 20ms. Apart from some very low level ringing at about 300Hz, this waterfall plot is nearly perfect. Overall the ATC SCM20A is an excellent performer. The on-axis frequency response and time domain performance are commendably good, and the directivity is well controlled. Perhaps the most impressive feature of this loudspeaker, however, is the low-frequency response; ATC have achieved very respectable low-frequency extension from a small cabinet, without the need for a port or a high-pass (subsonic) protection filter. The result is much less low-frequency group delay and increased response at very low frequencies. ATC claim low levels of harmonic distortion at high levels for their driver; our measurements at 90dB at 1m distance cannot confirm this claim as the measured levels are about average for a loudspeaker of this size, but if true, the low frequency performance of this loudspeaker should be very impressive indeed. The down-side for some, however, may be the sheer weight of the loudspeakers. ■

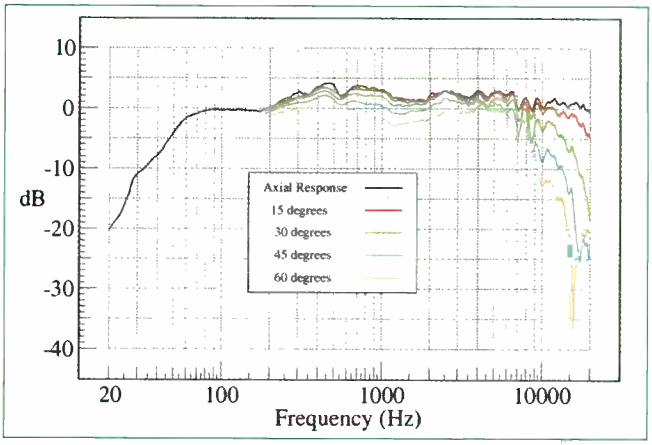

Fig.5: Horizontal directivity

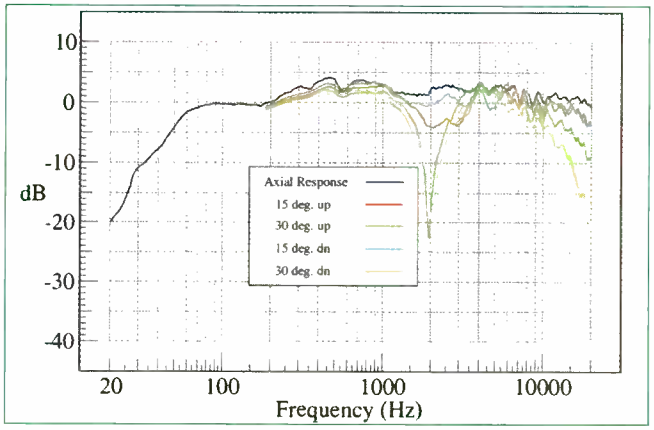

Fig.6: Vertical directivity

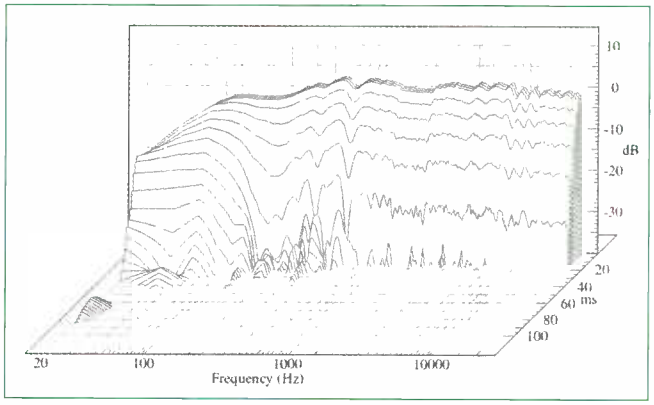

Fig.7: Waterfall chart

ATC, Gypsy Lane, Aston Down, Stroud, Glos, GL6 8HR, UK.
Tel: +44 1285 760561
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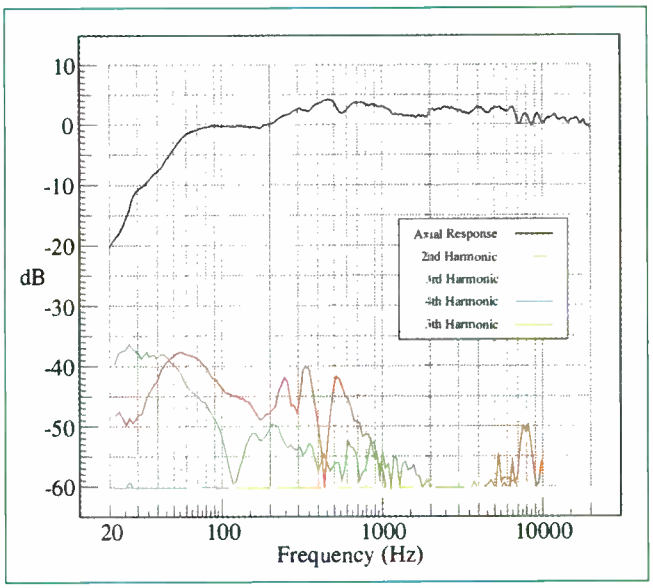

Fig. 1: On-axis response and distortion

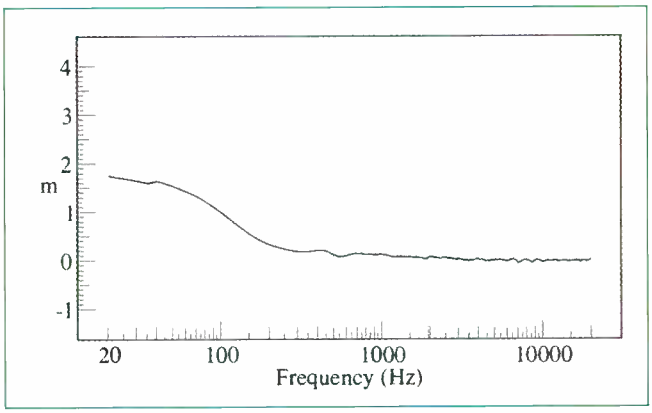

Fig 2: Acoustic centre

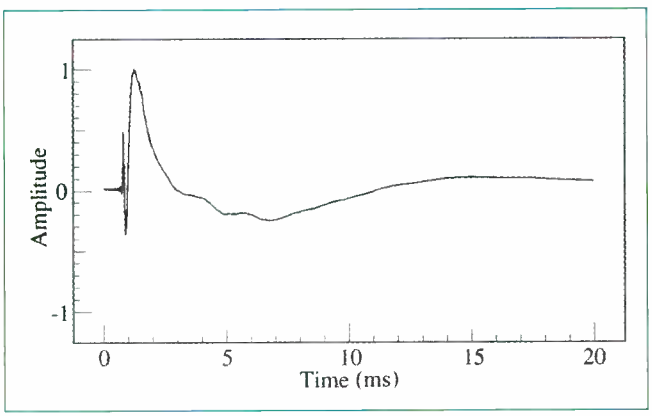

Fig.3: Step response

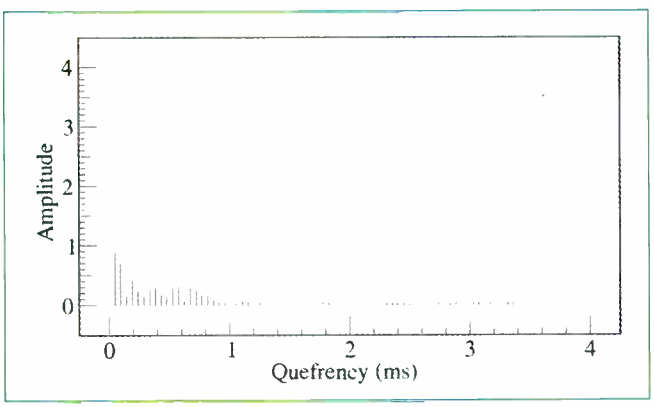

Fig.4: Power cepstrum

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Soundscape R.Ed

Soundscape's new R.Ed DAW is expected to ship in the summer and uses 32-track, 24-bit hardware with 28 inputs and 32 outputs per unit running on Windows NT, 95/98. Prices for a 32-rack system with 24 digital I-Os starts at £3,395 + VAT and supports two fixed and two removable EIDE drives per unit to a maximum of 137Gb per disk. It has two AES-EBU inputs ad four AES-EBU outputs plus 24 digital I-Os via three TDIFs. The TDIF ports can be connected to three Soundscape SS8IO-1 audio interfaces for analogue interconnection and TDIF-ADAT conversion. Recording, editing and playback runs from enhanced Version 2 software from the company's SSHDR1-Plus system. Synchronised high-quality nonlinear picture can be played via video capture cards and R.Eds can be linked together for a larger system with the Mixtreme PCI card providing an expandable mixing engine.
Soundscape, UK. Tel: +44 1222 450 120.

Dateq broadcast console

Dateq's BCS 25 console has been designed for postproduction rooms. OB vans, on-location transmission studios and second studios. The BCS 25 frame comes with eight input channels (with an equaliser being optional). Power Supply section and an extensive Master section with LED PPMs. The

universal Input Channel features three inputs (Line 1, Line 2, Mic), a Gain control, a 3-band equaliser (optional) and a Balance control. Communication facilities are integral to the console. Among these is the ability to route the communications signal to the PGM Output.
Dateq, Netherlands. Tel: +31 36 547 2222.

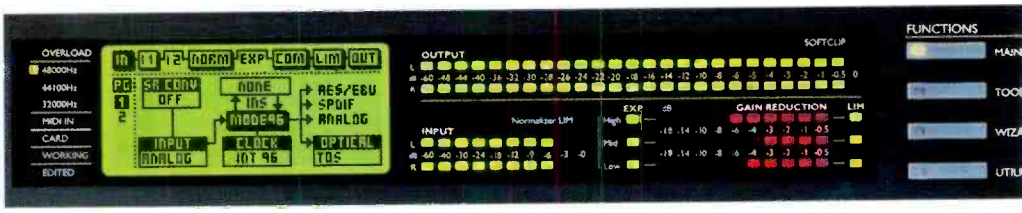
Fairlight pictures

Fairlight has unveiled the ViVid nonlinear digital recorder. ViVid's recording data density is selectable and runs to a 9Gb hard drive. To keep maintenance to a minimum, ViVid's mechanical design contains just six moving components. An optional editing package for ViVid video and audio files is included as part of the introduction, and the recorder will be interfaceable with Fairlight's digital audio workstations via future software release.
Fairlight, Australia. Tel: +61 2 975 1230. >

tc electronic Finalizer Plus 96

Upping the ante on an established processor is a shrewd move towards fast and wide digital audio. **Dave Foister** clocks the kit

WHEN tc electronic introduced the original Finalizer, it was aimed not at the mastering room but at the recording studio. The intention was to provide enough mastering tools in one box to allow the smaller operator to cut out the middle man and create finished punchy masters at the final mixing stage. The fact that it does this rather well is attested to by the presence of a Finalizer in a lot of mastering rooms, particularly since the upgrade to the Finalizer Plus. But nowadays you can't call yourself a mastering engineer if you can't deal with 24 bits and 96kHz sampling, and while the bits were provided for the sampling rate wasn't. Until now: here we have the Finalizer Plus 96, accommodating everything the aspiring high-end master needs.



The 96 does more than just add the high sampling to the Finalizer Plus, but before looking at what that is, a reminder of the Plus's features would be worthwhile—it was my first encounter with one after years of using an original Finalizer. On the Plus the signal path allows for even more flexibility; the original chain always had EQ, gain normalising, compression, expansion and limiting, plus an insert point that was really just a choice of three extra processes. The Plus retains the full set of multiband dynamic processing and the normaliser, but now has two insert points, either of which can contain a 5-band parametric EQ if it is needed. The other alternatives are still there, including the Digital Radiance Generator and the stereo width/balance processor, together with MS encoding and decoding, so that any two of these can be combined along with the dynamics. And there are extras, like the dynamic EQ, a powerful tool that can do de-essing and much more, with full control over the frequency band and width, threshold, attack and release. The last addition, perhaps the simplest but very much in demand, is the option to use either insert as a real insert point, taking the signal out of the Finalizer (in analogue or digital form) for external processing (reverb being the obvious thing that the Finalizer can't do itself) and back again.

The 96 version adds yet another insert option called Spectral Stereo Image. This uses familiar techniques to make the stereo picture wider or narrower, but as might be expected from the Finalizer it does it independently on three frequency bands, with user-adjustable crossover points. Thus the top and middle can have their widths extended without compromising things like bass and bass drum, which can be left sitting firmly in the centre. This small but original idea is very effective, adding controlled enhancement where it is most useful without the usual side-effects. Why this can only be done in the 96kHz version is not clear.

But of course this high sampling rate capability is the real key to the new version. The 96kHz mode is selected on the main input page, and thereafter the actual clock rate can be set to either 96kHz or 88.2kHz. Unlike some other processors, there appear to be no trade-offs to using the higher rates; the full set of processes is still available as it would be at 48kHz. This means that all the familiar features of the Finalizer can now be used in full-blown high resolution applications, complete with the facility to dither down to 16, 18, 20 or 22 bits (or even 8!) as required. As one would hope, there is a choice of dither options, although the basic type is fixed at TPDF. What is adjustable is the distribution of the dither across the stereo, with a choice of mono, stereo or out-of-phase.

The output format options seem to cover most requirements. It would have been easy to opt for 24 bits only at 96kHz on the assumption that the two always go together, but that is not the case; I am not the only one with a Pioneer 96kHz DAT machine that can manage the high sample rates but is restricted to 16 bits.

Although sample rate conversion is available on the Finalizer's inputs, it doesn't appear to include the facility to downsample from double to single rates, a job that needs to be done properly in the increasing number of situations it is required. The Pioneer, for instance, can do it, but the implementation according to some leaves something to be desired; this would have been a useful addition to the Finalizer's features as more and more material is being recorded at high resolution and converted down for existing CD-format media.

But that is a small omission, and the real point of the Finalizer Plus 96 is not necessarily to do very much new, but to do the things it already does so well in the high-sampling domain. The power of the system is established and the couple of extra features also work very effectively, broadening the palette still further. In its hot-rodded form it will be received enthusiastically by those who know it and trust it, and want to bring its familiar arsenal to bear on high-rate projects. ■

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beyerdynamic M 99

Returning to the root of its name, beyer's latest mic is a quality dynamic. **Dave Foister** goes into action

BEYERDYNAMIC's MCE 90, reviewed last month, is not the only newcomer in the catalogue. While that was an unusual electret condenser, the M 99 is the kind of thing that gave the company its name: a quality all-round dynamic. Dynamic microphones often have one special area in which they shine, and the true all-rounder is relatively rare, but this is what beyer appears to be trying to achieve here.

There is enormous potential for confusion when first using the M 99. Nothing on the microphone indicates which is the front; its related MCE 90 is a side-fire design and similar in appearance, sharing the same suspension mount; and the picture in the manual shows it sitting upright in its mount as though it were side-fire too. Putting it up like this results in huge disappointment, as the sound is distant and vague. The reason, you've guessed it, is that the M 99 is actually end-fire like the big E-V. Add the fact that its polar pattern is a tight hypercardioid (tending towards figure-of-eight at low frequencies) and its failure to work properly in the wrong orientation is hardly surprising.

Swivelling it through 90° brings a big sigh of relief, as suddenly everything comes into focus. It also makes it easier to inspect the switches on the microphone's base, a further indication of the flexibility beyer hopes to achieve. A dynamic microphone rarely has any controls on it, apart from the on-off switch on a hand-held vocal model, and user control over the behaviour is normally the domain of the condenser microphone. Yet beyerdynamic has opted to put not one but two frequency contour settings on the M 99.

One setting is the obvious bass rolloff for close work, designed to compensate for proximity effect, and the other specifically addresses broadcast voice applications with an overall loudness contour. This attenuates the mid band leaving effective boost at the top and bottom, aiming for a big punchy sound.

One of the microphone's two switches chooses between these two settings while the other bypasses them altogether for a linear response.

Neither of these curves could be called subtle. The LF filter does a more than adequate job of reducing the bass response, creating its own bright forward sound, which is distinctive enough to be used as an effect in its own right. The other setting does exactly what it says next to the switch, and produces a very thrusting sound that could cut through anything—I unwisely tried it on a close-up tenor sax and it could have cut through steel plate. In its place this will be very useful; this just wasn't its place. For spoken voice it has the right ingredients to grab the attention and punch through a background, delivering a sound that is much larger than life in all the important ways—and it looks the part too. I suspect that if the M 99 had to choose an application to specialise in, this would be it, as it does it so well. It is not completely immune to pops, but will present no problems to an experienced broadcaster.

No amount of on-board EQ tailoring would be worth a light unless the basic sound of the M 99 was up to the mark, and it has to be said that it would be surprising if beyerdynamic had achieved anything less. Attempts to put a dynamic into the same league as a condenser in terms of its accuracy and neutrality rarely succeed, but this comes far closer than most. Put it up next to a decent condenser on a demanding source like a grand piano and the differences are considerably less than might be expected. There's not quite the depth or the warmth, but the top end is remarkably smooth, extended and controlled. Obvious enhancement is avoided, and the overall breadth and flatness are very condenser-like.

Of course in the obvious applications it excels. It seems impervious to high levels, so that an enthusiastic guitarist's amp inches away presents no difficulties at all, and the sax mentioned earlier, while showing that the EQ does not suit everything, showed no signs of strain when the linear setting was used. This combination of quality frequency response and rugged SPL handling is a particularly attractive pairing of attributes that is no doubt exactly what its designers were hoping to achieve.

The supplied kit comprises the microphone and its suspension mount—there is apparently no other kind; although the stem at the base looks to be a standard 19mm diameter—in a big standard plastic carrying case. The box looks to be more than equal to the demands of protecting an already robust microphone. The mount centres on a ring with three teeth that clip into a groove around the M99's middle, and this certainly engages more easily than it disengages.

A dynamic that thinks it's a condenser? The best of both worlds, smooth, rugged, simple and sophisticated, would be a useful animal indeed, and, although the M 99 is not quite that animal, it comes remarkably close. ■

Contact

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UK: beyerdynamic.
Tel: +44 1444 258258.
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NEW TECHNOLOGIES

Octagon enhancements

D&R has launched the Airlab radio on-air console for local community and hospital radio. An original feature of the console is the ability to program various set ups of the console and store these on a chip card. This allows engineers and DJs to configure the console to their personal requirements using their own card. D&R has introduced a Stereo Dual Line module for the Octagon film console. The module features two stereo line signal paths with motorised 100mm faders. Each signal path has 4-band swept EQ with fully parametric mids. Twelve Auxes are available, the first four of which are stereo pairs. Inputs can be assigned to the main eight master buses as well as the 48 group output buses.
D&R, Netherlands. Tel: +31 294 418 014.

FAR's AV6

FAR's 2-way active AV6 features amplifiers that deliver 120W (180W peak) for the low frequencies and 70W (110W peak) for the high frequencies. The compact monitor will generate 120dB from 45Hz to 21kHz. The

woofer is a high-power 8-inch device able to reproduce high output without distortion. The Av6 also benefits from optional electronic 'curves' that include a simulation called 'car' that reproduces the sensations felt in the best car installations.
FAR, Belgium. Tel: +32 259 7412.

Euphonix convertors

Euphonix has revealed a range of multi-channel convertors described as offering high-quality 44.1/48/96kHz, 24-bit signal paths and 'setting a new standard in per-channel price performance for the digital broadcast market with 28-channel modularity', configurations include analogue-AES-EBU; AES-EBU-analogue; AES-EBU-MADI; MADI-AES-EBU; MADI-analogue; analogue-MADI; analogue-analogue via MADI (snake) and AES-EBU-AES-EBU via MADI (snake). Features include on-demand sample-rate conversion and bit reduction per AES-EBU stream and auto-detection of external sync.
Euphonix, US. Tel: +1 650 855 0400.

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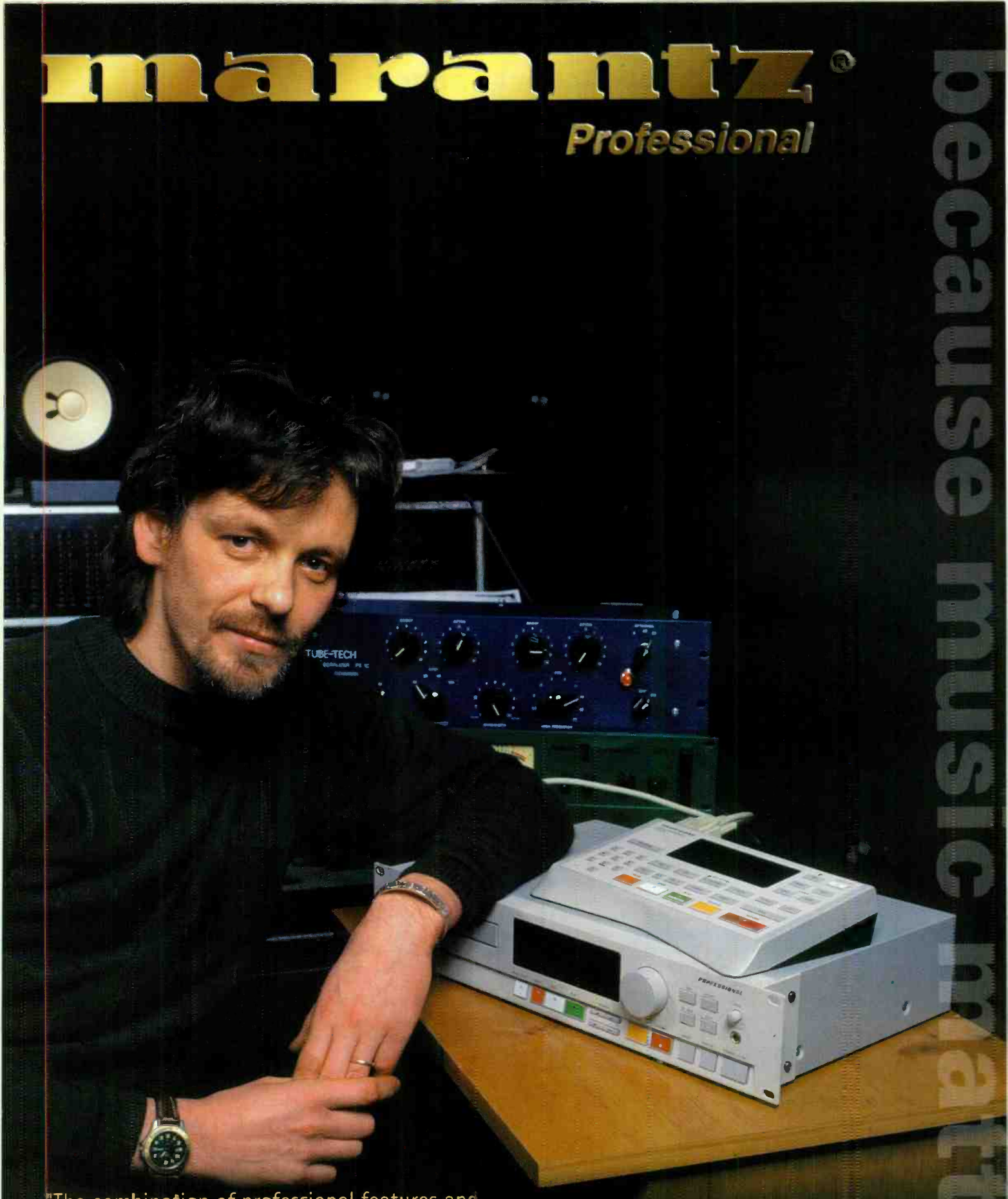

"The combination of professional features and easy to use remote interface makes the CDR640 unbeatable."

Graeme Clark (Producer/Bass Guitar)
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Black Box and Ravencourt gadgets

A location recordist's lot can be made considerably happier through the use of various gadgets. **Neil Hillman** weighs up a sack full

TIME WAS WHEN a sound recordist was considered to be just a little bit flash if he carried anything more exotic than a Sennheiser 416, a ¼-inch Nagra, a propelling pencil and an interchangeable screwdriver. Not these days; we could, should we choose to, take to the road with as many peripherals as a seventies rock guitarist on tour with his latest incarnation of super-group. I can verify, however, that woolly-windgags are flammable, so tucking a freshly lit cigarette into the end of the boom pole immediately before recording while appearing immensely cool, could be rather expensive. Therefore, while flared trousers are no longer obligatory, time-code devices certainly seem to be.

Black Box Video is a small British company that has been at the forefront of this new market sector, offering a fine selection of innovative products all built with the recordist very much in mind. BB's time-code TX-RX system is able to transmit time code from a camera to a recorder using a reliable, robust UHF link on 418MHz. The subminiature transmitter is little bigger than the aerial and plugs directly into the camera's BNC socket. Power is taken from the camera via a 4-pin Hirose plug. The standard range is approximately 100M, while the 'X-tra' version on 433MHz has a higher power output, lower power consumption and a 3-fold range increase. The receiver is small (30mm x 120mm x 60mm) and outputs data on a BNC connector. A locking toggle switch ensures that the unit is not accidentally switched and the quick change battery compartment carries a standard 9V MN1604 battery that powers the unit for about 12 hours. Time-code readers are also available for production staff to simultaneously take accurate shooting notes, fed from the same source. The whole system is DTI approved and the good news is that no licence is required.

A useful, inexpensive item is the Black Box BNC Time-Code Pad that offers just the right amount of attenuation for feeding a Walkman recorder for transcription cassettes. With the pad in place, the output is set at -12dB relative to the programme to ensure crosstalk is eliminated. Generally, the convention that has become common practice is to record time code onto Track 1 and programme material onto Track 2. This little addition to the armoury is necessary as an ordinary 600Ω 20dB pad does not present the correct impedance for the time-code signal.

Ravencourt is another small UK company that offers interesting specialist items. The 'Ravencourt Camera Splitter' has a small footprint (120mm x 60mm x 40mm) is robust yet lightweight and completely passive. It turns the 10-pin output of a location mixer into three independent stereo balanced feeds, all with return monitoring. Switched attenuators for each output give a choice of levels between 0dB, -10dB and -50dB, with respective output impedances of 600Ω, 3kΩ and 300Ω for each position. The stereo monitor returns are selected via a 4-position rotary switch, with the fourth return being on a 3.5mm mini-jack socket.

The Ravencourt Really Useful Box certainly conforms to the trade descriptions act, for either studio or location use. This is again a small and lightweight device that performs several functions to assist in rigging or lining-up to remote sources. The tone generator offers 1kHz or 10kHz at 0dBu and is routed to the output via a 3-position master toggle switch (marked TN, OFF or TB) set to TN, and then on to an attenuation bank of two switches that enable reduction up to -50dB in 10dB steps. With the 3-way master toggle set instead to TB, TalkBack communication may be created through the internal electret microphone and preamplifier sent to the output. The ¼-inch headphone output can be used to either monitor the output of the device or by pushing the REF switch, the signal arriving back at the device. The return input is electronically balanced and unperturbed by unbalanced signals. The main output is electronically balanced on a 3-pin male XLR connector and cross-coupled so that it may be unbalanced without any signal loss. Two LEDs indicate the presence of microphone power at the input to the microphone preamp; one LED lighting for T Tonader power, both LEDs illuminating to show phantom power.

But perhaps the most exciting device from Ravencourt is the Check-Mate, a pen-sized device that plugs straight onto the microphone connector of either a Micron or an Audio Ltd. radio transmitter. In the area that would normally house the pen cap there is a display window that on connection to the transmitter gives a read-out that shows, firstly, the battery voltage and then the operating time left in that battery. This display window may be twisted to enable viewing if the transmitter is being worn by an artist and would pay for itself in terms of reducing unnecessary battery changes in a very short time.

Okay, perhaps the simile to the lead guitarist is too rich; most of my sound colleagues would be most uncomfortable falling to their knees as if in the middle of a screaming-harmonic, middle-eight solo. Maybe then, we are really the bass players of the television industry. This reminds me of the first time I ever filmed in a rain forest in South America. When we were greeted at the jungle airstrip by our local fixer Mantu, we asked about the incessant tribal drums —'Drums stop, very, very bad' came the reply. Next day, incessant drumming, same reply. For three weeks the drums relentlessly tortured us until eventually we cracked and screamed 'Mantu, please, why very, very, bad when drums stop?'. Shaking his head slowly Mantu whispered 'Drums stop, bass solo'. ■

Contact
Black Box Video, UK.
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Ravencourt, UK.
Tel: +44 1422 844877.

NEW TECHNOLOGIES

< sample-rate convertors as 160mm plug-in Euro cards. Designed as a cost-effective solution where installation budget and space are limited, these units offer up to eight channels of A–D and D–A plus SCR conversion in 1U for as little as £199 UK per channel. The housing rack will accommodate up to four modules, and has built-in redundant power supplies with onboard external sync capabilities to lock the plug-in convertors to World Clock or house sync.
Audio Design, Germany.
Tel: +49 7141 22660.

Opticom OPERA

Opticom's OPERA—Objective Perceptual based Analyser—is claimed to be the first commercially available tester to incorporate PEAQ, the ITU-R recommendation for measuring perceived audio quality. OPERA can assist broadcasters, network providers and equipment manufacturers to objectively

evaluate and monitor the sound quality for almost any application from system design to live on-air operation. As opposed to traditional audio measurement methods, the new systems will be able to simulate the subjective evaluation of a single subject or even complete listening tests in the daily operational environment. This is because the systems, which work in the same way as the human ear, are able to distinguish between imperceptible and annoying transmission errors. The OPERA family of measurement equipment comprises a PC-based workstation with Pentium II processors, state-of-the-art audio interfaces, and runs Windows NT. This allows for easy interchange of measurement results with data bases, as well as convenient programming of automatic quality assurance applications.
Opticom, Germany. Tel: +49 131 691160

360 Systems hard-disk recorders

New from 360 Systems are the 4-channel TCR4 and 8-channel TCR8 synchronous digital audio hard-disk recorders. The models offer 24-bit audio, massive internal hard disk storage, high-density removable disks, random access hard-disk storage, complete time-code implementation, and VTR emulation. Editing features on both include >

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REVIEW

Tube Tech CL2A

The Danish blue brand has melded two CL1Bs for stereo compression. **Zenon Schoepe** counts pennies, wondering what might have been

IT IS NOT THAT OFTEN that Tube Tech comes out with a new unit, but whenever it does, valve aficionados have to sit up and listen. The last offering from the Danish company's camp was the superb MEC1A, a masterful interpretation of the concept of the voice channel and one that combined component building block derivatives from existing Tube Tech products. Combining a mic/DI input section with EQ and opto compression in a single channel device it used the preamp from the MP1A, the compressor from the CL1B and the equaliser is based loosely on that found in the more elaborately detailed EQ1A.

For the CL2A it has combined two mono CL1B compressors into a 2U-high unit to give a dual channel opto compressor. Enhancements over the original mono compressor include 5kΩ input impedance and the two channels can be linked for stereo operation and multiple units can be side-chain linked. Features include variable or fixed attack and release times, a valve push-pull amp, clickless relays for switching the compressors in and out of circuit, and balanced floating inputs and outputs.

It's a beauty. No amount of familiarity with the brand can make you bias about the construction quality, finishing detail and sheer feel-good factor that encountering a Tube Tech creates. At a push you could say that the pots could be slightly more damped and some form of gradation on the attack, release and compression ratio pot sweeps other than the extremes could help matters but they might detract from the fact that you are expected to use your ears when using a box like this. Dialling in constants from other units would simply not transfer at all well.

Even so attack time is fully variable from 3ms to 60ms and release runs from 60ms to 2s, while the ratio kicks in a 1.5:1 to a maximum of 10:1 and proves that if the compression type is musical and progressive then you can find a world of a difference between these values. As already mentioned attack and release times can also be fixed with a type of preset switch. Values for this aren't given, in the same way that they're not in the LCA2B stereo compressor-limiter, but I'd say they're fairly gentle settings given the performance with a variety of programme types. It's a thoughtful inclusion but doesn't detract from the satisfaction you get from setting values manually.

A valve-based gain make up section offers 10dB extra at the end of the chain and threshold is fully variable from -20dB to off. Rear panel XLRs provide the inputs and outputs to the device while jack sockets allow access to two link buses for connecting up multiple channels for simultaneous compression. Front panel switches in each channel allow selection of Link 1, Link 2 or off and each channel can also be bypassed individually. Each channel also has a small well illuminated VU meter which can be switched to read output level or gain reduction. All that remains is the large on/off knob with its associated standard 'Elvis ring' chrome surround red power indicator.

If you liked the CL1B mono unit then you will love the CL2A most particularly because it allows you to handle stereo programme that much more easily and conveniently. It's also substantially cheaper than buying two CL1Bs with no associated loss of functionality.

Remember that the CL2A only does compression, there are no bolted on bells and whistles, and this fact will immediately attract some and alienate others. The former camp will be drawn by the CL1B's legendary squash potential, a property that made Tube Tech's name in valve opto-compression, and it really is marvellous classic sounding stuff. Smooth as the proverbial infant's derriere and capable of a transparency that has to be heard to be believed. In fact you have to see it on the meters at times to reassure yourself that it is happening so complete and intact is the result albeit accompanied by a subtle thickening even on gentle settings.

It's a fabulous tracking compressor that is eminently versatile and supremely silent. Wind it up and its nature becomes far more pronounced and you can comfortably end-stop the device with no nasty artefacts or complaints, just more of everything for more of the time.

Comparisons will be made to Tube Tech's LCA2B, a stereo unit that combines sophisticated compression control with preset constants and separate limiters on each channel. It's probably the more advanced of the two boxes although the CL2A is probably the purer. Either way if you are turned on by the idea of Tube Tech compression then you should investigate both.

The CL2A is a classy piece of kit that you will not hear the like of from any cheaper pretender. That is something anyone investigating valve-based compression will have to come to terms with. If you want this sort of performance and this sort of silky smooth thickening opto-compression then you are going to have to pay for it. If you really cannot afford it then do not risk playing with it because it will only make you unhappy. ■

Contact
Tube Tech, Denmark.
Tel: +45 38 710021.
UK: Systems Workshop.
Tel: +44 1691 658550.

NEW TECHNOLOGIES

< user-selectable crossfade length dynamic edit mark features, and pre-roll edit in, edit out and post-roll. Rehearse functions allow for full simulation, and the RMW (Read-Modify-Write) feature provides layering and mixdown capability. All units include analogue and digital I-O, a large display screen, built-in keypad for cut titling and organisation, and a number of remote control options including P2 (9-pin), RS422 and GPI connections.
360 Systems, US. Tel: +1 818 991 0360.

Sono

UK-based talkback system manufacturer Drake Electronics, together with the German system house Sono Studiotechnik and the MCI subsidiary of Studio Hamburg, have developed a 3-in-1 desk-mounted commentator unit designed for international broaccasting and conferencing requirements. Featuring three configurable modes in one package, the Commentator Unit is

intended for conventional commentating at large and small events, provision of simultaneous translation at multilingual venues and traditional high-quality talkback. The Commentator facility supports broadcast quality audio in a portable format. This plug-in module allows the user to mix programme and intercom feeds to two separate ear-pieces, providing individual volume controls for mixing together with a master volume control for each headset. A desktop version of the unit is available for talkback only applications, but can be upgraded to a fully featured Commentator Unit as necessary.
Drake, UK. Tel: +44 1707 333 866.

AT UHF

Audio-Technica's UHF-7000 Series multichannel UHF system provides a 700MHz operating frequency band, a choice of multi-PLL-synthesised channels and InvisibleLink circuitry, that is designed to eliminate interference. The system comes as a body-pack or a hand-held system. The ATW-7375 UniPak Transmitter System is made up of the ATW-R75 true diversity receiver and ATW-T75 body-pack transmitter. A wide selection of Wireless Essentials mics and cables are available for the ATW-7375 UniPak system including lavalier, headworn, gooseneck and installed-sound microphones.
AT, UK. Tel: +44 113 277 1441.

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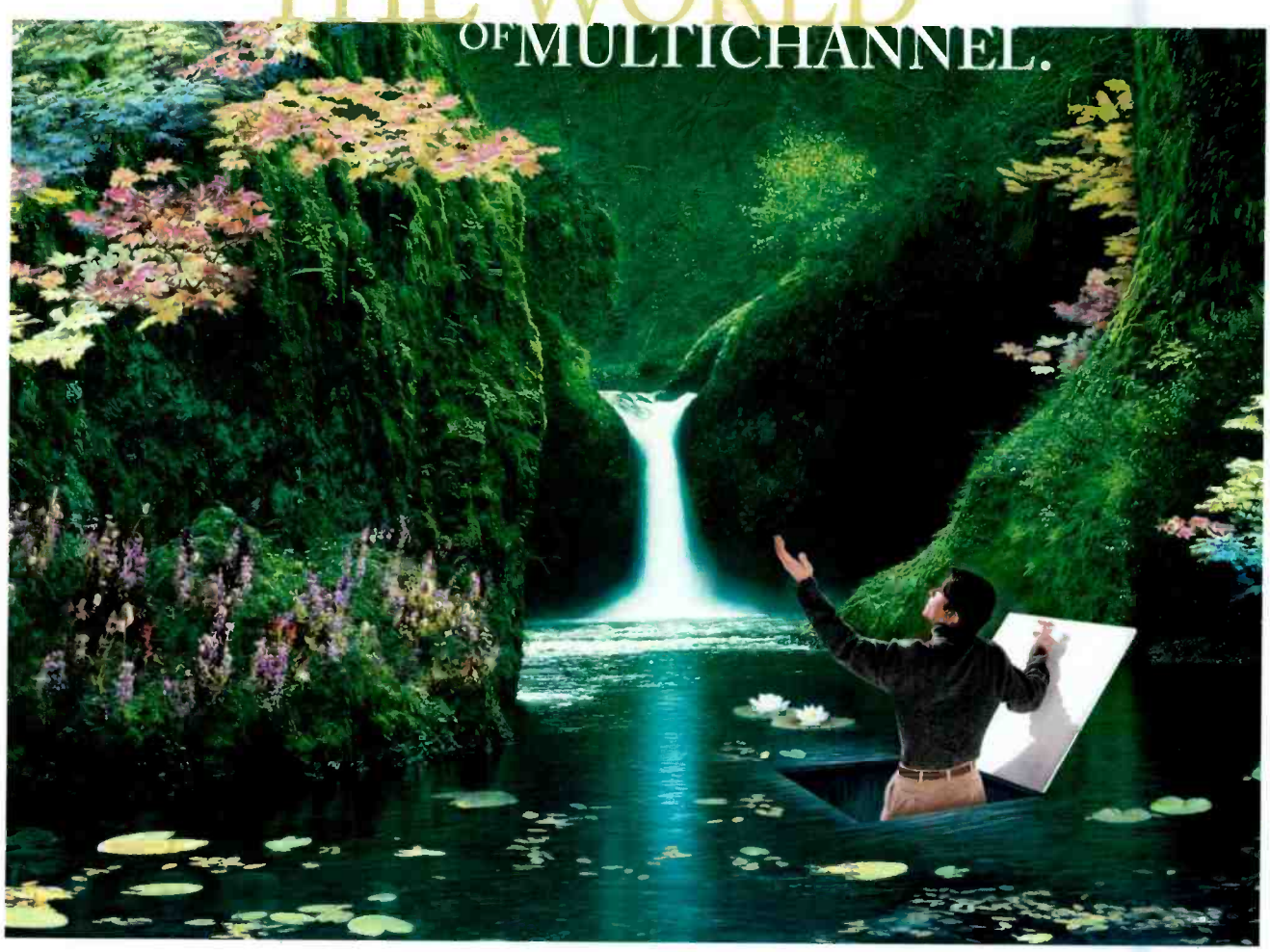

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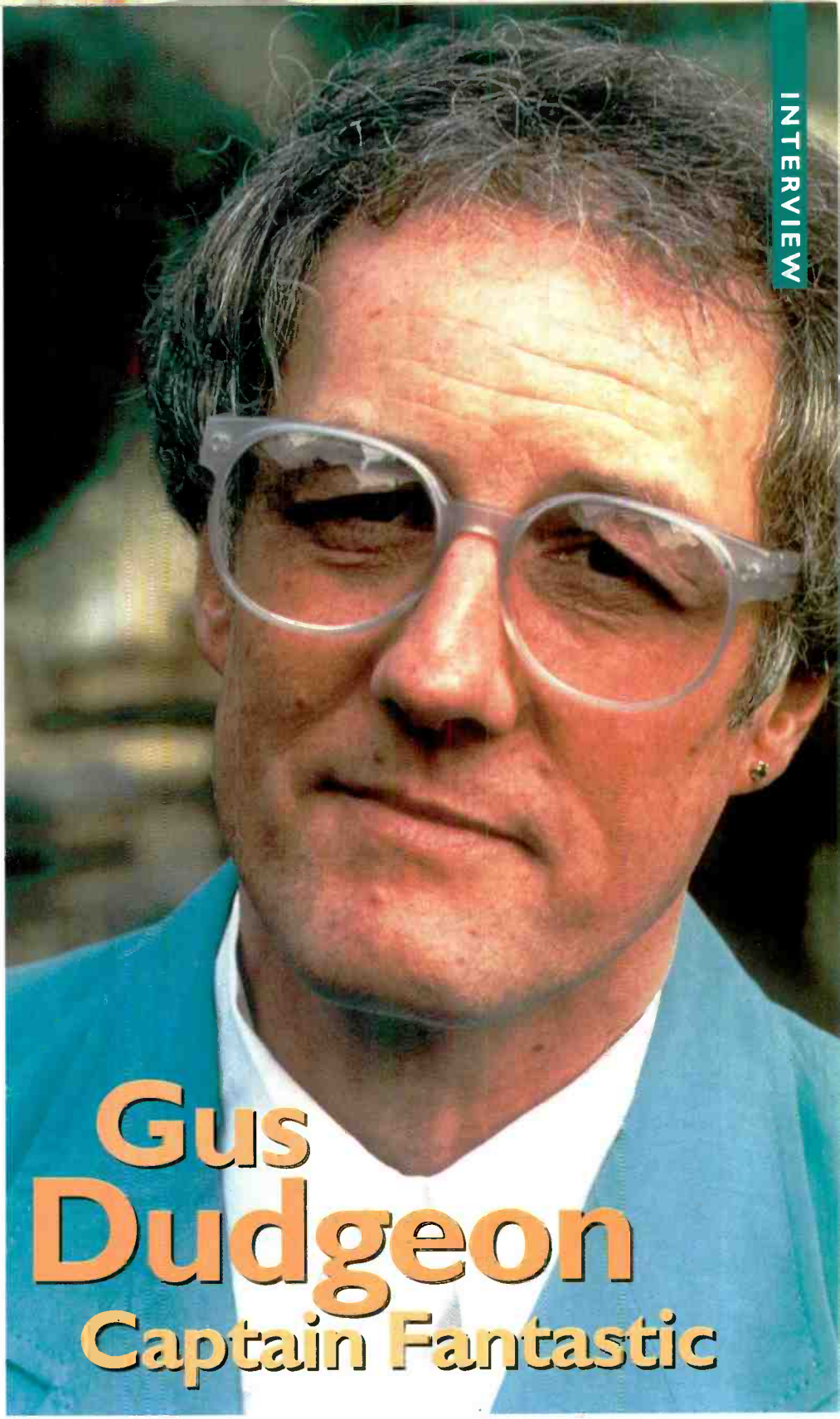

Gus Dudgeon

Captain Fantastic

Gus Dudgeon's insistence that his career is founded on his good luck is at odds with the level of his success. **Richard Buskin** untangles fact from fortune

'AS A PRODUCER I have always wanted a high-quality sound,' asserts Gus Dudgeon. 'Previously, when I was an engineer—and not a particularly good one—I wanted to get good sounds on tape, but I was never interested in how the gear worked. I went exclusively by my ears, which meant that more often than not I made bad decisions, yet I learned something out of it all by occasionally making good ones, and when I got a quality sound I knew it and I liked it.'

Probably best known for his 7-year, 10-album collaboration with Elton John during the seventies, Gus Dudgeon has enjoyed a varied and successful career as an engineer and as a producer over the course of more than three decades. Starting out at London's Decca Studios during the mid sixties, Dudgeon turned knobs and pushed faders on hit recordings by artists ranging from The Rolling Stones, The Zombies, John Mayall and The Small Faces to Tom Jones and Marianne Faithful. Later in the decade he then launched his own production company and enjoyed instant chart success with David Bowie and the Bonzo Dog Doo-Dah Band, before embarking on his aforementioned association with Elton John that resonates to this day.

Aside from quality of material, one characteristic that distinguishes John's early seventies recordings from those of most of his contemporaries is the quality of sound. Of course, in recent years said recordings have been denoised and generally cleaned up for CD reissue, yet even in their original state the arrangements, sonic clarity and separation on instruments make them stand out from the rest.

'Working with Elton I felt that his music required that quality of sound,' says Dudgeon, 'and I also thought that his records should particularly reflect the decision to use large orchestrations. After all, there's no point in using a large orchestration if it sounds like shit. At the time I thought that I was doing something really good and I felt it was high quality, but now, of course, it doesn't sound particularly special and you can only judge it properly by listening to whatever else was around back then. That's not something I spend time doing.'

Dudgeon's career moved from engineering into production early in 1968, the result, he recalls, of 'both Denny Cordell and Andrew Loog Oldham, within the space of a month, telling me that this was the area I ought to get into, not least because I had probably been interfering too much with my own opinions of their sessions. In fact, having left the studio, Andrew came back, stuck his head around the door and said, "Oh, and by the way, don't forget to ask for a royalty", and left. I thought, "Well, that sounds like a good idea", and consequently I was on royalties before George Martin, which is pretty >

< damned ludicrous.'

When, in 1969, Tony Visconti refused to produce David Bowie's 'Space Oddity', dismissing it as 'second-rate Simon and Garfunkel', Gus Dudgeon gratefully accepted the assignment, and it was this record that soon brought him to the attention of Elton John. Steve Brown, who had produced the *Empty Sky* album just over two years earlier, bravely declined the opportunity to take charge of the follow-up on the grounds that he felt under-qualified. As a producer Dudgeon was no better qualified, yet, egged on by arranger Paul Buckmaster as well as his own love for 'Space Oddity', Elton ignored the inexperience factor and asked the former Decca staff engineer to produce his eponymously titled second album. 1969, as you can see, was a very good year for Gus Dudgeon, and he made the most of the chances that came his way. So, for that matter, would Elton John.

'I think Elton has improved enormously as a musician over the years,' says Dudgeon. 'If you listen closely to 'Your Song' you'll notice that the piano isn't actually as loud as you might think it is; that's just an illusion. It's loud when it needs to be but at other times it really isn't, because his playing was a little bit messy, so it's not taken down far enough to disappear, but it's taken down to a level where you don't basically notice the fluffs. In those days he was good at

'I tell them very early in the process what I do and don't like, and I try to make them see that I like what I like so much that I want to improve what I don't like. However, I would never say, "This is set in stone, this has to change or I'm out of here"'

vamping and he was a good player, but I wouldn't say that he was anything extraordinary. He was, however, leaning towards a great feel, a feel that I happened to like a lot, which was that whole American choppy Leon Russell sound. Anyway, the supposition was that Elton would get better as he went along, and of course he did.'

The rest, as they say, is history. Dudgeon and John would join forces once again for a couple of albums during the mid eighties, yet in the meantime the producer also lent his ears to projects with acts such as Black Sabbath, Joan Armatrading, Ten Years After, Chris Rea, Elkie Brooks, Lindisfarne, XTC, Ralph McTell, the Strawbs and The Boomtown Rats. Today he is as active as ever, with

recents credits including up-and-coming names such as Menswear, the Frank & Walters, Marlo and Seafruit.

'I'm not a Phil Spector kind of guy,' responds Dudgeon when asked about what qualities he brings to artists' sessions. 'I don't create a sound that is me. What I'm trying to bring is openness on the basis of, "Look, what I love about what you're doing is this, what I don't like is that". I tell them very early in the process what I do and don't like, and I try to make them see that I like what I like so much that I want to improve what I don't like. However, I would never say, "This is set in stone, this has to change or I'm out of here", and I'm also not looking to create a compromise, because compromises are a wet wank. A compromise is solidly set in >

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< neither one thing or the other. There again, if a compromise is absolutely the only way to go, it's got to be because the other side is saying, "I honestly don't know. Why don't you go with your instincts?" and I'll say, "Fine".

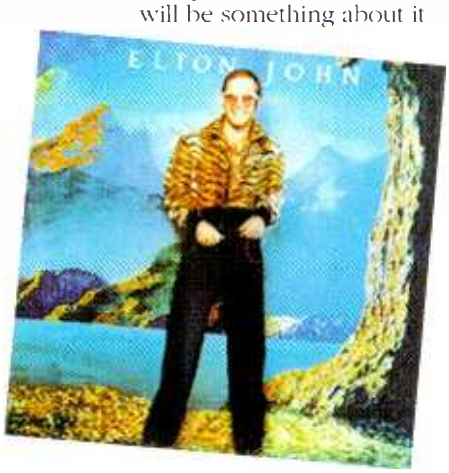
'If somebody hires me I guess there's something about what I do which they like, and obviously they don't have a clue as to how it's been arrived at most of the time and neither do I, because it's all hit-and-miss anyway. Half of the time you're flying by the seat of your pants in virtually any situation. Happy accidents happen all of the time. You think, "Wow. Where did that come from?"

'A classic example was "Bennie and the Jets". That was never intended to be live and it was never proposed that it should be faked at any point during the recording. First of all when I saw the lyrics I thought it was going to be an out and out rock 'n' roll thing, so when it turned out to have this quirky sort of jump feel I thought, "How bizarre". That threw me a bit, and then I was doing the mix and it just so happened that [on the tape] Elton struck a chord an exact four beats before the downbeat of the actual song, which was not something that he had ever done before, and I initially hadn't even noticed it. I suppose it was in place of a count-in, and while I was doing the mix I was just about to mute that piano part off the front when it occurred to me that, every time I played the tape, it brought to mind what often happens in a live situation, when somebody on stage is trying to cue a band as they're about to start playing a song.

'We basically threw delay on everything so that it sounded more like it was in a concert hall, and then we dragged in some applause tapes, and then I got some people to do some whistling on it and stuff like that, and slowly converted it into a "live" song. I didn't even say to Elton, "What do you think?", I just got on with it, and so the first time he heard it like that he went, "Bloody hell, how did you do that?". It's not that clever actually, it's dead basic, but it sort of paid off somehow. Happy accidents like that happen all the time. You just think, "Wow, where did that come from".'

So do the artistic and political machinations between musicians and record company execs. Having been hired by the latter, the producer is usually well advised to ensure that he knows precisely what the A&R department's requirements are. Nevertheless, this still won't help to circumvent a situation where the artist confides that he or she totally disagrees with the opinion of the A&R guy.

'When that happens it's very awkward,' says Dudgeon, 'because you're then trying to find some common ground where it all works. In that situation what you try to do—assuming that you're working in the same country as that in which the record company is based—is make sure that the record company gets to hear something every now and again. However, what you never do—ever—is let them have a tape at any stage, because if they do they get hooked on that particular mix. There will be something about it



'I'd be doing Kenneth McKellar followed by The Zombies, and I would also be swapping studios within the Decca facility. I'd do a session in the morning in Studio One and then move into a completely different room in the afternoon'

that they love that's completely wrong, and they'll want you to keep doing it wrong from then on.'

So whose side, if any, does Dudgeon feel more obliged to take?

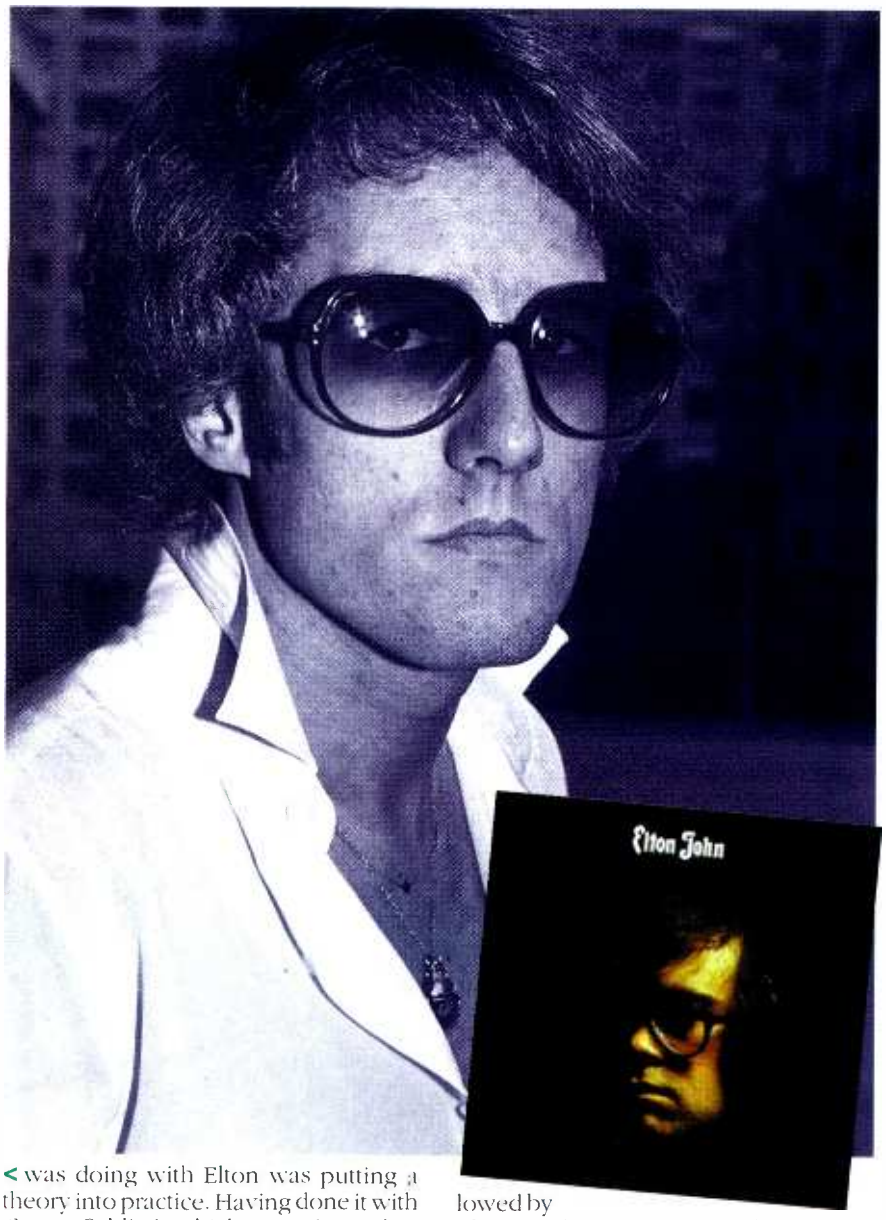
'Obviously, at the end of the day, I'm more inclined to side with the artist,' he responds. 'The artist's opinion in a split vote has to be the more important one when it comes to an artistic decision, and when it comes to a marketing decision which affects an artistic decision then I have to say no to what the A&R guy is saying. There are occasions when the A&R guy makes a very valid point about, say, a lyric, and he'll say, "We can't use that. You'll either have to bleep it out or get rid of it". Or there will be a situation where the artist wants to do a song at a slower tempo and the A&R guy says, "Well, I've always seen it as a dance song". What these A&R people are doing is taking in a whole load of fresh information on first hearing, even if it's slightly out of whack in the balance department, and hopefully they go away loving it. All they remember, in retrospect, is what they heard, and so when they then hear the final mix six weeks later they go, "Yeah, but you know, that was so great when the snare was hardly audible", and you're thinking, "But I was always intending the snare to be the biggest snare in the world". So was the artist, and that's why it's like that now. It's difficult, because they weren't there when the decision-making process was going on and therefore their concept wasn't tried, but presumably the producer has reflected what the artist wanted. So, you have to play a certain amount of mind games every now and again, and you occasionally just have to have an orgasm without any physical stimulation.'

Although not a musician himself—'I would have liked to be able to play the piano, but I can't. My dad thought it was poofy for me to learn it at school whenever I showed an interest'—Gus Dudgeon is never at a loss for words when conversing with artists and trying to relay musical ideas of his own.

'When I'm talking to musicians I've always got an idea in my mind,' he states. 'I've never said, "I've got no idea what to do with this. Just copy the demo". I've always got specific things in mind, and people usually choose to work with me just because they really love some record that I've made, even though what they don't know sometimes is that a particular record that they're going nuts over is one that I've always been pissed off with because I ruined the mix. Or it was always too slow, or I wish I'd done it the way it wound up eventually being done live, or all of the other ramifications that go with hindsight.'

That having been said, innovation was not exactly a prevalent feature of Dudgeon's early career at Decca. In line with other major facilities of the era the sessions were strictly timed and tea-breaks were adhered to, and even though such rules and regulations began to disappear towards the end of the decade their effect on the fledgling producer was tangible.

'I doubt that I was trying to do anything that was remotely innovative in the seventies,' he admits, while adding, 'I guess that to some degree what I >



PHOTOGRAPH: ROBERT ROBERTS AT RIDDLERNS

< was doing with Elton was putting a theory into practice. Having done it with 'Space Oddity', which was planned to the very last detail, I thought, "Well, I'll have to do the same with Elton". Then I realised that, having done it once, I only needed to do it once. I mean, having done something in minute detail, where I almost over-thought it and over-theorised it, when I went to do *Tumbleweed Connection* I just threw the rules out of the window completely and carried on like that. It really was very much a case of "seat of your pants", and I think that produces good results. It gives things a freshness and an energy.

'I'm so grateful for the experience that I got at Decca, working with such an incredible variety of artists. Everyone from Marianne Faithfull, Los Bravos, Billy Fury and Tom Jones to John Mayall and Mantovani. You could work with a maximum of three different acts within the same day, because there would be three sessions: 10.00am till 1.00pm; 2.00pm till 5pm; 7.00pm till 10.00pm; and every studio pretty much ran to that same schedule so that the musicians could finish a session and get to the next one.

'I'd be doing Kenneth McKellar followed by The Zombies, and I would also be swapping studios within the Decca facility. I'd do a session in the morning in Studio One and then move into a completely different room in the afternoon before going somewhere else in the evening. It was pretty scary, but I have to say that what you don't get as much of nowadays is the personality thing. There's a lot of artifice, and, consequently, there's a lot of artificial personality going on, because when you sample things you know that whatever personality in the grooves is born of a machine.

'With John Mayall I did the famous *Bluesbreaker* album, with Eric Clapton, and the amount of people who talk to me about that bloody album is ridiculous. It's as if I was Eric—they all go, "Christ, that album changed my life. It made me want to pick up a guitar". I love the fact that that album's become so important to people, I think that's wonderful, but what a fluke. My whole career has been a fluke from day one. It still is... It always will be. There's no plan to it.' ■

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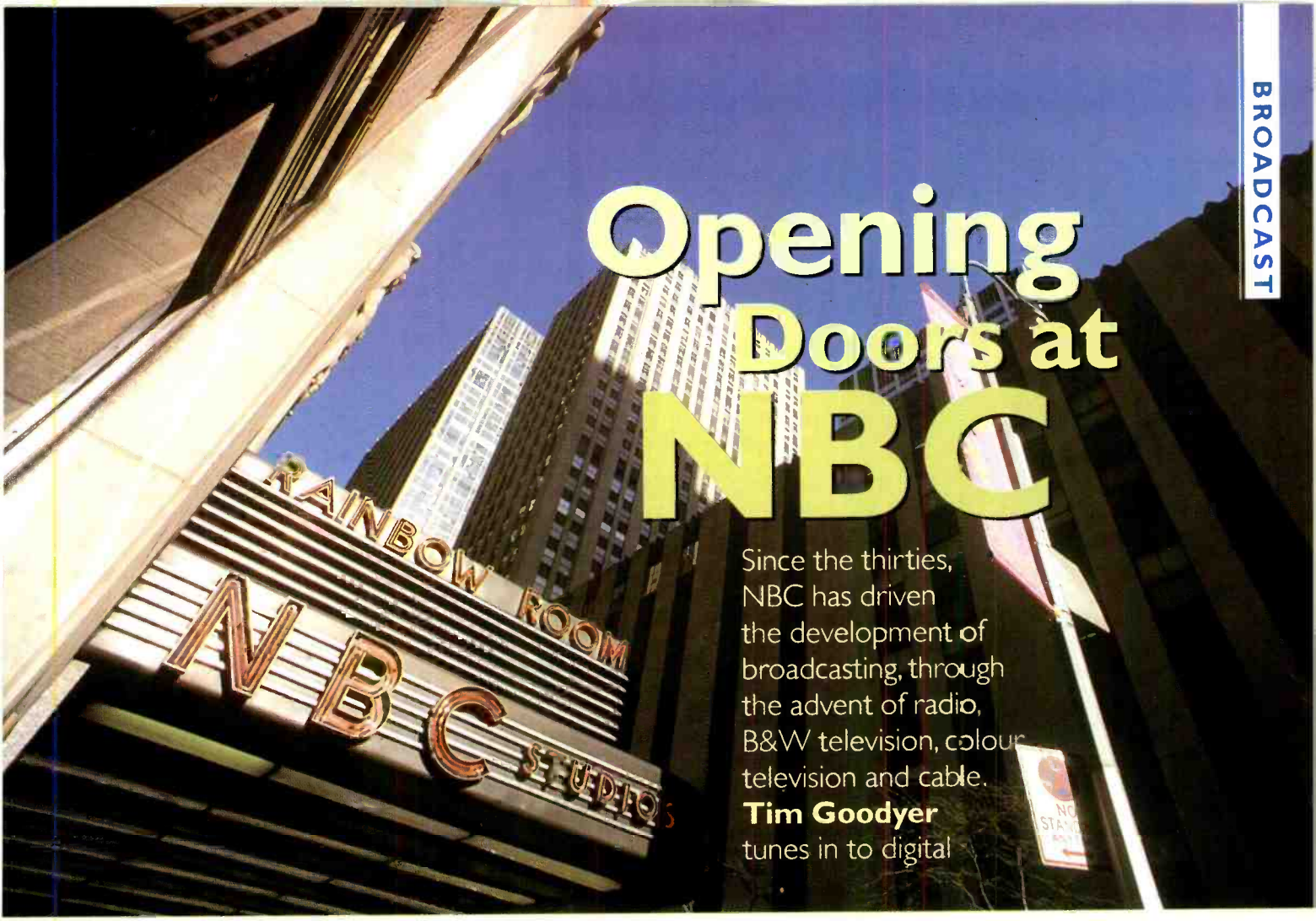

Opening Doors at NBC

Since the thirties, NBC has driven the development of broadcasting, through the advent of radio, B&W television, colour television and cable. **Tim Goodyer** tunes in to digital

SOME OF THE DOORS of NBC's New York City headquarters, are open to the public. Through them, you can visit the NBC Experience, which includes a tour of the studio complex including the famous *Saturday Night Live* set. The declared brief here is to entertain and educate.

'NBC has always been a popular place for the public,' says Jim Starzynski, project engineer of NBC's East Coast Entertainment Operations. 'We've got a lot of history—we were part of RCA, we introduced colour programming, we did a lot of early broadcasting technology R&D. We're very proud of our story and we like to tell it.'

Today at NBC headquarters there are entertainment and news studios. Three entertainment studios and control rooms, four news studios and control rooms deliver *Late Night with Conan O'Brien*, *Saturday Night Live*, and *The Rosie O'Donnell Show* (a Warner Brothers show using NBC studio space and crew with the signal distributed by Warner Brothers). Four news studios and control rooms produce the *Today Show*, *Dateline NBC*, *NBC Nightly News* with Tom Brokaw, *NBC News at Sunrise* and NBC News specials.

NBC is the broadcasting component of the American conglomerate General Electric Company whose services include CNBC, the Consumer News and Business Channel, a world-wide cable financial and business channel; and MSNBC, a joint venture between NBC and the Microsoft Corporation. There is also an MSNBC web site and NBC has an interest in the Snap portal. Apart from its NYC HQ, there is a studio production centre in Burbank California helping serve 13 owned and operated stations, and over 200 affiliated stations.

But tucked among the open doors, there are others that are firmly closed

> Jim Starzynski: 'We've got a lot of history—we were part of RCA, we introduced colour programming, we did a lot of early broadcasting technology R&D'

—not only to the public, but to much of the broadcasting industry. Behind them, the future of American broadcasting is being cast. As an NBC lead audio engineer, Starzynski is one of the few able to move freely through them; his responsibilities make it clear why.

'I make sure we keep on top of the audio end of our business in terms of research and product and installations,' he explains. 'Along with researching technology I get involved with the specification and purchase of new equipment, along with the design of control rooms and edit rooms—all the way from drawing the blueprints to buying the gear, to laying out the information for the room and writing up justifications.'

Keeping him busy recently has been the $60m–$80m task of establishing a digital infrastructure for the operation.

'Up until six months ago, we were operating out of a network distribution facility that was comprised of seventies, eighties and nineties technology —partly digital, but mostly analogue. Over the last three or four years we've been moving slowly off the analogue platform onto a full digital platform that allows us to create 40 network channels leaving the building. We can now do distribution and targeted sectionals to different affiliates based on the required programming for their market. That's a huge accomplishment and we think we're a cut ahead of our competitors.

'Most significant is the move off of tape and onto DDR—digital disk recorder —so everything is stored on hard disk. Another accomplishment is reinvention of the routeing control system. It used to be one massive analogue router, but now has become several independent computer controlled digital routers that have embedded audio inside the video signal. They talk to each other almost like telephone networks talk to one A

PHOTOGRAPHS BY TIM GOODYER

< another. So we can now build additional pieces onto the routeing system and swap around tie-lines for connectivity as we see fit. This digital architecture eliminates the deterioration and distortion, and maintenance issues associated with analogue distribution. From an audio standpoint that's significant.'

In terms of other audio facilities Starzynski comments: 'We have a combined audio postproduction and live room on the 8th floor that's used for audio sweetening available to all of our clients and additionally serves as the live music room for *Saturday Night Live*. Inside of that is a 96-channel SSL j-series console and that gets used on a daily basis either for *Rosie O'Donnell*, for live *Saturday Night Live*, for post *Saturday Night Live* or for other postproduction. That's the highest end audio facility in the company—both here and in Burbank.

'One of the key things that makes the room so popular is that we've always been able to keep up with technology in there. We built a really great architectural shell in 1988 and we continued to upgrade the audio technology in the room. Since 1988—and I've been involved in all of them—we've done at least four upgrades going from a SL6000-series console to a 48-channel SL4000-series and a 96-channel SL4000-series, and then to a j-series console. And it'll probably go to a digital console fairly soon.'

Each project has involved a predominance of off-the-shelf technology with custom solutions employed where necessary—as will be the case for the forthcoming replacement of cart machines with a centralised digital system, a project slated for the near future. More familiar items will be central to the planned replacement of our audio consoles and the refurbishment of the control rooms housing them.

But it is the infrastructure that will provide the platform for NBC's progress. Starzynski readily identifies the move from tape to a disk-based format, and digital routeing as the way to escape the inherent problems of analogue. Determining the best time to go to digital beyond that backbone is more difficult.

'In terms of the studios and the edit rooms, a lot of it is based on client applications and demands,' he explains. 'In my opinion, currently we don't have to go digital there. We could go super analogue and everybody would be happy >

At the SSL 9000j serving the Saturday Night Live set. L–R: SSL US President Rick Plushner; Jim Starzynski; UK Secretary of State for Culture Media and Sport, Chris Smith; and SSL's Dave Hansen

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< with that. But there's a maintenance issue with analogue—things as simple as dirty switches. The other issue is that analogue is nowhere near as flexible as digital because it can't be mapped out, snapshot and reset—and for broadcast, that's a really big one. In the post room, dynamic automation is important, in the live rooms it's not an issue and we'd actually prefer not have it cluttering the console. The ability to move console setups from one room to another is important—if you get a new client and you want to accommodate the business, and things get busy, you might get bumped out of a room. If you can take the setup with you to another suite, that's a great thing. Another desirable, networking microphones—terrific. Digital brings a lot, but we'll pursue it slowly and bring in onboard when the time is right to do so.

Adopting a digital infrastructure inevitably raises issues of audio standards. 'It's an interesting and sometimes controversial issue,' Starzynski admits. 'The infrastructure of the company is now basically digital and it has nodes that go out to the control rooms that are digital but how the control rooms deal with signals is based on what's necessary for the application. Currently

Jim Starzynski: 'The control rooms that are digital but how the control rooms deal with signals is based on what's necessary for the application'

that's a mixture of analogue and digital. We hope in the future that it will all be digital. In terms of audio, digital makes a lot of sense; it's cheaper to install, it's more reliable in the long term, it can sound as good—although we don't say better—than analogue. But there are a couple of things that come in to play here. In some cases the analogue studios are fairly contemporary and don't need to be upgraded again for a while. In other cases there are projects that need to be pushed forward and we need to move to another level of technology. In those cases the options are wide open and we'll make decisions based on what we feel is best for the operation.

'Our long-term intention is to go >

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< digital, but we won't do that unless it's done in a prudent fashion—meaning that we won't take the risk of going to digital until the technology is proven and as reliable as analogue has been over the last 15 years. There are some inherent complications to digital audio, however we've been working with various manufacturers to help them understand what our requirements are from a digital mixing standpoint so that they can develop products to suit our needs.

'Audio quality is absolutely an issue. Because it's digital does not mean it's better. Our plant is built around 20-bit digital-to-analogue convertors. It's a really solid, good-sounding infrastructure. In terms of the mixing consoles, audio quality is absolutely important, but I don't want to state that digital sounds better because it's not the case. We've had high-end analogue consoles that can blow some digital consoles away, but I think that as digital products mature they'll sound better. With the advent of DVD-Audio and different forms of lossless audio compression appearing, and digital surround-sound, audio is really taking a step forward. Our view is to determine what would help us the most and what the smart moves are to make, and then to make them.

'In television, what's important is clean audio and making it to its destination all the time—that's primary. Our requirement is for a reliable, flexible, non-stop, good-sounding performance from our audio equipment. With that said, the current standard is 48kHz, 20-bit and we're happy with that. We'll let the music industry push the envelope for us and we'll receive the benefits from their R&D.

'But what is television without audio? Nobody wants to stare at a monitor if it doesn't have sound. High-quality audio is pursued, created, maintained and researched by us and it's never been anything but that. Do we feel we're ahead of the game in terms of our competitors? Absolutely. Do we feel it's important that we're there? Absolutely. Do we see audio as being equal to video? I do. If we commit to a high-end video switcher for a new control room, you know there'll be a companion mixing console in the room that's just as important.'

Jim Starzynski: 'Do we feel we're ahead of the game in terms of our competitors? Absolutely. Do we feel it's important that we're there? Absolutely. Do we see audio as being equal to video? I do'

With the first regularly scheduled high-definition TV broadcasting just airing (a joint project between Sony and NBC broadcasting the HDTV *Tonight Show* with Jay Leno), NBC's strategy is about to be put to the test. And if Starzynski hadn't been busy enough, he's presently putting the finishing touches to the revamped NBC Experience.

'Inside is a retail space, candy shop, and displays about NBC entertainment, NBC news, and NBC on the Web. There's also a 40-person globe theatre with 7.1 sound and a 3-projector edge-blended high-definition screen. People can come in and enjoy the presentation and the store, get a tour of NBC studios and get a feel for what NBC is all about.' ■

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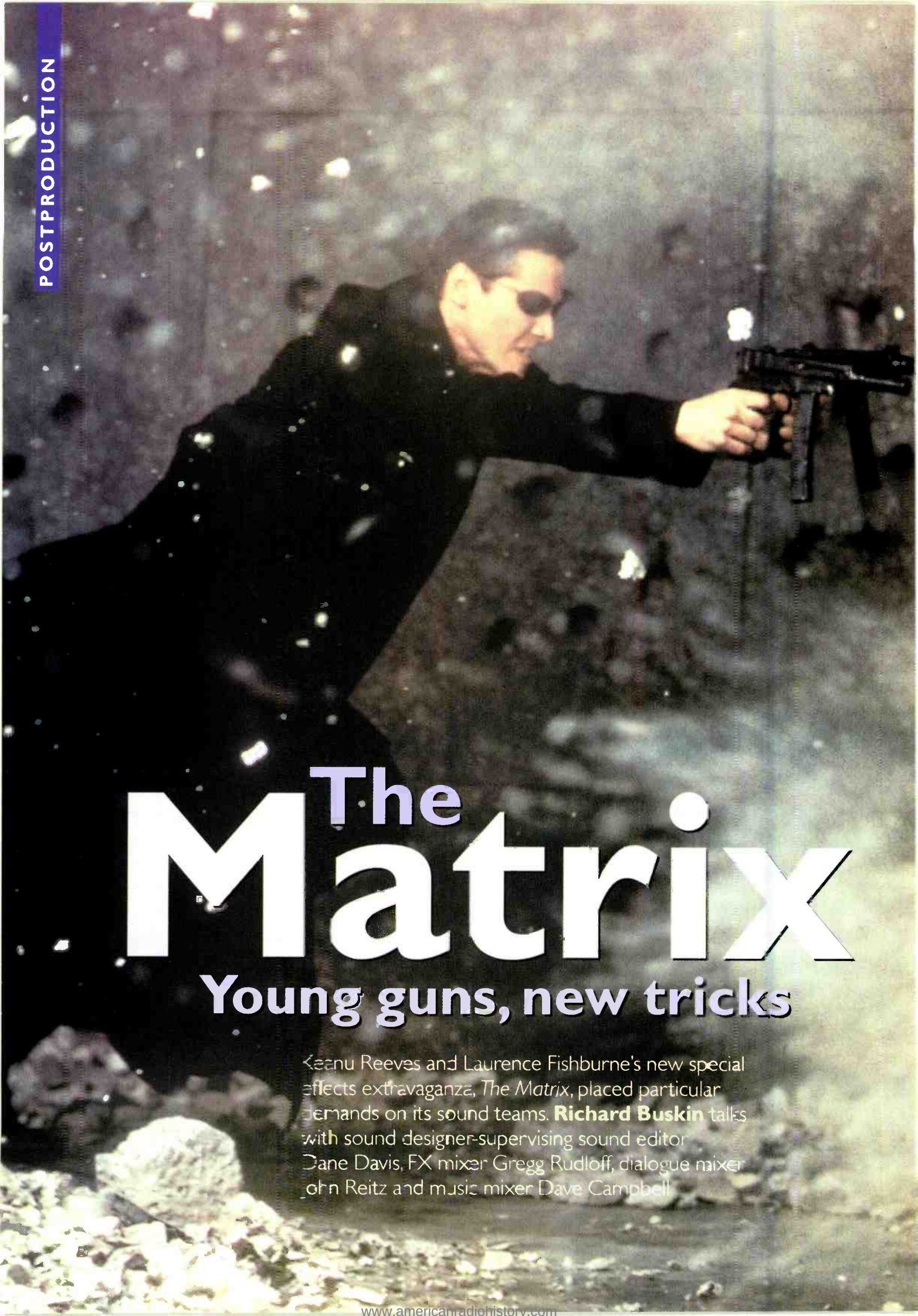


The Matrix

Young guns, new tricks

Keanu Reeves and Laurence Fishburne's new special effects extravaganza, *The Matrix*, placed particular demands on its sound teams. **Richard Buskin** talks with sound designer-supervising sound editor Dane Davis, FX mixer Gregg Rudloff, dialogue mixer John Reitz and music mixer Dave Campbell

EVER HAD TROUBLE analysing your dreams? Thomas Anderson has—in *The Matrix*, the new sci-fi thriller written and directed by brothers Andy and Larry Wachowski, Anderson (Keanu Reeves) is a mild-mannered computer programmer by day who, in his night-time guise as an arch hacker named Neo, sets out to find the legendary hacker-outlaw Morpheus (Laurence Fishburne). The trouble is, when he finally encounters this mythical god of dreams, Anderson is informed that his nocturnal world, the Matrix, is just one great big virtual reality trip. By then, however, he is transfixed, and so it is that the fun really begins, resulting in an effects-laden extravaganza of comic-strip cyber escapism.

'Basically we wanted to create all of the sounds for the movie from scratch in order to give it a very unique quality, but we were also dealing with a lot of genres that we really wanted to transcend; martial arts scenes, gun battles, and so on,' says sound designer-supervising sound editor, Dane Davis, who started full-time work on *The Matrix* project in July of 1998. This was about a week and a half before the completion of principal photography, which, although this is a Warner Brothers film, largely took place on the Twentieth Century Fox lot in Sydney, Australia. Thereafter Davis used his own Pro Tools-based Danetracks facility in Hollywood, while the mix took place on a Neve and Fairlight-equipped Warners sound stage in Burbank.

'We wanted to take all of the conventions, both good and bad, and just sort of blow them up,' Davis continues. 'I therefore created all of the noises for the movie—every body-hit and whoosh—and for these I primarily used plug-ins with the Pro Tools. I have a gigantic Pro Tools system with loads of plug-ins, and a lot of these sounds are evolved step-by-step. In fact, many plug-ins are feeding other plug-ins.

'Pro Tools was used for recording, editing, processing and manipulating all of the sound in the movie—the music, the dialogue, everything—and, aside from some mag stems for one of the temp mixes, tape was never used for any of the post work. That kept everything flexible and efficient, and I also think it added a lot to the clarity.'

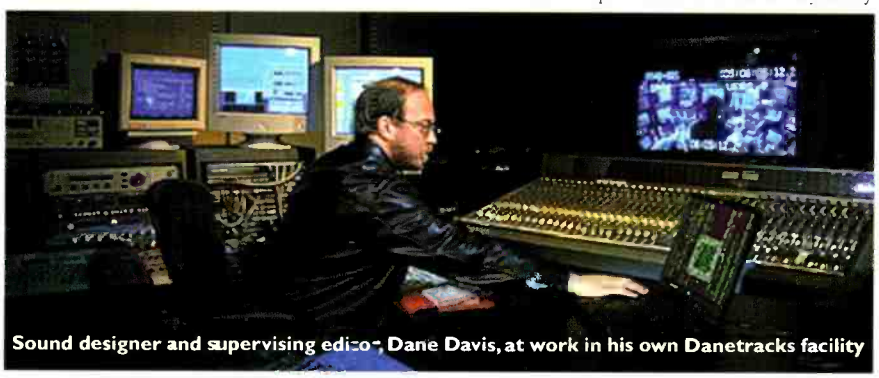
And that is a word that keeps cropping up whenever I talk with the audio guys about their *Matrix* assignment; clarity. 'Retaining clarity is, I think, the challenge with any big scene,' says effects mixer Gregg Rudloff. 'You can put in everything and add all of the music and it just becomes a cluttered mess. So, trying to keep clarity and have your focus go where you want it is the thing, and on this movie the directors were very keen on keeping it clean, whereas often you'll have a client who's interested in just having a lot of things going all of the time and they end up getting in each other's way. The Wachowskis draw a very definite line when it comes to distracting the audience, and that also ties into the sense of dynamics. We wanted the movie to be as dynamic as possible without necessarily being loud. We knew a lot of the scenes would be loud, but we did not want anything to be so loud that it would put people off.'

PHOTOGRAPHS COURTESY OF WARNER BROTHERS

The audio team for *The Matrix* was basically the same as that which worked on Andy and Larry Wachowski's previous picture, *Bound*. Once again, the film shoot adhered strictly to the storyboarding, so everyone was well aware in advance of what to expect, and consequently all of the special effects had to spring from the storytelling.

'The Wachowskis wanted electricity to infuse the whole movie,' Dane Davis explains with regard to his work as the sound designer. 'After all, it's about electricity. It might be dealing with the digital domain, but you're still talking about pulses and electrons, and so they wanted everything to have a kind of electrical edge and that was therefore one of the framework dimensions that I tried to go with.

'For instance, there were things like the Nebuchadnezzar hovercraft, where the propellers had to be electromagnetic. Well, I didn't see what those propellers looked like until just before they finished the movie, and the idea was to build something that had no engines, no thrust, no explosives, no exhaust, no combustion. The power had to be purely derived from electricity, and to that end those propellers were all made from arcs. We rented a six-foot-tall, 30,000V Jacob's Ladder, and I >



Sound designer and supervising editor Dane Davis, at work in his own Danetracks facility

< obtained the sort of Dopplering arc cycles that I needed for these propellers by recording this huge arc going very closely by the mic and making forward-reverse loops. I think there were ten propellers, and each of them had three forward-reverse loops of this Dopplering arc, and they were also pitch-shifted as samples. That's where all of that power comes from.

'There's also a lot of metallic resonating of the Nebuchadnezzar when it's moving, and, although that's propulsive it was all just produced with huge sheets of steel that were being vibrated with dry ice and things like that. So, that wasn't specifically electrical, but, being that the ship is electromagnetic, everything on the Neb is steel, and so that was another emphasis. I got to stomp around on some of the set parts from the ship when I was in Sydney and get a feel for that, because, even though it wasn't really steel, it looked like steel. I wanted to convey the idea that the electromagnetic field from those propellers was affecting everything—you know, like the steel was always being kind of pushed and pulled by the electromagnetic field, and so that's why I used the steel sheets.

'There was a giant metal gate that I recorded in Texas a few years ago that made this singing resonance, and so I pitch-shifted that down many, many, many octaves using a program called SoundHack, one of the few stand-alone applications that I used, can do pitch-shifting a long way without hearing any nonsense, and so I used that to create all of these extremely low metal resonances that you hear inside the ship.

'Another program that I used was MetaSynth, and that really defined the sound quality of a lot of things, giving them an extremely clean and distinct timbre while doing digital processing. I used it on anything that had to feel digital, not wanting to get grainy in an ugly way—except for five or six sounds in the movie that did have to be grainy in an ugly way. In some cases I had to create an audio file and import it to MetaSynth, export it back to Pro Tools and then let it continue with its linear progression.'

Meanwhile, further electrical devices were recorded in order to attain the >

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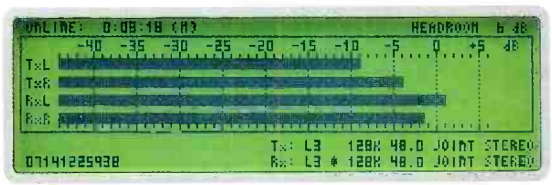

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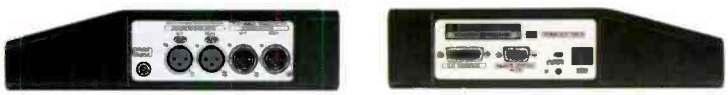

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Armed with his Rycote-encapsulated Schoeps mic, Dane Davis faces off against a 20,000-volt Tesla coil fulmination

sound of the power plant which the main characters visit. 'Everything had to have these throbbing electrical cycles,' says Davis, 'so I used a lot of free-arcing, where I was just taking transformers and arcing in the air, and recording Tesla coils and things like that. In all, that power plant has about 50 electrical elements that are all kind of working in sync to a big pulse, and that was fun. Also, when you go through the TV monitors, through the letters on the screen or through the code, there's a lot of electrical arcing that's been either digitally manipulated to feel digital or left fairly raw in some cases, just pitch-shifted way up in order to give it a really crackly quality. That's one of the things they really wanted, giving you the feeling that you are moving through electricity when you go through the screens.'

John Roesch and Hilda Hodges took care of the Foley work at the Warner Brothers facility in Hollywood, with Thom Brennan supervising. Recorded on 2-inch tape with SR before going into Pro Tools, this comprised a lot of the film's external elements in addition to the usual array of sounds. 'They did a fantastic job,' says Dane Davis, 'and it was very sparse Foley for a movie like this. Scenes like going into the pod in the power plant, all of the little splashes and movements were done by the Foley crew and the effect was beautiful. We were shooting Foley for months before the mix, because I was incorporating Foley into what I was doing, and I was doing little temp mixes for their Avid all of the way through the process.

'Being that the picture editors were in Sydney and I was in Los Angeles, I had editors building the sound-design and action-type scenes from the material as I was making it, and I would do premixes that I would wire back to Sydney. They would then download them the next morning—which was really a day and a half later for them—and cut everything direct into their Avid. Therefore, as they were cutting the movie they would have early versions of everything that I was making, which is a terrific way to work in spite of the 8,000 miles between us. Once or twice a week we would get on the speaker-phone with the Wachowskis and discuss where things were at, and so we all evolved together. Then, the morning after they arrived back in the US, we did a 3-day temp mix in my studio with all of the music that had been cut to that point, and for the first time we all got a sense of how everything was going to play.'

Chris Jenkins, Mark Smith and Ron Bartlett spent eight days in January of 1999 doing a temp mix off of five Pro Tools systems using a Neve console at Todd-AO. Thereafter, the temp mix updates were done by Dane Davis at Danetracks, while the mix proper saw John Reitz, Dave Campbell and Gregg Rudloff taking care of dialogue, music and effects on a brand-new sound stage at Warners, where a pair of 32-output Pro Tools fed a Fairlight MFX3 setup via the recently installed AMS Neve DFC console.

'The Fairlights and the Neve worked together really well,' says Rudloff who, together with his colleagues, mixed over the course of a 6-week period from early February to late March of 1999. 'The setup provided flexibility so that, when there were picture changes, the drives could be pulled out for the fixes to be made on a Fairlight editing station on the lot and then popped back in. That's very necessary on these kinds of movies. We used the Fairlights both for recording and playing back, and it all went fine.'

Configured for dialogue, music and effects, the all-digital, all-automated DFC console is set up in four tiers, with each fader capable of up to an 8-track pre-dub. 'We did a 6-track mix, so all of my predubs were in 6-track form,' explains Rudloff. 'The six channels consisted of left-centre-right, a left surround, a right surround and the sub information. I wasn't using the faders of each tier; just one layer had the 6-track predub, but I was using multi-layers for other things. Depending on how you set it up and what you're using the signals and routeing paths for, the board can provide up to 500 paths.

'It was a straightforward project in terms of satisfying what the client wanted, but it was also fairly complex, with a lot of stuff going on—the lobby shoot-out, the shooting-out of the office building with the helicopter and all of that—and so we kept as much separation as possible in the predub process. I was basically working with like 20 predubs per reel, and we were also flying stuff in wild because we didn't get some of the final

visuals until we were in the process.'

In terms of the dialogue there was very little ADR, the Wachowski brothers largely shunning the looping option —out of about 100 lines shot roughly only 20 were used, whereas some film projects can call for as much as 700 lines of ADR. Nevertheless, this is not to say that *The Matrix* didn't need it.

'The dialogue was in terrible shape,' says John Reitz. 'They had a lot of problems when they were shooting in Australia, with plenty of rain machines and lighting machines causing some high-frequency problems that we had to get rid of. Basically, anytime you have that many special effects going your production has a lot of noise that you have to deal with, and so I used different devices to clean it up. I used a 4-band gate splitter, and I also used the Yamaha dip filter in a lot of cases to get rid of steady frequencies. In the construct area where it was all white-screen I had all production dialogue and it was pretty noisy, so it was gated quite heavily, not so much with Dolby 430s, but basically just with the 4-band gate-splitter.

'Keanu Reeves doesn't really project that much, so it was kind of difficult at times to get him through. However, battling the effects wasn't really a problem because Gregg tends to work around me in a lot of cases, and the same applies with the music mixer Dave [Campbell]. We all pull down a little and he fits in around the dialogue—the three of us have worked together for 18 years, so we're very tuned into each other, and, if one guy has a problem trying to get something through, the other two guys will back down for him.'

'I worked less on this show than on anything I can recall,' adds Campbell regarding his mix of the score that was recorded on a Fox sound stage. 'It came in on 24-bit Pro Tools, it was set up in an adjacent room here and I never even saw it. It just came to me on faders and it worked wonderfully. Armand Steiner had recorded a 6-track orchestra and it was magnificent. It was absolutely perfect. Then I had an additional six tracks of synths which Don Davis did beforehand—these had been mixed down with Armand's orchestra, and it was so well balanced that I almost never touched it.'

Davis with the Warner brothers. L–R: Music Mixer Dave Campbell; dialogue mixer John Reitz; FX mixer Gregg Rudloff

Still, touch it he did. Meanwhile, when it comes to the overall sound, with any action movie there is always a danger of employing what could be described as 'Mickey Mouse effects', emphasising every nuance in unimaginative audio >

< fashion. On *The Matrix* Davis was therefore determined that obvious solutions to the on-screen proceedings were to be avoided at all costs.

'It's quite risky using things that illustrate the film-making process rather than what the characters are perceiving,' he says. 'You experience that in a lot of movies, where the sounds are all about the sound editors and the mixers. Well, the audience doesn't care about that process and it's also a distraction from what they're watching. On the other hand, a scene such as that in which the government lobby is invaded had sounds for every movement, every bullet, every explosion, every possible detail, and then during the mix we pulled everything out and just put in the things that we needed based on how the characters perceived them.'

'That scene, we decided, was really too big for too long, and it could become annoying,' says Gregg Rudloff. 'Again, there are directors and producers who like it to be that way, but the Wachowskis were more interested in peaks and valleys.'

'As soon as the audience would expect something, such as the guards to keep shooting, we'd pull way back on the gunfire and just go with the sound of the bullet flying past from Neo's perspective,' adds Dane Davis. 'That means it doesn't play at all in a literal way, but it's still really exciting.

The Powerhouse effects team. L–R: Eric Lindemann; Julia Evershade; Dane Davis

Similarly, a lot of times we'd insert the reverse sounds of guns being shot because it worked great with the music. It made the beat more intense and punchy, even though it had no literal meaning, and we'd also put in off-screen gunshots because they were interesting in a musical way. In fact, the producer, Joel Silver, is known for liking things louder, but he loved the poetic approach so much that even he said, "Hey, go more abstract". Coming from Joel that was terrific, and it was a license for joyous insanity.

'I always try to break down a scene into characters, whether they're humans, animals, robots or any other machines, and I then try to figure out what noises they would create when doing whatever they're doing in that scene.'

An approach that Gregg Rudloff refers to as 'see a bear, hear a bear'. 'Sometimes that makes a really big difference,' Davis continues. 'I don't ever use synthesisers—whether we're talking software or hardware, and even though I have tons of them—unless the thing on the screen is a synthesiser, and I apply that same principal to creatures such as the robots in this movie. I didn't want them to make a sound that seemed like it was being made for the benefit of humans, and, while that's guiding principle in all of my work, in this movie it was a law. If a sound makes the audience think about somebody creating that sound then it's the wrong sound.'

Still, with movies such as *The Phantom Menace* lurking around every corner, there is undoubtedly a lot of pressure on sci-fi film-makers to hit audiences between the ears with a plethora of novel sounds. 'We didn't want anybody to hear anything that they had heard before,' agrees Davis. 'Nevertheless, that kind of pressure to be unique does make it a lot more fun; ten times as much work, but a lot more fun. I had to kick people's butts with the sound effects, because certain scenes had to be really radical and intense, and they had to make a huge impression on the audience. Of course, I also didn't want it to seem like we were trying too hard—and that's never easy—but in a lot of cases the rule had to be that when we were getting used to a sound then that was the time to get rid of it.' ■

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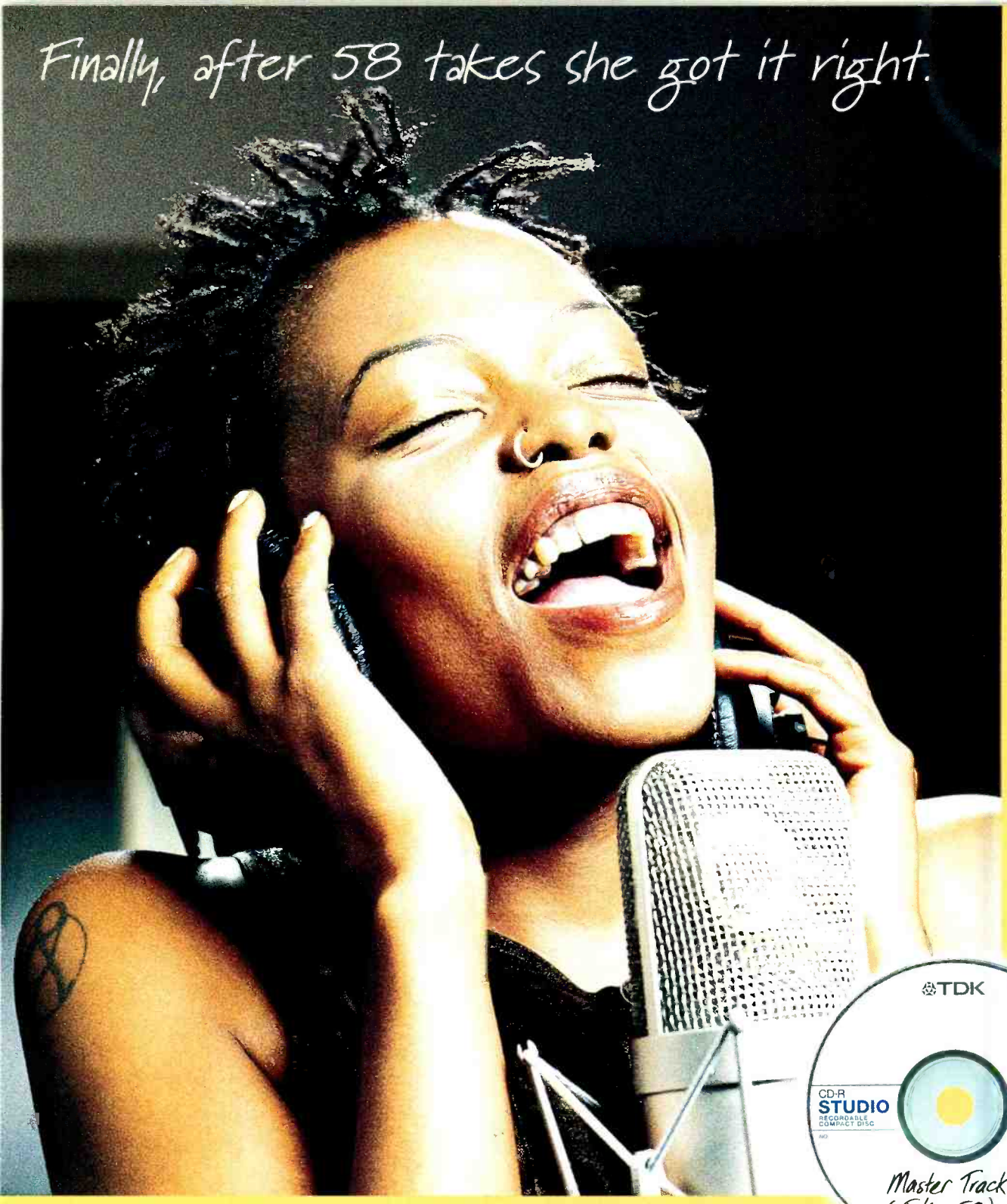

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Trouble in Store

Throughout the history of audio, the topic of recording media has prompted development and distress in equal measures. **Carl A Snape** replays the history of storage

FORTY YEARS is a long time. Forty years takes us back to 1959 when magnetic tape was the primary storage media for audio recordings. It also takes us, conveniently, almost to the very beginning of polyester base magnetic tape. Originally, in the very earliest days of tape, paper had been used, but over time this was replaced with cellulose acetate and in the early fifties, when the first long playing tapes were introduced, with polyvinyl chloride (PVC).

In the early sixties triple play tape was introduced. What made triple play a reality was a new plastic base film material. Polyester only needed to be 18µm thick compared to the 25µm thickness necessary for PVC and the 50µm of cellulose acetate. Initially the professional recording industry was suspicious of these new tapes and for good reason. Although cellulose acetate would stretch slightly under normal use, when it was put under high tension, such as abrupt braking, it snapped, and in most cases would have to be repaired with splicing tape.

Polyester, on the other hand, had a nasty habit of stretching, and the stretching got worse as the tension increased. effectively rendering that segment of the recording unusable. Pre-stretching the polyester (tensilising) did reduce the problem and this, coupled with careful tape transport design and improved braking, resulted in polyester ultimately replacing the earlier base films and establishing itself as the main base film material for virtually all professional recording tapes. Although normally referred to as polyester its full chemical name is polyethylene terephthalate so you are likely to see it identified as PE or PET. It is also widely known by its Dupont registered name of Mylar.

When BASF introduced its triple play polyester tape in 1963, it was originally designed for open reel applications, however its introduction caught the eye of another European manufacturer —Philips. With BASF's experience with low noise/high output formulations, and now with its ultra thin tape, it would seem that Philips' new innovation—the Compact Cassette—and BASF's new tape would make perfect partners. And indeed this proved to be the case. When the original Compact Cassette was introduced at the Berlin Radio show in 1963 it contained BASF's new polyester tape.

Although Philips invented the Compact Cassette, it was not the first company to have the idea of putting tape in a plastic shell. RCA had actually marketed a cassette containing two ¼-inch reels of tape as early as 1958.

The sixties were not the era of the Compact Cassette—in fact the Compact Cassette was not widely accepted until 1970. It was the time, however, when professional multitrack recording began to flourish. The early 3-track multitrack recorders used ½-inch tape. Although changing the tape width to accommodate more recorded tracks is a major design challenge for the tape machine manufacturer, it is a relatively straightforward procedure for the tape manufacturer. This is because during the manufacturing process the magnetic material is coated onto large jumbo reels, often several feet wide. Making ½-inch, 1-inch or 2-inch tape, although a precise and skilled operation, is essentially determined by the position of the tape slitting knives and how many you use.

By the late sixties most professional recording tapes were back coated. Normally a thinly coated carbon pigment, this would be applied with a suitable binder (usually a polyester urethane —the same binder used in the magnetic coating) to the back of the base film. The back coat helped dissipate static, hence the carbon, and the matte surface improved the winding characteristics.

Throughout the sixties, tape manufacturers competed with each other to improve their formulations. During the early part of the decade the emphasis was on low-noise formulations, but waiting in the wings was a new innovation. The prototype A301 Dolby A-type noise reduction was first demonstration at Decca Studios in London in November 1965. According to Dolby Labs, by the end of 1969, driven by the increasing use of multitrack recording, the majority of London pop music studios were equipped with Dolby A.

While Dolby noise reduction certainly addressed the noise issue this did not mean the tape manufacturers gave up developing their tape formulations. They turned their attention to higher maximum recorded levels—increased dynamic range in other words—during the latter half of the sixties and would continue with this type of development through the seventies and even into the eighties with tapes such as Scotch 996.

With the advent of digital recording however factors such as noise and headroom ceased to be so important. Dropouts, tape smoothness and improvements in runability were to become more important concerns with digital media.

Digital recording brought with it not only a plethora of storage devices, but also a bewildering number of recording formats and types of storage media. The latter can be classified into three main categories: open reel, rotary head (video cassettes) and data storage. When the very first digital recorders were built it was basically a free-for-all with each system being incompatible with any other. The very early systems developed by Decca, EMI, 3M-BBC, Soundstream, and Sony used open reel and video-based storage media. >

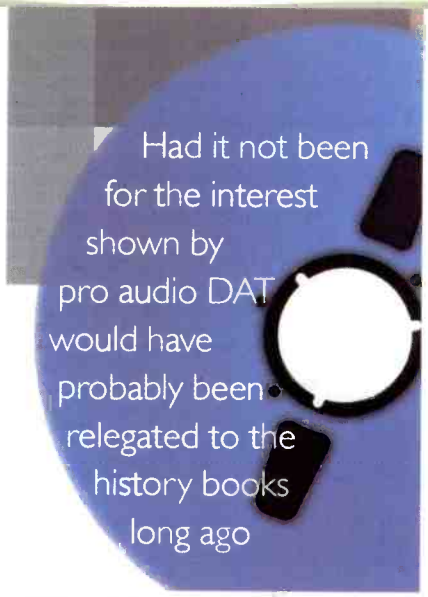
< There was no common recording standard, neither was there a common tape speed for the open reel formats.

Broadly speaking, three tape formats survived: DASH and ProDigi, which were both open reel, stationery head formats for multitrack and mastering, and, with the introduction of the Sony 1610, and later on the 1630, U-matic, which became the standard media for CD mastering. Also introduced by Sony, and taking its name from the way the tape was wrapped round the video head, U-matic was one of the very earliest video cassette formats. In spite of its close associations with professional users U-matic was actually conceived, originally, as a consumer format.

Another consumer video format from Sony would also end up in the recording studio. Betamax was introduced in 1975. Coupled with Sony's F-1 digital processor, it provided the basis for an inexpensive digital recording system. Although ultimately shunned by consumers as a video and audio recording format, Betamax tape continued to be used for CD mastering until it was finally replaced by DAT.

Betamax was joined by JVC's VHS format in 1977, Video 8 in 1985; S-VHS in 1987 and Hi-8 in 1989. All these video-tape formats would eventually end up being used, in one way or another, for digital audio recording: S-VHS for ADAT and Hi-8 for DTRS, for example. In 1986, however, a new tape format was announced specifically for recording digital audio.

The Digital Audio Tape format or DAT as it was to be universally known, revolutionised digital audio recording. Using a much smaller cassette, narrow 3.81mm tape and a rotary head recording system, R-DAT ousted its stable mate, S-DAT (Stationery head) when the final format was voted on at the DAT Conference General Assembly in September 1985. Details of the R-DAT format were finalised in 1986. Shortly afterwards Sony showed the first working prototype at NAB.



Although Sony had developed a professional DAT recorder very early on, once again the format was primarily aimed at the consumer market as a pre-recorded format and as a replacement for the analogue cassette. Originally four types of DAT tape were specified. One for 13µm tape and one for 'thin' tape. Standard and wide-track recordings could also be automatically detected by the arrangement of recognition holes on the base of the shell. The magnetic coating was specified as metal powder (metal particle or MP). With the thinner 10µm tape, recording time was increased by 50%. The first tapes were all 60 minutes long, but 90-minute and 120-minute tapes soon followed. Today DAT tapes are available in a wide variety of lengths from 15 minutes to 2 hours.

In spite of the efforts to market DAT as a consumer product this never really happened. Had it not been for the interest shown by the professional audio community DAT would have probably been relegated to the history books long ago. With hindsight many probably wish it had been!

Not everyone—including Sony—was happy about DAT being used for professional recording. Sony responded with the MO-based PCM-9000 format, but failed to get it adopted as a universal CD mastering format. Nagra, on the other hand, developed its Nagra-D format using ¼-inch open-reel tape in order to provide a higher quality and more reliable digital recording format for professionals needing a portable digital audio recording format.

Although DAT is still used today in many ways, the nineties has become the age of computer editing and recording with data-storage media increasingly replacing analogue and digital tape.

Originally vast arrays of hard disks were used to store digitally edited material, but as computer technology matured an increasing diverse range of high capacity storage options have became available. One of the first was the 12-inch Write Once, Read Many (WORM) disc which was followed in November 1988 with the first commercial rewritable MO disc. One of the first professional audio uses for this new double-sided disc was the Audiflex digital dialogue editor. At the time hard drives could store around 27–28 minutes of sound. The new disc could store up to 55 minutes per side. As the technology developed not only did the capacity increased but also smaller 3½-inch discs have been introduced.

Even smaller still, yet still using MO technology, MiniDisc was originally announced in May 1991. Its small size and protective shell have seen increasing numbers of broadcaster use the media for recording and program archiving. In fact a number of broadcasters are switching to recordable MD in preference to DAT.

Magneto-optical media is not the only option for data storage. Tape-based formats such as the 8mm Exabyte cassette (currently with three different storage capabilities) and the DLT cartridge (with four) are already well established. The former, in particular, for CD mastering and the latter for DVD. However, recordable CD and DVD already pose an on-going threat. Certainly CD-R has become an increasingly popular format for CD mastering and one imagines it is only a question of time before >

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< recordable DVD will follow in the same footsteps with respect to DVD Video and presumably DVD Audio.

So is that great survivor analogue tape finally going to be laid to rest? Somehow I doubt it. When you hear stories of recording engineers backing up their RADAR systems with analogue tape there is something to be said, not only for that analogue sound, but also for the compatibility and universal playability of the analogue tape formats.

As for the future, inevitably we will see more formats developing for digital audio recording and long-term storage. Certainly archiving on large computer networks will be the way forward for those responsible for large collections of media assets. For the smaller studio, keeping an eye on new consumer formats may provide some clues as to where digital storage may be heading. Whatever tomorrow may bring, it is still increasingly important to protect your current recorded assets for without these original recordings you compromise back-catalogue releases for future formats.

Although it may be tempting to imagine that all your problems are over once the multitrack has been mixed and the production master sent to the factory, in fact this is far from the case. Simply sticking a label on box, filing it on a shelf and turning the light out and then coming back in 10 or 15 years time expecting everything to be as you left it is simply courting disaster. If you do not look after your assets you may end up without any.

When it comes to proper analogue tape storage, prevention is far more preferable than cure. There are three key elements that are important. Avoid any form of contamination—dust, dirt, fingerprints, moisture. Avoid any physical stresses that might deform the tape. Finally ensure your tapes are stored in a stable, controlled environment. It is not a good idea to subject tape to rapid changes in temperature. Taking a tape from a cool library to a warm control room will have a detrimental affect on the tape's long-term stability. Another, often overlooked, point is to avoid storing anything in the box along with the tape such as track sheets. Although it may not seem so, paper is an ideal source of dust and also provides a comfortable home for bacteria. You should also avoid 'protecting' your tapes by putting them in plastic bags unless you are absolutely certain you are doing it in a moisture-free environment. The plastic bag will simply trap any moisture, which will then accelerate deterioration of the magnetic coating.

Ideally open reel tapes should be exercised every 3-4 years. Avoid uneven winding as this can create air pockets which can then create stress, greater air-to-tape contact and potential tape edge damage. Ideally, winding should be done as slowly as possible. Some archivists even suggest 'winding' the tape at play speed on a machine with the heads removed.

Environmental conditions are critical for ensuring that your tape library remains in the best possible condition. High temperatures and high levels of humidity should be avoided at all costs, as these will have an adverse affect on the tape and also encourage fungal growth. Quantegy, for example, recommends a storage temperature of 18°C ±1°C (65°F ±2°F) and a relative humidity of 40% ±5%. Others, suggest even lower temperatures (15°C) and relative humidity levels (24%). There is a >

Ash Howes

Photo: Chris Hook Studio: Battery Studios, London

on BASF tape

"I use BASF SM 900 *maxima* because of the sound – it is so punchy, the output is so high and the noise levels so low. A modern analogue tape like SM 900 gives me all the things I want: warmth, compression, etc., without losing that sound."

Ash Howes's credits include recordings with Texas, All Saints, Bryan Ferry, Alisha's Attic, Astrid, Another Level, Montrose Avenue, Hillman Minx, Rare, Roddy Frame and The Other Two, Seafruit and Jimmy Sommerville.

SM 900 maxima is a high-output analogue tape designed specifically for multi-track recording and mastering, with extra wide dynamic range, low noise and low print through.

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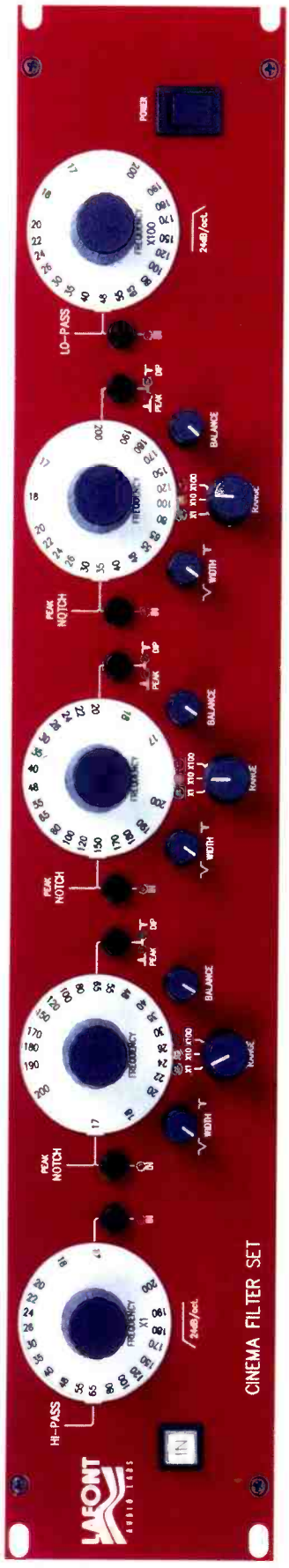

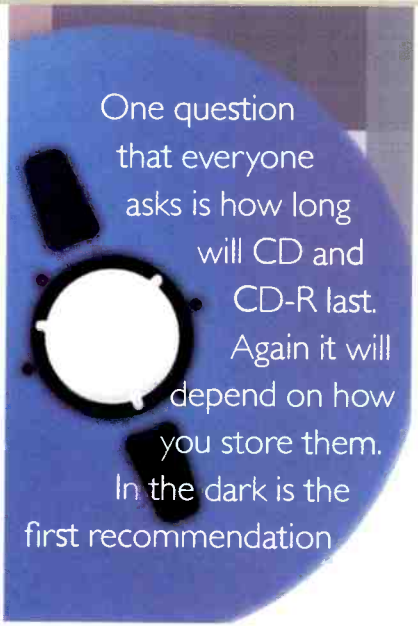

< danger, however, that if the relative humidity is too low this will encourage static build up and can cause shrinkage of the backing material.

As many have found to their cost, one of the biggest problems with the long-term storage of analogue tape is moisture. High humidity, for example, will not only tend to stretch the backing film, but will also increase hydrolysis. Although you may not have heard of the term you will no doubt have heard of its affect on tapes that have been stored for several years.

Hydrolysis is a chemical reaction between the tape binder and moisture in the air. The process creates carboxylic acid and alcohol, which ultimately manifests itself as gummy, tacky substance on the recorded side of the tape. In an advanced state, the reaction can affect the bond between the magnetic coating and the underlying plastic film resulting in total separation of the magnetic layer if any attempt is made to rewind or even play the tape.

The problem first came to light in the latter part of the eighties when record companies wishing to reissue back catalogue material on CD found to their horror that some masters from the sixties and seventies had been affected by hydrolysis. In some cases the tapes would squeal when played. In other cases the machine would slow down or grind to a halt. In the very worst cases engineers had to peel the magnetic coating from the heads. Early attempts to reduce the squealing involved lubricating the tapes. One method was to split a pencil lengthways so that the graphite core, supported at the rear with the wooden sleeve, was exposed. This could then be used as self-lubricating graphite guide. Also tried, were various waxes and special lubricating wipes used by the film industry for lubricating film stock.

Towards the end of the eighties, Agfa developed a commercial process for restoring these damaged tapes. Known as the XT Process the tapes were subjected to a 5-stage treatment process. After cleaning, the tape would be chemically treated and then baked. The major drawback with the technique was that the treatment only lasted an hour and the tapes could only be played once. After looking at the problem Ampex devised an alternative solution and published the details in 1991. Today there are a number of slight variations on the original recommendations but they all largely follow the same technique. The biggest differences are in the baking time.

Although the original baking process could take up to four days, tapes would normally remain stable for up to 30 days under reasonable room conditions (avoiding high humidity). The process could also be repeated a number of times even if the tape had been put back into storage and retrieved several years later. Critical to the process was the temperature and the ability to accurately control it. If the temperature was allowed to go above 55°F, the base material may soften and physically distort. Although a domestic oven could be used in theory this was not recommended simply because domestic oven thermostats normally do not operate below 70°F.

Using the highest recommended temperature it takes up to 48 hours at 55°F to bake a badly affected ¼-inch tape (96 hours for a 2-inch tape), however, at 55°F you run the risk of slightly increasing print-through (by about 1dB). If this is critical the recommendation is to use a lower temperature. In this case, typically, a ¼-inch tape would need to be treated for 72 hours at 45°F.

Although hydrolysis has not been an issue with digital tape that does not mean you do not have to be concerned. Similar binders can be found in videotape so in theory at least they are just as susceptible. Most of the general storage recommendations for analogue tape also apply to digital tape media. It is important that the tape is neatly wound and it is also recommended by some manufacturers that the winding of video cassettes is reversed every 1-3 years. Video cassettes, even if stored in library cases, should be stored vertically and open reel recordings should not have the end of the tape hanging loose when stored.

One question that everyone asks is how long will CD and CD-R last. Again it will depend on how you store them. In the dark is the first recommendation. According to National Media Labs, stored at 10°C and 25% RH, good quality CD-Rs should last between 10-100 years, poor quality CD-Rs up to five years. At 15°C and 30% RH expectancy drops to 5–50 years and two years respectively. Although these tests were based on media available in 1995 the tests do show the great variation in both the span of life expectancy and quality of individual manufacturers. The test results are also based on infrequent

access and good environmental storage conditions. Generally speaking CD-ROM and WORM discs have the greatest life expectancy; MO and CD-R the least.

More information on recording and archiving issues can be found via TRIUMF who can be contacted at http://www.triumf-uk.demon.co.uk.

In some ways, although analogue media deteriorates, at least it's still fairly easy to find tape machines on which to play the media. The same cannot be said of digital and the situation in 10 or 20 years time may be even worse for original multitracks or masters stored on computer media. One of the nice things about analogue multitracks is that the recordings can be remixed and reused with any future format. If you are relying on an archive of CDs then all you have got is 16-bit/44.1kHz stereo, which is great for CD, but very little else. If your archives consist of multitracks and-or mixes on computer storage media then you could face a more worrying situation.

Computers and computer products continue develop at an ever-accelerating rate. The leading edge 4x CD-ROM drive of four years ago is a snail compared to today's 40x drives, but you could argue that your CD-ROM is still playable and that's true. However a growing number of people are already finding it very difficult to locate machines to play the very earliest digital recordings. Spares are like gold dust and we are only talking about recordings from 10 or 12 years ago.

With computers, formats come and go; operating systems come and go, old processors and spares disappear off the face of the earth. Computers are constantly updated, so is software. Can you still read your old media? Are those old replaced drives still in good order? Do you still have the manuals? Do you know where the software drivers are? Unless you have a policy of backing up your archives with more modern media you could be creating a lot of work for yourself in the future. You could even end up with unplayable media.

Fortunately, largely due to CD and the recognition of the value in reissuing back catalogue, there is a far greater awareness of looking after multitrack and master recordings. Certainly the days when one large US entertainment company allegedly stored part of its tape library in an area exposed to the outside elements appear to be a thing of the past. But this isn't just an issue facing the major record companies and studios; it concerns everyone involved in professional recording. It is not beyond the bounds of possibility that you could be recording the first demo of an artist destined to become the next Sinatra, Elvis or Lennon. In 40 years time that recording will probably be priceless. The thing is, will it be playable? ■

Roman Holiday

In the land of the original voice-over, **Zenon Schoepe** visits four film facilities in the Italian film capital of Rome

LIKE MANY countries that have a language that does not transfer readily across borders, Italy balances a small, although relatively prodigious, national film industry along with the demand for foreign language dialogue replacement. As is often the case in these circumstances, this breeds a middle market industry that is a far cry from the flagship film emporia of places like International Recording, that recently opted for AMS Neve DFCs, but it is a middle market that is a hive of activity as it serves the demands of film and TV programming requirements.

Italy's film heritage is a long and illustrious one, and because of this it is unusual as a non-English speaking nation in having a good handful of directors that are well known and respected beyond the confines of its borders. This heritage also extends to its films studios and the name Cinecitta is at least as well known as any other non-Hollywood film making plot. Created originally by Italian Fascist dictator Mussolini in 1937 as part of an ambitious plan to aggrandise the nation's art and cultural output, and to serve his own party's propaganda needs, after the war the enormous plot's potential was spotted and pressed in to service by Hollywood which enjoyed its affordability, good climate and a willing and skilled indigenous workforce. Cinecitta played host to such low budget throw-away movies as *Ben Hur*, *The Bible*, and *Cleopatra*, and assured its immortality. Fellini almost lived at Cinecitta and made most of his films here (including of course *La Dolce Vita*). His office has been left untouched and his personal Stage, Stage 5, is referred to as Fellini's stage.

Later still part of the site became a permanent plot for the Spaghetti Westerns, but it has always managed to keep itself busy. Italian television was swift to take advantage of the film city located in the outskirts of Rome and RAI OB trucks are a permanent fixture working alongside the permanent sets that serve as the backdrop for soaps, games shows, drama and series. TV accounts for some 60% of the Cinecitta business these days, but Hollywood still comes back with the likes of Stallone with *Cliffhanger*, for example.

The plot has been reduced in size over the years with the selling off of areas for housing developments, but the majority that is left holds a lot of originality and is largely unchanged from the complex that was built within a pine wood all those years ago. It's a fact that is evidenced by the number of enormous pine trees that still dominate much of the landscape and served as backdrops in those Biblical epics.

And where better to build a proposed massive new 18-cinema multiplex than here in the home of Italian film. Some 200 people are employed with around 20 stages and there's a small audio department that has two mixing stages equipped with an SSL 4000 and a very heavily modified and extended Studer as its premiere theatre. Much of the supporting audio post work happens outside and Cinecitta's main hand is in its real estate and its film-making expertise. Italian productions do get some public financing and cinemas get a consideration if they show a minimum percentage of Italian produce in the course of a year and this goes some way to keep the industry alive.

However, a look at the middle market studio sector reveals just how complex the make-up of national film industry can be, and how different the forces that dictate what a market can >

Above: Sound Art's facility with Cinemix desk, silver screen, and the projector room

PHOTOGRAPHS BY ZENON SCHOEPE

Cinecitta's Venetian yet waterless plot

< support or tolerate are, and how these forces combine to create national identity and character.

Hollywood may well be taking to the DFC in force, but Rome is breaking out in a rash of—not D&R Octagons—the altogether cheaper D&R Cinemix console. But then it is a country in which the film audio industry employs a Cinetrack-modified incarnation of Digigram's Xtrack system as an editor of choice with a film-specific front-end designed by an Italian company.

Sound Design is a relatively new and compact film facility that has recently added a Cinemix for its second mix room for TV. The studio was started in 1996 with a Dolby mix room and Soundcraft DC2020, smaller tracking rooms plus a transfer suite, but a pick up in workflow soon necessitated the opening of another two voice-over rooms. It works on films and TV productions with pretty much the whole gamut of Dolby formats catered for, and the Cinemix room can also be used for voice and music recording as the console is on wheels and can be moved out of the way. Recording is handled by the aforementioned Cinetrack, Akai DR16s, the usual Tascam MDMs and film.

Owner Elio Gualfucci is a graduate of the Cinematography Centre in Rome and has served his time working up through the film ranks. He says the studio specialises in Italian TV fiction mostly in Dolby Surround, although there is still a high proportion of mono work passing through. 'The Soundcraft was the first affordable console with multichannel capability, although things have moved on a lot since >

Fonoroma

Fonoroma dates back to 1930 and predates even Cinecitta, it was Rome's first studio and the place where voice overs were invented with the first experimental recordings to lacquer in 1931. MGM opened its first studio in Rome within the Fonoroma complex. The building houses two new Dolby Digital dubbing studios with Cinemix desks and a third Amek Hendrix room. These are supplemented by ten additional studios used for voice overs and more rudimentary mixing and a dedicated video post facility. Originally a private company it was later sold to a co-operative made up the employees which still owns the complex today. The film work quotient of the facility has increased to 80% with the introduction of the two new theatres, something of marked swing away from the 50:50 split that existed before. Future developments include the installation of small digital desks in the voice-over studios and a small-scale board for one of the smaller mix studios in order to gain experience in digital mixing.

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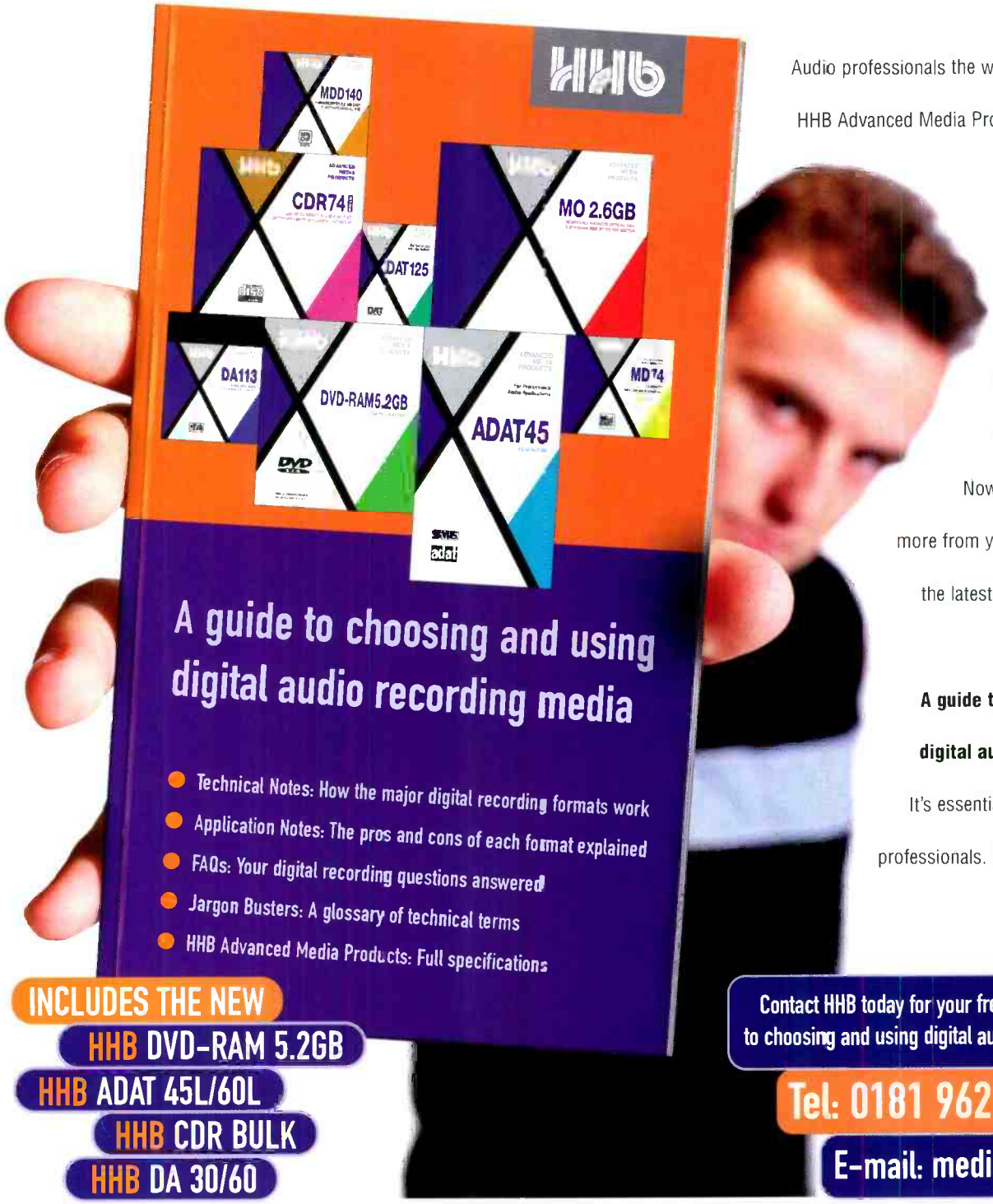

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Roman remains from Cinecitta's odyssey

< then,' says Gualfucci. 'The Cinemix is an example of that, and it's beginning to appear in some numbers in film studios in Rome. I like the fact that we have different types of desk here and that is generally the case in Rome studios, they've never really standardised and I think much of that has to do with the fact that suitable desks haven't been available, so people have had to experiment. This may well change as the Cinemix does give a lot of film features for the money.'

Sound Design typically supplies complete sound services to the TV projects it handles right up to the international soundtrack if required. The market is healthy, but hourly rates are low according to Gualfucci who says he counters this by booking bulk work that ensures the studio is kept full and also means they can justify the sort of quality output that they strive for.

'Even so our prices are less than half of what a comparable facility would be able to get in America for example,' he observes. 'Having said that I know that our prices are lower than those in Austria, France and Germany, but our predicament is dictated by the fact that there are studios in Rome that charge less than us and there is a lot of competition in the area of the market that we operate in. We are also a relatively new studio, but we represent very good value for money because our equipment is much newer than some of the other facilities, and that is a source of satisfaction for me.'

Gualfucci sees real business potential in finding voice-over talent as an adjunct to his existing services, and as a means of tying a production into his facility.

This precisely what Sound Art studios has done, although how it got there is not through the more usual facilities route. Studio owner Elizabetta Bucciarelli is also director of CDL, a premiere voice-over talent association that numbers membership of some 200 of the country's top film and theatre actors. CDL members get the best chance of regular work, and for getting paid for what they do, according to Bucciarelli.

Built in the basement of an old church, Sound Art has a large Cinemix mix theatre with three voice-over studios and they are building another two. There is also talk of another mix theatre possibly again with a CineMix and the facility handles Italian editions of foreign films, although it specialises in high quality art films plus all-Italian productions. The venture is clearly a success, but then the formula covers a lot of bases with the studio/voice-over agency arrangement. Bucciarelli has been involved with voice-over talent for more than 20 years, and is on a personal mission to maintain quality standards in this line of work. Some two years ago she decided that they ought to create their own facility

A neglected homage to Anita Eckberg in *La Dolce Vita*

Cinecitta's SSL desk

rather than rely on those of others. 'It all about the quality aspect,' says Bucciarelli. 'In our own facility we have total control over yet another and important aspect of the process.'

She claims there was a noticeable degradation in quality productions some ten years ago which was precipitated by changes in attitude in TV production. Budgets went down, throughput was high, and there was a kick-on effect to the film industry.

Bucciarelli claims that the general quality of dubbing in Italy today is inferior to what it was 15 years ago. 'Yet the Italian film industry has a rich history,' she says. 'Voice over was invented in Italy and we really progressed just after the war when we started translating American films into Italian and voicing them.

'Twenty years ago there was an explosion in the TV business in this country and there were many productions and a lot of work to do,' she continues. 'But they were watching costs and because of this many lower quality expertise voice-overs actors were recruited to supply the demand. The film makers started to ask questions about why TV production could be done so cheaply and applied similar savings. They were not prepared to pay for the better actors.

'We're beginning to see this change because, although TV quality has remained low, film is enjoying an increase in popularity and the people who go to the cinemas expect better quality in the sound systems, the acoustics, and the environment, and you really can't hide anything any longer, and that applies particularly to the voice overs,' claims Bucciarelli. 'I'm currently involved in a process of explaining to my clients what can be achieved if you do things properly and how much better their product will be received. When they understand and believe that then we'll be able to charge a few percent more.'

The studio facility has been on the site for 20 years, but Bucciarelli took it over only two years ago. 'It's an ideal combination for us because in foreign language replacement an obvious and natural relationship exists between where the voice overs are done and the place where it will be mixed. You do the complete job and you keep control,' she says.

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She adds that voice-over recording is also employed in Italian language films as she claims location recording in the country still leaves a lot to be desired.

Increased business will come from foreign films rather than Italian productions according to Bucciarelli who bemoans the lack of new Italian film-makers saying that any 'new wave' is concentrated not on cinema release, but on television production. But she's convinced the situation will change. In the meantime her operation is thriving by covering all aspects from voice casting through to the final mix.

'We handle the most films for cinema distribution in Italy,' she says, 'and the film makers trust us because we are experts.' ■

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US: A word from the wise

Identifying common themes in contrasting experiences is a smart way to glean what counts from what counts for nothing writes **Dan Daley**

EVERY NOW AND THEN you get to step back and see something that was there all along, something that transcends frequency spectra and signal-to-noise ratia. And there is nowhere better to see it than over here in the US, where, if you wait long enough and look hard enough, you'll eventually see everything.

Recent interviews with two industry veterans provided just such a epiphianic moment recently, and it put the day-to-day clamour over the persnicketiness of the record-making process in the digital age into a new perspective. In an interview with Norbert Putnam, the man who produced Jimmy Buffett and Dan Fogelberg reminisced about his days as a session bassist in Muscle Shoals and Nashville. A few weeks earlier and 800 miles further away, I had sat down with Carlos Bess, half Putnam's age at 29, but a veteran of the rap trenches as an engineer. Two disparate individuals, connected by music and the record-making process though separated chronologically, culturally, technologically, geographically and generically. But they had a common epiphany, one that's useful to keep in mind as you flip through the pages of trade magazines filled with technology.

When he was a studio musician, Putnam was obsessed with making the absolutely best tracks that had ever been heard on records—the tightest playing coupled with the best sonics, ambitions consistent with being a musician and a record producer. In the studio and in the control room, he grew up with the kind of selective hearing that is endemic to those pursuits. What musician in the studio *does not* listen most closely to his own parts?

Bess grew up in an urban culture, and musically speaking, one that has reaped many fine singers, musicians, composers and producers, but historically few technicians over the decades. His experience of trying to learn the technical end of recording reminded me of my visit to the Motown Studios museum in Detroit, where the curator told me that all the engineers at the studio had been white because virtually none of the black artists that Berry Gordy nurtured wanted to pursue that calling. They wanted instead to go right from artist to producer. Without a high school diploma, Bess could not get into any of the state-accredited engineer training programs. Instead, he learned the old-fashioned way, going from studio to studio and acquiring expertise via osmosis and hard knocks.

Both came into the studio culture with the intent of making things sound as good as possible. But in the course of their apprenticeships towards their ultimate goals, they both realised something. For Putnam, it came when he looked back over his time in the track trenches, striving for a good bass sound and part, but later, as a producer, realising that the producers that he had worked for, like Felton Jarvis, who had produced Elvis Presley, and Fred Foster, who had done all of Roy Orbison's hit records, did not care as much about how well those tracks hung together or sounded as they did in creating a comfort zone for the artist, one in which the emotion could flow from the lips to the microphone. And even the mic didn't have to be all that great—it just had to be there and be on at the right moment. And creating that moment is what, Putnam ultimately learned, producing records is all about.

Carlos Bess came to a similar conclusion, though from a slightly different perspective, from his work with platinum-selling rappers like Wu-Tang Clan, Jazzy Jazz and DeeLite. You can listen to those records and cringe at the rampant distortion and crude track edits that characterise them, and wonder how to reconcile the sounds you are hearing with the millions of dollars in sales that they have generated. But to attempt to make that connection is a fundamental canard. Those records are not about sounding good—they're about feeling good. The

Europe: Listen and learn

Problems with high sound levels in a variety of workplaces are prompting increased legislative action in Europe writes **Barry Fox**

EUROPE has had tight regulations to control noise at work for ten years now, but a recent report by the Royal National Institute for Deaf People and the TUC (umbrella Council for the Trades Unions) shows how people are still going deaf as a result of ignorance or indifference. 'Disturbingly little action is being taken by employers', says the Indecent Exposure report.

Our hearing is damaged when over-long exposure to over-loud sound damages the hair cells in the cochlea inner ear. Temporary threshold shift dulls perception for a few hours; if the problem persists after 48 hours the damage is permanent. Cochlea damage is irreversible. There is no cure. And time does not heal.

Damage is cumulative and usually affects the frequency band around 3kHz–4kHz, which is the most critical for speech. When your hearing dips in this band, the first you may know of it is when you find yourself saying 'excuse me?' regularly. At the same time you may experience tinnitus, a ringing or rushing noise in the ear which usually passes after a few minutes, but affects some people permanently.

The UK regulations are typical of those the European Union has imposed across the whole continent, and are based on the assumption that constant exposure to anything over 85dBA, for eight hours a day, is a risk. This equates to 88dBA for four hours, or 91dBA for two hours. The Noise at Work Regulations 1989 set so-called 'action levels'. The first level is reached when daily exposure is 85dBA; the employer must provide ear protectors to any employee who asks for them. The second level kicks in when daily exposure rises to 90dBA or there are peaks of 140dB. The employer must now ensure that everyone uses ear protectors.

Employers ignore these levels at their peril. Anyone who can prove they have suffered deafness because of excessive noise at work can claim disablement benefit and sue for personal injury. The unions will usually fight the case in court.

The RNID found that motorcycle couriers are going deaf through wind roar in their helmets. People who work in telephone call centres are suffering, because they spend all day with a headset clamped to their ear, turned up loud to defeat the noisy environment, and with beeps and hash coming down the line as high level transient bursts. DJs are suffering because they have to premix through headphones or monitor speakers at higher level than the main system. Bar and restaurant staff are now at risk, because it is trendy to blanket the premises in high level sound, which bounces off wooden floors, mirrored walls and metal or marble tables. Unfortunately

Hearing damage is cumulative and usually affects the frequency band around 3kHz–4kHz, which is the most critical for speech. When your hearing dips in this band, the first you may know of it is when you find yourself saying 'excuse me?' regularly. At the same time you may experience tinnitus, a ringing or rushing noise in the ear which usually passes after a few minutes, but affects some people permanently

for our hearing, soft furnishings, that damp the sound, are no longer in vogue.

The RNID is now starting a Noise at Work campaign, that calls for the UK's watchdog, the Health and Safety Executive, to do more to enforce the 1989 regulations—such as those employees

< track is almost an afterthought, though it is part of what Bess is hired to think about. But he has learned not to let details like distortion get in the way of achieving what everyone else in the studio is there to get: emotion. The most important part of being an engineer, he has learned, is making sure the microphone is on at the right moment.

That's what making records is all about, in the end. You can go back and listen to records made out of Muscle Shoals and Memphis 40 years ago and find the same things: soul records were loaded with distortion; not just the kind that everyone today raves about—tape saturation and such—but pure, unadulterated overloading of circuits that were not all that robust to start with. Those records, of course, were plenty good enough for the AM radio and $50 phonographs they were intended for at the time. The quality anomalies become apparent when you listen to them over FM or on a CD. But even the higher resolution of today's playback systems can not squelch the emotion that was contained in those recordings.

So the next time you are fretting about some minor blemish or imperfection in the track, or spending an entire night tweaking a vocal pitch problem on Pro Tools, remember what more than one generation of record-makers has come to realise over time and ask yourself the following question: What would Sam & Dave have done?

who listen through headphones. The report also calls for more workers to wear ear protectors. But if bar staff wear ear plugs, they will not be able to hear what customers order. DJs will not be able to cue up the next disc.

In many respects engineers, both in broadcast and recording studios, are the luckiest. They have control over the sound level in their working space. Anyone who gets a ringing in their ears or a temporary feeling of deafness after a working session should take it as a marker of risk. Anyone working with a producer who insists on monitoring at excessive level, perhaps because their own hearing has been abused over the years, should exercise their right and ask to wear ear defenders. A quiet word with the studio boss should usually be enough. No-one wants to be sued and fortunately the music industry is getting wise to the issue, and no longer thinks it is macho to listen loud. Over recent years I have noticed more and more musicians playing club and concert gigs with plugs in their ears.

Telling bars and restaurants that their music is too loud seldom makes any difference. There is however one very simple way of getting the message across. Don't raise your voice when ordering food or drink, just speak quieter. It's what cinema managers do if they get a noisy audience. Instead of turning up the wick to drown the chatter, the projectionist turns it down. The effect can be quite magical.

A resounding tinkle

Advancing technology and changing business priorities are leaving poor audio work in their wake writes **Kevin Hilton**

OF ALL THE WORDS heard in modern broadcasting 'budget' is certainly one of the most used, undoubtedly one of the most contentious. Everybody, in professional and private life, is subject to budgetary constraints, but it is broadcasting in particular, where the cost of programme making, and how much is allocated to each element of the production, that has come to embody the ever-tightening influence of the accountants. Most programme makers and their suppliers would doubtless shiver in recognition at the words of AA Latimer, who said, 'A budget is the mathematical confirmation of your worst suspicions.'

The impression is that some budgets are being squeezed so hard, the squeak can only be heard by dogs. Even on lavish productions, people involved in specific elements feel that they are missing out on the cash somewhere along the way. This means that some parts of the production could be compromised through lack of the green stuff. In his January editorial, Zenon Schoepe complained that he could not hear the soundtrack of many TV programmes these days, particularly the 'not going away very quickly' docusoaps.

Television does not understand sound and would not waste valuable budget on it even if it did. Factual TV is an area where money seems to be especially tight

This is either due to listening to too many remastered Who albums at fierce levels or it is down to the fact that not all docusoaps have a sound recordist, either for the sake of secrecy or because the budget will not run to one. This, coupled with a higher than average chance that there will be little or no audio posting, could produce a soundtrack that is like listening for the footsteps of the Little People in the fog.

All of which brings us back to a before discussed topic: television does not understand sound and would not waste valuable budget on it even if it did. Factual TV is an area where money seems to be especially tight, something not helped by the demands of schedulers. An example is 'Made In Manchester', one of the better docusoaps, that went out on BBC2 during 1998, with 24 half-hour programmes being screened three a week for eight weeks.

This workload forced the producers —who were also the camera operators and sound recordists—into a compromise for postproduction, using the Eidos Optima nonlinear editing system for assembly and Avid for on-line. Optima was chosen because much of the cutting was done by the producers, who found it an easier machine to operate. However, the technical co-ordinator admitted to me that it was a 'basic cut-and-paste editing tool and the audio is not as good as editors would like.'

Such pressure has caused postproduction houses to opt out of this work and look for better funded productions where audio is appreciated. Dennis Weinreich, MD of London facility Videosonics, said to me last year, 'We found things getting harder, particularly in the core business of rolling documentaries. It was getting difficult to compete with the all-in-one facilities, who can offer a good job at a competitive price. Producers are under pressure with their budgets in the factual TV sector, so we decided to change direction and concentrate on drama, comedy-drama and feature films. This is where we felt that concern for audio was strongest.'

Critics of independent production companies say that they collect the money from the commissioning broadcasters, work out how much they can get away with to make the programme and then keep the rest as profit. This is, of course, a highly contentious theory and one that producers would dispute. In their defence, another facility owner observes that it is the broadcasters that are less willing to spend the money in the first place. There does appear to be the expectation that producers can come up with the quality goods on the same, if not less, money as before because of modern digital technology. However, one post house owner has sourly observed that while some producers might not want to go near an audio suite, they would not claim to have no budget for cameras.

Doubters can be partly reassured by the words of Paul Thomas, series editor of arts and documentaries at BBC Wales. 'We're trying to get a high level of production values in sound,' he says. 'Not enough emphasis is put on sound postproduction, but we're trying to be creative, therefore there needs to be emphasis on sound if you want to take the production to a higher level.'

Cinema and video have had an influence, with surround sound making viewers aware of what can be done with audio. But there is still the statistic that the majority of TV sets are mono, which explains why some factual programmes are still made in that format and many dramas stick with vanilla stereo. Ultimately, the aim has to be to make sure that viewers hear what is going on. If a sequence is being shot in a noisy club, then producers should make allowances and either book a dedicated recordist or be prepared to put some work into audio post.

It either that or we should all invest in some ear drops.

20-20 vision

The arguments rage but the truth need not be as elusive as we believe. **Philip Newell** asks: 20k or more, do we really want to know?

HAVING HAMMERED AWAY for years on the topic of the need for better monitoring conditions in most studios, it is little wonder that I found myself agreeing with John Watkinson's recent comments ('How was it for you?', *Studio Sound*, January 1999). However, in the same issue, I also found myself agreeing with David Blackmer in his article 'The World Beyond 20kHz'. The very next article in the magazine was once again by John Watkinson, the guru of objectivist pedantry, who believes that 20kHz is all that we need. However, I am sure that the better monitoring that he was calling for would reveal to most people that Watkinson is wrong, and that Blackmer is right. How is that for a twist?

We all seem to want the same thing, better recordings, though Pete Waterman, in the same January issue, seems to be an exception; but I respect his honesty on the subject. With greater bandwidth, faster, lower distortion monitoring, I believe that the majority of people could tell that 20kHz was not enough, but John Watkinson holds the high ground, because his statements are based on proven facts. David Blackmer, on the other hand, wrote an article full of speculation and beliefs, which will not stand against the arguments of people like John. So what can we do to topple JW from his mighty column?

The answer is that we must beat him at his own game. Is 96kHz sampling better sounding than 48kHz per se, even with optimally designed, non-cost-conscious filters? Is 20kHz sufficient audio bandwidth for audiophile hi-fi? Is David Blackmer right in his speculations, or is he off his trolley? Am I off my trolley?

Fifty thousand pounds or thereabouts, will pay for a 3-year PhD project, and places such as the Institute of Sound and Vibration Research, (ISVR) at Southampton University, UK, are super-equipped to tackle such questions and produce definitive work. Even as little as £3,000 can go a long way towards supporting a one-year Master of Science (MSc) project, and even less can support undergraduate projects. It was one such undergraduate project, co-sponsored by Reflexion Arts SA, Acoustica Integral SA, and myself, which finally proved the wave guide effect of Tom Hidley's much disputed 'acoustic traps'.

Encouraged by these results, Hidley is now co-sponsoring a 3-year Doctor of Philosophy project that is investigating wide-band absorption systems. He and I co-sponsored a Brazilian student (or rather took over supporting him when the Brazilian government defaulted on payments, and the UK immigration authorities were going to throw the student out of the country) doing one-tenth scale modelling of control rooms. Although Luis Soares' work seemed to prove only negative results, it proved useful eight years later when Alastair Walter picked up the thread, that led to his successful wave guide experiment.

In the mid-eighties, I sponsored Keith Holland's PhD on horn design, and in 1989 *Studio Sound* published details of the Reflexion Arts AX2 axisymmetric horn that seemed to open the floodgates on axisymmetric 'wave guides' from countless manufacturers, all with different, complicated sounding registered trade names, but no patents, because in our enthusiasm, Keith and I published all the basic data. (I never was much of a businessman.)

My quasi-millionaire days are long gone, so I can no longer personally support some of the things which I would like to, but the arguments of David Blackmer and John Watkinson could be relatively easily resolved if companies would fund open, basic research. Is £50,000 really too much for this industry to spend to find out if 20kHz is as far as we need to go, or if Rupert Neve is closer to the target at 100kHz?

Of course, research work offers no guarantees, but I have never been disappointed in the results produced by any of the five students which I have wholly or partly sponsored, so far, at the ISVR. So much research is now surrounded in secrecy, and done behind closed doors, because so many people seem to want to make a killing with a patent or two. This somehow seems to defeat the object of the universities, which were intended to be reservoirs of knowledge for the cross-fertilisation of ideas. Yet even thought of in hard-headed business terms, if any company spent £50,000 and cracked the '20kHz or higher?' question, in definitive terms, its prestige value alone would be worth a much larger advertising budget. Their name would also go down in the history of recording.

Come on folks, time to put hands in pockets, or we will not be entitled to call ourselves a profession, just a business. We could publish all the results, with names of sponsors, in *Studio Sound*, and provide a real service to the whole industry, not to mention a respectable amount of credibility.

Too much corporate research is carried out in private, and many employees are restricted by their companies from publishing interesting data if, for example, it is inconclusive in the company's favour; it may give competitors a good idea; or it is not patentable. This sort of ego, selfishness and greed holds back the learning process. In the universities, there is also commercial secrecy, but researchers talk of general things over coffee, or at lunch, and this can lead to great meetings of minds and the birth of ideas; not to mention the time saved by avoiding half a dozen teams, in secrecy, all researching the same dead end.

In Keith Holland's current loudspeaker reviews, he is publishing cepstrum data. The process was suggested to him in the eighties by a professor of engineering acoustics, and it was a technique retrieving echo patterns from the noise in seismic research. Cepstrum analysis appears in the Bruel & Kjaer Frequency Analysis book, but not too many people seem to know what to do with it. It is, in fact, a very powerful tool for locating (physically) the sources of reflections within loudspeakers which manifest themselves as irregularities in the amplitude and phase responses. Such causes can be almost impossible to trace by other means. The technique proved very useful, perhaps even decisive, in Keith Holland's aforementioned horn research.[1,2,3]

In the universities, teams of such people are available to guide the students, and I have almost no doubt whatsoever that the 'Is 20kHz enough?' question could be answered, definitively, in the space of one, single, three-year doctorate research programme. Can it really be that the answer is not worth £50,000 to the whole industry? If so, then shame on us! ■

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Challenger 5.1

Multiple mic arrays are the future of acoustic recording. **Dirk Brauner** of Brauner Microphones discusses the challenge of finding the right array for surround recording

AS THERE ARE at present no agreed standards for a surround recording microphone setup, there are just two courses of action open to the recording engineer. The first one is quite secure, which is to wait until a standard is set by others. The second is to take part in the challenge of defining a standard. Both options are dangerous for various reasons. The first may prevent you from making surround recordings before your competitors while the second opens the debate to a potentially confusing body of people. Nonetheless, it is a better course than the first option.

The most important consideration is to establish a solid understanding of the requirements of a multiple array microphone setup able to meet the industry standards for surround productions. How can such an array be found and what is necessary to be taken into consideration? The most important thing to realise is that the ideal of getting a life-like impression of an audio event into a listening room of any kind is nearly unachievable—especially if we have to address consumer listening rooms. Consequently, we need to derive an optimum image of the audio event under the limitations of these rooms. In this context it seems natural that the microphone configuration should be flexible and easy to use in as many different kinds of recording application as possible. Also it should be able to supply the best overall results in a variety of applications. It is clear that all these demands cannot be met by one fixed microphone arrangement, that does not allow it to be configured to meet the individual requirements of different recording applications.

For example, an orchestral setup with an ABC microphone configuration (LCR) and another AB microphone to cover the ambience (routed to the Surround channels) will not work for a Foley recording where the target is to create a good image of sources located around the microphones, or with moving sources. Rather, Foley work requires an image that is as realistic as possible in terms of smoothly moving sound sources from one position to another. For example, a car driving from front to rear should be perceived as being as life-like as possible and not as a sound effect.

This example makes clear some of the problems that drive the search for a single, multicapsule-multichannel microphone. The question is how good such a microphone will be able to reproduce an image of a recording within these different applications. Also it is important to establish which system produces the most homogeneous image on a 5.1 reproduction system. Two German students dedicated their dissertation to answering this question. Ulf Herrmann and Volker Henkels made a comparison of five different surround microphone methods used for orchestral and Foley recording. The methods compared for orchestral recording are ABC, INA5, the Surround Sphere by Jerry Bruck and the Ambisonics method, using the Soundfield microphone system, decoded after a principle developed by Michael Gerzon. Because all these systems—except the Surround Sphere—produce a centre channel, the importance of a centre channel can also be questioned. In Foley recording, INA5, SAM, the Surround Sphere and the Ambisonics system where compared.

The most important consideration is to establish a solid understanding of the requirements of a multiple array microphone setup able to meet the industry standards for surround productions. How can such an array be found, and what is necessary to be taken into consideration? The most important thing to realise is that the ideal of getting a life-like impression of an audio event into a listening room of any kind is nearly unachievable —especially if we have to address consumer listening rooms. We need to derive an optimum image of the audio event under the limitations of these rooms

To achieve the most objective results, 88 independent listeners where asked to assess different recordings. The results where surprisingly clear. It was found in any application, that the centre channel was very much appreciated especially at listening positions away from the centre listening position. The overall location, in terms of seating position, was surprisingly uncritical with any of the methods under comparison. The orchestral recording using the ABC method gave the best image of room ambience—better than INA. INA, however, was slightly better than the surround sphere, and the Surround Sphere was slightly better than Ambisonics.

In terms of offering the best location of instruments, INA was clearly favoured, followed by ABC, which was better than the Sphere, and the Sphere better than the Ambisonics. Between INA and ABC, no significant differences were perceived. INA and ABC were preferred against the Surround Sphere and Ambisonics, while the Surround Sphere was liked much better than the Ambisonics. In the Foley recordings the results where also very clear. Of two test recordings the first, a car driving from right to left and from right front to right rear, INA proved better than SAM, while SAM was better than the Sphere, and the Sphere was much better than Ambisonics. The second Foley example was an ambience of the Dusseldorf-Main railway station and the question was which method provided the best illusion of being in a railway station? Here INA was slightly better than SAM, while SAM was slightly better than the Sphere. The Sphere was clearly better than the Ambisonics.

These first results are a very interesting investigation into the field of surround microphone technology. The clear advantage of the INA method in both applications shows that a microphone arrangement similar to a loudspeaker placement as determined by 5.1 reproduction is most effective.

This was also the reason I built the ASM5 (Adjustable Surround Microphone) based on the INA idea. Making different microphone parameters variable, will enable the additional ability and flexibility to find out more about the best possible results in different surround recording applications to achieve a system that matches the various demands of all the different recording situations independent from any surround decoding standard.

Right now it is too early to clearly say which system works best, but some indications may be gleaned from these first investigations. Let's accept the challenge. ■

DR JOHN

Time code

Time code is essential to almost all stages of audio production but it is often taken for granted until it doesn't deliver. **John Watkinson** begins by examining the practicalities

TIME CODE is no more than a means to record the time at which each part of a recording was made. There are various reasons for wanting to do this. When a recording carries time code, it is easy to synchronise it to another recording made at the same time. Thus audio recordings can be synchronised to video recordings or films. Time code also facilitates editing because the in and out points of an edit can be stored in the form of the time codes existing at those points and used to control an automatic editing process. Broadcasters also use time code to automate playout in radio and TV stations.

Time code was primarily developed to facilitate video editing and the audio industry subsequently adopted it. Time code does not have a single standard, largely because video does not. In Europe, video runs at 25Hz frame rate and the time code used was standardised by the European Broadcasting Union and is universally known as EBU time code. In the US, monochrome video originally ran at 30Hz and the Society of Motion Picture and Television Engineers standardised a form of time code suitable for that rate. In most respects EBU and SMPTE time code are the same except for the picture rate and some small details.

With the advent of NTSC colour television in the US, the frame rate had to be reduced by 0.1% and so a third form of time code had to be devised to suit. If I had a dollar for every incorrect explanation of why NTSC goes at 29.97Hz, I would have retired by now. A correct explanation follows.

In television, the line rate is the product of the number of lines in a frame and the frame rate. In US monochrome this is 525 and 30 respectively, giving a line rate of 15,625Hz. Fig.1a shows the spectrum of monochrome video is rich in integer multiples of the line frequency. The sound carrier was wisely placed mid way between a pair of harmonics. When NTSC colour was developed, the channel bandwidth could not be increased, and so it was necessary to use a form of compression known as composite video in which a subcarrier of carefully chosen frequency would carry the colour information within the same spectrum as the monochrome.

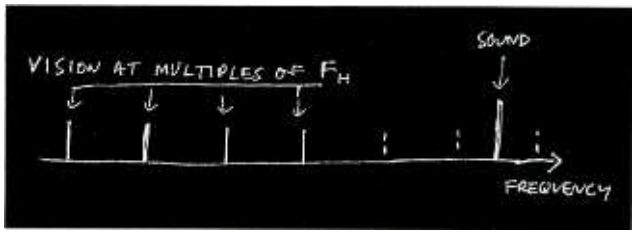

Fig.1a: Sound carrier placed between harmonics of video

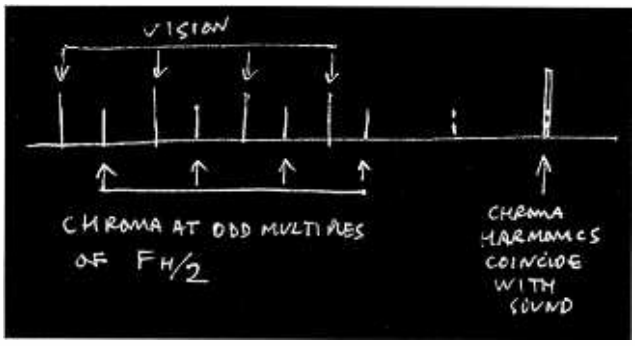

Fig.1b: Subscriber in NTSC has to be interleaved with vision, but this results in clash with audio carrier

Fig.1b shows that the subcarrier frequency chosen was 227.5 times the line frequency so that chroma harmonics would interdigitate with the monochrome signal spectrum. This worked superbly, and colour and monochrome could be separated at the receiver, but the harmonics of the chroma now fell directly on the unfortunate sound carrier.

The sound channel frequency could not be changed because the installed base of television sets could not all be readjusted, so instead the frame rate of the standard was reduced very slightly. This caused the line rate to fall by the same factor, and as the subcarrier was a multiple of line rate, it too was slightly reduced, and so harmonics would clear the sound carrier.

With the frame rate 0.1% slow, dividing the frames by 30 no longer gave real seconds and this was originally handled by the principle of 'colour time' which was a correction factor used to change the apparent duration of colour recordings to the actual duration.

Colour time was only a stopgap and the ultimate solution was to devise a form of time code that could link 29.97Hz NTSC with real-world seconds. The solution was known a drop-frame time code, which works on the same principle as 29th February on the calendar. If every TV frame is recorded with a contiguous code, the real time is too slow. Accordingly, certain code values are omitted, or 'dropped', from the recording so that over a long period, dividing the recorded frame value (not the number of frames) by 30 gives real seconds. In the short term, 'frames divided by 30' oscillates slightly by ±60ms with respect to real seconds, but this is of little consequence in video production.

The codes to be dropped were standardised so that editors and synchronisers would not look for them and get confused. Since the advent of NTSC, most nominally 60Hz equipment has actually run at 59.94Hz. The most notable exception was the PCM-1610 used for CD mastering. This pseudo-video recorder put three audio samples per TV line in 245 active lines per field. In order to get exactly 44.1kHz, the field rate has to be exactly 60Hz or the CD cutter will throw a Wobbler.

Time code puts a unique entry on the recording for every frame. Fig.2 shows how hours, minutes, seconds and frames are placed in each entry. It would have been most efficient simply to count frames in binary from midnight, but as much early time-code equipment was very simple and often required manual code calculation, binary would have made this a nightmare. Instead each parameter is coded as two BCD (binary coded decimal) symbols, universally referred to as HHMMSSFF. Fig.2 also shows how BCD works. Basically it is a 4-bit binary count that overflows at 9 rather than 16. It is very easy mentally to convert it to decimal because each 4-bit group can be converted individually.

Early video recorders could only record video and two or more tracks of analogue audio. In order to use time code with these machines the signal had to be compatible with an analogue audio signal so that it could be recorded on an audio track instead of an audio signal. This remains true and any audio recorder can—in principle be—given time code capability by sacrificing an audio track. Many people have discovered that the practice is different, however, because poor crosstalk performance causes the time-code recording to break through into the other analogue tracks. In multitrack analogue machines the early working solution was to put time code on one edge track and to have a buffer track between the time code and the first track used for audio. But as a result two audio tracks are lost and edge damage to the tape can destroy

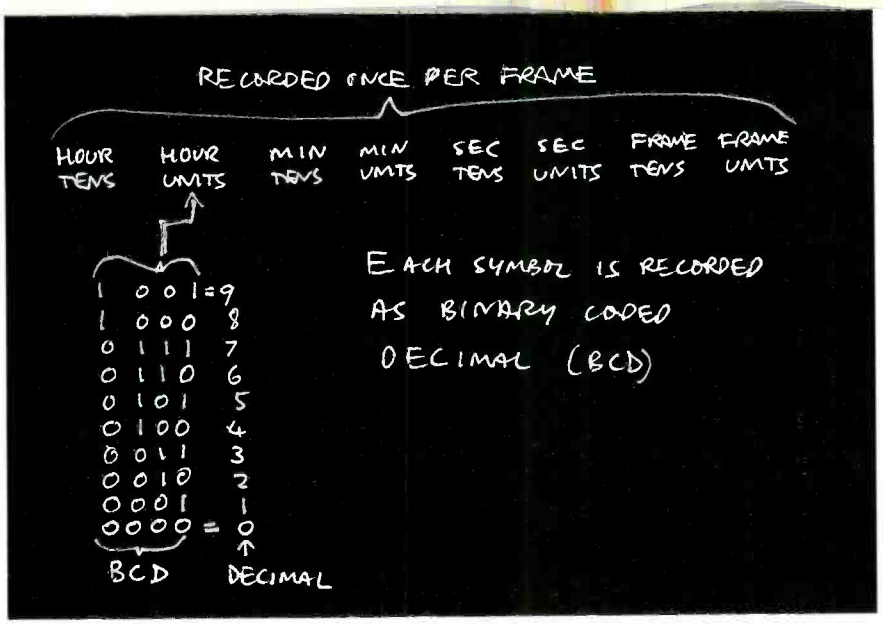

Fig.2:

the time code.

Later machines use dedicated time code recording facilities so that audio channels are not lost. The crosstalk issue was also addressed by better head design. In all analogue audio recorders and some video recorders, the time code is recorded with a stationary head on a linear track. Time code in this form is called LTC or longitudinal time code.

As production video recorders developed, it became possible to display a good still picture, but with the tape stopped, LTC is unreadable. This led to the development of a form of time code recorded on the rotating heads as part of the video signal. This was inserted in the normally invisible lines which make up the vertical interval between fields and became knows as VITC or vertical interval time code. This can be read with the tape stopped and gives the correct value even if the tape is incremented or 'jogged' by one frame during an editing session.

In digital audio recorders there were various approaches to time code. In stationary head digital multitrack machines it was simplest to have another linear track dedicated to time code. The crosstalk problem naturally disappears when the audio was in digital form. In DAT machines, a different solution is needed as DAT is a rotary-head format, having a mechanism like a video recorder. However, the drum speed in DAT is 33⅓Hz and does not correspond to any television frame rate. It is not possible simply to record one time-code entry per drum revolution as this would give a non-standard time code that EBU or SMPTE equipment would be unable to interpret.

Fig.3 shows how DAT handles time code. The DAT frames contain a time-code pack recorded in the subcode area, and this contains the HHMMSSFF data from the EBU-SMPTE time code. However, the pack also records an offset parameter that specifies the number of audio samples between the beginning of the last video frame and the beginning of this DAT frame. Using the offset parameter a player can calculate exactly where to put EBU-SMPTE time-code frames with respect to the recorded samples.

If the audio sampling rate is time-code synchronous, the offset is predictable and can be calculated. DAT however, allows asynchronous time-code operation and here each offset parameter will need to be individually computed.

In disk-based workstations, time-code operation is turned on its head. Instead of playing the audio linearly to see what time code results, the disk system accesses the disk to get the audio for a given time code. Workstations run a time-code generator while recording and incorporate the time code into the disk index system. The index contains a linkage between a given time-code frame and the physical address on the disk where the samples for that frame are stored.

To play a recording, the time code is fed in and the system finds the physical blocks on the disk carrying the audio for that time and immediately retrieves them. ■

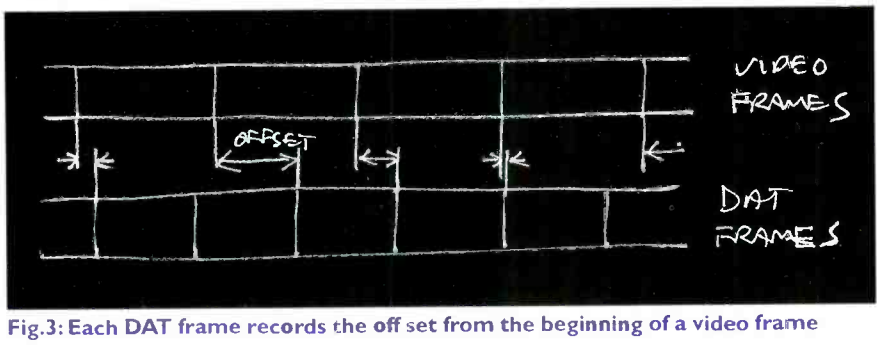

Fig.3: Each DAT frame records the off set from the beginning of a video frame

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Showmanship

On the eve of London's Recording Technology 99 show, APRS chief executive officer **Mark Broad** sets the scene for two days of kit, chat and change

ANYONE WHO has organised exhibitions over a period of more than 30 years would expect to negotiate some cycles of change. Given the history of Recording Technology 99, most people seem to agree that we are taking appropriate steps now to launch a new-look, new-feel show for audio-recording professionals, in London. Being in the summer slot does suit us best, I believe, and our new venue at the Business Design Centre is air-conditioned and really quite swish.

It seems timely that there has recently been a more open and supportive attitude between the industry organisations. Technology is driving so many changes, but we do find at least some durable principles that we have in common. For instance, those of us who are primarily concerned with the process of producing merchantable recorded work can be seen as being in the origination business. We are interested in working creatively, undoubtedly, but if it also can be done as efficiently as possible we optimise the number of rights-bearing works which might be produced from available production budgets, and which go on to generate revenues. That, ultimately, should be better for all of us in this content-hungry world. So ignorance and waste are the common enemies; hence the Association's growing emphasis on training and education—not least the important issue of training for trainers, an area where even quite general advice on best practice and recommended techniques can quickly have a significant effect in raising standards.

The APRS chairman and our director of training and education have both contributed in recent months to the government's New Deal steering committee. At a 'New Deal for Musicians' industry-briefing session, held at the BPI a few weeks back, a number of the associations present recognised that we are presently duplicating efforts in careers advice and industry sign-posting. It was agreed that we should explore ways to rationalise this and make better use of resources. The idea of a clearing house, for general careers information, advice and work placement enquiries was met with some enthusiasm. Representatives of corporate members were quick to point out that such a service, operated under the authority of the trade associations, would be of great help to their own companies, which are regularly inundated with requests for information and advice. Requests which they would prefer to know were being handled diligently without putting so direct a strain on their own resources. We are pursuing this idea. It's a good example of how the associations and trade bodies can complement each other's work and join forces when appropriate. There has also been talk of the possibility a shared 'showcase' presence in London. Another example of collaboration is the APRS working with PLASA in DTI joint ventures overseas, most recently in Light and Sound Shanghai, and AES Munich. We're not in competition, we're actively supporting anything that's good for our members' businesses and for the industry as a whole.

I'm hoping that Recording Technology seminar discussions will be able to continue, on-line, after the event in June, leading toward another round of workshop activity in the autumn. There's going to be a stronger emphasis on internet-based discourse and information services. Live sessions, specifically for business managers, are also being planned. We want to ensure that Recording Technology is an evolving thing, and that the corresponding role of The Professional Recording Association is understood to be participatory, facilitating dialogue—a dialogue that is part of a professional's living experience, not just a fixed snapshot at any one time. The Corporate Associate scheme is under way, involving individuals within member companies more directly, and we have a similar scheme for students on APRS Accredited courses. With a larger affinity group and wider industry co-operation, more things are possible. A careers fair and a work experience placement scheme are examples of ideas that seem to be attracting interest at the moment.

Recording Technology 99 has benefited greatly from the input of an experienced and imaginative team. Exhibitor's Chairman, Phil Dudderidge, is motivator-in-chief; and our Event Director, Rhona Greenhill, knows what works—she was formerly with the Television Show—and has many of bright ideas and a good understanding of what kind of people we are catering to. The Recording Technology 99 seminars are being co-ordinated by Francesca Smith, formerly of ITS, who these days organises our studios groups and various special projects for the APRS.

Catch us at the Business Design Centre, on 25th and 26th June 1999. ■

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