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STUDIO SOUND

AND BROADCAST ENGINEERING

INTERNATIONAL PRO AUDIO AND POSTPRODUCTION MAGAZINE

AES REPORT

Prospects from Paris

Exclusive reviews

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Testing times

Tektronix 764, Meyer SIM II

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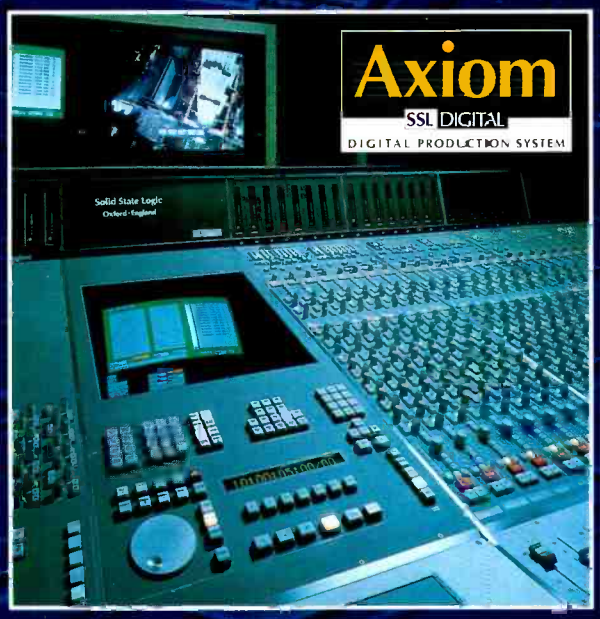

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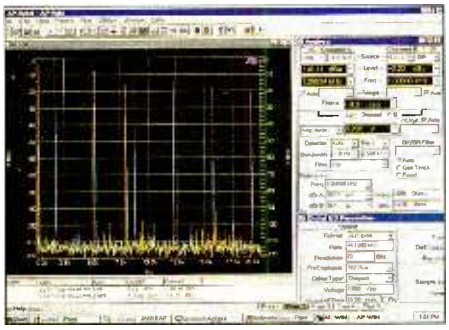

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USA: +1 615 391 33 99

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STUDIO SOUND
AND BROADCAST ENGINEERING

March 1995
Volume 37 Number 3
ISSN 0144 5944

EDITORIAL
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EDITORIAL AND ADVERTISEMENT OFFICES
Spotlight Publications Ltd, 8th Floor, Ludgate House, 245 Blackfriars Road, London SE1 9UR, UK. Tel: 071 620 3636. Fax: 071 401 8036.

NEWSTRADE DISTRIBUTION (UK)
UMD, 1 Benwell Road, London N7 7AX, UK. Tel: 071 700 4600. Fax: 071 607 3352.

© Spotlight Publications Ltd 1994.
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Origination by Craftsmen Colour Reproductions Ltd, Unit 1, James Street, Maidstone, Kent ME14 2UR.

Printed in England by St Ives (Gillingham) Ltd, 2 Grant Close, Gillingham Business Park, Gillingham, Kent ME8 0QB, UK.

Studio Sound and Broadcast Engineering incorporates Sound International and Beat Instrumental.

Studio Sound is published monthly. The magazine is available on a rigidly controlled requested basis, only to qualified personnel.

Subscription Rates:
UK. Annual subscription: £24.00
Europe. Surface mail: £30.50/US:$52
US. Airmail annual subscription: US:$70
Rest of the World. Airmail. £52.50/US:$89.00

Subscription Enquiries
UK: Subscription Dept, Studio Sound Magazine, Spotlight Publications Ltd, Royal Sovereign House, 40 Beresford Street, London SE18 6BQ.
USA: Studio Sound Magazine, 2 Park Avenue, 18th Floor, New York, NY 10016.
US Postmaster
Please send address corrections to: Studio Sound Magazine, c/o Mercury Airfreight International Ltd Inc, 2323 Randolph Avenue, Avenel, New Jersey NJ 07001.
US second class postage paid at Rahway, NJ.

ABC
MEMBER OF THE AUDIT BUREAU OF CIRCULATIONS

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PERIODICAL PUBLISHERS ASSOCIATION

Total average net circulation of 18,834 issues during 1993. UK: 7,357. Overseas: 11,477. (ABC audited)

un A United Newspapers publication

Chaos theories

Barriers—we love 'em. At least, we love tearing them down. And technology is our favourite tool. But there is often more to problems and their solutions than meets the eye. Situations have causes, and causes can have unpredictable effects

Whether it is bridges over rivers, ships over the seas or telecommunications all over the globe (and beyond), we seem to love a challenge. Sometimes our apparent disregard for the barriers we build for ourselves makes it difficult to believe that we would really rather not have them. Did SPDIF, MIDI, MADI, SDS, OMF and their like really need to be solutions rather than parts of their respective developments? It seems so.

Some barrier breakers may be taking us further than we realise, however. Certainly, more established means of media transmission have presented problems in the control of world current affairs, news and wartime intelligence information.

Let us take an example. The world has been watching the O J Simpson murder case. The whole world. From the live television of the infamous car chase to the protracted machinations of the court system, the audience has numbered in the millions. 'Only in America...', scolded 'civilised' Britons. But 'Only in America' is just about the mark. And the mark is about to become somewhat indistinct.

You see, the American legal system recognises the media circus attracted by a football star-cum-actor as part of the nature of justice and the current events it must embrace. In Europe, for example, such a sequence of events would have developed entirely differently. But for how long?

The allied forces involved in the Iran-Kuwait conflict certainly realise the power of the news media to influence world affairs.

And what of music and video? That piracy problems already abound in certain territories is beyond dispute, and our consistent endeavours to make transmission of digital audio and video programme material around the planet may be about to exacerbate the problem considerably.

Even in the pro-audio press, improved communications have already presented problems. Last year the European launch of Yamaha's *ProMix 01*, for example, was brought into line with its US release as soon as it was realised that the product could not be expected to retain its 'secret' status once American magazine correspondents were alerted to its existence.

Even earlier, in 1987 I found myself quizzing Mr Kakehashi, the Japanese founder of Roland, on his home turf. 'What,' I wanted to know, 'was the company's policy regarding musical controllers for synthesisers and samplers?' 'Simple,' I was told, 'we have a pitch-to-MIDI convertor which addresses the problem perfectly'. My report of Roland's philosophy—which had certainly come with authority—left me in deep water with the company's UK branch as the unit was not destined to brought into Britain.

I admit that the moral of this eclectic collection of stories is a little obscure, but such is the nature of anticipating the future. I am certain of one thing, however—that we cannot put the lid back on the Pandora's Box of communication. The channels will proliferate in both number and capacity and this alone ensures the development of further problems. Their precise nature remains to be discovered, but it is essential that we remain alert to them in order that we can contain them.

But then, not all problems require solutions—some simply collapse of their own volition. ■

Tim Goodyer

Cover: Calrec *T-Series* console at Television House, Nottingham, UK

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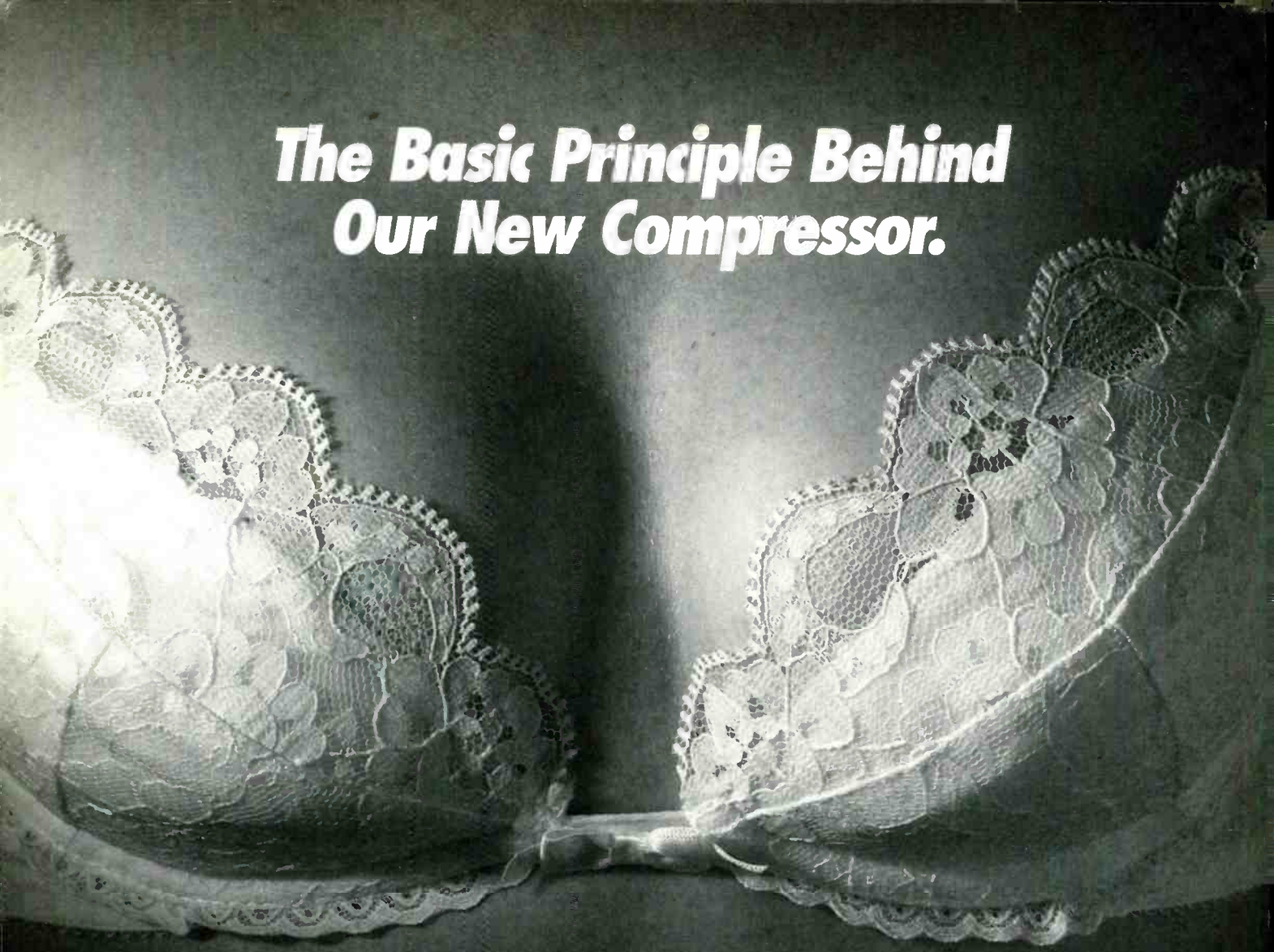

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World Events

March 1995

● March 8th–12th, **Frankfurt Pro Light & Sound**, Messe Frankfurt, Frankfurt, Germany. Tel: +69 75 75 6415/6907. ● March 8th–12th, **ITA Seminar: The Converging World of Entertainment, Information and Delivery Systems**, Westin Mission Hills Resort, Rancho Mirage, California, USA. ● March 9th, **Sound Sense Show**, Swallow Hotel, Gateshead, UK. Tel: +44 1491 838575. ● March 14th, **AES Conference: Patents and Audio Engineering**, Imperial College, London, UK. Tel: +44 1628 663725. ● March 15th–17th, **The Television Show**, London, UK. Tel: +44 1203 717897. ● March 25th–27th, **The Pro Audio Show**, Karachi, Pakistan. Fax: +21 493 2535. ● March 26th–28th, **ECTS**, Olympia Grand Hall, London, UK. Tel: +44 181 742 2828.

April 1995

● April 3rd–5th, **Cable & Satellite 95**, Olympia, London, UK. Tel: +44 181 910 7849. ● April 4th–5th, **Television Distribution Technology 95**, Olympia, London, UK. Tel: +44 171 637 4383. ● April 4th–6th, **REPLItech Europe**, Austria Centre, Vienna, Austria. Tel: +1 914 328 9157. ● April 4th–7th, **Communications Tokyo Exhibition**, Tokyo International Trade Fairgrounds, Tokyo, Japan. Tel: +81 3 3586 7865; US. Tel: +1 301 986 7800. ● April 6th, **The Music Radio Conference**, BAFTA, London. Tel: +4 171 323 3837. ● April 7th–12th **MIP-TV 95**, Cannes, France. Tel: +44 171 528 0086. ● April 9th–13th, **NAB 95 Symposia**, Las Vegas Convention Center, Las Vegas, USA. Tel: +1 617 965 8000. ● April 10th–13th, **NAB 95**, Las Vegas Convention Center, Las Vegas, USA. Tel: +1 617 965 8000. ● April 11th, **AES Conference: The Value of Industrial Design**, Imperial College, London, UK. Tel: +44 1628 663725. ● April 21st–23rd, **MEMS 95**, Olympia 2, London, UK. Tel: +44 1225 442244. ● April 26th–29th, **Broadcast Technology Indonesia**, Jakarta, Indonesia. ● April 26th–28th, **5th Australian Regional AES Convention: Making Waves**, Sydney Convention and Exhibition Centre, Sydney, Australia. Tel: +61 3 534 5755.

May 1995

● May 1st, **IEE Audio Engineering Colloquium**, IEE Head Office, Savoy Place, London, UK. Tel: +44 171 240 1871 ex2206. ● May 9th–12th, **Pro Audio, Light & Music China 95**, Beijing Exhibition Centre, People's Republic of China. ● May 13th–21st, **MultiMediale 4**, ZKM/Center for Arts and Media Technology, Karlsruhe, Germany. ● May 14th, **National Vintage Communications Fair**, NEC, Birmingham, UK. Tel: +44 1398 331532. ● May 15th–20th, **Expo Comm Moscow Sviaz 95**, Krasnaya Presnya Fairgrounds, Moscow, Russia. ● May 23rd–25th, **Midem Asia**, Hong Kong. Tel: +44 171 528 0086. ● May 30th–31st, **Leipziger MedienMesse Hörfunk**, Leipziger Messe, Leipzeig, Germany. Tel: +37 41 2 230. ● May 30th–June 1st, **ShowTech 95**, Messe Berlin, Berlin, Germany. Tel: +49 30 3038.

June 1995

● June 8th–10th, **2nd Annual South American Pro Audio Expo**, Centro de Extension, Santiago, Chile. Tel: +56 2 635 1994; +1 914 993 0489. ● June 8th–12th, **China Sound Light & Music**, Beijing Exhibition Centre, People's Republic of China. ● June 8th–13th, **International Television Symposium-Exhibition**, Montreux, Switzerland. Tel: +41 21 963 3220. ● June 10th–12th, **12th ShowBiz Expo**, Los Angeles, USA. Tel: +1 714 513 8400. ● June 13th–15th, **REPLItech International**, Santa Clara Convention Centre, Santa Clara, USA. Tel: +1 914 328 9157. ● June 19th–20th, **Radio Festival Trade Exhibition**, International Convention Centre, NEC, Birmingham, UK. Tel: +44 1491 838575. ● June 21st–23th, **Audio Technology 95.** Formerly **APRS**, National Hall, Olympia, London, UK. Tel: +44 1734 756218. ● June 21st–23rd, **7th Japanese Regional AES Convention: Advanced Audio Technologies for Audio-Video and Multimedia**, Sunshine City Convention Centre, Tokyo, Japan. Tel: +81 3 3403 6649.

July 1995

● July 12th–14th, **Pro Audio & Light Asia 95**, World Trade Centre, Singapore. Tel: +852 865 2633. ● July 17th–19th, **WCA 95. Wireless Cable Association Show**, Washington Convention Centre, Washington, USA. Tel: +1 202 452 7823. ● July 20th, **British Music Fair**, London, UK.

August 1995

● August 17th–20th, **Popkomm**, KölnMesse, Köln, Germany. Tel: +49 221 8210. ● August 25th–28th, **Beijing International Radio & TV Broadcasting Equipment Exhibition 95**, Beijing International Exhibition Centre, Beijing, People's Republic of China.

September 1995

● September 6th–9th, **1995 World Media Expo**, New Orleans Convention Centre, New Orleans, USA. Tel: +1 202 429 5350. ● September 10th–12th, **ECTS**, Olympia Grand Hall, London, UK. Tel: +44 181 742 2828. ● September 10th–13th, **PLASA**, Earls Court 2, London, UK. Tel: +44 171 370 8179. ● September 14th–18th, **IBC 95**, RAI Centre, Amsterdam, Holland. ● September 19th–24th, **Live 95**, Earls Court, London, UK. Tel: +44 181 742 2828. ● September 21st–24th, **Nordic Sound Symposium XVII**, Bolkesjø Mountain Hotel, Norway. Tel: +47 2 79 7730.

October 1995

● October 5th–8th, **99th AES Convention**, Jacob K Javits Centre, New York, USA. ● October 17th–19th, **Vision 95**, Olympia, London, UK. Tel: +44 181 948 5522. ● October 19th–23rd, **9th International Audio, Video, Broadcasting and Telecommunicationas Show. IBTS**, South Pavilion, Milan Fair, Milano-Lacchiarella, Italy. Tel: +39 2 481 5541. ● October 24th–26th, **REPLItech Asia**, Singapore International Convention and Exhibition Centre, Singapore. ● October 25th–28th, **Broadcast Cable and Satellite India 95**, Pragati Maidan, New Delhi, India.

November 1995

● November 1st–5th, **Audiovideo-95**, Lenexpo Exhibition Complex, St Petersburg, Russia. Tel: +7 812 119 6245. ● November 2nd–4th, **Broadcast India 95**, World Trade Centre, Bombay, India. Tel: +91 22 215 1396. ● November 7th–9th, **Wireless World Expo 95**, Moscone Centre, San Francisco, USA. Tel: +1 301 986 7800. ● November 9th, **20th Sound Broadcasting Equipment Show. SBES**, Metropole Hotel. NEC, Birmingham, UK. Tel: +44 1491 838575. ● November 21st–23rd, **Visual Communications 95**, London, UK.

December 1995

● December 5th–9th, **Expo Comm China South 95**, Guangzhou Foreign Trade Exhibition Centre, Guangzhou, Peoples Republic of China. Tel: +86 1 841 5250; US. Tel: +1 301 986 7800.

September 1996

● September 18th–23rd, **Photokina**, KölnMesse, Cologne, Germany. Tel: +49 221 8210.

November 1996

November 5th–9th 1996, **PT/Expo Comm China**, China International Exhibition Center, Beijing, Peoples Republic of China. Tel: +1 301 986 7800.

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International News

In-brief

● GRAMMY Awards Spatialized

The *Spatializer* 3-D sound system continues to find favour in an increasing variety of applications; the 37th annual GRAMMY Awards Show was broadcast live to 1.4 billion viewers worldwide by CBS on March 1st using the system, which is designed to give 3-D surround sound from any stereo television. The system was also represented in nominations for eleven different GRAMMY categories, including *The Lion King*, Barbra Streisand's *Barbra: The Concert*, and Bonnie Raitt's *Longing In Their Hearts*.

Spatializer Audio Laboratories Inc, US. Tel: +1 310 268 2700.

● *RADAR* price drop and new drives

Otari have announced a price reduction on the *RADAR* range of 6%, bringing the price of a 1GB 24-track system below 40,000DM. This comes with the announcement of a new 2GB version, offering more than 48 minutes longitudinal recording time at 44.1kHz. Also newly available is *ADATLINK*, a digital 24-track interface for direct digital track-to-track transfers.

Otari Germany. Tel: +49 2159 50861 3.

● Chipping Norton Studios for sale

Chipping Norton Studios, one of the UK's original residential studios, is up for sale as cofounder Mike Vernon concentrates on running his new record label, Code Blue, and producing its acts. The property consists of the studio building itself along with four cottages and contains a total of 14 double bedrooms, and is being sold with all the equipment and the goodwill of the business for £650,000. There is also the possibility of selling a 50% share if the right partner can be found.

Stephen Budd Management Ltd, UK. Tel: +44 171 916 3303.

● Genelec award

Genelec have been awarded the 'President's award for excellent export achievements.' President Martti Ahtisaari of the Republic of Finland has made the award for the company's export increases during the last five years, their distinctive marketing methods, and their heavy commitment to R & D. Genelec export 95% of their total production, the largest single market being the United States. In all the company's products are exported to around 50 countries.

Genelec, Finland. Tel: +358 77 133 11.

● Dolby Surround for Sudwestfunk

German broadcaster Sudwestfunk has recently signed agreements with Dolby Laboratories to produce programmes in Dolby Surround. Sudwestfunk's first production was *Flitterabend*, broadcast at the end of January this year ▶

ITS German expansion

The International Teleproduction Society has announced its first six German member companies, following meetings in Munich and Frankfurt. It is apparently the first time the heads of German facilities have sat round the same table to talk to each other openly about industry issues, which was one of the main benefits when the ITS UK Chapter was set up nearly three years ago.

The six new members are: ARRI TV (Munich); Hippo TV (Munich); Bildwerk (Frankfurt); VCC Video Copy Company (Hamburg); IVT Maz-Produktion (Frankfurt); and HSG Film & Videoproduktion (Frankfurt).

Further meetings were planned in Dusseldorf and Hamburg in March.

International Teleproduction Society (UK Chapter). Tel: +44 1707 260216.

DG 4D goes to third generation

The Deutsche Grammophon Recording Centre has developed a third generation upgrade of the Stage Box system central to the 4D recording chain. All recordings made by the Recording Centre since October 1994 have used the new DG AD III technology, whose convertors feature the new Crystal CS5390 delta-sigma 20-bit A–D convertor ICs to provide 23-bit digital-floating delta-sigma A–D conversion. The process employs two 20-bit convertors, one handling the input signal at unity gain and the other operated with 18dB gain.

A sophisticated DSP algorithm regulates the crossfade between the two convertors, producing three bits of supplementary resolution. The DSP program was modified to allow the DSP chip to handle 20-bit convertors at its inputs and a 24-bit wordlength at its outputs. Quoted specifications include THD+n of -121dBFs with an input of 997Hz at -30dBFs and linearity errors within 1dB down to -135dBFs, together with a largely flat noise-spectrum.

A further improvement is the development of the Authentic Clock Recovery system, permitting superior reconstruction of the master clock signal under real world operating conditions such as long cable runs and numerous interconnected PLLs, where phase modulation of the clock, jitter, becomes a limiting factor on overall system performance. Because Authentic Clock Recovery uses crystal PLLs driven at 512Fs, as opposed to the current 256Fs standard, A–D conversion at up to 96kHz is possible, with full oversampling capability.

Deutsche Grammophon, Germany. Tel: +49 4044 181115.

Audetel at G7 Conference

Audetel, a system for adding commentary to TV programmes, was demonstrated at the G7 Ministerial Conference on the Information Society in February. The system uses a special data signal carried in the television picture to provide an audio commentary describing what happens in the programmes during gaps in the dialogue. A special set-top receiver allows the commentary to be heard through either headphones or a loudspeaker. Originally developed by a consortium of broadcasters, consumer electronics companies and organisations working with the visually impaired and older people, the additional audio commentary is also expected to appeal to viewers who can follow a wide range of programmes without looking continuously at the screen.

There are an estimated 10 million visually impaired people in Europe. The G7 showcase was an opportunity to demonstrate the technology to Ministers, industrialists, the European Commission and Parliamentary officials, and the media to enable other European governments to evaluate its potential.

The Audetel project has already been awarded the 1994 Royal Television Society Communications Innovation Technology Award. A four-month period of experimental transmissions on both ITV and the BBC was broadcast between July and November last year in association with the Royal National Institute for the Blind (RNIB).

The Audetel consortium is led by the Independent Television Commission, and the members are the Age Research Centre, University of Manchester, the BBC, the ITA, Motorola, Portset Systems, RNIB, Seleco SpA, Softel Ltd and SPEKA Ltd.

EBU restructures

The European Broadcasting Union is to be turned into a more flexible and less cumbersome organisation, more able to react to and anticipate developments, thanks to management methods imported from private industry. The terms and conditions of this restructuring were adopted in February by an extraordinary General Assembly of its members. The changes will take place without detriment to the associative nature of the EBU 'club'—the spirit of solidarity prevailing among its members, especially in connection

China: Chinese News and Entertainment (CNE) have agreed a daily news delivery deal with ITN giving the Chinese broadcaster access to ITN's resource of news footage for inclusion in a daily programme of world and European news accompanying CNE's Far Eastern coverage. The extended coverage comes in response to research indicating a huge demand for authoritative world news to be presented by Chinese community broadcasters

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with programme exchanges. The EBU will remain a not-for-profit cooperative, but has given itself the means of meeting the foreseeable requirements of broadcasters, in view of the unprecedented upheavals in audio-visual media distribution and programming looming on the horizon.

At a time when most of the EBU's contributing members are experiencing financial problems, the reorganisation is being linked with a three-year economy drive aimed at cutting expenditure by 11.3m Swiss francs, equivalent to 15% of the fixed budgets. Once restructuring is complete, operational activities (Eurovision and Euroradio) will have to be self-financing. It is hoped that the decision-making process will be both simpler and faster, and the Union will step up those services likely to assist its members in fulfilling their public service remit and defining their national strategies. This will entail, among other things, studies of future trends and developments in the audio-visual media environment, together with lobbying activities.

Over the past few years the EBU has invested a great deal of effort in adapting to changed circumstances: it has admitted the eastern European broadcasters, opened its internal transmission network to outsiders, and regrouped all its permanent activities in Geneva. 'Now we must go even further, before external conditions force us to do so,' declares Secretary General Jean-Bernard Münch.

European Broadcasting Union, Switzerland. Tel: +41 22 717 21 11.

SADiE enhancements

Studio Audio are currently designing an Asynchronous Transfer Mode (ATM) networking solution for their *SADiE* disk editor. They plan to implement the network in two stages, firstly as a peer-to-peer network to allow small groups of users to share common disk drives. Subsequent software releases will expand this system to incorporate full client-server protocols to allow the use of large capacity servers. Also in the pipeline is a JPEG video card to work alongside the *SADiE* editor, intended for video replay in audio post facilities to replace traditional VTRs. This should also avoid tying up nonlinear video editors off and on-line during the audio conforming, tracklaying and dubbing process.

Studio Audio & Video, UK.
Tel: +44 1353 648888.

UK: The British Telecom Network Management Centre in Oswestry, played its part in securing a contract with the BBC to supply the comms network for the broadcaster's phone-in facilities. Serving all five of the BBC's National radio stations, the service fulfils part of the public service broadcasting remit

dSP workstations for Europe

The Australian dSP (Digital Studio Processing) range of products are now to be offered in Europe. dSP have enjoyed success in Australia for the last four years, having been marketed and distributed by Yamaha alongside their range of digital mixers. dSP have developed their editors in a close relationship with Yamaha and the result has been comprehensive dynamic automation facilities integrated into the dSP editor's user interface making most automation functions transparent to the user.

The most recent development is the *Postation* system, an integrated, totally-digital studio solution incorporating digital editing, fully automated dynamic mixer automation, and nonlinear digital video with a highly ergonomic user interface.

Digital Studio Processing Pty, Australia . Tel: +61 2 557 2292.
HL Audio Sales, Germany.
Tel: +49 30 694 9754.

Audio Technology 1995 *Briefings*

Following last year's success, Audio Technology 95 (aka the APRS Show) will again this year feature a series of *Briefings* and workshops throughout its three days. This year's programme is organised by Gateway Studios' Dave Ward, who explains:

'The success of last year's seminars highlighted visitors' enthusiasm for lively, highly practical sessions which convey real-world information —rather than esoteric papers. Improving on 1994, we have two dedicated rooms in which we can make as much noise as we like, and we can have some really live sessions!'

The large seminar room holds up to 250 people and will feature topics of relevance to the project studio, while the smaller room will be dedicated to high level topics. The preliminary schedule includes session on Multimedia developments with Tim Frost and Andy Bereza, ISDN, Radio Mics with John Wykes of Audio Engineering, Theatre Automation Systems with John Leonard, Synchronisation with John Watkinson (sponsored by *Studio Sound*), a Broadcast forum, ISRC ▶

and identified with the Dolby logo in the opening sequence. A further six programmes of this popular game show are scheduled for broadcast in Dolby Surround throughout the year. Other scheduled programmes already prepared include *Ohne Filter*, a series of live rock concerts, the annual ARD Christmas Concert and Christmas Service, plus a number of drama productions.

Dolby Laboratories, US.
Tel: +1 415 558 0200.

● **TL Audio Asian representation**

During the AES Tony Larking Professional Sales Ltd appointed VW Marketing as their Sales and Marketing representatives for the Asia Pacific region. VW Marketing already represent SA&V and hope to establish a suitable network of local agents from Korea and Hong Kong/China to India and Australia.

VW Marketing,UK.
Tel: +44 1372 728481.

● **US support for DAR**

Digital Audio Research have announced a new support structure for their workstations in the US market. The *SoundStation Sigma* and *Delta* systems are to be supported by SSL Inc New York, with whom DAR have also entered into a joint development programme to create a practical media interchange standard.

Digital Audio Research Ltd, UK.
Tel: +44 1372 742848.
Solid State Logic Inc, US.
Tel: +1 212 315 1111.

● ***M5000* standard for SAE**

tc electronic's *M5000* Digital-Audio Mainframe is to become a standard piece of equipment in the 18 colleges of the School of Audio Engineering as a result of an exclusive deal finalised late last year. All students on audio engineering courses at the various colleges will be trained on the *M5000*, and tc electronic look forward to feedback from the trainee engineers to contribute to the continued development of the system.

tc electronic, Denmark.
Tel: +45 86 26 28 00.

● **Antony David joins Sony***

Antony David has joined Sony Broadcast & Professional Europe as General Manager—Professional Audio, replacing Chris Hollebone who leaves after more than 14 years with Sony. David joins from SSL, and takes on overall responsibility for Business and Applications Development as well as Product Management roles.

Sony Broadcast & Professional, UK.
Tel: +44 1256 483646. ▶

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Contracts

● Astral DAR

DAR have announced that Astral Communications Inc, referred to as Canada's leading motion-picture production house, has taken delivery of two Sabre and three SoundStation Sigma workstations. Astral recently opened a new $9.5 million technical facility in Montreal which includes new and highly advanced laboratory and dubbing facilities.

Digital Audio Research, UK.
Tel: +44 13727 42848.

● SSL *SL 9000j Series* in US

Three US studios have purchased Solid State Logic *SL 9000j Series* consoles. Nashville's new Starstruck Studio will open with two 72-channel *j Series*, both with 48-track *DiskTrack* Digital Multitrack Recorder-Editors. Right Track in New York are expanding with a 96-input *j Series*, also with 48-track *DiskTrack*, and Record Plant in Hollywood have announced the purchase of an 80-channel *DiskTrack*-equipped *j Series* and an 80-channel *4000 G Plus* console with *Ultimation*.

Solid State Logic, UK.
Tel: +44 1865 842300.

● Graham-Patten *D-ESAM* for Ulster TV

Graham-Patten Systems have supplied Ulster Television, based in Belfast, Northern Ireland, with a *D-ESAM 800 Series* Digital Edit Suite Audio Mixer, due to be installed within a new Serial Digital Edit Suite currently under production at the station's video production facility.

Graham-Patten Systems, US.
Tel: +1 916 273 8412.

● Drake in China

Drake Electronics are to supply their second large intercom-talkback system to China. In a contract worth over £180,000 Drake are supplying a *3000 System* to Central China Television (CCTV) via their Hong Kong agents Macostar Technology Engineers. The purchase comes a year after a similar installation at Jiln TV Station.

Drake Electronics, UK.
Tel: +44 1707 333866.

● GEC-Marconi Indonesian contract

Chelmsford-based GEC-Marconi Communications Ltd have won a major turnkey contract for the supply and installation of a shortwave broadcasting system for the Republic of Indonesia. The contract, worth over £12 million, follows a 1991 £29 million order, and includes the system planning, civil works, and installation close to the capital Jakarta.

GEC-Marconi, UK.
Tel: +44 1245 275930. ■

USA: The Hollywood Todd-AO #2 stage recently saw the completion of the rebuild of the *ADM* console. Improvements include new input modules, microprocessor-controlled routeing, MC systems and the inclusion of *Flying Faders*. The project was undertaken by Martech —developers of the *Flying Fader* system in 1988 and immediately adopted by Neve for the *V-Series* console. Left to right: Dale Manquen, Joe Martinson and Toby Foster from Marctech; Bill Ritter and Dave Turkow from Todd-AO

presented by Re-Pro, and a presentation by PAD, the Pressers and Duplicators Group.

APRS, UK. Tel: +44 1734 756218.

Harman move on

March has seen the mighty Harman group move further into the professional A-V field with the acquisition of the German DAVID operation and intent to take Becker GmbH with its slew of pro, consumer and 'automotive' products.

Subsequent to the DAVID acquisition a new division of Harman is to appear combining the activities of DAVID and Studer. German coordinator Gerhard Möller comments, 'DAVID will contribute an important element in the new *RadioFrame*—a plug-in and play approach to digital radio. By integrating advanced audio and computer technologies we will provide software and hardware components to form a powerful broadcasters' system. Besides the DAVID applications we will integrate and interface systems from Studer AG, Studer Digitech and Studer Editech as well as other vendors' products.'

EMI regrets...

Two famed British studios, The Manor and Town House Three, have been closed by EMI Music International. In the official statement, UK studio VP Martin Benge claimed 'purely commercial reasons' for the closure—despite good business being conducted by both.

'Rather than dilute our energies and resources into running less profitable businesses,' said Benge, 'we can now concentrate our efforts and make increased commitment to the continuing success of Abbey Road, The Town House, Olympic and The Manor Mobiles.'

The Manor was famed for its involvement in Mike Oldfield's 1973 album, *Tubular Bells*, which helped put Richard Branson's fledgling Virgin label on the map. Town House Three became part of the Virgin operation in the early 1980s but was originally called Ramport and owned by The Who.

Neumanns stolen

Six Neumann *TLM50* mics have been stolen from the Decca Record Company. Serial numbered 313, 320, 328, 332, 333 and 340, Andrew Groves or Mike Mailes would be pleased to hear from anyone able to assist in recovering the mics.

Decca Record Co, UK.
Tel: +44 181 742 5595

Ampex *488* Hi-8

Addressing the demand created by the Tascam *DA88* modular digital multitrack machine, Ampex have introduced the *488* Hi-8 tape. *488* offers dual-layer tape formulation, durable shell construction and comes in 60 and 113-minute audio programme lengths. Both lengths come in a clear case and include a j-card and SPARS-APRS reference labels.

Ampex Recording Media, US.
Tel: +1 212 255 8491.

Newsworks

Lightworks have taken their initiative into the broadcast newsroom with the launch of the *Newsworks* editor. Designed as a stand-alone unit with ready compatibility with server systems, *Newsworks* is set to appear at the NAB show and offer high-resolution picture quality, intuitive user-interface and high speed of operation.

Lightworks, UK.
Tel: +44 171 494 3084.

The vision

Mag media manufacturer 3M have adopted their American Visionary Award in Europe. Established for three years in the US, the award recognises musical success where the production process has involved 3M tape—'Top 3' placings being required for qualification. The first two awards have been presented to French artist Patricia Kaas for *Je te dis Vous* (3M *275LE* Digital Mastering Tape) and the British *Elegant Slumming* LP (3M *996* Analogue Mastering Tape and ½-inch *996*)from M People.

3M Professional Audio-Video Group, UK. Tel: +44 1344 858614.

Tapeless goes 4th

Sypha's *Tapeless Audio Directory* has recently seen its 4th edition and now contains details of nonlinear systems, file compatibility, target markets and development plans. The *Directory* contains over 200 entries and is divided into two sections covering editing systems and broadcast systems—including certain systems not yet available but scheduled for imminent release.

Sypha, UK.
Tel: +44 181 761 1042.

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SS

DAT Digital Audio Tape

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In-brief

● RCF *DWM* wireless microphones

RCF Electronics (UK) Ltd have launched the *DWM* range of VHF high-band wireless microphones. Hand-held (*WM1000*) and belt pack lavalier (*WM3300*) models are available, both using Audio Technica capsules. Additional features include Tone Lock Squelch circuitry, reducing interference from other local radio microphones, and a rackmount receiver with a claimed ultra-low noise performance. Initial stocks will be on 173.8MHz–174.5MHz and 175MHz, and coming soon are three additional models in the 191 to 216MHz band, added to the Radio Microphone Spectrum for general purpose use and requiring a licence.

RCF Electronics, UK.
Tel: +44 1268 570808.

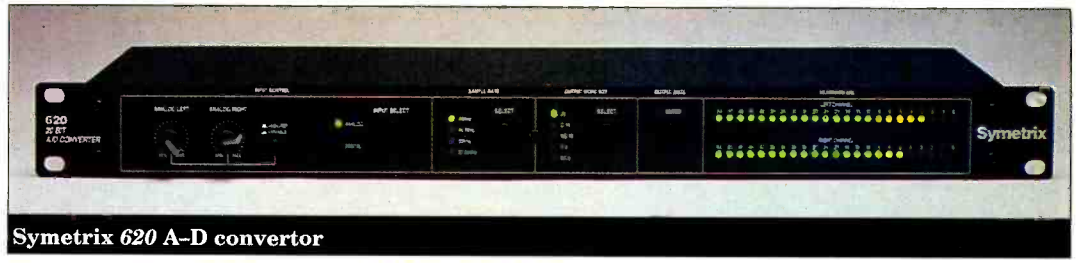
RCF wireless mic

● AKG *CK77*

Intended for use as a concealed microphone with a belt-pack radio transmitter, the new AKG *CK77* is a dual-capsule unit offering an omni polar pattern and protection against environmental damage. In hairline use, if the microphone becomes contaminated with sweat it can be cleaned and put back into service rather than being treated as disposable, and it is designed for use with AKG's existing wireless microphone systems or any other suitable transmitter.

Harman Audio, UK.
Tel:+44 181 207 5050.
AKG Acoustics, US.
Tel: +1 818 909 4500. ▶

AKG *CK77* mic



Symetrix *620* A–D convertor

Symetrix *620*

Symetrix have introduced the latest product in their *600 series* of Digital Productivity Tools, the model *620* 20-bit A–D convertor. The *620* is intended for a wide range of professional applications, including use as an alternative to the onboard convertors in DAT recorders.

The new convertor features true 20-bit quantisation, selectable output word size, dither and noise shaping, and compared to stock onboard 16 and 18-bit convertors, Symetrix claim clearly audible sonic improvements when mixing to DAT, CD mastering, sampling or hard-disk recording.

The *620* delivers digital data in either AES-EBU or S-PDIF digital formats at sample rates of 48kHz, 44.1kHz, 32kHz or 22.05kHz. Digital inputs are provided as well, and for multimedia production applications, the *620* down-samples from 44.1kHz to 22.05kHz as well as bit-rate converting from 16 to 8 bits.

Symetrix, US. Tel: +1 206 787 3222

Multimedia Studio

Macromedia have announced the availability of *Director Multimedia Studio* for *Windows* and *Macintosh*, a package that provides multimedia developers with a complete cross-platform production solution. It includes four separate production tools: *Director* 4.0, *Sound Forge* 3.0 (for PCs) or *SoundEdit 16* 1.0 (for *Macintosh* computers), *MacroModel* 1.5 and Adobe *Premiere* 4.0. The whole package is designed for the creation of corporate presentations, entertainment and educational multimedia titles, interactive kiosks, simulations and product demonstrations, and applications created with *Director* may be distributed royalty-free under the 'Made with Macromedia' program.

Macromedia, UK.
Tel: +44 1344 761111.

HHB CD-R

Following the success of their DAT cassettes, HHB Communications have announced the launch of an HHB Recordable CD as part of their expanding Advanced Media Products range.

The 680Mb, 74-minute, recordable CD employs a new Phthyalocyanine organic dye recording layer which is claimed to be far less susceptible to the effects of UV light and therefore more stable than the recording compounds used in conventional CD-R blanks. Recent tests conducted to Orange Book standards suggest that data recorded on the new discs will be secure for a period of 100 years under normal archiving conditions. In addition, the discs are double coated for further protection against scratches, fingerprints and the effects of extreme temperature and humidity. They are compatible with all leading CD writers and are capable of recording at speeds of up to 6 times real time (921kB/s).

HHB Communications, UK.
Tel: +44 181 962 5000.

HHB CD-R

DAWN IImx

On show at AES was the *DAWN IImx*, the latest in DRM labs' range of editors and workstations. The new model is a complete self-contained production tool, combining a *DAWN* workstation with an embedded *Total Recall* automated mixer and using 'Software 4' for recording, editing and mixing. The system's cue-based automation features dynamic volume, 3 or 4-band parametric equaliser, selectable shelf curve on the low and high EQ, 2 stereo assignable sends, stereo panning, and 2 stereo returns. The basic unit is a 3-unit rackmount box housing all the audio electronics for eight tracks, and multiple processors can be linked for larger systems.

DRM Labs, US.
Tel: +1 213 874 3411.

E-mu disk recorder

The MusikMesse saw the launch of the E-mu Systems 8-track digital hard-disk recorder. Intriguingly christened the *Buckeye*, the system offers dedicated tape-machine style control including a jog-scrub wheel, high-resolution graphic interface, SPDIF I-O, optional 1Gb internal drive and compatibility with a variety of OEM drives. Availability is expected to be in the third quarter of 1995.

E-mu Systems, US.
Tel: +1 408 438 1921.

Precision Amps

Well known for years for their loudspeakers and microphones, Electro-Voice have now produced a range of amplifiers, the EV *Precision Series*. The range comprises five models, all bipolar designs and topped by the *P3000*. The *P1250* incorporates switchable low-frequency box equalisation for use with E-V's *Sx200* loudspeakers, and all models feature protection against overheating, overload, short-circuit, RF burn-out and DC on the output. The whole range carries built-in comparator and limiter circuits, which constantly compare the input and output signal to prevent overload or clipping. The limiters have 'acoustically ▶

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Could you seriously use anything less than a Sony?

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Sony is a registered trademark of the Sony Corporation, Japan.

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Spirit mics

● ***Spirit*** **microphones**

The *Spirit* by Soundcraft range of live sound products has expanded to include three dynamic microphones, the *VM01* and *VM01S* vocal mics and the *IM01* instrument mic. All three are built to withstand the punishment of stage use with audio quality to match the *Spirit* mixing range. All feature neodymium magnets, elastic capsule suspension, a frequency response of 80Hz–20kHz and high sensitivity. The differences are in the polar patterns — the vocal mics are hypercardioid while the instrument model is cardioid—and the provision of a switch on the *VM01S*.

Spirit by Soundcraft, UK.
Tel: +44 1707 665000.

● **New media from Ampex**

Ampex have announced plans to introduce a series of five new format professional audio products, beginning with *489* Extended Play S-VHS cassettes for *ADAT* recorders. These will be followed by audio Hi8 and European shipments of certified R-DAT cassettes, and later in the year by CD-R blanks and DDS data storage cartridges.

Ampex Recording Media Corporation, US.
Tel: +1 415 367 3888.

● **Micropolis AV *Gold***

Micropolis have introduced their next generation AV product range, the AV *Gold Series*, offering a 4Mb/s sustained data rate which is over 35% faster than previous Micropolis drives. Similar to the original Micropolis AV drive range introduced in 1993, the new AV *Gold Series* has been specially optimised for the uninterrupted delivery of audio-video data required in applications such as multimedia, digital editing and video servers. Available in 2,4 and 9GB capacities, the range offers the flexibility of either an internal drive for a *Macintosh-PC* or a modular ▶

E-V *Precision* amplifiers

optimised' time constants, and their speed can be switched on the rear panel. Further distinctive features include E-V's Dual Differential Discrete input-stage topology, and in the larger amplifiers a fully-floating power supply which enables the output voltage to be twice the voltage seen by the output devices, enhancing reliability and sonic performance.
Mark IV Audio, Switzerland.
Tel: +41 32 51 68 33.

Sony *DPS-V77*

At Frankfurt Musikmesse Sony introduced a new multisignal processor for professional and high-end amateur studio use. Building on the success of Sony's previous *DPS* digital effects series, the *DPS-V77* combines capabilities of the *DPS-D7* delay, the *DPS-R7* reverb, the *DPS-F7* filter and the *DPS-M7* sonic modulator in one unit. High speed effects-control processing is provided by two effect blocks plus a level mixer block, and there is a choice of 50 effects for each block to provide a range of edit parameters giving a high degree of flexibility in sound design.

The unit supports both AES-EBU and SPDIF digital interfaces as well as analogue I-O, and other features include a new morphing function to crossfade from one effect to another to avoid the muting as effects are changed. 198 factory presets are complemented by 198 user-memories.
Sony Broadcast & Professional, UK. Tel: +44 1256 483646.

Barcelona radio installation

Onda Rambla, the latest radio station in Barcelona, has been equipped with two 16-channel Soundcraft *SAC200* consoles, a 20-channel *10S*, and a new computer based system for digital-audio automation and commercials management. The new system, which is called *Radioexe*, has been developed and installed by Lexon, and consists of several modules which can be adapted to the needs of different radio styles. *EasyRadio* is a DOS application for publicity and customer database handling, and produces commercial logs which are transmitted through the local network to the on-air station where the APL module (for *Windows*) can broadcast them in any chosen mode—manual, automated or synchronised.

The APL module connects through Windows to the GDS module, which records and plays audio files compressed in ISO-MPEG layer II format. Onda Rambla has five workstations which can be configured to work as production controls or on air systems, and the whole network has been equipped with a Pentium-based file server with a file storing capacity of more than 60 hours of stereo audio.
Lexon, Spain. Tel: +34 3 203 48 04.

Project X

A brand new digital console from US company RSP Technologies surfaced at the Frankfurt Messe this year. Called *Project X*, the desk is intended to be a direct partner for any of the current modular digital tape systems—Tascam *DA88*, Alesis *ADAT* and Fostex *RD-8*. *Project X* comes in five units—Master Module, 2-Channel Modules, rackmount Central Processor, 8-channel mic preamp and power supply. The console is expandable up to 64 channels (8 buses) and features 20-bit conversion, 24-bit internal DSP and comprehensive automation.
RSP Technologies, US.
Tel: +1 810 853 3055.

Procion AV-401 Sequencer

The latest in Procion's range of AV-Workbench products providing PC-based automation of routers, VTRs and General Purpose I-O lines is the *AV-401* Sequencer. This gives touchscreen programming of event lists, which can be constructed using resource keypads and on-screen numeric entry panels. Event lists for VTR replay-record, router crosspoint switching and GPI triggering can be quickly built using direct on-screen 'point to select' programming. Event lists can be replayed manually, or automatically on time, event follow or GPI triggers. Suggested applications include tape duplication and simple compilations, tape playout systems and automated line switching, where routes can be switched automatically throughout the day with manual override and last-minute reprogramming capability. ▶

The Technical Laser Company's *Speaker Sights*

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Spectrum™ Organ contains 128 presets including classic rock, jazz, gospel and pipe organ sounds. Each preset includes individual vibrato, distortion, reverb, key click and release click settings. These settings can be globally altered from the front panel or using MIDI controller messages. In addition, each preset contains four drawbar waves which can be accessed in real time using the PC™-1600 MIDI Controller.

- *1 Mb 16-bit Classic Organ Sample Wavetable*
- *128 Presets*
- *32 Oscillators*
- *32 Voice Polyphonic*
- *4 Part Multi-timbral*
- *Voice Pedal Input*
- *Leslie Speed Pedal Input*
- *Stereo Audio Outputs*

Spectrum™ Synth contains 256 (64RAM/192ROM) classic synthesizer presets including analog, digital and hybrid sounds. With 24 dynamic resonant filters, hard sync and pulse width modulation, the Spectrum Synth emulates classic analog synthesizers better than any other digital instrument. Presets can be edited and saved to RAM locations using the PC-1600 MIDI Controller.

- *2 Mb 16-bit Classic Synthesizer Sample Wavetable*
- *256 Presets (64 RAM /192 ROM)*
- *24 Oscillators*
- *12 Voice Polyphonic*
- *12 Dynamic Resonant Filters and 24 LFO's*
- *Poly and Legato Receive Modes*
- *Hard Sync and Pulse Width Modulation*
- *Stereo Audio Outputs*

Spectrum™ Bass contains 200 presets including classic analog and digital synthesized basses, as well as electric, acoustic, fretless and slapped sounds. The Spectrum Bass includes sustained and legato versions of most presets sounds. Up to 4 presets can be layered on separate MIDI channels to create incredibly fat combination sounds. Individual presets can be edited using the PC-1600 MIDI controller.

- *1 Mb 16-bit Classic Bass Sample Wavetable*
- *200 Presets*
- *8 Oscillators*
- *8 Voice Polyphonic*
- *8 Dynamic Resonant Filters and LFO's*
- *4 Part Multi-timbral*
- *Poly and Legato Receive Modes*
- *Stereo Audio Outputs*

Spectrum™ Analog Filter is a true programmable analog filter system which can be used to process any sound. It offers a 3-channel input mixer followed by a classic voltage controlled resonant 4-pole filter and voltage controlled amplifier. The filter circuit includes an ADSR envelope, velocity and key track amounts, and is MIDI controllable. The amplifier circuit also offers an ADSR envelope and master volume. 100 program locations allow settings to be stored in memory.

- *Classic Analog 4-Pole Filter Circuit*
- *100 Programmable Locations*
- *3 Audio Inputs*
- *MIDI Note Triggering*
- *Audio Trigger and Envelope Follower*
- *Filter Frequency Velocity and Key Tracking*
- *MIDI Controllable*
- *Mono Audio Output*

PC™ 1600 MIDI Controller This general purpose MIDI controller offers 16 sliders and 16 buttons that can be programmed to send system common or system exclusive MIDI messages. In addition, 2 CV pedals and the data wheel can be used as alternate controllers. The PC-1600 has many uses including programming and controlling any of the Spectrum series sound modules. The PC-1600 comes with 50 presets offering a variety of synth editors, sequence controllers, lighting system controllers, etc. All presets are fully programmable, so as other needs develop, they can be programmed by the user very easily.

- *16 Programmable 60mm Sliders*
- *16 Programmable Buttons*
- *2 Programmable CV Pedal Inputs*
- *Multi-function Data Wheel*
- *50 Programmable Memory Locations*
- *100 "Scene" Memory Locations*
- *Setup String Send on Patch Recall*
- *MIDI Dump/Load Capability*

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AND WANT. . . AT AN AFFORDABLE PRICE!

In a world of keyboards and sound modules which claim to offer "every instrument sound known to man," Peavey realizes that you probably don't want, or need, all of that! **The Peavey Spectrum Series** sound modules are each designed to do one thing--offer specific instrument sounds you do want. The Spectrum **Organ, Synth, and Bass** units offer unique features and capabilities needed to produce the most realistic reproduction of its particular instrument family.

Complementing the Peavey Spectrum Series sound modules are the **Spectrum Analog Filter** and the **PC-1600 MIDI controller**--offered to make the Spectrum Series modules even more powerful. The Spectrum Analog Filter will add that fat, classic and true analog sound to whatever you plug into it. And the Peavey PC-1600 MIDI controller allows programming and controlling of any Spectrum module.

Amazing sounds, amazing simplicity, amazing flexibility, and truly amazing prices! The only thing about the Spectrum Series that is not amazing is it's from Peavey...the company dedicated to giving musicians everything they need...and want!

For complete Peavey keyboard information, pick up the latest edition of *KEY ISSUES* at your local Peavey dealer.

Peavey Electronics (U.K.) Ltd. • Hatton House • Hunters Road • Weldon Ind. Est. • Corby Northants NN17 5JE United Kingdom • Tel: 0536 205520 • Fax: 0536 269029

PEAVEY

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MICRODISK AV external storage subsystem.
Micropolis Corporation, UK.
Tel: +44 1734 751315.

● **Gold Line *FD-23* feedback detector**

Gold Line have introduced a new product designed to make it easy to stop feedback. The Model *FD-23*, used with any equaliser, makes use of third-octave analyser circuitry to light an LED showing the frequency of any feedback which may occur, allowing its reduction by a sufficient amount to extinguish the LED.
Gold Line, US. Tel: +1 203 938 2588.

● **Sennheiser *Black Fire* microphones**

At the Frankfurt Musikmesse Sennheiser introduced two new dynamic microphones, the *BF 811* and *BF 812*, *BF* standing for *Black Fire*. They feature the specially developed Synthetic Calibrated Spring system, designed to drastically reduce handling noise, and the *BF 812*, specifically for vocals, incorporates a reed switch for click-free on-off switching.
Sennheiser electronic, Germany.
Tel: +49 5130 600 0.

● **Soundscape 8**

Frankfurt's MusikMesse provided the ideal opportunity for Soundscape to announce availability of v1.16 software for their disk recorder-editor. The system now supports 8-track audio scrubbing, automated punch in-out, noise gating, 100 markers and real-time fading and 'volume contouring' among other new functions.
Soundscape Digital, UK.
Tel: +44 222 450130.

● **Soundtracs *Topaz***

Consolidated at the MusikMesse was Soundtracs' *Topaz* range of consoles. With the *Mini*, *Macro*, and *Maxi* catering for entry to 8-track levels, the *Project 8* continues to feed the pro audio level with *Windows* PC-based fader automation newly available.
Soundtracs plc, UK.
Tel: +44 181 388 5000.

● **In-ear, in budget**

Garwood's cost-effective *PRSII System* is set to bring the advantages of in-ear monitoring to a wider audience. Launched at the Frankfurt MusikMesse, *PRSII* comprises a 1 unit-high, half-rack processor and belt receiver and offers single-channel, stereo operation on up to 12 frequencies over a range of 300ft (approximately 92m).
Garwood Communications, UK.
Tel: +44 181 452 4635. ■

Procion Innovative Control Solutions Ltd, UK.
Tel: +44 1734 756 936.

Steinberg declick

Famous for their MIDI sequencing software and subsequent developments, Steinberg have recently announced a declicking DSP plug-in for Digidesign's TDM technology. The unit features control over 'sensitivity and effectiveness' via two faders and is compatible with *Pro Tools III* although recommended for use with Steinberg's own *Cubase Audio 3.0*.
Steinberg, Germany.
Tel: +49 40 210 330.

Speaker Sights

For precise aiming of loudspeaker cabinets, the Technical Laser Company have introduced *Speaker Sights*, a pair of devices that attach to the midrange driver or tweeter. The universal design allows use with any size of driver up to 8 inches diameter, and once centred within the chosen components, the units emit laser beams perpendicular to the cabinet allowing optimum speaker alignment. Suggested uses include optimum alignment of control-room and mixing-positions, and home theatre systems. An accuracy of .001-inch is claimed for the lasers. At present only the Pro model is available, but a consumer version and an industrial strength version for sound reinforcement will follow soon.
Technical Laser Company, US.
Tel: +1 805 255 5500.

Lexicon LARC

Extending the sphere of *LARC* control, Lexicon have incorporated the *224XL*, *480XL*, *300L* into the control protocol via the unit's 3.5L ROM software.
Lexicon Inc, US.
Tel: +1 617 736 0300. ■

NAB Highlights

● **Amek to debut digital console**

Amek will premier their first digital console in prototype form at the NAB Exhibition in Las Vegas. With no rush to get the product to market, the project's three principle criteria are a flexible control surface allowing operating modes from traditional analogue to a virtual screen-based environment, sufficient processing power to be transparent to the user, and an attractive price.

Also new from Amek is the *RCMA* Remote Controlled Microphone Amplifier, using mic-amp circuitry designed by Rupert Neve for the 9098 console. Up to 64 microphone channels can be operated from the Remote Control Unit, and eventually each mic amp's transformer-balanced line-level output will be augmented by an optional 20-bit AES-EBU digital output card.
Amek Systems and Controls, UK.
Tel: +44 161 834 6747.

● **Systembase *C200xr***

On demonstration for the first time outside Europe at NAB 95 will be the new Systembase *C200xr* ISDN audio codec. Based on the apt-X 100 coding system, the unit can operate in various modes, from 7.5kHz mono for voice applications up to 15.2kHz stereo for FM stereo applications, such as studio to transmitter backup. An additional Broadcast mode is supported which allows a 7.5kHz mono channel to be transmitted to four separate destinations.

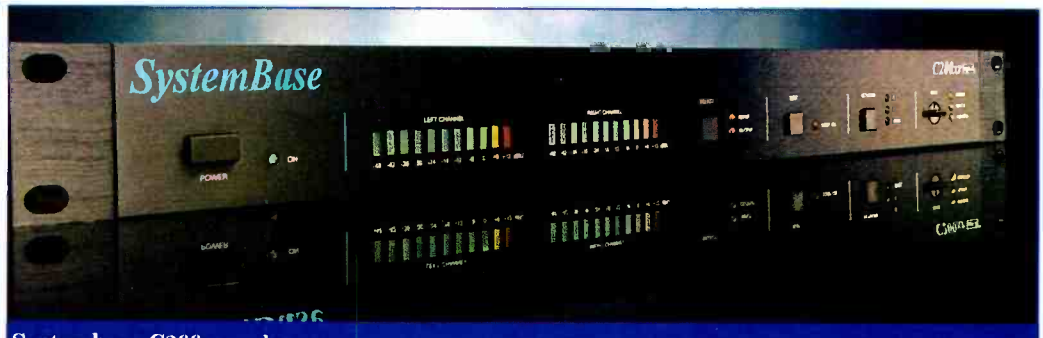
The *C200xr* also incorporates two unique facilities over ISDN; the first is the capability of upgrading the software revision of a unit within seconds, and the second is the ability to perform remote diagnostics to assist fault-finding. The 1-unit rackmount unit also features a full digital vu metering system ranging from +12 to -48dB, and self-calibrating analogue inputs for maintenance-free operation.
Systembase, UK.
Tel: +44 1256 882797.

● **Avid news**

At NAB 95 Avid Broadcast will unveil the Avid-Ikegami dockable disk-based video camera and a prototype of the company's *AvidNews* next-generation newsroom computer system. The Avid-Ikegami camera, the final piece for tapeless news production, records footage direct to disk, providing broadcasters with immediate access to media for editing and playback. Representing the combined technology and expertise of Avid, BASYS and SofTECH, *AvidNews* integrates all of the various media types used in creating news stories—text, video, audio and graphics—into one workstation.
Avid Technology, UK.
Tel: +44 1753 655999.

● **Audiomation Systems launch**

Audiomation Systems will launch *Audiomate 64*, a new low-cost motor fader automation system that is the first to run on a *Macintosh*. Following interest in the showing of the prototype at last year's San Francisco AES, the system is going through its beta-test phase and was available in production form at Paris AES. Audiomation say it costs half the price of any motor-fader system on the market and only a fraction more than the average VCA system.
Audiomation Systems, UK.
Tel: +44 1207 529444. ■



Systembase *C200xr* codec

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TL Audio Dual Pentode Valve Preamplifier

Tony Larking's TL Audio company have had a bigger hand than most in the resurgence of interest in both vintage equipment and modern equipment incorporating vintage ideas. They, as much as anyone, have seen the growth in demand for the old way of doing things and the increased recognition that new technology is not necessarily better technology, and have responded not by jumping on a bandwagon but by designing thoughtful, useful products based on their experience of what people actually want.

Here then is the TL Audio *Dual Pentode Preamplifier*—a snappy name for a box which seems singularly unconcerned about its image. Unless of course the basic, blue-grey finish with its trademark perforated grille is a conscious attempt at image and not just an easy way of looking retro. Everything about the preamp slots in perfectly with the rest of TL Audio's range, which some will see as praise and some not.

The preamp provides two very straightforward channels of microphone preamplification, with the bare necessities well provided for but little else besides. It should be remembered that the TL *Valve Compressor, Valve Equaliser* and *Preamp-DI* also incorporate mic amps; the ones featured here are a bit more special, using EF86 pentodes followed by ECC83-12AX7 triode stages.

Microphone inputs are on rear panel XLRs, although unbalanced 1/4-inch jacks on the front allow the unit to be used as a valve preamplifier for musical instruments. Phantom power is independently switched for each channel, and overall nominal output level is switchable between +4 and -10dB to the balanced output XLRs.

Each channel provides a coarse INPUT GAIN control, giving 20dB to 50dB of gain in 10dB steps, together with a centre-detented TRIM control offsetting by up to +/-12dB, giving a good overlap. An OUTPUT control is calibrated only from 0 to 10, and appears to provide nominal level at maximum. Metering of level is provided by means of three LEDs marked Signal, Peak and Clip, but as these are post the output control they give no indication of internal levels, and it is quite possible to overload the unit without having any visual indication of impending problems. I am assured, however, that production units will be metered pre the output level control.

The only other facility is simple filtering. A high-pass filter offers cut-off frequencies from 50Hz to 150Hz and the low-pass filter goes down as low as 5kHz, although it also has a nice subtle 15kHz setting. Adjusting these reveals the preamp's Achilles heel; the whole unit is microphonic, producing a gentle glassy ringing sound on both outputs as the switches are clicked round. In fact tapping the casework has the same effect, making it vital that the unit is placed very carefully in the equipment setup. Microphonic behaviour is not altogether surprising in valve equipment, and should not be a problem under normal circumstances, but it does mean the preamp should be treated with care and not adjusted during recording itself.

All of which is worth putting up with simply for the sake of the preamp's sound. Not long ago stand-alone microphone amplifiers were a rarity, intended more as problem-solvers than as desirable elements in the chain. Nowadays people are more aware of applications for units such as these. At one end of the spectrum is simple 2-microphone recording, where a good preamp avoids having to use the mic amps in a recorder (assuming it has any) and also removes the need to lug a mixer around just for the sake of two channels. In these situations something like the TL Audio box provides everything that is generally needed—this kind of work rarely needs EQ or added reverb, but could make use of the filtering. At the other extreme is the acknowledgment that the mic amps in many consoles—even top-flight ones—could stand a little improvement, and it is by no means uncommon to find units like this being used to bypass the console channels altogether, feeding line level straight into the multitrack.

While I had the TL Audio box I had the opportunity to try both these ideas. The first was a concert of Tippett and Saxton wind pieces in London's Barbican Hall, with a slung pair of figure-of-eight Sony Is. This is a hall-and-microphone combination I know very well, but this preamp gave me something I had not heard before. There was an openness and depth to the sound which surprised me, together with a remarkably clean performance—noise levels were below those of the monitoring system and only by deliberately misadjusting the unit could I get any kind of distortion or even strain to appear. Quoted specs include EIN of -122dBu at 50dB gain, distortion at less than 0.05% at 40dB gain, and frequency response within 1dB up to 40kHz, and I can well believe it.

Back in the studio, I tried the classic setup for vocal overdubs, this time using a *414* straight into the multitrack, and the result impressed everyone in the room, one person even saying it was the best vocal sound he had heard in our studio. Everything I put through it, from bright clean *KM84*s to Tandy PZMs, gave me the impression I was hearing more of what the microphone was producing, and given the chance I suspect I would find myself using it virtually all the time.

There are, of course, several microphone amplifiers on the market now (see Sam Wise's recent review for details of two of them) but most have a rather more esoteric price tag on them than this one. TL Audio have come up with a design that provides a genuine improvement on many signal paths at a per-channel price which probably beats any mixers capable of giving comparable results. Whether or not you're looking for The Valve Sound on your microphones, this is worth checking out. ■

Dave Foister

TL Audio, Letchworth SG6 1UJ, UK. Tel: +44 1462 480009. Fax: +44 1462 480035.
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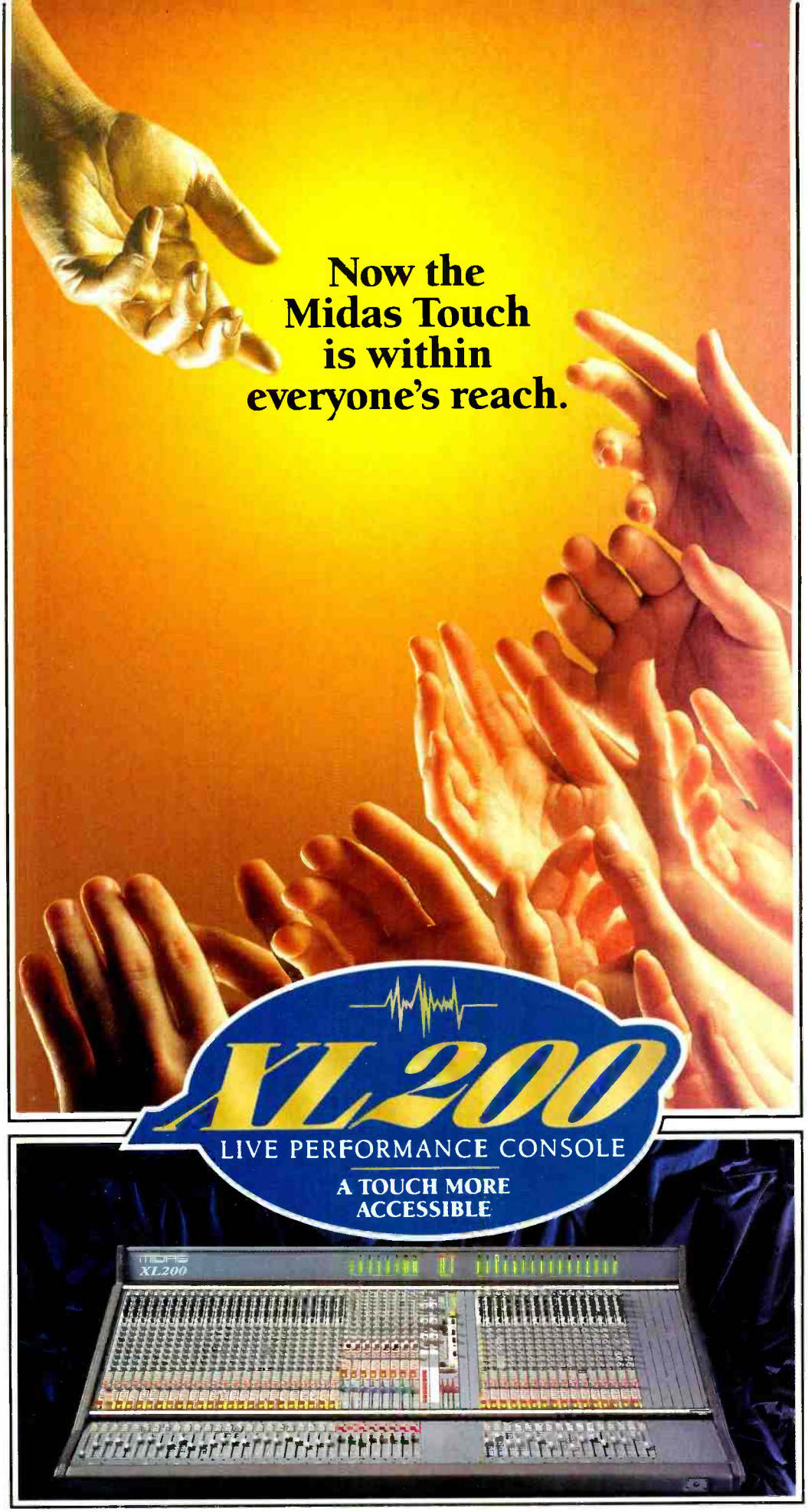

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Demeter VTCL-2

Welcome to Dave's Valve Corner. For the benefit of those readers who picture me puffing at a pipe in a rocking chair, reminiscing with misty eyes about the good old days when all the equipment glowed so much you didn't need lights or heating and you could toast muffins on the power amps, I should like to point out that I grew up with solid-state equipment, and that the only technology for which I carry a torch is good technology that helps me get my job done properly. I feel compelled to point this out because I am starting to forget when I last had a piece of solid-state equipment to review—not through personal choice but a direct result of the nature of the marketplace at the moment. The status of the valve has passed through the cult stage with its attendant wacky ideas and opportunist rubbish, through the stage of being taken seriously as equipment with occasionally something to offer, and has now, it seems, reached the stage of being the norm—every new compressor, microphone amplifier, equaliser and even DI box seems to have valves in it.

This month's offering is the *VTCL-2* compressor from Demeter. Demeter have already made their name in the US—so much so, apparently, that they have felt little need to explore other markets. The discerning elsewhere, however, have noticed their products' potential, with one major London studio reportedly buying Demeter DI boxes by the crateful whenever they were in town. Now moves are afoot to make them available in the UK and elsewhere, along with microphone preamps, power amps and this compressor.

The *VTCL-2* is a 2-channel/stereo compressor with few frills and an evident heavy reliance on its circuit design to mark it out from the competition. It looks the part, with its fairly basic, black, front-panel design, which just stops short of looking home-made. Its facilities are similarly basic, in fact surprisingly so. None of the controls are calibrated, being marked simply Min-Max or Slow-Fast. This is understandable in the case of the RELEASE control, as the release time is dependent on the amount of compression, but the others are not programme dependent or interactive in any way and a few numbers would not go amiss. In particular, calibration of the Input and Output levels—or at least a clearly marked unity gain setting —would be useful.

But by far the biggest surprise is that there is no ratio control. The ratio varies in a predetermined way as the amount of compression changes, with an initial ratio of 4:1, which increases to 6:1 when more than 6dB of gain reduction is being applied. When the gain reduction exceeds 10dB, the ratio becomes 20:1, effectively limiting the signal. This is in many cases very useful, as the characteristics have been well chosen for a number of routine compression applications. There are, however, times when a little more control would be helpful, particularly for more gentle compression. Unlike many valve designs, subtlety is not the *VTCL-2*'s forté. Specific compression effects are no problem, and it is very effective on vocals; I particularly liked what it did to bass guitar, producing a big round controlled sound which sat ideally in a mix without too much fiddling about.

As a stereo-programme compressor it undoubtedly delivers the goods, but again unobtrusive gain riding is not easy to achieve; this kind of role would probably never need a ratio even as high as the 4:1 the Demeter uses as its starting point.

In view of the lack of calibration, it is as well that the metering arrangements are reasonably flexible. Each channel can be individually switched to show input level, output level or gain reduction (labelled simply Change) and the meter sensitivity can be increased by 10dB.

Switching to stereo hands over control of Threshold and time values to Channel A, and does apparently odd things to the settings. With a steady tone through Channel A, I was reading a gain reduction of 5dB; switching in the stereo link changed this to less than 1dB, even though there was no signal present on channel B. This puzzled me, suggesting as it does that control signals are not being summed the way one would expect. This aside, the stereo linking works well, maintaining the stereo image the way it should.

The rear panel is not without surprises, carrying as it does TT jacks as well as XLRs and ¼-inch jacks. Despite the presence of XLRs, balanced operation requires optional Jensen transformers, and as supplied the unused pin is shorted to ground —not mentioned in the manual and of interest to those with balanced inserts on their consoles, I would have thought. On the plus side, each XLR has an associated switch to configure it as pin 2 or 3 hot—something not enough manufacturers think about.

For those who expect every new valve processor to be able to reproduce the characteristics of a vintage model, Demeter include in the manual a table of settings to mimic (Demeter actually use the word duplicate) those on a Fairchild *670* or a Urei-Teletronix *LA2A*. How accurately the imitation is achieved I am not in a position to say, but since many people are, it would surely be foolhardy to make these suggestions without being reasonably sure of oneself.

If some of this review appears negative, it is only because some details could in my opinion do with a bit more thought, and because this is quite clearly a compressor with a character all of its own which will not suit every job one might ask it to do. That same character is also its strength; there are things it does very well indeed, producing smooth, warm (there's that word again) powerful compression which in many cases will be exactly what is required. ■

Dave Foister

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Tel: +1 818 986 7103.
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Demeter valve compression - mimicking the Fairchild *670*

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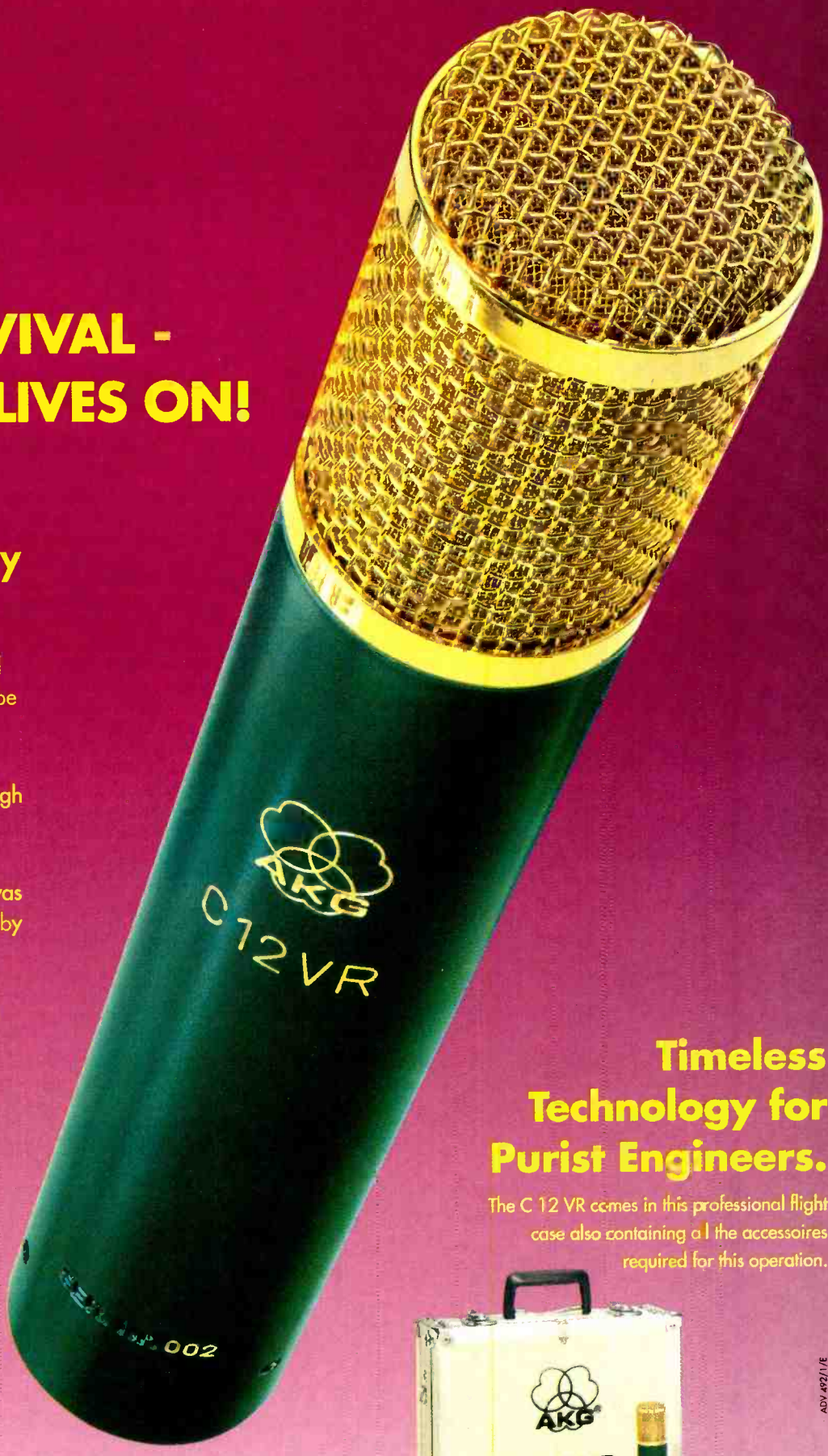

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Yamaha D5000

Yamaha D5000 – 'old fashioned values from a time when processors were designed to provide solutions rather than demonstrate technological prowess'

Engineers can easily be split into two main groups: those that like multieffects processors and those who prefer separate effects units dedicated to dealing with the creation of one aspect of the effects chain. While the convenience of having all your effects in one box cannot be denied, accessibility and flexibility are almost always compromised along with reduced control possibilities. Separate effects units were how it all started but signal processing has come along way since then—the dedicated reverb device, for example is about as common these days as the dedicated replacement for the old-fashioned tape delay. Many will therefore welcome Yamaha's *D5000* digital delay as a nod to the times when things were a little more straightforward and immediate.

The 'true stereo' *D5000* has 20-bit A–D and D–A convertors working to a sampling frequency of 50kHz with 100 user-programmable presets. Layout is typically SPX in nature, albeit the latest incarnation and evolution of this popular concept. Activity centres around an LCD panel, 2-digit LED preset number read-out, two bargraph meters, a block of four cursor buttons (two of which also deal with saving and recalling presets) and a block of eight parameter buttons for editing purposes. Data entry is via the now ubiquitous 'alpha' dial.

A dual-concentric pot controls input level, while another pot controls the wet and dry mix with connections parallelled on balanced XLRs and stereo jacks switchable for +4/-20 operation. You also get MIDI In and Out-Thru plus footswitches for program increment-decrement, bypass and trigger.

The *D5000* handles four different program types: a Dual-Stereo mode which uses two delay units for the two channels with three taps in each; a Mono Delay with six taps (predictably twice the delay time available in the Stereo mode at 10.4s); a Freeze mode with recording and playback; and a Sample and hold for grabbing and playing back in sequence. Two MIDI controllers can influence parameters in real time for all programs apart from sample and holds.

The selected program type dictates the way in which you program the device from the Parameter Edit mode accessing parts from separate function buttons. Buttons are provided for accessing the delay, Feedback, Modulation and Ducking sections of a preset, and it amounts to extensive control over fairly basic parameters. There is nothing fancy here but the unit is still very 'in-depth'.

For the delays you can alter pan, levels and time parameters in seconds, distance, frames and tempo respectively. These are entered by 'tapping' on the front panel TRIGGER switch. There are high and low-pass filters covering 20Hz–4kHz and 400Hz–20kHz respectively with bypass. Feedback is programmable for phase, level and high and low-pass filters, while modulation can be controlled by sine wave, triangle wave or autopanning, speed, depth and phase. There is also a sophisticated ducking and gating section tied into the delay which is a much underrated and interesting means of control.

The freeze section takes care of the setup for triggering of recording in mono, or stereo with editing, overdubbing, looping, trigger delay and masking plus of course pitch shifting while the sample and hold mode is the one you would want to use if you are hoping to catch and spin back lines in a live scenario.

In use, the *D5000* is an absolute dream and to my mind proves the validity of such extended stand-alone control over delay effects.

I especially like the speed of setup, delay-time tap entry and the useful LCD graphics that even give note displays for tempo sub division. Sampling is quick, precise, editable and triggerable (from front panel, MIDI or audio input) making it a real workhorse replacement and spin-in device. It will appeal to studio and live engineers as well as undoubtedly finding its way into serious musician rigs. It proves that there is a purity of embellishment possible with well-constructed delay taps that is missing with stacked multi-effecting.

I cannot hide the fact that I love this box because it's a no-nonsense piece of kit that is nicely optimised for the task. The sound is flawless —mirror image as opposed to brighter than the real thing—with a beautiful depth to the modulation effects that makes it sound more analogue in smoothness than that more usually associated with digital devices. It's also impressively quiet and while I originally wished that a few more knobs could have been provided, in practise the layout and menu structure is well planned.

In a way, the *D5000* is the sort of unit a machine in the mould of the once industry-standard BEL BD80S should have become because it tugs at old-fashioned values from a time when processors were designed to provide solutions rather than demonstrate technological prowess.

As such, the *D5000* is a valid implementation of the delay unit that will definitely earn its keep in the rack. ■ **Zenon Schoepe**

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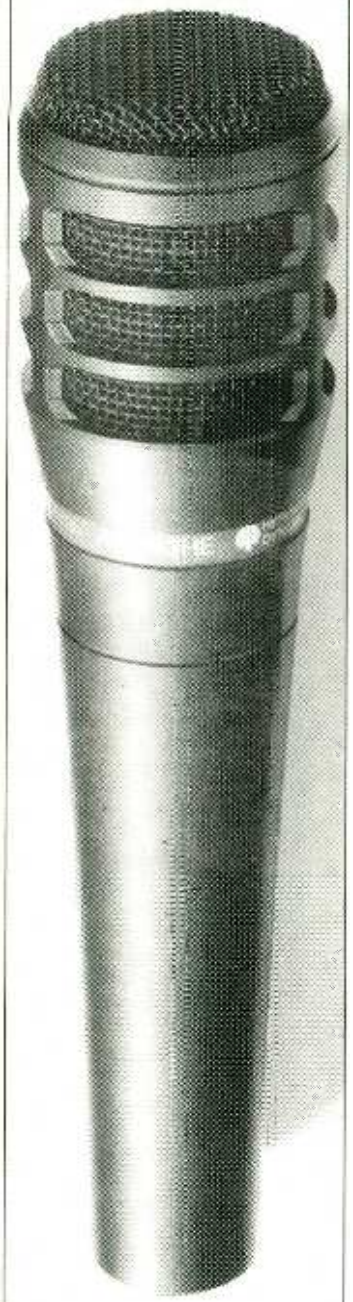

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Gigs and gear

'When was the last time you went to a loud rock concert?' was the greeting I received from ZZ Top's FOH mixer, ML Procise in anticipation of the bearded Texans' imminent show, 'because these guys are *loud*! In the event, I have to report that my ears were not singing at the end of the show even though the sound was loud and, more importantly, powerful.

The *Antenna* tour stomped its way through Europe until the end of 1994 with Showco veteran, Procise, behind a Harrison *HM-5* 32-channel console and driving a Prism loudspeaker rig.

By his own admission a 'company man' who has been with Showco for 19 years, Procise can also be considered the fourth member of ZZ Top for live performances and knows every subtle move of the Texan trio's arrangements like the top of his console.

A long haul from Lille in France to Lausanne, coupled with customs holdups, meant that the ZZ's setup was running behind time and, apart from a line check, it was get them on stage and go. Not that this seemed to worry Procise; his only concern being that the 'band play well tonight and keep the programme reasonably varied'. He went on to explain: 'ZZ Top can give the mixer a hard time if they don't vary the material too much as it is easy for many of the numbers to sound the same—it's basically balls to the wall rock 'n' roll and you just have to go with it!'

In addition to being late, one of ML's effects rack was suffering from having been dropped from a forklift in France and several definitely needed the doctor. However, Procise seemed happier with the fact that the AMS reverb was back working rather than bothering about the damaged equipment. 'I can always get around it—it's no big deal.'

Not that there was anything particularly special about the processing as most of the sound for the *Antenna* tour was dependent on the band itself. However, Procise likes to have some Summit Audio *TLA-100* limiters for the vocal, AMS and Lexicon reverbs, Eventide *H3000* and dbx-Drawmer gain reduction.

The loudspeaker configuration consisted of left-right arrays of Prism speakers in 4 x 4 clusters with subwoofers on the floor.

'We don't use any front fills on the stage in order to keep the sight lines clean and the stage (in the form of an immense 1950s Chevy dashboard) uncluttered.'

For three musicians, ZZ Top make a *big* sound and this came over without anything being overbearing. Also amusing to notice was the general atmosphere at the mix position—with ML Procise 'orchestrating' the various mix moves while the lighting crew were dancing behind their consoles. These guys definitely have fun (monitors were handled by Johnny Roberts and Bill Sheppell with a Ramsa *840* console and the new Prism wedges).

Looking ahead, the heavyweight tours for 1995 include the Rolling Stones' *Voodoo Lounge* tour (again with Showco and using Prism Stadium speakers and Harrison *HM* and *SM-5* consoles) and the Bon Jovi/Van Halen package.

We can clear the decks for 1995 with a look at some of the trends in equipment that were noted at the AES in San Francisco for live sound.

What I find encouraging is the move towards the tightening up of the various loose ends that still occur in live sound, such as a return to basic principles that are still valid (surprise , surprise), better systems management and integration, user-friendly operation and some sensible automation.

The increasing use of microprocessor-based equipment means that a poor quality mains supply becomes a far more serious problem than it used to be (experiencing memory crashes and glitches lately?) and the power conditioners that are now on the market by people such as ETA or Furman are a worthwhile investment for at least the control racks—if not the whole system.

Integrated processors continue to increase with JBL introducing an 'economy' version of their Array Series speakers and BSS hitting the top end with the *Omnidrive* system which pack an awful lot of control into 2U of rack space. I must admit that the dynamic limiting function (complete with lockout) really appeals as the almost ultimate deterrent for the system engineer against the overloading of certain frequency bands.

New consoles seem to be springing up everywhere and the new Crest *Century* mixers are no exception to the rule, coming complete with LCR panning (why this has taken so long to catch on still surprises me). Resolutely stereo-only, the latest offering from Midas, the *XL4*, corrects some shortcomings in the *XL3* will full flexibility routeing (audio groups-VCA groups-auxes-matrix) and onboard automation of switching functions and the VCA masters. The console can also be configured as either 100% house or monitor console—a definite plus. At the lower end of the scale, the new Fender (the 'guitar people') consoles have a lot going for them, both in the *MX-5200* Series which when stacked increase the total number of buses (two 16:4 consoles become 32:8) and the *PX-2200* powered consoles which feature power amplifiers for both the house and stage monitors. Yamaha joined in with the *PM3500* and *PM3500M* consoles in house and monitor versions which also feature integrated automation for mutes which can be fired via MIDI or manually. Ramsa were not to be left our and they showed a preproduction 'super *840* series' with VCA groups, parametric EQ and 20 aux sends (12 mono-4 stereo).

The Lone Wolf *MediaLink* network system is now becoming a serious proposition for system control and Apogee have launched a digitally controlled power amplifier which has been expressly designed for networked applications.

On the loudspeaker front, EAW restated their engineering philosophy towards systems with a White Paper on *Integrating and Application Data with Loudspeaker Design Concepts*.

Meyer Labs did much the same with a guide leaflet on large systems based around *MSL-5*s, *DS-2*s and so on.

Adamson Systems Engineering have an interesting range and this has been expanded with the *Hi-Q* Array Concert System which features very precise coverage characteristics and three handling options.

The closing note is a mention of some new software that John Meyer is working on. A sneak preview of John's work revealed an audio tool that will be a real boon to system designers and engineers. Though it obviously has in-house applications for Meyer sound, this extension of the *SIM II* analysis system (see main feature in this issue) will allow engineers to look at various parts of a system and zero-in onto which components are interfering with each other (badly placed horns causing lobing, nulls, for example) and be able to take corrective measures quickly. ■

Live Sound News is compiled by Terry Nelson

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Charlie Lab *Digitar*

The Digitar is 'an excellent accompanying and embellishing tool for guitarists and non-guitarists alike'.

Described humbly by the manufacturers as a 'Pocket MIDI Guitar', the Italian Charlie Lab's *Digitar* promises much to a world that is still searching for an affordable and dependable means of string-driven MIDI control. Closer inspection reveals that the instrument is not quite what it is cracked up to be—while it has six 'strings' its function is that of an imposer of guitar picking action on incoming chords which it interprets and maps into guitar-type chord voicings that can then be played from the strings. Strings is also stretching the description a bit because the six strips of metal on the Digitar are in fact metal bars that perform the function of strings and stimulate guitar-like note activity fairly realistically and sensitively.

What you are looking at in the *Digitar* is a small, but certainly not 'pocket', panel with the aforementioned strings and some control buttons. The unit is intended to be attached to a belt that you strap around your waist and strummed or picked at with the hand of your choice. Those of the Jimmy Page stance of axe strumming will be pleased to know that the device can, with a bit of ingenuity, be strapped to the thigh just above the knee while the rest of us will be content to pick away at our midriffs as if our underwear elastic were too tight.

The controller panel connects via a telephone-style socket and lead to a small interface box which takes mains power and provides MIDI In, Out and Thru connections. For starters, the interconnecting lead is curly and the connectors are small, fiddly and plastic with a dubious ability to stay connected long-term despite (fragile) plastic retention clips on the plugs.

The implementation of controller switches on the *Digitar* panel is not elegant because it is cramped and uses membrane buttons. There is a 4-character LED display and a number of buttons that access functions such as MIDI In and Out channel, the Global and Utilities menu, and least good of all is the fact that parameter values are incremented or decremented by pressing either side of the guitar 'bridge'. There are eight presets in the *Digitar* each of which contains patch change data, bank select, and legato-staccato behaviour plus two soft function buttons which can be assigned to such things as switching notes off, sustain, and fret noise in GM (General MIDI). You can also adjust volume from a dedicated button and the bridge, and mute the controlling device.

The *Digitar* operates in four modes—Rhythm which extrapolates chords from a 3 or 4-note input, Economy which is much the same but employs only the top four strings, an All-Channel mode which attempts to process 12 MIDI channels of data simultaneously for *strum-along-a* sequences, and a Lead mode that is a waste of time—given that you can only lead on what a sending device gives you.

Objectively, the *Digitar* is too clever for what it is—a good strum-and-pick generator—and such over-complexity of control dilutes the efficiency of what it is actually best at. This fussiness is misplaced particularly as the *Digitar* is only dealing with half of the task—you still have to feed it the chords from outside and none of extended control features change this fact.

Left-handers can turn the belt pack around after flipping high and low string assignments within the Global menu but they will not be spared the most irritating thing about the *Digitar* which is the bridge's function as a decrement-increment switch. I do not think there are many guitarists who don't either rest their hand on or at least touch the bridge while playing and doing this by accident can change a parameter—or even a sound—unless you are restrictively careful in your technique. It has also been overlooked by Charlie Lab, who expect you to hover over the bridge with your palm to change settings while playing—I could not do this, and I don't think there will be many who can.

More annoying still is the fact that if you hook the upper or lower strings hard with a pick you can stimulate the bridge into incrementing or decrementing a parameter.

The manner in which the *Digitar* interprets incoming chords into guitar-style chordal voicings is at times unpredictable, even surprising, but it does add to the variety. It also does not like to get too many fast chord changes in rapid succession.

Despite all this the box has an uncanny ability to generate realistic strummed and picked textures and it's creative and quick to use with any sort of timbre and not just guitar tones. It works.

You will not always have all six strings active and you will not always have obvious guitar voicings, but that is part of the entertainment value and as such the *Digitar* is an excellent accompanying and embellishing tool for guitarists and non-guitarists alike. However, I would say that the better your strum hand technique is the better and more interesting will your satisfaction be.

By far and away the best way to use this device is to program all the chord changes into a sequencer in advance and then to pass these through the *Digitar* on their way to the sound of your choice. I believe you will be inspired by the amount of interaction that can be achieved and if you are even nearly pretty good at finger picking you will take to it immediately.

It is amazing that the *Digitar* can still impress against a backdrop of so many minor irritations. It is too clever by half, unnecessarily complicated, has poor ergonomics and requires a modification in playing style yet it still produces reliable triggering of strummed and picked notes that are very controllable for sensitivity and volume. But it is as good a solution to injecting guitar playing textures into the MIDI domain as I have heard and if that is what you want, then I think you will be prepared to live with the peculiarities. Ultimately, it is a very clever idea. ■

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Music News is compiled by Zenon Schoepe

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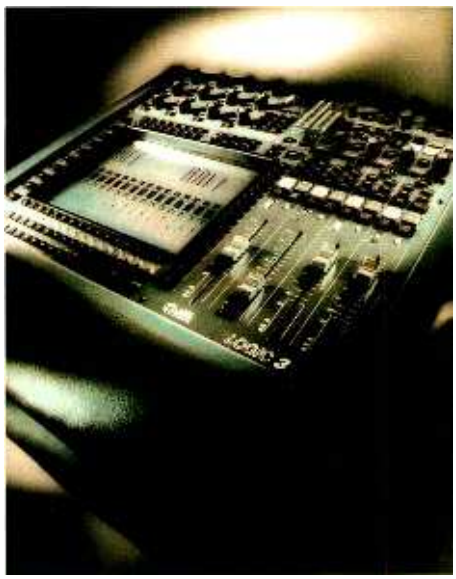

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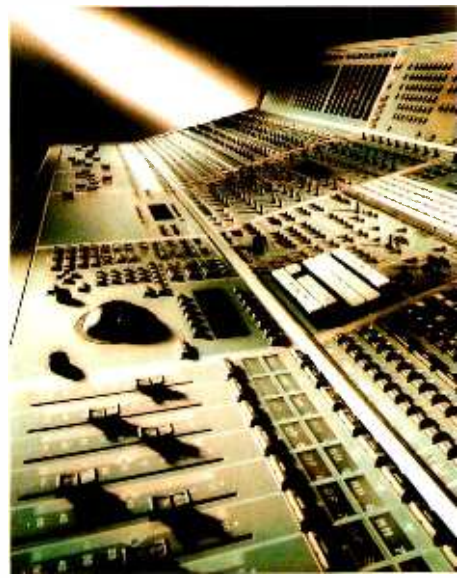

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PINEWOOD DIGITAL

Leading UK film studio Pinewood have a worldwide reputation based on major feature film production and are taking first steps towards fully digital postproduction. Keith Spencer-Allen follows developments

Passing through the unassuming doors of the Sound Department at Pinewood Studios, you find yourself in a corridor lined with awards and nominations for achievement in sound—all of them major movies. On the wall, a studio poster lists the better-known films made here over the last 30 years and you will need several minutes just to scan it. This is the home of serious movie making.

Since it is not possible to rely solely on movies to support a studio the size of Pinewood, moving into television production—and meeting its increasingly sophisticated sound demands—is a natural progression for the facility.

Pinewood is not new to television, however. The 1960s and 1970s saw a lot of production and postproduction of episodic shows such as *Space 1999*, *Strange Report*, *Shirley's World* and *Man In A Suitcase*. These productions were all shot on 35mm film but with the disciplines of episodic TV—a new theatre was even added specifically for TV post. As TV production practice moved to 16mm, Pinewood declined to follow and the TV post work slowed. The 80s was a boom time for feature films and the studios became fully occupied with their production. Eventually a small investment in 16mm facilities was made as a gesture towards TV work but digital audio as a medium had appeared and it was decided to think longer term rather than invest further in 16mm.

Mid-1994 saw the first of those moves with the introduction of an Avid *AudioVision* system followed by a new Theatre 3, dubbing theatre equipped with AMS Neve *Logic 2*.

Background

Film production differs from music recording in many respects—it involves more people; it has more processes; the sound is not an end in itself; aspects other than quality are equally important; and there are established practices. The significance of the last point is that unlike music recording, frequently it is not possible to just substitute a digital process for an analogue one and continue. With film, anything other than digitisation at a very basic level can mean changing the production process and the work of many people. Aside from simply installing and learning to use the equipment, there is the need to develop new techniques.

Pinewood has a background in using appropriate technology. Theatre 2 had the UK's first automated film console in 1981. A fully-automated SSL *SL 5000* sits in Theatre 1.

The facility had also looked at digital technology several years ago: 'At that time it was a brave production that attempted to complete a feature film totally digitally,' comments Graham Hartstone, Pinewood's Head of Postproduction. 'This was mainly because of the nature of feature production where people are not so disciplined as TV and changing your mind when working on a film with a digital workstation was not the easiest thing to do—storage capacity was limited and up and down load was slow.

'Coming from our automated mixing background, the concept of a fully-automated digital console would have been our idea of dubbing mixers heaven. We looked at the *Logic 1* in the early days and although I liked it, it wasn't actually man enough for what we wanted at the time and couldn't cope with surround.'

Pinewood decided to watch the development of digital technology until they felt the time was right. They also had the belief that for the use of full digital systems to be commercially effective it was necessary for their clients to be comfortable working with video picture. While many of the postproduction processes in film postproduction are now working with video picture, not all are. Television however is fully ready to work digitally, and the equipment to do it is here.

One of the first decisions Pinewood took was to concentrate on the services with which they had established reputations—ADR, Foley and mixing. Sound editing is not a core service at present, their attitude being that the choice of sound editor is normally a production decision and that the chosen editor has a preferred digital editing system and that at present it is more practical to look to others to provide these services. To that end Pinewood has been openly encouraging other digital-editing facilities to set up independently on the Pinewood facility.

The considerations behind the choice in equipment was quite straightforward for Graham Hartstone.

'I'm a great believer in compatibility with other facilities. *AudioFile* is widely used in UK television and there are a lot of operators out there. It also happens to be attached to what I consider the ideal automated console so the choice was easy. I do, however, feel that it is not so easy to handle ADR with the *AudioFile*. In contrast, the Avid *AudioVision* has a good ADR program and with the added bonus that the picture is on the hard disk with the sound.'

With this in mind an Avid *AudioVision* system with removable drives was purchased about six months ago. Rather than install this in a fixed location, several of the rooms have been prewired so that the Avid can be moved on a trolley which ever one of three ADR-capable studios is free.

In October 1994, the new digital dubbing studio, Theatre 3 was completed. Centre place is an AMS Neve *Logic 2* with 16-track *AudioFile Spectra*. The room was designed by Harris Grant Associates (who are also based at Pinewood) and marks a complete departure from other Pinewood theatres.

The new theatre

'Strange as it may seem, my first requirement was for a small room—I've got large rooms and large rooms are not suitable for critical mixing for TV,' explains Hartstone 'We have been dubbing TV in the large theatres to close proximity speakers but we wanted a living-room-sized theatre, and to work to an LCD projection TV. In fact, we mimicked the film theatre and added a perforated screen setup with centre speaker behind the screen, left and right to either side and discrete left and right surround speakers at the rear.'

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Dubbing Mixer Nic LeMessurier working on Gerry Anderson's new production *Space Precinct* in Pinewood's new Digital Theatre 3 complete with *Logic 2* console and Audiofile *Spectra*

A major achievement of the design has been to fit a lot of facilities into a relatively small space. Entering from the main corridor, you are in a sound lock area with a small window viewing across the console allowing confirmation that it is okay to enter the studio. To the right is a small voice booth that also can double as a producers office, also with a window into the main room. You enter into the studio at the rear at a level slightly higher than the front of the room. The rear wall houses a set of diffusors and a many-angled wooden ceiling that encourages multiple reflections into the diffusors and to provide some scattering for the rear surround speakers. Under the acoustic treatment is the guest seating area.

At the opposite side to the entrance, housed behind twin sliding glass doors, lies the machine area containing the *Logic-AudioFile* processing racks, the drives, the patching for audio, video, digital signals and time code. All other machines such as the bank of video machines and three Tascam *DA88*s are also held here, making the main room a very quiet environment. There is no direct access to sep mag machines from this room, any material from such sources would be copied to *DA88* prior to use.

To the right of the console there are the racks for peripheral devices and processors that will be added as required. The surface above is prewired for an Avid *AudioVision* should it be used here.

In front of the desk, the carpet is removable to reveal seven Foley traps. It is not intended for heavy duty Foley but for those occasions where there is a missing footstep. In this case the electric roller screen is retracted to reveal a cavity area that assists Foley acoustics while cues are taken from a video monitor. One advantage not immediately clear to most audio people is the ability of the EF LCD projector to zoom in on parts of the picture which is very useful if you are looking at a very precise piece of audio sync.

The speakers are all JBL *4410* for the front three and *Control 5*s for the rear— chosen to match the larger JBL systems that are in all Pinewood dubbing theatres. This has enabled transfer of mixes between the different theatres with a high degree of similarity in sound. The centre speaker behind the screen is equalised through the Dolby house equaliser to match the others but very little tweaking was needed. A single pair of surround speakers is used and combined with the rear QRDs creates the ideal diffused sound.

The colour scheme is designed to provide a pleasant relaxing environment at the rear of the room with the use of light oak wood and a blue wall colouring that graduates ▶

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darker to the front of the room so as not to detract from the picture.

The studio took about six weeks to build and is in the heart of the sound department. This will enable future digitisation to grow out from this point with one central machine room allowing easy access. This is important to the Pinewood approach as Graham Hartstone explains.

'Originally I had been thinking about networking, and thought that this would be the answer in the digital environment. However, and I know there are many who disagree with me on this, in our situation and variety of work, this could become an organisational nightmare requiring a vast amount of housekeeping and interaction between people who were on the network. So that is not under consideration at present.

'Besides coming from our film background, the actual practice of physically carrying something from one room to another is familiar and very reassuring.'

Interchange and transfer

If a network approach is not in favour, the ability to interchange data and audio is. For the first few months of operation the studio has been solidly ▶

THEATRE PROJECTS MIXER

In 1980, Pinewood were looking to replace the ageing, 36-channel Neve console in Theatre 2. It was based firmly on music recording console design practice with the exception of the monitoring which was, and still is, primarily outboard of the desk. The main desk was on a raised platform at the rear of the theatre, with another 'panning desk' located at floor level about 3m in front. All told, there could be up to five or six people required for a mix—one each for dialogue, effects and music, plus one or more panning operators. Everything was manual.

At that time, few manufacturers were making film consoles, mainly Quad Eight, a floundering Harrison with their landmark automated desk with processors in every channel. Neve and Calrec in the UK were still producing custom desks—but at a price and extended time scale. Then there was Theatre Projects with whom I was Technical Manager and Dave Higton (now at Racal Recorders) was the circuit design brains.

Somehow, Geoff Labram (then Technical Chief at Pinewood) heard of us after his encounters with Neve, Calrec and SSL. Following a brief discussion a meeting was arranged. At the end of the meeting Geoff remarked 'You have given me answers before I asked the questions,' and a successful relationship was in the making. A quick trip to the 'Academy' in Hollywood gave us a frame of reference, and a design outline and cost were put together. The contract was placed. Even at the time we were amazed at his confidence in appointing unknowns like us.

The time scale was short—about nine months from contract to installation for a totally custom 48-channel, 20-group console. A few months later, the requirement was expanded to 60 channels and in three sets of 20, and 32 groups, with intermediate frames for effects devices. Fortunately, our design had allowed for expansion so there was no extra design cost. Film-sound formats from mono to 6-channel surround were required with separate mixes for dialogue, effects and music. Automation was essential to reduce mixing time, increase accuracy and possibly reduce staffing levels.

One prime target was the 'panning console'. Our proposal was for what we termed 'programmable, memory-automated panning' —which did not mean a device which had a few knobs to automatically throw sound around, but rather a system which could record real-time panning motions and play them back. The concept of using X-Y joysticks and recording each axis as a fader automation channel seemed ideal. This could then be replayed, processed and interpreted by a separate computer-based sub system to move the sound around. The only problem was that 60 channels plus six panners each requiring two automation channels brought the automation requirement up to 72 channels —still large by today's standards. Since developing an automation system was not in our budget, a market survey was undertaken to find one we could use. The only one which would allow us a cost-effective solution was the Allison *65k* system with two fader-automation controllers. Each recorded its information to one track of a 3-track 16mm sep-mag film recorder—the third forming a guard band and providing for the future use of AMPTE time code. Thus, sync between the automation and film tracks was provided by locked sep-mag recorders, allowing frame slip or track edits to be easily accomplished.

At the time, this console was one of the largest automated consoles in the world, one of the few with LCR plus width pan pots on each channel and the only one with automated 6-channel surround panners. The joystick controlled panners could be selected into a number of modes ranging from two-channel stereo to the plus-two and five-plus-one formats. Later alternative controllers were provided giving three-channel left-centre-right panning on one knob and image width on a second knob—matching but automating the functionality of the manual pan controls on each channel. All other hardware remained the same and only new control law tables were required. The console now contains a mix of the two controller types.

Surprisingly perhaps, the project was most successful for both parties. And this very month we are visiting for only the second service call in 14 years and a possible upgrade to the automation for a console which everyone still loves. Any offers for 72 automation channels? ■

Sam Wise

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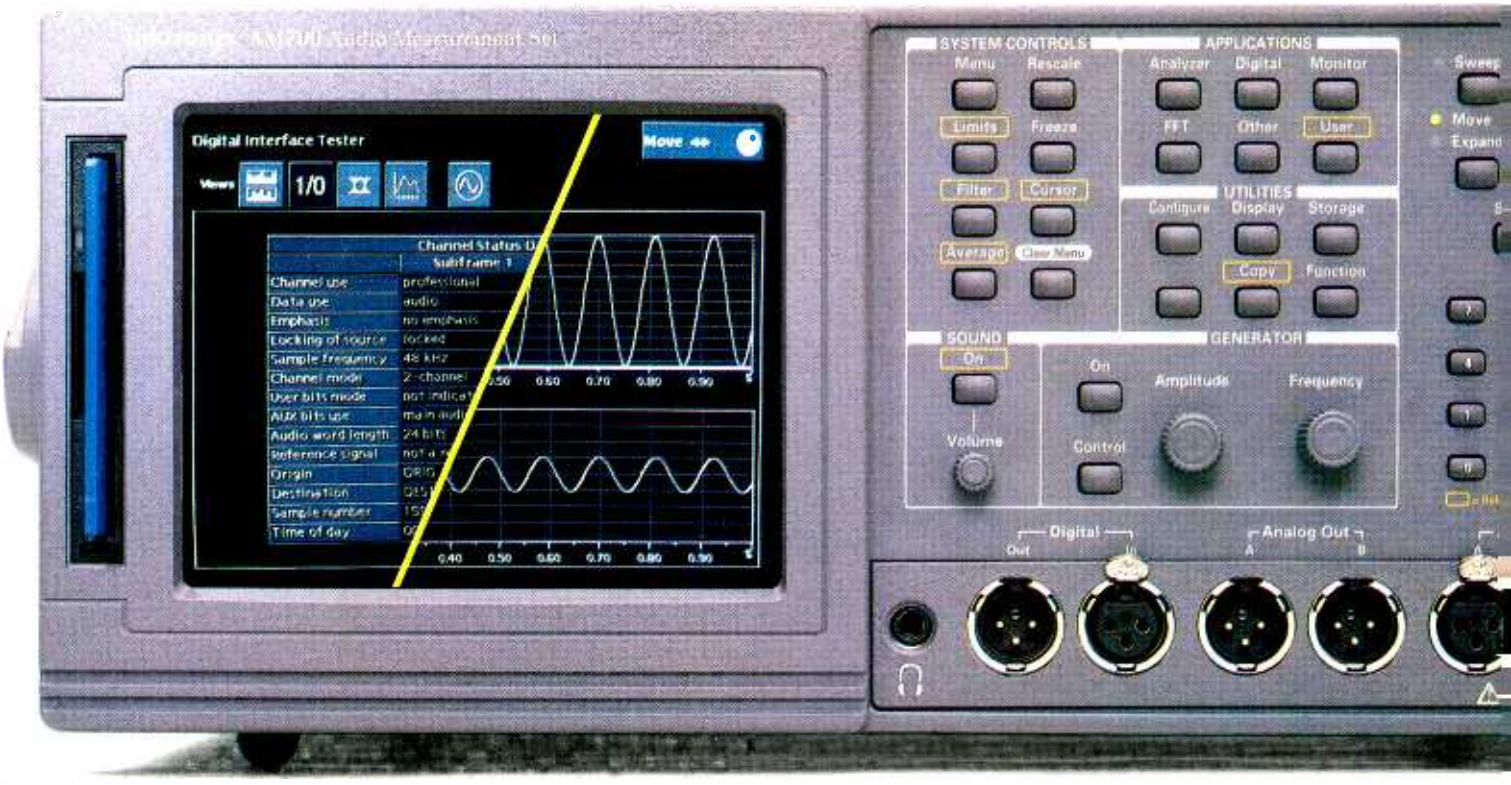

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booked by Yorkshire Television. YTV Dubbing Mixer Steve Haynes simply brings the audio programme on Magneto-Optical disk from Yorkshire TV's own *Logic 2* together with the data on diskette and boots it up. Apparently, even though YTV and Pinewood's *Logics* are of differing configuration, there are no problems in the transfer of material.

Pinewood is also fully behind the Avid proposed Open Media Framework (OMF). The *Logic 2* has the full range of associated software and drives—Exabyte, removable Winchesters and magneto-opticals. This has been high on the list of operational priorities and is integral to the philosophy of increasing production efficiency.

Graham Hartstone: 'OMF interchange works. With the early tests moving between the Avid and the *Logic* we were using Beta software and it nearly worked. We got most of it but not the fades. Software modifications have solved the majority of the problems—now we've got the fades as well. The remaining points will be fixed with the next software release.'

Another method of interchange standardised at Pinewood is the use of the Tascam *DA88* digital 8-track system.

'The *DA88* has come into film and TV in a big way. We use them as a way of transporting digital tracks rather than cabling, particularly for getting from mag to digital. They are also used when we work 16mm format rather than using the 16mm bays. The lack of ability to offset tracks against each other is not a problem with hard-disk editors available.

'We have clients bringing us feature-film sound prepared on workstation and transferred to *DA88* in part and in whole. We move the machines around as needed and they work very well for music, atmospheres and Foleys but they are not so good for dialogues.'

This is explained quite simply; traditionally dubbing mixers EQ and balance dialogues when the audio from the sep mag machines is running forwards and backwards (play speed reverse)—a unique learnt ability. This saves time waiting for the picture on film to rewind. The *DA88* is fast in rewind but it is also mute. Therefore the dubbing mixer cannot make any balance changes while waiting for the film to recue. However running with a digital desk and a picture sourced from hard disk with instant rewind, this is no longer a factor.

Efficiency of operation has also been developed earlier in the production process.

A major project shooting at Pinewood at the moment is Gerry Anderson's new TV series *Space Precinct*. Original dialogue, ADR and Foley are being handled by Pinewood in conjunction with Max Hoskin's The Sound Company, the first independent digital editing facility to set up on the lot. TSC is equipped with *Synclavier* and Avid *AudioVision* systems and has formed a close working arrangement with Pinewood's sound department.

Hoskins was asked by Gerry Anderson to find an efficient method of completing the original and post sync dialogues and decided to go the *AudioVision* route.

'Being more flexible than the shooting schedule, I can fit in with the actors,' explains Max Hoskins. 'I can be busy editing until I get a call the an actor is available to do dialogue lines. I then call the Pinewood ADR stages, pull the removable drive out of the Avid, walk with the actor to the ADR stage where the removable drive is plugged into the Pinewood Avid. The actor is then presented with picture sound and cue voices off the disk. When it's completed, I pull out the drive and go back to edit it. It's a disgustingly efficient way of working.'

Graham Hartstone: 'This a total revolution in the way that sort of work has been done. The Avid disk is also cloned so that Foleys can be prepared in the same way. It seems to work both in theory and in practice. The next step will, of course, be going straight into the *Logic* via the OMF.'

A digital future

Pinewood has also made commitments to digital audio at other stages in the post process. In the larger analogue dubbing theatres it has facilities for mixing to Dolby SR.D, Sony SDDS and DTS digital film-sound formats as well as the ability to create optical negatives for SR-D and DTS. Additionally, their Theatre 7 has the ability to exhibit all three digital formats.

Since the inception of the digital dubbing theatre, it has been busy. Nic LeMessurier is the main mixer in the new room having made the transition quite seamlessly working with the Yorkshire TV crew.

For all the investment, efficiency and new post techniques that the facility brings to TV production, Graham Hartstone sees the real world beyond this. ▶

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Graham Hartstone, Head of Postproduction (left) and Nic LeMessurier, Dubbing Mixer

'What we bring to TV mixing is our undoubted expertise in surround-sound mixing. We've been working with it for 20 years and seem to have ironed out all the wrinkles. At the moment we also need to remember that for TV, the vast majority of viewers haven't got surround and so we have to consider what it is going to sound like in their kitchen. TV production however is just going to go on increasing. There are a lot of hungry boxes out there waiting to be fed. Home surround is here to stay and growing.'

The new room has also been undertaking some preparation work for feature films.

'I'm sure that this new theatre will handle overflow work for temp mixes for features, or premixing, and foreign language versions. Although this room will be handling predominantly TV we don't see it as segregated from our film work.'

What is learnt from this investment will also effect future plans in other areas.

'It will influence my choice re-equipping the film theatres when the time comes. However, much still depends on the extent that there is a willingness to work with a video picture. A lot of film postproduction is going to editing with Avid and Lightworks. It is rather different at the mixing stage.

'In the longer term, we're looking ahead to a digital future that involves TV and commercials with home surround and digital stereo feature films from rushes transfer to final release. This is really just a first step.' ■

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PostProduction department direct lines.
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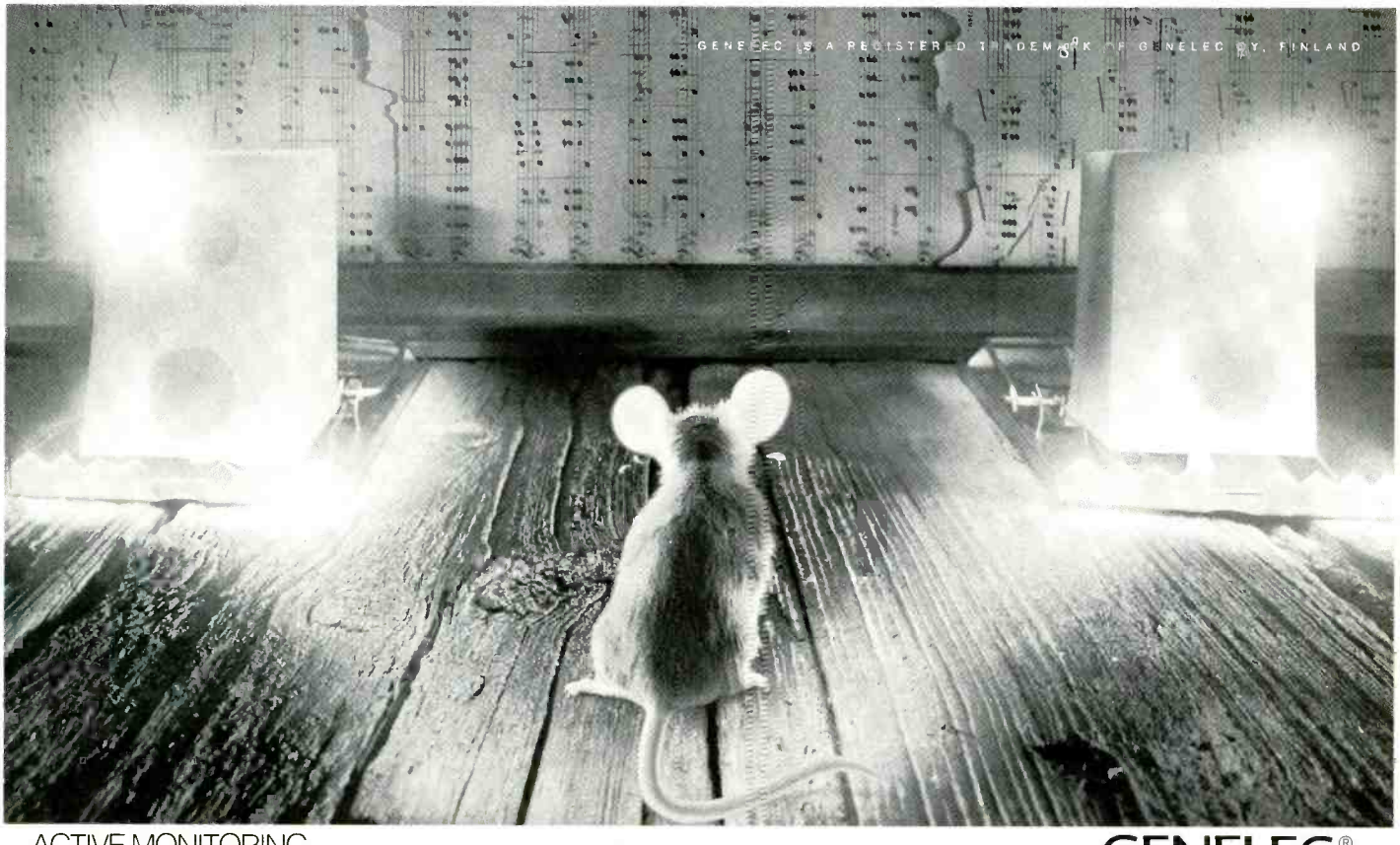

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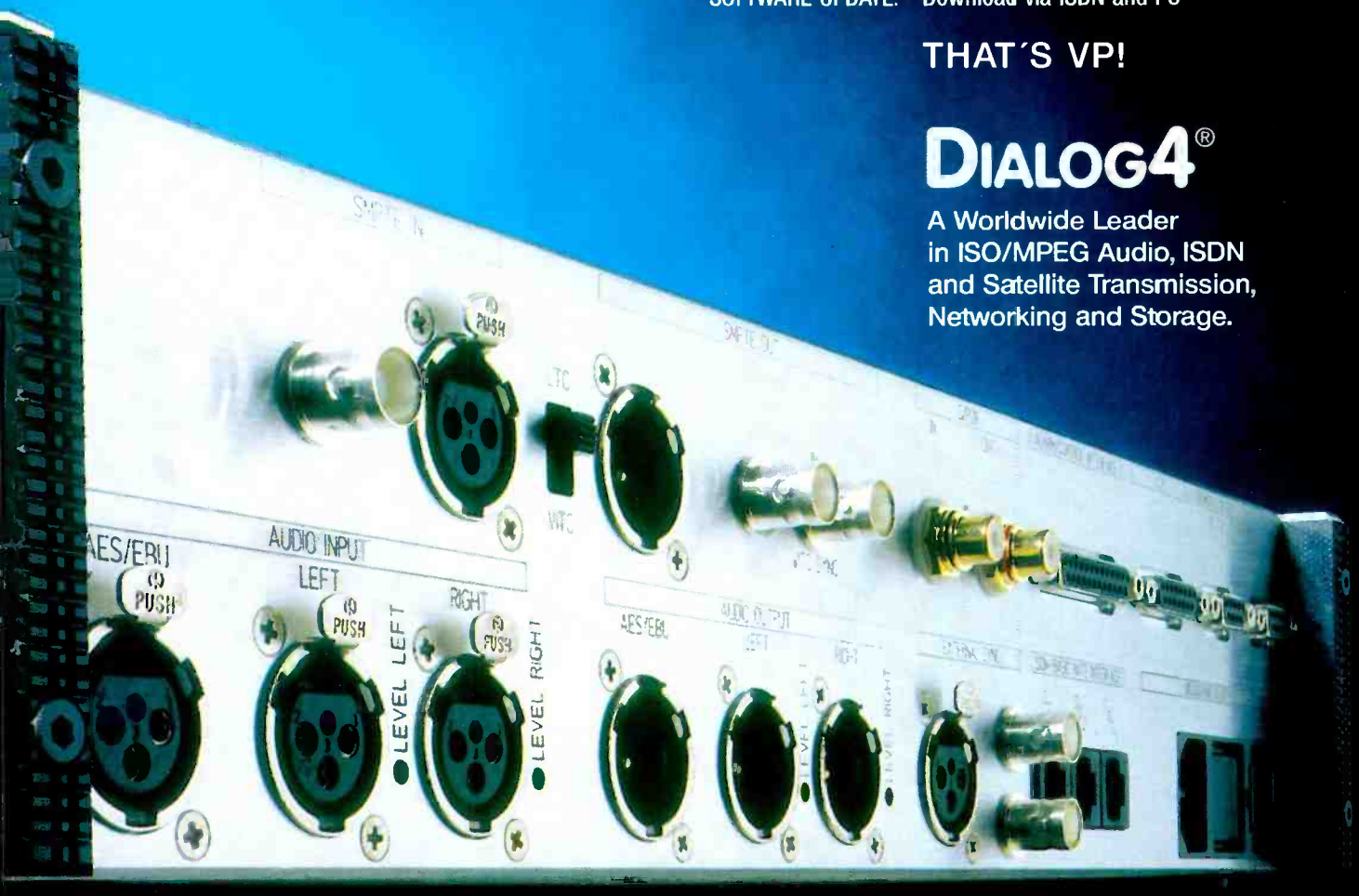

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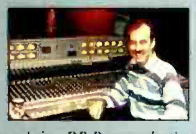

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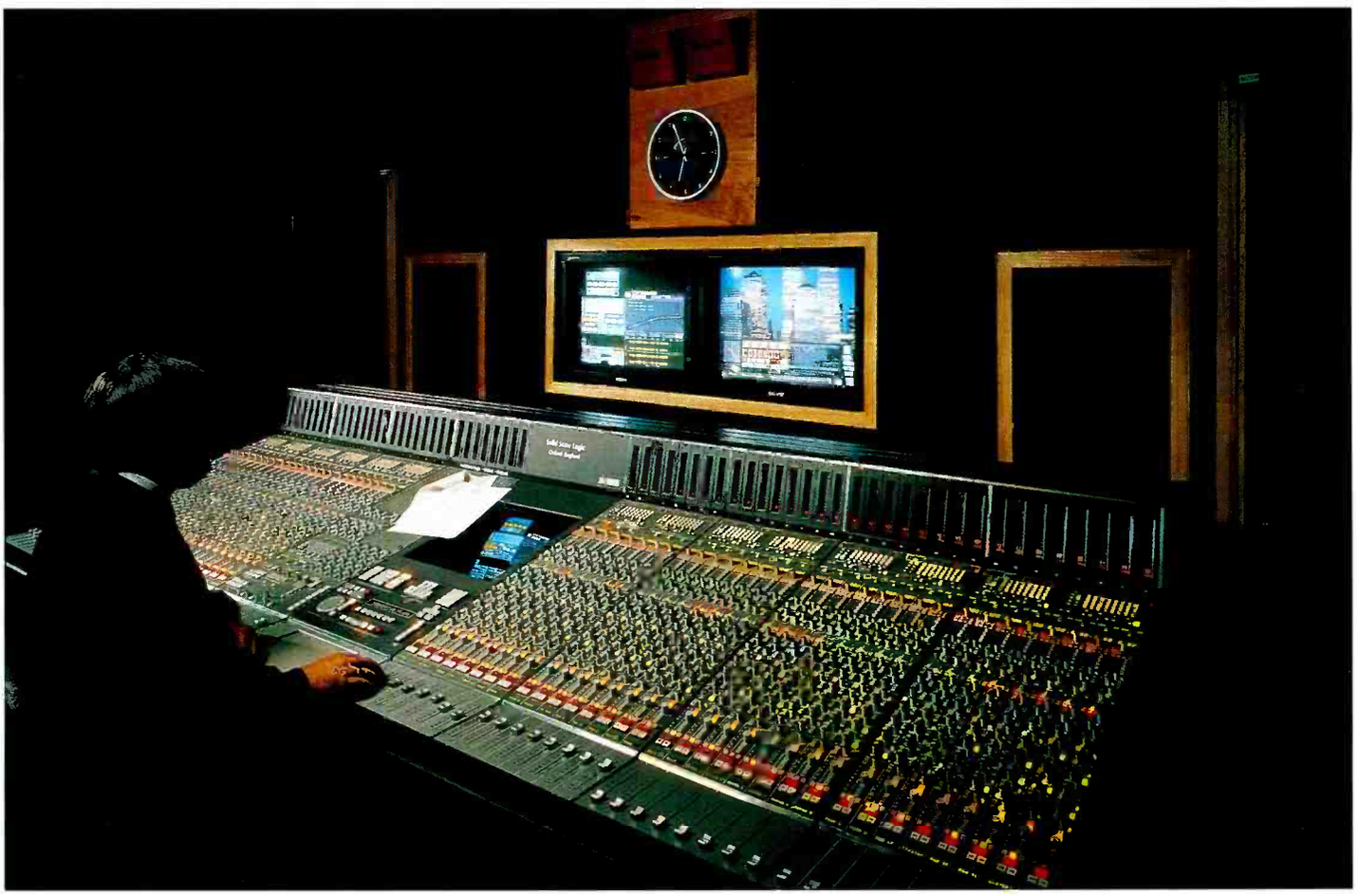

Although the *Axiom* is SSL's first digital console, it by no means represents the company's entry into the digital arena. With products such as *ScreenSound*, *Scenaria* and *Omnimix* having already paved the digital way, *Axiom* has been able to take full advantage of proprietary technology that has successfully proved itself over the last few years. Those with longer memories will also recall SSL's first foray into digital, the small *01* desk, that made a brief appearance nearly ten years ago.

Of course, the great advantage of all this is that a large percentage of the ground work has already been done, which has not only allowed SSL's 'first' digital desk to be put together relatively quickly, but has also helped avoid many of the teething problems, mainly software based, that can dog new, large-scale digital systems. Another significant advantage is that the *Axiom* becomes part of a mature family of compatible digital products.

As with other SSL equipment, the concept of integration has been a fundamental issue, and like the *SL 9000j* analogue console, the *Axiom* has been designed to operate closely with SSL's *DiskTrack* hard-disk recording-editing system. However, unlike the new analogue desk, *DiskTrack* is fitted as a standard feature and apart from offering a built-in tapeless production environment (minimum of 20 minutes continuous random-access recording for every channel on the desk), it also acts as an important piece of system infrastructure supporting input-output organisation.

Component parts

Like other digital desks, the console itself acts purely as a control surface and does not pass any audio. All audio processing takes place in the processor rack that connects to the console via a single umbilical up to 45 feet long. Also housed in the processor rack is *DiskTrack* which connects directly to the processor via a 'Highway Link'. This Highway Link provides 95 channels of audio both to and from the processor, and is made up of a trio of cables—a send co-axial and a return co-axial for the audio plus an ethernet for control.

DiskTrack itself supports a number ▶

Completing his exclusive review of SSL's latest developments, Patrick Stapley takes a tour of the digital *Axiom* console

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***Axiom* centre section showing display**

of things: firstly, there are Remote Input Output (RIO) units which are either analogue or digital. Each analogue RIO has 48 I-Os while each digital RIO has 96 AES-EBU I-Os. Secondly, there are mic-amp units each with 12 inputs. These contain the preamplifier circuitry, A-D convertors and the necessary multiplexing to put the converted data onto a Highway Link. The Highway Link in this case is also responsible for passing control data from the console to set mic gains, impedance switching, pads and so on before conversion. The idea here is that the mic box can be placed as near to the source as possible to provide optimum signals prior to conversion. Up to six mic boxes may be combined onto a single Highway Link providing 72 mic inputs, and the mic boxes themselves can be sited over 185m away from the desk.

DiskTrack operates with up to 24 Highway Links making a colossal total of 2,280 sources and outputs which can be managed and organised without the need for extensive cabling. Another feature of the system is the shared aspect, and *DiskTrack* can link to other studio consoles sharing sources and routeing. This is particularly relevant in a broadcast environment for easy patch-free linking of studios. It also allows sources to be easily paralleled between studios without complicated patching.

While on the subject of I-Os, it is interesting to note that when SSL refer to their proprietary convertors, they avoid talking in bits. Instead they specify audio performance in terms of noise figures, dynamic range, linearity and so on—the 'B' word simply does not get mentioned. As SSL Marketing Director Colin Pringle points out, there is something of a blind spot when people discuss bits: 'The most important aspect is how conversion processes are optimised,' says Pringle. 'There is often little correlation in what a manufacturer may quote in terms of bits and actual performance. We spent some time measuring the performance of other manufacturers' products, and discovered a wide discrepancy in quoted bits against performance, with many so-called 18-bit systems performing less well than competent 16-bit systems. We feel it's time that manufacturers start talking in dBs again rather than bits.' The A–D convertors in the *Axiom* mic amps are rated at +104dB (CCIR weighted) after quantisation.

The Channel

The *Axiom* is arranged in 8-channel bays, and the maximum configuration is 12 bays providing 96 channels. Bays may be specified as mono or stereo to suit user preference.

One of the control aspects that makes the *Axiom* different from other digital desks, is that the majority of channel controls and indicators are dedicated to a particular function and are not multiple function or assignable. This, of course, makes for a more familiar, consistent method of working, it also avoids control parameters from becoming buried and lost under assignable layers.

In terms of operation, controls are organised in a 'parallel' sense so that simultaneous parameter changes can be made without restriction.

The arrangement of the channel strip, has an almost analogue look about it with local, dedicated controls for Source Selection, Remote Mic Gain, Pad, Impedance, Channel Gains, Equalisation, Dynamics, Delay, Reverb-Effects, Auxiliary sends, Surround Panning, Stereo AFL-PFL, Cut, Solo, Program Routeing, Integral recorder Controls, and Motorised Fader.

Channel source

Spread across the top section of each 8-channel bay are two banks of identical switches which are used to access channel sources. Any channel can select any source in the system (that is any I-O from the *Axiom* processor and *DiskTrack*) and each source can appear on as many channels as required without any degradation. The source-selector panels are assigned to a particular channel by selecting that channels SET key, this will then allow selection to made from any of the source panels on the console, but usually this will be the nearest to the channel. Selection is made by choosing the type of source (that is ADC, digital input, *DiskTrack*, etc) and its relevant number from the 32-key matrix (note that if the number required is larger than ▶

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32, the keys can be shifted to higher numbers using the A, B, C, and D buttons—for example by selecting D, the keys transform from 1–32 to 12–160.

The selected source and number will be permanently displayed in an ID window directly above the channels SET button, this again being very much in keeping with the philosophy that the user should be able to see everything at all times. The sourcing system also includes some useful shortcuts, such as the ability to incrementally set sources between two chosen channel positions—so, for example, if I want to set 24 returns from *DiskTrack* to 24 consecutive channels, I can do so by pressing just four buttons.

Each channel also has an Alternate Input which can be simply flipped by pressing the ALT key. Additionally, there is a third channel-input source, the Record Source which is the signal that will be recorded direct to *DiskTrack* without passing through the console—see next section.

Routeing

At the bottom of the channel strip below the pan control is a bar-graph channel-input meter and a number of buttons that have a dual function depending on whether they are assigned to control mic amps or *DiskTrack*.

With the INPUT key selected, control is enabled for a remote mic amp, providing this has already been selected as the channel-input source. If this is the case, the rotary control next to the input meter will act as the gain control for the remote amplifier and a gain value will appear in the electronic scribble strip at the base of the channel. In addition, three keys below the gain control will provide Phantom Power, High-Low Impedance, and 20dB Pad switching. Once adjusted all these settings remain attached to the mic source, so, for example, if the mic is assigned to a different input or picked up by another *Axiom* console, the settings will automatically be defaulted to.

If the DISK key is selected rather than the INPUT key, a new set of functions come into play. Firstly the rotary control, instead of acting as a mic gain, is used to scroll through the available takes on the sourced *DiskTrack* track (*DiskTrack* allows takes to be overlaid onto a single track). The selected take will then become the playback take.

The PHANTOM POWER switch doubles up as the *DISKTRACK* SOURCE button, and when this is selected the channel source selector keys light up inviting a record source to be selected direct to *DiskTrack*. The channel then effectively acts as a monitor —any processing applied at this stage is not recorded to *DiskTrack* but will be duplicated when the signal is played back through the same channel. The *DiskTrack* track that is selected as the playback source is also the track that will be recorded to—thus if Channel 1 has been assigned to source *DiskTrack* track 1, it will also record to track 1.

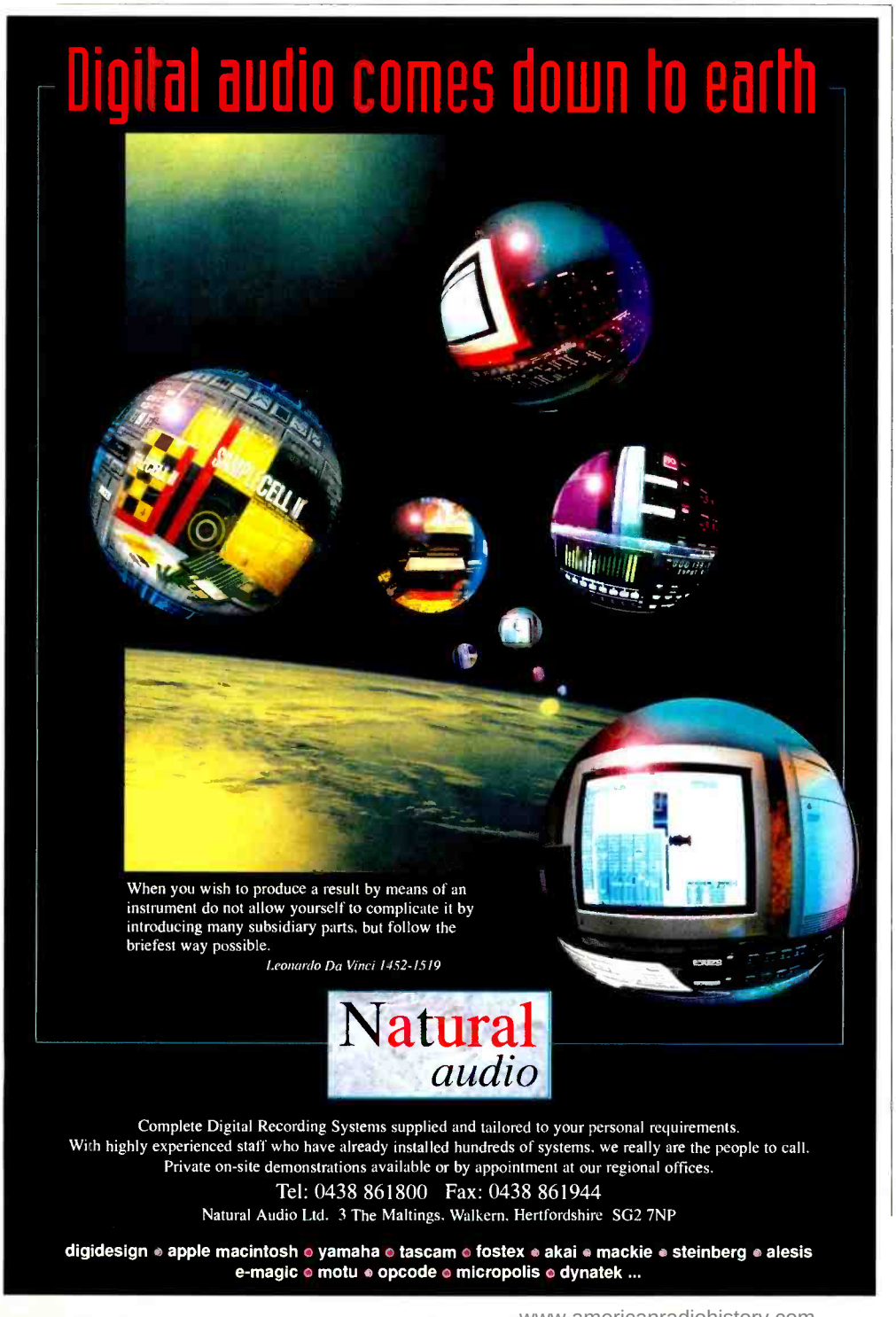
Realising, of course, that users will also want to use other multitrack recorders, SSL have paralleled *DiskTrack* sends so that they can feed an external machine—that is *DiskTrack* Send 1 will be duplicated to digital Output 1 and so on. If processing needs to be recorded to a track, this can be achieved by routeing the signal via a Small Universal Bus (see later).

Channel signal processing

There are three signal-processing sections in the channel strip—equalisation, dynamics and effects processing—and each of these sections is function dedicated. In conjunction with these, the console's central colour screen also plays a significant part in displaying graphical, numerical and textual information.

The equaliser is a 4-band design with each band covering the full frequency range (5Hz to 18.2kHz). The characteristic for each band may be selected from nine contour types and these include various parametric shapes, shelving, notch, and pass filters. Each band has two continuous rotary encoders and two keys associated with it. The top rotary control will always control frequency selection, while the bottom control can be switched between Gain (default) and Q using the G/Q switch. The other switch, TYP, selects the EQ characteristic for the band.

There are also a series of keys within the EQ section that are used for more general purposes ▶



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SS001

these include EQ IN-OUT, EQ COPY allowing settings to be copied between channels, EQ LOAD allowing settings to be stored in a 32-memory EQ Library for future use, and INPUT PHASE REVERSE.

The screen display shows all control values, as well as plotting a graph of the EQ curve itself. In addition, four boxes along the top of the graphical display show the EQ type selected for each band. The display automatically switches to the channel being worked on.

The dynamics section offers limiting, compression, expansion and gating in three adjustable level-range bands—low, mid and high. The low band is reserved for gating only, while the middle and high bands can be used for compression, limiting or expansion. All three of these bands may be active at the same time on a single channel, and as with EQ, parameter values and a graphic illustration of combined processing can be viewed on the screen. Depending on the minimum and maximum operating thresholds set for these bands and the type of processing selected, the dynamics can perform in a variety of ways, and quite differently to conventional analogue devices producing some very unusual dynamic effects such as high-level expansion.

Dynamic settings are controlled one band at a time using two rotary controls which are assigned between Attack-Decay and Threshold-Ratio respectively. As well as the central display each dynamics section also includes two bar graphs showing gain change and input level.

The processing features automatic gain make-up so that when the characteristic of the dynamic is altered, the user hears a quality change rather than a gross level change. Also included is a side chain Reassign facility that allows a channel's dynamics to be controlled from another channel simply by pressing the SCH buttons on respective channels. A side chain advance (up to 20ms) can be set to provide feed-forward limiting and gating facilities, and the side chain can be pre or post EQ. Dynamics may be copied between channels as well as to a 32-memory Dynamics Library.

Effects processing in the *Axiom* is also a channel controlled facility and up to 48 time-based effects processors are available—24 having both reverb and delay processing, and 24 having just delay processing. This is the only example of function rationing in the console, otherwise all facilities can be used all of the time on every channel without restriction. Unlike EQ and dynamics, effects processing must be assigned to a channel before the controls become active.

Once assigned, the effects processor becomes integral to the channel—there is no on-off switch, and signal will continually pass through the processor with the user controlling the wet-dry mix. There are eight parameters—Early Reflection Delay, Filter Frequency, Room Size, Reverb Time, Dry Signal Level, Delayed Signal Level, Reverb Level, and Delay Feedback Level —that can be directly selected from dedicated keys and controlled from a single rotary encoder with parameter values being displayed locally.

Alternatively control can be made from the central screen using the pen and tablet, and this opens up a wider range of parameter adjustment. The screen also provides a detailed diagrammatic display of the processing showing the various components involved and the signal flow between them.

Used as a straightforward delay, each processor can provide up to 1.3 seconds of delay to sub-sample accuracy, with three levels of control resolution. This degree of accuracy makes the system ideal for pulling phase-incoherent signals back into sync, and for producing perfectly coincident mic sources.

The whole subject of delay is one that SSL have addressed very carefully in the *Axiom*, and considerable effort has gone into minimising the effects of overall system delay. By keeping all the processing in all of the channels all of the time, a constant delay is maintained through the console. Also by virtue of proprietary designed DSP, processing delay has been kept to a bare minimum at just seven samples. This, of course, is extremely important in maintaining accurate phase relationships, and to avoid any signal lag during overdubbing.

Effects settings can be chosen from a set of 32 SSL created presets, or as with EQ and dynamics, from a user store of 32 presets. SSL Preset 1 acts as a Bypass function by setting delay and reverb levels to zero, providing a fast and convenient way of removing effects processing from the channel.

Auxiliaries

The console has eight auxiliary sends that have been arranged into control pairs—thus their are four rotary controls with individual toggle switches that assign control between pairs of sends. Additionally, each pair can be configured as a stereo send by a prolonged press of the assignment key—once configured the key will determine the action of the rotary control by switching between Level and Pan. Pre-post switching is available on an individual basis.

A unique feature of the auxiliaries is the way they have been bused. Rather than having 8 console-wide buses in the traditional sense, the *Axiom* partitions each of the aux buses at the boundary of every 8-channel bay. What this means is that a discrete auxiliary submix can be accessed for each bay thus providing 96 individually accessible sends from a 96-channel desk. However, it should be remembered that because the console sums each baymix to produce overall auxiliary buses, that aux levels for individual bays will also apply to the console-wide buses. To be of real benefit, the facility has to be used quite carefully and with a degree of preplanning.

Pans and mixes

The main mix bus on the console is set up for Left, Centre, Right, Left Surround, Right Surround and Subwoofer, with simultaneous stereo and mono buses being derived from it.

Every channel includes a rotary pan control that normally acts as a left, centre, right panner. However, by accessing the local P/FR key, the control is switched to perform as a front, back ▶

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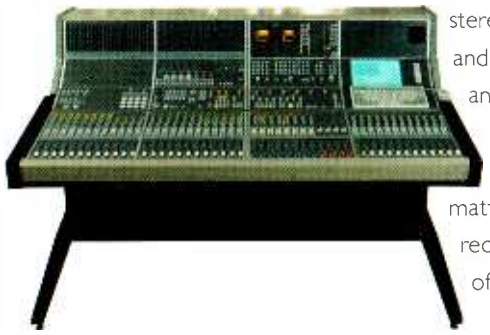

The system can store up to 99 settings, and any setting, no matter how complex, can be recalled instantly at the touch of a button.

The system architecture is extremely versatile, making the desk ideal for busy broadcast centres.

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Add in 16 auxiliaries, 48-track optional recording outputs and multi-track in-line replay and you have a formidably powerful piece of studio equipment.

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pan. At the moment no provision has been made for a joystick facility, but bearing in mind SSL's part in popularising this facility, it would be surprising not to find it included at some point in the future.

The main mix bus can be thought of in conventional terms as a single bus running the length of the console. However, the *Axiom* has the ability to subdivide it into up to four parts for creating stems and so on. This is achieved on a bay basis, so, for example, in a film mixing situation the desk can very easily be divided up into separate groups of bays for Music, Effects, Dialogue and Atmosphere using the bays as the boundary points.

Universal buses

The *Axiom* has 64 Small Universal Buses (SUBs) which are used to route signals within the console and to the outside world. Each SUB has two inputs with variable gain and phase inversion on one leg, and a single output also with gain and phase controls.

The inputs can be sourced from any input source or internal mix and assigned to any digital or analogue-console output, or used to feed other SUBs or channels. They may be used for many different applications, but a primary function is to output internal mixes from the desk for bouncing down tracks, creating auxiliary masters, mix minus feeds, communications feeds and so on.

The SUB controls are organised in the centre of the console each with a rotary control and two keys—a PHASE key and a SELECT key that toggles control between the input and output paths. To the left of the SUB controls is a source-selector panel from which input and destination sources may be assigned. This section also includes eight memory keys enabling routeing configurations to be stored and recalled. The SUBs facility works closely with the centre screen where the currently selected SUB will be displayed along with a signal flow diagram.

Centre section

The console's centre section is 16 channels wide and divided into various control areas which also includes the screen and pen and tablet, plus group and main faders.

Monitoring and meter selection is preconfigured within the system (although it can be modified later). All monitor and central metering (8 meters) source selection is independently selected, and main mix outputs include multichannel dynamics with feedforward sensing.

The master control area of the console looks very similar to the *j Series*. However, this is slightly deceptive and although there are common functions, there are also many unrelated ones. The section is arranged into several groups of keys offering functions for mix control, machine control, master menu selection, macros and various utilities. Also included is a prominent time-code display and a jog wheel.

Some notable utilities in this section are: the Record Groups function that lets the user store up to 66 snapshots of channel RECORD key configurations (for broadcast consoles these become PROGRAM keys); Solo Isolate which allows the solo bus to be split into two user-defined sections, so that channels used for effects returns can be positioned at one end of the desk and isolated from SIP muting; Snap which takes a picture of all the consoles settings and stores it in one of 66 memories—recalled snapshots can be Undone returning the console to its previous state, and channels may be individually isolated from snapshot reset; Post Meter switches channel meters from reading the input to the post-fader signal; and Override Channel switches the screen display to show detailed information on the currently accessed channel.

The Events system is substantially more powerful than on SSL's previous consoles. It allows time-code events and real-time events to be run side by side, so, for example, event triggers can be programmed into mixes, and time of day triggers, such as top of the hour station IDs, can be permanently set up. Events control any function accessible to a macro command such as snapshots, routeing patches, gain changes and so on. This also includes *DiskTrack* Freeplay mode which allows pieces of audio to be fired instantly rather like a giant sampler. Events lists can be stored on user disks and even edited on a PC.

Machine control is the same as the *j Series* console with four built-in serial control lines and parallel control via synchronisers. Also identical is ▶

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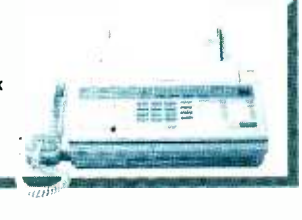

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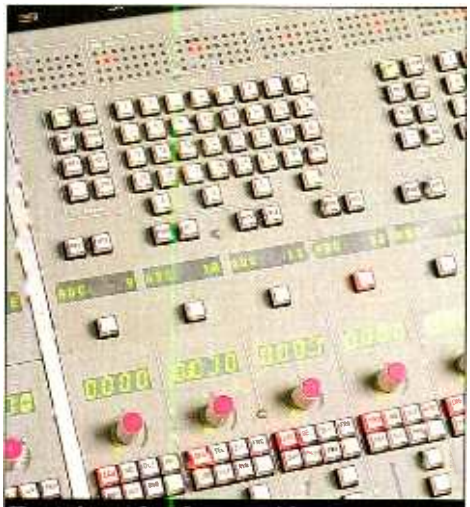

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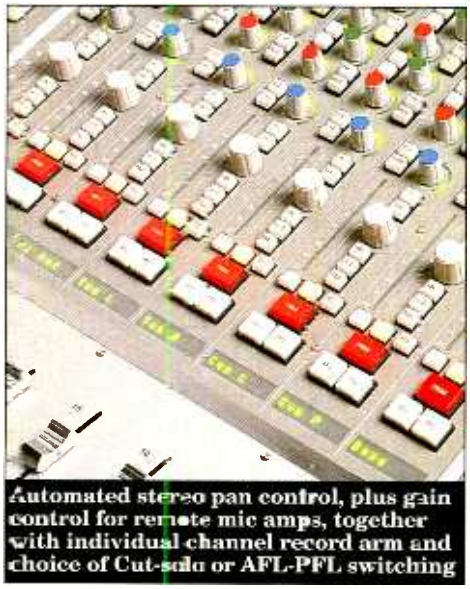

Automated stereo pan control, plus gain control for remote mic amps, together with individual channel record arm and choice of Cut-solo or AFL-PFL switching

the control of *DiskTrack* nonlinear editing functions from the screen, and these are very similar to the facilities found in *Scenaria* and *Omnimix*.

Automation

The automation in the *Axiom* is quite different from *E* and *G Series* consoles, having also evolved from systems used in *Scenaria* and *Omnimix*—it is in the process of coming closer together with *j Series* automation, and *j Series* fader data can currently be imported into the *Axiom*.

Compared to other SSL systems, the *Axiom* contains a much larger number of automated elements; to handle this, the system subdivides channel controls into various control sets—faders and pans, equalisers, dynamics, auxiliaries/Baymix sends, and effects—which can each be independently controlled by different automation modes. These modes include Protect (prevents new moves overwriting previous data), Static (writes current settings values to the entire mix—useful for setting up block data at the start of a mix), Overwrite (moves are recorded as the fader is touched or a control moved—on release settings remain set to the end of the mix), Snap with Overwrite (as Overwrite but previous data will be resumed once control is released), Rollback (As Overwrite but following a rollback, playback of any previous data will resume), Clip Fill (a defined block of audio will assume static control settings that match release settings), Clip End (similar to Clip Fill except that dynamics movements are recorded up to release point after which they remain static to end of the audio block). Additionally faders may be set between Absolute and Trim, and to Autoglide (automatic return to null point on release of fader). Protect mode can also be set locally where it isolates the entire channel.

Automation is enabled either by pressing the AUTO key in the centre section of the console or by stabbing the pen on the ENABLE button in the Automation menu. A mix is then generated as soon as 'forward movement' is detected and a control value is changed. When the system is stopped, the user has three choices: firstly, to keep the data by using a rollback command, secondly, to lose the information by flipping the AUTO key on-off, and thirdly, to continue writing data by simply returning to play.

Once a mix pass has been kept it appears in the Mix Pass List. This contains space for six mixes and as each new mix is added it appears at the top of a list—the others all shifting down one until they eventually drop off the end. This basically offers the user six levels of undo and should be viewed as a temporary store. If mixes need to be saved more permanently they are saved to the Project file which contains a wide range of data including I-O routeing, disk assignment, audio files, snapshots, macros and so on.

The system also includes an Overview display which gives a graphical representation of fader and control moves through the mix in relation to scrolling audio Clips on each channel. The user can choose which elements the display shows, and can edit parameters directly from the display. This includes changing switch data, drawing new levels curves, copying automation data from one position to another and so on. The display also provides direct access to location cue points.

Mixes from disk can be performed at any speed, even down to frame jog using the built-in jog wheel—this feature can be particularly useful when working to picture to accurately match audio events to visual action.

External control

An option for the *Axiom* is a small remote mixer that connects via ethernet providing an 8-channel submixer. This can be used by producers, assistant engineers, musicians and so on. Each channel fader may be assigned to any desk fader, and keys can access macro functions. Also available is the KeyPad remote box which provides macro keys plus a time-code display, and up to three units can be connected to the console at one time. A patchbay is also available for the system allowing both analogue and digital interconnection.

Projects in the *Axiom* can be fully backed up at 5 times real time to Exabyte, and this can be performed as a background function. Real-time backup-restore of audio to and from an external digital multitrack is also a simple operation via digital I-Os or MADI.

Conclusion

To those familiar with both SSL's analogue and digital product range, the *Axiom* will appear as something of a hybrid. On the one hand, dedicated controls and the avoidance of control layering make it operationally much closer to an analogue desk; on the other hand new approaches to console architecture and signal flow make it very different to SSL's previous analogue designs. This is certainly not a digital console in analogue clothing, its a radical new concept that will require a major shift in operational thinking by analogue users.

Many functions and facilities that have appeared in SSL digital products, such as *Scenaria* and *Omnimix*, have found their way into the *Axiom*, adding established, proven features to a brand new product. The inclusion of *DiskTrack* as a standard facility, further develops SSL's philosophy of integration, not only by offering a comprehensive tapeless recording-editing environment, but also by allowing resources to be shared between networked studios.

The *Axiom* is a multifunctional console, that can be configured for just about any application—here again the digital solution and some innovative thinking on SSL's part, has made this a reality. That said, the early indications are that broadcasters are currently showing most interest in the desk, and this has been illustrated by the BBC's announcement that they are to be SSL's first customer for the *Axiom*. It will be interesting to see if this trend continues, or whether the *Axiom* can do what other top-end digital consoles have failed to do, and spread itself evenly across all sectors of the industry. ■

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FOH desk. I was almost riding the fader between each word."

"We found a good Sennheiser and a Beyer," adds Kob, "but it was the Shure Beta 87 that cured everything. Fortunately, Elton's mic technique is brilliant and he stays right on the mic. As soon as he pulls back, the rejection is great, and we're now getting a good 20dB headroom with the separation."

This would seem the perfect case for in-ear monitoring, but it's a concept yet to be sold to

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THE ZERO OPTION

Philip Newell explains and argues the case for a studio design strategy which, while over ten years old, is still regarded as controversial

In spite of its conflict with other papers presented at the last Reproduced Sound 10 conference of the Institute of Acoustics , my own paper was well received. The main point of conflict was my advocation of the use of control rooms which fell way outside the limits of many accepted international specifications for control-room acoustics, but growing experience has shown that such low RT designs are producing musical results which are highly compatible with the end results which are hoped for from conventionally specified rooms. Their advantage is that they seem to allow their users to obtain these results with far greater ease and consistency.

Apart from the 'standard' RT of control rooms relating to the outside, domestic world, there are, of course, the two other reasons; control room to control room compatibility (which is particularly necessary in the broadcast industry) and the comfort of the users, but the intractability of the compatibility problem prevails. This situation is not helped by the fact that specifications for control room design, such as that of the EBU, are so loose as to be all but worthless. The fact that the political problems incurred in trying to settle on a specification to which all 28 countries of the Union can agree, is something about which only 'men in suits' could gain any satisfaction; to the 'real world' of musicians, engineers and acousticians, such standards are little more than dams across the river of progress.

Within the tolerances of such specifications, rooms can be built which are so subjectively dissimilar, that they do almost nothing to address the discrepancies between mixes done in different rooms. Furthermore, even if rooms are built to an acceptably tight standard, they still offer little overall chance of achieving any significant level of compatibility as long as the choice of the position of the monitors remains an entirely arbitrary aspect of any design. Inevitably, if a loudspeaker is moved to different positions in any room other than an anechoic chamber, then the cumulative response of the direct and reflected sounds will be different for each position. At least if one mounts the loudspeakers flush in a wall, there is little risk that persons will unwittingly move them from their preferred location, and hence, perhaps, move the performance of the room-loudspeaker combination out of its desired range.

Nonenvironment

The principle behind 'nonenvironment' rooms is that the variables which do exist are operating on performance figures which are themselves very small. A 50% variation on the number 10 is far larger in absolute terms than the same variation factor on the number 1. In a similar way, room-to-room subjective inconsistency will be greatly reduced if the characteristics of the rooms themselves (reflections and reverberations) are reduced to very small quantities. This concept moves many such rooms outside the more accepted standard parameters for room design, but experience has shown that working in this way has not produced mixes which then sound 'wrong' when played in more conventional rooms, beyond any subjective or objective 'wrongness' inherent in the loudspeakers and-or the room in which they are being auditioned. Surely, this should be the case, rather than the hit-or-miss situation which often exists, where a mix done in a room which is 'somewhere within' the accepted specifications can sound either similar, better, or worse than the room within which it is reviewed.

Much of this is enshrined in the philosophy of 'near field' monitors, where a limited number of loudspeaker types are widely used at close ranges. By this means the characteristic sounds of a clutch of loudspeakers could become well known to a great number of recordists. It follows that if these are auditioned inside the distance at which the direct sound sinks below the reflected sound, then—even if the loudspeakers are not particularly well liked—room-to-room transfers of work can be judged with minimal variation. Unfortunately, such monitors frequently lack good transient accuracy, rarely have the transparency available from better units, almost universally fail to be able to monitor the full frequency range of the recordings, and usually lack the dynamic range to be able to properly reveal low-level details in the presence of peak level sounds. Nonetheless, there is little in the concept of the near-field approach which in any way conflicts with the philosophy of the non-environmentalists. What the nonenvironment approach does offer though is the possibility of enjoying the positive aspects of the near-field approach, without its restrictions and limitations.

The terms 'control' and 'monitoring' imply some degree of reference standard by which objective judgements can be made. Unfortunately there are some aspects of control rooms which the real ▶

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world can never hope to standardise; for example, control room shape and size is dictated in many instances by a great number of factors, so to try to derive a standardisation of size and shape would be totally impossible. As discussed previously, different rooms of conventional design will have differently perceived acoustic characteristics, and hence monitoring can never be considered to conform to any reference standard unless the monitoring acoustic can be reduced to almost zero.

The nonenvironment approach advocated here is the only one currently on offer which addresses the above problems and present rooms which are comfortable for people to work in for hour after hour, day after day. Until this option became available, acousticians had not been getting anywhere close to what the industry needed in terms of achieving these compatibility levels. The whole near-field concept was born out of the recording staff taking the problem into their own hands, and dealing with it in the only way that they knew how. Given the fact that they chose to suffer the limitations and privations of such monitoring techniques, rather than work with endless room to room 'correction factors' was a strong statement of their dissatisfaction with the general state of monitoring.

It was the seemingly intractable nature of the compatibility problems which prompted Tom Hidley's early retirement at the end of the 1970s. Until this time, it was widely held that the third-octave pressure amplitude response in the room was the strongest governing factor in the assessment of a room's 'rightness'. It made little concession to phase response, and hence transient response. That whole 'room voicing' concept by means of graphic equalisers is now thoroughly discredited and passe, but Tom Hidley, among many others, learnt that one the hard way.

It was a chance set of circumstances in early 1980 which drew him towards the nonenvironment concept. A previous client of his called him, just after his retirement and asked if he could make some changes to an older room. One current catchphrase at that time was that rooms were 'over trapped'.

Nobody seemed able to clearly define exactly what they meant, but it was a feeling that has gained some widespread acceptance. After making some modifications to the rooms, one of its subsequent users was Stevie Wonder, who it was noticed kept pointing when referring to the loudspeakers, but to a point which was not consistent with their location. Realising that something was amiss, Hidley opted to increase the room's absorption, even though this was contrary to the suggestion that they were already 'over trapped'. The move was greeted with general approval, and Hidley returned to retirement with a lot to think about.

Some years later, he was talked into visiting a company in Japan who wanted two studios of similar style to some of his earlier, well-liked rooms in Tokyo. Hidley was a reluctant participant in all of this, the compatibility impasse had still not been resolved, but he eventually hammered out an agreement such that he could design one studio as the client wanted, and the other to his own current but untested thinking, with the additional rider that whichever of the two finished rooms was least liked by the musicians and engineers, would be demolished and rebuilt according to the designs of the preferred room. The 'winning' room was that of his first nonenvironment design, but it was radical and different.

Trapping

Hidley came out of retirement to produce more rooms, encouraged by what he had heard in the room in Japan, but the rooms were monstrous by the standards of the day, as the low-frequency aspects of the absorption techniques were very space consuming. In the meantime, I had been trying to achieve consistency by pointing directional monitors at an absorbent back wall, but the problems still remained of what to do about the room-to-room variation at low frequencies between rooms of different shapes and sizes.

In 1987 I had come across the work of Drs Elliot and Nelson at the ISVR (Institute of Sound and Vibration Research), and their work on active absorbers. Much work would still need to be done on these systems, but the potential seemed to be there for effective low-frequency RT control in small rooms. I was already funding some involved acoustic research at the ISVR, and was not in a position to take on another open-ended programme. Subsequently I discussed the matter with Hidley —we enjoyed a useful exchange of ideas, the upshot of which was that he had established compatibility, but needed more information about infrasonic absorption for the South African BOP TV projects. What immediately became apparent to me was that if these things would scale, then a more efficient system of infrasonic absorption would lend itself to building much smaller rooms within a more conventional frequency range.

I was receptive to Hidley's ideas because they immediately took me back to a control room of super-dead acoustics which I had built in 1970 in London, but which was soon rebuilt, not because of the monitoring (which was well liked) but because people simply hated working in there for long periods. The introduction of a hard front wall and floor would have reached the nonenvironment concept 15 years earlier, and I was furious with myself for not realising at the time that such a simple change could have rendered the room successful.

Hidley came over to the ISVR, and after many long discussions with the academics, we agreed to cosponsor the MSc of Luis Soares, a Brazilian, who would use a one-tenth scale model to investigate the interaction of complex absorption systems. In January 1991, with the research still in progress, I began work on a full-sized 'model' which was described in the November 1991 issue of *Studio Sound*. The 'model' still exists as The Lab in the Liverpool Music House. The rooms were still large though, so although we felt that we had the compatibility problem beaten in principle, that was no help to the vast majority of much smaller rooms, where the space for these designs could never be afforded.

The breakthrough came with the use of diaphragmatic walls, which in combination with resonant cavities and wave guides, reduced their depth to around 300mm for most practical purposes in small rooms. Thanks to about ten trusting clients, I was able to construct around ten control rooms using such philosophies and techniques, about six of which were in or around Lisbon, which with its relatively small music industry, ensured that there would be a healthy interchange of recording personnel.

This was an acid test, as the control rooms ranged from 45m² down to 10m². The first obstacle faced was that the rooms did not sound like their previously accepted 'professional' rooms, but eventually, people began to realise that the mixes were translating well to the world at large. The usual problem of taking something home to listen, then remixing was becoming a thing of the past. Three years later, people were moving between the control rooms with absolute confidence and no compatibility problems. All in all, there are now about 50 rooms scattered around the world which are built using these concepts. It was the success of the compatibility of these rooms, both between themselves and with the outside world, not only in conventional home systems, but also on headphones and in cars, which prompted the writing of the IOA paper.

We (Tom Hidley, Dr Keith Holland and myself) were all very conscious of the fact that yet another proposal for a new concept of control room could be greeted with a large international yawn. In actual fact, before the presentation of the paper, I sent pre prints to several US designers, including those mentioned in the text. George Augspurger replied that, 'Like every other neat theory, from complementary tint cross-spot stage lighting, to LEDE control room design, I guarantee that it is an over-simplification', and then, 'My own gut feeling is that, like long-range weather forecasting, we must learn how to work with chaos rather than trying to abolish it'.

Augspurger's comments were not entirely unexpected, as in the paper presented to the IOA, we had referred to other concepts of design philosophy which had had their moments of glory, then failed to pass the test of time. However, this was one reason why I left a three-year gap between my original *Studio Sound* articles in 1991 (March and November) in which I was guarded in my claims, and the November 1994 presentation to the IOA. The intervening three years had provided the time to gain much more experience of how these things were accepted amongst musicians and recording staff who had no axe to grind on any particular approach. They just wanted something which made their daily work easier, more consistent, more rewarding, and which could help them to relax into their work with the confidence that hearing was believing.

I have no vested interest in any one design approach or another. (My fees for studio design remain the same, irrespective whatever method I may choose to use to reach the mutually agreed end result.) All that I am saying here is that there is now a system which has been shown to work in practical terms, and work very well indeed. To the best of my knowledge, no owner(s) of any control room of this type has either had it rebuilt to a different standard (some are ten years old now) and nor have they ordered any further control rooms not of this type. Notwithstanding the comments made by George Augspurger, which, in fact, show quite a healthy reservation, the concept of the nonenvironment approach deserves wider consideration. It provides a consistency, repeatability and ability to minor detail that cannot as yet be achieved by any other means. ■

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ORAM SONICS HD-EQ2

Dave Foister probes the equaliser that recognises no equals

Keith Spencer-Allen's recent review of the Joe Meek compressor serves as a reminder that even in this hard-nosed age a name can still sell a piece of equipment. Rupert Neve's name, for example, will sell an equaliser design whoever has actually manufactured it, and the names George Massenburg, Ivor Drawmer and Clive Green continue to sell products. The latest name to bank on its own fame to promote its wares is that of John Oram, late of Trident consoles, who has launched a range of equipment under the banner of Oram Sonics. Each of the three current models is of interest as having something about it which sets it apart; typical is the *VU-More* metering module, which augments a pair of VU meters with red and green phase check LEDs and a feature for automatically displaying residual hum and noise levels during the gaps between actual signal.

John Oram goes so far as to describe himself in his company's publicity variously as 'the founding father of the "British Sound" in audio electronics and equalisation' and 'the father of British EQ', and it is perhaps fair to make the connection between Trident's success and the popularity of Oram's EQ design. His involvement in the development of the legendary *Series 80* and the *TSM* speaks for itself, and his stand-alone equaliser, the *HD-EQ2*, applies his years of experience to the problems of designing a versatile outboard EQ combining flexibility with a familiarly desirable sound. Oram has high aspirations for the unit; it is described as being 'designed as a reference equaliser for the Media Mastering, Broadcast and Live Sound environments' and the construction is described as 'mil-spec'.

There is no doubt that among the plethora of plainly-styled, hand-turned, aluminium knobs there is little missing from the list of what one would ideally hope to find on an equaliser. The fact that this is a two-channel unit with so many facilities means it is not small —3 units of hand-sculptured blue aluminium are required to make space for all the controls. The sculpting consists of bevelled recesses into which knobs and switches are set, and makes the push buttons safe against accidental operation without making them fiddly to use. This expanse of what is undeniably an unusual colour for an audio toy, together with the plain silver knobs and simple black and white push buttons, makes the equaliser quite distinctive, although its individuality may not be to everyone's aesthetic taste.

The initial impression given by the controls is that they are arranged in a bit of a jumble, but in fact a closer look shows them to be very logically laid out. The main EQ path includes six bands, and the first distinctive feature is that rather than having high and low bands which are switchable between shelving and sweep operation, both are offered simultaneously. These are then augmented by high and low mid bands, and all four swept bands are what one might call quasi-parametric.

As far as I am concerned, an equaliser only gets the right to call itself fully parametric if it has an infinitely variable Q or bandwidth control. The variable gain and frequency are taken as read, but on their own constitute no more than a swept equaliser. The Oram EQ splits the difference by having a push button on each band to select narrow or broad bandwidth, and for most purposes this does the job. The actual Q values for the two settings are not specified, but the narrow is not too narrow and the wide not too wide, and the characteristics of the two are usefully distinct.

The frequency ranges of the four swept bands overlap by an unusually sensible amount. Often adjacent EQ bands are designed to overlap so much that the range of each band becomes too great for easy delicate adjustment, but the Oram avoids this in favour of the detail provided by dedicated bands. The low goes right down to 35Hz and the high right up to 18kHz, so nothing is sacrificed in terms of overall range.

This degree of frequency control is perhaps part of the justification for the unit's name—the HD stands for high definition—and the other part is the flexibility of gain adjustment. ▶

Audio quality assured— John Oram's 'High Defintion EQ' seen with the *MWS* and *VU-More*

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Boost-cut controls all have an adjacent DETAIL switch, which reduces the range of the control from ±18dB to ±6dB, giving the possibility of much finer adjustment.

The shelving bands also have this Detail switch, but are otherwise much simpler. Shelf frequencies are switched rather than infinitely variable, with both extremes having three possibilities, again sensibly spaced to cover all eventualities—35, 60 and 200Hz for LF and 3k, 6k and 20k for HF.

At the extreme ends of the bands of EQ are filters for the frequency extremes. They really are extreme—the LF goes down to 5Hz while the HF all the way up to 80kHz, which even Oram admit is outside the audible range, although I am sure that there are many who would claim sufficient importance for those frequencies to justify having control over them. Adjustment of both filters is infinitely variable, with a fixed roll-off of 12dB/octave, and at their inner limits they almost meet in the middle, leaving a band of 300–1500Hz.

Input gain controls with associated peak LEDs —lighting at +10dBu—precede the filters and EQ, and although the EQ bands have a single overall IN-BYPASS switch, the filters are switched separately. A pair of bar-graph meters keeps an eye on the final output level. The rear panel is sparsely populated, having only XLRs for inputs and outputs, but Oram maintain that running either end unbalanced will give no problems.

Oram's published specifications for the *HD-EQ2* are a curious mixture of very impressive hard fact and subjective ideas which could be seen as controversial. For instance, the bypassed frequency response—which is not a hard wire—is absolutely ruler flat, with mid-band noise levels of -100dBu, but the response with the EQ switched in but set nominally flat is quite deliberately not. The deviation is very subtle—the response is within 1dB from 20Hz to 40kHz—but John Oram claims that the gentle droop towards the bottom of this range and the slight lift above about 10kHz is characteristic of Oram Sonics and is what gives his designs their distinctive sound. He predicts that the difference caused by this small deviation will make users want to leave the unit in circuit all the time whether actually using the EQ or not, and backs up this idea with exemplary noise and dynamic range figures which would make this less of an undesirable proposition than it might otherwise be. Not content with publishing simple figures for headroom and distortion, Oram provides graphs of such functions against frequency, showing that the unit will deliver +26dBu —balanced—right across the spectrum, and that THD+N at this level is less than 0.01% in the critical upper mid range. With worst case noise figures of -74dBu (all EQ and filters in circuit) this amounts to a technically impressive performance for six bands of active EQ, and the more subjective claims for the unit are easier to swallow coming from a man who can design like that.

And the result of all this design expertise is an equaliser that is a pleasure to use in all kinds of applications. I have never been much of a fan of graphic equalisers, much preferring the more flexible and to my mind more direct control of a well-specified sweepable design. The Oram *HD-EQ2* provides most of the potential advantages of such a configuration with the small omissions more than compensated for by the large number of bands, the precise control and the sheer quality, both objective and subjective.

The possibility of every band having 18dB of boost and cut affords the potential for quite vicious corrective equalisation, and yet it is very difficult to make it sound strained in any way. In fact it is possible to do quite radical things to the sound without the result giving away the heavy processing, so musical does the final output remain. Particularly impressive in this respect are the high and low-pass filters, which are the smoothest, least obtrusive I have heard.

At the other end of the spectrum of possibilities, the delicate control produced by using the DETAIL switches, in conjunction with the fine resolution of the frequency sweep controls, offers extreme subtlety (if that is not too much of a contradiction in terms) in dealing with the smallest nuances. Coupled with the excellent noise and distortion specs, this would make the unit an ideal choice for mastering applications, and I should not be surprised to see a demand for a switchable version, like that produced by Focusrite, to allow precise stereo matching specifically for this purpose. However accurately controls are calibrated—and it seems that the Oram's are very well matched—it is simply not possible to set two channels of continuously variable controls reliably to the same values. Whether the subtle effect of the 'Oram curve', when set flat is worth shouting about is a matter for debate; there is a slight difference switching the EQ in and out, but whether it is significant enough to warrant being made a feature of, particularly when some will object on principle to an equaliser which is not flat when it looks as if it should be, is questionable.

For general studio use all the above advantages apply. On a recent overdub session I ended up, just as the instructions said I would, with it left in circuit for everything I recorded. As much as anything, this was because its sensible control ranges make it extremely fast to set up and very easy to get good results with. Although it may seem a bit beneath its dignity, I used the EQ on a pair of Tandy PZMs stuck inside a grand piano, and the inevitable boxy lumpiness of this otherwise splendid technique was soon ironed out, giving the most natural sound I have so far managed to achieve with it. On more conventional microphone techniques it seemed unusually easy to lose that bit of room coloration, and to tailor, say, a vocal to the requirements of the track.

This is not a cheap equaliser, but neither is it as expensive as it might be considering its capabilities and sonic excellence. Judgeing by the way so many people complain about the EQ on otherwise superb desks, I am lucky in that I get on very well with the parametrics on my console, but the Oram is one of the few outboard EQs which I would quite happily use routinely in its place. ■

Dave Foister

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AES PARIS 95

The Paris Palais de Congres recently hosted the most vibrant European AES Convention of recent years. John Watkinson, Zenon Schoepe and Kevin Hilton were in the thick of it

Travel to the 98th European AES Convention was disrupted for many exhibitors by the industrial action of French seamen which turned a one-hour crossing to Calais into a six-hour cruise to Zeebrugge. I worked my passage as navigational consultant to Focusrite, skilfully guiding Richard Salter's red anodized Land Rover to the Palais de Congres. More accurately described as the Palais de Concrete, this neo-brutalist 1960s structure has never appealed to me as a convention venue. Some of the smaller stands were so well concealed that I doubt whether many visitors found them. And given the propensity of the Parisians for smoking, the ventilation arrangements should be better.

There are a number of long-term trends emerging from the audio industry which I have suspected for some time but which were increasingly apparent at the Paris AES.

The recession has not been kind to the industry. Sales have been poor and for many companies the little income which was available has been used to stay afloat rather than to fund R & D. Although economic conditions are improving slowly, we now have to face the legacy of the recession which is that for several years, fundamentally, very little new design has been done. With few exceptions the products displayed here were the result of incremental improvements over earlier models, and hardly warrant any attention in a column of this kind. In that respect, this AES Convention was disappointing because there was nothing new, nothing really exciting; a bit like the AES *Journal* in fact. As the industry recovers things will get better, but my view is that this will be a slow process and we may be in for a number of unremarkable trade shows in the mean time.

The nature of audio equipment is changing. In the good old days, audio equipment was invariably imperfect and it was quite normal to spend a lot of time fiddling with the equipment to make it work properly and choosing microphones whose defects were not highlighted by the sound to be recorded. With the exception of loudspeakers, today's equipment is reaching quite close to the sound-quality ideal. We are starting to take the quality for granted and to compare on economic grounds. This is not necessarily a bad thing. We should not confuse the means with the end. If, for example, the end is the creation of well-recorded music, then we should be happy that the equipment is taking a less critical role in the creative process. If we believe that fiddling with equipment is an end in itself, then disappointment is inevitable. Personally, I have better things to do. As equipment performance gets closer to the ideal, the probability of exciting developments must reduce.

The nature of audio manufacture is changing; it is no longer necessary to have the infrastructure of a large traditional company to make high technology products, particularly in the digital domain. In fact, the regrettable tendency has been for large audio companies to wring the last centime out of old designs rather than to adopt new technology. The belated launch of an eight-track recorder by **Sony** forced by the success of the competition underlines the fact that their audio division has become reactive more than proactive.

As general purpose processors become more powerful, all you need to do is write the software. The result has been a software driven fragmentation process. Hundreds of people have become disillusioned with their traditional employer, or have been made redundant, and have gone into business making the easiest software driven audio product, namely the digital-audio workstation. The Paris AES was awash with them, accounting no doubt for the dogged appearance of the ladies from Sypha who have seen their database grow exponentially. Since there is very little to differentiate the specifications of these workstations, choosing one is very difficult. I wonder whether the market can bear such a large surplus of designs. One price war could bring down the whole edifice. Another concern I have about workstations is that it is very easy to produce a system which is a thinly-veiled computer with ergonomics to match. It is very difficult to assess the operational characteristics of a workstation from a brochure. In contrast to the sameness of most workstations, the operator interface of the DSP (Digital Studio Processing) system stood out and may indicate a way forward.

I overheard a number of comments suggesting that this AES would indicate that tape was dead. Such a view in my opinion is simplistic and misleading. The DASH format is certainly reaching the end of the road, but eight track cassette and DAT are alive and well. ▶

Seen for the first time in Paris: the 16-fader AMS Neve *Logic 3*

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Before audio discovered hard disks, they coexisted with tape in the computer industry for decades and I see no reason why things should change now. Simple economics dictates otherwise. The relative costs of storage on RAM disk and tape stay the same as the absolute cost of all three come down. A few years ago it became economic to store small quantities of audio on hard disk, just as today it has become possible to do the same in memory using, for example the **Vamos** or **Nagra** solid-state recorders. However, for mass storage, tape will always win the economic race. A robotic tape cassette or cartridge library is cheaper than a disk farm and takes up less space. In standby it consumes little power. In the IBM robocart the tape is in containers having only one spool. The other spool is in the autolacing transport, making the tapes half as big as conventional cassettes. The logical audio system of the future will be a hybrid of RAM, disk and tape in order to give a range of speed-cost facilities. That future is not far away.

It is 13 years since I left a mass storage job in the computer industry. Back then a gigabyte was serious stuff. Finding a large IBM storage system at an AES Convention was a bit like coming home after a long absence. My, how the kids have grown.

John Watkinson

Recording

This was not a show of tumultuous product launches for the recording and post sectors in the the way that Autumn's San Francisco event was, but rather a case of enhancements and upgrades.

While **SSL**'s *Axiom* digital desk, *SL9000* analogue desk and DiskTrack random-access multitrack undoubtedly attracted a lot of attention for European first-timers, users of the company's existing products enjoyed some tweaks.

New automation features for *G Plus* systems included the ability to input song-tempo maps and a selectable mix data join which permits faders and/or cuts to be joined between mixes. Version 4 software for *Scenaria* now includes cycle-based automation, fader trim, autoglide and snap automation plus the ability to edit automation off-line. Remote mic amps are now supported and there are additional EQ curves, events list editing and a multichannel audio waveform overview display. *OmniMix* got enhanced hierarchical submix displays, phase reverse on HSM mix elements for things like mix minus feeds, extended surround sound spatial processing with the addition of a 'centre size' function and more reverb control parameters.

News that **DAR** equipment will be supported by sister Carlton Communications company SSL in the US was backed up the release of networking plans. Part of DAR's open media drive—the two Carlton Communications companies have entered into a development programme to create a practical media interchange standard—its network permits audio from remote machines to be displayed on a local station and stereo segments to be audiotioned. It was backed up with *Sabre* Digital Audio Workstation getting the *Plus* treatment for 16-track projects, up to 20-hours of hard disk and four hours of optical. There is a high-resolution monitor display and optional advanced signal processing for

Moving into serious mics—E-V with the *RE2000*

mixing, panning, EQ, aux sends and returns.

Dutch manufacturer **Augan** revealed three target develoment plans its *OMX* magneto-optical disc-based Digital Audio Workstations. All machines will be switchable for 16, 20 and 24-bit operation, Augan's networking capabilities will be enhanced with the arrival of 100Mbit links next year but the imminent arrival of the 2.6Gbyte M-O drive will realise the most significant development—a machine that is capable of playing back eight channels of audio from one drive and OMF-compatible video on another. It is a direction the company believe things will go.

Traditional desks launches were meagre the most notable of which was **Amek**'s *501 by Langley* live console—a stripped down derivative of the *Recall* sporting *Showtime* live automation, virtual dynamics and a virtual-outboard-effects-control module which will be made available across them company's SuperTrue recording and *Showtime* equipped products. The software has on-screen templates for popular effects units allowing MIDI control of parameters tied into scene changes and real-time automation. Other bolt-ons for *Showtime* are a relay interface for firing playback sources from cues and a software-based matrix to expand the hardware matrices on the *Recall* and *501*.

Tweaks to existing desks included the release of a Magtrax film monitoring panel for the **Soundcraft** *DC2000* moving-fader board, making it by far the cheapest console to be equipped for multiformat work.

Dutch company **Technica del Arte** revealed an innovative approach to digital mixing with the *Lupa* console. DSP and I-O rackmounts can be controlled totally from a *Windows* program or individual pot and fader controls can be substituted or paralleled by moving pot, switch and fader modules allowing a mix and match approach to be adopted.

The desk is built in 8-channel blocks and can be interfaced digitally to Tascam *DA88* and *ADAT* machines in addition to AES-EBU, SPDIF, SDIF and optical. Each channel has a noise gate, compressor-expander, 3-band EQ, adjustable high-pass filter, 6 auxes, pan, PFL, mute, fader and a peak meter.

Traditionalists flocked to **Tube-Tech** to view the *EQ1A*, all-valve, 5-band EQ with high and low cuts. A single channel unit, the three mid bands are fully parametric with ±20dB in addition to HF and LF ±15dB shelves and switchable 6/12dB-per-octave high and low-cut filters. All bands have switched frequencies and are individually bypassable and it looks beautiful. It also employs a valve op-amp similar in principle to those employed in early analogue computers.

Mic activity was high. **Schoeps** showed what they described as the smallest classical professional condenser in the *CCM*, which uses a non-electret condenser transducer with a low impedance output stage capable of operating at 12V and 48V phantom powering with automatically switched current to ensure consistent maximum SPL performance. Characteristics and performance of the omni cardioid is said to correspond closely to that of the *Collette* series.

Sennheiser majored on radio mic systems with the *EM2004* Mikroport Diversity receiver offering 16 switchable frequencies within a UHF bandwidth of 24MHz, the *SKM5000* VHF hand-held transmitter, and the *SK2032* VHF budget bodypack transmitter with six switchable frequencies, external charging contacts and operation between 138 and 250MHz.

Electro-Voice are making a bid for serious studio mic territory with their *RE2000* condenser. The mic offers transformer coupling, very low self-noise and atenuation-roll off switching. Already field tested with selected audio people, the *Re2000* promises much.

Bruel & Kjaer contented themselves with the limited 100-unit run of the *4040* valve mic and a hydrophone. The *DPA8010* is aimed at underwater recording, humid envirionments or recordings in gas-filled encloures. It is omnidirectional, frequency compensated, has phantom power and a built-in preamp.

Retrofitable moving-fader desk automation got a lift with **Audiomation** demonstrating an affordable package based on Apple *Mac* called *Audiomate 64*. Features included touch-senitive faders and off-line editing. At the same time **AD Systeme** showed a moving-fader option available as a mix and match for their existing *Optifile Tetra* system which employs the same screen-based user interface.

A European AES would not be complete without some innovative or problem-solving products. **Ultrasone Electroacoustics** have developed what they claim is the first 4-channel headphone which reproduces the positional information effects of multichannel recordings in the same that speakers do while **Harmonia Mundi** revealed digital interfaces for Sony's *DPS* series of effects units (*BB101*) and the *BB105* which upgrades Yamaha's price-breaking *ProMix 01* digital desk for full and direct digital 16-channel operation with Tascam, Alesis and ADAT, and Sony Hi8 digital 8-tracks machines.

Expanding their range of convertors, **Prism Sound** introduced the *DA-1* high resolution ▶

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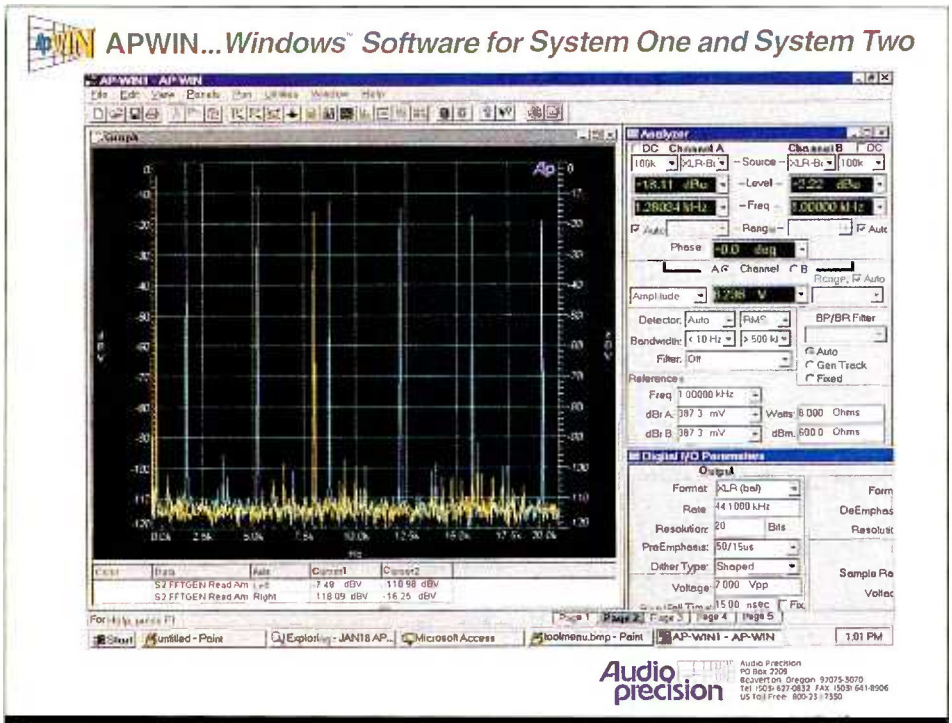

Ten years on from the 1985 NAB launch of the *System One*, AP bid for a second industry standard test set

D–A and also the *SNS4* noise shaper. The *SNS4* offers four 'graduated' noise-shaping alternatives, employing progressively more shaping.

Capitalising on the reputation gained by the *System One* over many years, **Audio Precision** introduced the *System Two* and *APWIN*, Microsoft *Windows* application. Intended to provide test and measurement solutions suited to the advancing world of digital audio—without abandoning that of analogue—the *System Two* will be contesting T & M turf into the next decade. **Zenon Schoepe**

Postpro Broadcast

With Europe's two premier broadcast technology shows set to go head-to-head later this year, it was surprising to see the amount of broadcasting and postproduction related audio equipment exhibited in Paris. At some turns it seemed more like a radio event than a general professional sound display.

Digital and disk technology continued to dominate proceedings—a statement that is now more likely to be greeted with disinterest as opposed to whoops of joy. Towering above all PC-based Digital Audio Workstations was **SSL**'s latest, the *Axiom*, with which the company hope to finally eliminate tape from the studio equation.

Featuring a fully digitally, completely automated mixing console, integral hard-disk storage-editing (up to 96-channels of concurrent access), a resource management system offering shared access to full analogue and digital ins and outs, and full reset capabilities, the *Axiom* can be specifically configured for a particular facility's needs.

SSL Marketing Director Colin Pringle commented, 'It is the industry's first opportunity to have a digital-audio production system built to order, according to the application.' The first installation of the system has been confirmed at BBC Radio outside broadcasts, which is using a 48-channel version with 48-track *DiskTrack*.

Digital Audio Workstations with more modest ambitions were very much in evidence around the Palais des Congres. **DAR** introduced the *Sabre Plus*, a compact, economical extension of their established edit console, which features up to 20 hours of storage and optical disc drives with 4 track-hours capacity. The company also announced new networking and Open Media facilities for all their range.

Harmonia Mundi displayed the upgraded *pdae* (Penguin Digital Audio Editor), which can now compile programs directly from DAT and-or CD without loading or unloading hard disks. Upgrades were popular, with **Akai** introducing v1.3 software for the *DD1500* dedicated postproduction Digital Audio Workstation.

A new range of integrated digital-audio products came from **Avid**, building on v3.0 software and giving end-users up to 16-channels of audio and video from the budget digital player-recorder configurations for *AudioVision* and *AudioStation*.

Claiming to be the first PC-based Digital Audio Workstation specifically designed to work under the Microsoft *Windows 95* multitasking operating system, *PyraMix* from **Merging Technologies** can be connected to such multitrack recorders as **Alesis** *ADAT* and **Fostex** *RD-8*.

Other usual suspects included **DigiDesign**'s *Pro Tools*, **Sonic Solutions**, **Soundscape**, **Spectral Synthesis** and **Studio Audio & Video**, with all the manufacturers attempting to provide the best possible user-interface, given that most editors find the mouse a cumbersome device.

Otari, who introduced a 2Gb hard drive for the *RADAR* system, have also worked on the matter of interfacing, displaying the *RADAR-GIU*, a prototype graphical interface. Two of the most popular control surfaces currently on the market are from **JL Cooper**, and **Penny & Giles**, who have introduced a motorised joy-stick for surround-sound mixing.

With the continuing boom in home cinema and the growing awareness of multichannel soundtracks, which can have an immense artistic impact on a movie, surround sound is becoming a priority for a number of manufacturers.

One of the specialists in the field, **Magtrax**, have collaborated with **Soundcraft** to develop the Interact TV routeing and monitoring interface for the *DC2000* moving-fader console.

Up to six independent outputs for monitor speakers can be accommodated by the system, along with automatic encoder-decoder insertion, while the console's group outputs are used as inputs to Magtrax TV's own routeing matrix. Soundcraft's Mike Mann estimates that the system adds £3,500 to £4,000 to the cost of a *DC2000*, offering an integrated Dolby Surround console for under £20,000.

On similar lines, **Otari** showed the *PicMix*, which can be directly integrated into all of the company's mixing consoles, as well as non-Otari multitrack mixers. Offering up to 32-inputs, the basic modules can be installed into a 19-inch rack and support all current surround formats: Dolby Stereo, Dolby Digital, DTS Digital and Sony SDDS Digital.

AMS Neve have also recognised the growing demand in this area and now offer the *Logic 3* and *AudioFile Spectra* package with a dual joy-stick 'podule', while the *Logic 3* itself got its first public showing in 16-fader form.

The other broadcast speciality evident in Paris in almost unprecedented numbers was radio automation. **Studer Digitec** introduced the integrated *Numisys II* system, which now features an improved acquisition software module, and additional elements like loop management and the naming of cuts in EDL.

Now that the ever-acquisitive Harman Pro Group owns **DAVID** (Digital Audio and Video System Integration and Development), this company's editing-mixing software has been integrated into *Numisys II*.

French companies **Audio Follow** and **Netia** have jointly introduced ABC (Audio Broadcast Concept), a modular digital system for both radio and television which automates recording, editing, archiving, management, scheduling, and transmission.

Back with the multinationals, **Siemens** have upgraded the *CARAT* (Computer-Aided Radio and Television) system, which now adds archiving to its other functions. During AES, live demonstrations were given by Radio CD, an Austrian station who have installed *CARAT* into their Vienna HQ.

Completing this radio feast were two Australian contenders, **ABC·Digital** with the *D-CART* Digital Audio Workstation and the new *D-RADIO* virtual console, and **Ogenic Technologies**, who were making their debut in Europe and are looking for new distributors. Like their Antipodean rival, they manufacturer digital audio storage-playout and automation systems. The difference is that they still deal with traditional analogue desks. How quaint. ■

Kevin Hilton

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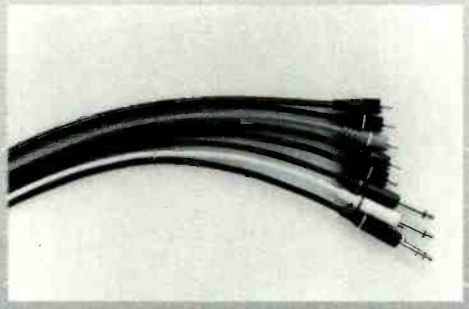

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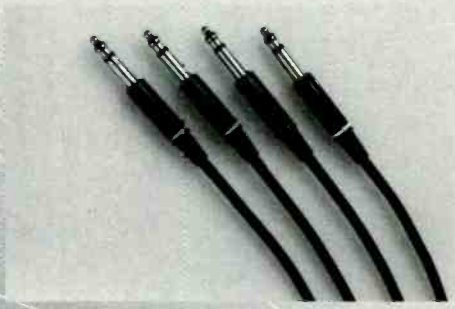

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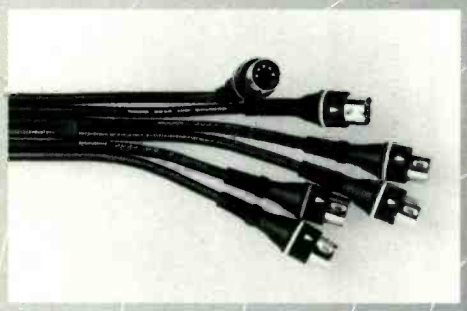

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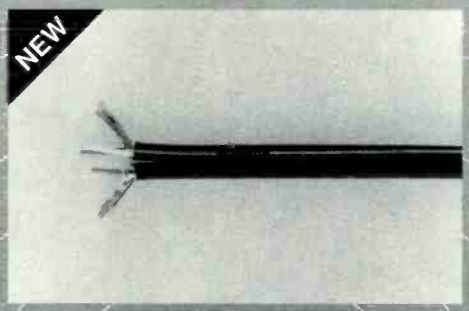

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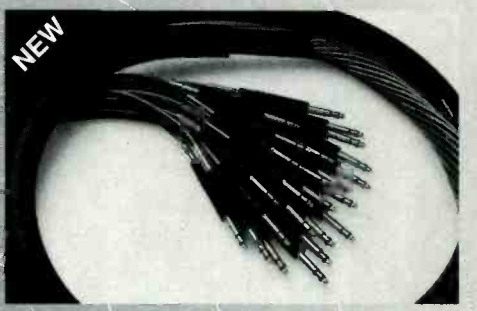

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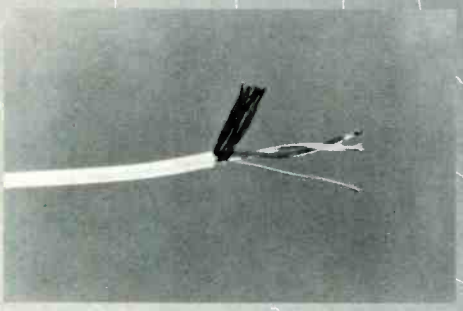

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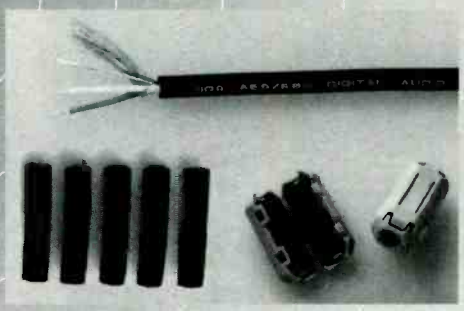

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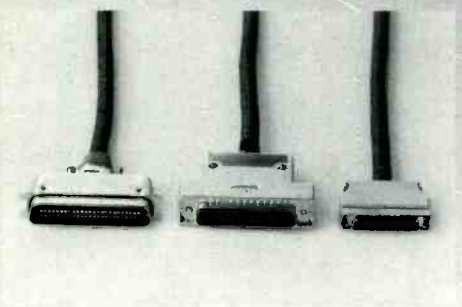

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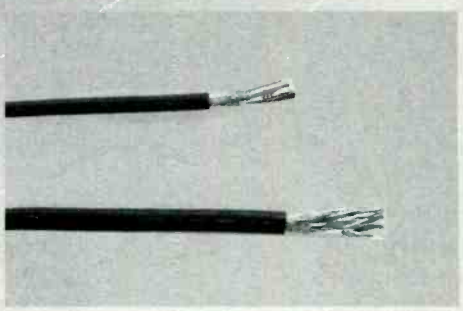

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MEYER SIM SYSTEM II

The Miles Davis Hall at the Montreux Jazz Festival has seen consistent use of *SIM* to optimise the arena sound

Everybody knows something about Meyer's *SIM* system. It is powerful, expensive, and has been used for setting up some of the biggest touring rigs on the road. What few seem to know, although a lot of people think they do, is what it actually does and how. Everyone I have spoken to while preparing this review has made some false assumption about it.

Which is curious in a way, as its name alone should dispel the most common misconception, which is that it takes charge of a system and automatically optimises it. *SIM* stands for Source Independent Measurement —no mention of correction, equalisation or any kind of automated control, just measurement. The key to its uniqueness is the first part—Source Independent —which means quite simply that it can measure audio performance using not just tones or noise but any sufficiently broad-band signal, including, of course, music. This, along with its enormous power and flexibility, is what has led to the application most often associated with it—setup and measurement, even during the show, of large-scale PA rigs.

This is just one of many uses, and indeed the one requiring the most hardware. A basic system, without the multichannel add-ons, can run two versions of the software, *Lab* and *Stereo*, to provide measurements of individual items of equipment or simple stereo systems such as studio monitors. Such a setup comprises the main processing unit, complete with diskette and removable hard drive, an S-VGA monitor and a qwerty keyboard, plus connection snakes and a measurement microphone, which, of course, is only required if acoustic signals are involved. Meyer's preferred reference microphone is the B&K *4007*. The main processor is built round a PC, and indeed the software will run on any suitable PC in order to allow examination and printing of measurement results. *SIM* will also save results in ASCII format for processing in external applications such as spreadsheets.

The processor incorporates a flexible noise and sine-wave signal generator, and there are three measurement inputs, one for the signal being presented to the system under test, one for its output, and one for the measurement microphone. Which combination will be required depends on the job in hand, but the point is that *SIM* compares any two of its inputs, calculating the transfer functions and allowing several sets of information about the performance to be displayed in real time. The multiple inputs allow all kinds of comparisons to be made. For example, the behaviour of an electronic device can be measured; the acoustic output of a loudspeaker can be compared with its electrical input; a system comprising a room, a loudspeaker and a corrective equaliser can be assessed for overall performance or have the individual elements of the ▶

Widely known but widely misunderstood, Meyer's *SIM* system needed a reintroduction to pro-audio. Dave Foister studied the System in the studio and on the road, and has made a new friend

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SIM installed at the mixing position alongside the equipment racks

chain measured. In all cases, the source signal can be either the internal generator or any suitable external signal, including music and speech.

Measurement

The first and simplest measurement is spectrum analysis, which shows a dense (24 points per octave) series of vertical lines representing the spectrum of the selected signal. There are two displays, showing the spectra of the chosen reference and the signal being measured. With a sine wave as the source, THD can be read directly from the data area, which is always present in some form giving extra information about the display currently being viewed. For example, there is a movable cursor on most traces, and its exact position in terms of frequency and dB of gain is shown in the cursor status box, making it easy to pinpoint peaks, dips and other phenomena.

The most frequently seen *SIM* screen shows the frequency response, displaying amplitude and phase measured against frequency. Before these measurements can be taken, the measured signal and the reference signal must be accurately synchronised with each other, otherwise any attempts at FFTs will be meaningless. One of *SIM*'s most powerful and intriguing features is its Delay Finder, which shows the amount of signal delay through a system and automatically compensates for it. By performing Inverse Fourier Transforms on the signals it produces a display which effectively shows the impulse response of the system, and it is very bizarre to watch what looks like a single impulse settle on the screen while continuous music or noise plays through the system. When measuring an electronic device the result will be a single spike, and although it may seem odd to be calculating the inherent delay of a signal processor it must be remembered that digital devices will always have a certain amount of processing delay, which must be corrected for when making measurements. The importance is even clearer with loudspeaker measurements to allow for the transmission of sound through the air, and in this case the delay finder is likely to reveal more than one impulse as the measuring mic picks up the reflections from the room surfaces. The cursor will normally lock on to the biggest peak, and then *SIM* will set an internal delay line to exactly the value of the offset in order to bring the measured pair of signals into line. The cursor's peak track mode can be overridden, allowing the delay to be aligned to a different point —in a multiple loudspeaker setup, for example—if required.

Once this is done, frequency-response measurement can begin. *SIM* performs FFTs at 48 points per octave (reducing below 80Hz) using a complex series of calculations to provide a logarithmic frequency scale without the excessively large data handling which a more straightforward approach would require. This gives an unusually high LF resolution using a time window for data capture of 640ms, the rate at which the screen display is updated under normal circumstances. The result is a trace on the upper screen of amplitude against frequency, and on the lower screen of phase against frequency, both with variable vertical scales and horizontal zooming. Smoothing can be applied to the traces (not the data itself) to clarify the display.

Various FFT windowing functions are commonly used for different types of measurement, and *SIM* automatically uses the most appropriate—Hanning, half Hann or Flat Top—for each function so as to give the most reliable results.

All this would be relatively straightforward under ideal steady-state conditions, using pink noise as a test source. *SIM*'s power comes principally from its ability to do all this with music as the source in much more difficult situations, such as acoustic measurements where noise contamination is a problem, and it has several techniques for dealing with this. The first is a simple amplitude threshold in each frequency bin —if there is not enough signal, it will not try to take a measurement. Even if there is signal present, the possibility remains that it has come from something other than the test source, so *SIM* calculates how much of the output power of the device under test is due to the input to produce a figure called Coherence (from which is also derived a signal-to-noise value). If the Coherence falls below a set threshold, the data is ignored, although either the Coherence itself or the resulting signal-to-noise is always shown on the display as an additional trace against frequency. This can be helpful in spotting where there are difficulties and where measurement may not be possible under current conditions. Finally, in order to produce a steadier display and to further eliminate random elements, successive readings are averaged before display. The number of samples to be averaged is selectable (2–16), lower numbers giving a faster screen response and higher ones giving more reliable data. The Coherence threshold is linked to the number of averages, becoming less critical as more averages are used. This is all performed on a frequency-by-frequency basis; those bins where there is plenty of useable signal will produce their sections of the trace quickly, while frequencies which are only present occasionally will wait until the chosen number of acceptable samples are available for averaging. This means that the trace gradually fills itself in like a join-the-dots puzzle and then continues to update itself, those areas with the strongest signal updating most quickly. Data are averaged in FIFO (First In First Out) buffers, which means that at any time any point on the trace is showing the average of the last 16 (or whichever number has been selected) values.

SIM's averaging process is all the more powerful because for most purposes it uses vector averaging, where both magnitude and phase (or real and ▶

The back of the *SIM* with the flails off to the EQs

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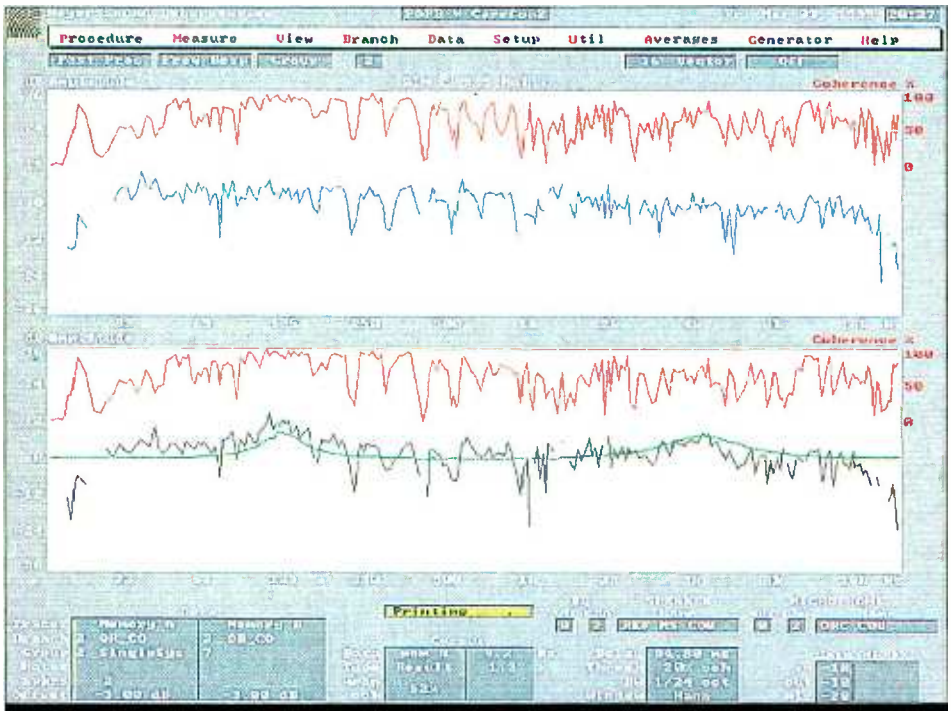

Colour plot showing traces from live show in Paris Bercy: Group view Main loudspeaker at 84.8 ms away Black = Room + SPKN (mic vs raw signal) Green = I/EQ (inverted EQ out/EQ In) Red (Lower-ragged) = Room + SPKR coherence. Red (Lower-straight) = I/EQ coherence Blue = Result (mic vs post EQ signal). Red (Top) = Result coherence

imaginary parts) are taken into account to produce a vector for each value. Random or periodic contaminations should statistically tend to cancel over a few averages, leaving nothing but the required signal, and this produces the bizarre situation where *SIM* can be showing a negative signal-to-noise figure but still be extracting useful data. Vector averaging relies on the time relationship between the measured signals remaining constant, so for conditions where this is not possible—a good example is outdoors where the wind is blowing the sound about—RMS averaging is also available.

Operation

All of this sounds quite daunting, but *SIM*'s multiplicity of parameters and functions are extremely logically laid out and soon become familiar. Everything is available via drop-down menus using a series of single keystrokes, with shortcuts available using the usual combinations of control and function keys for many operations. A mouse port is fitted, but the software for using it is not yet available.

Even when you start to get the hang of it, however, it is still unnerving to see real detailed measurement taking place with nothing but music passing through the equipment. Reluctant to accept it at face value, I compared two traces I had taken of a monitoring system, one with music and one with pink noise, and they overlaid almost perfectly. As expected, the noise-derived trace was quicker to produce, but the end result was in all respects effectively identical. Having established that, there is something intuitively right about measuring any audio chain—electronic or acoustic—using the material one is intending to put through it in actual use, and I quickly became very comfortable with it. If I had had more time, I would have been interested to align a tape machine with it—the Delay Finder would deal with the record-repro head gap, and bias and EQ could be set to give the best fit with real music, not just tones—surely more satisfactory. Meyer's European Manager Jim Cousins, who has spent a lot of time showing me the system and its various applications, points out that *SIM* could be used, for instance, to evaluate radio stations' received signal compared with the studio feeds, something that would otherwise be impossible for a 24-hour station. Several loudspeaker manufacturers use *SIM* for selection and matching of drivers, and there is even a story of an egg packing plant which has installed *SIM* to detect bad eggs; the acoustic properties of a bad egg differ sufficiently from those of a good one to allow *SIM* to measure the difference and reject it. Studios possessing a *SIM* machine have been known to use it to time-align a DI feed with a mic on an amp—a trivial use perhaps, but it quickly becomes apparent that *SIM*'s applications are limited only by the imagination, and that the image of the PA alignment tool, while representative of the possibilities, is still an over-simplification. While I had the system I used it to measure a loudspeaker in a detail I would otherwise have found impossible (including deducing its crossover frequency from the phase response); to check (with reassuring results) the behaviour of my control-room monitors; and to identify precisely a standing-wave LF resonance in my studio, which I was then able to blame on one particular dimension of the room.

Moving from the *Lab* to the *Stereo* version adds extra routeing and comparison possibilities. A flail from a rear-panel multipin allows *SIM* to be inserted into a stereo system, typically before and after equalisers treating a pair of monitor loudspeakers, whose output would then be picked up on measurements mics in the room. The flail takes the place of the front-panel sockets, and the generator must be connected separately.

The *Stereo* version introduces the different views offered of what is going on at various points in the system under test. There are now two channels, each with three measurement points, labelled for convenience EQ In (the source signal), EQ Out, and Mic for the measurement microphone. This makes it possible to look at the curve produced by the EQ, the behaviour of the loudspeaker in the room, and the overall response of the whole chain. A Group view is available showing all of these simultaneously, together with the Coherence trace, at the expense of the phase display, and also allows the inverse of the EQ response (1/EQ) to be displayed. This is very useful when setting up corrective equalisation, as the 1/EQ curve can be overlaid on the Room + Speaker curve and an attempt made to match it; if this is achieved, the Result curve (the complete system) should become more or less flat.

A chain to be measured must be set up as what *SIM* calls a Branch, consisting of a loudspeaker, a measurement microphone and the associated internal delay. The Stereo version allows two such Branches to be defined, and thereafter carries out all the necessary switching and muting for the various measurement procedures automatically. This makes it possible to switch very quickly from a study of a single loudspeaker to a view of the whole system, and even to do what *SIM* calls a Lobe Study, where the output of one speaker is measured using the other speaker's microphone to look at its off-axis behaviour and how the two will interact.

Live applications

These facilities become even more valuable when measuring a PA system with multiple speaker arrays and delay systems, and the multichannel version reflects this in the flexibility offered by its multiple input and output capability. Multichannel use requires the addition of an interface unit—the SIM 2403—handling eight EQ in-out points and eight measurement microphones, and *SIM* will happily deal with up to eight 2403s giving a total of 64 possible measurement channels. Up to 16 Branches can be set up for each 2403, so that, for example, a main cluster can be measured both from an ideal listening position and from a point off its axis, and even from the position covered by a delay system to make comparisons. Once again, the system intelligently handles all the required speaker muting for the different measurements, and it is therefore reassuring to note that Show mode—for live measurements during performance—disables this feature altogether. It is also recommended to move the interface snakes ▶

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Suitably set up in the venue, *SIM* makes quick work of aligning individual speaker arrays, spotting acoustic problems—reflections, cancellations, speakers in less than ideal positions—and time-aligning delay speakers and front fills. Placing an extra loudspeaker on stage allows the entire rig to be time-aligned back to the stage to help pull the image down to where it should be. All these measurements can be carried out quickly before a sound check using noise; the result should be a PA system which the mix engineer can rely on to produce his desired sound throughout the house. This is an important point —the role of the *SIM* operator is not to interfere with the mix engineer's sound but to enable him to trust the PA and not to have to equalise round its deficiencies, and moreover to keep the PA optimised as conditions change. 'Optimised' need not mean flat; it can also mean following a house curve or adjusted for best intelligibility in difficult conditions. The point is that *SIM* allows it to be kept the way the engineer wants it even though thousands of people may now be soaking up the sound, the wind has changed direction, and the humidity and temperature have increased.

When the system is running satisfactorily, the resulting curves can be stored in memory—each Branch can have up to eight sets of curves stored. These can then be recalled during the show in order to be compared with the live measurements. Besides this, curves measured in different positions in the house can be compared to check consistency of level and frequency response. *SIM* can show the complete Group of curves for both live and memorised results simultaneously, and by clever use of colour it manages to do it in a readable form—once you are used to the display, everything is clearly visible and comparisons are easy to make.

Multichannel mode provides an additional measurement procedure called Mic Compare, which allows unknown measurement microphones to be checked against a known reference. It can also be used, for instance, to set up equalisation for a hairline radio mic or a floor-mounted float by comparing its output to an ideally-placed ▶

TECHNIQUE AND DEVELOPMENT

Meyer Sound's decision to develop acoustic analysis equipment grew out of the company's inherently perfectionistic approach to audio. The objective was to ensure that the result arriving at the audience's ears was always as close as possible to whatever the performers, sound designer and mix engineer intended. This entailed devising a method of minimising the effects of the performance space itself—whether room, hall or stadium—enabling a loudspeaker system to be restored almost to its original free-field behaviour.

The principles of Source Independent Measurement were refined over an 8-year period through laboratory analysis and field research in concerts and theatrical performances. John Meyer spearheaded the research, assisted by *SIM* Engineer Bob McCarthy and, later, Senior Software Engineer Jim Isom. The original research equipment consisted of a Hewlett-Packard 2-channel FFT analyser, controlled by an HP portable computer running proprietary software, together with Meyer-designed external switching networks for automated access to multiple system branches and microphones.

Being designed primarily for laboratory and industrial applications, the HP analyser made *SIM* equalisation a somewhat involved and tedious process. However, the principles of *SIM* were proven to be remarkably effective at optimising complex sound systems and compensating for room interactions. It was a natural progression of Meyer's loudspeaker system research, which had already encompassed: a patented, low-distortion horn driver; the first arrayable enclosures; crossover-controller units which combined frequency and phase response alignment, and a complementary-phase parametric equaliser.

All these steps contributed to the final result. Firstly, the loudspeakers themselves had to be capable of providing significantly low levels of distortion, as distortion can be misinterpreted as an HF lift. Secondly, the design of the speaker drivers and the arrayable enclosures had to ensure—for maximum *SIM* accuracy—minimal coverage overlap between the components of a multi-speaker system.

Thirdly, sophisticated controller-processor electronics were required to enable the speakers to be driven as effectively and as safely as possible, with Meyer's parametric equaliser specifically designed to minimise phase errors. And then the final result—the development of a highly sophisticated measurement tool which enables sound engineers to check that the entire system is delivering the best possible results —irrespective of where it is installed.

The rationale behind the *SIM* development programme was that conventional FFT acoustic analysers were too slow and too inflexible to do the job effectively. Meyer felt that there was considerable room for improvement and had some very clear ideas as to how this could be achieved.

SIM is, as its name implies, independent of the source—making it possible to use it accurately and unobtrusively during a performance. Audiences do not listen to test tones and pink noise, so why not use real music as the source? And with real music, *SIM* is amplitude accurate to ±0.1dB. Again, as its name implies, *SIM* is purely a 'measurement' tool. It offers only information to operators, who can use their human judgement and experience to decide whether or not to act on the information.

SIM System II is one of the fastest, most powerful and flexible acoustic signal analysis systems available today. It was granted an R&D 100 Award in America in 1992—a prestigious award reserved purely for major technological and scientific advancements. ■

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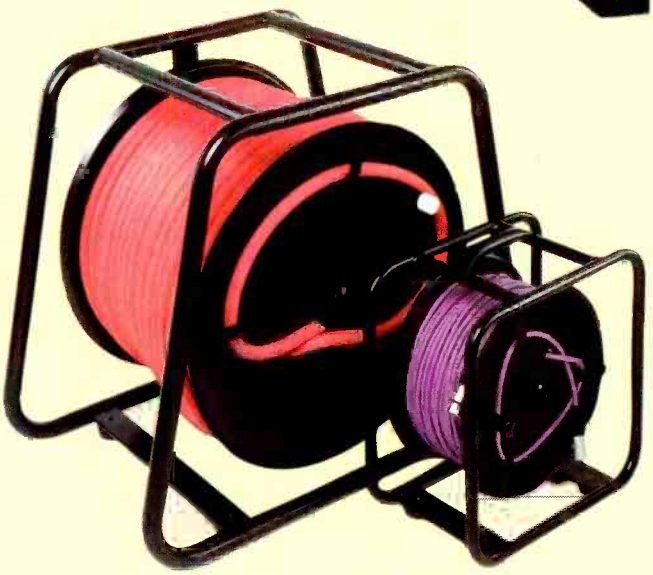

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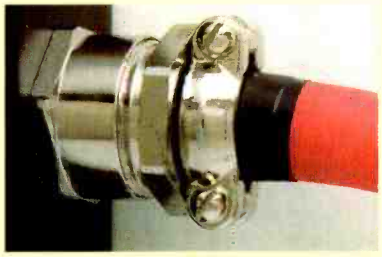

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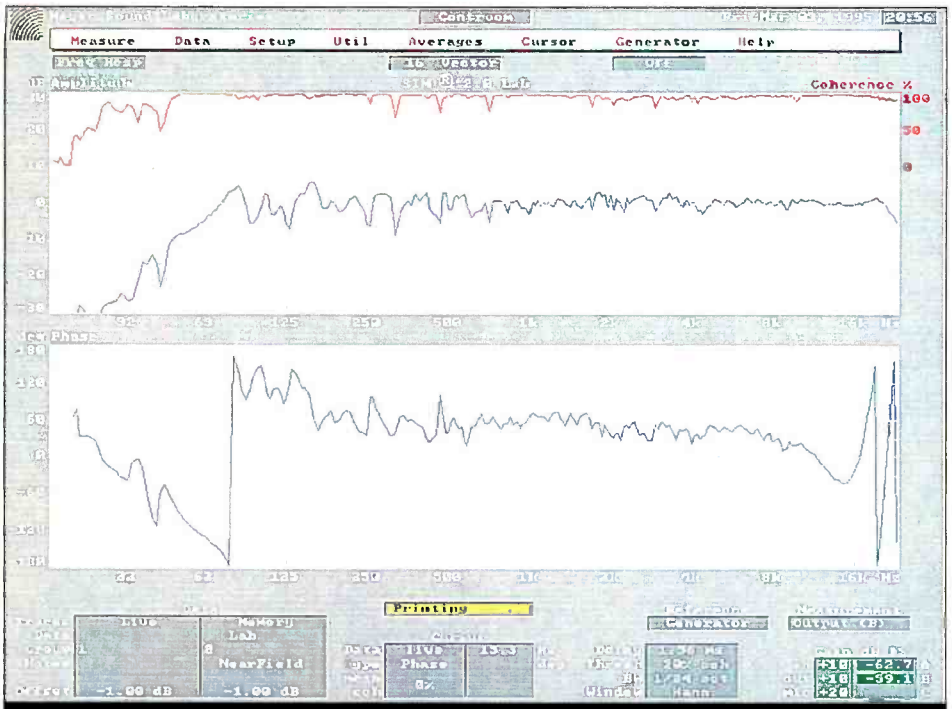

Colour plot showing nearfield monitor in control room. Propagation time = 1.56ms Upper section shows: Room + SPKR, coherence and amplitude vs frequency. Lower section shows room + SPKR and Phase vs frequency. Note ±180° phase scale. Wrap at about 80 Hz is LF delay from boundary conditions

conventional microphone—yet another example of *SIM*'s versatility.

The final stage in my introduction to *SIM* was seeing it in action on a stadium performance of a French touring show, *Starmania*. The venue was the 10 000-seat Bercy stadium in Paris, and the show was *SIM*ed by Marc de Fouquieres of Best Audio with Jim Cousins explaining what he was doing. The rig consisted of a main L-R pair of Meyer *MSL-5* arrays, outer arrays and four delay groups of other, unknown custom speakers, and 20 Meyer subs and front fills. Eight measurement microphones were rigged, and the system thoroughly tuned prior to the surprisingly brief sound check. EQ and delays were handled by a BSS *Varicurve* for the main arrays and Yamaha *2040* 4-channel delay-EQs for everything else. Several sets of curves were stored, and during the show comparisons made; it was immediately clear that the speed of sound had increased by then, as delay times needed to be shortened by over 1% to maintain the earlier alignment—important when you consider the combing effects caused by just 1ms of delay. The absorption of the audience was clear in the HF behaviour, and Marc was able to monitor all sections of the rig continuously and make any necessary adjustments. The show itself was fairly straightforward—all the backings were on tape, the singers had in-ear monitors, and the stadium acoustic was surprisingly dry—but even so the quality and consistency of the sound were quite remarkable. At the mixing position—200 feet from the stage—the rig sounded like a huge hi-fi.

SIM school

Finding one's way round *SIM* is so surprisingly quick that one can start to wonder why Meyer are so insistent on their *SIM* Schools and on operators being qualified. Despite its complexity, the system soon becomes fairly intuitive, and it is only by talking to experienced users such as Cousins and de Fouquieres that one starts to appreciate the ramifications, and that learning to use the machine is only the first step. Interpreting the information it gives is the next; for instance, it would be only too easy for an inexperienced engineer, on spotting a hole at 200Hz, to reach for the EQ, without considering that it might be caused by acoustic cancellation. The result would be crazy EQ curves, overdriven amplifiers and speakers, and still a hole at 200Hz. This is a basic example, but the knowledge experienced *SIM* people have about cabinet and crossover characteristics, acoustic danger areas and treatments and the likely effects of environmental changes speak volumes for the kind of measurements only *SIM* seems capable of.

Which is a long-winded way of saying that *SIM* is quite simply the most extraordinarily powerful, flexible and yet intuitive measuring system I have ever seen. Since learning what it can do, I have found myself repeatedly wishing I had access to a machine, even though I have little to do with large PA systems; it strikes me that there is virtually nothing in the audio sphere that it cannot measure quickly and in detail, and with the reassurance that it is measuring using the same raw material as one's ears use to evaluate it, and the reason it exists at all—music. ■

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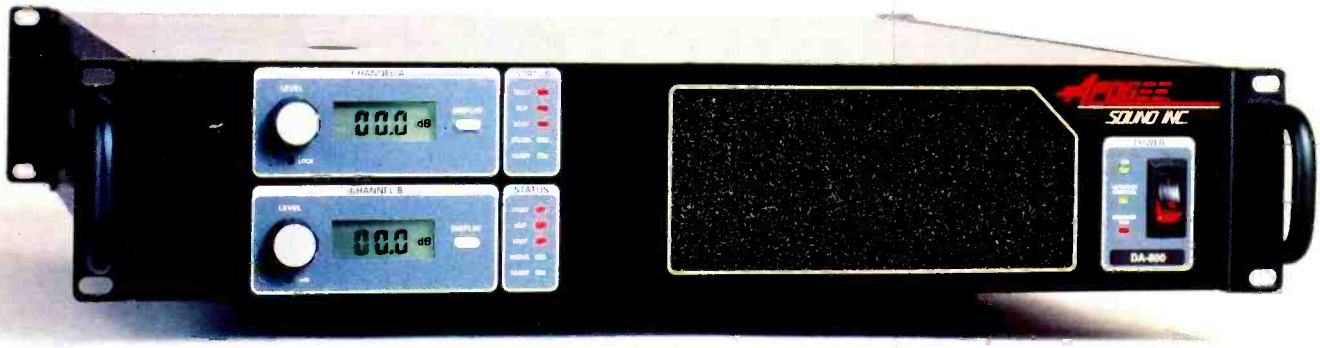
Digital Power.



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Literature received

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● ***The Sound Studio*** Alec Nisbett, Focal Press. ISBN 0 240 51395 9.

Bible belter

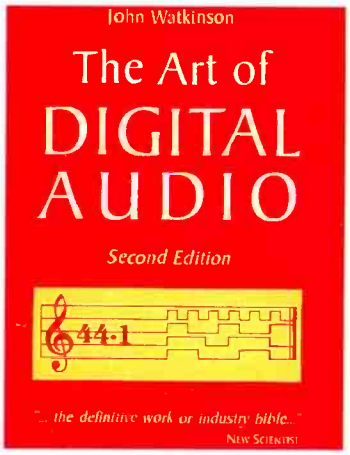
***The Art of Digital Audio, Second Edition* John Watkinson, Focal Press, UK. ISBN 0 240 51320 7.**

It must be difficult writing a sequel to the Bible. Let's face it, God hasn't got round to it yet, although John Watkinson has, and it only took him five years. Mind you, in this field, half a decade is the next thing to an eternity, and technical developments render reference books out-of-date almost before the print is dry. Watkinson has, nevertheless, set out to provide a relatively complete and up-to-date guide. How does he fare?

The first thing one notices about the Second Edition is its similarity to the First. Indeed, many chapters are almost identical to their predecessors. Others, of course, have developed in keeping with the changing industry, and there are many new chapters covering a number of the latest emerging technologies and techniques such as MiniDisc, DCC, D-2, D-3, optical drives, noise shaping and data reduction. Included for the first time, these topics have forced the number of pages up from under 500 to nearly 700.

The printing, layout and diagrams of the Second Edition are produced to the same high standard as the first and, despite the book being more comprehensive, the style has also become more accessible. Many explanations are clearer than before and there are more of them. There is also a new 92-page introductory section of fundamental principles which make it possible for more potential readers to cope with the AoDA without needing to refer to a less involved text before launching in at the deep end. There are omissions, and a number of fields (such as the increasing number of applications using DSPs, and digital implementations of emulations of analogue processes) have been skimmed rather than thoroughly plumbed. Ultimately, however, it's impossible to cover everything in a single tome, and whether or not Watkinson's compromises are the best possible will surely be a matter for the individual reader's taste.

In his preface of the new addition Watkinson suggests, somewhat tongue in cheek, that if the First was the Bible, maybe we should refer to the Second Edition as the New Testament. It's not a bad idea, and one with which I have no arguments—*The Art of Digital Audio* remains the truth, is



certainly not the whole truth, and there are no apocrypha anywhere in sight at all. As a bridge between introductory text and technical dissertations or papers, the AoDA remains highly recommended.

Gordon Reid

DAT handbook

***The DAT Technical Service Handbook* Richard Maddox, Van Nostrand Reinhold, New York. ISBN 0 442 01423 6.**

Although DAT was intended to be a consumer format to replace Compact Cassette, this did not happen for political and other reasons. Despite that setback, DAT found favour in the professional audio industry where it is now well established.

The use of a format intended for consumers in a professional environment has not been without its moments and a number of users experienced embarrassing failures. Time has shown that many of these were due to taking a machine straight out of the box and putting it into service without performing any alignment checks. Almost inevitably, interchange and error rate problems were the reward. Fortunately the need for caution in selecting DAT tape and the requirement for transport alignment is now widely appreciated, and Studio Sound has played a part in creating that awareness. There are now plenty of DAT machines in service and some of them have accumulated a lot of hours. With that background a book of this kind should be a welcome addition to a DAT user's library. This book is intended to be a practical guide to DAT servicing and as such is written in commendably plain language, if a little conversational. In that sense it succeeds because the reader is not subjected to a lot of technical jargon on what is quite a complex subject.

Unfortunately the freedom from complexity has been obtained by omitting to explain how DAT works. The reader is thrown straight in to the mechanical alignment process with no real knowledge of what he is doing and why he is there. The author has assumed that the reader is familiar with the geometry of rotary head recording and the principles of digital audio.

Where this book does involve itself with technical matters it comes unstuck. The description of the operation of a MASH noise-shaping A–D convertor is disturbingly flawed. Elsewhere we are told that an eye pattern is four sine waves lagging by 90° which is hilarious to the experienced but unacceptably misleading if this is only information you have to learn from. The cover states that a glossary is provided for readers new to the DAT format. Unfortunately the descriptions of Azimuth, Frame and Track contain errors. It could be argued that these technical errors are allowable in a practically orientated book, but perhaps my greatest reservation comes in the fact that the mechanical alignments are presented in the wrong sequence. The correct procedure for setting up any rotary head transport is always to make sure the tape tension is correct before adjusting the tape path around the drum. This book proposes the reverse order be followed. I could not understand the explanation of the capstan speed adjustment. The book claims that incorrect capstan speed causes the absolute time display to be off which is incorrect as it is locked to a crystal. In my view if a sufficient explanation of rotary head principles and geometry had been given these errors would have been obvious and could have been avoided. While the book contains plenty of diagrams, virtually all of these have been copied straight from manufacturers service manuals without bothering to correct the errors in them.

Allowing for the inevitable translation errors, the service manuals available from the major manufacturers are actually quite good. In view of that I wonder what value this book offers by repeating basically the same material. The UK price of £43 is extremely high for any book of this size and considering the poor technical quality it is, in my view, simply not worth the money.

John Watkinson

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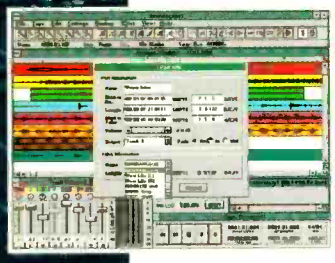

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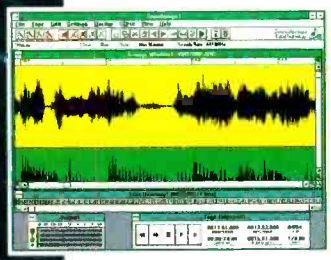

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Rejection factor

Dear sir, with reference to the article 'Spotlight on CMR' by Ben Duncan in the August 1994 *Studio Sound*. While it was good to see this subject aired I was most disappointed to see Mr Duncan describing his **Fig.2** as a balanced receiver. This receiver is differential but definitely not balanced. Look at my **Fig.**1 showing this circuit in its simplest form. The input at A has a resistance of approximately 10kΩ to ground (via the virtual earth effect of the op-amp's negative input). The input at B has a resistance of 20kΩ to ground (neglecting the op-amp's input impedance). While driving this stage from a single ended or active balanced source on a short line would give good CMR assuming close tolerance parts, if driven by a long line or from a transformer the CMR will degrade badly due to the unequal input impedance.

Fig.2 shows a topology which I think I originally saw in *Studio Sound*. This circuit is balanced, and by the right choice of components will give very good results. **Fig.3** is the so called 'Instrumentation' receiver, and although more complex, is also truly balanced. Both of these circuits will give better results in practice when used with an input pad as shown in **Fig.4**.

The topology in **Fig.**1 has been produced by manufacturers such as PMI, Analog Devices, and Burr Brown for audio use and it is disappointing that they did not spend a little more time on the design before committing to silicon.

Mr Duncan's graph (**Fig.3**) of variation of CMR with component tolerance is as would be expected. 1% gives 40dB, .1% gives 60dB and so on. However in the practical world the resistors are less of a problem then the capacitors. It is possible to buy or easily trim the resistive component. Obtaining close tolerance capacitors is more difficult or expensive. However the point that I would make is that 40dB of CMR is better than no CMR at all, and a great deal of professional and semi professional equipment does not have any balancing on inputs. I find it very annoying to come across the new Whizzbang box which Studio X has just bought to find that in order to interface it with their equipment reliability requires me to balance it. The extra cost at the manufacturing level is trivial, but at the end-user level is considerable. I would plead with equipment manufacturers to please balance your product. There is a huge market now in the semi professional area and much of this product is not satisfactory in terms of interface.

And now a challenge to Mr Duncan and others. Come up with a balanced output stage that acts like a transformer! As a final aside, have you noticed how all that old equipment (Neve, Pultec and so on) is so well regarded? And they are all full of transformers! There is a lesson here somewhere.

D W Jane, Auckland, New Zealand.

Ben Duncan replies

I agree wholeheartedly with Mr Jane that the one op-amp circuit should not be called a 'balanced' receiver. The term is however common usage. Ideally, we should all learn to use the less common expression 'debalancer' (a double entendre!) or 'quasi balanced receiver'.

I also agree that it is sad that the SSM division of PMI (now part of Analog Devices) apparently rushed into fabricating this less than perfect circuit. The article in a past issue of *Studio Sound* referred to by Mr Jane dealing knowledgeably with these balancing issues is Ted Fletcher's 'Balanced or balanced?' (*Studio Sound*, December 1981). In defence of the one op-amp circuit, it is worth remembering that this achieves useful results with unbalanced sources (see Ted Fletcher's earlier 'Balanced or Unbalanced?' (*Studio Sound*, November 1980), as well as having a minimum signal path.

The balanced output stage that acts (almost) like a transformer was developed some years ago and is in universal use—as implemented in Analog Devices' SSM-2142 IC, for example. More recently, a higher performance alternative has been patented and is available. When not needed for isolation, I believe that the sound engineers' love of transformers arises only in the context of the mediocre-quality active electronics that passes in much supposedly professional gear. At this point, Mr Jane and I clearly agree: any analogue (or even digital) equipment without balanced inputs is in the 'toy' class.

Cross connection

Dear sir, please allow me to say that Neutrik, as the leading XLR manufacturer (at least that is our view), are well aware of the problems you raise and indeed showed XLR's at the Paris AES which are designed to allow them to survive this latest crisis.

I must also correct your statement that Neutrik black XLR cable connectors are nonconductive. It is true to say that they have been painted in the past but two years ago in view of EMC we developed, in partnership with our plater, a new black chromating process and the connectors are conductive once again.

B. Weingartner, President, Neutrik (UK) Ltd.

Duncan backlash

Dear sir, In 'EMC: the Backlash' (*Studio Sound*, February 1995) Ben Duncan seems to be put out that good old analogue pro-audio is being 'lumped in with computers'. Unfortunately, this is what is actually happening in the real world—and it is not just computers either, the environment in which purely analogue pro-audio equipment has to function also includes: switch-mode power supplies (even for desk lamps); cellphones (the new GSM creates much more interference than the older analogue types); wireless microphones.

It also seems fairly obvious that analogue pro-audio equipment must expect to be in close proximity to digital (computer technology based) pro-audio equipment. I know of one video-editing suite where the interference field strength in the corridor outside is 7V/m, more than double the level in the generic immunity standard.

The realisation that the world is becoming very much more electrically noisy, and that products which have no immunity to interference will increasingly not work properly, is the basis for the immunity requirements in the EMC Directive.

Readers will be familiar with the restrictions on use of personal electronic products when flying: they may not be aware that CD and DAT machines, portable computers, and cellphones, are the worst offenders—interfering with the analogue signals in the aircraft's navigation and attitude control systems.

Is Ben suggesting that such equipment should not be allowed to be used in pro-audio environments either?

If a manufacturer's products are really only going to be used in environments where possible interfering sources are well controlled and the test limits in the harmonised standards are inappropriate, the manufacturer can use the Technical Construction file route on compliance with the EMC Directive. In some circumstances this would require no testing and could cost very little indeed.

Ben also appears to be having a problem with 'expert assessment of EMC requirements [that] varies immensely, depending on whom you address.' I am sure I don't have to spell out that you do not have to believe someone's own assessment of whether they are an expert. Choose your experts carefully! Ask them what qualification they have to speak knowledgeably about the pro-audio environment. Ask them what qualifications they have to speak knowledgeably about how a (insert your type of company here) can best comply with the EMC Directive. You will find that the number of experts which pass both these tests are actually very small, and the advice they give will match more closely.

Both myself, and Ian Ball of the EMC Test Centre (whose letter was also featured in the 'EMC backlash') have direct access to both the UK and European EMC Test Labs Associations. These associations exist to harmonise the actual interpretations of the EMC Directive across the UK and Europe.

I have already had occasion to ask these associations for clarification of issues on which certain EMC 'experts' disagree. Their judgements are circulated to every EMC Competent Body, and although they do not (yet) have the force of law, following the judgements of these associations certainly qualifies as 'best practice' and as 'due diligence'.

As far as the level playing field is concerned: the ability to close down illegal competitors is a big plus. I know of several companies (not in pro-audio, yet) who are eagerly awaiting the 1st of January 1996 so that they can shut down their competitors. Causing major headaches, if not complete shut down, for competitors who have ignored the EMC Directive can even be as simple as making a single phone call to an enforcement agency (Trading Standards in the UK).

It is now much too late to even think of changing the law on EMC.

Whingeing does not help any technical directors with the EU Declarations of Conformity that they are legally required to sign for all products sold after the 1st January 1996. It is time for constructive opinions and positive action.

Eur Ing Keith Armstrong CEng MIEE MAES ■

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Kevin Hilton

The development of terrestrial TV broadcast depends on transmission formats. Who controls these controls the future

Transmission. It is not a word that fills the soul with joy and at one time was an indication that a less than stimulating conversation was imminent. Everyone appreciates that the really sexy bits of television and radio would be for nothing without transmitters because they wouldn't get anywhere, but that still does not change the fact that a transmitter looks like a filing cabinet full of electronics, only not quite as interesting.

But in the last couple of months, transmission has become one of *the* hot topics. You cannot stop people talking about it, and they're not just complaining about how a fault at the Crystal Palace transmitter ruined their evening's viewing. The explosion in television channels depends on the delivery system chosen, and while satellite, cable, wireless cable, and, an outside bet here, the Internet are grabbing the high-tech headlines, good old fashioned RF transmission has suddenly popped back into the frame.

Around a year and a half ago, some transmission experts were predicting the end for conventional techniques, saying that a mixture of satellite and cable would kill off UHF in all but the outlying regions in under 15 years. Today, nobody is making such extravagant claims. If anything, the realisation is that whoever controls the terrestrial transmission networks will be best placed for the future, given that the younger delivery formats still only account for a minority of viewers.

Two recent events have changed the attitude towards RF: the White Paper suggestion that the BBC's transmission network might be privatised, and NTL's announcement that they are ready to build the UK's first digital terrestrial system by 1997. At the same time, there has been an upturn in transmitter business, as underlined by Bob Weirather at leading manufacturer Harris Corporation, 'The idea of digital TV has been accepted by both the commercial broadcasters and public service operations like the BBC. The uncertainty that everyone was experiencing has gone because of the realisation that NTSC, PAL, PALplus and SECAM will continue as digital won't come as fast as people thought, meaning that broadcasters can think about renovation and expansion.'

Depending on what the politicians and regulators decide to do, of course. The UK Government ignored calls from its own radicals to privatise the BBC, but placated them with the option to sell-off transmission. I'm with Robin Williams on this one: partial privatisation is like partial circumcision—do one thing or the other, or forget it. However, there is support for the proposal, largely from the right-wing think tank The Adam Smith Institute, which has published a slim volume called *Transmission To The Private Sector—The Future Of The BBC Transmission Network*.

Call me mean, but I'll spoil the ending for you by saying that the report's author, Keith Boyfield, is in favour of establishing the Beeb's transmission department as a separate company, responsible for publishing its own annual report and accounts. As soon as possible, he goes on, it should be privatised, 'allowing the newly privatised entity to raise private-sector capital to invest in digital technology'. It takes Mr Boyfield 40 pages to come to this unsurprising conclusion, during which he spends much of his time criticising the Corporation's lack of vision and its apparent reluctance to release information and balance sheets.

The BBC has issued a terse rebuttal of this report, saying that its prime concern is to ensure a cost-effective service on behalf of the licence payer, adding that there was no indication that 'the alternative' would be any better at that. This alternative could be embodied by NTL, an organisation that is hugely praised by Mr Boyfield for its policy of entering 'related markets' as well as making its core business highly profitable.

This preoccupation with privatising transmission goes back to the dark days of Thatcherism and the Peacock Report in the 1980s, and started in October 1991 when the IBA was wound up and its engineering division became NTL. This effectively privatised one part of terrestrial transmission in the UK, the mechanism dealing with the ITV network, Channel 4, S4C, and commercial radio. The idea was to stimulate competition, but apart from a few radio stations opting for small companies like Phoenix Communications and sbs (who look set to do well when community broadcasting is introduced), NTL are relatively unchallenged, particularly in television.

If digital terrestrial television (DTT) is approved by the government, then NTL are set to expand their current activities and introduce service by 1997. At the company's press conference announcing this project, some journalists made the point that NTL were manoeuvring to become the sole provider in this field, especially given the urgent tone of the event and the observation that the 'window of opportunity' would close by 1998.

Naturally, NTL's chief executive, Andy Sukawaty, who was brought in from Mercury One2One and gives the company an assured, corporate gloss, dismisses such suggestions. 'We are a transmission company that sits in the middle,' he states, 'a catalyst who will ultimately implement the technology.' The press conference demonstrated the first-ever live multichannel DTT pictures in the UK, with four services broadcast from NTL's Croydon site, alongside a conventional analogue picture from Crystal Palace, only a few miles up the road.

Privatisation of the BBC's transmission network would add greatly to NTL's plans, although it would compound the monopoly situation that the Adam Smith Institute are so concerned about. NTL are heavily in favour of privatisation and are interested in acquiring the BBC operation, but think that the Monopolies and Mergers Commission would pass this move. As an incentive, NTL reckon that savings of between £10 and £20 million could be made by combining the two transmission networks.

Whatever the outcome of the White Paper proposal, NTL have already written to the Beeb offering to digitally transmit its programmes in parallel with ITV and C4 at less than £4.8 million per service. 'We expect that there will be competition in the future and we welcome it,' said Sukawaty, 'but the BBC must not be given a favoured position over ITV and C4. The future is now for digital terrestrial.'

As with the privatisation issue, the BBC have issued a statement, this time pointing out their role in the research and development of DTT. 'The corporation will continue to work closely with NTL and other broadcast colleagues both in the UK and Europe in setting the technical standards for implementation,' the communique continues. Feasibility studies are due to be published on the matter towards the end of March, a time when the Corporation says it will comment further.

In the meantime, NTL are continuing with their crusade to convert those who doubt the viability of DTT. 'With any new technology there will always be naysayers,' counters Sukawaty, who indicated the bank of TV screens to his left during the press conference. 'We're trying to eliminate some of the doubts—just look at the technical quality, it's already floored some of the doubters.'

The improvement in quality was undoubtedly impressive, although it's not a good idea to have pictures running while people are meant to be concentrating on something else—it's very distracting. If they get the go-ahead, NTL intend to invest millions of pounds in building a pan-UK network, with the home viewers picking up the signals through a set-top box, which will give access to pay-TV services offering movies and sport, all with pristine, widescreen clarity.

What is worrying some is not the technology, but the software—if DTT does not offer anything substantially different to conventional terrestrial broadcasts, then the viewers could decide that it's not worth the bother, especially if NTL are right and the first set-top boxes cost around £300 (don't forget that the company is involved in a joint venture with consumer electronics manufacturer Pace). 'More than 30 services are possible,' Sukawaty predicts, 'and we've set the money aside and are confident that everything will go ahead. But we need the programme providers behind it and they need to give us as many programmes as possible.'

All of which sounds like a self-fulfilling prophecy: just because something can be done, we then create something to occupy the space, whether we need it or not. This may look dangerously like a case of technology for its own sake, but it could be even more sinister than that. If free enterprise goes mad, then it has to surround itself with something to justify its position—the technology is merely a scapegoat. ■

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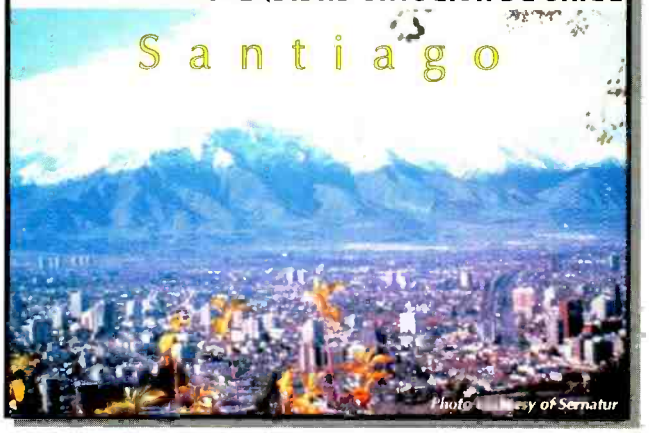

South American countries are now joining the international pro audio market. The standard was set at the First Annual South American Pro Audio Expo in June 1994 in Buenos Aires, Argentina. The next host to the South American Pro Audio Expo is appropriately, Santiago de Chile. Santiago boasts South Americas strongest and most vibrant economy. Chile is a leader in the education of sound and acoustic engineering, offering four specialized Universities. Chile, as well as other South American countries, will now continue to have a unique annual hands-on experience with the latest in sound technology. We look forward to having you and your company be a part of the growing Pro Audio Marketplace in South America.

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Martin Polon

Are the viewers right—is television always bad?

Despite technical gains made in television sound quality, the typical viewer's perception of sound quality has not increased significantly. Admittedly, not all local TV stations have embraced the issues of stereo (let alone Surround) sound production and postproduction with equal enthusiasm—one station executive commented on local broadcasters, saying: 'the engineers treat the loss of stereo technical-quality as though they have witnessed the death of their first dog. Nothing in life is that black and white, on stereo television, we all have to have it to sell ads at the same rates. And ad revenue, my friend, pays the bills for the engineers as well a the rest of the station.'

But that is only part of the problem. The real difficulty is that despite gains in using digital technology in production and postproduction and transmission, the technological infrastructure of the television industry has been very slow to change and works against the transfer of sound from the production mix to the viewer.

Consider: for television broadcast, stereo television-programme audio will be transferred repeatedly. TV audio travels from original recording to postproduction to edit copies to transfer to digital or analogue-videotape copy for 'air' origination to network 'airing' (or syndication) to local reception and on-air transmission.

The potential for abuse of the technically perfect origination copy is significant. In the US, this transfer is usually made on the West Coast—where most TV programmes are produced—either by the production house for the network, or by the syndicator, or by an outside transfer house. That so-called 'original' tape is usually delivered to the appropriate network facility or to the syndication recipients via satellite uplink and downlink. In the case of network origination 'on-air' in the East, the programme is received, routed through various network plant facilities and again recorded on video tape for future network airing at the appropriate time and date.

When it is finally ready for distribution to the entire network (or it is directly syndicated), it is then played back, routed and signal processed through the network plant. after the passage up and down via satellite on the transponder electronics as a network (or syndicated) feed, it will reach the downlink antenna and electronics of the local broadcaster. There it will be sent through several levels of switching, control, routeing and signal processing before being sent to the transmitter via STL (Studio to Transmitter Link) or telephone company facilities. At the transmitter, the signal will be signal processed and be sent out over the air waves.

Consider then that there may be as many as 100 audio transformers passed during the stereo signal's travels from studio to home. There may be as many as 100 switching, patching and transmission points where signal phase integrity may be compromised. And there are hundreds of points where hum and noise can be introduced into the audio. Even if digital audio is used in major components of the audio signal path (such as videotape recorders, signal processors, mixers and so on), analogue still lives in various TV audio processing systems and ancillary equipment at various points in the transmission chain. Add a confluence of differing digital-coding technologies in digital systems from different manufacturers and you may have a trail of undesirable artefacts along the way, as well.

Yet no matter what is done—good and bad—in getting the signal into the home, the tragic disregard for stereo-sound transmission standards on television receivers has left little or no option to improve the audio quality at the end-of-the-line. Today, one finds four kinds of sets in use and being sold. The first category is the mono TV set. There is no absolute number for any percentage of stereo sound on TVs until one hits the 25-inch TV set, from which point nearly 80% of the installed base is stereo-equipped. But smaller sets frequently are not.

The second grouping includes all stereo TV sets utilising some but not all components of the MTS-DBX (multichannel television sound) stereo reception scheme. The third group includes all psuedo-stereo or alternative stereo TV sets utilising none of the components of the industry-adopted MTS scheme but instead has dedicated chips which according to the manufacturers, 'sense the presence of the transmitted stereo signal and recreate it accordingly'. It is estimated that at least 20% and possibly as many 30% of all sets sold and labelled as stereo are not equipped to correctly decode the MTS signals with appropriate hardware.

The fourth category utilises the approved and sanctioned MTS and DBX chips to receive stereo broadcasts appropriately. Unfortunately, far too many of these sets are not equipped with decent output electronics to feed audio output jacks. Thus, they are incapable of properly feeding augmenting sound systems. Also, any of these same 'stereo' TV sets are equipped with the infamous 'Ubangi' 2-inch x 3-inch, or 3-inch x 4-inch speakers for their audio reproduction.

To many in the television industry, it seems a miracle that any stereo signal arrives in the home. None of the above address the additional nightmare of the US cable TV industry.

Yet there has been progress over the ten years since the advent of MTS stereo television. And much of the audio now accompanying TV pictures is better than it has ever been. Despite the problems, however, there is no excuse for complacency at local television stations. The first step in continuing to improve the quality of television sound is to monitor that sound properly. If technical staff cannot hear problems, they cannot fix them.

> The potential for abuse of the origination copy is perfect

In the first place, all stations must have a cable TV connection in master control to monitor on-air audio. Remember that as many as 75% of your total audience many be getting their audio through the cable system.

Secondly, though many in the TV industry view it as a hard fought battle well won to get most TV stations to at least monitor their on-air audio, rather than in-house line feeds—there are still many TV operators who either monitor in-house or use a feed from a modulation monitor. Unless a stereo TV set is being used to monitor on-air signals, the station will not be monitoring what the viewer receives.

It may also be prudent to replace every audio transformer in your physical plant that was manufactured prior to 1980. Use state-of-the-art transformers if you have to use transformers at all—and accept that you many have to use transformer due to leakage currents and-or electrical safety-isolation issues.

State-of-the-art audio monitoring facilities should be installed in master control. Even stations with a reputation for quality audio put their emphasis on audio production facilities—not on-the-air monitoring of the broadcast signal. Most master control facilities do not put the same kinds of emphasis on audio monitoring as they do on the visual.

In the 1990s, it still is not that unusual to find audio being monitored in cavernous master control spaces via speakers built into rack panels or sloping enclosures attached to the top of the equipment rack on the facing wall. One also finds recording studio near-field monitors on video consoles in untreated barn-like spaces or floor standing inexpensive hi-fi speakers to the side of operating positions, and so on.

Acoustical treatment and-or noise reducing audio enclosures for the audio-video monitoring position should be used in master control. No-one would attempt to monitor recording studio audio in a bus depot, but that is exactly the acoustic comparison to the space here crucial audio quality decisions are made in some local television stations.

Monitoring loudspeakers and amplification similar to that used in recording studios are ideal for TV broadcast use. Investment in high-quality speaker systems is essential in dealing with complaints about audio problems. How many times has a master control operator had to say 'I cannot hear anything wrong'?

Ultimately, it has to be recognised that TV audio in the US suffers from *laissez-faire* technical politics as well as from parsimonious financial behaviour. 'We've always done it that way,' 'You can't fight the system,' 'We can't afford it,' and so on have for too long been the response to requests for improving TV sound. How all of this is going to integrate with the forthcoming multichannel, digital standard for high-definition television should be very interesting, indeed. ■

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TEKTRONIX 764

Tektronix *764*—easy to learn, difficult to forget

Although they are one of the world's largest manufacturers of test equipment, some readers may be unaware of Tektronix. Those who are, probably realise this American company are also market leaders in the provision of Waveform Monitors and Vectorscopes which are a necessity of life in the analogue video world.

In the field of audio test, Tektronix —along with Hewlett Packard—were among the main suppliers until a few staff left to set up Audio Precision. While never leaving this market, it has been a while since Tektronix launched a major new audio test product. Their *AM700* test set for analogue and digital audio systems, however (see *Studio Sound*, November 1994), shows a strong re-activation effort into our industry, joining the range of products for audio measurement and test grade switching shown at the recent AES convention in San Francisco.

The *764* Digital Audio Monitor is a companion to the *760* series Stereo Audio Monitors for analogue audio signals, which have been in use for a number of years. In the analogue arena, the *760* competes with the BBC-type stereo PPM with its switchable Left-Right or Sum-Difference reading capability, and alternative metering instruments from NTP and others. There are, at the moment, far fewer competitors for the *764*.

The Digital Audio Monitor is also a partner to the *1700* series of video-production monitoring equipment which includes the *1730* series Video Waveform Monitors, *1720* series Video Vectorscopes, and *1740* and *1750* series combination Video Waveform-Vectorscopes. It is intended to sit in the radio-TV production studio or studio central area and provide stereo compatibility, level monitoring and digital signal-quality assurance. Of course there are other uses for anyone else concerned with stereo-mono compatibility.

Construction

As standard the *764* comes in a single unit case of about half-rack width, with a CRT screen and controls at the front, and all connectors (except for headphones) on the rear. The ▶

Already a familiar and authoritative name in video test equipment, Tektronix are quickly making their mark in pro-audio testing. Exclusive technical review by Sam Wise

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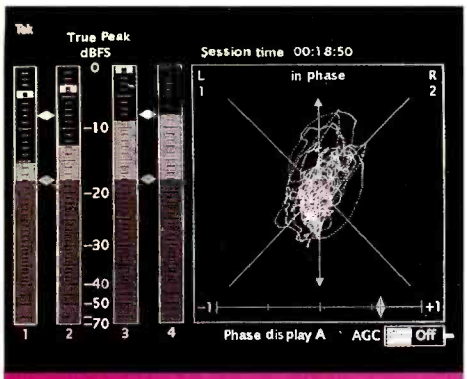

Fig.1: The *764* Audio View

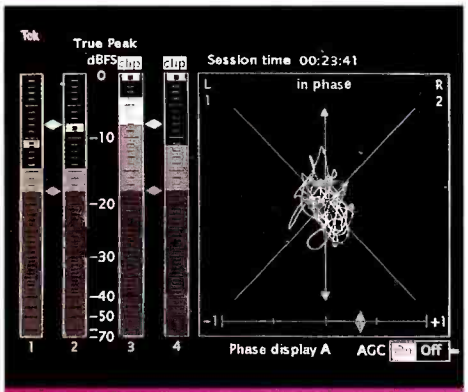

Fig.2: Digital clipping

quality is that which those in the know have grown to expect—the *764* is well built and finished, light in weight and with a comfortable carrying handle on the top. Underneath are a total of eight feet (why?) and a tilt-up frame for desktop use. Alternative cases allow two instruments from the *700-1700* series family to be mounted side-by-side in three units of rack space. This is how they are typically seen housed alongside top-end video equipment or in a video-production—edit-suite environment.

Operation

The instrument is menu driven, using the CRT as a text and graphics display. Control is by a combination of dedicated push buttons, volume and brightness knobs, 'soft-key' multifunction buttons which are labelled by adjacent text on the screen display and finally a rotary encoder parameter selection knob. Even without reading the manual, operation is easy to figure out though the exact meaning of some functions may require a bit of paper enquiry.

Routine operations are performed entirely through dedicated controls. Most of the other function selections use a maximum of two menu levels. The top-menu displays the status of all the parameters within the set selected by the rotary knob. Selecting submenu on a 'soft-key' then allows these parameter items to be changed as required. This user-interface is one of the best I have seen, combining instant access for routinely selected items with quick access to all other parameters.

I-Os

Most connections are made via the rear panel. As standard, the *764* can connect to two pairs of AES-EBU (AES3-1992) signal sources on XLR connectors or their consumer (IEC958) equivalents on BNCs. Selection between signal sources is done via the on-screen menus. Both connector sets are designed to loop-through the instrument to compatible output connectors. The instrument effectively bridges the line unless the built-in terminator is switched in.

Additionally there are VITC (vertical interval time code from a video signal source) and LTC (linear time code) inputs which can be read out on the Session display and printed in the Session Report. Finally, there are REF IN inputs of both BNC and XLR types for connection of an in-house synchronising signal in standard digital-audio format.

Outputs are a 15-pin, D-type, VGA socket for connection of an external colour monitor, and a 9-pin, D-type for RS-232 serial communications with an external computer or printer. The demo unit provided little information on this last facility so it was not possible to test it. But, it will be used for printing out the Session Report which provides statistics on signal performance, and to allow uploading of new software versions into the instrument. Finally, there is a front-panel headphone socket complete with D–A convertors, stereo amplifier and front-panel volume control. A rear-panel analogue audio connection would be a useful addition for use in a central racks area for connection of monitor loudspeakers.

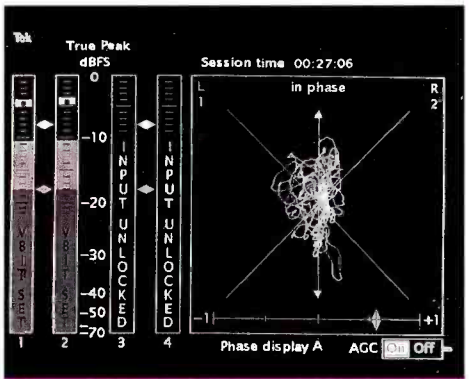

Fig.3: Status information displayed in bar graph

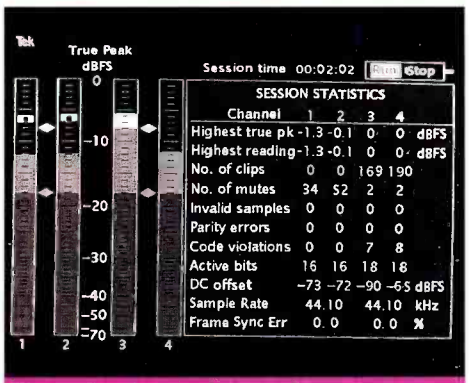

Fig. 4: Session screen accumulates statistics that characterise the quality of an audio program

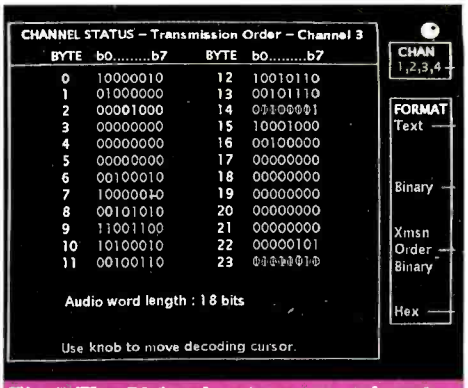

Fig.6: The *764*'s adaptive cursor decodes selected bits

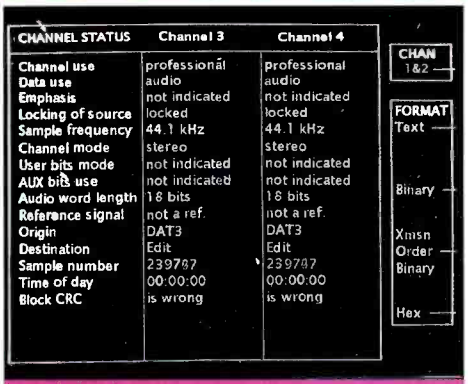

Fig.5: Typical decoded Channel Status data view

CRT display

The main display is apparently a conventional oscilloscope CRT display, but, it is very sharp and crisp, demonstrating Tektronix' expertise in this field. Additionally, a standard VGA (640 x 480) colour display can be connected to the rear-panel connector. This will be useful in a video-production suite where the audio signal monitor could share one of the several computer displays which are usually present. The *764* display can be selected to view Audio, Session Report, Channel Status, user Data or to act as a menu screen for the instrument.

In Audio mode, the two pairs of digital inputs are displayed as four vertical bar graphs. The scale range and reference level of these bars can be adjusted by the user to suit the application. Meter ballistics can be selected from VU, PPM and True peak. As on typical home hi-fi, whichever meter ballistics are selected, a true peak level is indicated and held—here for 0–10 seconds according to user needs. Level indication can be referenced to digital full scale (dBFS) or with respect to a reference level (dBr). In either case, a test (alignment) level and peak levels can be set into the instrument resulting in markers on the *764* level display, and colour change from green to yellow to red on an external VGA display. In addition, the lower part of each bar graph is used for a text-based error display —giving indication of parity or CRC errors among others. Clip is indicated at the top of the meter ▶

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and appears following a user-defined number of sequential, full-scale digital samples.

It is not widely known that the audio reconstructed from a digital signal can actually be higher in level that the full-scale digital signal would indicate. This could happen, for example, when an analogue signal was sampled on either side of a peak, but not on the peak itself. An Interpolation function can be switched on to display this reconstructed analogue signal level, indicating possible overloads in following analogue equipment such as a transmitter.

Displays

Either of two pairs of signals, called A and B, can be selected for phase display at the same time as the audio level adjacent to the level meters. A or B can be defined as inputs 1 & 2, 1 & 3, 1 & 4, 2 & 3 or 2 & 4, allowing comparisons to be available for various signal combinations.

The phase and amplitude relationship between the left and right digital signals is shown in a conventional analogue type of lissajous display. This is the same as the method used in a high school physics class for the display of the amplitude-phase relationship of two signals by connecting them to the x and y-axis inputs of an oscilloscope. When two signals of the same frequency and amplitude are input, this results in a line on the screen tilted 45° when the signals are in phase, and -45° when they are in opposite polarity. Other combinations of amplitude and phase between the signals results in various circles and ellipses being drawn, which indicate to the experienced user information about signal level and phase relationships. When the signal is more complex, such as typical programme would be, the display detail looks a bit like a box of microphone cable after a ride in the car or a snake pit. However, there is still a general shape to the display which tells the user a lot about signal compatibility

This Phase display can either be shown as indicated above—where in-phase tilts 45°—or it can be switched to Soundstage mode where the in-phase direction is vertical and the image width is expressed by the width of the display. Not having used such a display since university, I found that it was possible to get a feel for compatibility within about ten minutes by comparing different source material.

The display sensitivity can be set to accurately reflect signal levels, but then with classical music, the display is very small a lot of the time due to the wide dynamic range. Alternatively, an AGC (Automatic Gain Control) can be activated, keeping the display covering a lot of the viewing area. This is the most useful mode since there are separate audio level bar graphs anyway.

Additionally, there is a horizontal bar graph beneath the Phase display which shows the correlation between left and right signals in a simple form. The scale of this ranges from +1 (fully correlated—mono) to -1 (identical signals with inverse polarity). For suitable mono-stereo compatibility, the bar will display between about +0.4 and +1. It can be set up to average the signals over various time periods ranging from instantaneous to several tens of seconds. Both the phase display and correlation meter read the same pair of input signals.

Pressing a dedicated push button switches the Phase portion of the display into Session mode, leaving the level meters on screen. This gives information on signal characteristics observed during the present 'session'. Among these are highest true peak (always the true digital peak), highest reading (this depends on meter characteristics selected), number of clips, number of mutes, number of invalid samples, parity errors, code violations, active bits (active word length up to 24 bits), DC offset (an indication of correct A–D operation and signal coding at source), and sample rate (true rate measured from the input signal). Session time is displayed using the selected time-code source or an internal clock. The 'session' data accumulation can be interrupted and restarted at any time, and reset as required. the final software will allow the report to be printed out on a standard PC.

In Channel Status View mode, the entire display is taken over to report a range of information contained in the channel status bits. The information is displayed in human readable, rather than the more typical hexadecimal form and includes Channel use (domestic or professional), Data use, Emphasis, and many more. Usefully, this display can also be used to read our the user bits to take off information which might relate to the programme source or destination, or some other in-house application for this information. Alternatively, binary or hex versions of the display can be selected.

Setups and RS-232

As with most programmable products, it is possible to save multiple setups of the many functions of the instrument. This will assist operating environments where setup selection might vary between users, or where various operating conditions occur which are optimised in different ways. Where the *764* is used for fault finding and debugging a digital-audio system, the setups could be sent to optimise its use for different items of equipment which will be tested.

In addition to the uses suggested earlier, the RS-232 port is intended to enable the instrument to be used as part of an automatic quality-assurance system in a digital-audio transmission or switching environment. Under computer control, it will be possible to automatically select inputs to the instrument and to capture the output of the session report to computer for future or automatic analysis.

Performance

The various operational facilities of the instrument were tested using both pure tone test signals and programme material. The unit tested was a beta test model and had a couple of minor bugs, but these were identified and fixed by Tektronix before I notified them. Otherwise, performance was flawless. Meter ballistics were found to comply with the standards mentioned. One aspect which was not tested were the time-code inputs, due to lack of a generator.

Summary

The Tektronix *764* Digital Audio Monitor is easy to use, with only occasional reference to the manual necessary—usually to clarify the exact effect of a setup parameter. Connections to most useful programme, sync and time-code sources are provided, along with both professional and consumer digital signal compatibility. Useful additions to the instrument would be rear panel analogue outputs which could be sent to a local monitor loudspeaker (this could be plugged-in to the headphone socket), an optical digital-audio input and some way to monitor the AES-EBU optional 7kHz coordination channel—which is sure to come into regular use in due course. This last item could probably be included by a software-only upgrade once the market demands it.

Operating methods are quick to learn and difficult to forget, and the information provided is reliable, comprehensive and accurate.

Where there is a need to monitor mono-stereo compatibility within a digital-audio environment, the instrument is one of few options. When its level measurement and signal quality assurance data are added, I know of no alternative. Anyone in broadcasting, or preparing programme for broadcast use will find the *764* a valuable addition to their audio system. ■

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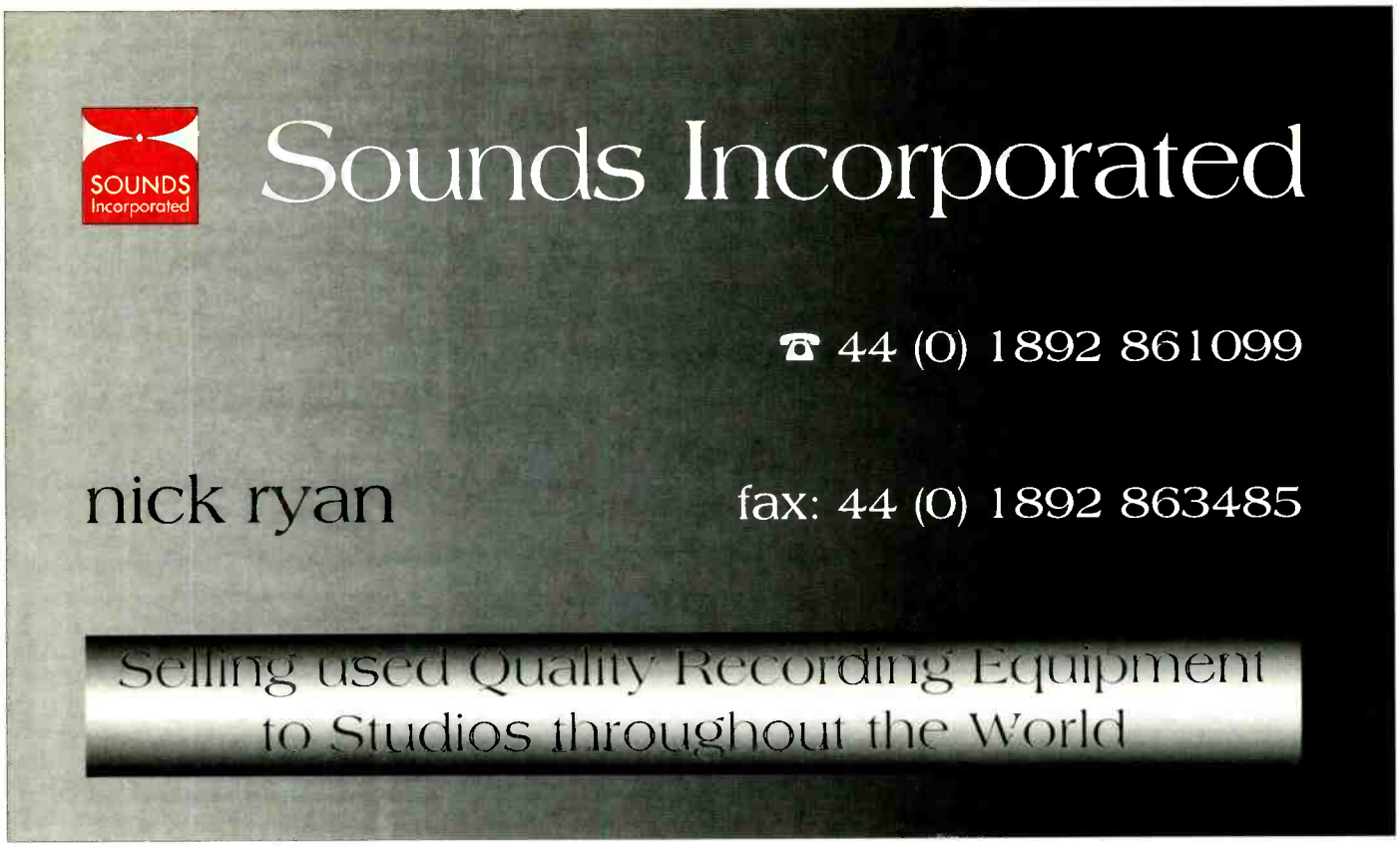

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Barry Fox

Piracy of CD ROM; CD encryption protection and DVD taking sides

The outbreak of peace has spun off an interesting new development. The Bulgarian army has set up its own CD pressing plant, which the IFPI believe is pressing pirate discs. The Chinese military is already suspected of piracy.

China has over 30 CD pressing plants, with an annual production capacity of over 75 million discs. In December Bulgaria tripled national production to 10 million CDs a year by opening three plants, including the one owned by the military.

All the pirate plants began by making music CDs but are now producing multimedia ROM discs. Publisher Dorling Kindersley recently found copies of its family education CD-ROMS on sale in Singapore at one-third the normal price.

At the *CD and CD-ROM Security Conference*—held in London in February—Philips' Gerry Wirtz, best known for his work on DCC, talked about the speed at which home and office copying of CD-ROMs is growing. A few weeks before the London Conference, at the *Consumer Electronics Show* in Las Vegas, manufacturers were showing CD-ROM recorders at a street price of under $1,500.

'Within two to three years all new personal computers will have a CD recorder built in as standard, instead of a CD-ROM playback drive. We see CD-R as the ultimate replacement for today's CD-ROM drives,' says Wirtz. 'The data world does not want to restrict copying. People see copying as almost a right.' Computer companies have solved the problem of copying by fast upgrades. Copies of software quickly become obsolete. This is not like music, where copies do not go out of date. 'CD-R for personal computing will ultimately reach the mass market and pull CD-R as an audio product.

'You need legal backup for technical solutions. The standard for the new CD-Plus format is 99% finished. But people are only now realising that they are moving audio out of its protected environment and into the computer environment where there is no protection.

'When a ROM recorder makes a copy it is just pumping numbers from one disc to another. Everything is copied, whether it is encrypted or flagged with copyright protection. The recorder just makes a duplicate copy.'

'Is it too late to protect CD-Plus?' A worried publisher asked Wirtz.

'No, it is not too late, it is never too late. There is a massive lobby in the computer world against any kind of copy protection. But how long, though, before we see the computer lobby swing round?'

The British company C-Dilla of Reading, have developed an elegantly simple system for controlling home copying of CD-ROMs.

The useful data on the CD-ROM disc, for instance the content of an encyclopedia, is encrypted so that is can only by read on a PC that is loaded with de-encryption software. This software can either be given away, or sold, to legitimate owners of the disc.

In each case, the de-encryption software looks for a 'signature' stored on the ROM disc. If the signature is there, the software de-encrypts all data from the disc automatically. Usually the user is never even aware that it was encrypted. But if the signature is not there, the de-encryption software does not run, so the ROM disc is useless.

When a CD-Recorder makes a copy of an original CD-ROM, it automatically copies all the data files onto the blank CD. But C-Dilla have found a way of putting the signature on a pressed CD-ROM so that it does not copy across to the CD-R with the data.

All CD-ROM discs, and ROM readers, adhere to the ISO-9660 standard. This dictates that there must be an electronic index, or File Descriptor, at the start of the disc, which lists all the data files on the disc and their location. Although a CD-ROM drive must read the File Descriptor, before it can read the files on the disc and deliver them to a PC or CD-Recorder, it does not deliver the Descriptor to the PC or CD recorder. So the recorder accurately copies all the data files onto a blank, while building its own File Descriptor. But the CD-R does not copy the vital signature from the original File Descriptor. So the de-encryptor software will refuse to work with the copy disc.

Could this system perhaps be modified for use with DVD and Super CD?

No-one could ever have predicted how fast and how far the situation on Digital Video Disc and Super CD would move after Christmas. But do not be too sure that the standard issue is fully resolved.

The electronics companies agree that the new format must be able to store a whole feature-length movie, or enough compressed audio to cope with most of The Ring Cycle. They also agree that new players must be backwards-compatible, and play today's CDs.

But the industry is still debating one vital issue. Should DVD store everything on a single side (as proposed by Philips and Sony) or be made from two sides, made separately and then stuck together with glue (as proposed by Toshiba and Time-Warner and now backed by Panasonic).

Forget for a moment the technical issues of whether it is optically easier to focus a laser into a tighter spot through the half-thickness plastics of a glue sandwich. Forget the cost issue of whether it is really as cheap to press and glue two discs instead of one. Stop thinking, for the time being at least, about whether Toshiba's super-high-density pressing will cope with the public's sticky fingerprints.

Instead, just ask a couple of much more basic questions. If DVD is a double-sided glue sandwich, where will the makers put the label? At a recent press conference in new York Toshiba and Time-Warner seriously suggested that one on the two sides could be overprinted with a label, thereby destroying the whole point of having a double-sided disc.

And if they solve the label problem by putting the disc inside a labelled caddy (like those used for some CD-ROM systems), how will they build a backwards-compatible player? It is no mean feat to make a CD player with a slot and mechanism for a caddy, which also plays a bare CD of today's type, as designed to drop into a drawer.

Audio engineers are also starting to worry that no-one has yet given any serious thought to audio-only users for DVD. The movie disc will have multichannel surround sound, whither Dolby AC-3 or a similar compression system. This is not the way to deliver hi-fi to the home. What Super CD needs is uncompressed audio of improved standard, say 90 minutes of 96kHz, 24-bit stereo, with Ambisonic coding of surround and height information.

For those who want to see this happen, take my tip, do not waste time looking for someone on the Toshiba/Time-Warner/Panasonic DVD team who knows or cares about audio, their target is the movie industry. Panasonic's sister company Technics has some fine audio engineers, but there has always been a clumsy split between the two divisions. Thomson and Hitachi are backing DVD as a multimedia and movie medium. Audio is an afterthought.

The way to get things moving is for concerned audio engineers to get together, under the AES banner, and draft a proposal for Super CD. Then present their thoughts to named heads of all the companies involved. That way the industry can never say they were unaware of the issues, even if they do not understand them. With a bit of luck they will pass the AES proposals to advisers who do understand audio, and the opportunity for a genuinely useful second generation music CD will not be lost. ■

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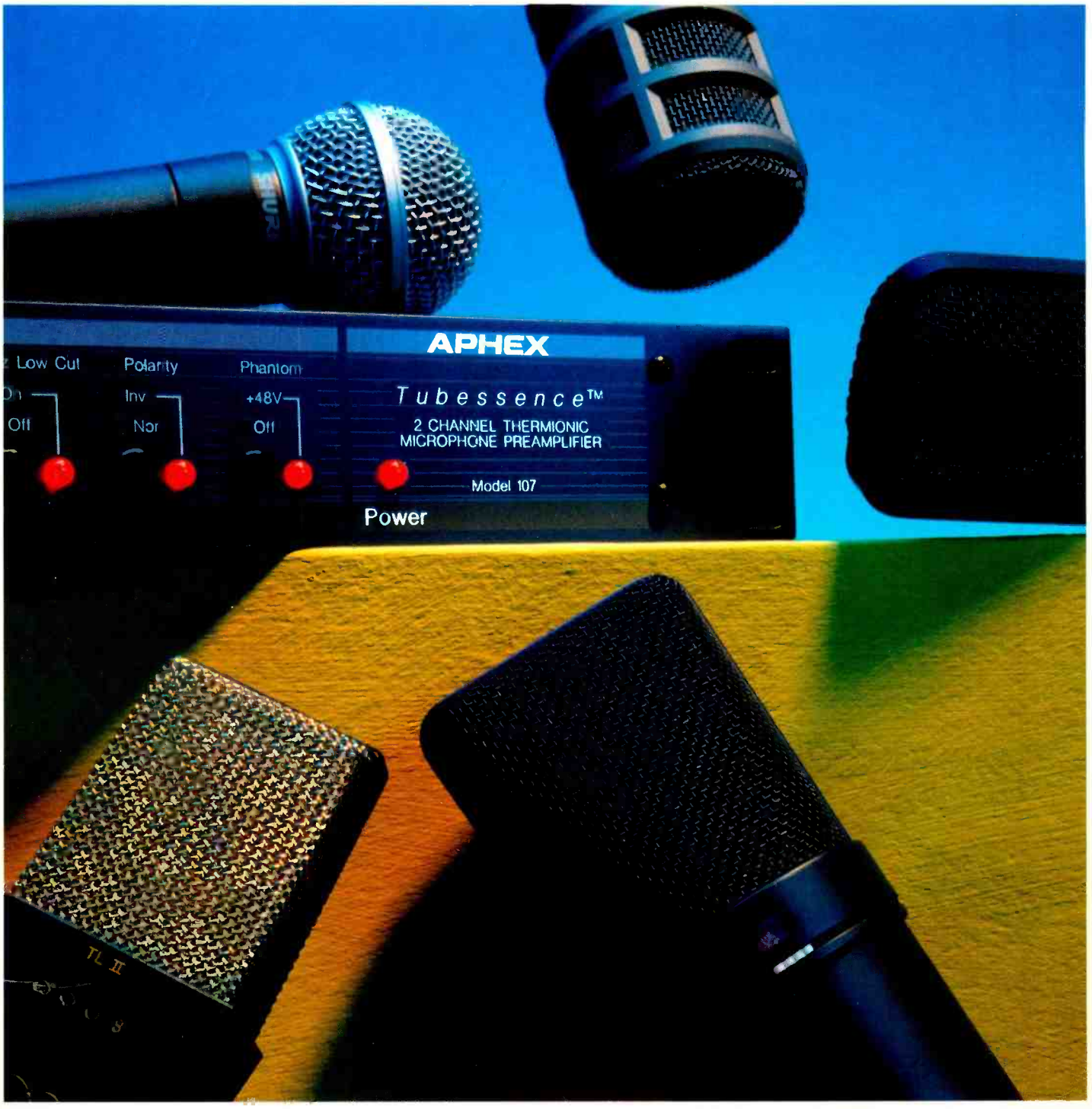

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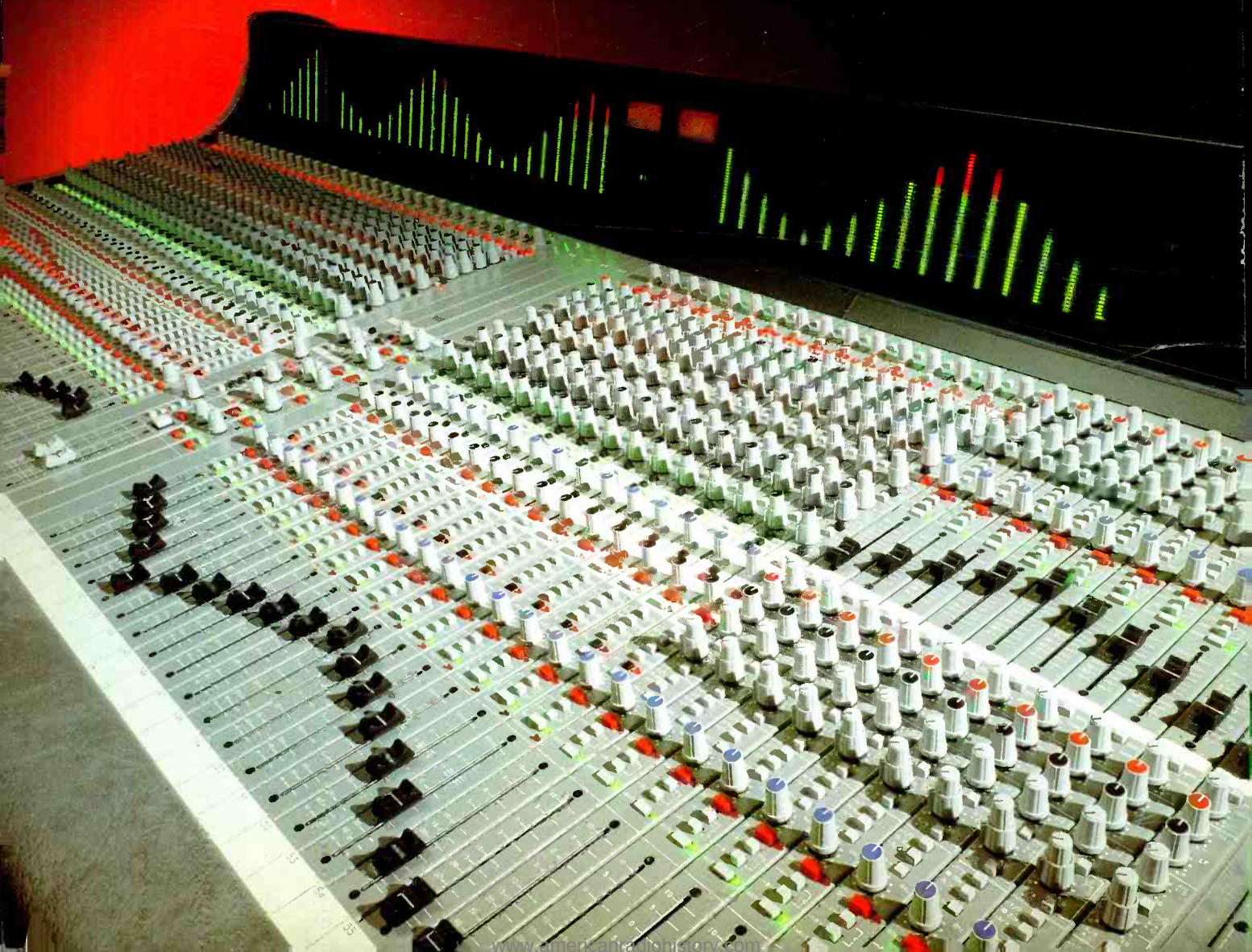

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