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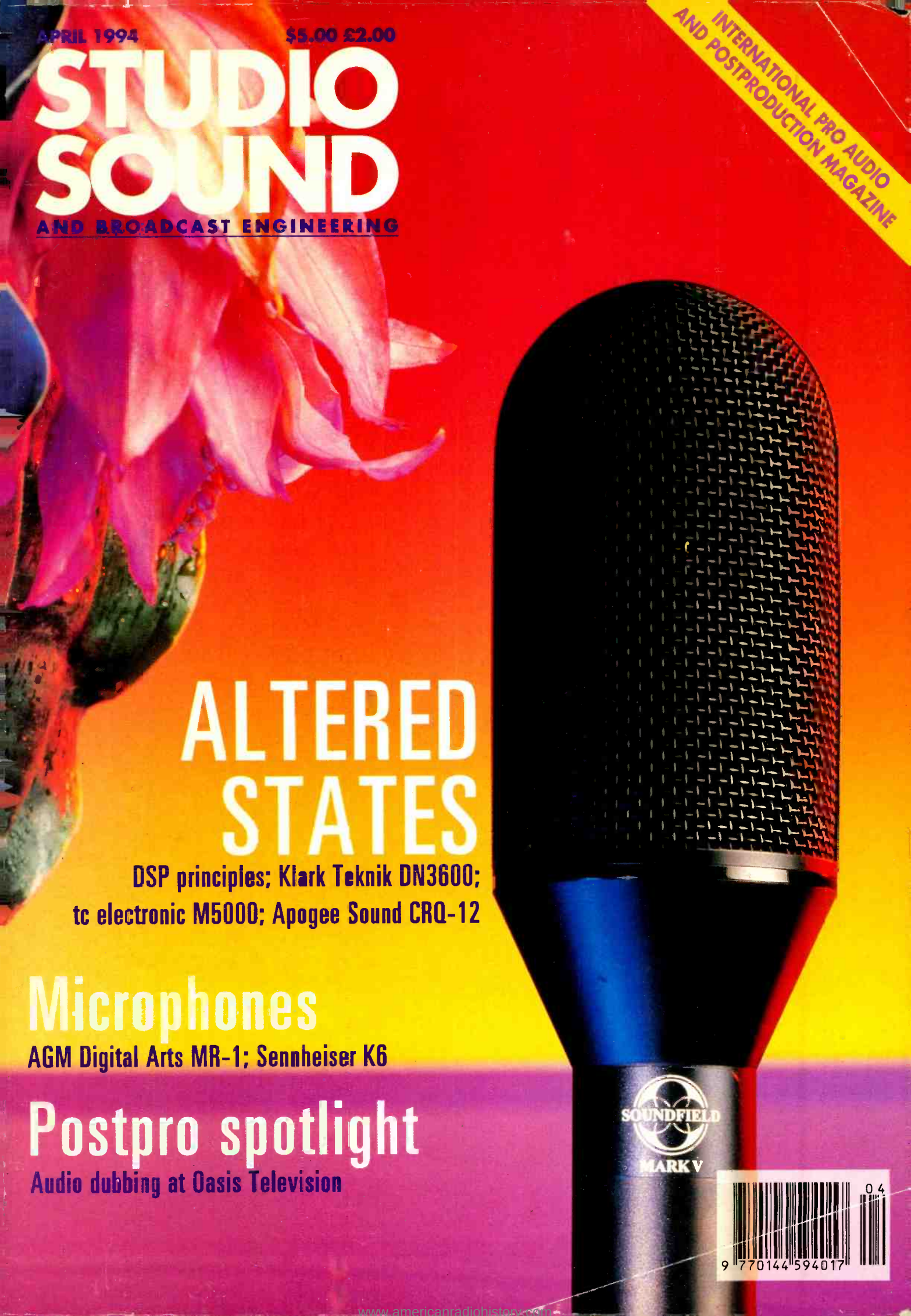
STUDIO SOUND

AND BROADCAST ENGINEERING

INTERNATIONAL PRO AUDIO AND POSTPRODUCTION MAGAZINE



ALTERED STATES

DSP principles; Klark Teknik DN3600; tc electronic M5000; Apogee Sound CRQ-12

Microphones

AGM Digital Arts MR-1; Sennheiser K6

Postpro spotlight

Audio dubbing at Oasis Television

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ILLUSTRATION: CARL FLINT

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The Missing Link

The erosion of the 'traditional' recording studio by cheap tape recorders, drum machines and samplers is hardly hot news. The wrath vented a few years ago by the world of professional recording at the (largely Japanese) developers of cassette-based multitrackers and ROMs blown with expensive studio recordings of kick drums and pianos could probably have been felt in the Far East without the aid of telecommunications.

The pro-studio fraternity felt affronted, that some of their number had been 'replaced' by cheap machinery and sliding standards. Today, the dust has settled, the dignity has been largely restored and certain studios have been closed permanently. On reflection, however, it is increasingly evident that we have lost more than 'just' the lower level of the studio industry.

We have lost more, even, than the partially-treated acoustic of the rooms in which these budget facilities resided (an aspect of personal and preproduction studios which has been replaced by the virtual acoustic of reverberation algorithms and inadequate monitoring conditions). We have certainly lost the ready availability of musical instruments and recording equipment affordable to commercial facilities but denied to most aspiring musicians and composers. Perhaps, and most importantly, we have lost the skills of the engineers who owned and ran these studios.

Often frowned upon by fully-fledged professionals, the rank of enthusiasts and entrepreneurs at the base of the 'recording studio pyramid' provided a valuable link in the music business. Yet the professional recording facility was not a spontaneous creation—rather, it was the culmination of years of technical advancement, engineering experimentation and, of course, business opportunity. It evolved from all these factors and its evolution was sustained, in part, with the willing cooperation of the demo studio.

The modestly-equipped studio of the 1970s was more than a 'way in' for budding artists, it was one of the training grounds for *wannabe* top engineers and producers. And as such, it was a considerable asset. Illustrate this loss, in Britain today there is a need for a relatively cheap recording facility in which there is a good quality acoustic piano (as opposed to piano sample) and an engineer who knows which end of which microphone to point at it. Small gigging jazz bands are among those who are demonstrably being neglected by the recording industry.

And there is more to this than the studios themselves; take a look at the state of modern microphone design and the level of education required to get the most from it. It should be easy for us to agree that we are dealing with a mature technology which demands the respect of its operators. The continued interest in multichannel replay systems is certainly not about to simplify matters should surround systems be accepted by the general public, many orchestral recordists (music only and music-for-picture) are going to be carefully reconsidering their mic techniques.

The practice of larger recording facilities providing cheaper programming rooms in response to technological and musical trends may simply be the beginning of quiet studio revolution. It could be that people tire of the limitations and responsibilities of operating small personal studios (as I am certain many of them will), they will find the smaller, cheaper rooms of larger studios an attractive working environment. Who knows, they might even pick a few useful tips on engineering there. ■

Tim Goodyer

Cover: The *Soundfield* microphone

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International News

In-brief

● **New Editor for *Pro Sound News***
Julian Mitchell has been appointed as the new Editor of *Pro Sound News* Europe. He has been Assistant Editor of *PSN*'s sister publication *Studio Sound* for five years. Joe Hosken has been appointed Group Publishing Editor for Special Projects.

● **Industry movements**
AMS-Neve have promoted Jim James to Marketing Manager. He joined the company's sales and marketing department 15 months ago as Marketing Communications Manager. Ray Gillon, Senior Sound Consultant of Dolby Laboratories has left to pursue interests with three new companies.

● **Sony Broadcast on the move**
Sony Broadcast & Professional UK will be moving to new office premises in Weybridge, Surrey this month. Sony Broadcast & Professional Europe will remain at the Jays Close offices in Basingstoke.
Sony Broadcast & Professional UK.
Tel: 0932 816000. Fax: 0932 817011

● **SBE introduce radio station course**
The Society of Broadcast Engineers (SBE) have introduced the SBE Radio Operators Certification Course, designed for entry level operators at the radio station. The course is intended to replace the former FCC Radio Telephone Third Class Operator License with the Broadcast Endorsement which had been discontinued in 1977.
SBE National Office.
Tel: +1 317 253 1640

● **Turbosound expand R&D**
Danny Cooklin has returned to the Turbosound fold, after three years on the road with Britannia Row's *Flashlight* rigs. He joins the Turbosound R&D department as the new Design Engineer, he already has a substantial practical and theoretical knowledge of the *Flashlight* system.
Turbosound. Tel: 0403 711447

● **Martin Audio strengthen Germany**
Martin Audio have announced the appointment of Beyerdynamic as the new distributor of their products within Germany. Beyerdynamic, based in Heilbronn, will continue to support the successful *F2, F1* and *VRS* ranges of installation systems.
Beyerdynamic GmbH & Co,
Theresienstrasse 8,
D-74072 Heilbronn, Germany.
Tel: +49 71 31 6 17-0/6.
Fax: +49 71 31 6 04 59

● ***StellaDAT* recorder gets UK rep**
Radio microphone manufacturer Audio Ltd have been appointed by Sonosax of Switzerland to distribute the *StellaDAT* time code DAT recorder for the UK market.
Audio Ltd. Tel: 081 743 1518

EC Directive causes unrest for producer's lobby

The right to 'equitable remuneration' for producers to be established under the EC Rental and Lending Directive has moved Re-Pro, The Guild of Recording Producers, to lobby the British Government.

Re-Pro are seeking to have legislation adopted that, in common with practices in most other territories, shares the 'equitable remuneration' equally between performers and producers (record companies).

They are concerned mostly with the danger of diminishing royalties for producers, as new methods of supplying music via digital transmission systems are introduced.

In their March newsletter, Re-Pro reveal for the first time details of their submission to the Monopolies and Mergers Commission and they are inviting all producers, remixers, programmers and engineers to attend a special forum at AIR Lyndhurst on the 18th May which will focus on the future of producer income.

The 1000th Solid State Logic console to be built is this 72-channel *SL 4000 G Plus* with *Ultimation* in Studio One at The Town House, London. In 1978 The Town House Studios became the first studio in the capital to install a Solid State Logic *B Series* desk. Ian Davidson, Technical Manager of The Town House commented, 'We chose the latest *G Plus* console because of the commitment that SSL have made over the years enhancing and improving both the console's specification and sound quality.'

To be or not to be?

The International Broadcasting Convention is set to become an annual event from 1995.
The management committee of the exhibition received the report of a working group looking into the matter during January and they have decided that this year's show, to be held at the RAI Centre 16th–20th September, will be the last biennial IBC.

Commenting on the decision to take IBC annual at the earliest possible opportunity, IBC spokesperson Tony Lawes said: 'We think that it's a case of the sooner the better. If we left it longer, someone else might step in, or Montreux (home of the rival International Television Symposium) will move.'

The 1995 exhibition will take place at Amsterdam's RAI centre between 8th–12th September. Meanwhile, Lawes reported that almost 30% of companies signed up for this year's event were first-time exhibitors.

Meanwhile, some of the major television-equipment manufacturers are joining the fray.

In a letter to John Wilson, Chairman of the IBC Management Committee, that was cosigned by senior management from BTS, General Instrument, National Transcommunications Ltd, Panasonic, PESA, Philips, Quantel, Rank Cintel, Sony and Thomson, the opinion was expressed that two major European shows every two years for the television industry was neither in the manufacturers' nor customers' interests and that the cosignees would not be exhibiting at IBC '95.

The present (until now) arrangement of alternate IBC and ITS events was deemed to be more than satisfactory. The letter also noted that, 'following the progressive improvements in facilities at Montreux and new initiatives planned for 1995 to make the Symposium and Exhibition even more successful, we are satisfied that Montreux offers the best opportunities for us in 1995 and beyond.'

AMS-Neve first

At the recent NAB show in Las Vegas, AMS-Neve were claiming a world first in performing an OMF Interchange from a Mac platform (Avid *Media Composer*) to a proprietary platform (*AudioFile*) using a removable medium.

The demonstration involved taking an Avid removable hard-disk drive comprising 4 tracks of audio with cue information and EDL, all of which had been consolidated by *Media Composer* into the OMF format. The drive was then connected to *AudioFile* on the SCSI chain as a bank C drive. *AudioFile* then required a short time to establish where the OMF headers were, and once this had been done, the system could play the audio, directly from Avid's disk, in real time. Cues were listed in *AudioFile* as normal, and could be auditioned and spliced in the usual way. According to AMS-Neve's Doug Ford all-digital video house Cutters in Chicago already have two *Media Composers*, a *Logic 2* and *Logic 3*, and are keen to beta test this new feature. **Yasmin Hashmi**

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DG 4D: judgement day

The verdict on a complaint made to the British Advertising Standards Authority concerning the advertising campaign mounted by Deutsche Grammophon over their 4D Audio Recording System (see *Studio Sound*, January 1994) has been published.

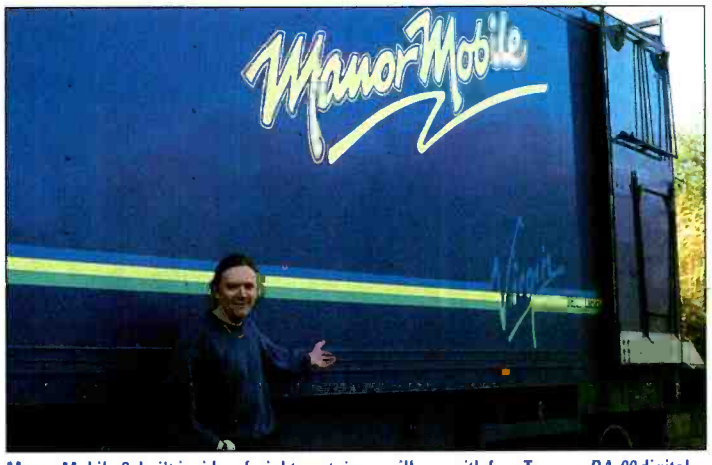
Choosing to pass comment rather than find for or against the complaint, the ASA have said the following: 'The advertisers stated that the advertisements were addressed to potential purchasers of compact discs and that their purpose was to describe the recording techniques used by Deutsche Grammophon to distinguish their recordings from other digital recordings. They also provided technical information and test data in support of their claims. The Authority sought the views of technical experts within the field and found that there was a divergence of opinion within the recording industry concerning the respective merits and advantages of the advertisers' recording system. It understood that the advertisers used existing technology in a unique configuration with specific components adapted by Deutsche Grammophon. While acknowledging that there was no agreed standard definition of true 21-bit conversion within the recording industry, it nonetheless considered it inappropriate for the advertisers to use their own definition in the advertisement without a full explanation to an informed, but not expert, readership. It noted that the advertisers would not repeat the advertisement in its current form and that they were prepared to seek prepublication copy advice from the Committee of Advertising Practice.'

PolyGram Classics, on behalf of Deutsche Grammophon acknowledged the ASA's statement, adding the following comment: 'A number of specific issues relating to the analogue-digital conversion measurement standards within the industry seem to be raised by the ASA statement. Deutsche Grammophon Gesellschaft thus plan to invite the Audio Engineering Society Head Office in New York to discuss, comment and issue a statement on the following questions:

'a) What is true 21-bit conversion?

'b) Under what conditions can specific components be described as "adapted" rather than "developed"?

'Deutsche Grammophon Gesellschaft will continue to use, further develop, and promote their own 4D Audio Recording System, encouraged by the wide acclaim that the first 4D recordings, released during the past year, have won from consumers, critics and artists alike.'



Manor Mobile 2, built inside a freight container, will run with four Tascam *DA-88* digital recorders, one of the first mobiles to choose such equipment for on-the-road use

Manor Mobile 2: a trip with Tascam

UK pro-audio distributor The Home Service have fitted out Europe's first Tascam mobile recording studio.

Manor Mobile 2 has just gone on the road with a 32-track Tascam digital recording system, made up of four *DA-88* 8-track recorders, and a Raindirk *Symphony* console.

The studio, built inside a freight container, will be based at Manor Studios, Shipton-on-Cherwell, Oxon.

Other mobiles The Home Service have fitted out include Eurosound in the Netherlands; El Camion, Barcelona and Track One, Stockholm.

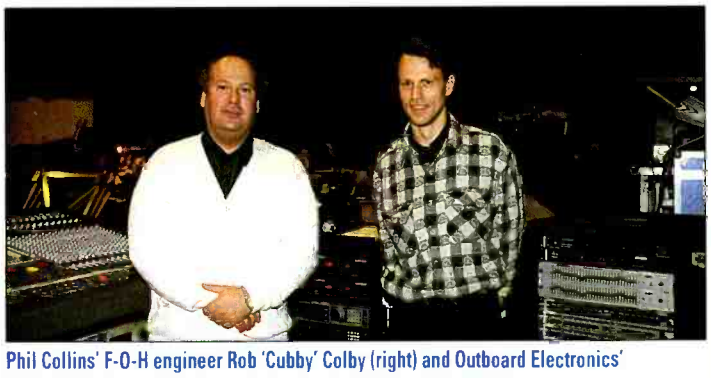


PHOTO: MARY WALSH

Phil Collins' F-O-H engineer Rob 'Cubby' Colby (right) and Outboard Electronics' Robin Whittaker at the rehearsals for the *Both Sides of the World* tour

Phil Collins automates *Sides*

The Phil Collins' *Both Sides of the World* tour for 1994–5 has begun with ShowCo providing the sound and Rob 'Cubby' Colby driving the F-O-H.

This is a major tour lasting into next spring and has been in rehearsals at Bray Studio near Windsor for six weeks. Spectacular concept sets will accompany the songs and to help with audio setups the two Midas *XL3*'s that Colby is using feature fader and mute automation.

For Rob Colby, a veteran of Prince and Collins' last *Seriously Live* tour, the idea of automation is exciting.

'We're only automating the faders on the one desk at the moment, but the automation will handle much more. For me this is the first time with automation and its the natural step for live sound. Using the *Mac Powerbook* we just click onto the different song setups and off we go. I have complete manual override and that gives me more time to worry about the mix and not everything else that is happening.'

Automation is from UK company Outboard Electronics but the news is that the next Midas desk, the *XL4*, will carry automation from day one.

Contracts

● Second *Sigma* for NHK Osaka

Digital Audio Research have recently supplied a second *Sigma* digital audio workstation to NHK Osaka, Japan, for operation in the latest of their new digital studios. The 8-channel *Sigma*, complete with the DAR segment-based processing and full DSP performance, will be used for audio recording, editing and layback tasks on NHK's fully digital drama productions.

DAR. Tel: 0372 742848

● SSL *G Plus* in Far East Factory

An *SL 4000 G Plus* have recently been bought by Music Factory, an independent recording facility in Hong Kong. The 56-channel console, fitted with *Total Recall* and *Ultimation*, is to be installed as the centrepiece of Tang Lou, the company's newly built studio on Hong Kong Island.

SSL. Tel: 0865 842300.

● *Foundation 2000* ships worldwide

Foundation 2000 are now shipping, and sales to date include: Soundstorm film postproduction house in Burbank, USA; Jor-Dan Productions, Wheaton, USA; Oporto Polytechnic Institute, Portugal; and Audio Mixers, New York.

Fostex UK. Tel: 081 893 5111.

● Modus goes for the full 20-bit

Independent classical recording company, Modus Music have acquired two Nagra *D* recorders to further the company's commitment to 20-bit recording. The company which produces recordings for labels as diverse as EMI, Chandos, Conifer, ASV, BMG and even Sony in Japan. With the purchase of the two Nagras, equipped with onboard 20-bit A–D convertors, the company now have five 20-bit capable recorders in the field.

● Second *Scenaria* for Tape Gallery

The Tape Gallery in London is installing a second SSL digital system, a *Scenaria OmniMix*, and is updating its first *Scenaria* to *OmniMix* specification.

● Stirling supply DDA to Koh-San

A DDA *QMR* console with *microFILE* automation, supplied by Stirling Audio Systems, has recently been installed at Koh-San studios in Bath. The console, which is the centrepiece of the newly refurbished Studio 1, is one of the first *QMR*s to be installed in Britain.

DDA *QMR* desk at Koh-San studios

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***SSL.6048E.** 48CHANNELS FITTED. G. SERIES COMPUTER. T/RECALL. RIGHTHAND PATCHBAY. PHONE FOR FULL DETAILS/PRICE.
***HARRISON.MR2.** 48 FRAME FITTED 32 CHANNELS (MORE AVAILABLE). PPM METERING RIGHTHAND PATCHBAY. MASTERMIX AUTOMATION. PHONE FOR FULL DETAILS/PRICE.
***HARRISON.MR4.** 36 FRAME. 36 CHANNELS. RIGHTHAND PATCHBAY. LEFTHAND PRODUCERS DESK. MASTERMIX AUTOMATION. PHONE FOR FULL DETAILS/PRICE.
***DDA.AMR12.** 44 FRAME CONFIGURED 20/12/24/2. BANTAM PATCHBAY. MIDI AUTOMATION. PHONE FOR FULL DETAILS.
*AVAILABLE END OF MAY: NEVE 8038 AND NEVE 8058.

***Please note all consoles are exclusive to AES Pro Audio or are owned by AES Pro Audio**

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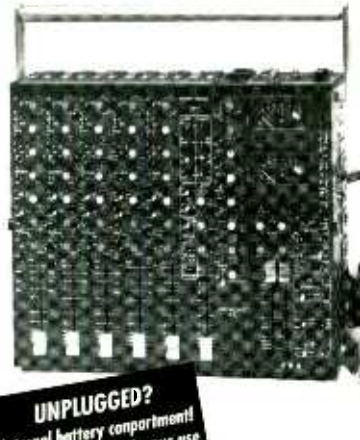

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EC RSI Directive

A recent EC Directive has been making its presence felt to UK audio manufacturers, with many companies predicting critical knock-on effects throughout the industry.

The Directive highlights recent EC concern over Repetitive Strain Injuries (RSI), especially among operators of large mixing consoles, and calls for manufacturers to respond accordingly with urgent design revisions. Dimensional constraints are stated in the Directive's guidelines, drastically restricting console worktop area to well below 1m². There are also restrictions on the density of controls, the range of control movement and on panel slope angles.

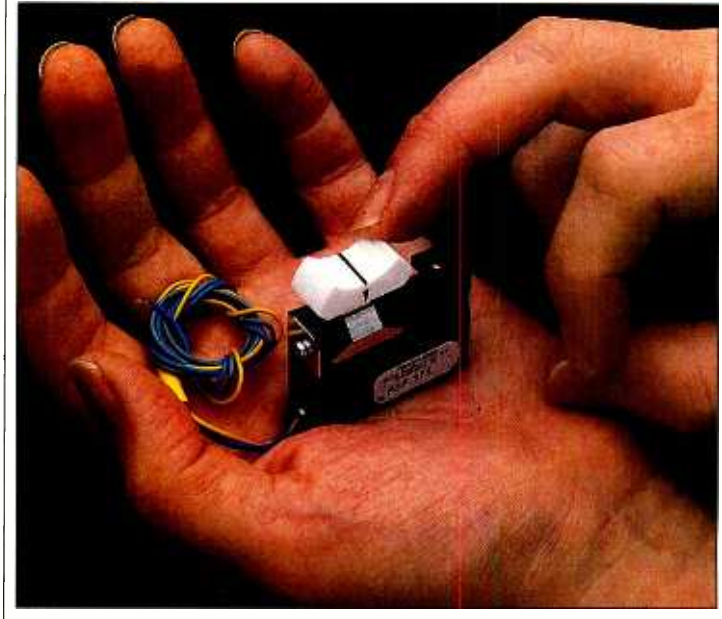
The new restrictions are to be phased in over a 2-year period —a timescale with frightening consequences for many manufacturers. One of the first UK companies to respond is Clive Green & Co, manufacturer of the successful CADAC range of theatre mixing consoles. Clive Green comments: 'Whilst we applaud the principles behind the Directive, the timescale would appear to be somewhat devoid of an appreciation for the real world. However, we have responded as quickly as possible and have incorporated the new restrictions into our development programme. Apart from the obvious consequences of PCB component density, one of the biggest hurdles to overcome has been the restrictions on panel controls. We have received considerable support in solving this problem from fader manufacturer Penny & Giles, who have developed a series of new high-resolution, limited-range designs in record time.'

Working jointly with Clive Green & Co, Penny & Giles' rapid research programme has resulted in a new range of miniature faders and controllers. The products are designed to comply fully with the Directive's ergonomic guidelines, which limit hand and finger movements to very small rotations and stroke lengths.

Following close co-operation with the research department of a major UK university, Penny & Giles have developed a new generation of small-molecule conductive polymers. The surface characteristics of these advanced materials retain the traditional smooth feel of P&G faders, while permitting ultrafine resolution across the diminutive travel lengths.

Fred Howse, Sales Manager of Penny & Giles, comments: 'This new EC Directive has taken everyone by surprise and we had no idea that these restrictions would prove to be quite so drastic. While we share the general concern over the timescale of the changes, we are pleased to have progressed so far down the miniaturisation route already. Our new products lend themselves to greater use of software-driven control resolution and we are delighted to be the first company to offer control devices which satisfy the technical requirements of the industry, whilst also meeting the new EC guidelines.'

Based on current progress, Penny & Giles are scheduled to supply the first evaluation samples of the Mini-Control range to CADAC at the beginning of April. While solving the RSI problems of sound engineers is to be welcomed, it does raise the question of whether Brussels has overreacted, resulting in a potential increase in the incidence of eye-strain throughout the audio industry. ■



Motivated by a new EC Directive on RSI (Repetitive Strain Injury) Penny & Giles have been swift in developing the minifader

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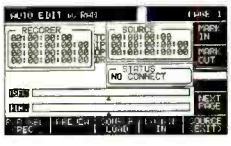

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AMEK 2520 40 channel, p/bay ..... POA
AMEK 2520 56 channel, p/bay ..... POA
AMEK Angela 36 frame fitted 28 channels, remote p/bay & automation .. £9,995

CADAC Classic Console
Cadac Large famous 1970's discrete console, 28 channels, 24 monitors, double width p/bay. .. POA

DDA
DDA AMR24 36 frame, 28 channels, p/bay ..... POA
DDA S Series 32/4:2 NEW £4,495

HARRISON
Harrison MR3 32 channels, p/bay. £9,995
Harrison Series 1032 dual inputs (Total 64) Private use only. vgc. £65,000

HELIOS
Helios 40/32 40 channels, 32 monitors, 72 inputs in remix, eq based on API 550 bantam p/bay (ex Townhouse, last Helios built) ..... POA
Helios 32 channel discrete electronics, 24 monitors, p/bay. VGC ..... POA
Helios 24-8 discrete electronics, manufactured 1974, immaculate ..... POA

NEVE
Neve 542 8/2 portable suitcase mixer vgc ... £2,500

NEVE EQ & SPARES
33114 classic EQ Modules £995pr
PPM meters + driver boards £50ea
Stereo PPM meters (no drivers) £95

RAINDIRK Classic Consoles
Raindirk Series 3 40 channels, p/bay ..... POA
Raindirk Series 3 26 channel console with p/bay, to be refurbished & 24 monitors added, giving 50 line inputs. ..... POA
Raindirk Series 3 10/4 P&G etc. a true classic £1,495
Raindirk concord 28 channel in-line console with p/bay £3,500

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Soundtracs FM8/4 (2 available) £995ea

SSL
SSL4048E 40 E channels, 8 G channels, p/bay. No Total Recall £59,995

TAC
Tac Matchless 26 channels, p/bay £4,995
Tac Scorpion 16/8/8 ..... £2,500

TRIDENT
Trident Vector 56 frame fitted 50 channels + 6 dynamic modules. Bar graphs £49,995
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Fostex M20 2 track with centre track for time code £550
Fostex 4030 syncroniser + remote £750
Fostex 4050 remote £295

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Lyrec 532 24 track + full remote ..... OFFERS

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MCI JH110 2 track, 71/2-15-30ips. 1/4" & 1/2 " head blocks £1,500
MCI JH110 2 track 1/4" VGC £995

MITSUBISHI
Mitsubishi 850 32 track + remote. 1 Owner, vgc. £19,995

3M
M79 24 track £2,995
M79 4 track 1/2" ..... OFFERS

OTARI
Otari MTR90MK2 24 track with remote & autolocate. One owner, vgc £12,500
Otari MTR90MK1 16 track pre wired 24 track with remote & autolocate. vgc. £3,995
Otari MX80 24 track with remote.Late machine, low hours. £8,999

OTARI SPARES
Otari MX80 audio cards ..... £250ea.
Otari MX80 32 channel 2 " head block (as new) with 8 audio cards £1,995

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Revox 877 MK2 71/2-15ips. £595

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Sony APR 5000 3 speed 1/4" VGC £1,995

SOUNDCRAFT
Soundcraft 760 MK3 24 track with remote. Private use. VGC £4,995
Series 20 1/4" recorder in console £750
Series 20 1/2" recorder in console £750

SOUNDCRAFT SPARES
Soundcraft MK3 24 track remote £295

STUDER
Studer A80 MK2/3 24 track + rem/auto £7,995
Studer A80 MK2/3 24 track £6,995
Studer A80MK4 8 track £1,995

TEAC/TASCAM
Tascam MSR24 vgc £3,995
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EV's *System 200*, a complete replacement for the *S-200* series

EV launch *System 200*

At the Frankfurt Musik Messe last month Electro-Voice launched the latest addition to their range of sound reinforcement products, *System 200*.

System 200 comprises three elements which together form a completely intergrated system: the *Sx200* portable loudspeaker; the *Sb120* bass module; and the *Xp200* electronic controller. An active subwoofer the *Sb120a* will be available from October.

The *Sx200* is a portable two-way constant directivity loudspeaker system featuring a moulded-in high-frequency horn with a varipath throat geometry and 65° x 65° coverage pattern. The 12-inch *EVM 12S Pro-line* woofer delivers solid bass performance down to about 80Hz. The whole package has sensitivity levels of 101.5dB (1W/1m) and continuous power handling of 300W (1200W peak) delivering power handling of 120dB. However, the total weight of the system is just 391bs.

The passive bass unit brings the bottom end down to 40Hz with only a 12-inch woofer, the new *DL 12sb*. The *Xp200* dual channel controller provides a fourth-order crossover and full infrasonic speaker protection for the system. It also includes a special low-frequency profile circuit that enhances the performance of the *Sx200* and the *Sb120* by slightly delaying low frequencies in time, as they are boosted and summed with the original signal. The combination of enhanced and direct signals changes the relative levels of musical fundamentals and harmonics resulting in an audible improvement in sound quality.

The system is available now and completely replaces the *S-200* cabinet EV's bestselling unit since it was launched ten years ago.

Electro-Voice, 600 Cecil Street, Buchanan, Michigan 49107, USA.
Tel: +1 616 695 6831.
Fax: +1 616 695 1304.
UK: Shuttlesound, 4 The Willows Centre, Willow Lane, Mitcham, Surrey CR4 4NX. Tel: 081 646 7114. Fax: 081 640 7583.

Beyer pedal power

Beyerdynamic have announced the introduction of a new kickdrum mic, the *TG-X50*, which uses the same casing as their *M380*, but features the latest advances in neodymium magnet technology for better gain-before-feedback characteristics coupled with good transient response, hypercardioid polar pattern, and a frequency response of 30–18,000Hz in a close miking position, and 75–16000 Hz at a distance of 1m.

The *TG-X30* and *TG-X35* head-worn mics are omnidirectional and cardioid, respectively. Designed for hands-free use by keyboard players and drummers, they can also be plugged into a pocket-pack wireless transmitter for active lead vocalists, and being very lightweight they are well suited to theatre and stage use. The miniature noise-cancelling electret condenser microphone is mounted on an ultraslim, flexible gooseneck for easy positioning, and has a frequency response of 45–16,000Hz.

Beyerdynamic, Theresienstrasse 8, D-74072 Heilbronn, Germany.
Tel: +49 7131 6170.
Fax: +49 7131 60459.
UK: Beyerdynamic (GB) Ltd, Unit 14, Cliffe Industrial Estate, Lewes, Sussex BN8 6JL. Tel: 0273 479411. Fax: 0273 471825.

D&R introduce *Merlin*

Merlin is D&R's fully automated studio mixing console featuring True Dual Input design whereby each input contains two fully equipped input channels with comprehensive equaliser and filter sections, 12 aux sends, complete 24-bus routing, 2 VCAs, 2 faders and full automation. So a 32-frame console becomes a 64-input console.

Another feature is the ARM, short for Advanced Routing Multiplex. This is D&R's ergonomical solution for signal routing complexity of modern studio consoles. ARM digitally controls the routing of each and every signal, including the AUX sends. A single push on the SELECT button of an input reveals its complete routing in the Master display. Thanks to ARM it is, for instance, possible to route every input to every mixbus during recording and to route every input to upto 36 aux sends during mixdown.

The automation controls every function in every signal path as well as every function of the Master section, including the routing. A standard feature is that every single VCA can be bypassed by the audio signal. If the console then is also fitted with the PowerFade option, the signal is being controlled by motor-driven faders. Another option is the Virtual Dynamics Function; for programmable, automatable full 'dynamics control' of each input signal.

D&R Electronica bv, Rijnkadd 15 B, NL-1382 GS Weesp, The Netherlands.
Tel: +31 2940 18014.
Fax: +31 2940 16987.

Martin Audio on the *Wavefront*

Launched at the Frankfurt Music Messe the *W1 Wavefront System* is a high performance, ultracompact trapezoid loudspeaker system designed for specific applications where both high output capability and small size are required. The ▶

AES Amsterdam Live News

● Progress was recognised on all fronts though there is an ever-increasing trend towards systems control and stored settings and parameters. Moving from the microphone through the system chain to the speakers.

Live performance will always have the 'flash' element about it and what better than the ● **AKG** limited edition *Tri-Power* microphones (*D3700* or *D3800*) with two choices of dual-colour liveries.

On the distribution side, ● **BSS** have upgraded the *MSR-604* to the MkII version and this features lower system noise, mic-line switching and a new power supply with monitoring for each output via LED meter and headphones.

● **Soundcraft** debuted two new consoles, the *SM24* monitor console with 24 sends configurable to mono or stereo in any combination plus dedicated main stereo mix for sidefills or FOH. The *Delta Series* has been expanded with the *Theatre* model, featuring 4 main buses, 6 aux sends and a 6 x 4 matrix section.

Though primarily a recording console, the ● **Otari** *Series 18RP* (derived from the *Concept 1*) could easily find a place in live sound, particularly fixed installations, due to the high degree of storable settings and functions offered at an extremely attractive price. If Otari decide to do a full-blown 'live' version, it could be a winner.

Celebrating longevity in the business, ● **Cadac** now have three new options for the *J Series* consoles in the form of a quad-panning module, central-control module and motor fader system.

● **Outboard Electronics** have added to their automation systems with the *Mac*-based *SS2* Event Controller, which allows easy access to cues and MIDI systems for better overall control of a show.

For the processing racks there were several new goodies.

● **Symetrix** *602* Stereo Digital Processor provides 128 presets plus 128 user-memory locations for complete processing on 'special' channels, for example: lead vocals. The unit features digital and analogue inputs, 18-bit A–D convertor and all the processing one could wish for.

● **DNA** from Holland introduced the *Dymand* 2-channel compressor and the *Dictator* stereo mastering and broadcast limiter. The latter could easily find applications as a main system limiter or for ear monitoring. ▶

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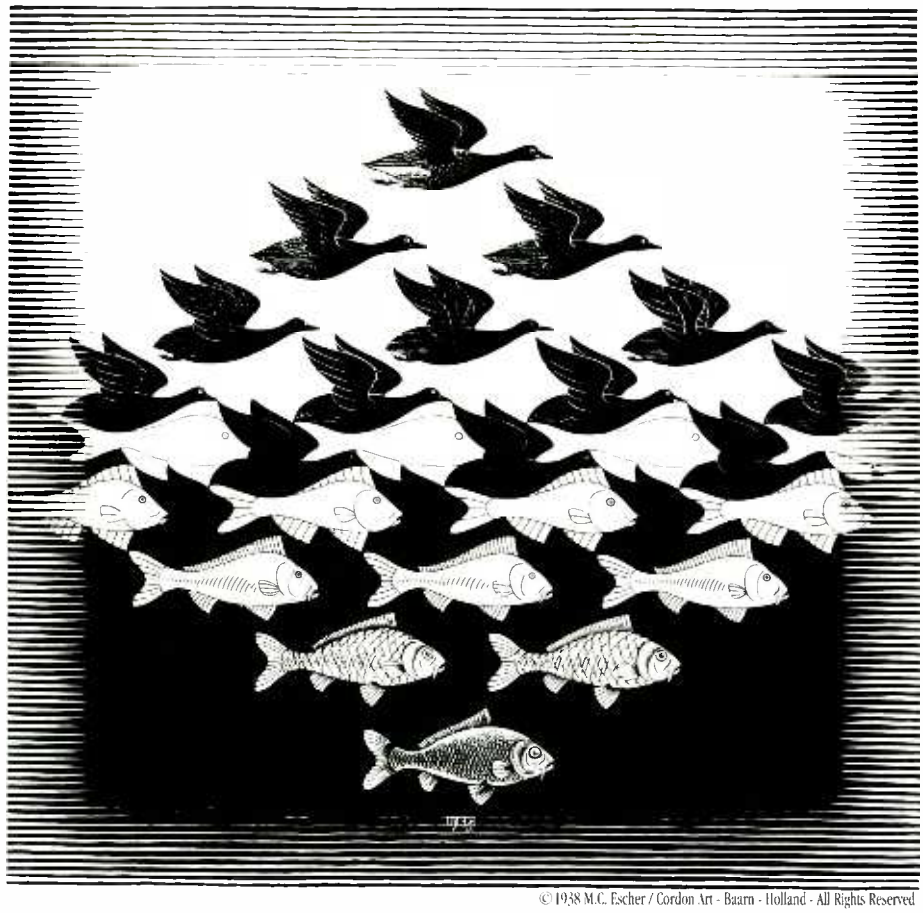
If you think only your eyes can play tricks on you...



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Study the illustration. Are the geese becoming fish, the fish becoming geese, or perhaps both? Seasoned recording engineers will agree that your eyes *and* your ears can play tricks on you. In the studio, sometimes what you think you hear isn't there. Other times, things you don't hear at all end up on tape. And the longer you spend listening, the more likely these aural illusions will occur.

The most critical listening devices in your studio are your own ears. They evaluate the sounds that are the basis of your work, your art. If your ears are deceived, your work may fall short of its full potential. You must hear everything, and often must listen for hours on end. If your studio monitors alter sound, even slightly, you won't get an accurate representation of your work and the potential for listener fatigue is greatly increased.

This is exactly why our engineers strive to produce studio monitors that deliver sound with unfailing accuracy. And, why they create components designed to work in perfect harmony with each other. In the laboratory, they work with quantifiable parameters that do have a definite impact on what you may or may not hear. *Distortion*, which effects clarity, articulation, imaging and, most importantly, listener fatigue. *Frequency Response*, which measures a loudspeaker's ability to uniformly reproduce sound. *Power Handling*, the ability of a loudspeaker system to handle the wide dynamic range typical of the digital domain. And, finally, *Dispersion*, which determines how the system's energy balance changes as your listening position moves off axis.

Models pictured (L-R)
3-Way 10" 4410A, 2-Way 8" 4408A and 3-Way 12" 4412A

The original 4400 Series monitors have played a major role in recording and broadcast studios for years. Today, 4400 Series "A" models rely on low frequency transducers with Symmetrical Field Geometry (SFG™) magnet structures and large diameter edgewound ribbon voice coils. They incorporate new titanium dome tweeters, oriented to create "Left" and "Right" mirror-imaged pairs. Refined crossover networks use conjugate circuit topology and tight tolerance components to give 4400A Series monitors absolutely smooth transition between transducers for perfect imaging and unparalleled power response.

If you're looking for a new pair of studio monitors, look into the 4400A Series. We think you'll find them to be a sight for sore ears.

JBL

JBL PROFESSIONAL, 8500 BALBOA BOULEVARD, NORTHRIDGE, CA 91329. USA PHONE (818)893-8411

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www.americanradiohistory.com

W1 features a high power 10-inch bass driver and a 1-inch exit compression driver. Applications are audio-visual presentations, theatre sound and club reinforcement.

The *W2* system is a switchable active-passive two-way enclosure which uses high power drive units to achieve the maximum SPL's possible from such a compact enclosure. Featured is a high power 12-inch bass driver and a 1-inch exit compression driver. Typical uses include theatre sound, club sound reinforcement, underslung/in-fill for concert sound reinforcement and on-stage instrument monitoring.

The *W3* system is a full-range system using advanced engineering principles to achieve true three-way full frequency performance from an enclosure only 28 inches in height. The system features a 15-inch bass driver, 6.5-inch mid and a 1-inch exit compression driver. The *W3* is suited for any application where high sound pressure levels are required from a compact enclosure and typical uses include theatre sound systems, live-club sound reinforcement, concert sound reinforcement and music playback in nightclubs.

Also in the range are the *WS2* subwoofer and the *WX3* electronic controller designed to maximise the performance the *Wavefront* series. The *WX3* can be configured either as a two-way stereo or three-four way mono device depending on the *Wavefront* system in use.

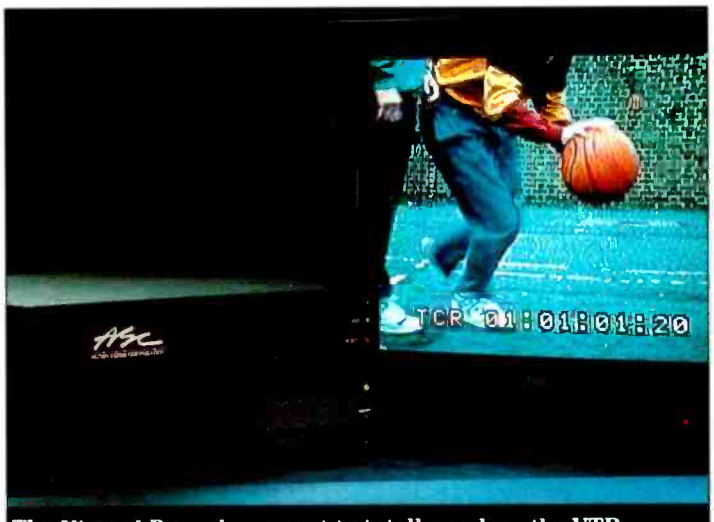
Martin Audio Limited, 19 Lincoln Road, Cressex Industrial Estate, High Wycombe, Bucks.
Tel: 0494 535312. Fax: 0494 438669.
USA: Martin Audio, 22930 Miller Road, Chicago Heights, IL60411.
Tel: +1 708 758 0652.
Fax: +1 708 758 0717.

Apogee follows music trends

The *AE-15* subwoofer has been designed as a companion to Apogee's *3X3s2* three-way concert loudspeaker. The system was developed in response to customer demand for a long throw device suitable for heavy metal, reggae and other bass-heavy styles of music performed in very large indoor and outdoor venues. The *AE-15* features 4 15-inch long-excursion ferrofluid-cooled driver mounted in an optimum vented enclosure identical in size to the *3X3s2*. Each driver is rated at 600W continuous—2400W peak.

Recent additions to the Apogee Sound range are the *AE-9* and *AE-8* biamped speaker. The *AE-9* is a three-way system comprising of a 15-inch vented bass cone driver, a 10-inch sealed midrange cone driver loaded by an advanced horn construction of Finland birch, and a 1-inch throat, fluid-cooled tweeter loaded by a controlled directionality horn. The *AE-8* is a two-way system and is a F-O-H version of the *AE-8B* floor monitor introduced last year.

Apogee Sound Inc, 1150 Industrial Ave, Petaluma, CA 94952.
Tel: +1 707 778 8887.
Fax: +1 707 778 6923.



The *Virtual Recorder*, meant to totally replace the VTR

Virtual recorder

The *Virtual Recorder VR* from the Audio Video Corporation is a digital random-access video recorder.

VR has been designed to complement random-access audio workstations and allows instant picture location to video. With the system an operator can locate any scene or frame, move to any other time-coded point on the video and relocate to the original point.

Compression technology is used plus a variable field rate and resolution allows use with both high speed hard disk and removable optical technology.

UK: Stirling Audio Systems, Kimberley Road, London NW6 7SF. Tel: 071 624 6000. Fax: 071 372 3670.

RCF *Event Series*

Italian manufacturer RCF have released preliminary details of their new generation of speakers, the three-box *Event Series*.

The *Event 3000* is a two-way bass reflex system suitable for a wide variety of application including discos and clubs, high level music reproduction, live music performances, audio systems for churches, auditoriums, theatres and cinemas, sports facilities and audio-visual presentations.

Event 4000 uses a cabinet design exactly like the *3000* but is a three-way system with the same 90° x 75° constant directivity horn and 1-inch exit, high-frequency, compression driver.

The *ESW 1018* subwoofer is a compact bass-reflex system with special long-tuning duct, designed to be used in combination with the *Event Series* units.

The *Event Series* was previewed at the Frankfurt Musik Messe and will be fully launched at Plasa in London this year.

RCF Sound Systems, Via G. Notari, 1/A, 42029 S. Maurizio, Italy. Tel: +39 522 354111.
Fax: +39 522 551875.
UK: RCF Electronics (UK) Ltd, 2 Blenheim Court, Hurricane Way, Wickford Business Park, Wickford, Essex. Tel: 0268 570 808.

RCF are to launch the *Event Series* at the Plasa show

● **Valley Audio** (formerly **Valley People**) showed the *Dynamite*[3] 2-channel compressor-limiter-expander and the successor to the *Kepex*, the *X-Gate/NR*. The 2-channel unit provides very sophisticated gating-expansion functions together with a single-ended high-frequency noise-reduction system.

● **Aphex** launched two low-cost 4-channel units which use the basic circuitry from their more sophisticated brothers, the *Easyrider Model 106* compressor and the Logic Assisted Gate *Model 105*.

● **Dynacord** are making a big push for the professional market and have released an economy version of the *ARS-10* DSP unit, the *DRP 5*. There is also the *DSP 224* 18-bit digital crossover-processor which is well worth attention and offers a lot of useful facilities.

● **TOA** have introduced the Integrated DSP and Control System that covers EQ of all types, gain reduction, filtering and an 8 x 8 digitally-controlled analogue matrix. All parameters and settings can be stored and controlled from a PC.

The ● **JBL** *MPA* range of power amplifiers feature Open Input Architecture and fibre-optics links that can be easily integrated into MediaLink systems for full computer control. ■

Other Brief News

● **v2.0 for KT *DN3600* EQ**
Klark Teknik have released v2.0 software for the *DN3600* Programmable Graphic EQ. New facilities offer easier and more intuitive control, faster memory access, comprehensive MIDI control and improved performance.
Klark-Teknik. Tel: 0562 741515

● **Fostex *D10* option card**
Fostex have introduced the TC/RS422 interface for their *D10* DAT recorder. The option card will extend the *D10*'s talents to include IEC-format time-code record-playback, and Sony protocol RS422 machine control. Among the benefits offered is the facility to use the *D10* for low-cost time-code DAT transfer.
Fostex UK Tel: 081 893 5111

● **Sampling software for *M5000***
The latest version for tc Electronic's *M5000* effects processor offers various improvements, including a powerful sampling algorithm. The basic version (v1.12) allows 1.5s of stereo sampling. An optional version allows up to 190s stereo.
tc electronic Tel: +45 862 62800

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SENNHEISER K6

It may not be what they are best known for, but Sennheiser have for years included some form of modular microphone system in their catalogue. The latest incarnation is the system built round the *K6* powering modules.

Apart from the choice of capsules, there are two models of powering modules (preamps, bodies—call them what you will). The more basic is the *K6-P*, operating only on phantom power, its only control is a bass roll-off filter—quite an aggressive one, with 12dB cut at 100Hz. The *K6*, which is what was supplied with the review set, is a little larger in order to accommodate a battery, and consequently also carries an ON-OFF switch and a battery check LED. Battery life is quoted as being up to 150 hours, and when phantom is connected, the battery is automatically switched off. I was pleased to note that the battery powering comes from a single standard AA battery; a similar earlier Sennheiser model in my possession needs a rather more specialised camera-type battery which is becoming hard to obtain.

Sennheiser seem to be more committed to the concept of the modular microphone than anyone else, in the sense that their systems are built to be assembled, disassembled and generally swapped around in much the same way as an SLR camera and its lenses. Other manufacturers' systems give the impression that their aim is to provide a wide range of options at the purchasing stage, such that once you have bought what you want you screw it together and leave it that way—making changes only under exceptional circumstances. The main point of the modular design would appear to be to simplify manufacture and, one would hope, to keep the cost down, not to provide a flexible system in the field. We all know, I'm sure, microphones whose capsule screw threads are so fine that they cross and strip at the slightest provocation, deterring the user from fiddling with them any more than is necessary. Some microphones, such as the now-discontinued Neumann *KM80* series, are really modular in name only—few people regard them as such, and many do not even realise that, for instance, the *KM84*'s capsule is removable and that other types are available.

The *K6* series, by contrast, is so dedicated to the chop-and-change approach that the review set comprising the *K6-P* body, an *ME64* cardioid capsule, an *ME62* omni and an *ME66* supercardioid (short rifle), all set out in a slim foam-lined plastic carrying case like a photographer's kit. Two more holes in the foam accommodate the stand clip and a spare battery. This is not the entire system; there is also a long rifle head, the *ME67*, and a supercardioid head with a built-in pop shield apparently for hand-held vocal use, the *ME65*. There are two tie-clip extensions, one cardioid and one omni, a selection of windshields, and alternative mounting hardware including a rubber-coupled shock mount and a camera-top hot-shoe-type holder.

Swapping the ends is quick and reassuringly easy, with sturdy reliable threads which never threaten to jam. The various components appear to be solidly and robustly built, despite being surprisingly light, although once again, the stand mount wasn't up to the job until I got at it with a screwdriver.

Being the responsible company that they are, Sennheiser provide frequency-response and polar pattern diagrams with the capsules, revealing some typical shortcomings that other manufacturers might have preferred to gloss over. Not that they show anything too surprising for microphones in this price bracket, nor that the audible result is particularly serious, but I wonder how many people would have sufficient trust not to be alarmed at the realisation that all three capsules have a very similar, highly directional polar response at 16kHz. Up to about 2kHz they are all reasonably close to their respective ideals, and the cardioid and omni stay roughly the right shape up to 8kHz, but the deviations above that suggest an uneven off-axis frequency response which is borne out by the other diagrams. The chief consequence of this, of course, is going to be the coloration of spill and ambient pickup, which in many applications will not be a significant problem. It is worth repeating that this type of characteristic is by no means unusual; what is unusual is

The new Sennheiser *K6* system

Sennheiser's willingness to share the information with the rest of us.

The other general tendency shown in Sennheiser's specification is a significant rise in the HF response on-axis, ranging from 3dB up at 7kHz for the omni, to 6dB at 8kHz for the cardioid. This, inevitably, is audible, as we shall see.

Listening to the microphones shows, as one would expect, some of the specifications to be audibly relevant while others are less so. The first surprise is the system's high sensitivity, quoted as 32mV/Pa (compared with, say, the *414*'s 12.5mV/Pa); it delivers significantly more signal than my more familiar condenser mics, leading me to worry about what it might do in the presence of a high-level source, particularly since it has no pad fitted. To its credit, it didn't flinch, even when used on a snare. The snare also showed the HF lift to be pleasant and musical, bringing out the drum's crisp edge without making it harsh or sibilant. This turned out to be the case on all the instrumental sounds I tried it on; while none of the capsules could be thought of as flat or clinically accurate, the slight added brightness was usable and controllable, and did not seem to be at the expense of the bottom end, which remained full and warm.

In practice the off-axis colouration never made its presence particularly obvious, even on the rifle, which one would have expected to have its own idiosyncratic way of hearing things. This behaved very well, giving a natural full sound on-axis with good off-axis rejection. The omni gave a similarly good account of itself, although I would recommend pointing it at the desired source as one often has to do with so-called omnis.

I would hate to give the impression that the only reason for buying a *K6* microphone is its flexibility, although for those recording on location it must be one of the most useful such setups available. It also has a good, usable sound, with a performance easily comparable with similarly-priced microphones which do not share its other advantages. Even without its versatility it would make a good general-purpose microphone, but its easily-interchanged heads make it a very useful tool indeed to have around. ■

Dave Foister

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UK: Sennheiser UK Ltd, 12 Davies Way, Knaves Beech Business Centre, Loudwater, High Wycombe, Bucks HP10 9QY. Tel: 0628 850811. Fax: 0628 850958.
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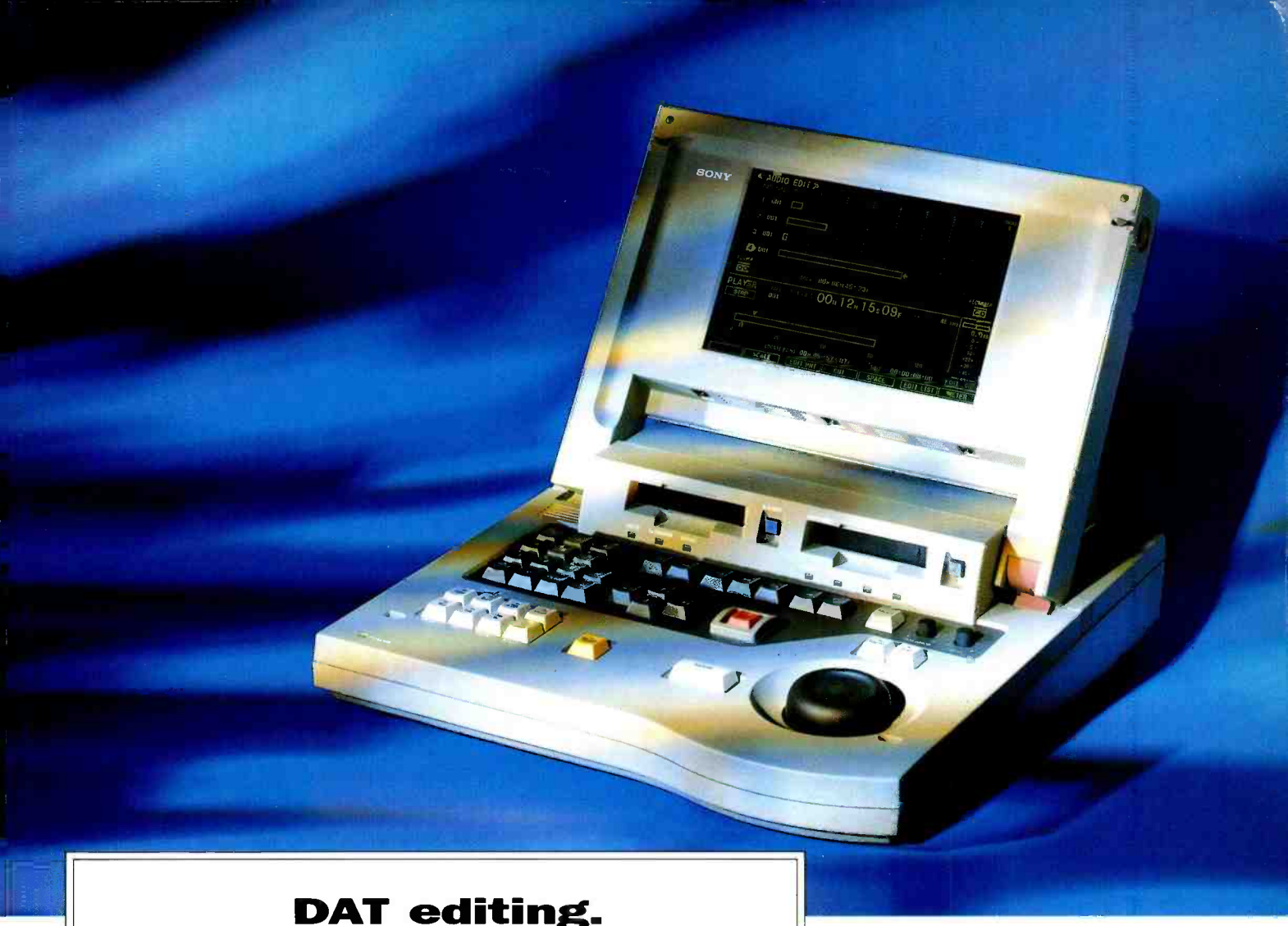

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IMPEDANCE	100 ohms	100 ohms
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NOISE (A-WEIGHTED)	14dB (Typ)	17dB (Typ)
DYNAMIC RANGE	113 dB	>112 dB
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LIVE ROUNDUP

The end of 1993 saw several 'blasts from the past' playing to capacity audiences, though it is, perhaps, unfair to say 'past' as they have, in reality, never gone away!

Britannia Row was out with a *Flashlight* system for Cliff Richard, with Colin Norfield running house and John James on monitors. With a programme running from 'Move It' (Was it really that long ago? How does he do it?) up to the present day, Mr Richard certainly shows no signs of flagging and it was interesting to note how Colin Norfield was able to vary the quality of the mix to keep it suitably 'period' for all of the songs.

There was a marked absence of monitor wedges, apart from a keyboard and guitar fill, with all main monitoring being via headphones or in-ear wireless systems. 'He won't use anything else now,' was the comment from Colin Norfield, 'and it certainly makes things easier for me!'

Other end-of-the-year tours for Britannia Row included Eros Ramozotti, George Michael and Madness, with *Flashlight* systems, and Crowded House and Four Non-Blondes with the new Turbosound *Floodlight* system.

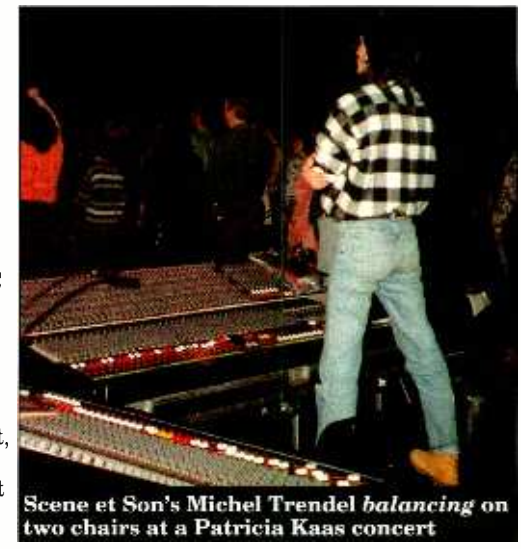
Deep Purple went smoking across Europe with a Showco *Prism* system and John Blasutta behind a Harrison *AIM* console with extender board. This allowed the Purple Ones and the local support band to be accommodated by the same console and avoid messing about with separate FOH systems. However, the *AIM* does sort out the engineers from the boys and people involved in mixing local bands as support to incoming tours would be well advised to check on the console!

I caught Deep Purple at the Malley ice rink in Lausanne and Mr Blasutta gave the best sound for a rock band there that I have heard so far—clean, powerful and not too loud!

'With a group like that, you don't have to work hard,' he commented. 'It sounds great on stage so it'll sound great in the house.' Again, the stage monitoring was of interest with no wedges at all, just a flown system of rear and front fills to give an overall 'wash' down on the stage.

SSE had a busy end of year and 1994 is already looking good, with UB40 in the UK and Ireland with an EV *MT4.MT2* rig and Jerry Parchment on FOH with a *TAC9000* and Jon Ormisher on monitors with a TAC *6500*. Other tours included Hothouse Flowers, Brian May and Anthrax.

Current tours include Wet Wet Wet, Nirvana and Manowar throughout Europe and the UK Midas *XL3* consoles are well in evidence with the exception of FOH Engineer Jim Ebden, who is using the Langley *Recall* for Wet Wet Wet.



Scene et Son's Michel Trendel *balancing* on two chairs at a Patricia Kaas concert

The European spotlight goes on Scene et Son from Strasbourg, France, who have been out with French songstress, Patricia Kaas. Scene et Son are steadily making a name for themselves in France and are the only company running a sizable MT system. The Kaas tour featured four *MT4/Hs* plus two *MT4/Ls* flown per side together with two *MT4/Ls* per side on the floor and EV *Deltamax* front-fill speakers. A delay system of two clusters of two *MT4/Hs* was also installed for the rear half of the hall.

Michel Trendel handled FOH behind a Soundcraft *Series 4* console while Stefan Kijek ran monitors on a Ramsa. Wedges were Clair Bros for the vocals with a selection of EV for the other wedges and side fills.

The hazards of mixing from the floor without any riser when surrounded by an enthusiastic audience which insisted on spending nearly all of the concert standing on the chairs were ably met by Michel Trendel, who made a splendid counter performance by doing a balancing act on two chairs to listen the mix while making balance adjustments when necessary.

Britannia Row have started off 1994 with a busy calendar—while Depeche Mode and Peter Gabriel are on the other side of the word, Britro stalwarts Pink Floyd are on the road again with their new tour which starts in the States before moving into Europe.

FOH mixing duties are being shared by Andy Jackson and Colin Norfield with long-time monitor engineer Seth Goldman being aided by Alan Bradshaw. The quad system is being manned by David Lohr. The tour also sees the Floyd using a Turbosound rig for the first time—a mixture of *Flashlight* and *Floodlight*.

Now able to handle a variety of tours and gigs, Britannia Row are also in the West End of London with *Hot Shoe Shuffle* to the end of the year, and this is being engineered by John Fitzpatrick & Bob Lopez. Steve Ludlum & Chris Wade-Evans will be looking after the Sony International conference in Scotland, and Micky Sturgeon is out with David Hasselhof in Europe. All systems in use are a combination of *Flashlight* and *Floodlight*.

Proving that even the bosses like to get out once in a while, Eric Alvergnat of Dispatch is on tour —with French songstress, Barbra, and a Meyer system. However, some concerts are using systems provided by the venue to make life 'easier' for the crew.

Patrick Aufour, formerly with Saje, has been keeping himself busy with *Memory* consoles and also rediscovering the joys of being on the road. A major gig for him will be the *Victories de la Musique* in Paris (more or less the French 'Grammy' awards) where three *Memory* consoles will be used together for house and monitors.

The *Chronologie* tour by Jean Michel Jarre may have been a success in terms of audience but the accounts seem to have been miscalculated somewhere, leaving a deficit of around £1.8m for the promotion company, CICS.

Three suppliers (of lighting, MIDI systems and lasers) have already gone 'bust' due to nonpayment and the atmosphere is quite bitter. A shareholder in CICS, Jarre has been reported as 'feeling involved' in the collapse of the company. Megalomania, it seems, may have its price. ■

Terry Nelson

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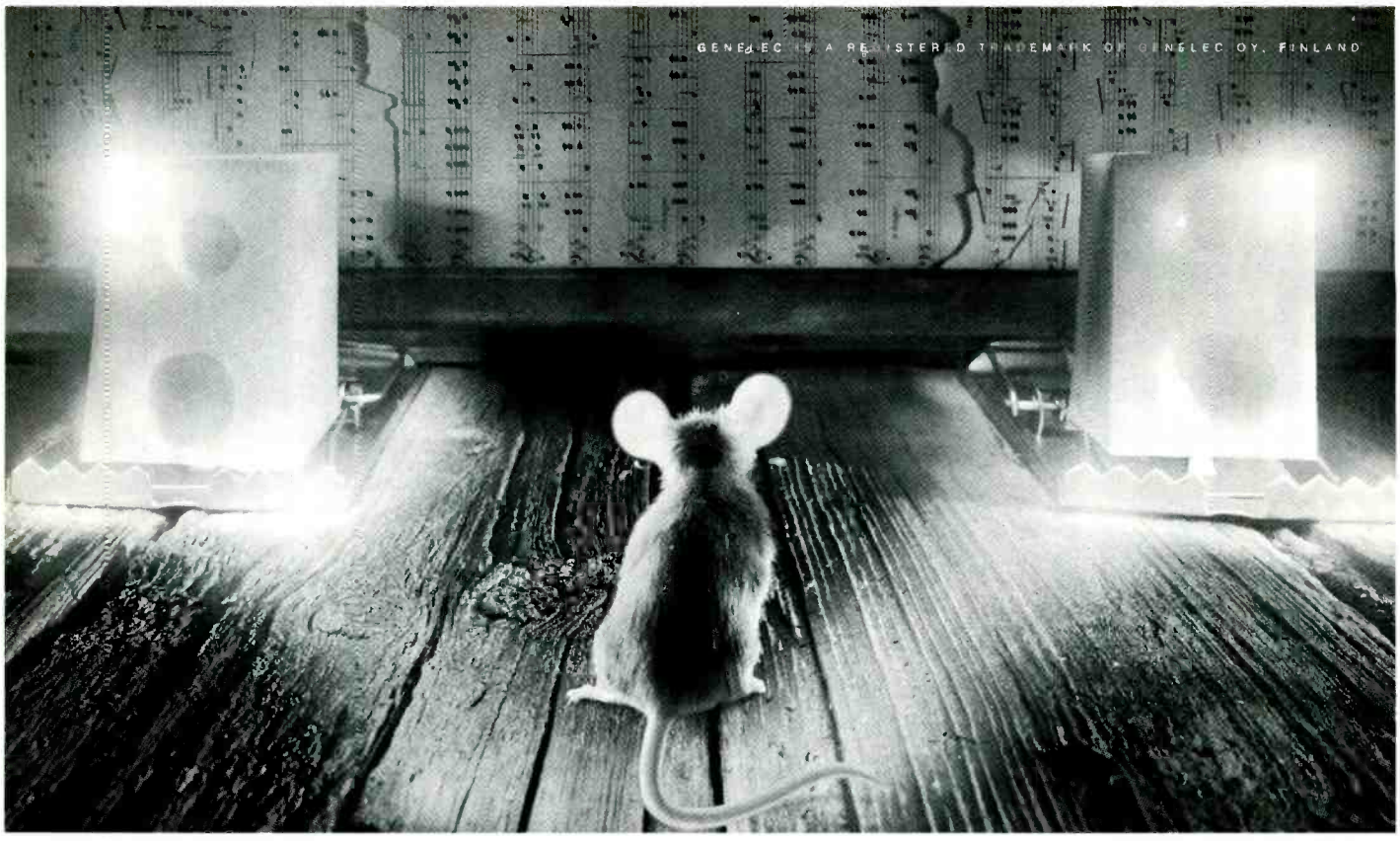

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SPRING 94

Solid State Logic

1,000th SSL Console to Town House

Famous London Studio Installs 72-Channel SL 4000 G Plus

Second Scenaria for The Tape Gallery

ALSO INSIDE

Paisley Park Installs 80-Channel SL 8000 G Plus

SSL Digital Success Around the World

CBS uses two new SSL consoles for David Letterman Show

Paris Post Facility Chooses Scenaria

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Solid State Logic

Tape Gallery Installs First OmniMix in UK

And Upgrades First Scenaria to OmniMix Specification

New OmniMix room at The Tape Gallery

Operator Tony Rapaccioli (front) working with Scenaria on the Texaco 'Pit Stop' commercial

The Tape Gallery is one of London's leading audio post-production houses specialising in commercials for television, radio and cinema.

Last year, the five-room facility installed a Scenaria in a studio specifically designed for engineer Malcolm Bristow. Now, thanks to a very successful year, the company is installing a second SSL digital system – a Scenaria OmniMix – and is updating its first Scenaria to OmniMix specification.

Managing Director, Lloyd Billing, commented: "Scenaria is a brilliant concept that combines everything – instant access audio and video – in one box. We regard ourselves not just as mixers, but also as our clients' sound design team, and pride ourselves on a fast turnaround. The ability to recall previous mixes in their entirety is a major bonus for both us and our clients, and makes for considerable time savings in remixes and the production of multiple versions. With the increased level of bookings over the last year we need a second Scenaria room. Mixing to Surround Sound is becoming more important, so it made sense to install an OmniMix in the new room and to upgrade our existing system to OmniMix standard."

Over the last thirteen years, The Tape Gallery has established a solid reputation within the UK advertising scene for first class audio post-production. Among the recent projects to have been produced using The Tape Gallery's Scenaria is a new series of ground-breaking TV commercials for Lloyds Bank.

Scenaria operator Tony Rapaccioli describes the system as: "An absolute godsend for these ads! Each commercial featured over 80 separate segments that could be individually shaped, with EQ, dynamics, echoes, etc. With Scenaria it is so easy to produce a number of different mix versions. VisionTrack also enables us to locate to any point in the production and let the client hear the differences instantaneously."

The Tape Gallery's Scenaria was also used on the Texaco 'Pit Stop' commercial starring Nigel Mansell, where the audio tracks were sourced from 35mm. Scenaria has also been used by the Tape Gallery on longer productions, such as a Dolby Stereo programme for Levis on the making of their 'Creek' commercial, and a promotional film for Adidas released for the 1994 Soccer World Cup. On both of these productions, Tony Rapaccioli praises the automation: "Having used the automation on Scenaria I couldn't live without it. It's so good knowing that all your fader movements and set-ups on any particular mix are saved and can be instantly recalled and reset. We work to tight deadlines. For instance, we may only have an hour to record the voice, lay up music and effects tracks, synch everything up and produce a final mix. With Scenaria, compared to conventional dubbing, you can do so much more!"

Scenaria In French Television Industry

Paris post-production facility chooses SSL Digital

Tigre Productions, a well-known post-production facility in the French television industry, has installed a Scenaria digital audio/video production system.

Facilities at Tigre already include an audio post-production room equipped with a 16-track analogue system. Tigre's objective is to guarantee clients the highest level of equipment from the beginning to the end of a production, and decided that the addition of an SSL Scenaria was the most effective way to achieve this. The Scenaria is installed in a new studio at Tigre, which was designed and built by a local company.

Managing Director of Tigre Productions, Mrs. Weiman-Curtis, says: "We decided on SSL's Scenaria because its digital audio/video capabilities made the product very attractive to us. I feel totally confident with SSL, having heard so much about their quality and reliability. We are sure our customers will appreciate the many new possibilities offered to them with Scenaria."

Scenaria has also enabled Tigre to expand its services into the fields of advertising and films for television.

Scenaria in use at Tigre Productions, Paris

Tigre Productions has fifteen specialists in the fields of video editing, dubbing and special effects, and provides the complete range of video post-production services. Tigre currently undertakes short to medium length projects, mainly mixing for various television channels, including France 3.

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Paisley Park Installs SL 8000 G Plus Console

"The G Plus has a sonic brilliance to it!"

Paisley Park, the world-renowned, multi-room recording complex in Minneapolis owned and operated by rock superstar Prince, has installed a winged 80-channel SL 8000 G Plus console with Ultimation™ in its Studio A.

The new G Plus replaced an earlier SL 6000 console: "Our initial decision was to upgrade the SL 6000 with an Ultimation retrofit. Ultimation is extremely intuitive. Unlike other moving faders, you can actually hear your moves under it," explains Sal Greco, Chief Technical Engineer at Paisley Park. "Then we tried the new G Plus console at AES in New York, and were instantly hooked! The G Plus is a significant improvement and has a sonic brilliance to it now."

Paisley Park, which opened its doors in 1987, consists of three studios and a 12,000 square foot soundstage, which was the location for the recent Warner Bros project *Grumpy Old Men*. As well as being home to Prince, who is currently working on tracks for a forthcoming album in the new G Plus room, groups such as REM have recently completed projects at the facility.

"The G Plus, with its oxygen-free cable, is much punchier sounding, and makes a big difference. I'm really looking forward to working with it," says Director of Studio Operations Tom Tucker.

▲ *SL 8000 G Plus console installed in Studio A at Paisley Park*

1,000th SSL Console Goes to The Town House

Studio Which Had London's First SL 4000 Installs 1,000th SSL Desk

In 1978, The Town House Studios became the first studio in the capital to install a Solid State Logic B Series desk.

Now the studio is installing a 72-channel SL 4000 G Plus console with Ultimation as part of a major refurbishment of the facility. This will also be the 1,000th console that SSL has built.

"It is particularly fitting that The Town House should receive the 1,000th SSL console, given our long association with the studio," says SSL's Marketing Director, Colin Pringle. "The sound quality of the latest G Plus consoles, as well as their functionality, reflect the use of ninety's electronics and techniques," he added. "Over the years, we have also received feedback from long standing clients like The Town House, and the producers and engineers which work there."

▲ *Martin Benge, Managing Director EMI Studios Group (left) Karen Harding, Studio Manager and Ian Davidson, Technical Manager in Studio One at The Town House prior to the installation of the new G Plus console*

One of those engineers is Hugh Padgham, who actually helped to install that early B Series in Studio Two. "We've all come a long way in the intervening years," says Padgham, "And I'm pleased that SSL has managed to keep its lead by making improvements to both the sound quality and automation of its consoles."

"The SL 4000 console made history by putting a really powerful creative tool into the hands of the people who record music," Padgham relates. "It is a remarkable testament to SSL that, fifteen years after The Town House installed that first SL 4000, a new G Plus desk is still the best console they could buy."

"We chose the latest G Plus console from SSL because of its popularity with our clients, and because of the commitment that SSL has made over the years to enhancing and improving both the console's specification and sound quality," says Ian Davidson, Technical Manager of The Town House. "Our clients recognise these improvements and now demand the new G Plus desks."

The refurbishment of Studio One is only part of a year of redevelopment at The Town House, which also sees the addition of two new programming/pre-production rooms, three new mastering suites, and the refurbishment of artists accommodation, lounges and restaurants.

SSL DIGITAL

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Solid State Logic

Spanish Studio Adds to its SSL Digital Network

Second ScreenSound For Duy Sonido In Barcelona

Duy Sonido studio complex, the most technologically advanced in Spain, has installed a second SSL ScreenSound to provide a digital audio editing capability in its new Studio 4.

One ScreenSound is already used by the studio for post-production of both feature films and television advertisements. With the addition of the second ScreenSound and SoundNet, the projects in each studio can now be shared or combined.

The two ScreenSound systems can also be synchronised for the final digital mixdown of complex soundtracks, increasing the number of available hard disk channels.

Managing director of Duy Sonido, Rafael Duyos, explains: "ScreenSound's unique networking capability makes it ideal for our multi-studio environment, and permits fast and effortless access to our central audio database of sound effects." He continues: "Both our own engineers and our clients have been very impressed by the way the SSL systems provide excellent audio quality and speed of use. Our most valuable assets are quality and creativity, and to achieve this we believe the SSL systems are the best possible choice."

Established in 1986, award-winning Duy Studios specialises in the composition, production, and post-production of music, effects and dialogue for the film and television industries.

Turkish Delight at SSL Consoles

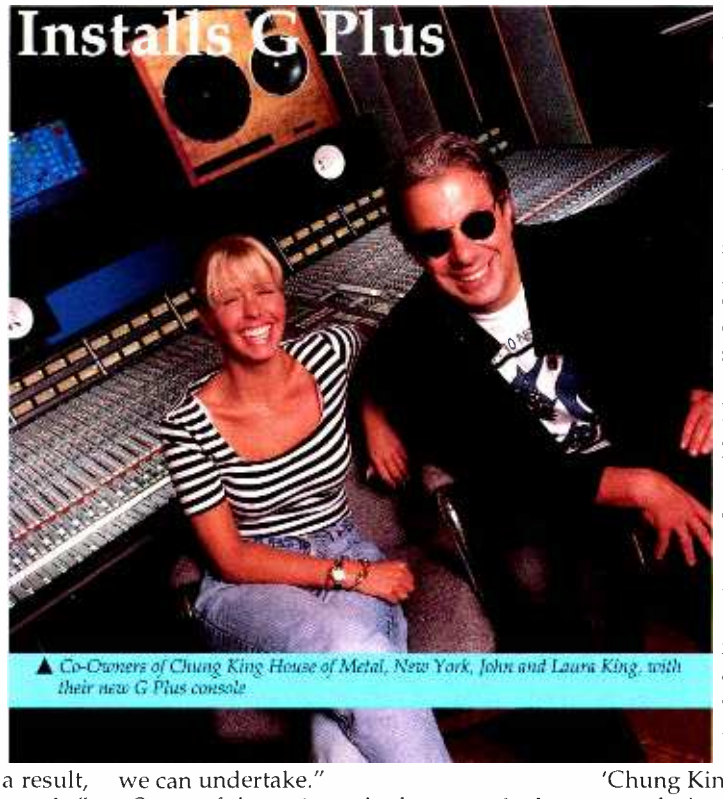
With the continuing expansion of the Turkish entertainment industry, there has been a notable increase in demand for SSL consoles by recording and post-production facilities in Istanbul. **Erekli & Tunc** and **Raks** are among the latest Turkish facilities to specify SSL.

Erekli & Tunc, a 24-track recording studio in Istanbul, was the first commercial Turkish studio to install an SSL console. "We chose the console because of SSL's reputation and after-sales service, and the reliability and performance of the consoles. They also have excellent signal processing," explains co-owner Riza Erekli. Since it's launch in 1987, Erekli & Tunc has become the first choice for leading local artists.

One of the biggest recording companies in Turkey, **Raks Recording**, also recently installed an SSL console in its new studio complex, Raks-Marsandiz Studios, in Istanbul. The 32-channel SL 4000 G Plus console is used in Studio B of the new complex. Such has been the success, that there are already plans for the installation of an SL 4048 G Plus in Studio A.

Chung King Installs G Plus Console

"Our new SSL will broaden our client base and give us more options"



▲ *Co-Owners of Chung King House of Metal, New York, John and Laura King, with their new G Plus console*

New York's Chung King House of Metal, one of the pre-eminent rap/hip-hop recording studios on the East Coast with record sales totalling over 200 million, has installed an SL 4064 G Plus console with Ultimation.

"Until recently, we were known as a Neve house, but I feel that it's not beneficial to be a one-horse facility," explains co-owner John King. "Also, over the past few years, SSL has made some significant audio enhancements, and as a result, the G Plus is a very slick sounding console."

Co-owner and manager Laura King adds, "The G Plus will help us to broaden our client base. It will also give us more options in the type of projects we can undertake."

Some of the artists who have worked at the facility recently include Jodeci, Heavy D, Onyx, Beastie Boys, Run DMC and LL Cool J. The facility currently consists of two studios, although plans are underway to add a third. "Our roots firmly rest with rap, but we have a dream of adding a huge rock and roll room," explains Laura. "We are also working with new artists from labels such as Atlantic, Elektra, Def Jam and Uptown, and are having 'sit-in' sessions in the new SSL room to get them familiar with the new console. It is important that our clients feel comfortable with a system."

John adds, "Client demand played a role in our deciding to go with SSL — a lot of my clients were asking for it. They seem to really like the ergonomics of the console as well as the flexibility that Ultimation provides, and if that's what they want, then that's what they get."

The G Plus console is complemented by two Studer A827 analogue recorders, 48-track digital, and 24-tracks of the new ADAT digital audio recorders.

The suite also features the 'Chung King Genius' line of custom monitors designed by John King himself. "We are relentless in the pursuit of audio perfection," Laura explains, "And our new addition will help push us closer towards that ultimate goal."

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CBS Installs GB and G Plus Consoles in New York

Used in Ed Sullivan Theater on David Letterman Show

American TV network CBS has installed two new SSL consoles – an SL 4080 G Plus and an SL 8056 GB, adding to their existing two SL 6000 consoles.

The consoles are installed in the legendary Ed Sullivan Theater, New York, for use on the new CBS *David Letterman Show*. The SL 8000 GB is used for on-air production, taking feeds from various sources and sending them for transmission. The SL 4000 G Plus, which features Ultimation™ and Total Recall™, is used for mixing the show's house band *Paul Shaffer and the World's Most Dangerous Band*, and the various guest bands featured on the show. "Our investment in these SSL consoles reflects the seriousness of our commitment at CBS to high quality audio broadcasting," says Alan Hodgson, Director of Audio/Video Engineering.

CBS was also impressed by SSL's commitment to serving both their music recording and on-air needs. Often broadcasters have special operational needs, requiring detailed custom modifications. This is where SSL's project engineering skills prove invaluable, winning them broadcast clients around the world, by incorporating those features which enable broadcasters to work in a manner that is most appropriate to their specialised applications.

▲ *SL 4080 G Plus console installed at CBS's Ed Sullivan Theater, New York*

Facilities Across the U.S. Install Scenaria

SSL's Digital Audio/Video Post-Production System Becomes an Industry Standard

The ever-increasing number of facilities across the USA installing Scenaria reflects the growing acceptance of SSL's digital audio/video production system as an industry standard. Recent installations include the following:

Big Shot Productions, Baltimore

This full service film and video production and digital post-production facility recently installed Scenaria for work on a variety of advertising and film projects. "Scenaria takes care of our two most important issues — creativity and productivity," explains owner Brooks Moore. "Scenaria's random access and automation features allow us to recall everything, make a quick change, and continue working without losing any valuable time."

Soundtrack, New York

Soundtrack has recently taken delivery of its first Scenaria digital audio/video production system. Scenaria will complement Soundtrack's impressive family of SSL products, which includes seven ScreenSound digital audio editors, two SL 4000 G Series consoles and three SL 6000 G Series consoles. "The fact that we have all of this SSL equipment shows just how we feel about the company and its products," explains CEO Rob Cavicchio.

Hans ten Brocke, Sound Designer at Crew Cuts, New York

Sound Techniques, Boston

This facility recently added Scenaria to its already formidable SSL inventory of two ScreenSound digital audio editors and an SL 4000 G Series console. "We feel that Scenaria is a complementary addition to our two ScreenSounds," says Lance Duncan, President. "Scenaria is so much easier than a component system because, with Scenaria, everything is instantly resettable."

Video Post & Transfer, Dallas

One of the first facilities in North America to install Scenaria, Video Post & Transfer handles both commercial and long format projects for a variety of clients, including GTE, McDonald's, Home Depot and Radio Shack. "Scenaria is a completely integrated system that's fast, flexible and easy to understand," says audio engineer Don Clark. "Not only is it a hard disk editor, but it also has the capabilities of a full blown mixer."

"The fact that we can network between our Scenaria suite and ScreenSound room saves us a lot of time," continues audio engineer A an May. "A project can be started in one room and accessed by an operator in the second."

Soundtrack Recording, New York

Crew Cuts, New York

As part of a major expansion, Crew Cuts has added a Scenaria digital audio/video production system, as well as two ScreenSound digital audio editors.

"The ergonomics of Scenaria were what initially attracted me to the system — it is so incredibly compact and efficient, with superb audio and video quality," explains facility designer and audio consultant Richard Alderson.

"The fact that you can load in and back up a project while at work on Scenaria without losing valuable mix time is an incredible benefit," explains Crew Cuts' co-owner Steve Kraftsow. "Its multi-user accessibility is simply mind blowing — our new addition will certainly open some eyes."

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ScreenSound is a Worldwide Hit for Audio Post

Facilities Around the World Install SSL's Digital Audio Editor

Since its introduction a few years ago, SSL's ScreenSound digital audio editor has become an industry standard, with systems in use at facilities around the world.

Recent sales and installations include the following:

Absolute Music, Minneapolis, USA

Absolute Music, which specialises in original music and creative sound for broadcast and commericals, recently installed its first ScreenSound.

Owner Johnny Hagen says: "ScreenSound is a statement about SSL's commitment to the industry. It is an integral part of my studio and controls every project that is going on. It's a very creative and compact system. I believe that ScreenSound has a strong impact on my client base. Clients work here because we have it."

Kampo Cultural Center, New York, USA

This ten year old facility in downtown New York, has recently taken delivery of its first SSL ScreenSound.

"ScreenSound is a brilliant product," explains studio manager Alex Abrash. "SSL has the best R&D, sales, and support staff in the industry. It is apparent why ScreenSound has become the industry standard."

M-Net, Randburg, S. Africa

Africa's leading Pay-TV station, M-Net has added a new dimension to its existing facilities with the installation of ScreenSound, for use on the majority of the station's audio projects.

Brett Manion, audio engineer and post-production supervisor comments: "The system we chose had to be affordable and friendly. It also had to be expandable. ScreenSound's networking capabilities through SoundNet, allowing several users to be linked, proved to be ideal for our needs."

SOS Productions, Columbus, USA

SOS, a production/post-production house that specialises in regional television spots, is one of the latest in a growing number of midwest facilities to install ScreenSound.

"Almost every project we undertake here involves ScreenSound," CEO Jefferey Scheiman explains. "It offers us incredible efficiency, and I know it's a success because the attitude around here tends to be 'How did we ever do anything before we had ScreenSound?'"

Universal Music & Post, Tulsa, USA

This Oklahoma facility which handles post-production and sweetening for commercials, motion pictures and corporate projects, has recently installed a ScreenSound.

"We looked at a number of systems, and because we are familiar with SSL's reputation in the industry, initially thought that ScreenSound would be out of our price range," explains owner Rod Slane. "We decided to demo ScreenSound on a trial basis, and once the system was up and running, our chief engineer Keith Slane was hooked! Now it's definitely a permanent fixture at our facility."

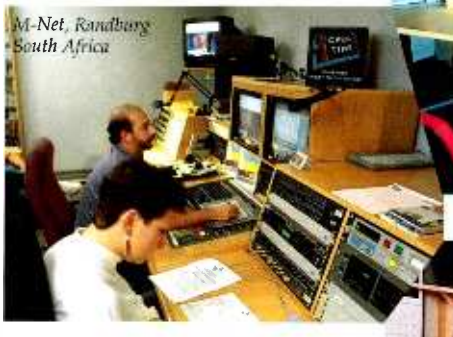
East Side Audio & Video, New York, USA

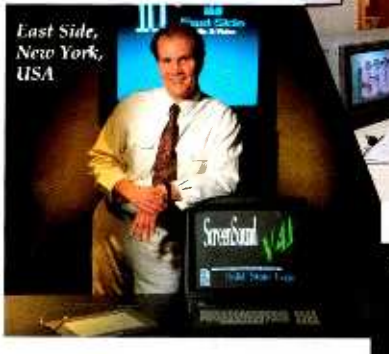
A five-room audio post-production facility, East Side has recently purchased two additional ScreenSound digital audio editors to add to its already formidable SSL inventory of five consoles, and four ScreenSound digital audio editors.

"The key to ScreenSound is its straightforward interface," says audio mixer Bob Giammarco. "The fact that the system cleanly and easily does what I want it to do, when I want to do it, makes all the difference, particularly in the advertising business."

VTM, Brussels, Belgium

Vlaamse Televisie Maatschappi (VTM), the only commercial TV station in Belgium, has a new SL 4000/ScreenSound suite for voice and effects editing of VTM's in-house programme trailers. Chris Wolters van der Hey, Head of Audio Engineering at VTM, comments: "I am very happy with the choice of SSL consoles and ScreenSound. It reflects the serious efforts of our department to improve on TV sound."





ScreenSound V5 with VisionTrack to M2

M2 Facilities, London, UK

One of the capital's leading post-production houses, M2's digital audio facility has recently added a new ScreenSound V5 with VisionTrack, plus SoundNet, to its existing ScreenSound.The second ScreenSound is installed in a new room at M2, which has been created as a result of client demand.

Other orders for ScreenSound V5 include, **Holly Studios, Italy** (Two V5 upgrades); **TCT, France** (V5 with VisionTrack); **East Side, New York** (ScreenSound V5); **Copra Film, France** (Two V5 upgrades); **Pompidou Centre, France** (V5 upgrade).

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SSL Success in Japan and Korea

Region's Leading Broadcasters and Recording Studios select SSL

◀ *SL 6000 G Plus console in Studio A at On Air Azabu Studio, Tokyo*

24-channel SL 4000 G Series console in Studio 3, NHK, Sendai ▼

Throughout Japan and Korea, SSL consoles and digital systems are increasingly in demand by recording studios and broadcasters.

Among the latest SSL consoles to be installed in the region are those at:

On Air Studios, Japan

Located at four separate sites within the Japanese capital, On Air owns rehearsal rooms, concert halls and recording studios, and can handle all aspects of music production. At its Azabu studio, On Air has installed two SL 6000 G Plus consoles – one for recording and mixdown, and the other for recording and overdubbing.

NHK, Japan

NHK, the Japanese national broadcaster has installed three Scenaria systems in its local stations at Sendai, Nagoya and Matsuyama as part of a modernisation programme. The Scenarias are used for post-production on drama and documentary programmes.

NHK has also used SSL consoles since 1985, and has recently installed two more, again for use in its local stations.

These are an SL 4032 G Series for use in Sapporo, and an SL 4024 G Series in its satellite station at Sendai.

Seoul Recording, Korea

This leading Korean studio has installed its fourth SSL console – a 56-channel SL 4080 G Series in Studio A, the largest room at the facility.

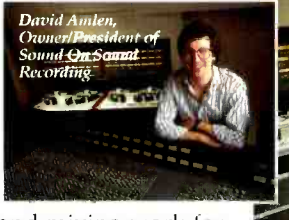
Established in 1975, the majority of the work carried out at the studio is music recording for official use, such as the music for the opening and closing of the Olympic Games. Other projects include recording for television programmes, audio cassettes and records.

Dai Young A&V, Korea

This successful Seoul studio, whose President is the manager of twenty leading Korean acts, has recently installed a 56-channel SL 4000 G Plus console with Ultimation after judging it the best for sound quality.

Sound On Sound Recording Installs G Plus

"I know that my SSL room will always be booked!"



David Amlen, Owner/President of Sound On Sound Recording

Sound On Sound Recording, the New York studio that hosts a wide variety of recording and mixing work for rock, pop, R&B, rap and modern jazz artists, has installed a 64-input SL 4000 G Plus console in its Studio B.

"My client base is most comfortable working with top audio products — that's what they want and expect," says owner/ president David Amlen. "I know that my SSL room will always be booked; the company also has a solid reputation and everyone in the industry knows that SSL stands behind its quality products."

Sound on Sound's project list has included albums from Roger Daltrey, Peter Frampton and Deep Purple, as well as the critically acclaimed debut album by Digable Planets. A tribute to Otis Blackwell, which was recorded in July, is slated to be mixed on the new console, while Disney and Warner Bros. have recently worked on soundtracks for movies such as *Life With Mickey* and *The Concierge* at Sound on Sound.

▲ *SL 4000 G Plus console in Studio B, Sound On Sound Recording, New York*

Additional clients have included: BB King, Branford Marsalis, Living Color, The Lounge Lizards, and Sonic Youth.

The studio features two main control rooms with a full array of outboard equipment from Pultec, Teletronics, Lexicon and others. Each room has 48 track analogue and digital capability, and video lock-up at the flick of a switch.

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From the Desk of... *L.A. Reid*

L.A Reid is one of America's leading producer/songwriters. With partner Babyface, L.A. has been responsible for many of the great R&B albums and singles of recent years. The phenomenal success of Boyz II Men's *End of the Road*, TLC's *Baby, Baby, Baby*, Whitney Houston's *I'm Your Baby Tonight* and Bobby Brown's *Humpin Around* are a testament to L.A.'s range and talent. Married to singing star Pebbles, L.A. also owns the SSL-equipped Studio LaCoco in Atlanta.

"I patterned the design of Studio LaCoco after a recording studio in Los Angeles where I had spent a lot of time and had enjoyed some success. I wanted to recreate that same kind of sound, so I went to the owners of the LA Studio and asked them if they could give me some recommendations. When it comes to equipment, I go by what my engineers, Jim Zumpano and Jon Gass, like and recommend. The only piece that I would call a personal favourite is the SL 4064 G Plus console which was recently installed, replacing an earlier SL 6000 E Series console.

"I have been using SSLs for ten years.

First and foremost, it's extremely user-friendly – and that was one of the things that first attracted me to it. I'm a producer, and although my engineers operate it for me on a day-to-day basis, I can make things happen with it. Secondly, I'm really married to the sound of an SSL, and when I was thinking about upgrading, I didn't want to risk my sound by using a different console. With the new G Plus, the mixes that I'm getting now are a lot warmer and have a lot more bottom to them, which is something that I prefer in my music. Ultimation is extremely clean; bypassing those VCAs certainly makes a difference."

SSL Digital Products Video

Following the worldwide success of its award-winning 'Family of Digital Products', SSL has released a 20 minute video featuring interviews with owners and users of these systems in which they discuss their applications for, and the benefits of, SSL Digital products.

The video, which was shot in England, France, Austria, America and Japan, is available in both PAL and NTSC video standards. It can be obtained from all SSL offices and distributors.

WorldNet SSL DIGITAL Studio to Studio Digital Audio Networking

SSL pioneered the concept of multi-system, multi-user networking with the introduction of SoundNet.

Now modern ISDN technology has enabled the company to extend its networking philosophy beyond the confines of one building, to enable facilities across town, or across the world, to quickly and effectively pass entire projects between each other. The new system is known as **SSL WorldNet**.

SSL WorldNet – Project is specifically designed for use with SSL's own digital products, extending the concept of networking beyond the confines of a single building. Entire ScreenSound or Scenaria multitrack projects, complete with full bandwidth audio, mix and project data can now be transferred speedily to any other facility linked by SSL's WorldNet to exactly recreate the project.

SSL WorldNet – Audio provides low-cost, live digital audio links between studios. Unlike other systems, both WorldNet utilities are available for outright purchase, without the on-going cost of subscriptions.

Uses for **SSL WorldNet – Audio**'s live two-way studio links are vast. Systems are already in daily use allowing voice-over talent to 'telecommute' their contributions between cities, even countries. Completed mixes can also be played back to clients in their own office across town, or across continents.

Principal Benefits

WorldNet PROJECT

- **Send or receive entire ScreenSound/Scenaria projects, including:** *Full bandwidth digital audio; All edit data (incl. EDL files and notes); Mix data: gain, pan and signal processing*
- **Recreate *exactly* a project and mix in another facility**

WorldNet AUDIO

- **Low cost, live recording between studios**
- **Realtime transfer of dialogue/music/sound effects**

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Roland goodies

Roland turned out with the usual, although particularly bulging, jamboree bag at the recent Frankfurt Musik Messe.

Following sound modules with a MIDI interface, the *MCR8* is a MIDI controller with a computer MIDI interface. The unit has faders, buttons and an 'alpha' dial and works in modes for mixing and control changing to GS modules or as a multipurpose configurable controller. Additionally, it is compatible with JL Cooper's *CS10* meaning that it can be used to interact with Digidesign's *Pro Tools* and *Sound Tools* packages.

There is also a MIDI interface on the *SK50* workstation, which combines a 61-note keyboard and 226 GM-GS sounds lifted straight from the *JV80*, but no sequencer. The *MT120S* on the other hand features a GM-GS sound module, 40,000-event-per-song sequencer, 3.5-inch disk drive, but no keyboard. This is accounted for by the inclusion of a stereo pair of 14W powered speakers as it is aimed at accompaniment playing MIDI files.

Roland's *Sound Canvas* line —which gave GM an enormous boost when it first arrived—has been added to with the top of the range *SC88 Super Sound Canvas*. The unit has 8Mb of waveforms, a *stonking* 64-voice polyphony, 32-part multitimbrality and a built-in serial port. A total of 570 instruments are on board—354 from the *SC55 MkII* and 226 from the *JV80* plus 20 drum kits, effects and 256 user-locations. It looks good too.

Further down the tree we happen upon the more affordable *SC50* —which incorporates much of the *SC55 MkII*. Features include 226 instruments, 9 drum kits digital effects, 28-voice polyphony, 16-part multitimbrality and a serial port.

Pianists will be interested in the *RD500* digital stage piano with 88 weighted piano keys and sounds such as vintage grands, electric pianos, digital pianos, Rhodes, Clavinets, harpsichords, organs, synths, strings, basses and percussion. Edited sounds can be saved to 31 locations and there is onboard 3-band EQ. The instrument is also an able master keyboard, four zones can be created and outputs are via two stereo pairs.

Roland have suffered an attack of the expandables with the *JV35*, *JV50* and *JV90* all of which can be expanded for more sounds, polyphony and multitimbrality. The *JV35* has a 61-note keyboard and comes with a VE-JV1 board yielding 56-note polyphony, 16-part multitimbrality and 738 *JV1000/80/880* and GS sounds. Aimed at live performance, the *JV50* uses the same sound source as the *JV35* but has a MIDI file player. The *JV90* is serious; fully loaded the 76-note velocity and aftertouch-sensitive keyboard with 8 sliders and a sound editing palette can handle 928 sounds, 56-note polyphony and 24-part multitimbrality gleaning these sounds from up to 14Mb of waveforms.

One of the expansion-board options for the *JV*-range is the SR-JV80-04 Vintage Synth board which houses Roland *SH1000*, *System 700*, *Jupiter 8* and *D50*, *Minimoog*, Oberheim, Sequential, *Mellotron* and *ARP2600* sounds. The other boards in this series are Pop, Orchestral and Piano 8Mb collections of sounds compressed from 16Mb.

For guitarists, Fender will be building selected models of their electric guitars fitted with the *GKT-2A* guitar synth pickup making them compatible with Roland's *GR*-series guitar synths. Affordability is the message in the *GR09* guitar synth, a floor unit using a new *GK2A* guitar synth driver—this is similar to the *GK2* but the hexaphonic pickup is smaller. The new unit can be expanded to 360 tones with a GR9E-1 expansion board which adds 4Mb of samples from the SR-GR-01 expansion board.

UK: Roland (UK) Ltd., Rye Close, Ancells Business Park, Fleet, Hampshire GU13 8UY.
Tel: 0252 816181. Fax: 0252 812692.
US: Roland Corporation, 5759 Uplander Way, Culver City, CA 90230. Tel: +1 310 338 9974. Fax: +1 310 338 9973.

Wavedrum

Korg are focusing their attention on drummers again. Rather than replace the *skinbashers* with a beat box or sound module, the company have taken the unusual action, with *X230 Wavedrum*, of adding to the list of things a drummer would like to hit.

Launched at Frankfurt: the *MCR8* MIDI controller

The instrument attempts to mimic and reproduce all the acoustic properties and dynamic range of a standard acoustic drum presenting the player with a 10-inch drumhead in solid wood body-laced underneath with a wodge of piezo-electric pickups. Sound familiar? It should not because Korg make much of the fact that these piezos are not just converted into MIDI impulses for triggering the associated sound generating circuits but are actually used as the input for the DSP synthesis. This, say Korg, gives a wide scope for sound variety and response that can even be influenced by the choice of drumhead, so it seems they are talking about a little more than a 'zone and layer' approach.

The *Wavedrum* contains algorithms of traditional instruments plus the ability to roll your own using a 'variety' of synthesis methods. It also takes an analogue input for external impulses but must presumably also put out some interesting stuff over MIDI.

It has 100 programs and two levels of edit—a basic level plus more extensive access requiring an *RE1* remote.

This I have to see.

UK: Korg UK, 8–9 The Crystal Centre, Elmgrove Road, Harrow, Middlesex HA1 2YR.
Tel: 081 427 5377
US: Korg USA, 89 Frost Street, Westbury, NY11590.

E-mu

The *Vintage Keys plus* module does for the box of analogue synth sounds what previous memory and wave upgrades have done for E-mu's own *Proteus*. Again it is available as an all encompassing complete unit or existing *Vintage Keys* owners can install the extra 8Mb of sounds that differentiate the *plus* from the *Keys*. On paper, though, the difference might not live up to everybody's expectations as the sounds added include Dyno Rhodes and Yamaha FM electric pianos, 'classic' (so soon?) *Emulator II* and *III* samples and unlikely 'classic' stringed instruments such as, of all things, the Chapman *Stick* (maybe), Electric Sitar (erm...) and Fender P-Bass (no).

The exciting stuff comes in the form of more Sequential, Moog, Oberheim, Roland and ARP sounds, plus the *SP1200*, *DR55* and *TR808* drum machines. Personally I would still like to see an E-mu unit dedicated solely to the organ.

From elsewhere comes the *Proteus FX*, tagged as the most affordable *Proteus* unit it has 8Mb of *Proteus/1* and *Proteus/2* sets plus a grand piano. There are 512 presets, built-in effects, 32-note polyphony, 16-channel multitimbrality but only one stereo output and none of the usual TRS sub ins.

Finally, we come to the *Ultraproteus*. Tagged as the most powerful *Proteus* ever, you get 16Mb of *Proteus/1*, *Proteus/2* and *Proteus/3* sound sets, plus the *Pro/formance* piano, new drum sounds and other waveforms. The Mbyte mathematicians out there will have surmised that this represents something of a double boxed-set 'best of...' collection of *Proteus* hits but you do also get effects and 32 digital resonant 14-pole Z-Plane filters, *a la Morpheus*, thrown in. The expected levels of polyphony, multitimbrality and the full complement of outputs complete the package.

It is a testament to the superb basic sound quality of the *Proteus* family that E-mu are the only manufacturer I can think of who can do this amount of repackaging and still get away with it.

E-mu Systems, PO Box 660015, Scotts Valley, CA 95067-0015. Tel: 408 438 1921.
UK: E-mu Systems Ltd, Suite 6, Adam Ferguson House, Eskmills Industrial Park, Musselburgh EH21 7PQ. Tel: 031 653 6556. ■

Music News is compiled by Zenon Schoepe

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TRACKS IN THE DESERT

Patrick Stapley goes in search of Oasis Television in London

When Dubbing Mixer Hugh Mitchell-Dawson approached Oasis Television for freelance work, he was unaware of two things: firstly, that Oasis did not have a dubbing suite, and secondly, that in under three months time he would have built one and would be running it for them.

Up to that time Oasis offered 4 on-line edit suites, 2 off-line suites with Lightworks systems, plus various graphics and duplication rooms, but no audio facilities—audio post work was passed on to other nearby Soho facilities, to the increasing irritation of MD Andrew Coppin.

'We do a lot of programme work here and we were doing everything bar the audio postproduction which seemed a bit silly. I wanted us to be able to deal with all aspects of postproduction and offer a complete service which seems to be what people prefer these days. It used to be liked that originally and then things became more fragmented and fashion orientated—off-line edit, to another for graphics, and yet another for the sound dub. It makes much more sense to have everything combined under one roof; production companies then only have to deal with one facility without having to worry about shipping tapes around, or getting stuck in the middle if there are any arguments between facilities.'

Mitchell-Dawson's visit to Oasis was a classic case of being in the right place at the right time; Coppin had made his mind up to expand into audio postproduction, and wanted results fast—as he says. 'We're in a position here to make decisions quickly and really get things moving.' The speed of events certainly took Mitchell-Dawson by surprise who suddenly found himself unceremoniously thrown in at the deep end —'I was basically shown a large space in the basement, given a budget and told to build a studio as quickly as possible—it was an offer I couldn't really refuse!'

Hugh Mitchell-Dawson's first month at Oasis was taken up with an intense period of preparation work—appraising equipment, talking to studio designers, getting quotes from builders and so on. Having worked in postproduction departments at the BBC and TVS (among others), he had a clear idea of what he wanted, but he was still intent on exploring all the possibilities.

'The first thing I did was to make up a list of the contending workstations, which included *AudioFile*, *SoundStation*, Fairlight *MFX2*, and Avid's *AudioVision*. Each system was then evaluated in detail and direct comparisons made, which turned out to be very time consuming. On the basis of this, we picked *AudioFile* because apart from being able to do things that other systems were still sorting out, its transputer-based design made it the ideal platform for future development. Add to that the *Logic 3* desk, and you have an amazingly powerful and flexible system.'

After specifying other equipment, including an Otari *DTR 90T* DAT machine, Denon *DN970 FA* cartridge CD player, Akai *S1000*, Lexicon *300* and Yamaha *SPX990* effects processors, plus a enormous 37-inch Mitsubishi monitor, ▶

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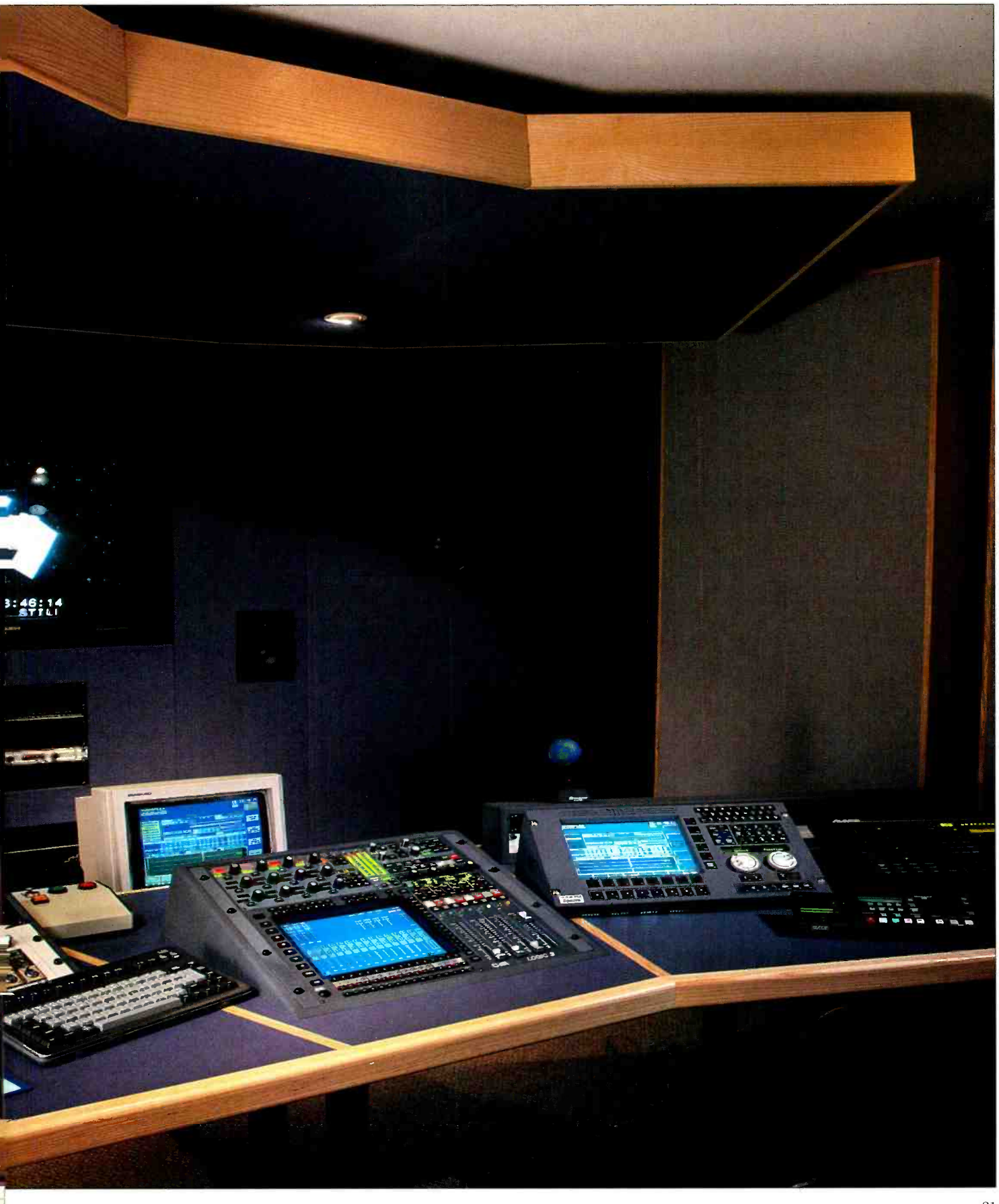

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Mitchell-Dawson next set about consulting various studio design companies.

'I talked to a selection of companies and ended up with number of interesting proposals, but in the end we went for Andy Munro's design. I knew his work from my TVS days which had turned out really well; apart from sounding good, his rooms always look good too which impresses clients as well as creating a relaxed environment to work in. Another important point for a facilities company like Oasis is that everything should be as flexible as possible. If, say, at a later date we need to move or expand the room, it should be relatively easy to shift things around because of the standardised construction and the use of Munro's *System Z* modular acoustic panels.'

'It's also important in postproduction to have lots of client space; quite often you'll have the director and producer sitting next to you spreading scripts and papers all over the place. With the *Logic 3* being so compact, it left us with a lot of extra space and allowed us to go for a much more open layout. The technical furniture builders Lund & Halsey, who had already supplied AMS-Neve with a desk for their demo *Logic 3*, built a large L-shaped desk to our specifications which not only places equipment ergonomically but also leaves plenty of space where it's needed.'

With most of the preparatory work complete, work could now begin on the studio itself and in mid-August Mitchell-Dawson embarked on what he imagined would be a two to three-month schedule. But just hours into it, he received a telephone call that was to change things dramatically.

'I was standing in the middle of this space that was about to become a building site, when I got a call from upstairs telling me that they'd just taken the first booking—a session in six weeks time! My blood ran cold, it seemed like an impossible time-scale, and to make matters worse, everyone who was in a position to help suddenly decided to go on holiday.

'I was left single-handed, trying desperately to keep the project on course. It was a frantic period of juggling everyone around—the wireman against the air conditioning man, the acoustic guys against the builders—and generally putting pressure on people to deliver ahead of time. I had to push AMS-Neve hard on their production dates to get the *Logic 3* in time. They'd scheduled the first console for the beginning of October, which would have been a month late, but they worked really hard to bring the date forward and managed to deliver the day before the first session.'

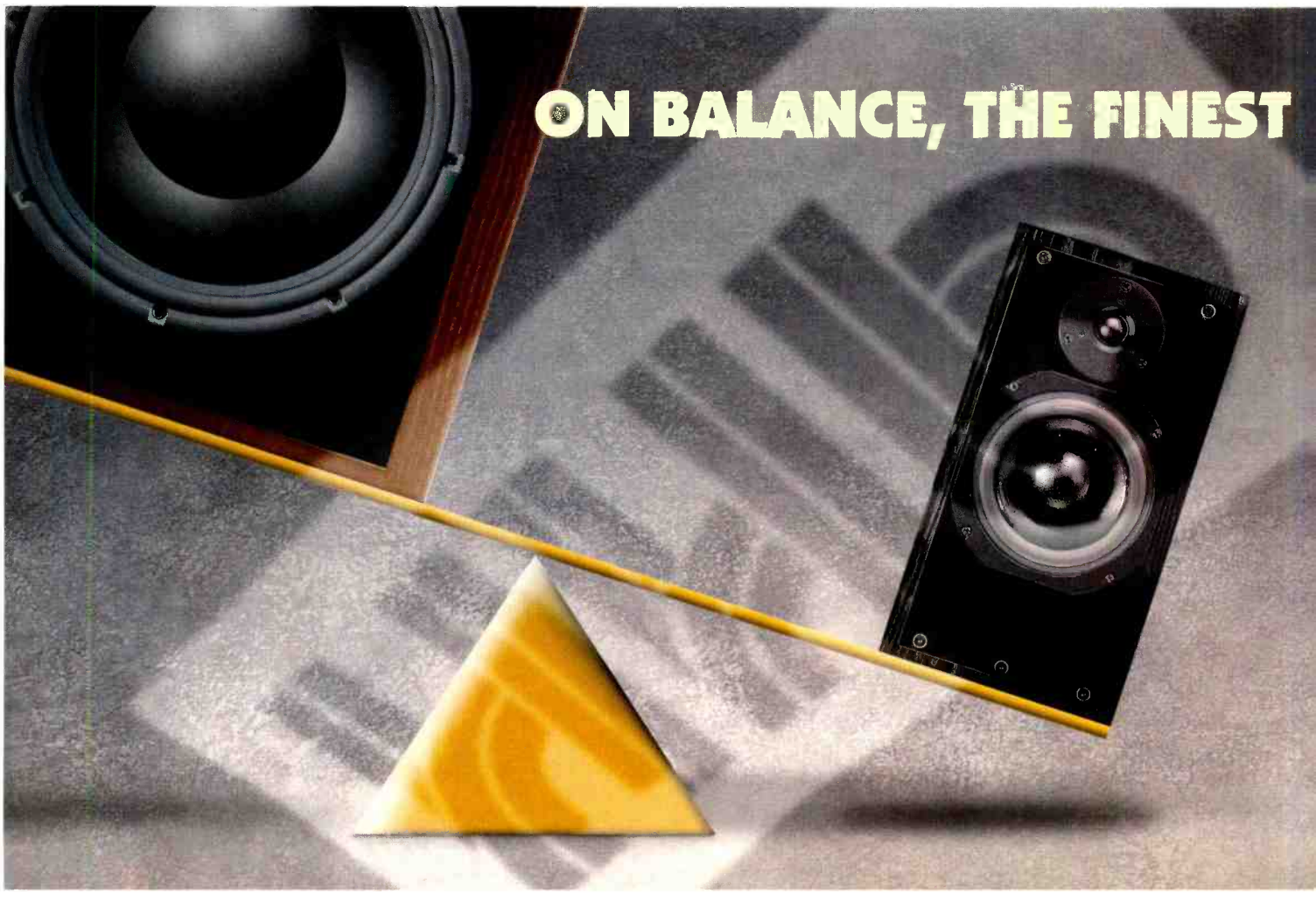
Through an incredible amount of hard work, often very late into the night, the studio was completed in time. However, on the morning of the first session things did not go quite as smoothly as they should, and just moments before the client was due to arrive, the *Logic 3* died.

'We'd booted up the desk and it kept on coming up with messages telling us that it couldn't do things, eventually it completed gave up the ghost. AMS were there instantly and discovered a fault on one of the transputer boards—there are two of these boards with seven transputers on each. The impressive thing was that by removing the faulty board we could still run the console on half processing power. Luckily the session wasn't that demanding, so we managed to get by with the reduced power.

'AMS worked right through the night to get us a replacement board, which was installed the following morning. I have to admit thinking what have we let ourselves in for—we've taken the first desk, running prototype software, it's going to be a nightmare—but thankfully that wasn't the case, and since then the desk has been problem free.'

In fact, Mitchell-Dawson has only praise for the console and has been particularly impressed with the automation.

'The *Logic* automation is the most transparent system I've



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ever used. You don't really have to think about it, you just mix and it works away in the background. It's so invisible that I've had clients ask me when are we going to do the mix, and I have to explain that we're actually doing it! Having absolutely everything on the desk automated is quite mind-boggling, but I find that mix time is greatly reduced because of it.'

With this degree of automation there could be a temptation to over mix but this is something that Mitchell-Dawson has avoided, finding that, instead, the system has operationally freed him up to concentrate on making better mixes. Another aspect of *Logic 3* that has impressed him is the EQ.

'The EQ is incredibly powerful; whereas before I'd use an outboard equaliser if I needed something extreme or specialised, I now do it all from the desk. To give you an example: on one of the first programmes we did here, I received a tape to lay back from which had a 1k tone accidentally recorded along with the programme. Using the notch filtering on the *Logic*, I was able to entirely remove it without affecting the program.

'A thing I've noticed with digital EQ is that it doesn't have a characteristic of its own. With analogue EQ you know how much you can add before you start becoming aware of the effect of the equaliser, but that doesn't happen with digital and at first you tend to find yourself cranking-in loads of EQ because you can't quite hear the effect. When I started using the desk, I was amazed at the amount of EQ I was adding to things; I'd look down at the control and find I'd just added 12dB or more, which would be flat-out on other equalisers. At first you have to listen very carefully to what the equaliser is doing and familiarise yourself with it, but it's something that you pick up on quite quickly and once you do you start using it more sensibly.'

Other things Mitchell-Dawson likes about the desk include the fact that he no longer wears holes in the carpet by sliding his chair up and down to reach end faders, and that he always remains in the optimum listening position—but how do clients react to the console's diminutive size?

'People tend to react more to the overall room, I've had comments that it's like the bridge of the Starship Enterprise. A few people have asked if the console is only a four channel mixer because it only has four physical faders, and the standard spiel is that it's a big mixer in a small box. I've also been asked if it's restricting having just four faders to play with, but because all the fader positions are shown on the screen, and you can quickly jump from one user-definable fader group to another, it's never a problem. Lets face it, you only have two hands so you're not likely to be actively changing the level of more than two or three faders at a time anyway. I'm sure some people will avoid using *Logic 3* thinking they will be restricted by the number of faders, but they should give it a try because I think the concept will surprise them.' (*Logic 3* is also available with an additional 4-fader side-car making eight faders in total.)

One of the last components of the studio to be decided upon was monitoring, and here again Mitchell-Dawson compared a number of systems before making up his mind. Being an Andy-Munro room there was an obvious leaning toward DynaudioAcoustics.

'We started off looking at DynaudioAcoustics' *M3*s, but they were a bit over the top—they're massive and seemed to work best when you're really thumping them, which would have meant doing more with the front-wall construction. We went on to another DynaudioAcoustics system, the *PM2*s with subwoofers which were getting rave reviews everywhere, but this worked better as a nearfield system than midfield which is really what we required. Eventually it was a toss-up between Genelec *1032*s and DynaudioAcoustics *PPM3*s; we decided on the *PPM3*s because they gave a more accurate ▶

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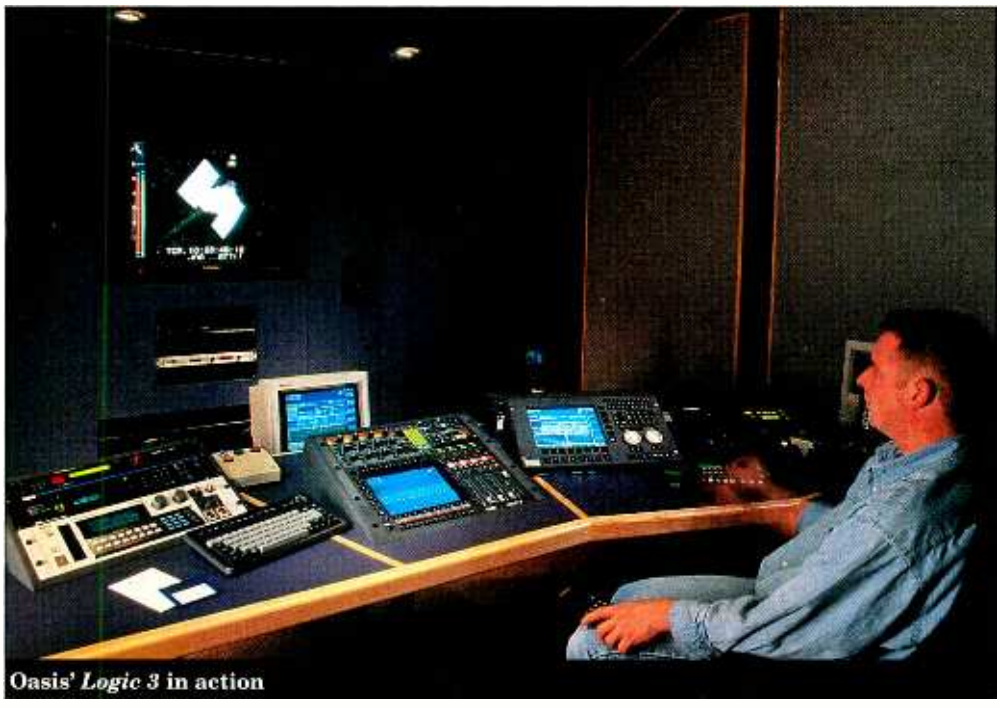

Oasis' *Logic 3* in action

soundfield across the whole room, the Genelecs appeared slightly coloured in the low end which became more pronounced towards the back of the room. We also installed Wharfedale *Lynx* speakers as small reference monitors.'

Apart from the main room two other areas were constructed—a voice-over booth and a machine room. Both were built behind the control room being separated from it by a small corridor. From the booth there is direct visual contact into the control room via a back wall window. As part of the move to keep the control room as spacious and uncluttered as possible, certain equipment such as cassette and VHS machines were installed in the machine room. To control them a simple but rather ingenious system has been utilised which Mitchell-Dawson found in a nearby hi-fi shop.

'It's an infrared transmitter system called *Powermid* which allows me to control machines in the machine room from the control room using their individual infrared remotes. It consists of two small black pyramids: the one in the control room picks-up and transmits control signals to the one in the machine room which in turn beams signals to the respective machine. It's amazing how many people comment on it, in fact I'd say it's the most talked about piece of equipment that we've got in here, even though we've installed the world's first *Logic 3*!'

Most of the work that comes to Mitchell-Dawson needs to be autoconformed and he will receive an EDL which can be in various formats and a box of assorted tapes. Jobs that originate from within the building will come from one of the Lightworks rooms, and something that Oasis are currently looking at very closely is the optical link between Lightworks and *AudioFile*, whereby audio can be transferred via an optical disk, thus doing away with the need to autoconform.

At the moment, though, Oasis remain somewhat sceptical for two reasons. Firstly, it requires the off-line editor to lay-up production-quality audio (48kHz stereo) rather than working with the usual edit quality audio (24kHz mono), which will significantly eat into the available storage space. Secondly, there is concern that the off-line suite is not the ideal environment to monitor production-quality sound. So for the time being it looks as though Oasis will continue autoconforming audio—Mitchell-Dawson gives a brief outline of the procedure.

'First the EDL is loaded from floppy into *AudioFile*, which crunches it and asks you to load a reel. It will then control the tape transport, winding to the sections marked out on the EDL, and record them into memory with predefined handles at each end. Once the audio has been loaded into the system you hit the CONFORM button and *AudioFile* puts it in the correct place relevant to the pictures.

'The next stage is to spin through and tidy things up. One of the beauties of *AudioFile* is that you can actually do so much of the mundane bits of mixing within the system itself. So, for example, I can fill minute gaps and ramp across scenes to produce smooth transitions. While I'm doing this I can if I want also start building-up EQ changes from *Logic*. Because the *AudioFile* and *Logic 3* are so intrinsically linked, you can say from this point to that point I want this EQ, or during this scene I only want to listen to the A Leg of this stereo signal. By loading material from so many different source tapes, you will often end up with a mixture of AB stereo, mono, MS stereo and even SM recordings where the signals have been recorded in reverse. On the input side of *Logic*, you have the ability to change the configuration to match the recorded segment; an alternative is to load everything into the system as AB stereo—it depends on the time allotted to the project.'

Also at this stage any voice-overs that need to be added will be recorded along with any additional atmospheres, effects and music. These can be taken from the original source tapes, or from the 250 hours worth of CD libraries stored in the facilities Denon *DN1200* CD jukebox, or from previous effects made-up on *AudioFile* which are stored on Exabyte, or from the Akai *S1000*. Once all the components are in place, Mitchell-Dawson will start mixing.

'I usually mix an M&E (Music and Effects) and a final mix. Both these can be layed-back simultaneously using *Logic 3* grouping facilities, in fact the other day we layed-back three separate mixes simultaneously—guide voice-overs, M&E, and the full mix. The ability to design the desk to suit the job is really useful, and I've currently got over 40 desk setups stored. We can lay-back to any format here but mostly it's to D3 or Beta—all the lay-back machines, incidentally, are kept in a shared central machine room.'

At the moment *Logic 3* does not offer any surround sound facilities, although they will be made available as a future option. Has this been a problem for Oasis?

'No not really, to be honest there's not a lot of nonfeature broadcast that is currently being done in surround, so for the kind of work we specialise in it's not essential at the moment. However, I can see the situation changing and there becoming a demand for it; when there is we'll obviously cater for all.'

Since opening, there has been no shortage of clients, and Mitchell-Dawson describes it as being 'pleasantly busy.' Oasis are also starting to see more clients booking-in purely for audio work, rather than the audio being a follow-through from the facility's video work. Hugh Mitchell-Dawson is justifiable proud of his dubbing suite and its increasing popularity, but he has got one slight problem: 'Because I'm currently the only dubbing mixer in the country who knows how to operate *Logic 3*, I don't get any holiday!' ■

Oasis Television Ltd, 76 Wardour Street, London W1V 3LF. Tel: 071 43 4133. Fax: 071 494 2843.

PATRICK STAPLEY began his career in pro audio in 1972 at London's Abbey Road Studios where he worked with artists as diverse as Paul McCartney, The Damned and Matumbi, and was involved in quadraphonic remixes of *Tubular Bells* and *Dark Side of the Moon*. Patrick also ran his own production company and worked as Falconer Studios' Production Manager before beginning writing for *Studio Sound* in 1985.

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THE ART OF DISCRETION

The recording venue—a recital room in Pfaffenhofen near Munich

Anyone who has been following the world of classical music recording lately will be aware we live in exciting times. This traditionally staid sector of the business has in recent years seen a explosion of development, with attempts being made to refine every stage of the recording chain and to find new solutions to old problems. This in turn has led to healthy heated debate, and there will be those who may find something to say about bandwagons and hype, but the general thrust has been positive and innovative. Players in the game cover a wide spectrum, and include small specialist manufacturers, such as Crookwood with the *Paintpot* mic preamp; influential names, like Yamaha, whose 20-bit mixers and recorders are in widespread use; and, of course, the record labels, notably Sony Classical and Deutsche Grammophon. These, and many others, have highlighted several key areas for re-evaluation, and attention has been particularly focused on:

1. The placing of microphone preamps locally to the microphones to minimise the length of low-level cable runs.
2. Remote control of those preamps.
3. Conversion to digits at the earliest possible stage in the chain.
4. Digital encoding using more than 16 bits.
5. Carrying out all processing and mixing in the digital domain.
6. Enhancing the sonic performance of the final 16-bit medium.
7. A move away from the big multimicrophone rigs and a reappraisal of simpler 'purist' microphone techniques.

What seems to have been missed by many in of the industry is the fact that since 1991 AGM Digital Arts have been quietly developing a microphone recording system which addresses every one of these key areas and does considerably more besides. I went to see it, and try it out for myself, during rehearsals for a chamber music recital at a beautiful intimate recital room in Pfaffenhofen, near Munich.

On the mic

The AGM *MR-1* is a complete recording chain, beginning with a rather special 4-capsule microphone and delivering a 2-channel digital final output. Along the way it incorporates several fresh approaches and explores some established but under-used ideas. The system comprises the microphone itself, preamplification to line level, analogue-to-digital conversion, matrix processing of the four microphone signals, stereo reduction-encoding and an output section offering a variety of 2-channel formats.

The microphone itself is visually ▶

Dave Foister evaluates the startling 20-bit digital, discrete 4-channel *MR-1* microphone from AGM

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AGM Digital Arts' *MR-1*

very striking; it may appear bizarre to some but will be instantly familiar to anyone acquainted with the *Soundfield* microphone, with which it shares its fundamental approach. Like the *Soundfield*, it has four discrete microphone capsules, mounted in the form of a regular tetrahedron (the significance of this arrangement and the configurations derived from it are discussed in the sidebar 'A-format, B-format and Steering'). In the *MR-1*, the capsules are modified B&K *4011*s, carefully selected for matching and for off-axis performance; the electronics in the slim microphone stem are also B&K, as is the shockmount. The whole thing is much smaller than one might expect from the publicity shots, and is surprisingly elegant and unobtrusive.

The microphone is connected to its dedicated quadruple preamp by an 8-pin multiway terminated with screw-lock Tuchels, and although it is claimed that runs of up to 100m can be used without problems, the nature of the system is such that it is much more likely that this multicore will be kept as short as possible. The preamp powers the capsules and brings their four discrete signals up to line level to feed the convertors, which expect by default +18dBu for full modulation. The nominal gain is adjustable in 6dB switched steps from 0dB to +24dB, and each step employs a separate optimised amplification stage rather than varying the gain of a single stage. This should avoid the noise performance compromises of a single variable preamp.

The *MR-1* in operation over the stage

Although the gain is selectable from front-panel switches, the unit will normally be set for remote operation. In this mode, the main computer takes over control of the gain, allowing the rack containing the preamp to be sited right by the microphone. The remote switching is smooth and click-free, and the threat of control data breaking through to the audio is avoided by complete separation of the relevant boards in the unit.

In the same rack as the preamps sit the A–D convertors. These are AGM's own units, known as the *Dream AD-1 Classic*, and are built round Prism 20-bit convertors. Since they are the same devices as those used later for digital format processing, most of their features are not used at this stage, but a synchronised pair of *AD-1*s provide the two 20-bit AES-EBU outputs carrying the four signals from the microphone; this means that before it even leaves the bottom of the microphone stand the set of A-format signals can be encoded in robust digital form.

Given a suitable recorder—the Nagra *D*, with its four 20-bit-capable tracks, is ideal—these signals can be recorded directly on site and the full processing done elsewhere post-session, removing the problems of inadequate monitoring and difficult listening environments often encountered with location work. This, however, requires a considerable act of faith, since the A-format signals give no coherent idea of what the possibilities are for the final stereo image, or even whether the microphone is ideally positioned —although this is far less critical than with conventional microphone arrangements.

Where possible, then, the A-format signals will be fed to the main processors, with perhaps a ▶

A-FORMAT, B-FORMAT AND STEERING

The principles used to extract directional information from a microphone array such as that in the *MR-1* will be familiar to those who have worked with the *Soundfield* microphone but perhaps not to many others, although they are quite straightforward. The tetrahedral array allows the four capsule outputs, known as the A-format signals, to be combined and matrixed into a standard set of directional signals known as B-format, and this is a two-stage process. The capsules are arranged so that the first faces left, front and upwards (known as LF+), the second faces right, front and downwards (RF-), the third left, back and downwards (LB-) and the fourth capsule right, back and upwards (RB+).

Given that the capsules have a suitable polar pattern—somewhere around subcardioid—then subtracting the RB+ signal from the LF+ signal will produce a figure-eight pattern facing front-left in the horizontal plane (the vertical components will cancel out). Similarly, subtracting LB- from RF- gives a horizontal figure-eight facing right-front. Adding these two derived figure-eights gives a new figure-eight facing directly forwards, and this is known as the X component of the B-format set. In the same way, a figure-eight facing to the left can be derived, and this is known as the Y component. A similarly obtained upwards-pointing figure-eight is the Z component, and a straightforward sum of all the capsule outputs gives an omnidirectional response which becomes the missing W component.

The first thing to notice is that by gradually replacing X with Y in suitable proportions (sine-cosine proportions to be exact), and doing the same with Y and -X, the whole array effectively rotates about its vertical axis; this is what the Azimuth control of this type of microphone does. A similar crossfade between X and Z produces an up-down swing about the side-to-side axis, and this becomes the Elevation. Furthermore, simply inverting the phase of the Z and Y components inverts the whole microphone, and swapping the roles of X and Z switches between side-fire and end-fire.

It is also apparent that simply adding X (figure-eight) and W (omni) will produce a front-facing cardioid; adding X and Y produces a figure-eight facing 45° left, which can be turned into a cardioid by adding W. By extension, any type of first-order microphone (omni through to figure-eight via cardioid) facing in any direction can be precisely generated, and given sufficient controls and outputs, any number of such microphones can be produced. Simulating a conventional coincident pair, with fully variable polar pattern, angle, and orientation, is therefore an easy task, as is an M-S configuration, where M is a mix of the X and W components and S is simply the Y component. ■

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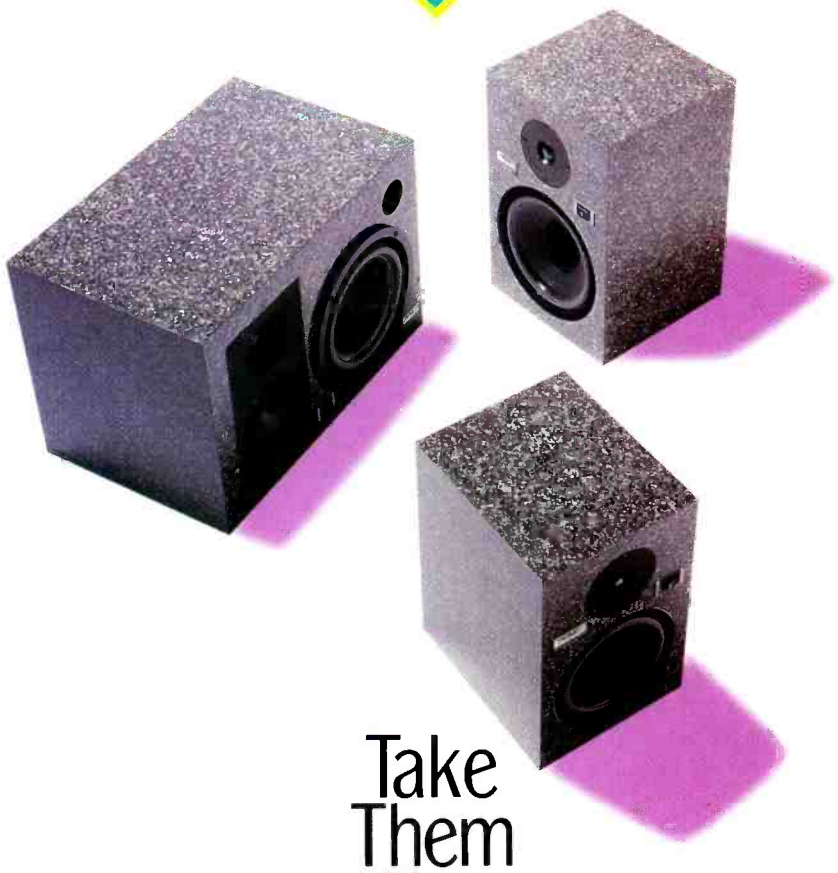

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Location control room showing the twin PC control stations

4-track backup recording running alongside for later reworking if required. In the full *MR-1* system the processors live in two rackmounted PC-compatible computers with remote screens, keyboards and mice. The first computer deals with control of the preamp gains, matrixing of the A-format signals into B-format (or Component Audio as AGM prefer to call it) and subsequent steering and configuration of the microphone, all controlled from a familiar *Windows* environment with real-time metering, calibrated control sliders and pop-up menus for the various options. Four meters show the incoming A-format signal levels while another four show outgoing B-format after the all-important matrixing and steering.

There are only four controls on the screen, and they all operate with the mouse in the same way, giving the choice of direct dragging, incrementing with the top and bottom buttons, faster movement by clicking in the bars, or instant reset to the default position by clicking the right-hand button. The first control is a digital level trim, giving a +10dB to -20dB variation (in 0.1dB steps) on the coarse-set preamp gains before the A-format metering. This is followed by the two B-format steering controls for the Azimuth and Elevation, both giving the full range of control to 180° in ▶

The complete picture

dCS 900B used by: Masterdisk

Remote 2 used by: Chop 'Em' Out

dCS 902 used by: Otec Recording

dCS 980 and dCS 988 used by: Gateway Mastering

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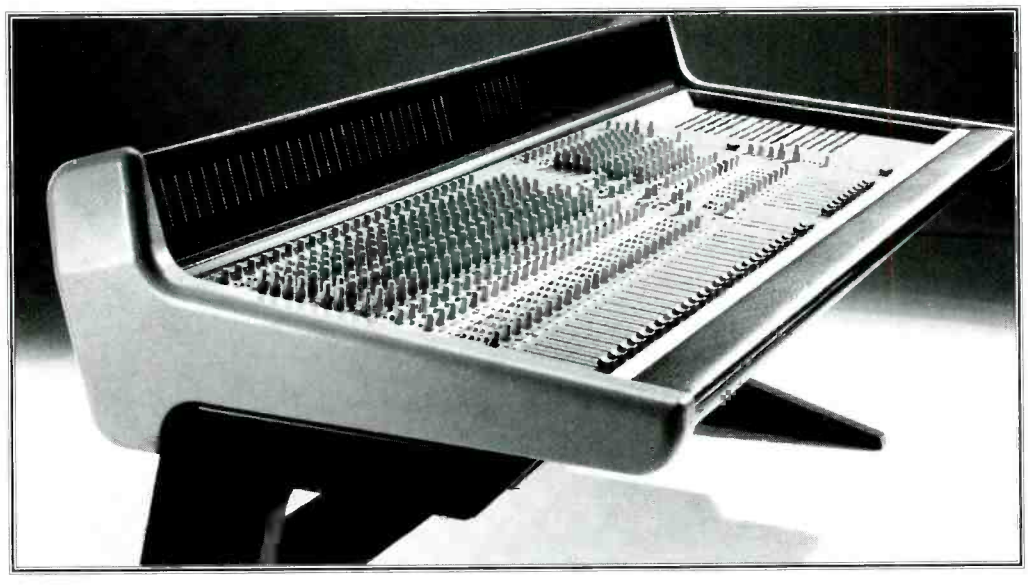

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Detail of the displays from the *MR-1*'s twin PC control stations

either direction. This means that no matter how the microphone is suspended in relation to the performers, it can be made to 'point' directly at them (without, obviously, any physical movement taking place). The remaining slider is for front-back Dominance, often thought of as a Zoom control since it approximates to the effect of moving the microphone towards or away from the performers so as to balance direct sound with room ambience to the desired degree.

The controls all operate smoothly and intuitively, with only an occasional zipper effect when making very fast alterations. There will never be a computer substitute for the continuous 360° azimuth controls on, for instance, the earlier *Soundfield*s and the Audio Design Pan-Rotate, but the end result is the same and settings can be achieved quickly and precisely. Future software may feature rotary on-screen controls, but the sliders do the job well enough for me.

What they do not do is provide any way of directly synthesising a conventional microphone or stereo pair. Production of first-order microphones, pointing in any direction, is so straightforward from B-format (see sidebar) that it seems, perhaps, a curious omission, although eventually there may be a library of off-the-shelf configurations available, simulating traditional techniques and familiar microphone characteristics. This would be made possible by the file storage facility, which at present allows the current setup of the system to be saved for future recall.

Pop-up options include various diagnostic setups, which can bypass various stages of the processing or produce a tone cycle, where all the B-format outputs generate 1kHz pulses in sequence. I would like to see more possibilities included here; I know from experience how hard it can be to trace a problem in a B-format system, ▶

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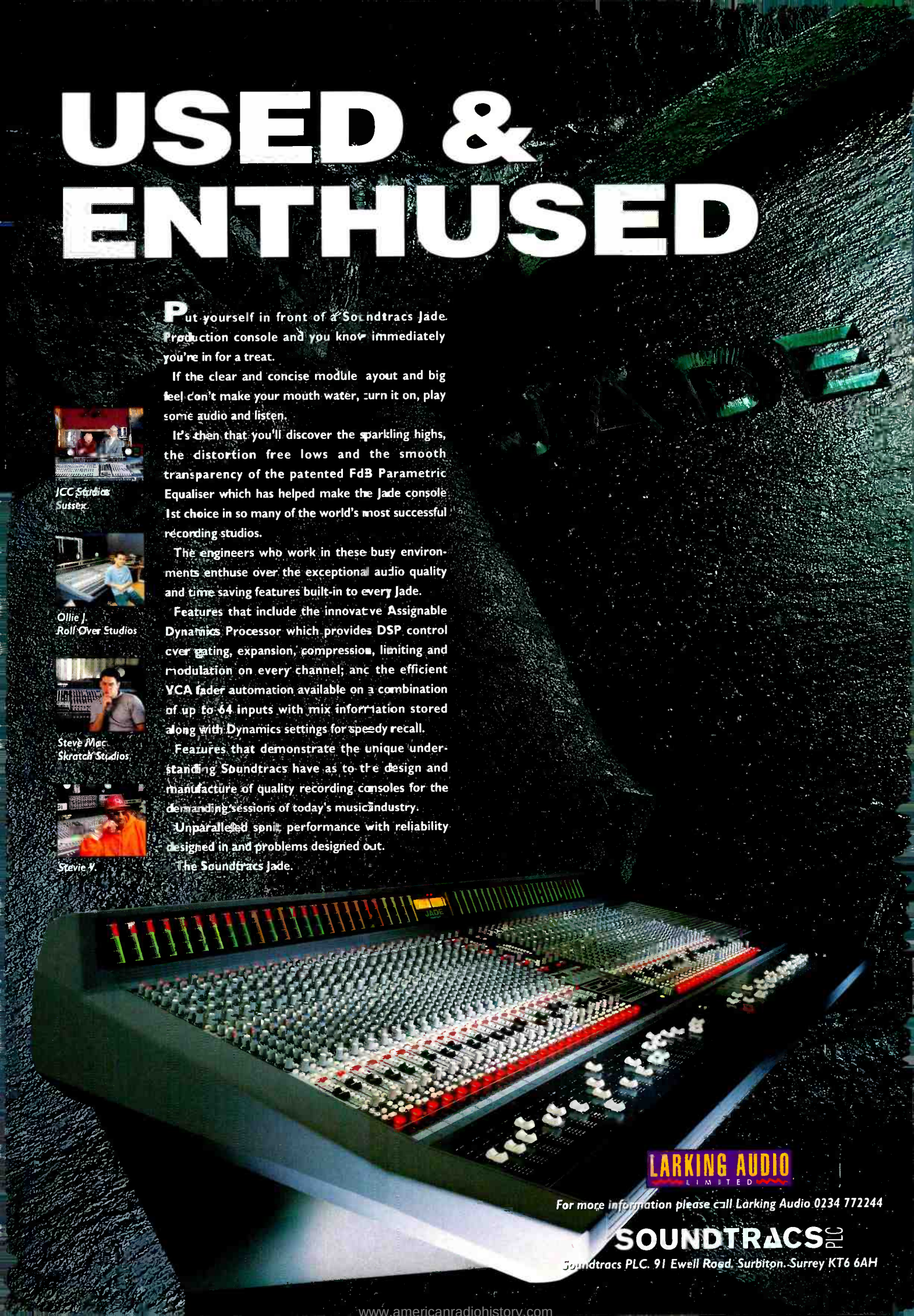

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AMBISONICS AND UHJ

The most spectacular use of B-format is the generation of a complete Ambisonic surround sound stage, including height if required, matrixed on to as many loudspeakers as are appropriate for the listening venue. A feature of the resulting soundfield is its relative independence of listening position; it is even possible to locate sounds with some accuracy and to detect movement when listening from outside the ring of speakers. Where 4-track storage is not available for the discrete components, encoding to fewer channels (using a system called UHJ) gives very good results; since most recording and transmission media are 2-channel, this is the most commonly used version, although this obviously cannot encode height. Decoding this to multiple speakers gives results almost indistinguishable from raw B-format signals, with the exception that rear images are less precisely located.

It cannot be denied that Ambisonics and UHJ, following so closely behind the damaging quadraphonic debacle and suffering from confused direction and marketing, has had a pretty lukewarm reception down the years. People who have heard its full capabilities, however, have a tendency to become instant converts, and there is no doubt that UHJ encoding, far from being incompatible with coded playback, actually produces an extremely natural, powerful stereo soundstage with an unrivalled sense of depth and of the space in which the recording was made. A typical comment from listeners is that the loudspeakers seem to disappear.

Some of those who have espoused Ambisonics most enthusiastically have had their own preferred working methods and have produced results which, while pleasing to many, have not perhaps been to everyone's tastes. The unfortunate consequence is a body of people who believe that Ambisonics is only capable of producing a warm, ambient, reverberant recording, and has difficulty achieving immediacy and impact; this is decidedly not the case, as I would urge people to find out for themselves. ■

where one misbehaving microphone capsule can cause strange effects on all the outputs. For these purposes mutes and-or solos on each of the A-format signals would be enormously useful.

The steered B-format signals pass to the second PC, again via two 20-bit AES-EBU links which could, if desired, be recorded onto 4-track for later stereo processing. Normally, however, these go straight to the software responsible for producing the final 2-channel output, which will be UHJ-encoded Ambisonic. This screen shows meters for incoming B-format (only three channels, since the vertical Z component is not required for UHJ and is therefore discarded) and outgoing 2-channel UHJ. There are three control sliders, one for level trim, one for stereo width and one for another front-back Dominance control, presumably on the assumption that B-format signals from another source, not equipped with such a facility, might be presented here.

This final output—still 20-bit—can be converted to analogue at this point for monitoring purposes. The setup I was using employed a Lake People D–A for this purpose, which has an auxiliary digital output to feed the final *AD-1* convertor. This is used in digital–digital mode, and can record direct to a 20-bit medium or via a choice of formats to 16-bit. Like most 20-bit systems, this needs to come down to 16 bits in the most civilised manner possible, and offers a choice between flat dither and Super Noise Shaping (SNS), which reshapes the noise out of the ear's sensitive midrange and into the HF band where it will be less troublesome. This is claimed to give a weighted signal-to-noise ratio of 110dB from 16 bits, and its effect when monitoring via a connected DAT machine is quite distinct, with a clearly perceptible increase in perceived transparency.

A further mode offered by the *AD-1* is DRE (Dynamic Range Enhancement) which is a double-ended encode-decode process designed to yield virtually 20-bit performance from a 16-bit medium; the idea is that DAT could be used for temporary storage of the system's output prior to subsequent 20-bit editing or other processing. I was not able to try this technique, but it sounds like something we should know more about as a freestanding process.

Future plans include systems for combining multiple *MR-1*s into one B-format soundfield, ideas which have their germ in the digital mixer modules already available from AGM. These allow external mono spot microphones or other feeds to be added to the *MR-1*'s image with appropriate positioning and compensatory delays. The use of these is, in fact, vital since the processing involved in the *MR-1* system itself adds several tens of milliseconds of delay to the microphone signal.

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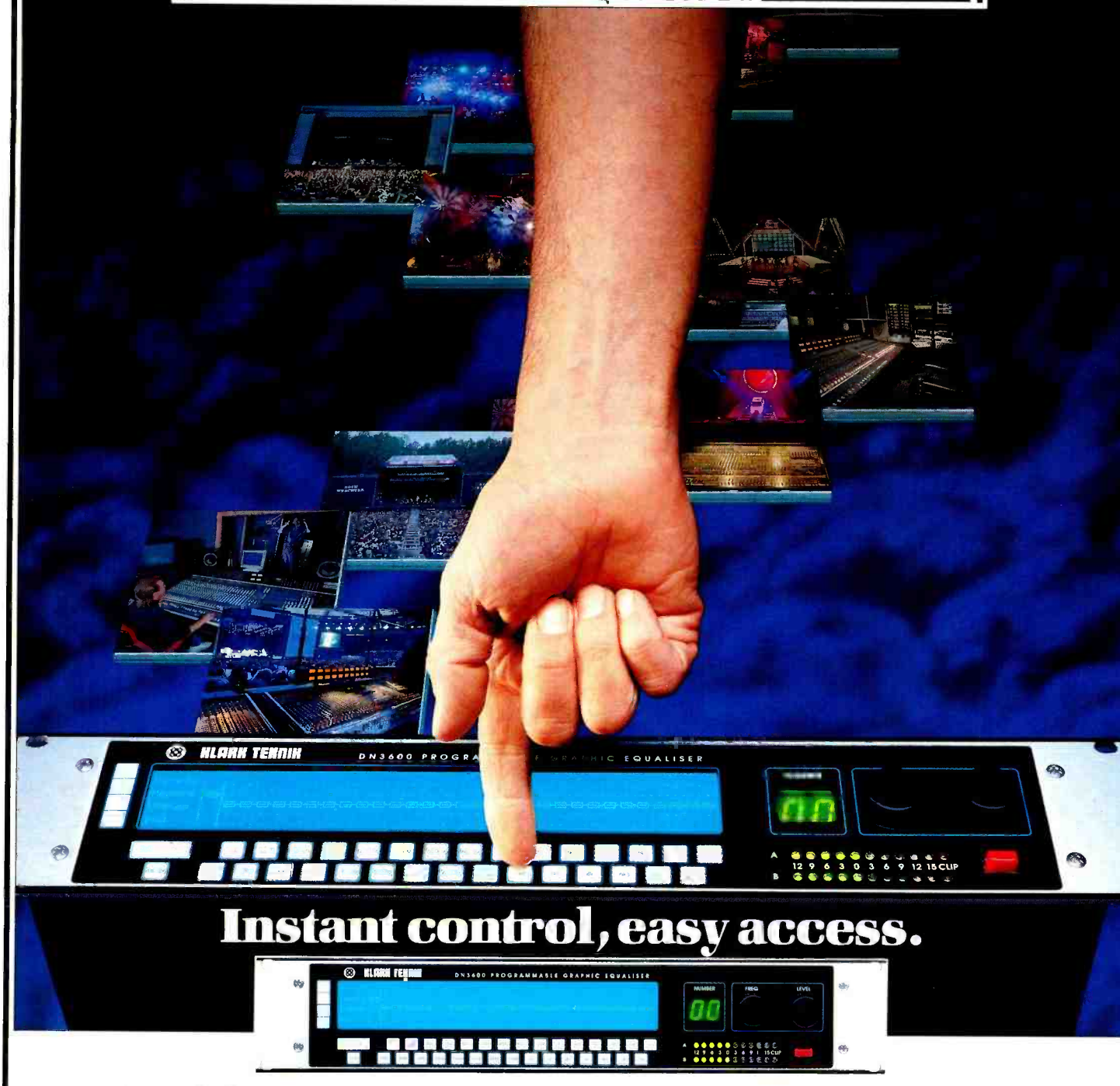

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loudspeakers and UHJ to B-format conversion —available and in the pipeline. The *MR-1* clearly has the potential to operate effectively as a digital B-format workstation.

Conclusion

Despite the apparent complexity of the *MR-1* system, it is in fact extremely simple to set up and operate, and any effort involved (principally in lugging it all about) is repaid in the results it produces. It takes a special piece of audio kit to make the little hairs on the back of my neck stand up these days, but the *MR-1* managed it, with its startlingly natural, clean, quiet, accurate portrayal of the musical performance I had already heard going on in the next room. Its ability to convey the character of the room was uncanny, to the extent that in when we placed it in one particular position I thought something had gone drastically wrong, as the image became indistinct and positions hard to identify; when I checked in the room, it turned out that the microphone must have been at the meeting of several room resonances—the image live in the room was just as blurred at that point. Having established that, a more suitable position produced the now familiar transparent reproduction of the impressions received in the room itself.

It is important to be clear about the fact that none of this is 'vapourware' or lashed-up prototypes; this is a complete finished product, ready to go, and it works superbly well. This is a dream of a system, built with no compromises and with a careful selection of leading-edge techniques, which in the right hands will be an enormously powerful tool, justifying every penny of its price. There is no substitute for recording acoustic music, simply and to the highest available sonic quality, in an appropriate venue, and the *MR-1* has to be the most elegant, musical way of going about it. ■

Thanks to the Vienna String Trio, with Peter Schilbach at the piano, for allowing their rehearsal to be used as the raw material for this review.

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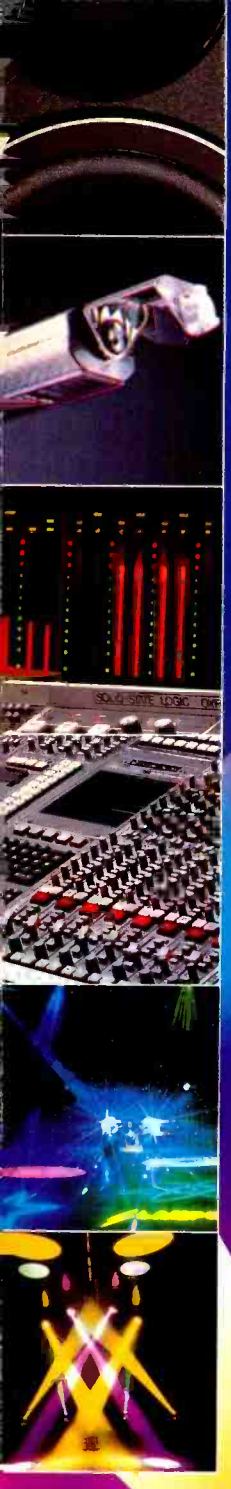

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DANISH MASTERY

Jim Betteridge boots up tc electronic's contender for the heavyweight pro-reverb crown and discovers a powerful processor with flexibility at its heart

The *M5000* is a new high-end digital effects processor from the Danish company tc electronic. Their name first gained widespread recognition back in 1986 when their excellent dynamic digital delay line-effects processor, the *2290*, stole a large chunk of the market from the established high-end unit of the day. Similarly, tc electronic now have their sights set on the very top of the reverb/digital-effect tree where there are surprisingly few real players —the American Lexicon being the acknowledged market leaders in terms of quality and mystique.

In the interests of flexibility and longevity, the *M5000* employs a 'mainframe' format whereby a number of processing modules can readily be plugged into the rear panel ports of a single 2U-high rackmount mother unit or mainframe. As new and more wondrous devices emerge from tc electronic's R&D department, mainframe owners will be able to take them onboard while retaining the, by then familiar, front-panel control surface and operator interface.

The flexibility-longevity theme continues in that the system is entirely software controlled. Thus, as better ways and means evolve, or as new effects algorithms are developed, all you have to do is get hold of the new software. tc electronic have gone out of their way to offer as many ways as possible in which this can be done. For a start, all *M5000*s have a data card slot, and so a card can be used to install new software. Additionally, a 3.5-inch floppy drive offers another means of data acquisition. Also, all *M5000*s have MIDI ports which will allow you to port new software from one *M5000* to another. An extension of this is the facility to download software from tc's electronic notice board in Denmark via modem to a PC (or compatible), a *Mac* or an Atari. Official software updates and professionally created algorithms will almost certainly be charged for, but the notice board is also available for the free interchange of programs between users. During the course of this review I was given two software updates: one via a diskette which I was able to load literally in seconds, and another which I downloaded via modem to a PC. Both processes were quick and easy. The card and the drive can also be used to store user-created programs and, the idea being that an engineer-producer is able to carry favourite programs from session to session.

The mainframe can play host to up to four modules. Each module consists of a PCB assembly-mounted onto a panel containing all the necessary connectors. This plugs into the back of the mainframe, secured by two finger-screws. All quite simple. Currently, there are two types of module available: a stereo A–D/D–A called the *ADA-1* and a digital signal processor called the *DSP-1*. Any combination of four of these is possible. If you work entirely digitally or prefer to use your own convertors, you could have up to four *DSP-1*s, that is four entirely independent stereo processors in a single unit. Very neat. If you are still floundering about in the analogue swamp, you will need to work in *ADA-DSP* pairs.

The *ADA-1* has two female and two male XLRs offering electronically balanced, line-level audio ins and outs. The input is capable of receiving all standard line-levels or the output of an electric guitar without apparent difficulty. The *DSP-1* offers AES-EBU in-out on XLRs, consumer optical I-O and SPDIF in-out on phonos. In all cases 32kHz, 44.1kHz and 48kHz sampling rates are supported.

There are three sockets on the rear panel which are currently unused, but which will come into play with future software updates: a time-code input jack (a cue list facility is in the pipeline that will also respond to MTC), a SCSI socket and a remote control socket. When it arrives next year, the remote unit should be very comprehensive. There is also a foot pedal input jack, an LAN port (Local Area Network) for future development of a kind of expanded computer-network notice board for users and, to return to rather more basic facilities, a standard IEC mains socket. There is also a full set of MIDI sockets, which we will discuss later.

No one could accuse tc electronic of being cosmetically gaudy. A more workman-like front panel would be hard to imagine. All knobs and buttons together with the surface against ▶

tc electronic's *M5000*—quick and immediate to use, and beautifully quiet

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which they are set are matt charcoal-grey. With the exception of the metering, all LEDs are red and virtually all writing is in white, with the occasional flash of blue. It is ruggedly constructed, the soft keys are tooled alloy rather than plastic, all controls feel nicely positive and the whole thing speaks of sturdy reliability.

Hands on

Though far from dull to use, the *M5000* is delightfully predictable in operation and, unlike some other less expensive models, gives little cause for frustration or manual hunting for anyone familiar with the basic principles of such a device. The user interface is excellent and employs a combination of buttons and a set of five soft knobs—like soft keys, but they are rotary encoders instead. These pertain to a simple 2-line, backlit LCD, alphanumeric display which works in conjunction with a simple LED display showing the current program number.

It is only possible to address one DSP module at a time. A momentary rocker switch is used to nudge you through those available, allowing you to choose. The DSP card is not a multieffects device as such, it concentrates on performing one effect well, although there are programs that combine effect types, as we will see.

In addressing a DSP, there are three main modes which can be accessed by pressing dedicated buttons entitled PROGRAM, EDIT and UTILITY. In Program mode the right-hand knob takes you through all the programs (100 preset in ROM, 100 user-definable). When you find a name of interest, you hit the DO button to load it (which takes a fraction of a second during which time the unit goes into Bypass). Press the EDIT button and the program's parameters are made available as a set of pages accessed via a pair of nudge buttons situated to the left of the display. Each page has a set of up to four values adjustable using the soft knobs. These adjustments are heard in real time and you can toggle between the original and the edited version using the DO and the UNDO buttons.

The effect types are divided into 'configurations', of which there are currently 11: Reverb 1, Reverb 2, Reverb 3, Nonlin[ear] 1, Chorus 1, Revpitch, Pitch 1, Pitch 2, Delay 1, Delay 2 and Sample. More are continually being developed, though tc electronic are giving little away about what they may be.

Reverbs 1 and 2 are of a similar type, but Reverb 2 concentrates on smaller spaces and provides more control over the early reflections—nine variables for this aspect alone. Reverb 3 is different in that it aims at greater clarity and a denser tail by offering individual decay times for four independent frequency bands. At this price level it's very unlikely that a digital reverb will be other than pretty good, and whether you'll prefer it to the Lexicon *300* or any other is bound to be very personal. I have to say that I really liked the sound of virtually all the *M5000*'s effects and especially the reverbs. Just like they claim, they're very quiet, smooth, dense and non-digital sounding. Apparently, George Massenburg was brought in to lend a golden ear or two in the programming of the Reverb 3 effects. Nice job, George. The nonlinear reverbs—reverb effects that could not be created by a natural space—are also excellent and offer all sorts of opportunities to give individual sounds their own particular ambience—if that's your *bag*.

Delay 1 is a simple stereo delay offering independent left-right delay times plus overall feedback with high and low filtering and an overall high shelf. Delay 2 allows a more unusual range of effects. In addition to the standard parameters it is possible to create cross-channel feedback, to shift the relative phase of the left and right outputs and also to modulate the pitch of the delay with variable speed and depth. The effects can be strikingly rich and unearthly.

Pitch 1 is a 2-channel pitch-shifter, allowing two independent intervals to be created. Pitch 2 is simply a stereo-linked version of Pitch 1, where a single interval is created for both sides of a stereo signal. tc electronic claim an 'intelligent deglitcher', and indeed the basic pitch-change effect is smooth for simple signals, although given a more complex input the glitches can be very noticeable. This problem is apparently in hand, however, and a more stable response is planned for some future revision. The RevPitch configuration allows an ambience (rather than a full-blown reverb) to be added to a pitch-shift effect.

The Chorus effect goes from a subtle thickening to churning flange. As with all the other effects, it is notably quiet allowing you to add some sparkle to such as a lone acoustic guitar without a background swirling around. Filtering on both the feedback and the overall sound allow detailed tailoring of the effect.

The most recent software addition to the *M5000* is that of sampling—I was given a pale version of what will have hit the RAM by the time you read this. Though relatively limited as samplers costing several thousand pounds go, the full-blown package will be able to utilise standard PC SIMM chips to offer up to 160s stereo sampling (using 16Mb chips). Though all the details are not clear, the sampler will allow good basic editing and will hold multiple samples, disk saves and loads and offer extensive triggering facilities. If you do not have a dedicated sampler, it would be a relatively inexpensive means of acquiring a useful basic sampling facility.

The MIDI implementation is unusually comprehensive: virtually any controller can be used as a source to control up to 32 of the *M5000*'s parameters, without audible interference. Double controllers can also be used if higher resolution is desired. Few people will ever use all 32 controllers—unless perhaps you wanted to create a full-function MIDI remote. . . You can also recall *M5000* programs using MIDI program commands, and remap them to allow certain effects to be associated with certain synth patches. What you cannot do, that might be a useful addition, is to control the pitch of the pitch-change effects using MIDI notes, allowing you to get around the changing harmonic requirements of a given melody—again this is apparently being considered for the future.

Summary

The tc electronic *M5000* leaves very little to be desired as an effects box. It is quick and immediate to use, it is beautifully quiet and the effects are pristine and inspiring. In terms of the market it is addressing, it is also good value for money —although it is still rather expensive compared with the vast majority of (lower quality) digital effects units in common use. There is no obvious reason why the *M5000* should not become a new industry standard. But then such things can never be logically predicted. We're talking art. ■

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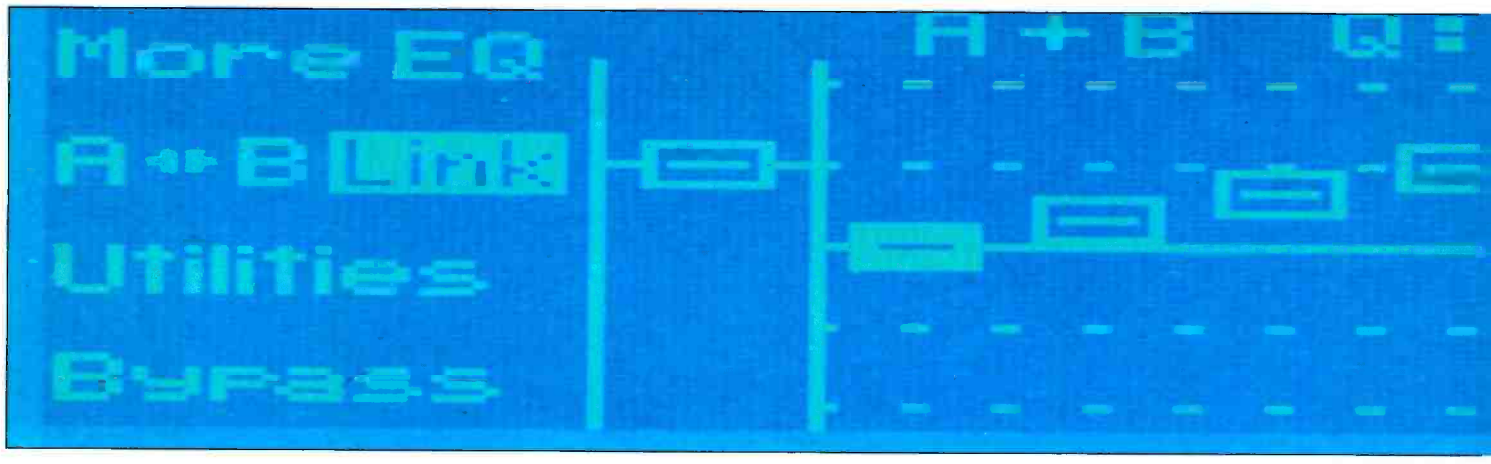

THE ULTIMATE WAVE

Terry Nelson gets the first hands-on session with the revised *DN3600* programmable graphic equaliser

The Klark Teknik *DN3600* programmable graphic equaliser was presented to the world at the Berlin AES last year and is now in production with version 2.0 software.

The revised *DN3600* will find applications in live sound installations —both touring and fixed—as well as in studio situations, typically postproduction.

In my opinion, all programmable equipment should function at least as well as the standard unit it replaces —and then some. It should help you to do what you already do, but do it better and faster.

The appeal of the graphic equaliser has always been that it is fast and easy to access and gives an immediate display of its current status. So how does the *DN3600* shape up? For anyone who has a reasonable idea of what a graphic is supposed to do, the *DN3600* is very easy to understand and I had most of the functions down within a couple of minutes without opening the manual. But back to the beginning...

The Klark Teknik *DN3600* is a 2-channel programmable 1/3-octave equaliser housed in a 2U-high rack package so space saving is already on the agenda. Interfacing is via the balanced XLR input and output sockets and mains supply is via a standard IEC connector. The unit also features MIDI In and Out on XLR connectors and a 16-pin ribbon cable connector.

The front panel consists of a large LCD with a graphic representation of the 30 ISO 1/3-octave frequencies (25Hz—20kHz) together with an output gain 'slider', four soft keys to the left of the display, a twin-character numeric display to the right of the LCD screen and two rotary encoders for Frequency and Level. Underneath the rotary controls are two LED level meters and power ON-OFF switch. The remaining controls are touchpads underneath the main display for Curve-Fader display, Gain and the 30 frequencies.

The frequency bands provide ±12dB of boost and cut in 0.5dB steps while the gain is variable from -18dB to +6dB, again in 0.5dB steps. Setting the gain lower than -18dB mutes the system and a graphic appears to indicate Mute status is active.

As far as intuitive operation is concerned, KT have done their homework and it is obvious that the 'slider' which is highlighted is the one affected by the Level control and that different 'sliders' can be accessed with the Frequency control. It is also fairly obvious that pressing the relevant touchpad is another way to select a frequency—or to access the unit's main gain control.

So far, so good. We can operate the *DN3600* just like a standard graphic with the exception that you have to use key pads or knobs rather than a handful of sliders. Access is fast and the thought processes are pretty much the same.

The touchpads do require a bit more pressure than you might expect in order to select a frequency and no doubt this is to avoid inadvertent brushing by little fingers. However, if you are too much in a hurry you could find yourself boosting or cutting the wrong frequency.

One of the nicest features of the unit is the fact that you can grab a number of faders and move them up or down. This is done by either pressing two frequency keys quickly in successions or at the same time. In both instances, the two keys define the lower and upper limits of the faders you wish to move. This 'block' of faders can then be boosted or cut as required and it is amazing how effective even a minimal tweak (say 1dB) can be. The block is cleared by pressing a single frequency key.

The *DN3600* offers the characteristics of the popular *DN360* EQ, with its wider curves, or the equally popular *DN27* with the narrow-band performance of an *LC* equaliser.

When the *DN3600* is powered up, the start up display next to the unit's four soft keys reads: 1: More EQ, 2: A:B Link, 3: Utilities, 4: Bypass.

The rest of the display shows the 'virtual' EQ faders (Klark Teknik's terminology) plus additional information

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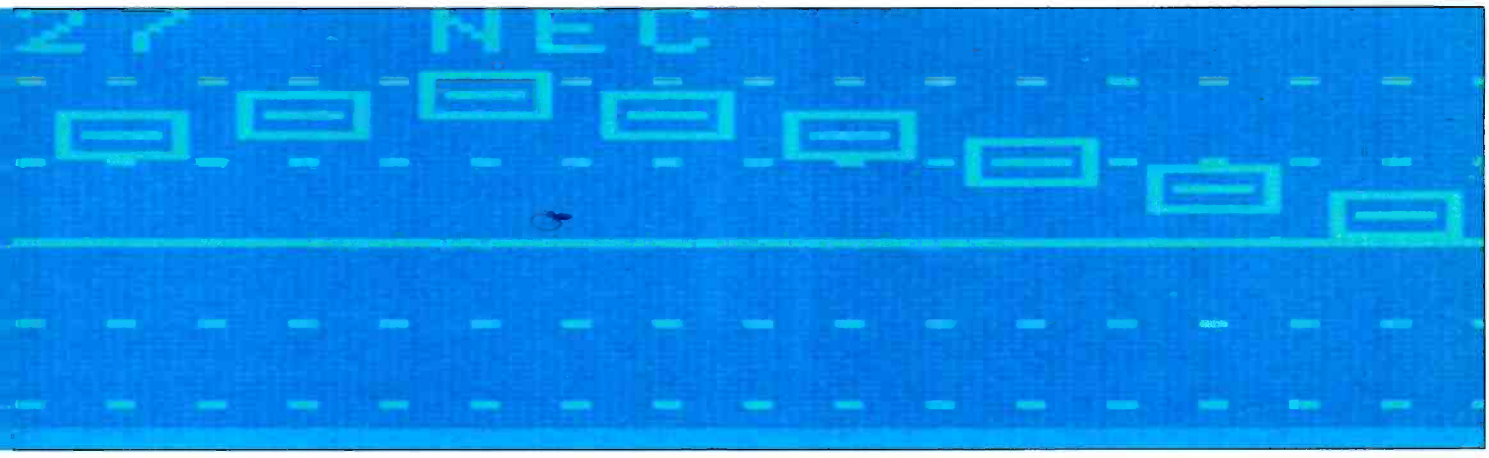


at the top of the screen, this being from left to right: Channel selected, Q type, Memory name (eight characters), Current frequency selected, Gain setting (±12 dB in 0.5dB steps).

Functions

Looking more closely at the *DN3600* functions, a frequency can be selected either by pressing the appropriate key or by turning the FREQUENCY knob to give the desired frequency. The button on the selected 'fader' is highlighted and easy to see. The amount of boost or cut can now be determined by the LEVEL control. The output Gain is adjusted by pressing the GAIN touchpad and setting the level with the LEVEL control.

Other functions immediately available are Curve-Fader display, A:B:Link and Bypass.

Pressing the CURVE-FADER touchpad varies the LCD from the fader graphics to the overall frequency curve and this is very useful for fine-tuning operations. The top of the screen displays the frequency band currently selected —together with its gain setting—in both display modes.

The A:B: LINK soft key selects between the A and B Channels with a single press while holding the key for a second links the two channels together. The Link mode is more flexible than one might first think; if both channels are set flat, then both channels will be adjusted simultaneously—the same EQ being applied to both. However, depending on whether the cursor is on A or B when selecting Link, the 'master' channel will be different.

If, for example, both channels have been adjusted separately and from now on you want them to work together, selecting Link mode means that whichever channel was highlighted (A or B) will now become the master and further adjustments will be made to both channels. The Link function can be deselected at any time by pressing the soft key.

The BYPASS key is self-explanatory. However, it also acts as a Clear key for the equaliser settings.

In order to do this, the key is pressed and held down until the Bypass highlight starts to blink. The key should be held down for another five seconds which will results in all the 'faders' being reset to 0.

Delving deeper into the possibilities of the unit, pressing Soft key 1 (More EQ) brings up the filter screen with the prompt 'Select a Function' at the top of the display. The four soft keys now show: 1: Filters, 2: A<>B, 3: In-Out, 4:Exit.

Functions immediately available are A<>B which selects either the A or B channel, In-Out which switches the filters in or out (independently of the main graphic EQ) and Exit which returns the unit to the startup screen (or display).

In addition to graphic equaliser functions, the *DN3600* features two sweepable high and low-pass filters (12dB-octave) which allow basic response shaping and the elimination of 'problem' frequencies before moving on to creative EQ.

Pressing FILTERS displays: 1: Notch 1, 2: Notch 2, 3: ±, 4: Back.

The frequencies for Notch 1 and 2 are selected either by the frequency keys (1/3-octave spacing) or by the Frequency control (12th-octave spacing). Maximum cut is 12dB in 1dB steps. However, should it be required, the two filters may be set to the same frequency, thus providing up to -24dB.

Soft key 3 selects the high-pass and low-pass filters and these are adjusted by the FREQUENCY and LEVEL controls respectively.

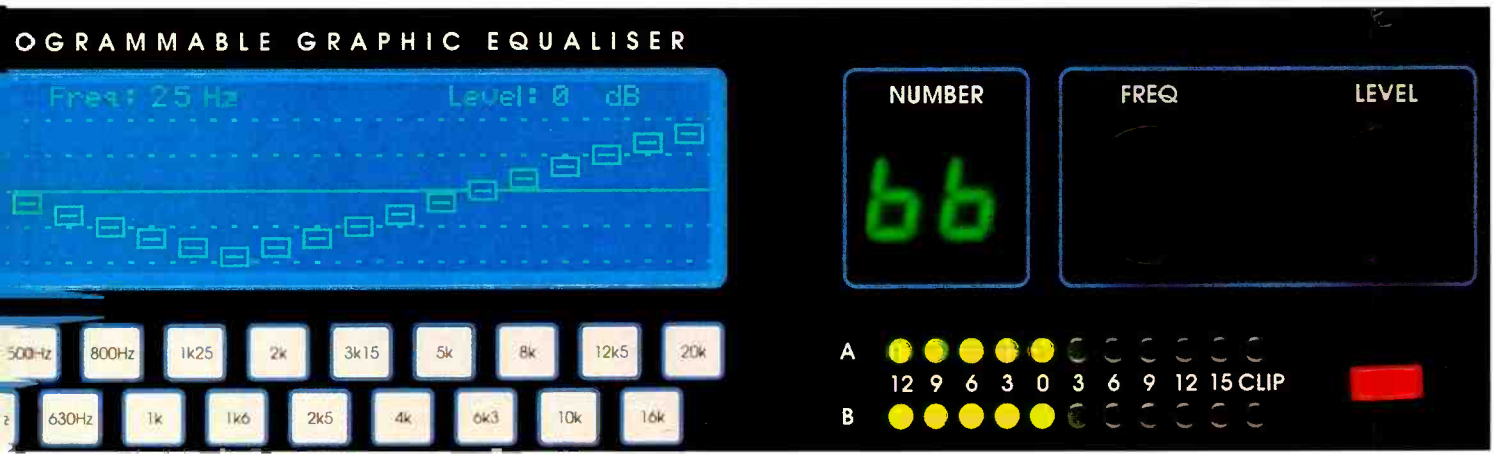
The screen graphic shows the response curve of the filters, together with the frequencies selected. However, pressing CURVE-FADER for curve will show the combined frequency response of the filters and EQ.

Pressing BACK returns the *DN3600* to the previous screen and EXIT returns the unit to the startup screen.

Advanced functions

Pressing Soft key 3 Utilities brings up the prompt 'Page 1 Press More For Page 2' while the soft keys read: 1: Auto-Q, 2: Memory, 3: More, 4: Exit.

Pressing Soft key 1 calls up the functions: 1: Auto Gain, 2: Auto EQ, 3: 'Q' Type, 4: Exit (to startup menu). ▶



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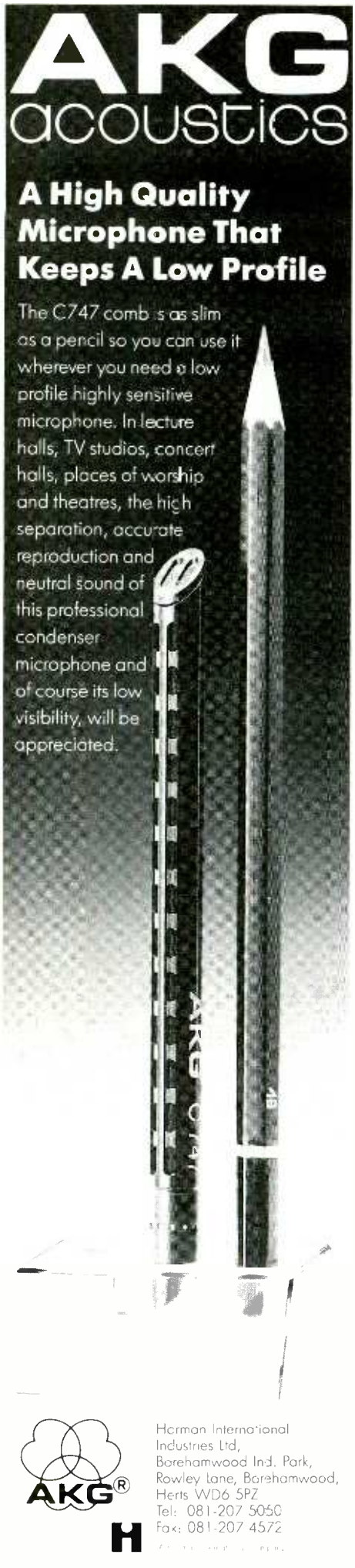

Pressing AUTO GAIN switches this function in or out. This facility is useful in that it adjusts the output level automatically depending on the EQ settings, thus maintaining unity gain throughout the system. The graphic 'Auto' is displayed over the gain fader when the function is in service.

Auto EQ is for use with the KT RTA and will be dealt with later.

'Q' Type toggles between the filter characteristics of the *DN27* or *DN360* graphic equalisers for the channel selected. This means, for example, that the A Channel could emulate the *DN360* while the B Channel emulates a *DN27*. Going into Link mode from the A channel would mean both channels will emulate the *DN360* while going into Link mode from the B Channel will emulate the *DN27*.

EXIT returns you to the startup screen.

The Utilities software sees the start of some niggles. The More EQ pages toggle nicely back and forth and you know where you are. With the Utilities, things are a little different.

You would assume that the same logic would apply, but it does not. If you press AUTO EQ and 'Q' TYPE, the functions stay displayed and you can make up your mind whether you want to exit or not. Pressing AUTO GAIN selects the function and puts you back in the startup screen. This can prove to be annoying as maybe you had thought of going through the functions in sequences and do not want to exit automatically. In a high pressure situation (such as monitoring for a festival) it is the sort of small thing that can cause big problems for the engineer.

Returning to Utilities we can now select Memory, which controls the 66-slot user memory section. The soft keys now read: 1: Recall, 2: Save, 3 Lock, 4: Exit.

In order to recall a memory, press RECALL. The numeric display will show the memory number while the screen will display the fader positions for both channels plus the memory name. The various memories can be selected by turning either the FREQUENCY or LEVEL controls. The desired memory can then be called up by pressing RECALL a second time (this is also prompted by a screen message on the LCD).

In order to save a memory, press SAVE. The LCD now shows the letters of the alphabet corresponding to the frequency keys together with shift and backspace (delete) functions. The shift key calls up the numbers 1–9 or returns activity to the letters.

The screen displays 'Old Name' and 'New Name'. You can now write an 8-character memory label alphanumerically as required. In the case of updating a memory, the name will be displayed on both lines. If you wish to modify the name, pressing a frequency key (a letter or number) will delete the old name in the 'New Name' line and allow you to enter the new character.

The memory position can now be selected, if required, by either the FREQUENCY or LEVEL knobs. Pressing SAVE now saves the memory to the number selected.

(Once again, pressing either SAVE or RECALL returns to the startup screen, not necessarily what you always want).

The Auto EQ function allows the analysis of the *DN60* to be converted into a suggested EQ curve on the *DN3600*

The Lock function allows the unit to be protected against unauthorised tampering or resetting, particularly useful in fixed installations where the temptation is greatest.

Pressing LOCK displays the functions: 1: Full, 2: Partial, 4: Exit—together with the letter display as for saving a memory.

A screen prompt asks you to enter a password of up to eight characters. The password is hidden under '????????', and if you cannot be bothered to write a password, '8' will do! If you do enter a password, pressing a frequency key shows the word momentarily so make sure you remember what it is before proceeding further with the lock function. When in doubt, press EXIT and begin again.

You now have two options, Full or Partial lock. Pressing LOCK provides full lockout of the system and no further adjustments can be made unless you re-access the unit via the password. The Partial lock function allows memories to be selected and recalled.

When Lock or Partial lock are selected, the screen returns to the startup graphic display together with the status Locked—No Access or Locked—Memory Access only.

The soft key functions will now be UNLOCK for Full Lock and UNLOCK and RECALL for Partial Lock, where a memory can be selected and Recalled.

In order to gain access to the unit, press UNLOCK, key in the password and press UNLOCK a second time. If the password is correct, the unit is returned to normal operation, if not...

The last section of the Utilities menu is More, or Page 2, and displays the following options: 1: Slaves, 2: MIDI Chan, 3: Inv LCD, 4: Exit.

The SLAVES soft key is for use with multiple units so we will come back to this later on.

MIDI CHAN allows MIDI channels to be selected and when pressed displays MIDI Chan and Slaves (which accesses the Slaves function). Turning either the Frequency or Level knob selects MIDI status to be omni—in which case the numeric display shows 00—or one of the MIDI channels 1–16. Press MIDI CHAN again to confirm the command. When the *DN3600* receives MIDI program-change commands 1–66, the corresponding memory location is recalled. Similarly, when a memory location is recalled, ▶

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the unit sends out a MIDI program-change message from 1–66.

The INV LCD soft key allows the LCD to be changed from a blue to green background with what are basically white graphics. A screwdriver preset above the LEVEL control allows the display to be adjusted according to the angle of vision. Depending on the ambient light conditions, it is a useful facility to be able to change the screen background and the display itself was found to be sharp and not tiring to the eye.

The EXIT key returns to the startup menu—as do the other soft keys for Page 2 once pressed.

RTA

As can be seen, the *DN3600* is a very flexible piece of equipment and when used with additional *DN3600*s or *DN3601* slave units, and-or with the *DN60* real- time analyser, becomes even more flexible.

We touched on the Auto EQ function earlier on in this report and this is for use with the *DN60*, which should be interfaced to the *DN3600* 16-pin connector by a ribbon cable (supplied) from the plotter output of the *DN60* (the connections should be made before powering up the DN60 in order for the units to 'understand' that they have been connected.)

As the term suggests, the Auto EQ function allows the analysis of the *DN60* to be converted into a suggested EQ curve on the *DN3600*. The starting point may be a flat setting on the DN3600 or a preferred setting such as a house curve.

In order to obtain an average response, the Auto EQ operation should be repeated in a succession of microphone positions—say a minimum of six.

In practice, the Auto EQ facility was very fast and could certainly prove to be an important time—and nerve—saver in hectic situations. The suggested curves were actually good and can always be tweaked to suit personal taste once the basic operation is completed.

However, a word of warning, which in passing goes to show that the operation of Murphy's Law is not always to our detriment. As luck would have it, the 8kHz filter on my *DN60* decided to be down on response (even though the startup routine said 'OK') for the test sessions and as far as the *DN3600* was concerned, the 8kHz frequencies were therefore lacking by about 10dB. The Auto EQ response was decidedly bright and the 8kHz band had to be brought in line manually to fit in with the overall balance. This is certainly no criticism of the system—it works well, but this unexpected fault did have the merit of exposing a possible danger area.

The last but not least function of the *DN3600* concerns the slaves. This can either be in the form of multiple *3600*s or a master *DN3600* with *DN3601* slaves which must be programmed from the master unit.

In order to use this facility, the equalisers must be connected together in a closed loop using the MIDI Ins and Outs. For large installations, once the slaves have been programmed, the master *DN3600* may be removed and the memories accessed by MIDI program-change commands.

The units supplied for this report consisted of two *DN3600*s (rather than a *DN3600* master and *DN3601* slave) ▶

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but operation is identical.

Upon selecting the Slaves function (Utilities—More—Slaves), the LCD shows: Select All, Stand Alone, Select Slave Number, then confirmed by pressing the soft key SLAVES a second time. The unit then returns to the startup screen.

Select All means that all changes made on the master unit will be copied to all other units in the chain.

Stand Alone means that change made on the master unit will not be copied to other units.

Select Slave Number allows individual slave units in the chain to be selected and programmed by the master unit. A maximum of 64 units can be slaved up with their number corresponding to their place in the chain. Units are selected for control via the rotary controls.

The LCDs of all units show their current status and when a modification is made on the master unit, the screen on the slave(s) blanks over and displays that the unit is under remote control. In the case of a slave *DN3600*, response changes can be made locally in the normal way. If this is not desirable, the Lock function should be used.

On a final note, if MIDI program-change messages are to be introduced into the loop from external equipment, a MIDI merge unit should be used.

Conclusion

Klark Teknik have certainly done their homework on this equaliser, and it represents a step forward in terms of programmable systems. The audio quality is very good and I found the EQ to be suitably 'musical'—the switchable *DN360-DN27* emulations are also very worthwhile additions.

The change between settings was found to be very smooth with no objectionable clicks or breaks. In fairness, I did also try the units at home with my custom mixer, unbalanced outputs and feeding into an equally unbalanced Quad *405* amplifier and did notice some *zipper* noise. However, when interfaced to a professional console and amplifier system, everything was very clean. It is to be assumed that people buying the *DN3600* will have professional balanced systems with line level gain structure.

The units themselves are cleanly laid out and easy to use. However, they are not exactly light and some form of support (such as rack rails) is recommended for mobile applications.

The real niggles concern some software functions where it is often annoying to find oneself back in the startup screen when you still have other things to do. However, this does only apply to the Utilities menu and is something that can be looked into.

The *DN3600* will find its way into various areas of audio, not the least being the postproduction studio where EQ changes can be executed swiftly and smoothly by MIDI commands for audio—follow-picture situations. Highly recommended. ■

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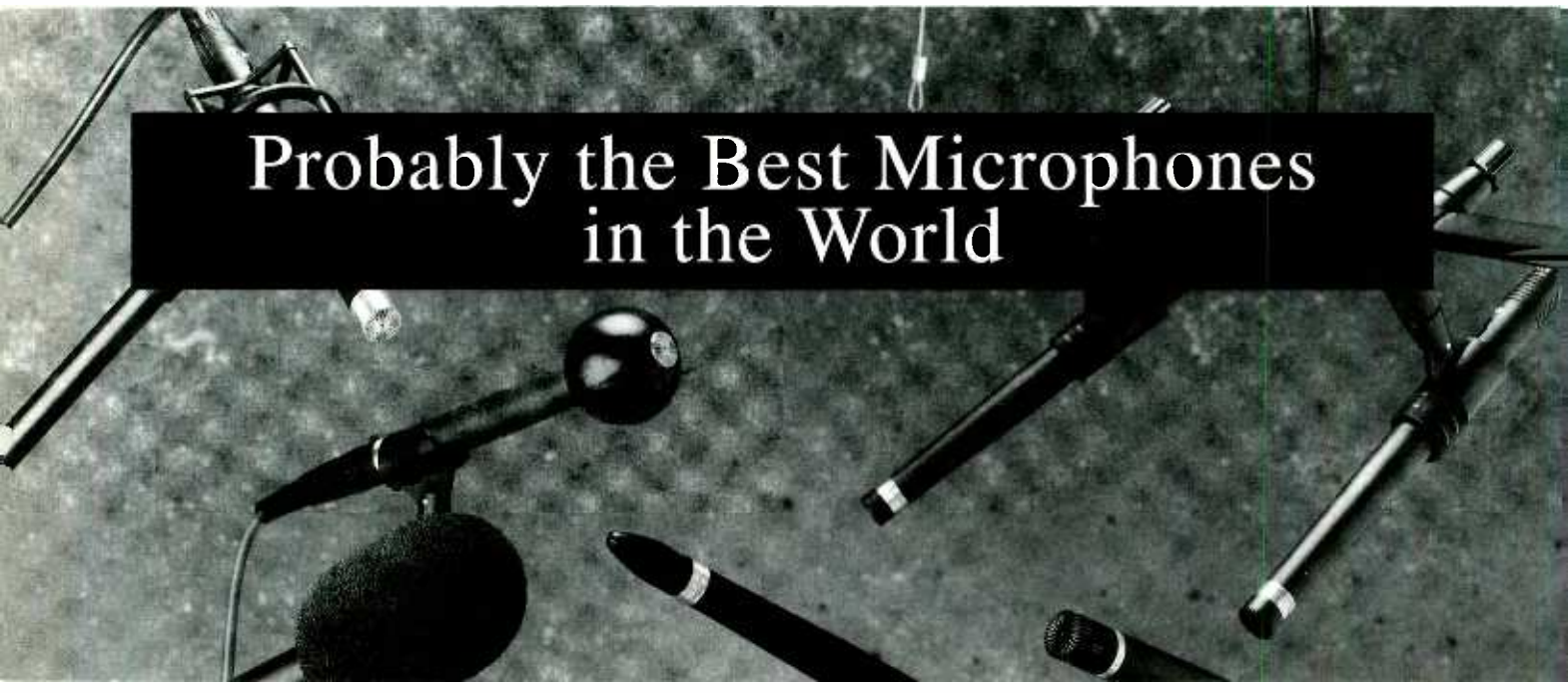

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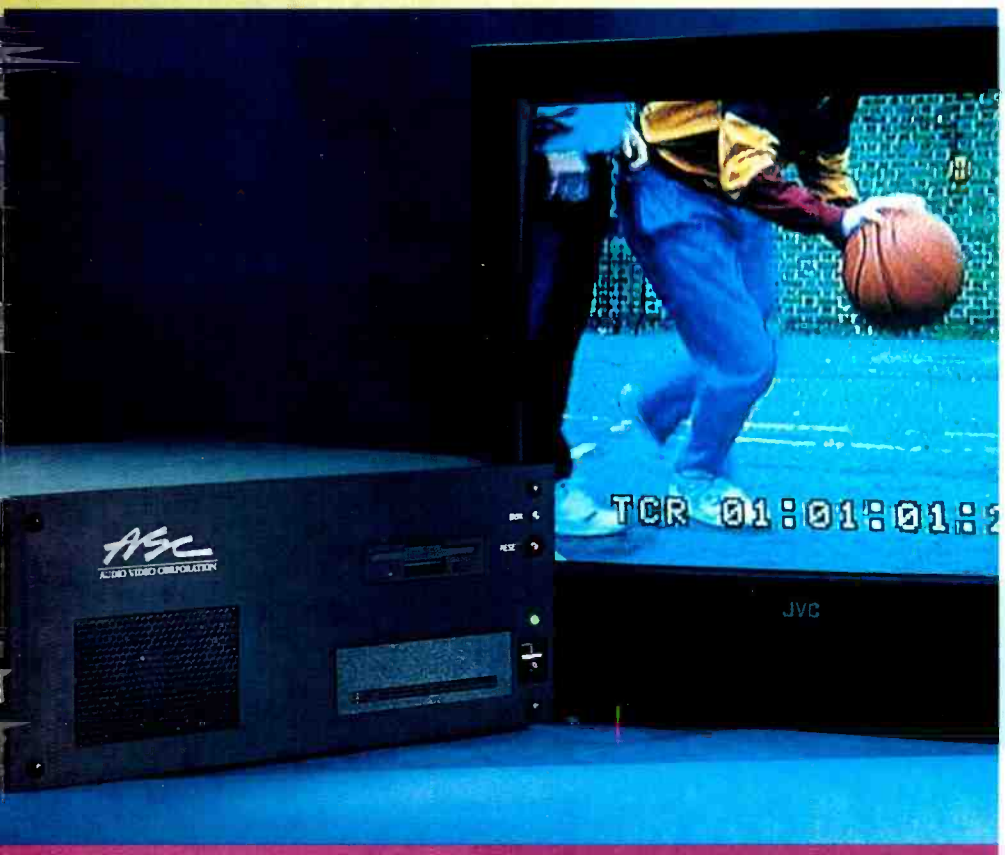

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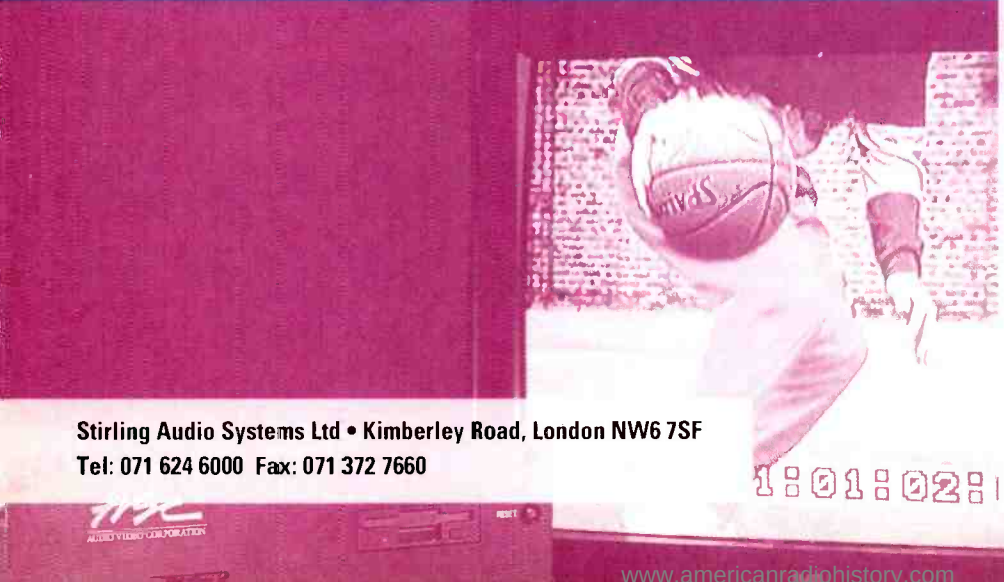

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APOGEE CRQ-12

The Apogee *CRQ-12*—live EQ designed to studio standards

Apogee's *CRQ-12* multimode parametric equaliser has been developed primarily for sound reinforcement applications. However, the facilities and quality on offer make it eminently suitable for studio use, and this was certainly in the mind of Apogee's Director of Electroacoustic Technology, Bob Cavin, who designed the system.

'When I designed the *CRQ-12*, although live sound was the primary emphasis, I was looking at it from a studio standpoint. The alternative operating modes the unit employs are obviously there for live applications, but as a stereo 6-band equaliser with shelving filters and cut filters all built-in, it's pretty versatile. Also when I was specifying the distortion and noise figures, I was thinking strictly from a studio point of view.'

The physical

The unit is split into two channels each featuring six parametric bands, separate low and high shelving, and low and high-pass filters, making ten filters per channel. The parametric bands are each adjustable between 20Hz–20kHz with a variable bandwidth from 1/25th to 2 octaves; cut and boost are -20dB and +15dB respectively. This 20dB attenuation is pretty much standard for live applications, the philosophy being, particularly in America, that room equalisation is best achieved by cutting frequencies rather than boosting them.

The high and low-frequency shelves have a range from 670Hz–11kHz, and 40Hz–430Hz ±15dB, while the high and low-pass filters are both 12dB per octave designs operating from 3.2kHz–35kHz, and 15Hz–200Hz. The sequential flow of signal through the unit is: Parametric —Shelves—Pass filters.

The 2U-high unit manages to squeeze a lot of clearly laid-out controls into a relatively small space without constricting operation. The polycarbonate front panel is divided into two identical halves which have been laid out to give a modular appearance. Each of the vertically arranged parametric bands are split into three sections: the upper section contains the frequency-selector pot scaled from 200Hz to 2kHz and a 3-position range switch which multiplies the scale by 0.1, 1.0, or 10 thus allowing access to the full frequency range. A small operational criticism here is that the switch could have functioned in a more logical way —instead of assigning the low frequencies to the left position, mid frequencies to the middle position and high frequencies to the right, the switch curiously places the high frequencies in the middle position and the mid frequencies to the right. Bob Cavin explains why.

'Unfortunately you can't buy a switch that will fit in the space to accomplish this. The toggle-type switch we use here does not give you three true positions, it gives you a left position, a right position and a central off position. Due to the way the capacitors are arranged, the off position has to be the lowest value capacitance which is the highest frequencies—so you end up with the high-frequency selector in the central position. I would have loved to have it the other way; I tried doing a solid-state switching scheme with FETs turning on and off the various capacitors, but it always introduced distortion and I decided it was more important to stay with distortion figures down at 0.001%, rather than modifying switching.'

The remaining two sections of parametric controls contain the bandwidth pot, and at the bottom are the centre-detented boost-cut pot and EQ IN-OUT switch with green LED.

To the right of each channel's parametric controls are the high and low filters and shelves, arranged horizontally into two sections, one above the other. These group together LPF and high-frequency shelf in one, and HPF and low-frequency shelf in the other. There are no individual IN-OUT switches as with the parametric ▶

Born into the live sound arena, Apogee's *CRQ-12* multimode parametric also finds itself blending comfortably into studio outboard processing. Patrick Stapley on dual standards

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Detail of *CRQ-12* front panel showing parametric multimode equaliser

bands, although shelving can easily be switched out by virtue of the detented cut-boost controls. However, the two pass filters can only be individually 'removed' from circuit by setting them to their extreme values (35kHz and 15Hz) resulting in 3dB of attenuation at each frequency and a 0.3dB drop at 20kHz and 30Hz. Although most users, in particular for live use, will find this perfectly acceptable, there will inevitably be some purists who will be uncomfortable with it. One only has to dig up the old chestnut of Geoff Emerick's alleged ability to hear 56kHz to illustrate this. However, the design is going to be changed as Bob Cavin explains.

'I had a complaint from a reviewer in Japan who was measuring the phase shift at 20kHz which was somewhere in the region of 20°. He said we just can't have 20° phase shift at 20kHz—this, incidentally, was for live sound. I wanted to say, "look what is your phase shifter, your microphone, your tweeter, or any amplifier you have up there?". But we decided to redesign it. So in the near future we'll be adding a push-on/push-off knob for each cut filter along with LED indicators.'

Each channel also includes an overall EQ IN-OUT switch with LED, plus indicators for Ready (confirms that power supplies, output relays and so on are functioning correctly), and Signal Present-Overload operating at -35dBu (green) and +19dBu (red: 4.5dB below clipping). There are two level-controlled outputs per channel with mute switches, and these are designed to operate in conjunction with the unit's three modes—6-6, 6-12, or 12-12.

In 6-6 mode the *CRQ-12* functions conventionally as a discrete dual-channel equaliser. In 6-12 mode, a single input will be output from Channel A with six parametric bands, and from Channel B with all 12 parametric bands—each channel retains independent level control, as well as band-pass filtering and shelving. In 12-12 mode, both channel outputs reflect the settings of all 12 parametric bands, while the two output sections—with respective levels, band-pass and shelving—remain independent.

To understand the intended use of these unique mixed modes and how they relate to the two sets of outputs, here follow a couple of operational examples given by Apogee.

Example 1: In the 6-12 mode, the first six filters feeding the first pair of outputs are used to equalise a central cluster 'tuning out' the room resonant modes.

For ease of balancing the horizontal coverage, Output 1 feeds the inner speakers and Output 2 feeds the outer speakers.

The second six filters feeding the second pair of outputs are routed through a delay line to equalise a group of speakers under a balcony. Since the first six filters are 'carried through' internally to the second set of six filters, all of the corrections for room resonance are already completed, and the operator still has six parametric filters left to tune the response of the under-balcony speakers, filling-in only those frequencies not arriving from the main cluster.

Finally, the overall tone and texture for both the under-balcony area and the central cluster can be independently adjusted by the low-pass, high-pass, and low and high shelving filters which remain separate for each of the two channels.

Example 2: In 12-12 mode, all 12 filters are available to equalise a complex central cluster consisting of an upper row focused on the balcony of a theatre and a lower row focused on the lower seats. All 12 filters are used to precisely notch-out room resonance and reduce feedback from the stage mics. The lower row of speakers is fed from Outputs 1 and 2 which feed the inner and outer cluster sections. The upper row is fed from Outputs 3 and 4, again split inner and outer. Significant attenuation is required in the low frequencies from the upper row of speakers to reduce 'contamination' of their energy in the lower seats. This is accomplished with the 12dB per octave high-pass filter combined with low-frequency shelving on Outputs 3 and 4. The lower row of speakers, however, requires broad-band high-frequency attenuation to compensate for its closer working distance. This is done with the shelving filter on Outputs 1 and 2. There are still several unused low and high filters remaining to make additional adjustments to taste. When critical, narrow-band, low-frequency notches need to be realigned for changing conditions, all of the parametric filters will uniformly affect all four outputs, though, again, the low-pass, high-pass, and high shelving filters on each channel remain independent.

> 'One of the reasons that we built the unit in the first place was through our frustration with equalisers that shifted response as they heated-up'

More modes

As can be seen, the *CRQ-12* offers a level of control that would only have been possible before by chaining units together with the inevitable problems of interconnection and increased noise. This degree of flexibility gives the user the option of using less equipment, along with the benefits of simplified operation, improved audio quality and low cost.

The 6-6, 6-12, 12-12 MODE SELECTOR switch is positioned at the back of the unit, and its setting is confirmed by LEDs on the front panel. Also at the back are the electronically balanced inputs and outputs on XLRs (including separate fixed level I-Os for interfacing a room analyser such as Apogee's Correct Multipoint Tuning System), the mains switch, a recessed ground lift, and a fan control (which depending upon internal jumpers will either switch the fan off or set it to its lowest speed). Thermal stability is an aspect that Apogee have taken very seriously, as Bob Cavin outlines.

'The thermal operation of the unit has been very carefully thought through; not only have we included a thermostat-controlled, variable-speed fan, but we've matched the temperature characteristic of the polypropylene capacitors to the characteristic of the conductive plastic frequency controls so they are self-compensating.

'One of the reasons that we built the unit in the first place was through our frustration with equalisers that shifted response as they heated-up—particularly when using tight bandwidths. Ken Deloria, the President of Apogee, spends quite a bit of his time out equalising halls—he does the Grammy Awards, the Academy Awards and stuff like that. Over the years he has become quite concerned about the thermal instability of equalisers and the effect that was having on the sound; so the *CRQ-12* was originally conceived to overcome this type of problem.'

In the event of power loss or system failure, the *CRQ-12* bypass relays will automatically switch in. To avoid the possibility of bypass feedback occurring during a live performance, each output includes a passive bypass level control allowing optimum bypass levels to be set once the equaliser itself has been set up. Bypass switching follows the selected 6-6, 6-12, 12-12 mode.

The unit can be supplied with an optional security cover, and for permanent room installations where there is concern over tampering, the output levels can be set internally, bypassing the front panel controls.

The *CRQ-12* boasts high-quality components throughout, including metal film temperature-stable resistors, polypropylene capacitors, high grade op-amps (specifically designed for audio filter circuits), and conductive plastic pots. The unit delivers a good, clean sound with low noise, broad dynamic range and a high degree of precision. Operation is simple and the unit is well enough equipped with indicators to keep the user confidently in touch with setup. The addition of IN-OUT switches and LEDs for the high and low-pass filters will further improve the *CRQ-12*'s operation and should be implemented by the time this review is published. ■

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PATRICK STAPLEY began his career in pro audio in 1972 at London's Abbey Road Studios where he worked with artists as diverse as Paul McCartney, The Damned and Matumbi, and was involved in quadraphonic remixes of *Tubular Bells* and *Dark Side of the Moon*. Patrick also ran his own production company and worked as Falconer Studios' Production Manager before beginning writing for *Studio Sound* in 1985.

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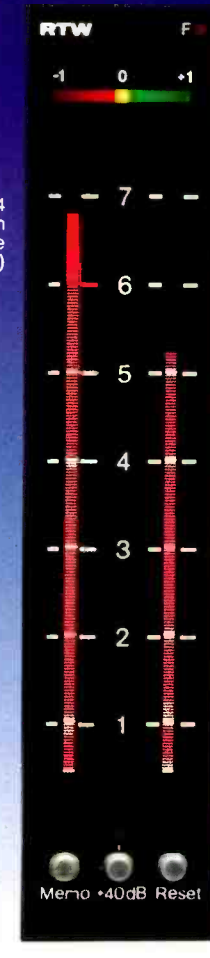

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TAPELESS MULTITRACKING FACT OR FICTION?

The Fairlight *MFX3* offers full 24-track recording to hard disk

The idea of replacing the traditional linear multitrack tape machine with nonlinear (tapeless) technology has been around for some time. However, although tapeless systems have been on the market for nearly a decade, they have, so far, made little impact on the multitrack music recording market. This is not to say that nonlinear technology is not being used in music studios—Akai's RAM samplers, and disk-based systems such as Digidesign's *Sound Tools* are commonplace—but are generally used as stereo supplements to the multitrack tape machine and-or for mastering and compilation purposes.

As far as multichannel tapeless systems are concerned, these have generally been disk-based rather than RAM-based, since disk storage is nonvolatile and costs much less than RAM. While the backgrounds of the companies who pioneered such technology have generally been in music, they have found the audio-for-video postproduction market far easier to address. The main reason for this is, historically, the maximum number of channels supported by a multichannel system have been limited to eight, and achieving this was no mean feat. Those systems whose designs were based around a single-disk operation, such as AMS-Neve's *AudioFile*, Lexicon's *Opus* and SSL's *ScreenSound*, could, therefore, offer no more than 8-track replay, whereas digital multitrack tape machine manufacturers had already achieved 24-track capabilities.

However, from the manufacturer's point of view, the main purpose of developing random-access technology was to move away from the constraints of tape-based operation, to provide nondestructive editing. Hence the multichannel tapeless system was aimed at audio postproduction for video, where its time-saving editing capabilities far outweigh the need for a relatively large number of tracks. For large-budget cinema films and music productions, however, the primary requirements are for digital sound quality and a large number of simultaneous tracks (in tape terms) or channels (in disk terms) so that a greater degree of control is available at the final mixing stage.

In support of this, systems such as NED's *Direct-to-Disk* and DAR's *SoundStation II* were designed to use multiple disks operating in parallel, and could offer up to 16-track replay—in fact Otari's *ProDisk 464* was designed from the onset to support up to 64-track replay. However, while producers, engineers and artists might have been in favour of recording digitally, persuading a market, in some cases to spend the same or more for an 8 or 16-track disk-based system as a 24-track digital tape machine, was, perhaps, too much of a challenge.

Because of the way audio could be handled within a tapeless system, it was argued that fewer channels than tracks would actually be needed. However, having sounds of a different nature effectively sharing the same track or output, introduced what appeared to be an unnecessary layer of complication, and effectively getting the same 'polyphony' from a tapeless system as a tape machine not only required a good appreciation of how the tapeless system worked, but also required a different approach to mixing.

While many tapeless systems support integrated mixing to a greater or ▶

Ten years on from their introduction,disk-based multitrack recorders still defer to analogue systems in the recording studio. Yasmin Hashmi evaluates the state of the tapeless art

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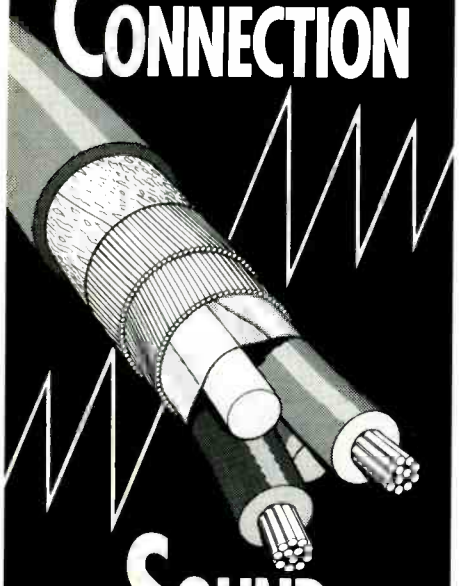

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lesser degree, it is often the case that simple operational functions which would be useful for multitrack music recording are not accommodated, and traditionally straightforward multitrack operations can be more complicated—not everyone would be familiar with the screen-and-cursor operation of a particular system, whereas most know how to use simple track-arming and transport controls.

On the other hand, with the growing popularity of sequencers and samplers, the project or preproduction studio user was already familiar with screen or display-driven operation and the concepts of random-access editing. Furthermore, as the capacity of samplers-sequencers increased, the need for fewer continuous audio tracks became increasingly evident. For such users then, an 8-track tapeless system with MIDI support may have been the ideal, but unfortunately MIDI was not a priority for most manufacturers and in any case, the cost of an 8-track system was often beyond the means of the home market.

Two types of user could therefore be identified in the music market: one with a need for a low-cost system with a number of channels to work in conjunction with samplers-sequencers, and another with a need for a large number of channels with fairly straightforward operation. The need for a relatively low-cost basic 8-track digital machine was recognised by manufacturers such as Alesis, who caused quite a stir with the launch of their tape-based *ADAT* modular 8-track system. The cost, capacity and ease of operation of *ADAT* generally set the tone of what the market could expect for its money. Furthermore, *ADAT* promised to satisfy the needs of the high-end user, since multiple *ADAT* units could be connected and operated together. Hence if tapeless technology is to compete, it must offer advantages over such low-cost, tape-based digital systems.

Archiving

The other drawback of the tapeless system is loading time. At some point a disk will become full, and if a copy of the audio is to be kept safe so that a project can be restored, it has to be transferred to a suitable archiving medium (such as a digital tape streamer). The need for archiving can be avoided (or at least delayed) by using a relatively large amount of disk storage in the first place; eventually, however, the storage will become full and the need for archiving will arise. The problem of archiving is highlighted by the fact that for example, if a 16-track tape represents a 5-minute music arrangement, and each of the tracks contains continuous audio, although the arrangement is only five minutes long, if a tapeless system were used to do the job, the amount of audio stored on disk would be 16 x 5 minutes = 80 minutes. Archiving to a single-track backup device in real time would therefore take 80 minutes, and even if backup were, as in many cases, up to five times faster than real time, it would still take 16 minutes.

It is unlikely that all 16 tracks would consist of continuous audio—the total may be much less, which would reduce the loading time. However, this will still be compared with a tape machine, where loading requires no more than removing a reel and replacing it with a fresh one! Of course, rather than archiving to a serial device, the audio could be recorded to multitrack tape in one 5-minute pass, but in this case, the file structure would be lost and the project could not be readily reconstituted. Furthermore, in order to transfer in one pass, the tapeless system must possess sufficient audio outputs (and appropriate synchronisation if the transfer is to be done in the digital domain), otherwise multiple passes will obviously be necessary.

For direct digital transfer purposes, most tapeless systems support digital interfaces in 2-channel formats such as AES-EBU and SPDIF. However, for multitrack transfer, either multiple 2-channel interfaces (if supported) must be provided or an appropriate interface which supports multichannel transfer (such as MADI, Sony DASH format). However, for archiving, transfer to high-speed tape streamers may also be supported and to reduce loading time, systems which use multiple disks in parallel may support a tape streamer per disk.

Normally, archiving must be performed in 'down time'—that is, the system cannot be used while archiving is taking place. However, if the system is capable of 'background loading', work need not be interrupted and the apparent loading time can ▶

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be reduced or even eliminated. Background loading generally involves the system doing a bit of up or down loading every time the computer is idle. However, this capability varies from system to system and its efficiency will depend on the demands made on the system's processor. It also requires discipline from the user—remembering when to start loading, ensuring that the correct material is loaded and so on.

If not all the material on disk is actually used in the final arrangement, some systems offer the option of automatically archiving only the audio which is used; this again reduces the amount of loading time required. For successive archiving, another way to reduce loading time is to allow selective archiving. This is useful where only parts of a project (such as certain tracks) are required and taken one stage further, 'intelligent' archiving will automatically only store those parts of the audio or edit list which have been modified.

Transfer between systems

Until recently, loading onto tape was also the only way of transferring material between remote systems of the same make (where recording has taken place in one studio and is to be mixed in another). Again, the multitrack tape machine user still has the obvious advantage of being able to quickly remove a reel and take it to another multitrack machine. However, the development of the optical disc promised to solve the problem of archiving as well as transfer between systems—it could serve as the recording medium itself and, like tape, could be removed and replaced-transferred. However, there are still certain drawbacks. The medium could not support as many record channels as hard disk and its cost compared with tape, is still high.

So although optical storage was keenly taken up for stereo/4-channel systems, growing frustration with its limited recording channel capacity for multitrack purposes led to the use of removable hard disk drives. In this case, the whole hard disk drive is designed to be removed. This has the advantage of quick project changeover, but for archiving, it appears to be the wrong direction in terms of cost. It is therefore assumed that a removable drive will be archived onto a cheaper medium at some point and re-used (at least the archiving can be done at the user's convenience and some manufacturers, such as Otari, offer relatively low-cost workstations which are dedicated to off-line archiving).

As far as transfer between systems is concerned, the development of network technology for multichannel professional audio (currently being led by companies such as Sonic Solutions) means that material is transported electronically rather than physically, and no intermediary storage medium is required. This indeed, has a distinct advantage over tape.

Channels and tracks

Although a tapeless system may provide any number of recording-editing tracks, the actual number of individual sounds which can be replayed simultaneously will depend on how many channels the system supports. As expected, disk capacities have grown, their cost has decreased and disk-handling technology has developed to a point where a number of manufacturers are now achieving between 12 and 16 simultaneous channels from one disk. In fact Fairlight, with their *MFX3*, have managed to achieve 24-channel operation from a single disk. However, whether the user can effectively use all of the channels as direct replacement of tape tracks will depend on the operational design of the system. For systems such as Fostex' *Foundation 2000*, which offer real time crossfades, a 16-channel system may be marketed as an 8-track, since the extra channels are internally 'reserved' for the crossfades.

Conversely, some systems provide more tracks than channels (virtual tracks) so that sounds of a different nature can have their own unique track, but there is a limit to the number of outputs the system has. So, for example, a system may support 12 internal channels which can be arranged across 100 virtual tracks, but it has only four outputs. Hence for external mixing purposes, although 12 separate sounds can be replayed simultaneously, multiple tracks will have to share the same output (or input to an external mixer) and the flexibility of track to output routing will vary from system to system. This implies that a certain amount of premixing will be done within the system. However, the amount of mixing control (that is static or dynamic level changes, EQ, panning, mute, solo...) will again, vary from system to system.

Simple multitrack functionality

Operationally, the simplest form of multitrack replacement is where the tapeless system emulates a multitrack tape machine by having the same number of inputs, outputs, tracks and channels, and by having fixed routing from input to recording track to output. Direct Research's *Direct 32* is such a system—it supports up to 32 tracks with 32 inputs and outputs in modules of eight and is operated by a remote with familiar controls. It takes advantage of random access by having a supplementary display and allowing marks to be made on the fly, which can then be instantly located. The remote also sports mark label keys with generic names which will automatically label the beginning of a verse, chorus or whatever. As far as integrating with a mixing console is concerned, the *Direct 32* has analogue I-O as standard, but also offers a range of optional digital I-O including MADI and Yamaha formats.

For synchronisation with external devices, as with all tapeless systems, by supporting an appropriate interface, a track does not have to be used for time code. In fact the *Direct 32* will synchronise to LTC, VITC, MTC and word clock, and can varispeed ±12%. As far as archiving is concerned, the system uses background loading to tape, and even allows the tape to be replayed while uploading to hard disk.

Anatek's *RADAR* was primarily designed to replace the 24-track analogue machine, and consists of up to three 8-track modules housed in a rackmount unit which has LED metering. For those requiring larger systems, Anatek maintain that up to four 24-track systems can be linked for 96-track operation. Again, a remote with traditional controls is provided (including track-arming buttons) and LTC, MTC and word clock are supported, but the standard digital I-O provided supports only two channels (although an AES-EBU breakout box is planned). In terms of record, replay and editing functions, the system supports looping, cut and paste editing and varispeed, and allows track bouncing (but not submixing). ▶

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RED ff RANGE

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Digidesign's *Session 8* supports both PC and *Mac*-based sequencers

Akai's *DR4d* has also been designed as a simple multitrack replacement. Each *DR4d* rack unit supports 4 inputs, 4 outputs and 4 channels from one disk, with a fixed track-channel relationship and fixed track to input-output routing. Up to 4 units can be synchronised to support pseudo 16-track operation, but the one limitation is that although a track from one unit can be bounced to another track within the same unit, it cannot be bounced to a track in another unit. For synchronisation, optional LTC and MIDI sync interfaces are supported and digital I-O is provided as standard. The *DR4d* can be operated via the front panel of the rack unit or by an optional remote with traditional multitrack functions, however in addition to varispeed, the system also introduces basic nondestructive editing with cut, copy and paste functions.

The multitrack editing system

In terms of functionality, the benchmark of a tapeless system for multitrack music editing applications was NED's *Direct-to-Disk* which, when used in conjunction with the *Synclavier*, represented a formidable synthesising, sampling, sequencing and recording-editing system (and still does). It displays in measures and beats, can support as many inputs as outputs and has a dedicated meter-bridge. Useful record-replay functions include instant locate to a mark made on the fly, a variable metronome (which can be resolved to), automatic or manual punch-in, rhythmic loops between marks for retakes (which can be treated as traditional punch-ins or stored as separate takes, each being automatically given a generic name and take number, and each maintaining original sync). Replay or punch-in can be activated from an external switch.

From a functional point of view, at its most basic level, the *Direct-to-Disk* can be used as a multitrack replacement, using the same concepts of linear operation with fixed tracks-to-output routing and track monitoring. However, in addition to random-access record-replay functions, there are also a variety of editing features which are particularly useful for music applications. Cut and paste-type editing for example, allows choruses to be copied and placed as many times as required, unwanted sounds (such as mic pops and foot thumps) can be replaced (using a loop-fill function and-or adjustable crossfades) with silence or ambience copied from the vicinity, a point within a cue can be synchronised to a beat by marking an offset point within the cue, vocal tracks for remixes could be chopped up and resynchronised and dynamically pitch corrected (although the time base changes accordingly).

The tapeless music studio

The *Synclavier Tapeless Studio*,as it is now called, has an integrated 200-track sequencer, a potentially massive RAM sampler and can support up to 32 disk-based record-replay channels. For users who have such a configuration, it is not unusual for complete productions to be created within the system alone. Mixing however, must be done externally, although with volume envelope and dynamic panning control for individual cues, as well as overall track level control, pressure can be taken off the external mixing console since a certain amount of the mix can be prepared within the system.

Roland's *DM-80*, on the other hand, is an 8-track system which supports integrated mixing. It has a custom remote for recording, replay and editing functions and an optional remote with faders for mixing. It has high and low-band EQ which, together with cue and track level can be automated using the remote or MIDI. In order to capitalise on the system's potential editing functions however, optional software is available which allows event-based editing to be controlled using a *Mac*, as well as allowing multiple *DM-80*s to be controlled for larger multitrack operation.

Korg's *SoundLink*, although marketed mainly as an audio postproduction tool, is an 8-track system with a number of features suited to music. It is operated using a custom console with dedicated sections for editing and mixing, and supports automated dynamic cue and track level control, EQ, reverb and compression—all with 200 snapshot automation, as well as noise gates, high-pass filters and phase control. It can varispeed ±6% with a constant sampling rate output and also has an integrated 16-track MIDI sequencer with a variety of useful features.

As far as sequencing is concerned, many manufacturers, particularly of personal computer-based systems, find it more appropriate to support existing popular software-based sequencing packages rather than develop their own. Digidesign's *Session 8*, for example, supports both PC and *Mac*-based sequencers which multitask with the 8-track disk recorder using the same ▶

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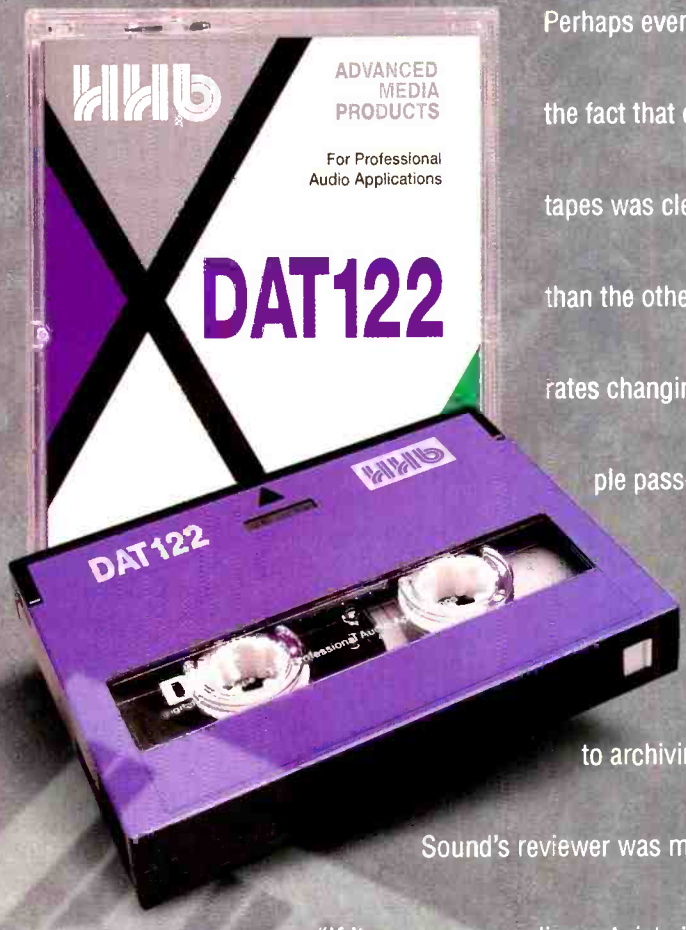
ALL DAT TAPES ARE NOT THE SAME BUT DON'T TAKE OUR WORD FOR IT

Ask Studio Sound, one of the world's most highly respected professional audio publications. They recently subjected eight leading DAT tape brands to an exhaustive series of tests and the results should be of interest to everyone serious about audio.



In the critical area of block errors, the tapes fell into two distinct categories of performance. Three exhibited similarly low error rates with the others presenting error levels considerably higher. HHB DAT Tape was one of the leading three.

Perhaps even more significant was the fact that one of these leading tapes was clearly more consistent than the others, with its low error rates changing very little over multiple passes. That tape was HHB.

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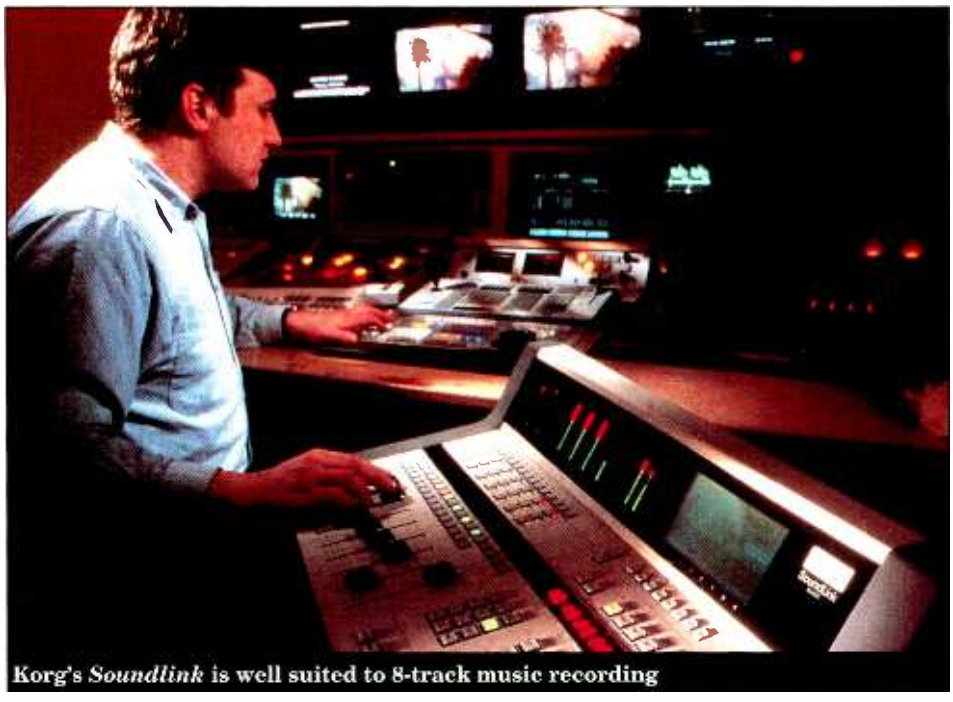

Korg's *Soundlink* is well suited to 8-track music recording

platform. *Session 8* has 8 analogue inputs, 20 analogue outputs and includes a 10:2 analogue submixer. Multiple sources as well as the internal tracks can be mixed down in real time (an optional mixing remote is available) with up to 6 parametric EQs.

Soundscape Digital's *Soundscape*, can grow as a larger multitrack by chaining modules, and at the time of writing, a beta version of an 8-track module is running. Using a standard MIDI card, *Soundscape* will run with any PC-based MIDI sequencer (including *Cubase* or *Cakewalk*), as master or slave, and MIDI can be used to dynamically control track level and pan. The system uses as PC as the user interface only and has a dedicated processing rack. The manufacturers therefore maintain that since the system does not rely on any of the PC's processing for internal timing, power-thirsty sequencers do not affect the performance of the audio. *Soundscape* also has eight fully-parametric EQs which can be freely assigned to any combination of tracks and allows real-time mixdown of the 8 internal tracks and up to 2 additional inputs (analogue or digital) into 1 or 2 stereo outputs. It can also perform a non-real-time submix (including fades, level and EQ) of 8 tracks into a new mono or stereo take.

Spectral Synthesis claim that their *Audio Engine* was the first PC-based system to incorporate a TDM (time division multiplexing) bus, which according to Spectral means that routing within the system is not constrained. An on-screen digital patch bay allows any of the 256 virtual tracks to be routed to the internal mixer and EQ and on to a full range of internal effects (such as reverb, filters, dynamics) as well any input or output (up to 24 of each are supported). As well as supporting time compression-expansion (as many systems now do), the *Audio Engine* can perform harmonising (pitch change where the time base stays the same) and a sampler option with various sound design features can also be run on the same platform. Spectral's new card, the PRISMA, is a relatively low-cost plug-in for the PC and supports 12 channels with integrated real-time mixing into eight outputs.

At the luxury end of the market is *Dyaxis II* from Studer. This supports up to 48 channels, unlimited virtual tracks and up to 24 inputs and outputs. It offers dynamically-automated mixing using a dedicated surface, and has 5-band parametric EQ on each input with snapshot automation. In addition, if the channel capacity of the system is exceeded, the system will automatically perform a submix at 7 times faster than real time.

Conclusion

While established systems maintain their relatively high-cost by developing sophisticated synchronisation and machine control features as well as editing and DSP functions, the increased performance and reduced cost of hardware has seen the potential for a new generation of basic-function, low-cost random-access record-replay systems. As modular units, these have the potential to grow into large multitrack systems, offering at the very least the advantages of disk-based reliability and instant locate. However, given the remaining drawback of archiving, it is inevitable that the tapeless system, for the time being at least, will be viewed more as an editing tool, than as a multitrack tape machine replacement—although it should be noted that the performance of optical media is ever-increasing and the cost of disks is reducing.

In any case, the lure of nondestructive editing has already seen the tapeless system replace the 2 and 4-track tape machine, and as the market grows accustomed to nonlinear practices and increased processing capabilities of computer technology, it is becoming more apparent that the tapeless system has the potential to replace not only the larger multitrack tape machine, but the external mixing console as well. Furthermore, with an increasing number of systems offering direct mastering to CD, as well as direct transfer between systems, for a growing number of users, the tapeless music studio has already arrived. ■

Under the name Sypha, YASMIN HASHMI & STELLA PLUMBRIDGE operate an independent consultancy to manufacturers and users of disk-based audio-video editing and related systems. Sypha have published *The Tapeless Directory* and various market studies, as well as regularly contributing to *Studio Sound*.

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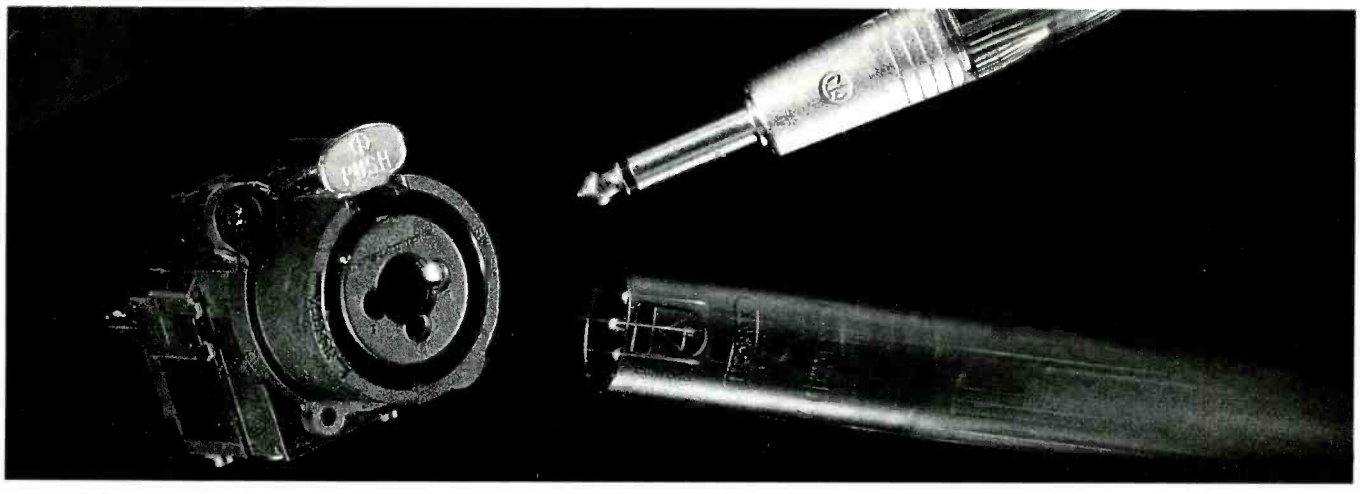

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Mission impossible

Dear sir, I am still in shock from the *Studio Sound* DAT Tape Tests. There was already enough static in the air concerning RDAT and then along came your articles...

We here at Harvard's Modern Language Center/Production Services Facility use a lot of tape; a lot of TDK tape. For a long time we have had very good results with their audio and video tapes. Over the years, test reports on TDK tape have rated TDK tapes as among the best available. As far as we can tell, we have not had any storage-retrieval problems with our TDK RDATs but we won't really know we have a problem until we have a problem.

Most of our DAT usage is for up and downloading to-from our Sonic Solutions systems, but we are starting to have more longer-term storage on our RDAT cassettes (we even back up our computer hard disks on our regular TDK RDAT cassettes).

We have a 40,000-piece reel-to-reel archive library of language master tapes. This collection was started in the 1950s and now we are starting to see various stages of 'shed'. This spring we will be purchasing a Sonic Solutions/Sony CD 'Burner'. Our archive will be transferred to CD as quickly as is possible. Because we knew that we would be going to CD, we started two years ago to remaster and 'short-term store' the earliest reel-to-reel masters on DAT.

I am trying to find nonanecdotal verification of what you found (first hand and personally observed). Everyone has an opinion, the National Archive, the Smithsonian, the National Medical Center, the Library of Congress, Consumer Reports, different well-known audio collections and even the AES. But a lot of this information is based on R–R tape history and background. Nonetheless, I will contact some of these organisations to see if they have any current info—particularly the AES—to corroborate your findings. Your articles have serious implications for us. Thanks for any additional enlightenment.

Conrad J White, Manager, Modern Language Center, Harvard University, Cambridge, Massachusetts, USA.

Structural ruin

Dear sir, please find enclosed a copy of my local newspaper in which there is an article giving a condensed version of what has been an enormous problem for me over the last seven years.

Works were carried out on my studio in 1987 by the PSA on behalf of the Department of the Environment. They inserted five steel girders to support the floor above my studio (office space used by the DoE). In order to do this they had to close my studio and virtually dismantle the acoustic and sound-proofing treatment that existed. My studio was closed for six months, and when I was able to re-enter, the noise from people walking on the floor above made the studio useless for recording.

The PSA returned to attempt to rectify the problem but would not admit that they had done anything to the floor above which would have made any difference. I consulted solicitors on the matter and the argument went on for a further 18 months. During that time, sound experts were called in to measure the level of the intrusive noise. Both my own expert and the expert brought in by the PSA measured a reading of NR40. The PSA experts say that this is acceptable for recording purposes and managed to convince the judge of this.

The situation now is that my studio has been closed for seven years waiting to get the matter before the courts, the outcome of which has been devastating for me. You may wish to publish this letter as a warning to other studios, and to stress the importance of taking regular sound level readings and of keeping a log of these in case anything like this should happen.

Roger Messer, Torquay, UK.

Roger Messer facing ruin—see 'Structural ruin'

Head start

Dear sir, I read with interest Barry Fox' short item on Sensaura recording in 'Business', *Studio Sound*, January 1994. In 1988 I wrote an article (printed in the IBS Journal, *Line Up*) detailing how we recorded and produced the first totally digital European programme at the BBC here in Wales.

The microphones used in that early programme were B&K omnis mounted on a home-built 'head' which could be hand held. At the same time, I realised that something special worked within this setup, and very soon, following the making of courtesy copies on ¼-inch tape, it became obvious that the stability of the digital recorder was the key element.

The interesting and relevant point of all this is that for almost every drama recorded in Wales ever since, this has been the basic microphone kit—both in-house and on location. Further, when used in the studio, 'spot' microphones have been mixed in with the binaural head.

To my knowledge, no-one has yet complained of any problem with the stereo effect as heard from loudspeakers and hopefully many of our listeners will have experienced an extra dimension when listening on headphones to this compatible technique.

I would make the point, however, that the primary reason for adopting this technique was not the excellence of the sound quality but the freedom give to the actors who are able to forget about the microphones to a great extent and concentrate on the performance.

MA Gittoul, Senior Audio Supervisor, Radio Drama Deptartment, BBC Wales.

Remaking it

Dear sir, in your editorial, 'Making it', [in the first issue of *MDR: Mastering Duplication and Replication* a periodical supplement to *Studio Sound*] you mention that the mastering business is moving away from traditional tape-based systems. This is correct, but it is not the new Sony *PCM-9000* system backing this move.

In fact, we told the German Sony staff during the Berlin AES Convention that they have lost the fight. Sonic Solutions, with their Sonic System, are offering a full range CD Premastering system including the *PM-CD* (PreMaster CD), this being accepted by the majority of CD plants as a ▶

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mastering medium.

Although Sony's clients—for well-known reasons—have been dissatisfied with the performance of U-Matic mastering since the mid-1980s, Sony have not been able to introduce a better working system. Further, I must point out that the *PCM-9000 Master Disc* should be regarded primarily as a recording system and not a dedicated mastering system. Besides, there are other mastering media such as Exabyte, costing a fraction of a Sony M-O, and giving more than 16 bits.

Reiner Oppelland, Diplom-Tonmeister and Managing Director, Bauer Studios, Ludwigsberg, Germany.

Sony reply

Dear sir, Mr Opelland rightly points out that our *PCM-9000 MSdisc* recorder should be regarded as a recording system. It is ideally suited for this role with its long recording duration of 20 or 24-bit stereo audio using robust M-O disc technology.

This same removable M-O disc allows the audio data to be exchanged between facilities in an efficient way. Transporting recordings from location to editing and on to mastering is facilitated by the use of a single durable package.

Direct nonlinear editing of the audio on the removable disc allows more time to be spent on the creative aspects of postproduction and less on the housekeeping.

All of these benefits are available through the use of a single recording system, the Sony *MSdisc*. There are other systems available on the market, but *MSdisc* offers benefits in all three areas of CD production: recording, editing and mastering. We can offer these benefits to the market and it is the market as a whole who will decide whether to adopt the system as a standard.

Andrew Tait, Product Manager, Professional Audio, Sony Broadcast, UK.

Novelty

Dear sir, I read Dave Foister's review of the *Intelligate* (*Studio Sound*, January 1994) with particular interest. Mr Foister uses the word 'novel' in describing features of this unit. The word is inappropriate in as much as the Behringer unit is a poor copy of the Aphex *Model 612*, which was first introduced in 1987.

In addition, Behringer accepted a German court's decree to stop using their manual which was blatantly and brazenly copied page-for-page from the *612* manual. Behringer have also copied other products and have been found guilty of patent infringement by the German Federal Court.

Reading the technical review, I would like to mention that clicks generated by fast-moving control of a VCA (as would be the case in a noise gate) are most definitely a problem. One of the reasons that we could confidently make a $10,000 challenge to the world that it could not come up with a better gate was that we had our own exclusive VCA1001, which exhibits just microvolts of DC offset (control feedthrough). The VCA in the Behringer unit, the MTA1537 (which we had used until 1987), exhibits much higher dynamic DC offset. The best way for a user to test the validity of any manufacturers' claims of 'click-free performance' is to use the key input to open and close the gate at extreme settings, and to listen to the output with no audio input.

One very positive impact of having to deal with the presence in the marketplace of a company like Behringer is that we are forced to make sure our technology is unique and well protected legally. One recent example is our new *Model 622 Logic Assisted Noise Gate*, which offers major improvements over the *Model 612*. The negative side is that we are forced to spend thousands of dollars in legal fees and months of extra work before any technology is released so that our legal protection is in place.

I have no problem with your editorial policy including reviews of Behringer product. The problem lies in the use of the word 'novel' when the particular product has been copied from another manufacturer.

Marvin Caesar, President, Aphex Systems Sun Valley, California, USA. ■

If you have a letter of comment please write to: The Editor, Studio Sound Magazine, Ludgate House, 245 Blackfriars Road, London SE1 9UR

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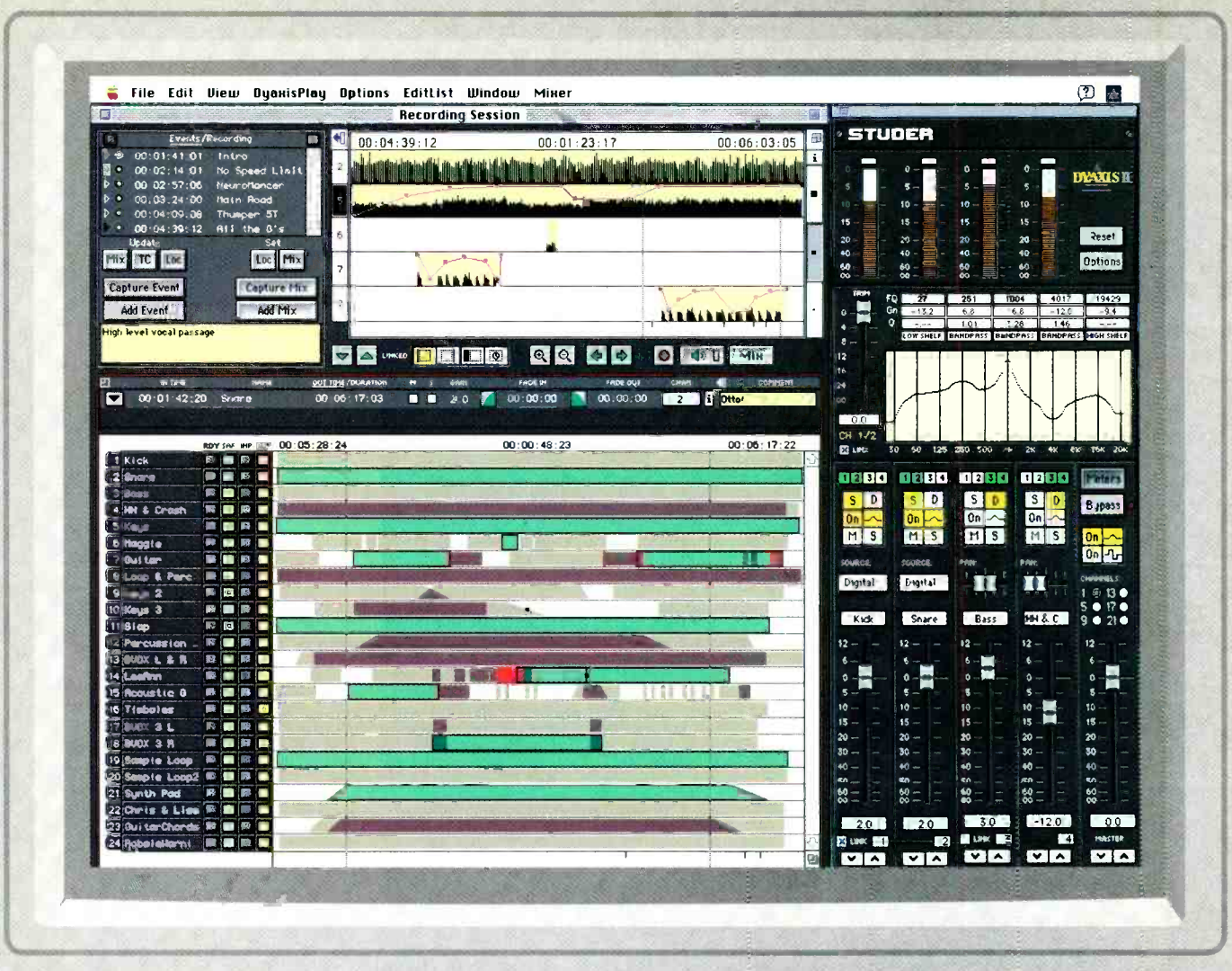

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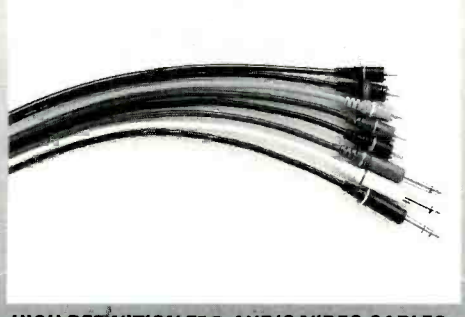

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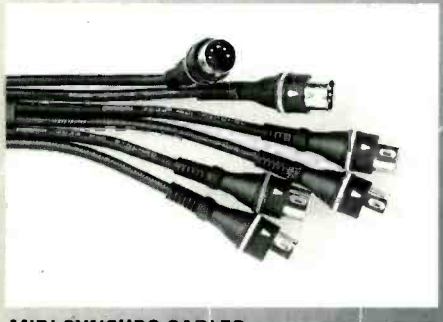

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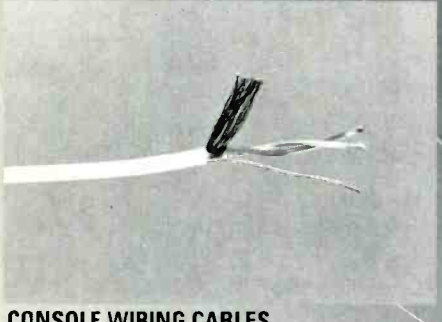

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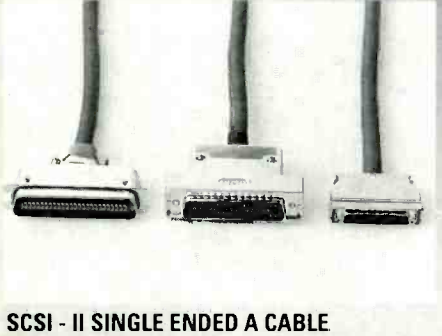

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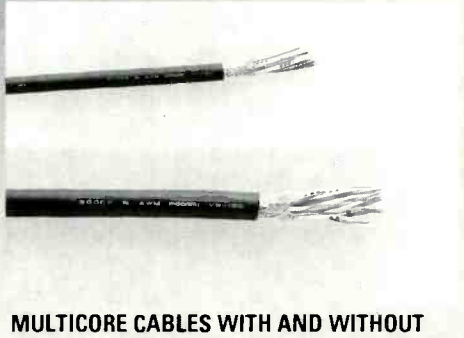

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Martin Polon

Future formats: the real cost of ill-conceived marketing

For many reasons the recording studio today, while not exactly an endangered species, is not the stable financial proposition it once was. Let's face it, the consumer audio business is functional but the relatively steady-state status of the record industry is not creating prodigious numbers of studio sessions prepping or recording new groups. And one of the worst moves made by the world record industry—in conjunction with the shakers and movers who populate the world's consumer audio manufacturers—has been to entertain the battle between the MiniDisc (MD) and digital compact cassette (DCC) formats.

The problem is, it is difficult to calculate whose death could really be occasioned by a clash between two formats destined to be DOA (Dead On Arrival)—if the current level of interest prevails. Unintentionally and only by inadvertent error, the public have received a faint message from the 'sell' campaign for the two formats that maybe the compact disc itself is somehow flawed and on it's way out. And the record companies carry some of the blame for secretly hoping that one or both of the new formats would replace DAT and-or bring about the 'still birth' of recordable compact disc and subsequently end their home copying 'paranoia' forever—since neither the DCC nor MD formats deliver anything close to sonic perfection.

In a recent survey of advertising lineage in newspapers and editorial comment from July 1993 to early 1994, less than 1% of the space devoted to audio electronics was dedicated to MD and DCC. In fact, the survey team considered the MD-DCC numbers to be 'statistically not important'.

Of the editorial material in the 'general' press as opposed to the specialist audio press, the same survey in the same period indicated that positive comments about either system were far less than expected—averaging less than 50% of the total. Even within the consumer audio press, negative commentary focused on high price tags, high blank media costs, psychoacoustic encoding and bit-rate reduction techniques, and the paucity of prerecorded titles both in terms of numbers and of titles focused on the more mature buyers who could afford the formats' prices.

Many record stores that had devoted prime retail space to MD and DCC upon release, have since rethought their posture and either removed these products to a less important location in the store—thus freeing the space for fast-moving CD and cassette titles or else reduced the size of the stock or removed DCC and MD altogether.

The same audio industry 'experts' who heralded the inception of MD or DCC last year are now announcing that the DAT is DOA in the consumer electronics audio marketplace of the 1990s. At the January 1994 Winter Consumer Electronics Show (CES), several well-known 'experts and spokespersons' for major audio equipment manufacturers delivered sombre pronouncements as to the passing of the DAT format for home recording. Curiously, these manufacturers avoid reporting what dealers still acknowledge—that is that DAT sales are still 'respectable' in the advanced audiophile marketplace. In fact, some US stores specialising in DAT have moved their clientele up into so-called broadcast and recording-studio-quality DATs at twice the price point of consumer gear.

The superior characteristics of DAT still attracts those enthusiasts that the record companies insist do not exist: the 'original recordist.'

The same pronouncements as to the demise of DAT suggest that CD-R will be delivered 'still-born' to the consumer marketplace and that even ordinary CD is 'dead' for the car market. The assumption offered at the Consumer Electronics Show in Chicago is that since the 'new' MD players utilise a 4-disc 'clip' that allows CD changer-like performance, there is no need for the larger and bulkier trunk-mount CD changer for in-car use. As to the inability of CD-R to survive introduction to the consumer market, there is less clear prognosis from audio the current $3,000 price floor, anything is possible in this 'best of all possible worlds'.

Dolby *S* cassette decks, especially in the multimotor, multiple-head models upstream from more conventional implementations, are beginning to gather momentum and could challenge any new digital format introduced. This is especially true in terms of the compatibility with the publics' trusted Philips' analogue-cassette format and because of the high quality of the recorded sound. Those of us in the pro-audio business must not forget that the number of record releases utilising Dolby *SR*, the professional progenitor of Dolby *S*, has equalled or outnumbered those done in the digital domain for four of the last five years worldwide.

Those promoting the 'information highway' have announced that any and all of these formats are obsolete anyway since the direct digital delivery of audio on 20 or so digital channels will replace buying music on prerecorded formats. Apparently, music copyright holders believe these pronouncements since they have gone back to US Congress for a new royalty package designed to deal with audio 'infomania' amongst other things.

In a recent US study of audio hardware sales to focus on the success or failure of MiniDisc and-or DCC turned up some interesting numbers. For example, at one of the top consumer audio equipment retailers in a major East Coast city, there have been 12 MiniDisc units with recording features sold during the last six months. On the other hand, there are 24 DAT machines on back order, with nearly 50 DAT machines already sold during the same time period.

DAT sales are still 'respectable' in the advanced audiophile marketplace

One factor ostensibly invisible to most in the world's audio industry is that the traditional connection between Japanese development of new audio products for the Nippon domestic market and its enthusiastic and affluent audiophiles has been more or less broken. So has the traditional product release and development cycle of 'year one in Japan with debut at the Tokyo Hi-fi Show, year two in England and Europe with introduction at Festival Du Son and the London Hi-fi Show and year three in the United States with release at the Winter or Summer CES'.

Another factor that influences the development of new audio products in Japan is the recessive state of the Japanese economy, and the impact that has had on the well-paid audiophiles who used to be the number one target of Japan's audio equipment makers. Aside from the issues raised above, as Japan's audio makers have 'gone global' in their outlook, fear of loss of employment has refocused Japan's 'salary men' from their hobbies to the more prosaic issues of economic survival. With this change, Japanese equipment makers trying to contend with their economic retrenchment, have less latitude in new product introduction.

Make no mistake about it, each of the Japanese equipment manufacturers will survive financially with whatever product line it takes to do so. Whether it is CD-R, DAT, DCC, Dolby *S*, MD or some other newer format, the big equipment-makers will commit to a winner and have, in fact, already 'hedged' most, if not all, of their 'bets' on the one system or the other.

A savvy US record-store owner offered her opinion recently: 'One factor that is being completely overlooked is the reaction by women to both of these new formats. Contrary to popular male belief, women do not just spend their lives buying recordings but... the women have absolutely no interest in MiniDisc and virtually no interest in DCC. Despite the presence of nearly 300 titles for MD, they are all pointed towards a male youth market. What the marketeers forget, is that the young women have and keep more money than the young men by a long shot. And with few of the 300 MD titles pointed towards the over 30s, no one with any affluence has any reason to consider the format... since none of the content is pointed in their direction! Yet the hardware is all priced well beyond the affordability of the young males targeted by the content.'

We end where we began: the adoption of a reliable single standard for any product area will make adequate profitability for all concerned. The best example of this are the Philip's analogue audio cassette and the Sony 3.5-inch diskette. Both have become universal standards. Not to mention that a new standard digital audio format for portable recording and playback would give the entire music industry from recording studio to record store a major league shot-in-the-arm—even if it should turn out to be MiniDisc, with PASC encoding. ■

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Kevin Hilton

Ripples in the UK ether—the politics of radio frequency allocation

The available broadcasting spectrum is becoming increasingly crowded and with the bulk of this valuable resource, in all bands, already taken, new operators are staking their claim to what is left. In the UK at the moment, independent radio (IR) broadcasters, both existing and aspiring, are gearing up for the allocation of the last batch of FM frequencies for broadcast purposes.

In advertising the final 3MHz—which becomes available early in 1996—the Radio Authority, the licensing and regulation body for independent radio in the UK, have set themselves a tough and unenviable task. On passing the 1990 Broadcasting Act, which deregulated and partially changed the make-up of IR, the Conservative Government said they were committed to choice and opportunity in radio. This has seen the creation of a number of local stations catering for ethnic communities or specific musical tastes.

Many came on air after the last bout of AM franchise bids and are now considering the move to FM. The last independent national radio (INR) service to go on air, Virgin 1215, is also coveting the attractive 105–108mHz band range and has started a loud, persistent campaign among its loyal listeners to get it. To fulfil their remit, the Radio Authority have to be seen to be fair. Allowing existing licence holders to switch bands, even though it will make space on AM, could create bad feeling within the industry and hold back the development of local and national radio in the UK.

However, the Authority appear to be well aware of the dilemma, and during February 1994 issued a comprehensive consultation document that sets out a number of alternatives for the allocation and use of 105–108mHz. There are also several technical aspects to be considered, one of the most important being that the available frequencies are right at the top of the FM broadcasting spectrum and are close to those used by aircraft navigation equipment. Licence allocation in these cases will be critical if intermodulation problems—so-called phantom signals—are to be avoided.

While Digital Audio Broadcasting (DAB), due to be implemented during 1996, will create more opportunities through multiplexing in the 217.5–230mHz range, the Authority warns that FM allocation will have to be carefully monitored and administered in the run-up to DAB. To this end, it has drawn up four different permutations, some of which have several variations.

The first is the simplest, a fourth INR which would reach 90% of the population. Virgin's boss Richard Branson is convinced that his 24-hour rock station, which went on air on 30th April 1993, should be the sole beneficiary. Although critics appreciate that AM is unsuitable for an all-music service, they say that Branson bid for AM, he got it and now he should be satisfied.

On launching the campaign to get Virgin on FM, Branson said that the original proposal for the station was that it should be a stereo FM service but as this was not available at the time of the last INR franchise, 'We agreed to give it a go on AM'. He drew an analogy with his airline, which was initially restricted to Gatwick Airport only; after campaigning he won the right to fly out of Heathrow as well. 'We're getting the listeners to campaign,' he told Virgin morning Presenter (and Programme Director) Richard Skinner. 'I think we've got a good chance of getting it if the listeners back us. If we get it, we'll hand back our AM frequency to be used for community radio.'

Despite the already vocal support, such a decision would come down to the size of Mr Branson's cheque-book, as the licence will go to the highest cash bid. In its list of pros and cons, the Radio Authority say that a fourth INR would increase choice but as a single service it would effectively stop the growth of ILR on FM and might affect the chances of existing local services getting national advertising. This new service would differ from the established UK national FM services, BBC Radios 1, 2, 3 and 4 and the independent Classic FM, in that it would have to use lower power transmitters due to the proximity of aircraft bands. In addition it would use all three available megahertz.

The second option would create almost a second ILR network, with a similar number (around 50) of stations of a similar size to what already exists around the UK. Again there is an element of 'upgrading' here, with a possibility of switching existing AM services to FM. However, it is acknowledged that this would require changes to the current rules of ownership as laid down in the Broadcasting Act and would complicate matters when licences were re-advertised. In addition, it would not be extending listener choice much and would probably be seen as a wasted opportunity.

The third proposal would create a number of small services, ranging from 10km radius to 15km radius to 40km radius. Although this smacks of the often-derided 'community' or 'neighbourhood radio' concept, it would give smaller towns the chance of their own radio services and take the medium away from the large consortiums and groups that currently run it. Such stations would not be considered for DAB due to their small operating area and would use FM from the beginning, instead of much of the band being taken up by 'sub-bands' (stations using another service's frequency in certain regions due to different transmission configurations) which would probably move to the digital format anyway.

All three of these are familiar universal services, which deliver the same range of output to everybody. The final option is a combination of the second and third options and is based on the concept of population-weighting, bringing a new FM service to major population centres, perhaps a choice to outlying areas on the cusp of the transmission footprints but probably no new services to those in sparsely populated regions. Possible permutations are three new services in around most towns and cities and a number of smaller stations, perhaps with a radius of 10km, or two new services for the cities and a network of 15km radius services, giving around 25–30% coverage, plus a number of smaller stations of 10km radii.

Although the document is billed as a consultative one and the Authority say that they are looking forward to receiving the views of interested parties, there are clear indications, reading the spaces, that this is a preferred and flexible solution to a knotty problem. While stating clearly that this scheme would be an economic use of frequencies and would provide more services to listeners and more opportunities for advertisers, the document gives a big clue elsewhere. The Authority intended to advertise two new London-wide licences in March at the same time they re-advertised those already held by Capital Radio. They also state that there could be a total of five services in the capital.

However, this could all have changed by the time the deadline for responses is reached on 22nd April 1994. No doubt Richard Branson is banking on it.

Radio Authority, 14 Great Queen Street, London WC2B 5DG. Tel: 071 430 2724.

Since the fall of the Berlin Wall in 1989, which resulted in the opening up of former Eastern Europe and the dramatic emergence of new countries from politically homogenised amalgams, East and West have been coming together in many ways, through commerce, transport and, perhaps most crucially, communication links.

Significant in this is the number of applications to join Eutelsat, the European Telecommunications Satellite organisation. Past requests for membership have come from Poland, Romania, Slovenia, Croatia, Bosnia-Herzogovina and Hungary, plus emergent countries that were once part of the now dismantled Soviet Union: Armenia, Azerbaijan, Georgia and the Ukraine.

Eutelsat's Assembly of Parties have now unanimously approved applications to join from other former USSR states: the Baltic Republics of Estonia and Latvia, and the Southern Republic of Moldova. Once these applications have been completed, there will be Outlast members in 42 countries, 16 of which have joined since 1990.

The organisation operates the three *Outlast I* and the four *Outlast II* birds, which carry a mixture of television and radio channels, telecommunications, European Broadcast Union (EBU) transmissions (including the Eurovision radio exchanges), business communications and the Euteltracs land mobile service. Customers divide into two groups: public reception, for example direct-to-home broadcasting, and professional, which covers the EBU and satellite news gatherers.

Other countries are currently gearing up to join the existing 42. ■

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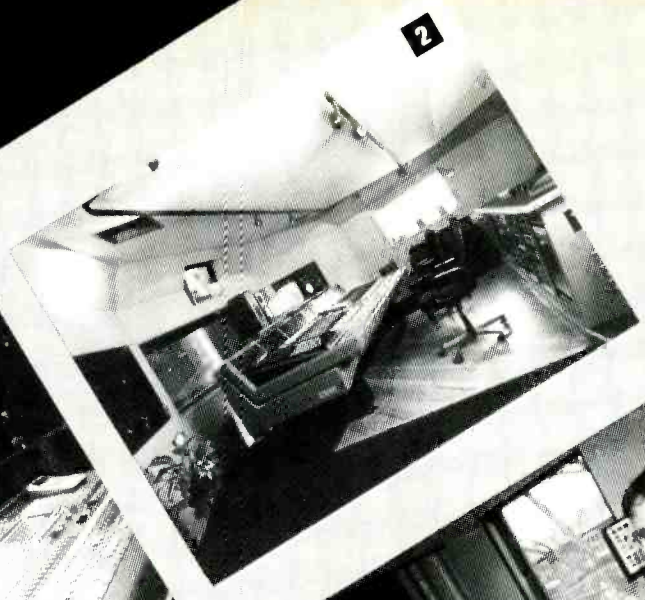

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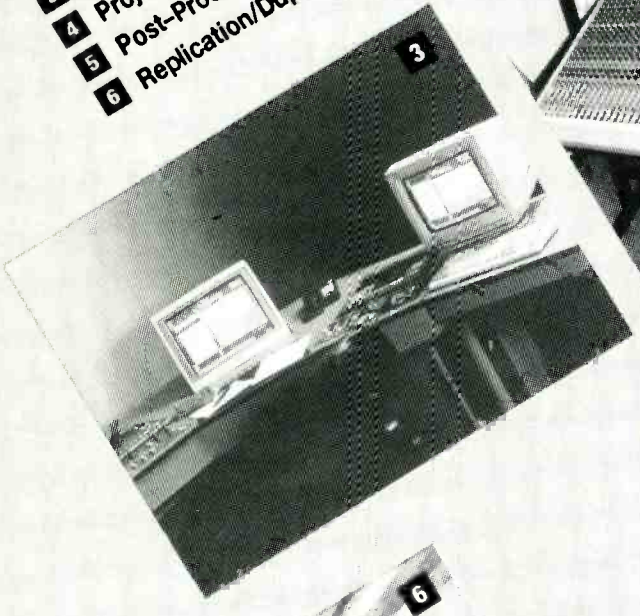

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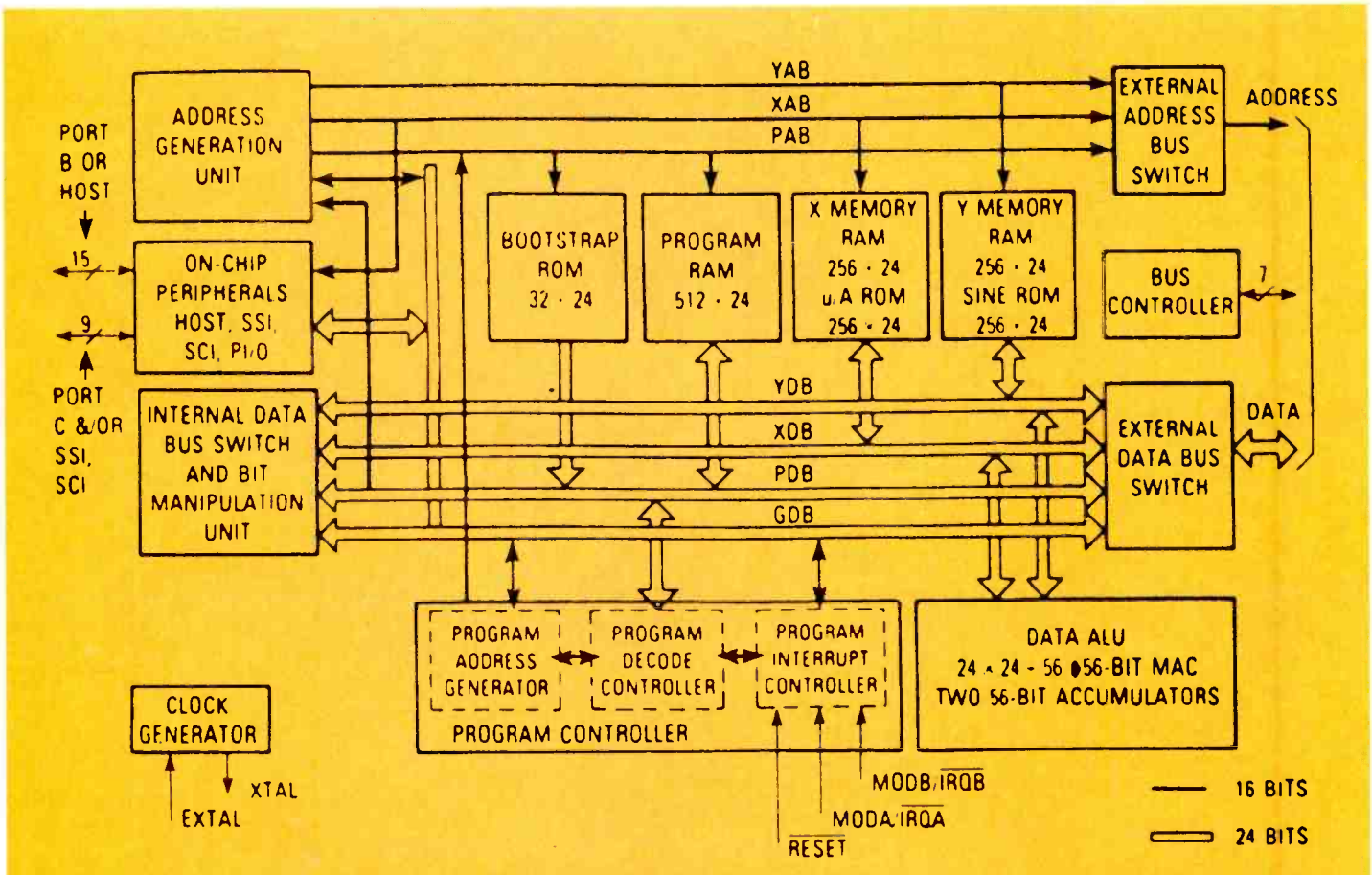

Fig.1: Interior structure of a DSP chip (in this case the DSP 56001)

Digital audio equipment is now dominant, and there are many reasons for the dramatic adoption of numerically-based techniques. The initial reason for developing digital audio was to improve quality. A full-bit digital recorder is transparent and the sound quality is determined by the convertors rather than the medium. However, quality is only half the story. The other half of the story concerns flexibility and economics. Digital audio is more accessible and manipulation is easier. The cost of ownership can be less. DSP is basically driven by economics as it is a way of performing complex processes with generic hardware. Transparency is often sacrificed when DSP is employed.

Digital audio is no more than an alternative way of describing an audio waveform, using periodically updated whole numbers. In other words, it is a digital simulation of analogue. Any process which can be performed in the analogue domain can also be performed on a digitally-represented waveform by suitable simulation. For example, gain changing in analogue requires a VCA; the equivalent in digital is a multiplier. The control voltage becomes a coefficient. Signal mixing in analogue requires an operational amplifier; the equivalent in digital is a two's-complement adder. In much equipment these digital processes are performed in dedicated hardware. In DSP, general purpose computer-like hardware is programmed to simulate ▶

As digital audio becomes the established technology and analogue continues to recede, more processes are taking place in the digital domain. John Watkinson introduces the principles of Digital Signal Processing (DSP) and points out some of the pitfalls

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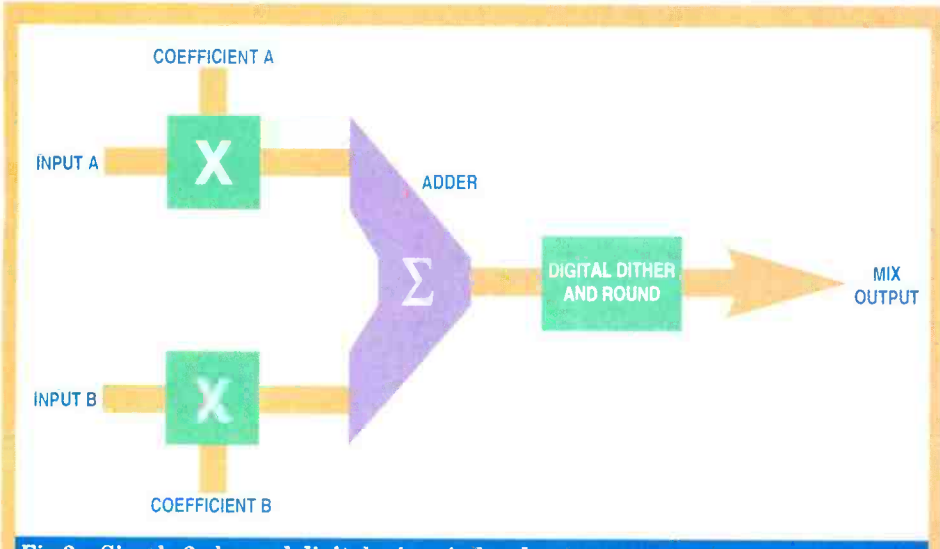

Fig.2a: Simple 2-channel digital mixer in hardware

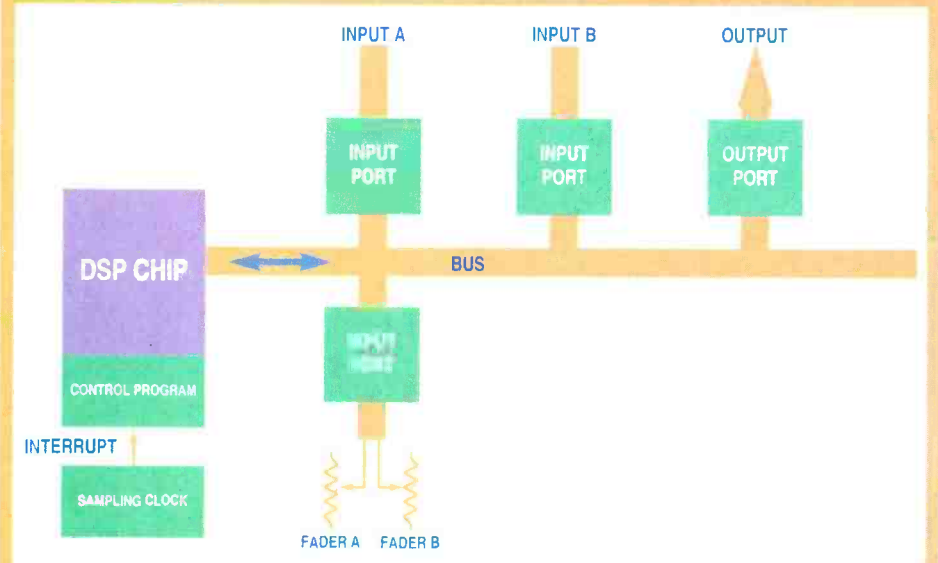

Fig.2b: DSP implementation of mixer

Fig.2: Comparison of digital studio mixer and a simple DSP system

specific hardware. Although general-purpose computers can be programmed to process digital audio information, they are not really suitable for the following reasons:

1. The number of arithmetic operations in audio processing, particularly multiplications, is far higher than in data processing.
2. Audio processing is done in real time; data processors do not generally work in real time.
3. The program needed for an audio function generally remains constant for the duration of a session, or changes slowly, whereas a data processor rapidly jumps between many programs.
4. Data processors can suspend a program on receipt of an interrupt; audio processors must work continuously for long periods.
5. Data processors tend to be I-O limited, in that their operating speed is limited by the problems of moving large quantities of data and instructions into the CPU. Audio processors in contrast have a relatively small input and output rate, but compute intensively.

This is sufficient justification for the development of specialised Digital Signal Processors (DSPs). These units are equipped with more internal registers than data processors to facilitate implementation of, for example, multipoint-filter algorithms. The arithmetic unit will be designed to offer high-speed multiply-accumulate using techniques such as pipelining, which allows operations to overlap. The functions of the register set and the arithmetic unit are controlled by a microsequencer which interprets the instructions in the program. **Fig.1** shows the interior structure of a DSP chip.

DSPs are not restricted to audio, in fact they are used in many other industries where waveforms which were originally analogue need to be manipulated in the digital domain. In fact this is probably the best definition of DSP which distinguishes it from computation in general. The large multidisciplinary market for DSP means that audio applications only form a small part of the overall use and the special requirements of audio do not have as much leverage at the design stage as we might wish. Unfortunately, the requirements of high quality audio processing are much more stringent than in most other processes. The situation is rather reminiscent of the convertor problems of a decade ago, when top-quality instrumentation convertors were found lacking when used for audio applications.

One example of this is the common use of floating-point processing in DSP. In a floating-point system, the input values are converted from the conventional two's-complement coding to a gain ranging convention in which signals between 6dB and 12dB below peak are bit shifted one place left, signals between -12dB and -18dB are shifted two places and so on. The wordlength is then reduced by losing low-order bits in order to create a value known as the mantissa. The number of bit shifts forms a value called the exponent.

The reduction in wordlength of the mantissa simplifies the arithmetic logic unit. In order to multiply two floating-point numbers, the mantissae are multiplied but the exponents only need to be added. On conversion back to two's complement the exponent is used to shift the mantissa back to its correct level. Clearly the dynamic range of such a system can be very large, but the accuracy is given by the wordlength of the exponent. Shortening the wordlength at the floating-point conversion is a form of requantising and this causes distortion products. The system relies on these products being sufficiently far below the signal level to be inaudible. While this is the case at the initial floating-point conversion, after manipulations have raised the level of artifacts further this may no longer be the case. Fixed-point processors avoid this problem.

Fig.2a shows a simple digital audio mixer which accepts two inputs, sets the gain of each and then mixes (adds) the two signals together. The sum will have increased in wordlength and must be digitally dithered prior to rounding to the required output wordlength.

Fig.2b shows a simple DSP system which is designed to do the same job. The hardware is trivial; a few ports and a DSP chip (known colloquially as an 'engine'). The program which is needed to operate the DSP is shown in **Fig.3**. This has been written in English rather than in DSP gobbledygook which is incomprehensible to most humans. If all of the steps in the program are executed in turn, the output value ought to be the same as if the hardware of **Fig.2a** had been used.

One problem is that the DSP engine is designed to run as fast as its technology allows, whereas in digital audio results are required at the audio sampling rate. This is solved by using interrupts. An interrupt is a hardware signal which causes program execution to change. The interrupt signal can occur at any time with respect to the processor clock without causing difficulty as it will only be examined when an instruction has been completed, prior to executing another one. The normal program is suspended, and a different program, known as a subroutine, is executed instead. ▶

The situation is rather reminiscent of the convertor problems of a decade ago, when top-quality instrumentation convertors were found lacking when used for audio applications

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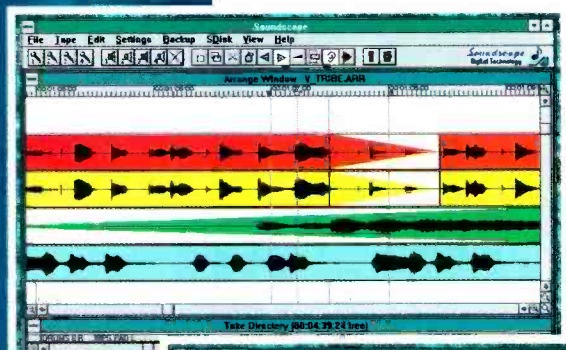

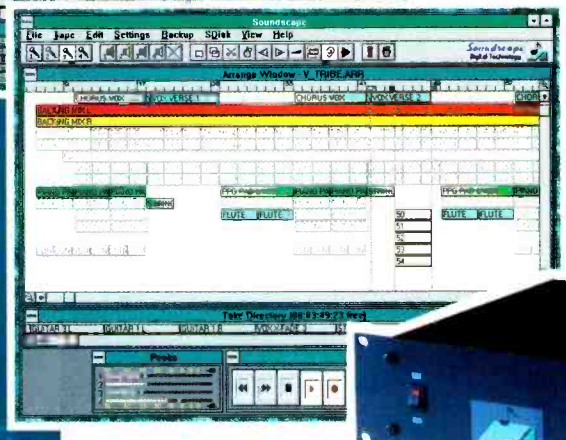

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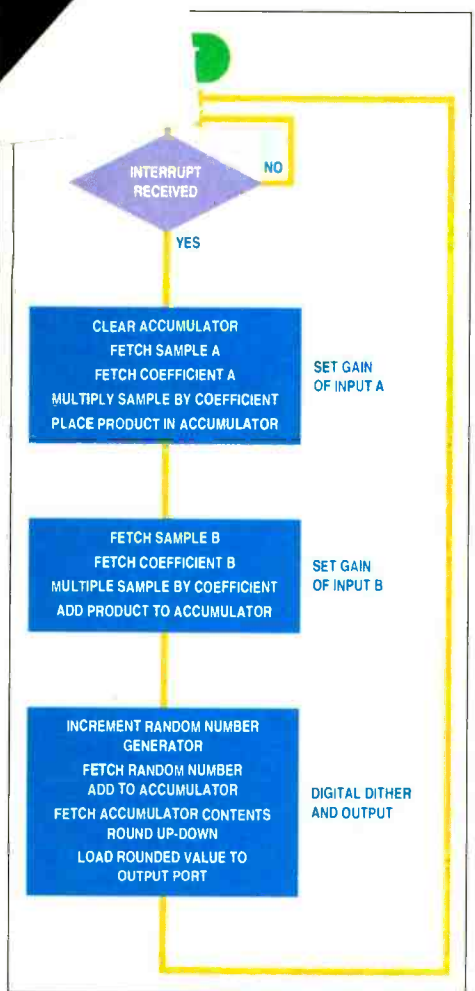

Fig.3: Simplified DSP program for 2-channel mix

When the subroutine is completed, the normal program resumes. In a DSP application, the normal program is an idling program—that is, it doesn't do anything useful. The sample calculation is contained in the subroutine. The master sampling rate clock is then used to generate interrupts to the DSP just after input samples have been made available. **Fig.4** shows that if this is done, the subroutine is executed at the sampling rate with idling periods between. In practice this is only true if the subroutine is short enough to be executed within the sample period. If it is not, the system is doomed and a more elegant program or a more powerful engine must be sought.

Although a simple example, the mixer shown illustrates what happens in all digital audio processing. As soon as a sample value is multiplied by a coefficient, the wordlength will increase as low-order bits come into being to describe the output which no longer lies on one of the input steps. Thus the internal wordlength of a digital mixer needs to be considerably longer than the input wordlength.

Coefficients need to have sufficient wordlength to make gain steps inaudible over a realistic gain range. Sixteen bits is not unusual for a coefficient wordlength. If a 20-bit input sample is multiplied by a 16-bit coefficient, the result may be a 36-bit product. The accumulation of products which simulates the mixing process must be performed to this accuracy.

As there are no known 36-bit recorders or interfaces, the output wordlength needs to be shortened. This can only be done by using digital dither of the appropriate level prior to rounding up or down to the required wordlength.[1] Practical equipment needs to be able to provide a range of output wordlengths; 16, 18 and 20 bits being a basic minimum. It is essential to match the rounding level to the destination. Dithering to 20 bits is no use if the destination is a DAT machine. This will truncate to 16 bits and cause quantising distortion at low levels. Similarly dithering to 16 bits is no good if the destination is a 20-bit recorder, as 24dB of dynamic range have been needlessly wasted.

The simple mixing example requires very few instructions per output sample and the least powerful DSP device available could execute it with time to spare. However, a linear-phase sampling-rate conversion or equalisation stage can easily require over a hundred multiplications just to compute the value of a single output sample, and this requires a lot more computation, especially in multiple-channel systems.

In analogue audio mixers, the controls have to be positioned close to the circuitry for performance reasons; distributed analogue circuits pick up interference. In order to have a compact structure, one control knob is needed for every variable, and the control panel is physically large. The physical layout is determined to a great extent by the need to maintain signal quality. Remote control is difficult with such construction. The order in which the signal passes through the various stages of the mixer is determined at the time of design, and any changes are difficult to make.

Dithering to 16 bits is no good if the destination is a 20-bit recorder, as 24dB of dynamic range have been needlessly wasted

In a digital mixer, all the filters are controlled by simply changing the coefficients, and remote control need not result in any quality loss. In practice, the signal-processing circuitry is in a separate rack and the console is no more than a control surface. Since control is by digital parameters, it is possible to use assignable controls, such that in the limit there need only be one set of filter and equaliser controls, whose setting is conveyed to any channel chosen by the operator. There is some debate about the relative merits of a fully-assigned system of this kind. Although a large traditional analogue mixer definitely has too many knobs on it, this does not justify the equally useless opposite approach where there are not enough knobs and the operator has to go through several stages of menu selection to obtain the desired effect. In postproduction this may be frustrating; on-air it could be disastrous.

The use of digital processing allows the console to include a video display of the settings. This was seldom attempted in analogue desks because the magnetic field from the scan coils tended to break through into the nearby audio circuitry.

A further advantage of working in the digital domain is that delay can be controlled individually in the audio channels. This allows for the time of arrival of wavefronts at various microphones to be compensated despite their physical position. One application is in the seamless combination of a coincident pair with a number of spot mikes.

Since the audio processing in a digital mixer is by program control, the configuration of the desk can be changed at will by running the programs for the various functions in a different order. The ▶

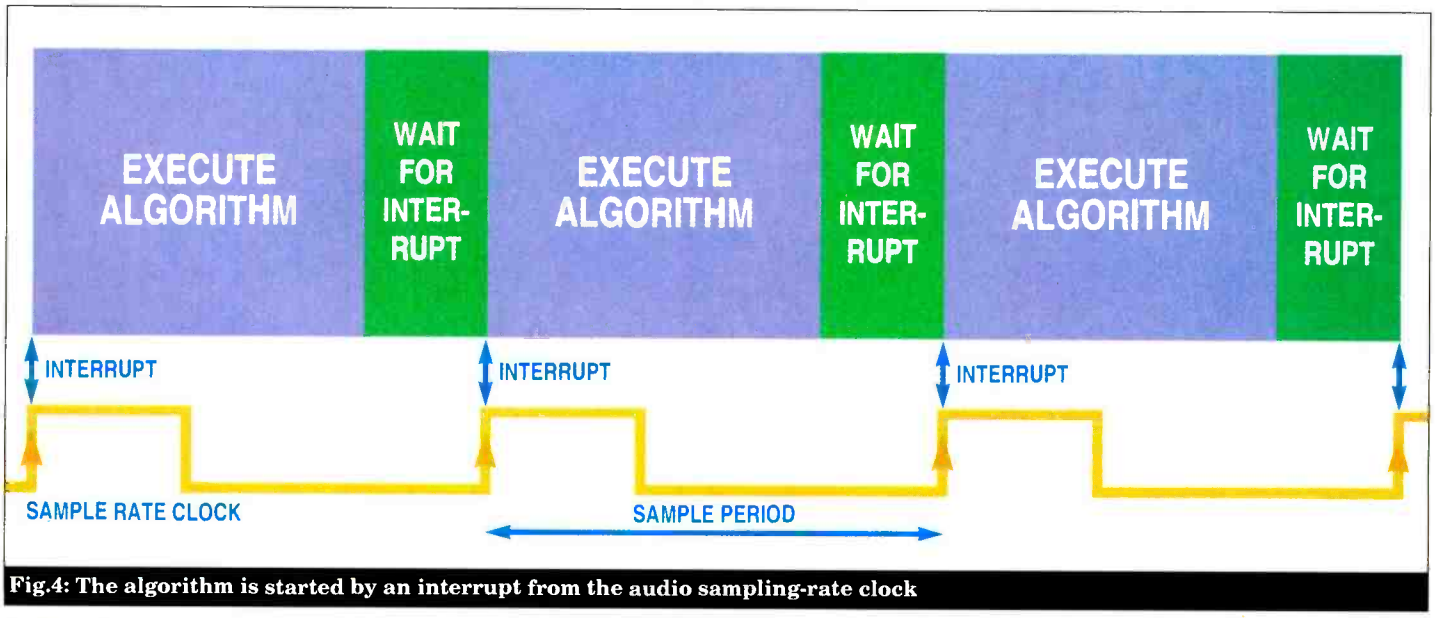

Fig.4: The algorithm is started by an interrupt from the audio sampling-rate clock

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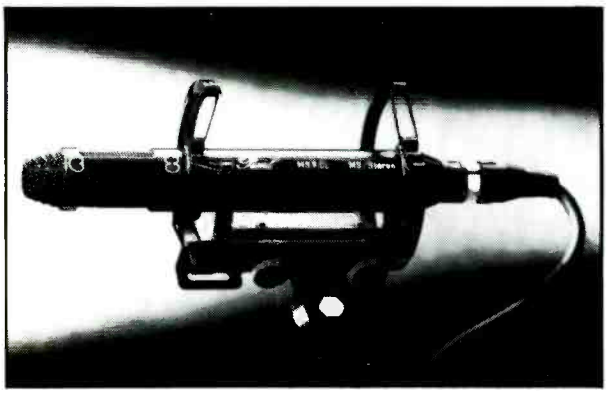

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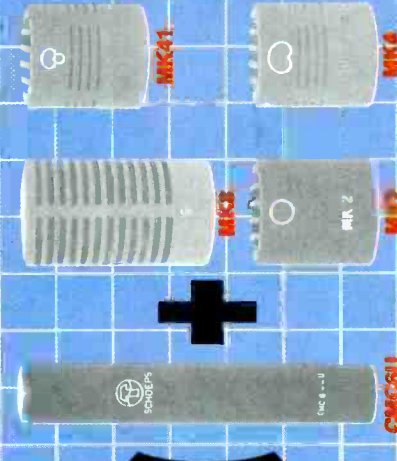

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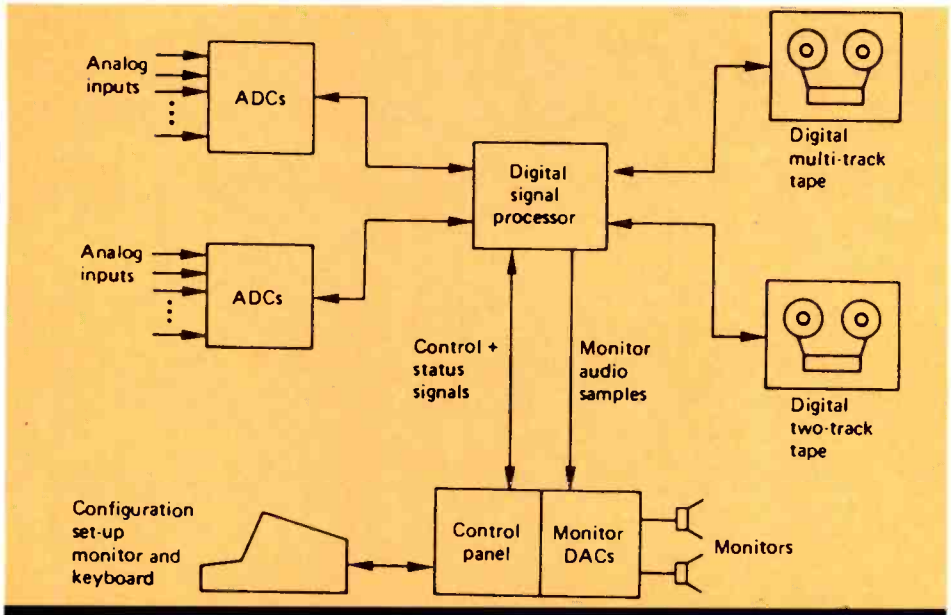

Fig.5: A typical digital mixer installation

operator can configure the desk to his or her own requirements by entering symbols on a block diagram on the video display, for example. The configuration and the setting of all the controls can be stored in memory or, for a longer term, on disk, and recalled instantly. Such a desk can be in almost constant use, because it can easily and exactly be put back to a known state after someone else has used it.

In analogue desks, automation is generally restricted to the operation of gain faders. In a digital desk there is no reason in principle why every single function should not be automated, although this may not be necessary. Automation of equalisers requires some care. While the controls of an analogue equaliser can be changed at will, digital filters are more difficult to control. A step change of filter coefficients can result in transient noise generation. In some cases an otherwise stable filter can be forced into oscillation by a step coefficient change. The solution is to incorporate low-pass filtering or ramping of the coefficients so that however quickly the command changes, the coefficients at the filter itself change at a manageable rate. In practice the filtering of coefficients takes up a significant part of the processing budget in an automated system.

Fig.5 shows a typical digital mixer installation. The analogue microphone inputs are from remote units containing ADCs so that the length of analogue cabling can be kept short. The input units may communicate with the signal processor using digital fibre-optic links or MADI interfaces.

A theoretical advantage of programmable hardware is that the functionality can be changed without a hardware redesign, simply by changing the software. Unfortunately, this ease of updating is often abused as an excuse for shipping equipment that works badly because it can be put right later. This situation is compounded by the difficulty of testing software and processors in all conceivable states.

It should be self-evident that professionalism in the form of discipline and quality control is an essential ingredient of software used in production and broadcast equipment. ■

Reference

1. J R Watkinson, *The Art of Digital Audio*, second edition, chapter 3, Focal Press 1994.

JOHN WATKINSON is an independent consultant in digital audio, video and data technology. He is the author of seven books on the subject including the definitive *The Art of Digital Audio*. John is a fellow of the AES, is listed in *Who's Who in the World* and regularly presents papers at conventions of learned societies. He has presented training courses for studios and broadcasters around the world and is currently writing a book on digital video recorders.

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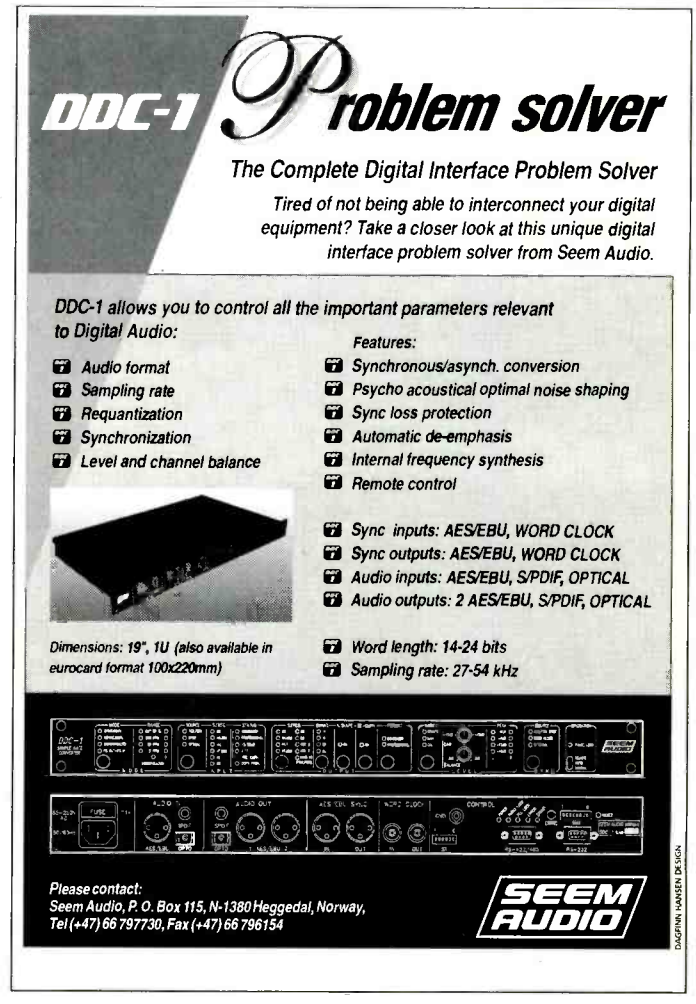

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Barry Fox

'Bye-Bye' to the Beeb's Big Band and 'Hello again' to sticky tape

More cuts. The BBC are now sacking their staff Big Band, four years after sacking the staff Radio Orchestra.

The trouble is that you can see why the BBC management see the Big Band as a good way to save money. It is a fine band, but a lot of the time it is playing fairly dated re-creation music that could equally be played from original artists' records. When the band hired an open-top bus to play outside London's Broadcasting House in January to drum up support for the 'Save the Big Band' campaign, you could just picture the BBC managers peering down from their offices upstairs and saying, 'We did the right thing'. The band on the bus were playing Glenn Miller hits.

But realistically, what else could they play to drum up support on a cold winter's day by a busy main road? If they had played subtle modern scores, the assembled crowd of passers-by, photographers and popular press would have sympathised with the sacking. It was a no-win situation.

As an official of the Musicians' Union said about a previous band sacking, 'Don't complain about what they play. They are professionals who play what you tell them to play'.

And that's the key point, which the 'Save the Big Band' campaigners seem to have missed. For who knows what historical reason, the BBC Radio Big Band are tied to Radio 2. So the fees come out of Radio 2's budget. So Radio 2 producers dictate what is played to keep Radio 2 listeners happy. And Radio 2's remit is to generate middle-of-the-road entertainment. Although the band play new music on some shows, a lot of the time they play music that could equally well come, at much lower cost, from records.

There is no way that Radio 2 will now rethink the decision to sack the Big Band. The campaigners are on a hiding to nothing. But if the band's service were available to the whole of the BBC, then Radio 3 (and also BBC TV) could request music that would never fit any Radio 2 programme.

This would put the BBC in line with other European radio station big bands—like those in Scandinavia and Germany. In those countries the radio station pay for a staff band who are then available to producers throughout the station, and they use them for a wide range of music.

So don't campaign to save the Radio 2 Big Band, campaign for a BBC-wide Big Band.

How soon will it be before the BBC chop their local radio stations, and hand over the frequencies to the Radio Authority for use by commercial stations?

Even in the days when BBC London was broadcasting from Hanover Square, the station was short of money. It was still poor when it moved to Marylebone High Street. Then the station became GLR and the BBC found some money to pay 'star' presenters.

Until recently, BBC local had a small budget to pay a few independent guests to come on a programme and counter the puff PR from whoever was only too happy to appear free to plug their company, product or service. The same was true of provincial BBC stations too.

But now things have changed. On average I get at least one call a week from some BBC radio station or other, asking me to take part in some programme or other—usually to balance the PR claims for some new 'teckie' product or service. For instance it makes sense for a radio station to balance the puff for National Westminster's new Mondex smart-card banking system with the cold-water reminder that BSkyB's experience with Videocrypt card cloning has shown smart-card technology to be a lot less secure than many people first believed.

Each request to participate in these programmes goes the same way: I say I want a small fee, for taking part down the line. I say I want something for being available at a time that suits the station, for having done the research and for putting my head on the block with often unpopular comments. The researcher checks, and the same answer comes back. The station now has *no* budget for *any* contributor.

Recently I got five separate lengthy long-distance calls on the same topic, from different people in the same BBC local station, all trying to persuade me to contribute free. The cost of the calls would have paid for the nominal fee I was asking.

Perhaps I am being unreasonable. Perhaps BBC local radio stations really do get plumbers to come out and fix their burst pipes for free. Perhaps the staff do get free lunch from the cafe next door and the station does not pay anyone for petrol, postage stamps or electricity. Perhaps all other independent contributors do contribute for free.

But if not, and the BBC's accountants are forcing local stations to rely solely on 'puffer' guests who have a something to plug, then there cannot be much of a long-term future for BBC local radio.

Remember the sticky tape syndrome? Around five years ago engineers started to find that analogue tapes, especially fromAgfa and Ampex in the late 1970s, were unusable.

A chemical reaction between moisture in the air, and the resin which binds the magnetic oxide to the plastic base-film, was leaking a sticky goo onto the surface of the tape. This gummed up the drive mechanism of the recorder, so the machine ground to a halt, stripping off the oxide and destroying the recording.

Ampex developed a baking service, which dried the tape so that it can be used just once, to make a copy recording. Agfa developed a similar system, and the IDT of Florida currently use it to provide a commercial transfer services.

Until now there has been a general feeling that digital tapes were in some ways immune from the sticky syndrome. But not any more. The bad news for digital tape comes from the University of Minnesota, where the Charles Babbage Institute (CBI) run the Centre for the History of Information processing.

Recently the CBI found the U-matic video cassettes recorded in 1981, which were still playable in 1990, had suddenly deteriorated to the point of refusing to play. The tape sheds gunge, which clogs the heads within a few seconds. The CBI took advice from the University of Minnesota's Media Resources Centre, and could find no published work on sticky video tape. The CBI then tried baking the tape, in an oven, but it still would not play.

The CBI solved their immediate problem, by finding another copy of the same tape. 'The episode... is particularly disturbing because it indicates that video tape barely 12 years old can become unplayable,' say the CBI.

Surprisingly, the CBI do not point out the obvious connection between video and digital audio archiving. With the exception of Decca (who use their own design based on 1-inch IVC recorders), the audio industry has extensively been using U-matic cassettes for mastering. The earliest of these are only just now notching 12 years in storage.

A spot check through one engineer's store showed that of ten tapes made 12 years ago, six would neither rewind nor play. They just stuck solid in the machine. Four more showed very high error-correction rates. Storage conditions were not ideal, but typical of the industry.

How many people can afford full air-conditioned storage for all their tapes? And who has time to go back through their collection, regularly checking and copying old masters?

But everyone should have time to do a couple of spot checks. Do it now. Pull out a few 10-year-old U-matic tapes, and see how they play. ■

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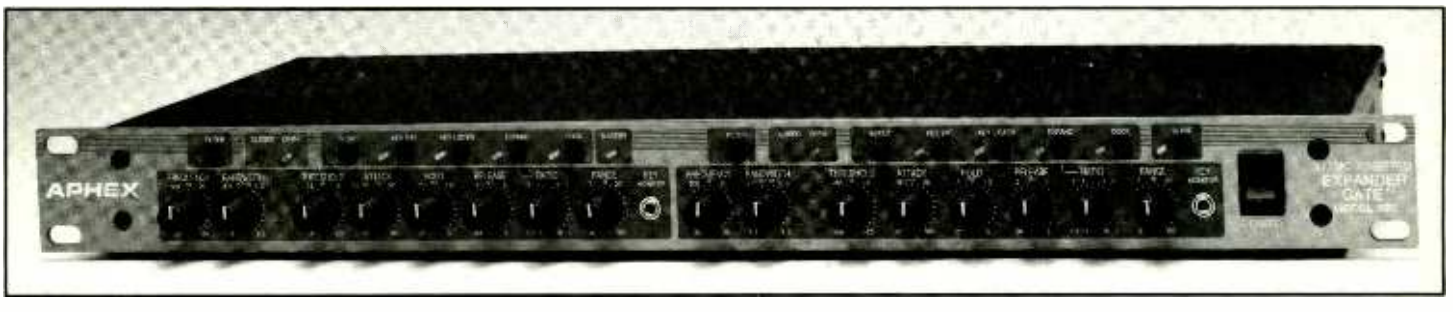

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