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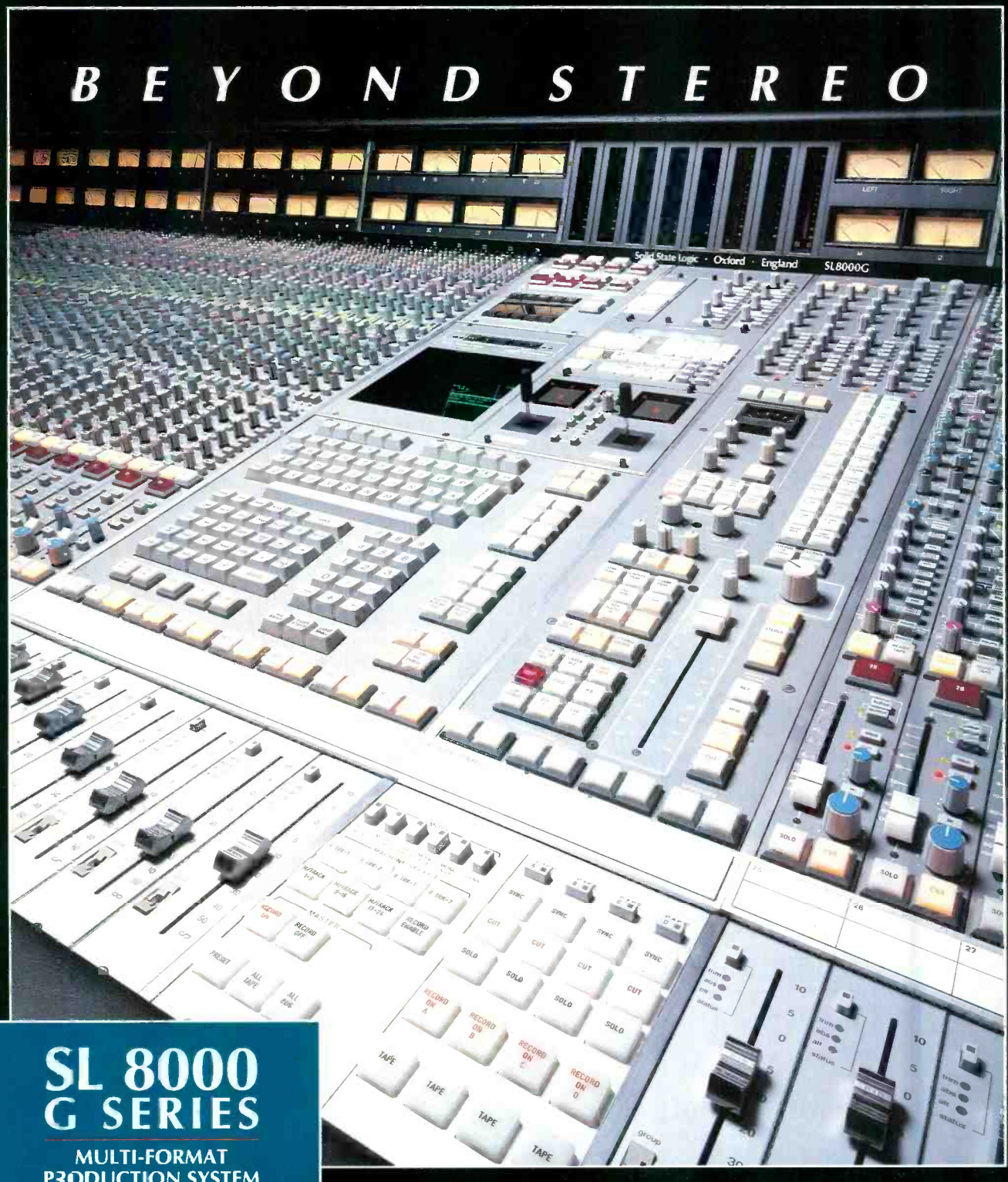

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EDITORIAL
Editor: Tim Goodyer
Assistant Editor: Julian Mitchell
Production Editor: Peter Stanbury
Secretary: Mary Walsh
Consultant: Sam Wise
Columnists: Barry Fox, Martin Polon, Keith Spencer-Allen
Regular Contributors:
James Betteridge, Ben Duncan, Dave Foister, Yasmin Hashmi, Mike Lethby, Terry Nelson, Francis Rumsey, Zenon Schoepe, Patrick Stapley

ADVERTISEMENTS
Executive Ad Manager: Steve Grice
Advertisement Production: Mark Trainer
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CIRCULATION
Circulation and Development Manager: Colin Enderson
Controlled Circulation Manager: Maria Udy

Director: Doug Shuard
Publisher: Steve Haysom

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EDITORIAL

Digital Delay?

It is a curious fact that, while many of the analogue signal processes to which we subject our audio material were only made possible by the existence of analogue technology, the majority of treatments which employ digital technology are imitative of other processes. More than this, many of these digital imitations are of the treatments made possible by those preceding generations of analogue processes.

True, there are natural acoustic 'treatments' which audio engineers have attempted to imitate regardless of the technology available. Echoes have been elicited from tape machines, and delay lines of both analogue and digital persuasion; the recording studio variant of reverberation, meanwhile, has been derived using everything from drain pipes to DSP chips. But if it were not for passing police sirens, pitch shifting would be more of an intellectual abstraction than an everyday event, and variable equalisation is a far more elusive natural phenomenon still.

Analogue electronics have allowed us into a new realm of audio treatments, both in making natural phenomena a manageable recording tool and in providing treatments —such as flanging — less readily evident in nature. What, in comparison, has digital signal processing brought? Admittedly, digital electronics have made reverberation cheap and brought it an unprecedented level of sophistication. They have also — through the availability of programmable processors — allowed us to apply signal treatments with a freedom and efficiency only previously dreamt of. But where is the progress that you would anticipate digital electronics to have brought?

Looking over the wall into the world of digital video production, it is blatantly obvious that digital technology has opened the door to a new generation of visual effects. Image treatments bearing names like 'roll', 'ripple', 'accordion' and even 'dual-channel zipper' are now familiar to the television-viewing public at large. Where the audio fraternity seem to have hesitated to push the limits with DSP, the video fraternity have not.

Signal processing is not, of course, the only application for digital technology, and there are other areas of audio activity capitalising upon it without apparent reservation. And none of this is to say that DSP has not brought benefits to audio — in addition to those mentioned above, there have been significant developments in time compression and expansion, and audio restoration, to quote just a couple of examples. But could it be that analogue processes had become sufficiently well refined in advance of digital electronics that they had largely anticipated its applications? Or is it that a new era of digital processes is just around the corner? ■

Tim Goodyer

Cover: The *SADiE* hard disk editor **Photography: Nik Milner**

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Autumn digital audio times 1992

DAT breaks the price barrier - Aiwa HDS100 portable £299 at HHB

Europe's leading supplier of DAT technology can now supply the fully-featured Aiwa HDS100 portable at the unprecedented low price of **£299**. Supplies are limited so please place your order today.

Special offer on Sony DTC1000

We also have limited supplies of the industry standard choice in digital mastering – the Sony DTC1000ES and DTC1000ES Pro (the latter with balanced analogue inputs/outputs and rack mounting kit). Prices are just **£749** for the standard machine and **£895** for the DTC1000ES Pro.

We stock more than 25 DAT machines from Sony, Aiwa and Panasonic (including the SV3700 studio DAT recorder pictured here) and provide an after sales service of unrivalled quality. Call us today to discuss your needs.

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ATC's new SCM10 2-way nearfield monitor articulates tight, controlled bass with dispersion and dynamic range synonymous with the manufacturer's larger models at a price of just **£808** per pair. Call HHB today for a demo.

Processors

new from Summit, Sony and Eventide

For that pure valve sound, Summit Audio's precision engineered range of processors are an ideal partner in digital recording. Call for details of the Summit range including the new DCL200 dual compressor / limiter. **£2495**.

The new Sony DPS M7 multi effects processor (**£995**) with extensive pitch shifting facilities, complements the highly successful DPS R7 reverb and DPS D7 delay. Call for details of the full Sony range.

New from Eventide is the H3500, adding sampling and "Mod Factory" facilities to the industry standard H3000SE harmonizer. Call for news of special prices.

Professional DAT News

A host of professional facilities make our own Aiwa HHB1Pro (**£995**) ideal as a high quality portable recording device. Particularly cost-effective is the HHB1 Pro kit, comprising an HHB1 Pro with a Sony ECM 979 stereo mic, 2 rechargeable batteries and a cable pack, packaged in a metal flight case.

Representing the last word in Swiss digital expertise and engineering know how, the Stelladat is set to become the definitive portable timecode recorder. Call HHB for details of the Stelladat and Sony's industry standard PCM7030 studio timecode DAT recorder.

CDR Technology

Our choice of professional CD recording systems is the Marantz CDR1. Conforming to the "Orange Book" standard, it also produces discs to the full "Red Book" standard as well as providing full CD playback functions. **£2995**.

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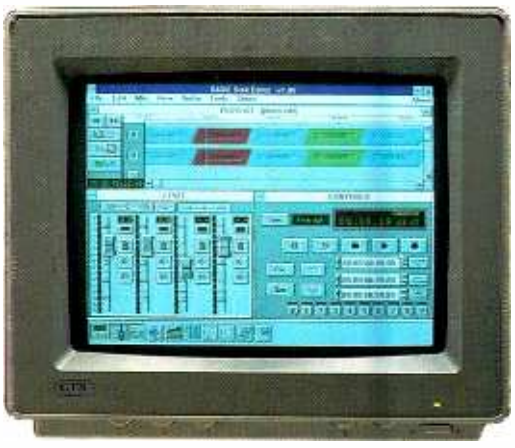

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STUDIO AUDIO

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Highlights at the AES

Upwards of 14,000 audio professionals and enthusiasts are expected to attend the San Francisco AES, from throughout the Americas, Europe and the Far East. In all, more than 125 technical papers will be presented during the four day convention, on subjects ranging from architectural acoustics and digital music to psychoacoustics.

More than 275 exhibitors will feature new products like the DISQ *Digital Mixing Core*. The *Core* is a digital signal processor that promises to turn popular analogue recording consoles, like Neve *VR* and *SSL 4,6,8 Series*, into fully digital desks via *EtherNet* cable connections . The project is a joint effort by **AT&T**, **GML** and **Gotham Audio**, and a new company, DISQ has been formed to market the idea.

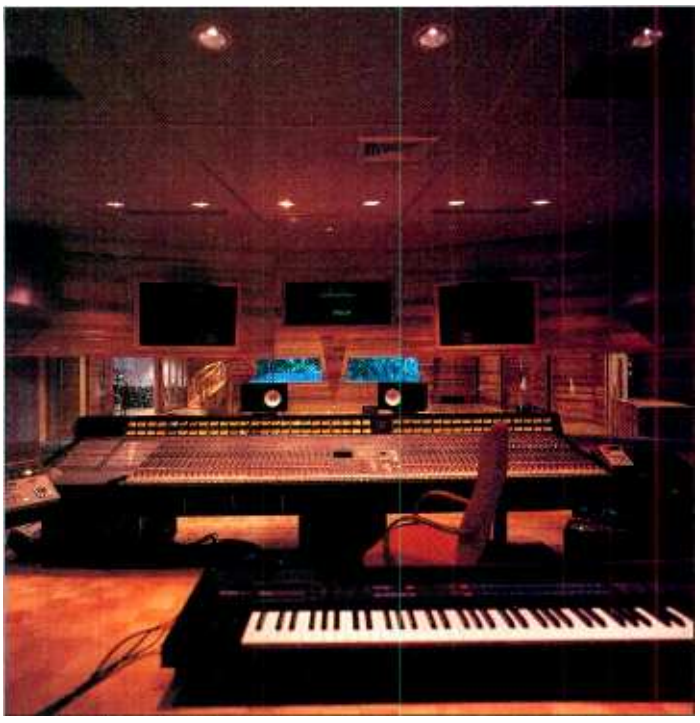
Another collaboration, between **QSC** and **Lone Wolf** has resulted in a new audio control system based on the MediaLink network, using the Virtual Network Operating System (V-NOS) . MediaLink is an open standard for communications between digital devices and has been used for the past three years for Lone Wolf's *MIDITap* products. An exciting new product from **Dolby**, the *Spectral Processor*, will be shown in full working order at the AES after a display showing only at London's APRS show. The 2-channel unit makes it possible to raise low-level signals in three frequency bands by as much as 20dB without affecting high-level signals. It works surprisingly well as our review will show in next months issue.

Also new for AES but something that has been seen elsewhere is the **Solid State Logic** *Scenaria*, first of a new breed of Digital audio-video production systems. The *Scenaria* seeks to change the way postproduction studios work. For the first time, editing, signal processing and mixing can be carried out to picture, entirely in the digital domain. Since its introduction at this year's NAB SSL has taken twelve orders for the system from the US, Europe and the Far East.

DigiDesign have announced various new products including a 20-bit recording and editing system, *ProMaster 20*; and DigiDesign Intelligent Noise Reduction, *DINR*, one of their series of software-based plug-in DSP modules for their hard disk recording and editing systems. Also **Tascam** will enter the low-cost 8-track digital recorder market with their launch at the show.

Highlights of the technical papers come under titles like, 'Is Digital Audio Forever?'; 'Multimedia and Acoustics'; and 'New Media and New Developments'.

Full AES exhibition details on Page 25.



The Caribbean Sound Basin Recording Studios in Trinidad and Tobago, a recently completed four studio complex, has been host to the Rolling Stones management who are looking for possible venues for their next album. They could do worse than booking in to CSB with its abundance of after-session activities; sauna, exercise gym, pool, Cessna plane; and 46ft yacht. The recording equipment is not bad either with an SSL 4000 G Series and Neve VR48 consoles and rooms built by The Acoustic Design Group of London and Kronos Acondicionmientos of Venezuela. For bookings call Josanne Leonard at Amar Entertainment. Tel: + 1 809 628 6176 17 18

Stellavox refinancing

Digital Audio Technologies SA, the holding company of Stellavox, has officially announced that its capital will be raised within the coming weeks to 4 Million Swiss Francs.

This new capital investment has been brought on by the original shareholders, to keep up with the production needs generated by the reception of the *StellaDAT* DAT player. Michel Reverchon, the company's majority shareholder has increased his personal capital share in the company.

Helene Wegmuller of DAT commented, 'After the long and costly development of the StellaDAT, the rapid successive announcement of the *StellaMode*, the *Stellamaster* and the *Stellaword*, the new financial size of the company proves that Digital Audio Technologies SA has decided to become the real Swiss contender in the professional audio field.

AMS on Quality Street

Advanced Music Systems (AMS) has been awarded the highly sought BS 5750-ISO 9002 quality award. The company is believed to be the first in the professional audio industry to achieve the award, presented to Managing Director Mark Crabtree during recent celebrations at the company's Burnley based head office.

AMS' quality assurance system has been rigorously assessed and will be continually monitored to ensure that it complies with the British Standard.

Treble CLeF

Three companies CLeF Digital Systems, French software developer IRCAM and NeXT have joined forces to further investigate the digital audio potential of NeXT computers.

CLeF is currently developing a multitrack sound editor to run on an IRCAM Music Workstation within a NeXT computer. The workstation comes complete with CPOS (Co Processor Operating System), FTS (Faster than Sound) for realtime event handling, a C compiler, Animal (Animated Language) graphical language for end-user programming, and a signal processing version of IRCAM's MAX language. By using MAX and Animal, end users can create their own effects processors, samplers and synthesisers. There are also applications for non-destructive editing, special filtering and spectral synthesis.

CLeF Digital Systems, Llanon, Dyfed, SY23 5NL. Tel: 0974 272525 Fax: 0974 272571

New dates for APRS '93

APRS '93, Europe's leading exhibition for the professional audio and sound recording industry, will be held from Wednesday to Friday, 23rd to 25th June 1993, at Olympia 2, London. Once again the theme of the event is THE ONE SHOW: the one show which combines products, systems and services for ▶

In-Brief

● Sun Valley, CA: The 6th Chamber of the Frankfurt Provincial Court in Frankfurt found the firm Behringer guilty of infringement on the German patent number 27 11 083 covering the Aphex Aural Exciter. The court determined that all past and current version of the Behringer 'exciters' infringe on the Aphex patent.

● Washington, DC: The National Association of Broadcasters has been invited to conduct a professional seminar on 'New broadcast technologies' at the International Broadcasting and Telecommunications Show (IBTS) in Milan October 15th to 19th, 1992.

● Slough, UK: Otari has just introduced MADI (Multi-channel Audio Digital Interface) to the European market. A plug-in module, MADI is designed specifically for Otari's DTR900II PD digital multitrack and allows the machine to be connected to digital consoles. ■

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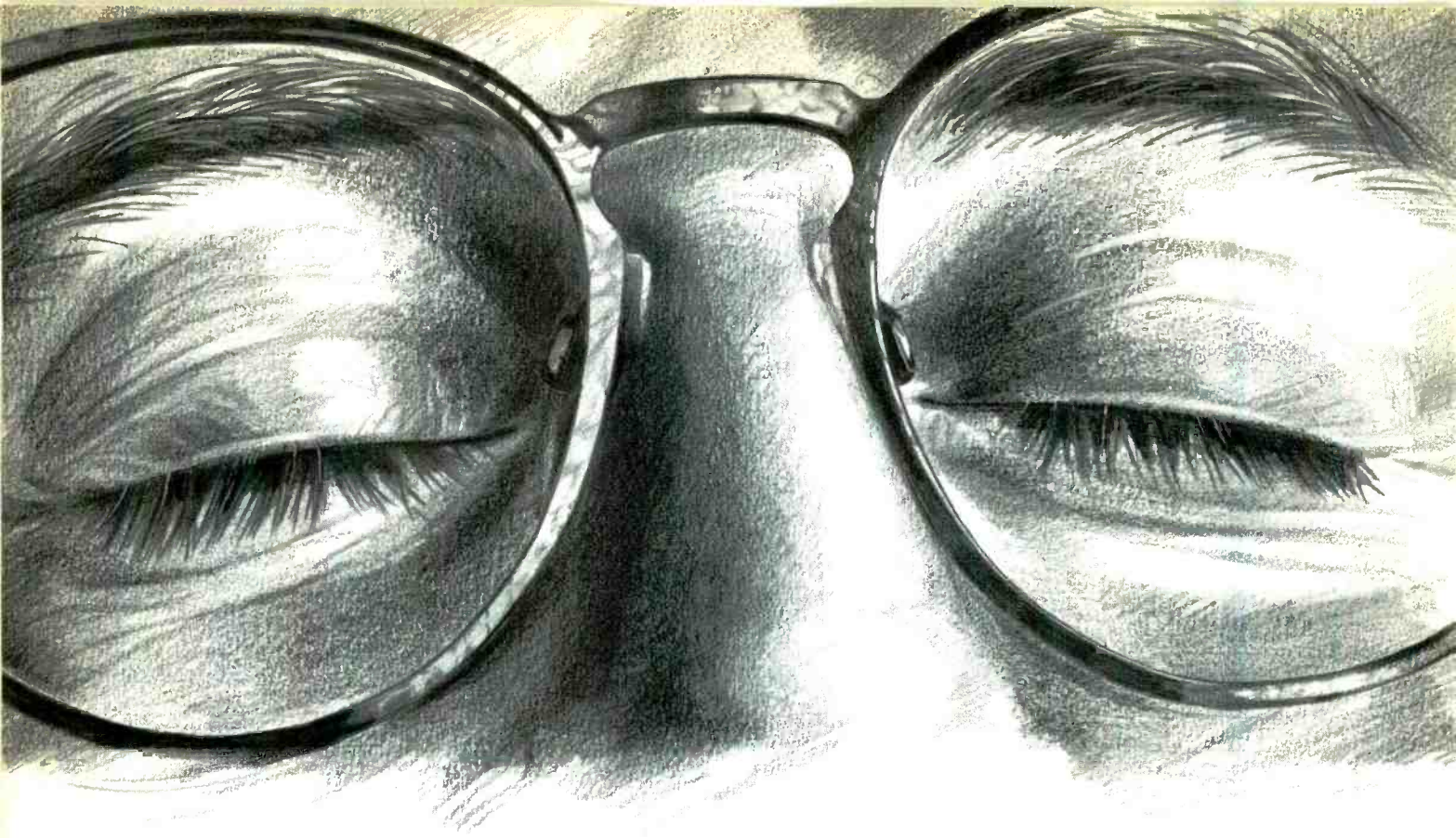

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recording, sound broadcasting, postproduction and sound reinforcement from virtually all the world's leading suppliers to the European market. (over 5,000 professionals were at the 1992 exhibition).

Digital future for Fostex

Fostex Corporation have announced the formation of Fostex Research and Development, Inc, a dedicated research and development subsidiary in North East America. The primary focus of this group, some members of which are ex-NED staff, will be the design of equipment for the recording and reproduction of digital audio.

'Fostex is a recognised leader in high-end digital technology' said Hiroaki Shimohara, President and CEO of Fostex Corporation of Japan. 'The formation of this new R&D company represents our continuing commitment to digital technologies while, at the same time, increasing our potential for future innovation in the Fostex tradition. It will enable us to continue to lead the industry in the development of man-machine interfaces, as well as computer control of mixing and sound reinforcement devices.'

The location of the new Fostex Research and Development, Inc, offices are in Hanover, New Hampshire.

Agencies

● New company The Tyrell Corporation will now act as exclusive UK distributors for Sonic Solutions and the *DAWN* digital audio systems. The company is headed by Nigel Scott, ex-Sound Technology, and Stephen Paine, ex-Syco Systems. The Tyrell Corporation, 20 Great Chappell Street, Soho, London. W1. Tel: 071 287 1515

● As a direct result of export successes in the Far East, Belfast based Audio Processing Technology, have opened a Japanese office and appointed distributors in Singapore and Korea. More details from Steve Cheung in Belfast. Tel: +44 (0) 232 662714

Contracts

● Tim Jaquette, gold and platinum engineer-producer, has chosen a 32-input,32-track, D&R *Orion* console to complete his new recording facility, Bazzbo Productions in Southern California

● BBC TV Outside Broadcast have bought four more Neumann *RSM 191* Variable Stereo Shotgun Microphone Kits, which are used regularly at Wembley Stadium for stereo footbal coverage.

● The Record Plant in Hollywood is to install a SSL 96-channel *SL 8000 G Series* console with *Ultimation*.

● Life Studio in Tawain has ordered an AMS *Logic 2* console for its studio in Taipei

AES British Section News

Forthcoming events

Lectures

13th October

MiniDisc

Andrew Tait, Sony Broadcast
Room 408, Dept. of Electrical Engineering, Imperial College

10th November

Developments in stereo and surround sound

Michael Gerzon, Consultant
Room 408, Dept. of Electrical Engineering, Imperial College

Special meeting

8th December

Live demonstration of high quality digital using ISO Layer 3 data reduction at 64 kbit/s over an ISDN link from Germany to London.

(In collaboration with the Fraunhofer Institute and BBC Research).
This is a special meeting to be held in the BBC Concert Hall at Broadcasting House, Langham Place, W1. Because of security arrangements it is necessary to book in advance by ringing the AES office. Guests are welcome. Starting 6.30 pm for 7 pm.

● Lectures are free and open to members and guests alike. Lectures normally start at 7 pm with coffee and biscuits from 6.30. For further details on AES events, venues, book sales, etc., please contact:

Heather Lane, AES Secretariat, PO Box 645, Slough SL1 8BJ, UK.
Tel: 068 663725.
Fax: 0628 667002.

DL241
a u t o compressor

"The DL241 is a user friendly unit that sounds good and has a per channel pricing that should put a scare into the competition"

George Peterson.
Mix

"I should not be at all surprised to see the DL241 join Drawmer's original DS201 gate among the ranks of the classics"

Dave Foister.
Studio Sound

"In twenty years of reviewing products I have seldom come across such a good product"

Martin Homberg.
Fachblatt

"*Once again Drawmer have hit on a winning formula based on flexibility, ease of use and true innovation. The DL241 is destined to become a modern classic amongst compressors*"

Paul White.
Recording Musician/Audio Media

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CALREC RQP3200

Calrec's *RQP 3200* preamplifier, compressor and expander-gate takes circuitry used in the *Q-Series* broadcast console and incorporates it into a 1U rackmountable with integral PSU. Like its sister unit, the *RQP 6400* twin stereo compressor-limiter (*Studio Sound*, February '92), the *RQP 3200* has been considerably influenced by suggestions and request from the broadcast sector, in particular from BBC Radio and Television engineers. However the unit should not be thought of as a broadcast-only device, as it has applications wherever a high quality preamplifier with EQ and dynamics is required.

The front panel controls are divided into four sections: mic and line input, 4-band equaliser plus independent filters, dynamics, and output.

The input is switchable between mic and line with a shared phase-reverse switch. The unit provides stepped mic gain (-72 to 12dBu in 6db increments) plus a centre-detented TRIM control (+5dbu, and 48V PHANTOM POWER switch. When selected to line, the TRIM control provides 15dB of gain-attenuation. Input level is indicated by a single overload LED; ideally a more comprehensive form of input metering would be preferable, especially for setting-up mic levels.

The parametric equaliser is divided into LF (30 to 470Hz), LMF (160Hz to 2.4kHz), HMF (470Hz to 6.8kHz), and HF (1 to 16kHz), with +16dB centre-detented controls. The two mid-frequency bands include high Q switches while the other bands are Peak-Shelf selectable. High-pass (18dB/octave) and low-pass (16dB/octave) filters are variable between 2 to 30kHz and 16 to 330Hz respectively. EQ and filter sections both have IN-OUT switches, and can be independently inserted into the dynamics side chain allowing frequency-conscious gating and compression. The overall quality of the equaliser is excellent, providing an 'expensive' sound with no trace of distortion or harshness: in fact it is quite difficult to purposefully 'screw-up' the signal —this is not a unit for coarse EQ lovers!

Dynamics are controlled by a dbx2150 VCA providing expander-gate and compressor sections. The expander-gate has Threshold (-40 to 0dB), Attack (4ms or Fast 50ms) and Recovery (75ms to 4s). A double function control provides Depth (0 to 40dB) when the expander is selected, and Delay (0 to 1s) when the gate is in circuit, the gate depth is fixed at just under characteristic that starts with a gentle curve (1.5:1) which progressively steepens as the signal drops below threshold. Hysteresis is fixed at 6dB, so that for a set threshold attenuation will start 6dB below the recovery point. A KEY button is included to switch external sources to the side chain, but the unit does not incorporate a key-listen facility.

The expander-gate operation can be a little confusing to start with due mainly to the double function DEPTH-DELAY control, but once familiarity sets in, it becomes reasonably straightforward and provides a versatile facility with gentle expansion and incisive gating. The A-B between processed and nonprocessed signals is impressive, with no audible base-loss which can sometimes be a problem with expander products.

A horizontal, 20-segment bar-graph meter displays separate gain reduction for both expander-gate and compressor, by dividing the meter centrally, the left side shows expansion in green, while the right side displays compression in yellow. The metering shows up to 20db of gain reduction in a nonlinear fashion providing a fine resolution at small reduction levels. The display also remains functional when the dynamics are bypassed, but will dim to indicate they are out of circuit.

The compressor has a hard-knee characteristic with variable Ratio from 1.5 to 50.1 (limiting), Threshold (-20 to +10dBu), Attack (4 ms or Fast 0.2ms) and Recovery (0.1 to 4 s) plus autorecovery. Normally the compressor will appear post-EQ and after the expander-gate, but a preswitch enables it to be positioned before the equaliser. The compressor is simple to use and works well on a wide variety of programmes. The ability to position it pre or post adds considerably to the units versatility, and frequency-conscious compression performs well providing functions such as de-essing and depopping.

The DYNAMICS IN-OUT switch bypasses the dynamics section as a whole; there is no facility for bypassing expander-gate and compressor separately. Above this switch is the OUTPUT LEVEL control which adjusts level from Off to up to 20dB in hand. The last control on the front panel is the illuminating mains switch.

The back panel has Mic and Line Inputs, Key Input, and Line Output all on balanced XLR sockets. Also on XLR is an External Switch Output which allows EQ and filters to be switched in-out from an external source, and a Link output (follows front panel LINK button selection) for side chain ganging to other *RQP 3200*s. The unit has an IEC mains socket and twin earthing posts providing separate access to the mains and chassis earths.

The *RQP 3200* is a high-quality unit providing versatile facilities and excellent sonic performance both in terms of processing and noise. It offers an interesting alternative to comparable products from other top-end console manufacturers, and would make a welcome addition to any outboard rack. ■

Patrick Stapley
Calrec Audio, Nutclough Mill, Hebden Bridge HX7 8EZ, UK.
Tel: 0422 842159
Fax: 0422 845244

A high quality unit providing versatile facilities and excellent sonic performance

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YAMAHA DEQ5

Given Yamaha's pioneering commitment to digital mixing and signal processing it is no surprise to see them release the *DEQ5* digital equaliser. It provides two EQ modes, a 30-band graphic and a 6-band parametric, together with several useful extra facilities, all in stereo, and it features a surprising number of interfaces for talking to the outside world.

The adjustment of equalisation, above all other processes, is tactile and intuitive, very often performed without even looking at the controls, and I have seen programmable equalisers which were virtually unuseable because they simply could not be adjusted quickly and easily enough. EQ needs knobs, not nudge-buttons, and Yamaha evidently agree since the *DEQ5* has not one but three rotary encoders, whose functions vary with the context. For example, the Parametric mode uses the three as Frequency, Q and Gain for the currently selected band, while in Graphic mode one controls gain while another selects the band. There are, of course, nudge-buttons as well, performing functions like selecting the parametric band and turning bands on or off, but the provision of three real knobs gives the unit a reassuring feel and makes adjustment a very natural process.

Occasionally its digital nature is given away by the software failing to keep up with a fast adjustment, so that a fast sweep of the frequency control produces audible steps, but by and large the *DEQ5* handles like a conventional equaliser.

Operation is made simpler still by the excellent display, a large back-lit LCD graphic screen which can show what is going on in various ways; for example, the state of the parametric can be shown numerically, with a column for each band, or graphically as a frequency response curve, with the values for the currently selected band displayed beside it. The graphic display is surprisingly fast in response (although not instant) and has sufficient resolution to produce smooth curves and detailed notches. The screen also works as a real-time (almost) spectrum analyser, placed after the EQ, although whether this is genuinely useful or just flashy is hard to judge on such a brief acquaintance.

Ultimately, of course, any equaliser stands or falls by its sound, more so than any other type of processor. No amount of programmability and flexibility can take the place of subjective sonic quality; unlike, say, a compressor, where transparency is all one asks for and can almost be taken for granted, in the case of an equaliser the characteristic sound is everything. Yamaha have avoided the temptation to stake all on the bells and whistles, and the *DEQ5* is a fine equaliser, controllable, versatile and capable of covering the whole spectrum of EQ requirements without complaints or unwanted side effects; this is an equaliser I would choose on sound alone, regardless of its other aspects.

Both EQ modes provide, unusually, an additional set of filters, independent of the main EQ. Adjustable high-pass and low-pass filters can be found alongside a set of four notch filters, each sweeping the entire spectrum and having variable Q. This a very nice idea dealing with common problems while leaving the main EQ available for more creative treatment, and it is further complemented by an adjustable hum cancelling function. Also provided is a built in delay, adjustable up to well over half a second.

On the back, it is good to see AES-EBU connectors alongside Yamaha's own digital format; even Yamaha gear has to talk to other people's sometimes. The digital I-Os can be configured to appear at various stages in the chain, so that, for instance, another processor could be inserted in to the *DEQ5*'s signal path all in the digital domain. An unfamiliar sight is an RS-485 interface on XLR connectors; this allows a number of units to communicate with each other and-or a host computer selectively using Group and Device addressing.

One does not expect to find time-code sockets on an equaliser, but the *DEQ5* incorporates its own event controller, which performs program changes at specified time-code points. It does not appear to be possible to capture the points on-the-fly, but the manual data entry is straightforward enough.

The MIDI facilities are surprisingly basic, restricted to SysEx dumps and mapped program changes, although there are four separate maps, or Banks, as on the *SPX-1000*. Forty presets are provided, and all are user memories; the idea of factory preset effects is hardly appropriate here.

The manual is not the clearest or best translated I have ever seen, but since it doesn't mention all the facilities I found on the unit it may be an early obsolete version.

With console EQ becoming ever more comprehensive, an outboard equaliser has got to offer something a bit special to warrant bothering with it at all. The *DEQ5*, with its well thought out combination of sensible ergonomics, flexibility and excellent sound, offers that something. ■

Dave Foister
Yamaha-Kemble (UK) Ltd, Sherbourne Drive, Tilbrook, Milton Keynes MK7 8BL, UK. Tel: 0908 366700. Fax: 0908 368872
USA: Yamaha Corp. of America, 6600 Orangethorpe, Buena Park, CA 90620, USA. Tel: +1 714 522

Yamaha have avoided the temptation to stake all on the bells and whistles with the *DEQ5*

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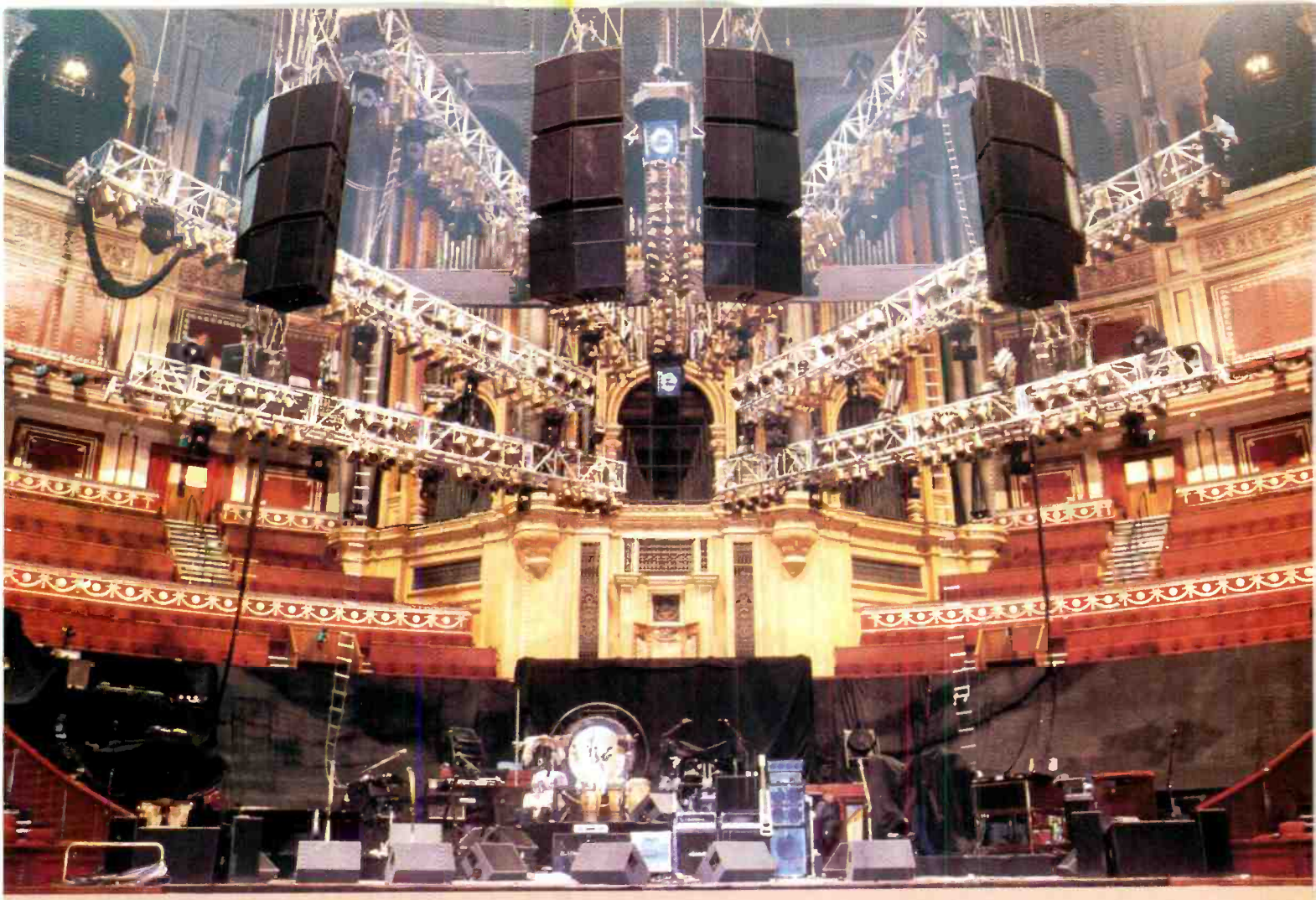

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Logic 2

The Logic 2 large format digital console brings maximum flexibility and control to the mixing process. Operational facilities can be tailored to users' needs through user "set-ups" to suit the full range of mixing requirements. The console is currently in use worldwide for music recording, post production and broadcast applications.

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Logic 1
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Fax Int. +1 203 792 7863

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ON TOUR

A round-up of the major highlights of this month's live sound reinforcement scene

The end of summer concluded the UK and Europe's busiest live season on record, with a total of 14 major touring acts and festivals playing Britain alone between May and August. US PA companies — suffering their own recession — fought hard for larger contracts. Yet while the plethora of shows and economic depression shaved ticket sales from some promoters, especially on provincial dates, the boom revived a British production industry moribund since the Gulf War. Perhaps the most encouraging sign for UK firms is that 1992's third quarter business looks strong compared to the same period last year. While 1993 may not bring as many stadium extravaganzas, the signs are that core bread-and-butter business is better than for a long time.

● **AudioLease** have the Christians' UK tour using Meyer PA, two *PM3000*s and a *Midas* desk on monitors; a large Meyer system at Expo 92 (an ongoing 6-month hire); and the UK return of Emerson, Lake & Palmer using AudioLease's new *A3* PA; the tour includes two Royal Albert Hall dates. One flaw in an otherwise excellent summer was a 'substantial' robbery after only a month at their new Cambridgeshire premises.

● **Britannia Row** are out with James Last, the Iron Maiden tour, The Cure, Cliff Richard, Dire Straits and Crosby Stills & Nash. September saw them returning to Barcelona's Olympic Stadium, this time for the Paralympics ceremonials.

● **Canegreen** have David Byrne on tour in the USA, Torville & Dean and The Stranglers — the latter using an EAW system — and a Meyer subhire for ELP's October dates. More partnership work involving EAW systems, this time in conjunction with Concert Sound, is for Shirley Bassey and Tom Jones. They also have a number of one-offs with Elaine Page and Van Morrison.

● **Capital Sound Hire** are providing PA in October for Toto, Status Quo's dates and Magnum.

● **Concert Sound's** current roster is headed by Chris de Burgh, who is playing large arenas throughout the UK and Europe. The company is also working on Tom Jones' dates, Gary Moore's two nights at the Royal Albert Hall in October and its continuing contract for FOH control and mixing on Dire Straits' tour — a two-year marathon now reaching its conclusion.

● **Encore** have eight systems out with three separate troupes of the Chippendales, Manic Street Preachers, Happy Mondays' October UK theatre tour and long-term systems rentals in two London clubs, the Ministry of Sound and The Grand in Clapham. Comments John Tinline: 'The second half of 1992 is proving much better than the first half, but overall it's been a very good year indeed.'

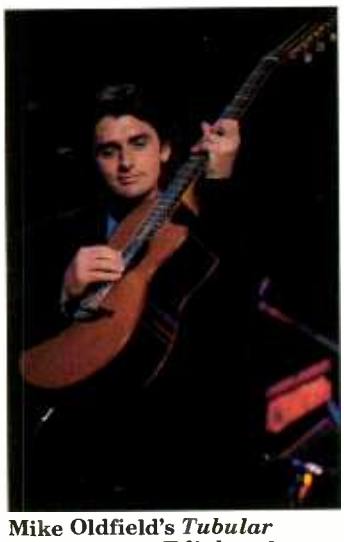
● **Entec** returned to the traditional August Bank Holiday mud bath that is Reading Festival after a three-year absence. One of the longest running outdoor rock events in Europe, Reading has a three-day line-up of leading 'indie' acts — this year's biggest draw being Nirvana. The site's perennial problem is sound spillage, for it is bordered by housing estates, imposing a sound limit at the desk of 95dB(average)/98dB peak. Entec reverted to their trusted PA arrangement for the main stage, consisting of main left–right stacks and a series of small delay-towers facing in towards to the central audience areas and angled down at 22°. Explained Mark Langley: 'It's not the perfect arrangement for our systems, but it's the council's preferred format as it reduces complaints.'

The system in question was the largest JBL *Concert Series* PA yet assembled in the UK. The eight stacks used JBL *4873*s, *4847* high fills, *4862* low fills and *4866* long-throw units, driven by Macrotech *1200* and *2400* amplifiers. On stage were JBL *Accord 212* wedges, DDA crossovers; two Ramsa *WS-840* monitor boards, Court *Signature* sidefills and Martin *RS1200* drum fills.

Soundcraft supplied two *Europa* consoles for FOH, of which Langley says: 'In this situation engineers can get a little mixed up; but the *Europa* is ergonomically laid out so there's lots of space and it's fairly simple to use — an excellent festival board which also sounds very good.'

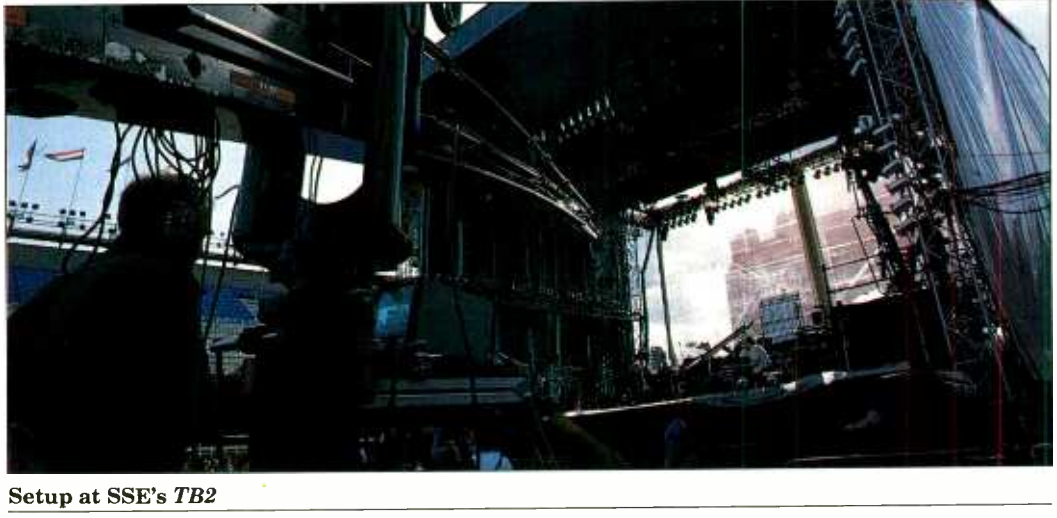
Fuji TV, Fleetwood Mobile and the BBC provided 80 channels of active BSS splitters to ensure nothing interfered with the 10-minute changeovers. On Sunday afternoon the elements gained the upper hand with the Comedy Tent blown down and the B Stage (Session Tent) threatening to collapse. Langley, meanwhile, said his team was 'extremely pleased' with the performance of JBL's biggest *Concert Series* rig in Britain.

● **SSE** began September with one of the most intensively hyped shows of the season: the Edinburgh premiere of Mike Oldfield's *Tubular Bells 2*. A contemporary sequel to the album which helped propel both Oldfield and Richard Branson to fame and fortune, *Tubular Bells 2* features new music, new instrumentation, producer Trevor Horn and soundman Tom Newman. The show, part of the Edinburgh Festival, involved 17 musicians and a large MIDI setup — effectively a rock orchestra. SSE deployed a 40kW EV *MT-2* system for the show, mixed by Gary Bradshaw on TAC *SR9000* and *SR6000* desks. Robin Fox mixed monitors on two *Midas XL3*s. SSE's autumn tours include Thunder, the Tatton Park festival, Utah Saints, Saw Doctors, the Shamen, MC Hammer, Curtis Stigers and Metallica (in conjunction with dB Sound).



Mike Oldfield's *Tubular Bells 2* at the Edinburgh Festival

● **Theatre Projects Sound and Vision** is on the road this autumn with the touring production of 'Annie Get Your Gun'. Sound design is by Rick Clarke of The Sound Department and the show sees extensive use of MIDI to trigger sound effects via an a *Mac PowerBook* as well as the Atari *Stacey*, using either *Vision* or *CuBase* software in conjunction with TP's custom-built MIDI interfaces, line drivers and patch systems. ■



Setup at SSE's *TB2*

Live Sound is compiled by Mike Lethby

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RM50

In the numbers game Yamaha's *RM50* rhythm sound module does well — 500 preset voices, 500 voice variations, 128 user voices, 64 preset kits and 64 user kits. Yet it also promises editability and optional expandability of memory and sounds to a fully loaded package that starts to require systems management.

Front panel space is restricted by four card slots which can be used to expand the RM50 portfolio considerably. A Data-card slot adds 500 variations, 100 user voices and 64 kits. The three Waveform slots accept cards from RY30 , SY77 and SY55 Yamaha products as a stand-alone source of sounds, or for combining with external sample dumps into an optional 0.5Mb RAM expansion board. This launches the RM50 into a league apart from other drum units — more into tone module territory. This really is a lot of machinery.

Back panel connectors include MIDI In, Out, Thru DINs, jacked left and right main-stereo-audio outputs, six assignable individual outs and six external trigger inputs. The front panel centres around an excellent back-lit LCD and good quality buttons including an all-important 127 velocity one-shot voice preview.

All functions are controlled from a 4 x 3 array of buttons that includes a shift key and a cursor key. The screens are for the most part fairly busy and operate on an adaptation of the SPX theme (though you have to look for it) using page forward–back, cursor movement and button increment–decrement. Kits of sounds are assembled in a similar way to the Alesis D4 with similar Note Chasing — you select a note within a kit and then assign a sound to it. However, scrolling through the legion of sounds on a single button is short change on the D4's alphadial.

The RM50 is multitimbral, so kits can be stacked although the 16-note polyphony can get stretched.

Sounds

Kick drums are quite awesome, there is a devastating amount of low-frequency energy tucked away which will appeal to current fashions. Some of the reverb tales are a bit abrupt when listened to in isolation. Snares offer a fine selection, with the slightest of leaning towards the *ringier* types, plus a handful of convincing and usable brushes and some damn good stick and rims. Toms include an incredible set of power toms plus some fairly mundane *ringey* sorts, for the most part arranged in sets of four apart from the 'metal' set which has to have six. On the whole they are great but I am personally not so keen on the modulated effects.

Hi-hats are arranged in wonderfully realistic sets and the rides are excellent but I was dissatisfied with all the crashes — they sound cheap or mishit to my ear. General percussion is varied but with a little too much *bong* in the congas for my liking and a little too much use of pitch shifting. There is nothing more ethnic than a Guiro. Bet you'll have to buy a card to go World. A selection of 'special' effects did not do much for me, neither did some rudimentary bass sounds that could tempt the user to push the polyphony. The unit is supremely silent.

Yamaha's *RM50* rhythm module, a lot of machinery for the price

Editing

Each voice can consist of two elements (waveforms) derived from the present memory, Wavecards or optional internal RAM, and this composite sound can be adjusted for balance between its constituent waves, pan, volume, pitch; an attack, decay, release and punch-envelope generator(effectively attack overshoot to decay slope); variable cut-off low-pass filter with resonance and high-pass filters with variable rate and level; an LFO section for the amp, pitch or filter with variable speed and delay plus six LFO waveforms; an element's sensitivity from velocity or note modulation to level, pitch, and the envelope generator, filter or modulation; an element-pitch envelope generator; element time delay, repeats and subsequent pitch shifts; and an element's velocity curve. The amount of control available is staggering.

While this is admirable, many people will wonder why they need this degree of fine tuning on a one-shot, one-note, half-second blast of percussion, as indeed I did. The adjustment, while wide ranging, is laborious in the extreme to administer especially as the parameters are so interactive — it is easy to spend a good deal of time to produce only subtle results. The modulation and delay effects may not appeal to everyone, in which case it remains to alter the general ballistics and brightness of a sound relatively easily. I applaud Yamaha for making such fine control available take advantage of it.

Much more exciting is the ability to combine elements into a voice and this is quick and effective with the number of permutations available. Instant passage to the land of monster drums.

Pitch, decay, pan, filter, balance, modulation and volume can be addressed via MIDI control change and the RM50 can also patch map.

Conclusions

Comparisons will be made to Alesis' *D4* as both aim to achieve the same — a wide range of high quality drum sounds. For the extra money the *RM50* offers more sounds through its editability, more kits, more separate outputs, multitimbrality, expandability via Wavecard and Data card. The *D4*, however, offers the same polyphony, twice as many trigger inputs and is infinitely easier to use.

On the sound side there is very little in it, both devices are excellent. The RM50 clearly has a larger portion of daft sounds. Neither do much for ethnic percussion.

The Yamaha's external triggering, while more elaborate, does not seem to be significantly more effective than the D4's — both devices represent audio to MIDI convertors of some sophistication, something that is tempting to overlook in the numbers game.

Ultimately the RM50 should be judged on its sound quality which is quite excellent and any niggles on operating ease, which extend only to the editing aspect of the device, could easily be lived with if it generates the sounds you want. There is simply no getting away from the fact that it is an extraordinarily capable unit. ■

Yamaha Corp. of America, 6600 Orangethorpe, Buena Park, CA 90620. Tel +1 714 522 9353. Fax: +1 714 739 2680.
UK: Yamaha-Kemble, Sherbourne Drive, Tilbrook, Milton Keynes MK7 8BL.
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Music News is compiled by Zenon Schoepe

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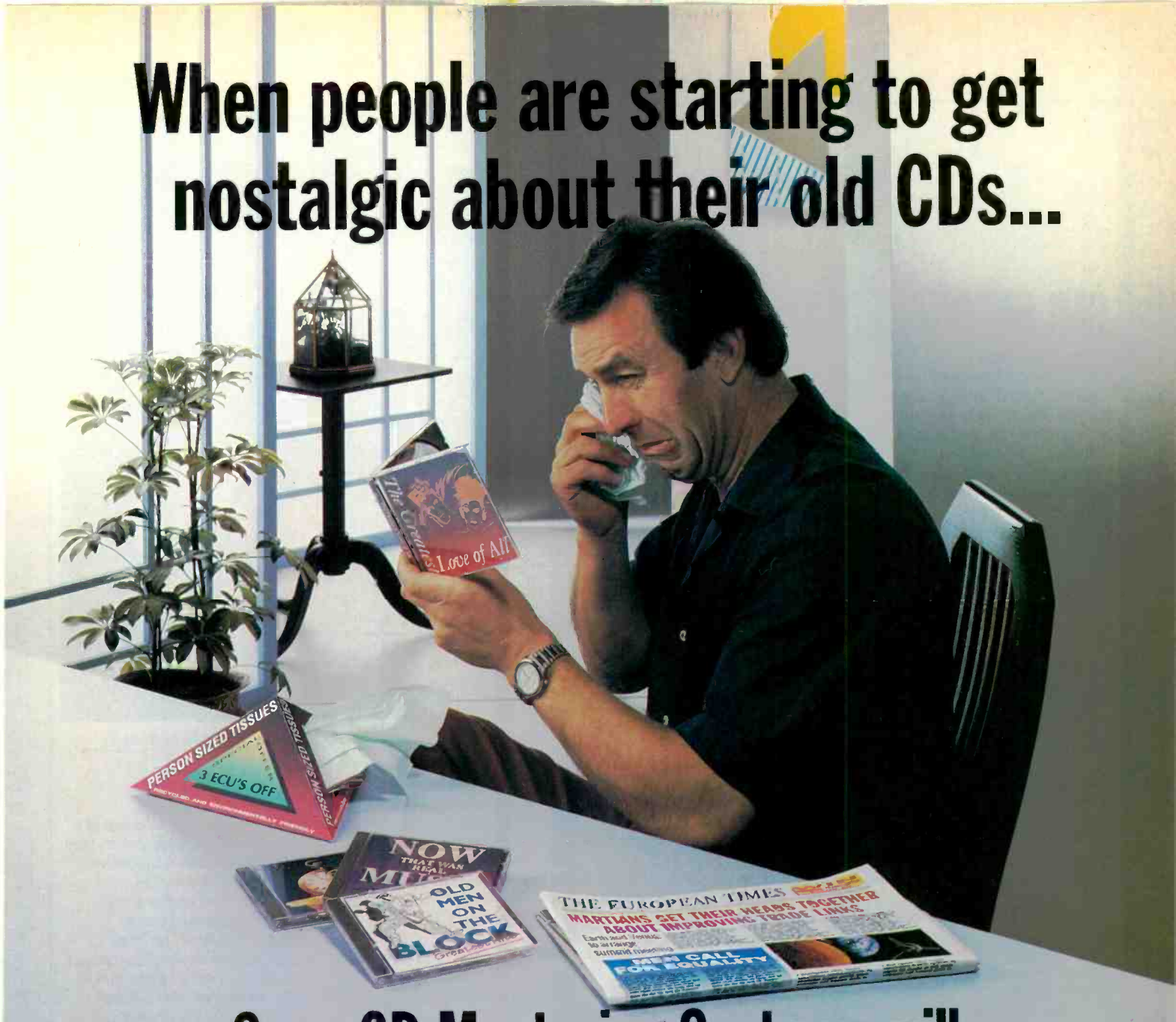
When people are starting to get nostalgic about their old CDs...



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Sony Broadcast & Communications

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GML HRT Mixing

George Massenburg Labs in California have introduced the GML *High Resolution Topology Mixing System*. The system is designed to address a wide range of applications including — high-resolution recording and mixing; video postproduction; film transfer; and disk-based recording.

The mixing rack will handle both digital and analogue modules. GML make available two modules, the *9110* input and *9102* output module. The system accommodates a maximum of four main and four aux buses. Each output module handles two main and two auxiliary buses as well as providing accurate metering, switchable from either source.

The input module accepts XLR line level inputs from -20 to +4dB. It allows panning between two pairs of four main buses and separate mixing to four auxiliary buses. There are in-place solo and muting facilities and a rotary channel gain control. Unused op-amp stages are removed from the signal path if not used; even the panning circuit op-amps are taken in and out of circuit depending on the pan-pot push-pull-in-out switch position.

George Massenburg Labs, 7821 Burnet Ave, Van Nuys, CA 91042, USA. Tel: +1 818 781 1022 Fax: +1 818 781 3828.
UK: Stirling Audio Systems Ltd, Kimberley Road, London. NW6 7SF. Tel: 071 624 6000 Fax: 071 372 6370.

Audire

Californian-based Audire Inc has introduced a new line of three power amplifiers. The *Crescendo-Pro*, rated 75W/ch @ 8Ω, 130W/ch @ 4Ω. The *Forte-Pro* features a dual-mono design (two independent amps on one chassis) and is rated at 125W/ch @ 8Ω, 250W/ch @ 4Ω. The top of the line *Otez-Pro* features the performance efficiency of Class AB output, with all remaining components Class A. The dual-mono *Otez* is rated at 1000W bridged mono into 8Ω

Audio Intervisual Design. Tel: +1 213 845 1155.

NTP PPM

Danish Electronics company NTP have launched what they have called the world's first digital true Peak Programme Meter. The PPM features a dual-mode display (combining two different display-types). The user can enjoy the advantages of the familiar analogue PPMs, as well as a conventional meter display from digital audio equipment (DATs etc.). The analogue features an integrated time of 10ms, and readings that are relative to a user-defined normal operating level. The digital display features 'zero' integration time and readings relative to absolute maximum digital audio values.
UK: Meridien Communications Industries Ltd, 33 Greenwich Market, London. SE10 9HZ.
Tel: 081 293 0909 Fax: 081 293 5856.

CD-R Labelling

Audio Design have announced the availability of their professional CD-R labelling system. The system is designed in conjunction with specially-printed Audio-Design-own label CD-Rs (*CD-R63* and *CD-R74*) which allow the use of self-adhesive labels. The discs are printed in three block-area segments using blue UV-cured ink. The ink acts as a barrier between the fragile plastic surface and the label, preventing migration between plastic and adhesive.

Audio Design offer a custom printing service which normally prints the top half with the studio detail and logo; the side panel with copyright or other information; leaving the bottom segment to be typed or further overprinted with the individual disc details.

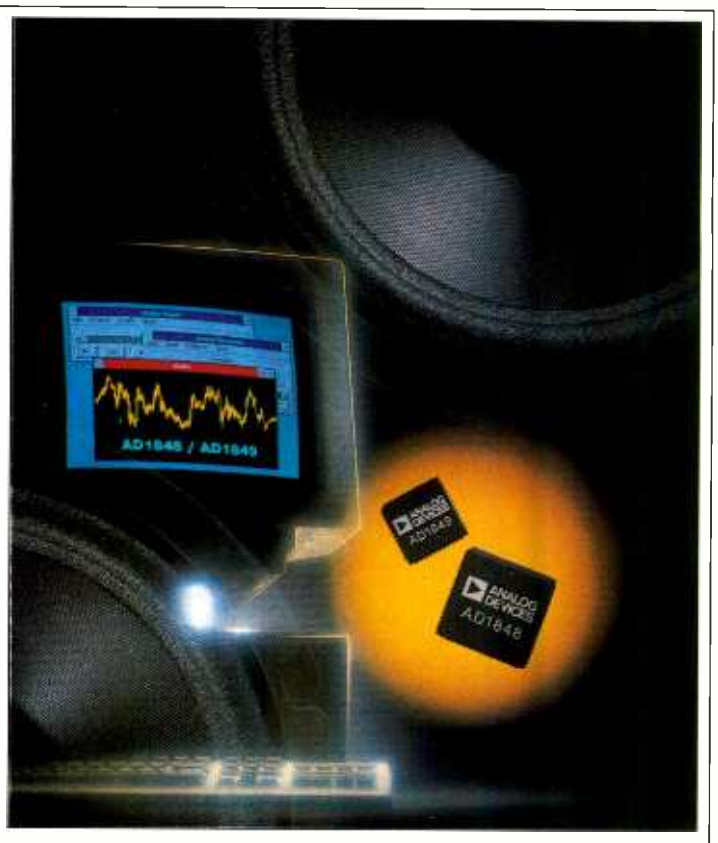
Audio Design, Unit 3, Horseshoe Park, Pangbourne, RG2 9BE, UK. Tel: 0734 844545 Fax: 0734 842604.

Nagra

In response to demand for the Nagra *T-Audio TC*, Nagra-Kudelski has decided to resume production of the model for worldwide distribution. The US distributor is acquiring a number of units and because the numbers are large a fully-loaded *T-Audio TC* can be bought for nearly half its original price.

The Nagra *T-Audio TC* is a two-channel, centre-track time-code machine capable of synchronising to any reference including SMPTE–EBU time code, house sync, pilot tone, bi-phase signals from a telecine machine, and its own internal generator. It can chase bi-directionally in real time or fast-forward-rewind modes. The *TC* is also equipped with an RS422 port and can accommodate a variety of video edit system protocols including Sony, Ampex, and Grass Valley formats.

US Distribution: Phi Technologies, 4605 north Stiles, Oklahoma City, OK 73105-3339, USA.
Tel: + 1 405 521 9000.
Fax: +1 405 524 4254.



Analog Devices' *SoundPort AD1848* and *AD1849* codecs

SoundPort

SoundPort codecs have been designed to provide a high-quality audio subsystem for PCs and workstations, two codecs (coder-decoder) feature a complete 'system-on-a-chip'. Both ICs, the *AD1848* and *AD1849*, support microphone and line level A-D conversion, D-A line level output, and include nearly all related components, reducing digital audio requirments to a single IC.

With a pair of 16-bit A-D to D-A convertors (all using sigma-delta architecture) these devices promise to provide multiple channels of stereo input and output for analogue signals plus complete interface to a system processor.

Analog Devices, One Technology Way, PO Box 9106, Norwood, MA 02062-9106, USA.
Tel: +1 617 329 4700.
Fax: +1 617 329 1241.

Morel

The *Bassmaster 602* is the first of a new generation of loudspeakers from Morel UK, a British company known for its OEM products. The self-badged *602*s employ a double-chamber bass system designed specifically for Morel's vented-magnet woofer. The centre of the magnet is vented at the rear in Morel woofers and it is this that makes the *Bassmaster 602*'s dual-chamber system possible. By having separate custom-tuned enclosures for both the cone areas (one for inside and one for outside the voice-coil) and using carefully controlled acoustic resistance, Morel claim to have achieved greatly extended bass, down to 16Hz and with good power handling all from a compact 14-litre cabinet. Morel call their system Controlled Acoustic Turbo Duct, or CATD for short.

Tweeters are a 28mm treated-fabric dome on an aluminium former, with an aluminium Hextech voice-coil, a vented magnet and a rear chamber. Performance for the *602*s is a claimed frequency response of +2.5dB, -3.5dB, 40Hz-20kHz (-12dB at 16Hz). Power handling is 250W. Price of the Bassmaster 602 will be around £1250 to £1350 including VAT (depending on finish).

Morel (UK), 11 Foxtail Road, Nacton Rd (Ransomes) Industrial Estate, Ipswich, IP3 9RT.
Tel: 0473 719212 Fax: 0473 716205

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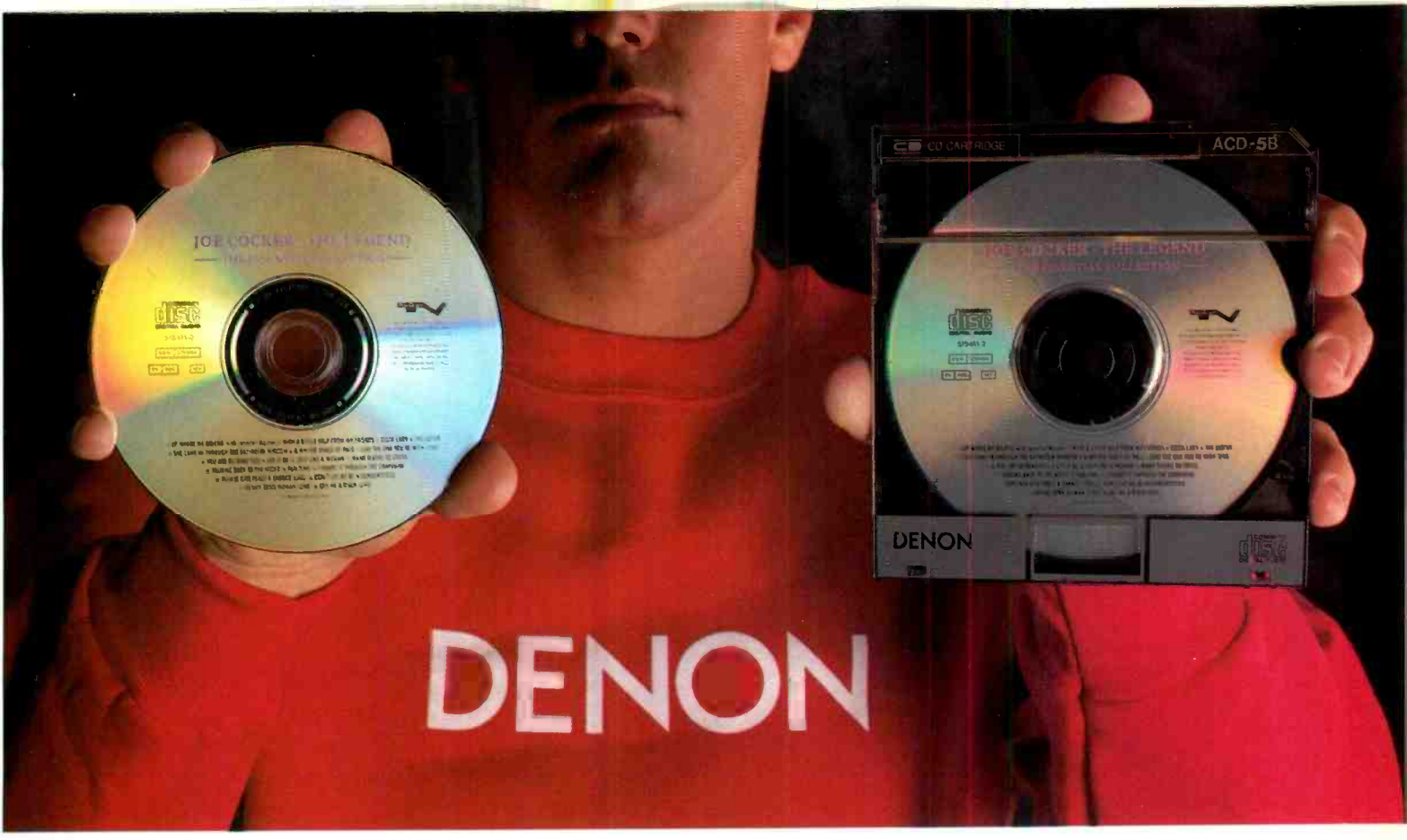

For the first time, DENON is offering professional users the choice of drawer or cartridge loading in the latest two CD players from the company.

While the CD cartridge has become very popular, and not just with broadcasters, or for jingles, some users still prefer drawer loading. Now DENON is able to offer the choice, in machines designed and built for professionals.

DENON

Features include:

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- ❑ RS422 interface
- ❑ Fader start option
- ❑ Single track or continuous play modes
- ❑ Automatic re-cue after single track play
- ❑ Narrow body

For more information and to arrange a demonstration contact Hayden Pro-Audio

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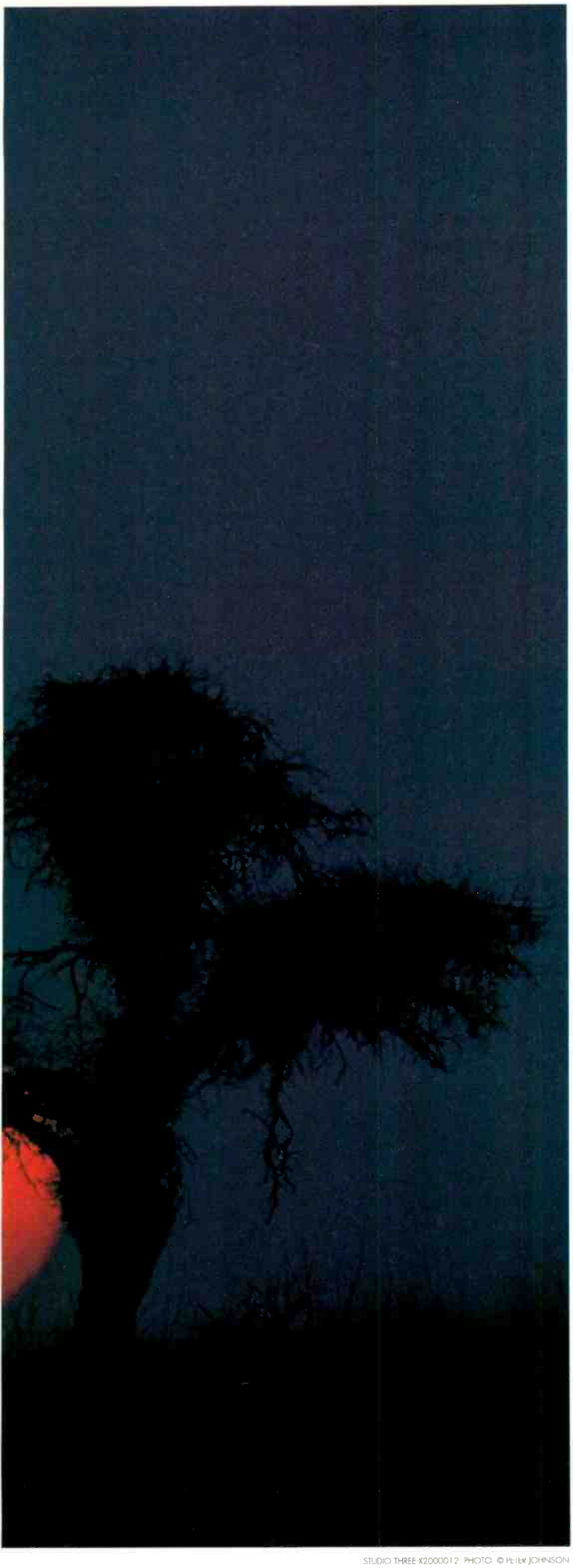

STUDIO THREE X2000012 PHOTO © PETER JOHNSON

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AT4033 shown with optional shock mount AT8441

But does it measure as good as it looks ? If very high output, low noise, tremendous SPL handling of 140dB and flat response from 30Hz to 20KHz are the numbers you need, the answer is a definite yes ! Before you ask, AT4033 can also be powered from any 48V phantom source and sports a switchable high pass filter plus 10dB pad. We suggest it's time to join the growing band of engineers on both sides of the Atlantic who are starting to appreciate the A-T skills of precision transducer building. You could even get your accountant to call us first.

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AT 4031	Fixed Charged Condenser
AT 4049-ELE	Omnidirectional Element
AT 4051-ELE	Unidirectional Element
AT 4053-ELE	Hyper Cardioid Element
AT 4051	Complete Set (4051E + 4900-48)
AT 4071	Shot Gun (395mm Long)
AT 4073	Shot Gun (232mm Long)
AT 4900-48	Pre Amplifier
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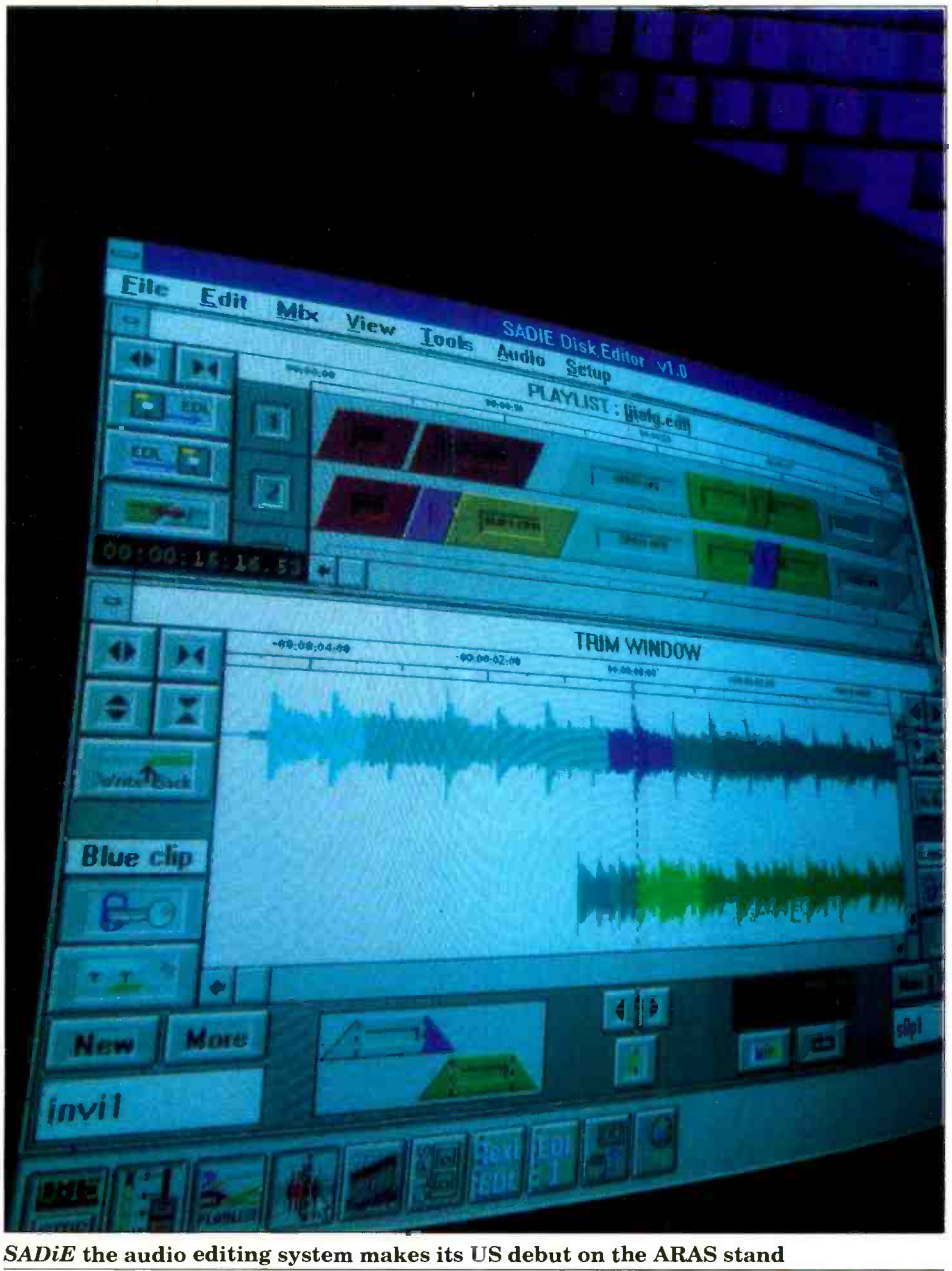
AES GUIDE

The 93rd Convention of the Audio Engineering Society will be held at the Moscone Convention Center, San Francisco from the 1st to 4th October 1992. As usual the Convention will consist of a wide range of technical papers with an associated exhibition. We have compiled this guide from details available to us at the time of writing



***SADiE* the audio editing system makes its US debut on the ARAS stand**

● **AB International Electronics**, Stand 333: showing their range of power amplifiers ● **Accurate Sound Corporation**, Stand 708 ● **ACO Pacific Inc**, Stand 3029: music and measurement microphones and Acoustic Interface System. ● **Acoustical Supply International**, Stand 2901: will exhibit a large range of components, tools, and utility items for the professional designer, engineer and installer. Including high power loudspeaker components from Fane Acoustics and Nordschow-Wright, CAD software, The *MLSSA* acoustical measurement and analysis system, and a variety of accessories, such as cable and connectors from Neutrik and Esoteric Audio. ● **Adamson Acoustic Design Corporation**, Stand 206: will present examples of their concert systems loudspeakers. Also on display will be their DSP controller, the first link of a digitally controlled concert system designed to overcome the difficult parameters encountered in live sound reinforcement. ● **Adams-Smith**: exhibiting the *A/V-S* audio editing software with its Super-Sync feature. Super-Sync has two parts; Cross-Lock, which permits tape, film or MIDI synchronisation among any combination of time-code frame rates; and Vari-Lock, which permits true synchronisation — repeatable, interruptible and recoverable — of a vari-speeded transport to one running at a fixed speed. Also showing their newest product The *Q-GEN*, still at semiproduction level. The *Q-GEN* generates SMPTE-EBU LTC and MIDI time code, a wide range of user-configurable, talent-cueing, wipes and counts (including multiple, colour-coded, wipes) and video black for resolving transports and-or as a background for the talent cueing display. ● **ADC Telecommunications Inc**, Stand 143: cables and connection ● **Akai Digital-IMC**, Stand 332: A digital offset editor for two *A-DAM* multitrack recorders. Software upgrades for Akai's optical disk system including *MAC* editing software with full jog function in the Q-list and Edit Cuts pages ● **AKG Acoustics Inc**, Stand 242: *Direct* optical disk multitrack with up to 32-channels and autolocator. *Blue line* modular condenser and *TriPower* microphone system; ● **Alesis Corporation**, Stand 936: will display and demonstrate the *ADAT* 8-track digital audio recording system with 128-track capability, 48kHz sampling rate and BRC remote. Also a full range of signal processing, drum modules and mixers, ● **Allen and Heath US**, Stand 1237: will display mixing consoles for studio and live applications. Including the *Ace* console series and compact *GS3* consoles with automation available. ● **Alpha Audio-Acoust. Solutions**, Stand: will display acoustical fabric and material solutions for audio production and post. Including acoustic foam panels, Alpha Pyramids, Sonex and Whisper Room, an isolation room product. ● **Altec Lansing Corporation**, Stand 214: range of speaker systems ● **Amber Electro Design Inc**, Stand 215 ● **Amek-TAC US Operation**, Stand 638: console series *Big-By-Langley*, Inline design with *Minitrue* automation and compete recall system. The *Einstein* 24-bus console with automation options. *Media* film and video dubbing console with switchable pan configurations and Rupert-Neve-designed circuits. ● **Ampex Recording Media Corporation**, Stand 1202: exhibit includes *Grand Master Gold 499* analogue tape with the ability to run at +9dB; *456 Grand Master*; *467* digital audio tape packaged in *DATpak* ● **Analog Devices Inc**, Stand 1342: will display their line of linear, digital and mixed-signal integrated circuits for use in professional, ▶

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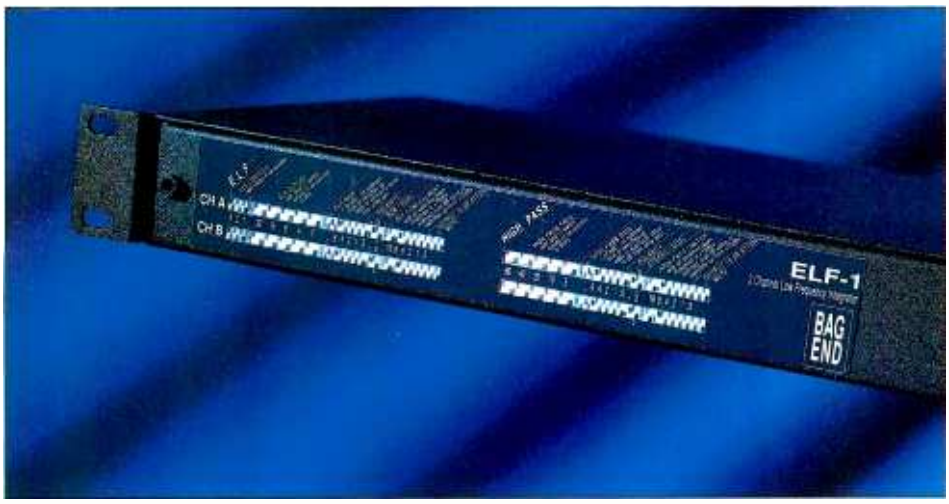
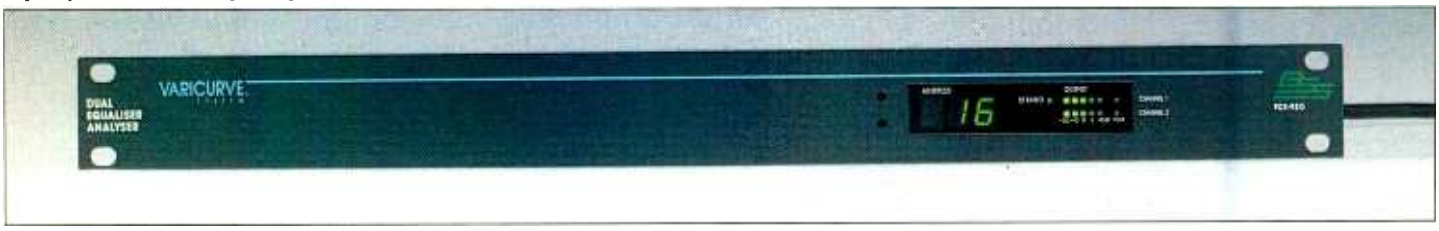


The new *ELF-1* low-frequency from Bag End Loudspeaker systems

consumer and automotive audio-signal processing applications. ICs include digital audio convertors, low-noise amplifiers and preamplifiers, Dolby Surround decoders, audio switches and balanced line drivers ● **Anatek**, Stand 414: launch of the *RADAR* 24-track digital audio hard-disk-based system; also range of MIDI devices ● **Apex Machine Company**, Stand 1138: will exhibit the *CA-20* high speed rotary gravure offset printer. ● **Aphex Systems, Ltd**, Stand 1138: will display the *9000 Series* modular signal processing system; the *320 compellor*; the *720 Dominator II* precision peak limiter; and the *723 Dominator II* transmission limiter and a new version of the aural exciter Type-C called *Type-C2* ● **API Audio Products:** will be featuring their new discrete series console with touch recall and a touch screen recall system. Also showing established processing modules. ● **Apogee Electronics**, Stand 510: showing their portable convertors *AD-500* and *DA-1000E*. ● **Apogee Sound Inc**, Stand 114: will show their range of loudspeaker systems and combination processor-amplifiers. ● **Apollo Masters Corporation**, Stand 2907: will exhibit their line of lacquer discs used in conjunction with vinyl records. Also shown will be the Adamant stylus for use with Neumann, Westrex and Ortofon cutting heads. ● **Applied Research & Technology**, Stand 1142: full range of microprocessed controlled digital audio signal processors. ● **APRS**: Association of Professional Recording Services in the UK ● **ARAS:** making its USA debut is *SADiE*, a PC and *Windows*-based on hard disk audio editing system from Studio Audio and Video Ltd. Available in 2 in, 2 or 4 out versions with AES-EBU and SPDIF digital I-O as standard, analogue I-O, SMPTE and MIDI synchronisation is offered as an option. ARAS will also offer complete *SADiE* system workstations in a minitower or rackmount format, including SCSI storage subsystems and a *SADiE* Breakout Panel ● **Archon Company**, Stand 131: will be featuring *ARCOSET Mini Printer*, a fully automatic, double-sided, micro-processor controlled on-cassette imprinter with output capacity of 3000–6000 imprints per hour. ● **Ariel Corporation**, Stand 1531: featuring their new DSP developments systems and pro-audio products. ● **Ashly Audio Inc**, Stand 2903: MOSFET amplifiers, limiter-compressors, noise gates, graphic and parametric equalisers and a line of rackmount mixing consoles. ● **Audio Accessories Inc**, Stand 710: will display audio jack-panels and jacks; prewired audiopatch panels; patch cords ; video panels. ● **AudioMation**: will be showing two new *Uptown* automation systems. The *Series 990*, available in both recording and and live formats. The second is the MIDI-based *Uptown* Automation System *600M*, creates a hands-on interface for mixers offering screen interface only, thus adding moving fader automation to digital mixing and editing systems. Also Sellmark fader products. ● **Audio Precision**, Stand 1418: exhibiting a full line of audio test equipment, including *Portable One* with complete 2-channel measurement capability in a portable package. Also *System One + DSP* and *System One Dual Domain*. ● **Audio Processing Technology**, Stand 205: will be demonstrating their latest products including the *LINK100 ISDN* interface and inverse multiplexer, which allows the *DSM 100* digital audio transceiver to be connected directly to the ISDN network for temporary or permanent broadcast quality stereo audio links. Also new is the *ACE100 Mac* expansion card which uses APT's proprietary 4:1 digital-audio compression to permit real-time CD-quality stereo recording and playback from the Apple *Macintosh* ● **Audio Services Corporation**, Stand 530: will display equipment for production sound. With one of the world's largest inventory of major manufacturers of audio equipment. ● **Audio Technica**, Stand 1317: debut of the new *Engineered Sound* series of microphones, especially designed for sound contractors ● **Audio Teknology Inc**, Stand 202: the *Paragon* live mixing console; the LMS PC-based, gated, swept-sine-wave analyser for electroacoustic measurements; and the *LEAP* loudspeaker system design and analysis software. ● **Audix Corporation**, Stand 110: line of microphones and monitors ● **Augan Instruments bv**, Stand 1618: multichannel optical recorder/editor, the *408 OMX* ● **Australian Monitor (Pty) Ltd**, Stand 1626: launching the new *PROphile* amplifier — 400W into 4 Ω and 255W into 8Ω and will be available in the US in early November.

● **Bag End Loudspeaker Systems**, Stand 221: making its debut at AES is the new extended low-frequency system. Bag End have abandoned traditional thinking and the large enclosures that necessarily result. The new *ELF-1* low frequency system module is a 2-channel loudspeaker controller. Designed for either stereo or two independent channel operation, the *ELF-1* incorporates ELF dual integrators, active equalisation, frequency dividing, and system protection in a configuration in which system parameters are digitally controlled. ELF integrators replace conventional crossover filters and achieve frequency separation without the use of filters and the phase shift associated with all filters ● **BASF Corporation**, Stand 1310: full range of audio and video tape ● **BEC Technologies Inc**, Stand 604: on display the *AudioPlex AD16* 16-channel line input and A-D convertor-transmitter modules; *DA16* 16-channel line output 18-bit convertor-receiver module. Also *DataPlex FB2* fibre optic 64-channel transceiver module. ● **Beyerdynamic**, Stand 624: entire range of microphones, including the new *MC 834* condenser microphone; and the new UHF wireless mic system, *U 700* ● **BGW Systems Inc**, Stand 1210: exhibiting full range of power amplifiers ● **Bose Corporation**, Stand 1008: speaker systems for installations purposes ● **Brainstorm Electronics Inc:** range of time code associated products ● **Bruel & Kjaer Instruments Inc**, Stand 223: range of microphones and accessories ● **BSS, a division of AKG**, Stand 242: showing *Varicurve* the programmable *FCS-926* dual equaliser-analyser, and also the new *Varicurve* Slave to expand the range of the *Varicurve*. Up to 16 slaves can be fully, independently controlled from one standard master unit; in prototype form will be the *FPC-900 Varicurve* controller, a hand held remote capable of addressing up to 16 *Varicurves* and-or slaves via a single XLR cable or standard radio-mic link; *DPR-901* dynamic equaliser and other devices.

● **Cadac:** the *J-Type* theatre mixing console will be on show for the first time in San Francisco. ● **Cambridge Sig. Tech**, Stand 633: *ASC 1000* adaptive signal-correction digital-filtering unit for automatic analysis and real-time compensation of loudspeaker and room interaction. ● **Carver Corporation**, Stand 115: introducing the *PMCX-1*, a new active crossover specifically designed for high-end touring concert systems and installations. The *PMCX-1* uses four cards for programmed crossovers, one tailored to the band-pass parameters of a particular driver, rather than three cards defining crossover points between the drivers; also new to AES is the *PDR-10* CD Recorder offering professional ▶



The *Varicurve* slave from BSS

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No Artificial Colouring

PPM1

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114 dB, 60Hz - 20kHz
Broadcast/Music
Reference Monitor

PPM2

H 333 W 205 D 278 (mm)
117 dB, 50 Hz - 20 kHz
All applications
Nearfield Monitor

M1

H 210 W 450 D 310 (mm)
122 dB, 50 Hz - 20 kHz
Console Top Music
Nearfield Main Monitor

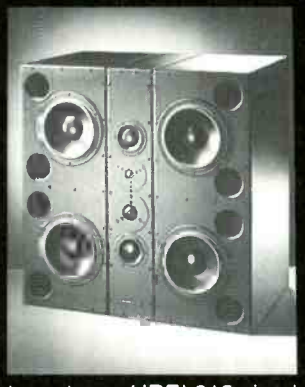
M2

H 340 W 680 D 500 (mm)
125 dB, 45 Hz - 20 kHz
Film/Broadcast/Music
Midfield Main Monitor

M3

H 775 W 555 D 505 (mm)
123dB, 40 Hz - 20 kHz
Film/Broadcast/Music
Main Monitor

M4



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Egypt: Alpha Audio; Tel. (02) 245 3199 Fax: (02) 247 8969 **France:** Hilton Sound SARL; Tel. (01) 46 67 02 10 Fax: (01) 47 89 81 71
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Korea: Saetong Corporation; Tel. (2) 783 6551 Fax: (2) 784 2788 **Malaysia:** Meteor Sound; Tel.(03) 291 6559 Fax: (03) 292 2560
Norway: Lydconsult; Tel. (09) 190381 Fax:(09) 191334 **Portugal:** Valentim de Carvalho; Tel. (01) 443 5667 Fax: (01) 443 2195
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Sweden: TonKraft Import AB; Tel. (031) 13 49 50 Fax: (031) 11 34 72 **Taiwan:** KHS Ltd.; Tel. (02) 709 1266 Fax: (02) 704 5524
UK: Stirling Audio; Tel. (071) 624 6000 Fax: (071) 372 6370 **USA:** Group One Ltd.; Tel. (516) 249 3660 Fax: (516) 420 1863

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a truly virtuoso performer

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facilities ● **Cedar Audio:** announcement of an improved noise reduction module as part of the *CEDAR 2* restoration system. The new module features entirely new noise reduction identification and removal algorithms. *CEDAR 2* also uses a completely new user interface with improved graphics and facilities ● **Circuits Maximus Company Inc**, Stand 227: personalised monitoring systems ● **Community Prof. Sound Systems**, Stand 1117: loudspeakers systems for live sound and installation purposes ● **Concept Design Electronics Mfg**, Stand 542: will display their equipment systems for cassette duplicating ● **CTI Audio Inc:** wide range of products from microphones to mixers ● **Connectronics Corporation**, Stand 635: will display their range of audio wire and cable, patch bays, patch panels, Bodge connectors and cable reels ● **Countryman Associates Inc**, Stand 941: their range of lavalier microphones designed to combine unusually low handling noise with a good degree of water resistance. ● **Crest Audio Inc**, Stand 302: range of power amplifiers ● **Crown International**, Stand 1309: full range of power amplifiers and microphones systems. ● **Crystal Semiconductor Corporation**, Stand 1537: showing their range of integrated circuits ● **CST Manufacturing & Sales**, Stand 133: range of imprinters and inserters

● **D & R Electronics USA Inc**, Stand 3007: will debut the *Triton* recording and mixing console which features floating subgroups, three mute groups, 10 aux send busses, 4-band sweepable EQ and optional patchbay. Also on show the *Orion* recording and mixing console; and the new *Axiom* sound reinforcement mixer. ● **dbx, a division of AKG**, Stand 242: range of noise reduction units and noise gates including new 172 expander-gate; 1024 buffer amp and 760x dual mic preamp ● **Demeter Amplification**, Stand 440: tube microphone preamplifiers; tube direct-box injection; tube power amplifiers and guitar amplifiers. Introducing the *VT275HF* tube reference monitor power amplifier ● **Dialog 4 GmbH**, Stand 111: German company who make digital encoder and decoders designed for CD quality audio through the ISDN using ISO-MPEG/MUSICAM data compression standards. ● **DIC Digital**, Stand 910: will exhibit a complete line of digital audio tape, 8mm video tape, 4mm and 8mm computer back up (CBU) tape and their own 3.5-inch magneto-optical disc. DIC Digital will also introduce a new recordable CD-R, with their own new packaging concept. ● **Digidesign**, Stand 324: showing the latest *ProTools* software and the new version of *SoundTools* ● **Digital Designs**, Stand 236 ● **Digital Expressions Inc**, Stand 3028: displaying their *Soft Splice* editor, designed for the *Macintosh* computer. A portable digital-audio, sequencing and editing system featuring EDL and graphical editing ● **DOD Electronics**, Stand 1239: featuring the new Audio Logic *266* dual-gate compressor-limiter; new DOD mixer offering 2-bus and 4-bus operation; DOD *RTA series II* real-time analyser; Digitech's new *RP-1* guitar effects controller-processor. ● **Dolby Laboratories Inc**, Stand 1112: Lower cost multitrack *SR;* new *Spectral processor*, a 1U 2-channel unit making it possible to raise low-level signals in three frequency bands by as much as 20dB without affecting high-level signals; model *430* dialogue cleaner; *DP5500* studio to transmitter link ● **Doremi Labs Inc:** exhibiting their *Digital Audio Workstation Nucleus (DAWN)* disk-based ▶

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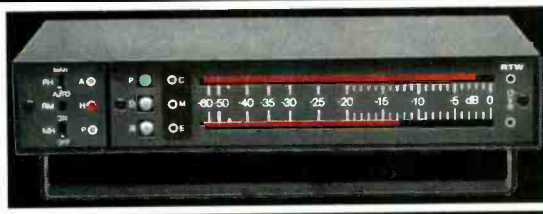

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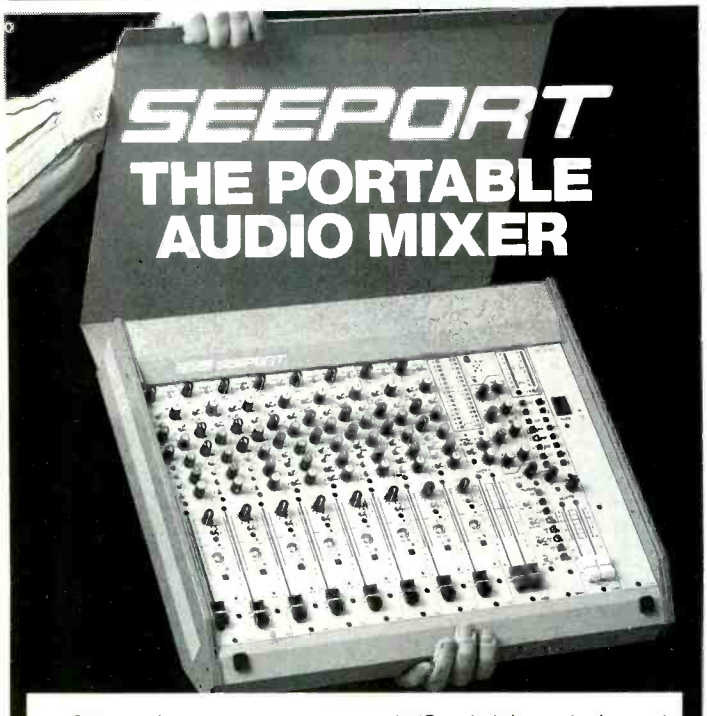

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AUTUMN 92

Solid State Logic

The Portable Dream

New York Rental Company's Flight-Cased SL 4000

Worldwide Success for Scenaria

Twelve systems sold since launch

ALSO INSIDE

Top US and UK studios install SL 8000

Broadcasters choose SSL consoles

Fox TV goes digital with SSL

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Solid State Logic

The Portable Dream Machine!

Now you can take your studio with you

These days it can take a year or more for a top artist to record and mix a new album. With so much time devoted to the creation of a new work, the traditional solution has often been to build a professional studio in your home. To avoid being tied to one location for a year or more, the perfect answer would be a complete studio, neatly packaged into flight cases, which can be taken anywhere, and set up in less than two hours.

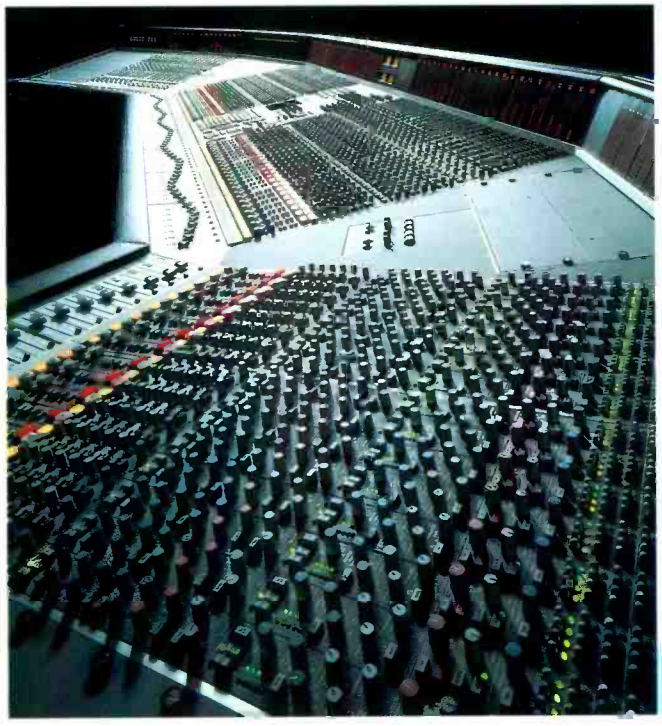
The SSL Portable Studio provides solutions to all of these problems, and is the brainchild of Steerpike, an enterprising New York-based rental company. The company's dream of a transportable studio package was brought to life this summer by designers and production staff at Solid State Logic's Oxford headquarters. The result is a 64-channel SL 4000 G Series console, with the Ultimation™ moving fader system and Total Recall™, which breaks into three sections and folds up on its flight case bases. Other flight cases contain the patchbay, G Series computer, power supply, outboard equipment and a Sony 3348 digital multitrack. All of the units are linked by multipin connectors to allow rapid assembly and packing.

Steerpike's first client for the Portable Studio is Sting, who recently began work on a follow-up album to *The Soul Cages* at his home in rural Wiltshire. Sting has spent time developing tracks at home with producer Hugh Padgham and other musicians, but has the capability to pack up and relocate whenever he wants.

"The great thing is that everything is fully connectorised," says Hugh. "Once the flight cases arrive, the system just plugs together, and you're ready to roll."

Sections of the console pivot onto their backs on the flight case bases, before the tops are fitted ▶

The complete Portable Studio, showing the console completely assembled and all outboard equipment, power supplies and G Series computer fitted in flight cases ▼



Dreams Built To Order

The last twelve months have seen an increasing demand from broadcasters, music studios and artists for G Series consoles, large and small, built to meet their precise specifications.

The recent Portable Studio package is only one example of a trend amongst clients to specify something unique and individual, either as a focus for their recording facility, or to meet specific practical needs.

Here is a summary of the many G Series options that clients are able to choose from:

- Frame sizes from 32 to 96 channels
- L or U shaped console wings
- 45, 55 or 95 degree frame angles - or user specifiable
- Mono or stereo I/O modules
- Two styles of equalisation (E or G Series)
- Oxygen-free cable
- VU, PPM or Plasma Bargraph metering
- Patchbay on left, right, or remote from console
- VCA automation or Ultimation™ moving fader system
- Total Recall™ computer system
- Master Transport Selector
- Synchroniser Interface
- Events Controller
- Programmable Equaliser
- Programmable Joystick Pan Controls (SL 8000)
- Additional Tape Transport Controls (SL 8000)

◀ *A winged SL 4000 G Series console - the Dream Machine*

SSL DIGITAL

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Scenaria - A Major Success Worldwide

Twelve systems ordered since launch

Scenaria, the world's only Digital Audio/Video Production System, has been warmly welcomed by post-production facilities around the world. In the few months since its introduction at NAB, Solid State Logic has received orders for twelve Scenaria systems from major facilities, from Tokyo to Detroit.

These include:
Avenue Edit, Chicago
Mouri, Japan
Omnibus, Japan
Post Perfect, New York (3 Scenaria systems)
Producer's Color, Detroit
Saunders & Gordon, London
Tape Gallery, London
Video Post & Transfer, Dallas
Video Sunmall, Japan
Voss & Partners, Dusseldorf

Facilities around the world have been quick to realise the advantages of combining random access audio and video. With Scenaria they have a 38-channel, fully automated digital mixing console with a 24-track random access recorder/editor and random access video storage. For the first time, editing, signal processing and mixing can be carried out to picture, entirely in the digital domain.

The Scenaria demonstration suite at SSL's Oxford headquarters, which has been booked solidly since the launch ▶

ScreenSound and SoundNet Updates

A major software revision is now available for ScreenSound which extends its range of operational possibilities to make it the most powerful and comprehensive audio post-production editor available.

Amongst this latest package of operational features are:

- **Multiple input recording - with unlimited drop-ins/outs**
- **Audio clip Hold - for fast re-editing**
- **Selective back-up/restore to MO disc**
- **MO working discs**
- **Serial VTR emulation**
- **Full Scenaria compatibility**

To coincide with the latest enhancements to ScreenSound a number of important new SoundNet features have also been added:

- **Print a Directory**
  Includes all Sound Files and Desk Files
- **Expanded Off-line Directory**
  Directories of up to 32 off-line MO discs can be stored in the SoundNet database
- **Selective Back-up/Restore**
  Back-up and restore of individual Desk Files, Desk Files with audio sources, or the entire working disk
- **Full Scenaria compatibility**

There are also a number of new hardware options available for both ScreenSound and SoundNet:

- **SSL's PatchBay audio/control routing matrix**
- **High Speed MO drive**
- **Faster Exabyte tape streamer which offers 5 times realtime back-up and restore rates.**

London Studios Install Scenaria

▲ *(l-r) Robin Saunders and Ken Gordon with SSL's Stuart Grant*

Top post companies order systems

Two of London's top post-production companies, Saunders & Gordon and The Tape Gallery, ordered Scenaria systems within weeks of the official launch.

Saunders & Gordon

Saunders & Gordon Studios, owned and managed by Robin Saunders and Ken Gordon, became the first UK facility to install a Scenaria in September.

Most of the studio's work is post-production for television commercials, although it is also involved in broadcast television dubbing, corporate and audio-visual work, radio commercials and even talking books.

The Scenaria, which is to be used on a wide variety of projects, brings Saunders & Gordon's total of digital suites to three. With five other recording rooms and comprehensive audio and video transfer facilities, Scenaria was chosen as the ideal addition to the studio's capabilities.

Says Robin Saunders: "We had been looking for a system that combined 24-track digital random access recording with a totally automated digital console, but until Scenaria came along, the only solution was to mix and match one manufacturer's console with another manufacturer's recording system - with all the compromises of performance that entailed. With Scenaria we have a dream system that not only fulfils all our requirements for an integrated production tool, but also looks like the cat's pyjamas!"

The Tape Gallery

The Tape Gallery was founded in 1981 and has five recording studios specialising in sound for television, cinema and radio. The first London studio to record and edit digitally, The Tape Gallery plans to use its Scenaria for a variety of projects, but primarily for commercial 35mm film dubbing and video post-production.

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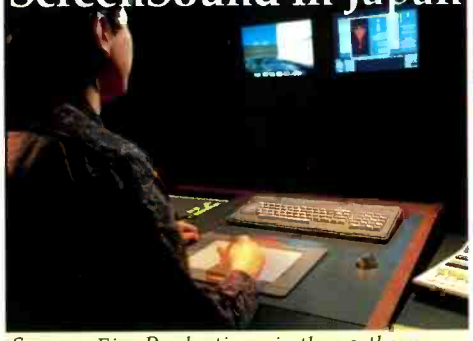
Solid State Logic

"How I Use My Network..."

SoundNet users talk

Craig O'Donnelly, Aspect Ratio
"SoundNet has truly enhanced the flexibility of our ScreenSounds, because we can go from one job to another, grab something from the hard disk, copy it and keep right on working."
Mike Levesque, Nutmeg Recording
"Before we added SoundNet, if a client booked an hours worth of time, I used to have to waste an hour of time for back-up and restore - SoundNet has given me back that hour of downtime and I'm using it to work with clients."
Jay Scott, General Television Network
"SoundNet allows us to work from a central database, giving us rapid access to a huge number of sound files. Since many of our jobs involve revisions, SoundNet's off-line back-up and restore capabilities are essential for efficient servicing of our clients."
Jeff Buikema, Image Express
"SoundNet has helped us to expand our audio capacity. When we are working with a job that requires more than eight channels, SoundNet allows us to set up more channels by slaving several ScreenSounds together."
Craig Maniglia, Musifex
"We can have four drives on-line via SoundNet - that's twelve hours of audio. We could have two drives with two different programs on them; we can have one drive with music, one with sound effects, while the optical drive is also filled with sound effects. The possibilities with SoundNet are just mind-boggling."

ScreenSound in Japan



Sapporo Eizo Productions, in the northern Japanese city of Sapporo, is one of the increasing number of post-production facilities in the country where ScreenSound is being installed. As in the rest of the world, Japanese studios are realising the creative benefits of SSL's digital technology

They Keep Coming Back!

Studios place repeat orders for ScreenSound

Such is the popularity of ScreenSound that first time users quickly realise the creative and financial benefits to be gained from the system.

After having purchased a ScreenSound and used it for a short while, many customers have been back to place repeat orders, some for multiple ScreenSound systems and SoundNet digital audio networks.

▲ *Buddy King (right) and Tom Maydeck of Soundcastle/ Post Modern, Los Angeles, working on a new Batman cartoon series with ScreenSound*

Among those repeat customers are Soundtrack (4 ScreenSounds + SoundNet), COPRA (2 ScreenSounds + SoundNet), Howard Schwartz (2 ScreenSounds + SoundNet), Clack (3 ScreenSounds + SoundNet), Pomann (2 ScreenSounds + SoundNet), Soundcastle/Post Modern (3 ScreenSounds + SoundNet), Sounds Interchange (3 ScreenSounds + SoundNet), and Nutmeg (3 ScreenSounds + SoundNet).

◀ **ScreenSound in Virginia**
Phoenix Recording, Arlington, Virginia has recently installed a ScreenSound. Pictured is Grant Rutledge (right), Chief Engineer, with client David Powers of Harrison Powers Transmission

SSL Digital for TV Documentary

Audio to picture editing on ScreenSound

Peter Gabriel's continuing involvement with WOMAD (World of Music, Arts and Dance) has led to a series of projects being undertaken over the past year at Real World Studios, in Wiltshire, culminating in a TV Special screened in July of this year. The audio to picture work was undertaken on a ScreenSound digital audio editor.

Real World Records, owned by Peter Gabriel and WOMAD, is dedicated to giving world musicians the opportunity to work with technical equipment otherwise unavailable in their own countries. Since last August, Real World Records has produced five individual albums from bands as far away as Tanzania and Russia, and three collaborative albums involving a number of well-known artists such as Sinead O'Connor and Karl Wallinger from World Party. Four SSL consoles were involved in the project, under the supervision of producers which included Rupert Hine, Phil Ramone and Tony Berg.

▲ *Editing the WOMAD TV Special at Real World Studios, Wiltshire, England*

Filming for the TV Special took place throughout recording. All post-production work was subsequently carried out at the studio on ScreenSound. The programme was broadcast in the UK, Germany and Australia.

The final editing of the TV documentary was completed at M2 Video in London, where the music, which was re-mixed onto ScreenSound, was integrated with all the various behind-the-scenes noises and commentary - again using ScreenSound.

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Top UK Studios Confirm Commitment to SSL

London's Abbey Road and Air Studios Install SL 8000s

Two of the world's leading recording studios are among the latest to re-equip with the SL 8000 Multi-Format Production System.

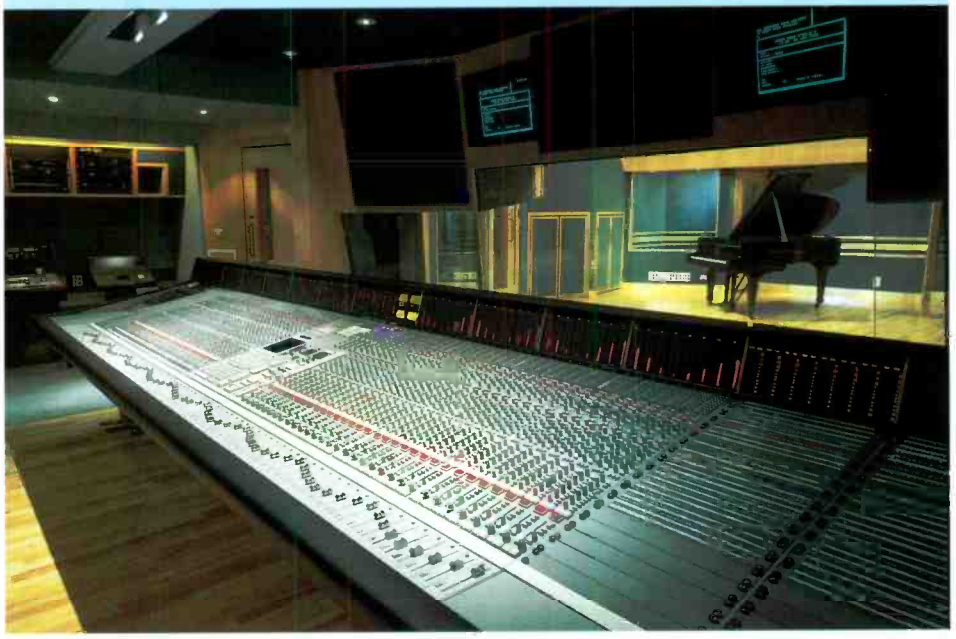
Abbey Road Studios

Abbey Road has installed a 72-channel SL 8000 G Series console complete with Ultimation™ dual automation system in the refurbished Studio 3

Ken Townsend, Director of Operations at Abbey Road, explains the reasoning behind the studio's new console purchase: "Studio 3 is a first-class room, and we have updated it with the latest and best equipment. The flexibility of the SL 8000 will enable us to carry out a wide variety of projects in there, from pop music recording, to film and video work. Abbey Road has always attracted top-class producers and engineers from around the world, and the SL 8000 will bring in more of the better quality rock album work. At the same time, of course, the SL 8000's ability to work in all formats gives us the 'future-proofed' capability to handle practically any audio recording project."

In the short time that the console has been installed, Kate Bush, Morrisey and Julia McKenzie have recorded in Studio 3, and Henry Mancini has used the console for film soundtrack mixing.

▼ *Studio 3 at London's Abbey Road Studios, where one of the world's first SL 8000 Multi-Format Production Systems is installed*



Air Studios

London's renowned Air Studios is also amongst the first to order an SL 8000 G Series Multi-Format Production System. The console, which is an 80-channel frame with 72 modules fitted, also has Ultimation™. It is being installed in Air's magnificent new Lyndhurst Hall facility in North London.

Malcolm Atkin, Studio Manager at Air Studios, says: "In planning ahead we needed to cover all the bases, and the SL 8000 is the best and most versatile console for use in many different applications. Although the room will be used primarily for Rock and Roll mixdown, we also plan to be doing a lot of audio-to-picture work with the desk. In fact, we already have a two month booking for the room for just such an application. When the client heard that we can also do LCRS mixing with the SL 8000, he immediately began to think of extending the booking!"

ScreenSound for Satellite Broadcaster

Leading Asian Broadcaster installs digital editor

Hong Kong is home to one of the most sophisticated satellite broadcasting installations in Asia. STAR (Satellite Television Asia Region) TV broadcasts 5 television channels - including the BBC World Service and MTV - via the AsiaSat 1 satellite.

ScreenSound was chosen for the station's new audio post-production facility because of its flexibility, ease-of-use and proven upgrade path. Adam Pinch, Sound Supervisor, explains: "We looked at other hard-disk editing systems, but felt that ScreenSound met our needs far better. After having used it operationally now for six months or so, I can say that we made the right decision."

With five different channels and transmission in two standards, STAR TV has chosen an all-digital system of internal signal coding to take full advantage of the digital processing of its signal converters. This also allows a clean signal path for digital graphics and provides for support of future formats, such as HDTV. ScreenSound fits perfectly into this environment. "At STAR TV, the Broadcast Operations and Engineering departments have to serve the needs of five channels, all of which have different requirements and ways of working," says Phil Braden, Vice President Broadcast Operations and Engineering. "The bottom line is that the channel producers prefer working in our in-house audio suite rather than going to any of the outside Hong Kong sound facilities. That says it all."

▲ *Adam Pinch, Sound Supervisor, using ScreenSound in the new audio post-production facility at STAR TV, Hong Kong*

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Solid State Logic

Enterprise Beams Aboard SL 8000s

Two Multi-Format Production Systems keep studio "Ahead of the curve"

The Enterprise Recording Studios, Burbank, has become the first facility in the USA to feature the world's only mixing console designed for all music, television, video and motion picture formats.

The installation of the 96-channel and 80-channel SL 8000 G Series consoles, both with Ultimation™, marks the eighth and ninth SSL consoles at this Emmy Award-winning studio complex. Last year, The Enterprise became the first studio in the world to install SSL's Ultimation™, moving fader/VCA automation system.

Enterprise CEO, Craig Huxley explains: "Our mission is to keep our clients ahead of the curve and to offer them an interbreeding of the finest in music technology with the farthest advances in multi-dimensional film sound technology."

"The SL 8000 offers Enterprise the music capabilities of the acclaimed SL 4000 console as a platform, and adds to that vast additional capabilities to work in a variety of formats traditionally used for television and film. The crew on The Enterprise chose the SL 8000 because it offers music producers and engineers the chance to get creative with tomorrow's formats today!"

With the SL 8000, Enterprise engineers can now mix for Dolby™ Surround, Dolby SR-D, Kodak™ CDS, HDTV and even new '3-D' music recording processes.

The console features SSL's powerful Ultimation™ moving fader/VCA automation, and the new Automated Joystick Pan controls.

The system also provides Left, Centre, Right and Surround panning on every channel.

The Enterprise, conceived and constructed after Huxley composed and designed music for the popular *Star Trek* films, has always taken an innovative "new frontiers" approach to audio. High ceilings, geometrically shaped furniture and huge video projection screens in the control rooms of the Kandinsky-like ('Memphis' style) studios add to the facility's vibrant feel of the future.

Craig Huxley, CEO of The Enterprise, with one of the studio's two SL 8000 G Series Multi-Format Production Systems

Fox TV Goes Digital with SSL

Members of the team at Fox Tape working with ScreenSound include Russell Brasher, Judy Frenkel, Steve Jamerson, Jon Shroeder, Kent Tunks, Gary Singleman, Chris Homer, Paul Robie, Andy Harper and Carol Woodford

ScreenSound and SoundNet assist creativity in editing

Fox Tape Division, the Hollywood-based audio/video post-production facility that handles most on-air promotions for Fox Broadcasting Company, recently added two ScreenSound systems and a SoundNet network to its post-production facilities.

Currently, Fox Tape produces 300 to 350 promos per week for the network. With this heavy schedule, a key issue for Fox, according to VP of Operations, Tony Ciesniewski, is the ability to work with people and equipment that can make rapid changes.

"Fox has been fortunate in terms of viewer popularity, and our operations are growing at a tremendous rate," says Ciesniewski. "It is our philosophy that engineering should be transparent, and technology should facilitate creativity rather that stand in its way. ScreenSound and SoundNet have given our mixers more flexibility in the way they work; now we spend our time on the creative aspects of the overall project, rather than worrying about which patch cords to put together."

Fox currently has five off-line rooms, two on-line rooms and two sweetening rooms. ScreenSound is currently being used in both sweetening rooms for editorial work, for recording, effects, time compression and expansion, and for retrieving information instantly.

"Before we added ScreenSound, we used to do razor blade editing on 4-track, and we used many carts, a lot of mixdowns, and we would have to edit pieces on a separate machine on analogue tape," explains Chris Homer, Manager of Post Production for Fox Tape Division. "Now we're using ScreenSound to pre-edit and we've really increased the output capabilities of the rooms. Now we can edit portions of a job on ScreenSound at the same time as we're mixing other portions on the console."

Adds Ciesniewski: "At Fox we are always looking for better, faster ways to accomplish our projects. ScreenSound is definitely one of those better and faster ways."

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European Broadcasters Choose SSL

◀ *BBC Radio 2 Presenter John Dunn, on-air with the latest of four SL 5000 M Series consoles to be installed in Broadcasting House, London*

Variety of consoles used in Radio and TV

Across Europe, radio and television broadcasters are increasingly specifying Solid State Logic audio consoles for a wide range of applications, from recording and on-air use, to in-house training. Amongst the latest to have specified SSL are:

BBC – London

BBC Radio 2 has ordered a fourth SL 5000 M Series console for its new transmission suite complex at Broadcasting House. This latest console has identical features to the previous three, including remote facilities that allow a measure of self-operation by the presenter.

Teletota – Paris

Teletota is one of France's largest production companies. The studio also has the contract for adapting productions to Dolby consumer video cassette format. Teletota has installed an SL 4040 G Series with modifications which will enable it to meet the requirements of the Dolby contract.

LNN – London

London News Network is a news service shared by the two commercial television stations for the London area. A news production facility has been built at LWT's South Bank studios, and an SL 5000 M Series console with Instant Reset™ has been installed for on-air use.

The console's unique flexibility, and the ability to configure it to match LNN's exact operating requirements, were major factors in LNN's decision.

AB Productions - Paris

AB Productions, an independent broadcast production company specialising in children's programmes and cartoons, has recently installed an SL 4048 G Series. The SL 4048 was chosen because its versatility will enable it to be used for a variety of projects.

Swedish Television – Axjo

Swedish Television, responsible for national broadcasting of both radio and television, has recently purchased its 11th SSL console, an SL 6040 G Series, which will be used for on-air work in the south of the country. Swedish Television chose SSL because of its reliability and flexibility for live broadcasting.

Antenne 2 – Paris

The second State television channel in France, Antenne 2 has specified an SL 4048 G Series console, the first to be sold to a broadcaster in France. The console is to be installed in Rejie 40, the company's largest shooting stage, which is currently being refurbished to provide a full digital production capability, including digital video. The SL 4048 has been modified to suit all the applications required.

VTM - Brussels

VTM, the only commercial television station in Belgium, has purchased three SL 5000 M Series consoles to be installed in a new facility in Brussels.

ScreenSound for Film Dubbing

"The obvious choice" for digital editing

Studiosound, part of Mercury Theatres, the London-based film dubbing studios, has chosen Solid State Logic's ScreenSound audio-for-video editing system to take them to the forefront of digital sound editing.

Henry Dobson, Head of Sound, explains why they installed the SSL ScreenSound: "It was essential that we chose a system that was not only a complete recording device in itself, but could also be used in combination with our existing dubbing operations to achieve greater flexibility. ScreenSound is the only system that has been sympathetic in its design and operation with film editors and mixers."

Studiosound attracts a wide range of clients from television, film and video and it was felt essential for the continuing success of the studio to install ScreenSound. As Henry Dobson says: "SSL's reputation and commitment made ScreenSound the obvious choice."

▼ *Henry Dobson, Head of Sound at Studiosound, dubbing to picture with the studio's ScreenSound*

NY Mobile With Ultimation

Effanel Music, the first US independent mobile recording facility to feature a Solid State Logic console, has installed a new 52-channel SL 4000 G Series console with Ultimation™ in its newly-expanded recording vehicle.

Effanel thus becomes the first mobile recording facility in the world to offer its customers Ultimation, SSL's new Moving Fader/VCA console automation system.

"Though we're a mobile facility, having the new SSL with Ultimation makes us equal to any of the top five recording studios in New York," says Effanel owner Randy Ezratty (rear) pictured with engineer/producer John Harris

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Solid State Logic

From the Desk of...

Hugh Padgham

Hugh Padgham enjoys the highest reputation for his work as both engineer and producer. He has created many of the most memorable recordings of recent years, including albums for Phil Collins, Genesis, David Bowie and Police. He is currently working on a new album with Sting, using the special Portable Studio package developed by SSL (see page 2).

"I love the excitement of everyone playing ensemble when we're recording the basic tracks," Hugh says. "And with the Portable Studio set-up at Sting's home there's the additional thrill of having all the musicians actually performing in the same room as the console, without the divisions you normally get in a studio. The whole process has been much more relaxed. I know that Sting is absolutely delighted with it."

In his role as producer, Hugh has to keep sight of the final result through the whole track-laying process. "I have the mix in mind all of the time that I'm working on the recording, from the first performance, through experiments with overdubbing to the mix itself," he says. "In contrast, the two or three mixing projects that I do every year take a different kind of skill. There you largely have to make the most out of what is already on tape."

And the main advantages of taking the studio into the home? "SSL has done a brilliant job putting the Portable Studio together. We are working in fresh air and daylight - and we don't have to send out for pizzas!"

▲ *Hugh Padgham with the SSL Portable Studio in Sting's Wiltshire home, where they are working on the follow-up to the* Soul Cages *album*

Product Training

Continuing SSL's worldwide support for its system users, a Maintenance Training course for SL 4000 and SL 6000 console systems was recently held in SSL's Los Angeles office.

The office demonstration room provided an intimate classroom atmosphere, with a complete G Series console and computer system forming the centrepiece for demonstration and hands-on experience.

Conducted by David Grinsted, SSL's Training Manager and Graham Caddy, Product Support Manager, the course was attended by engineers from Seattle, Dallas and Phoenix as well as Los Angeles.

For further information on SSL Training Courses, contact your nearest SSL office, or David Grinsted at Begbroke

▲ *Engineers at the SL 4000 and SL 6000 Maintenance Training Course recently held at SSL's Los Angeles office*

SSL Sales Boom in France

Paris Office Meets Demand of French Studios

Throughout France, studios are increasingly choosing Solid State Logic consoles and digital systems for a variety of applications.

"We have seen a number of major console and ScreenSound orders over recent months," says Alain David, Sales Manager of SSL France. "These include consoles for internationally renowned music recording facilities like Studio Guillaume Tell, and orders from leading post-production houses and broadcasters like Antenne 2."

Apart from the sales to AB Productions, Antenne 2 and Teletota (detailed on the previous page) the following French studios have also purchased SSL:

COPRA Film has opened a new department dedicated to audio editing using ScreenSound. The studio has also recently ordered a second ScreenSound and SoundNet to give the disk-switching and off-line back-up needed for a new feature film which they are working on.

Studio Guillaume Tell is one of France's most prestigious recording studios. Regularly used by artists such as Elton John, the studio has ordered its third SSL console. The SL 4080 G Series Master Studio System has 64 channels fitted, and features Total Recall™ and the unique Ultimation™ system which combines moving fader and VCA automation.

▲ *Yves Fougeray, Head of Audio Operations at Antenne 2 (seated), and Alain David, Sales Manager, SSL France, seen with the French broadcaster's SL 4000 G Series console during acceptance testing at SSL's Oxford headquarters*

SSL Worldwide

International Headquarters
Solid State Logic
Begbroke, Oxford, OX5 1RU, England
Tel: (0865) 842300 • Fax: (0865) 842118

France
1 rue Michael Faraday
78180 Montigny le Bretonneux
Tel: (1) 3460 4666
Fax: (1) 3460 9522

Germany
Röntgenstrasse 104
6100 Darmstadt 12
Tel: (6151) 938640
Fax: (6151) 938645

Italy
Via Pirandello 17
20099 Sesto San Giovanni
Milan
Tel: (2) 262 24956
Fax: (2) 262 24938

Japan
3-55-14 Sendagaya
Shibuya-Ku
Tokyo 151
Tel: (03) 5474 1144
Fax: (03) 5474 1147

USA (Headquarters)
320 West 46th Street
New York
NY 10036
Tel: (212) 315 1111
Fax: (212) 315 0251

USA (Western Region)
6255 Sunset Boulevard
Los Angeles
CA 90028
Tel: (213) 463 4444
Fax: (213) 463 6568

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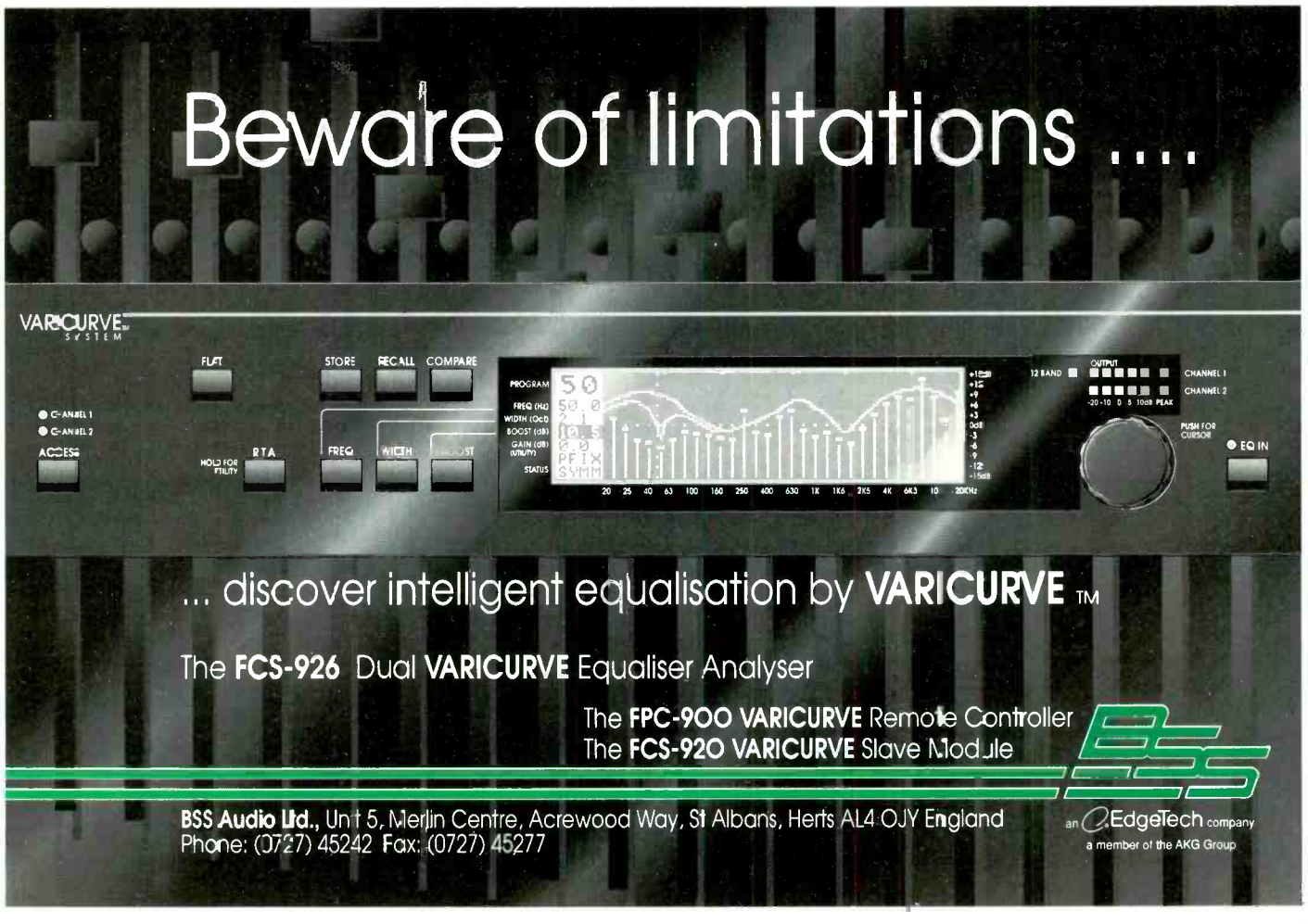
The *UM92S* on Gotham Audio's stand

● **Gauss-Electro Sound**, Stand 1034: will display high-speed audio tape duplicating equipment and the Gauss range of loudspeakers ● **Gefen Systems:** featuring the *M&E* organiser system; *CDJ* classic background music systems; several sound effects libraries; and a line of CD changers with interfaces to *Macintosh* and IBM computers. ● **Genelec Oy**, Stand 218: will display a range of active monitoring loudspeakers, including the new 1031A nearfield ● **GML Inc:** World launch of a revolutionary interconnecting sound-processor system developed in conjunction with AT&T and Gotham Audio. The digital-mixing core uses a central processor to connect to recording studios; also featuring the new *HRT* mixing system and the latest software for *GML* automation systems ● **Gold Line-Loft**, Stand 509: will show portable *DSP 30*, third-octave real-time analyser. Also shown will be the complete line of real-time analysers. ● **Gotham Audio Corporation**, Stand 1218: will be exhibiting Microtech Gefell's full line of products, including the *Perestroika UM* 70S microphone. Two new products include the *UM92S*, a vacuum tube studio microphone with a large diameter condenser capsule. Also new is the *SMS 2000* miniature condenser microphone series with interchangeable capsules for cardioid, super cardioid and omni. Also on Gotham's stand is the *IBIS* digital console from Harmonia Mundi Acustica. ● **Groove Tubes**, Stand 231: on display and in use their range of tube microphones. ● **GTS (Fabrications) Ltd**, Stand 212: will be exhibiting its latest audio, DAT, and also launching for the first time the new DCC D-O, cassettes and cases.

● **Hafler Pro-Div. Rockford Corporation**, Stand 538: range of power and preamplifiers including the *9300* and *9500* that feature transnova circuitry using short signal paths to improve linearity, speed and musical transparency. *9300* is rated 450W bridged 8Ω; *9500* at 750W bridged 8Ω ● **The John Hardy Company:** will display the *M-1* microphone preamplifier; the MPC-3000 microphone preamplifier card and the *990* discrete op-amp ● **Harrison by GLW Inc**, Stand 1118: featuring the new *MPC Motion Picture Console* which has been specially designed for film postproduction; the *SeriesTen* console and the *ARS-9* audio routing switcher ● **Hewlett-Packard**, Stand 2906: Portable Dynamic Signal Analyser; the PC Spectrum-Network Analyser, plus other measurement solutions for the audio professional ● **HHB Communications:** will be showing their professional-quality series DAT tape along with key DAT recorders. Also showing the *HHB CDR Indexer* which allows DAT index points to be converted to CD-R track numbers automatically. The ATC *SCM series* of studio control monitors will displayed in addition to the Coles range of microphones. ● **Heino Ilsemann GmbH:** will be showing their Assembly Machine for DCC cassettes. The machine has a capacity of up to 90 cassettes per minute.

● **Innovation Electronics Designs**, Stand 3006: showing the *UDAPS* universal digital audio processing system with the *500 ACS* announcement control system ● **Intersonics**, Stand 438 will feature their low-frequency switching amplifier designed for servo drive ● **J.L. Cooper Electronics:** will show *dataSYNC*, a MIDI time code synchroniser designed to work with the Alesis *ADAT* 8-track digital-audio recorder. It allows *ADAT* to drive sequencers, and digital audio workstations. Also on show is the *Media Control Station*, which works as an universal controller with Multimedia software, disk-based recording systems and sequencers. An optically encoded jog-shuttle wheel provides positioning and audio 'scrubbing'. The *Station* can be used with with multimedia applications like *Hypercard* and *Macromind Director*. The *FRO3700* automation upgrade package for the Tascam *M3700* recording console provides moving fader graphics, SMPTE display and additional status information. Installation can be done by combining a user-installable circuit ▶



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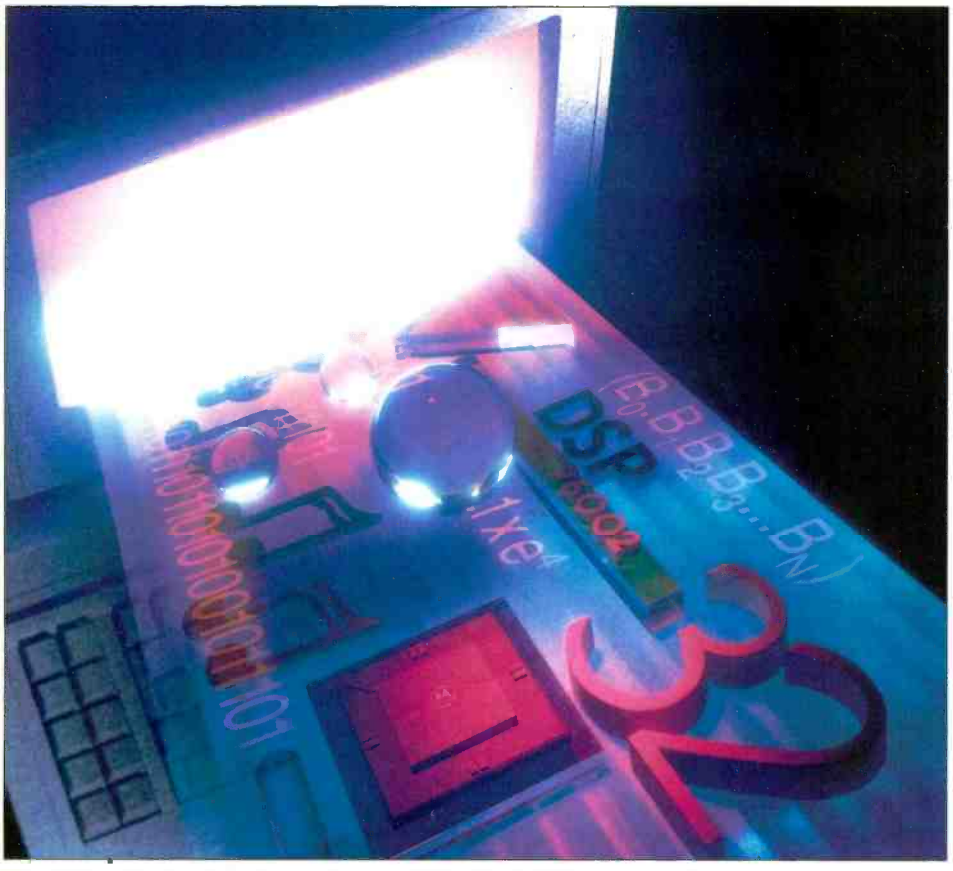

The Motorola stand features demos of the Atari *Falcon* computer

board with software for the *Macintosh* computer. ● **JBL-Soundcraft**, Stand 512: *8000* replacement *Vienna* with optional VCA. New theatre version *Venue II* with extra LED illuminated input functions. Entry level *Delta SR* with up to 32 channels. *BVE100* audio-for-video developed with European broadcaster RAI. *Spirit*

Neotek's *Esprit* console

Auto with VCAs ● **JBL International**, Stand 714: full range of speaker systems, dynamics modules and signal processors ● **Jeanius Electronics**, Stand 434: music production accessories ● **Jensen Transformers:** full range of high quality transformers ● **Josephson Engineering:** condenser microphones, accessories and mic preamps ● **JRF Magnetic Sciences**, Stand 1214: full line of replacement tape heads; alignment tapes and information on relapping services ● **JVC Professional**, Stand 228: will exhibit the *DS-DT900N* digitak tape recorder that reads and writes SMPTE time code.

● **KABA**, Stand 1320: showing the direct-from-digital, 4-track, real-time cassette duplication system. ● **Klipsch & Associates Inc**, Stand 629: complete line of professional sound reinforcement speaker systems ● **Klark-Teknik:** products on display include the new *DN728* configurable digital-audio delay line and *DN800* configurable active crossover; the *DN735* solid-state audio recorder with new software which allows synchronisation and tracking with almost any video editor. Also the MIDAS *XL3* live performance console, now available in a 16-channel version measuring only one metre in length. ● **Korg USA & Marshall Amp**, Stand 228: featuring the Korg *SoundLink* digital audio system in its version 2 and the *A1* processor ● **KRK**, Stand 3027: full range of monitors

● **Leitch Inc-HEDCO**: will display *ViewGuard* Scrambler-Descrambler; digital and analogue clock systems; and audio and video distribution amplifiers ● **LES Corporation**, Stand 534: exhibiting video tape loaders as well as cassette tape housing and computer floppy diskettes. ● **Lester Audio Laboratories**, Stand 1442: will display the digital audio transmission and routing system through fibre optic cable. Providing noise and interference free signals on up to 80 channels ● **Lexicon Inc**, Stand 316: showing the *LFI-10* data verification and standards convertor; the *OPUS* and *OPUS-e* digital audio workstations, *LARES* (Lexicon Acoustic Reverberance Enhancement System) and a new and as yet unnamed 20-bit processor ● **Lone Wolf:** MIDI routing and LAN systems

● **Mag-Zon Inc**, Stand 537: will display Zonal's audio magnetic films, and Zonal's audio magnetic tapes. ● **Magnefax International Inc:** will exhibit the model *7801* four-track cassette duplicator and the model *HP110* continuous belt tape degausser ● **Marantz Professional Inc:** *CDR1* professional recordable CD machine and new PMD-700 portable DAT recorder ● **Mark of the Unicorn Inc**, Stand 841: range of music software and associated hardware including *MIDI TimePiece* II MIDI interface-patchbay-time code convertor ● **Marshall Electronics Inc**, Stand 505: will display the Mogami high-definition, flexible wire and cable. Also on display Snake cable; mic cable; high definition bantam patch cords and connectors for the pro audio-video field ● **Martech-Martinsound**, Stand 1533: their range of sound reinforcement systems ● **Media Technologies**, Stand 1533: first time showing of the Philips DCC Mastering and Text Editing System, which enables the basic time code and PQ codes used for the compact disc to be added to DCC. Other products shown include Duplitronics digital bin; ● **Meyer Sound Laboratories Inc**, Stand 1113: will introduce the *HD-2* high-definition midfield monitor, similar to the established *HD-1* monitor but a more powerful ▶

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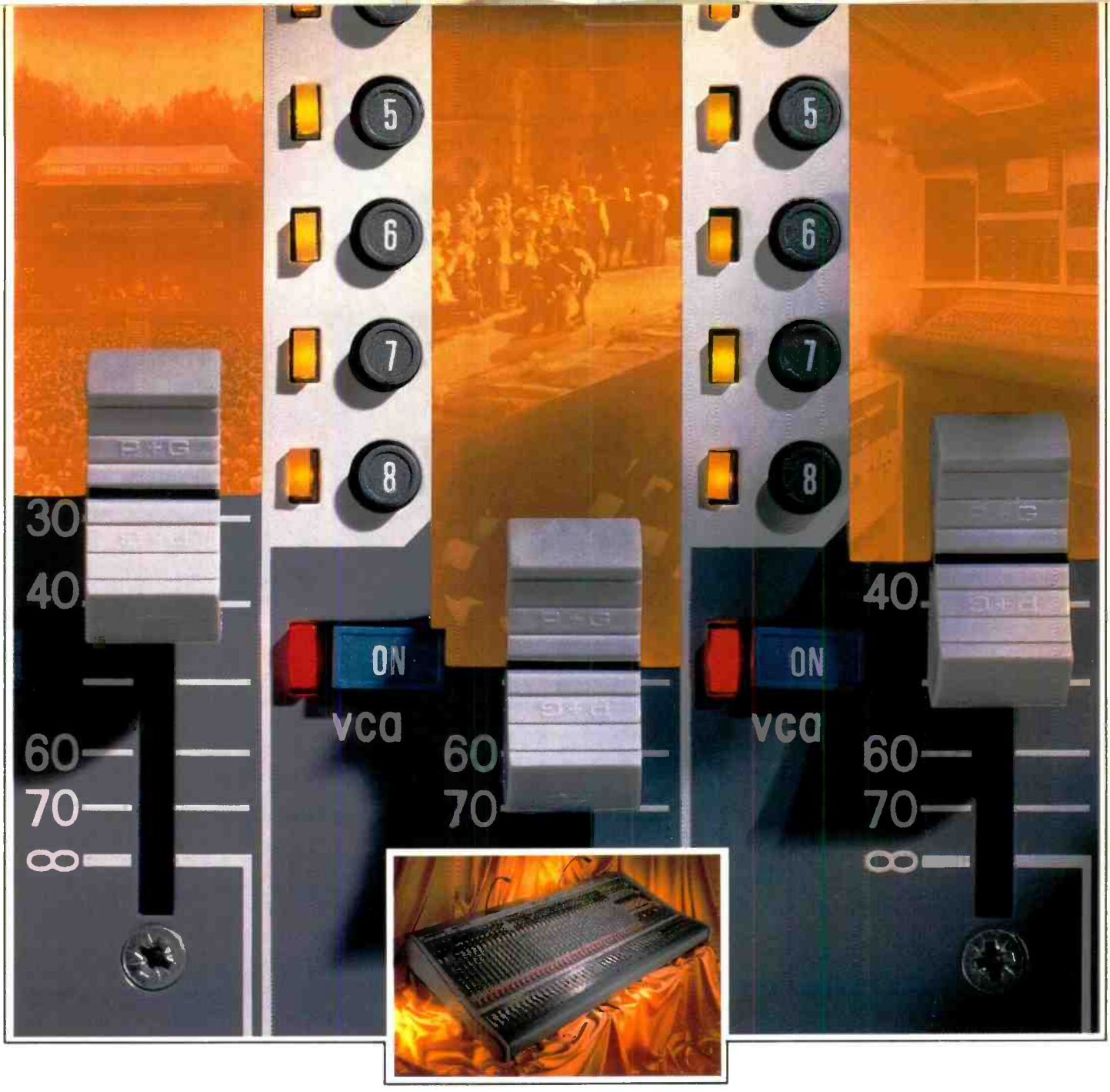

Photograph of O.B. Vehicle courtesy of N.O.B. Holland.

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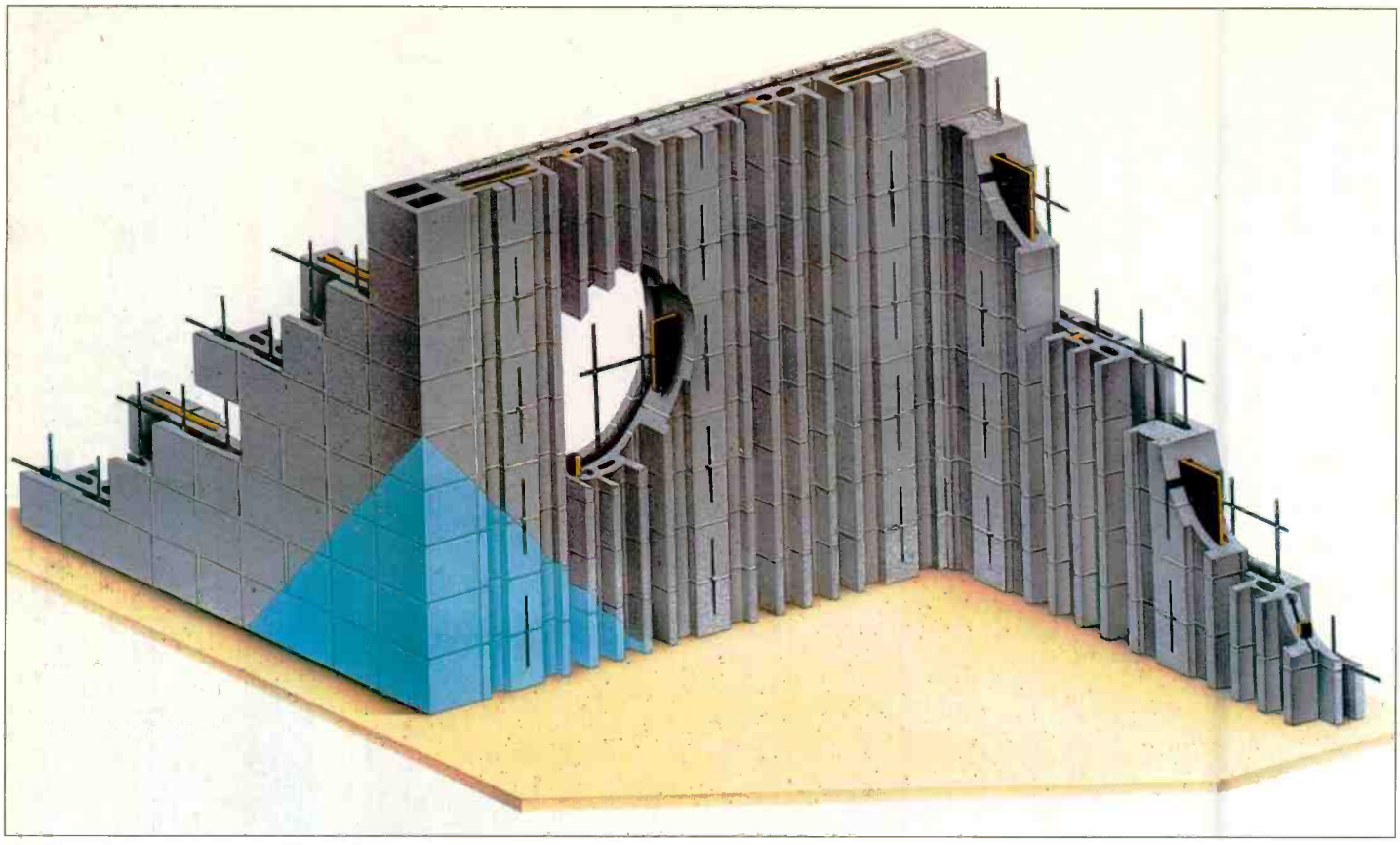

RPG's *Diffusorblox* a new kind of acoustic masonry

unit. Also new is the *MeyerPRO* Series which consists of three product categories from compact to full range systems. ● **Motorola SPS**, Stand 1039: featuring many active audio demonstrations; *DSP56401* AES-EBU Transceiver will be demonstrated as well as the *DSP56002* IC. Atari has just introduced their new *Falcon030* home computer featuring the *DSP56001* and *MC68030*. Demos of the *Falcon* on the stand ● **Music Maker Publications:** UK-based publisher of musicians' magazines.

N ● **Nady Systems Inc**, Stand 702: radio microphone systems ● **Nagra-Phi Technologies**, Stand 342: Nagra tape machines including the *Nagra-D* digital tape recorder ● **Neotek Corporation**, Stand 706: will be displaying their new *Esprit* line of consoles designed as a multipurpose console with broadcast needs in mind. Extensive customisation is available to order. A console has already been sold to process audio from the Space Shuttle in Houston. ● **Netstal Machinery Inc**, Stand 842: will display *Uniline*, total automated cells for CD manufacture ● **Neutrik USA Inc**, Stand 513: *A-1* test and service unit and their full range of connectors ● **Nobler Technologies Inc:** designs, manufacturers and installs CD metallisers, lacquer, optical inspection and automation equipment for stand-alone or Inline production ● **NVision Inc**, Stand 535: will feature their first-generation digital system-solution products, including the *NV2000* high definition audio system and the *NV4448* Digital Audio Sample Rate Convertor

O ● **Opcode Systems**, Stand 3041: Apple *Mac* music software including *Studio Vision* sequencer/audio recorder and *Galaxy* patch librarian. ● **Optical Disc Corporation**, Stand 1610: they manufacture complete turnkey CD mastering modules as well as CD analysing equipment ● **OptoDigital Design Inc**, Stand 1136: will display a complete range of professional and sound contractor-cable products. Also shown will be fibre-optic snake systems and components from the *LS12* digital multimedia broadband fibre-optic product line for distributed sound, video, intercom and MIDI ● **Orban, a division of AKG**, Stand 242: will display the new Optimod processors and the full line of professional studio products ● **Otari:** the *DTR-90* professional DAT recorder and *CB-149* editor; the latest updates for the *ProDisk 464* digital audio workstation; the *DDR-10* audio editor ● **Oxmoor Corporation**, Stand 1542: displaying the *DEQ-1* and *DEQ-2* programmable EQ; RMX mixing matrixes; and distribution amplifiers

PQ ● **Panasonic Broadcast & TV Systems**, Stand 502: will exhibit DAT recorders, microphones, mixing consoles, power amplifiers and loudspeaker products from Panasonic and Ramsa ● **Passport Designs Inc**, Stand 1635: music software including *Pro5* sequencer and *Encore* scorewriter for the Apple *Macintosh* and PC-*Windows*. ● **Peavey Electronics Corporation**, Stand 816: software-based *Autograph EQ*, *PC-4 KXL* electronic crossover, *DPC-750* amplifier with digital power conversion, *SDR20/20* multi-effects processor. ● **Penny & Giles Inc**, Stand 731: ▶

SSL *Scenaria*, the digital postproduction mixing system

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endless-belt digital encoder and LED level indicator; *M3000* motorised fader and other controllers. ● **Plitron Manufacturing Inc:** will display a range of toroidal transformers with multiple standards available ● **Pro Sound News:** US and European pro-audio magazine ● **Professional Audio Systems**, Stand 606: introducing the *PermTec* Series, designed to offer the sound professional a line of weather resistant speaker systems. The model *P-100* is a two-way passive speaker handling 200W at 8Ω. ● **QSC Audio Products Inc**, Stand 524: will show the *Series One and* MX Series and the *EX Series* of professional 2-channel power amplifiers ● **Quested Monitoring Systems**, Stand 242: range of monitoring systems

● **Rane Corporation**, Stand 533: signal processors including the half-rack, 4-channel *FPL-44* Programme Limiter. ● **Recording Industry Sourcebook**, Stand 3021: one of the best-selling music business and production directories in North America, containing over 8,500 US music industry contacts. Other titles include — *Sourcebook 9.2: The Electric Sourcebook*; *Euro Pop Book*; *Australasian Music Industry Directory*; *Music Directory Canada*. ● **REP-S & VC Magazines:** US music recording magazine ● **Renkus-Heinz Inc**, Stand 1035: full range of sound reinforcement systems ● **Richmond Sound Design Ltd**, Stand 412: showing their high speed Command-Cue programmable sound router for live performance. New versions of Stage Manager cue software with internal clock timing, external time code chase, complete manual override and export of most valid MIDI messages. The *FOL-24* fibre optic link, which transmits Command-Cue instructions from a central location to distributed racks at roughly 100MHz. ● **Roland Pro Audio-Video Group**, Stand 424: latest enhancements of the *DM-80* hard disk recorder-editor; *RSS* Spatial processor; *SN550* single-ended noise reduction unit ● **Roldex Industries**, Stand 338: audio cassette printing systems ● **Rolls Corporation**, Stand 1638: will display range of power amplifiers, mic preamps, equalisers, mixers and personal monitoring systems ● **RPG Diffusor Systems Inc**, Stand 1536: *DiffusorBlox* is a new load-bearing structural acoustic-concrete masonry unit offering 100% absorption at 100Hz. *DiffusorBlox* are produced near the job site by qualified, licensed, block producers using proprietary RPG automatic-block machine-moulds and so minimising shipping costs ● **RSP Technologies**, Stand 1640: exhibiting their line of products for the semiprofessional and professional studio owner, including the *Intelliverb, Studio Gate* and *Studio Q*.

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● **Sabine Musical Mfg. Co Inc**, Stand 1628: will display the *FBX* feedback exterminator which automatically identifies and eliminates acoustical feedback in sound systems ● **Saki Magnetics Inc**, Stand 0508: a complete line of metal 24-track 2-inch replacement heads for various manufacturers ● **Samson Technologies Corporation**, Stand 1236: will display their wireless microphone systems ● **Sanken Microphones-Dev.Tech**, Stand 1334: full range of microphones including the new *CQ-1* 4-channel shotgun mic. ● **Schoeps-Posthorn Recording**, Stand 607: full range of microphone systems and accessories including the *KFM-6U* stereo *Sphere* mic ● **SCV Audio-QMI**, Stand 632: showing their full line of signal processing equipment ● **Selco-Sifam**, Stand 511: digital panel meters, set point comparators, remote monitors as well as isolation-conversion transmitters. ● **Sennheiser Electronics Corporation**, Stand 1024: new *EM1046-SK50* radio mic system with modular eight channel receiver frame and miniature UHF body packs. Also featuring Neumann microphones ● **Shure Brothers Incorporated**, Stand 902: full range of microphones and accessories ● **Siemens Audio Inc**, Stand 1302: the AMS *MkV* is the new version of the *SoundField* microphone system. The new product has updated electronics, improved system diagnostics, new ergonomic design, and 40Hz high-pass filter. AMS' *Logic 1 Spectra* will now provide an on-line magneto-optical drive for recording and editing directly from a removable M-O disk; high-speed Exabyte back-up; a colour LCD active matrix, VGA resolution control surface screen. Neve will be showing *Flying Faders Junior*, a new compact version of the automation system; and *Capricorn*, the new all digital console. ● **Solid State Logic**, Stand 1324: will be exhibiting its full range of systems, plus major new features for the *ScreenSound* digital audio-for-video editor-mixer and *SoundNet* version 2.0. Also the first AES for the *Scenaria* digital soundtrack production system. ● **Sonex Acoustical-Illbruck Inc**, Stand 437: will exhibit the Sonex line of acoustical materials for recording studios, control rooms, film, video, and postproduction studios ● **Sonic Solutions**, Stand 1532: will exhibit the *Sonic System*, a modular digital audio workstation. This hard-disk-based production system provides 2 to 24 channels of digital I-O. Also featured will be *CD Maker* and the *NoNoise* sound restoration software ● **Sony Corporation of America**, Stand 0824: new products will be the *PCM-2700A* DAT recorder featuring absolute-time recording, balanced analogue I-O and AES-EBU digital I-O; *DPS-F* digital-dynamic-filter-plus processor features 10 filter effects algorithms. Also on show is the new *PCM-3324S* 24-channel DASH digital audio recorder, featuring 1-bit 64X oversampling A-D convertors and 18-bit 8X oversampling D-A ▶

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Studer's *Dyaxis II* hard disk recorder

units; and *C-800* and *C-800G* large diaphragm condenser vacuum tube microphones. Both mics use a 6AU6A vacuum valve, have selectable uni-omnidirectional patterns and a 20Hz-20kHz frequency response. ● **Sound Ideas**, Stand 1212: The Universal Sound Effects Library is launched at AES. This is a five CD package, each CD containing over 70 mins of material, comprised of over 1000 sound effects. Effects come from such feature films as *Jaws*, *Earthquake*, and *Buck Rogers*. ● **Soundtracs Plc**, Stand 1236: *Jade* is the new production console from Soundtracs offering DSP features and fader automation on both the inputs and monitors. Also included is the company's own FdB parametric equaliser on all channels. Also in display the *Solo* range of consoles and the new *Exiom* rack mixers offering up to 64 stereo channels, all with total recall and mix automation via a MIDI sequencer. The console is ideal for programming suites and MIDI studios where the mixer can be controlled on screen, ● **SPARS**, Stand 1438: the Society of Professional Audio Recording Services will be conducting educational and membership events. Information from their stand. ● **Spectral Synthesis Inc**, Stand 1630: featuring the *Audio Engine* digital audio workstation ● **Stellavox Digital Audio Tech:** exhibiting the *StellaDAT* portable R-DAT recorder with time code options ● **Stewart Electronics Corporation**, Stand 1135: featuring a line of amplifiers which use high-frequency-switching power supply technology ● **Studer Revox America Inc**, Stand 802: will show their full product line including the *927* in-line digital mixing console; the *D780* DAT recorder, the *D820-48* 48-track digital recorder and a US debut of the *Dyaxis II* multichannel digital audio system ● **Success Specialty Sales Corporation**, Stand 337: will feature splicing tape for high speed audio and video tape loaders and duplicators ● **Summit Audio Inc**, Stand 134: featuring hand-built vacuum tube compressors, equalisers and preamplifiers ● **Sunkyong Magnetic-America Inc**, Stand 1516: full range of tape products ● **Symetrix Inc**, Stand 415: full range of dynamic processors and signal processor equipment; also the *DPR44* digital recording-editing station ● **System Developments:** will show the *Cutting Wedge* wide-band absorber and a new Diffusor, the *Model P*

T● **T.C. Electronics of Denmark**, Stand 1235: full range of signal processing equipment including the *M500* DSP mainframe ● **Tannoy-TGI North America Inc**, Stand 1042: will show their new *System 6 NFM* studio reference loudspeaker designed with a 6 1/2-inch dual concentric transducer ● **Tapematic USA**, Stand 402: will exhibit their range of audio cassette loaders ● **TASCAM**, Stand 1524: full product range with new *DA-60* DAT player featuring confidence monitoring and time code facilities; *CD-601* CD player for broadcast use; *MMC-100* time code generator with MIDI machine control ● **TDK Electronics Corporation:** full range of tape products ● **TAD-Pioneer**, Stand 201: loudspeaker systems for touring sound and fixed installation applications ● **Techron**, Stand 1315: will exhibit the *TEF 20* spectrum analyser ● **Telex Communications Inc:** will display a variety of audio equipment including wired and wireless microphone systems ● **THAT Corporation**, Stand 401: showing their range of integrated-circuit voltage-controlled Amplifiers. ● **Theatre Craft:** magazine covering live events from lighting to makeup ● **3M-Professional A-V Products**, Stand 1002: will present a full range of tape products including *996* analogue tape ● **TimeLine Inc**, Stand 1641: featuring their range of synchronisation products including the *Micro Lynx* ● **Times One**, Stand 209: range of power amplifiers ● **TOA Electronics**, Stand 836: featuring digital console *ix-9000* and a new console; also signal processing in the *SAORI 3* 2-bit digital module ● **Trident Audio USA**, Stand 602: AES debut of the *Trident 90*, replacement for the *80*. ● **TubeTech-Audio Techniques**, Stand 540: range of signal processors ● **Turbosound, a division of AKG**, Stand 242: full line of loudspeaker enclosures including the *TFM-350* floor monitor ● **Turtle Beach Systems**, Stand 639: range of IBM sound editing products, featuring the *56K* Digital Recording System

UV● **UltranAnalog Inc**, Stand 1614: will show the *ADC20048* 20-bit A-D convertor among other convertor products ● **UREI**, Stand 718: Time-Align studio monitors ● **Vacuum Tube Logic Inc**, Stand 3026: no information received ● **Vega Wireless Systems**, Stand 1440: will display the *600 Series* UHF professional wireless microphone system using Dynex III audio processing ● **Versadyne International Inc**, Stand 101: showing the *1000 Series* high speed tape duplication system providing dual capstan drive, motorised tape wiper, and Saki ferrite heads on a plug -in assembly.

WYZ● **Waveframe Corporation**, Stand 1510: showing the *1000* and *400* system hard disk digital audio workstation and the new budget *401* system offering eight tracks at under £10,000 ● **Westlake Audio:** will be exhibiting the *BBSM* Series reference monitors. ● **Yamaha Corporation of America**, Stand 1102: featuring latest digital products the *DMC1000* all digital desk; *DRU-8* 20-bit 8-track recorder and also the full product line of mixers, loudspeakers and signal processors ● **Yorkville Sound**, Stand 629: will display *AudioPro* power amplifiers; *AudioPro* mixers' Elite speaker systems ● **Zoom**, Stand 736: range digital signal processors including the new *9000* guitar effects processor. ■

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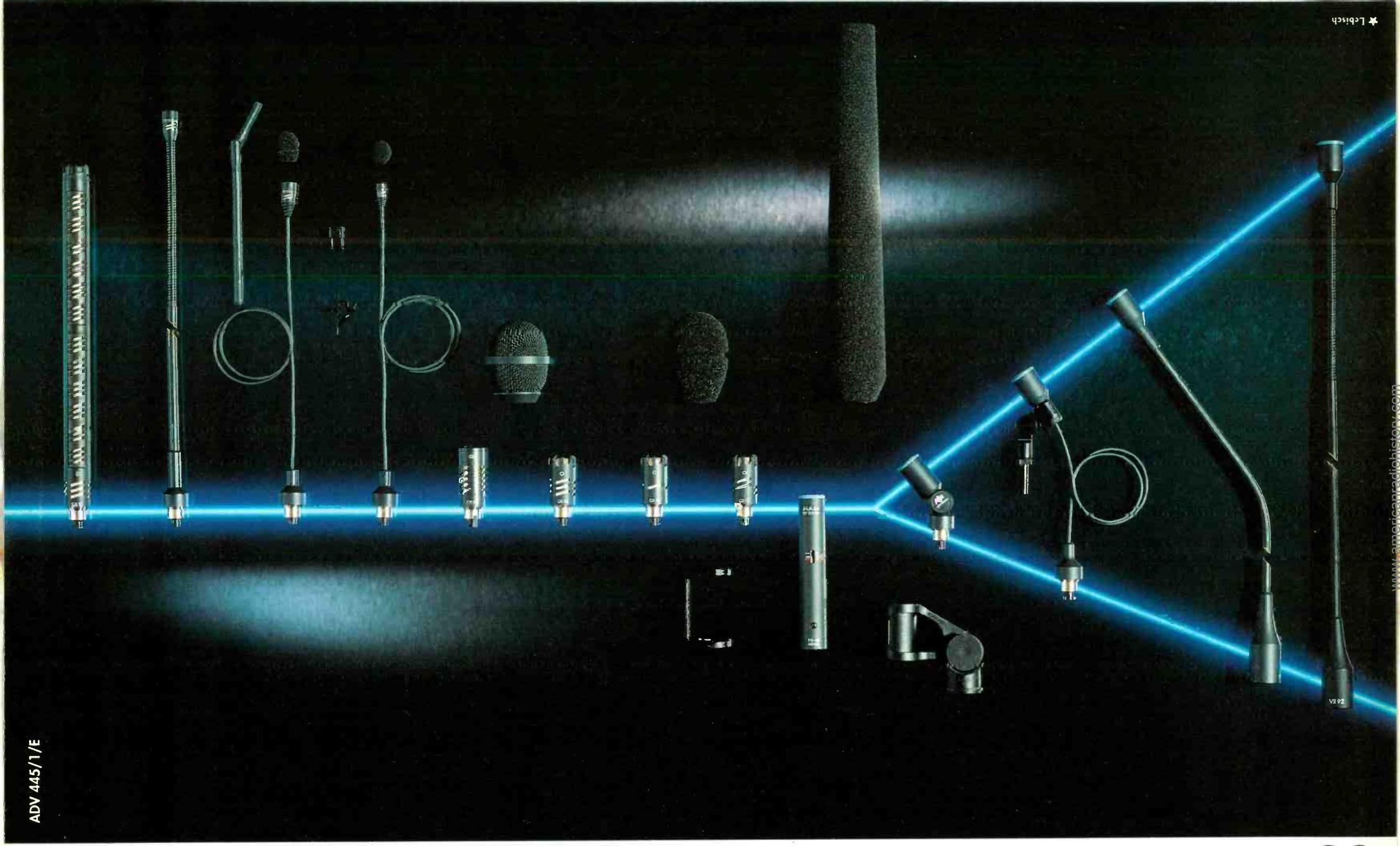

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COME IN, PORTUGAL

Portugal does not have a great name when it comes to international music, even at Eurovision but the recording industry is experiencing something of a boom. Julian Mitchell reports, while, studio designer, Philip Newell describes life as a resident

In 1975 Portugal had their revolution against a particularly restrictive dictatorship. Since then the Portuguese culture has been on overload trying to make up for lost time. The music industry included. Recording studios have begun to spring up and prosper, mostly in the capital city Lisbon, but also in the North, the industrial centre of the country, in Oporto. The British connection, still good after 900 years, is helping the recording community push its barriers.

Portugal is a country of 10 million people and at the moment, thanks to EEC grants, has the fastest growing economy in Europe. Although of those 10 million five could be described as being on the poverty line and from a record promoters point of view, untargetable. The music industry, up to a few years ago could be summed up by one musical style, *Fado*. This is the Portuguese blues, a soul-rendering wail with much Mediterranean passion blended with an Arab-based angst, born from the reign of the Moors, and these days performed at the drop of a travellers cheque in your typical Portuguese bar.

Therein lies a problem for your more progressive recording studio. *Fado* is by its nature is stripped bare of any complex musical content. So, as is the case in Austria with its popular Volksmusic (aka Oompah-oompah music), there is no reason to spend hours and thousands recording it. The result, poorly equipped studios with the thought of re-equipping seemingly a long way off. But as ever a few more travelled and more enlightened individuals are busy trying to reinvent the Portuguese indigenous music industry.

Discossete's first attempt at studios have become a stepping-stone

Discossete as a company has a worldwide reputation, but not for their recording studio, not yet anyway. They represent over 600 music publishing companies worldwide including BMG and Rondor. They were also one of the largest producers of cassettes in the country, hence the name. As a music publishing company, like many others they felt they needed their own recording studio for their own artists (of which there are about a hundred), signed to the Portuguese arm of the company.

These first studios were built a number of years ago and look it. The equipment is fair with a Soundcraft *6000* desk and a Studer multitrack, but the feeling there with the dark wood and faded paintwork hardly constitutes a creative Nirvana. It was only last year that the company decided to build new studios. Studios that could compete on an international stage.

PHOTOS: MICHAEL MITCHELL

Reflexion Arts monitors were central to the design

Enter the British connection in the form of studio and monitor designer Philip Newell. As he explains in *A Letter from Lisbon* (see sidebar) he was introduced to Discossete through Sergio Castro, a partner in a studio that Philip designed in the North of the country. Discossete had recently bought a basement flat in a tower block on the outskirts of Lisbon. The flat was opposite their existing studios and the idea was to build a new studio to improve the company's image and of course the sound of their artists.

You know you are in a developing country when a commercial recording studio can buy a basement flat in a 10-storey tower block in the middle of a residential area. The same thing in Los Angeles caused the Zone laws to be rewritten and a similar situation in London just wouldn't be allowed. No such problem in Portugal, even when there are bedrooms directly above the recording area and control room.

As a result of the site, the studio design had to feature a completely floating structure. In fact, three floated boxes were eventually used to make sure of the isolation. The studio worked with Sergio and Philip to advise on equipment and an initial list included a Raindirk *Symphony* console and the first Sony *PCM 3324A* digital multitrack in the country. Sergio Castro had bought a Raindirk for his previous studio Planta Sonica and was impressed with the sound quality, 'The sound quality of the desk for the price is quite superb. We were considering the *Optimix* automation but managed to get a very good price for a *Necam* system straight from the demo facilities at Neve, we also had a very good deal for the Sony multitrack.'

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Raindirk *Symphony* with Portugal's first ever digital multitrack at Discossete

The studio features a trademark, Philip Newell, granite live room as well as a similar-sized second recording area which is normally treated. The control room has flush mounted Reflexion Arts monitors and a small selection of outboard. Hiring in equipment is still a problem in Portugal and usual done through Madrid or even Hilton Sound Europe, so initially Discossete's equipment list will remain small.

The studio itself is not yet open and was just beginning testing a couple of months ago even though the rooms and equipment have been ready for a while. The decision not to push ahead with a full booking list was just one that seemed

Live room at Discossete

at odds with the way things are done elsewhere. Sergio Castro explains a for instance, 'Take the stairs down to the studio for instance, its a small space and there is no other access. We proposed making the stairwell as open as possible for flightcases and various equipment to come down. What happened was the stairs were turned the wrong way and now open up into the wall with no chance of getting anything big down. There's going to be trouble there.'

It could be said that there are problems like this in any new studio venture, but what you have here is a clash of the old and the new money. Portugal as a country is saying yes to every conceivable EEC grant offered, who can blame them. There is an enthusiasm about the place like a birth of a new country not one that is 900 years old! The recording studios are hungry for success and acceptance from recognised music centres like the UK is part of that. Mix that with the Portuguese *Amanha* philosophy and you have frustration and joy all in one go. ■

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A Letter from Lisbon

In the summer of 1985, I was asked to design a studio for a company consisting of Spanish and Portuguese people in Vigo, Spain, just north of the border with Portugal. The equipment revolved around an ex-Advision (London) 3M *M79* 24-track machine and the Raindirk console bought from Olympic (London) after its acquisition by Virgin. Other studios in the area were largely equipped by inexpensive, off-the-shelf, Japanese equipment which people in Britain would largely consider to be for home recording use. Despite the antiquity of the equipment at Planta Sonica, the sound quality was noticeably superior to that of most other studios in the area. They also had the advantage of a specifically designed control room, and an excellent granite live room.

Two of the Portuguese partners, Sergio Castro and Alvaro Azevedo, decided to follow up some enquiries from people wanting advice on studio building, after having heard the results or reputation from their studio Planta Sonica. In early 1991, some of these enquiries began to solidify into real projects and Sergio asked me if I could come over to Portugal to meet some of their prospective clients.

I am building studios based on Anglo-American concepts of materials and methods. When those materials and labour are shopped from the UK, then remarkably few problems exist, and by far the majority of the local people are exceptionally friendly and helpful. On the other hand, if one tries to use Anglo-American methods using local materials and labour, then chaos rules; working to times and budgets can be very difficult indeed to control. Chipboard for example, comes not in its accustomed 8ft x 4ft sheets, but in sheets of 2m 50cm x 1m x 88cm. The numbers will not divide conveniently and the sheets are so large and heavy that they refuse to pass down many staircases, a sudden gust of wind while carrying one can be very damaging to both people and objects, and strangely-sized off-cuts can produce considerable waste. Many people here have had to make do and mend, so the 'wastage' of materials is an anathema to them. In my budgeting, however, I cannot afford to spend half an hour of extra labour to save two ft² of chipboard, so the chipboard goes into the skip. We had one lady client who complained bitterly about this 'wastage' of materials. It was impossible to explain to her that large sections of materials were necessary for the acoustic design, and that ▶

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the off-cuts were of no use unless she wished to accept a degraded performance from the finished studio and higher labour costs. Furthermore, despite detailed explanations about the floating of the isolated rooms, when we went away she called in a local builder to literally cement them all together by laying marble slabs over a cement base in the corridors because she thought that it looked much nicer that way. Appearance again; the 'impress your not-so-knowledgeable-friends' factor was more important to her business than the acoustic performance. Because of the lack of previous yardsticks to measure things by, people get away with such things, especially as nobody dare question 'the boss'.

In the UK, the entertainment industry largely operates on first name terms, but here, the Portuguese equivalents of Mr and Mrs, and titles of authority and rank still prevail to a great degree; it is much more formal.

Many of the young people in Portugal are much better endowed with ecological awareness, but this does not seem too well distributed through the 'haves' and 'want-mores' of the older business types. For several years now I have refused to use hardwoods in any of my studio designs. I have noticed an element here however of 'to Hell with the rain forests, and what does it matter if some people die on the other side of the world, I want mahogany so that it will impress my friends.' I never was the best of businessmen, so my attitude has been 'well to Hell with you friend, go and find yourself another studio designer', many of them really do need to grow up.

Plasterboard does not seem to feature much in Portuguese building, indeed a request for such at the local builders merchants will bring an exceedingly puzzled look from the storeman.

Most of the studios which I have been building or have visited are located in the basements of blocks of flats. The buildings are made from a lattice frame of reinforced concrete which is begun by inserting vertical iron rods into the still wet foundations, shuttering around them, pouring concrete between the wooden mould around the rods, then stitching the rods for the next floor in the still wet concrete pillars and continuing the process upwards when the first floor pillars have set. Crossbeams are formed in a similar manner, then the entire lattice, but for the doors and windows, is filled in with hollow bricks which are them rendered with cement, and plastered on the inside. They do not use plasterboard for the ceilings, believe it or not they use the sort of wattle and daub, lime plaster and horse hair over thin wooden laths, which I remember my grandfather talking about. I do know that these techniques were in use in Britain in Shakespeare's day. The entire structures ring like bells and it is entirely possible to put one's ear to a pillar and hear the television three floors up. If anybody uses a hammer drill to put a plug in a wall to hang a picture, the whole population of the building is deafened. What is more, the plug probably will not take the weight of a large picture as the lime plaster is so crumbly and the hollow bricks have little strength, even if they did not shatter completely on the first application of the hammer drill.

The upshot of all of this is that sound isolation in such buildings is difficult. The only saving grace is that the Portuguese are relatively noisy people and someone in the block will probably play their hi-fi system till 3 am and completely swamps any minor leakage from the studio. Isolation problems can be solved, but the cities in Portugal are quite overcrowded and property is expensive, so people are reluctant to 'waste' available space on sound isolation which may be absolutely necessary.

It will be very interesting to see how things develop. What is a fledgling industry by the standards of more technically advanced nations, is developing from a different starting point. There is only a small number of people in the industry with any long-term experience of high quality recording systems. Few people have been brought up to expect high levels of performance for monitoring or room acoustics. The greater part of the industry is expanding from a base built largely out of Japanese, 'semiprofessional', inexpensive equipment and computers. I find many people who think only in terms of equipment, with little emphasis given to the acoustics or general 'ambience' in terms of aesthetics. This has no doubt been influenced by both the lack of available cash, and a predominant link with the outside world via the glossy advertising pages of the magazines.

What is worrying me at the moment is that many of the studios receiving highly complex new equipment, will install it on bare wires and treat it simply as a more expensive version of the Japanese semipro stuff, without realising that you have to upgrade everything in the signal path to achieve its full potential. Also the technical back up seems thin on the ground. I feel that they must stop muddling through and concentrate on attention to detail if the Portuguese recording industry as a whole is to join the mainstream. ■

Philip Newell

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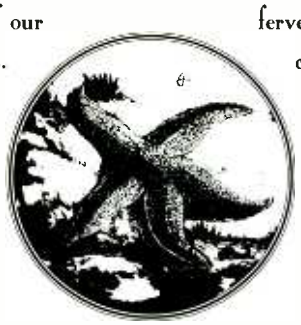

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SADiE* will run on an *IBM 386* or *486* running *Windows 3* 0r *3.1

SADiE

Yasmin Hashmi reviews this PC-based hard-disk editing system from fledgling UK company Studio Audio & Video

Although many have been persuaded of tapeless recording's benefits for some time, until recently it was affordable to relatively few. However, the personal computer has had much to do with bringing such technology to a wider audience — processing power has increased while costs have decreased, including the cost of practical amounts of storage.

With such a prevalent hardware platform, the personal computer has a major advantage over the proprietary system in that the popular brands have a wide base of system developers — enthusiasts dotted around the world who are not directly employed by the computer manufacturers, but who continually add to the system's range of hardware and software applications. It was inevitable therefore, that this third-party development process would extend to tapeless recording and that a host of relatively low-cost systems, particularly those aimed at stereo recording-editing would appear on the market.

One of the first of these was Digidesign's *SoundTools*, which is based on Apple's *Macintosh* range of personal computers and has done exceedingly well in terms of worldwide sales. Almost certainly due to its friendly operating system, the *Mac* has also become one of the most popular platforms on which to develop sampling and sequencing packages, but in terms of pricing, is still out of reach for many pockets. IBM *PC* or *AT* compatibles on the other hand are generally much cheaper and therefore promise to reduce the entry-level cost of tapeless recording further still.

Company background

The five founding members of Studio Audio & Video Ltd. were previously employed at Spaceward. This was originally a recording studio in Cambridge, England, which then went on to develop computer graphics. However, following an unfortunate dispute with Quantel, Spaceward found itself in difficulty and had to lay off most of its staff. Thus Studio Audio & Video was formed in May 1991 with the intention of designing digital-audio products.

Their first product was a plug-in card called *XS*, which was designed for IBM *PC* compatibles and was aimed at OEMs (original equipment manufacturers). It supports floating point DSP and SCSI and provides digital I-O only via SPDIF interface. Due to client demand, the next product was a complementary card to *XS* called *XACT* which provides analogue I-O as well as an LTC and MIDI interface. Although the cards are being used by OEMs such as OLE (who make the *Lightworks* system) and Cedar Audio, Studio Audio & Video anticipated that more OEMs would use them to develop tapeless audio recording-editing systems. However, after nine months only one company in Germany had expressed intentions in this direction, so Studio Audio & Video decided to design one for themselves hence the birth of *SADiE* (Studio Audio Disk Editor). Work started on *SADiE* at the beginning of March 1992 and the system was commercially available a few months later.

Hardware

The system will run on an IBM 386 or 486 running *Windows 3* or *3.1*, but records to a SCSI hard disk separate to that of the PC's DOS drive. The system is based on the *XS* card which uses a 32-bit floating point AT&T *DSP32C* processor (running at 50MHz) and supports AES-EBU and SPDIF via SPDIF connectors. It provides two inputs and either two or four outputs and allows 4-channel replay. The addition of an *XACT* card provides analogue I-O as well as MIDI and LTC. The system will generate time code as well as slaving to it (using trigger lock rather than chase lock).

Operation

The user interface consists of a colour monitor, alphanumeric keyboard and mouse. There is one main operating screen for recording and editing and a choice of various windows which appear as icons in a 'tool bar' at the bottom of the screen. These can be pulled onto the screen, placed anywhere and enlarged or reduced. One of ▶

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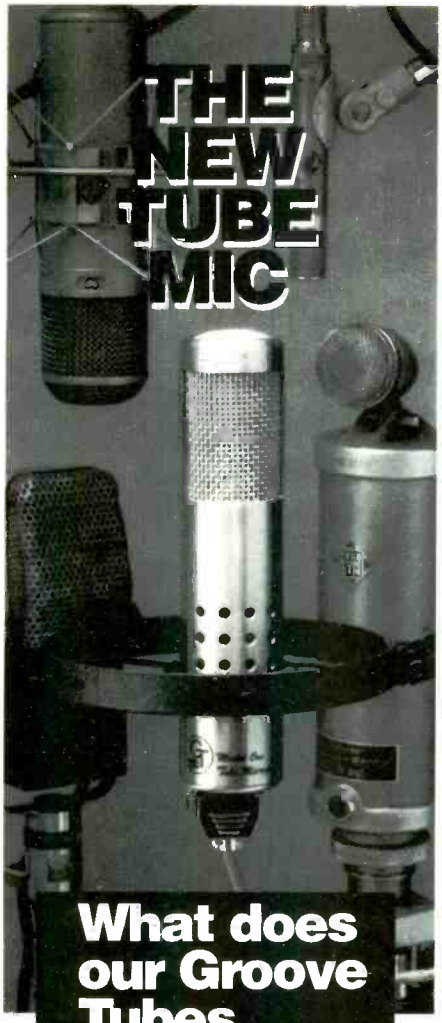

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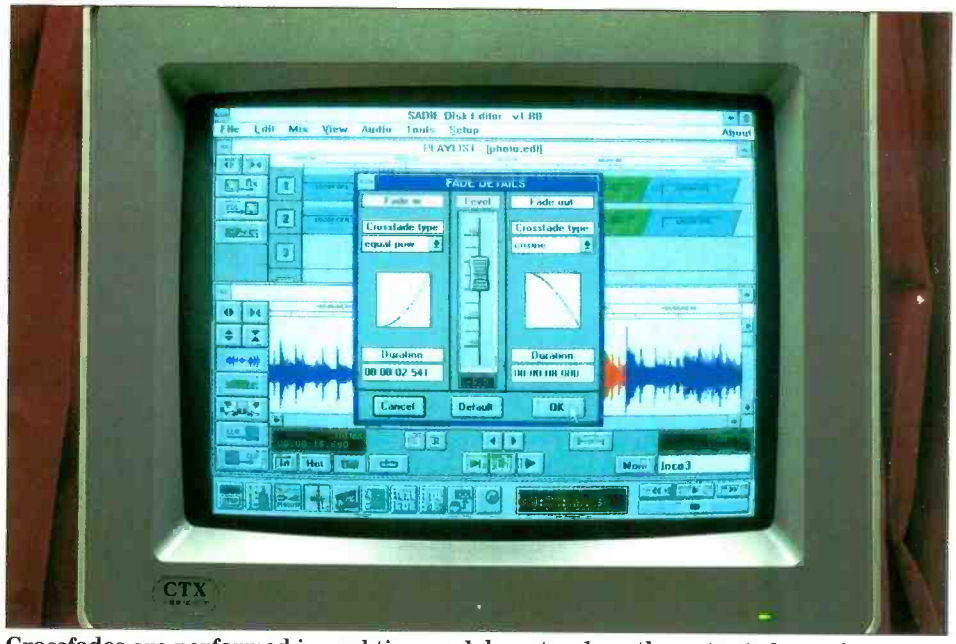

Crossfades are performed in real time and do not reduce the output channel capacity of the system

these windows provide transport control with a 10-memory autolocate and a sync mode which defines whether the system is acting as master or slave. If the transport window is not pulled on screen, a simple transport control appears at the bottom right of the screen. There is also a level control window with faders which digitally control the output level of each channel. This window also provides functions such as mute, solo, fader disable, peak display and a display which indicates how near the level is to absolute maximum. In addition, faders can be ganged and there is a PPM display for each channel.

Recording

The system supports sampling rates of 32kHz, 44.1kHz and 48kHz with a 16-bit dynamic range (although the hardware is actually capable of supporting 24 bits). Timings can be displayed in time code, samples or absolute time. To record, the RECORD button is pressed and a dialogue box appears in which the name (called Track)is typed and the channels on which the recording is to be monitored on are selected. Markers can be made on-the-fly and once the recording is completed the take name appears in a 'Clipstore'. This lists all takes recorded in a particular project, allows takes to be auditioned and provides statistical information on each take.

Editing

For editing purposes, an edit window can be pulled up which supports either mono or stereo editing. The selected take from the clipstore will appear as a waveform in the edit window and the mouse is used to select an area for editing — the selected area being highlighted in a different colour. Currently there is no scrub editing and transport controls cannot be used with the edit window. In and out points are defined by the selected area and can be nudged forward or backward. In order to establish where an edit point is aurally, the system allows auditioning up to, away from the through the point with adjustable pre and post roll and also allows looping between points.

The edit window allows cut and paste-type operations and crossfades to be defined by entering fade-in and fade-out durations for either side of the edit. Crossfades are performed in real time and do not reduce the output channel capacity of the system, that is up to four mono crossfades can play simultaneously.

Once a cue (called Clip) has been defined it can be saved in the Clipstore and-or placed in the playlist window. The playlist window is used for assembly editing (or sequencing) and displays four tracks with cues highlighted as blocks. Within a track, alternate cues are displayed in alternate colours and stereo cues have different colours to mono ones. If a cue is selected it becomes red and left and right channels of a stereo cue can be independently selected and edited.

There are various sequencing modes, one of which will automatically chain sequence (or butt joint) each cue as it is placed in a Track. Another mode will separate cues by a default amount. Alternatively, the user can freely place cues anywhere in the Track and overlay one cue on top of another. Unlike many other system, the overlaying cue will not mask that part of the cue being covered, but both cues will play simultaneously. So, for example, Tracks 1 and 2 can support four mono (or two stereo) cues playing simultaneously.

The playlist is designed to be similar in operation to Steinberg's *Cubase* sequencer in that any number of cues can be selected and globally moved, copied, etc. There is also the facility to lock successive cues such that if a cue is deleted, the cues which follow will remain where they are. Alternatively, an 'autoshift' mode will bring following cues forward to compensate for the removal of a cue.

The sequence in the playlist can also be displayed as an events list. This is not a pop-up window but a completely different page which displays cue names in their sequential order vertically. Next to each cue is its event time within the sequence, the name of the take from which it was derived, the cue's 'in' point (referenced to the source take), the duration of the cue, whether it is stereo or mono, which channels (or Tracks) it occupies and whether it has a fade or not. Parameters in the list can be edited such as cue name, event time etc. as well as the cue's 'in' point and-or duration. Although the events list is a textual representation of the playlist, both lists are not completely operationally interactive, in that a cue selected in the playlist will not automatically

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be selected if the user switches to the events list and vice versa.

Although events lists can be stored on floppy, the system does not currently provide archiving facilities. However, plans include the ability to archive source audio, cue information and events lists to any SCSI back-up device such as magneto-optical or DAT.

Future developments

Imminent new features include user-definable crossfade shapes and the ability to adjust the level of a cue. There are plans to allow the generation of cues on the fly (with automatic naming and placing in the playlist) and to allow an offset marker to be placed within a cue (that is allowing the event time to be referenced to a marker within the cue rather than to its 'in' point). In addition, the user will be able to save the configuration of the recording-editing screen as well as disabling certain function s according to the application-type of user.

Punch-in and looping within the playlist are intended as well as audio scrubbing and DSP functions such as segment-based EQ, dynamic range control, time compression-expansion, harmonising and dynamic level automation. There are also plans to allow 24-bit recording and to ability to add further cards for multichannel operation. The system's synchronisation will be developed to provide chase lock and there are plans to provide PQ subcode generation.

Conclusion

The *SADiE* system provides all the basic functions expected of a general-purpose tapeless recording-editing system such as generating and saving cues and placing them in an events list or sequence. In addition, it provides features which some higher-end system have yet to offer such as locking event positions and the ability to instantly access more than one arrangement, for quick comparison purposes, without having to close a project. However, some operation which are generally taken for granted such as being able to quickly type in an event position when in the playlist, or transport control and-or audio scrub to find edit points in the edit window are not yet implemented. Furthermore, the ability to archive all source and edit information is essential for most applications and if *SADiE* is to compete favourably, it must be able to provide this function.

These are early days yet for the system — as indicated by the extensive list under future developments. Nonetheless, the main operating screen and windows are already established, are easy to understand and are enhanced by the use of self-explanatory icons and helpful use of colour. Furthermore, the literature provided on the system is informative and honest. Having established a platform with sufficient headroom, Studio Audio & Video obviously intend to enhance *SADiE*'s capabilities through software development and promise to widen the choice further still in an ever-growing market. ■

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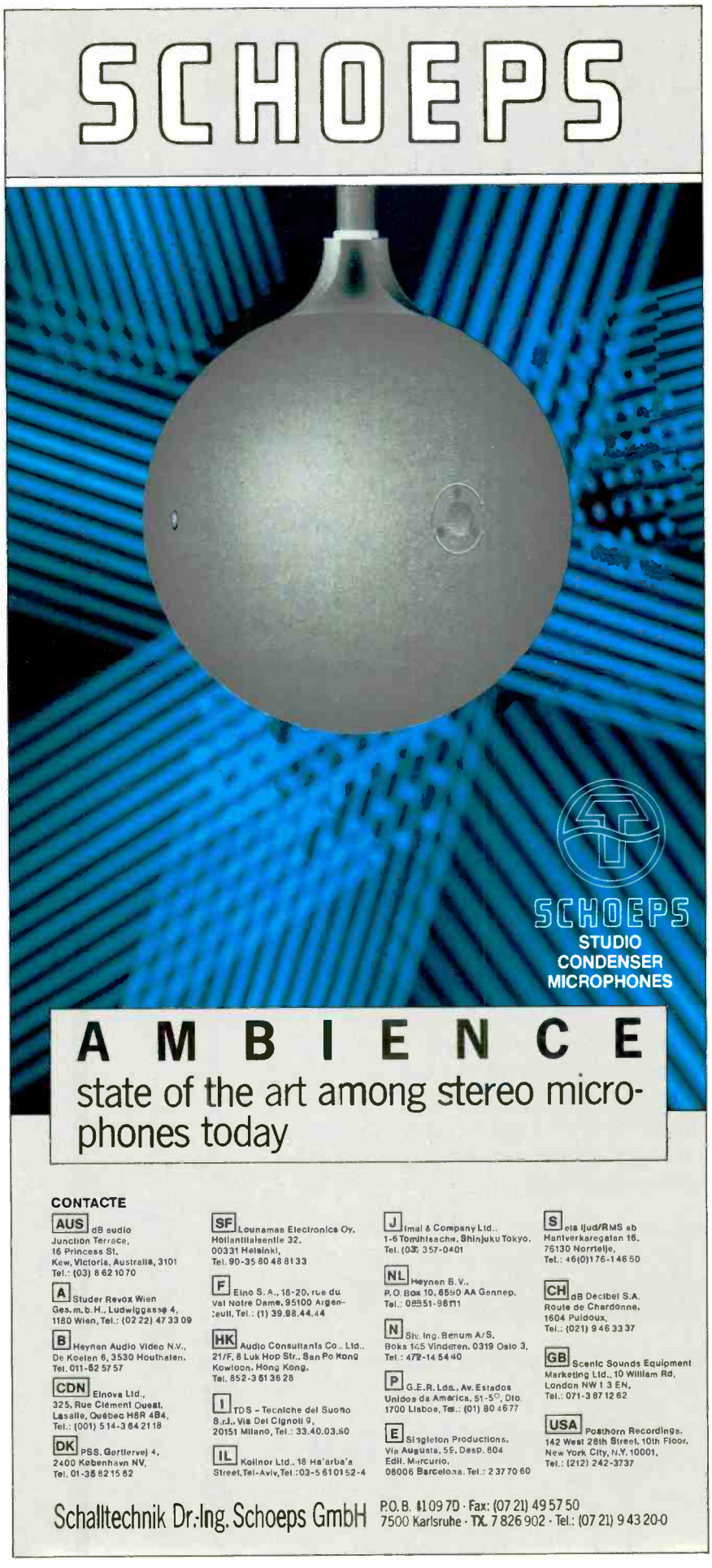

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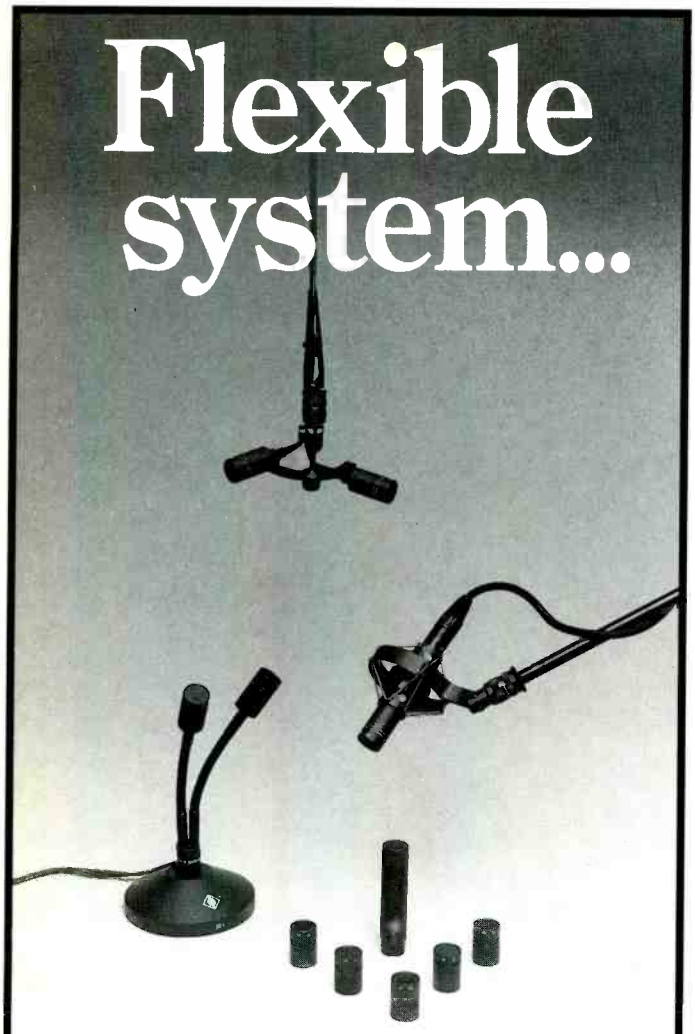

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ANALOGUE'S FUTURE

George Massenburg challenges those who would believe that analogue technology is yesterdays' technology

Among audio professionals, the mention of analogue equipment is likely to foster an image of its digital counterpart. And vice versa. The two domains seem to exist as opposed poles; conversation between partisans may reveal near-religious convictions. For some of us, the differentiation between analogue and digital — the first mention of the words jointly, in fact — was most likely in engineering school in the '60s when analogue computers frustrated even patient experimenters, and the digital computer was held up as the promise of the future. This pattern has repeated itself over and over again. When recording studio professionals speak of 'digital' and 'analogue' without further qualification, we often assume a discussion of storage media; and storage is an area where professional digital formats seem to outperform most professional analogue formats. For most of us today, these terms symbolise more than competing technologies.

Digital audio fits so perfectly into a once-uniquely American and more recently a Japanese sense of reality: a reality having an inconsequential past, a fleeting present, and a perfect future. In one of the first press announcements for the CD format Philips advertisements trumpeted 'Perfect sound forever'. Hardly a week goes by that an new, essential, application of digital technology isn't announced. There are such clear advantages to applying technologies based on determinate forms and functions that manipulating digitised audio data seems a panacea. Forgetting about errors and assumptions in conversion to a digital representation, ignoring errors in storage and transfer and neglecting rounding errors in calculations, the data is long. Furthermore, the instructions for the processing of digital data are soft, so to speak, and current methods greatly extend the capabilities and simplify the maintenance of such systems. Finally, and most importantly, extraordinary functions are made possible, and are extremely stable.

In the linear-analogue domain, techniques for processing and storage are certainly well advanced along the learning curve. On one end of the application scale, analogue components are still the choice for more modest applications not involving storage (hi-fi amplifiers and cassette recorders). On the high end of the that scale, analogue recording methods have never been better, able to resolve musical performance with detail, ambience and great bandwidth. In the not-too-distant past, Bob Ludwig made a comparative study of the number of pop albums, hit albums, made in one format as compared with the other — and analogue was the overwhelming favourite. And as recently as last year, audio cassettes were still the format of choice for the distribution of commercial music.

It is further instructive to remember that for many musicians, digital 'somethings' are not necessarily acceptable replacements for analogue 'somethings'. Musical instruments such as violins, acoustic pianos, guitars, saxophones, (not to mention the singing voice) continue to offer the virtuoso artist a far richer palette than digital replacements. Even drum machines have had their weaknesses revealed (not the least of which if the inability of commercial machines to offer acceptably small latencies), and live drummers are getting more work than ever.

Digital computers, digital tape machines, digital audio workstations, digital synthesisers and the like may be sexy technology, but with so much past experience in linear systems, it is clearly a mistake to make quick assumptions based on apparent elegance and simplicity in some particular, perhaps transcendent, application of 'digital' technology, and to assume that the world will soon be digital.

The physical universe is exceedingly detailed, ornate beyond comprehension — infinite — and almost never thought to be bounded at larger than molecular proportions. In fact, to exchange data between a purely numeric system and the 'real' world it is almost always necessary to carefully adapt our transducer-convertor-interface and to narrow the scope of the measurement. In like fashion, sound in nature is at once subtle and eloquent. We are aware of no substantial evidence that sound is generated, transmitted, or experienced in some ultimately-determined, even-quantum fashion that might eventually yield a direct conversion to pure data domain. In addition, for playing recorded material, our transducers and their influence on listening spaces are primitive compared to the capability of human ear.

No acoustic transducer as yet comes close to convincingly capturing a broad range of sounds in a variety of natural spaces without very specific preconditions but what transducers there are, are most certainly analogue. We are just beginning to computer-simulate acoustic dimension and ▶

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The Focusrite with GML automation at Conway Studios in Los Angeles

directionality. Presentation systems, as in the home or in theatres, are not much more evolved in principle today than in the late 1950s. If the technology break (taken here to mean the technological discontinuity at the transition between analogue and digital methods) has been significant in improving the quality of the storage and distribution of recorded material, it has not significantly improved the sound or vitality of best musical performances, and has merely improved the status quo.

Of course, what is often considered to be a simple, linear path in audio electronics seldom remains so under scrutiny. If we have learned anything, it is that given enough resources and incentive there are improvements to be made almost everywhere. In the 1970s amplifiers improved with the knowledge about tertiary disturbances like transient intermodulation distortion. Magnetic tape is still being improved. Even the lunatic fringe in consumer audio occasionally comes up with breakthroughs that contribute to the body of knowledge regarding artifice. In the domain of extremely high-resolution analogue audio there is a world of data, increasingly ambiguous data, as one approaches, even moves below, the noise floor. And ambiguity notwithstanding, these signals are meaningful to the ear. Current analogue-to-digital convertor design rules tend to assume resolution of ambiguity rather than to attempt to convey the greatest signal detail. Most designs fall woefully short of conveying important low-level detail and a purely analogue domain is demonstrably superior in retaining this sort of detail. For instance, it is easily demonstrated that one of the more accessible artifacts, real errors, of current low resolution, low bandwidth conversion techniques is the loss of 'air' or ambience, or low-level reverb.

From this and the way we' are heading in conversion technology we can assume that the future of applied analogue technology will be required to produce something better, perhaps more compatible with the ear; one can only hope for, say, a 24-bit ranging convertor. No matter that an advanced noise-shaping A-D convertor relies more and more on exotic number crunching; it is internally dependent on a fast, accurate, linear A-D and D-A convertor whose performance determines the unit's effectiveness.

So, is that it? Once perfect conversions have been made, is anything and everything easier and maybe cheaper in the data domain? Or do we run the danger of ignoring the real world once again? Is higher education in digital design engineering producing the equivalent of today's MBA? Are we going to have a cadre of smug digital bean counters whose goal is perfecting the science of manipulating numbers without an artistic context or further accountability? Hopefully, there will still be those who will be willing to use their ears in evaluating equipment and, more, have the courage to describe the rather subtle differences that are heard.

If engineering is the science of compromise, then the art of engineering is the search for increasingly subtle factors that further the ostensible state of the art. The ability to make audio research a creative science means judging and valuing these many factors in perspective — often working independently of cost and cost-related marketing considerations, and certainly from other prejudices such as the 'sexiness' of a technology.

One can only conclude that there are at least two significant, perhaps irreplaceable, future roles of analogue systems. New linear technology will contribute to vastly improved interface and, certainly, conversion technologies. And we will continue to be mindful of certain linear-analogue processes; systems that exemplify the purest form of high resolution technology, systems whose performance will serve to benchmark and calibrate our hearing and thinking for generations to come.■

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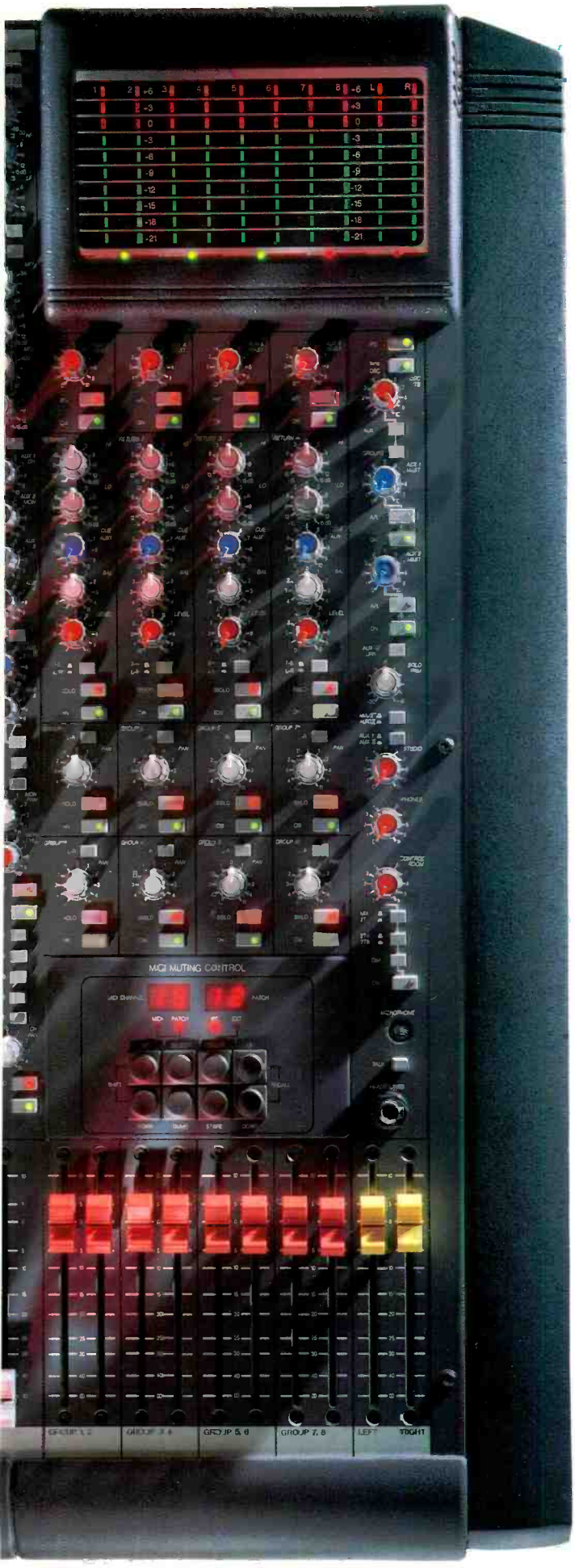

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THE BIT BOTTLENECK

Much has been made of recent 20-bit recording, but how do the techniques fit in to a 16-bit medium. Francis Rumsey explains

Although considerable interest has been generated over the past few years in professional recording at resolutions above 16 bits, there is considerable misunderstanding over whether the benefits of such improved resolution can be passed on to consumer media such as the CD. DAT and CD were not designed to store more than 16 bits per sample, and their formats do not allow them to be extended beyond that, so there is no point thinking that some clever technology will suddenly allow 20-bit CDs to be produced. Nonetheless there are ways of making the best of the 16 bits available, and these techniques can have beneficial effects on sound quality, passing on to the consumer some of the benefits of 20-bit original recording. Furthermore, low bit-rate consumer formats soon to appear on the market, such as MiniDisc and DCC, may have an apparent dynamic range which is marginally better than that of 16-bit linear PCM (depending on the programme material) thus making it worthwhile to master at higher resolution.

20-bit recording

Convertor technology is such that it is now possible to design convertors with a real resolution of around 20 bits. In other words, not only are 20-bit samples produced but even the LSB contains useful information. This requires a very stable clock frequency and the use of a range of advanced design techniques to ensure linearity, stability and low jitter. Using a 20-bit A-D convertor it is possible to achieve a better dynamic range than with 16-bit convertors, and this either makes it possible to be less careful with level settings (such that some headroom may be left to accommodate unexpected signal peaks) while still ending up with a good 16 bits of dynamic range, or to use the whole 20-bit window, controlling peaks to be near full scale. The important point, though, is that the professional's recording system has an edge over the consumer's replay system, which is a useful position to be in.

A number of issues arise, however. Firstly, there are not many professional recording formats capable of handling 20 bits. Secondly, there aren't many editors around capable of handling 20 bits. Thirdly, how do you ensure that the improved sound quality gained through 20-bit original recording is not going to be lost when transferred to CD? And fourthly, what possibility is there for extending the capabilities of 16-bit professional recorders so that they have improved dynamic range?

20-bit formats

As Mitsubishi are keen to point out, a version of its *X-86* two-channel recorder will record 20 bits, using Mitsubishi's *HBC20* A-D convertor and is seeing current use in the field of classical music - Tchaikovsky's *Symphony No 4 in F minor Op 36* as performed by the St Petersburg Philharmonic Orchestra (conductor. Yuri Temirkanov) having recently been recorded by BMG in St Petersburg and postproduced at Finesplice in the UK.

There are also a number of third-party 20-bit convertors on the market which have AES/EBU-format digital outputs. The problem is that the professional is rather stuck for alternatives if he does not want this machine, except for the recently introduced *Nagra-D* machine which is designed more for portable use with pictures and has four audio channels. Sony has modified the 2-channel *DASH* format to accommodate 20 bits, calling the format *DASH-X*, but these machines are currently only used by Sony Classical for its own CDs, such as the forthcoming release of Verdi's *Don Carlo* performed by the New York Metropolitan Opera (Conductor: James Levine). Presumably this is to give them the edge over other record companies. The DAT format will not accommodate 20 bits, neither will Sony's *PCM-1630* CD mastering system.

As for multichannel formats, Yamaha is the only company currently to offer 20-bit recording using its *DMR-8* system. This is a custom cassette-based format which allows eight-channel units as required. Neither the PD or *DASH* multichannel formats allow 20 bits.

From an editing point of view, clearly a 20-bit recording must be edited with a 20-bit editor, and, in the interests of saving disk space, most hard-disk editing systems only record to 16-bit resolution. One exception here is the Sonic Solutions system which will store up to 24 bits per sample if required, with a pro rata increase in the disk space consumed. Since 24 bits per sample is half as much again as 16, and hour of stereo at 48kHz would require around 1Gbyte of storage. Many users, though, regard this as a small price to pay for the capability to edit high resolution masters.

16-bit enhancement

For the professional without a 20-bit recorder, it would be valuable to investigate ways of enhancing the performance of 16-bit systems.

Since the golden rule of digital audio is that you can not get out of a recording any more than you put in, it makes sense to use the highest quality A-D convertors possible. Most recordings remain in the digital domain all the way to the consumer's player, and it does not matter how good the D-A convertors in a consumer CD player, they cannot compensate for distortions introduced in the professional's A-D stage — they will simply reproduce them more faithfully! Most recorders have digital inputs and these can be connected to an external high-quality. A-D convertor from a third-party source. Although such convertors may be capable of 20-bit resolution, they can usually be dithered correctly for 16-bit resolution. Correct dithering is vital to ensure that the optimum sound quality is achieved for the resolution intended, and there is absolutely no point leaving the convertor in 20-bit mode when a 16-bit recording is being made. The result will in fact be worse, not better than the convertor used in 16-bit mode.

High-quality delta-sigma A-D convertors use oversampling and noise shaping to improve the signal-to-noise ratio of the recording, and this has the effect of removing much of the quantisation noise to a frequency outside the audible spectrum. Another feature of such convertors is that the noise floor does not always remain entirely constant as the signal level changes. In a number of cases the noise floor drops at low signal levels and increases slightly at higher levels, whereas in simpler convertors the noise level remains relatively constant.

Recent work by Louis Fielder and Elizabeth Cohen, published in the AES Journal in May this year [1], suggests that with the listening level adjusted for peaks of 110dB SPL (a high domestic listening level) the noise spectrum of a particular high-quality CD player using the right amount of dither in the source material lies below the threshold of hearing at almost all frequencies, except that it rises just marginally (1dB) above this threshold at the ear's most sensitive frequency of 3-4kHz. An average 16-bit professional recorder's noise spectrum only rises slightly more than this above the hearing threshold in this part of the spectrum, suggesting that unless exceptionally high listening levels are used in the home it is probably not noise that will be the ▶

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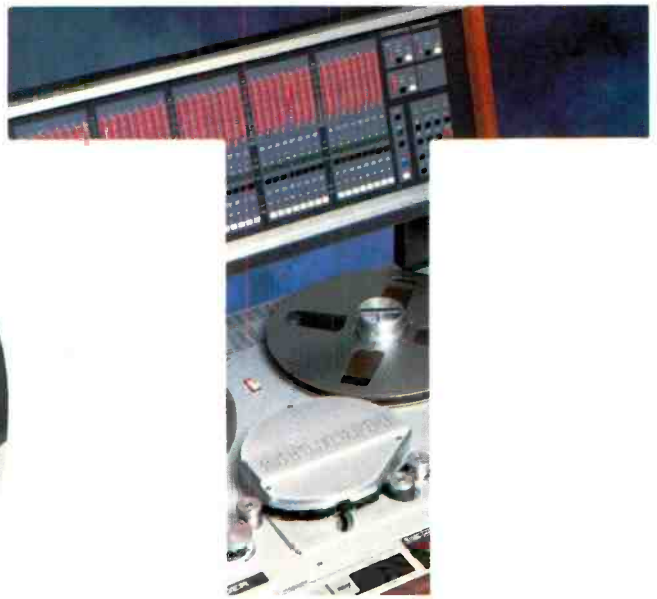

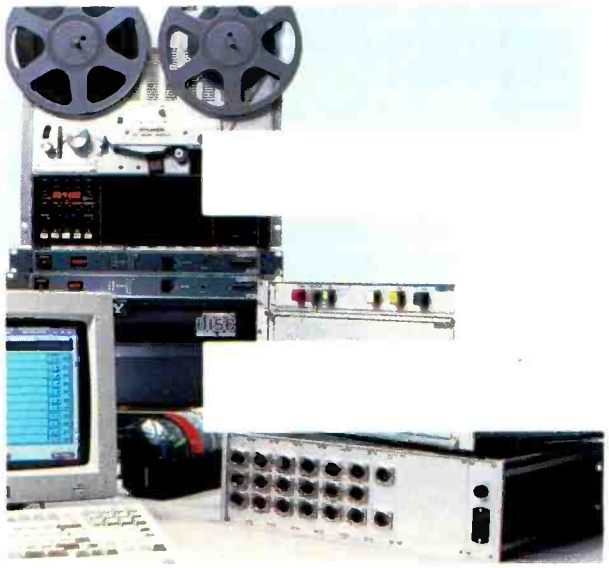

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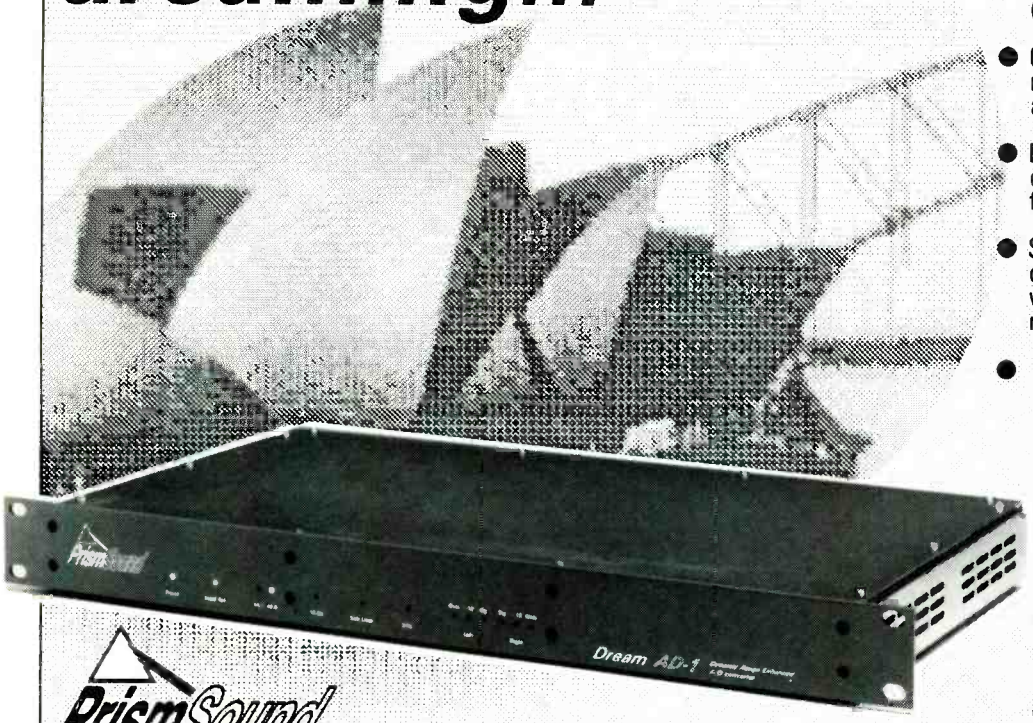

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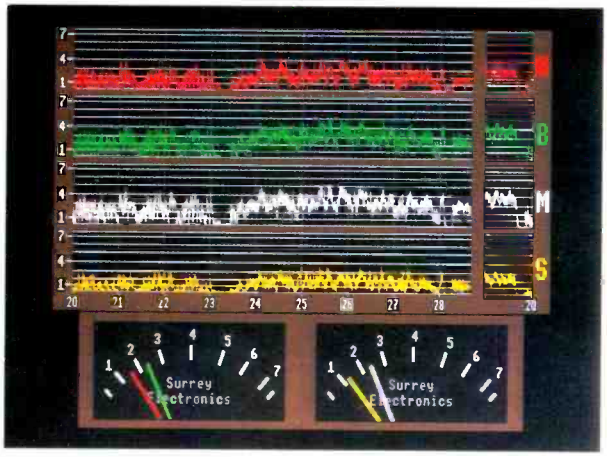

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The 20-bit ready Mitsubishi X-86 2-channel recorder

limiting factor for sound quality.

It is very difficult to specify a noise floor for a digital system that has a useful meaning in real situations. It has been suggested that the noise floor in the presence of small signals is much more meaningful than the quiescent noise floor, and systems differ quite considerably in this respect. It is quite possible for a system to show a phenomenally low noise floor in the absence of signals, but to sound dreadful at low signal levels due to the nonlinearities created by incorrect dither, clock jitter and other effects. The spectrum of the noise is also a vital factor to consider, since it is the shape of the noise spectrum related to the ear's sensitivity spectrum that will dictate how audible that noise may be. Thus single figure noise specifications for digital convertors should be regarded warily.

At a recent AES lecture in the UK, Julian Dunn of Prism Systems demonstrated a preliminary version of the company's DRE (Dynamic Range Enhancement) algorithm which is designed to be used as a means of improving the perceived dynamic range around a 16-bit bottleneck such as a multitrack or two-track recorder. He compared 16-bit digital audio undithered, dithered, noise-shaped and then subjected to the DRE process, each stage of which resulted in a lower level of perceived noise. The DRE process is intended to be used rather like an analogue noise reduction system in that audio data is passed through the DRE process before recording and then passed through a complementary DRE process on replay. Although the company is not prepared to give away much concerning the method by which the extra dynamic range is achieved, Julian did suggest that it had to do with the fact that listeners were prepared to accept a small increase in noise at high signal levels in order that lower noise could be achieved at lower signals levels, owing to the masking effect of high level signals on noise. He quoted a well-liked delta-sigma A-D convertor which exhibited similar characteristics as partial justification. In any case, the proof of the pudding will be in the eating, and potential purchasers or licensees will be able to judge for themselves whether they like the resulting sound quality.

Postprocessing

For the 20-bit recordist and postproduction engineer the task is to ensure the highest quality on 16-bit CD. A number of techniques can be used to adjust the gain of the 20-bit master if necessary and to reduce its resolution to 16 bits. These range from straightforward truncation, through bit-shifting and re-dithering at the new resolution, to the latest Sony development called 'Super Bit Mapping'. ▶

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Control Room during Sony's *Don Carlo* 20-bit sessions

Truncation is the worst possible solution, and involves simply losing the four least significant bits of the 20-bit word. Without re-dithering the result of truncation is very unpleasant low-level distortion. If a 20-bit source such as a Mitsubishi *X-86* were connected to a 16-bit destination the result would normally be the straightforward truncation of the four LSBs. Rounding of the 16-bit sample's LSB depending on the value of the lost bits is a slight improvement over simple truncation.

The addition of dither noise in the digital domain at the point where resolution is reduced is a suitable means of improving the distortion situation, and this has been implemented on some digital interface processors such as the ADT *FC-1*, and in professional digital mixers. The Sonic Solutions' editor also has various dithering algorithms for this purpose. The process randomises the quantising error that results from truncation by adding a pseudo-random number sequence of controlled amplitude and spectrum to the incoming audio data. If the full 20-bit dynamic range has not been used (if headroom has been left, for example) it may be possible to bit-shift the 20-bit samples upwards before truncating and redithering, such that more of the MSBs are used, thus losing less of the information contained in the LSBs. This is achieved by a simple chain of gain in the digital domain prior to 16-bit transfer.

In the recent revision of the AES-3 interface standard (AES/EBU interface)[8], provision is made for much more careful definition of the sample resolution, such that receiving devices may optimise the transfer of data from a transmitter of different resolution. Byte 2 of the channel status information can now be used to indicate both the maximum audio word length and the actual number of bits used in the word. Standardisation work has also gone on within the EBU to determine how analogue signal levels should relate to digital signal levels, especially since

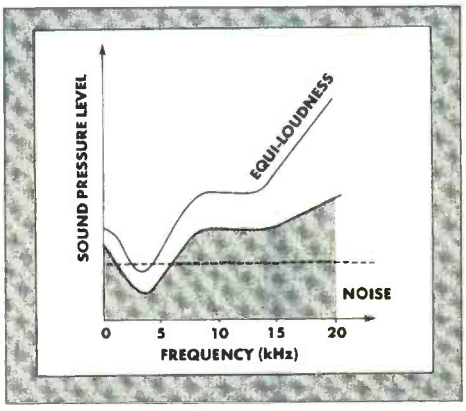

Fig.1: Noise shaping process

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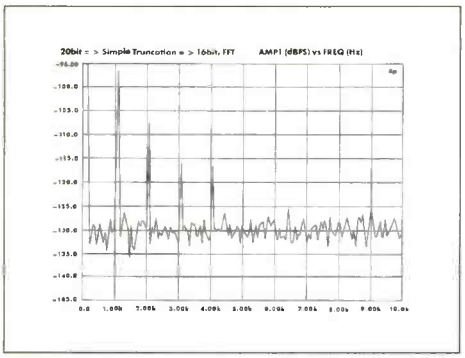

Fig.2a: 16-bit data, transferred from 20-bit master by truncation

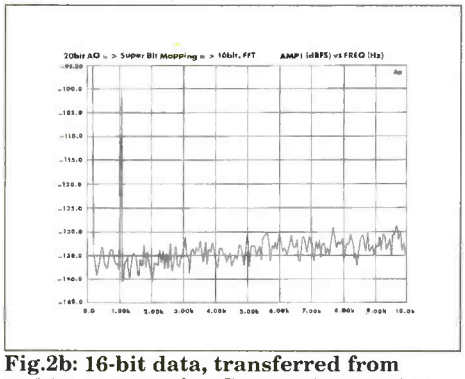

Fig.2b: 16-bit data, transferred from 20-bit master using Super-Bit-Mapping process

20-bit recording can be used on the audio tracks of digital video recorders. The conclusion reached was that one could not rely on correct implementation of Byte 2 of channel status in devices using the AES/EBU interface in all cases, especially in older equipment, and thus that the only practical argument was for the same relationship to be used between analogue and digital levels, irrespective of the number of bits[3].

Originally EBU *R-64* specified that analogue alignment level (corresponding to a meter reading of PPM4 or 0dBU electrically) should be set to read 12dB below full scale (0dB FS) on a signal system. This was based on the dynamic range available from typical 16-bit convertors, and assumed that the finished programme's level would be well controlled. Since 16-bit convertor technology has improved, and since it was necessary to use the same alignment for 20-bit systems, the new draft recommendation now specifies alignment level to be 18dB below full scale. This allows for an additional 6dB of operational headroom. Clearly such considerations are only really important in a mixed analogue and digital world, and will become less important in a fully-digital system.

Sony 'Super Bit Mapping'

Sony's bold claim that its 'Super Bit Mapping' (SBM) technique will allow 20-bit performance from 16-bit CDs is based on the use of a new noise shaping process in the conversion of 20-bit masters to 16-bit format. The SBM process analyses the quantising error which would result from the loss of four LSBs, and subjects it to an algorithm which shapes the spectrum of the error so that is lies below the threshold of hearing. As shown in **Fig. 1**, the noise spectrum level is made to rise considerably above about 4kHz, with the majority of the noise being placed above 12kHz, where the ear is least sensitive. Although the hearing sensitivity curves would suggest that some noise could also be shifted to the LF end of the spectrum, listening tests conducted by Sony proved that such noise and distortion spectrum of an original 20-bit signal using a 1kHz tone at low level is worsened considerably by simple truncation to 16 bits (see **Figs 2a,2b**). Using the SBM technique the noise level in the 16-bit version is reduced and the harmonic distortion disappears. Although this is an extreme contrast it illustrates the point. A CD produced in this fashion is still not truly '20-bit', although it may have a perceived dynamic range which seems almost equivalent.

Conclusion

Although 20-bit recording systems are not widespread at the moment, the use of the technology is growing and it is highly unlikely that the next generation of professional systems will be limited to 16 bits. In order to obtain the best sound quality when transferring to consumer media with lower resolution some of the techniques above will be useful, and for those still working with 16-bit formats a number of approaches are possible which may make best use of the dynamic range available.■

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The rear hall will feature a unique system of ceiling-to-floor sliding partitions

AIR MOVEMENTS 5

With a session already booked for December, Air Lyndhurst is taking shape. The latest report from Patrick Stapley

It is now exactly two years since Dave Harries moved offices from Oxford Street to Lyndhurst Hall. Since then, the completion date for the new Air Studio — originally set for March this year — has drifted further and further into the future. Since our last report, however, and despite one or two hiccups, things have progressed a long way, and the end is now very definitely in sight.

Working from the top of the building down; the five bedrooms in the roof space have all been completed, each having an *en suite* bathroom or shower room (two include small balconies with far-reaching views over London). The room itself and lantern have all now been fully restored, and air conditioning louvres have been sympathetically added to comply with English Heritage requirements.

'English Heritage have actually been very good,' says Harries, 'and we've obviously abided by everything they've said. If it wasn't for organisations like them, buildings like this would simply not exist — they'd all be demolished or turned into blocks of flats. So we're really grateful to them for that, but we're a bit cheesed-off they've never offered us a grant considering the restoration of the building alone has cost virtually half-a-million pounds.'

A feature that English Heritage showed little interest in was a curious and inherently dangerous Victorian air conditioning system discovered in the lantern. Harries explains: 'It consisted of a big gas-burning ring with a 10-foot diameter tube filled with hanging iron baskets of clinker material. These baskets would be heated up and

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then they'd open these triangular flaps in the ceiling rose below. The heat from this contraption would pull the air up from the hall, and fresh air would be sucked in from small air vents around the base of the building. It was an early type of air purging system, and we actually offered it to the Science Museum but unfortunately the whole thing was dumped in a skip before they had a chance to look at it.'

On the floor beneath the attic bedrooms are two mastering rooms, one of which is to be equipped with Sonic Solutions, the exact use of the other is still to be decided. Further down the corridor the residential lounge and kitchen area is taking shape, although there appears to be some dispute whether this will become George Martin's office instead. The fine 18th Century fireplace that was stolen from the building in 1990 and rediscovered in an antique shop in East Finchley, has been fitted in here.

The second floor Remix Room, the first floor Remix Room and the ground floor Control Room for the rear hall, are all structurally complete. The three rooms stack one on top of the other with the basement acting as the supporting raft. Ceilings were built first by constructing a steel frame that hangs from the vertical steels on rubber Tico pads. Rib decking was then pop-riveted to this and six inches of concrete poured on top, leaving out preformed holes to allow for air conditioning. The air conditioning and services were then put in place and tested before the floor above was constructed, as once this is cast, everything is sandwiched beneath a further 10 inches of concrete.

It is, of course, essential that a ceiling-to-floor void remains between rooms to ensure proper isolation, but this very nearly did not happen. After finishing the ceiling in the top Remix Room it began to bow quite noticeably; according to specifications this type of construction will move by up to 9mm, but in this case some of the structure was distorting by as much as 30mm. The concern was that it the same thing should happen to the floor, where the gap was relatively small in places, there may be danger of an acoustic short. All parties involved, from manufacturers to concrete layers, got together to try and establish what had gone wrong. According to Harries, everybody was quite happy to blame everybody else but nobody was prepared to take responsibility. In an attempt to quickly get things moving again, plans were hurriedly redrawn to increase the depth of the void by reducing the floor thickness. A test section was then constructed which was found to meet specifications perfectly, making them confident that whatever had caused the problem had been corrected. As far as the bowed ceiling is concerned, it has not presented much of a problem, although there has been some difficulty with level fixings.

All three Control Rooms have been fitted with Machine Rooms and artist relaxation areas which can double up as overdub booths. Speaker enclosures are now in place to take the hybrid Air-Andy Munro monitors currently being built and tested.

'Air have built their own speakers for many years but this time we're doing it in conjunction with Dynaudioacoustics,' says Harries. 'In the ground floor Control Room and the main hall Control Room where we want left-control-right monitoring over the window, it's very difficult to provide the number of units that you'd want in ▶

Speaker enclosures are now in place in the main hall Control Room for the hybrid Air-Andy Munro monitors

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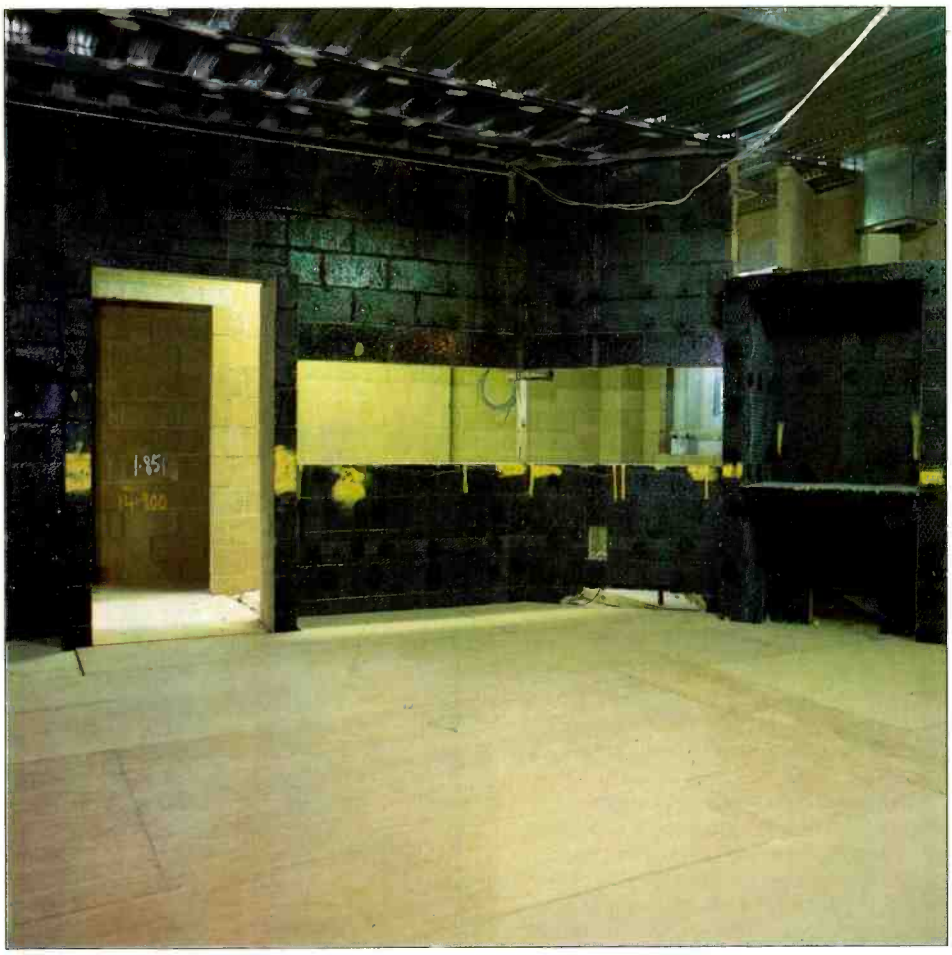

The Solid State Logic *SL 8000* Remix Room is now structurally complete

the space that's available. There certainly isn't a standard monitor that could fit there, so we have to build our own anyway, and we're developing that design at the moment with Andy. The units have been specially designed to suit the conditions we're going to install them under, they've got extra Ferrofluid, extra damping, different magnets, and different surrounds from the standard Dynaudio drivers. Its all quite experimental, but we've been very pleased with the initial tests. The surround speakers will probably be in pretty standard cabinets, and in the two Remix Rooms we're making the centre speaker floating, so if people don't require them we end up with a spare stereo system that can be used somewhere else in the building.'

The A-V postproduction area is also taking shape with staggered studwork showing the outline of the various rooms. The largest is to be fitted with a *Logic 2* (Air's second) and will include a small voice-over booth. The original plan to provide a Pioneer laser disc suite has been shelved due to Pioneer delaying the opening of their Wakefield factory. Apparently the American factory that produces all the NTSC discs has the capacity at present to produce enough PAL discs to supply Europe. Consequently alternative uses have had to be planned for the area including a preproduction *AudioFile* room with a built-in Foley stage. The use for the third room is presently undecided but *CD-I* seems to be on a number of people's lips. Also included in this area is a workshop and a large central Machine Room which will initially house the *Logic 2* racks and video machines. The view for the future is that instead of wheeling machines from room to room they will remain in one area and be networked. Air have also announced that dubbing engineer Cliff

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Jones, from Thames Television, will be joining them in the near future.

The downstairs rear hall now has a floating floor which is effectively a large concrete platform supported on piers capped with the ubiquitous Tico pads. Underfloor heating has been added and once the original wood block flooring has been put back, the whole structure will be 3.3-ft deep. The next stage will be to add the internal walls which will feature convex glass sections over the existing windows resulting in quadruple glazing (external glass cover, original stained glass, internal glass cover, and glass wall). A false plaster ceiling will be added, reducing the height of the room to the top of the windows, and where the curved glass sections meet the ceiling, high-end diffusers will continue the convex shape across. The room is also to feature a unique system of ceiling-to-floor sliding partitions designed by the German company Huppe. These double-glazed partitions move on tracks and will divide the room crossways at one of three points. Once in place, a special mechanism seals them top and bottom, and when not in use they simply fold away against the side walls. The system that was originally designed to Air's specifications.

The base of the lift shaft has been fully excavated, but in digging out the last few feet the builders hit another problem. The shaft which is six feet deeper than the basement started to fill with water; rather alarmingly the bottom of the shaft collapsed and a large amount of clay beneath the adjacent cottage (which was being used for office space) was washed away. The pressure of the water was actually so great that it caused serious seepage through the basement walls, even though the whole area had been fully tanked. To release the pressure a well has been sunk with an ▶

The office is now being turned into a games room with a restaurant beneath

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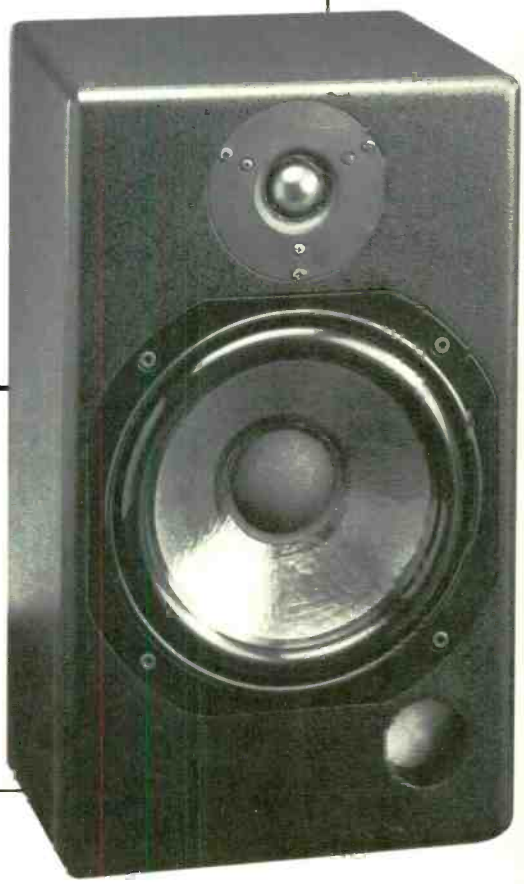

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automatic pump to drain off the water once it reaches a certain level.

The lift shaft had intercepted a watercourse, which possibly may be part of the river Fleet. This area of Hampstead is known as 'The Vale of Health', because in Victorian times many wells were dug to take advantage of the spring water and its reputed healing properties. Harries had (has) the idea of pumping the water up to a fountain in the reception area and bottling it.

'Some of the lads drunk it and said it tasted very good, so we sent it away to be analysed. It does, in fact, have a very high mineral content, but unfortunately there were also slight traces of sewage. We're going to have it retested, though, just in case one of the builders had a pee in it!'

The space between the cottage and the main building is to be turned into an atrium with York stone paving. The reception area will be built into the front end of the cottage, the rest of which will be turned into a ground floor restaurant and first floor games room. So far Air are resisting temptation, as they had in the past, to incorporate a bar. The studio manager's office and bookings office, which features a large coffin-shaped skylight, are presently being built into the main building and will face out onto the atrium.

The A-V postproduction area will feature Air's second AMS *Logic 2* digital console

Of all the areas in the studio complex, the main hall is nearest to completion. Already RT measurements and listening tests have been carried out in the control room with encouraging results. The scaffolding has all been removed from the hall, but, unfortunately, some of it will have to come back due to an irritating accident that occurred as the floor was being screeded. The mixture used to screed the floor was brought into the hall by a concrete pumping machine, and during this process a hose split spraying the vaulted ceiling. The ceiling had just been finished in a violet-blue colour (Harlequin Blue), and it had taken 14 coats of paint to get the correct finish. Harries estimates that by the time the scaffolding is re-erected and the ceiling is cleaned and repainted the cost will be in the region of £8,000.

'The weird thing about it is that just before the accident they'd removed this old memorial plaque dedicated to some missionaries who'd died in South Africa. It was all smashed up and covered in paint, totally beyond repair, but when the hose burst it was in exactly the spot where the plaque had been.'

The original wood-block flooring from the hall is to be put back once the screed has dried off. Each of the three-inch thick blocks has been sawn in half and carefully matched to make up the numbers lost to rotten or missing sections. Air have recently set up their own carpentry workshop to deal with all their joinery requirements in what used to be Syco Systems premises; another North London facility, Livingston Studios, is providing warehouse storage. When the wood floor has been relaid, the organ, which was sent away to Walkers & Son to be cosmetically restored, will be returned. The same company are also restoring the pews which will provide seating in the galleries for approximately 300 people either as audience or performers. Air estimate that the main hall should be capable of seating 700 if the floor area is used as well.

A corridor that originally provided access to the rear of the organ has been widened and reinforced to take the weight of 14 tons of tapes, and a concertina-type racking system is shortly to be installed to maximise on available space. This area also offers a good vantage point down into the main hall through a series of thickly glassed-over archways. The end of the corridor will be used as a Plate Room.

At the moment the hall has quite a long decay time (approximately four seconds), and to offer a variable acoustics, Air have come up with the idea of an acoustic canopy. The tent-like structure, which is to be made from treated sail cloth, will winch up from the centre of the ceiling to cover the floor area at different heights.

October should see the Control Room fully fitted and ready for the arrival of the Neve *Legend*. The main hall will be the first of the four studios to be completed, followed closely by the rear hall. Harries envisages the complex opening with some work still to be done on the upper floors, but with the two ground floor studios fully operational. Whatever the situation the main hall must be ready by December 13th when a charity concert has been booked for the Prince's Trust. ■

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Ian Silvester and his three cascading Yamaha consoles

GANG OF THREE

One year after he looked at Yamaha's *DMC1000* Patrick Stapley sees it in action at three different studios

Since looking at the *DMC1000* digital console in prototype form in the April '91 issue of *Studio Sound*, Yamaha have sold in excess of 150 units with a staggering 50 going to Deutsche Grammophon alone. To find out how people are using and liking this now established product, we spoke with three users — West Heath Studios, Deutsche Grammophon, and London Post.

West Heath

West Heath Studios were acquired just over a year ago by Eric Woolfson and Ian Silvester. Woolfson (who is 'the other half' of the Alan Parson's Project), is presently using the studio to compose new material, while Silvester (who is a digital-audio consultant), also runs a rental business from the premises. The facility has a single studio featuring three cascaded *DMC1000*s which can be linked to the various digital equipment including two Sony *3324*s, DAR *SoundStation* and a Yamaha *DRU8* 8 track digital recorder.

'With the three consoles there is no format I cannot handle, and there is no format-to-format transfer I cannot do,' says Silvester. 'If someone wants to copy from, say, a Sony multitrack to Mitsubishi, I can do a totally transparent one-to-one copy. There's no other desk that allows you to do that at the moment.'

By cascading the three consoles 48-track operation becomes a reality. Each desk offers a total of 22 inputs 8 channel inputs, 8 monitor inputs, and 6 additional inputs associated with the stereo channel inputs, and 25–48 on monitor inputs, the remaining 18 inputs are then used for microphones, keyboards, and effects returns (both internal and external). The last desk in the cascade chain globally controls monitoring, apart from Mono and Dim functions which can be switched from any of the three desks — Silvester would like to see this approach taken for all monitor functions, allowing the operator full control from whichever desk he is currently working on.

The system offers four auxiliary buses. ▶

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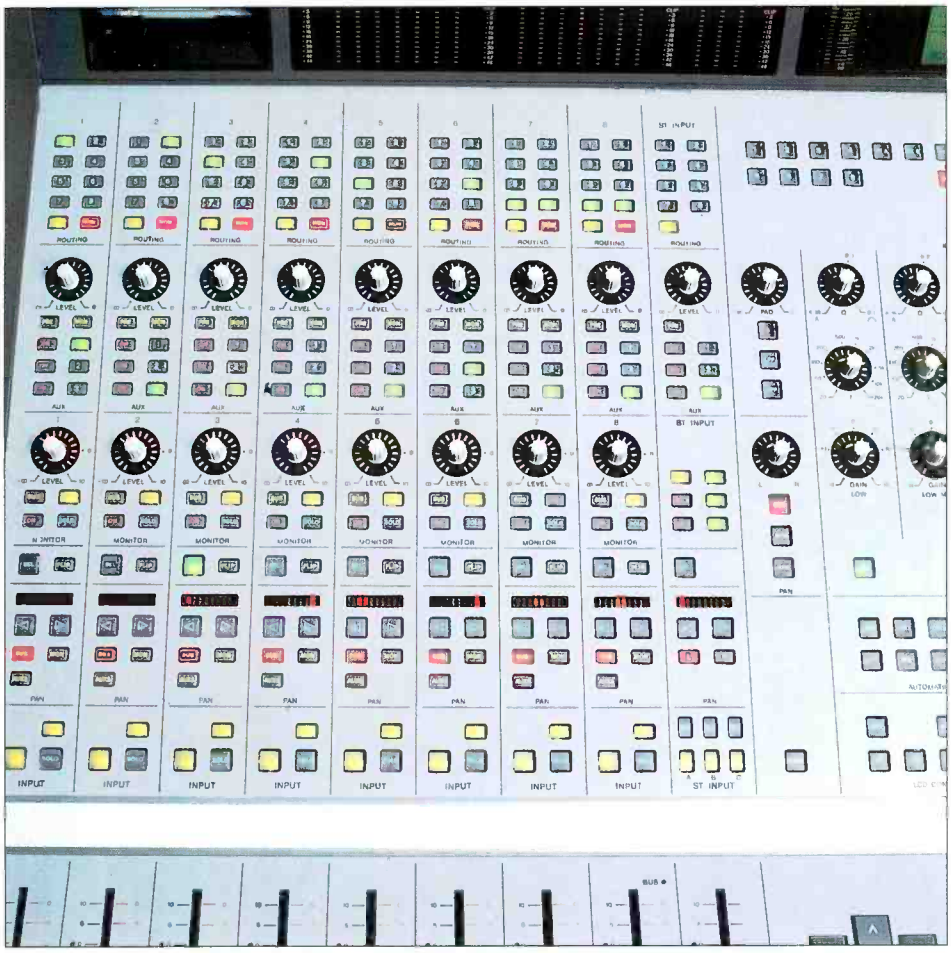

Each desk offers a total of 22 inputs

Originally these could only be accessed from either the channel or the monitor path, but Yamaha's most recent software, now allows simultaneous access from both paths — an essential requirement for the way West Heath operates. To add extra sends the 8-group buses may be used in the traditional manner during mixdown, but here again only one path has access, and Silvester is currently talking to Yamaha about dual access.

Being an 8-bus console, the three desks can be arranged to send tracks 1–8 from the first mixer, tracks 9–16 from the second and tracks 17–24 from the third. Obviously this is not always going to be the ideal arrangement, and even with track parallelling there are going to be items when a digital patchbay is essential. Yamaha supply patchbays (IFU5A-B) for the console, but Silvester has found it necessary to build his own.

'If you don't have a digital patchbay you then have to realise the limitations of the desk. Yamaha supply 24 or 32-channel bays providing inputs and outputs between the console and the machine in blocks of eight. Basically that works fine because you're going into something and out of something, but what I've done is take it a stage further and build a bay that allows you to insert into different parts of the desk just like the sort of patch one expects to see on an analogue console. Now two years down the line, we're not going to need this type of patchbay because everyone's going to realise what's going on inside the digital console and that you can manipulate the audio within the desk itself'.

The cascading element of the *DMC1000* is particularly useful for Silvester, when it comes to his rental business.

'The beauty of the system is that I can rent out one of the consoles and still have a fully

DN728
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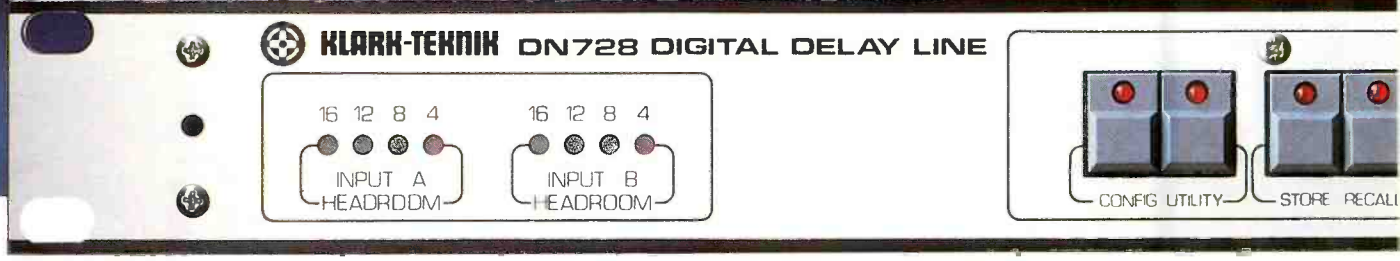
New flexibility adapting to any audio environment.



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It's equipped with true 18-bit linear processing for matchless audio quality.

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Silvester, 'The system is extremely portable so effectively we have a studio setup and a mobile rolled into one.'

operational 24-track studio; instead of having a 66-into-2 setup, we've got a 44-into-2 mixer. The other thing is that the system is extremely portable so effectively we have a studio setup and a mobile setup rolled into one. For me it's much more useful having a console in sections like this'.

Apart from using the console for 24 and 48-track recording, Silvester has also employed it for postproduction mastering purposes.

'I've recently done some album postproduction work using the desk with a hard disk editor. By dialling up an EDL, I can programme in all my level and EQ changes totally off line at the relevant edit points, so when the song changes over or crossfades on the hard disk editor, the desk will follow suit. Now that's great because it means that you don't have to dedicate anything onto hard disk or off hard disk onto tape.'

So what about the sound of the console? Abbey Road engineer-producer Haydn Bendall, who has been working with Woolfson, gave me his impressions.

'With most cheap mixers that's what you end up with — cheap sound. We actually did an experiment at Abbey Road Studio 1, where we paralleled the outputs of Massenberg mic amps to both the SSL and a *DMC1000* and recorded the results to identical digital machines. The Yamaha really knocked the spots off the SSL; the difference was stunning, it was so incredibly clean and ▶

For quality, it combines true 18-bit linear processing with an effective 200kHz sampling rate, giving all the benefits of a 108dB dynanic range, flat 20Hz-20kHz phase and frequency response – and a 5μS resolution for critical time settings.

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Alan Silvester and Hadyn Bendall

there was an amazing sense of realism — it was like opening the door and walking out into the studio. I'm continually shocked at how a particular standard becomes acceptable, and it's only by doing comparisons like this that you really find out the differences.

'I do have one criticism though, and that's the inclusion of the *SPX1000*. I'm convinced that the only reason *SPX1000*s are popular is because they're cheap, not because they sound any good. For a little extra they could have added REV 1s which would have matched the professional quality of the rest of the consoles'.

Deutsche Grammophon

Deutsche Grammophon produces somewhere in the region of 120 recordings a year, making them the most prolific classical music label in the world. To deal with this volume of work, the company can have as many as seven all-digital mobile recording units out on location at one time. Additionally, the Hannover-based recording centre has 10 remix rooms and host of editing and mastering suites. Taking this into account, their requirement for 50 *DMC1000* becomes more understandable, especially as they sometimes cascade up to four at a time.

The *DMC1000* is now the only console to be used by the company, and Yamaha have developed software specifically for their requirements. Klaus Amman, Deutsche Grammophon's Director Of Recording, explains.

'We actually became involved in this project three to four years ago. Yamaha showed us their first designs and then the console was changed to meet our demands. We were the first client to use it, and as we did so we made further changes. So our software gets called Deutsche Grammophon software which is entirely different to the standard issue in every respect.'

Another difference is the use of 21-bit A-D convertors which are exclusively built for Deutsche Grammophon by Yamaha — although according to Amman they intend to install 24-bit convertors by next year. The D-As are currently 20-bit Yamaha.

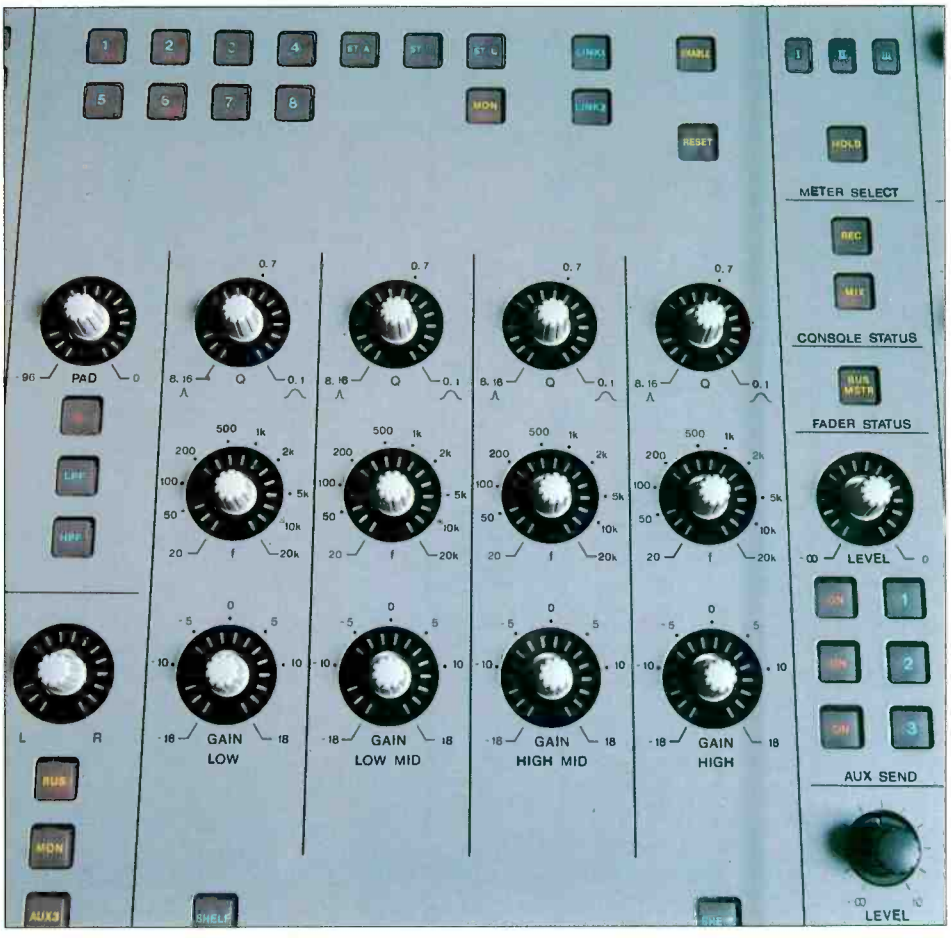
Amman believes the console has played a significant role in enhancing the quality of the companies recording: 'It's as if you wore glasses that were not very clean, and then you polished them, everything suddenly becomes much clearer.'

Having heard Haydn Bendall's criticisms of the *SPX1000*, I was interested to get Deutsche Grammophon's reaction.

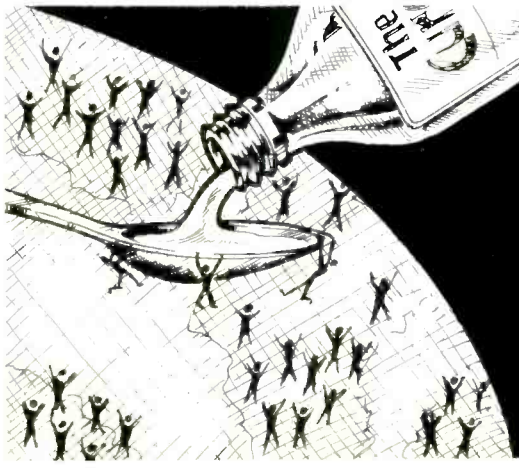
'We consider it as a free gift, but it doesn't fulfil our demands, the quality is not good enough. The overall processing quality of the console is excellent, the equalisation is excellent, but for reverberation processing we would rely on the Lexicon *480L* which is interfaced to the console digitally.'

Amman views the console as a highly sophisticated computer and trains his engineers on it for a minimum of six months.

'It's extremely complex and if you don't understand it fully you can make many mistakes, so we make sure our engineers fully understand every possibility including automated mixdown. The automation is something we use all the time now, not only does it save time but it also saves tape — we used to mix in sequences and then edit them together, but now we can do it all within the



Deutsche Grammophon's Klaus Amman, 'The overall processing quality is excellent.'



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system.'

Deutsche Grammophon also make novel use of the *DMC1000*'s recall capabilities.

'We preprepare a floppy here at The Recording Centre with the main setups that we estimate will happen during the recording; all are engineers are Tonmeisters so they are musically trained as well as electronically trained, and they'll go through a score and work out the setups required and write them onto the floppy. Also during the recording, we take snapshots whenever a change is made to the console, so that we can easily reset it — a typical opera might have 30 or 40 of these snapshots for example.'

'We generally try and keep the number of microphones as small as possible, but we are prepared for recordings like Mahler's *Eighth* where we use 24. We tend to have straight technology — 24 mics, 24 A-Ds, 24 channels, and 24 tracks, soon we'll also have 24-bits.'

London Post

London Post is a year-old video editing facility with four on-line edit suites and a separate postproduction studio with a *DMC1000* and Audiofile *16 Plus*. Technical Manager Dave Hunt told me what had inspired their decision to install the desk.

'The first decision was the *Audiofile* and then we set about finding a desk. The only cost-effective digital console was the *DMC1000*, and in fact it's great for *Audiofile* because it provides 8 bus outputs and 16 inputs. However the slight problem we had was that although the desk provides 16 inputs only half of them are AES-EBU and consequently we had to convert eight of the *Audiofile* outputs to SDIF. So we feed the first eight tracks from the *Audiofile* into the channel inputs, and tracks 9–16 into the monitor inputs via format conversion cards. It's a shame that Yamaha couldn't have provided 16 AES-EBU inputs in the first place.

'Another thing we discovered was that the 18-bit A-Ds within the *DMC* were not really as high quality as we would have liked — they have improved them but the noise floor is about 80dB, so we've installed 20-bit Drake A-Ds for our high quality microphone inputs.

'Apart from not needing an orangutan as an operator, it means that the installation is a lot tidier and compact, and we don't have to make room for a rack of electronics. The quality apart from the things I've mentioned is excellent and the automation is very powerful.'

The resident dubbing mixer at London Post is Steve Rogers, who, before working on the *DMC1000*, was using a Soundtracs desk with *Tracmix* automation. What were the benefits for him?

'To start with there's no problems with noisy switches, and the overall sonic quality is very high. The EQ is excellent and can be quite dramatic, it's also very easy to see what's set up — I originally thought the visual aspect was going to be a problem, but you get so used to focussing your attention on the assignable EQ panel and pressing the appropriate select buttons that it becomes second nature. The automation is very useful — for example when I've done foreign versions of a programme, I can recall all the original mix and just update it in the relevant spots. Of course the fact that the whole desk is automated including the two *SPX1000* processors make the system much more powerful than a conventional automated console, and I find that helps me work faster.'

What do clients make of it?

'A lot of the clients we have aren't interested in the technicalities, what they want is to see and hear a good programme. Having said that though, if they can see a few faders moving up and down and you can recall patches quickly, they do perceive that the sessions moving quicker and they get the impression they're working in a hi-tech environment with some new and exciting equipment, which ultimately reflects well on us. There are certainly projects that have come here and stayed here because of that.

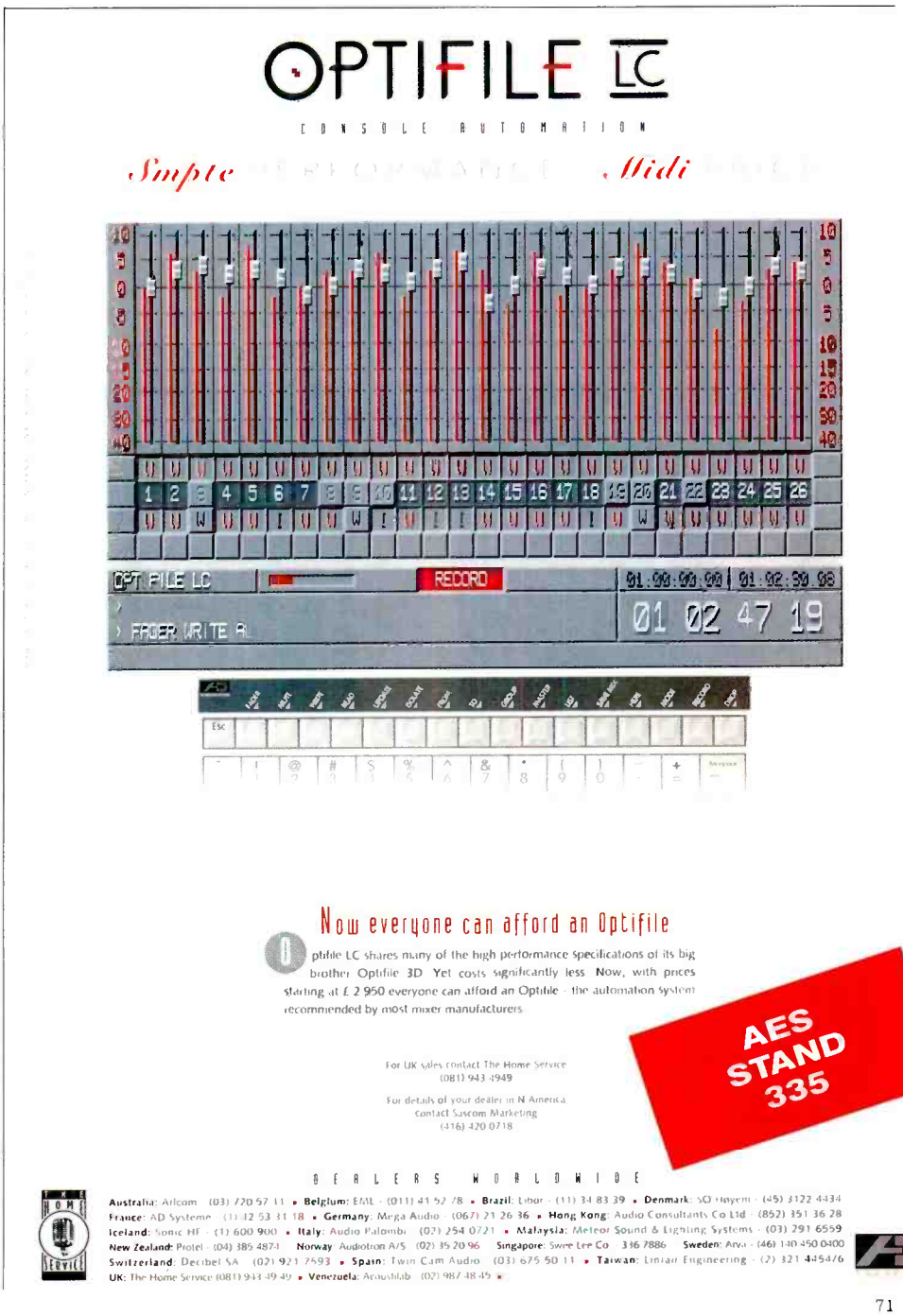
'It's little things, like in the middle of a mix the client might suddenly find he has an emergency voice over to do, and instead of it being a major headache with loads of repatching, it becomes a simple and fast procedure. There are also lots of housekeeping things, for instance someone can come in who isn't particular familiar with the desk, but by simply recalling a snapshot, they can be completely confident the desk has been set flat; similarly different working configurations can be stored, and I keep about ten different desk setups that I regularly use.

'I think that word's going to spread about the *DMC1000* in the postproduction world, and in rather the same way that people have grown very reliant on *Audiofile*, I can quite see producers booking a studio because it has a *DMC1000*.'

It would appear that the *DMC1000* is suited to a variety of applications; consequently it is having to satisfy a wide cross section of demands and become all things to all men. But, as the manufacturers are always keen to tell us, it's only software and anything is possible. In Yamaha's case, this is probably not far from the truth.■

UK: Yamaha-Kemble, Sherbourne Drive, Tilbrook, Milton Keynes. MK7 8BL. Tel: 0908 36 6700.

US: Yamaha Corporation of America, 6600 Orangethorpe, Buena Park, CA 90620. Tel: +1 714 522 9011.



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EMI digital desk

Dear sir, may I point out to you that the idea of a continuously variable fader using a rubberised belt ('Fading Fast' by Tim Frost, *Studio Sound*, August 1992) is not novel. When we at THORN EMI Central Research Laboratories were working on digital audio studio equipment for EMI Music in the late 1970s our experimental all digital control desk had similar faders designed using optical encoders to generate digital control signals.

Also incorporated in the design were assignable controls for EQ, logged control settings for status recall, visual display of status, etc.

This experimental console was installed at Abbey Road Studios in April 1980. It was used in parallel with the main control room for many classical sessions. However for financial reasons EMI did not proceed further with the development of a larger console or with the manufacture of digital multitrack machines, so essential if it was to be used as the prime console in the control room.

It is interesting to note that a Neve *Capricorn* digital desk is about to be installed in the Penthouse Studio.

The digital desk from EMI that never went into production

Reg Willard, CRL, Dawley Road, Hayes, Middlesex. UB3 1HH, UK

No Soft Cell

Dear sir, thank you very much for your most excellent article in the August edition of *Studio Sound*. We were pleased with the tone and quality of the writing and were absolutely delighted at being on page 9!! We are already receiving enquiries as a result of this feature.

We would like, however, to point out a minor error of fact you have made. Mark Almond has never been a client of ours. Perhaps there was some confusion, since another client, Mark Edwards, has worked with Mark Almond.

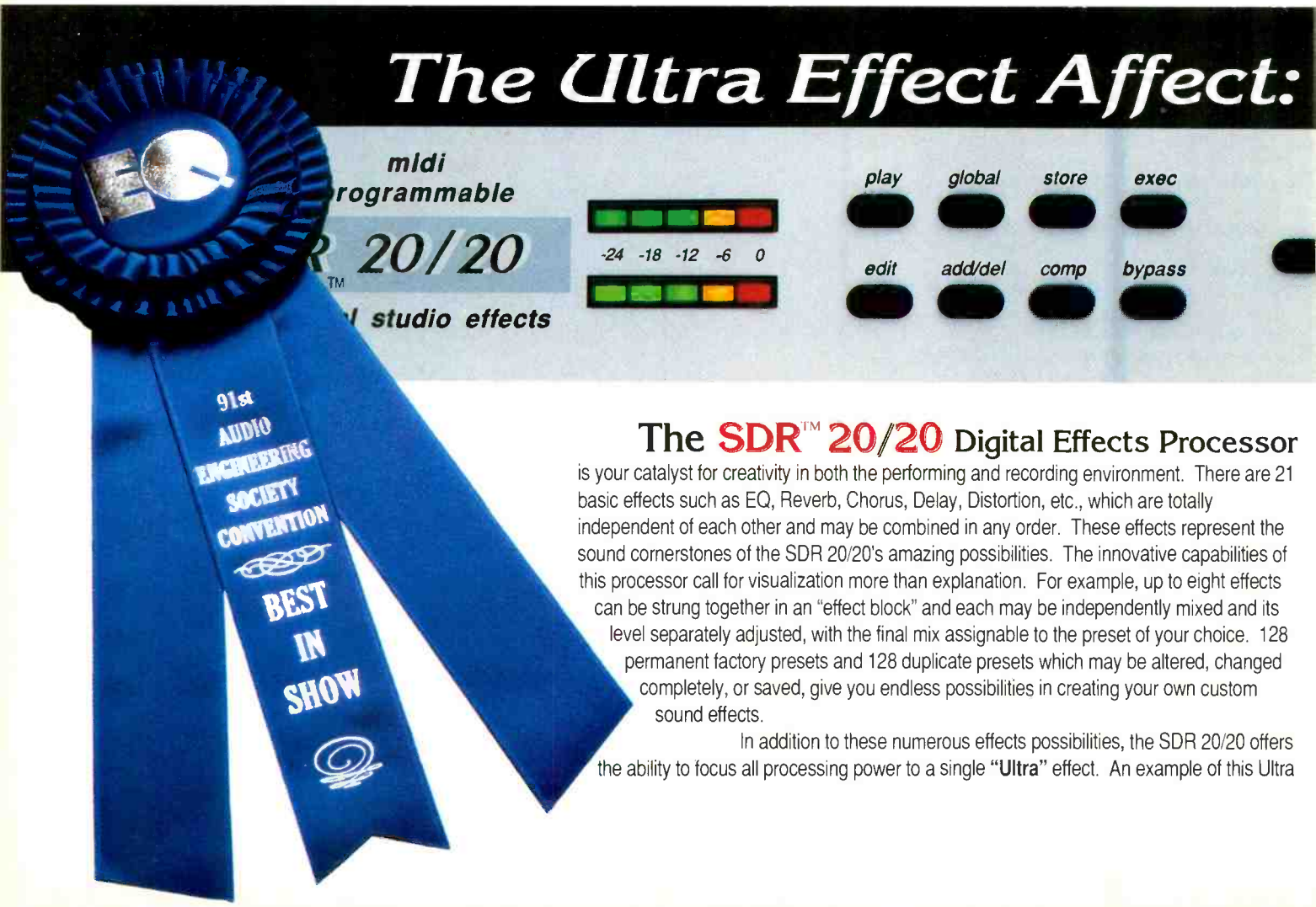
James Gosney, Rainbow Sound & Recording, The Connaught, 131 Lewes Road, Brighton, E.Sussex BN2 3LG. Tel: 0273 624048

Window-less

Dear sir, one of the reasons I built Far & Away Studios, Inc. the way I did was because of my experience as a session player with control room communications or lack thereof. We've used the concept of no control room window (Keith Spencer-Allen's 'Craft' column, *Studio Sound* June'92) successfully for 15 years now.

Here's what it affords: Instead of using talkback I'm able to keep the monitors off and use the tape machine input as foldback. When using a mic like a *U-87*, with the machine in input, the musician(s) can hear the engineers voice also and it doesn't sound like it's coming through the 'mic from hell'.

Of course with a loud band rehearsing in the studio I can override them with the standard talkback. We use *AKG 270* headphones and monitor all tracking and overdubs on them. We have the option of checking playback in our different sets of monitors also. This actually allows just another reference point for determining the quality of sound going to tape. The monitor mix, engineer's mix, and musician's mix are all from the same sends. There is no guessing what



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change is actually being made if a level balance is modified.

The biggest plus is this: the musician is in the control room, since the control room is the studio. He or she knows exactly what is being said. (A negative for some less than truthful producers) and everyone there has to shut up or end up on tape. Bored hangers-on are the first to leave and anyone left is committed to the project.

I recently convinced my friend Les Paul to build his new room this way. He reminisced that most of his hits were done with the tape machine in the same room.

Try it, you'll like it.

Geoff Gray, Chief Engineer, Far & Away Studios, Box 63, Rd 1, Chester,New York 10918, USA.

Letters should be addressed to:
The Editor,
Studio Sound Magazine,
Spotlight Publications,
Ludgate House,
245 Blackfriars Road,
London SE1 9UR.

'Talking Tape' — feedback from the manufacturers

Dear sir, a couple of general comments on the 'Talking Tape' review (*Studio Sound*, September 1992).

a) For completeness' sake, it would've been useful for the text to have highlighted how many samples of tape were tested in each case.

b) Did the ±0.5dB measurement error cited under the Bias Noise section apply to all the tests? If so, this could have been stated.

c) In the conclusion, if there is a ±0.5dB error in measurement, the differences between *996* and *499* could be regarded as negligible (given that the maximum differences recorded were around 1dB).

d) The tape care issues could have been further highlighted, particularly where the tape is provided with protective packing for storage-shipping.

Jonathan Lewis, 3M United Kingdom plc, 3M House, PO Box 1, Bracknell, Berkshire RG12 1JU.

Dear sir, having had the opportunity to read Sam Wise's submission I wanted to say that I felt his review seemed very fair and I'm sure will prove interesting to all those users still waiting for the 'Tapeless studio'! I would however like to comment regarding the packaging of Ampex audio tape products.

Prior to the launch of *499* at last years New York AES show, we carried out quite extensive research on whether to move away from our standard high quality cardboard cartons, to a plastic 'shipper' style product.

Firstly we discovered that whatever we did would have to allow studios who have personalised labels to continue to use them — in nearly all cases this meant staying with a square design. Secondly we confirmed the need for a considerable amount of space to be available within the box for storage of track sheets and other documents, and in an increasing number of instances, even DAT cassettes and floppy disks. In most cases our current packaging meets these needs.

Having confirmed these requirements we made a conscious decision to stay with our standard style of cartons but establish a programme to develop a new design of packaging which retained all the good features of our current design and also looked at possible improvements. This is now in place and I would welcome suggestions to pass on to the team working on this project.

Tom Gittins, Ampex GB Ltd, Acre Road, Reading, Berks.

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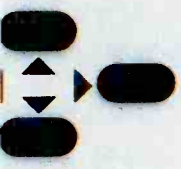

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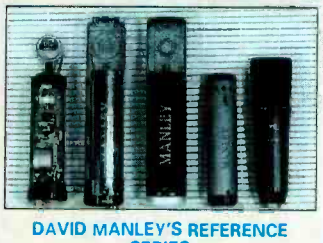

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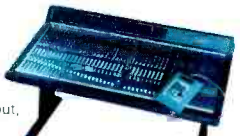

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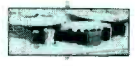

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Barry Fox

Questions are raised about the pricing structure of blank CDs in the wake of Kodak's *Photo CD* launch

Kodak's *Photo CD* was officially due to go on sale on 1st September, but was already being advertised and test marketed in both the UK and USA as early as July. This is going to make a lot of difference to the audio industry.

To see why, you need first to see what is likely to happen in the consumer market.

Kodak is currently offering *Photo CD* a stand-alone format, alongside Philip's *CD-I* system. A *PCD* player costs £370 and a *CD-I* player costs £600.

A *CD-I* player will playback *Photo CD* discs, albeit sluggishly because of the need (so far, at least) for the *CD-I* player to decode the *PCD* image and recode it in *CD-I* format, 'on-the-fly'. Philips can cure this by using *PCD* chips in a *CD-I* player.

A *Photo CD* player will not play back *CD-I* discs. Kodak can cure this by using *CD-I* chips in a *PCD* player.

Then the industry will have what it clearly should have had from Day One, a single 'picture disc' player that plays all discs. Until then customers will be confused, and peeved when they find that they cannot play *CD-I* discs on a *Photo CD* player.

Ideally, too, the single standard player will also play the Full Motion Video discs which, from this winter, will carry over an hour of VHS-quality video and stereo sound. But the cost of FMV chips will initially put up to £200 on the price.

Perhaps necessity, born out of slow sales of 'base case' (FMV-less) *CD-I*, will force Philips' hand here. It is hard enough selling a radically new concept like Multimedia, without a confusion of only partially compatible hardware and software. And Kodak may well find that amateur photographers do not jump at the idea of paying to store their pictures on CDs, for watching on a TV screen, instead of paying less for prints which they carry in a pocket to show friends and relatives.

But, whatever happens in the consumer market, the idea of *Photo CD* is already scoring with professional photographers and picture libraries. They need only to standardise on some kind of encryption system which protects against piracy of a full film resolution digital image.

And as previously reported, the blank disc which a *Photo CD* processing centre will use to store up to a hundred full resolution still pictures, or many hundreds of low resolution copies, is almost exactly the same as the blank disc sold by Taiyo Yuden for CD write-once recording.

Taiyo sells its *CD-R* blanks through a maze of distribution outlets, at a maze of prices. Kodak buys in *Photo CD* blanks (e.g. from Taiyo) and makes its own at Rochester in the USA. The only real difference is in price.

If the blank is made by Taiyo and labelled '*CD-R*', it is priced high and varies from source to source. Taiyo sells to Europe from Germany, at a wholesale bulk price of around 40DM each, which is nearly £15. Add VAT, handling, and profit mark-up by a studio or secondary outlet, and you can easily end up with a selling price of £30.

But if the blank is labelled '*Photo CD*' the photographer pays the *Photo CD* centre just £4.99 retail, including VAT. On top of that the photographers pays £8.75 for the transfer of 24 images at the time of film processing, or £12.11 for the transfer of 36 images.

Contrary to what some readers (and Taiyo Yuden in Germany) have thought, these are not estimated figures. They come from Kodak as firm retail prices, including VAT.

And Dr. Ravi Khanna of Kodak, in charge of *Photo CD* in the UK, assures that there will be 'no problems with disc supply'.

Of course Kodak is cutting profits to the bone, perhaps even loss-leading, to try and get the *Photo CD* system established. But none of this can change the basic message. Kodak has set a benchmark price for a blank CD-R of under £5 retail including VAT.

I, and others, have been asking Taiyo Yuden the same, and obvious question. How does Taiyo expect to maintain the price differential? The simple answer is that Taiyo has now answer.

Andy Ishizaka of Taiyo's European headquarters in Germany, says he is 'quite sure' that Taiyo is not now supplying discs to Kodak in commercial quantities. He suggests there may be some slight differences between the disc types, but cannot say what they are. Clearly they do not justify the massive price differential between Kodak and Taiyo.

Ishizaka told me that, 'Of course Taiyo must reconsider its price structure. I will ask Tokyo for a comment'. Presumably Tokyo had no comment because I heard nothing further. From this and other discussions one thing is clear. Taiyo are thoroughly unhappy about Kodak's price structuring.

But nothing can undo this, even if *Photo CD* fails as consumer product and Kodak ends up selling the system to professionals at domestic prices - just as Sony and others ended up selling DAT to professionals for domestic prices because the format failed as a consumer product.

> 'Of course Taiyo must reconsider its price structure. I will ask Tokyo for a comment'

Philips is quietly deterring duplicators from moving slowly into DCC work with real-time decks. This would save them the very heavy commitment cost of buying a 'digital bin' solid-state store for the master recording, high-speed slaves with thin-film heads and modified loader-winders.

A real-time duplication deck would halve dubbing time by writing both halves of the tape or sectors, A and B, at the same time, while interleaving text and indexing information with the music code. It also writes SCMS code which is configured to allow the duplicated DCC to copy once.

But there are no real-time decks available. And if anyone tries to use a domestic deck, they are snookered on several counts.

A domestic deck writes sector A, then autoreverses and writes sector B, which doubles dubbing time. More importantly, it does not copy text or indexing information. And it will configure the SCMS code to prevent any copying of the cassette produced.

On all these counts, the dubbed tape falls outside Philips standard for DCC prerecorded cassettes.

The standard also says that prerecorded cassettes must have a welded shell, with embedded label. These are only available to duplicators who have taken license from Philips. So recording onto a blank DCC would fall outside the standard.

So when Philips says they have nothing against real-time duplication, but do not make a real-time deck, the bottom line is that Philips are so far banning real-time duplication.

There was panic recently, when Revox started quoting £162 plus VAT for each replacement record or playback head for the trusty old *A77* reel-to-reel warhorse, with erase heads at £76 plus VAT. This doubled the previous prices and put the parts cost alone for refurbishing an *A77* (with new record, playback, and erase heads) at around £400 plus VAT, plus of course labour on top.

As there are probably around 50,000 of these machines still in the field and working, engineers started wondering what on earth Revox was trying to do. Well, I bring you good news.

According to Revox it was a 'computer glitch'. For some reasons that I do not pretend to understand, the Revox computer was misquoting prices.

Who cares how or why? What matters is that the real price, I am assured, is £89.50 plus VAT for a record and playback head, only £5 more than previously. Erase heads cost £42 plus VAT.

If you were among those who got wrong quotes, and decide against repairing machines, think again - or make haste to the dustbin and hope the junked machine is still there. ■

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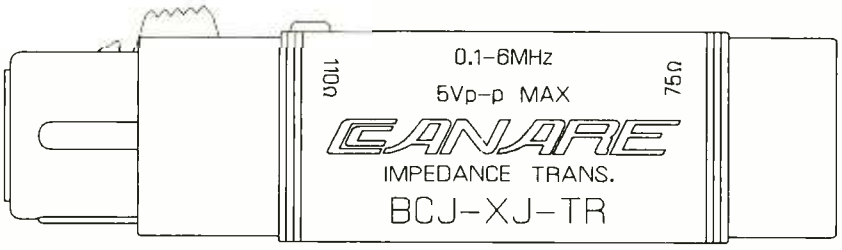

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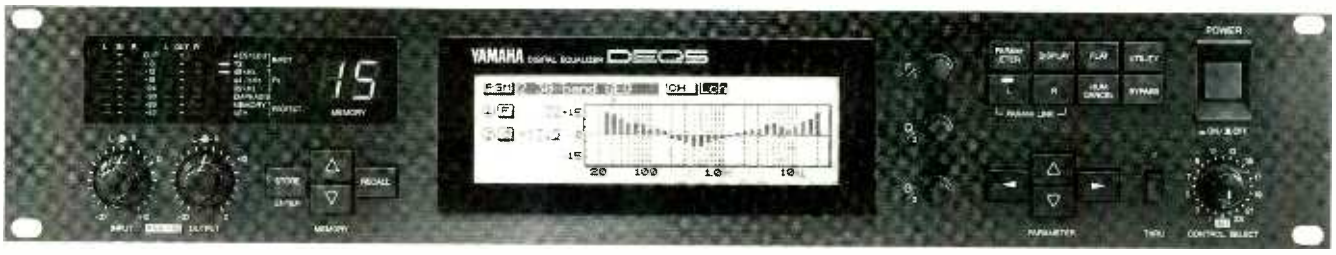

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Martin Polon

Our US columnist investigates TV broadcast audio

Nobody asked me, but isn't it time that we finally do the 'right thing' and either improve the quality of broadcast television sound all the way or else 'shoot the poor beast in the head to relieve it of its suffering' — and the audience's for that matter! We have all heard again and again just how much progress the television industry has made around the world in improving aural quality but like Shakespeare, 'methinks he doth protest too much!' Add to that the interminable flow of press releases announcing the purchase by this programme production house or that Hollywood studio of a digital audio workstation editing complex capable of scoring the collected works of the Warner Brothers in just under six hours. Top that with computerised mixing consoles capable, it would seem, of launching the Space Shuttle. At least one would think so for a purchase price rivalling the national debt of the Marshall Islands!

All right, devoted readers of this column know that on occasion I get on a tear. Something must be bothering me. Are my planets aligned properly or is Venus ascending to the seventh orbit of my horizon. Too much asparagus, perhaps. Or is it the carrot juice. You are darned right something is bothering me. But, it has nothing to do with my horoscope or my vegetarian diet. TV sound in 1992 is more or less execrable about 50% of the time. Now that may be better than it was say 12 years ago in 1980 when television sound quality was execrable 80% of the time or in 1970 (22 years ago) when the figure would be close to 100% of the time. I am going to have to have my ears revulcanised. All of the insides have been corroded by listening to over 300 hours of on-air television via an up-to-date state of the art cable television system. I recently finished a research project for a major corporation interested in the value of using high quality stereo sound for commercial presentations. The different ways that TV sound is degraded reaching the home have become a truly astounding matrix of audio disaster! Let us examine the improvements that have been visited on the TV sound community over the past twenty years or so.

1. Dolby noise reduction.
No other innovation has provided as much improvement as the reduction of noise and distortion in the sound recording process. Whether original programming was recorded on magnetic tape-film or distributed as an optical soundtrack, the advances offered by Dolby tamed the fidelity monster in the motion picture studios that produce so many TV programmes. Video tape recording of audio on such universally adopted systems as the 'C' Format helical scan (one-inch) has been improved significantly by the Dolby process.

2. Adoption of stereo broadcasting schemes.
The fact that there is an MTS (multichannel television sound) system in the United States with upwards of 60% of all programming in some kind of stereo and an Ambisonic-based scheme in the UK gathering considerable momentum represents a quantum leap forwards.

3. Consumer acceptance of stereo TV broadcasting.
Penetration of stereo television in the United States now exceed 30% of all colour sets purchased. The figure could be higher if all of the stereo-equipped VCRs, audio receivers and outboard adaptors are counted in the last eight years.

4. Digital audio transmission via coaxial cable, microwaves, satellite and fibre optics.
The placement of the audio signal first on the video transmission system via PCM (pulse code modulation) techniques and then the use of dedicated digital audio transmission systems over various 'backbones' has allowed noiseless and distortionless full-fidelity connection between programme distribution centres and the broadcasting stations—at least in theory. Whatever the current problems, still a quantum leap over the old, telephone-company-provided, low-cost, minimal-frequency response circuits favoured by cost conscious broadcasters.

5. Higher quality sound systems in TV sets.
The provision of more amplifier power, better speakers and enclosures, controls, input and output jacks has to be applauded. In addition to the stereo decoding circuitry needed for stereo listening-viewing, some sets have elaborate speaker baffling, psychoacoustic stereo enhancement systems and audio remote control functions.

6. Home theatre systems.
Utilising receivers and-or control preamplifiers with surround steering logic capable of encoding the TV programmes and motion pictures produced with the surround feature plus high powered multichannel amplifiers and speaker systems to provide a level of home television and video enjoyment rivalling that of the cinema. A long jump from the 3-inch x 5-inch Ubangi speaker driven by 100mWs from a distorting *12AU7* vacuum tube that used to mark TV audio.

7. Audio production suites.
Spacious computerised and digitised production rooms allowing for the handling of 10 inputs automatically with digital signal processing, reverb and equalisation. A significant contrast from the 6-foot x 10-foot control booth and the six-input vacuum tube mixer with the seven-inch accordion-coned monitor loudspeaker.

8. Digital-audio-editing workstations.
Computerised editing of the audio portion of television programming in complete synchronisation with picture. Unlimited ability to manipulate the programme audio in terms of content, time, insertions and deletions, etc, etc. Consider that in the past, editing may have meant a 1/4-inch tape and a razor blade. Or it could have meant no editing at all on early video tape recorders.

9. Digital video tape recorders with full digital audio.
The advent of the *D1* component video digital recorder and the *D2* composite digital recorder plus the various future versions (*D3*, *D5*, etc.) has provided the television industry with video recording tools that have audio quality to match the picture quality. Consider what the audio quality of kinescope recordings delivered.

10. Synchronisation via time code of multitrack audio recorders.
The ability to use full multichannel audio recording and studio facilities in the production of television music shows has allowed telecasts of programmes such as *The Grammy Awards* to have virtual compact-disc sound quality to accompany the programme.

11. New and upgraded full-fidelity Television transmitting facilities.
The ability to 'wring' the audio bugs out of the TV broadcast transmitting plant has allowed all of the previous signal improvements to be passed on to the home viewer.

12. Full-frequency-response studio-to-transmitter (STL) links.
The cessation of usage of low-grade telephone company lines has accompanied the improvement in TV transmitter aural quality as the enabler of all of the other innovations that have improved television sound. High quality telephone company microwave, fibre optic or coaxial links and-or station-owned microwave links have supplanted the previous technologies used. In addition, digital transmission is becoming much more common.

Now the question of the hour or perhaps it is 300 hours, is why with all of these changes and innovations in constant usage does so much of television audio sound become so degraded? Consider the options in a negative sense:

A. Hum.
The number one star of audio degradation all over the world .Veteran of theatre, motion pictures and television and special favourite of sound reinforcement systems. In television programming, hum is a fairly regular companion of remote broadcasts — especially where an audience is watching a musical performance with a separate sound system. The presence of a ground loop to the TV truck is clear to every body but the PA operator who is clearly is no danger of becoming a rocket scientist. This has happened to everybody in the TV audio business at least once on remotes — so the question is why does it have to happen again and again?

Then there is the phantom hum on your very favourite cable channel. It does not matter which channel your favourite is, the hum will eventually and inevitably home on it. Call the cable company for service and the technician will have one of two responses. He may say that he cannot hear anything even though you raise the gain by 85db so he might notice it. He will mention that he is on overtime and wants to finish your service call so that he can hop on his large Kawasaki unmuffled motorcycle to get to the gun club. ▶

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Having established from that encounter that the cable repair person would not be able to audibly distinguish a small nuclear war, you sink into your chair — a beaten man. The second option is the cable repair person who can indeed hear the hum. The response is that he gets the same thing at his home and they have not been able to fix it in two years. Back to the chair!

Consider the lot of the consumer who has purchased a reasonably expensive 25-inch colour television set, loaded with features, to watch a lot of television. The set does not provide the usual psychoacoustic cues of stereo reception — it does not sound quite right — but the little red 'stereo' light is always lit. Lo and behold, it seems that the maker has decided to pinch a penny here, and a penny there, in the quest for ever greater profitability. Instead of using the FFC (Federal Communications Commission) approved chip-set for MTS stereo with dbx noise reduction, this particular manufacturer has substituted a pseudostereo chip-set devised by their own 'rocket scientists'. And guess what, gentle reader, this manufacturer is not the only one. Even more interesting is that these TV sets makers are among some of the biggest names in the electronics industry and that they have sold potentially millions of these not-quite-stereo sets. One has to say potentially because these folks of the crossover-filter-stereo school of management are not talking.

Now the really funny part comes when the consumer risks a self-inflicted hernia to bring the set back to the dealer. Of course the dealer had sold the consumer an expensive five-year warranty from a third-party provider who has since entered the nirvana of bankruptcy with the customer's money. At any rate, the TV salesman, careful not to scuff his white suede shoes, listens and pronounces the stereo sound from the set to be perfect. He does not share with his customer the interesting fact that he was formerly employed as a riveter with the North American Bridge division of Pennsylvania Steel. How did the Romans put it? *Caveat emptor*, baby!

C. If at first you don't succeed, synthesise.

This should not come as a news bulletin to anyone in the world TV industry but a certain amount of programming is shot monaural and run though a stereo synthesizer. That is simply a dollar-and-sense decision by the producer. While most so-called primetime network television programming is carefully recorded and digitally edited into conformed stereo (done to eliminate any possibility of phase cancellation for monaural TV listeners-viewers), some of what is syndicated to independent stations and used by network affiliates during nonprimetime hours is anything but 'real' stereo. Certainly the old television series and computer-colourised motion pictures that are the staple fare of cable-programme 'networks' are massaged into electronically homogenised pseudo you know what! Now, this is not to say that all synthesis is bad, especially when upgrading old programmes or movies. In fact, some of the newer synthesis systems have microprocessor controlled steering systems and do a very creditable job. No, the 'rub' comes when the synthesized programme gets synthesized again and again and even again. There are television stations in the United States which have broadcast synthesizers on line 24 hours per day. The idea is that the stereo light on every TV set in their viewing area will always be lit. The goal is to sell commercial time as the 'stereo' station. Then there are home systems that have the synthesis option. You get the point. Thrice-cooked chicken is a rather successful speciality of certain Chinese restaurants. It is unfortunate that thrice-synthesized stereo is not as desirable.A variation on the theme involves programme producers who encode their programme with either surround information of spatial cues from psychoacoustic encoders or sometimes all of the above ('If one works well, then two should work better'). What sometimes works wonderfully in the studio can turn into a nightmare by the time it reaches the viewer's home.

D. Amplification and transformation.

It was estimated recently that audio recorded for eventual TV reception at home will pass through at least six digital-to-analogue and analogue-to-digital conversions and a' minimum of the nine signal processing devices and-or amplifiers and 18 audio transformers. In addition, a minimum of 30 signal routing points will be traversed with the accessory 60 soldered or crimped or pressure connected terminations. Most knowledgeable TV distribution specialists concede that these figures are probably too conservative and that the real numbers in some cases may exceed double the figures given above. That places the signal more or less in the home via on-air transmission.

But, in the United States, cable television systems provide over 60% of the viewing population with their signals and are connected to more than 70% of all television homes. That adds another set of satellite up-and-down links, another set of satellite transponders, cable-head-end amplifiers, distribution amplifiers, and coaxial cable plus amplifiers in every neighbourhood to maintain cable-system signal levels. And, of course, on cable systems the audio is not processed in a discrete way but exists as a component of the total transmission in a multichannel system subject to interference from any other cabled signal.

Now what all of this does is to bring up the philosophical question of whether or not you can take prime sirloin steak, grind it up into hamburger and then somehow miraculously bond it back into steak — all the time shipping it across the country by various means of the transportation. That analogy is meant to convey just what happens to the stereo signal from start to finish, but frankly it appears that the steak may be having the easier time of it!

Considering the incredible variety of components that the television audio signal traverses, the fact that anything is received in the home is just short of a miracle. Start with a microphone and go through a cable to a connector on a wall and then via wiring into a mixing console and then into signal processing and then into a digital video tape recorder. Then in the digital domain to a digital-audio-editing workstation and then perhaps to another audio-video workstation and back to another digital VTR. Then playback on yet another digital VTR to signal processing to telephone company links and to a satellite-up station. Then from a satellite-down station to a network master control via telephone company fibre-optic cable. Then through switching and routing and signal processing and back to the telephone company and up to yet another satellite and down to a receive station on the roof of a TV broadcast centre. Through master control with routing, switching and signal processing and then transmission on microwave STL systems to the transmitter site. More automated switching and routing and signal processing and on the air via the transmitter. And as with the numbers given above, this is a very simplified view of the audio production, distribution and transmission process in television.

What is needed is an industry-wide effort to simplify the complexity of the TV audio chain and to identify those areas that still pose problems. What is also needed is an industry-wide effort to develop sensitivity to what the home viewer-listener experiences. Here are just three examples out of hundreds of public experiences in trying to get help with TV audio-qualitative issues.

Example one.

A successful public television station gets a number of telephone calls for over a week from viewers who complain of hum and distortion in the programme audio. Station engineers and management staff all respond that it sounds fine to them and that the problem must be with the viewer's set. No one takes the time to interrogate the viewer as to whether cable TV might be involved. It was and nothing was done for over ten days.

Example two.

A major musical event is broadcast after weeks of advertising and promotion by both the network and the station plus the programme's advertisers. Viewers are appalled to find the stereo feed is out of phase and cancellation effects spoil the broadcast. The problem is somewhere in the intercontinental transmission network. Numerous phone calls to the local station produce no result. Finally, a long distance call to the network offices on the west coast gets immediate response and the problem is corrected.

Example Three.

Certain British programme producers practice what has been waggishly labelled 'environmental audio' or 'audio verite'. The idea being that if the character in the drama cannot hear well what is being said, then neither shall the audience. That is all well and good up a UK digital backbone but when passing through the US audio conundrum, the results leave much to be desired! Complaints to the involved public television stations go nowhere and the topic becomes a standing joke in certain film and TV journals.

Bottom line.

Enormous gains in audio quality for television have been made but there is still so much left to be done. ■

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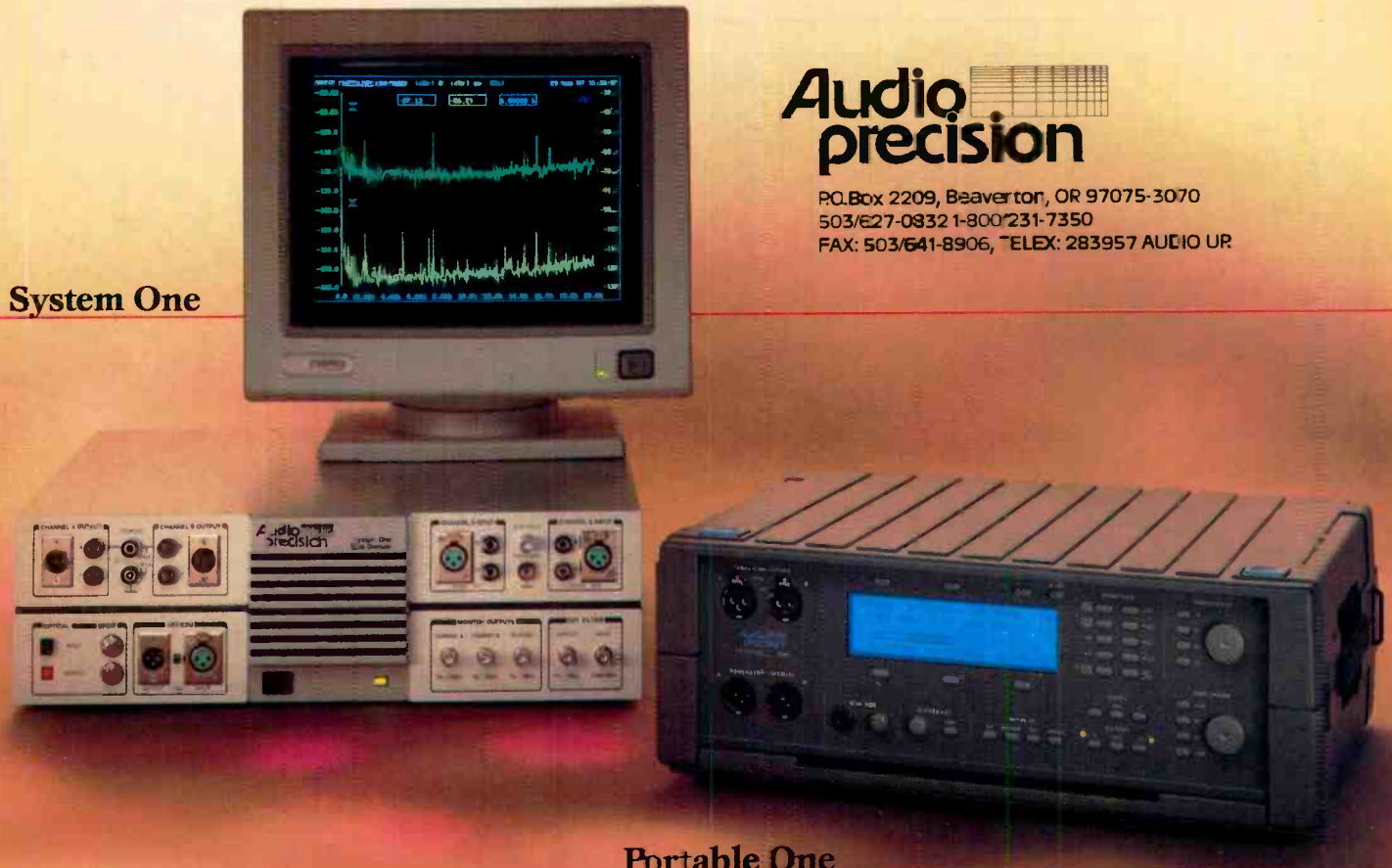

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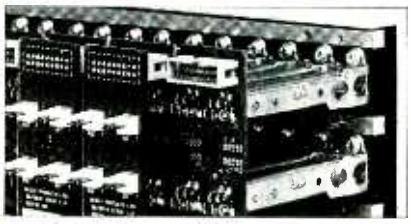

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FOSTEX PD-2

A technical review of the Fostex *PD-2* portable digital recorder by Sam Wise

When I arrived in the audio business in 1971, there was one particular audio product which really attracted my interest — the *Nagra III*, soon to be followed by the *Nagra IV*. It was small, but full of highly polished, finely engineered parts — and since battery power was essential, low power consumption required its mechanism and control to be entirely mechanical. Yet, performance was as good as most full-sized tape recorders. A pilot-tone track, located between the stereo tracks, allowed time synchronised recordings for film and video to be made. Absolute time alignment was done using a clapper-board or its equivalent. *Nagra* was *the* machine to have for high quality location recording. Another company, Stellavox, built a 'clone', but it never achieved the same degree of acceptance or reputation. Over the years, detailed additions and improvements were made to the *Nagra*, including the addition of SMPTE time code, but the basic design was retained.

The other portable tape recorder which reached a high degree of market acceptance was the *UHER*. This did not attempt to emulate the *Nagra*, but was focused more directly on the needs of the roving radio reporter. It was less expensive than the *Nagra*, and a bit larger. Like *Nagras*, *UHER*s are still widely used today.

Both of these machines, using standard 1/4-inch audio tape, provided ease of editing, using the tried and true method of splicing block and razor blade. You could even edit directly on the machine if necessary, though this was by no means the optimum. For film use, the sound tracks were transferred to sprocketed tape, mechanically synchronised with the film, and edited in tandem with the visual material. In radio, there were always tape editors about, cutting the material to fit into inadequately large time-slots.

Along came digital

Then came digital audio. Recorded quality, particularly in terms of noise and distortion, improved beyond recognition. While recording in the field, where events sometimes only happen once, an immediate benefit accrued directly from the increased dynamic range — a safe recording level could be set with little compromise in tape noise. Miniature DAT recorders abounded, making this audio quality improvement accessible away from base. But, editing became a nightmare. Everybody already had lots of analogue recorders, some optimised for tape editing. Radio stations switching to DAT found that transfer to analogue tape was required to allow easy editing to take place. And, the capability to use time code synchronisation, well developed on analogue recorders was lost.

The Fostex *D-20*

Meanwhile, engineers at Fostex began to tackle the problem. Fostex was largely known in the home studio end of recording, initially producing small integrated mixer-recorders using compact-cassette technology. They then began to produce larger reel-to-reel machines in the middle price bracket, a little below Revox. But their desire to move up into the fully broadcast professional category was exemplified by a new product launch, their *D-20* DAT recorder. This was the first DAT recorder to provide SMPTE time-code-based control and off-tape monitoring using four heads rather than the original two. At that time there was no standard for time code on DAT, and Fostex made their customers a promise that when a standard was agreed Fostex would adapt all machines sold to the new standard at no more than a nominal charge. This promise Fostex has fulfilled, bringing them recognition as a company who takes the commitments of the professional market seriously.

The *D-20* not only allows play after record, but the capability to record after playing. This means that DAT tapes recorded in the field, using a miniature DAT machine with no time code capability, can have time code added after recording, with no degradation to recorded quality. The *D-20* provided the first opportunity to synchronise and edit DAT recorded material to picture, without transferring the material to disk-based editors. The *D-20* became well accepted, and is still in production.

Fostex *PD-2* launch

Now, in 1992, technology has advanced beyond what anyone could foresee 20 years ago, and there is another product — designed in the mould of the Nagra location recorder — the Fostex *PD-2*. Not only will this produce sales itself, but is likely also to enhance sales of the *D-20*, since they are complimentary products. Fostex have competition in the marketplace from Sony, who also produce DAT time code portables and desktop machines. Nagra have recently launched a reel-to-reel portable digital recorder, producing a format ▶

MANUFACTURER'S SPECIFICATION

Analogue Inputs

Microphone	
Level to Max -28dBu	Min -70dBu
Source Impedance	<600Ω
Input Impedance balanced	>10kΩ electronically

Line

LevelMin	-6dBu to Max +36dBu
Input Impedance balanced	>20kΩ electronically

Analogue Outputs

Standard Output	+4dBu
Max Output	+16dBu to +22dBu depending on reference level setting
Output Impedance	<50Ω electronically balanced
Min Load Impedance	600 Ω

Digital Input

AES-EBU and SP-DIF (IEC 958)

Input Impedance	250Ω
Minimum Input Level	0.25V peak-to-peak

Digital Output

AES-EBU and SP-DIF (IEC 958)

Output Impedance	110Ω
Output Level	2.5V peak-to-peak
Min Load Impedance	60Ω

Time code Input-Output

Standard Level	2V peak-to-peak
Output Impedance	<50Ω electronically balanced
Input Impedance	>20kΩ electronically balanced
Minimum Input Level	0.25V peak-to-peak

Headphone Output

Load Impedance	>32Ω
Level	80mW into 32Ω

Performance

Rec-Replay Frequency Response	±1.0dB, 20Hz to 20kHz
S/N Ratio	>90dB (Emphasis ON)
Dynamic Range	>9dB (Emphasis ON)
THD	<0.05% @ 1kHz, +4dBu out, Emphasis ON
Channel Separation	80dB @ 1kHz
Pre-emphasis error	±1dB @ 10kHz
De-emphasis error	±1dB @ 10kHz
Wow and Flutter	<0.002% W/ Pk
SMPTE IMD	<0.03% (60Hz and 7kHz)
Channel Phase Difference	<20°
Pitch Deviation	<0.005%
Level Display	28-segment LCD peak meter
Peak Hold Time	0.5 sec
MIC Limiter	
Ratio	1:3
Attack Time	20msec
Release Time	200msec
THD	<0.1% (–10 dB @ 1 kHz)
MIC FILTER	
'M' position	Fc = 40Hz, -12dB/oct
'V1' position	Fc = 80Hz, -12dB/oct
'V2' position	Fc = 400Hz, -6dB/oct
MIC ATT	-30dB ±1dB

Battery

NP–1B or equivalent, approx 70 minutes operating time

Operating Conditions

Temperature Range	0°C to 45°C
Humidity	30% to 60%

Dimensions (HWD)

96 x 307 x 216mm (3.75 x 12 x 8.5 inches)

Weight

4.2 kg (approx 9lbs)

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which is out of step with everyone else, but which can be edited with a blade. And Stellavox have launched a similar sized location DAT recorder. But the *PD-2* is unique in its capabilities, with features which may result in Fostex becoming the new market leader in location recorders.

Initial impressions

The long-winded introduction above must give readers an impression of my reaction to this machine. As an engineer, the *PD-2* brings a wave of wishes similar to those I felt when my audio career began. I wish I had designed this machine. I wish I had a legitimate need to buy one. I wish I had enough money so that need did not come into it. In a different product category the Soundcraft *Delta* series mixing consoles created the same reaction — and there is now no dispute about their value for money within their product categories.

Maybe Fostex will not achieve the market preeminence that others have before them, but it will not be because they have been careless in either market research, product design or manufactured quality.

The *PD-2* is of a size and shape which will be familiar to all location recordists. DAT machines can be made smaller, but when all of the features are provided, with connectors which match those in the studio, and controls which are relatively quick to use, matching the size of the previous market leader must be acceptable. Anyway, everyone knows that the location camera crew is more robust than average humanity, with a similar training regime to the army infantry. *PD-2* weighs in at 4.2kg (about 10lbs), a mere feather compared to associated video equipment.

Except for the two surfaces it can rest on, the *PD-2* is literally covered with connectors and controls. These are logically laid out, making familiarity easy to develop. In this machine, the extra buttons and switches are a godsend, making operation much less fiddly than its smaller (usually non-time-code) brethren. For example, a full numeric keypad is provided for setting time code entries and the like, removing the irritation induced by the use of the cursor UP, DOWN and ALONG keys which have become so familiar on recent designs. And you do not get trapped by special and usually fragile connectors when your bag of adaptors gets forgotten in the haste to capture an unusual event. Even the battery has been chosen to ease availability and charging.

Yes, Fostex have thought about this machine — it is truly made for the professional recordist. Its strength and its weakness is likely to be the choice of the DAT format, with its ready availability, but rather delicate recording system — perhaps too subject to climate conditions. Yet, even this has been carefully considered to minimise its impact on day-to-day field operation.

Housing

The *PD-2* is designed for shoulder-slung operation. The housing is robust in appearance, with rubber bumpers laminated onto the corners. As standard, a strong strap secured by screw-in clips is provided. A well-designed padded protective cover is an optional extra. The unit is laid out for right-handed operation, though a left-handed person will adapt easily. All controls necessary for routine operation are clustered together on the right front edges. Controls and connectors are recessed somewhat, minimising the likelihood of damage. Controls likely to be left exposed when an outer case is fitted appear to be further sealed against water incursion, though this is not claimed by Fostex.

Inputs

The right side-panel of the machine contains all connectors used for input, along with their associated operational controls. The *PD-2* is, as expected, a stereo machine, with virtually identical facilities on each channel. At the top is a MIC-LINE switch. In MIC position, the input impedance is about 10kΩ, and is designed to match with low impedance microphones. A 30dB attenuator, measuring 29.7dB is provided giving maximum levels for meter 0 of -14dBu and -44dBu respectively — suitable for the purpose. A further switch allows for phantom or 12 V A-B powering to be activated with an associated soft switch allowing the phantom to be selected to 12 or 48 volts. In LINE position, the meter reads 0 for an input level of +7dBu at maximum gain. With the input gain controls turned down, input overload occurs above +30dBu (specified at +36dBu), making the unit tolerant of virtually any input signal.

A further FILTER switch provides three high-pass filter characteristics and F or flat. M (for music) is a 12dB per octave 40Hz filter to remove only rumble. V1 (for voice 1) is also a rumble filter, providing 12dB per octave at 80Hz, while V2 is a 6dB per octave filter turning over at 400Hz to correct for bass boost due to close miking. The actual curves are shown in **Fig. 1**, conforming well to specification.

Front panel controls provide fine input-gain control, and can be mechanically linked for stereo operation using a sliding lock directly beneath them. These controls matched well in stereo operation as shown in **Fig. 2**. The stereo lock can be activated with the two gain controls offset, but in this condition they will not track accurately — this is not a fault, but normal with logarithmic potentiometers.

Common mode rejection is shown in **Fig. 3** under various operating conditions. The performance on microphone input is particularly good, while line input performance is certainly acceptable.

When MIC is selected, a 'limiter' can be switched into circuit. This is really a compressor, having a 3:1 compression ratio with a fixed threshold 10dB below the digital clipping point. This ratio, in conjunction with fixed attack and decay times result in compression action which is almost inaudible on speech, while giving an improved input safety margin of 20dB. The resulting gain curve is shown in **Fig. 4**.

A PHASE REV-NORM switch allows the signal into channel 2 to be inverted with respect to channel 1.

Microphone and line inputs share a pair of XLR female compatible connectors wired pin 2 hot. Below these are a further pair of identical connectors. One provides an analogue input for externally generated time code, while the other is an AES-EBU/SP-DIF compatible stereo digital input. Connection of a digital audio signal automatically overrides the analogue input. This caused irritation during testing when we tried to connect all of the sources at once and select between them. Users may wish to do this too ▶

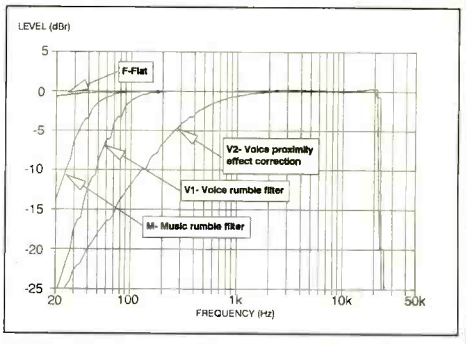

Fig.1: Mic input, filter characteristics

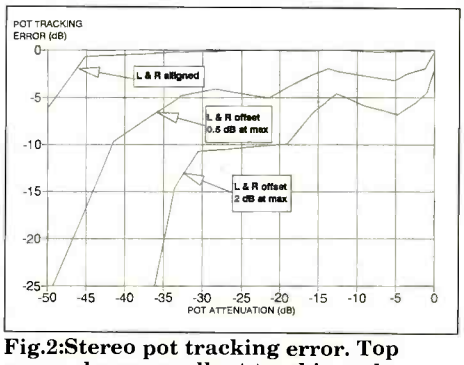

Fig.2:Stereo pot tracking error. Top curve shows excellent tracking when pots are aligned lower curves show result of offset by around 0.5dB and 2dB. This is not a fault, but should be born in mind by users

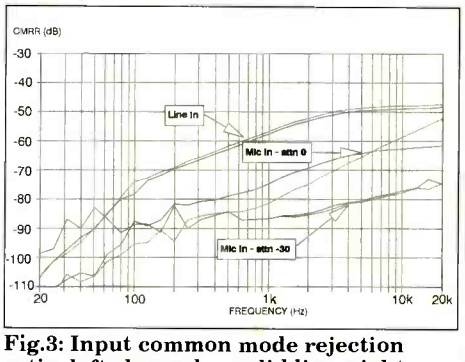

Fig.3: Input common mode rejection ratio, left channel — solid line, right channel — dashed line

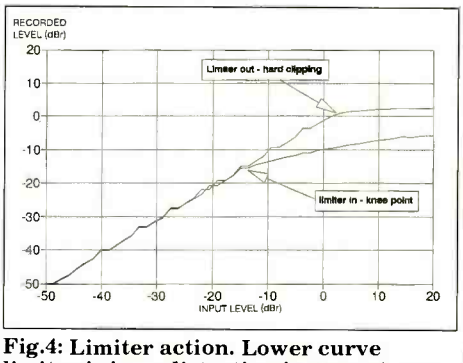

Fig.4: Limiter action. Lower curve limiter is in — distortion is limited. Top curve shows hard clipping as a result of overload

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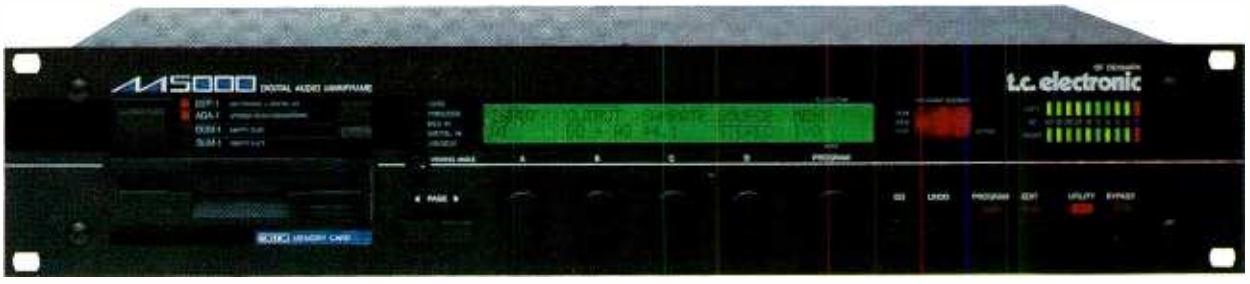

Frequency Response: 10-22KHz, +0,-0.5 dB. Fs=48KHz; THD: < 0.06% 1kHz, 0 dBm; Dynamic Range: >95 dB; Digital Conversion: Linear 18bit 64x in, 20bit 8x out. Max. Level: +22 dBm

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TABLE 1: BROADBAND NOISE

Conditions	rms 22–22k	rms 400–22k	rms A-wtd	Q-peak 22–22k	Q-peak CCIR
Emphasis ON Battery powered	-95.7dBr	-96.0dBr	-98.8dBr	-91.8dBr	-86.0dBr
Emphasis ON Mains powered	-91.7dBr	-95.2dBr	-97.0dBr	-87.0dBr	-85.0dBr
Emphasis OFF Battery powered	-90.8dBr	-90.9dBr	-95.5dBr	-87.8dBr	-83.0dBr

when the *PD-2* is on the bench back home.

As is specified, the digital input accepts either AES-EBU or SP-DIF input signals without apparent problems, though every possible limiting condition was not investigated.

Time code

Time code generation was checked in some, but not all modes of machine operation and found to operate as specified. The machine contains no vari-speed or tracking remote control functions, so cannot be slaved to another time code source. Fostex's other DAT machine, the *D-20* can be used in slave mode however.

Lastly, to aid in locking to external digital clocks and sync pulses in various types of systems, two further BNC connectors provide for WORD CLOCK IN and video SYNC IN.

Outputs

The left side of the machine contains all of the connectors relating to outputs. The analogue stereo outputs are electronically balanced on XLR type connectors, with pin 2 hot. These can be selected to carry either the input signal, or monitor. In monitor mode, the output follows the setting of the REC MON switch on the front panel. This allows monitoring to automatically follow the machine's operating mode similarly to conventional analogue machines.

The stereo analogue outputs will give a maximum level of +22dBu when the reference marker is set to -18dB. Alternate settings of -16, -14 and -12dB are available, placing a marker at this point on the meter. When the signal reaches reference marker level on the meter, an analogue level of +4dBu will result, making it a sort of headroom limit indicator.

Further monitor selection controls allow MS stereo or mono monitoring, or AB source 1 or 2 monitoring. As with the output sockets, the front panel meter can be switched to read the input or the selected monitor source. The 6.35mm stereo Phones monitor jack socket is on the front panel and has a PHONES LEVEL control which does not affect the main outputs. A further MON LEVEL pot allows adjustment of the loudness of the internal loudspeaker monitoring signal. Both of these level controls can be pushed flush into the machine to prevent accidental operation. Since the built-in loudspeaker usually receives a mono sum of the left and right signals, when these signals are similar or identical, it can reach very audibly apparent clipping up to 6dB before anything more important has hit the stops. This can be quite disconcerting at first.

Next on this side is DIGITAL OUT. This is a male XLR connector which can be soft selected to operate as a SPDIF or AES-EBU output.

TC OUT and TC LOOP OUT follow, both outputting SMPTE-EBU time code. A soft switch can calibrate TC OUT to match the timing of either the analogue or digital audio signal outputs. TC LOOP OUT is simply a parallel of the signal on TC IN. The time code reference source is selected automatically according to soft switches and machine status. The method of recording time code can set by soft switch to IEC or Fostex standards, or both. A JAM switch on the front panel allows temporary connection to be made to a master time code source which is then maintained by the *PD-2*'s highly accurate internal time code generator when the connection is removed — allowing frame matched time code to be maintained on video and audio recorders which are not physically linked.

A BNC-type SYNC OUT connector can output a video frame sync pulse or DAT frame sync signal according to soft switch status and the signal connected to the SYNC IN connector. WORD SYNC, also on BNC, follows the WORD SYNC IN signal, if present — or the internal DAT frame sync.

These, and other synchronisation and timing issues are new to us in audio, a cost we have to pay to receive the benefits of digital audio. The thing to remember is that we are no longer processing in near enough 'real time', but now have all kinds of potential delays and timing errors to contend with.

Power Supply

DC IN:12V is a 4-pin XLR type for connection of the external power supply. This supply can be used to operate the machine and simultaneously charge the battery and has automatic voltage setting for mains voltages anywhere between 100V and 240V — ideal for a recorder intended to travel the world. The battery compartment below will accept either a standard Sony-type *NP1A* battery pack as widely used for field portable video equipment, or 10 *HP-2* (C size) batteries. These latter last only about seven minutes, and are only intended to be used in emergency, while the *NP1A* has a nominal operating time of 70 minutes. Low or high DC voltage warnings are provided visually and optionally audibly, allowing the recordist to stop for a battery change at a convenient time. The front-panel meter can also display battery voltage at any time by pressing a panel button.

Fostex warn that there is no protection against overcharging a battery. However, a CHARGE warning light illuminates continuously for the six hours required to recharge a *NP1A* — when this goes out pull either the battery or the charger plug. In practice, the battery does not mind remaining on charge over the six-hour limit, but continuous charging is likely to reduce battery life dramatically.

Display and metering

The front panel contains a large multipurpose LCD display. The level meter section of this can be set to read INPUT or MONITOR levels. Meter response is virtually instantaneous to increases in level, with a slower decay. Peak can be set for for 0.6 or 3s, or manual clear. Meter accuracy is good, and well within 0.5dB of the calibration markings down to -60dB. A multiplicity of other information is provided, including various fault and warning conditions which flash to attract attention, and indication of many control or software settings. Very useful indeed.

Operation

The front panel controls: as mentioned near the beginning of this review, basic operations of the *PD-2* are easy and fall readily to hand. In addition to traditional operating controls, record operation is of the 'one-touch' type with a very positive no-accident type of action. The adjacent PAUSE control will switch the machine into pause mode, returning to record mode following a REC press with no loss of digital signal continuity. Pressing CLR and then REC will record a mute (digital zero) section on tape.

SLATE TONE records 1kHz at the reference marker level accurate to ±0.5dB. SLATE MIC instead records the signal presented to the front panel mounted slate microphone. Either can also automatically record a Start-ID marker. The S-ID button allows further Start-IDs to be recorded at any time, while the ERR MARK button allows an error marker to be placed on the tape. Error markers can also be placed automatically when the machine detects digital errors beyond prescribed limits. These can be automatically located to allow them to be aurally checked — an excellent resource for location recording when a further take is possible. Any such error causes a message to be displayed on the meter until the MESSAGE RESET button is pressed to clear it.

Rather too frequently, using various brands of tape, the machine signalled PCM ERROR. Sometimes this resulted in a warning tone recorded on tape and a program signal mute. The excellent performance of this machine in other respects leads us to suspect a fault or serious maladjustment rather than poor design. Fostex will be asked to comment when the machine is returned to them following the review.

There are many other functions available on the front panel, too many to describe, but most are logical in their function and thus relatively easy to remember. Users may input their own preferred soft-switch selections in one of five user memories suiting either different people sharing a ▶

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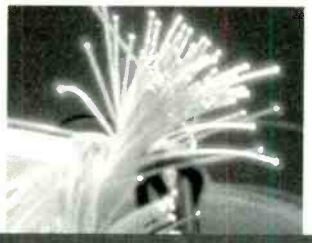

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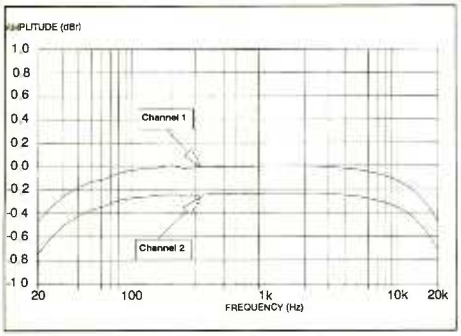

Fig.5: Analogue to analogue frequency response. Output level is referenced to 1kHz left channel output level. Level at meter max, attn -30, mic input

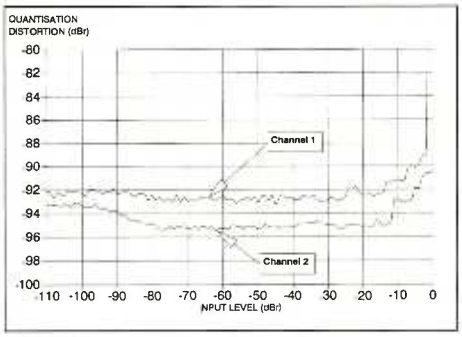

Fig.8: Quantisation distortion 22Hz–22kHz. Input and distortion level are referenced to full scale level. Analogue to analogue

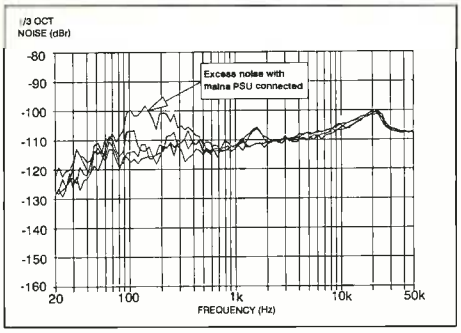

Fig.6: 1/3-octave noise (dBr) vs. frequency (Hz). Analogue input to analogue output. Left channel: solid. Right: dashed. Line input, ref: digital maximum, emphasis on. Top curves with mains PSU, bottom curves with batteries

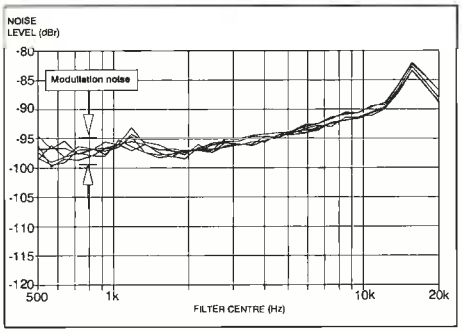

Fig.9: Modulation noise —1/3-octave noise spectrum. The noise in the 500Hz–20kHz region with a 60Hz tone between -100dBr and -40dBr excercising the D-A and A-D

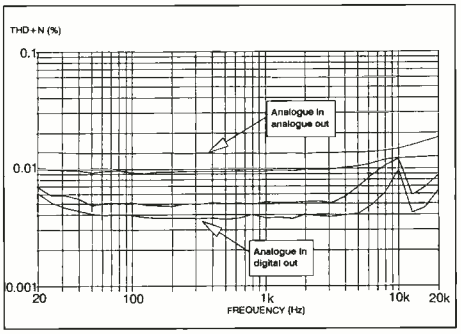

Fig.7: THD+N vs frequency, 22kHz bandwidth

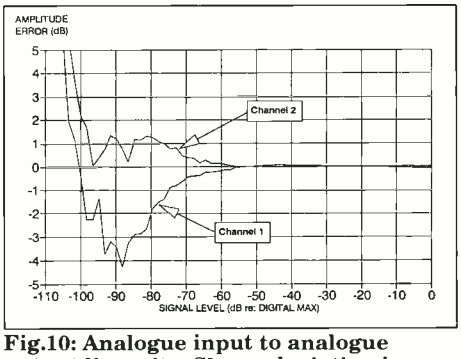

Fig.10: Analogue input to analogue output linearity. Shows deviation in output signal level versus input level

machine, or different types of recording operations. Two locate memories, and a full set of program number, error and time locate functions are provided. A full numeric keypad is provided to ease entry of starting times or dates allied to time code use.

Frequency Response: the analogue to analogue frequency response is shown in **Fig. 5** for the microphone input with attenuator set to -30dB. The response with attenuator at 0 is similar, giving a 0.5dB loss at 20Hz and 20kHz. Switching emphasis on and off has almost no effect on these curves and is confirmed to the specified accuracy. Using the line inputs reduces the level loss at band extremes to about 0.2dB. Further investigation shows that the loss is evenly split between the A-D and D-A sections of circuitry. These are all within published specifications.

Noise and Distortion: the *PD-2* is fitted with 16-bit convertors, setting the basic limits to its performance. Overall wideband noise performance is shown in **Table 1**. All measurements were made in record while monitoring off tape. They reveal an excellent basic noise performance which are at the limits of 16-bit convertor accuracy, though it is downgraded by low level mains hum products when powered from the PSU.

Fig. 6 shows the 1/3-octave band noise. There are obvious peaks at 50Hz and 100Hz when the machine is running off of the mains supply.

THD + N is shown in **Fig. 7** under various operating conditions. These are all lower than obtainable with analogue recorders, and within the specified limit of <0.05% at 1kHz and +4dBu.

Quantisation distortion differs between channels as in **Fig. 8**. Since this same result shows up in both analogue to digital and analogue to analogue paths, it appears to be caused by performance differences between the two A-D convertors. This also can be seen in **Fig. 7** above, with the same channel having a slightly higher apparent THD+N and quantisation distortion.

Modulation noise in this product is very small. In **Fig. 9**, there is almost no difference between the noise curves, indicating a good performance.

In **Fig. 10**, analogue in to analogue out linearity reveals once more the deficiency of one channel convertor compared to the other, this too on further investigation proved to be the A-D convertor at fault. We have recommended to Fostex that improved testing and setup procedures are planned to improve this on future shipments.

Serviceability

Following repeated problems and unsatisfactory support for a Technics portable DAT machine, purchased following an impressive review (by me!), it seemed to be a good idea to investigate product support a little more thoroughly as a part of the review process. How much good is an excellent product if what should be warranty failures are chargeable, and replacement batteries are on 12-month delivery?

For this review I visited Fostex's UK operation. The place is small, but gave the impression of being well organised. The service support people have good customer support attitudes, with records kept regarding turnaround of machines in for repair. Spares stocks were not examined in depth, but questions arising from my own experience elicited the right answers.

The machine itself is relatively easy to get into, being of modular construction internally. Small design details are still being improved to reduce the likelihood of repair being required early. A manual was not examined, so no comment there.

In this regard Fostex attitude seems to be confirmed in practice by the keeping of their promise to upgrade the *D-20* to any future SMPTE time code standard, even when they had little idea of what might result.

Field use

With the *PD-2* slung over his shoulder, my son ventured out onto the waterfront in Cowes to conduct 'interviews' about the popularity of late night RAVE parties. The machine added weight to his credibility and resulted in a degree of hilarity the next day as we listened to the results. And his inexperience did not show in the audio quality of the recorded programme, benefiting from the forgiving nature of the wide dynamic range combined with microphone compressor.

Summary

Aside from our concern over PCM error warnings — serious if they prove to be a product feature (which we doubt), the *PD-2* lived up to our expectations and the manufacturer's published specifications. On a machine of this complexity intended for field use, it is not possible for us to simulate all potential troublesome conditions, but we are convinced of its sound design. We can certainly recommend that purchasers of location recorders demand a trial of the *PD-2* before spending their money elsewhere. ■

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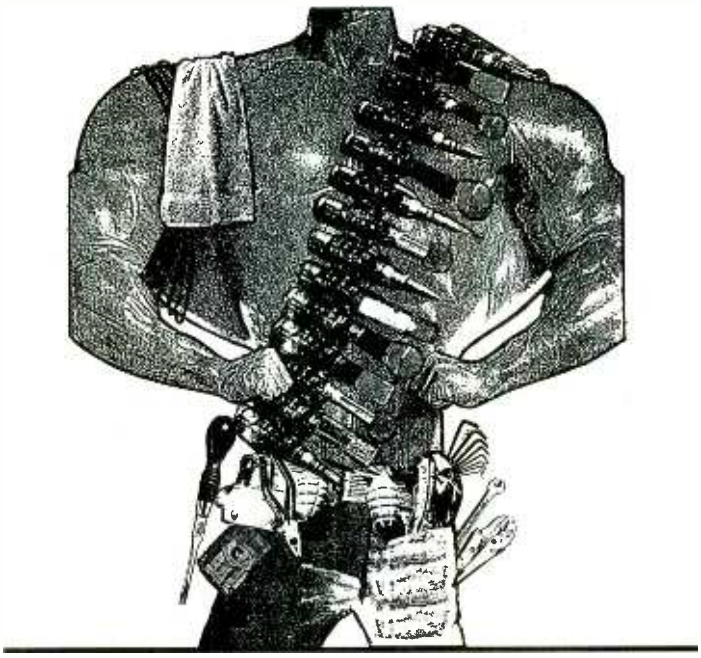

Keith Spencer-Allen on creative maintenance

Pursuing the theme that the purpose of all recording techniques is to aim for quality in performance and fidelity, I would like to look at another side of achieving that.

We might view selection of the right microphone or acoustic as part of the positive creative process yet regard maintenance as a noncreative process. I would like to suggest that this attitude is wrong. In the same way that a creative action can extract the optimum performance from a musical instrument or acoustic, maintenance can be seen as achieving the optimum performance from the tools. It matters not how brilliant the sound you capture musically, if it starts to deteriorate the minute it enters the studio's signal chain via the microphone. What price creativity then? Surely any action that maximises the performance, maintains its current performance and helps prevent failure has to be part of the creative process.

In the context of this column I am not talking about full technical workshop-type maintenance but more those points that are within the recording engineer's control before and during session time. It obviously depends on the type of studio and the way that technical support is handled, and in some ways this may actually be more meaningful to freelance engineers who may not themselves be sure about the degrees of competence behind the maintenance at the recording location.

The first point has to be to use both ears and eyes. You normally see equipment before you hear it, and this is the best place to start within pre-session setup time. Look at the mics you select; are there any signs of damage on the casing? The most common time for mics to become damaged is when dismantling the previous session, and the first time it will be noticed is the beginning of yours. It is easier to detect a mic problem at this stage rather than after two hours of innocently trying to EQ it 'right' from the control room. If the mic is a dynamic type then there is every chance that it is OK but it may be worth checking on speech. A condenser mic is more delicate and will definitely need checking more closely. A ribbon-type would be the most suspect and should not be used without a thorough checking. Remember, not all ribbon mics are the large monsters of yesteryear — for example Beyer have several (*M130*, *M160*, *M260*) small ribbons in their range and although fairly robust, a swift fall from five feet does not do them any favours and full repair could be required.

If any doubts remain about a mic it is best to check it side-by-side against another of the same type on the same signal when deficiencies of performance will be clear.

Checking leads and connectors is another angle to pursue. Frequently a simple visual examination as the cable is played out is enough but check more closely around the connectors. If there is any play in the cable as it enters the connector it would be wise to check that internally the cores are not just holding onto the plug pins by single threads.

Any damage elsewhere in the cable should also be checked — burns, severe twists or crushing comes under this heading. Without a cable tester to hand, the easiest check method is to attach the cable to a condenser mic at one end and phantom power it from the console at the other. The channel should be monitored loudly but with care. The suspect areas of the cable should them be manipulated — any problems should be immediately obvious.

I might also check phase (polarity) of all the mics to be used. Group them all together as closely as possible facing a sound source which should be a sustained low-frequency note, such as that from a synth, via an amplifier or something similar. One mic should be chosen as a reference and in turn each other mic should mixed on the console with the reference. The metered levels should rise with the addition of the mic under test. A reverse polarity mic will cause a drop in level. In the event of finding one reversed, it would be as well to check that it is the mic and not the cable or indeed any other part of the signal chain that is actually reversed. In a studio environment the problem will invariably be a rogue cable.

I have always had a paranoia over patch-fields. Many of the weirdest problems I have encountered stemmed from faults in this area. A general rule that works for me is that any patch-field mounted vertically is worth making and breaking each jack a few times to improve contact. If the patch-field is a horizontal type, particularly one without a cover, leave it well alone unless there are problems. It is worth noting that patchbay faults can give level, intermittent, frequency and distortion related effects some of which, in retrospect, seem unlikely but can happen.

There is little to be done with the console other than checking each fader with a tone to ensure it is problem free. This also gives a chance to ensure that there is a similar feel from all the faders.

It is in the area of the recording machines that most can be done. Cleanliness is of course essential — not just of the heads but anywhere over which tape travels. Pure Isopropyl alcohol or a proprietary head cleaner is suitable for analogue machines. Pinch rollers should also be checked. Some types seem to absorb lubricant from the tape back-coating and then slip against the tape on acceleration so causing tape damage. A wipe over the roller with a damp cloth normally cures this.

Demagnetisation should follow over the complete tape path including, for thoroughness, the nonferrous parts as magnetic particles can still collect there.

Assuming a machine has been fully aligned before the session, I still like to check across the tracks on–off tape with a familiar, full-band music signal which allows easy confirmation of frequency response and level alignment on each channel.

A digital machine is rather more difficult to assess. Other than cleaning with a recommended cleaner there is little that I would address in the context of this piece. Mechanical tolerances are critical on digital machines and I would assure myself of its alignment before this stage in session preparation.

The same goes for a DAT machine, although I might consider a DAT cleaning tape and making a recording on the machine to test playback on a known machine at a later date, before I had to use the machine seriously.

Head cleaning is something that should also be checked during session in a casual way. I once experienced, a minute sticky deposit on the record head (despite cleaning) removing oxide from the tape and building up a finely honed point that cleanly slit a two inch tape into two equal inch widths — all within three hours.

Other minor analogue points include demagnetising razor blades and thoroughly cleaning editing blocks. The recorded surface of the tape comes into contact with the open surface and all the wax crayon, sugar, salt and grease should be cleared before use.

Many of these points are the kind of simple checks that can be completed before a session and are proven useful particularly when working outside of a studio that you know. None of these suggestions replace a proper maintenance programme but might save you considerable aggravation and creative frustration when you least need it.

You may have suggestions of your own to add to this list; checks that have saved you in the past. Or you may disagree with some of the ideas here. If so send them in. ■

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