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FOR RECORDING, POSTPRODUCTION AND BROADCAST

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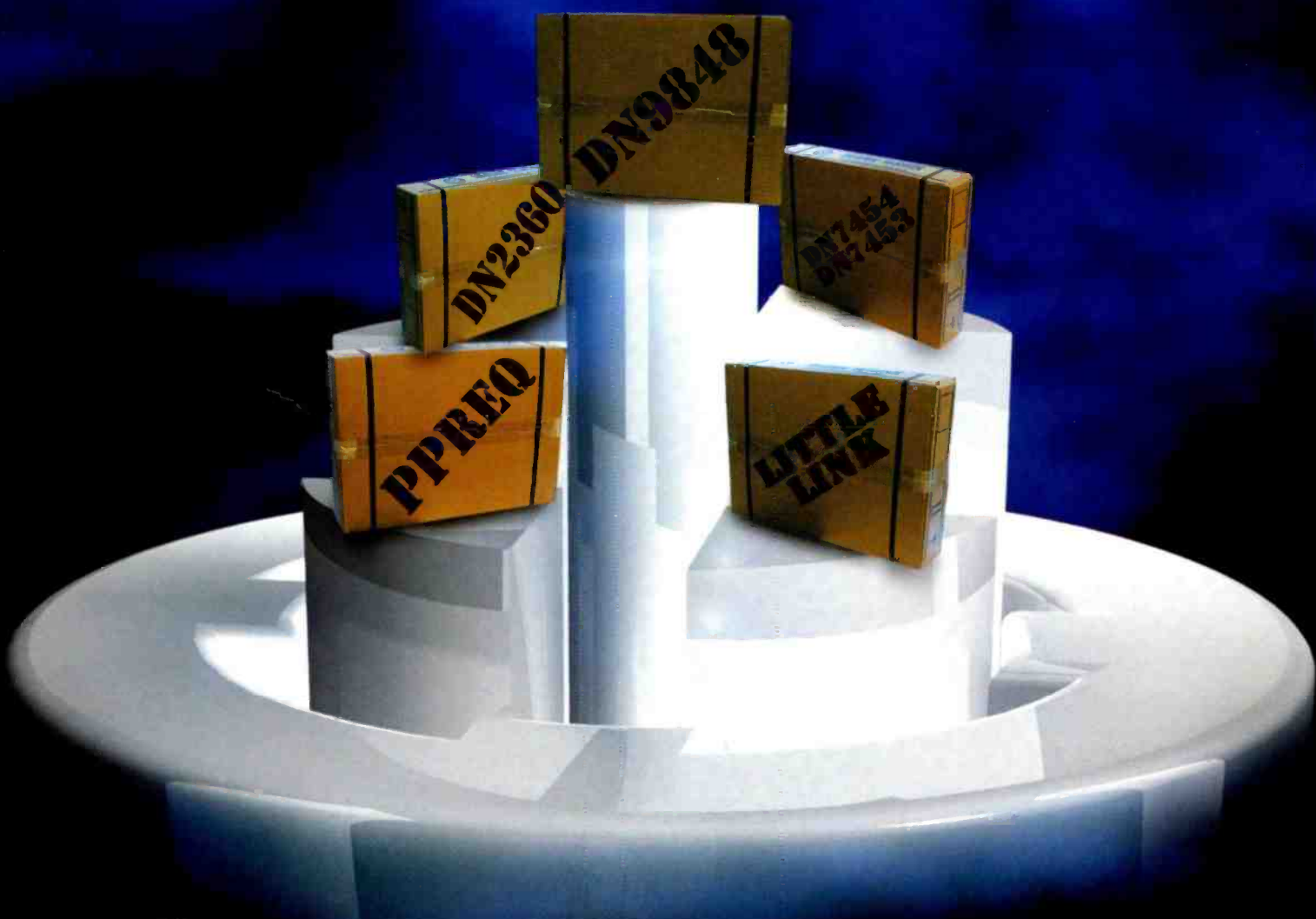


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**JAMES
GUTHRIE**
Interview

- ANALYSING LOUDSPEAKER PERFORMANCE
- SOUND EFFECTS LIBRARIES
- MAKING WAVES IN ISRAEL
- LOCATION RECORDERS



5 Sound Reasons To Visit Booth 4.1D50 Musikmesse



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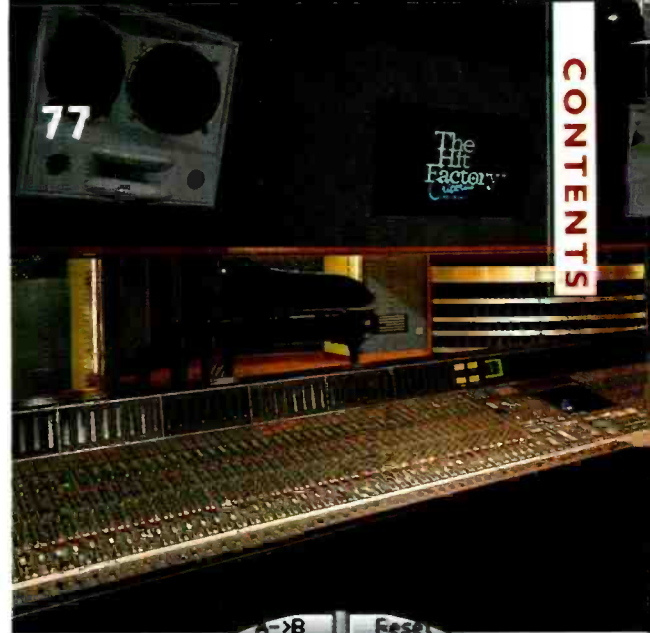
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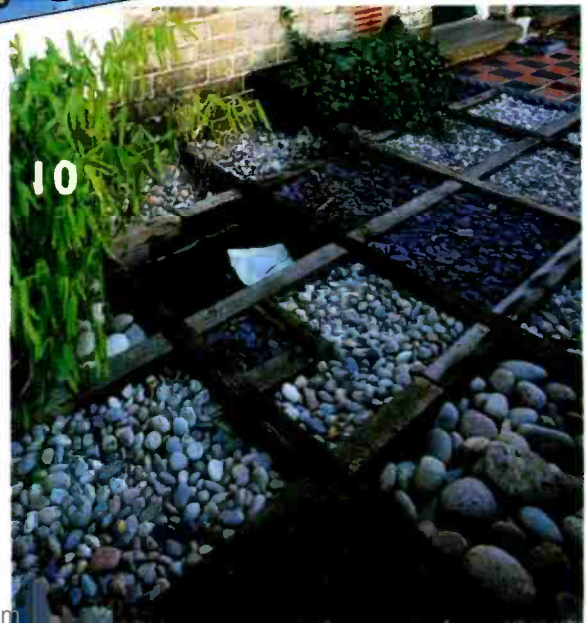
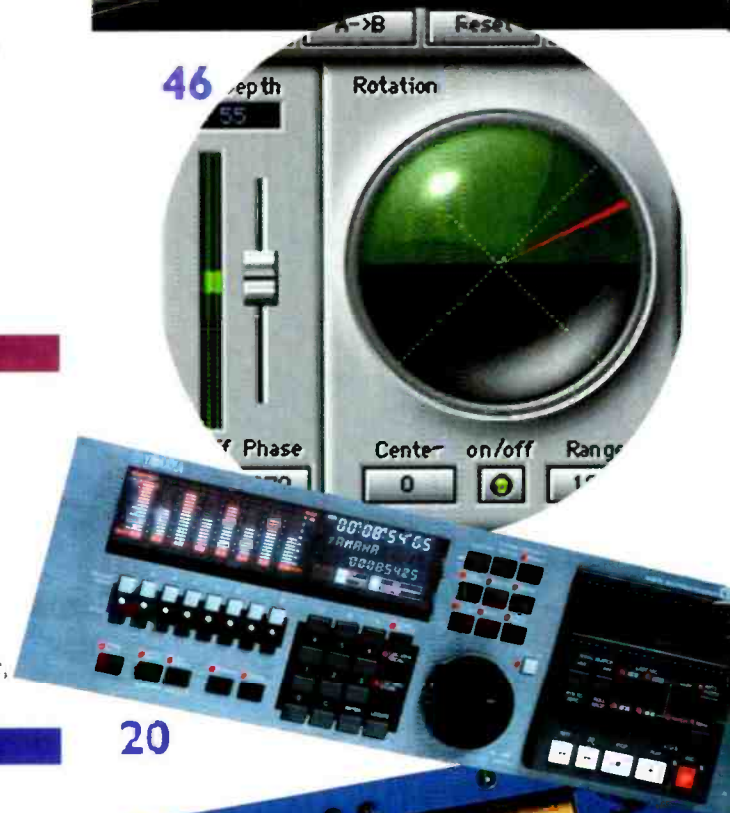
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STUDER 01993
The World of Professional Digital Audio

SSAIR Awards - for your favoured pieces of equipment

Product Reviews
- reviews and previews, plus a whole new technology section

Features
Interview: **Eric Burdon**
From player to producer via Zappa

Comment
Comment: **SS**
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Broadcast
Audio distribution in the digital age

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Double mediocrity

WE STUMBLE THROUGH OUR DAYS faithful in the knowledge that despite all the best efforts to upset our internal gyros we are always tied to the earth by reassuring certainties. What you are looking for is always at the bottom of the pile; the suspect patch-lead always falls easiest to hand; precious objects always bounce and roll when dropped; an unmuted phone will always ring in the quiet bit; and synchronisation problems always materialise when someone else is watching. Oh, and Hollywood will always put on a spectacle worth watching.

The last is by far the hardest to agree with and while its output has always been peppered with catastrophic failures and examples of style over content, Hollywood is now exhibiting all the signs of an industry short of good ideas for its throughput requirement.

A transatlantic crossing courtesy of dreadful Continental Airlines treated me to top billing in-seat entertainment of *Double Jeopardy* (Paramount Films) not just on the way out, but with masterful foresight on the return too. If you think this film is luke warm on first sight it is doubly so on the repeated screening. My objection is less to the unconvincing and uninvolved story line, which is dressed in the merest tissue of making a political statement, it is the packaging. I expect a little more from a so-called blockbuster on this sort of budget. The sound was great, even on those atrocious Continental head clamps, and it looked good too, but it belonged on television not the silver screen especially as the blood, flesh and special effects count was peculiarly low. It is almost as if they'd targeted cheap hit video as a priority, which they undoubtedly have to consider anyway.

They must try harder if they are to hold on to any notional high ground as purveyors of ultimate entertainment even if the pressures for throughput are enormous. Can it really be that difficult to make good entertaining films when the money is available?

Then again Hollywood may be hiding behind that portion of the Fifth Amendment to the Constitution of the United States that is quoted on the film's website. 'No person (shall)... be subject for the same offense to be twice put in jeopardy of life or limb...'

Zenon Schoepe, executive editor

Writing on the firewall

STANDING IN THE QUEUE to enter the computer fair would have given you ample opportunity to watch people freely coming and going from the antiques and record fairs running simultaneously in the same Birmingham hotel. If it were needed, it was a clear indication that, while they are far better established, antiques and records fairs cannot compete with software for popular appeal. It wouldn't be so strange if these events weren't regularly termed 'collectors' fairs'.

Expecting to pull £300 for an original 1955 Tempo release of King Tubby and Cleo Laine may be standard fare at a record fair, but the computer commandos had come to liberate as much software as possible without breaking the bank. The idea of a stall with a handful of 10-inch fifties 'Kenton Presents' Capitol releases as its main attraction would have passed them by, and they it.

Knowing the market seems to be the only commonality between the two types of event. The superficial similarities between music and computing as entertainment are as far as it presently goes. The 'collectable' status enjoyed by music software has no ready parallel in the world of games software, where a library is a resource rather than an investment and desirability is dependent on currency, rather than rarity.

Unfortunately for old-style music lovers, on-line music delivery threatens more than quality; it threatens to replace the tangible and collectable with the transitory and disposable. For when data has only intrinsic value, recordings have nothing to offer but their musical content. It's time to forget promotional pre-releases, limited editions and deleted catalogue and concentrate on the music. For better or for worse.

Some music is transitory, some is destined to outlive its original inspiration. The reasons for the success or failure of a recording often defy ready explanation—whether at the hands of musicologists or popular historians.

History alone will judge the ultimate effect of music on demand. How will music free of a definitive release, supporting artwork and packaging fare?

It's time for a change. It's time for Roger Dean to check his email—the writing's on the firewall.

Tim Goodyer, editor

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Incorporating Broadcast Engineering
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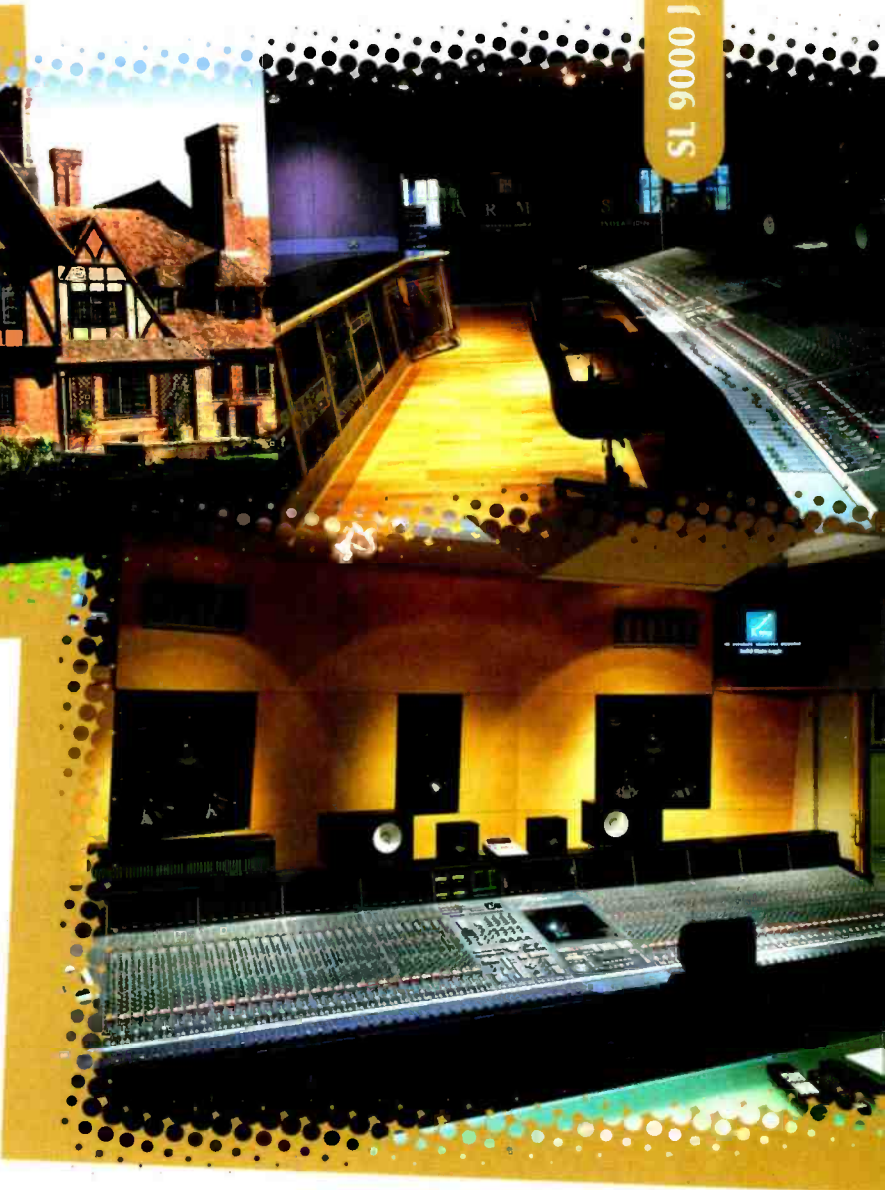
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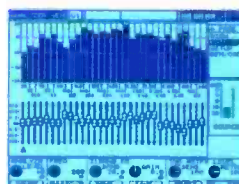
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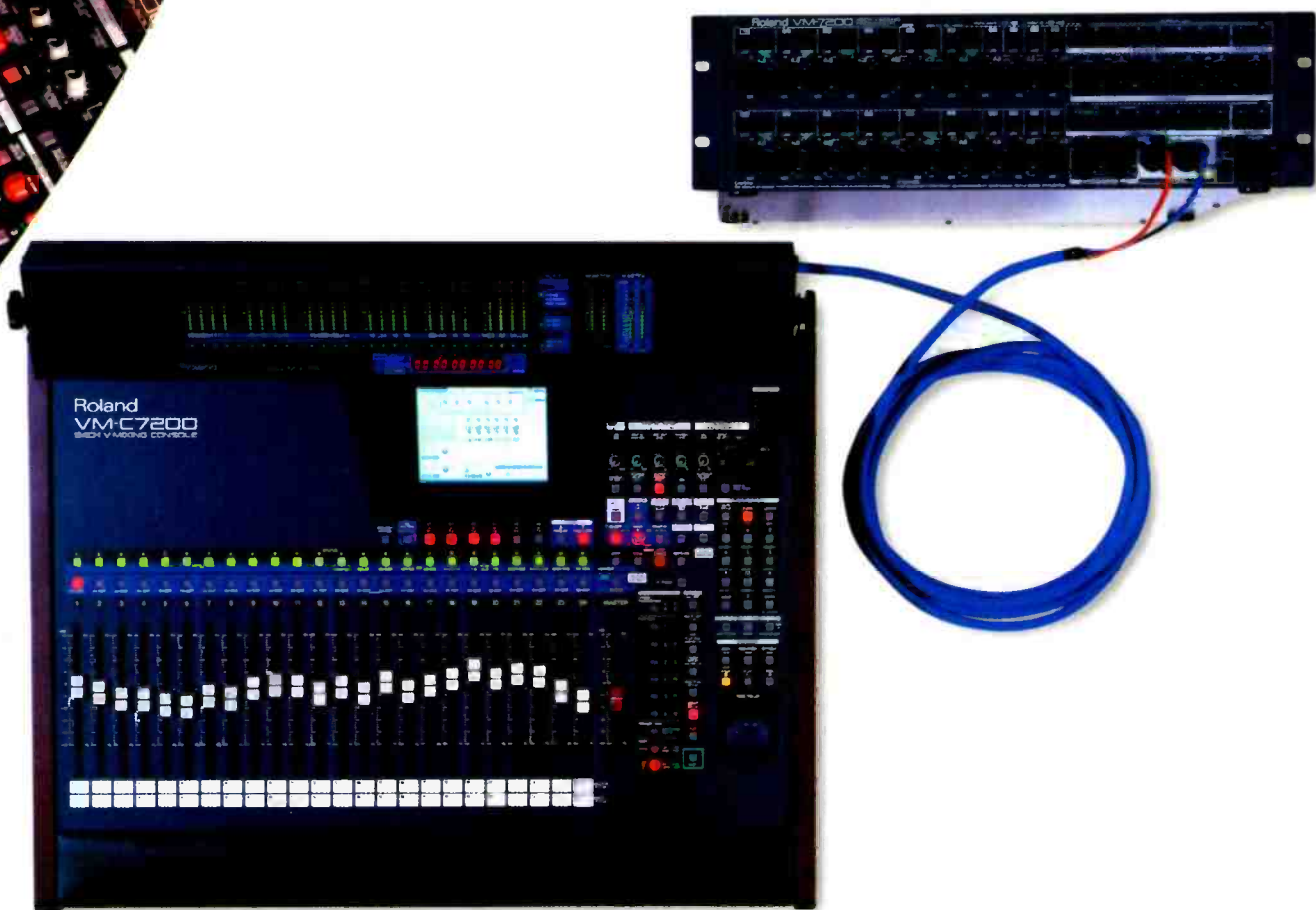
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WE DESIGN THE FUTURE

■ Tokyo-based audio facility VASC has built a new postproduction room around a 20-fader, 48-channel Amek DMS teamed with a 24-channel Fairlight MFX3 and a DoreMi video hard-disk replay system. Although the new room is not 5.1 capable, the DMS is in anticipation of future development at the facility. VASC specialists in drama postproduction for key broadcasting clients such as Fuji TV, NTV and TV Tokyo. In response to growing demand.

Amek, UK. Tel: +44 161 868 2400.
 ■ Munich's SZM-Studios took delivery of the first Jünger C8000 modular processing system earlier this year. SZM's configuration contains the d05 digital transmission signal processor with adaptive preemphasis and SDI interfaces giving embedded audio processing for up to seven programme chains. A second identical C8000 system is already on order.

**Jünger, Germany.
 Tel: +49 30 67 77 210.**

■ LA's Plant Recording Studios has opened a new mastering suite designed by Manny LaCarruba and John Cuniberti around a SADiE Artemis 24-96 workstation, Crookwood mastering desk, Pnsm AD/DA2 converters and Krell-powered B&W Nautilus 801 speakers. Presently a stereo facility, it will be converted to 5.1 working 'when market demand becomes a reality'.

**The Plant, US.
 Tel: +1 415 332 6100.
 SADiE, UK. Tel: +44 1353 648888.
 Crookwood, UK.
 Tel: +44 1628 528 026.
 Prism Sound, UK.
 Tel: +44 1223 424988.**

■ London's Videolondon post house has installed its second SSL Avant digital console as the latest stage in the major refurbishment and digital upgrade of Studio 1. Two years ago, Videolondon took the city's first Avant in the Munro Associates designed Studio 4. The second console will provide a further 64 channels to serve the variety of projects passing through five studios. Projects include long-form drama, documentaries and foreign language dubbing. Recently completed productions include *Monarch of the Glen* for Ecosse-BBC Productions. Another London facility, Whitfield Street, has opened a new 5.1 mastering suite based around a 16-channel SADiE system with Dolby AC3 encoding and using Magtrax' MusicBox and MBI monitoring routing systems. Projects already completed include *Charlotte Church*, *Black Sabbath*, *The Talented Mr Ripley* and *Gormenghast*.

**Videolondon, UK.
 Tel: +44 171 734 4811.
 Whitfield Street, UK.
 Tel: +44 171 636 3434.
 SSL, UK. Tel: +44 1865 842300.
 Aspen Media, UK.
 Tel: +44 1442 255405.**

■ Mobile news includes Iceland's National Broadcasting Service ordering a 48-channel Calrec S2 analogue production console to replace the EMT mix system currently installed in its OB-2 vehicle. The UK-based Fleetwood Mobiles, meanwhile has upgraded the 96-channel Euphonix desk in its main mobile truck by installing Cube router enabling 5.1 surround sound audio mixing. A live broadcast and recording for Radius Television on the Irish *Three Tenors* in Belfast is already in the can. Surrey-based Sound Moves

has ordered a second Soundtracs DPC-II for a newly established post-production facility. Sufficient clients have wanted to book Steve Williams' mobile for postproduction that the new console will go straight into two months of remixing opera with Andy Rose of ARC, in 5.1 for DVD enabling the mobile to stay on the road.

**Fleetwood, UK.
 Tel: +44 8700 771071.
 Soundmoves, UK.
 Tel: +44 1342 844190.
 Calrec, UK. Tel: +44 1422 842159.
 Euphonix, Europe.
 Tel: +44 181 901 7510.
 Soundtracs, UK.
 Tel: +44 181 388 5000.**

■ Egypt's newest production, dubbing and music recording studios at Media Production City will house six SSL consoles. The £400m state-of-the-art green-field-site project dubbed Hollywood on The Nile will employ four SL8032GB analogue multitrack consoles with stereo channels for broadcast production, a 64-channel Avant digital console for postproduction and a 96-channel Axiom-MT digital multitrack console for music recording and mixing. The project is being handled by The Fourth Consortium headed by Sony BPE and civil engineers Kvaerner, and is due for completion mid 2001.

**Solid State Logic.
 Tel: +44 1865 842300.**
 ■ British Maidstone Studios has replaced its old 40-channel Raindirk Symphony console with a new 48-channel Calrec C2 production console. The installation is part of the refurbishment of Studio 1 which will see use with Media Merchants, Screenshop and Flextech Productions and for other live broadcasts.

**Calrec Audio, UK.
 Tel: +44 1422 842159.**
 ■ Portugal's state TV broadcaster RTP recently took delivery of its fifth Otari console, a 48-frame Elite+, and is planning to order a further Elite console. RTP mainly uses its Otari consoles for the production of the national TV breakfast show and morning news.

**Otari, Deutschland.
 Tel: +49 2159 50861.**

■ Virginia's Wolf Productions has installed an AudioCube3-II with dual 500 MHz Pentium III processors, CD ROM and CD writers, removable 9Gb audio drive, External SCSI and 100-Mbit Ethernet cards. The system is configured with restoration and mastering tools (VPs) including Loudness Maximizer, DeNoiser, DeClicker, Spectralizer, De-Clipper, DeBuZZ, Magneto, FreeFilter, RepairFilter, AnalogEQ, DeES, Free-Shaper and DeCrackler. In addition to CD mastering, Wolf productions is active in the area of audio restoration and does a great deal of work with the Smithsonian Institute.

**Spectral Design, Germany.
 Tel: +49 421 22 1440.**

■ New York's Broadway rental house, Masque Sound and Recording Corporation of New York and New Jersey, has added two Richmond Sound AudioBox 8-track hard-disk playback system and show controllers to its inventory. In the UK, Dreamhire has become the first pro-audio hire company to adopt Digidesign Pro Tools v5.0 for post. Dreamhire now has nine Mix Plus systems.

Net: www.RichmondSoundDesign.co



▲ **US: California's New Wave Entertainment has replaced its entire digital audio complement with the complete range of Fairlight digital audio and video systems. The 5-room NWE audio postproduction facility is now an all-Fairlight using three Fairlight FAME integrated digital audio production system, two Fairlight MFX3plus digital audio workstations, five Fairlight ViVid hard disk recorders, and the Fairlight MediaLink audio server. NWE also has an extensive video postproduction department where the Fairlight systems interface with 12 Avid video editing systems using OMF protocol.**

Merging allies with Algorithmix

Switzerland: Merging Technologies and Algorithmix have joined forces in audio workstation technology. Algorithmix will provide high-end plug-ins for Merging's Pyramix Virtual Studio 3.0, an integrated digital audio workstation for recording, broadcast and mastering. As a first stage in the planned long-term strategic alliance, Algorithmix will implement on Pyramix the whole range of its real-time restoration tools.

Claude Cellier, president of Merging Technologies said: 'The excellent audio restoration technology Algorithmix developed is fully compatible with our high-end audio quality philosophy, and considerably extends application fields for the Pyramix Virtual Studio. In addition, we are proud to present the world's first audio workstation providing audio restoration with 96Hz sampling frequency.'

Algorithmix president Christopher Musialik added: 'We have been asked many times to make our restoration technology for shellac and vinyl accessible for video and film applications, too. The problem was to find a suitable platform covering all audio areas being interested in signal cleaning and powerful enough to cope with the large processing power required to run our algorithms at. The new Pyramix Vir-

tual Studio 3.0 seems to be the ideal audio workstation we have been looking for.'

Netia buys Audio Follow

France: The Paris AES Convention provided the opportunity for Netia to announce the signing of an agreement that gives it control of Audio Follow, the Paris-based specialist in digital audio playout systems for radio. In 1999, Audio Follow launched a new range of software under Windows NT which has recently been completed with a music scheduling system.

The deal is seen by the two companies as natural extension of a working relationship that goes back to 1993. As well as having customers in common, particularly in Europe and Asia, they have been undertaking joint research and development projects for the last 18 months, and have already interfaced their software. The deal also gives Netia, which is based near Montpellier in southern France, a permanent presence in Paris.

Last September Netia joined the Belgian group EVS. The combination of the two alliances will allow the company to accelerate its expansion both in France and abroad. Founded in 1993, Netia develops software for radio and television professionals, and has undertaken projects involving digital radio, digital television and the Internet. The company's

clients include Radio France, RAI, RTL, TF1, France 3 Television and Euronews.

DSP Moves to Los Angeles

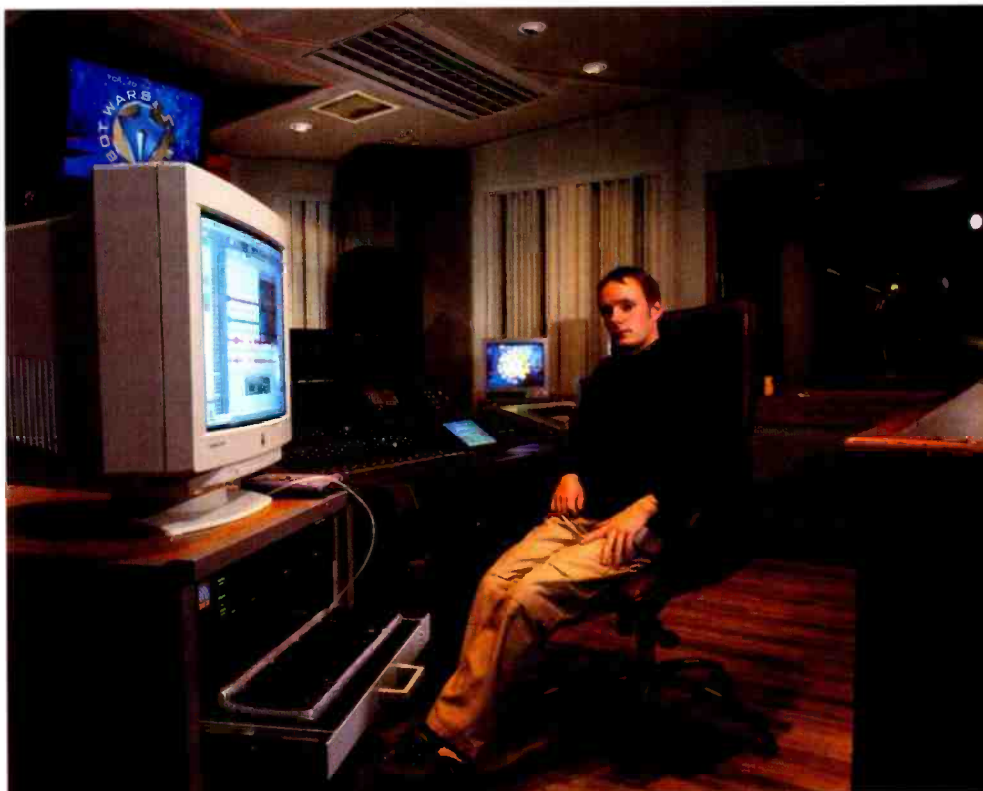
LA-Sydney: Following a successful round of Venture Capital raising, Australian-based Digital Studio Processing has now moved its headquarters and operations management to Los Angeles. The new US company, named DSP Media Inc. is located in Studio City while R&D, engineering and manufacturing will continue to be based out of Sydney. The LA office will include company headquarters, demo and training facilities, and provide the world-wide base for sales and marketing. Company CEO Andrew Wild said: 'DSP has a great product range and a diverse and enthusiastic client base. Now it's time to let the rest of the audio world know what the company has to offer. The new office will also allow us to more effectively provide training and customer support to the US and world markets.'

DSP Media designs, manufactures, and distributes integrated solutions in digital audio post-production for radio, television and film.

Net: www.dspmedia.com

AES Success

France: The 108th AES Convention in Paris was one of the most successful conventions ever in Europe. More than 8,700 attendees visited the Palais des Con-



▲ **UK:** Soho-based Molinaire has recently added a Digidesign Pro Tools Mix Plus v5.0 system running on an Apple G4/350. The system includes a Digidesign 888 interface, Universal Slave Driver and a number of plug-ins, is currently installed in a mobile unit, which allows use of the system in any one of the facility's four dubbing suites and two track-laying rooms. The setup was first used with a 16-track AudioFile for sound design on BBC2's offbeat comedy, *The League of Gentlemen*

gres in the French metropolis to take a look and discuss about the latest in pro-audio. This number also shows the growing influence and popularity of the AES in Europe.

The success story continues with the next AES event: the 15th AES UK Annual Conference in London on 8th-9th May 2000.

The subject is Moving Audio—Pro-Audio Networking and Transfer which was also one of the most popular subjects in Paris. Details about the program will be released on www.aes.org/sections/uk/moving_audio. Of course this year there is also a convention going to come in the US.

LA in the sunshine state Cali-

fornia will be the place to go in September 2000. Other future convention venues will be Amsterdam, Netherlands (May 2001), New York (September 2001) and Munich, Germany (May 2002). Further information:

Stefani Renner,
medientechnik.presseservice
@t-online.de



▲ **China:** Ultimately destined for installation in a mobile truck, the 64-fader Soundtracs DPC-II digital desk ordered by China's largest independent television company, TVB, will first tour various locations as an on-air broadcast and programme acquisition console. Once mobile, the OB truck will serve the Guangdong region in the south of China.

Studio Sound www.prostudio.com/studiosound

Educating India

India: The School of Audio Engineering has tied up with India-based Access Atlantech Technologies to open SAE facilities in major cities including New Delhi, Hyderabad, Kochin, Mumbai, Pune and Bangalore.

SAE Technology College conducts audio engineering and multimedia diploma courses in 29 locations world wide and has recently introduced a filmmaking course that covers the latest digital filmmaking and audio-visual postproduction techniques, camera and lighting techniques, and instruction on Silicon Graphic computers and Avid media editing systems. With the advent of the Indian and Sri Lankan colleges, SAE Technology College will be the largest international audio and multimedia institution in the World.

SAE, Amsterdam.
Email: saeaudio@euronet.nl

April 2000 9



Small wonder

MOVING FROM JAPAN to England I have found living space both an affordable luxury and a business opportunity. In my Tokyo apartment building a Foley studio in my garden meant risking falling from my window box, but in my London terrace this is just what I have done (see photo). If we can build driving ranges on our rooftops in Japan you can surely build Foley into our landscape in England. Now my wife and I can combine our favourite pastimes of audio and gardening and claim a tax rebate at the same time.

As it says in the Asahi advertisement: 'Remarkable and finesse. So good.'

J Sumisu, Twickenham, UK.

More mics and men

I WOULD LIKE to draw your attention to the article in the February 2000 issue of *Studio Sound* on dynamic mics, entitled 'Of Mics and Men'. Billed as an 'overview of dynamic mics that have recently offered themselves to the market', I was more than a little surprised not to see the Sennheiser evolution range of new dynamic microphones included in what is assumed to be an authoritative round up of recent developments in that sector of the market.

An extensive range of vocal and specific instrument microphones, launched only two years ago, evolution represents the greatest single investment in dynamic microphone technology in recent times by any manufacturer, both in terms of R&D and in-house production capability, and we would have thought that an article such as this would have at least acknowledged that fact. Mention is indeed made of the MD 504, now incorporated in the evolution range as the e604, but does not include any of the other new models in the range.

In an article that largely details further improvements to the existing designs, it is unfortunate not to see included, such a significant contribution by Sennheiser to the expansion of available models.

Paul Whiting, Sennheiser UK.

Tim Goodyer replies

The evolution range is certainly worthy of note, but the article identified the last 12 months as its target. The alternative is to reduce the frequency of such 'round-ups' to

two years, reducing the information content of the magazine and offending everybody with a revolutionary (evolutionary?) product that's three years. Setting an arbitrary cut-off is a practical solution, not a comment on the life-cycle of mic design.

Millennium misses

MY COMPLIMENTS on a well produced and most informative Millennium Special Edition; and I won't comment upon whether the year 2000 is the first year of a new millennium or really the last year of the second millennium. However, the timeline entitled 'The First 130 Years' contains a number of inaccuracies and omissions, some of which are as follows:

1. '1876: Alexander Graham Bell with Thomas Alva Edison invent a microphone.' First of all, Bell did not work with Edison; they worked independently and with no knowledge of each other's activities, nor did they even know one another. Secondly, Edison's microphone was invented in 1877, not 1876.

2. '1877: Emile Berliner invents a microphone.' This is, of course, correct. This is the device acquired by Bell in 1878 and used in all of the world's telephones for the ensuing 100 years. The Berliner patent application was filed 13 days before Edison's, and this saved the Bell System from destruction at the hands of the Western Union Telegraph Co which had acquired the Edison patent in order to enter the telephone business and eliminate Bell. Two Bell Telephone presidents (Hubbard and Vail) independently declared Emile Berliner the true and sole inventor of the telephone transmitter (telco parlance for what we call the microphone.)

3. '1888: Emile Berliner invents the disc record.' Sorry, but his patent date is (7th November) 1887.

4. '1899: Magnetic recording of sound is devised.' No, the true and recognised deviser of magnetic recording was Oberline Smith, in 1887. A dozen years later, Valdemar Poulsen introduced a working model of a magnetic wire recorder.

5. '1899: The first gramophone factory opens in Hanover, Germany'. Sorry, but Emile Berliner formed Deutsche Gramophon on 12th June 1898.

6. '1919: The only recording made by Edison himself—'Let Us Not Forget...' Sorry, but he made at least one other recording.

An omission: '1954: Charles C Davis of Westrex Corp develops '45-45' stereo disc system which recording industry adopts, only to later learn that this is precisely the system invented by Alan Blumlein in 1931.'

Oliver Berliner, Gramophone Music & Records, US.

QA Q&A

THE MORI SURVEY quoted by Simon Trask makes depressing reading for those who still look to improve the qual-

ity of audio: '50% of 15-24 year-olds... believe PC sound quality is better than the sound quality of the average home hi-fi, while 30% use the PC for listening to music...' Of course, if they're comparing a typical PC audio setup with a £200 domestic micro hi-fi, maybe they're right, but quality doesn't seem to be the right word.

Before CDs, the best quality audio in the home was a live VHF-FM broadcast. It's ironic that today, whilst at one end of the quality spectrum we're striving to improve on CD quality by exploring 24-96, DVD-Audio and DSD, the broadcast end is going the way of digital television by pursuing quantity instead of quality, with multiple programme strands on MPEG(ged) Digital Radio and all the uncertainties of Internet audio. Following this train of thought, what is the logic of demanding 24-96 quality for audio which is going to be mastered through a digital replication of an analogue processor, filtered down a telephone line and played back over PC loudspeakers or squashed into an MP3 beltpack?

The quantity-quality equation isn't just about broadcasting. Multitrack mix-down demands lots of channels, but with current offerings, doubling the frequency either doubles the price or halves the number of channels. Producers who need 96 channels for mix-down can't have them at 96kHz for the same money, and if the result is to be heard via MPEG-3, I suspect most producers would rather have 96 channels at 24-48 (still a lot better than 16-44.1) and not 48 channels at 24-96.

John Andrews, Marketing Director, Solid State Logic, UK.

Mini appreciation

I NOTE ZENON SCHOEPE'S CARPING on the rigours of driving a Mini long distance during his Great Ormond Street Hospital Beaujolais challenge with some mirth as he's clearly a Southern softie.

When I was a lad I thought nothing of jumping in to my 850cc Austin Se7en on a Friday night and driving down from Barnsley to Truro to see my girlfriend and to be back in time for the Monday morning show at the radio station I was working in at the time. In three years and 70,000 miles I did nothing but change the oil regularly, regap the plugs and occasionally wipe out the distributor cap with an old pair of pants which, as it happens, was about all the excitement I had with that dull Cornish woman.

The Mini's rear subframe collapsed a few years later and I disposed of the car. Your report reminded me of the combination of elation and fear that accompanied those high-speed jaunts. Feelings that non-Mini drivers can't appreciate and those that haven't met her mother wouldn't understand.

Angus Fazeley, Ormskirk, UK.

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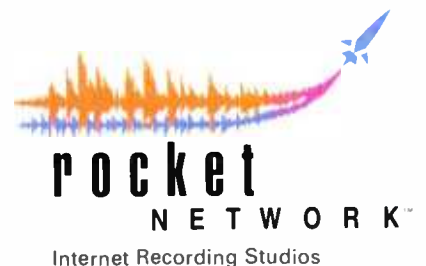
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WINNING WAYS

THE TIME HAS COME to sign off Studio Sound's mammoth Ruby competition. Begun last year as part of the magazine's 40th anniversary celebration, Ruby Rewards saw us collect together a catalogue of widely varied but equally desirable pro-audio kit dressed in a special ruby red livery simply to offer it to you. For the trouble of answering a scarce handful of questions you could bag anything from a Joemeek VCI Studio Channel through a selection of AKG mics, and Allen & Heath GS3000 console, a Marantz CDR640 CD recorder, a TL Audio CI Classic Compressor, a CEDAR Series-X DHX Dehisser, a pair of Genelec 1029A speakers, a Drawmer DS201 gate, a KT360 graphic equaliser, a Purple Audio MC76 compressor to a selection of EMO 'boxes. Good, eh?

Closing dates have passed, entries counted in, judgements made... The final results of Studio Sound's Ruby Competition are in your hands

The first round of winners were announced in December's issue of *Studio Sound*, leaving just six more to finish the job. So here we go...

Having recruited the editors of three of *Studio Sound's* sister titles to assist with the draw, it fell to *Television Broadcast Europe's* Fergal Ringrose to pull the name of Finland's Kjell Lolax from the CEDAR pile and that of Dutchman Jenderman van den Berg from the Genelec pile. Interestingly only Kjell had managed to correctly identify the *Star Wars* soundtrack as CEDAR's Billboard Top 200 hit. Genelec's 1029As, meanwhile had attracted

entries from as far afield as Singapore, the Philippines and Brazil but it was the American Michael Carnes who explained away Genelec DCW technology as 'beats me, but it sounds great'. When *PSN* editor Phil Ward was called to the stage, he picked The Netherlands' Leo Jacobs to receive Drawmer's DS201 and Nashville's Bob Hailey to take KT's DN360. Andre Patrouillie correctly pointed out that we'd called the DS201 the 210 and got himself excluded from the draw (although he'd got some of the questions wrong too) while Shawn Chua managed to send the most incomprehensible

entry and joined Andre in the Sin Bin. Finally, *One to One's* Tim Frost picked Ecuador's Robert Vogel as a worthy winner of the Purple Audio MC76 and Cheshire's Danny Davies to receive EMO's E520 DI, E325mic splitter, E630 mains distribution board and E445 cable tester. Prizes will be dispatched either from *Studio Sound's* London office or directly from the manufacturers concerned in fairly short order leaving just one last 'thank you' to go out to all who supported this event either with donations of equipment or their bids to win it.



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In today's rapidly evolving media landscape, confidence in new technology has to be earned. With the abundance of equipment being introduced, can you depend on your supplier, the product reliability, the life-span? Can you know if you've allowed for all the possibilities of new mix formats, digital input/output configurations and new standards of automation which may appear without warning?

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2000 SSAIRA VOTING

THE THIRD YEAR of the *Studio Sound* Audio Industry Recognition Awards finds us departing from previous years' events in one significant respect only: due to the early timing of the European AES Convention, we will not be holding our Awards ceremony in Paris, but in London at a slightly later date. In all other respects you are invited to vote for your favoured pieces of new equipment through the established channels of post, fax and email (details below). Based on the growing success of the previous two Awards, we are anticipating an even bigger response this year. Please support the manufacturers of your choice with your votes.

Ways to vote

Readers can vote for one product in each category in four ways.

1. By filling in the form and posting it to: SSAIRAs, *Studio Sound* Magazine, Miller Freeman Entertainment, 8 Montague Close, London Bridge, London SE1 9UR, UK.
2. By faxing the form to: +44 171 407 7102.
3. By emailing their unique reader identification number, the category numbers and their votes to: SSAIRAs@unmf.com
4. By filling in the interactive voting form on the *Studio Sound* web-site: www.prostudio.com/studiosound

16 April 2000

N O M I N A T I O N S

1. Large scale console

AMS Neve Libra Post; Calrec Alpha 100; Euphonix System 5; Midas Heritage 2000; Toa ix5000B; Soundtracs DS-M

2. Medium to small scale console

Allen & Heath ML5000; Audient ASP8024; D&R Airlab; Klotz Digital Spherion; Mackie D8b; MTA 924; Soundcraft Series Two; Soundcraft Series 15; Studer On-Air 5000; TL Audio VTC; Tritech TS-24; Roland VM3100 Pro

3. Outboard dynamics

Avalon 747SP; dbx Quantum; Drawmer DC2476; Joemeek C2; TL Audio Valve Classic C-1; Tube-Tech SMC2A

4. Outboard preamp

Aphex 1100; Presonus MP20; Summit MP4X; TL Audio Valve Classic PA-1

5. Outboard equaliser

Focusrite ISA430; KT DN422M; Summit MPE200; Summit EQ200; TL Audio Valve Classic EQ-2

6. Outboard Reverb

Eventide Orville; Roland SRV3030; Quantec Yardstick; Sony DRE-S777

7. Combined outboard device

Eventide Orville; Focusrite ISA430; Joemeek VC6Q; Jünger Audio Accent I; TC Intonator

8. Monitors

ATC SCM70SL; Genelec 1036A; HHB Circle 3; Munro MA1; PMC TB1S; Tannoy Reveal Active; Westlake LC5.75

9. Microphone

Audio Technica AT895; Audio Technica AT4047SV; DPA 3541; Earthworks SR77; GT Electronics AM40; Joemeek JM47; Neumann Series 180; Sennheiser Evolution wireless

10. Convertors

Apogee PSX100; Euphonix multi-channel convertors; Prism ADA8; Weiss SFC2 SRC

11. Audio editor

DAR Storm; Digidesign Pro Tools V5.0; Soundscape R.Ed

12. Audio recorder

Digidesign Pro Tools MIX plus; Euphonix R1; Fairlight Merlin; Marantz PMD650; Sony MDS-EI 1; Sony MDJE530; Soundscape R.Ed; Studer A827 Gold; Tascam D40

14. Location portable equipment

Cooper Sound CS208; Marantz PMD650; You/Com ReporterMate

15. Plug-ins

Aphex Big Bottom; Digidesign Bruno/Reso; Digidesign Sound Replacer; CEDAR Declick 96 (SADiE); CEDAR Declick (Soundscape); Line6 Amp Farm; Steinberg TL Audio EQ-1; Wave Mechanics Pure Pitch/Pitch Doctor;

16. Special category

CEDAR BRX+ debuzzer; CEDAR AZX+ azimuth corrector; Neutrik Minirator MRI; mSoft ServerSound; Symbolic Sound Kyma 5

VOTES CAN BE CAST by photocopying or cutting out the page opposite, filling it in and returning it to: SSAIRAs Nominations, *Studio Sound*, 8 Montague Close, London Bridge, London SE1 9UR UK. Fax: +44 171 407 7102. Alternatively, you can email the category numbers and your nominations to SSAIRAs@unmf.com

Readers will only be allowed to vote once. Readers may only vote for one product in each category.

Your reader identification number is the nine-digit number starting with a zero that is located in the middle of the top row of your *Studio Sound* address label. In all instances the inclusion of the reader identification number is essential.

The objective is to identify equipment

that genuinely warrants recognition for being special in some way.

Readers are not obliged to vote in all categories and their attention is drawn to Special Category 16 which serves as a 'catch all' for any products not covered in the other categories.

Any questions can be directed to Zenon Schoepe and Tim Goodyer at *Studio Sound*. Tel: +44 171 910 8500.

www.prostudio.com/studiosound Studio Sound

SSAIRA FAX VOTE

1 Large scale console

7 Combined outboard device

14 Location portable equipment

2 Medium to small scale console

8 Monitors

15 Plug-ins

3. Outboard dynamics

9. Microphone

16 Special category

4 Outboard preamp

10 Convertors

5 Outboard equaliser

11 Audio editor

6 Outboard reverb

12 Audio recorder

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Tascam DA-78HR

The migration of modular digital multitrack recording from budget to big time continues with the DA-78HR **Dave Foister** enjoys the ride

MDM WAS NEVER supposed to be about this. MDM was about affordability; features, convenience and scalability at a home studio price. It may have been digital but it was plain vanilla digital, which was still better than eight tracks on 1/2-inch analogue. It was not about keeping pace with top-end systems in terms of resolution—at that price how could it be? Alesis changed all that with the 20-bit XT machines, and, although it's been a long time coming, Tascam has responded, not just matching the 20, but going all the way to 24 bits.

High bit-rate recording on MDMs has been possible for a while by making use of the various bit-splitting techniques on the market, and indeed for some classical recording specialists this has been the preferred way of doing things for some time. The point here is that a typical classical session only needs stereo, and bit-splitting on to an 8-track eats tracks as it distributes the extra data across the tape. Tascam's DA-78HR makes this a thing of the past, as in High Resolution mode it offers eight full tracks of 24-bit recording. The surprise is that it does it without any trade-offs in terms of tape speed and consequent running time, maintaining its big advantage of almost two hours capacity on a single tape. It will probably also quickly get round the issue of the non-standard nature of the different bit-splitting systems such as the Rane, Apogee and Drawmer devices—not many facilities have them, making interchange of projects a problem, yet the DA-78HR is, I would guess, destined to become as familiar as the other DTRS machines.

From the front the new machine simply looks like a dark grey DA-38. Tascam has never been one for ostentation—its 24-bit DAT machine, the DA-45HR, is almost indistinguishable from its straightforward 16-bit counterpart. The only indication of the 78's capabilities is the HR logo, and a closer inspection of the controls reveals some new stuff and new ways of getting at it. At the same time it remains fully compatible with the entire DTRS system; 16-bit tapes from other machines will play happily in it, and the full range of supporting hardware stays the same,

all the way to the full RC-898 remote control unit. This, in conjunction with another extra, makes it a potentially very useful addition to an existing DTRS setup.

The other extra is full time-code support, with an on-board generator and built-in chase synchronisation. This being standard at this price point is a real bonus, as opposed to the 88 with its optional SY-88 sync board and the 38 with no time-code facilities at all. A big advantage of this modular type of system is that only one machine in a set has to have time-code features, as all the others will synchronise to the one master. This means a 78 can be the master in a system of several 8-tracks, all of the others of which can be the much simpler 38s. This will not make best use of the high resolution, as all the others will be 16-bit machines, but the 78 is worth considering on this basis alone.

Time-code handling is in fact quite sophisticated and flexible. Like many digital formats, the 78 is able to convert its own built-in tape timing information to standard time code and vice versa, allowing it to operate as either slave or master without having been striped with SMPTE at all. In fact it recommends this approach as being the simplest to set up in terms of digital sync and the least likely to give problems if there are sync difficulties elsewhere. The only circumstance in which the manual advocates transferring code from elsewhere is if existing audio is being copied to the 78 and must remain in sync with the code on the source. Even then it recommends great care in locking the clock to a central reference, and transferring code and audio in two separate passes. Remember though that the code is recorded within the digital sub-code, not on an audio track.

Whatever the approach, the 78 handles all rates of code, and has various operating modes in master and slave configurations. Chase locking can be either single trigger lock or continuous resync, and a clever routine works round the problem of optimising a preroll

when parking in slave mode. A simple one-off rehearsal of starting the master, of whatever type, allows the machine to calculate how long to allow for the two to achieve lock, and this value is then stored as the preroll—quite separately from the locate and punch prerolls. When working as master, the 78 has a choice of options as to how code will be sent during wind and shuttle operations.

Taking its cue from one or two other digital 8-tracks, the DA-78HR now incorporates a simple mixer, providing a stereo output from a selection of tape tracks and input sources. Each channel has variable level and pan, and in common with earlier machines an



adjustable delay setting for each tape track. In Mix mode the mixed output appears on channels 7 and 8, in both analogue and digital formats. Another newcomer on the 78 is a pair of phono sockets for SPDIF signals, and the mixer output also appears here; at other times the SPDIF output carries tracks 7 and 8. The SPDIF input can be routed to any pair of tracks, and provides a useful transfer method for stereo material for those who are not equipped with interfaces between TDIF and a stereo format.

All of this has to be controlled from somewhere, and as there are few additional hardware controls on the front, the obvious conclusion is that the menu system has become bigger than ever. Evidence of this is the fact that the shuttle wheel is also clearly marked as a data-entry knob, and this helps considerably in navigating the labyrinth of options.

The hierarchy depends partly on menus





called directly from front panel buttons, and partly on main menus called by the **MENU** button and submenus within them. There are so many functions that there is sometimes more than one main menu to deal with a particular area. Thus there are two audio menus, and three related to time-code functions, leaving three more to handle system settings, MIDI and maintenance. The mixer is actually accessed directly by a **MIXDOWN** button, and the settings for a particular channel are accessed by pressing the relevant track arming button. Each channel can carry any track, any analogue input or any digital input, up to a maximum total of eight, and the levels and pans are set with the data wheel, although fine adjustment is possible with the nudge buttons. Note that with this mode switched on, nothing appears on outputs 1 to 6 of the machine.

The only difficulty with the system is the rather basic display that is still in use on the 78. It carries a limited number of characters, each of which is still a 7-segment display. This is fine once you can remember that an 'n' with a bar over it is an 'm', a '9' might be a 'q', a

'k' looks like a backwards 'y' and an 'x' looks like a wheel brace, but it's still difficult to read and despite Tascam's best efforts at abbreviations it's often not immediately obvious what it's trying to tell you. If you want to do any of the advanced stuff you'll need to be able to find the manual. It does seem strange nowadays that this should still be an issue, yet at the same time it seems almost churlish to criticise the display in view of the power it helps to harness.

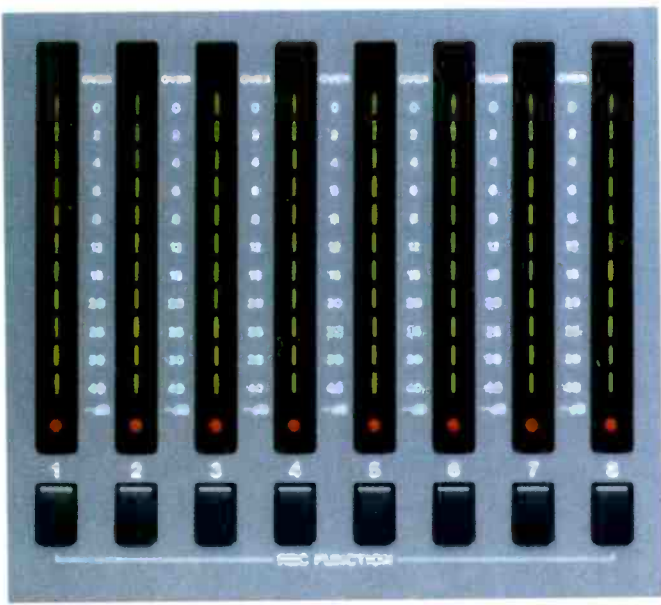
Because we haven't even come to the best bit yet. For all its new tricks, the principal bonus of the new machine is its High Resolution recording mode. I have no technical details as to how the feat of recording 24 bits on this format has been achieved, but it seems incredible that 50% more audio data can suddenly be squeezed on to the tape without any compromise. As already mentioned, the tape speed and therefore the running time of the standard Hi-8 cassette remain unaltered, yet there is no doubting the audible benefits of what Tascam has done. My main test was to run a Soundfield microphone directly into the machine, and play it back straight into a rather special pre and power amp combination—not a console in sight, nor any mic pres, EQs, or any processing at all. A shorter signal path would be hard to devise. And this enabled the strengths of the recording to shine through, with an undetectable noise floor, extraordinary detail in quiet and delicate moments,

and a real danger that in turning up the playback volume to discern the low-level subtlety, some damage might ensue when something happened at a more normal level. This was particularly apparent when recording a rehearsal of the *1812 Overture*, where the range between the conductor's quiet instructions and the flat-out bits was enormous. In terms of dynamics, the recording system simply disappeared, as one would hope when using this kind of resolution. This is what it's for, and for Tascam to have made it work in this established tape format is good news indeed.

The HR mode has to be established when the tape is formatted, along with the sampling rate (no 96kHz yet, but then nothing would surprise me). The machine will dither down to 16 bits on its digital outputs if required, as will be the case when transferring to a 16-bit DTRS machine, but otherwise the full wordlength is available on all tracks from the TDIF outputs. Note that 24-bit tapes from this machine cannot be played at all on previous DTRS machines, although the 78 can be used to record in 16-bit mode and will also play 16-bit tapes from other machines.

There has always been a feeling that DTRS is a bit more at home with the big boys than ADAT, although the 20-bit Alesis machines and the Studer V-Eight and its mighty remote control would challenge that perception. The battle may now be rejoined, however, as the DA-78HR brings top-flight recording resolution to a format that already enjoys such a remarkable market penetration thanks to its flexibility and speed. It may also mean the end of the various formats of bit-splitting, and the introduction of a genuine purpose-built high-definition recording format that needs no bodge boxes to make it work and whose products have a real industry-wide compatibility. This could be the answer to an awful lot of people's prayers, coming close to overcoming any remaining reservations about this hugely successful format. ■

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Fax: +1 213 727 7641.
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Tel: +44 1923 819630.
Fax: +44 1923 236 290.



Yamaha D24

Pushing down the cost of 24-96 recording, Yamaha's D24 nonlinear digital multitrack machine is finally here. **Rob James** puts it through its paces



YAMAHA HAS NOTHING to prove when it comes to innovative design and manufacturer of digital consoles. The 02R, built on the early foundations laid by the DMP-7 and DMC-1000, virtually created the market for digital 8-bus consoles. To date, however, the company has not enjoyed quite the same success with either DAWs or hard-disk recorders.

The D24 is a new 8-track recorder using a 3 1/2-inch direct over-write magneto-optical disc drive for storage. The bill of fare includes: 24-bit 96kHz recording, time-code-chase synchronisation, RS422 serial control eight virtual tracks per main track and Yamaha's solid build quality. The versatile I-O and control options make it easy to integrate into most environments.

The D24 uses a Project, Track and Part model with up to 99 projects being stored per disc. A Project consists of one or many sound files and a settings file which carries configuration information—bit depth, sampling rate, time-code frame rate absolute start time, relative zero position, title (up to 12 characters or spaces), virtual track assignments, up to 100 locator memories and the In, Out, A and B points. Wordclock and time-code sources are not stored with the project and must be set manually. Finding Projects and switching between them is made easy by the two Project search keys.

From the operator's point of view, the D24 is essentially a 'destructive' recorder. There is a single level of undo but otherwise once the last recording In and

last recording Out points have been lost any audio covered by a new recording is effectively orphaned. It still exists on the disc, but there is no way of getting at it and it continues to take up disc space until the Optimize function is invoked. Conversely, by using the Auto Punch In-Out function up to 99 takes can be recorded in the same place on the same or any tracks and auditioned before deciding which take you want to keep using the Fix function. However, the same caveat applies, once the Fix function is invoked or the In and Out points are altered there is no way to get at the other takes.

There is another worry about the punch in-out functions—with eight tracks selected for recording there is a time lag of almost 2s between pressing the button to punch out and the monitoring reflecting the change. The resulting recording is fine and the punch out actually happens where you press the key but the monitoring delay is annoying. Also, if several punch in punch outs are carried out in succession without stopping the transport, there is a hiatus of up to 10s

when you do stop, while the D24 sorts out its housekeeping.

Record time using the internal DO MO drive is 15 minutes of 8 tracks at 16-bit 44.1kHz sampling or a paltry 9 minutes of 4 tracks at 24-bit 96kHz.

Editing functions appear in several guises. Tracks can be slipped by modifying the individual track's start time. This is changed by selecting the track, track pair or all tracks to slip and slipping the track or tracks to any of the locate or mark points. The exact value of the chosen point is adjustable as part of the process. Each track has eight virtual tracks which can be swapped individually or collectively with the 'live' tracks. Whole tracks may be copied >

Front Panel

EIGHT, 16-segment bar-graph track meters dominate the bright, vacuum fluorescent display. A Peak Hold function is supplemented by two meter scaling options. Normal shows from -60dBFS to 0dBFS and Fine displays from -26dBFS to 0dBFS. Red Over lights appear when several consecutive samples exceed 0dBFS, and the large numbered segment at the bottom of each meter flashes to indicate record ready and goes solid when recording.

A small Absolute-Relative time indicator adjacent to the main counter toggles according to time mode. Indicators light up to confirm status of lock, chase, word clock internal or external bit depth, 16, 20 or 24 frequency of sampling 44.1kHz, 48kHz, 96kHz or variable and time code master or slave.

Two rows of 12 characters form the message area. This is used to display relevant operating information and when setting up the machine or editing.

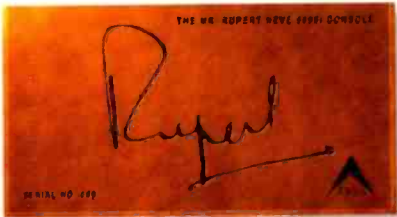
Transport keys are chunky, internally illuminated items which click reassuringly when pressed. A recessed mains push button, phones socket and volume pot complete the picture.

www.prostudio.com/studiosound Studio Sound

Creative Genius

and **Practicality** are
Rare Partners.

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and his Newest Achievement
demonstrates **Lightning does**
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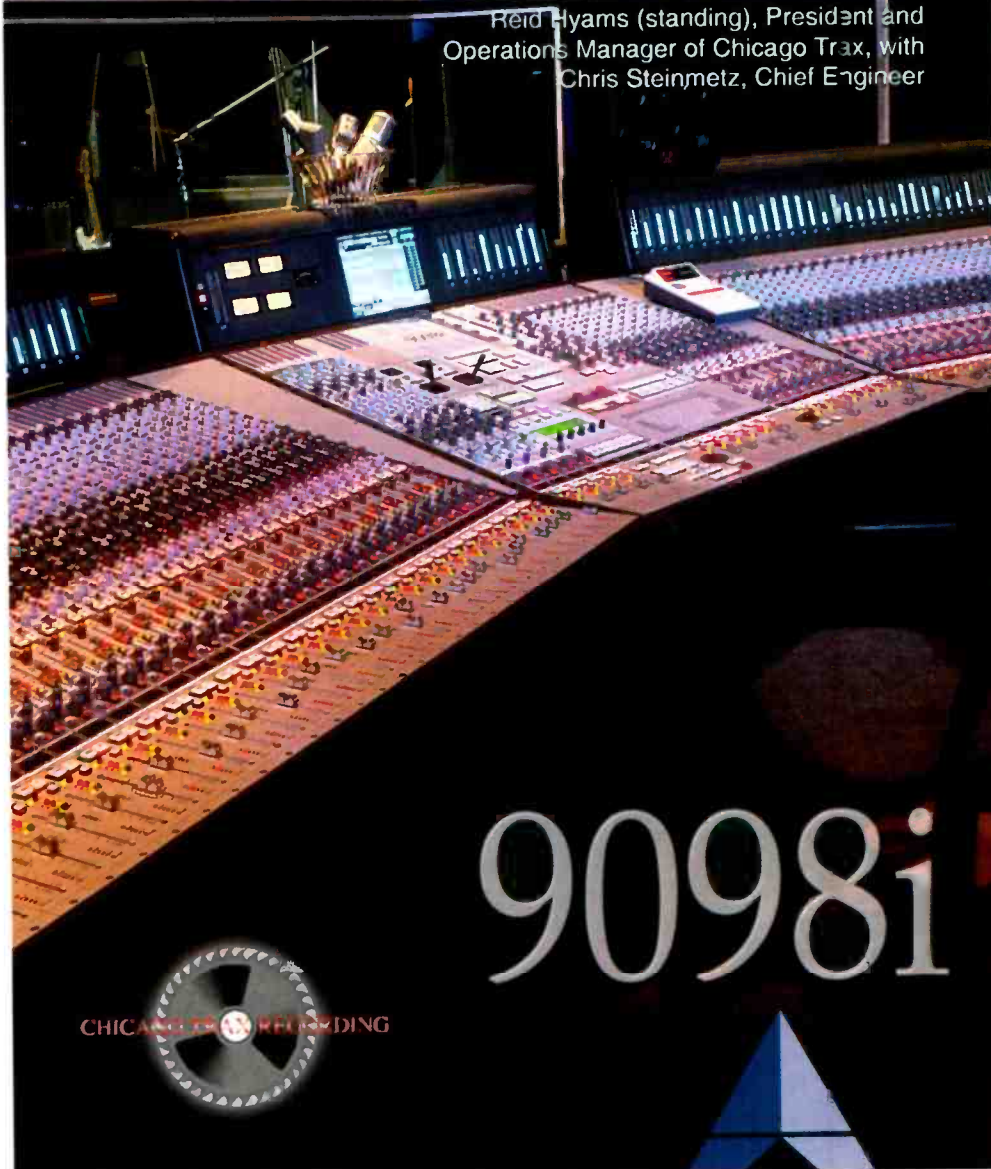
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Reid Hyams (standing), President and Operations Manager of Chicago Trax, with Chris Steinmetz, Chief Engineer



9098i

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< moved or erased. As the name implies, Part editing is used to copy, erase, delete, insert silence or insert copied parts of tracks. No DAW style fading or crossfading is possible, but the global fade in/fade out time may be set to 2ms, 5ms, 10ms, 25ms, 50ms or 100ms. The editing functions all involve a considerable number of steps and keystrokes on the front panel, although with practice they don't take too long. In any event serious editing using front panel

Rear Panel

BNCs are fitted for Video and word clock sync in and out with switched termination. MIDI In, Out and Thru. A 50-pin half pitch connector allows for external Narrow SCSI-2 storage or connection to a PC or MAC. A 9-pin D-sub serial port enables control from RS422 (Sony 9-pin protocol) devices. Two 15-pin D-sub connectors deal with Sync In and Out for synchronising multiple D-24s. Time code I-O is balanced XLR and two SPDIF phono sockets provide a stereo I-O routable to individual track pairs, all tracks or off in 16, 20 or 24-bit depths depending on the project setup. Four slots enable the use of optional mini YGDAI cards. These are the same type used in the 01V. Usefully more cost effective than the 02R / 03D type.

controls is not really an operationally viable option on this type of machine.

D24 jog and shuttle functions are better titled 'nudge and shuttle'. Shuttle gives audio playback at speeds of 1/16th up to 4x speed forwards or backwards. Nudge is initiated by turning the inner 'jog' wheel. A small section of audio is continuously looped. The loop length may be set via the utility key to 20ms, 50ms or 100ms. The start time of the loop changes as you nudge as indicated in the display. The catch is, when in shuttle or jog modes, all tracks are mixed down onto Outputs 7 and 8. This will be inconvenient in many applications.

DSP functions, timestretch and pitch change, may be applied to one track or a stereo pair at a time as an off-line process. A choice of three algorithms is available for time compression-expansion. Ratios of between 50% and 200% are possible using the General or Vocal algorithms and from 50% to 150% using Rhythm. Pitch can be varied from 50% to 200%. The effect is auditioned using Test Play. Odd number tracks will appear on Output 7, even on Output 8. The audition quality is not quite as good as the recorded result, but more than adequate for auditioning. The final quality is, as might be expected from Yamaha, excellent.

The D24 can use disks formatted using FAT16 a PC format. When discs are mounted on a PC the sound files and

some project settings files are accessible. However, since the files are in a proprietary format they cannot be played or manipulated by third-party editing software. Presumably Yamaha intends to provide an editing package at some point. Meanwhile, it is still worthwhile making the connection since it allows discs to be copied which is otherwise only possible with a second external drive or second D24.

I tried a number of the comprehensive transport synchronisation options. The 9-pin serial control facility and a CB electronics SR series synchroniser controller gave access to play, stop, rewind and fast forward, although in the absence of a specific machine profile I didn't manage to get track arming or record to work. No details are given as to the specifics of the serial protocol and the 9-pin port does not return an identity or 'alias' to the controller. I also played about with time-code chase, MTC (MIDI Time Code) and MMC (MIDI Machine Control) all of which were fine. Four modes are possible for time-code chasing—All Chase continuously checks the external code and synchronisation takes place as necessary. Free Chase locks up to external code, then runs free and Re-Chase 1 or 2 locks up the D24 then runs free unless the external code deviates by 1s or 2s respectively whereupon it re-syncs.

The four mini YGDAI slots offer con-



siderable flexibility. Slots 1 and 2 are used for analogue input or digital I-O cards. Slot 1 or 2 may be selected as the wordclock source. Slots 3 and 4 are intended for analogue output cards. Recording at 96kHz is catered for using an AES-EBU option card in Dual mode. If 96kHz operation is contemplated the track count is reduced to four and the

Available I-O Cards

- MY8-AD**—eight analogue inputs on unbalanced phono connectors with 20-bit 128x oversampling converters.
- MY4-AD**—four analogue inputs balanced on XLR-3 connectors with 24-bit 128x oversampling converters.
- MY4-DA**—four analogue outputs on balanced XLR-3 connectors with 20bit 128x oversampling converters.
- MY8-AT**—two TosLink optical connectors for ADAT Lightpipe format I-O in 16, 20 and 24-bit word lengths
- MY8-AE**—AES-EBU format digital I-O on a single 25-pin D-sub connector in 16, 20 and 24-bit word lengths. Also supports Dual AES-EBU mode for 96kHz sampling rate.
- MY8-TD**—Tascam TDIF-1 format digital I-O on a single 25-pin D-sub connector in 16, 20 and 24-bit word lengths plus a BNC for wordclock output.

Project, Track and Part editing functions are not available.

Up to eight D24s may be connected in parallel sync mode for a total of up to 64 tracks. Alternatively the record time can be extended using two machines and the Serial Point function. This works by setting a suitable serial point time on the second machine so that it kicks into record before the first machine runs out of space.

The D24 is a difficult machine to pigeon-hole. It is late to the market—it appeared in several of last year's catalogues and has been seen at the shows for longer still. At first sight it looked reasonably exciting, now it will need to work hard to be noticed against the background of recently announced low-rent 24-track machines. However, the accent is on 'announced'. You cannot actually go out and buy either the Tascam or Mackie machines right now and shipping dates are yet to be made final.

Given the specification, with its comprehensive machine control possibilities, it is inevitable that the D24 will be compared with other 8-track digital recorders especially the so-called 'digital dubbers'. This is a little unfortunate and rather unfair since they come in at two or three times the price and have

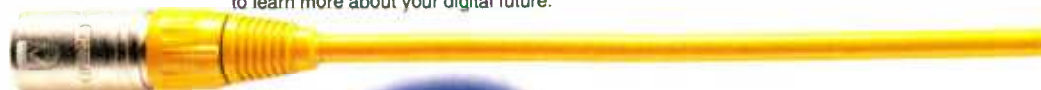
been refined with the particular requirements of film dubbing in mind. The D24 should really be seen in the context of linear tape replacement. In this light it acquits itself reasonably well. On the other hand, if you forget the tiny 640Mb maximum capacity of the internal drive and use something sensible externally, it does make a useful and cost-effective 4-track 24-96 recorder. In fact, anyone considering a D24 would be well advised to budget for an external drive if contemplating anything more than laying down a few tracks. Unfortunately, since Yamaha has opted to use SCSI instead of the ridiculously cheap and fast IDE drives available today this will add significantly to the cost. The only real advantage the little MO has is the relative cheapness of the discs.

The D24 is beautifully built, feels good to use and does what it is designed to do. If it had arrived at around the same time as the 02R and at anything approaching the present price point it would probably have sold by the truckload.

The 0-series consoles do have their compromises but their pre-eminent position in the market amply demonstrates the users' willingness to tolerate these. It remains to be seen whether the same will apply to the D24. ■

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IR BYTES

Focusrite Platinum MixMaster

Retaining analogue on the processing chain, Focusrite's affordable mastering unit offers convenience and control—and an A–D stage **Dave Foister** takes control

THE MASTERING PROCESSOR is a newcomer to our repertoire, yet has established itself as a concept very quickly. The thing is, they all do what they do in the digital domain, whereas traditionally mastering processors have been analogue, often very old analogue. Into the fray steps Focusrite, with an all-analogue mastering chain inheriting the qualities of the grown-up Blue range mastering processors in an all-in-one box priced for the project studio. This is the latest in the Platinum entry-level range, the MixMaster.

There's an established suite of components that goes to make up a mastering processor, as the job needs both dynamic and EQ control. Most such chains will therefore include compression, EQ and a final protective limiter, and most will handle all the functions slightly differently from the way a straight single-channel device would do it; most will also add some distinctive touches of their own to mark them out from the crowd. In a sense Focusrite's class-A analogue circuitry is its conspicuous feature, but it doesn't end there.

familiar enough approach, but here we find some distinctive features. The expected controls are all there, for threshold, ratio, attack (just a switch to make it slower) and release, and all are specifically tailored for the mastering application. The compression ratio has a very fine degree of adjustment at low values, and the release function has two automatic programme dependent release settings, one slower than the other. There's a control for making up the lost gain, complete with nearby Overload LED.

Besides these there are Trim controls for the behaviour of the upper and lower bands. These can add more or less compression in these bands relative to what's happening in the mid band, and their effect is also dependent on how hard the compressor is working overall. This allows elements of the spectrum to be emphasised or played down dynamically, giving a very different result from straightforward EQ, and is a very direct way of achieving this. Other multiband compressors offer complete sets of controls for the

from a graphic on the front panel that this is a shaping of the edges of the band in which the low frequency compressor works, allowing the effect to be tighter or bigger as required.

Three big bright LED meters show gain reduction for the three bands, showing very clearly the difference between multiband and locked operation. The audible difference is also as significant as one would hope, showing that the crossover frequencies are well-chosen to allow powerful transparent compression without the dreaded side-effects. This is how mastering compression should be, and to have this alone, with all the attributes that the Focusrite name represents, makes the MixMaster worth its asking price.

But, of course, there's more. Next up is EQ: this doesn't have the five bands that seem to be standard on the digital boxes, but its three offer a surprising degree of subtlety and control. There is a single parametric band in the middle, with a frequency span from 100Hz to 10kHz in two switched overlapping ranges. What is perhaps unusual, and



The MixMaster begins with an expander, and like many of Focusrite's gain control devices it uses an opto-coupler. Its purpose is to deal with very low level noise in the source before the rest of the processing gets at it, and consequently its threshold can go very low, its release can be very long, and its actual expansion is smooth and discrete. A dedicated meter shows when the expander is reducing the input gain and by how much.

From here the signal goes to the compressor. Mastering processors generally have quite elaborate compressors to allow them to deal effectively with complete mixes, and the MixMaster's compressor follows the expected trend of being a multiband device, or a Spectral Compressor as the front panel calls it. The signal is divided into three frequency bands—the crossover points are fixed—and each is processed separately in order to avoid loud elements in one band, such as a heavy bass drum, modulating the whole signal. This is a

three bands, which obviously allows maximum flexibility, but the MixMaster's method gets you similar results much faster.

If you want more straightforward compression, the three bands can be locked together, so that the gain reduction in each tracks the others. This clearly defeats the object of having the three bands, but sometimes might be just what the job requires, and it's interesting to speculate whether the end result is the same as a single-band compressor. I suspect it isn't, as (a) a high level in one band will achieve the same result as (b) the equivalent level in all three, whereas a single band device would see case (b) as a higher total excursion over threshold and would therefore compress more. Stereo tracking is of course built in, as it is into every facet of the unit.

There is a further switch to select between two slopes at the bottom end, and, although the available documentation is not very clear, it would appear

again indicative of the overall sweetening function of the MixMaster, is that only 10dB of boost and cut are available, and the calibrated Q control only runs from 0.4 to 1.5. No drastic slashing at the sound here, then, but very fine control over exactly what the equaliser is doing.

Either side of this are the low and high frequency shelving bands. In the interests of accurate stereo matching, the turnover frequencies are switched rather than continuously variable, but then nobody seems to consider this a problem on the ISA 110. Each band has three frequencies available, very much towards the outer ends of their respective bands: the highest LF point is 120Hz and the lowest HF is 10kHz. Again these are optimised for subtle use, and are augmented by completely different settings marked Tilt. These switch positions introduce a curve that is quite different from the traditional shelf, with a gentle (3dB per octave) slope that is continuous out to the extremes. The >

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< subtle effect these can achieve is perhaps more appropriate to the function of the MixMaster than any other kind of EQ. All the words like warmth, smoothness, depth, sparkle, sheen, and all the other vague emotive guff whose precise meanings we intuitively know, seem to be directly translatable with these tilt controls, always with a lack of any kind of lumps and bumps or any other side-effects. Again there is an Overload light in case the EQ lifts the overall level too much.

That, you might think, ought to be more than enough for the money. EQ and compression with real Focusrite quality and careful application to the special job the MixMaster is designed to do—what more could you want? But there is a finishing analogue touch: adjustment of the stereo image, with both balance and sum-difference-based width controls. Finally there's a limiter, with only an in-out switch to activate it and its own red LED meter to show its operation.

Each section of the MixMaster can be switched in and out independently, and there is also an overall BYPASS switch and an output level trim. Overall levels are shown on helpfully large LED meters that can be switched between input and output, and a useful adjunct is a phase-correlation meter, showing green on the in-phase side, red on the out-of-phase side, and a tasteful blue in the middle for no signal or completely uncorrelated signals. If you like your equipment to light up when it's working, you'll love the MixMaster.

The digital approach has two distinct advantages over the all-analogue box: preset memories and digital output. It's hard to do anything about the first, but Focusrite has addressed the second by installing an A-D converter after all the processing. The meters in fact suggest that the unit is intended to be used in its digital mode, as the scale has 0 at the

Not everyone will admire the bullet-shaped knobs, but the white stripes make it easy to read the calibration; the unexpected gentle backlighting in the buttons is also very helpful. The panel is clearly divided into its separate sections

top. Analogue outputs are, of course available, balanced or unbalanced at either level, but AES-EBU and SPDIF outputs are there too. Neither is this a basic afterthought for the sake of completeness—this is a full-blown 24-bit 96kHz converter, with a BNC wordclock input, and can dither down to 16 bits. All the settings are on switches on the back near the digital connectors, which could prove awkward, but hey—once again, you could pay the price of the MixMaster for a pair of converters, so who's quibbling?

The back panel is quite busy, with XLRs and jacks for both ins and outs, plus a pair of balanced jack inputs for direct connection to the converters. There is no insertion point nor any side-chain access for the dynamics, but with the flexibility they've already got, and bearing in mind the application, that's hardly surprising.

Cosmetically Focusrite tends to veer between staid and statement, with the

Platinum range having perhaps the most restrained and conventional appearance yet. In fact it was some time before I even noticed the pale 'Focusrite' printed across behind the controls on an otherwise bare silver panel. As there is such a lot on the MixMaster this is all to the good, as clarity is paramount. Not everyone will admire the bullet-shaped knobs, but the white stripes make it easy to read the calibration; the unexpected gentle backlighting in the buttons is also very helpful. The panel is clearly divided into its separate sections, and everything is so well laid out that no manual was necessary, which was just as well because at the time there wasn't one. This was a preproduction unit, only available for a short time, so the fact that I felt at home with it so quickly is testimony to its thoughtful layout.

Most importantly, I instantly took to the control it offers, and the sounds it is capable of producing. Focusrite has a knack of making things natural to use, and I couldn't help feeling that for most jobs it would be almost as quick to get what you want from the MixMaster as it would be to recall a preset on a digital box. From the subtle to the more aggressive, this can do almost anything you might want to do to polish up a mix quickly, effectively and with very

high quality, and once plugged up to your console outputs is likely to stay there for good.

This thing really ought to take the world by storm, especially now that everyone's got to grips with the idea of this kind of unit. A Focusrite contender was always going to give everybody a run for their money, in whatever form; for it to be in the Platinum range at such a silly price is going to give several people sleepless nights. ■

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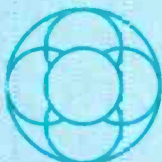
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Yamaha CDR1000

Returning to the fray it started some time in the sepia and distant past, Yamaha now has a CD-R/CD-RW that can fight on an equal footing. **Zenon Schoepe** reports from the ring side

IN WHAT NOW SEEMS AN ETERNITY AGO (1989) I remember traipsing across what I think was Paris, to sit in on and witness the introduction by Yamaha of a do-it-yourself CD recorder. The panel was made up of company and industry heavyweights all pitching together to tell us that here was the future. A disc was burnt 'live' for our benefit, the technology was explained, the exclusive media was even passed around for us to paw, and the applications of this 'marvellous' idea were spelled out. They told us we would all have one soon, although I now suspect that something had been lost in the translation.

The audience was more baffled than astounded. The cost was astronomical (\$25,000 US), the media costs were prohibitive (\$80 US and the discs were different beasts to ones we have today with player compatibility a real issue), the system, for indeed it was more a system than a one-box solution, was bulky and the manner in which the process was performed seemed incredibly complex and susceptible to operator error and inatten-

tiveness. Aside from thinking 'How much?' and 'Why?', I remember feeling intimidated by technology and gear that I did not understand, and felt compelled to swat up on it. As it happened I needn't have rushed, for as we all now know the new age of CD-Rs was still some way off.

Incredibly Yamaha went on to sell these systems to a number of high profile users who spoke well of the convenience of being able to run off discs for clients who were then free (the service certainly wasn't at £200 UK per disc) to assess them at their leisure. More affordable derivatives followed, but the eventual advent of substantially cheaper competing products drew Yamaha's initial involvement in professional audio CD-R to a close.

With the announcement of the CDR1000 last year that interest was rekindled, although only the lessons learned have been carried over. To Yamaha's credit it has weighed in with a machine that is immediately price competitive with existing products and comes with a features list that places it right up there with the top-end products. This is not a toe in

the water exercise, this is an example of analysing a market and hitting it with a box that satisfies all the entry requirements that a pro CD-R/CD-RW should.

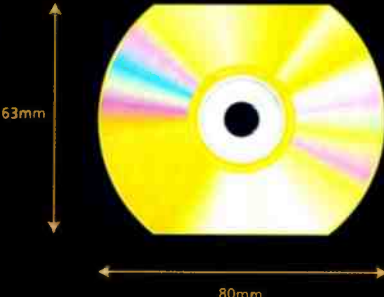
The CDR1000 is beautifully built and sports more buttons and switches than its competitors and a number of USPs that include the incorporation of Apogee Electronics' UV22 super CD encoding. Connection possibilities are taken care of by balanced analogue XLR I-Os with a -10dB/+4dB input level switch, SPDIF I-O on coax, AES-EBU I-O on XLR and BNC word clock in. There's also a 9-pin parallel port.

Operationally it's a doddle due to the fact that so many dedicated function switches are provided. Aside from PAUSE, STOP, PLAY AND RECORD you get FORWARD and BACKWARDS keys for SEARCH, TRACK and, that mighty rare inclusion on a CD-R these days, Index because not only can you record track increments there's also a dedicated button to record indexes with. Am I alone in finding track Index subdivisions a mighty useful tool when preparing CDs?

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cluster of 12 switches to the right of the display. These offer peak hold reset with an LED (the metering can be adjusted for fast or slow fall in the Utilities menu), time display (elapsed, remaining and total), Input Select, Record Mute with LED (2s) and UV22 selection with associated LED. Other buttons activate SYNC recording, auto track increment with an LED plus repeat playback and A-B point setting. A UTILITY button accesses auto track increment threshold setting in steps: audio delay (in steps up to 4950ms); fade in (up to 10s); fade out (up to 10s); clock (internal, word, AES or coax); digital out (normal or thru); copy bit setting (protect, once or permit); remote on-off; and SRC on or auto selection. Values are adjusted using the track forwards-backwards selection buttons.

Our front panel tour is completed with ERASE and FINALISE buttons, ganged record level controls, a headphones monitoring section and the somewhat curious inclusion of a footswitch socket for stopping and starting record and playback. The display does a good job of cramming in a

good many text icons in to a relatively small amount of space and includes an indicator for SRC selection.

Unusually in this day and age of CD-Rs the infrared remote actually has fewer functions than the front panel with the one exception of a numeric keypad for direct track access. This means that you really don't have to be bothering with it.

I have very little to criticise the CDR1000 for operationally it really struck a chord with me, distilling a lot of established CD-R machine practice in to its own way of working and not inventing anything peculiar or irregular. However, I feel obliged to try so I'll say that the track and index increment buttons are a little too small and crowded for their significance; fade in and fade out, once set, is activated each time you enter record or exit it which can be a surprise if you've forgotten that you've activated them; and it would be nice to be able to use the

box as a converter without needing to be in record pause on a disc. That's about all the downside I can muster.

I got on very well with this machine and have only just unwrapped the manual from its plastic bag. It's a case study in ergonomics, the performance is to the standard and the inclusion of UV22 is such an obvious master-stroke that I wonder why no-one else ever thought of incorporating it before. I don't even mind the remote that much because the

layout is grouped and logical but most importantly it is not essential to the operation of the CDR1000. Therefore it is a bonus that is non-critical.

Yamaha has a winner in this its first pro audio CD-R in more than a decade. At

£1,000 (+ VAT UK) it still has competitors that are cheaper, but this machine matches them on features, offers extras and is presented in way that is a pleasure to use. Highly recommended. ■

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Hafler P9505

Studio Sound's bench test amplifier reviews continue with the Hafler P9505. **Paul Miller** reports



NOW DISTRIBUTED in the UK by Ticket Audio alongside Manley and ARX, the Hafler range extends to a series of pre-power amplifiers, a pair of active close-field monitors, two active, sub-woofers and, uh, a wardrobe of what it describes variously as 'wearables'. Ultimately, the origins of its top-of-the-range P9505 power amplifier may be traced back over 20 years to classic designs like the DH-200 and, latterly, the DH-220 which, in both prebuilt and kit form, were a reference point for what we now know as the 'audiophile generation'. Over the last five years, Hafler has concentrated exclusively on pro-orientated equipment, even though the basic recipe of big power supplies, differential

J-FET (typically cascaded) input buffers and multiple pairs of lateral power MOSFETs remains as a hallmark to the breed. The big, spacious and typically effortless sound quality of the P9505 is equally reminiscent of Hafler's early amplifiers.

Its last big domestic power amplifiers included the DH-500 and XL600, the former offering 250W/8Ω, the latter some 300W/8Ω, which is not too dissimilar to the 250W/8Ω rating of today's P9505. Neither is the 50+lb bulk, accounted for by its centralised toroidal transformer, four 20,000µF reservoir capacitors and substantial heatsinking that parades the periphery of its case. Single-ended phono and jack inputs are provided with balanced XLR connections and the option of bridged (monophonic) operation. Earth may be grounded to the chassis or left floating, depending on the application. Speakers are hooked-up via 4mm binding posts.

At 3U-high, the 19-inch rackmount case is not as slim as competing designs from Bryston and Lab Gruppen, but neither is its heatsinking fan-assisted as in earlier Hafler amplifiers. Either >

	20Hz	1kHz	20kHz
(Rated Spec. in brackets where given):			
Max Continuous Power Output	369W	385W	370W
1% THD into 8Ω (one channel)	360W	375W (250W)	355W
1% THD into 8Ω (two channels)	535W	595W (375W)	530W
1% THD into 4Ω (two channels)			
Frequency Response @ 0dBW	0.0dB	0.0dB	-0.05dB
Dynamic Headroom (IHF)		+1.0dB (465W)	
Maximum Current (10ms, 1%THD)		35.0A	
Output Impedance	0.0261Ω		
Damping Factor	306.9 (1000)		
Unbalanced Input			
Stereo Separation (1kHz)	>125dB		
(20kHz)	115dB		
Channel Balance, 1kHz (0dBW)	0.02dB		
Total Harmonic Distortion (0dBW, 1kHz/20kHz)	-91dB / -74dB (<-54dB)		
(2/3 power, 1kHz/20kHz)	-75dB / -62dB (<-54dB)		
CCIR Intermodulation Distortion (0dBW)	-95dB		
(2/3 power)	-75dB		
Noise (A wtd. re. 0dBW)	-94.1dB		
(re. 2/3 power)	-116.4dB (<-100dB)		
Residual noise (unwtd)	-77.0dBV		
Input Sensitivity (for 0dBW)	105mV		
(for full output)	2005mV (mV)		
Input loading	47kΩ		
DC offset, left/right	-2mV / +6mV		
Serial Number	2267942000-01		
Retail Price	£1375 (ex-VAT)		

For methodology see *Studio Sound*, June 1999, page 27.

See it on the web-site:

www.prostudio.com/studiosound/index.html

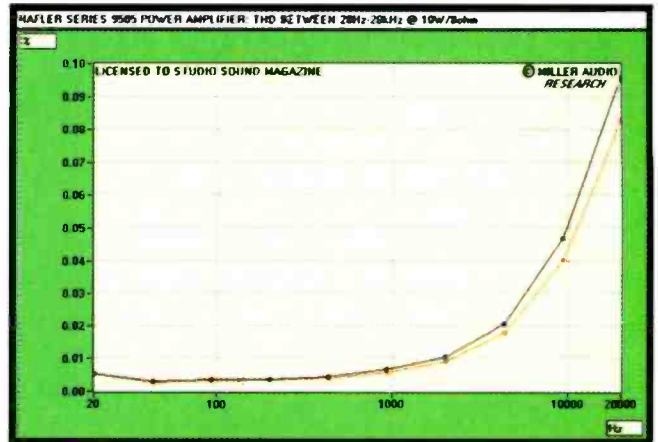


Fig. 1

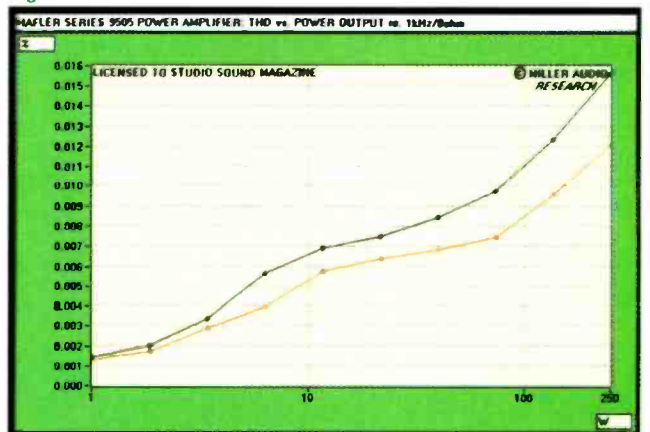


Fig. 2

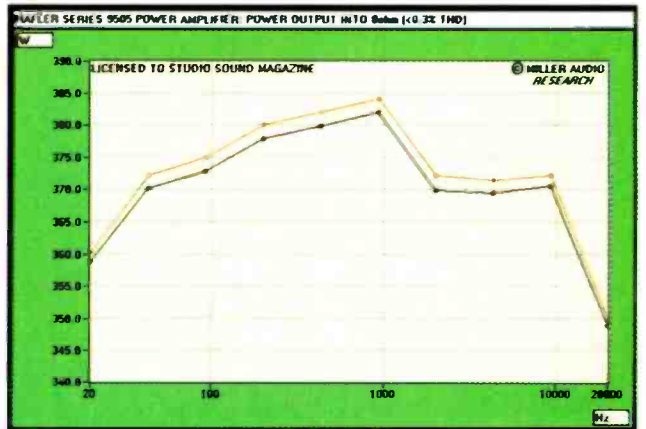


Fig. 3

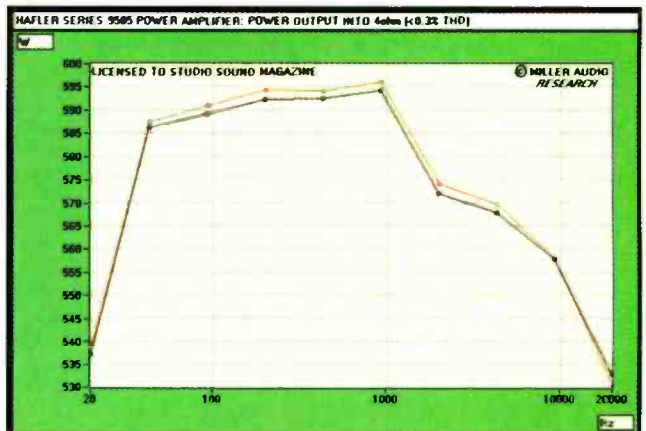


Fig. 4



Neil Karsh is the Vice President of Audio Services for New York Media Group. Recently, Karsh selected LSR monitoring systems for two of his Manhattan facilities, *Lower East Side* and *East Side Audio*.

“We’ve installed the first of our LSR 5.1 surround systems at East Side Audio and it’s a great addition. The sound is extremely clear and is enjoyed by our mixers and our clients. Everyone is very pleased with the result.”

New York

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Los Angeles



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< way, the P9505 runs hot to the touch when driven hard, suggesting that forced-air cooling will be necessary if one or more of these amps are loaded into a rack or cabinet.

Back in Hafler's formative years, talk was of its 'Excelinear' amplifier topology where reduced levels of feedback were employed without compromising stability margins or adversely increasing noise and distortion. This has been usurped by a patented 'Transnova' output configuration that attempts to reduce distortion and output impedance without sacrificing gain. From what I can gather, instead of running a very high level of

from a technical standpoint and indicative of some performance variation at different monitoring levels, these figures are still well within Hafler's 0.2% target.

The novel MOSFET power stage yields a minimum of 350W into 8Ω (both channels, maximum 385W/1kHz) and 530W into 4Ω (maximum 595W/1kHz). The increase in midband output is evident from Figures 3 and 4, as is the -0.4dB and -0.5dB loss at the frequency extremes, into 8Ω and 4Ω respectively. Incidentally, at 0.3% THD, the P9505 is at clipping and though this is well within Hafler's conservative specification, the 0.026Ω output impedance is not. Do not confuse the plots with its frequency response, which is very flat indeed (+0.0dB/-0.09dB 12Hz-30kHz).

Under dynamic conditions (10ms duration), the output increases to 462W, 825W (14.4A), 1290W (25.4A) and 1225W (35.0A) into 8Ω, 4Ω, 2Ω and 1Ω loads, respectively. The dynamic profile is depicted in Figure 5 and shows THD broadly unchanging over 90% of its dynamic range into 8Ω and 4Ω loads. The increase in THD into 2Ω (blue trace) and 1Ω (green trace) is less than expected, while the P9505's excellent load tolerance is further demonstrated by the acceptable 10V drop from 8Ω to 2Ω loads. Only into 1Ω, where the 35A current limit is reached (re. 1% THD), do the rails really begin to collapse. Amplifiers with genuine current reserves beyond 40A are very uncommon in my experience, so the P9505 passes muster in this regard and should be more than capable of driving today's monitors, even in a parallel configuration.

Hafler's near-dual-mono construction technique is reflected in the very similar single/2-channel power measurements and in the superb >125dB separation, although this sample did show a slight difference in residual noise (-77dBV left, -82dBV right). This is shown in third-octave form on Figure 6 with the right channel in red, the left in black. Otherwise, the A-wtd S-N ratio of 94dB (re. 0dBW or 1W/8Ω) is a positive indication of the P9505's low hiss levels. All things considered, the P9505 displays some technical curiosities which may, or may not, have some link with its 'Transnova' output stage, but the combination of high power, good load tolerance, low noise and distortion plus

a very fair £1,375 (UK) ticket, all add up to a very attractive package. Notwithstanding its Pro-styling, I'm bound to wonder just how well the P9505 would fare back in the domestic market... ■

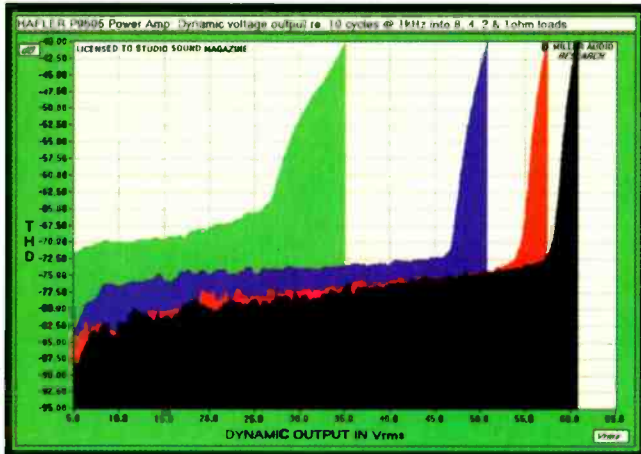


Fig.5

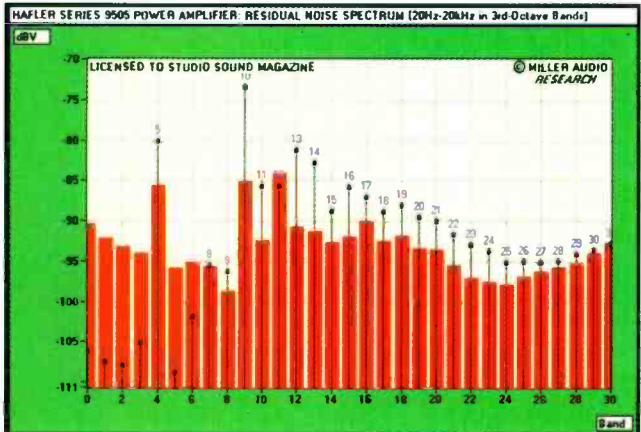


Fig.6

voltage feedback around the output stage, which would reduce gain close to unity, Hafler supplements this loop with a parallel current feedback to maintain low noise and distortion while sustaining the overall gain at a (measured) 28.6dB (x27).

In practice, figure 1 suggests the P9505's trend of THD versus frequency is little different from those amplifier's adopting conventional feedback, with values as low as 0.003% through the midband at 1W/8Ω and increasing to 0.02% at 20kHz. The values are uniformly higher on Figure 1 where the amplifier is raised to 10W/ 8Ω, a trend repeated on Figure 2 where a ten-fold increase in THD occurs through its specified 250W range (note the log power axis). While interesting

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Meyer monitors

Meyer Sound has introduced a new large format monitor in the self-powered X10 for freestanding or soffit mounting which claims low distortion, 'near perfect' impulse response a wide sweet spot. It comprises a 15-inch LF driver and 4-inch compression driver and constant Q wave guide. The all-new 15-inch driver with a 4-inch voice coil suspended in a high intensity field uses Pressure Sensing Active Control to control



driver excursions and employs a feedback regulation system based on one originally developed for Stealth fighter jets. PSAC employs a pressure sensor in front of the speaker that monitors output pressure and feeds the data into high order correction circuits. Both transducers are driven by Class AB/H Mosfet amps with 620W available for the HF and 1200W for the LF.

Meyer, US: +1 510 486 1166

MIDI mains

Canford Audio has introduced two MIDI products—a MIDI mains switcher and a MIDI distribution amplifier. Developed from the successful Opto Switcher, the MIDI switcher provides the user with the means to switch power on and off using the 'magic of MIDI'. There are six operating modes to choose from, permitting operation from all types of MIDI controller such as a synth or sequencer, including those that do not send note-off information. Settings can be controlled remotely using MIDI commands or set via the 16 DIL switches. The MIDI Distribution amplifier feeds MIDI data simultaneously to 12 other devices and avoids the signal delays and distortion which can occur as a result of several pieces of equipment being 'daisy chained' together. There are two versions available, the first with all MIDI connections through the front panel and the second where all are through the rear panel. Both versions have front panel LED indicators for mains and MIDI data present. The rear panel version, intended for more permanent installations has an additional MIDI present LED to the rear.

Canford, UK. Tel: +44 191 418 1000.

Mixer-router

Yellowtec has launched the Intellimix desktop mixer-router designed as an interface between digital or analogue signals and PC-based audio workstations. Intellimix features nine audio inputs and a separate

Oram Sonicomp

With a combination of solid-state and optocoupled processing, Oram's compressor leads **Dave Foister** down the dual path

IF IT IS A DELICATE powder blue; if it has specially made silver knobs: if it does things a little bit differently, then it must have the name of John Oram on it. Oram has been quiet for a while, concentrating on the sale of consoles; now it is time for some new stuff, departing slightly from what we might usually expect of him.

Oram has built his company on a combination of his EQ design and a subtle character christened Oram Sonics which has been at the heart of most of his products, from powerful outboard EQ to complete consoles. What we have here has no EQ in it at all, but in characteristic style the Sonicomp-1 compressor offers more than just the basics. It looks simple enough: two channels of compression with little more than the essential controls, neatly fitted into a 1U-high box, but there's slightly more to it than that.

The basics are, of course, all present. Inputs and outputs are balanced XLRs on the back, with jacks alongside, and side-chain access is available on 3-pole jacks. The front, too, is



simply furnished, with the smaller versions of Oram's custom aluminium knobs in a single row for parameter adjustment. The usual controls are provided, with variable input and output gain, and knobs for ATTACK, RATIO, THRESHOLD and RELEASE. All are pots, with no switched adjustments, although gains have a centre detent and THRESHOLD has a fine click-stop mechanism. The control ranges and spread of values are unusually helpful, offering fine control where it is needed: as an example, the ratio setting is only 4:1 with the control vertical, making it easy to get those low ratios just right. Calibration is a secondary consideration, as shown by the markings themselves and the simple dot on the end of the knob to line it up. This is not a box for mixing by numbers, but for using your ears.

Other functions are on push-button switches, each with a LED, so you can see at a glance what's happening. The two channels can be switched in independently, and linked for stereo working with a single button. Above the LINK switch there's a line under four of the controls whose purpose is not immediately obvious, until you realise it shows which controls are in fact linked in stereo mode. This is a nice little thought; there are some compressors that only let you know the make-up gain is not linked when you find out the hard way (or, perished the thought, read the manual). Here everything except input level and output gain (effectively make-up

gain as there's no separate control) is linked in the way you'd expect.

In the centre of the panel is a pair of vertical LED meters, and a switch on each channel decides whether its meter is showing level or gain reduction. In the Gain Reduction mode, all the LEDs are lit until the compressor starts compressing, at which point the top ones start to extinguish. But there's one more switch on each channel, and here lies the Sonicomp's secret, although the label is a bit cryptic without further explanation.

The switch says ss LDR and its meaning is clear when you realise that the Sonicomp incorporates not one but two separate signal paths. In the same way that some specialised equalisers offer valve and transistor circuits with a switch to choose between them, the Sonicomp has a conventional solid-state gain reduction circuit, along with an optocoupled circuit using a Light Dependent Resistor (LDR). This method of gain control, common in early designs, is still very much with us in classically based units such as the Joemeek com-

pressors and the dynamics in the Focusrite 430. What is unusual with the Oram is to have both options available on the one box.

Oram's description of the difference is simple: the solid-state circuit is for precision control, presumably with a hard knee, while the LDR path has a round knee, and the implication of the manual is that the LDR version will be more musical while the solid-state version is for safety compression and limiting. In use the difference shows itself sonically as well, the LDR setting having a distinctly brighter feel to it. The circuits are well matched in that switching between them always gives subjectively a very similar amount of compression, enabling proper A-B comparison, and the general character of the two is much as Oram describes it. I found myself using the LDR path for most things, as it seemed a little sweeter, smoother and more unobtrusive. This was true for lead vocal, overall mix control, and individual instruments including stereo use on piano, often a challenge for a compressor. This is not to say that the solid-state setting does not have its uses, simply that it is more functional.

There's a Sonicomp-2 as well, apparently identical apart from two big VU meters in place of the LEDs, necessitating a 2U-high box. The concept is attractive and genuinely flexible and useful, making the Oram an interesting new option in the huge compressor market. ■

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Tascam CD-RW700

In its own personal quest for CD-R/CD-RW nirvana, Tascam has an offering in uncharacteristic black. **Zenon Schoepe** sets the time

REPRESENTING SOMETHING of an upstage in features over its first and rather basic CDR-W5000, Tascam's new CDR-W700 presents a busier front panel and features list, but reduced interconnectivity. Analogue I-Os are restricted to phono and digital I-Os are available on coax and optical, albeit with a curious Mix Mode that allows the analogue inputs to be mixed together with the selected digital input, the latter receiving 12dB of attenuation. More use-

of the source start material in a buffer and loop it so you can adjust the precise start point of the recording using the dial control to move up and down the sample. When happy you stop the process, cue up the source to the original point in sync record and let it happen with a similar philosophy applied to the setting of track increments. Better than winging it and getting it wrong but you have to remember to reset this trim before your next sync recording or the same offset will be applied.

One point of particular interest concerns the REHEARSE key, which incidentally only appears on the front panel, and aims to

increase the accuracy of synchronised recording and auto track incrementing. In a nutshell what this does in the case of sync recording is grab a 4-second chunk

of the source start material in a buffer and loop it so you can adjust the precise start point of the recording using the dial control to move up and down the sample. When happy you stop the process, cue up the source to the original point in sync record and let it happen with a similar philosophy applied to the setting of track increments. Better than winging it and getting it wrong but you have to remember to reset this trim before your next sync recording or the same offset will be applied.

What you're getting in the CDR-W700 is a nicely rounded set of functions that far outstrips the capabilities of Tascam's modest CDR-W5000 on features. However, it loses out to it in terms of packaging—the CDR-W5000 feels the more solid unit, although both have relatively delicate disc drawers—and connectivity. The former observation probably doesn't amount to much, but balanced analogue connectors and an AES-EBU input are important considerations.

The button feel of the remote is fine, but I found the arrangement of the buttons a little compromised and unprioritised. Despite a wealth of CD-R recording experience I still get very twitchy at the beginning and end of this write-once process, and I like to believe that I can find a button in a fluster. The RECORD button, for example, is separated from the all-important STOP, PAUSE and PLAY buttons by a row of search and skip buttons. Something that is unique to the CDR-W700 in the current generation of machines is the use of the RECORD button on the remote or the front panel to enter manual track increments. This isn't a problem, it's just that it's different and initially had me puzzled and reaching for the manual.

However, on balance Tascam has made undoubted progress and bettered its original CD-RW machine with this box. Most importantly it has brought itself up alongside the contenders in this field which now makes for quite a selection. I liked it and enjoyed using it, the results are good and dependable. The choice is, as they say, yours. ■



fully digital inputs can be adjusted for level in cases where the SRC is engaged.

Things don't get off to a fabulous start on initial power up as you are prompted to correct the time for the machine's built-in timer and the machine remains in standby mode on power down unless you pull its plug. I have to admit to having a problem with a machine with professional aspirations and rack ears that wears its timer quite so obviously.

Unit control is shared between the front panel and an infrared remote that duplicates functions, but also adds extras most notably in direct track selection and programme play modes and that all-important omission from the CDR-W5000, the inclusion of record mute which is available as a circa 4s gap only at the end of a recording after which it reverts to a paused record status.

Front-panel controls include stop, play, pause and record, with track selection performed via a jog dial. A MENU switch accesses fade in and fade out times (both variable from 1s to 24s and smooth enough to be genuinely usable and fired on a dedicated button), auto track increment, sync recording threshold level, and digital recording level all of which also use the jog dial to change values while a press of the same confirms the action.

A DIRECT switch bypasses the SRC and digital volume control for bit for bit 44.1kHz transfers, and sync recording (which can be turned on and off while recording). FINALISE and ERASE buttons do exactly what you'd expect on a CD-R and CD-RW device. Analogue input level is controlled on a ganged pot with a usefully pointed out unity gain setting at 12 o'clock while a loud and good quality headphones circuit comes with a volume pot.

Operational feedback centres around the unit's main display area with good resolution peak-hold meters and legends that appear to signify status selection or condition. This area is well thought out and perfectly clear. A clever addition, and one that no doubt harks back to Tascam DAT machine designs, is the inclusion of a MONITOR button

Contact Us

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NEW TECHNOLOGIES

sync input, two mic inputs, three AES-EBU inputs, one SPDIF input and three analogue line level inputs. Each input can be routed to one of the three faders, and feature alphanumeric displays. Automatic prefade cue offers flexibility for listening to external sources, and several digital and analogue outputs, two stereo mix-minus outputs are provided for use with telephone hybrids and codecs. All controls offer complete on-air logic, that is fader start, mic-mute and on-air signalling. The unit can be networked via the built-in 10baseT, RS 232 or integrated USB connection. User presets can be changed by inserting a personal smartcard.

Thum + Mahr, Germany.

Tel: +49 2173 96730.

TL gets fat

TL Audio has introduced the FAT 1 stereo valve compressor that combines fully adjustable controls with 15 preset compression settings optimised for different types of programme. Manual mode provides user adjustable threshold, ratio, attack, release and knee controls while input gain, output



gain and gain makeup controls are fully variable in manual or preset modes. Line I-Os are on balanced jacks and complement front panel stereo instrument inputs. The unit comes in a 3-unit-high half-rack enclosure which can also be table-top mounted.

TL Audio, UK: +44 1462 680888.

Fostex hard-disk desk

Fostex' VF-16 hard-disk-based, 16-track recording console features a total of 24 tracks (the additional eight ghost tracks being available for multiple takes), and simultaneous 16 track recording to an internal E-IDE hard disk, all under the control of Fostex's FDMS-3. Additionally, Fostex has made additions to its range of stand-alone digital multitrack recorders with the new 24-bit 96kHz compatible D1624 and D824. These machines record uncompressed digital audio at up to 24 bit/96kHz to standard E-IDE hard drives via 128x oversampling delta-sigma 24-bit A-D/D-A's. NF-1 near field studio monitors have a 'unique' internal baffle configuration using HP sound reflectors to naturally extinguish standing waves; 21mm thick super-rigid MDF particle board for the main enclosure construction widening to 33mm where the drivers are mounted, and two precisely tuned 2-inch cylindrical ports for increased bass response while maintaining a compact enclosure.

Fostex, UK. Tel: +44 171 923 1892.

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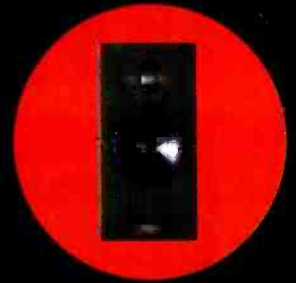
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Pausing for breath in *Studio Sound*'s monitor review programme

Keith Holland collates the results to date and offers some conclusion

SOME BACKGROUND. For years, people have been asking me the question 'Why do all these loudspeakers measure the same yet all sound different?' The answer that is most often heard is that people can detect more subtle differences than can measurement equipment, and that the only real way to assess the performance of a loudspeaker is to listen to it. Being an engineer by nature, I have always preferred to think that we must be measuring the wrong things, or perhaps not measuring the right things well enough. Clearly, when listening to a loudspeaker, the room in which the loudspeaker is housed has a significant effect on the perceived sound quality, as does programme material, visual aesthetics, and so on, so one might reasonably expect two different loudspeakers, auditioned in different rooms, possibly on different days, to sound different. However, one might also expect similar differences to be apparent when auditioning the same loudspeaker in different rooms, but in most cases, although the room does alter the perceived sound quality, the 'character' of the loudspeaker is still clearly audible and recognisable.

It was with a mixture of excitement and apprehension, then, that I agreed to conduct this series of loudspeaker reviews for *Studio Sound*. The phrase '...all measure the same...' worried me; these are monitors—some of the highest quality loudspeakers in the world—they all have similar specifications—would there be any measurable differences between them? The editors of *Studio Sound* and I decided that the reviews would be purely objective with all of the loudspeakers measured under as close to identical conditions as possible. Thus we were presented with the unique opportunity to directly compare the measured performance of a wide range of high quality loudspeakers.

The series has been running since April 1998, over which time 20 loudspeakers have been tested, so it seems timely to attempt to summarise the findings to date. It is not my intention to directly compare the individual loudspeakers here, but rather to highlight differences and similarities in loudspeaker design philosophy and their effect on measured performance.

Subjective versus Objective Assessment

Inevitably, loudspeaker design will always involve compromise, so those loudspeakers that do well in one aspect of performance will often do less well in another. Philip Newell's article in the March 2000 issue of *Studio Sound*¹, put forward a strong case to suggest that we each hear differently and, as a consequence, will rank the relative importance of the various strengths and weaknesses of a design differently. It therefore follows that the ultimate 'judge' of the worth of a loudspeaker design is the ears and brain of the person listening to it. However one must be careful here; this series of reviews is concerned with studio monitors and, whereas loudspeakers intended for other markets—such as hi-fi—should be assessed in terms of listening pleasure, musical involvement and so on, monitor loudspeakers are a tool for monitoring, and, like any other monitoring tool such as a gauge or meter, only work properly if they are accurate. Assessing the absolute accuracy of a loudspeaker by merely listening to it is very difficult and, strictly speaking, cannot be performed by individuals, even when comparing 'live' versus 'reproduced' sounds², so we must rely on measurements as well. Taking accurate measurements of the performance of a loudspeaker is only part of the story however; the interpretation of the results of those measurements is also important. There exist a number of established guidelines as to what level of performance can be considered

to be acceptable, such as tolerances on frequency response and maximum permissible harmonic distortion, but many of these may have become obsolete as the general performance of audio equipment has improved over time. The reviews have therefore tended towards just presenting the facts, with comments on the audibility of performance compromises reserved for the more obvious cases.

From even a casual glance at any of the reviews from the series to date, it is quite apparent that every single loudspeaker measures significantly different to every other loudspeaker in almost every aspect of its performance. The answer to the question posed at the start of this article is quite clear: 'They all sound different because they are all different and they all measure differently'.

Frequency Response

The frequency response of a loudspeaker is generally considered to be the most reliable indicator of sound quality. As well as demonstrating the overall bandwidth of a loudspeaker, the frequency response plot also reveals the more subtle irregularities in response within that bandwidth. All of the loudspeakers tested in this series have bandwidths that extend to 20kHz, but there is some variation in the low frequency limits. The larger loudspeakers, such as the Apogee CSM-2 and JBL LSR32, generally have -10dB points at around 35Hz or so while, at the other end of the scale, the smaller ones, such as the Acoustic Energy AE2 and AVI NuNeutron only extend down to 60Hz—nearly an octave higher. This is not too surprising; to achieve reasonable low-frequency levels from a small drive-unit requires very large cone excursions which limit power handling. Nevertheless, some of the smaller, active loudspeakers, notably the Alesis M1, Adam S2A and Tannoy A600 do extend as low as the larger models through the use of electronic equalisation.

Of the 20 loudspeakers tested, 9 incorporate a ported enclosure along with an electronic high-pass protection filter, which in most cases results in a 6th-order roll-off at low frequencies. The rapid roll-off appears to be a necessary evil in the quest for high levels of low frequencies from small loudspeakers, although one model, the ATC SCM20A, achieves extension down to 40Hz with no port and no filter in a reasonably small cabinet; albeit at a weight penalty! Research currently being conducted at ISVR, University of Southampton, may provide information as to the audibility (or otherwise) of such rapid low-frequency slopes and their associated phase-shifts—watch this space... Incidentally, these high-pass protection filters are often termed subsonic filters. The term 'subsonic' refers to something moving at less than the speed of sound (as opposed to supersonic); the correct term should be infrasonic.

The differences between on-axis frequency responses alone are often enough to explain why different loudspeakers sound different.

Figure 1 shows the decibel average of the on-axis frequency responses for the 12 loudspeakers having responses that lie within ± 3 dB from 80Hz to 15kHz. Also shown on the graph are the maximum and minimum responses at each frequency represented by the grey band. Each frequency response has been divided by the average response of that loudspeaker over all frequencies, prior to calculation of the levels, to account for differences in sensitivity. The graph shows that the response of one of the loudspeakers can be up to 6dB higher at a particular frequency than that of another while the overall output level is the same. Selecting any two of the loudspeakers tested to date and comparing their on-axis responses will reveal very significant differences. Nearly half of the loudspeakers tested have

on-axis frequency responses that fail to keep within ± 3 dB limits from 80Hz to 15kHz, with some even falling outside ± 5 dB.

Considering that reliable experimenters have reported the detection of a peak in response of only 0.5dB under favourable conditions, and that 10dB represents a doubling of perceived loudness in the mid-frequency range, the differences in sound quality between one loudspeaker and another should come as no surprise.

Many of the loudspeakers demonstrate a response that rises gently from the low-frequency cut-off to a broad peak in response at around 800Hz; indeed, the average response shown in Figure 1 has this characteristic. This sloping response, followed by some mid-frequency response ripples, is characteristic of loudspeaker cabinet edge diffraction. Loudspeakers that exhibit this type of response may benefit from flush-mounting in a monitor wall. By way of example, Figure 2 shows the on-axis frequency response of the Hafler TRM8 (shown in red), along with a prediction of the

response if the same loudspeaker were flush-mounted (shown in black). The response is seen to be flatter overall when flush-mounted, with a more extended low-frequency response. Obviously, loudspeakers designed to exhibit a flat response under free-field conditions, such as the Studer A5 and Alesis M1, would show a significant bass rise if flush-mounted. To correct for this, some of the active loudspeakers are equipped with switchable low-frequency equalisation.

Directivity

The measurement of the directivity of a loudspeaker can be a lengthy and costly process. In order to correctly quantify the directional characteristics of a loudspeaker, one has to measure the frequency response at a large number of points on an imaginary sphere surrounding the loudspeaker; in some cases, thousands of measurement may be required. Such extreme measures are only necessary, however, for loudspeakers intended for use in public address applications, where coverage angles, and so on, are important. Most >

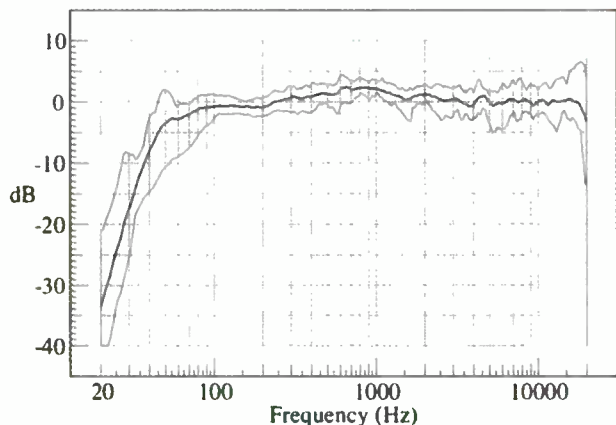


Fig.1: Average (solid line) and maximum and minimum (greyed) on-axis response of 12 loudspeakers having responses that lie within ± 3 dB

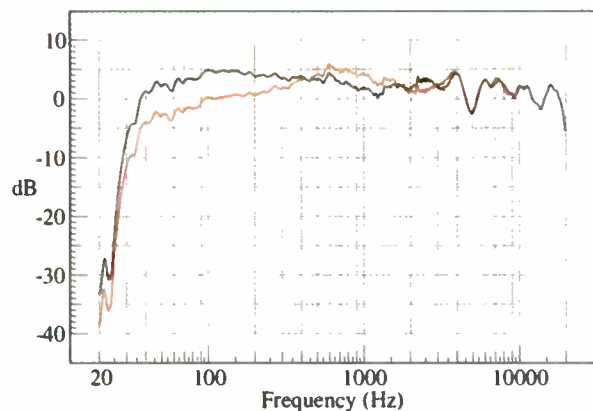
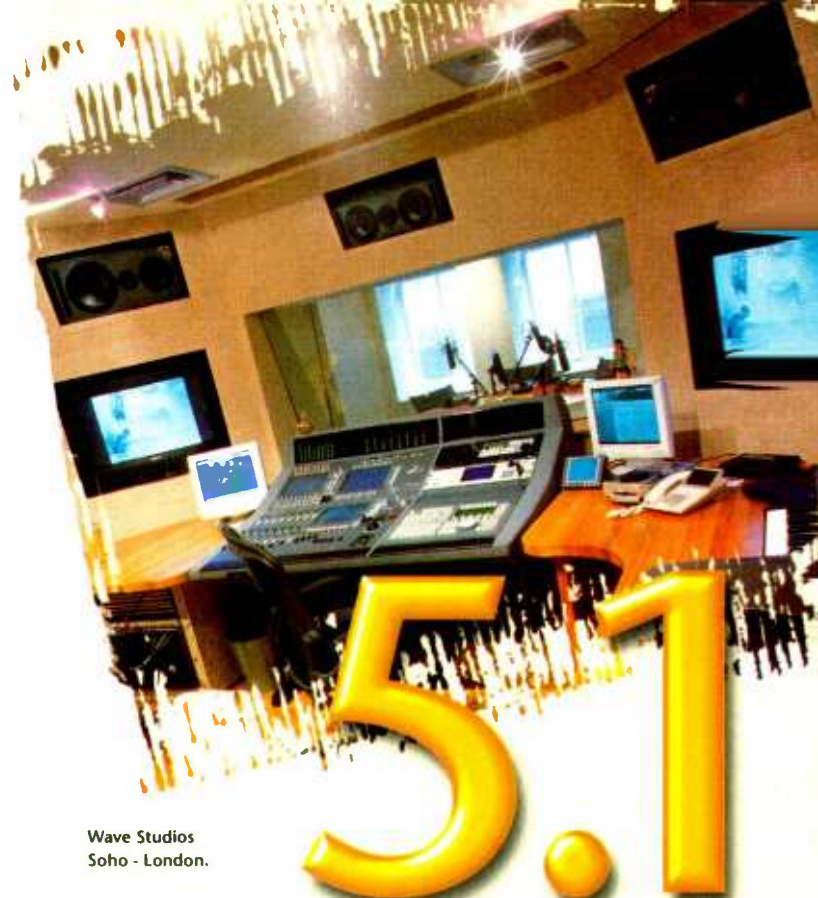


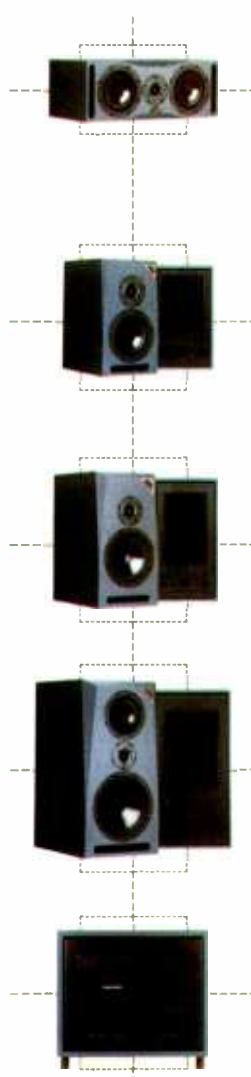
Fig.2: Free-field on-axis response of Hafler TRM-8 (red) and simulation of same loudspeaker flush-mounted in a wall (black)

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critical listening to monitor loudspeakers is carried out on or near the loudspeaker axis, so the off-axis response is only usually heard via reflections from walls and equipment in the control room. The directivity measurements carried out for this series of reviews is therefore limited to 60° horizontal, and 30° vertical, both in 15° steps. These nine measurements are sufficient to demonstrate irregularities in off-axis response due to lobing, drive-unit interference, and so on. The first four reviews featured third-octave plots of the total power response of the loudspeakers, measured in a reverberation chamber, but it was soon realised that these revealed no more information than could be found in the off-axis responses: the power response was therefore dropped for subsequent reviews.

Probably the most notable feature of most of the directivity measurements is the interference notches that occur when drive-units are spaced apart. These notches occur when the distance from the listener to one drive-unit is different to the distance to another drive-unit. The off-axis angle at which a notch occurs at a given frequency is dependent upon the relative levels and phases of the outputs of the drive-units and their distance apart; the closer they are together compared to a wavelength, the wider the angle. The most common arrangement of drive-units is a single woofer and tweeter in a vertical line: 11 of the 20 loudspeakers tested are of this type. As there can be no path length differences in the horizontal plane, the horizontal directivity is simply that of the individual drive-units and in most cases is well controlled. Path

length differences do exist in the vertical plane, however, and all of the 11 loudspeakers show interference notches at, or near, the crossover frequency: some as deep as 20dB.

Figure 3 shows a graphical representation of this effect. Listeners are seldom very far off-axis in the vertical plane, so these interference notches do not present too much of a problem: the same cannot be said of the horizontal plane though, as strictly speaking, even the two ears of a listener cannot be on the same axis at the same time. It is for this reason that most manufacturers state that these loudspeakers should be mounted with the drive-units arranged vertically.

Of the 4 loudspeakers that use multiple woofers, 3 have them arranged horizontally, the Acoustic Energy AE2, FAR D5W-80 and Westlake BBSM-5, and they all demonstrate a horizontal off-axis interference notch. The M&K MPS-150 overcomes the problem of multiple drive-units by using two woofers and three tweeters arranged alongside each other in compact vertical arrays, and suffers very little from interference effects in either the horizontal or vertical planes as a result. The best off-axis performance in terms of interference dips is reserved for the Tannoy A600: the dual-concentric design ensures that there can be no path length differences in any plane.

All of the loudspeakers tested exhibit well controlled off-axis responses at high frequencies, although there is some variation in beam width. Those fitted with soft-dome tweeters of either 25mm or 28mm diameter exhibit the narrowest beam at high frequencies, and the two loudspeakers fitted with 25mm metal domes,

the Apogee CSM-2 and JBL LSR32 demonstrate the widest high frequency dispersion. To demonstrate this, Figure 4 shows the average $\pm 45^\circ$ off-axis response of a number of loudspeakers. The red curve is the average of all of the 25mm soft domes, the green curve the average of the 28mm soft domes and the black curve the average of the 25mm metal domes. There appears to be little to choose between mid-bass drivers of a given size in terms of directivity: all demonstrate a similar degree of mid-range narrowing regardless of cone material.

Time Response

All of the reviews feature step response, power cepstrum and acoustic >

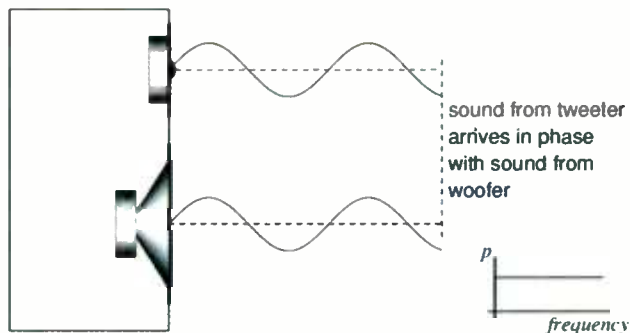


Fig.3a:

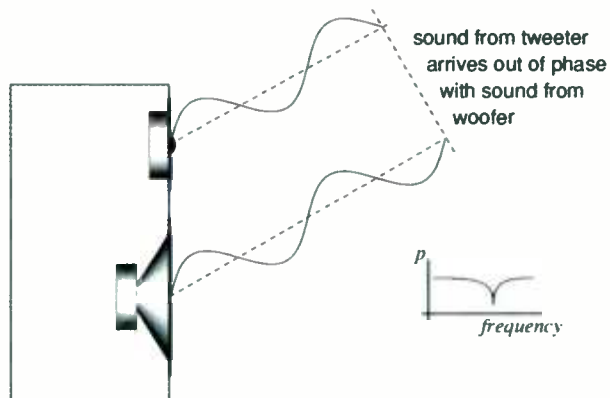


Fig. 3b: Interference notch due to vertically-spaced drivers

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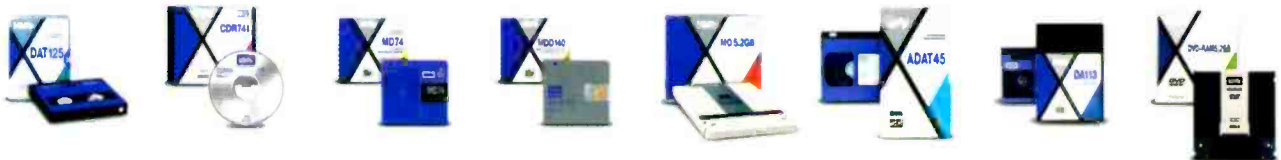
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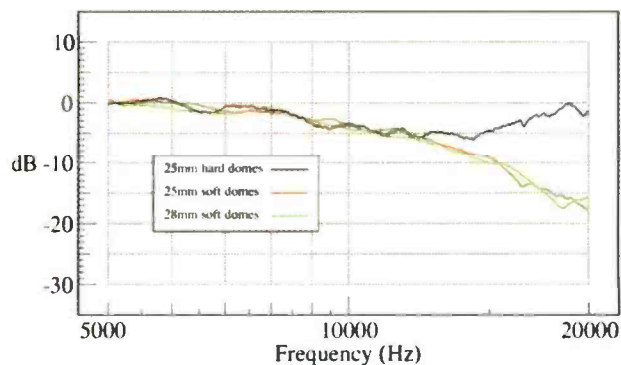


Fig.4: Average 45° off-axis responses for different types of tweeter

< source position plots, and all those after the fourth review have a waterfall plot. The leading edge of the step response reveals details about driver time-alignment and relative phase. The most accurate leading edges are demonstrated by the Acoustic Energy AE2, Hafler TRM8, PMC LBI-BP, Roister SNF-6 and Tannoy Reveal. The Hafler and the Roister have tweeters mounted behind the plane of the flange of the woofer to aid time-alignment through the use of stepped and sloping baffles respectively, the others achieve a similar result through drive-unit selection and crossover design.

All other models have mid frequencies that lag behind the high frequencies by around 0.5ms. This apart, most of the loudspeakers reproduce the overall shape of a step fairly accurately, with the exception of the JBL LSR32 which shows good time alignment at mid and high frequencies, but the low frequencies appear to respond about 2ms late. The Alesis M1, Quedt VS2108, Spondor SA300 and Studer A5 all have phase-reversed tweeters.

The most notable feature of the acoustic source position plots is the delay in the low frequency components of transients due to the low-frequency roll-offs of the loudspeakers. This delay varies between about 4ms (equivalent to about 1.3m distance), for sealed-box enclosures having 2nd-order roll-offs, to 12ms (about 4m) for ported enclosures with protection filtering having 6th-order roll-offs.

The waterfall plots show the decay of individual frequencies in response to a transient signal. The ADAM S2A, Alesis M1, Apogee CSM-2, ATC SCM-20 and Westlake BBSM-5 all show good decay characteristics at all frequencies; the other loudspeakers show some evi-

dence of ringing at discrete frequencies. The ATC also shows very rapid decay at low frequencies, primarily due to the second-order roll-off. In many cases, ringing can be linked to sharp peaks or troughs in the frequency response plots, indicative of lightly damped resonant behaviour.

Just how audible these time alignment differences are is not fully understood. It is possible that sacrificing accurate time alignment in favour of other aspects of performance is a sensible option; but, on the other hand, with all else being equal a loudspeaker with an accurate transient response must be favoured over one with some time smearing.

Harmonic Distortion

It is an accepted fact that no transducer is perfectly linear, and that loudspeakers are no exception. The effect that the presence of nonlinear distortion has on a signal depends, not only on the nature of the nonlinearity, but also on the signal itself, so the assessment of the audibility of nonlinear distortion is therefore fraught with difficulty. Harmonic distortion measurements are a standard, convenient way to assess the degree of nonlinearity present in a loudspeaker and are therefore only useful for meaningful comparisons between models; they cannot reveal what the loudspeaker will sound like, unless you are listening to a pure sine wave that is.

The harmonic distortion measurements in this series of reviews were carried out at an average sound pressure level of 90dB at a metre distance, about 10% of the maximum output capabilities of the smaller monitors. As a general rule, harmonic distortion in loudspeakers is level dependent and tends to increase with increasing level. This must be taken into account when comparing >

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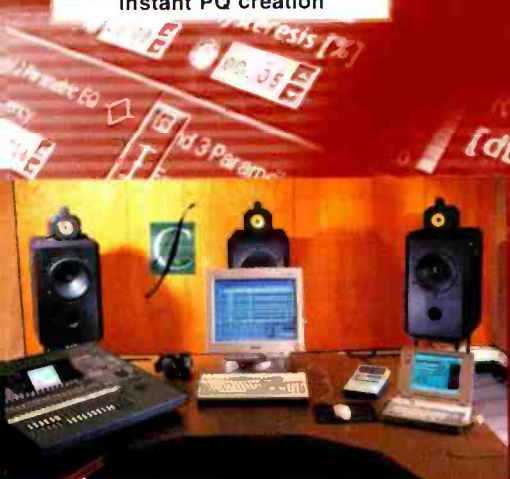
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< the review figures with those from other sources.

For most loudspeakers, the harmonic distortion is highest at low frequencies where diaphragm displacements are largest, and for many of those tested, the highest distortion levels occur below the low frequency bandwidth limit of the loudspeaker and may not, therefore, be important. One exception to this rule is the Apogee CSM-2. This loudspeaker produced harmonic distortion levels below 0.3% (-50dB) at all frequencies above 35Hz; the lowest levels of any loudspeaker tested. The Apogee is, as mentioned above, considerably larger than many of the other loudspeakers tested, with a 270mm woofer, so diaphragm displacements are lower. Another large loudspeaker, the JBL LSR32, also produces low distortion at low frequencies, with a maximum of 0.6% (-45dB) at 60Hz. Of the smaller loudspeakers, the Westlake BBSM-5

exhibits the lowest distortion with 0.4% (-47dB) at 85Hz, and levels below 0.2% (-54dB) at all frequencies above 200Hz. Perhaps the biggest differences between the loudspeakers, in terms of harmonic distortion, are those in the mid- and high-frequency ranges. Whereas the 3 loudspeakers mentioned above, as well as the PMCLB1-BP, have very low harmonic distortion at mid and high frequencies, many others have levels as high as, or above, those at low frequencies.

Interestingly, the 4 loudspeakers mentioned above as having very low distortion are all passive designs, but when considering all 20 loudspeakers, there appears to be little to choose between passive and active designs in terms of harmonic distortion.

Unusual or Novel Features

Nine of the 20 loudspeakers tested to date are 2-way active systems, but within these there are a number of unusual or novel

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1998	
April	Tannoy A600 and Reveal plus details of testing procedure
May	Hafler TRM8
June	Meyer HM-1S
July	Quested VS2108
August	AVI NuNeutron
September	Spendor SA300
October	JBL LSR32 and Meyer HM-1S (repeat)
November	Studer A5
December	FAR D6W80
1999	
January	Acoustic Energy AE2 Pro
February	M&K MPS-150
March	HHb Circle 5A
May	Roister SNF-6
June	ATC SCM20A
July	Westlake BBSM-5
August	Apogee CSM-2
September	PMC LB1-BP
October	ADAM S2A
November	Alesis M1

design features. The ADAM S2A is fitted with an air-motion-transformer tweeter that operates in a very different way to the dome tweeters fitted to most of the other models. The Meyer HM-1S and the Tannoy A600 have concentric designs, but they are quite different. The soft-dome tweeter of the Meyer is mounted in front of the woofer and is loaded by a constant directivity horn, and the Tannoy has a compression driver mounted behind the woofer which uses the cone of the woofer as a horn. The ATC SCM20A has a very unusual cabinet, which I described in the review as having a cross-section shaped like a lady's fingernail. Although quite compact, this loudspeaker was the heaviest tested at around 30kg per cabinet; mount on your monitor bridge with care!

The PMC LB1-BP is a transmission line design which, although not unusual in itself, is the only loudspeaker of this type reviewed to date. The Acoustic Energy AE2 and the M&K MPS-150 both feature 3 tweeters, but the crossover arrangement and front panel layout give them quite different characteristics. The JBL LSR32 and Studer A5 have removable front panels housing the mid- and high-frequency drivers; this panel may be rotated to maintain vertical alignment of the drivers with either 'landscape' or 'portrait' positioning of the cabinets.

The Westlake BBSM-5 was supplied with an add-on 'muff', which is a block of open-cell plastic foam that fits around the front of the cabinet. Westlake claims an improved subjective performance with the muff fitted and measurements show that it does indeed reduce cabinet edge diffraction effects, but not to the same degree as flush mounting. The AVI NuNeutron is by far the smallest loudspeaker tested having a volume less than half that of any of the others and one tenth that of the largest.

Finally, the HHb Circle 5A has a bright purple woofer and the Roister SNF-6 has a yellow one. ■

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THE FIRST COMPANY in this series on audio plug-in developers, TC Works, grew out of a hardware effects processor manufacturer's response to the software effects plug-ins market. The subject of this month's article was in at ground zero of that market and is now expanding into the hardware effects processor market. Waves began life in 1993 when cofounders Gilad Keren and Meir Shashua met up with Digidesign and created the first software plug-in, a file-based EQ processor for Sound Designer called the Q10 (this being before the days of TDM and real-time mix effects processing). Keren, a former recording engineer and producer, says he and Shashua had actually begun working on audio DSP programming five years earlier, and had been contemplating doing it for several years before that.

'We actually developed the Q10 in 1988 on a Motorola DSP running under Windows 1.0,' he reveals. 'The goal was to make a new breed of audio processor. And it still is our goal, basically. We love audio and making tools.'

In 1990 the pair went to work for a company called Audio Animation in the States. After that company folded in 1992, they decided to set up by themselves, and went on to form Waves. Today the company, which is headquartered in Keren and Shashua's native Israel and has a wholly owned subsidiary in the US, produces a range of Mac and PC software effects plug-in products for both native and DSP computer-based platforms, and sells around the world. But why did the pair set off down the software plug-ins route instead of producing hardware effects units?

'That had more to do with our financial resources and abilities at the time,' says Keren, who is Waves' president and CEO. 'We wanted to set up an independent company, and it was just easy to go that way. We ran into the Digidesign people early on, and it was a good opportunity for us to do software. Now that we're doing hardware, we see how right it was, because doing hardware projects is way more difficult. You need the software, and that was the easy part for us to do. But the whole logistics of manufacturing and quality

Waving Not Drowning

Audio plug-ins pioneer Waves is seeing the reach of its effects software extend into new areas. **Simon Trask** surfs the Waves with company cofounder Gilad Keren...

assurance, and bringing the same quality that people expect of Waves to hardware, it's a really big task.'

Still, Keren says that its L2 Ultramaximizer hardware unit won't be a one-off. 'We're into making audio signal processing tools first and foremost, so in the future we'll be covering both the software and the hardware markets. You can expect a lot of hardware from Waves. People work with a lot of applications which require boxes, and we wanted to bring our technology to that space. We tried doing it with partners, but we were never really able to achieve it, so we bit the bullet and did it ourselves. But it takes time to get everything just right.'

Keren describes the L2 as 'an optimised L1 [software plug-in], with different, more advanced algorithms that aren't available in software at this point.'

New kernel and control software also had to be written. The L2 runs on the same Motorola DSPs that Digidesign use, giving up to 56-bit resolution.

He sees the US as the number one regional market for Waves plug-in sales, both native and TDM, accounting for 50%–55% of total, with Europe coming second and Japan third. Native plug-in sales, he says, are growing a bit faster than TDM; the company sells both types of bundle through the same outlets. Last Summer, Waves announced a 20% worldwide sales increase and a 27% increase in Asia during the first half of the year—a sales boost that Keren puts down to 'a combination of new tools, a growing marketplace, and a better sales and marketing organisation that we'd created.' He reveals that Waves' best-selling native product is the Native Power Pack bundle, while on the >



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<TDM front the Gold TDM bundle comes out on top (both available for Mac and PC). The company now supports Pro Tools on NT (originally announced at last Autumn's AES convention), but according to Keren 'the market is really slow at this point.' As for supporting another DSP platform, Creamware's Pulsar and SCOPE, he says 'We're evaluating this, but there's no definite plan at this time.'

Waves' initial Q10 EQ plug-in for Digidesign was in the file-based Sound Designer plug-in format, and ran on a single-DSP Sound Tools DSP card 'because the hosts at that time weren't strong enough to do the processing,' recalls Keren. The company expanded into supporting the Adobe Premiere (native) and Digidesign AudioSuite (DSP) file-based processing formats, and from there into real-time TDM effects when the format became available. Real-time native plug-in support came in the mid nineties with Microsoft's introduction of DirectX and Steinberg's introduction of VST. 'It was

obvious to us that that was a great market,' says Keren. 'It didn't make the Digi people happy, but...'

Today the company has around 10 plug-in bundle products (collections of plug-in effects), all available for both Mac and Windows platforms and divided about evenly between TDM and native packages. Collectively they draw on some 15 plug-ins, available in both native and TDM versions. The company's best-known native bundles are the Native Power Pack (L1 Ultramaximizer, C1 compressor-gate-side chain, Q10 parabolic EQ, S1 stereo imager, TrueVerb virtual space-reverb) and Native Power Pack II (Renaissance equaliser, Renaissance compressor, DeEsser, MaxxBass bass enhancer). On the TDM front, the TDM and TDM II bundles parallel the Native Power Packs in effects, but with the TDM bundle adding the PAZ Psychoacoustic Analyzer plug-in (Mac version only), and the TDM II bundle adding the PS22 StereoMaker stereo expansion plug-in. Also available are Gold TDM and Native

Gold bundles that each provide the effects from both the bundles already mentioned, and also add UltraPitch, MetaFlanger, MondoMod and SuperTap plug-ins (which are available separately in another bundle, Pro-FX, for native and TDM platforms). The Windows Native Gold bundle also includes WaveConvert Pro for streaming audio optimisation (see later). That just leaves the entry-level EasyWaves native bundle, which consists of reverb, compressor and equaliser plug-ins, and the newly introduced Pro-FX Plus bundle for native and TDM. Pro-FX Plus, which continues the Pro-FX bundle's exploration of more creative and wacky effects processing, adds Doppler pitchshifting and Enigma 'notchbox' feedback-filter-modulator plug-ins to the four Pro-FX plug-ins, and in fact supercedes the Pro-FX bundle (Pro-FX users can upgrade to the new bundle). Waves' approach to dealing with the different markets and platforms for software-plugs is to provide the same audio processing tools via different Wave-shells, which act as connectors to the different software environments.

Keren explains: 'You could make effects setups in a Digidesign system and then take those setups over to a MotuMAS system or to a VST-based system and just load them in. Processing is processing, it's independent of the host platform.'

To this end, the company's TDM packages include Waveshells for the native formats—VST, MAS, DirectX, and now RTAS. This also means that someone running Cubase VST can go over to Digital Performer and use their plug-ins within Motu's MAS environment. However, native bundles don't include TDM, so there's no 'upward mobility'. 'It's kind of a pyramid structure,' says Keren, 'and the high end is more Digidesign, but some of these people work in various multiple environments. So it's a convenience for us and a convenience for our users. A lot of sound engineers don't just use one

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tool, they have all sorts of tools, they use this one for this thing, another thing for another... Some people are more religious, they're just into that tool, they don't want to hear about anything else.'

Keren also sees catering to diversity of approach being a key factor in graphical interface design. 'Our trend is to try to minimise the number of controls, just to give a few really meaningful ones. Because it's very easy when you're making a plug-in to provide a lot of controls, and then nobody really knows how to work it. So we're working on the software side to come up with an interface that you'd want in a hardware unit, to make it simple. But then also there's a market and there's a need for the tweaks, for being able to go in and tweak every parameter, and we try to accommodate that. We have quite a few tools like that, but then the Renaissance line is more the approach where we have less controls and everything is just right. But that's our industry, you've got these people, you've got those people.'

While historically Waves has been closely associated with the professional music and audio production market, Keren sees the plug-ins market as no longer being confined to these traditional applications. 'We're real world, real solutions people, and we'll give the real world our solutions in any way that makes sense,' he says. 'Waves is very busy in the consumer marketplace. You can expect MaxxBass in your next TV very soon. I can't release any names yet, but I can say that MaxxBass [Waves' virtual subwoofer bass enhancement technology designed to improve the bass delivery of any speakers] has been embraced by several consumer markets, such as TV and multimedia, that require better bass sound.'

In fact Waves' history over the past couple or so years shows that the company has been long been open to exploring other avenues for its technology. Motorola originally announced DSP support for MaxxBass in 1998, embedding Waves' technology in its



DSP56362 and DSP56364 audio DSPs, which were aimed at a wide range of consumer audio delivery applications. Waves scored a coup at last year's Winter NAMM show when it announced that Microsoft had licensed elements of its TrueVerb technology for inclusion in the Windows DirectMusic API. Another venture, dating back to 1997, saw Waves provide the Windows DSP Bundle (now discontinued) consisting of five real-time Waves plug-ins for Digital Audio Labs' PC-based V8 digital audio workstation software.

Waves has also been active in pursuing possibilities in the growing market for Internet audio processing and enhancement. In fact, as far back as 1997 the company announced the Waves ATP (Audio Transmission Processor) and WaveConvert Pro software packages for Internet audio processing and streaming, with support for RealNetworks' (then Progressive Networks') RealAudio and Microsoft's ASF streaming formats.

That same year the company also provided a set of real-time plug-in effects for the Mac and PC-compatible AP24 24-bit PCI audio card from Tel Aviv-based Galim Signal Processing (a business unit of Waves), with the plug-ins being hosted by Waves' MultiRack application, which allowed multiple cards to be used in one machine.

Although WaveConvert Pro still features in the Waves product catalogue, Keren admits that there hasn't been any significant update to this tool for over a year now, and at this time I don't know when the next update will be available. Consequently, the program isn't guaranteed to work with the latest streaming audio technology. However, Waves has been more active in Internet streaming audio processing with its ATP software, through an alliance dating back to 1998 with US company Broadcast Electronics. The ATP package has now mutated into the MaxxStream suite of audio processing tools, which is being >





used by Broadcast Electronics as part of its new eSTREAM Internet and intranet streaming audio package. eSTREAM integrates A-D conversion,

audio processing, audio encoding and bandwidth management capabilities, and delivers audio streams optimised for delivery via RealServer. Microsoft

Media Server or an MP3 server. The Galim AP24 PCI card will also be available as a part of MaxxStream (as soon as the Mac drivers are completed," according to Keren.

With the advent of SACD and DVI-Audio, production-stage surround sound-effects processing is on the cards—but can it also be in the computers?

"The main problem now is that there are no good editing, mixing and mastering tools for multichannel audio," says Keren. "This will probably change in the next year or so. Digi and Steinberg need to release surround sound APIs and tools. These tools can be native, but one thing for sure is that the computational requirements will increase three-fold!"

When it comes to native versus DSP, the distinctions are not as clear as they might seem, according to Keren. "There is a difference between the code that runs on a DSP and the code that runs on a host, but it's almost identical code, and it's a negligible difference in terms of audio quality. Also, there are DSPs that are fixed-point (for instance the Motorola 56xxx family as used by Digidesign) and DSPs that are floating-point (the Analog Devices DSP used in Creamware's Pulsar), while on native systems you can work in both fixed and floating point. Floating point is easier to program, but the code will be less efficient than well-coded fixed-point; also, with floating-point calculations it's significantly harder (although not impossible) to control internal noise build-up in the algorithms."

However, when it comes to the future of DSP-based systems in the face of ever-increasing host-based (native) computing power, Keren is clear that "DSP is here to stay, especially for the high end, and multi-DSP applications. Where native is coming in, you can do a tremendous amount of things on native right now, and it's going to continue to grow, but there's always going to be a place for DSP, for the higher end and for the people that want a lot of performance, a lot of processing. You can scale your processing power by adding more DSP, as you can with

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Digidesign by adding more farms. DSP is more predictable, too. You know exactly how much processing you have available on each channel, and this can really be meaningful when you're doing a mixdown. But you put it on a native system and somewhere in the middle there's just not enough processing and the whole thing screws up. Also when you start putting these parallel DSP processors together, it's much more linear, a much closer process to getting multiple times of performance. Whereas on a native system there's diminishing returns, if you go from a 300MHz to a 600MHz processor the performance doesn't double.

'On the other hand, with native you can typically address huge amounts of memory, which you don't necessarily have available in the DSP space. This means that with reverberation, for instance, you can do crazy things that you might not be able to do in DSP. So there's a potential there. Another big difference is in latency. With DSP you have very low latency processing, whereas when you're doing native you've got a latency of the OS which can screw you and bog you down.' But the power of host-based systems continues to grow, for instance with the latest-generation PowerPC processors as used in Apple's PowerPC-based G4 Power Macs, which also have the added benefit of the built-in Velocity Engine, or AltiVec, support processor. Keren says that Waves hasn't optimised its native Mac plug-ins for the Velocity Engine yet, but that optimisation is 'definitely in the future sometime.' Of the additional processor he cautions that 'it will allow you to do more things and faster things, but it's not as good as everybody's hoping it is. The marketing folks tend to hype it up.' Finally, how does Keren see the software plug-ins market developing and changing in the future?

'I think you're going to see less companies in this niche, and the ones that survive will be more focused. The market can't support so many companies over the long term. This is evident now with many companies pulling out of the market since they can hardly make any revenue. Moreover, with companies like Digi and Emagic giving plug-ins away for free with their software and hardware, this makes life a lot tougher for the small players and raises the entry bar to the market to really distinctive and unique products.' ■



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James Guthrie

After the Goldrush

Twenty years old and twelve months in the remaking, a classic Pink Floyd album is attracting attention once again. **Richard Clews** scales *The Wall*

LAKE TAHOE, high in the Gold Country of the Sierra Nevada, is an unlikely location for a recording studio. A must-see for tourists and popular with skiers, it seems out of step with the record business. Yet for British producer James Guthrie, the benefits of his environment are clear. I'm six and a half thousand feet above sea level, with a fantastic view of the mountains and the lake, and that's what I look at when I'm working.

The calm surroundings are an ideal match for Guthrie's outlook. He gives the impression of being easy-going but at the same time, passionate about maintaining the highest standards. This dedication is evident in a career encompassing production and engineering for Toto, Kate Bush and Chicago, among many others, and soundtrack credits on films by Ridley Scott, David Cronenberg and Alan Parker.

Over the last 12 months, Guthrie has returned to the project which has brought him most recognition. Pink Floyd's award-winning, double LP, film-concert, *The Wall*. December 1999 saw the DVD release of the film, restored and remastered by Guthrie himself. As I spoke to him, he was putting the last 'bricks' in a *Wall* live album, titled *Is There Anybody Out There?*

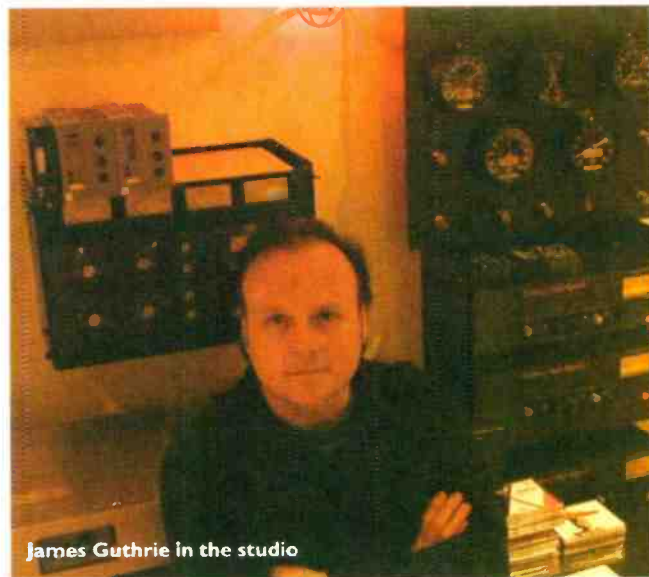
Guthrie found his entry to recording in the early seventies. After a short career as a guitarist, he decided to try his luck as a teaboy-tape operator with

one of the major studios. In 1973, John Hudson gave him his first job at Mayfair. 'I thought that I knew a little bit about audio, but when I started working there I realised I knew absolutely nothing, and John made that pretty clear to me. One day I was sitting in on a session with John and [producer] Phil Coulter, and at six o'clock that evening the tape op left, so I was thrust into the deep end. John didn't want Phil to know it was my first day on the job, so he walked over to me at the tape machine and very quietly said, "just do exactly what I tell you to do, as fast as you can", then turned around and walked away.'

Guthrie survived the ordeal, and progressed rapidly to production work at Mayfair and later Audio International, with bands such as The Movies, Runner and Judas Priest. In the summer of 1979 he came over to America with Pink Floyd to mix and coproduce *The Wall*, and was impressed enough to stay. 'I thought it was a pretty interesting lifestyle—I could

get up in the morning, put a pair of shorts on and go to work. I really admired the work ethic at the time in L.A. the people in the studios were really meticulous and into working. So I stayed for two years and during that time I applied for a green card.'

Work brought him back to the UK during the eighties, until he was able to set up his studio (named Das Boot after Guthrie's fascination with submarines) in northern California. Recent Pink Floyd projects have been worked on here and at Doug Sax's Mastering Lab in Los Angeles. The first assignment was to remaster their entire back catalogue. 'The restoration work was designed to get as much off the original tapes as possible. A good example of this is the *Animals* album. For some strange reason, >



James Guthrie in the studio

< in the late seventies the band decided to use dbx rather than Dolby noise reduction, and that is very tricky in terms of keeping alignment between different decode cards. So *Animals* was recorded and mixed with dbx, and then a Dolby A copy was made to cut the original vinyl. When we set about remastering the album, we went back to the dbx master and spent a lot of time very carefully trying out different tape heads in the Mastering Lab.'

In 1998 Guthrie and designer Storm Thorgerson investigated the possibilities of DVD on the band's behalf. Dismayed by poor quality transfers and awkward menu navigation, they proposed an interactive disc of the *Wall* film, complete with easy layouts, hidden sound-bites and numerous extras. But the design stage was the easy part.

'We originally dubbed the film at Pinewood to 35mm full-coat magnetic film and 16-track 2-inch. When we returned there to make digital copies of the 35mm mag, I was absolutely horrified. The mag had not stood the test of time at all well. We had problems with drop-outs, high levels of distortion and the film breaking apart. After three long days I walked out wondering if we should even be doing this project. The only saving grace was that we had the 16-track, but I didn't know if all the live loops and sound effects were present.'

Guthrie was relieved to find that the 16-track contained the necessary elements but faced considerable hurdles resyncing the sound to picture. The main problem was that Maglink, rather than SMPTE, had been used during the recording of the original *Wall* album, live shows and film. Nigel Taylor, owner of Synchrotech and Pink Floyd technical expert, restriped the tape with SMPTE code, enabling Guthrie and assistant Joel Plante to work on the film at his studio.

The latest *Wall* offshoot is based on recordings made at Earl's Court in 1980 and 1981. Originally marked down for a November 1999 release, *Is There Anybody Out There?* has taken longer than expected due to the sheer number of tapes involved—Abbey Road studios shipped over 110 reels of 2-inch tape. The final stage before mixing was to physically restore the tapes, as the glue binding the oxide had become soft. 'We baked the 2-inch tapes in a convection oven at 130 for about eight hours,' Guthrie explains, 'which is about the same temperature as the glove compartment of your car on a sunny day. So it's not over the top, it just takes a lot of time.'

The restored tapes were played back on two Studer A827 24-track machines through Guthrie's Euphonix console. 'I needed a console that would pan properly to 5.1, and the Euphonix does that very well. It has digitally controlled



analogue circuitry, so in many ways it's the best of both worlds. You've got a nice clean analogue signal path, with loads of headroom, plus there's the benefit of total recall. As film footage will eventually be cut to these mixes, everything must be resolved, so I'm mixing at 24-bit 96kHz with dCS convertors straight into my SADIe system.'

The choice of equipment in Guthrie's studio reflects his love of analogue sound and his efforts to preserve its warmth and vitality on digital formats. Valve equipment is well to the fore, including an all-valve 2-track tape machine built by Tim de Paravicini of EAR (Esoteric Audio Research). The same company also supplied several limiters and equalisers.

Alongside the Euphonix console, digital tools include Genex GX8500 recorders, that Guthrie uses to master at 24-bit 192kHz. While his dCS and DB Technologies convertors are all important, Guthrie has reservations about current A-D techniques: 'All of the A-D convertors I've heard share a common

problem—they can sound very reasonable with a fairly simple waveform, such as acoustic guitar or a bit of vocal with some echo, but as soon as the whole band comes in, they tend to fold. Certain convertors deal with that problem better than others, but it's always been an issue to me.

'I deal with noise on the tape while I mix' he explains. 'I either EQ or balance, keeping faders out where nothing's playing. Unlike a lot of people, I don't have a huge problem with tape hiss. Given the choice, I would choose not to have it. But my feeling is, when you listen to old recordings, you hear the tape hiss for the first second, and then you become absorbed in the music. I'd much rather suffer a small amount of tape hiss than listen to a digital recording with clock jitter.

'Don't get me wrong, I love digital and analogue,' he continues, 'but when I analyse it, the things that I love about digital are technical things. All of the things I love about analogue are musical things, and let's face it, what are we dealing with here? In the early days of digital, people used to say to me, "Oh man, you've gotta change over to digital, it's so great. You don't have to align anything and it's so much easier". It's turned out over the years that the exact opposite is the truth. Maintaining resolution in a digital audio chain can be quite tricky.

'A poorly aligned analogue tape machine still sounds like music. A poorly aligned digital system will either mute or you'll hear horrible distortion. Having said that, once I get things into the digital domain, the amount of control that I have over that information always staggers me. The type of repairs and manipulation you can make is brilliant.'

In the light of digital recording's prominence, Guthrie's comments may at first seem at odds with popular opinion. But many in the recording world credit him with extensive technical knowledge and superb hearing. How did this reputation come about? 'I don't know the answer to that, to be honest with you', he replies. 'Probably because I'm so picky. But I don't consider myself to be technical at all. I just try to take a musical approach and trust my ears.'

'I was fortunate in that I had fantastic training from people who really understood the technicalities of audio and also understood sound. John Hudson was the first person responsible for my training, and he's one of those guys like Tim de Paravicini or George Massenburg who are brilliant technically, but also very musical, and can make that translation from the technical side into music. The other person was Richard Millard who ran Audio International. I would credit a lot of my sensitivity to things like distortion and phase shift to John and Richard.'

Guthrie places great value in listen- >



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ing without prejudice. 'Whenever I do any evaluation of a piece of equipment, I do all of the listening blind, because it's the only way to be completely objective. When you're A-Bing stuff and doing the switching yourself it's very easy to become biased, for whatever reason. This is what we do at the Mastering Lab, making a completely impartial judgement based on what we hear. It's very important to understand that we don't just listen with our ears, we listen with our whole body and I try to listen that way, to intuit the sound.'

The original *Wall* album has become a classic hi-fi demonstration record, and often features in lists of the best engineered recordings. As a consequence, many Floyd fans and audiophiles will be looking to *Is There Anybody Out There?* for more 'amazing sonics'. Can it live up to the first album's reputation?

'You have to take into consideration the fact that it's a live recording in Earl's Court,' comes the answer, 'which is an acoustic nightmare. The ceiling is a false ceiling, the real one is another 30 or so feet above that, and then the other problem is that underneath the main seating area is a huge cavern. That's the bit where they take up the floor and flood it for the boat shows.'

It's interesting how the acoustics change quite dramatically throughout the concert, when the wall gets built between the band and the audience. This giant cardboard wall made a huge difference to the acoustics. There were far fewer reflections and it was much more like a studio environment. We had sort of created a studio environment on stage anyway. Phil Taylor [Pink Floyd's backline chief and manager of David Gilmour's Astoria studio] and I got these enormous acoustic foam blocks and put them between the amplification on the backline and hung them under the stage. We also got the band to play on stage at a much lower volume than they normally would. So the separation on the recordings is very good, but it

changes during the show.'

While Guthrie mixed the sound during the 1980 concerts. Doug Hopkins recorded the proceedings on the RAK mobile. The following year, Guthrie made the recordings himself, using a mobile and a Portacabin full of tape machines. At the time, the band had possibly the most complex live mixing system ever assembled, with 106 channels, and used quadraphonic sound to bombard the audience with fighter planes, exploding televisions and,

Monitoring and Studio Design

JAMES GUTHRIE's 5.1 monitoring setup comprises three ATC SCM150As for LCR, two SCM50As for the left and right surround, and an ATC SCM0.1/15 subwoofer.

'Initially I was going to buy ATCs for my home hi-fi system, but as soon as I heard them I knew I could mix on them,' he explains.

'I mixed a whole album for Ashley Maher on the SCM50s and took it to Doug Sax for mastering. After a couple of minutes listening to the tape, he turned round and asked what speakers I was mixing on. When I told him, he said "this is nailed". We had to do so little to it, in terms of the mastering and EQ, that from that day on they became my work speakers and they went everywhere that I went.'

Guthrie is passionate about the monitor's role in studio design, something which he feels often gets overlooked. 'For me, the speakers are the most important piece of equipment in the room. They are your window to the outside world and tell you whether what you're doing is correct. If you don't know what you're listening to, then it doesn't matter what gear you're working on. In a lot of the studios that I've worked in, with regard to acoustics, it seemed that the studio designers were guessing. People tend to build a room that looks correct on paper, then, when the main monitors don't sound right, they start EQing them. Now that's completely arse-about-face. You end up with a system that will never translate to the outside world. You need to start with speakers that are correct, place them in a room, and if they sound wrong you change the room, not the speakers.'

infamously, the schoolkids' chorus on 'Another Brick in the Wall'.

To give a sense of this sonic assault, Guthrie is mixing with Q Sound, which he used on Pink Floyd's *Pulse* and Roger Waters' *Amused to Death*, and taking a 'cinematic' approach. 'I treat the mix like a camera,' he says. 'Between songs, you're back in the audience, "wide-angle", and aware of the audience atmosphere and the hall, and then as soon as the band start playing you zoom-in to the band. You might pull back at certain points for audience participation and then zoom-in again for the continuation of the song.'

Following the live album's release, Guthrie is looking forward to another collaboration with Roger Waters for his American tour and further DVDs with Pink Floyd. Once again, Guthrie's skills will be put to good use, but will the future of high quality sound ultimately be compromised by MP3? 'It's a real concern for me,' says Guthrie. 'Doug Sax and I have joked that there may come a time when we'll look back on low resolution digital as being the good old days! What horrifies me as much as compressed audio, perhaps even more, is that not only are people downloading inferior quality audio, they are also listening to it on inferior sound systems. They're doing most of their listening at their computers or playing it in their cars.'

'Having said that, the upside is that even though the *Wall* DVD is compressed audio, reviewers have been talking about the richness of the sound. I think it's a question of generations. I read an article about MP3 which gave the statistic that one band had had 75,000 downloads of their music in one month, but they had only sold nine copies. That says to me that kids don't want to own music anymore and music has become a disposable commodity for that generation. That doesn't bode well for record sales, but there are still people out there who care about audio quality.' ■

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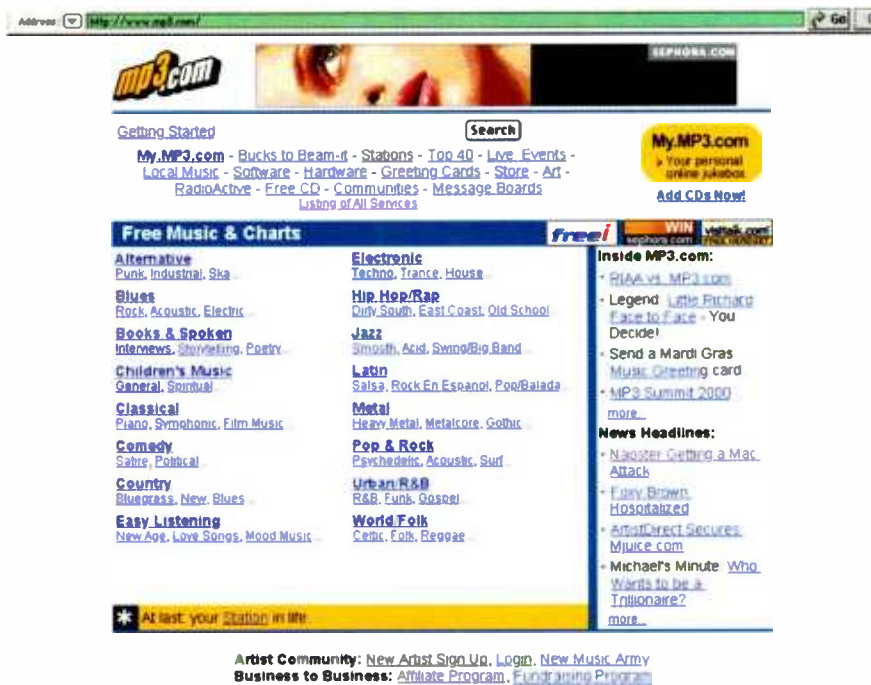
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Everyone is talking about the on-line music revolution. **Simon Trask** looks at the opposite ends of the emerging production and distribution chain

IT HAS BEEN A REFRAIN of the music industry ever since it discovered what college students were up to with MP3s that online music piracy, and even the very existence of "unsecure" online music, was a mortal threat to the industry's continued well-being. Yet figures released recently by the Record Industry Association of America give the lie to any such notion. The US market for recorded music last year was actually up 6.3% to \$14.6bn with shipments of full-length CDs increasing 10.8% to 939m while the value of those shipments increased 12.3% to \$12.8bn. Meanwhile, the value of CD maxi-single shipments almost doubled to \$65.3m. In fact, the industry trend over the past decade has been one of almost unbroken growth year on year, and 1999's total US market value is more than double the 1989 figure of \$6.5bn.

Online CD sales outlets have played their part in boosting sales. In e-commerce surveys, music CDs have consistently been in the top three of best-selling products. *CDNOW*, a leading online music sales outlet now closely aligned with Sony and Warner through its ongoing merger with Columbia House, outpaced all other e-commerce sites in visitor growth last December, according to web stats company Media Metrix. From November to December the number of visitors to the site grew by 11.9%, peaking at over one million visits a day for a couple of days.

Meanwhile, various research firm projections for the next few years see online music sales (CD and downloadable) contributing significantly to music sales growth. Jupiter Communications sees online music sales generating \$2.6bn in revenue by 2003, or 14% of the US market, while Music Tracking International estimates \$3.9bn by 2004, around 8% of an estimated global music market of \$47.5bn, while Music Business International looks furthest ahead, to 2005, and estimates a value of \$5.2bn for online music sales, with downloadable music contributing \$635m worth, out of an estimated total music market of \$46bn. In a report released last November, MBI also estimated that 3m music tracks were downloaded each day, albeit most of



them for free, which is where the record industry comes in with its copyright protection technologies.

However, free downloads do not equate to piracy. Today there are a massive number of acts offering (their own) tracks for free download. Leading online music site MP3.com reported the number of songs posted to the site increased from 273,000 last December to 307,000 in January, while the number of song plays from the site rose 2m from December to reach 20.4m in January. Total page views during January amounted to 125m. The company reported a staggering revenue growth of almost 1900% for 1999. But only a small part of its revenue comes from selling music by those acts; the majority is from online advertising and a growing number of other ventures. Artists who put their music up on the site for free streaming and download can also sell their tracks through MP3.com in the form of CDs which contain tracks in MP3 and CD audio formats. However, in the whole of last year it only sold 141,700 CDs, and the monthly number sold actually decreased from December to January of this year (25,800 down to 25,600). Meanwhile, the number of songs posted to the site increased from 273,700 in December to 307,000 in January.

A cynic might say that MP3.com has done very well off the backs of musicians who make little or no money from uploading the fruits of their creativity to the company's web site. There again, no-one has to pay to put their music up

on the site, nor does the company tie up artists in exclusive contracts or deprive them of revenue from their tracks. The choice is with artists to make selected tracks freely available online, the lure is the potential of building a fan base and making money either independently or by using the showcase and fan base as a springboard into a recording deal. Meanwhile, MP3.com uses its music base as a springboard into earning revenue from other means such as the lure of free music and the excitement of discovering new artists attracts a massive website audience that enables the company to make money by selling advertising space on line.

And where MP3.com pioneered, a growing number of websites are following. Notably the Internet is giving rise to a whole new way of doing A&R that lowers the entry barriers and removes the traditional filters. Now anyone can post tracks to a site such as *garageband.com* and have them judged not behind closed doors by a small clique of record company A&R execs, but in the open by the many music fans and fellow musicians who visit the web site. *garageband.com* was cofounded by producer and Talking Head Jerry Harrison and has an advisory board chaired by George Martin no less, with Brian Eno, Steve Lillywhite and George Massenburg among the board members. Its stated goal is to identify, cultivate and sign the best of the acts showcasing themselves on the site. To this end, it has already awarded two recording contracts, each worth >

On-line audio

< \$250,000. The online A&R-showcase model has also attracted the biggest of the big, with Universal Music Group, the largest of the majors, setting up its own A&R site, with the unlikely name of Jimmy and Doug's Farmclub. However, artists should beware. Recently, New-York-based pop act the Rosenbergs rejected an invitation to perform on the related FarmClub.com TV show when they discovered that a condition of appearing was signing a contract giving Universal a 60-day exclusive signing option. In other words, the band wouldn't have been able to talk to any other interested label for two months. Old habits die hard, it seems—though reportedly the label subsequently cut the option period to 30 days before

of onerous contracts. Or maybe the majors will surf in with their cheque-books, their secure music delivery systems and their tie-ins with major on-line retail outlets and establish a dominant presence on-line as well as off. According to recent research from Jupiter Communications, more and more online attention is going to fewer and fewer sites, and the top three portal sites—AOL, Yahoo! and MSN—have all opened a sizable gap between themselves and their competitors. To quote David Card, director of Jupiter's Content and Programming services: 'Even in the limitless arena of the Internet, consumers spend most of the time on 20 or fewer sites.' The company recommends that 'mid-tier' sites should

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- Best Lyrics: *First Step* by Electrobliss
- Best Dance Track: *Love Junkie* by Sunshine
- Best Female Vocals
- Best Beats
- Moddiest Track

dropping it altogether—a sign, perhaps, that even the most powerful of record companies don't have the bargaining strength that they once did.

Quite where these developments are leading is unclear. As with so much where the Internet is concerned, the fast-changing online music world is itself a work in progress—an open-ended improvisation, perhaps. Maybe sites like MP3.com, garageband.com and peoplesound.com will open up the range of music that people are exposed to, and by putting A&R duties in the hands of music fans and musicians will enable a broader spectrum of music to float to the top and get signed. Maybe the Internet will level the distribution playing field and enable independent labels to have a world-wide presence on a par with that of the majors without having to make major-league investments. Maybe it will allow a thousand self-sufficient artists to bloom, independent of label intermediaries and free

concentrate on delivering focused content while joining with other such sites in what it calls 'invisible networks' in order to deliver a critical mass audience to advertisers and commerce partners.

Meanwhile, the other end of the music production and distribution chain is far from untouched by online developments. Back in November 1997 *Studio Sound* wrote about the, then, fledgling Res Rocket Surfer (www.prostudio.com/studiosound_nov97/internet.html) and speculated about the possibilities that its virtual 'music studio' technology could open up for online music production, and indeed producers. RRS, now with significant venture capital behind it and the inevitable name change to the more 'respectable' Rocket Network, is finally approaching the realisation of its vision with the introduction of online audio collaboration functionality alongside the original MIDI. Neatly dovetailing with the growth of desktop computing power >

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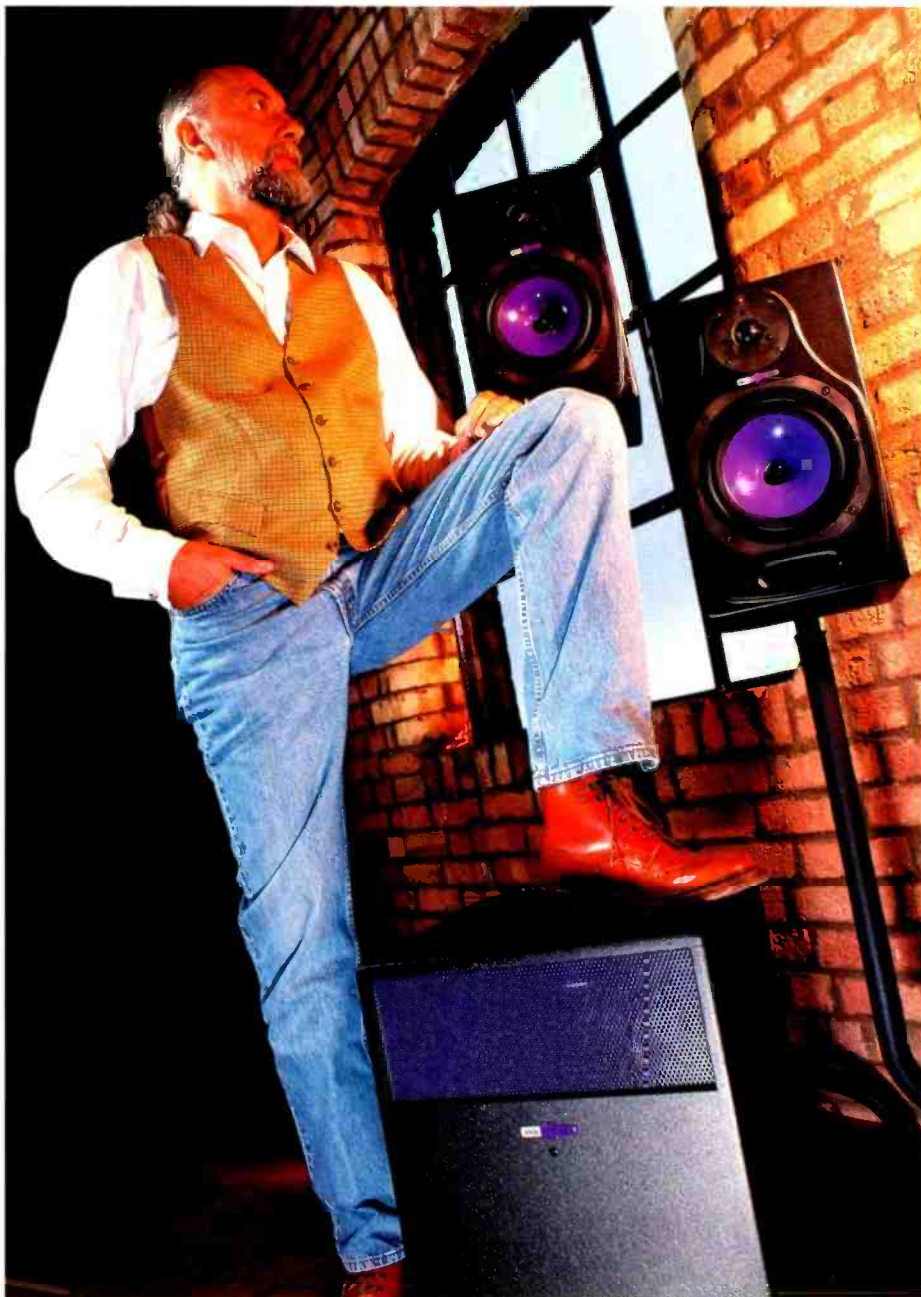
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Above (left to right): HHB Circle 5 midfield monitor (active and passive versions available), HHB Circle 1 powered sub-woofer, HHB Circle 3 nearfield monitor (active and passive versions available).

Left: Mick Fleetwood with HHB Circle 5 active midfield monitors and Circle 1 powered sub-woofer.

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FIRST WE LISTEN

< and the associated rise of the computer-based virtual music studio, Rocket Network has been working with companies such as Steinberg and Emagic to integrate its technology into the likes of Cubase VST and Logic Audio. These programs are now acquiring Rocket Power functionality which gives users the ability to log onto public and private online virtual music studios, or Internet Recordings Studios, to collaborate on music projects with fellow users anywhere in the world, working within the familiar program environment and communicating via online chat windows. Collaboration is cumulative rather than live, technically speaking based around a client-server computing model, but with multiple clients working together via a server that provides the virtual studio model. Each virtual studio defines who is working—and who is able to work—together, and handles the coordination of content file transfers over the Internet between participants in the virtual recording session. Just as with the original MIDI-only collaborations, only now with the addition of audio parts, when you're happy with a part you hit 'send' and it's distributed to the multitrack recording software being used by other session participants. They can then add their parts and send them over the network to your software, which will integrate them into your multitrack environment at the appropriate location. Various audio compression codecs will be available, some for additional purchase, to facilitate transfer of audio over the Internet. Depending on length of audio tracks and the Internet bandwidth that participants have access to, varying degrees of compression can be set. Anyone who has used MP3 encoding software will be familiar with the variety of options available. As session

The screenshot shows the cubase.net website interface. At the top, there are navigation links for 'news | transmissions | studios | downloads'. Below that, a 'today's highlights@cubase.net' section features several articles:

- the cubase.network is live!**: An announcement that the internet-enabled Cubase with Rocket Power is now available for free download, allowing users to collaborate with other Cubase users worldwide.
- Gear Watch: TL Audio EQ-1 Valve EQ Plugin**: A review by Rodney Orpheus of the latest VST plugin.
- Tips & Tricks: Installing Cubase on New Macs**: Advice for users having problems installing on G3 or G4 Macs.
- cubase.tv : The NAMM 2000 Wrap-Up**: A video report from the NAMM 2000 tradeshow.

On the left side, there is a 'News Index' with a list of recent news items dated from March 03, 2000, back to February 22, 2000.

members will all have their own full-bandwidth original audio recordings, original tracks can be collated when recording is finished. Session members can post their own mixes to a studio webpage at any time, say as an MP3 file; other members can then log on to the page and listen to the track, whether it's a work in progress or a final mix.

Rocket Network's business model, apart from licensing the core software functionality to companies to integrate into their software, is to lease studio 'clusters' to a wide range of audio-related companies, who may want to use them for in-house work or to lease out studios in turn to end-users. Steinberg, for instance, has recently opened cubase.net as an online location for Cubase users to get together online and collaborate using the new free add-on Rocket Power functionality available for Cubase VST, VST Score and VST/24 version 3.7 (PC) or 4.1 (Mac). The company is making Public Studios available free of charge, but users can also lease Private Studios starting at \$99 per

annum. Private Studio owners can store their work securely online and control access and permissions for each session. Meanwhile, Emagic is introducing a cut-down Rocket Powered version of its software, Logic Rocket, to be followed by Rocket functionality for the full Logic Audio range. Hosted online music studios open up a new area that artists need to be aware of, and I would caution people to read the Terms and Conditions for a setup like cubase.net before signing up.

If the likes of Cubase VST and Logic Audio don't quite grab your attention, perhaps Euphonix and Digidesign will. Euphonix has signed a definitive software licensing agreement with Rocket Network and plans to develop future software releases for the R-1 multitrack recorder and System 5 digital console that will feature Rocket functionality. Euphonix Founder and Chief Product Officer Scott Silfvast explains the company's thinking: 'Rocket Network's technology provides a new opportunity for our high-end customers to expand >

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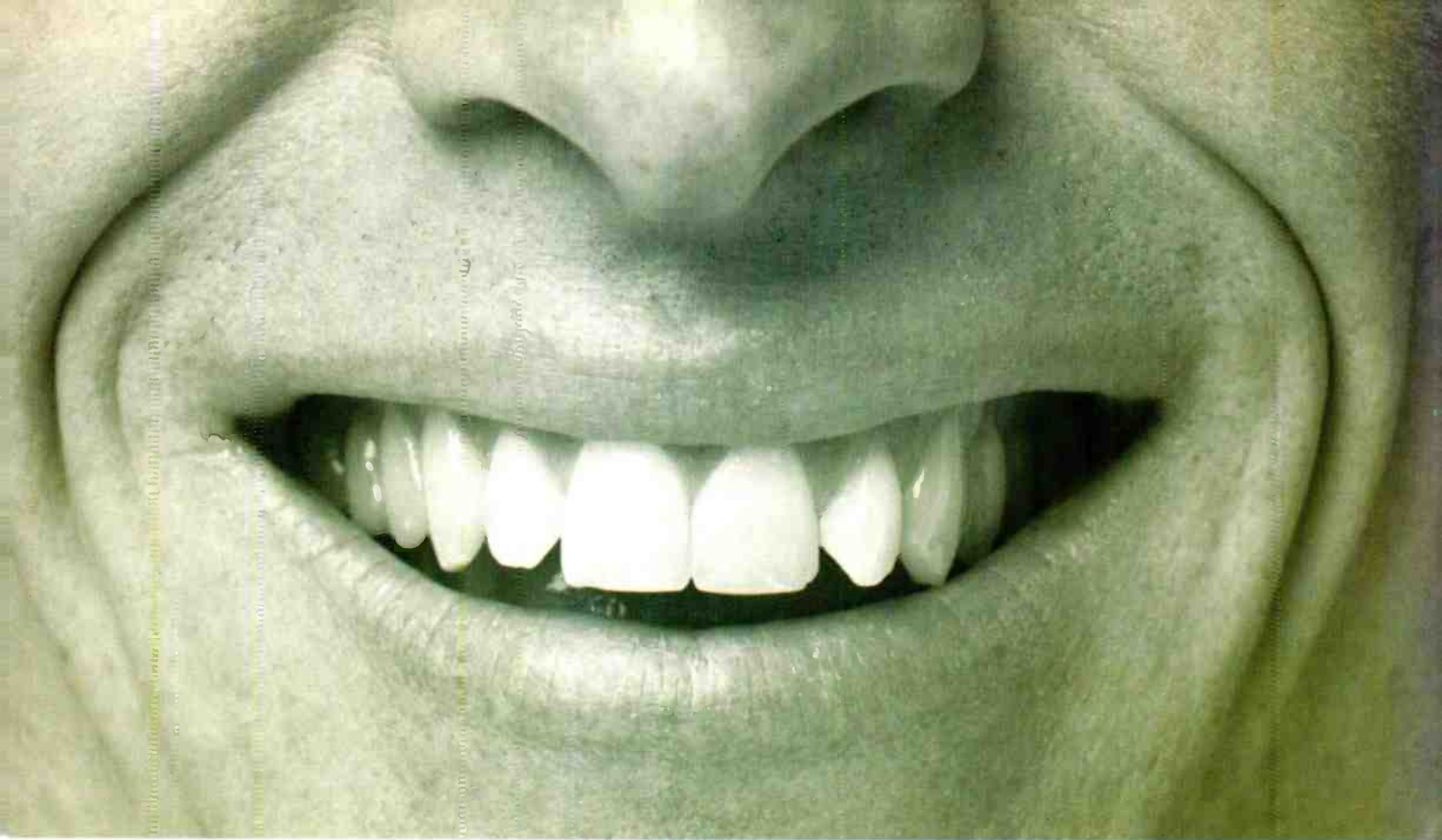
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The advertisement features a large black mouse with a white cord pointing towards the text. To the right is a CD-ROM case titled 'The HHB Catalogue Online' with a colorful, abstract cover design.



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< their services beyond the walls of their studios. Euphonix-equipped studios will soon be connected to the Internet for a variety of services including online collaboration with studios around the world via Rocket's Internet Recording Studios.' Digidesign has gone even further

virtual synth, fully integrated into virtual multitrack recording and mixing environments, enabled by the ever-growing power of desktop computers, is another aid to on-line virtual collaboration.

Typical Internet activities—web browsing, file downloading and email, are down-



in its association with Rocket Network. In a joint announcement at NAMM, the two companies said that they planned to establish a technology and strategic partnership, with Digidesign providing a significant equity stake in Rocket Network and taking up a seat on Rocket's board of directors. Digidesign's Internet studios would be based on an enhanced version of Rocket's technology.

Digi believes that the Internet will greatly expand collaboration between audio pros in completely new and exciting ways,' commented Digidesign president Dave Froker at the time. 'Our strategic investment in Rocket ensures that our customers will have access to the world's best tools and technology for high quality collaboration with other Pro Tools users—anywhere, anytime.'

Digidesign, of course, has acknowledged the significance of the MIDI + Audio concept by integrating MIDI functionality into Pro Tools, and while the company pioneered the audio effect plug-ins concept it is now following in Steinberg's footsteps by adding virtual synth plug-in functionality through its DirectConnect architecture. The continued rise of the

load-heavy. However, it's a characteristic of the online collaborative model that Rocket Network are facilitating that uploads and downloads will be more evenly balanced. Yet with dialup and broadband access technologies the upload rate is typically much less than the download rate. It's also worth bearing in mind that, while Rocket Network opens up the possibility of global collaborations, different parts of the world are at widely differing stages of Internet access (witness the rapid growth of ADSL and cable modem broadband net access in the States while in the UK BT has announced yet again a delay in the roll-out of ADSL). There are also other issues to do with changing models of ISP access and funding and consolidation of ISPs that are going to have an impact on the way that people will be able to use the Internet, and also on the range of content and sites that most people will be able to access. Which is getting back to the significance of un-metered and broadband net access in stimulating growth of the online music market, and the potential impact of broadband wireless net access. But enough for now. ■



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Give me Sound

An essential part of the DAW revolution is the ability to optimise the use of sound effect libraries.

Rob James explores the advantages and opportunities

THE DAW IS NOW ubiquitous. In a very few years it has almost completely supplanted earlier technologies especially in the field of sound for picture. As a result, many production processes have been changed or adapted to fit in with the brave new world. In some cases this has not been an easy or happy transformation, in others the benefits have been tangible and genuinely improved the end product as well as reducing costs. The field of sound effects is a good example. Before delving too deeply into this rich vein I should declare a couple of interests - in a previous incarnation I was responsible for founding a sound effects library for the film department of a major British broadcaster and later specified and operated a networked sound effects system using PCs, CD juke-boxes and routers. I can also state that apart from my salary the fee for this article is the first time I've ever made a red cent out of sound effects.

In many areas of human endeavour there are pivotal points in development. These tend to be perceived as exciting

and sexy while the steady progress in other areas goes almost unnoticed. So it is with sound for picture. Workstations have transformed the way we work and unsurprisingly, attract a huge amount of attention from manufacturers, the press and the specifiers and users. However other equally vital areas have also changed, sometimes even for the better. From the early beginnings of sound film, not to mention radio drama and the theatre, sound effects have played a vital role. Viewed from the beginning of the new Millennium there has been a great deal of progress. When I began working in this industry 30-odd years ago around half the sound effects library was still stored on 78rpm bakelite discs. Some of these were so old they were single sided and played from the centre outwards. The remainder were mono 7-inch 33rpm vinyl discs, supplemented by 1/4-inch tape and NAB tape cartridges. If all this seems a little quaint it is worth remembering many of the effects in commercial and film studio libraries were still stored on optical tracks, often in the form of 'loops'.

Begging for a sound effect from the FX library

All these media have several disadvantages in common. For a start they all deteriorate to a greater or lesser degree over time and, perhaps more importantly, with repeated use. All are comparatively bulky to store and tape and film have the further problem of being a linear access medium. In order to allow reasonably fast location only a few effects are stored per reel. Small wonder then, the advent of the CD was embraced with open arms by almost all consumers of effects. Certainly the ultimate quality of a top class analogue recording may arguably be superior to 16 bit 44.1kHz digital but to anyone who has struggled with the inconvenience of linear tape and suffered the surface noise, clicks and pops of analogue discs there is no contest.

The DAW is the ideal tool for compiling, editing and preparing CDs whether PQ masters for mass duplication or short runs of CD-Rs at low cost. Workstations also allow otherwise unusable material to be sympathetically 'rescued'. The other side of this coin is the excessive use of de-noising and other clean-up techniques which can mangle recordings beyond redemption.

CD and CD-R are still the lingua franca of the effects world. Library storage on hard disk or magneto-optical disc is already employed in some areas, but a moment's thought will reveal the snag. Even with the continually declining cost per megabyte this type of storage is still prohibitively high for really large libraries. If a library consists of several hundred if not thousand CDs (not uncommon) simple arithmetic tells us this equates to terabytes of storage.

I reckon there is a little of the magic in everyone involved with sound, a reluctance to throw anything out that could possibly be useful. Thanks to this tendency the total number of recorded effects is staggeringly large. Many of these libraries were and remain 'private', amassed by individual recordists, editors and mixers. Larger organisations, broadcasters, film studios and theatres maintained and continue to maintain huge libraries of effects. Many thousands of effects are available commercially, either for outright purchase individually or compiled into collections. The cost of these usually includes various rights to use the sounds. Sound effects are also available on a similar basis to mood music libraries with royalties payable 'per use'. In the old film effects libraries a common commercial model involved separate charges for auditioning, transfer and use. This could easily result in very big bills. On one notable occasion from my own experience we paid over UK£400 for a single gunshot in the final product. More recently a similar commercial model has appeared on the Internet.

So far I have avoided addressing another major issue—that of cataloguing.

A single major production may use many thousands of individual effects. Some of these will be recorded specifically for the production including the 'manually' produced effects which come under the umbrella heading of Foleys. But by far the majority of productions will use at least some effects from libraries. A big film, radio or TV series may have many people working on aspects of the soundtrack. It then becomes essential to keep track of what effects have been used in order to maintain consistency and also to reconstruct tracks for the various versions of the final product. This used to be achieved using manual techniques, books and card indexes. With networked DAWs it is possible to centralise the storage of all this material and with carefully thought out management systems and procedures to control it.

Books have long been categorised according to a variety of internationally agreed, formal systems. One of the best known is Dewey decimal. Unfortunately there is no analogous universally accepted standard for cataloguing sound effects. There have been several proposals and a vast amount of work has been done, but to date there is no agreement.

As a result there are some very strange cataloguing systems in use. I remember one library where, for example, explosions and gunfire were to be found under Q? Apparently the logic behind this was Q stood for Quarrels.

Part of the problem lies in the necessity of ascribing verbal descriptions to abstract sounds. Thus we have subtly differing groups of sounds such as 'scraffle', 'scrabble' and 'scruffle'. Categorising and cross referencing effects is extremely time-consuming and tedious work. I know, I've tried it.

In printed catalogues it is difficult or impossible to thoroughly cross reference without producing a book the size of a telephone directory and it is extremely annoying when trying to find say, marching feet, to look under 'foot-steps, marching' only to be presented with 'see under Armies'.

This is where computers came to the rescue. The first attempts were rather slow and creaky, home brewed database offerings which nonetheless took a lot of work and, thanks to the search capabilities, were a huge improvement over the paper equivalents.

Modern database search engines are capable of rapidly searching through complete descriptions rather than simple titles and employing 'fuzzy logic' techniques there is a much better chance of finding something suitable, always presuming somebody has actually entered a reasonable description in the first place. GIGO applies as usual (Garbage In, Garbage Out).

Geffen was an early commercial entrant to the field with its M&E library

software. The company is still operating in this field with much improved and updated products.

The use of computers for cataloguing was swiftly followed by harnessing the software to the emerging CD juke-boxes which provided much quicker access to the discs than could be achieved manually. Software such as WinFX and M&E library enabled several users to share a library of discs on one or more juke-boxes. Some software can also control audio routers to deliver the effects to the correct user and also to prioritise access. The jukebox approach has the advantage of not infringing most copyright restrictions. This is one of the earliest examples of a practical sound-for-picture network solution using computers.

Juke-boxes represented a huge improvement over the conventional 'on the shelf' effects library. Leaving aside other considerations, it drastically cut down on the number of CDs going 'walkabout'. A not inconsiderable benefit given the cost of replacing individual discs.

There was another key advantage, the clients loved it.

As CD became the *de-facto* standard for storing and distributing effects many people began to invest in transferring their existing 'private' libraries to the medium. A number of small companies such as The Music Suite offer a very cost-effective complete service; editing, copying and cataloguing if the effort cannot be found in house.

Purists may say this wholesale transfer to CD was unwise if not actually vandalism. I appreciate the argument that locking analogue recordings into 16-bit 44.1kHz on CD may well not realise their full potential. However, in many cases due to the cost of storage space and the deterioration of analogue tapes it was the only viable option. As it is, much potentially valuable material has been junked, but a lot has been preserved. Our successors will have to judge whether we made the right selections.

What has all this to do with DAWs? Well apart from their applications in producing CDs, even some of the earlier examples of the breed made valiant attempts to address sound effects requirements. The New England Digital Synclavier was, and in some places still is, particularly prized for its effects capabilities. You could purchase effects libraries on physically massive optical WORM (Write Once Read Many) discs. These had huge capacity for their time and a price to match. The library software was fairly rudimentary by today's standards, but the Synclavier had another trick up its sleeve. Some of the most impressive demos of the Synclavier I ever witnessed (by Max Hoskins) used multisamples of effects tied to the keyboard. Particularly clever was the ability to 'record' a sequence of foot-steps or whatever at speeds much >

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< slower than play. Much easier and quicker to get them in sync with the picture than doing it roughly and then laboriously nudging them individually after recording.

DAR (Digital Audio Research) was another early entrant. Mike Parker's company has championed the use of magneto-optical discs for many years and was one of the first to attempt to exploit the benefits of network access.

Many manufacturers have provided useful tools for the manipulation of effects. Time-stretch and pitch shifting together with sophisticated looping, fill and multiple replace options spring to mind. Then, of course, there are the many 'creative' effects tools and plugins for systems which support them. For instance Synchro Arts, best known for Jeff Bloom's VocAlign, also have an excellent tool that allows a small section of atmosphere to be resynthesised rather than looped. But despite all the added features very few DAW manufacturers have made any serious attempt to handle the basic management problems posed by really large effects libraries.

This neatly brings us to the present state of play. Storage costs have dropped to the point where it is becoming viable to mount libraries of considerable size on fast access media. Networking bandwidth is increasing and costs are falling. No DAW manufacturer serious about sound for picture can afford to ignore the possibilities this opens up. It may well be many years before all storage is centralised, but meanwhile it makes considerable sense to make sound effects accessible 'on-line'.

There are many questions remaining over the management issues, but products are already appearing. Akai has basic library capabilities for multiple disks built into the operating system with the DD1500 and its relatives. AMS Neve's new AudioFile SC and Sarnet networking system open up extensive possibilities for library management. DAR has been building on its early start with CD drives accessible across networks, improved search facilities and unique IDs for each recording. Fairlight have introduced Audiobase which together with its Medialink network offers strong sound effects capabilities.

Other manufacturers such as SADiE, Soundscape and Digidesign have so far preferred to rely on the in-built hierarchical filing systems of their host computers or third-party applications to handle large effects libraries.

There is a serious practical problem with the use of commercial libraries. Most of the key players include rights to use individual effects synchronised to picture for production purposes without further royalty payments. However, perfectly reasonably, they also prohibit wholesale copying of effects CDs to any other medium. Some suppliers have

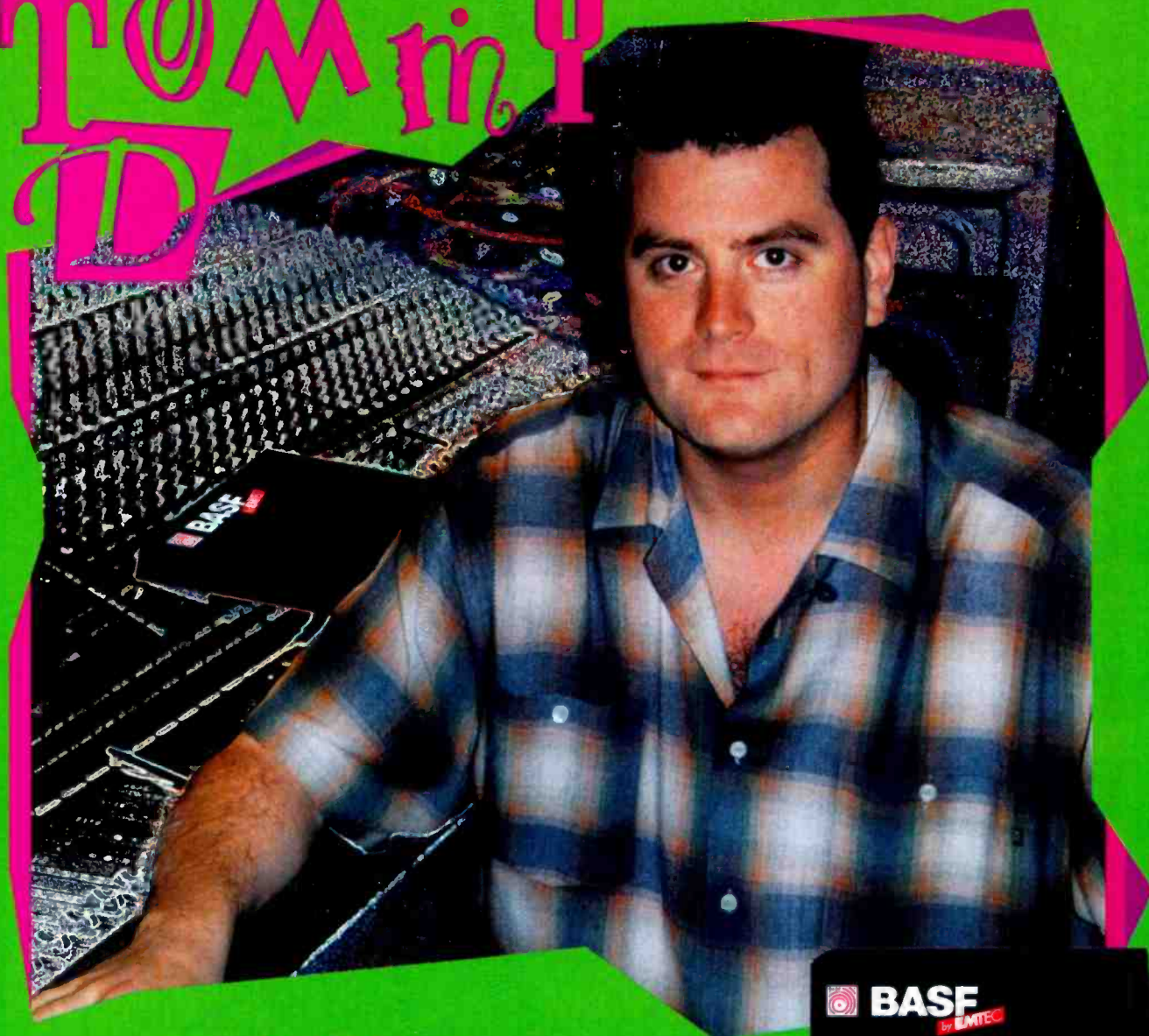
caught up with current developments and come up with suitable licensing arrangements, but many have not. Any power user of effects will own many libraries from different publishers. If such a user wishes to transfer these effects to on-line storage they may well have to negotiate an alteration of the copyright conditions with each library provider. It's a daunting and potentially expensive task. There is an alternative: Companies such as MSoft who supply complete network effects systems have made the necessary arrangements and can offer effects libraries with appropriate rights and cataloguing information together with a bespoke service for clients own libraries.

The next logical step involves the Internet. Some enterprising library owners have already made effects available for download, but, for several reasons, this has not really made any big inroads in the market. The main limiting factors to date have been the restricted bandwidth available, the high cost of connection, the relatively high cost 'per effect' and the chicken and egg problem—if library owners do not believe they will get a return they won't invest in on-line services and if they don't there will not be enough material available to make the net the first choice when shopping for effects.

As 'big pipe' bandwidth becomes almost universally available over the next couple of years and the telecoms providers stop being so greedy, I expect to see a burgeoning of online effects libraries. This is one area where the net has real potential to revolutionise the way we work. Permanently on, broadband connection will enable effects to be auditioned and selections downloaded from libraries all over the world at minimal cost. Effects which were not considered worth the investment of production in CD form should become generally available. This would represent a genuine increase in 'choice' for a change. People are sitting on huge libraries of valuable material that could be exploited in this way. The only thing that will slow this process down is greed on the part of copyright owners. If they don't invest in putting their libraries online or charge too much for individual effects there will be a strong temptation for users to continue with 'private' libraries. This would be a real shame.

All this has a number of implications for DAW manufacturers. The real world emphasis is shifting away from adding more and more features, many of which are seen as superfluous. The time is rapidly approaching where simple stand-alone operational functionality will not suffice. The winners in tomorrow's market will be the ones who can provide carefully targeted operational feature sets together with bullet-proof networking and integration of asset and project management tools. ■

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Recording in the Field

With so many media offering a confusing range of recording options, **Neil Hillman** takes a timely tour of location recorders

THINGS HAVE MOVED ON since the earliest accounts of location working: ...at pagan shrines they vowed offerings to idols, swore oaths that the killer of souls might come to their aid and save the people. That was their way, their heathenish hope; deep in their hearts they remembered hell. But, hey, who hasn't worked on such shoots, or harboured such thoughts towards a particularly draconian production manager?

While the above is a recollection of Beowulf, probably the greatest of all the legendary Anglo-Saxon warrior-recorderists; and while it's not all location caterers and tea urns, our channels to commemoration are rather more forgiving than those of the ancients; with a plethora of options and media for today's discerning recordist—more solid-state, then, than solid slate.

Given the variety of recording media—hard disk, DAT, PCM-CIA card, MiniDisc and open-reel tape—it makes sense to divide location recorders into corresponding categories. Beginning with hard disk, then, we find Zaxcom's Deva-II. As if hewn from stone itself, the Deva-II has created a considerable reputation for being a hard-disk location recorder that is completely robust to the rocky and rolling of location life. This is thanks largely to a RAM store of 24s for recording and 8s for replay, and the ability to read or write while experiencing up to 125Gs of force. Collating four tracks of uncompressed 20-bit audio onto a removable, 4-hour 2½-inch IBM PC hard disk, the Deva-II also offers an inbuilt 4-channel mixer with assignable onboard equalisation and effects, and the ability to interface with either a sealed DVD Ram drive or a Jaz drive. These slave recordings can be made on location simultaneously as the Deva's internal drive records, in an attempt to

get around the problem of still high recording-media costs. With selectable sample rates of 48kHz, 48.048kHz or 47.952kHz and supporting all time-code rates it is technically impressive, and would look at home in the high-tech intensive-care wards of *ER* or *Casualty*, should you ever get the gig.

In the DAT world, Sonosax' Stelladat-II offers 16-bit, 4-track recording at either 44.1kHz or 48kHz, or 2-track 96kHz and a more lowly power consumption than its rivals. It also has a meticulous build-quality with a price to match its high pedigree. User-configurable setup software offers almost total access to the machine's variables via menus and an onboard joystick. M+S monitoring and phantom power is available, and along with the four inputs and outputs, the time-code input and output, and two AES in and out pairs are all on XLR connectors. BNC connectors route SYNC in-out/wordclock, two pairs of optical outputs are available and a 5-pin Hirose connector accepts Aaton time code. Everything you could want in a DAT recorder is here—including a claim of its time-code being ten times more stable than its rivals: an oven baked crystal version can increase this performance a further ten-fold. There's nothing half-baked about this then.

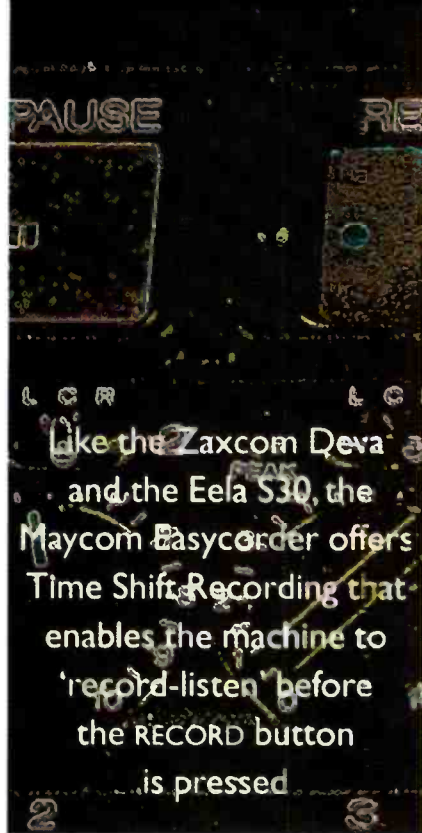
Since January of this year, HHB's PDR-1000TC plus DAT recorder became available only in its bulkier time-code version; offering +48V phantom power, a -30dB input pad, high-pass filters, a master sync module and an M+S headphone matrix. One of the claims from HHB about its machine is that none of these recorders have ever been back for head-drum replacement before at least 3,000 metered hours have elapsed—which tells you something about the ruggedness of the 4-head, 4-motor transport. The machine has balanced

XLR line-mic preamp inputs, switchable AES-EBU or SPDIF digital in and out on XLR or RCA connectors and phono sockets for the stereo line-out signals.

Two unique features of the Fostex PD-4 v2 set it apart from other location DAT recorders—the anti-jam transport mechanism and the digital-video-friendly sampling frequency option of 48.048kHz. Otherwise a comprehensive range of features are present including full time-code capability. The Fostex has three inputs and two outputs routed via a built-in mic-line mixer with 3-position pan-pots and master output control, -15dB or -30dB attenuation pads per channel, +48V phantom power and continuously variable filtering. The user settings to configure the machine for recordist preferences are simple to execute and software upgradable, while the 4-motor transport ensures reliability. The 4-head drum provides off-tape confidence monitoring.

Built to Sony's usual high standard, with nice attention to detail like providing a battery holder for 12 'AA' cells for emergency powering, the TCD-D10 is a non-time code, 2-head recorder, but with a larger drum assembly than domestic recorders, safely secured behind a double cover. The machine offers a switchable limiter, balanced mic-line inputs on XLR connectors, line outputs on RCA phono plugs and AES-EBU digital in-out signals on a multiway connector. Internal power is via Sony 6V domestic camcorder batteries, which can give a recording time of two full hours. Never the most economical of devices, DAT-toting recordists may be recognised by their laboured breathing and walking, due to being weighted like a deep-sea diver with the necessary extra recorder batteries.

Tascam's DA-P1 occupies a comfortable little niche for itself at the bud- >



get end of the professional DAT market, and in real terms is a steal. It sits alongside the Sony TCD-D10 in terms of quality, which sells at more than three times the price of the Tascam. The DA-P1 is another non-time code, 2-head machine and its balanced mic-line inputs are on XLR connectors with switchable +48V phantom power. Its line out and digital in-out SPDIF signals appear on what would appear to be the popular standard, RCA phono sockets. A robust, switchable limiter keeps the lid on heavy mods and the constantly updating headroom margin, shown on the backlit LCD in dBs, inspires some confidence in the absence of off-tape monitoring. Sampling rates are the normal 44.1kHz, 48kHz and 32kHz. The DA-P1 lacks only the monitor speaker fitted to its closest rival, the Sony TCD-D10 and with the large wad of money saved you could go out and stock up on recorder batteries.

Disappointingly—given the possibil-

ities that PCM-CIA 2-channel progressive-technology recorders could offer the film and television sector—they are not really aimed at the location recordist, but at news-gathering radio journalists. In general they all tend to use removable PCM-CIA PC cards which decrease the transfer time to a workstation, and record either linear, compressed MPEG, or combinations of both, and byte-for-byte give the highest storage capacity at the lowest price. Simple cut-and-splice, nondestructive editors are also incorporated to allow the preparation of reports either to be played in live via onboard ISDN codecs or modem connectors, or given as a finished-edited 'WAV' file on flashdisk to the studio.

The Nagra Ares-C is so unquestionably a Nagra-designed device; you would recognise it immediately in a very dark room. The Ares-C is a comprehensive MPEG recorder with two balanced XLR outputs and two line-microphone inputs offering +12V 'T', +12V and +48V phantom power, gangable input pots, standard Nagra filters (LFA, Speech and Flat) and a straightforward editor with a choice between an optional in-built ISDN codec or SMPTE-EBU time code. Weighing-in at around 6½ pounds, and with no moving parts, the Ares-C is impervious to the inevitable bumps and bangs of location life.

The Mandozzi DART carries more than a passing resemblance to the Nagra Ares-C with its two balanced XLR line-mic inputs with phantom power, two XLR line outputs and an XLR AES digital output, right down to the large single rotary function key enabling the machine to record or playback its linear audio. Where it differs noticeably from the Nagra is the consummate ease with which the machine can be configured to alter recording parameters such as mono or stereo, bandwidth and titling individual recorded tracks.

Worthily selected by the British Design Council as a Millennium

Product, Sonifex' Courier shares the beauty of Han Solo's 'Millennium Falcon'. But its real beauty is subcutaneous; this is a serious tool, recording linear or MPEG compressed audio to type-III hard-disk or type-II flashdisk, via two balanced XLR line-mic inputs offering phantom power and LF filters, plus 'off-disk' confidence monitoring with a reassuring 'record delay', the time of which is dependant on the level of compression selected.

The You Com ReporterMate has two balanced line-mic inputs with phantom power, line out and AES-EBU digital in-out—all on XLR connectors—to access recording and playback of either MPEG or linear audio. The mixer offers gain compression, a limiter and a voice-over mixing function. With a dual card-slot, the PCMCIA cards may be 'hot-swapped' during recording.

The design of the Eela S30 Reportable betrays the extensive experience Eela have in the remote communications field, with the Reportable looking very similar to the telephone-mixer reporting products. With balanced XLR connectors for line-mic in, and line out, but no digital output, the S30 records MPEG in a 'WAV' format at a sample rate of 48kHz.

Like the Zaxcom Deva and the Eela S30, the Maycom Easycorder offers Time Shift Recording that enables the machine to 'record-listen' before the RECORD button is pressed by means of a RAM store that, depending on the settings chosen, can store up to the previous one minute. Using either MPEG compression or linear 'WAV' recording formats, the Easycorder offers two XLR balanced line-mic, inputs with +12V phantom power and two XLR analogue outputs. A 'joint-stereo' feature allows for the sharing of data between channels when there is no difference between them, and storage is possible either on internal memory or by the inclusion of removable PC cards.

At present, the Marantz PMD650 has the location MiniDisc market to itself, >

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because music matters



The Nagra IV-S TC
was designed in 1971
and is still providing
sterling service
to those working to
1/4-inch open-reel tape

< all other 'professional' location Mini-Disc recorders being taken from the domestic market and respectfully clothed into beefed-up bags, brackets and braces a la ASC's MD-Report, housing the domestic Sony MZ-R30 or the Denon DMP-R70. The Marantz, however, has been excellently designed as a field acquisition tool, with balanced XLR line-mic inputs offering +48Volt phantom power, balanced digital output, limiter, built-in speaker and the ability to record through its line inputs from digital sources with sampling frequencies of 44.1kHz, 48kHz or 32kHz.

The Nagra IV-S TC was designed in 1971 and is still providing sterling service to those working to 1/4-inch open-reel tape. The addition in 1984 of centre-track time-code brought unparalleled sophistication to location recording on a 1/4-inch tape machine and it is difficult to over-estimate the revolutionary effect of this marvellous mach-

ine on the industry as a whole. It may be used with its own stereo-input microphone pre-amps—offering 'T'-power, Phantom power or dynamic settings—or with a current line-input via an input cable. The IV-S also offers a built-in limiter (one of the best that there is), an onboard loudspeaker, a reference generator for calibration and facility for connection to an external noise reduction system. It broke my heart when I sold mine due to productions requiring rushes to be delivered on DAT.

The Nagra-D—like the Zaxcom Deva or the Stelladat 2—offers 4-channel recording, but at the higher 24 bits on its two AES digital inputs; 18 or 20-bit sampling rates are available on the analogue inputs, and are recorded onto either 5-inch or 7-inch open-reel metal-oxide 1/4-inch tape. Sampling frequencies are comprehensive (32kHz, 44.1kHz, 48kHz, 64kHz, 88.2kHz and 96kHz) and for 4-channel recording a 5-inch spool can give two hours record-

ing capability; a 7-inch spool can give a useful four hours. Four analogue XLR mic-line inputs provide 'T'-power and +12V or +48V phantom power and the 4-head arrangement allows read-after-write, off-tape monitoring. Three additional longitudinal tracks of 'time-code', 'control' and 'cue' add to the already comprehensive list of features that also include tape directory management, fault diagnosis, external control and PC interface. Each successful debutante Nagra-D recordist is also awarded the rather more straightforward reward of their own private pilot's licence.

There is a wealth of choice for us today in how we leave our legacy to history through our respective recordings. Before Emmys or Oscars, Sony's or BAFTA's, Beowulf relied on the northern warrior's honour-code: 'Let whoever can, win glory before death. When a warrior is gone that will be his best and only bulwark.' An Oscar on top of the telly might be nice though. ■

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Criteria's Greatest Hit

After undergoing the biggest refurbishment of its 42 years, Miami's most famous studio is ready to take on the world.

Tim Goodyer finds sun, sand and sound

Criteria's signature 'big room': the SSL 9000-equipped Studio A

AS IF REDISCOVERING the value of their past, today's high-end studios are enjoying an unprecedented period of rejuvenation. Late last year the doors opened on Australia's Studios 301 following the massive investment and passionate involvement of entrepreneur Tom Misner. Now, across the Southern and Atlantic Oceans in Miami, Criteria Recording has received similar attention from Eddie Germano's Hit Factory operation.

'Even with the way the entertainment world is going to change in the next ten years, you're always going to need studios like this,' explains Troy Germano.

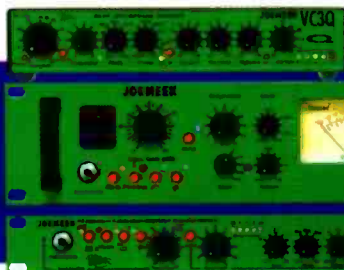
'You can record great things in your home but you will still need studios where the artist feels special and you get a special performance.'

Founded in 1958 by Mac Emmerman, the history books credit Criteria with a phenomenal catalogue of special performances and productions: James Brown's 'I Feel Good' and Aretha Franklin's 'Young Gifted and Black' among them. The complete list reads like the proverbial 'Who's Who' of popular music including Eric Clapton, Bob Seeger, Crosby Stills & Nash, Aerosmith, REM, and, of course, the Bee Gees. As we walk through the nearly complete

renovation, projects from Celine Dion and Julio Iglesias are up and running following an inaugural session for Gloria and Emilio Estefan involving a 60-piece orchestra.

Originally a one-room facility, Criteria is one of the oldest independent recording studios and Emmerman one of the pioneers of independent recording. The facility progressively expanded with the big tracking room being added in the early sixties and a complete wing going up in 1982 primarily to accommodate the regular presence of the Bee Gees. The fact that the studio struck up a mutually advantageous relationship >

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< with Atlantic Records and remained 'the only studio within 500 miles' made it a regional recording centre. 'Like a lot of people, they thought it would never end,' comments director of technical development, Roger Charlesworth.

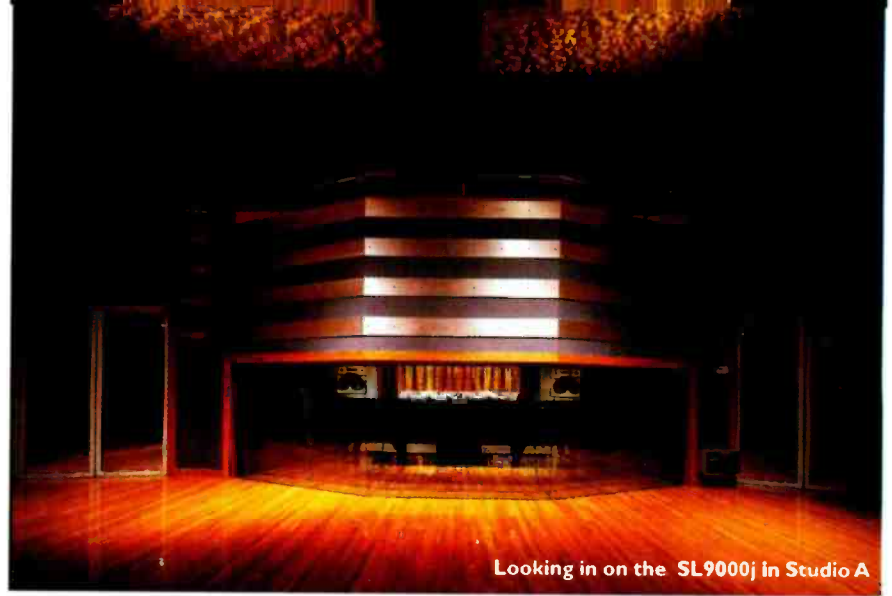
Criteria's fortunes waned with the eighties cooling of the record business, it became hard for Emmerman to maintain the earlier level of investment. Enter Joel Levy.

'He was looking to start a studio,' Germano recounts. 'Mac and he became partners until Joel eventually bought Mac out in the late eighties. Mac stayed involved for a long time and we've had conversations with him and he's still very interested. I think he's proud to see what he started having a new life.'

Eddie Germano's interest in Miami began around three years ago, born of a longer-standing conviction that Latin music was about to break and recognition of the city's geographical value. After a protracted search for suitable real estate proved fruitless, it was Germano's wife who suggested approaching Criteria as having all the necessary facilities and a great reputation to boot. It took just four months for the deal to come together.

'The conclusion we drew was that it was a diamond in the rough and it needed to be polished,' says Troy Germano. 'But the most interesting thing is that I can't think of many facilities where you would find such ceiling height and if you look at the history of studios there aren't that many that have multiple rooms and high ceilings. And that brings a lot both in terms of acoustics and atmosphere.'

'For the last four or five years my father has felt that Latin was going to be the next wave of music—and not as a fad,' he elaborates. 'We embraced hip hop in the late eighties and that's cer-



Looking in on the SL9000j in Studio A

tainly not going away. What sets the Hit Factory apart from other studios is the diversity of its clients and the reason for coming here was to embrace the Latin community. Whether we were going to buy Criteria or build from scratch in Miami, the reason for this was to be at the gateway to Latin America.'

'The recording industry is capital intensive and if you're not in a position to invest in both the present and the future of your field you fall behind and are summarily trampled,' veteran studio manager Trevor Fletcher observes. 'Rather than be the tramplee, it's preferable to be the trampler so they realised that we had a number of components in place—equipment, staff, clientele, real estate—and coupled with the desire to expand to the south of the United States and into the Hispanic market, it made sense to purchase Criteria. When we're done, there won't be anything like this place on the planet.'

For his money, Eddie Germano secured four operational studios, one mothballed room, a dedicated staff including Fletcher and chief maintenance engineer Stan Miller, and an eclectic collection of equipment. Of Criteria's

consoles, an API Legend and E-series SL4000 proved surplus to requirements, an 80-input G+ was expanded to handle 96 inputs, a 32-input Neve 8078 (used by 'everybody') was completely refurbished and orders were placed for two 96-channel SSI SL9000j analogue consoles, and 120-channel Sony Oxford and 208-channel Euphonix Series 5 digital consoles. The finished facility will offer six studios (with the addition of Studio F), a digital editing room and a mastering room.

'In order to do the work that Hit Factory anticipated it meant significant re-equipping to do any kind of session' states Troy Germano. 'All the rooms had to have 96-channel or more consoles, they had to support multiple multitrack machines and we bought a considerable amount of outboard processing.'

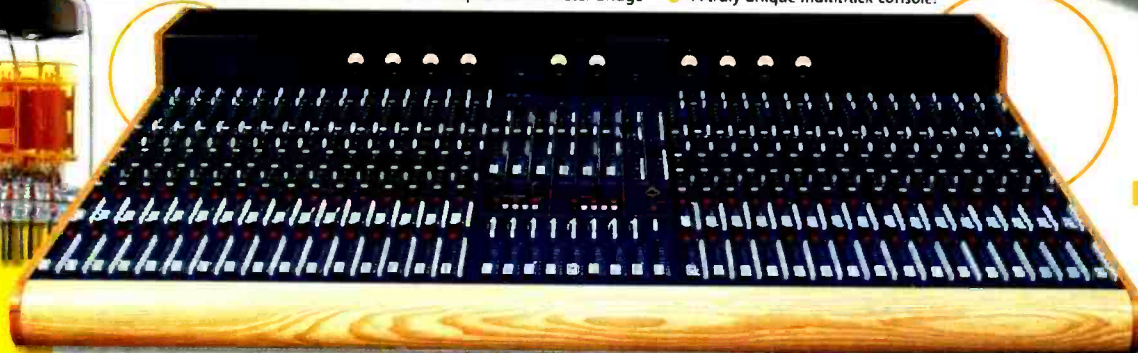
'But there was some great vintage gear here,' he continues, 'old tube microphones and outboard. There were Pultecs, LA2A, 1176s, stuff that we didn't have to go out and pay a fortune for in order to equip the rooms well. The microphone collection was incredible—C12s, C24s, U47s, U67s—what you would expect from a studio that's >

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< been around a long time.'

'As far as the desks go, you can't argue with keeping the vintage 8078,' comments Trevor Fletcher. 'And you have to applaud the Hit Factory for applying the financial resources to pull 175 feet of extraneous wire out of it and going through every pot to make it what it is.'

'The Neve was interesting,' Germano concurs. 'It was a really special 40-input 8078 that had been in the big tracking room, but we wanted that room to be really versatile and so it had to have an SL9000. The 8078 was a beautiful console that had been lovingly maintained by Fred Hill in Nashville who is one of a few people in the world who rebuilds 80-series Neves. I can't praise the job he did on that console highly enough.'

'He did two things: a complete reworking of the master facilities—a relay-controlled external switching and monitoring matrix—and he installed a balanced mix bus where a line level feed off of every module to a Eurocard rack where the mix resistors are located. Not only is the whole mix bus balanced but it's only about six inches long. Then he mounted the original Neve mix amp on a motherboard in the mix bus. So it sounds absolutely beautiful and stunningly quiet. We put a huge amount of money into it and installed it in Studio C where it will be used primarily for tracking.'

'With the exception of the 8078 tracking room, we felt that all the rooms should be able to do any kind of session,' Charlesworth continues, 'so we opted to keep the G+ as it's probably the world's most popular mixing console. For the new consoles in the two big recording rooms the 9000 was a fore-gone choice. It's a brilliant-sounding orchestral recording console and people rarely get the chance to hear how good it sounds. If you listen to live microphones against the console, it's incredibly quiet and flat from 5Hz to 150kHz or something ridiculous. For the three other mix-overdub rooms, we put the G+ in one and wanted to make the other two digital.'



The original Criteria studio. Now Studio D with Euphonix' System 5 console

The consoles were only one aspect of the technical refurbishment however.

'One of the things I felt for a long time was somewhat inadequate was the main monitoring,' comments Trevor Fletcher. 'That's been addressed in all the rooms and all the monitors are now essentially uniform. We had one room that didn't have soffited mains and then the mains came out and it had no mains at all—crazy stuff like that. We made do and made almost 400 platinum records, but we've made a quantum leap in both the acoustic environments and the monitoring that we're able to offer.'

Troy Germano picks up the story: 'We worked with George Augspurger on the monitors. They're all 2-way, dual 15-inch designs. One of the great things we were able to take advantage of was the 44-bit 96kHz BSS Omnidrive crossovers. It's an interesting convergence of DSP and convertor technology. Digital crossovers have been appealing for a few years but haven't really had the sonic performance you might want. It takes advantage of affordable horsepower and allows us to do some good stuff like playing very closely with the time-domain performance and storing different settings for different producers. It makes managing the subwoofers very easy. It's a simple and good-sounding speaker.'

'One of the things we wanted was large surround systems so in Studio F and Studio A we have soffited 5.1 systems. We recognise that producers are going to want to listen critically on close-fields, but there's a frustration to having to sit in one spot and we wanted them to be able to throw the mix up onto big speakers and have everyone in the room hear it. All of the rooms are equipped for 5.1. A lot of studio owners are taking a wait-and-see attitude, but in actual fact lots of product gets put out in 5.1 every day and all your clients sooner or later will have 5.1 projects to do so its one of the services you have to offer.'

But before the consoles were installed the rooms themselves had to be brought up to date. 'We've essentially built new studios and control rooms in the spaces where the old studios and control rooms existed,' Troy Germano reveals. 'In some cases we've gone down to the isolation shells, but we've been constrained by what existed so we've tried to build on the strengths we found, but we've been forced to seek solutions to some unusual problems. If we'd had a blank sheet of paper, I think the rooms would have been more similar and less interesting and it's nice to have a variety of rooms so that you can offer people different choices.'

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< 'This was a major and unique challenge,' comments White Mark's David Bell of the studio design. 'The history and character of the complex together with the need for integration with the Hit Factory facility in New York, presented both problems and opportunities. Significant technical advances were required in the isolation performance, the electrical, technical and mechanical systems. Interior design co-ordination involving much loved historic studio features, the local Miami vernacular and the company corporate style was vital.'

'The necessarily high co-operation between Eddie and Troy, Stephan Wang, the architect, and White Mark was facilitated by extensive use of 3-D modelling and renderings together with regular and extended visits to site,' he continues. 'An installation of our house

drafting software was made in New York and at the site and, allied to local A1 plotters, enabled the provision of updated drawings and pictures within minutes to both locations.'

'Modern thinking on stereo monitoring—including the containment of modern monitoring levels and the accommodation of the necessary low noise floors—and the inclusion of two specialist 5.1 mixing environments were specific acoustic and architectural challenges, together with the, all too rare, opportunity to create a full-sized scoring stage. The technical installation was significantly prebuilt in the UK and this drew deeply on specialist knowledge of the integration of digital and analogue systems at the highest level. All of the studios have consistent technical interfaces and can access a wide range of multitracks, Pro Tools and



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other digital systems.'

'I think the end result is that the studios are even better than they otherwise would have been,' Troy Germano concludes. 'We're really proud of what we've done.'

The result is certainly impressive. All the rooms display a character missing from most modern rooms and retain essential elements of the studio that has produced so many classic recordings. 'We were very concerned about keeping the integrity of the rooms,' confirms Troy Germano. 'A couple of days ago Maurice Gibb was working with his son's band in Studio F and when Trevor walked him around to Studio C he said, "Oh yeah, we did *Saturday Night Fever* in here". So even though the room looks completely different the space is the same and that magic is still there. There will be a lot of new people come here who won't necessarily know the studio's history but if the walls could talk...'

'There's something about these rooms,' agrees Stan Miller. 'Tom Dowd was in here the other day doing something for Gladys Knight and he was walking round saying "I did *461 Ocean Boulevard* in this room". Eddie walked into Studio C and said, "Every song on *Hotel California* was done in this room. Even for the old hands in the industry, there's still magic in these rooms. This place has been here for 42 years. I think Eddie likes that and he knew that it needed him. He loves the fact that instead of something new with no history he's got Criteria.'

If the history of Criteria Recording is the history of popular music recording then it is also Trevor Fletcher's history as he grew up in and around the facility while his mother took bookings and has spent the last 16 years on its payroll.

'I was a small child wandering around the facility in its heyday—when it was booked nine months in advance, 24 hours a day at rates that were ridiculous,' he recalls. 'Tom Dowd, who's

Contact

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done 50-75 records here over the last 30 years walked through and said, "This is so pleasing to see, this is what it deserves", and

to have some one who's done records here from ground-breaking soul and R&B records like Aretha Franklin to current stuff see the facility doing what it's done is fabulous.

The Hit Factory's faith in the re-vamped Criteria will only be proven through bookings, but already the signs are good. And having chosen to build on the studio's reputation rather than set up in competition to it, the existing relationship with its clients should provide a good starting point.

'There's local Latin music and local Latin producers,' says Troy Germano, 'and then there are artists from all over south and central America who come to Miami to record and to work with some of the producers here. Rock acts have historically liked to record at this facility because of the laid-back atmosphere. In addition to that, we are used for orchestral recording for film scores and popular records in both Studio B and Studio A.'

'Where can you go to find this many gigantic consoles available?' asks Trevor Fletcher. 'Where can you go to have this many rooms with the volume of space we have available? Where can you go to find this many rooms with different recording environments? I can't conceive of going anywhere else and having all these needs met.'

Stan Miller, too, is confident: 'When it's all said and done, it's going to be frightening. You can do anything you want to do. One of the engineers who used to work here in the old days had a lot of requests that we just weren't able to meet equipment wise, technology wise and quality wise. He came in on Monday to work with Julio Iglesias in Studio C and he was blown away with it.'

'Some people have an "if I build it, they will come" mentality,' Roger Charlesworth observes, 'but it's not enough to build a nice facility and it's certainly not enough to build a nice facility in some randomly chosen location, you have to know how to run a studio. You have to have a relationship with the record companies, engineers and producers in order to book the facility and run it smoothly.'

'I think this place is going to stand on its own against any complex in the world,' Germano concludes. 'I'm not saying it's the best, but it will stand up against anything else. And with a little bit of luck the studio will be busy, the clients will make some great records and we'll add to its history.'

You already have, Troy. ■



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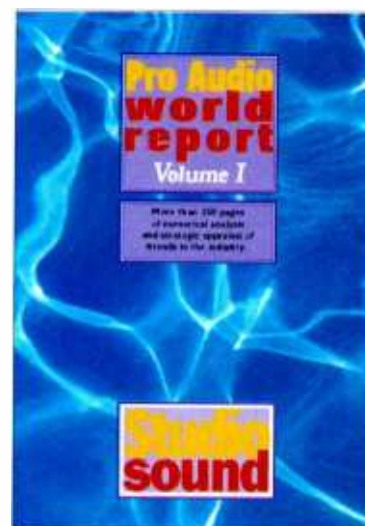
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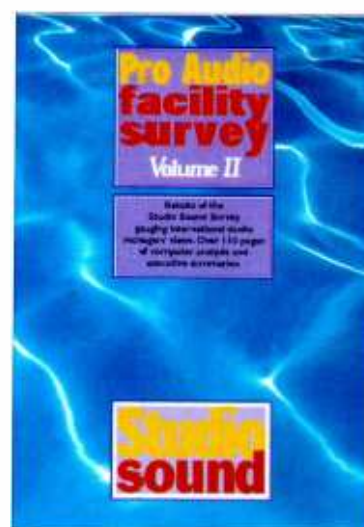


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US: Dear landlord

The hierarchy of modern recording studios is the key to profitable business management writes **Dan Daley**

A FEW GRUELLING sorties over the floor of the Paris AES Show makes you realise that the door slammed on linear media at the New York Convention last autumn. It might be an American conceit—God, knows, we have them—that the turning point came in the Colonies, with BASF distributing literature on archiving instead of new formulation as its central show thesis, and the number of makers of tape hardware heading for the nonlinear hills.

But trips to Europe are useful to remind Americans that history extends back before 1776 and that American music would not have the same effect without the aid of Commonwealth engineers over the last 40 years or so. Besides, I'd rather look at the Paris Opera House than the Seagram's Building any day.

And it was the Europe show where Sonic Solutions finally put forth the DVD-Audio tools that everyone has been clamouring for. It remains to be seen how well the first go-round works. But even if there are bugs—and I doubt they'll be significant if there are, given Sonic's experience with DVD video so far—it'll take some time for dedicated multichannel music to make a dent in the European market. While many

have hedged their bets by putting in three more speakers and a subwoofer, European studios for the most part have wisely held back on jumping on the high-density bandwagon before the road it will follow has been constructed. Which certainly was not the case in the States, where the Emperor's New Clothes managed to make magazine covers regularly. It just took a while to realise that it was the same four engineers and same two studios that were getting all the work.

Another trend that emerged from the show floor, and the floors of others shows like NAMM, is that the modern mantra of technology—Smaller, Faster, Cheaper, Better—is changing the social as well as the technological fabric of the studio business. Recent visits to London have illustrated that studios in that city are formalising a new iteration of the old mothership concept, in which large studios become the central gravitational core for smaller ones. It's just that this time, the motherships are also becoming the landlords.

Those familiar with the UK studio business have likely noticed this phenomenon. Town House, Olympic, Roundhouse and Stanley House have all become landlords in recent years, dividing existing or new

studio space into little rental units and letting them out to tenants on long-term and short-term leases and, hopefully, creating synergies with those producers, engineers and programmers that lead to new business for the main studio. But if all else fails, at least there's always the rent every month.

That same phenomenon has been going on in the States for some time, though on a less formal basis. I have to credit Chris Stone, from his Record Plant days, with coining the 'mothership' term and giving the idea a handle. But studios in the US have always had 'mice', musical limpets who have attached themselves to larger facilities. It's just that American relationships generally tended to be less formal. But the list is long, such as New York's Sound On Sound and Miami's Criteria (pre-Hit Factory) housing independent mastering facilities. Other relationships have put technicians into studio back rooms, and audio post operations on to the sides of larger video post operations.

But what's going on in the equipment side is simply going to propel this strategy of alliances even further. Bigger, Faster, Better, Cheaper is enabling more convergences between people and facilities. This will be the true legacy of turning the corner from linear to digital. DVD authoring, which is already in the process of radically changing the audio mastering business as we know it, will be one of the new motivating factors. The cost of compression systems is coming down quickly, and the expertise needed to make compressed audio work is getting easier to acquire all

Europe: Tune in, turn on...

Although digital radio broadcasting comes with data compression, choices of format and audio quality remain writes **Barry Fox**

WHEN DAVID MANSFIELD, Chief Executive of Capital Radio, called on the British Government to 'show its commitment to digital by announcing a switch-off date for analogue radio' I can only hope he was trying to comfort the company's shareholders, rather than displaying shocking ignorance of the real world of digital radio. The Digital Audio Broadcasting system for terrestrial digital radio was developed as a pan-European research project known as Eureka 147 and the technical specification is now set in stone by ETSI, the European Telecommunications Standards Institute. The BBC took the lead with introduction of live services in September 1995. The UK's commercial stations are now going live and Canada, Germany, and the Scandinavian countries are all using DAB, with Singapore, Hong Kong and Malaysia and the rest of Europe now readying launches.

The BBC's foolish publicity for the 1995 launch, which should have been described as an engineering switch-on, ended up a national joke because it trumpeted a new service for which there were no receivers. The commercial service, Digital One, has

ditched the name DAB in favour of Digital Radio, leaving consumers vulnerable to expecting too much from analogue radios with digital tuning. The only terrestrial receivers available, from Technics, Arcam and Cymbol, cost over £500 and are being bought by the hi-fi enthusiasts who are most critical of any audio defects.

Most of the terrestrial digital radio services are now available free from the Sky-Astra digital satellite, at the same MPEG audio data rates and on receivers that Sky gives away free. The broadcasters get distribution free in return for giving Sky free radio advertising creating the risk that manufacturers and chip makers will be deterred from terrestrial DAB investment.

The most important issue, however, is one of audio quality. Cascading the compression systems used in studios and links with the compression that DAB relies on, can produce some very nasty sounds. The hi-fi buffs who have bought those pricey receivers are already complaining. All the stations use 48kHz sampling to give an audio bandwidth of over 20kHz. The BBC planned to transmit the code at 256kbps, but compromised at 192kbps because it

lets the transmission channel, with a capacity of around 1.25Mbps, carry more programmes. Most of the commercial stations compress to 128kbps because it gives them more programmes and more chance to earn revenue. Some stations use 64kbps for mono and 48kbps is mooted. Others due soon will adopt 180kbps for stereo. Ideally the radio station studio would handle all signals in linear PCM, without any compression, and use linear links to the transmitters. D1 and partner NTL require all the stations which put programmes on its multiplex to send their signals to the

The hi-fi buffs who have bought those pricey receivers are already complaining

transmitter by fibre or ISDN, at twice the data rate used for DAB transmission, using proprietary apt-X compression. They believe apt-X does less damage than MPEG but it is still compression before compression. What really causes problems, though, is compression in the studios. At a seminar organised recently by the Institute of Broadcast Sound, BBC engineers demonstrated how music sourced from an uncompressed digital recording, such as a CD or DAT, sounds fine after straight wire connection to an MPEG DAB codec working at 192kbps. But if the music has already been copied onto a digital sys-

the time. Given the limited number of mastering facilities versus the vast number of recording studios, the trend will be towards compression cohabitating with recording.

The Internet has created an entirely new generation of baby record moguls, and they are already beginning to eye recording studios less as cogs in the big wheel, as their predecessors did, than as tools that can be lived in and worked from. Studios are not passive in this trend, and even as they are looking at the technologists as potential tenants for the future, they are also looking to the new breed of Internet content developers as business partners who can help them reposition their facilities along more businesslike lines, something that studios have historically not been good at in general.

What I'd expect to see develop next—and recalling my predilection to American conceit, I expect it to happen in numbers here first—is the evolution of the new audio Übermensch as a significant force in shaping the future of music and sound. Just as the record labels that defined an era, like Herb Alpert's A&M (and are now becoming history themselves to a large degree, thanks to business trends), were started by musicians who found as much satisfaction in orchestrating deals as they did notes, a new crop of entrepreneurs is coming from the ranks of technology to create new content entities. And the germination soil from which they will spring will very often be found in recording studios.

tem that uses compression, such as MiniDisc, MP3, or onto hissy analogue tape, the DAB codec mistakes spurious noise and compression artefacts for music and throws away musical detail while faithfully recording the noise and corruption.

Capital Radio's engineers have already ruled that only CDs or high data-rate hard-disk recorders can be used in its digital studios. Other stations care less. Alan Tutton of the BBC's Training and Development division has demonstrated a clever, counter-intuitive solution. If the sampling rate is reduced to 32kHz, the encoder does not have to throw away so many bits and the audio bandwidth is reduced to 15kHz—this matches FM and betters most people's hearing. The overall result is much better sound than with 48kHz sampling.

Unfortunately the ETSI standard only covers 48kHz sampling, or 24kHz which is too low for good quality. None of the chip sets or receivers currently available could handle 32kHz signals.

Any countries which are still at an early stage of DAB development should seriously consider building the 32kHz option into their infrastructure. Chip makers should look at it too. The world is relying more and more on compression, and if 32kHz sampling makes things sound better, we should be lobbying ETSI to unlock that option.

Assumed identity

Broadcasters' obsession with promoting their own identities may have become counterproductive writes **Kevin Hilton**

BRAND LOYALTY is one of the foundations of consumer society—and it makes sense if you're talking about tea, coffee, baked beans, even condoms. You buy something, like it and continue to buy it in the future, which is probably why broadcasters are trying to work on the same principle: tie viewers into a channel through the programmes and the overall style of the service.

Channel branding is not new. The station logo is the longest standing, most recognisable form of TV branding. For many years, BBC1 identified itself by a spinning globe at its programme junctions. It received a lot of criticism when it abandoned this, getting even more flak when it effectively reinstated the motif, albeit with a globe, printed onto an air balloon, floating over various parts of the UK.

At one time, the ITV Network identified where each programme had been produced by prefacing them with the relevant region's logo. This was dropped a long time ago, possibly to avoid any confusion,

Radio is responsible for that blight of recent media history: the ident jingle

but if you know you're in the London area, you're not suddenly going to think you've been relocated to North of England when the Granada logo appears. This notwithstanding, the taste is now for the production company's ident to appear at the end of the show, clearly stating that the programme was produced on behalf of the host channel.

Some logos are merely static graphics, others move. Even before modern computer animation, some stations made the most of what technology there was to stamp an identity on proceedings. As befitted a master showman, Lew Grade's ATV (the ITV contractor for the Midlands, before losing its licence to Cental, which was in turn bought by Carlton) was an unashamedly tasteless epic, replete with moving ellipses and portentous music.

When it launched in 1982, Channel 4 literally burst onto the screen, its logo being what was once memorably described as a set of exploding Lego bricks. It was accompanied by a jingle that was so associated with the channel, it was played as switchboard hold music. Many were sorry when it was replaced a few years ago—but not as sorry as composer David Dundas, whose regular royalties probably paid for the upkeep of his stately home.

Another important audio element is the continuity announcement. Each channel has a specific style and a roster of announcers whose voices become synonymous with the service. This was arguably copied from radio, where conti-

nuity announcements are as much a part of a station as the programmes they introduce. Such snappy slogans as 'This is the Voice of America' and 'Radio Luxembourg, Home of the Stars' have become part of popular culture.

Radio is responsible for one of the blights of recent media history: the ident jingle. The idea is to make it clear which station is being listened to but often the result is plain irritating. Perhaps the nadir of all this is when celebrity guests are persuaded to record such messages as, 'Hi, this is Pope John Paul II and I always listen to Robbie Daye on Radio Glossop', when the listener and even the DJ know that the celeb will instantly erase the ordeal from their minds as soon as they leave the studio.

Multichannel TV and radio are making branding a crucial tool for broadcasters and creating a new, lucrative market for specialist manufacturers. One such is Oxtel, which started out designing logo inserters and now concentrates on controllers and channel branding products. Among the broadcasters using the company's products are Telepiu and ART in Italy and BSB. The pre-merger Sky and BSB shied away from permanent on-screen idents; now it is unusual to find a cable, satellite or digital channel that does not have a logo in one corner of the picture.

It has to be wondered why broadcasters now feel the need for such obvious branding. Most TV sets will identify a channel when you select it, so is a permanent ID totally necessary? In sports it is perhaps understandable; news programmes and other stations require clips from big matches and the source producer wants to make sure viewers know where the footage comes from.

Elsewhere it is getting to the point where there are sometimes more logos on a TV picture than there are on a Formula 1 racing car. Take Cartoon Network: the channel ID is permanently in the right hand corner; when it has themed nights or weekends, another logo appears elsewhere on the screen. Other channels have such obtrusive branding, it obscures the credits of the programmes. Then there are the talk shows that not only have the subject of that particular edition—'You shot my hamster and slept with my dentist, but I want you back!'—but the title of programme and little recaps: 'Wayne is really angry now!'

Richard Brice, strategic marketing manager at Oxtel, comments that channel branding can sometimes be too strong but sees a time when everything could change: 'Channel branding will move to a new epoch, to the point where it's almost subliminal, done just with distinctive voice-overs.' Probably a good thing: if we wanted to read, we'd pick up a decent book, not turn on the TV.



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Lapping it up

Raymond Budd and **Martin Berner**

discuss the lapping of multichannel sound heads

ARGUABLY, HEADS are the single most important part of any tape machine, in that poor maintenance can have a direct detrimental effect on the sound quality. The general idea of lapping is to even out the flat spot across the middle of the head, using graded film of varying thickness to file it out. Obviously how often a head needs lapping is very subjective, if a machine has been set up with incorrect tape tensions. The flat spot will become quite deep very quickly, and relapping will be necessary.

The average life expectancy of a 2-inch machine's head with good maintenance can be up to 10,000 hours. But to get this amount of use out of a head we must first ensure that the correct maintenance procedures are carried out (discussed last month). Also we must also expect to relap our heads at regular intervals, typically at 5,000 hours and 7,000 hours.

Relapping is generally carried out on

2-inch, 24-track heads. Instability at high frequencies (10kHz) occurring on the outer tracks (Track 1 and Track 24) offers a good indication that relapping may be required. The tools required for relapping are: a lapping block, methylated spirit or isopropanol (used as a lubricant), one waterproof felt pen, three sheets of lapping paper 23µm, a sheet of lapping paper 8µm, and a sheet of lapping paper 3µm. There is a complete lapping kit available from Studer representatives (index no. 10.010.202.000).

It is advisable that only the lapping block supplied is used for the process, although other lapping bases, such as glass, have been used by engineers in the past. These cannot be recommended because the unevenness can have an adverse effect on lapping patterns of the head. Such heads are regularly seen in the Studer head department for repair, and uneven lapping often results in level differences between tracks.

The lapping process involves first dismantling the head and pulling off the shield. This

is achieved by removing the screw on the top of the head (above Track 1), lifting the shield above the lower base and gently pulling back along the connecting wires towards the edge connector, through the lead in holes.

Next, the lapping block must be cleaned using the methylated spirit or isopropanol and a moist piece of 100% cotton cloth.

Now place the lapping paper (23µm) on top of the lapping block and firmly press down ensuring any excess spirit is squeezed out between lapping paper and block. If this process has been carried out correctly, the lapping paper should adhere to the block.

Next the head must be gently moved across the lapping film in both directions. It is advised that you firmly grip the head with both hands while moving it in order to prevent it from bouncing across the film and thus resulting in a more even lap. The head only needs to be rotated to such an extent that the radius is corrected within the zone of wear. After every three or four strokes across the lapping block it is imperative that the lapping film is cleaned. Small metal particles (often invisible to the naked eye) and other residuals do accumulate on the film and without regular cleaning intervals these particles will be redistributed across the head. Now hold the head against a light, observing visible un-lapped sections. These sections are worn more severely and thus are recessed, continue lapping the head until these sections are fully refinished.

Once the full width of the head has been lapped, it should be inspected as follows: the felt pen should be used >

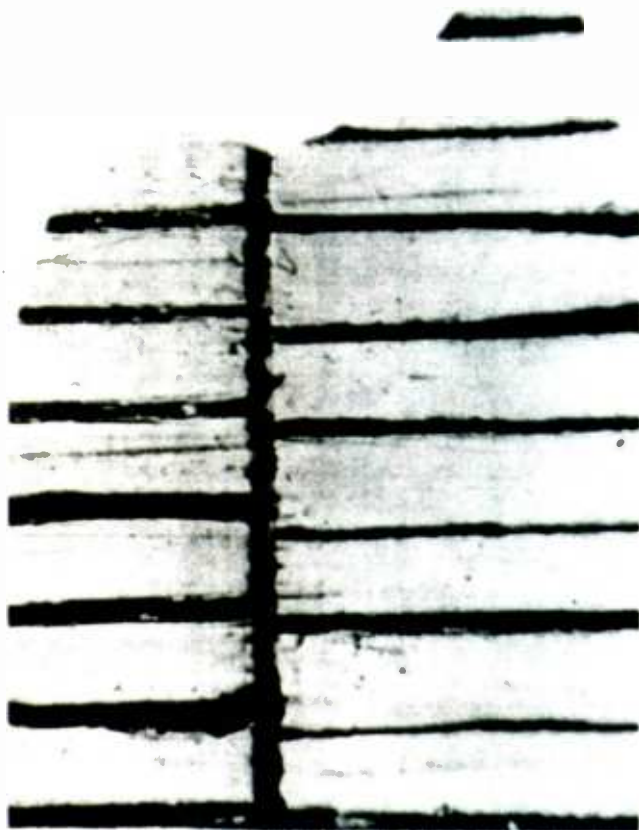


Fig.1: Permanently damaged track

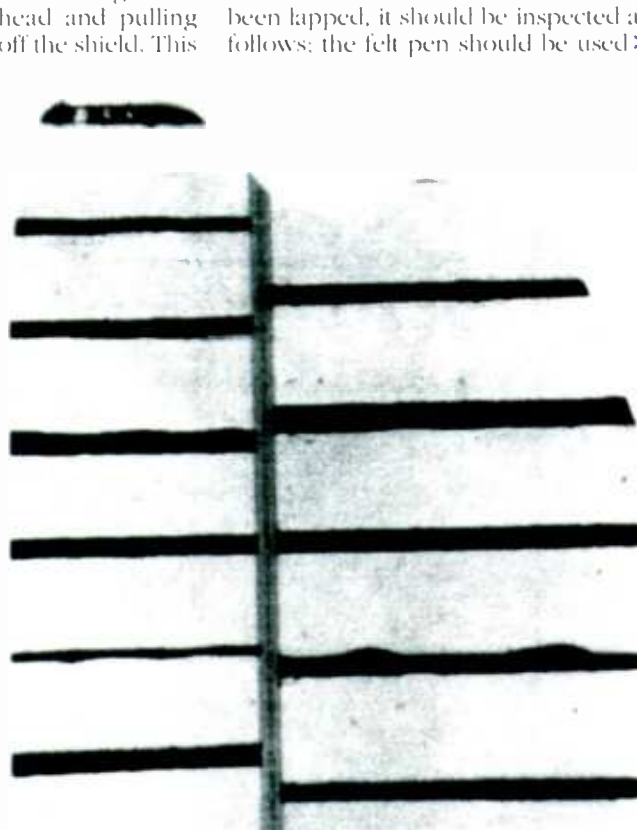


Fig.2: How a track should look



< to draw a fine line across the gap zone. Now draw the head across the lapping film without the rotary motion, ensuring that the gap zone contacts the lapping film. The contact reflection should show a clean rectangle extending across the full width of the head. Once this pattern is obtained, repeat the process with 8µm lapping film until smooth finish is obtained. The finish is completed using 3µm film.

It is vital that you pay attention while using the 23µm lapping film as essentially you are filing away at the head. If you go too far then you are going to erode life from the head. In extreme cases, Studer has seen complete heads fall apart because somebody got a bit carried away with the lapping film. As mentioned previously, you should only need to lap a head a maximum of twice

If you go too far then you are going to erode life from the head. In extreme cases, Studer has seen complete heads fall apart because somebody got a bit carried away with the lapping film. As mentioned previously, you should only need to lap a head a maximum of twice in its life-time

in its lifetime. If you start to see flat spots appearing to quickly then you should look more closely at the tape tensions.

It is advised that you should only attempt to relap those heads with the index 317 or 318. The compound that was used to make up the 316 heads (used on A80 MkI, MkII and A800 MkI) was very soft; relap attempts on 316 heads usually result in permanent damage.

Static discharge can also be a problem on heads once they reach a certain, the symptoms of which include indiscriminate clicks at intermittent times. Poor grounding within the compound on the head usually cause this. The best remedies are too carefully drilling out (1mm drill bit) the small holes either side of each track, and refilling the holes using a special conductive compound. Remember to remove all residues from within the holes before refilling. The special refill compound is available from your Studer representative with the index 99.02.0364.

Finally, if you have any problems with the procedures outlined please consult your Studer representative. They will be happy to help you through any difficulties you may encounter (support@studer.ch, service@studer.co.uk). ■

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Transforms and spectra

Transforms and spectra are normally described mathematically and this is almost guaranteed to limit readership.

John Watkinson explores what can be understood without maths

AT ITS SIMPLEST a transform is a process that takes information in one domain and expresses it in another. Audio signals originate in the time domain. In analogue audio signals the voltage changes as a function of continuous time, whereas in digital systems the sample value changes in discrete time steps to carry the same information.

Audio signals may be transformed to the frequency domain for a number of purposes. One of these might be to analyse the performance of some piece of equipment. A test signal having a known spectrum is input, and the resulting output spectrum is analysed. Looking at the difference between the input and output spectrum will give an insight into the performance. For example, if some of the input spectrum is missing, the device under test may have an inadequate frequency response. However, if there are new frequencies present, the device may be nonlinear such that the

Fig. 1 shows that with an analogue input, the spectral resolution will theoretically be infinite, but if the input is sampled the spectrum is also sampled—it exists at discrete frequencies.

Many transforms are reversible, which means that in principle it is possible to go from the time domain to the frequency domain and back again without any loss of information at all. Of course, real hardware may not be sufficiently well engineered to reach this ideal, but don't blame the transform. Because of this reversibility, a given characteristic in one domain will give rise to a matching characteristic in the other domain.

Fig. 2a shows an example of the spectrum of a square wave.

It will be seen that this spectrum is a decaying wave which passes through zero at all even multiples of the fundamental. These zero crossings are the reason that there are no even harmonics in a square wave. The shape of the spectrum is a sinc/x curve. Thus a time-domain waveform which is square has a frequency domain response which is a sinc/x curve. Surprisingly enough the converse also holds. Fig. 2b shows that an ideal

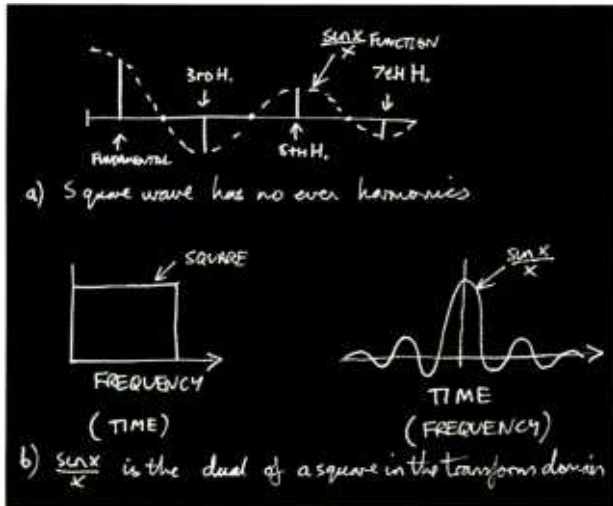


Fig. 2 Square wave spectrum

input signals are being intermodulated. Frequency transforms are also used as part of certain audio compression algorithms, including MP3 and MiniDisc which suffer a relatively high artefact level and the rather more respectable Dolby AC-3 system. Many audio signals have a dominant frequency where most of the energy resides. The level at other frequencies may be much lower so that it could be coded with fewer bits. By converting audio information into the frequency domain it is easy to take advantage of the level differences from one frequency to another.

In the frequency domain, the signal is described as a kind of spectrum—a table of the energy at different frequencies.

low-pass filter has a rectangular spectrum, and this has a sinc/x impulse response. These characteristics are known as a transform pair. In transform pairs, if one domain has one shape of the pair, the other domain will have the other shape. Thus a square wave has a sinc/x spectrum and a sinc/x impulse has a square spectrum.

There is a special case in transform pairs which is the Gaussian pulse. This has a Gaussian spectrum and so, uniquely, the information is unchanged after a transform.

One frequently encountered way of entering the frequency domain from the time or spatial domains is the Fourier transform or its equivalent in sampled

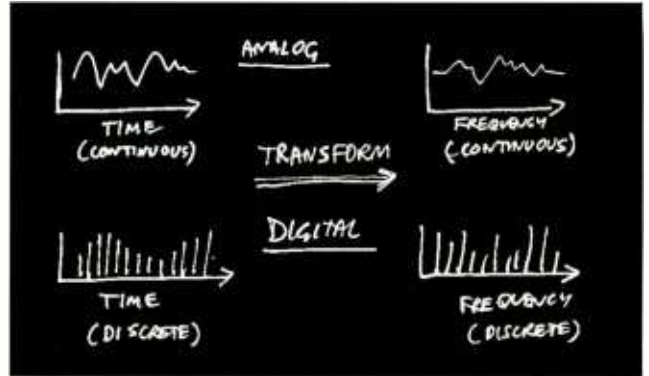


Fig. 1: Time discrete signal has a discrete transform

systems, the discrete Fourier transform (DFT). Fourier showed that any periodic waveform can be reproduced by adding together an arbitrary number of harmonically related sine waves of various amplitudes and phases. Fig. 3 shows how a square wave can be built up of harmonics. The spectrum is a sinc/x function so the amplitude of each harmonic is easily calculated.

The ideal Fourier transform specifies the amplitude and phase of the frequency components just once and such sine waves are endless. As a result the Fourier transform is only valid for periodic waveforms—those which repeat endlessly. Real programme material is not like this and so it is necessary to break up the continuous time domain using windows. If a block of time is cut from the continuous input, by wrapping it into a ring it can be made to appear like a continuous periodic waveform for which a single transform, the short-time Fourier transform, can be computed.

Rectangular windows are used in

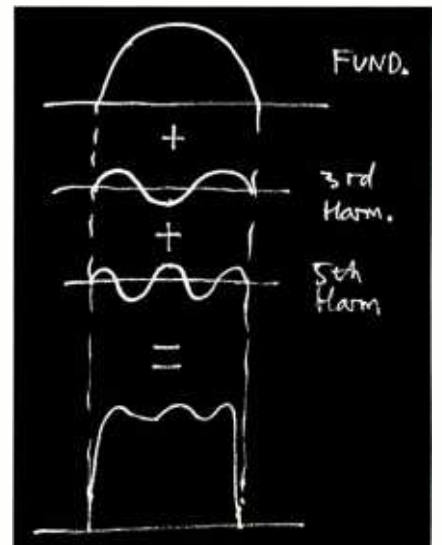


Fig. 3: Building up a square wave

video compression but are not generally adequate for audio because the discontinuities at the boundaries are audible. This can be overcome by shaping and overlapping the windows so that a cross fade occurs at the boundaries between them.

As has been mentioned, the theory of transforms assumes endless periodic waveforms. If an infinite length of waveform is available, spectral analysis can be performed to infinite resolution but as the size of the window reduces, so too does the resolution of the frequency analysis. Intuitively it is clear that discrimination between two adjacent frequencies is easier if more cycles of both are available. In sampled systems, reducing the window size reduces the number of samples and so must reduce the number of discrete frequencies in the transform. Thus for good frequency resolution the window should be as large as possible. However, with large windows the time between updates of the spectrum is longer and so it is harder to locate events on the time axis.

This affects audio equipment and quantum mechanics equally. Fig.4 shows the effect of two window sizes in a conventional STFT and illustrates the principle of uncertainty also known as the Heisenberg inequality. According to the uncertainty theory one can trade-off time resolution against frequency resolution. In quantum mechanics Heisenberg found that if he used equations which predicted the exact location of light energy, its frequency would be unknown. In this form light can be considered as a discrete packet or photon. If the wavelength were predicted, the location would be unknown. This is the origin of the wave-particle duality of light which falls out of transform theory.

In most programme material, the time resolution required falls with frequency whereas the time (or spatial) resolution required rises with frequency. Fourier-based compression systems using transforms sometimes split the signal into a number of frequency bands in which different window sizes are available. Some have variable length windows which are selected according to the programme material. The Sony ATRAC system of the MiniDisc uses

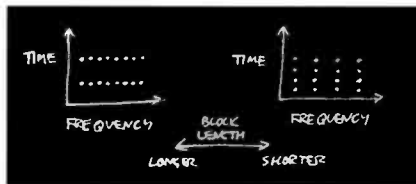


Fig.4: The Heisenberg inequality

these principles. Stationary material such as steady tones are transformed with long windows whereas transients are transformed with short windows.

The recently developed wavelet transform is one in which the window length is inversely proportional to the frequency. This automatically gives an advantageous time-frequency resolution characteristic.

Although compression uses transforms, the transform itself does not result in any data reduction, as there are usually as many coefficients as input samples. Paradoxically the transform increases the amount of data because the coefficient multiplications result in wordlength extension. Thus it is incorrect to refer to transform compression; instead the term transform based compression should be used.

Having fought our way through the theory, let us now look at a practical audio device; the spectrum analyser. This works using a creative application of aliasing. If two signals are multiplied together, the result is an upper and a lower sideband which are the sum and difference frequencies. In the special case where the frequencies are the same, the lower sideband frequency falls to zero. It is possible to detect zero frequency because it is the only signal that can pass through a time averager. Fig.5 shows the structure of a spectrum analyser. An oscillator is provided that can produce a frequency sweep through the whole spectrum to be measured, in other words through the audio band. The signal from the swept oscillator is multiplied with the input signal. Whenever there is energy in the input signal at the same frequency as that of the oscillator, the lower sideband frequency will fall to zero and the signal will be able to pass through the averager. The amplitude of the signal will be proportional to the level of the energy in the signal at that frequency. As the spectrum analyser knows what the generator frequency is at all times during the sweep, it can plot a graph of the output of the averager with respect to frequency. This will be the spectrum of the input signal.

What a spectrum analyser does is not far from calculating the Fourier transform of an input signal. In the next part the Fourier transform will be considered. ■

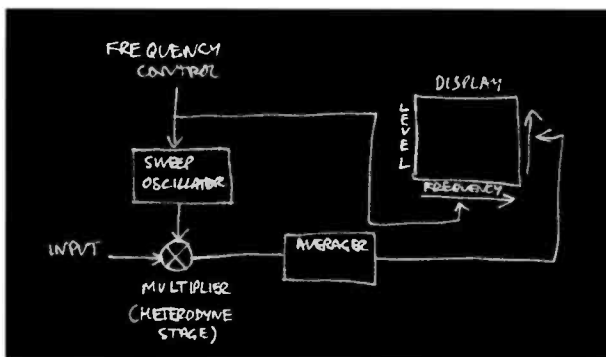


Fig.5: Spectrum analyser basics

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Disappearing act

Having dallied with assorted mediums, stored music eagerly awaits yet another new home writes **Simon Trask**

A RECENT TV PROGRAMME on the origins and impact of musical notation highlighted the durability of lines and blobs recorded on paper as a means of storing music. Thanks to notation, paper and, along the way, the invention of the printing press, we have access to centuries of music that would otherwise have been lost to posterity, if not the means to listen to original performances of that music. By enabling the sketching out of musical ideas and the crafting of multilayered compositions outside of real time, notation has also contributed integrally to the development of music itself—much as the technology of computer-based MIDI sequencers and audio workstations does nowadays. And today notation itself exists inside the computer, a virtual representation of a virtual representation of music, with dots and lines cast in bits and bytes.

No longer inherently tied to the written or printed page, notation has acquired a drag 'n' drop plasticity in its computer-based form that previous generations of composers could only have dreamt of. But perhaps it's also disappearing into the computer, increasingly relegated for many contemporary recording musicians to the status of an incidental and redundant outcome of alternative machine-mediated creative processes.

Today, the physical media that carry the audio recordings of our music also seem to be accelerating towards invisibility. The 78rpm disc lasted for decades. Scratchy, tinny sound and frequent flipping of disc sides and swapping of discs and needles were the price for being able to listen to recordings of musical performances. Then came the 12-inch 33rpm vinyl disc, offering better sound quality and longer playing time per side, and with this increased playing time came the concept of the album. Album sleeve design and artwork, too, came into their own, at once informing and enticing us.

Vinyl's heyday lasted some three decades, while its nemesis, the shiny 12cm optical CD, has clocked up around half that time to date and will be lucky to spend two decades at the top of the media tree, faced as it is with a growing range of challengers. At least, while never an option in the move from analogue to digital formats, backwards compatibility has been a surmountable problem with the CD, which is now also playable on DVD and SACD machines. Still, there's a growing sense of the mutability of music storage media, as the

options open out and other factors increasingly come into play, such as alternative delivery mechanisms and the question of where music will come to be located in our increasingly networked and 'mobiled-up' world.

What about flash memory cards for storage? Even smaller than MiniDiscs, which, of course, are themselves smaller than CDs and DVDs, the smallest of these cards is about the size of a postage stamp. When costs fall and memory sizes rise sufficiently, memory cards will be a direct challenge to optical media. By which time they'll probably also be integrated into hi-fi systems, as well as all manner of portable Internet appliances for which optical discs would be both unfeasible due to their size and undesirable due to the 'joggability' factor.

Then again, how about an optical disc the same physical size as a CD or DVD but capable of storing 140 gigabytes of data? This is what C3D plans to offer with FMD (Fluorescent Multilayer Disc) storage technology. Even with the new high-resolution surround-sound music formats being introduced with DVD-Audio and SACD, one FMD disc could hold far more than the traditional album's worth of music. C3D may also blow the card market apart with its planned credit-card-sized 10Gb FMC cards.

Meanwhile, a new generation of music fans is growing up having as its reference point downloadable music, jukebox software, and hard-disk databases of tracks which can be readily configured into playlists of any length. No more albums—or rather every 'album' becomes a compilation album.

Even more radically, once music tracks are stored on hard disk they can be uploaded into the network; in fact, this is already starting to happen, with a growing number of web-based services offering on-line storage. A few years down the line, when always-on terrestrial and mobile broadband access is widely available, perhaps new generations of music fans will log on to their online databases of tracks bought and transferred from their favourite online music store(s), and stream tracks on demand to whatever playback device they want to use. Maybe the very concept of owning music on physical media will eventually disappear, and on-demand pay-per-listen at a few pence or cents a time will be what future generations consider normal. In which case rows of discs taking up shelf space will come to seem as anachronistic and archaic as music notation does to many people today. ■

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