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Studio Sound

THE INTERNATIONAL PROFESSIONAL AUDIO MAGAZINE
FOR RECORDING, POSTPRODUCTION AND BROADCAST



EXCLUSIVES

Audient ASP8024

Tascam MA-AD8 ; IF-DA8

Millennia Media Twincom

Sennheiser Series 3000

Maycom Easycorder

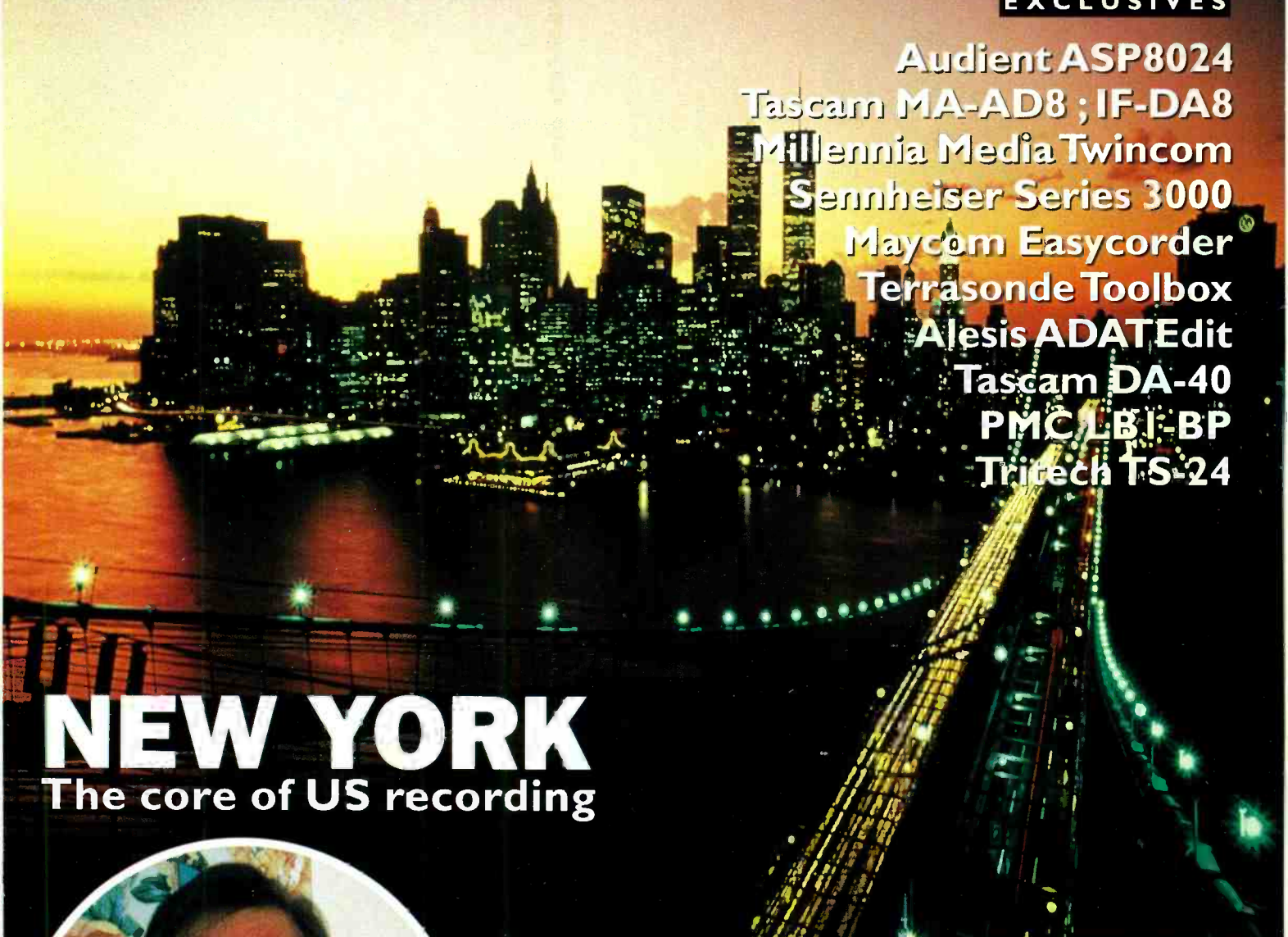
Terrasonde Toolbox

Alesis ADAT Edit

Tascam DA-40

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NEW YORK

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The
**HUGH
STRAIN**
Interview

WIN A TLAUDIO CI COMPRESSOR
THE SCIENCE OF LISTENING
THE RISE AND RISE OF ISDN
DISCOVERING BeOS



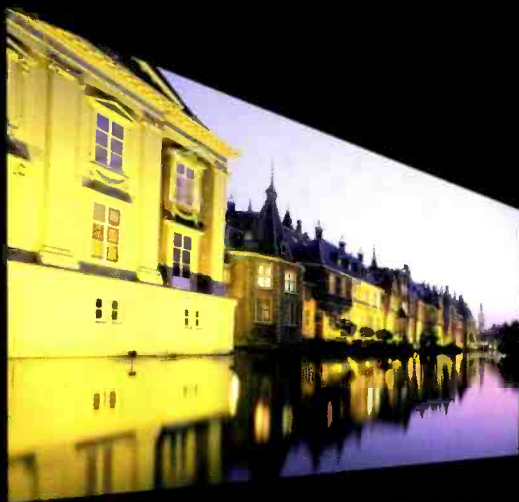
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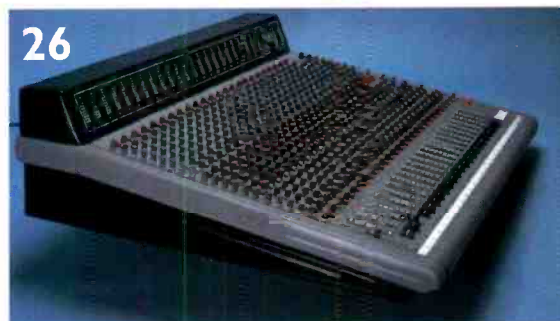
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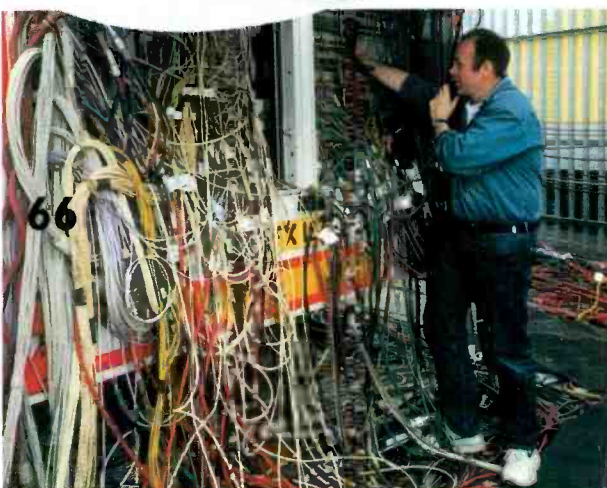
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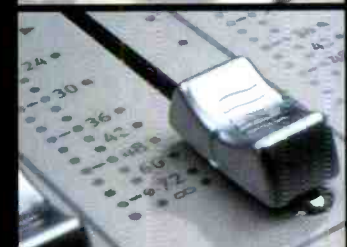
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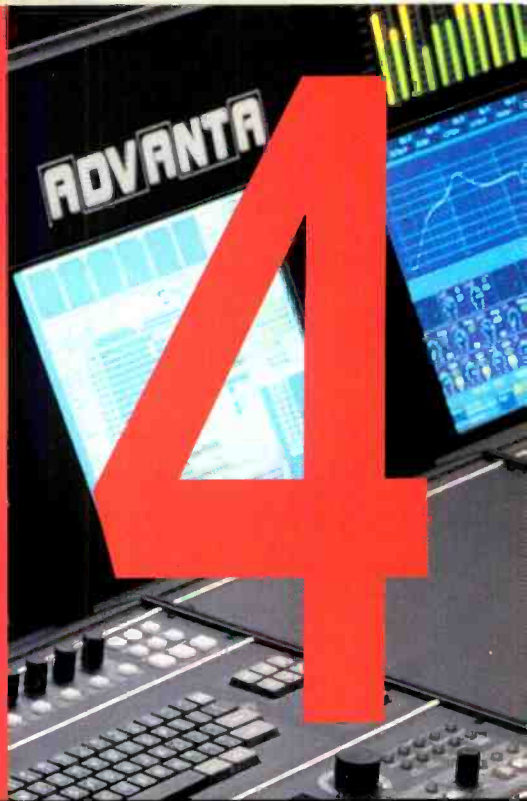


The Future of Audio Production.

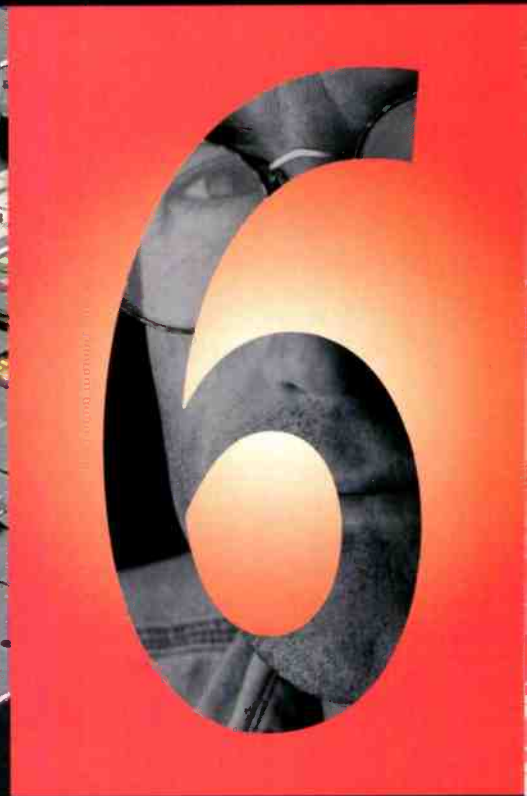
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All the trimmings

WE INTERACT with our environment because it is a means of staying alive, yet this rudimentary function is now threatening to be applied to our entertainment as if the lack of it were a long-standing limitation of what we have.

Digital TV and new audio and picture carriers promise to allow the viewer and listener to elevate their passive roles to those of the director with some jurisdiction over what they are experiencing.

I can appreciate the novelty of being able to switch cameras on TV Formula 1 coverage or change the camera angle on a musical production, but I like my entertainment very much on a plate as the originator's best shot at the job. I limit my interaction to switching the thing off or not.

It is worrying for a whole number of reasons, but does the consumer need to be given this degree of control or choice? How many different versions of a film could you bear to program when you've already decided that it stinks? We appreciate a finished product in its own space and time and don't lose sleep over how much better it would have been if Hero B hadn't had her brief fling with the airline pilot or if the vocals had been mixed a bit higher on that 1960s classic.

And you'd be handing control over to a populace that attributes audio and image quality to the brand identity of its hi-fi in much the same way as it attributes importance to the words Tommy or Calvin stitched on its pants. They don't need control they just need to be entertained properly.

Interactivity is a red herring at a time when the real application should be focused on pouring money into raising the universal average standard in ordinary vanilla TV programming.

Always this modern obsession with the trimmings, God forbid we ever address the basics.

Zenon Schoepe, executive editor

Neophobia

NEOPHILIA HAS MUCH to answer for. On one hand, it is one of the aspects of human nature that ensures our progress. On the other, it readily threatens established means and methods that need no improvement. It is, of course, the love of the new, or novel.

Almost every aspect of modern living—professional, recreational and educational—has been impacted upon by new technology. But while technology offers change in many areas, the keyword here is 'enabling'—we're concerned with those technological advances that make established tasks quicker, easier and often cheaper to perform. They make perfect sense in the professional world, of course, where 'quicker', 'easier' and 'cheaper' are invariably translated to mean 'more efficient'. The adoption of equipment that makes some aspect of an established task more efficient is what has helped drive Western civilisation forward for hundreds, if not thousands of years. It is a picture so familiar that we frequently no longer see it.

Trouble is, quicker and easier frequently don't necessarily mean better.

As you can tell from the general standard of published print in the twilight of the 20th Century, replacing typesetting and layout methods that often demanded days to complete with electronic alternatives that reduced them to minutes has done little to raise the standard. The inevitable conclusion is that quicker is not better, and easier and cheaper are definitely worse. Quicker invites those mistakes that we used to associate with haste while easier opens the doors to those lacking essential skills and cheaper opens the doors to the hoi polloi.

So what of audio?

Happily, audio tends to fall into one of two categories: the first ensures that anyone accepting progress' poisoned chalice is driven by enthusiasm if not ability, and the second requires them to be part of industries too big to readily fall foul of over ambitious amateurs. You can apply these definitions to music, radio, television, film... Everything, to date, but the unproven Internet.

Accept my neophobia and look carefully at what you do—and how long it takes you.

Tim Goodyer, editor

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Incorporating Broadcast Engineering
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hot property

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wave studios soho - london

When Johnnie Burn and Warren Hamilton decided to create their own facility "Wave" in London's Soho district, the decision to go fully digital was immediate.

However, their selection of equipment took a little longer.

They knew that in order to satisfy their Client's demands they had to optimise not only their award winning talents but also their speed of operation. The evaluation of the DPC-II was conclusive.

The console demonstrated the highest level of audio performance with an unmatched ease of operation. Johnnie has this to say:

Having had the demo we knew we wanted the DPC-IIs before we even knew the price. We had both previously worked on other major systems yet still remain consistently happy with our choice of console."

SOUNDTRACS

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email: sales@soundtracs.com web: http://www.soundtracs.com

DPC-II

digital
production
console

■ London's Angel Studios is flying high after spending almost £40k expanding its recording capacity. New equipment includes a SADiE 24-96 system, Radar II hard-disk recorder, Apogee AD8000 and CD-R850 recorder. Imminent is a tc electronic M2000 effects unit destined for Studio 2 and a Magtracks 5.1 Music Box.

Angel, UK.

Tel: +44 171 354 2525.

■ The Hawaii studio of Japanese record producer and artist Tetsuya Komuro has been completed by LA-based studio design consultants, studio bauton. True Kiss Disc Studios offers two SSL SL9000J-equipped rooms with custom TEC:ton TTH1 stereo and 5.1 monitoring systems.

Studio bauton, US.

Tel: +1 213 251 9791.

■ US Fox Television affiliate WITI-TV is to install a 48-input AMS Neve Broadcast Television Console in the station's control room. It will be used for five news programs as well as news preproduction and local programming. This is the station's first purchase of AMS Neve equipment. It replaces a 24-year-old Ward Beck production console and is part of the station's expansion in news programming.

■ London post facility, 750mph, has opted for Dynaudio M2 monitors and Chord 1032 amplifiers throughout. The facility's three studios offer Fairlight workstations and surround monitoring and have seen work from British Airways, Barclaycard, Virgin Cola and Heineken.

DynaudioAcoustics, UK.

Tel: +44 171 403 3808.

Chord, UK.

Tel: +44 1622 721444.

AMS Neve, US.

Tel: +1 212 9651400.

■ Swiss television channel, SFDRS, has installed a second Fairlight Fame digital audio production system, replacing an analogue console. The upgrade will also include a MediaLink networking system linking the Fame, MFX3plus workstation, Avid Media Composer and Digidesign Tools systems.

Fairlight, UK.

Tel: +44 171 267 3323.

Digidesign-Avid, UK.

Tel: +44 1753 653322.

■ Burbank's Fotokems production facility has taken 23 Miller & Kreisel 5.1 monitoring systems. The systems will be installed in ten of Fotokems telecine suites, four edit suites, four audio suites and five QC bays, each consisting of three MPS-2550s (LCR), two MPS-2575s (surrounds), an MPS-5310 powered subwoofer, and an LFE-4 Bass Management Controller.

M&K, US.

Tel: +1 310 204-2854

■ Sausalito's Studio D music, film and broadcast facility has completed a major upgrade that includes a 72-input Amek 90981 console, a JBL 5.1 surround monitoring system, an editing suite with the latest 24-bit Pro Tools, redesign of the control room acoustics, and reinforcement of the isolation booths. Studio D's varied clients

include Soundgarden, Van Morrison, Aretha Franklin and Huey Lewis and The News.

Studio D, US.

Tel: +1 415 332 6289.

Amek, UK.

Tel: +44 161 868 2400.

■ The European DTS transfer suite, responsible for the DTS multichannel encoding of British and European film soundtracks for cinema distribution, has installed an HHB Circle monitoring system.

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

■ New York's Sony Music Studios has purchased a True Audio Precision 8 preamp for its classical remote recording kits. The purchase follows trial recordings made with the Los Angeles Philharmonic Orchestra although it has since seen use on piano-voice duets with Neumann TLM170 mics in New York.

Sony Music, US.

Tel: +1 212 833 4186.

True Audio, US.

Tel: +1 520 299 3351.

■ London music production house Music By Design has installed a 160-channel Soundtracs DPC-II digital console in place of a Sony MXP3000 analogue desk. MBD specialises in commercial soundtracks and music composition, with recent projects including Macdonalds, Coca-Cola and Cadburys. Another London facility, Golden Square Post Production has taken 15 new audio patch panels from VDC. The panels handle digital and analogue audio, and time code, and were prewired with Van Damme Blue Series and PSN-type digital audio cable.

Music By Design, UK.

Tel: +44 207 434 3244.

Soundtracs, UK.

Tel: +44 208 388 5000.

VDC, UK.

Tel: +44 171 700 2777.

■ German composer Harry Kulzer has purchased a 24-track Fairlight MFX3plus as the primary music recording editing system in his recording studio, Whoopee Records, in Horgau, Southern Germany. Kulzer enjoys a reputation as one of Europe's preeminent composers for television and film scores as well as being resident composer for the popular German variety television show *Sendung Mit Der Maus*.

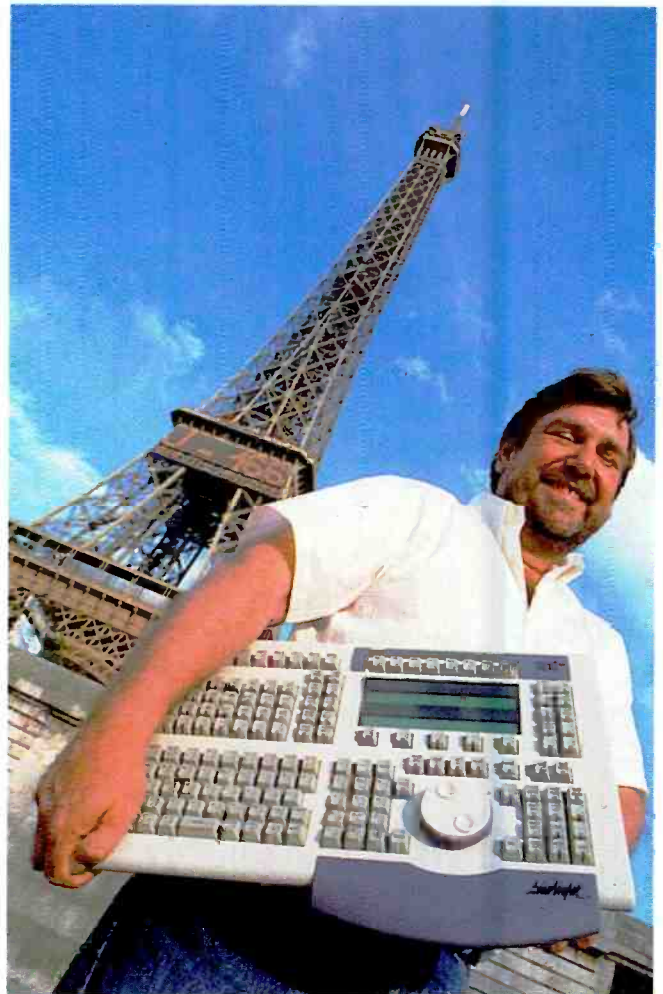
■ London-based El Camion, part of the Manor Mobiles fleet, is up and running with a 64-channel SSL Axiom MT digital console at its centre. Having already notched up sessions on the British TFI Friday television show, Manau in Paris and a London concert for the Japanese broadcaster NHK, El Camion's diary is looking busy.

SSL, UK. Tel: +44 1865 842300.

■ The British Galaxy dance radio network has taken two on-air consoles from Audionix. The expansion of the Chrysalis-owned operation includes a production studio, newsroom preparation facilities and station talkback system all furnished by Audionix.

Audionix, UK.

Tel: +44 114 242 2333.



▲ France: Highway Television, one of a new wave of Parisian television postproduction facilities, has replaced an Akai system with a 24-channel Fairlight MFX3plus digital audio workstation. The system is busy on Highway's staple of television features, documentaries and commercial spots.



▲ Spain: A collaboration between British loudspeaker specialist ATC and Japanese corporate giant Pioneer has resulted in the development of a 5.1 mastering system for the Pioneer Optical Disc Europe facility in Barcelona. Based on ATC's SCM100 reference monitor for the front and rear LR pairs, the new monitoring system also uses a symmetrical SCM100 for the centre channel and an SCM0.1/15 sub, all cabinets being driven by SPA24-850 Ampacs. ATC systems are already in use by Sony Music in New York, Athens Mastering in Greece and CTS 11 in London.



▲ **UK:** Reunited with former Eurythmics' partner Annie Lennox at the 1999 Brit Awards, Dave Stewart, is recording again at his Church Studios complex in North London. Commenting on his choice of Marantz' CDR640 CD recorder for the project, he sited the high-quality audio and facilities: 'At the end of a session I can take away a true representation of what we have done,' he said. 'I can listen to alternative mixes or listen back to different arrangements in the car or at home and I know I'm hearing the same thing that I hear in the studio.' Unfortunately Mr Stewart's CDR640 is in standard livery, not the striking ruby red of the Studio Sound 40th Anniversary special issue (pictured) provided by Marantz for the magazine's celebratory competition—see August issue or www.prostudio.com for details.



▲ **South Africa:** Leading film mixing and dubbing facility, The Chris Fellows Sound Studio, has upgraded its Studio One to digital working and Dolby SR and SR.D compatibility. New equipment includes a Soundtracs DPC-II digital production console, 64-track Digidesign Pro Tools system, Akai DD8 digital dubbers, and Tascam DA-88 MDM machine. The Johannesburg studio is responsible for features such as *Sarafina*, *Cry The Beloved Country* and *Bravo 2 Zero*.

SATIS 99

France: The 16th edition of SATIS, France's premiere exhibition for the sound and image industries will be held 19th-22nd October at the Paris Porte de Versailles. As is traditional, the event will attract technicians and image creators and manipulators. New features for this year will include a new hall, thematic visiting guides, an international bookstore, a suppliers' village and a 3D-virtual animation area.

SATIS, France.

Tel: +33 1 41 90 48 47.

Net: satis@reed-oip.fr

Master race

US: Los Angeles-based Quad Teck Digital has opened a second mastering suite to offer its 4-channel surround format to a growing clientele. Claimed to be fully compatible with the existing CD standard, and offer 'more air, more ambience, more warmth,' according to Quad's Hank Waring. 'You get a larger sound in the rear surround channels,' he asserts. Studio 3 is scheduled to open in a matter of months.

Quad Teck Digital.

Net: www.fdslabs.com

Pirates repelled

World: Copyright Control Services (CCS) announced today that following close cooperation between CCS and the German Public Prosecutors office, the home of an alleged software pirate in Cologne, Germany known as 'X-man' was raided and equipment taken for forensic analysis. If prosecuted, X-man faces up to three years in prison or a substantial fine.

Dr Oliver Giessler, Attorney-at-Law, acting for CCS in Germany praised CCS' role in bringing X-man to the attention of the police: 'The Germany Prosecutor never would have opened a case without CCS' and our efforts. CCS tracked down the Internet Service Provider that X-man used and then asked the ISP to keep backups of the log files which documented X-man's Internet activities. These were a big help in the prosecution.

'If the Prosecutor proves he was uploading illegal software into UseNet groups then, if this was his first offence, he could get 6-9 months on parole. If he's also had previous convictions, he could face 1-2 years in prison.'

Dave Powell, Managing Director of CCS, added: 'We also believe X-man was hacking software and removing copy protection, since he was bragging on the Internet about his "hack being better" than someone else's. If found guilty of



▲ **US:** San Francisco's Paul Stubblebine Mastering has brought the first 1-inch 2-track ATR-102 analogue recorder to the US West Coast. Converted by Mike Spitz and with custom electronics by EAR's Tim de Paravicini and heads by Flux Magnetics' Greg Orton, the machine offers a 10Hz-28kHz flat frequency response. Stubblebine already has a second Spitz-de Paravicini ATR-102 on order.

criminal charges we will pursue him in a civil court for recourse on behalf of our clients.

'We hope that cases like this demonstrate very clearly that you can be caught distributing pirated software on the Internet and that the international legal community is now prepared to treat this very seriously.'

Broadcast update

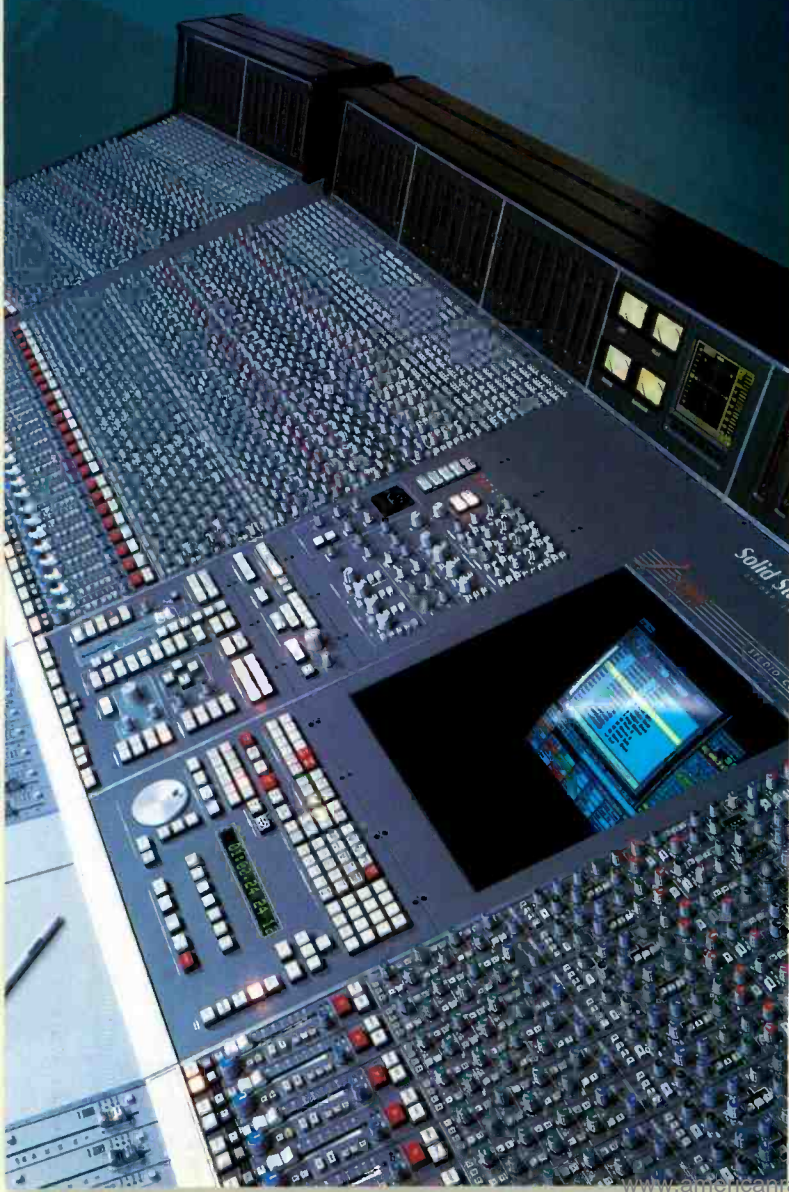
India-Latin America: Developments in the uptake of the DVB-T digital video broadcasting standard have seen the Indian government announce its adoption and various South American countries expressing interest, including Argentina's reconsideration. India's commitment follows a unanimous recommendation from the group responsible for selecting a DTTB standard. Services are being proposed as a multiplex of five or six services including data covering the metropolitan areas of Delhi, Calcutta, Mumbai and Chennai. In its search for a common continental standard, Latin America currently has Brazil conducting field trials that will be followed closely by Argentina after its earlier comparison of the American ATSC standard and DVB. Mexico, Paraguay, Ecuador and Uruguay are all also considering the DVB-T standard. DVB-T networks are presently operating in the UK, and Sweden with Australia, Germany, and Spain about to launch.

NOW THERE'S AN ALTERNATIVE

TO THE WORLD'S

ULTIMATE ANALOGUE

MUSIC CONSOLE ...



LETTERS

Desk job

WHILE I MUST express my admiration to John East and Antony David for even attempting to chart the development of the mixing desk in three pages of *Studio Sound*, I can't let some of the obvious omissions go unnoticed. 'Eventually digital consoles came of age with AMS Neve's Capricorn and later Sony's OXF-R3 'Oxford' console'. I think the SSL Axiom/Avant/Aysis Air and Axiom-MT might be allowed to creep in here, with 'A Class' sales approaching 150 units since Axiom was launched in 1994.

A little later: 'At the high end, control surfaces such as Sony's Oxford have balanced assignability with a short learning curve'. Hmm. Only if you're computer literate, according to the previous paragraph. Also at the high end, you could of course choose the knob-per-function approach of SSL's Axiom-MT, where digital technology is used to automate an analogue-familiar control surface with a zero learning curve—according to Quad owner Lou Gonzalez, 'Nobody had to show me how it worked'.

There is never enough room to mention every design and manufacturer in such an article, but it certainly started up the nostalgia machine. No doubt my ex-colleague Ted Fletcher will write to remind you about the Alice Silk series 24-track digitally-controlled mixer of 1982, and who remembers Helios?

Nevertheless, if one ignores the perhaps understandable oriental bias in some sections, it's a good read, and to my great delight it sets the record straight about the in-line concept 'pioneered by MCI and Harrison in the mid-seventies'—despite the recent claim to the contrary by a certain legendary audio console designer who should know better. When's the next installment?

John L Andrews,
Marketing Director, SSL

Computer love

A COUPLE OF points (besides my head). I am in head-scratchy mode with the mentality that musical instruments bad, touchy computer good...

I guess I am a throwback—I got early training on woodwinds, then went the Satan route of GTR and pop music. After engineering and producing for a while, I am now (don't ask me how) making outboard gear (Valvotronics) and composing again, using primarily a computer. However, I like being able to trace every nice thing about me back to something taught by a woman, everything I do in sound goes back to my youthful training in orchestra class.

Maybe there is nirvana in a silicon only diet. Maybe I am an old fuddy-duddy (I'm not that old!) but playing is good and virtual is virtual. I know I am a money-grubbing yank, but please print the pricing when available? And, dual monetary

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types would be nice—especially when you talk of price drops.

I love this mag—I quote it all the time, because the equipment reviews are complete, and the least biased—compared to many 'CA' publications.

RA Derby, US whiner

Tim Goodyer replies

It may be unusual to readily agree anything concerning money, but in this case I concur. Having discussed the issue of published prices with various manufacturers in the past, however, it's clear that *Studio Sound's* international circulation is a cause of acute nervousness to many of them. Officially, their concern is that people in different territories will not readily recognise factors such as shipping and import duties when comparing prices—with quite obvious consequences. Less officially, encouraging direct comparison of prices between different territories compromises certain styles of sales and marketing.

I could quote numerous situations that have arisen over what various manufacturers have regarded as the 'right' price for publication—and even more over what's not. As it stands, the prices you see printed are those that are readily available, if any, along with some indication of where a particular product sits in a range or in a market. It's not ideal, but it's what the

Studio Sound September 1999

industry dictates. On a more positive note, one factor that might go some way to reconciling international pricing is the Euro, of course, but then you're just a 'money-grubbing yank'.

Soft deliverance

I HAVE BEEN enjoying Simon Trask's excellent 'Soft Focus' series in *Studio Sound* despite initial scepticism concerning its appropriateness in the pages of a professional audio magazine. I, like many of your readers, I am sure I have been steeped in substantially more up-market and up price equipment and had developed a healthy loathing for any 5-pin DIN equipped PC with pretensions to professional applications following very early bad experiences. I was drawn into the Opcode article (*Studio Sound*, August 1999, p68) and have since gone back and read all the other profiles in the series.

I now feel comfortably up to speed on the directions of the relevant products even though I can't pretend that it has changed my opinions about the suitability of the equipment we use.

But more importantly my degree of ignorance on MIDI + Audio devices had reached the point where I have felt embarrassed to ask anyone younger to explain it all to me. Mr Trask has allowed me save face in the privacy of the smallest room in the building.

**Anton Cartwright,
Mesmera, Germany**

THE WORLD'S DEFINITIVE

DIGITAL MUSIC CONSOLE ...



RUBY REWARDS



STUDIO SOUND'S GREAT GIVE-AWAY continues with TL Audio's C1 Classic Compressor. The C1 follows the likes of AKG mics, an Allen & Heath console and a Marantz CD recorder (among other classic kit) in marking *Studio Sound's* 40th anniversary. In every issue of the magazine until the end of the year, you will have the opportunity to win a selection from the *Studio Sound* Ruby series listed below. The current model C1 (*Studio Sound*, May 1999) is a refinement of the earlier C1 compressor (*Studio Sound*, November 1994) that found ready rack space in many of the world's best recording studios. A valve model in the best tradition of classic audio processing, the C1 features a low noise solid-state preamp followed by two General Electric ECC83/12AX7A valve stages per channel and uses a proprietary transconductance stage instead of VCAs. The frequency response of the C-1 is virtually flat between 20Hz and 40kHz, and measured between -3dB points, the C-1's bandwidth is 5Hz to 70kHz.

ALL YOU HAVE to do to secure a unique Ruby issue TL Audio C1 is to answer correctly the questions below and select a suitable bottle of ruby wine in anticipation of your success.

THE QUESTIONS

- Q1 Which colours have been associated with the TL Audio outboard range?
- Q2 What is the name of TL Audio's new large-scale valve console?
- Q3 What is the name of TL Audio's chief designer?

CLOSING DATE: 1st DECEMBER 1999

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

As long as you are a registered *Studio Sound* reader, you may enter any number of installments of the competition as long as you do so separately (multiple entries will be collected and used as fuel for *Studio Sound's* summer barbecue season), and include your Unique Reader Identification Number.

...include your Unique Reader Identification Number.

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



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- Drawmer DS201 dual gate
- EMO E520 Single DI box; E445 cable tester; E325 3-way mic splitter
- Genelec 1029 monitors
- Joemeek VCI compressor
- KT CN-360 graphic
- Marantz CDR640 CD recorder
- TL Audio C1 Classic compressor
- Purple Audio MC76 compressor

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

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Toronto

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September

2-5

AES UK Conference: High Quality Audio Coding

Florence, Italy.
Contact: AES.
Tel: +44 1628 663725.
Email: uk@aes.org
Net: www.aes.org

5-8

Plasa 1999

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

10-14

IBC 99

RAI, Amsterdam, Netherlands.
Contact: Michael Crimp
Tel: +44 1525 750880.
Email: ibcpress@compuserve.com
Net: www.ibc.org.uk

15-17

Infocomm Asia

Singapore International Con-
vention Centre, Level 4.
Contact: Infocomm Asia
Tel: + 65 297 2822
Fax: +65 296 2670.
Net: www.infocommasia.com

23-26

Nordic Sound Symposium

Bolkesjø Mountain Hotel,
Bolkesjø, Norway.
Contact: Richard Andersen
Tel: +47 67 54 14 83.
Email: riander@online.no

24-27

107th AES Convention

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

25

Fall Film Conference 'Screen Shadows: The Technology of Movies'

Warner Brothers' Ross Theatre,
Los Angeles, California USA.
Contact: Bryan Nella, SMPTE.
Tel: +1 914 761 1100 ext 1100.

Fax: +1 914 761 3115.
Net: www.smpte.org

October

8-17

Telecom 99

Palexpo, Geneva, Switzerland.
Tel: +41 22 730 5969.

12-13

DVD Conference Europe 99

Alfa Lisboa Hotel,
Lisbon, Portugal.
Contact: Understanding
& Solutions.
Tel: +44 1582 607744.
Email: DVD99@undansol.co.uk.
Net: www.undansol.co.uk.

14-18

IBTS 99

Milan Fair, Pavilions 9/1
and 9/2, Milan, Italy.
Contact: General Secretariat
Tel: +39 02 481 5541.
Email: assoexpo@assoexpo.com.
Net: www.assoexpo.com.

15-17

MusicBiz 2005

Ex'pression Centre for New
Media, Emeryville, California, US.
Contact: Keith Hatschek.
Tel: +1 415 227 0894.
Email: info@hatschek.com.

21-23

Broadcast India 99

World Trade Centre, Mumbai
(Bombay), India.
Contact: Kavita Meer, Saicom.
Tel: +91 22 215 2721.
Email: saicom@bom2.vsnl.net.in.
Net: www.saicom.com
/broadcastindia

20-23

LLB 99

Sollentunamässan, Stockholm,
Malmvägen 2, S-19123
Sollentuna, Sweden.
Tel: +46 8 92 59 00.
Net: www.solfair.se/llb/

November

2-3

24th Sound Broadcasting

Equipment Show

NEC, Birmingham
Contact: Point Promotions.
Tel: +44 1398 323 700.
Email: info@pointproms.co.uk
Net: www.sbes.com

18-21

Reproduced Sound 15

Residential Weekend, Stratford
Victoria Hotel, Stratford upon
Avon, Warwickshire, UK.
Contact: Institute of Acoustics.
Tel: +44 1727 848195.
Fax: +44 1727 850553.
Email: acoustics@clus1.ulc.ac.uk

19-22

SMPTE Conference and exhibition

New York Marriott Marquis,
New York, US.
Contact: Bryan Nella.
Tel: +1 914 761 1100.
Net: www.smpte.org

22-24

Messe Frankfurt

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

December

8-10

Convergence India 99

Pragati Maidan, New Delhi, India.
Contact: Exhibitions India.
Tel: +91 11 463 8680.
Fax: +91 11 462 3320.
Email: exhibitionsindia@vsnl.com
Net: www.exhibitionsindia.com

February 2000

19-22

108th AES

Palais des Congres,
Paris, France.
Contact: Hermann A O Wilms.
Tel: +32 2 345 7971.
Email: 108th_exhibits@aes.org
Net: www.aes.org

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Audient ASP 8024

The resurgence of the analogue console continues with Audient's ASP 8024, bringing quality, simplicity and affordability to the party. **Dave Foister** gets an invitation

IF THE DIGITAL CONSOLE is a Ferrari (or perhaps, at the more affordable end, a Porsche) then for many the analogue console is still a Rolls-Royce. In areas where DSP muscle, total automation and bucket-loads of on board effects are not especially relevant, the sonic attributes of analogue circuitry and a real control surface populated with real knobs and switches have a strong appeal. Expertise in the field still abounds, and David Dearden and Gareth Davies personify that expertise. The two Ds whose Association founded DDA, they are now reborn as Audient, with a novel business approach and an instantly familiar analogue console.

The novelty lies in the fact that Audient concentrates on its core strengths of research and design; actual manufacture is contracted out elsewhere and sales and marketing are in the hands of close associates who are nonetheless third parties. In a world where outsourcing is increasingly the sensible option, and manufacturing has become ever more sophisticated, this all makes good sense.

And good sense also lies at the heart of the ASP 8024 mixing console. ASP is for Analogue Signal Processing, while the number indicates 80 inputs and 24 output buses. This is a slight simplification, as the number of channel strips can be increased to 60, giving a total of 128 inputs, and the output capability is more flexible than the 24 buses might suggest, but it gives an idea of the scale of the desk. The overall geography is conventional in-line, with a spacious master section and some common-sense aids to navigation. The surface is big enough to impress yet compact enough to reach, with few operational shortcuts to fit the functionality into the frame.

The familiar difficulty of identifying which channel elements have been allocated to the two signal paths has been addressed in a very straightforward manner. Assuming the two basic functions of input and tape return, a simple light-dark colour coding identifies the panel areas normally associated with each. Thus the mic input section, the routing area and the short fader are dark, while the long fader, the auxes and the EQ are light. Most blocks can be flipped between the paths, and a suitably coloured switch shows whether this has been done. There are also plenty of illuminated buttons, and backlit labels shining through the panel, to show what's going on.

This is made possible by the interesting choice of panel material, a finish that

looks good and allows practical touches such as the illuminated labels. The panels are polycarbonate, with a metallic finish and print on the underside, so that it cannot be rubbed off. This means that there are scribble panels everywhere, really no more than silver areas delineated by printed lines, that can be written on and rubbed off even though they look like an aluminium surface.

The resulting pale metallic grey finish is complemented by restrained, almost pastel shades on the knob caps, making the whole thing very easy on the eye. Controls are easy to identify and the geography intuitive; this is a desk you can sit at and work with almost instantly. There are no dual-concentric knobs in sight, and in spite of a fairly high density there is plenty of finger space between controls.

The surface looks particularly sleek because it is not modular, but built in units of 12 channels. There are clear manufacturing advantages to this, including the fact that boards run across the desk rather than up and down, grouped by function rather than channel. The usual down side is access for maintenance, but this is particularly easy on the ASP 8024 as the removal of a couple of bolts allows whole sections to be hinged up and unclipped quickly, with the hope that dealers will carry spare sections for quick turnaround.

The meter bridge stands up high at the back, with bar graphs for all the tape returns and simple signal presence indicators for the input stages. As with so much else, these functions can also be flipped so that the big meter shows the signal in the input path. The meter scaling is unusual and makes it apparent that Audient assumes the console will be used with digital multitracks. In fact the scales look like those on a digital machine, with zero at the top and a division lower down. The division has been set sensibly at -18, corresponding to a signal level out of the console of 0vu (+4dBu).

The channel facilities are comprehensive and logical. The path begins with a mic preamp of which Audient is particularly proud, with careful design to produce a performance comparable with the kind of outboard pres increasingly used as a substitute for mediocre console circuits. The design is such that no pad is necessary to handle a wide range of input levels, the only switch being the line input selection. The block also includes phantom, phase reverse and high-pass filter switches.

The short fader follows, feeding the



12 routing switches. These go to either 1 to 12 or 13 to 24, and the fader's pan pot can be switched in for stereo pairs. The assumption is that this will be the path to tape by default, and the tape returns come back to the long faders and big meters. No automation is fitted at all, although Uptown moving fader automation will be available, and the fader well has been designed to accommodate virtually any retrofittable third-party automation, either moving fader or VCA.

EQ is simple yet flexible, and again of a very high quality. Shelving high and low sections have two switched frequencies each, and the two mids are fully parametric with an overlap of a good couple of octaves. 15dB of boost and cut is available on all, and the package gives a very musical and smooth sound. For increased versatility these two sections can be independently flipped into the input path.

Auxes abound; the eight knobs conceal the presence of 14 sends as six of them can be switched in pairs to alternative buses. This leaves two dedicated feeds intended for foldback use, and these are the only two that can be individually switched between the paths—all the others are switched in pairs. Pre/post switching is also in pairs. To overcome the problem of feeding both paths to the same outboard unit, the master section includes an unusual aux matrix facility alongside the master level controls. Switches under the pots allow Auxes 3 and 5 to be sent to the aux 1 bus, 4 and 6 to Aux 2, 9 and 11 to 7 and 10 and 12 to 8—a simple touch but hugely flexible.

As if this were not enough, there is a novel facility for using the short faders and main buses as additional aux sends. Each short fader has a switch that feeds it with the signal from the corresponding long fader, and its usual routing can then be used to send the signal to the 24 buses, effectively turning the buses into 24 post-fade auxes for mix-down, with the extra advantage of proper faders instead of rotary knobs for adjustment. For those few stereo reverbs that actually deal properly with a stereo input, this may in fact be the preferred way of working, as pairs of buses can be assigned to the short fader complete with panning.

Four simple line level stereo returns

round off the input complement, with level trim, feeds to auxes A and B, simple EQ and a full long fader. Eight sub-groups are provided (mix groups rather than VCA subs); they are fed from the first eight bus switches and can be fed to the main mix bus via pan pots or used separately.

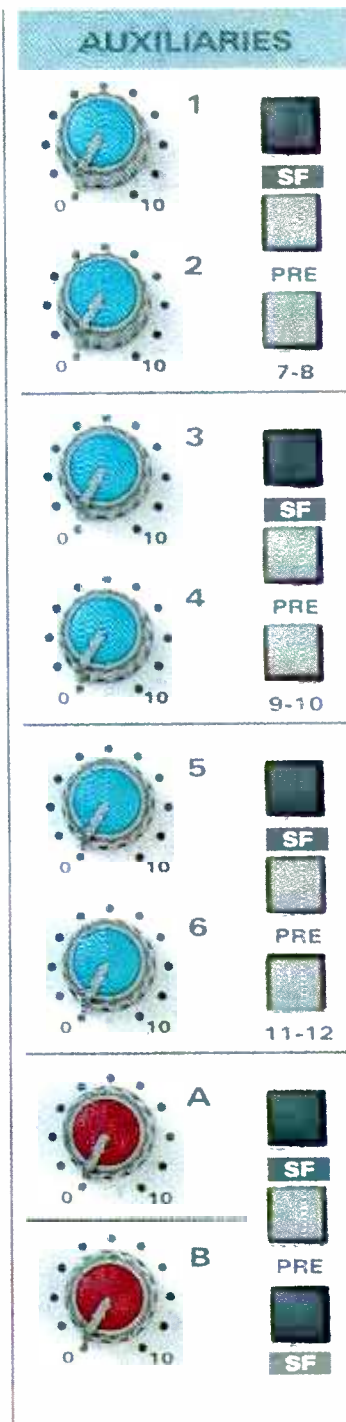
These are found on the master section of the panel, which is unusual in having acres of space devoted to it. Normally real estate is too precious to allow this kind of spreading out, but here the result is a comfortable mixing position with everything under the hand without the need for a map or a magnifying glass. Also found here are selectors and trim controls for four sets of control room monitors, studio loudspeakers, and two foldback sends. The studio and foldback outputs have some nice touches; they can be independently fed with the main stereo mix, either of auxes A and B (sent left, right or centre) or either stereo tape return, or any combination of them.

Solo facilities cover all the expected requirements and offer a couple of extra twists. Solo in place normally physically mutes all the non-selected channels; here it simply replaces the mix bus with the soloed channels, avoiding the need for expensive switching on all the inputs. This misses my most frequent use of SIP, which is to hear a channel with its reverb while cutting all the other feeds to that reverb, and leaves me wondering what it can be used for that AFL can't do. On the other hand, there is a very useful feature that I have only rarely seen elsewhere, that allows the mix to be heard at a low level behind the selected solo signal. There is even a balance control to determine the relative levels of solo and mix, allowing the soloed channel(s) to be heard in context while still standing out for special attention.

Above the main mix bus fader is a deceptively simple group of controls that inserts a stereo compressor into the mix outputs—a surprising frill on a console that has no dynamics anywhere else. There are three switched ratios, switched attack and release times with an automatic programme-dependent release setting, fully adjustable threshold and variable gain make-up, with a main in-out switch. This turns out to be no mere afterthought or gimmick; the

compression works extremely well, with enough control range to do most things from subtle protection to heavy squashing, all with superb sound quality. This is a real bonus, and very easy to set up.

Sound quality is of course paramount in a console that prides itself on representing the advantages of analogue. Audient has been careful with the



Here are the notes we talked about...
Thanks for lunch!



we have a new logo too!

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http://www.summitaudio.com

Email: sound@summitaudio.com

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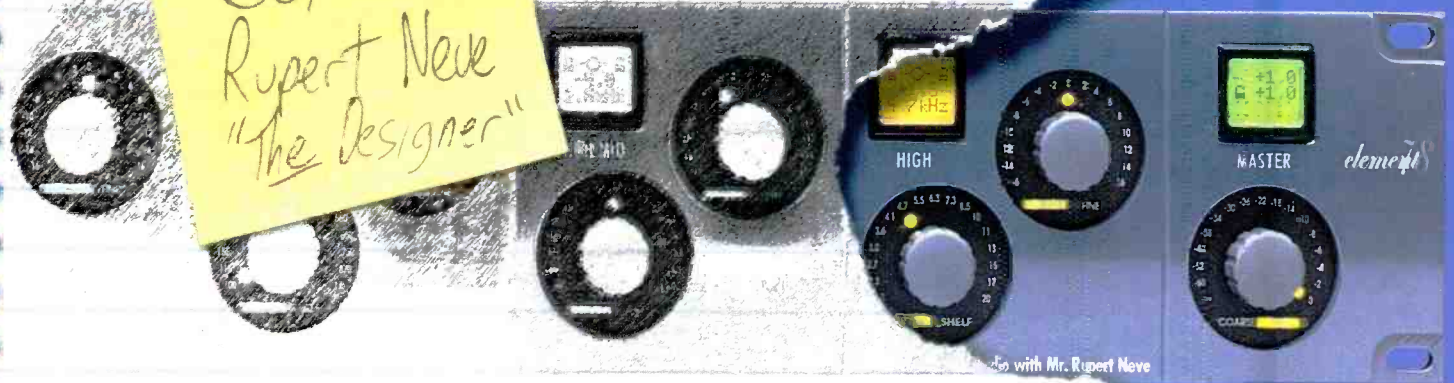
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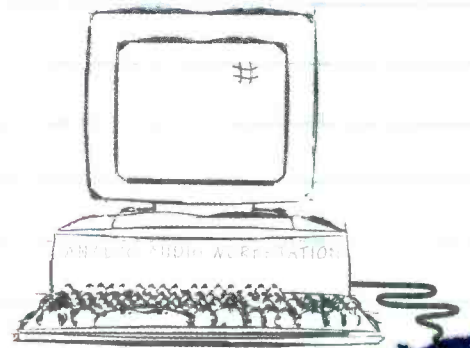
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- ✓ .0009 THD
- ✓ FLAT 1-look

DIGITAL
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- ✓ on board user presets
- ✓ external controllers:
 - ✓ -Digidesign Pro Control (with PT)
 - ✓ -Yamaha 02R
 - ✓ -Mackie H.U.I.

200k

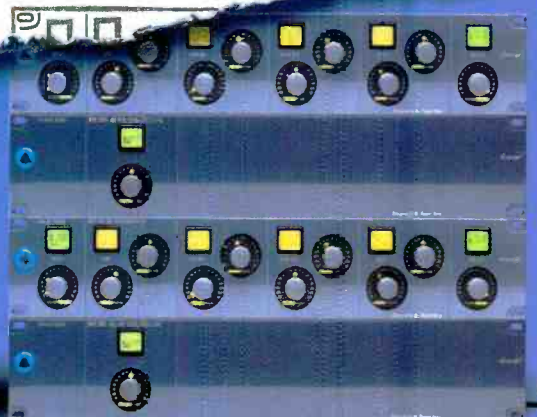


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< integrity of the signal path throughout; besides the fact that the channel board construction means a drastic reduction in the number of connectors, there is no electronic switching anywhere. Gas filled relays do the job wherever remote signal switching is needed, and the signal path through the monitor section is pretty minimalist. Specifications are superb, with excellent noise, distortion and crosstalk figures throughout. Attention to detail is the recurring theme; for instance, the insert sends are ground-sensing pseudo-balanced, but great care has been taken to ensure proper impedance matching in the two legs, a characteristic often overlooked. All main outputs are of course fully electronically balanced.

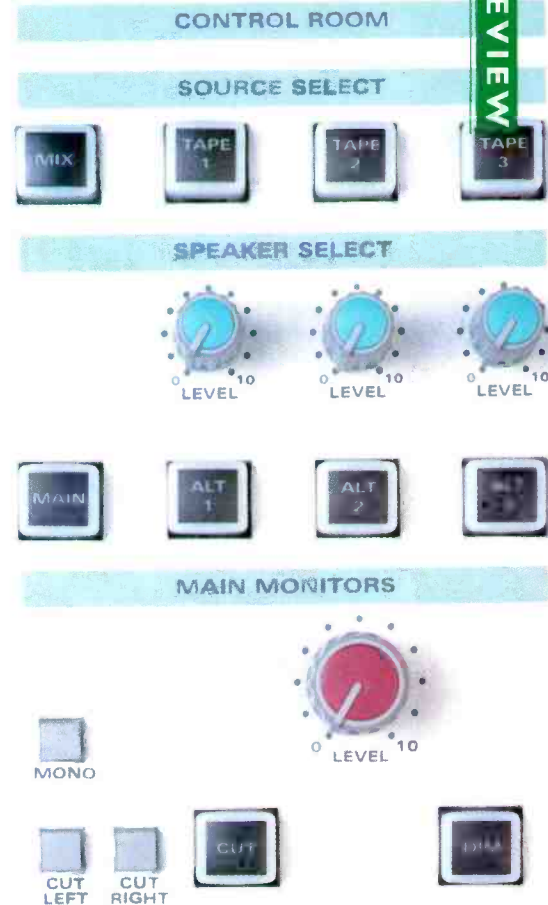
Nothing has been skimped in the mechanical construction either. The frame is sturdy and stiff, with torsion bars running the length of the bucket to keep it rigid. The stand comes with the desk as standard, with adjustable feet and cable boxes built into the legs. All connectors appear on the back, and are mostly XLRs and TRS jacks; the only multis are for the multitrack sends and returns, and are D-sub as standard with EDACs as an option. The power supply is a silent convection-cooled unit using traditional technology, and again its manufacture is contracted out to the

company that used to make Neve PSUs.

This is a desk that you can feel comfortable with as soon as you sit in front of it. Everything you could expect to find on it is there in a sensible place, often with unusually clear indication of what it is doing and how it is set. Further exploration reveals several simple and useful things you might not expect; all of these work very well indeed and reflect the years of experience and accumulated expertise of Audient's founders. This is by no means a run-of-the-mill console; although it does things in a very familiar way, it does them with imagination and flair. The final—and biggest—surprise is the price. There is little or nothing else on the UK market of a comparable nature at £14000, so that the ASP 8024's only real competition is a refurbished second hand console—and, indeed, a restored classic and the Audient are likely to appeal to the same kind of potential purchaser.

Contact
Audient, UK.
Tel: +44 1256 381944.
Fax: +44 1256 381906.

However many do-it-all digital desks there may be, there is still a market for this kind of analogue quality and simplicity. There are still areas of the business where the accessibility and sheer sonic integrity of a properly-designed analogue console is far more important than the processing power that comes with digital, and for people in those areas the Audient will surely put a smile on a few faces. ■



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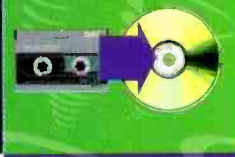


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ADAT Edit

Alesis has made light work of turning an ADAT into a digital audio workstation through the ADAT Edit package. **Rob James** makes the upgrade

ALESIS HAS A REPUTATION for surprises, usually pleasant ones. From early reverbs to the ADAT digital multitrack recorders, the key selling point has been providing good if not outstanding functionality at a very reasonable price.

With the rise and rise of the digital audio workstation, helical scan digital tape recorders are no longer enough for many applications, however clever they have become. But tape is not dead by any means and still makes a lot of sense as a recording medium. Tape also has a role to play in project interchange and as an archiving medium.

The ADAT Lightpipe interface has become a de facto standard for digital audio interconnection. The convenience and immunity to electrical interference of a single fibre-optic Toslink 'cable' connecting eight channels of audio cannot be ignored. This, together with the availability of low-cost components to other manufacturers has led to widespread use and acceptance. Consequently a fair number of the current rash of PC audio interface cards are equipped with the ADAT Lightpipe.

It makes perfect sense for Alesis to offer their own solution to the integration of ADAT tape with a DAW. The surprise is the extremely reasonable cost. The shrink-wrapped product actually contains a tiny PCR card equipped with two optical connectors for eight channels of I-O and two 9-pin sub-D ADAT sync connectors. Also included are two 3m optical cables, a 3m ADAT sync cable, a single CD containing software and a slim printed manual. The applications supplied are drivers for the card, ADAT Connect and ADAT Edit. ADAT-Edit setup songs are also included that contain the proper settings for using ADAT-Edit in Master or Slave mode. All of these come in both PC and Power Macintosh (G3 preferred) flavours. ADAT Edit is in fact a version of EMagic's MicroLogic package. All this comes at less than the cost of most bare multichannel interface cards. So what is the catch? Well there are one or two but I will come to those later.

It could be imagination or just sheer luck but I think add-on PC cards are getting better. The last two or three I have had for review have all installed in a literal 'plug-and-play' manner. A far cry from earlier specimens which required endless messing about with IRQs (Interrupt ReQuests) memory addresses and DMA (Direct Memory Access) settings. The PCR card dropped into a PCI slot, the software installed in textbook fashion and worked first time. I used a 450MHz PIII with 128Mb of RAM and a 7200rpm IDE drive. I also had an ADAT XT20 for the review.

For PC use the drivers support both the Windows multimedia and Asio standards. The eight ins and outs appear as four stereo pairs in the usual Windows multimedia manner. The skinny manual covers the installation, system optimisation ADAT Connect and

potential problems with commendable clarity. Unfortunately, the manual for ADAT Edit is a whopping great PDF file. For most purposes it is advisable to make the computer master and the ADAT machine(s) slave(s). In this configuration the computer controls the physical transports which is generally more convenient.

In many ways ADAT Connect is the more interesting of the two applications as it allows transfer of tracks between the PC and any connected ADAT recorder with claimed sample-accurate synchronisation.

The main screen uses Status buttons for each track to determine whether the transfer is to or from the PC. Corresponding horizontal bar graph meters show the level. Start and end times for each track are displayed together with file information. Adjacent odd and even tracks may be linked as stereo pairs. An autolocator with up to 16 locate points helps to make complex transfers easier. Check boxes allow selection of AutoTransfer and or Rehearse. The transport controls replace the usual Record key with a TRANSFER button. The software defaults to 48kHz sampling rate so, if you habitually work in 44.1kHz you will need to set this manually each time you use the software. Up to eight tracks can be transferred at once, if the computer-hard drive can cope. Selecting a track opens a Save dialogue box where the file location, type and name and the bit depth are chosen. 16, 20 or 24 bits may be selected, depending on the bit depth of the source. Transfer times, start and end, can be captured on the fly from the tape. These values can be edited or new values typed in. After messing about with odd mono and stereo files I bounced a 6-channel mix from the PC to ADAT and back again with no problems. The only minor annoyance with multitrack mixes is the necessity to enter the file name for each track. The default is 'TrackX' (where X is the track number). It would be nice if after you change the first track to say 'Armageddon1' the second offered you 'Armageddon2' instead of 'Track2' Each file created is time stamped with the start time. This enables material to be put back on tape with sample accuracy. However, certain editing operations such as truncation or the addition of reverb will invalidate the time stamp. Also certain third-party applications do not retain the time stamp. Alesis suggests the time-honoured analogue method of avoiding problems—write it down. Material can also be moved to a different time by changing the temporary Start and End times in the File Information dialogue box. This does not lose the original time stamp.

As mentioned earlier, ADAT Edit is a version of EMagic's MicroLogic software which only works with the ADAT PCR card. It will be instantly recognisable to anyone familiar with the EMagic way of doing things. There

are, as you might expect, some limitations. The most annoying is that ADAT Edit is limited to 16-bit source files. You are also limited to two effects. Of course there is an upgrade path to Logic Gold or Platinum which removes these limitations and several others. An external ADAT machine can be controlled via MMC which gives useful integration. The usual caveats about sampling and frame rates apply. ADAT Edit can also load and play digital videos in AVI format for Windows, or QuickTime format for Macintosh. The picture runs synchronously with ADAT Edit's song position.

Songs created with ADAT Edit for Windows can be opened in ADAT Edit for Macintosh.



The main menu bars are similar. Unlike Windows, Macintosh OS does not use 3-character file extensions. When transferring from Macintosh to Windows, it is important to add the file extensions. This may be done on either the Macintosh or on the PC.

The main screen is the multitrack recorder or Arrange window. The track display contains narrow objects or 'sequences' representing individual recordings. Each time you record, a sequence is created in those tracks armed for recording. The sequence is a container, which holds the MIDI or audio data. MIDI data can be notes as well as control data, program changes, or SysEx data for MIDI tone generators. Notes can be entered in real time from a MIDI keyboard or manually entered >

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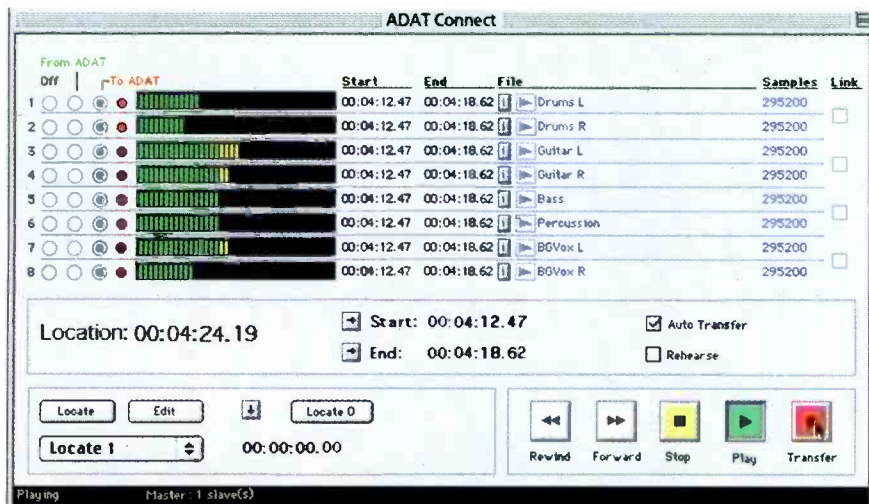
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< in piano roll or music notation screens. Tracks can be moved around in the Arrange window, the MIDI tracks can be given a different sound, or divided into sequences. You can cut, copy, move, transpose, or quantise to a grid.

A loop function enables a passage to be repeated as many times as required. As alternatives to the arrange window, MIDI events can be displayed as an alphanumeric list in the event list window or notes can be shown as blocks in the Matrix editor window or in notation in the Score window.

Audio editing is a mixture of destructive and non-destructive processes. The Sample Editor is opened by double-clicking on an audio track.

ADAT Edit uses 'tools' for cut and paste, erase and so on. Clicking on a tool in the toolbox attaches the function to the relevant mouse button. The icons chosen are more penetrable than many. Scissors cut, a rubber erases, glue merges. When copying and cutting, the object is copied to the clipboard. From there it can be pasted to other locations as many times as required. There is a single level of undo.

The Transport window is a small, floating window 'always on top' and contains the controls for operating the playback, cycle, and other transport functions. In ADAT Edit parlance autopunch is known as Autodrop. Non-destructive editing is done in regions where a region is automatically created when you

record an audio file and when you edit recordings in the Arrange window. A region has a start and end point and also a sync point known as the 'anchor'. In the Sample Editor, the anchor is denoted by a triangle under the waveform. If no anchor is user defined it is assumed to be the start point of the region. The Sample editor also enables selection of areas to form new regions and destructive edits on selections of regions.

The Functions menu accesses DSP processes—Normalize raises the level of an audio file to the maximum level, without clipping. Change Gain, raises or lowers the output level of the file by a percentage. Silence replaces the selection with digital silence. Invert reverses the phase of audio files. Fade in, Fade Out and Reverse do what they say. Trim erases the selection from the hard drive. Remove DC offset centres the waveform on the zero axis.

There are three 'Digital Factory' functions, sample-rate conversion, the Time Machine and Audio Energizer. The Time Machine enables time domain functions to be undertaken including time compression-expansion and pitch transposition. The settings are represented by the position of a dot on a graph with time and pitch as the axes. The Time Machine is claimed to analyse the spectral components and dynamics of the sound, and then process the result. When processing stereo files, the phase relationship between left and right channels is not affected. The Audio Energizer is intended to increase the perceived volume of the audio material, while altering the sound as little as possible and



without causing clipping.

Audio and MIDI tracks may be freely added in the Arranger. Newly created audio tracks appear below the selected track, and then have to be defined in the parameter box before they appear in the mixer. The mixer is 'adaptive'—it reconfigures itself automatically to mirror the tracklist, and displays MIDI and audio channels in the same way. Each audio channel has a simple, fixed frequency and Q, 3-band equaliser and two auxiliary sends for the internal effects. Any MIDI object can be mixed using the standard GM controllers. The switches and controllers of the MIDI tracks' channels remotely control parameters of the tone generator. To do this, the mixer produces controller events, which cannot be automated. The mixer indicates the program, volume, and pan settings in the instrument parameter box and controller events are also shown in the tracks.

Bus 1 and 2 faders appear to the right of the last audio track strip. These are the internal effects returns. There is also a stereo fader, which acts as a master volume control for all the audio tracks.

Automation for audio tracks is achieved by recording MIDI controllers as automation data is to the corresponding track in the Arrange window audio tracks. On playback, the MIDI data is used to control the mixer. These MIDI events can be edited in the same



way as other MIDI sequences.

General MIDI tone generators can be controlled remotely from the Mixer window. The GS (Roland), and XG standards (Yamaha) are also supported. With these, extra sound and effect parameters can be remote-controlled, for example, the filter frequency. ADAT Edit multi-tasks with other MIDI programs provided you use a MIDI interface with a multi-client driver.

Audio data can be mixed in the Arrange window using the glue tool. This is non-destructive since a new audio file is created. The mixer settings determine the pan and vol-

ume levels in the new file. Automated changes in level or pan are not recorded in Digital Mixdown. This can be achieved by using the Bounce function activated by the Bounce button on the Mixer Master Mixdown can be done during song playback. The software replaces the selected region with a new region generated from the merged file. During Mixdown, ADAT Edit automatically maintains the maximum level without clipping. Processing is 32-bit resolution.

I also used the ADAT PCR card with my current favourite PC hosted application, Samplitude 2496. This was completely drama free and files created in Samplitude were easily bounced to ADAT and

the files from ADAT Connect work perfectly in Samplitude.

The ADAT Edit application is not totally bomb proof. I did have a number of unexplained crashes and a certain reluctance to play audio in some circumstances. I also found the mixer graphics unclear. However, I think Alesis have come up with a highly attractive package. I consider it almost essential to anyone who owns an ADAT recorder

and a computer whether or not they already own sequencing software. It is also well worth considering for anybody just looking for a multichannel audio interface. ■

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MTA 924

Spanning the gap between its entry level and top end products, MTA has arrived at an impressive 24-bus in-line design. **Zenon Schoepe** reports on affordable big desk feel

THOUGHTS that Malcolm Toft's MTA console company has settled in to a nice niche market with its refined mid-market analogue desks is missing the point. His Intermix modular mixing component system is planted firmly in mass-market land and still represents the only product of its type that allows you to combine 16-channel desk parts to create a custom configuration or to apply certain components in isolation as a convenient means of expanding, for example, an existing desk's aux capability or functionality.

The new 924 desk fills the gap between the Intermix system and MTA's bigger boards and as such is not dissimilar to the Trident founder's old Trident 24 console in terms of approach. As a point of interest there is a remarkable parity in cost between the 924 and the old 24 except that the new 924 outstrips the old desk on just about every count. It's a pertinent demonstration that we do indeed get very much more for our money today and it's generally smaller and better all round.

There are certainly few desks that offer this sort of quality for this sort of money, unless, of course, you buy second hand. The 924 is unusual at this price point in having 24-buses and it's available in 24, 32 and 40 input sizes all of which are expandable in 8-bus sections. Prices start

at £7,800(UK) and rise to around £10,900(UK).

All other products in the MTA range remain current with the top of the tree occupied by the 980/990 which are split and in-line in design respectively. The 900 is a stripped down 980 with virtually the same module although physically compressed and has the fader in the same panel as the module which saves cost and uses an Alps fader instead of P&G. On the monitor section it has 2-band swept EQ instead of the 4-band arrangement on the 980 and doesn't come with a patchbay as standard. The 900 starts at around £17,000 with the 980 and 990 kicking in at around £32,000. The 924 bridges the gap between these desks and the Intermix.

The things that link all MTA desks across the range is that they all share the same mic pres and EQs and 8 auxes on the channels however a major difference is that all models above the 924 have internally balanced buses.

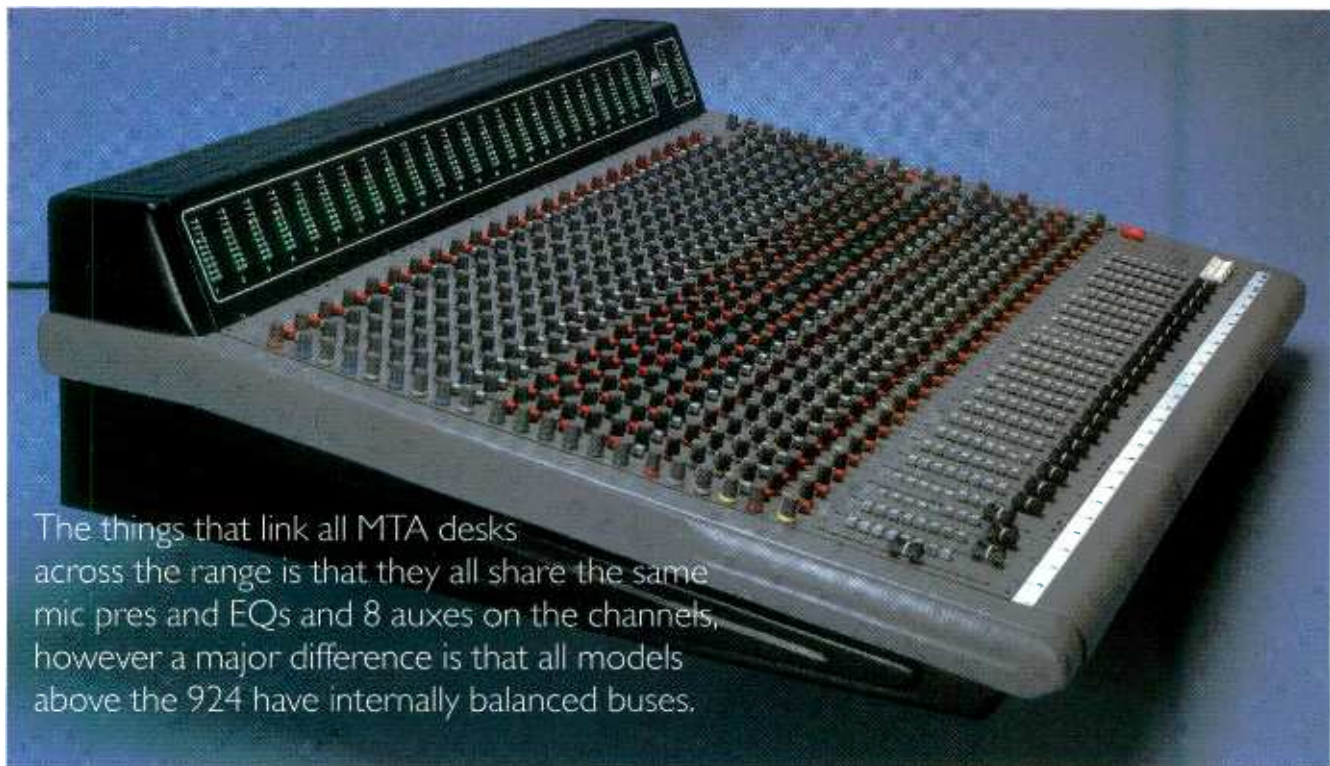
Toft consequently describes the differences as a packaging exercise of facilities that make the different price points attainable. Savings in the 924 have therefore been made not in the electronics and spec side of the desk but in other less important areas. The desks is smaller than previous models and is a table top frame which works in blocks of four physical modules although chan-

nel electronics remains separate within this. It means you can strip modules out for servicing which is something that cannot be said about many desks in this area of the market.

In terms of strip features the 924 runs a 980 fairly closely but doesn't have things like the ability to send an aux to the groups when they're not being used and it doesn't have fader reverse or full 4-band EQ on the monitors or the meter options or built-in patchbay.

It interesting to note that the 924 is able to accept the new Audiomation moving fader module which makes a surprisingly attractive proposition for those who are looking for an affordable motor fader analogue desk. The desk is also described as being Optifile Tetra ready. There is an optional 19-inch patchbay extension and the desk can indeed be extended beyond 40 channels in the aforementioned 8 module blocks for those who might be tempted. It runs from a 2U-high external PSU.

Going down the channel strip connectors you have mic input with phantom power selected individually, line input, channel insert, direct out, group insert and group balanced output plus a tape return. The Master section has connections for three 2-tracks, inserts on master LR output, main balanced stereo output, monitor output, oscillator output (very grown up), studio >



The things that link all MTA desks across the range is that they all share the same mic pres and EQs and 8 auxes on the channels, however a major difference is that all models above the 924 have internally balanced buses.

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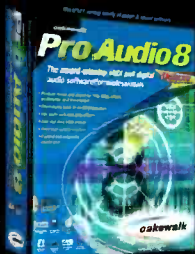
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< stereo playback, four effects returns, alternate speakers, and the eight balanced auxes.

Channels have a wide ranging mic-line pot with line selector and phase reverse and then we're into the famous MTA EQ. This is made up of four ± 15 dB swept bands with reciprocal curves and ranges of 1–15kHz (HF), 700Hz–10kHz (HMF), 150Hz–2kHz (LMF), and 40–650Hz (LF) with a Q of around 1.5 plus a 50Hz high-pass filter.

There are 8 auxes in the channel path: 1 and 2 are mono and prefade, the remainder are stereo and pre-post switchable. Level and pan pots for 3 and 4 can be switched to access Auxes 7 and 8 and can be switched into the monitor path. This is a surprisingly efficient and flexible arrangement despite its simplicity and makes you wonder why other desks are so frequently compromised in this department.

All EQs sections, and by that I mean even the ones on the monitors and stereo returns, have LED associated bypasses which is a nice touch but most significantly for me there are mutes on the aux sends, something that a lot of desks have forgotten about.

The Monitor section has group-tape switching, the same 80Hz and 12kHz shelving EQ as the stereo returns, a group trim pot, pan and monitor level plus AFL and, in common with the channel and stereo returns, LED equipped mute. The channel strip is rounded off with a pan, AFL, signal present and peak LEDs (something you won't find on the more upmarket MTAs) plus routing to the main mix and the 24 buses via six shifted buttons.

Stereo returns are stacked two to a strip, have the EQ as described, identical aux access to that on the channels, and are controlled by half module width faders straight to the stereo mix.

The Master module is a positive delight and crams real big desk features

into no space at all. You can tell more about a desk's pretensions from its master facilities than you ever can from its input strips as it's here that you'll discover if you are able to do anything more than simply mix to stereo. As such the 924 may be a little over-qualified in this respect than perhaps its target buyer will need and many of the features may remain unused. But they're there for all eventualities and you could certainly do a proper session comfortably on this board. Individual aux masters each have solos, there's a three-frequency oscillator with a level pot (max +10dB) routable to all buses while a studio playback section with level pot sources from the monitor mix or Auxes 1/2 and 5/6. There's a solo master level with larger than standard active LED and an alternative speaker circuit with level and on switch.

Control room monitoring can be sourced from three 2-tracks and the results can be monoed or muted. It's the MIX button that collects together the monitor and channel signal paths to the main stereo for remix. Talkback via built-in mic is to the first four auxes, the groups or the studio.

The EQ will need no introduction to anybody who has any experience of any MTA product. It's known for its musicality and thickness and like all good designs (Toft's Trident EQs established the brand as one of the world's most respected) it has a simplicity which belies its power.

There are no bells and whistles on this circuit just four swept bands operating over well chosen frequencies with contours that have an extremely tactile and pleasing response. I've used an MTA Signature Series EQ for many years now and would rate it amongst the finest tracking EQs around. A desk full of it is an

unusual luxury.

I particularly like the use of good old licorice allsort double coloured buttons which leave you in no doubt about whether a switch is up or down which is important as the LED count is not enormous. Solo is stereo AFL on channels and monitors and the meters are peak reading and follow the 24 buses.

What is being offered here is a serious desk for low money. I find that some of the more affordable consoles leave a bit a bad vibe with me because while they may have an impressive range of facilities for the price, they fall short on the feel factor of the more expensive desks they would like to challenge.

This is not the case with the 924 which feels substantial and deliberate in way that inspires confidence. It's the sort of personal impression that can make all the difference when it comes to a crunch job or whether you continue to feel happy to use a desk time after time.

The point is that Toft realises that there is really little gain in designing a desk down to a price electronically because he believes, quite rightly, that this is not what potential purchasers will be impressed or drawn by as it would erode the desk's unique selling point. Costs are cut in how the thing is put together and I believe the Intermix illustrates precisely how far you can go down this route but then it pales in comparison to the real-desk feel of the 924. The fact that he has succeeded in building the 924 for the money he charges is down to his long experience in desk design and don't ever doubt that this console is up to serious work.

If you're tired of your 8-bus desk and want to move on to a 24-bus board with excellent mic pres, EQ, performance and flexibility then this is a desk worth considering. ■

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Maycom Easycorder

A portable solid-state recorder at an entry-level price, Maycom's latest product is made for life on the move. **Neil Hillman** hams it up but is swayed by its charm?

IT'S A MYSTERY TO ME how she found me, and how she came to be in that hovel that my large, greasy landlord's rental agreement laughingly described as commercial premises; and which I in my delusions referred to as an office. I'd managed to avoid that great slug of a guy each time in the last two months that he had dropped by to collect the outstanding rent, but it could only be a matter of time before his sweaty top lip broke into a grin as some equally-trapped musclemen repaid their debt to his numbers racket by playing the xylophone with my rib cage.

'I see your office has not yet received the wisdom of Feng Shui.' She said, looking around the room, her voice was as husky as a Canadian sled with rusty runners.

'I need a job doing, you come highly recommended and even a dizzy blonde like me can work out that you need money fast.

'What I need you to do is report back to me on my elderly husband's business. I suspect that funds are being transferred from the main account without my husband's knowledge, and as I am due to inherit the company when he dies I need to know that the considerable sums involved are not being siphoned secretly

into someone else's pockets.'

'In the event of his death?' I repeated. 'Or as a divorce settlement?'

'Mr. Postlethwaite—although you have dredged the very depths of human nature in BBC local radio, please do not judge other people by yours or the town of Cheltenham's standards. My husband is totally devoted to me, and I in turn to him; he would never cheat on me—but yes, you're right; our prenuptial agreement does specify that his infidelity will also cost him the controlling shares of his multinational corporation.'

A blue plastic attaché case slipped past her heeled nyloned legs en-route to my desk. Big Blue it wasn't, but electronic storage it was.

'This may come in handy. The Maycom Easycorder—a digital solid-state recorder specially developed to record and play back high quality audio material. I want you to enter the company under the pretext of reporting for a radio station and interview my husband, his secretary and the financial controller to see what you can unearth.'

There was a softening in her attitude towards me I noticed as she came to my side of the desk to open the case housing the Easycorder.

'Telephone your findings to me on a regular basis—I have added my personal number to the optional ISDN software to enable the transfer of recorded items. Stay in touch'

So this was not going to be a ¼-inch tape, razor blade and croc-clips on the bare telephone wires job. I set to examine the Easycorder at close quarters.

I discovered that the Easycorder is a portable battery/mains-powered recorder that offers in its basic guise the marginally cheapest entry into the solid-state recording market against the proven abilities of the Nagra Ares-C, Mandozzi DART and Sonifex Courier. In fairness it looked and felt the cheapest too, but in use it soon inspired con-

fidence in quality and robustness of recording. The 2-channel analogue male XLR mic-line balanced inputs and female XLR line balanced outputs are mounted on the right-hand side of the machine along with the mains input on a Canon 4-pin male socket. A ¼-inch stereo jack socket completes the analogue outputs on the right-hand side, its level control adjusted by means of a recessable knob on the top left-hand corner of the front face. The left-hand side of the machine is home to the digital connections with an AES-EBU input on a male XLR, twin phono sockets for SPDIF input and outputs, a 25-pin ECP port for transferring audio between the Easycorder and a notebook or desktop PC and an unshuttered open slot to accept an external PC hard disk, or flashcard, or the optional ISDN modem.

On the top face sits the grille for the integrated 1W playback speaker that is defeated while in record or when a headphone jack is inserted into its socket and the switch panel controlling the dynamics for the 20Hz to 20kHz recording channels. Each channel may select +48V, +12V phantom or dynamic powering; input amplifier sensitivity is switchable between line, mic level or a -20dB pad in the mic input; a 120Hz rumble filter 'on' or 'off' and a twin limiter switched 'in' or 'out'.

The front face is dominated by the large, backlit LCD screen that displays recording levels with a moving parallel bar graph graduated between -60dB and 0dB, with indication on each channel showing whether the limiter is in circuit, which type of mic powering is selected, if the roll-off filter is 'on' or 'off' and if the input is at line or mic level; the screen across the top also shows in which format the recording is taking—whether it is linear BWF-WAV, AIFF or compressed MPEG 2 layer II BWF-WAV, RAW; the audio mode of either mono, mixed mono, stereo or joint stereo; the sampling rate between >

The front face is dominated by the large, backlit LCD screen that displays recording levels with a moving parallel bar graph graduated between -60dB and 0dB, with indication on each channel showing whether the limiter is in circuit



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< 16kHz and 48kHz and the recording time available still on either the 40Mb internal disk or an external disk that can take the cost and the storage up to 140Mb. A battery level display completes the visual feedback from the machine, showing a diminishing stack as the NiMH battery pack works itself down over a stated 6 hours in Record-playback mode. A large twin-concentric rotary fader adjusts the record levels to the right of the screen above smaller transport controls configured in the usual fashion, but with the RECORD button being the largest. The seven slim menu, setup and edit configuration buttons are neatly mounted above the display window.

It was a matter of minutes to master the in-built non-destructive editor that offers a very basic cut, paste and copy service. Switching from Record to Edit is a simple push on the EDIT button while in Stop. This brings up a new screen in the display window showing the selected recorded track as an audio waveform bar graph. It appears to be too large a scale to pin-point an edit 'in' and the audio scrolls through the relatively small window at a rate of knots, but it is possible with a double push on the FF key to play the track at half-speed. A single dab on the FF or REW keys moves the track forward or back by one frame at a time.

The audio Wavefront scrolls horizontally right to left past a small 'head', alluding to a 1/4-inch tape machine, and the edit 'in' point is entered by pressing the MARK button—an electronic chinagraph dot—either 'on the fly' as the track plays, or while 'paused' at the

It was a matter of minutes to master the in-built non-destructive editor that offers a very basic cut, paste and copy service. Switching from Record to Edit is a simple push on the EDIT button while in Stop



appropriate place. The 'out' point is similarly constructed, and from the edit menu 'cut' may be selected.

Sophisticated as the editor on the wonderful yet expensive Nagra Ares-C, it is perfectly possible to edit accurately on the Maycom EasyCorder. What it will mean is that for radio journalists who are for the most part 'topping and tailing' or extracting a sound-bite, it makes sound sense—technically and financially—to not necessarily buy the most expensive recorder on the market.

The EasyCorder's closest cost-rival is the Sonifex Courier, and again while that machine offers more facilities for just slightly more

money, I have no doubt that it will be between these two machines that the hearts and minds of radio journalists will be won.

But in less time than it takes a rabbit to beat a pack of greyhounds 'round the ring and for me to gift another wad to an undeserving bookie, the recordings of daily office life were easily transformed.

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Tri-Tech TS-24

With a look and features list that shouts Trident, new company Tri-Tech's first console effort will have instant appeal to some. **Zenon Schoepe** investigates and compares

BASED ON A HANDFUL of ex-Trident Audio Developments personnel, Tri-Tech is a new small mixing console manufacturer with clearly an eye on attempting to take advantage of the demand that still exists for consoles of classic Trident ilk.

The first product from the company is the TS-24, a desk that conjures up a type of medley of Trident nostalgia with strong visual keying from the late 80 series in particular.

Stylistically the similarities are main-

tained. This is a big split desk with generous strip widths and a refreshingly old-fashioned space is not an object feel. Those pale wood end cheeks and surrounds are evocative Trident symbols and this is carried through to a similarity in the pot caps and a particular oblong switch that was favoured on the later models.

The standard frame size is 32 input with 24 outputs but other sizes are available to order and it comes with a Mosses and Mitchell bantam patchfield's stan-

dard. The price is circa £32,000, although Tri-Tech are offering a particularly attractive introductory offer of £24,000 for a limited period only.

Transformers are available as an option on the mic stage, all inputs and outputs are balanced, the desk is available with 12 or 24 routing buttons, there are a variety of metering options and the desk is described as automation ready.

There is similarity in the features list between the TS-24 and the Trident Ventura, one of the last designs Trident produced and a relatively little known one. Things like the double stacked monitors, the 2-band fixed EQ on the effects returns, and the 3-band EQ on the monitors remind me of it. Indeed the channel EQ, on paper at least, is extremely similar to the Ventura. Now the Ventura was genetically linked to the Series 90 and the extremely attractive Vector. The Ventura's EQ was an interesting hybrid of existing and passed Trident designs and used the filter circuit of the 90 Series and Vector, the two sweepable mids with switchable Q from the Series 90 and the HF and LF switchable frequency shelves taken from the Series 80. And it was the Ventura that was the legitimate heir to the Series 80, not the Series 90 which was very much more desk all over. The TS-24 may look a bit like a Series 80 but some of its facilities look a bit like a Ventura. However it exceeds and improves on it.

You get 12 auxes most with cuts and pre/post switching. The aforementioned channel EQ has sweepable high and low pass filters, switchable two-frequency HF and LF shelves, and sweepable mids with switchable Q. There's a switchable insert with pre/post EQ switching and a clutch of automation switches. Monitors get 3-band swept mid EQ and access to all the auxes through an ingenious method of reducing the pot count but including cuts for all the aux buses as the means of assignment.

The stereo effects returns are grouped four to a module and get 2-band fixed EQ, access to a stereo aux bus, and full multitrack routing. Facilities in the master section are pleasantly vintage with a multitude of buttons enabling the sort of direct access once

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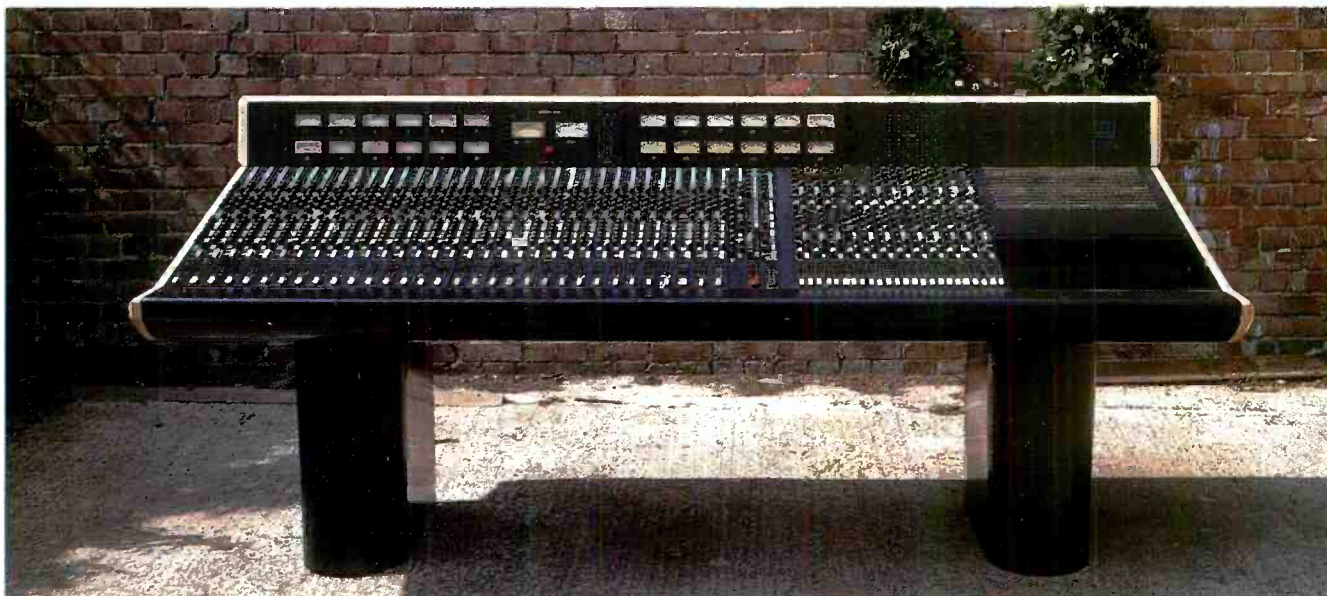
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commonplace but now the reserve of only the top flight analogue desks. Little things like talkback selection from each of the aux masters and all permutations of all the auxes and all the sources being available for the fold-back, studio and the control room chains. Two sets of alternative speakers, a proper oscillator and two master auto mutes go some way to completing an outline of the TS-24's facilities.

The build quality looks good and well finished and a quick play with the desk revealed it to be as straightforward and logical as its layout would suggest. It's a proper big mid market desk in the old sense of the expression. You'll need a big room for it but on looks alone you could easily plant it in a nice retro-feel room and it would be immediately at home.

So who would want such a desk? Technologically it's not breaking any new ground, that's not what it's about because it harks back to a time when character and quality were taken as read. Facility wise it is clearly well equipped but you could argue that we have learned to cope with lesser, leaner, modern modes of operation. At its standard price it is not without competition particularly from former Trident founder Malcolm Toft's efforts with his top end MTA consoles.

The answer lies in the fact that old Trident 80 Series desks are still working in studios around the world, they're sought after and good ones still change hands for large sums of money and the TS-24 looks the part.

There are people who will get very excited about the prospect of this console, the US is a natural target as the Trident name and anything associated with it still commands immense respect in the territory that judged it an equal to anything else that emanated for English shores. Yes, there will be people who are very interested in what Tri-Tech has produced. ■

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Terrasonde Audio Toolbox

The Audio Toolbox literally places the technical tasks of test and measurement in the hands of the common man—and within reach of his pocket. **Andy Day** measures up

THE THOUGHT of reviewing a piece of test gear is rarely an exciting prospect, but Terrasonde's Audio Toolbox promises something for everyone, even the non-technically minded. It has many functions usually only available on high price specialist test gear as well as some very practical studio tools. But first the basics.

The Toolbox is a general-purpose test tool, providing the basic functions of acoustic analysis, audio test-measurement, session tools and cable testing in one easy to use package. Its funky grey-purple plastic case measures 14cm x 24cm x 6cm and it weighs only 1kg. My only reservation here concerns whether it will take the daily knocks of studio life too well. The Toolbox can be powered from the supplied 9V wall wart or a screw-on battery canister (using four AA batteries) for more portable use. The top end of the box houses the in-built omni-directional microphone, which again would be better protected by some kind of metal cover.

Most common combinations of connectors are provided allowing connections to +4dB balanced systems and the increasingly prevalent -10dB unbalanced systems. XLR, jack and phono connectors are provided as well as 5-pin DINs for MIDI In and two MIDI Outs. There is a headphone socket for using the Toolbox as a guitar practice amp and an integral speaker for monitoring signals. The inputs can be mono or stereo depending on the test performed but the outputs are always mono. Leaving the hardware for the software functionality, we find the approach of the Toolbox straightforward to the point of being slick—in contrast to many current software-driven pieces of equipment. I found that I could second guess the user-interface—read it's intuitive to use—without having to resort to the manual at all. Rather than repeat sections of the manual, which incidentally is good, it is better to describe the functions of the Toolbox, from a user's point of view...

Acoustic analysis is normally something of interest to studio owners only when there is a problem, and as such is often seen as a luxury rather than the necessity it actually is. The relevant functions in the toolbox are comprehensive, from real-time analysis (RTA) for checking room flatness, sound pres-



sure level (SPL) for aligning amplifier gains to the more exotic such as reverb decay time (RT) and energy time for aligning monitor systems. In addition to the above the Toolbox can generate a variety of test signals from pink noise to tone pulses. These kinds of functions are normally only available in specialist test systems costing many times more than the Toolbox.

I used the Toolbox to check out a THX Dubbing theatre and DVD premastering suite within minutes of getting it out of the box, and although I knew what I was doing, I am confident that you could do the same without prior experience, as the manual adequately explains the test functions and their practical use. The audio test functions include signal-to-noise ratio, frequency response, frequency measurement and even an oscilloscope—yes, it is basic and quite difficult to read, but useable nevertheless. You can even use it as a phase scope across your main stereo output, a great tool for people working in film or TV post.

Cable testing is covered allowing quick testing of XLR, jack and phono cables, even MIDI cables can be tested very easily without using test probes. There are a few other extras which allow you to use the Toolbox as a practice amplifier for guitar (including effects), a phantom power tester and for those dull studio moments a game of seventies-style 'Pong'.

The session helpers are the truly unique aspect of the toolbox though,

these include a comprehensive tuner for guitar, bass, viola and cello, a tempo computer for calculating the tempo of an audio signal against a MIDI clock (a basic version of the Russian Dragon), a time-code generator-reader, regenerator-analyser and calculator (similar functionality to the distripaliser) and a hum canceller for removing hum from signals. The guitar tuner is excellent allowing capo tunings, the tempo computer is ideal for any music studio combining audio and MIDI giving an accurate way to measure the timing between audio and MIDI tracks (a constant issue with the new generation of host based sequencers). In addition the Toolbox can generate MIDI note on information from an incoming audio signal, allowing a snare track to trigger a sampler for example. The time code functions are invaluable for anyone working in film or TV post, you can instantly tell if a tape has bad code and even replace it.

Having concentrated on the main practical aspects of the Toolbox, it's worth mentioning that there are other more esoteric offerings available and there is the promise of further developments from Terrasonde. The software can easily be upgraded by using a PC to upload future software enhancements, the details of which will become available on the company's web site at www.terrasonde.com.

I was pleasantly surprised by the Audio Toolbox, given the general reluctance to get anything techie for the studio, due mostly to the fear of all things geeky and scientific by the majority of engineers, the developers have approached the subject in the best possible way. By providing a broad range of useful session tools which appeal to both audio post and music studios and, most importantly, doing it at reasonable cost, there really is no excuse for any studio owner not to invest in such a unique and versatile piece of equipment, which will almost certainly pay for itself over time. ■

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Version 2

Version 2.0 Toolbox will soon be shipping. Here is a summary of the major software improvements. Distortion meter (THD+N, 0.2% to 50%). Impedance meter (1Ω–2000Ω, 20Hz–20kHz) Continuity tester. RTA low-frequency mode (10Hz–332Hz) New RTA averaging modes. RTA now has octave, 1/3, and 1/6 modes. 20 RTA non-volatile memories. SPL meter upgraded to ANSI type I Sound Level meter (certification pending) with LEQ. The signal generator sweeps smoothly.

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Picture this

The working interface between audio and video exposes the practical as well as technical schism between the two disciplines. **Rob James** enters unexplored territory

WE LIVE in a world that is increasingly obsessed with images. Professionally, an alarming number of video people pay scant attention to sound, while too many of that endangered minority, the audio professional, are guilty of neglecting the importance of pictures. There is a saying among some sound-for-picture practitioners, 'The picture is only there to keep the sound in sync'. But in common with many seemingly daft statements, it contains a grain of truth—the most important attributes of the picture in sound-for-picture work are: utterly trustworthy synchronisation; picture quality good enough to see relevant detail, both for sync checking and spot-

—to name but a few factors. The resultant images were frequently so murky you would be lucky to recognise which way up they were or they could be so burned out Surrey looked like the Sahara. Film dubbing editors watched pictures on a tiny, flickering, Moviola, Pic-sync or Steenbeck screens. Most editing machines employ prisms rather than intermittent motion which results in a still frame that consists of the frame 'in the gate' and a dim image of the one before and the one after superimposed. Not ideal for checking sync.

Early projectors used for film dubbing were intermittent types, essentially the same as theatre projectors. Synchronisation with other equipment often involved adding an optical shaft encoder and electronics to produce biphasic pulses. This meant the projector controls (or remotes) controlled the rest of the transports. The problem with intermittent projectors is they are limited in speed to a maximum of perhaps 4x. Later purpose designed projectors manage a maximum of around 30x (16mm) using either prisms or horribly complex and ingenious drums

video machines such as open-reel 1-inch and 1/2-inch and later Sony's U-matic VCRs plus the development of time code after earlier attempts such as Mag-Link, that more sophisticated post-production sound work became possible on a regular basis. U-matic machines (from various manufacturers) could locate faster than film, but the picture was tiring to work with for long periods due to instability and break up at anything other than single-speed play. Today, U-matic has been largely replaced, initially with Beta SP and more recently Digi Beta. At the low end, people have also successfully used VHS, Hi-8 and DTV. These formats all have disadvantages for our purposes, mainly to do with synchronisation performance and transport dynamics. High-end Beta SP machines such as Sony's ubiquitous BVW75 or the Digi Betas are much better in these respects, but good performance comes at considerable cost.

Against this background it should be clear by now ultimate picture quality is not really the issue. Anything that improves on transport dynamics and synchronisation capabilities ought to be welcomed with open arms. If it is also cheaper then so much the better.

Some of the earliest attempts at something better for the job came from SSL with Visiontrack (a hard-disk video system of remarkable sophistication for the time) and AMS, who used Laserdisk. As HDV became affordable, nonlinear off-line editing systems such as Avid and Lightworks began to appear. In ten years this technology has achieved a virtual monopoly in off-line editing for film and TV. On-line looks set to follow suit. It should come as no surprise that one solution to the picture source problem is to use an editing workstation, but this is not ideal for several reasons—not the least of which is that editing workstations are expensive and are not primarily designed to operate as slaves. In fact, at the time of writing, there are really only two models of HDV in common UK use which are plug-and-play replacements for a VCR, although there are others waiting in the wings. Several manufacturers have proprietary solutions that work only in conjunction with their DAWs, and many people are using video capture cards in conjunction with a variety of PC and Mac hosted DAWs.

The advantages of HDV are not disputed. All the current solutions can provide pictures of at least VHS quality which is more than adequate for most purposes. The random access >



ting and good transport dynamics—speed of spooling and location, reverse play and acceleration. Add to this stability of still frame and low and high-speed pictures.

A slot-in replacement for film projectors and video tape must also be easy to interface. Biphasic synchronisation is still frequently a requirement for film, RS-422 is a must and ideally it should be able to chase time code at all the common frame rates. Those of us who have been in the sound-for-picture business grew up watching pictures which, by any standards, can only be described as dire. In film, most sound work was carried out against a black and white 'slash dupe' print or, more recently and especially in 16mm work, a cutting copy made up from 'one light rush prints'.

In bygone days, the quality of the picture depended on several factors. Whether the original exposure was correct, the film stock used and sheer luck

of whirling mirrors where greater light output is required. These projectors are often biphasic slaves enabling a master pulse generator to control the system and provide time code and other interfacing. In recent years a lot of 16mm and some 35mm film dubbing has been carried out with a prism type 'scanner' using a small TV camera to pick up the image for showing on monitors or video projectors. These are in effect, rudimentary telecine machines.

Video people were not much better served despite being much later into the game. Early quadruplex video recorders were huge, vastly expensive pieces of hardware and using them for anything beyond the most basic 'audio sweetening' was almost out of the question. Ironically, one alternative was to 'tele-record' material from video tape—transfer it to film for more complex sound and editing work. It was only with the development of lower-cost helical scan

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◀ capability makes spooling times irrelevant and most devices provide a stable freeze frame, jog and shuttle with pictures from a field a second or so up to around 4x speed or more. A further advantage with most is the ability to do rudimentary editing and conforming. Most useful for the inevitable changes of mind from the picture editing department. So, what is holding up widespread adoption of HDV in sound for picture?

In reality there are a variety of reasons. The market is not large enough to excite the Far Eastern manufacturers. A common response from facility owners, particularly those specialising in short form work, is, 'I've just bought this bunch of Digi-Betas, when they wear out we'll probably go to HDV'. Another frequent comment from long form facilities is: 'I'll buy when I can take a disk from my editing machine and plug it straight into the player.'

In film work the story is similar. The most common machines are the lower spec PVW and UVW Beta SP. Even, or perhaps especially, where several editing rooms need a copy of the same picture, Beta SP is the *lingua franca*. With the processes in current use it would not be easy to introduce one or two HDV machines, you would really need to replace the lot. And you would still need the odd Beta around for compatibility. In broadcast TV there are other reasons for the longevity of tape. Fast and efficient postproduction processes compensate for the high capital and maintenance costs of keeping a broadcast VCR attached to each mixing room and Sound Supervisors tend to feel more secure if they are responsible for the entire sound process.

At present, the majority of early adopters in the UK are small facilities that can benefit from the relatively low cost of HDV and recognise its advantages. Other, larger facilities, such as film schools where time is less important than capital outlay, have also bought in. Anyone setting up a facility for film sound from scratch would be mad not to at least investigate HDV.

Over the next few years HDV will slowly supersede VCRs. This will be driven by the usual engines of lower costs and enhanced capabilities following on from developments in computing hardware. This will result in machines capable of working at broadcast quality, for those who require this, at the same sort of cost as the current generation which use fairly highly compression ratios to achieve reasonable costs. A further possibility lies in the development of recordable DVD. But the real advance, for those who can afford it, will come with integrated sound-and-picture networking.

The Rorke Data FED VMOD-100 was the first stand-alone HDV machine to gain real acceptance. It can use a wide

variety of storage media from magneto-optical and Winchester hard drives and even down to Jaz. Picture quality is claimed to be the equivalent of Lo-band U-matic at the high end and S-VHS at the low. Record times vary from around 13 minutes per Gb to 77 minutes. The compression used is M-JPEG (Motion-JPEG) and two tracks of 16-bit audio are available. There are a number of options for versatile interfacing including RS 422, biphasic and time-code chase using an external time code to RS-422 convertor. Other possibilities are VITC, a 'film style' remote control, Media Controller Edit Suite and spot-commercial playback software. Video connections are composite on BNCs or Y/C using S-VHS mini DINs. Audio is on XLRs and external SCSI is 50-pin Centronics.

Rorke has recently announced an alternative series of HDV machines under the name of Viper. Using the Windows NT operating system these can read and write material in VMOD format, their own native formats and AVI-WAV. Viper Lite uses 14:1 compression with two channels of 18-bit audio as standard, Viper, 7:1 compression and four audio channels and Viper PRO 2.65:1 and eight audio channels. There is also a ViperNest option that together with Rorke's Galaxy RAID storage systems offers server capabilities, allowing up to 24 hours of PAL or NTSC video to be online to multiple users at the same time.

Doremi Labs (makers of the Dawn DAW) was also early on the scene with the V1 Video Disk recorder-player. This is a 3U-high rackmount unit with a full-function remote control. V1 also uses M-JPEG with compression ratios between 4:1 and 34:1 NTSC or PAL and two channels of 48kHz 18-bit audio. Storage options include MO, removable Winchesters and the V1 server. This consists of a File Server, a computer that reads video and audio data stored in files on the VSU (Video Storage Unit) and transfers it to be played on the Video Channels—V1 family machines. The File Server connects to the VSU via Fibre Channel, which allows up to 126 hard disks per interface card. The File Server connects to the V1s via a choice of interfaces (SCSI-3, Fast Ethernet). Multiple V1s can simultaneously play the same video file, which should reduce time spent copying and moving files.

The system is managed by Doremi's automation software. This can run from the file server or from the monitoring stations. The software allows recording from any Video Channel, viewing of previously recorded files, construction and playing of cue lists on any of the V1 video channels. The V1(s), the File Server(s) and the Monitoring Station(s) are connected via a Fast Ethernet network, which carries control information as well as low-resolution video information for monitoring purposes.

V1 comes with RS-422 serial Sony

9-pin control and built-in VITC and LTC time-code reader-generator and biphasic. Ethernet is available as a further option as is a colour LCD screen mounted on the front panel. Video connections are composite on BNCs or Y/C using S-VHS mini DINs. Audio is on XLRs and external SCSI is 50-pin Centronics.

There are now several other variants of the V1. The V1m is probably of most interest in sound for picture as it is a cheaper version without front panel controls, intended for RS422 operation. The V1D adds a serial digital interface, 2:1 compression and four audio tracks to the V1 spec.

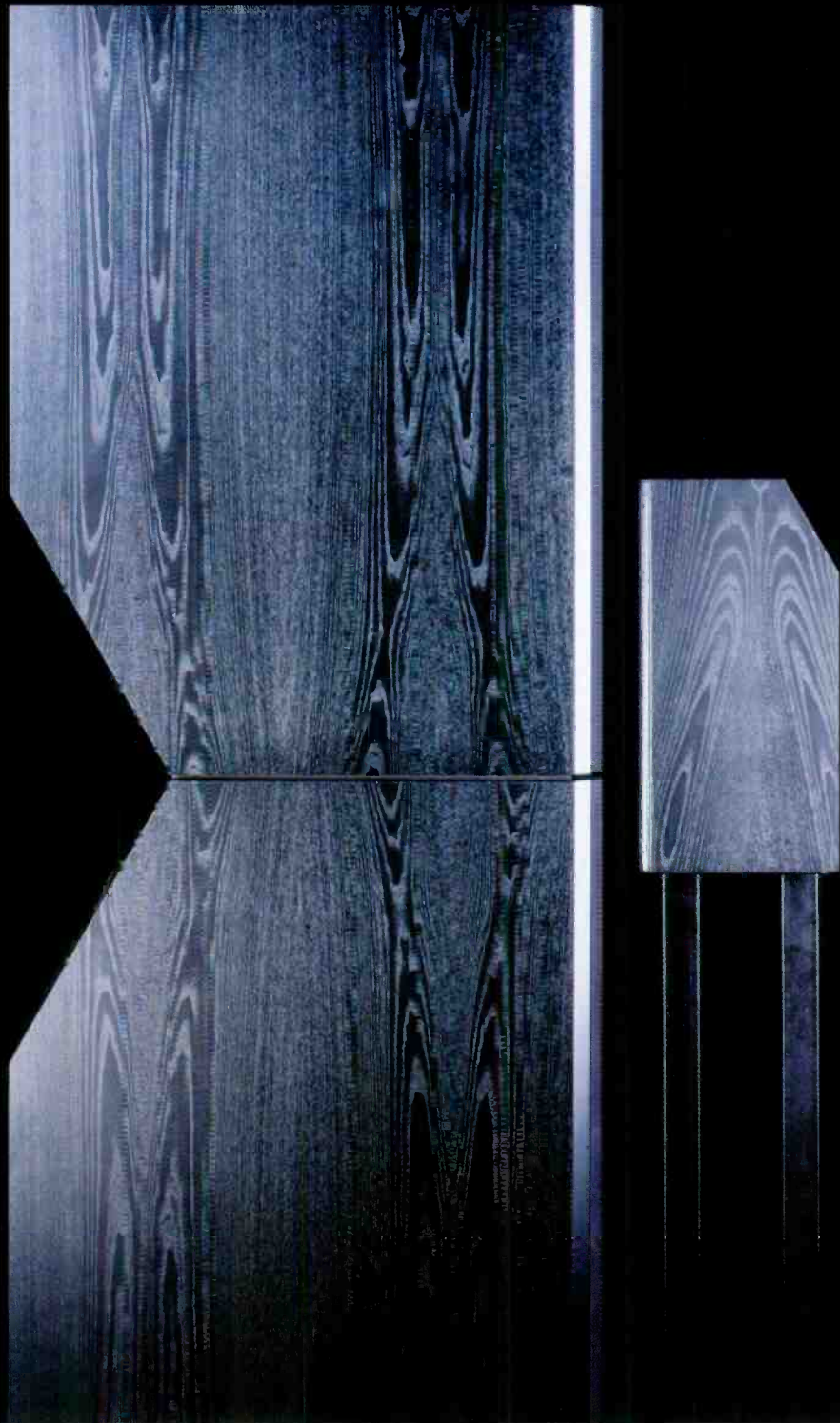
Fairlight is about to join the party with the ViVid unit. The ViVid offers a substantially similar specification to the VMOD and V1, but with the promise of integration with the rest of the Fairlight's products. The other departure is emphasis on editing capabilities and the ability to work across Fairlight's MediaLink networking system. With ViVid Fairlight will offer a tantalising glimpse of what may be possible with a fully integrated, sound and picture, networked system.

Digidesign, now part of Avid, have long offered picture options. These range from simple use of QuickTime movies to more sophisticated use of video capture and compression cards. The Avid AudioVision (apparently now a Pro Tools option) is perhaps the most integrated example. AudioVision makes it relatively simple to move projects from Avid on and off-line picture editing systems to the sound-for-picture workstation.

Studio Audio & Video offers Portia. This is an HDV system that can be installed into any SADI E DAW. Using JPEG video compression, video can be recorded into a SADI E edit list and accessed alongside the audio. Physically, the Portia system is a full-length PC expansion card, a 2U-high 19-inch rack unit supplying video, time code and 9-pin I-O, and a SCSI-2 hard disk for storing the video data. A single 9GB drive provides from 5¼ hours video storage at the highest compression, to 1½ hours at the lowest compression. The breakout box provides YUV and mixed sync I-O, VITC and LTC I-O, and 4 channels of 9-pin I-O. Up to 15 50Gb drives may be installed, giving around 125 hours of Betacam-quality video storage. Video I-O is YUV component only so a convertor is required for composite environments. Unlike stand-alone systems, Portia video may be cut, edited, copied, deleted or moved within the SADI E audio playlist so changes in the video do not require redigitisation onto disk.

Scrubbing of the audio and video together is claimed to be field and frame accurate, even when scrubbing at speeds faster than play.

Soundscape now have considerable experience with the use of video capture cards integrated with Soundscape >



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< workstations. Soundscape's Chris Wright tells me they are working with Fast AV/DV Master, Miro DC30 and now the Matrox Digisuite. The old bugbear of this approach, dropping frames during capture, is almost unheard of these days using a properly specified and set up system that is consistent with the data rates being captured.

Dropping frames in Capture would make digital video completely unusable for proper sync and is a function of the type of compression, the video signal program material and the processing speed of the card from compression. Dropping frames in capture is now extremely rare, as the processors are beefy enough to deal with difficult video signals within a frame. This was not the case with earlier low-cost cards.

According to Chris Wright, 'Most Soundscape users are happy with an AV Master with around 600Kb/sec to 1Mb/sec for the guide video for sound-to-picture use and many Hollywood TV shows are posted with this setup (Frazier, Seinfeld, Viper, Baywatch, Mad About You) as well as hundreds of others for film soundtracks, language dubbing, Foley recording, and so on.'

'For sound-to-picture editing we have a very simple sync method and the Soundscape hardware timing is used to control playback. We always recommend capturing with burnt in time code with a running capture (tape rolling

first) to ensure continuous frames. In Soundscape you open the file and type in the time code shown for the first frame and save it as an AVI offset in the file. The file is then always played from this offset and we access the file according to the hardware timing. A very simple method of getting the sync, but completely effective. It also allows for a "video follows audio" approach that allows for really accurate scrubbing with no lag at all."

If this last section has tempted anyone into thinking a PC-hosted HDV could be a candidate for Betacam replacement a word of caution is required. According to Dave Shapton, who has been working in this field since it started, 'Surprisingly, as far as I know, there are still very few systems that will accurately (or at all) chase time code. This is a great pity because all of the well known video editing systems work with only frame accuracy, not sample accuracy. So however good the audio facilities on a given video NLE (non-linear editing) platform, you will never be able to do proper audio editing.' Shapton suggests making the video edit (using sync audio and possibly other audio tracks as a guide only) and then using an audio application such as SoundForge, Samplitude or Cubase VST and so on, to control the resulting AVI file's playback. Even this is not ideal because at anything other than

normal playback speed, results are unpredictable.

Ten to fifteen years ago HDV became first possible and then affordable as the underlying computer hardware developed. Even theatrical release of 'movies' in electronic form is now realistic possibility. With George Lucas saying the next *Star Wars* will be shot electronically the age of HDV is well and truly with us. You might expect there would be a rash of products that would be ideal for replacing video tape, 16mm film and, for most purposes, 35mm film as a sound-for-picture source. As with the development of digital dubbers the reality is rather more complex. These are dangerous and fast flowing waters for the pro-audio fraternity. The safest approach, if a simple videotape replacement is all that is required, is undoubtedly one of the stand-alone units. For others, well versed in the mysteries of PCs and Macs, there are some interesting alternative approaches that, with patience, allow a great deal to be achieved at very low cost. At the high end, broadcast TV and Movie production, there are still more potential solutions than actual. The promise of fully integrated sound-and-picture network systems has yet to be realised, but I am certain this is where we are heading. Meanwhile, there would seem to be some life left in that old dog, Betacam. ■



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PMC LBI-BP

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

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

THE PMC LB1-BP is a 2-way passive loudspeaker consisting of a 140mm woofer and a 28mm soft-dome tweeter. The cabinet has external dimensions of 532mm high by 178mm wide by 275mm deep (including binding posts). The drive-units are mounted vertically near the top of the cabinet with a



foam-filled port, that appears to be the end of a transmission line, at the bottom some 280mm from the woofer. The woofer is slightly unusual in that the centre dome has a diameter of 75mm that represents a large percentage of the radiating area of the 95mm diameter cone. The review loudspeaker was supplied with a frame-mounted front grill that was removed for the measurements. Connection to the loudspeaker is via four 4mm binding posts on the back panel that permit bi-wiring. No power

handling specifications were supplied with the review loudspeaker.

Fig.1 shows the on-axis frequency response and harmonic distortion for the LB1-BP. The response is seen to be quite uneven, extending from 50Hz to 20kHz within ± 5 dB limits. There are distinct, sharp peaks and dips between 200Hz and 1kHz and a rising high-frequency response above 8kHz. The low-frequency extension is good with the -10dB point occurring at about 38Hz. Average sensitivity is about 88dB for 1W at 1m. Harmonic distortion performance is very good, with the 2nd harmonic peaking at -42dB (0.8%) at 100Hz, reducing to -57dB (0.14%) by 300Hz. The 3rd harmonic remains below -45dB (0.56%) from 50Hz upwards. Figs 5 and 6 show the horizontal and vertical off-axis responses respectively. The horizontal directivity is well controlled with only a little mid-range narrowing between 1kHz and 3kHz. The high frequency response falls off smoothly with frequency, with little evidence of side-lobes. The vertical directivity shows the interference notch at 2.5kHz which is characteristic of spaced drivers. The step response (Fig.3) shows good time-alignment between the drivers and some evidence of ringing with a period of about 2ms. The acoustic centre (Fig.2) is seen to shift to just over 2m behind the loudspeaker at low frequencies, which is typical for a loudspeaker with a 4th-order roll-off. Phase anomalies are evident between 200Hz and 1kHz which correspond to the peaks and dips in the on-axis response. The power cepstrum chart (Fig.4) is somewhat unusual in that, although the response up to 1ms is well behaved, there is a lot of activity after longer times from 1ms to 3.5ms due to the sharp irregularities in the on-axis response. It is in the waterfall chart (Fig.7) how-

ever, where the time-domain problems associated with these sharp response irregularities are most evident. The ringing at 250Hz and 400Hz can be seen to decay very slowly, reaching only -40dB after approximately 60ms. Overall low harmonic distortion, con-

trolled directivity and accurate driver time alignment are let down by an uneven mid-range on-axis response. The peaks and dips in the response are sufficiently sharp to upset the time domain performance to a significant degree, and would probably be very audible. ■

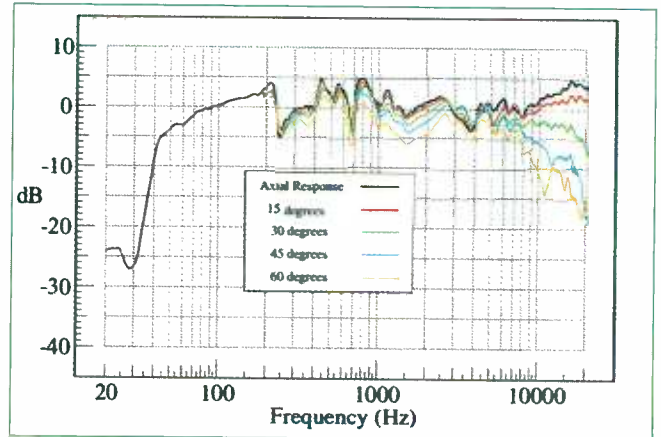


Fig.5: Horizontal directivity

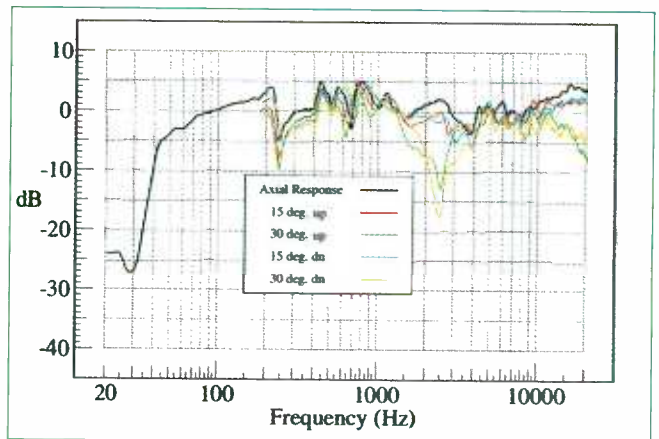


Fig.6: Vertical directivity

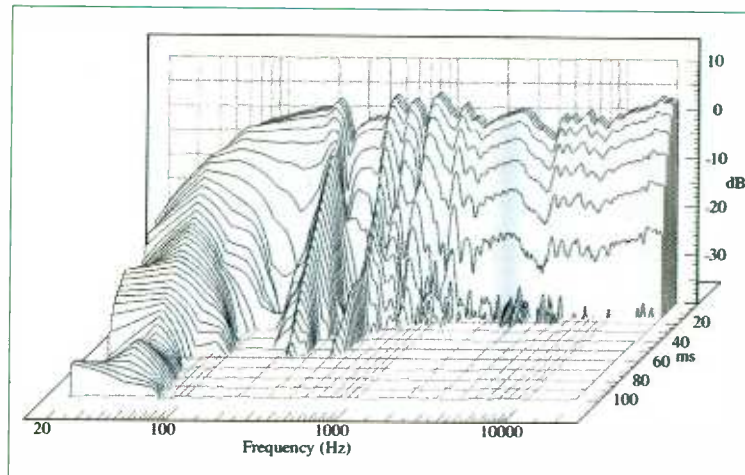


Fig.7: Waterfall chart

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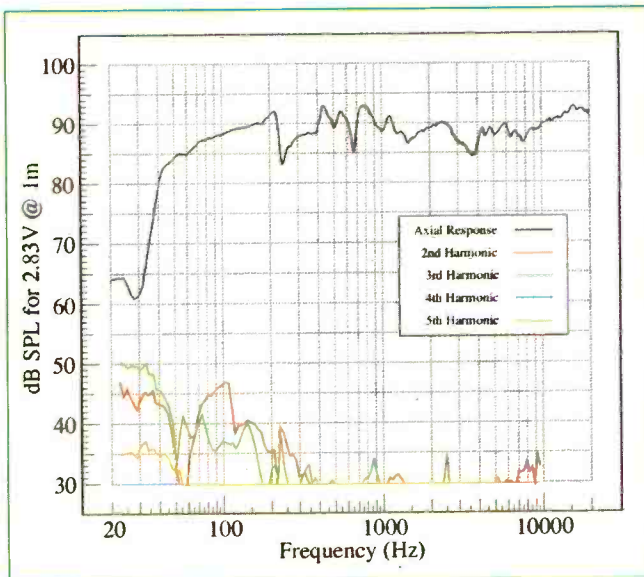


Fig. 1: On-axis response and distortion

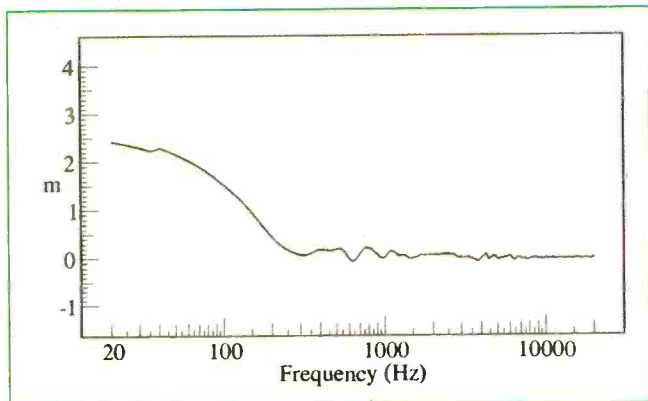


Fig 2: Acoustic centre

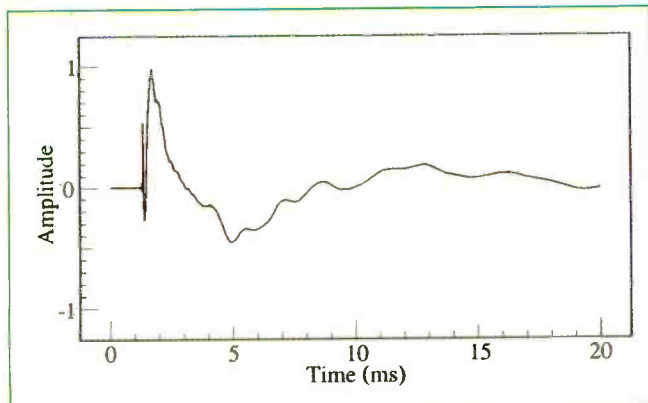


Fig.3: Step response

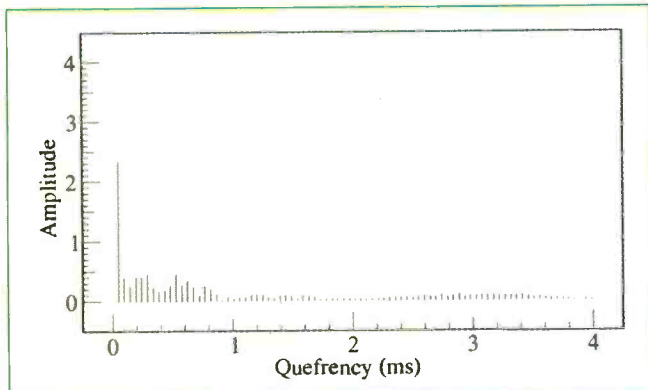
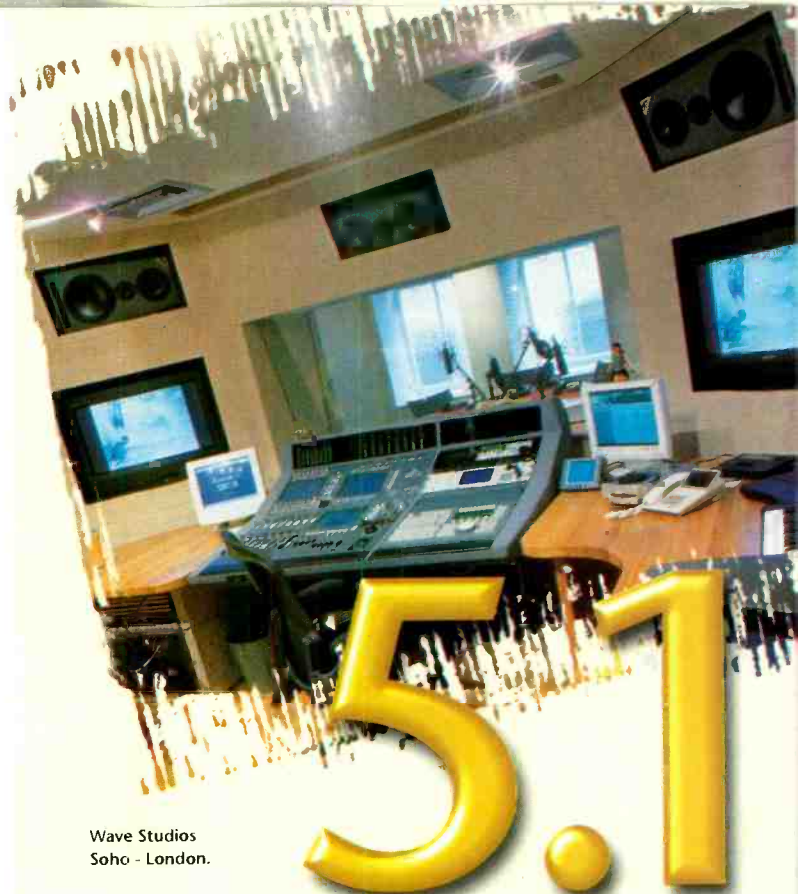


Fig.4: Power cepstrum

Studio Sound September 1999



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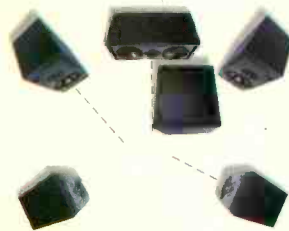
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Choosing the right audio Codec.



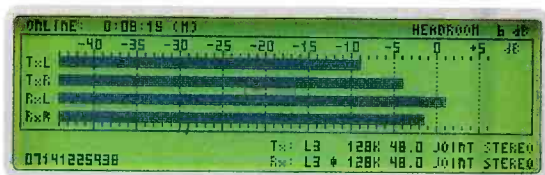
The Dialog4 MusicTAXI range is one of the most comprehensive codec packages on the market today. It contains all the standard ISO/MPEG audio coding algorithms in common use today such as Layer 2 and Layer 3, as well as CCITT G.722 for high grade voice bandwidth connections, and G.711 so it can talk to a plain old analogue telephone line, too. Connectivity features include upto three ISDN terminal adapters and X.21 port, for operation up to 384kbps. Dialing is quick and easy using the 96 entry directory.



The range of network protocols included means that it can be taken to virtually any part of the world. In the studio the audio i/o can be analogue or digital (AES/EBU & S/PDIF interfaces are both provided). The aux data channel enables embedded control data to be sent alongside the audio, and the unit can be controlled remotely from a PC or the external Remote Panel if desired. Most importantly automatic sensing of the codec at the other end of the call means that it sets itself up to communicate with the most commonly used systems in use today, i.e. Telos Zephyr, CDQPRIMA, Glensound and



others without complicated manual programming. Operationally the buttons are large and straightforward to use, while the illuminated LCD display gives a clear indication of what is going on at all times. No noisy internal cooling fan to worry about in quiet studio conditions. The Remote Panel can control a MusicTAXI from over 500m away via the RS422 interface. The online menu indicates online time, send-level, receive-level, adjusted headroom, Rx



and Tx audio configuration, SYNC flag of MusicTAXI at the other end.

Tapeless recording and transmission on the spot is the answer to the enhanced requirements of correspondents. The CTAXI is the solution and is set to become the standard for mobile recording and transmission, because it satisfies the users demand: stereo recording, editing, file-transmission to computers, realtime-transmission to all well known codces. The CTAXI is, of course, child's play to operate. You can use it as telephone, walkman, audio recorder, mobile editing station, transmission device. The size is as small as today's cutting



edge technology allows: 58 x 239 x 150 mm, the weight is 1150 g including 2 x Li-ION batteries. The charger is inbuilt and allows uninterrupted operation. PCMCIA flash cards or hard drives can be used for stereo recording. BWF format is supported.

We are not American or British. We don't belong to a big industry corporation. So we have to work that little bit harder. We started 8 years ago with advanced MPEG integration into Audio Codecs and have dedicated ourselves to making them as user-friendly as possible. Our product know-how covers ISDN and satellite transmission, recording, editing and storage. Add our experience, research capabilities and production expertise and you have the legendary German Quality that keeps us one step ahead. For more information, call our UK distributor Charlie Day at THE UK OFFICE, Tel. +44 (0) 1442 870103, or contact our headquarters in Germany.

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Studer On-Air 5000

Studer is to launch the On-Air 5000 Digital Continuity Console for radio broadcasting at IBC and will exhibit the system controlling Studer's Digital MADI Router.

The On-Air 5000 has an integrated source router that allows a high number of inputs to be connected to the desk. The source label will be routed and appear on the respective input channel. It's clean-feed circuits enables all forms of telephone calls to be inserted into the programme content. The console's modular construction is designed for optimum space saving. Version 3.0 On-Air 2000 now features six clean-feed channels and assignable master faders for the recording and the programme bus.

Studer, Switzerland. Tel: +41 1 870 7511

Digitracs DAW

Digitracs is a Soundtracs DAW based on the architecture of its new DS3 digital mixer totally integrated with a SADiE editor with video playback. It is described as a 96-channel mixer combined with a 32-track editor giving subframe accurate sync between audio, video and automation and single step filing.

Soundtracs, UK. Tel: +44 208 3885000

Calrec minidesk

Calrec is to launch the M3 console which follows on from the success of the Minimixer II and is designed as a compact desk with a high level of facilities. It is intended as a main mixer for mono and stereo broadcasting in small studios and OB vehicles or for use as a submixer.

Calrec, UK. Tel: +44 1422 842159

TimeLine conversion

TimeLine Vista's TransAudio PipeLine is a file utility program that supports backup, export and tape mode conversion of popular audio workstation file types. The program can read Digidesign Pro Tools



sessions, Waveframe projects, Akai DD8, Tascam MMR8, Zaxcom Deva (Broadcast Wav), Sonic Solutions (on Mac HFS volumes) and OMF/Sound Designer II. Additionally the software writes Pro Tools, Waveframe and OMF/Sound Designer II. The program is based on the file backup and export capabilities of the MMR8 and runs on PCs with Windows 95/98 or NT.

TimeLine, US. Tel: +1 760 761 4440

D8b gets Autotune

Mackie and Antares have announced a partnership for the development of Auto-Tune real-time pitch correction software for the Mackie Digital 8-Bus console. Auto-Tune is a fully automatable software Plug-In that provides the ability to correct the pitch of a voice or solo instrument, without distortion or artefacts, while preserving all of the expressive nuance of the original performance.

Mackie, US. Tel: +1 425.487.4333

Tascam DA-40

Adding a cost-effective professional model to its range of DAT records strengthens Tascam's growing reputation in recorders. **Dave Foister** puts it through its paces

TASCAM'S BEST known recorders may currently be the DTRS series of modular digital multitracks, but there is also a range of DAT machines that has quietly established itself as representing remarkable value in a fully professional package. The last incarnation of the range was the ground-breaking 24-bit DA-45HR, and now a version without the high-bit capability is set to replace the familiar DA-30 as one of the standard non-TC recorders.

The DA-40 shares the designer styling and glossy image of the current Tascam machines in place of the functional plain flat black of the 30. It has so many buttons that a quick look round the back is required for reassurance that it is not just a gadget-laden prosumer machine. In fact all the essentials are in place: proper balanced line-level analogue ins and outs, and AES-EBU as well as SPDIF. The rack ears are integral with the front panel, although the feet have to be removed for rack mounting.

The facilities available within the standard DAT format are very wide ranging, and it is rare to see machines that can exploit them all. Tascam's recorders come close; one indication of this on the DA-40 is a button marked CHAR, that allows text character packs to be displayed on the screen. It can record them as well, and, although this is rarely implemented, it is a standard DAT subcode feature, so if titles and so on have been recorded on another machine (Pioneers can also do this) they will show in the window if desired. Also available for display are all the different time read-outs, and 4-digit error displays for each of the two playback heads. A neat Tascam trick is its ability to log any errors it finds against time and locate them for checking. This stores up to five points where error correction has had to be used and these can then be accessed directly.

The panel is dominated by a dual wheel control that is not quite the jog-shuttle wheel it appears to be, as it is more importantly used to adjust the many menu functions. These hidden options are another area where Tascam scores highly as the flexibility of the machine in the professional environment is enhanced by some of the stuff on offer here. Parameters hidden in the menu system include adjustable pre-roll for the two locate memories and an end tally output that sends a signal to the control I-O port at a user-variable time before the end of the tape is reached. It is also possible to decide whether the fast wind keys will switch from play to wind or from play to cue-review. There is a head drum use memory to help schedule maintenance, and the facility to automatically write an End ID every time recording stops.



The rear panel is quite full of connectors, again indicating the machine's pro status. Among the analogue and digital signal connections are a socket for the optional wired remote and a 15-pin D-sub connector for full remote transport operation complete with tally indication. The analogue outputs have level trim controls next to them, while input levels are switched on the front between standard calibration and manual setting with the two level controls. In fact most of this kind of setup is on dedicated front-panel switches familiar from previous Tascam machines: sample rates, analogue-digital input selection, and the choice of balanced or unbalanced inputs (note that the XLR digital inputs will accept SPDIF data). I was surprised to have a few problems with the digital outputs, shown only by the error monitor window of my SADiE system and not translating into audible problems; the SPDIF output consistently showed as Poor Signal, and the machine has the annoying habit of dropping its clock or producing Validity Errors when stopped. This is by no means unique—the DAT machines that do not do things like this seem to be in the minority in fact—but I would be interested to know why so many machines do not maintain a consistent digital output when others manage it.

The transport keys are big and reassuring, and even the tape drawer is unusually friendly as it locates the tape in place as it closes rather than making you jiggle it into a tight slot. All the transport modes are indicated in the display, and the important ones have LEDs as well.

Sonically Tascam's DAT machines have always impressed, and the DA-40 is no exception; although no details are given of the converters either end, the sound is everything you can ask of a 16-bit 48kHz recorder.

The DA-40 is a very easy-to-use and competent DAT machine. It will slot in as a good workhorse straight out of the box, with a build quality and a history that suggests it will take a lot of punishment, but has the additional facilities on board to make it more adaptable to different ways of working and different applications than appearances would suggest. Tascam DATs have quietly built up a strong following and market share, and the DA-40 should reinforce the image as a value-for-money professional recorder. ■

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Fax: +44 1923 236290.

Tascam, US.

Tel: +1 213 726 0303.

Fax: +1 213 727 7641.

Sennheiser Series 3000

The latest addition to Sennheiser's RF range offers a solution to both radio mic systems and in-ear monitoring requirements.

Keith Spencer-Allen takes the middle ground

SENNHEISER IS UNUSUAL among wireless microphone system manufacturers as it is active in all areas of the RF market rather than just in particular price categories—no doubt due to the way that the name is established in consumer, MI and pro circles. The benefits of such an arrangement come from both ends—the economy of scale and the direct 'trickle down' of technology.

The Series 3000 is a total restatement of Sennheiser's 'middle ground' RF product range. It sits between the Series 1000 budget MI systems, and the sophisticated Series 5000 systems that can handle 40 channels plus of simultaneous radio mic channels. Aside from including Sennheiser's entry into in-ear monitoring systems, the new range is particularly notable for the use of switchable frequencies at a lower price point than normally accepted.

The series starts with two transmitters. The SKM3072-U hand-held can choose from one of 32 pre-programmed UHF operating frequencies using the LCD display and controls mounted in the base section, enabling its use in multichannel systems. There is a choice of capsules to suit vocals or speech, and the sensitivity can be adjusted on the mic itself. Transmission uses

Sennheiser's HiDYN plus noise reduction system and retains compatibility with 1000 and 5000 Series receivers. Most practical points—each unit is supplied with 8 different colour-coded end caps to distinguish between units when several are in use, while the LCD can show low-battery warnings.

The other transmitter is the SK3063-U Body pack, which is based on the SK50 unit in the 5000 range. It can operate on any of 16 UHF frequencies within a 24MHz window from 450MHz to 960MHz. It can be matched to the mic used with 8-steps of input sensitivity even if you are not using one of Sennheiser's own clip mics.

The standard unit is supplied with a 2-cell battery pack, although larger 3-cell or rechargeable packs are available. The battery status is transmitted permanently and can be monitored when using Series 3000 receivers.

There are three 1U-high rack mount receivers in the series. All have been designed so that they can be used singularly, or to varying degrees within a large scale multichannel installation. The EM3031 and 3031 are single and dual-channel true diversity receivers, that are described as competitively priced. They can be switched over 32 UHF frequencies within a 24MHz window. A front panel display can be interrogated for all major functions from radio signal

strength, programme and battery status.

The more upmarket EM3532 UHF receiver houses twin diversity receivers, each having 32 programmable frequencies that can be fine tuned within a 24kHz window. All frequency and channel selection is handled through the front-panel menu, and it shows the current settings and battery status with a 20-30 warning of signal loss. It can also scan and lock onto active RF signals.

The 3532 can also be run under Windows PC control using Sennheiser's S-MCD software that enables control and monitoring of up to 126 channels on 63 channels over a network. In practical terms this allows the operator to alter and monitor all channel parameters for each attached networked unit, and to create 'scene' changes to follow large scale changes in the event-show and tailor the RF mic system appropriately.

Another receiver in the range is the EK3041-U, a miniature UHF stereo receiver that is being promoted as the world's smallest ever UHF diversity unit. It was developed specifically for use with the compact new digital ENG camcorders and is tailored to fit into the available RF slot on several popular units without the need for connectors or adaptors. It has 32 switchable frequencies within a 24MHz window and can be supplied for use over a wide frequency range, enabling worldwide operation.

Sennheiser's entry into the world of in-ear monitoring comes in the form of the 3050-U System. The SR3054-U and SR3056-U are stereo and twin stereo 1U-high rackmount transmitters. Each transmitter can operate on any one of 16 UHF frequencies, enabling the assembly of an all-band monitoring system using the same components. A version of the HiDYN noise reduction system has been developed for this application and is known as HiDYN Stage. Full control is provided from the front panel—including stereo-mono operation, together with the ability to select transmission from the unit mounted aerials or more suitably positioned remote aerials.

A choice of in-ear receivers are provided by the EK3053-U and 3052-U Body Packs. Both are robust units with the 3053 mainly aimed at musicians where a dual mono mode of operation, rather than stereo, may be important, together with the ability to balance between them. The 3052 is for broadcast and theatre use and assumes stereo operation, but with more emphasis on LED indication of status.

The Series 3000 RF System would seem to provide a comprehensive new addition to the wireless market, specifically notable for switchability and scalability in operation. The pricing being talked about for large multichannel mic systems also suggests that it will provide most of the facilities of existing choices, but at far far less cost, while still retaining the ability to be used as single channels. A very interesting approach. ■

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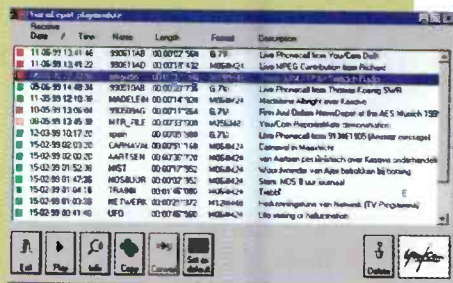
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NEW TECHNOLOGIES



You/Com developments

You/Com has acquired the distribution rights for the Jotron Radio-Reporter for Central Europe. Developed in co-operation with NRK this unit is the first portable wireless digital reporter system. Weighing 2.5kg it is able to broadcast within a number of kilometres of the receiving station and is well suited to the requirements of a roaming reporter. In comparison to analogue FM systems the Radio-Reporter uses MPEG and data reduction and 20kHz stereo signals can be transmitted or two mono signals of 11kHz. You/Com's ISDN hybrid StudioSet is unusual because it doesn't contain a hybrid and the output of a t.6 phone call is offered in the form of an analogue or digital 4-wire connection. Designed for simplifying the registration of requests and remarks of listeners phoning in to a request programme, PhoneDepot can answer and register eight calls simultaneously. Recordings are stored on an NT server connected to ISDN and calls are logged and messages can be listened to from any PC with a sound card. Calls can be converted by the PhoneDepot into the relevant digital format used by the Broadcast Automation System.

You/Com, Netherlands.

Tel: +31 15 2625955

\$200 large diaphragm

Marshall Electronics has started a pro-audio division to build a line of low-cost large diaphragm condenser mics for the professional and project studio market. The first in the line is the MXL 2001 which, according to the company, has the look of an expensive European mic but will list in the USA for \$199.95. It has a 1-inch gold sputtered diaphragm, balanced transformer output, 80dB signal to noise, 130dB SPL and operates on standard 48V phantom power. It comes complete with a mic stand adaptor while optional accessories include a high isolation shock mount and a 2-channel phantom power supply.

Marshall Electronics, US.

Tel: +1 310-390-6608



Matrix amp

The class-H amp combines a switched power supply with metal Mosfets in a 2U-high case that can generate 3000W. The Mosfets are run well below their voltage limits making the amp cool and reliable. The amp is targeted at installations and touring rigs and has switchable limiters and input sensitivity.

Matrix, UK. Tel: +44 1562 883116

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Tascam TM-D1000 boards; IF-DA8; MA-AD8

More functionality for the starter digital desk and two converter boxes, **Zenon Schoepe** is very impressed



READERS OF MY APPRAISAL of the TM-D1000 (*Studio Sound*, December 1998, p32) will have noticed that I was extremely taken with the clever digital pocket rocket despite the fact that its complex operating system is so clearly beyond the mass entry level target audience that its lowly price might attract.

Tascam has now added to the console with an I-O expansion board and expansion of the on-board effects processing—features that were always promised since the first announcement of the desk.

The IF-TD1000 (£120) board fits into the desk's rear panel empty slot and provides an additional two sets of XLR and phono AES-EBU and SPDIF inputs, which emerge as Digital ins B and C in the set-up menu plus a second TDIF port for an extra eight digital I-Os referred to as TDIF-1B. What is useful is that Digital in C incorporates an SRC.

The FX-D1000 board (£99) doubles the effects capability of the desk and amounts to doubling effect 3's capacity for eight-channel simultaneous processing. It also introduces effect 4 which is equivalent the desk's original processing for dynamics, delay, chorus, pitch shift, flanger, phaser, de-esser or exciter and effect 5 which equals this but adds reverb and gated reverb effects.

Installation is straightforward, although the manual dissuades self-fitting in favour of authorised experts, and involves opening the desk up, bolting the I-O card onto the back plate and connecting a ribbon cable and plugging the effects board into a connector on the main-board together with some supporting studs. I also had to update a software chip on the desk I was using to V 1.20 to enjoy the benefits of the new cards but the desk in question was from the very early part of the product run and this might not be necessary with newer units. Check.

The advantage of the increased I-O capability is fairly simple to comprehend as it removes what is a limitation on the standard desk. It impacts on an improvement in clarity of organisation and most specifically allows the direct outputs of channels 1-8 to be fed through the new TDIF port with free assignment to the original port.

Predictably it will enable simultaneous 16-track or paralleled twin 8-track recording.

The importance of the extra effects will depend entirely on how important they are to the way you employ the console. This might be of more interest to personal recordist but for the money I'd be tempted anyway as it can do no harm. The I-O board is a must.

The two boards expand the power of the TM-D1000 quite alarmingly, but if anything again remind of the complexity of the operating system. However, if you've conquered this desk already then you won't even notice.

The boards coincide with the high arrival of two exceptionally cost effective 1U rack-mount interface boxes that can be pressed into service with the TM-D1000 or indeed anything else with a TDIF port. The IF-DA8 (£259) is an 8-channel 24-bit capable D-AC while the MA-AD8 (£279) is an 8-channel 20-bit mic pre to TDIF A-DC.

The former has a spartan front panel with only word clock source selection while the rear panel has eight balanced XLR outputs with 3-position level switching, the source TDIF port and a straight through TDIF port for daisy chaining the input.

This twin TDIF port arrangement means that analogue and digital equivalents of a digital input can be paralleled up for simultaneous multichannel monitoring and recording, for example, in a manner that would otherwise not be possible.

The MA-AD8 has individual level pots with 42dB of gain, 22dB pad switches and overload LEDs. Phantom power is curiously split into two groups of four inputs with options to power the first pair or all in the group or to defeat it.

There's clock source selection on the front panel along with four input switches. In the up position each of these route pairs of mic inputs to the TDIF port, while when down they route pairs of digital channels from the rear panel Aux TDIF to the same destination. Thus we have a convenient means of repatching on TDIF here. Mic inputs are on XLR and in common with the IF-DA8 the unit has word through and in on BNC.

These are fantastic boxes that provide solutions to real world dilemmas for ridiculously little money. We mustn't forget that the bi-directional IF-TAD TDIF to ADAT interface is also part of this set.

Performance is well beyond what its amounts to on a cost per channel basis and makes these two units immediately applicable as low end TDIF equipped DAW companions. They are a stroke of genius and make an immediate nonsense of entry level 2-channel devices. There may be better mic pres and better converters around but certainly not for this sort of money. Highly recommended. ■

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NEW TECHNOLOGIES



Millennia mic pre

Employing mic amp circuits identical to those found in Millennia's acclaimed HV-3 stereo mic preamp, the HV-3D four and eight channel microphone preamplifier is packaged in a 2U-high rack mount with built-in, fully isolated power supply. The 4-channel version can be field upgraded to an 8-channel unit at any time. The HV-3D replaces the four channel 'Quad' mic preamps. All channels offer 130 volt DPA mic input options as well as an option for optimised DC-coupled 'ribbon mic' inputs. Every channel offers standard high resolution gain switching (36 gain steps with 1.5 dB per step) using Roederstein precision resistors and mil-spec gold contact rotary switches. A gloss black 1/8-inch thick rad-used face plate has illuminated push button switches and hand-machined aluminium knobs. Remote preamp control and A-D conversion options are in development.

Millennia Media, US. Tel: +1 530-647-0750

ARX DI

ARX' DI-Plus is a single-channel device with a clamshell design for interior access. Inputs are via a normal gain high impedance balanced input and a separate -40dB speaker level input from an instrument amplifier. Both inputs can be attenuated



by a 20dB pad. Switching to a console's phantom power is automatic or it reverts to its internal battery power. Connections include an input loop-through, balanced XLR output and ground lift. The company has also released its Climate series of weatherproof loudspeakers with 126mm bass driver and 20mm soft dome tweeter. Dispersion is claimed as 120° x 120° and recommended amp power is 60W. All metal fixtures are stainless steel and the drivers and back plates are sealed with rubber gaskets.

ARX, Europe. Tel: +44 181 742 0350

A&H ML5000

Allen & Heath's ML5000 is an 8 VCA group, 8 audio group, 16 aux EOH mixer that can be reconfigured as an 18 mix, 8 VCA group dedicated monitor console with all mixes on faders and inserts, talkback and metering. The desk boasts an LCRplus image control system, enhanced IEM capability, new 4-band EQ with swept Q mids, a 12x8 matrix, and a 128 scene memory for mute automation and scene mixing on VCAs.

Allen & Heath, UK. Tel: +44 1326 372070

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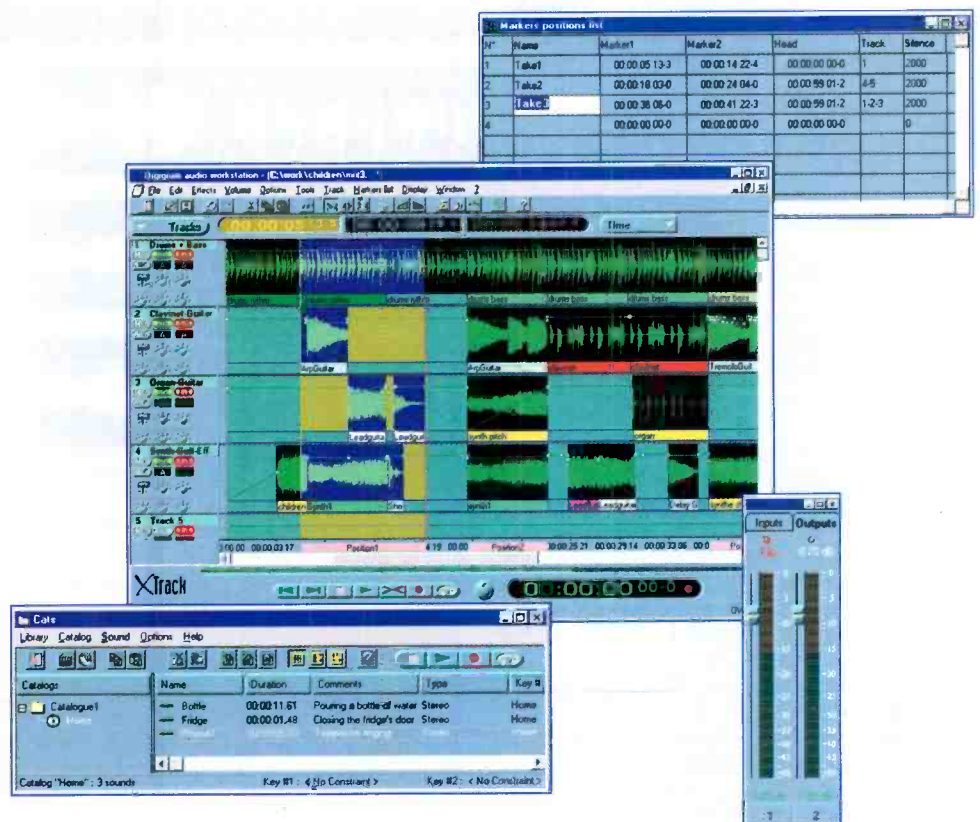
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Millennia Media TCL-2 Twincom

Expanding its Twin Topology stable, Millennia Media adds a stylish compressor to the line. **George Shilling** takes the twin challenge

HOT ON THE HEELS of Millennia's NSEQ-2 comes the similarly styled Twincom. Like the equaliser, this 2-channel compressor-limiter features 'Twin Topology' - there are theoretically two compressors in one, although both seem to share the same optical sensing. One amplifier is based on twin-triode vacuum tubes run at high voltage, the other features discrete J-FET servo amplifiers; both circuits are class-A. Unusually, fully-balanced signal paths are retained throughout all processing, negating any need for transformers. Ventilation for all of this heat-inducing circuitry is provided in top and side panels of the 2U-high case. If the top didn't have vents, you could almost fry eggs on it—it is seriously hot. An external heat sink might have helped, but a large amount of heat comes from above the valves, so allow for extra rack space and an air-con upgrade. And with all this heavy valve and class-A circuitry, you will



need a strong rack. The front panel is extremely thick, radiused like the Focusrite Red range, with an unusual dusky metallic finish. The front panel power rocker is recessed to avoid accidents, and there is a central power-on LED. The latter is somewhat superfluous, as the pretty meters glow a warm yellow when the unit is on. These meters have oversized numbers and are easy to read.

Each channel features small, undamped knobs (though not as frictionless as those found on some Manley gear) for Attack, Release, Threshold and Ratio. These are machined to look similar to those found on Focusrite Reds. Unfortunately, they have no pointer along their sides, so recalling exact settings is tricky.

The ratio knob starts at 2:1 and is already at 6:1 in less than a quarter-turn. It continues all the way through 15:1 half way round, and on all the way to 30:1. This must be a compressor for people who like lots of compression. There is not much scope for fine-tuning at low ratios, but, oddly, lots of scope for subtly different hard-limiting. Well, the popular Urei 1176 is usually left on its switched 4:1 setting with no problem. But that old workhorse has a more forgiving knee characteristic than the Millennia Media. There's nothing wrong with the Twincom's character, it's just a matter of personal taste. And I generally prefer a softer knee with my slower compressors. And the Twincom is fairly slow. Attack ranges from a quoted 2ms to 100ms, and Release from 100ms to 3s (both are slowest when clockwise), but

I felt the fastest times were just not fast enough in some circumstances, say percussion and certain stereo mixes, but good for vocals and acoustic guitars.

The uncalibrated THRESHOLD knob does little in the first half of its rotation. Then the limiting suddenly kicks-in. Compression increases as this is turned clockwise, so presumably it feeds the signal to the light in the optical sensor circuit. The OUTPUT level knob for each channel is huge by comparison to the other knobs, and is pleasantly knurled but similarly undamped. This uses a conductive plastic potentiometer, and is not just a make-up gain: you can fully attenuate the signal with the knob anticlockwise. In contrast to the power switch, each knob sticks out a long way. While a pleasure to use, some reservation must be expressed about vulnerability to accidental knocks or even breakage. Another slight niggle is that while there is a series of small marks around each knob, these have no calibration, so it is difficult to match settings.

Push-buttons illuminate when depressed. Each channel features Channel In (or bypass), Meter Gain Reduction (or output level), and Twin Topology—on is FET, off is valve. Additionally, there is a stereo UNK button.

I was looking forward to comparing the two modes, but the initial revelation that the solid state sounded obviously better than the valves was soon abrogated by the discovery of a boost in the output level of 1dB in J-FET mode. It's not the end of the world but a shame nevertheless. Comparisons are also made difficult by the Output Level knobs being active at all times—even in bypass. A by-product of Millennia's minimalist approach, no doubt, but I prefer make-up gain which is additive only, and only active with the compressor active. The CH IN button appears to simply activate the side chain feed to the optical sensor.

There was a slight discrepancy between the two channels' controls: checking with an oscilloscope showed up differences—a potential problem when stereo-linking. Stereo mode is a little unusual: altering the individual channels' Ratio controls only seems to affect the adjusted channel, while Threshold affects both.

Alignment discrepancies aside, this is a clean, great sounding compressor. The simple manual claims a remarkable frequency response from 2Hz to 100kHz in both valve and solid-state modes. The two topologies both sound pure, transparent, and, in most circumstances, remarkably similar, with the J-FET circuit

sometimes marginally more detailed. The compression has all the brute force of the dbx 160S, but lacks some of the latter's agility. For the purist, this is a good value high-performance compressor. And it's also available in black. ■

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NEW TECHNOLOGIES

Weiss SRC

The SFC2 SRC handles 44.1, 48, 88.2 and 96kHz sampling frequencies and can convert between any of these. It is a dual unit with two fully independent stereo sampling frequency converters in one box which can simultaneously down- and up-sample signals. Its synchronous design eliminates any signal degradation due to sampling frequency jitter. In addition, a word length reduction (dithering-noise-shaping) function is built in. The output word length can be set to 24, 20 or 16 bits. Version 4.1 software for the EQ1 parametric equaliser adds variable slope in high low shelf mode, M-S encoding/decoding for equalising the two parts separately, and enhanced MIDI control. Upgrades from version 4.0 to version 4.1 are free.

Weiss, Switzerland. Tel: +41 1 940 20 06

Soundscape gets CEDAR

CEDAR DeClick for Soundscape is a plug-in that runs under Soundscape's SSHDR1 Plus and R.Ed digital audio workstations. It has been engineered in order to address the widest possible range of scratch, click and thump removal problems, and combines two radically different de-clickers into a single package. Auto declick has been designed to restore the most damaged of material. This automatically detects each click, removes it, and then fills the gap with the best estimate of the material that existed (or would have existed). Manual declick has been designed to remove clicks that auto declick can not process adequately. It does this by allowing you to specify the audio that constitutes the click. Since auto declick is more likely to fail when the clicks are longer, the manual declick interpolator is optimised for longer clicks and scratches.

Soundscape, UK. Tel: +44 1222 450120

Telex portable UHF

Telex ENG-100 portable receiver has 100-channel capability and compatibility with the existing LT100 belt-pack transmitter and the SH100 hand-held transmitter. With a claimed frequency response of 50Hz-15kHz and less than 2% THD, the ENG-100 operates in the 608-746MHz RF frequency range within TV channels 47/84 or 58/59 with an RF stability rating of 0.005% or better.

Telex, US. Tel: +1 612 884 4051



Chord D-AC

Chord's DSC 1500E flagship D-AC has a fully functional remote control and a fully upgradable architecture with 192kHz, 384kHz and DSD/SACD modules available. Standard issue is 24/96 and features multi-bit hybrid or delta sigma technologies selected via the remote. Inputs are AES-EBC, SPDIF, AT&T glass and Toslink and outputs are AES, SDIF2 and Toslink and balanced XLR.

Chord, UK. Tel: +44 1622 721444

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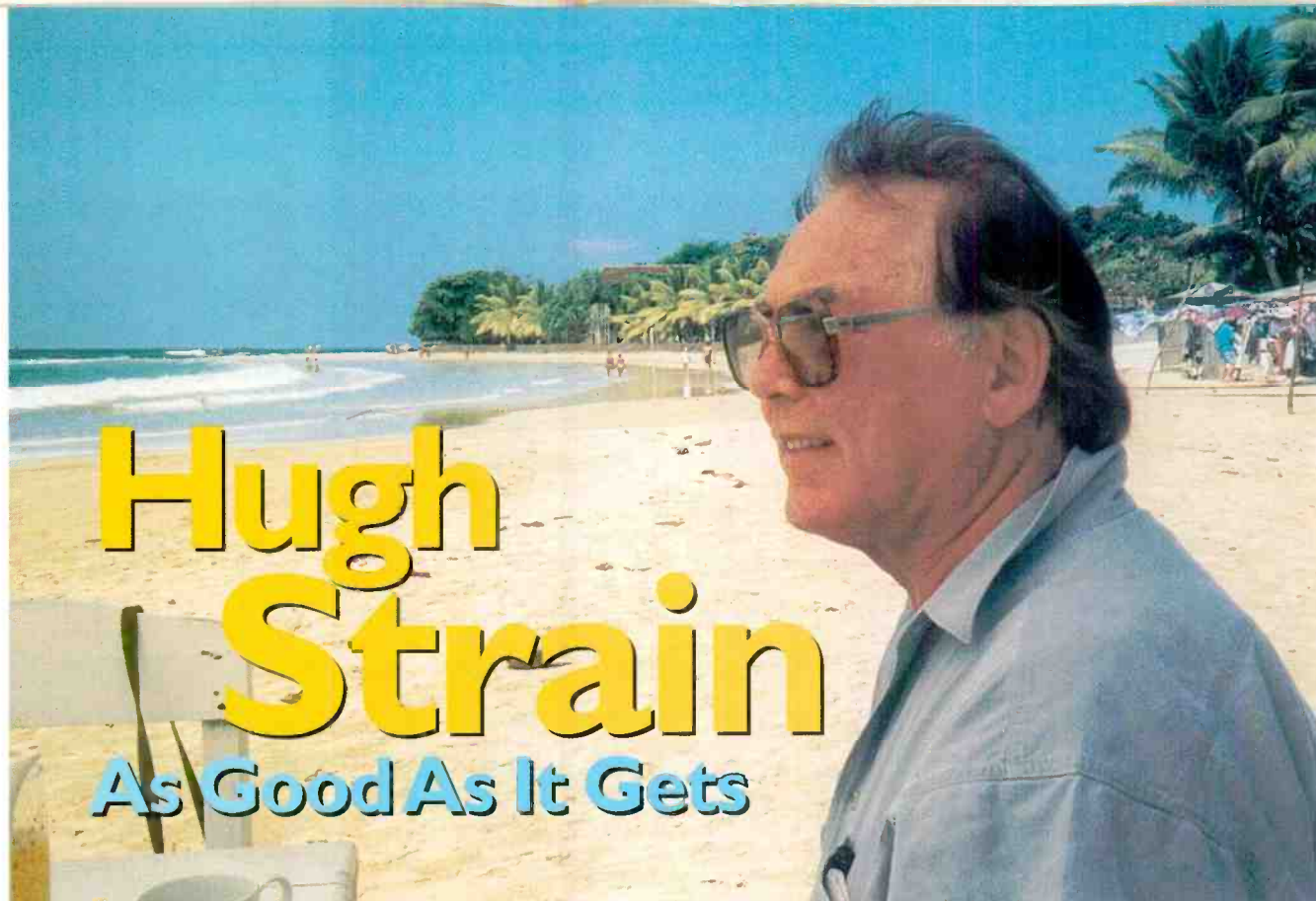
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Hugh Strain

As Good As It Gets

With a career that mirrors the development of the film industry, Hugh Strain is a legend among sound rerecordists.

Rob James talks with him about his experiences

MICHAEL CAINE MIGHT have put it: 'His name is Hugh Strain, but not a lot of people outside the film industry or those without a penchant for reading the small print of the credits know that'. While music engineers often become famous in their own right, with the possible exception of Walter Murch who is more renaissance man than most, the dubbing mixer remains a long way down the credits. And it is as a dubbing—or rerecording

engineer that Strain has spent his professional life.

Fifty years ago, Strain began work as a general trainee at the Borehamwood studios of MGM. In those days it was common to spend time in several departments before specialising. He had been interested in sound but worked in production, editing and cameras before coming to rest in the sound department.

'I had the use of a large house in Ayrshire and it had pathway beside it

with big wall,' he recalls. 'I used to love running through there and listening to the change of sound of my footsteps on the flagstones, the changing reflections and that sort of thing.'

One of the first movies Strain worked on was *The Dream of Olwen* (1947), starring Sonia Dresdel and containing an eponymous piano piece. It was before the development of magnetic film recording and all sound recording for film at MGM was done on optical sound cameras. He worked in all the junior roles, operating the sound camera and assisting on the mic boom.

'Just before I went in the army I was part of a team loaned out to 20th Century Fox to shoot *Night and the* >



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'I think it's very important, dialogue premixing, you can sometimes leave extraneous noises where you know there is going to be music or whatever but generally you must get it right'



< *City* (1950) with Richard Widmark and a lot of fine English actors,' he recalls. 'I think it was the first film to use so much location shooting in London. We filmed from a bus attached by cable to a generator on a truck, right through Piccadilly Circus.'

Returning from national service in the Royal Signals he spent a couple of years in various roles including doing playbacks to accustom horses to loud noises for *Ivanhoe* (1952) and, while still at MGM, he worked on *Knights of The Round Table*, (1953) the first Cinema-Scope film to be shot in the UK. Moving on to the Associated British Picture Corporation, (ABPC) also at Borehamwood, he worked on *The Dambusters* (1954) and John Huston's *Moby Dick* (1956). In the middle of shooting Strain made the move into the dubbing theatre, working on sound camera.

'We were on magnetic by then, still without rock-and-roll, with Selsyn interlocks,' he says of *Moby Dick*. 'Because John Huston had to keep leaving the country for tax reasons it took about six months to mix.'

In 1954 dubbing was still done a reel at a time with rehearsals and 'takes'. You continued until the whole reel was as good as it was going to get and 'printed' that. 'By 1955-56 the demand for television films was increasing and we needed another dubbing theatre at Elstree,' he recalls. 'Two of us were made up to assistant dubbing mixer on the same day and I ended up in the features theatre.' The other was the late Bill Rowe, a legend in the British film sound industry.

Among the movies Strain worked on at this time was *Ice Cold in Alex* (1958) with Trevor Howard. 'They asked if

I would swap because Bill and the mixer, weren't getting along. This guy, Len Abbott was quite a charming man socially but difficult in the theatre. I remember working with him on one occasion when I was playing effects and him saying "Take that down... take that down... take it down more... take it out!" and having to say, "I'm sorry, I'm not playing anything. I think it's on your dialogue track".

'I think it's very important, dialogue premixing, you can sometimes leave extraneous noises where you know there is going to be music or whatever but generally you must get it right. It's a combination of things, clip (notch) filters, the Dolby Orange Box, the Cat 43a and the newer one, the Cat. 430, or even graphics. But it is the combination which counts—you need all the tools for different problems.'

The first film Strain worked as lead mixer was *The Helions*, made in South Africa with Richard Todd. During its casting, the Producer said to one of his henchmen, 'We must get this guy Wilde,' meaning Oscar. They ended up with Marty.

Moving to Warwick sound meant building up the business with commercials and some of the spill from other studios, post sync for the first Bond film, *Dr No* (1962) and a temp mix. Various movies followed from the directors such as Richard Donner. Strain mixed *What's New Pussycat* (1965) with Peter Sellers. In 10 years at Warwick, Strain mixed more films than he can remember. These included *Ghenghis Khan* (1965), *The Go Between* (1971), *Get Carter* (1971), *The Terminal Man* (1974). The equipment used on this formidable body of work seems Spartan by today's standards: 'We had a triple-track recorder which was custom built for us and 10 or 12 followers for mag or optical. By the time we did *Ghengis Khan* most of the tracks were mag but you'd still occasionally get the odd effects or loop on optical track. The console was a mono Westrex we converted to use as a triple-track console, which meant an extra switch on each channel to route to the three tracks. The faders were sliders but operating rotary pots with a bit of string. It was a passive desk so everything was attenuation, the limited supply of equalisers, were patched around to suit what you were doing.'

This was the precursor of the current multitrack premix and 'stem' recording where dialogue, effects and music are recorded separately at the final mix stage.

'We only had one echo device, an echo chamber, and when I did the dialogues I used to lay it down with echo on a separate track so if I needed echo at certain places I would have it without tying up the chamber. Dialogue mixing was interesting but you could patch things around really quickly and the general quality of location recording was >

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'You've got to come up with suggestions and put your head on the chopping block as far as the director's concerned, then he takes the final decision'



< far better so cleaning up was less of a problem. We get such horrendous changes now with the use of directional microphones. The room tone was higher but that usually didn't matter and of course there was the Academy roll-off which worked in your favour to hide it. We always did premixes 4dB high to keep the mag noise down and then backed them off on the final. Even in optical days we did the same. With digital the wide dynamic range is fantastic.'

After working on the Beatles cartoon, *Yellow Submarine* (1968) ('We never did manage to get our hands on the stereo tracks and all the Beatles voices in the movie were done by impersonators except the songs'), Strain was offered a job in Canada and accepted the opportunity with alacrity. Here he mixed *Maboney's Last Stand* (1975) and others. On his return to the UK, he went to Worldwide Sound where he did TV shows including *The Sweeney*, *Special Branch* and *The Professionals*. Leaving Worldwide on a matter of principle, Strain worked at Trevor Pike Sound and Delta Sound at Shepperton before getting together with Richard Paynter, Norman Brown, Malcolm Stewart, mixer Peter Maxwell and editors Vic Vine and John Carr to take over De Lane Lea. The facility was established around 1948 by Major De Lane Lea and inherited by his son, Jaques. It was later taken over by Humphreys Holdings and then by BET, and by 1984 it was in need of a change. It was here that Strain mixed *Monty Python and the Holy Grail* (1974) and *Life of Brian* (1979).

'Working with the Pythons was marvellous, crazy, but it was really a matter of adjusting to their way of working,

They would drop disks in, in BBC style with Terry Jones beside me cueing them and I'd watch him and open the fader.'

Dolby Stereo came on the scene at this time and Strain mixed *Life of Brian* in this format. At Trevor Pike's Strain mixed John Mackenzie's *Long Good Friday* (1980), another landmark movie that set a style for the time, it was also an early chance to get a glimpse of Piers Brosnan.

Between Shepperton and De Lane Lea Strain returned to Canada to mix a couple of pictures. One of these was the Alexis Kanner film *Kings and Desperate Men: A Hostage Incident* (1981)—regarded by some as a flawed masterpiece with notable sound design.

'It had been mixed in Montreal and we didn't have access to all the original tracks so it was a bit of a patchwork quilt with the new music. The technical quality was not as good as it might have been but it was an interesting film, although perhaps suffers from over editing. You could make one film and spend the rest of your life on it—on *Maboney's Last Stand*, after about a year of editing he went back to the rushes and started all over again. But he's a great character. He was over here recently getting backing for a new project.'

STRAIN'S EXPERIENCES question the distinction between the dubbing mixer's role and the director's.

'You've got to come up with suggestions and put your head on the chopping block as far as the director's concerned, then he takes the final decision,' he comments. 'But you've got to be able to have your say. I particularly remember Fred Zinnemann coming out into the camera room at Elstree and saying, "What do you think?" I wasn't sure if he was serious but I answered him and he listened carefully and changed a few things.'

Film-making is a truly collaborative process. One great director said if there were to be a god of film making it should be the Norse god Heimdahl who mysteriously declared, 'I am the child of nine mothers, I am the child of mothers nine.' If so, then the dubbing mixer would be the midwife.

Strain mixed a total of 14 Michael Winner pictures including *The Jokers* (1966), *I'll never forget Whatsisname* (1967), *Hannibal Brooks* (1969) and *Deathwish 1* (1974), *Deathwish 2* (1981) and *Deathwish 3* (1985).

I had the privilege of working with him on the Dennis Potter series *Black-eyes* (1989) at De Lane Lea. We had both worked with Potter independently, but this time I was hired as lead mixer. I learned a great deal from Strain, particularly about using dynamic range in the cinema. Strain is gracious enough to insist he also learned from me. Either way, we both enjoyed an unusual amount of freedom to experiment >



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'A good story that's what you start with. No matter how good the technician is, if you're working on something with a lousy story, *The Avengers* (1998) for instance. Adrian Rhodes did a very good soundtrack on it, but...



< along with sound designer Michael Parker.

You might suppose someone with Strain's experience might by now be resistant to new technology but nothing could be further from the truth. 'I like it but not for the sake of it,' he asserts. 'Sometimes with multitrack recording, which is what we are doing, there is a quicker way of doing something. The idea that in a hard-disk system you have the whole picture in one roll means if there is a problem you have to stop and let the editors take the whole thing away. If it is in reels of 10 or 20 minutes there is usually something else you could be doing. In the old days if you wanted to reprise a bit of music from Reel 2 in Reel 4, you put the track up on a spare head, ran it down and bang—there it was. It is only recently we've been able to work as quickly with digital. Digital dubbers took a long time to get close to what we already had with mag. Direct and replay switching and being able to hear sound going backwards, why change until the new technology offered at least the same performance along with the advantages?

'I love the speed you can move music and dialogue around but the equipment is only as good as the operators. There are too many people who know how to work the machines but slow you down because they have no idea about laying tracks. But don't get me wrong, we had that in the old days as well.

'One idea is to edit as much material as possible onto one track. That makes

it very difficult to match things if there is camera noise or something which isn't heard when track laying. With the new technology you can do finer work. Some people always did fine work, cutting in some cases to less than a sprocket, (1/4 frame) or actually scraping the oxide off, like blooping on optical, but the technology makes it easier'

In the late-eighties, Strain was one of the founder members of AMPS (the Association of Motion Picture Sound) and was its chairman for the first three years. 'In a lot of cases, the discipline in television is better than in cinema,' he reflects. 'People are doing good work and it's underrated. It's how the tracks are laid out for you. In television, if you can overlap, you overlap. A lot of features people cut the sound on the picture cut regardless and miss the useful moves and so on. With background problems, if you don't overlap you don't stand a chance so you end up adding unwanted sound to cover. Loops of background can help you but it's not the same as having the correct overlap.

'I still like good films. As *Good As It Gets* (1997) or *The Shawshank Redemption* (1994), that was a lovely film. A good story that's what you start with. No matter how good the technician is, if you're working on something with a lousy story, *The Avengers* (1998) for instance. Adrian Rhodes did a very good soundtrack on it but...

'A good dubbing mixer is a guy who can clap his hands without lifting his hands. Co-ordination is very important and a trained ear, a detailed ear. A feeling, an emotion to feel when something happens. You've got to be technically good as well from the point of view of dialogues and so on, getting things in the right place and pre-mixes, but then, when you've actually got everything up and you're playing, you're mixing it, you've got to feel it. You're on the go, it's really going and it's great. It's the greatest feeling you can have. Maybe you get that tingle at the back of your neck and it's great.

'The greatest art form is still literature, it's the most direct communication, but once you are convinced you can be led up the garden path gently. Cinema is, after all, based on persistence of vision and it applies equally in sound. I always used to think sound was at most, 40% of a picture. What we are trying to do is make it believable. There are times when you can only do this by being surreal. In Losey's *Figures in the Landscape* (1970), when the real mayhem was going on the effects were pushed back to heighten the effect. There is a helicopter scene, which goes to silence. Silence is the thing most people are afraid to use. I don't know why.'

Perhaps it's because nature is suspicious of silence and people abhor it. Or perhaps it's because Strain himself is capable of filling a silence with so many

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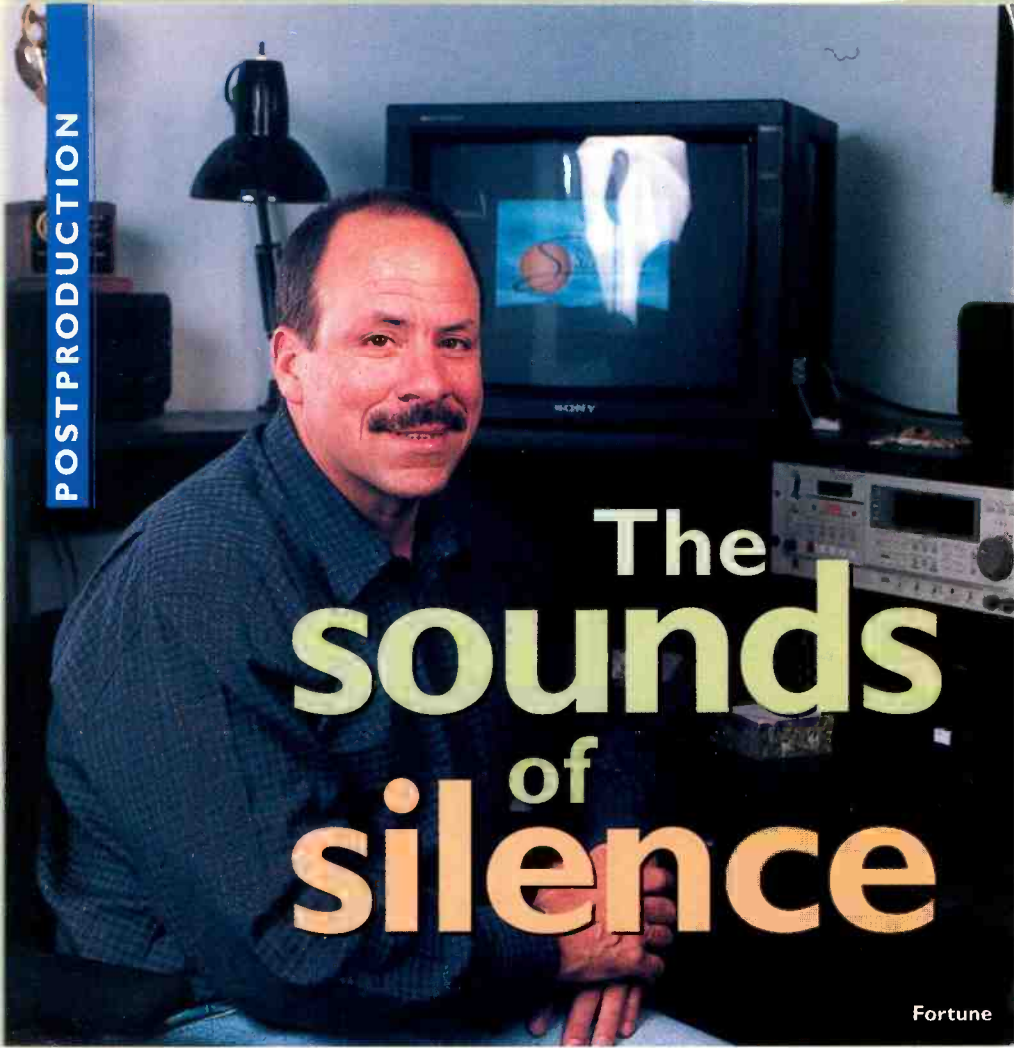
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The sounds of silence

Fortune

Director David O Russell's *The Three Kings* mixes war action with suspense and silence. **Richard Buskin** talks with co-supervising sound editor Bruce Fortune and music mixer Mike Herbeck about their work on the picture

IT'S DEFINITELY NOT 'Saving Private Ryan', says Bruce Fortune about *The Three Kings*. 'It's more like "Pulp Fiction Goes To War". Huh?

Bruce Fortune, you see, was the co-supervising sound editor on director David O Russell's new movie starring George Clooney, Ice Cube and Mark Wahlberg, and the point that he is making is with regard to the kind of sound effects that audiences might expect from war films in the wake of Steven Spielberg's landmark Oscar-winner. *Saving Private Ryan* basically gripped its viewers' attention during the stunning first 20 minutes of the picture by way of a visual and aural assault on the senses, with blood, guts, bullets and bombs flying in all directions to the accompaniment of sounds that are excruciatingly lifelike. (Not that I would know, never having been in a war zone.) *The Three Kings*, on the other hand, wields its silences as boldly and cleverly as Spielberg used his whizzes, roars and explosions.

'David O Russell wrote and shot a very stylised war movie with this film, and we augmented that in large part by util-

ising silences,' says Fortune, whose fellow supervising sound editor was John Leveque. Both men work at Sound Storm in Burbank, which, along with Warners Brothers' own facility, is where sound on the Warner-Atlas Entertainment film was posted. The mix took place at the Samuel Goldwyn Theatre.

Set in the Iraqi desert during the closing stages of the Iran-Iraq war, the story of *The Three Kings* takes place within a day and a half. While the fighting swirls all around them, our hunky heroes George Clooney, Ice Cube and Mark Wahlberg attempt to snatch the gold reserves of Saddam Hussein, yet they soon find themselves deeper than they ever expected—or wanted—in the political and social machinations of war.

'This is definitely not your basic shoot-em-up war movie,' asserts Sound Storm president, John Fanaris. 'Bruce and John tried to match the noir approach of the visuals and the dialogue, and the result is a lot of space in the audio.'

'The using of silence really does contribute to the overall effect of the picture,' adds Bruce Fortune, while pointing out just how quiet digital audio can make those silences be, thus creating an even

greater contrast with the more high-volume moments.

'It's become something of a cliché to say that the boldest stroke of sound is silence, but it's true,' says Fortune, who worked on the documentary commemorating the rerelease of Sam Peckinpah's *The Wild Bunch*, and who consequently knows a thing or two about noisy pictures.

'Sam Peckinpah liked to have people shot two or three times before they went down,' he laughs. 'This picture, however, isn't all about explosions and flying bullets. That's not to say that there isn't a fair amount of that sort of action—there is—but those moments stand out all the more when they're juxtaposed with silence. That's the effect that we were going for. We were trying to bring out the emotional components of the script—what it was like not only to be in a fire-fight, but also what it feels like right after one is over.'

Fortune and his colleagues needed to establish locations for the audio; specifically open desert, Iraqi villages and underground bunkers, with exterior desert and interior bunker shots utilising a variety of wind effects in order to create their respective ambiances.

'For interior shots we used wind sounds based upon their tonal qualities,' Fortune explains. 'We mixed them with some time-delayed reverberant sounds and really played them front to rear in the surrounds to achieve the desired enclosed effect. You have to give a new emphasis to the mundane things of life when you're trying to create an environment without any real audio focus. There will be dripping water here, a cough there, and it's a lot harder to set that kind of stage than it is to communicate a battle scene.'

A significant portion of the more obvious sound effects was recorded in the field by location recordist Edward Tise, who sent in synced and unsynced effects recorded to Nagra D digital recorders. The list of military effects was long and detailed, and this included HumVees and classic "deuce-and-a-half" 2.5-ton lorries together with a VW Chenoweth. The sound of the Chenoweth—a sort of civilian dune buggy adapted for military use—was not altered after recording, and this was largely because David O Russell liked the civilian feel of the stock 1800cc VW motor in a military environment.

'We also rerecorded a lot of these sorts of sounds on a custom basis as we got the dailies in,' says Fortune. 'We went up to the Eagle's Nest in Little Tujunga Canyon, where the LAPD SWAT team does its weapons training, to record the extremely loud reports of a helicopter-borne 30-calibre Minigun supplied by local armourers. We recorded to four recorders—a Nagra IS, a Nagra IV-S and two Fostex PD4s—using seven microphones; two for each of the stereo machines and one for the

'This is definitely not your basic shoot-'em-up war movie. Bruce and John tried to match the Noir approach of the visuals and the dialogue, and the result is a lot of space in the audio.'



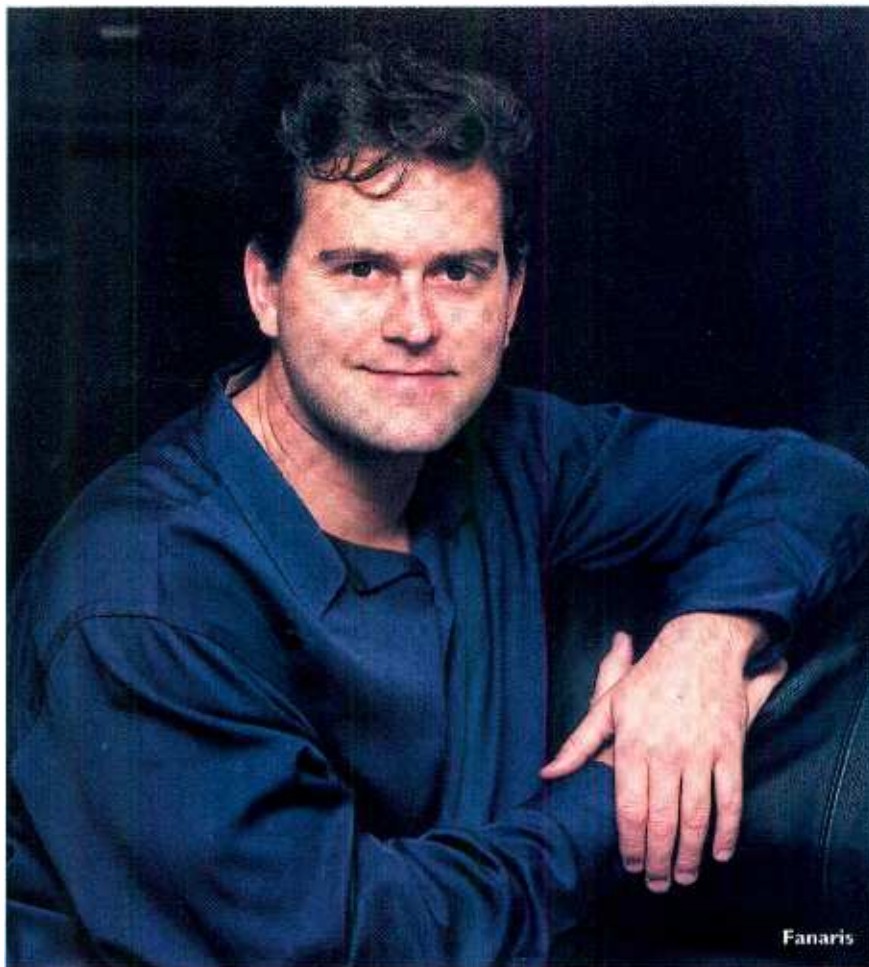
mono Nagra IS.

'I like the way the analogue Nagra records explosive sound better than digital. You see, as the digital processor analyses the input and then records it some of the sound's immediacy is lost in the processing, whereas with analogue you're getting a representation of the sound, including the immediacy of the explosive effect. It seems counter-intuitive because digital has this amazing headroom, but analogue almost always works better for those kinds of sounds.'

'One of the strangest sound effects was a thing called a blivet; a large sort of water bed that the Army uses for storing water in the desert. The film opens with a soldier jumping up and down on one of these and bouncing some of his comrades around on it. Well, Edward [Tise] managed to capture the strange sort of sloshing noise that it makes and we then tweaked it, so there was plenty of enhanced location sound.'

Tise also got to do a lot of intense recording when the flu confined George Clooney to his bed for four days during principal photography, and this was later augmented with new custom recordings of the same elements. Again, in terms of sound design and effects there are long moments of silence that heighten the impact of the more bombastic sounds throughout the film, and intrinsic to the movie's design in this regard, as well as to all of its dialogue editing, were several of Sound Storm's dozen Fairlight MFX3plus digital audio workstations, as well as four Fairlight DAD 24-track dubbers which match the MFX3plus and DAD systems at the Warner Brothers post and mixing facilities.

'These allow us to make changes at any step of the sound process, right down to the mix, and it's nice to have that sort of instant, integrated compatibility built into the postproduction



aspect,' says Bruce Fortune. 'It means that you can concentrate on the work at hand without ever having to think about compatibility at all. There again, we also had a lot of separation of the individual sound elements that came in from the field, because Edward was using several 4-track Nagras—kind of like the old [Robert] Altman 8-track days—and the 24-channel MFX3plus systems gave us the capacity needed to keep them separate, and give each track the treatment it required and the ability to keep each character's dialogue separate for dubbing. We also used the MFX3plus to conform all the dialogue and effects predubs and the final mix stems.'

'There were several scenes in which David slowed down the action, using six and 12 frames [per second], and we were able to use the MFX3plus to pitch down the dialogue to match it. We couldn't really pitch down as far as the picture had been slowed, because you reach a point going for that effect when the dialogue starts to lose intelligibility and it becomes more like a sound effect than a spoken word. I mean, you don't want the actors sounding like monsters. There's a thin line between dialogue and sound effects in those sorts of instances, and it's the analogue human ear that you have to use to gauge the useful limits of compression and expansion, serving as the final arbiter.'

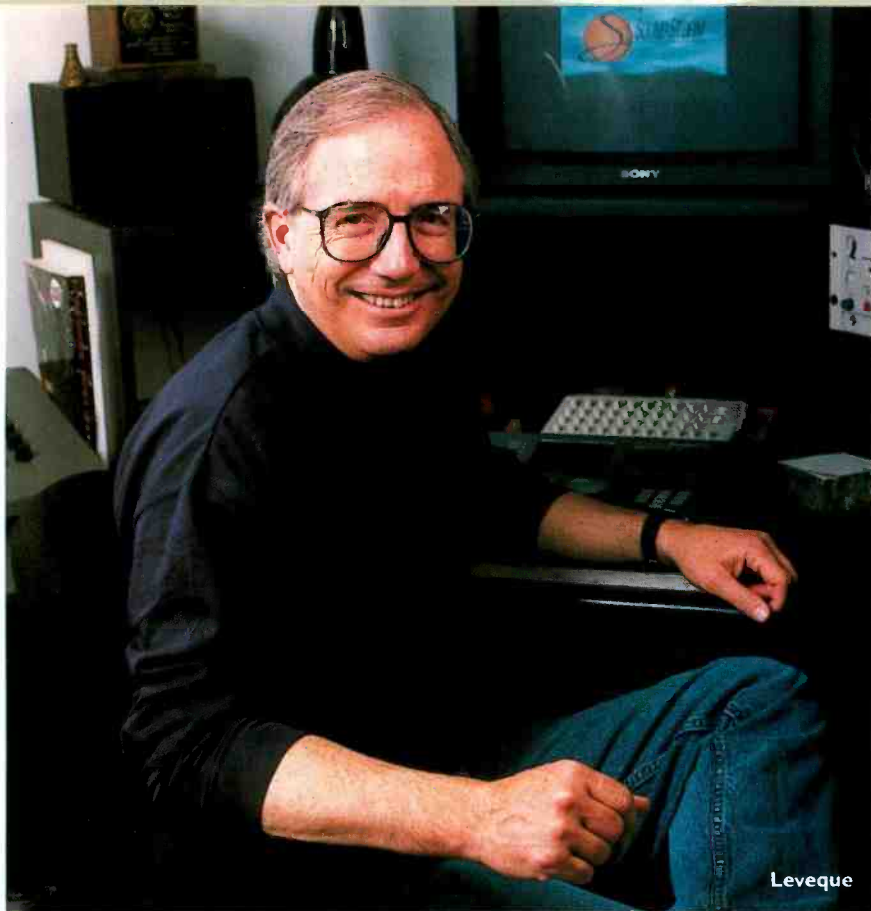
Prior to the film's mix at Warner Brothers, predubs were prepared using

the MFX3pluses at Sound Storm.

'The 24-bit capability of the system is really wonderful, and the same goes for the DADs,' says Bruce Fortune. 'In reel five we expect to have seven of them running for the main action sequences. Warners has six DADs dedicated to the Goldwyn Theatre and can bring in more when needed. As good as analogue is for things like explosions, you need a reliable, accurate digital system for complex film sound.'

Bob Litt mixed the dialogue, Dan Leahy the sound effects and Mike Herbeck the music at the Warners facility in Burbank, where a Harrison PP1 console with an innovative new automation system apparently does the trick.

'I actually prefer the automation to that of SSL and various other companies,' says Herbeck. 'It's much more user-friendly and you can do a lot with it. The Harrison board itself isn't automated but all of the fader moves are. The system is manufactured by Uptown Systems in Colorado, and, being that we were one of the first postproduction facilities to use their equipment, they listened to everything that we asked them to do. For instance, having three people sitting at a console—the music mixer, dialogue mixer and effects mixer—we are all working in different modes. Well, a lot of these systems will just give you one or two computers, meaning that the mixers basically have to share and work in the same mode, whereas with this >



Leveque

< system we each have our own computer and can therefore do whatever we want. If the dialogue mixer needs to go back and redo something I don't have to touch my material, I can just leave it alone, and vice-versa. Also, other systems aren't as easy to change parameters with. This one has two buttons on each fader, so you're either in manual mode, you're ready to write or you're reading back at just the push of a button, whereas with others you sometimes have to go into the computer and tell it which fader you want to change.

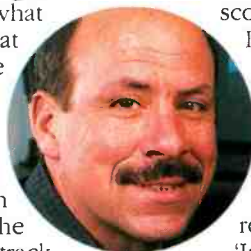
'Built into the main board the effects console only has 32 inputs, the dialogue has 24 and the music has 24, but what he have are outboard mixers that plug into them. You see, they've taken other PP1 consoles that are no longer here and put them in roll-around racks, so basically we can double the inputs.'

Whereas dialogue and effects on *The Three Kings* employed the Fairlight. Mike Herbeck mixed to 6-track SR mag tape, not having previously familiarised himself with what was coming his way.

'On some movie projects I go to the scoring stage, and that can help in that I can ask for certain things to be separated out,' he says. 'They don't normally separate all of the instruments; you'll get a premix or, with certain composers, just a mix, and all you can really do is EQ and raise or lower it. There again, other composers will give you separation, where you don't have the trombones tied in with the drums and so forth, and, depending on the sound effects, that often helps.'

Still, while part of the movie's musical

'Sam (Peckinpah) liked to have people shot two or three times before they went down. This picture, however, isn't all about explosions and flying bullets.'



score comprises Carter Burwell's original orchestral composition, in line with the current industry trend a large portion of it also features the usual smattering of tracks by a variety of rock artists.

'In some scenes a song will be heard coming over a car [audio] system, but then the song itself will have some sort of meaning in the film, so as the scene progresses we'll just keep playing that music as if it's score,' Herbeck says. 'So, it changes from coming out of a source speaker, where it's heavily compressed, to becoming part of the score, and for that compressed version we'll often have to go further than reality to get the effect that conveys that it's coming out of a car speaker. Of course, today's cars often have got their own 6-track setups, but that also points to how much more sophisticated the listeners' ears have become... not to mention those of the directors.'



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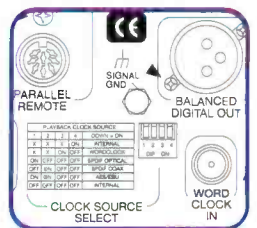
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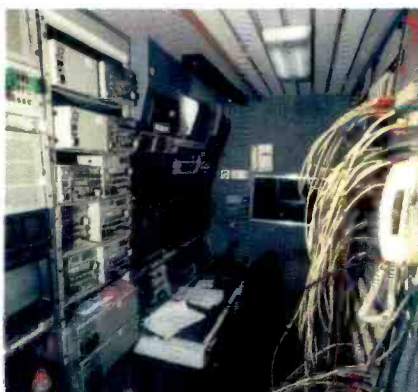
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Yakety Yak

It isn't sent to air or even recorded, but audio talkback is an essential part of any broadcast setup. **Neil Hillman** tunes into the comms zone



CONFESS: on a regular basis I lose sight of the joy of single-camera sound recording on location, which is the simple need to concentrate on producing a high-quality audio product. As a location man working in the rain, it's all too easy to assume that a sound supervisor in the luxury and warmth of an outside broadcast vehicle has it made. After all, he has the convenience of a dry mixing desk which will allow him greater flexibility of signal processing, equalisation, routing and a place to rest his foam coffee cup. But as the rain seeps down my headphones and drips onto the meters, I draw comfort from the realisation that what will almost certainly weigh heavier around his neck than the 4-channel mixer, three radio mics and two feeds to the camera that are around mine, is the word that can cause a terror more acute than that experienced by the last horse in the annual Longchamps Prix de la Charcuterie race: 'comms'.

If I were to ask you what Dortmund and Ennepetal, Boulogne and Le Touquet, Napoli and Caserta, Hull and Scunthorpe have in common, I'd stake my mortgage—or Bolivia's debt to the World Bank which is a smaller sum—that you would not guess the link. It's not that these towns have all bid to host the Eurovision song contest nor is it that they are contenders to host the 2012 Olympic Games or even provide extended stages for the Tour de France cycle race. Nein, non, no. The answer is that they are all 26km apart from each other—and this is the total length of communications cables installed by Carlton 021 for its 54-camera coverage of this year's FA cup football final at Wembley stadium. Imagine standing in Scunthorpe and watching all your single XLR's running down the A 15, and then across and beyond the Humber bridge as far as the eye can see.

The fact is that sports coverage over the last ten years has become increasingly complex as broadcasters vie for more novel ways to attract and excite an ever more discerning viewing public. The good news is that within this particular sector of broadcasting the technician head-count has grown—in direct proportion to the number of Paracetamol tablets dispensed to alleviate the headaches associated with enabling people on-site to talk to each other. What I cheerfully never need give a second thought to as a single-camera recordist is providing talkback to, from and within a closed loop of a host broadcaster's transmission control, a producer, a director, a production assistant, a vision mixer, a commentator and his expert analyst, a presenter, numerous cameramen, a VT co-ordinator, a floor manager, a stage manager, a reporter, sound control, vision control, VT area, graphics, a Production Manager and a Unit Manager all wanting to talk to each other within a prioritised network. And this is without considering yet the need for the audio to cover a football match in Dolby surround sound with an emphasis on close effects, clean match effects, two commentators with headsets and lip-mics, an interview hand mic for a reporter tied to the pictures from a hand-held camera, sound effects from CD and MiniDisc for captions and replays; and a studio setup somewhere in the ground with three personal mics, foldback speakers, telephone extensions from the 32-line onboard exchange, more lip mics and standby hand mics, and a separate cabled mix of presentation talkback and off-air sound for the pivotal in-vision link-man.

Perhaps ten years ago, a respectable OB vehicle might incorporate around 10 4-wire circuits to and from the outside world, a rudimentary Inter-Area Communication system between >

< production, sound, vision and VT and a radio-talkback setup to serve a floor-manager and a floating sound technician. Today, a digital 80 x 80 talkback matrix is seen as the norm or even minimum for these highly evolved, F-1 hybrid mobile production centres often complete only when accompanied by a separate 54-foot long, 16-machine Video Tape truck. Indeed for a presentation as complex as the FA cup final, 021 cascaded several of these vehicles together to enable one truck to look after presentation, another to look after match coverage itself; while the VT truck and several other smaller add-ons parked alongside for such things as aerial and hot-head cameras. Even with the advantage of the assignable talkback, a further 80 cables married the two scanners together.

It would be difficult to conceive that



these complex setups could be achieved in the short rig-times allocated these days without the advent of flexible, saveable and assignable matrices, which in essence provide access to the cross-points of every in and out junction of a truck's communication circuits. Early digital systems provided for just the making or breaking of junctions on demand. Later systems are now offering PC-based VCA control that allows for the variation of volume from unity down to zero at a crosspoint (typically a dimming by around 18dB of a 4-wire circuit) so that when a VT co-ordinator keys 'on' to the director to tell them that the shot that just flashed by the goal post is available on a particular slow-motion replay machine, if the director is busy he can at once be heard grunting his 'not now' message by the person keying-on without them having to release their key and without a hint of howl-round. These modern VCA systems also bring the advantage of remote access from the sound control room of the various volume knobs on any particular talkback control panel within the network, as these pots are 'virtual', sending a control voltage back along a data line to the controlling computer telling it at what level to send audio out along that particular branch. This can be immensely useful at a time when the director or producer has 'twiddled' and left themselves deaf to the cries of an important source and claiming a fault in the system—a quick perusal of the system's PC screen can quickly rectify the situation speed-

ily and diplomatically. But this is why even in the modern age, a 2-wire control line to a telephone instrument can be very reassuring, just in case inadvertent adjustments take place on the front desk.

Within the architecture of these talkback systems is the ability to assign a priority to the various outstations so that if two people key 'on' simultaneously, one may override the other. Most of the newer units have around eight priority banks, rather like groups on a mixing desk, with stations assigned to '0' being overridden by all other keys, while stations assigned to '8' will take precedence over all others on the system. It is usual for the producer with overall on-air responsibility to take this top priority while the director may sit somewhere in the middle to enable him to receive important information from critical stations even while he is in full flow.

On-air, in-vision talent will no doubt be free of cabled talkback and receive information through a wireless Interruptible Fold Back (IFB) system operating as an adjunct to the main matrix. Here a separate sub-mix of talkback will be on offer such as the director's voice constantly (open talkback), producers voice when directly addressed (keyed talkback), programme sound and perhaps at a sporting event, clean commentary. Talk-through is also sometimes used to help cues between various in-vision reporters at various parts of a large venue. For out of vision commentators, 'lazy talkback' is invariably available whereby the programme microphone is taken off the programme output bus by the commentator pressing a button which acts as a mute or 'cough' key, routing that particular microphone onto the talkback system.

Even the most flexible of assignable systems will need some good old-fashioned plugging to give the complete flexibility needed for outside broadcast operations, and most sound supervisors would see the need for a jackfield offering break or semi-break jack access to the various talkback points. Perhaps then we should think of a digital talkback system in terms of that which is best and worst in hotels. The ideal hotel of course has a French cook, a German manager, British entertainment and an Italian bathroom. But beware of the hotel that offers British cooking, German entertainment, an Italian manager and French plumbing.

Clearly what is not desirable is the half-way house that requires both assignment and a tangle of patch cords—as the British army once famously discovered, it is not difficult for the message to be missed: 'Send reinforcements, we are going to advance' all too easily became 'Send three-and-four pence, we are going to a dance'. I would have rather been standing in the rain when that one was incoming. ■





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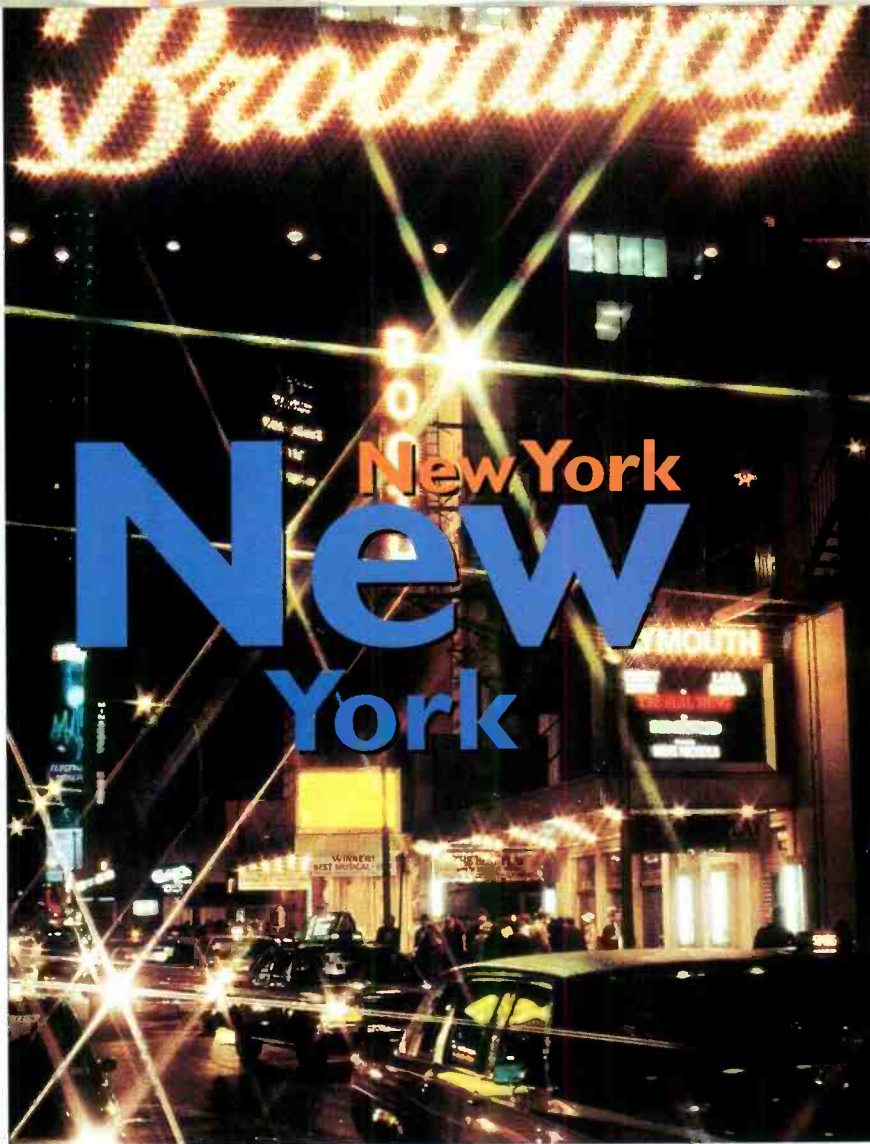
In the city so good they named it twice lives a long and convoluted history of recording studios.

Dan Daley revisits the memories and locations of audio's evolution

IRONICALLY THE HISTORY of audio recording in New York City began across the Hudson River in New Jersey, a place most New Yorkers regard with the kind of effete disdain that only New Yorkers can muster. But the fact remains that recording of all sorts began over there, in Menlo Park. Here Thomas Edison set up his laboratory and here, in December 1877, he constructed his first 'talking machine' which used tinfoil wrapped around a brass cylinder imprinted by a diaphragm-stylus combination powered by vocal energy and a hand crank. Edison would not attempt to commercially exploit his invention for another decade—initially as a dictation machine, at that—but it was with this contraption he gave the words 'Mary had a little lamb' a place in audio history and launched an industry that endures to this day.

New Jersey held onto its grip on the nascent studio business for some time. Opera great Enrico Caruso and RCA founder and former telegraph boy General David Sarnoff reportedly opened a recording studio in Camden sometime in the early 1930s, which may have been America's first dedicated recording facility. And New York expatriates like jazz producer Rudy Van Gelder continued to build facilities there for decades to come. But New York City's financial magnetism dictated that it would ultimately become a major star in the studio universe.

Most early recordings were made here in one of two ways—either bands and vocal artists would cut directly to lacquer or wax disks in the radio stations that were the first real centres of audio technology, or else they were recorded by musicological pioneers like Ralph Peer, who ventured out with cumbersome recording equipment and set in hotel rooms in New York and elsewhere. In fact, Peer essentially started the country music business with his recordings of the Carter Family in Bristol, Tennessee, on one of his many field trips. Both the radio stations—most of which, like WHOM, WNBC, WOR, WOR and WCBS, all had house orchestras—and the ad hoc hotel studios continued to be the locus of recording in Manhattan for years onward. Capitol Records maintained a lease on the Barbizon Plaza Hotel ballroom and made records with big band leaders like Stan Kenton and Fred Waring there. However, starting in the 1930s, major record



labels like Columbia and Decca began to see the need for dedicated recording facilities to feed the growing music market as Edison's phonograph had evolved into a major consumer product. These studios would become the foundation for the present-day business in Manhattan.

By the forties, Decca had a studio in the commodious Pythian Temple building; Capitol had a studio on 46th Street; Columbia built a classic facility on East 30th Street, close to the rumbling of the Third Avenue El train which remained in place even after the label had opened its more modern facilities on West 52nd Street; RCA had a small facility in the former Webster Hall in the East Village and a larger facility on East 24th Street, which in 1967 moved to 1133 Sixth Avenue where it remained until it closed in 1989 (it was the last of these grand old rooms to close, shortly after Atlantic Records' studio, opened in 1957 on Columbus Circle and reportedly the first studio in New York to go 8-track, closed in 1989.)

Essentially, the major labels owned the music business in those days, in much the same way that a few Hollywood studios dominated the film industry. But in the 1950s, things began to change. A restless and increasingly affluent post-war generation wanted more thrills, and some of them found exactly that in rock 'n' roll and 'race' records—R&B recordings by

the original black artists who had never had a chance to break out of their regional boxes in an age of Jim Crow oppression and lynchings. Once white artists began covering those songs and releasing them, a cultural and commercial explosion took place that set the stage for a new kind of studio industry. The confluence of these forms and new formats such as the 45rpm single and the LP album increased demand for recorded music exponentially. The staid facilities owned by the major labels couldn't hope to keep up, even if their management deigned to acknowledge this new music—which, of course, they eventually did, once they realised that they could make a lot of money at it. And while this same sequence of events took place elsewhere in the US, it was the New York City-based major labels that took it to a national level.

Early independent studios had a link to New York's pro-audio past: they grew out of radio stations. One pioneer of this development was the late Fortune Pope, still remembered by a handful of pioneers in New York as a character who loved to consort with gamblers and mob members. While still working as a staff engineer in the 1950s, producer Phil Ramone remembers that the joke was that if you did something wrong, you'd wind up in one of Pope's Colonial Sand & Concrete cement mixer trucks; 'You never >

Equitable Life Insurance Company bought out Aura and probably made them all more money than they could ever have realised in the studio business

'wanted any of Fortune's concrete on your shoes,' he laughs.

It ran in the family, apparently; Pope's father was reported to have given flamboyant New York mayor Jimmy Walker a check for \$1m and later described that transaction to a judicial corruption hearing as, 'just something that was in my pocket'. Fortune Pope, who owned Spanish-language radio station WHOM, opened Coastal Recorders in 1953 on West 52nd Street, a likely location since the street was lined with jazz clubs and was the centre of live music in Manhattan. West 48th Street endures as the centre of audio technology, housing stores for Manny's, Sam Ash and others, as well as Right Track Recording and a few other studios. Pope later bought Fulton Sound at 80 West 40th Street. Known as Coastal Times Square, this room would become a favourite of early rock and pop acts including Bill Haley and Patti Page ('Sh-Boom' was recorded there), as well as young engineers like Tom Dowd and the late Bob Daugherty, who later produced the Carpenters. Many of Ahmet Ertegun's ambitious Atlantic Records' race records were also made in Coastal's large, ambient room, which also had another sort of past—it was originally a penthouse apartment used by publisher William Randolph Hearst for trysts with his paramour, the actress Marion Davies. Coastal Times Square later became Olmstead Sound, owned by Dick Olmstead. At one



point, Coastal operated in three locations, with a studio called Audio/Video at a third location at Fifth Avenue and West 57th Street, which at one time was the sole Ampex machine franchise east of the Mississippi.

Coastal was an engineering spawning ground. Staff engineer Al Mirchin and some partners bought the 52nd Street location and turned it into Aura Studios. In 1972, they bought the former Allegro Studio and turned it into Generation. And in a move typical of New York's real estate-driven environment, the Equitable Life Insurance Company bought out Aura and probably made them all more money than they could ever have realised in the studio business.

Bob Fine's Fine Sound opened with two rooms in 1951 at 711 Seventh Avenue, then moved in 1959 to the Great Northern Hotel at 118 West 57th Street where the Parker Meridian Hotel is. A pioneer in modern recording techniques including stereo ping-ponging, Fine used the hotel's penthouse, ball-

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room and catering hall as studios. A 2-channel Gates custom console became New York's first stereo desk, according to Bob 'Red' Eberenz, who worked there as an engineer.

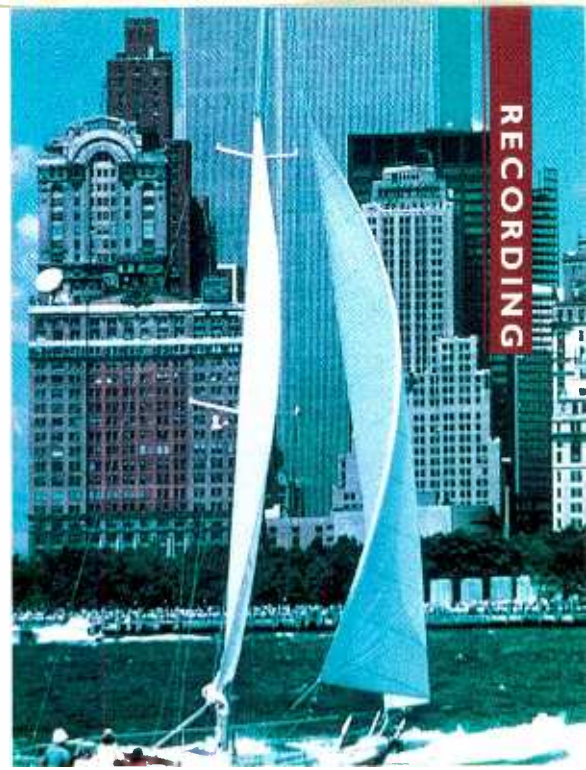
Fine, who passed away in 1984, had pretty particular ideas about what sounded good and what didn't—a characteristic of the new breed of independents that he was part of in the city. For instance, Fine's long background in film work (most independent studio owners were engineers themselves and most came from other disciplines, such as radio or film sound) convinced him that using 25mm mag stock as a music recording medium was the superior way to go, citing film's lower S-N ratio and absence of print-through characteristics.

Like many others of his generation, Fine built his own equipment—consoles, outboard, the works... Thus, maintenance tended to be quite good since they knew their own gear pretty intimately. The same could be said for the label-owned studios like Columbia, that could afford full-time technicians on staff, as well as the expensive professional equipment they were beginning to load up on. Over a decade ago, Gene Cattani, the manager for over 25 years at RCA's New York facilities but who spent time as a freelance engineer recalled, 'At RCA on 24th Street we had two rooms and 18 maintenance engineers, 12 of whom did nothing but build equipment. All of us

independents would drool over the equipment that the major-label studios could afford. We would go over to Columbia Studios on East 30th Street and just sit there looking at it.'

Many of the early desks were simply modified radio boards, like the Altec FM radio console used at A&R. As more purpose-built desks appeared, studios began to identify themselves with their equipment as much as by their staff talent and acoustical benefits. An early favourite was the Langevin console, a mono desk with a wire-wound rotary knob in place of faders. Some consider an Electrodyne to be the first dedicated purpose-built board used in Manhattan. Bell Sound, which was opened by Al Weintraub in 1950 at first in his basement as a place to do radio air checks and later in the West 40s, built the first solid-state console; it had 20 inputs, considered a lot in those days.

Bob Goldman, who opened Mira Sound, is reputed to be the first to implement 24-track recording in Manhattan, doing it at first with a pair of old Ampex 2-inch video decks that he had refitted with audio heads (he later put in one of the first Ampex MM1000 decks). Mira, like many studios at the time, used a hotel grand ballroom, in this case the one at the Henry Hudson Hotel. And also like the others, it had a custom-built console. Lou Gonzales, now owner of Quad Recording but who worked with Mira in the sixties before serving as a staff engi-



neer at Power Station and later The Hit Factory, remembers the desk was cobbled together with components and modules from electronics parts manufacturer Electrodyne. 'The modules had EQ, a mic pre and a fader,' he recalls, 'but Bob didn't like the fader so he ripped it out and put in Danner faders. The first off-the-shelf consoles that came to New York in any number were MCI boards, which had pretty groovy switching.' >

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< But mono was still king, and overdubbing, which was pioneered by Les Paul (who also lived in New Jersey and still does) evoked the wrath of Local 802 of the American Federation of Musicians, which occasionally posted what former RCA studio director Don Frey called 'union cops' at studios to guard against the trend.

Stereo was introduced at Capitol Records' facility in 1956 by its former chief engineer Irv Joel, who did it as a demonstration for the label's executives to illustrate dual-channel recording using an Ampex 351 mono deck outfitted with an extra set of electronics through a pair of RCA OP-7 radio consoles. (Joel recalled that Capitol's execs were less than impressed at the time, but ironically, right around that time, EMI — who had been experimenting with stereo recordings since the 1930s — was in the process of purchasing Capitol Records and its assets, including its studios in New York and Los Angeles.)

Once the concept gained acceptance, multitracking grew dramatically, going from stereo to 3-track, 4-track and 8-track/1-inch quickly through the sixties. Mort Fuji, then Ampex chief engineer, developed a 12-track system on a 2-inch deck for Bell Sound, which was the first to install a purpose-built 24-track deck in the early seventies, an Ampex.

From independent studios came independent engineers, at first a rarity in New York, where the indie owners generally worked their own rooms and their counterparts at major labels were not only staffers but union men, at that. Interestingly enough, the first full-time freelance engineer in New York may not have been from New Jersey but a little closer to old Jersey. Malcolm Adley, born in Hull, Yorkshire, 65 years ago, makes that claim and certainly was one of the first, going freelance in 1973 after a stint at Bell Sound. Adley was trained at Abbey Road under Stuart Eltham, and moved up unnaturally quickly at that staid institution — within three months he was assigned to music sessions, the first of which was Cliff Richards' first hit record, 'Move It'. But when Bell Sound found it was having trouble keeping staff engineers, Adley was recruited, arriving in New York in 1968, where he found Bell's three studios running their home-made 12-track decks with Scully electronics and custom consoles designed by Dan Kronin, the first solid-state consoles in use. 'The more EQ you put on them, the better they sounded, and you couldn't distort them if you tried,' Adley says. Adley's first session was a Joe Newman jazz record with Sonny Lester producing.

The rise of independent engineers had an effect on rates in Manhattan studios. Lou Gonzales recalls that one of more difficult transitions the business had to make was 'getting people used to the fact that the room no longer came with an engineer, like it always had up until that



PHOTOGRAPH COURTESY OF @NVCVE/LONDON

point,' he says. 'Once the engineer was no longer included and people had to hire their own, there was a pressure to lower the rates, even though the standardised consoles studios were now buying — that contributed to there being independent engineers in the first place — meant they had to pay more for equipment, just like it is today.'

Veterans also note another turning point in studios around this time: the introduction of the EMT reverb plate, which cancelled out more of the customisation that differentiated studios through the sixties. 'Regent had a beautiful echo chamber, a closed-off stairwell with a speaker at the bottom and a microphone at the top,' recalls Gonzales. 'Studios were known for the sound of their echo since each one created it differently. You used to be able to tell where a record was made by the sound of the echo. With the arrival of the EMT plates, that levelled the playing field. The shift later from plates to electronic reverb was much less critical than the shift from chambers to plates.'

What must be regarded as the first Golden Age of Studios hit its stride as numerous new independent facilities came on line through the sixties. In addition to Bell Sound there was Belltone (no relation), which was sited in the old Hotel Walcott in the East 30s and which was home to many New York blues recordings; the now-independent Audio/Video, which when the legendary engineer Hal Lustig was chief engineer was not only home to many R&B dates but where he also hired New York's first African-American staff engineer; Herb Moss' Gotham Studios; Bob Lifton's Regent Sound; United Recording; and A&R Studios.

But history has a way of never neatly turning the leaves of its books right on the mark, and perhaps the most signal event that would characterise the seventies was the opening, in 1969, of Electric Ladyland, Jimi Hendrix's studio and one of the few of that era still in business. Hendrix originally conceived the studio as a nightclub, which is what the building had once been. But Hendrix' >

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< studio costs had become so astronomical that his business advisors recommended he build his own studio instead. He bought the building for \$50,000 and in several ways it marks a major turning point in New York. It was one of the first artist-owned facilities, presaging the wretched excesses of the seventies; it was one of the first facilities to use an outside, professional studio designer (a very young John Storyk); it was a multi-room facility, which reflected the growing specialisation of tracking, overdubbing and mixing; and it was rather quickly on the for-hire market, partly because of Hendrix' untimely demise in 1970 but also because, in the wake of such rapid growth in Manhattan's studio community, competition was suddenly a factor in what had previously been a rather gentlemanly club. The studio business in New York was on the cusp of becoming an industry.

There were never so many (conventional) studios in New York City as there were in the seventies, the era in which rock 'n' roll went corporate and money became a goal instead of simply a means to a less grubby end. The trends which had been building in the sixties came together in the following decade. Independent studios became the norm though they coexisted with label-owned facilities for most of the decade while there was enough work to go around. Freelance engineers saw staffers leaving to join their ranks, and the beginnings of the modern model of studio technology—mass-manufactured and standardised—prepared to move studios' identities from their owners' sonic preferences to their technology complement.

There were a number of critical facilities during this period. A critical handful reflects the era, and while many actually opened in the late-sixties, they grew to define the tumultuous seventies.

The Record Plant opened its doors on 13th March, 1968, a partnership between Chris Stone, Gary Kellgren, Tom Wilson and Wes Farrell, all of whom had motley careers in a rapidly evolving rock music industry; Farrell, for instance, was an independent record company owner and writer of the McCoys hit 'Hang On Sloopy'. The facility started as a one-room, 12-track facility, and Stone recalls going to Larry

Scully's office and laying out \$36,000 total for a 12-track, an 8-track, a 4-track and a mono deck. The studio's first record was Hendrix' *Electric Ladyland* album, the record that he spent so much time and money on that it both got the fledgling studio on its feet and prompted the guitarist's business managers to get him to open his own studio. But Record Plant quickly became a launch pad for a number of production and engineering careers, including those of Shelly Yackus and Jimmy Iovine, both of whom worked on Springsteen's *Born To Run* recording there. 'We used to call Iovine Jimmy 'Shoes', because he had 20 pairs of those square-toed shoes they used to wear in the Bronx', recalls Stone; and it was on a session in Record Plant with this writer that Iovine taught me that you could mix all night without doing cocaine—instead, you chewed tinfoil, which has an interesting effect on metal dental fillings. Also in the picture were Eddie Kramer, whom Record Plant's ownership wooed away from Olympic Studios in the UK and was in turn wooed over to Electric Ladyland, and producer Bill Szymczyk (The Doors, The Eagles). Record Plant eventually expanded to three rooms in New York, as well as acquiring one of Wally Heider's remote trucks.

Media Sound was founded in 1969 in what had been a church building on West 57th Street (and what is now the trendy Le Bar Bat disco), started by a consortium of owners including Bob Walters (who would eight years later co-found Power Station), John Roberts and Joel Rosenman (who were co-producers and financiers of the Woodstock festival which took place that same year), John's brother Robert (a silent partner) and engineer Harry Hirsch. Media was notable for several reasons. According to Harvey Goldberg, who worked there are a staff engineer during its heyday, Media's cavernous church halls defined its sound and harked back to an era, already on the verge of fading, in which ambient sound rather than electronic processing defined a studio. Studio A was considered an acoustical masterpiece of a main room. Media became an incubator for an entire generation of studio luminaries, starting with studio manager Susan Planer, who had been lured away from Fine Sound >



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◀ (and in the process established Media as a place that was more than willing to head-hunt personnel) to its first generation of senior staff engineers including Fred Christie, Joe Jorgenson and Tony Bongiovi (who was recruited from the Record Plant — which previously had recruited him from Motown Studio in Detroit), to its home-grown generations, including Goldberg, Joe Ferla, Michael Delugg, Jeff Lesser, Ron St Germaine, Michael Barbieri, Bob Clearmountain, Godfrey Diamond, Ed Stasium and Michael Brauer, most of whom served as assistants there. 'You have no idea how exciting it was to have people like that around you all the time,' recalls Goldberg. Though Media's four studios were eventually outfitted with a pair of Neves, a Harrison and an API, its original complement of decks were a pair of Specta-

bia Studios engineer at A&R even when I was working on Paul Simon records at A&R,' recalls Ramone. Otherwise, places like the fledgling A&R did demos or worked on records for the growing number of independent record labels in New York.

By the early-sixties, Arnold had departed and Ramone was working with a growing pool of associates including Don Frey, Bill Schwartau and Art Ward. The technology was a custom-made console, a 3-track deck and a Fairchild cutter. Ramone says A&R was the first indie studio to go 4-track, and it had a tradition from early on of heavily reinvesting in new technology. Indie labels like Roulette Records, overflow from studios like Atlantic Records', and a growing commercial music business (jingles) was propelling A&R, particularly after Don

Frey came aboard in the mid-sixties. The Rockefeller family made A&R's owners an offer they couldn't refuse and the facility then moved to the site of one of the older Columbia studios at 799 Seventh Avenue, and a few years later in 1968 opened a second location at 322 West 48th Street. With his production career steaming forward, Ramone left the studio in 1982 and it closed for good in 1989.

'Believe it or not, at the time I left it was considered a conflict of interest for a producer to own his own studio,' Ramone observes, 'an attitude which would be considered ridiculous today.'

Ramone remembers that period in the sixties as an exciting time for recording studios in New York. 'Independent studios had a lot to offer a growing record industry,' he says. 'There were tons of people making master [recordings] at low budgets, and the big-label studios had union engineer costs and high overheads, which we didn't have. The new small studios also didn't have a formulaic sound to them, either. That's what broke the back of the staff engineers, who were basically nine-to-fivers: they couldn't adapt to the need for more and more new ways of making records.'

Having once started a console company himself with several associates, Ramone also watched with interest as broadcast electronics manufacturers began to establish beach heads in the studio business. 'Neve was the shining one of those,' he recalls. 'I remember calling Rupert Neve in London and saying I want one of those consoles.' Ramone was also watching as people like Bill Putnam, who owned United Studios in Los Angeles, began putting out products like

the LA series of compressors. And he embraced revolutions like the EMT plate, though with a peculiarly New York kind of elan. 'The EMT plate helped studios like ours compete with the bigger ones,' he says. 'But in New York people still thought in terms of chambers, so we had four EMT plates but I kept them sealed in the basement so no one would know they weren't big chambers.'

Ramone got out of the studio business when he saw how MIDI rooms were beginning to decimate the city's rate structure in the early-eighties, followed by the advent of personal recording equipment. He wishes he still had access to the rooms A&R once occupied, or any of those used by the major labels. At this juncture in its history, New York City has only one studio owned by a major label — Sony Studios—whose continued presence Ramone attributes to label chief Tommy Mottola's stewardship.

Power Station was built in 1977 in an old Con Edison power station on the edge of New York's Hell's Kitchen. Between 1977 and 1996 over 400 gold and platinum albums were created in its walls. Power Station also attracted and developed many talented engineers and producers within its thick walls, including Neil Dorfsman and Jason Corsaro.

However, by 1994, a combination of a declining area studio market and internal financial problems had forced Power Station to the brink of bankruptcy. After a three-year, often acrimonious struggle, Power Station was forced onto the auction block by a US bankruptcy court. Its rooms were booked for months in advance, yet everything had to be cancelled when the doors closed two days prior to the auction. On 28th June, 1996, the real estate sale was completed, and the building and its assets were purchased by Voikunthanath Kanamori, a Japanese producer and studio owner. Kanamori, along with Zoe Thrall, the former vice president of studio operations for Power Station, officially reopened the studio as Avatar in August, 1997.

By the end of the eighties, many of the stalwarts listed here were gone, buried under a combination of New York's relentless real estate market, whose costs have been spiralling upwards almost constantly since the first bull market of the eighties and continues today; and music-technology trends, including more direct recording, which negated the need for so many ambient spaces, and personal recording technology, whose effect on studios in every market continues to make itself felt.

But plenty of facilities which started in the seventies and eighties remain robust, including Quad Recording, Electric Ladyland and Right Track Recording. In the city that never sleeps, New York's studio history is still being written. And the line in Frank Sinatra's paean to Gotham still holds true: 'If I can make it there, I can make it anywhere...' ■



sonics working with its 12-track and 16-track tape configurations.

Remembered by most as an icon of the seventies and eighties, A&R Studios was actually founded in 1959 by Phil Ramone, who had been working as a staff demo engineer at JAC studios (his first credit was on 'The Girl From Ipanema' on Verve Records by Astrid Gilberto with Stan Getz and produced by Creed Taylor — a demo that became a master, as was often the case at the time) and musician Jack Arnold, whose collective initials gave the facility its name. It opened its first room at 112 West 48th Street in the milieu of new independent rooms like Bell, Mastertone and Allegro. That location was adjacent to Jim & Andy's lounge, a nightclub and favoured hang-out of New York session players and to which A&R had a direct telephone link from the studio to the bar to call musicians for sessions. Like them, A&R coexisted with the label-owned facilities, though the pecking order was regularly reinforced when, on the rare occasions that a major label would allow one of its artists to record at an independent studio, it also sent along one of its union engineers to supervise, a practice that continued through the decade.

'I remember that there was a Colum-

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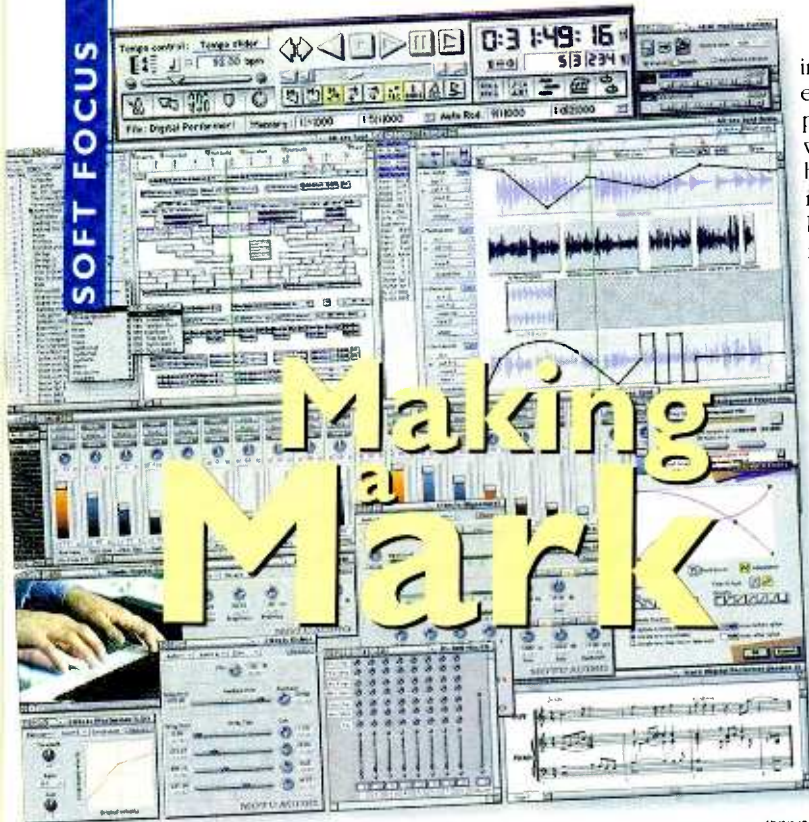


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LIKE PREVIOUS 'focusees' Steinberg, Emagic and Opcode, Mark of the Unicorn started life in the early days of computer-based MIDI sequencing and in the ensuing years has helped define and grow the technology and the market. Together these four companies make up a Grand Quartet that has dominated the computer-based MIDI and then MIDI + Audio market over the years, if not always playing in harmony then at least collectively banging the drum for the computer-based MIDI + Audio approach to music-making.

Mark of the Unicorn, or MOTU for short (pronounced 'mow-to'), is a US company, but based in Cambridge, Massachusetts rather than any of the West Coast locations favoured by many US software companies. The company began life in 1985 with two MIDI programs for the Apple Mac: Performer (sequencing) and Professional Composer (notation). With a common sequence file format, Performer sequences could be edited and printed as a score in Professional Composer, while scores created in Professional Composer could be played back in Performer as MIDI sequences.

Performer has remained a core package for the company till this day; currently at v6, it now includes digital audio record-

ing capability up to eight tracks but no support for audio hardware beyond the Mac's basic built-in capability. MOTU moved into MIDI + Audio software in 1992 with the introduction of Digital Performer, and it's this package (now at v2.6) which remains as the company's MIDI + Audio flagship. Meanwhile, the company replaced Professional Composer with Mosaic in 1992, and this program is also still part of the MOTU lineup.

Rounding out the MOTU software range are Unisyn, FreeStyle, WaveEdit, and PureDSP. Unisyn is a MIDI patch editor and librarian program

which started life as Dr T's X-OR in 1989 before being bought by MOTU in 1993 and integrated with Performer and Digital Performer; as such it's MOTU's equivalent of Opcode's Galaxy Plus Editors and Emagic's Sound-Diver. The librarian section allows you to send and receive MIDI System Exclusive dumps of patches and patch banks, while the editor provides Profiles, or 'virtual front panels' offering ready parameter access, for MIDI instruments and other devices from a wide range of manufacturers. With v1.5 software, a Performance, or 'snapshot' of settings for an entire MIDI setup, can be stored as part of a sequence file in Performer (v6 or higher). MOTU has also improved FreeMIDI support in Unisyn, so that current patch lists for all devices in a FreeMIDI setup are automatically available for selection in any program which supports FreeMIDI, such as (Digital) Performer and FreeStyle, via pop-up menus.

FreeMIDI is MOTU's equivalent of Opcode's OMS (Open Music System), in that it allows you to create a definition of instruments and connections for an entire MIDI setup, which can then be used for routing tracks and selecting patches by name. OMS is the more widely adopted and used of the two alternatives, a fact acknowledged in the latest version of FreeMIDI, which includes an OMS emulator option.

FreeStyle, which was introduced by the company in 1994, is a MIDI sequencing program with a difference, in that it adopts a performance-centred model based around ensembles of players, rather than the more usual MIDI multi-track recording model; MOTU refer to it as a 'trackless' sequencing program. Notation features are also built in, complete with automatic transcription of MIDI-played parts and the ability to trans-

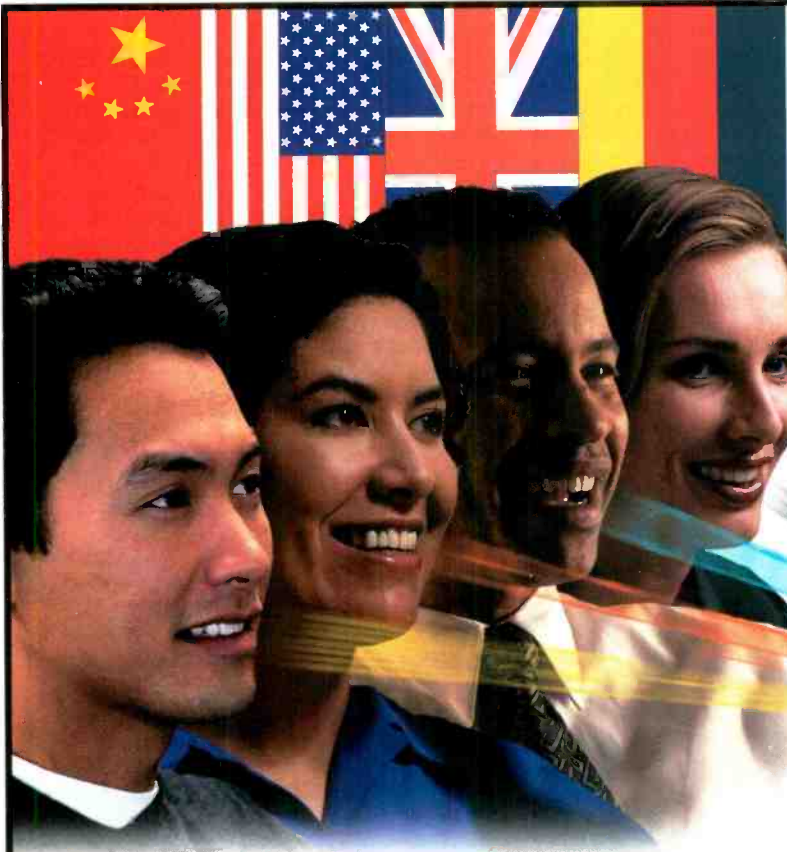
pose parts to any key for full score and individual part printout, and as from v2.0, released in 1997, the software includes a Sense Tempo feature which tracks and records tempo fluctuations in performance, so that parts can be scored accurately while also being played back with the original timing nuances. FreeStyle, which is a MIDI-only program, also supports SMPTE synchronisation and transmission of MIDI Time Code, allowing it to be synced to tape and hard disk audio recording systems.

WaveEdit is a more specialised offering, a waveform editing program for Akai's DR4d 4-track hard disk recorder. WaveEdit, which works with DR4d v3 software and above, provides a user-friendly graphical front end for the DR4d and lets users edit anything from regions of audio down to individual samples for removing clicks and pops. Audio remains in the DR4d rather than being copied across to the Mac for editing, which saves on both transfer time and RAM requirements; however, Sound Designer II files can also be transferred into the DR4d, while DR4d audio can be saved to the Mac in SDII format. Cut, copy and paste along with multiple zooms from individual samples up to whole tracks are available, along with normalisation, phase inversion, freeform waveform drawing down to sample level, and shortcuts for auditioning different audio regions. The software also supports multiple DR4d units.

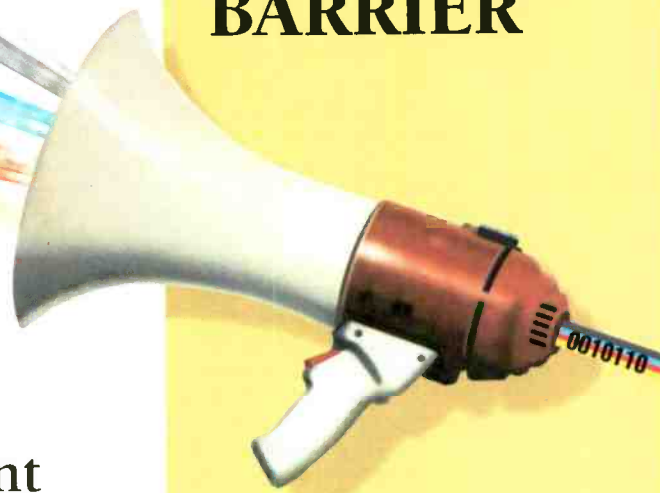
PureDSP takes the opposite tack, in that it's a general-purpose audio time-stretching and pitch-shifting software plug-in in the widely-used AudioSuite (non real-time) plug-in format.

Performer, Digital Performer, Mosaic, WaveEdit and PureDSP are all Macintosh-only packages, reflecting MOTU's historical association with the Mac. However, the company hasn't ignored the Windows market altogether. FreeStyle and Unisyn both come in Mac and Windows versions, albeit the Mac versions were introduced one and two years respectively before their Windows counterparts.

MOTU's PCI-based 2408 and 1224 computer-based multichannel hard disk recording systems, introduced last year and this year respectively, both come with Mac and Windows drivers; however, only the Mac version benefits from additional MOTU AudioDesk workstation software, while the systems can alternatively be used with MOTU's Mac-only Digital Performer software (available at a special upgrade price) if integrated MIDI sequencing is a requirement. Of course, writing Windows drivers is a lot easier than writing Windows versions of whole Mac-originated programs, and here Steinberg's cross-platform ASIO audio streaming protocol has provided a solution. In addition to Apple Sound Manager and Windows Wave drivers, the systems ship with MOTU-written ASIO drivers for Mac and Windows which allow customers to use MOTU's hardware with any ASIO-compliant software. This includes Mac and Windows versions of Steinberg's >



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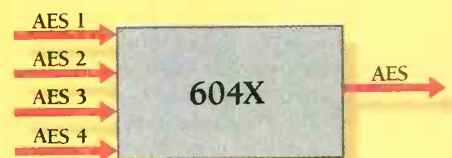
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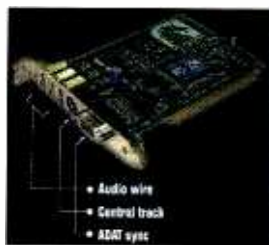
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◀ Cubase VST and Emagic's Logic Audio Platinum, as well as Opcode's Mac-only Vision DSP and Studio Vision Pro. In addition, the systems can also work with a variety of other Windows software including Cakewalk Audio Pro (Versions 6 and 7), Sound Forge, Cool Edit Pro, Peak and Samplitude.



The core 2408 system consists of the cross-platform PCI-324 audio card, the 1U-high rackmount 2408 I-O unit, connecting cable, software drivers and the AudioDesk workstation and PureDSP plug-in software - while the core 1224 system substitutes the newer 1U rackmount 1224 I-O unit for the 2408. You can also expand on the core systems by buying additional units, with up to three units connectable to a single PCI-324 card, and combine 2408 and 1224 units in one system.

The PCI-324 card contains a custom VLSI processor, three Audiowire connectors for connection to individual 2408 or 1224 I-O units, and an ADAT sync in connector and Digital Timepiece control track sync connector (for sample-accurate synchronisation with ADAT decks and the Digital Timepiece respectively). The Audiowire connectors use standard IEEE-1394 (more commonly known as FireWire) components, but implements a proprietary MOTU communication protocol between the card and the I-O. The VLSI chip simultaneously processes all available audio inputs and outputs, and also implements a 72 x 72 audio patchbay enabling routing of any input to any output. The 2408 I-O unit provides eight analogue inputs and outputs with 20-bit converters, 24 (3 x 8) channels of ADAT optical I-O, 24 (3 x 8) channels of TDIF (Tascam Digital) I-O, two channels of SPDIF in and four channels out, and word-clock in and out. The 2408 has a 24-bit internal data bus, so you can use it for 24-

bit recording if you hook up an external 24-bit A-D converter such as an Apogee AD-8000 to the 2408 via ADAT optical connection. The unit supports both 44.1kHz and 48kHz audio. In addition it can be used as a stand-alone

format converter, performing conversion from any one of its supported formats to any other - you can convert up to 24 channels of ADAT to 24 channels of TDIF.

The 1224 brings 24-bit A-D and D-A onboard, with eight 24-bit balanced TRS analogue ins and outs and two 24-bit balanced XLR analogue outs, plus AES-EBU digital I-O and word clock in and out. The unit supports 16, 20 and 24-bit recording at 44.1 or 48kHz.

Today the 2408 and 1224 sit at the apex of a hardware range which also consists of, in descending price order, the Digital Timepiece (introduced in 1997), the MIDI Timepiece AV, the MIDI Express XT, Micro Express, Pocket Express, PC MIDI Flyer, and Fast Lane. The Digital Timepiece is a digital audio synchroniser which supports LTC, MTC, ADAT, TDIF, Video, VITC, wordclock and Sony 9-pin formats. The other units offer various numbers of MIDI ins and outs with or without SMPTE-to-MTC sync and MIDI Machine Control support, with the cheapest being the sub-£100 2-in/2-out PC-MIDI Flyer and Fastlane MIDI interfaces for the Mac and PC respectively. All the other interfaces are for Mac and PC. MOTU is also introducing versions of the existing range with cross-platform USB connections, following the trend to USB in the Mac and PC computer markets stimulated by the success of the iMac and blue-and-white G3s.

MOTU actually began producing hardware as far back as 1990, when it introduced the MIDI Timepiece, which subsequently became an industry-stand-

dard unit, along with the Video Timepiece and associated Video Distribution Amplifier and the MIDI Mixer 7s MIDI-controlled mixer, which didn't. These days the MIDI Timepiece AV, which was introduced in 1996, combines audio and video sync functions into a single 1U-high rackmount unit, with an 8-in/8-out MIDI interface, SMPTE and MTC sync, MIDI Machine Control, and ADAT, wordclock and video sync.

Another piece of MOTU hardware that fell by the wayside was the Digital Waveboard, a Nubus board for the Mac offering four channels of digital audio, introduced around 1992; the Waveboard lost out to Digidesign's AudioMedia II Nubus card and Digidesign's predominance in computer-based digital audio at the time. However, the audio

I-O card market has changed dramatically since then. A combination of the cross-platform PCI hardware standard and Steinberg's cross-platform ASIO software protocol has stimulated a dynamic and diverse market of cards, with or without additional I-O units, designed to suit a variety of pockets and requirements. MOTU's PCI-324 card and 2408 and 1224 I-O units

are the company's Take 2 on the Digital Waveboard, and this time round MOTU is spot on with the timing, the balance of functionality and pricing, and the ready-made integration with all the major software packages. Another point worth observing here is that MOTU has opted not to offload capabilities such as mixing, effects processing, and even synthesis to on-card DSP with its 2408 and 1224 systems. This has allowed them to keep down the price of the PCI-324 card and hence of the core systems. It also sets MOTU at odds with the likes of Creamware, Yamaha, and of course Digidesign. MOTU's argument is that cards with onboard DSP will be >



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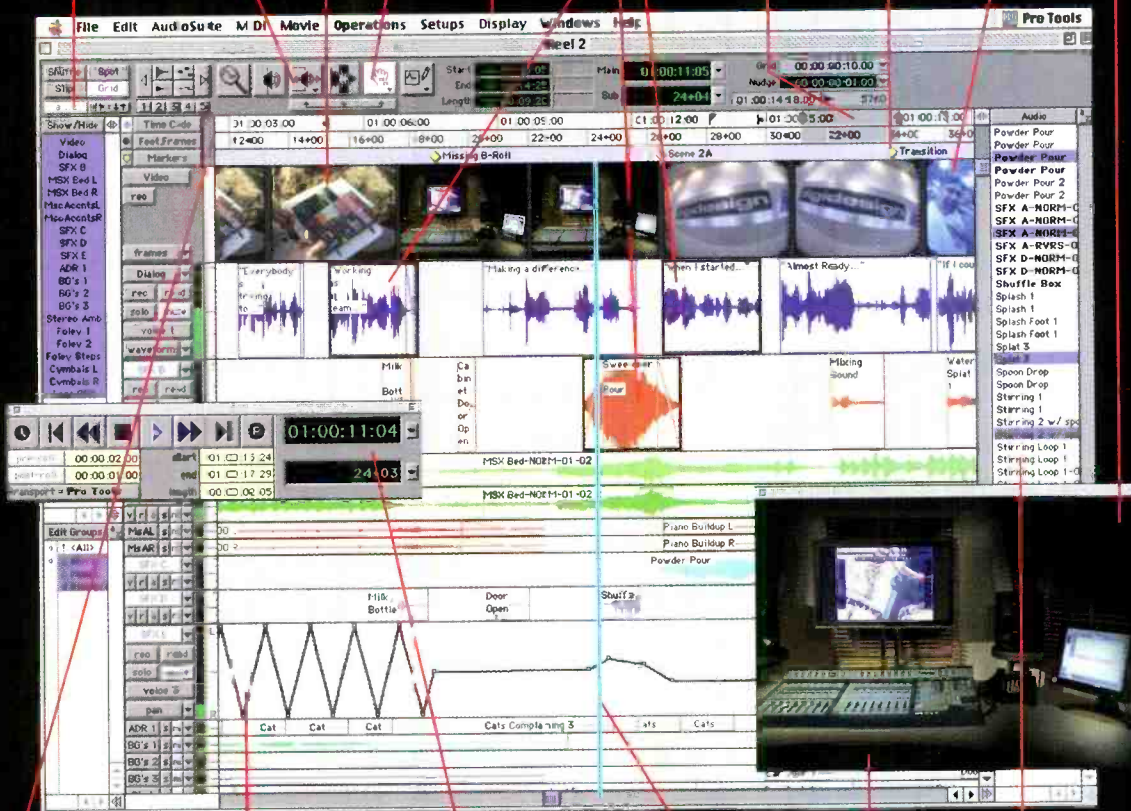
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2408 rendered obsolete by continuing increases in the processing power of personal computers, while money saved through not investing in DSP can be put towards the next, bigger and better computer or hard drive. Hence in its 2408 brochure the company states, somewhat grandly: 'When you buy a 2408 system, you're buying into the R&D future of the entire personal computer industry'.

It could be added that with the 2408 and 1224 systems MOTU has concentrated on providing optimum audio quality, I-O connections, and (on the 2408) audio format flexibility and conversion capabilities at a reasonable price; with the core systems being expandable up to three units, there's potentially plenty of I-O quality and capacity to grow with the capability of computer software as it's unlocked by increasingly powerful computers. On the subject of computer power, it's worth noting that computers can benefit from additional processors as well. The next generation of Power Mac computers from Apple, due some time in the Autumn, will not only use the more powerful G4 PowerPC processor, but also include the powerful AltiVec chip, which will considerably speed up media processing on G4 machines while taking some of the load off the core PowerPC chip. AltiVec is capable of processing multiple data streams simultaneously, and contains an instruction set that addresses many traditional DSP-type functions. As of writing, indications are that the G4 series will ship with 400MHz-550MHz PowerPC processors and include dual-processor models.

MOTU's flagship software is Digital Performer, which like the other leading MIDI + Audio packages provides a complete MIDI + multitrack digital audio recording, mixing and playback environment complete with mix automation and onboard effects processing via plug-ins, and with v2.6 software also the ability to integrate software instruments such as ReBirth and Bitheadz' Retro AS-1 virtual analogue synth into the environment. With the introduction of v2.4 software in May of last year, Digital Performer gained 24-bit audio support, along with 24-bit to 16-bit dithering, sample-accurate syncing, and Pro Tools 24 and MOTU 2408 support among a range of new features which also included drag-and-drop support for Yamaha's A3000 sampler. A neat feature of Digital Performer is its support for dragging and dropping of audio samples between the program and a range of hardware digital samplers.

New features in v2.5, introduced at the beginning of this year, included a built-in stereo waveform editor, 64-bit Master-Works Compressor and Multiband Compressor MAS plug-ins, Digidesign Direct I-O and Pro Tools 24Mix and MixPlus support, and support for further third-party

audio cards including Yamaha's DSP Factory, Sonorus' StudI/O, and Event Electronics' Darla, Gina and Layla.

Version 2.6, introduced in June, brought several significant new features, including iMac and blue-and-white G3 compatibility, support for BitHeadz instruments, OMS support, and direct audio input from Sound Manager. However, the star feature of v2.6 is undoubtedly POLAR, or Performance Oriented Loop Audio Recording, which provides 'live and continuous' RAM-based audio loop recording, with multiple instrument takes and multiple overdubs. You can set up loop points anywhere in a linear Track, so for instance you could import a drum loop into a Track from a sample CD and then loop-record other instrument parts over it.

MOTU AUDIO
1224
High Resolution Audio Interface

At the heart of Digital Performer is the MOTU Audio System, or MAS. Currently at v2.01, with upgrades available for free download from the company's web site, MAS defines the complete audio recording, mixing and playback environment as well as providing audio card support and a plug-in architecture for real-time effects. Although MOTU has also implemented ASIO support for audio transfer between software and hardware, it isn't supporting the other Steinberg-originated protocols, VST and ReWire. This is in contrast to Opcode, which introduced VST plug-ins support in Vision DSP and Studio Vision Pro last year and is implementing ReWire support in its upcoming new version releases.

So, rather than tap into the large existing market of VST plug-ins like Opcode and also Ensoniq with its PARIS system, which supports VST plug-ins in addition to its own proprietary effects, MOTU in addition to providing a healthy selection of free MAS effects with Digital Performer is relying on attracting third-party developers to develop or port commercial plug-in packages to build a credible, er, MAS market (though MOTU do also support TDM, along with Adobe Premiere non-real-time, effects plug-ins). It's a strategy that appears to be paying off, as several major plug-in developers have ported their effects to MAS. First to embrace the MAS format was DUY with a port of its DUY Bundle, followed by ports from Waves with its Native Power Pack and Native Power Pack II, Antares Systems with Auto-Tune, Arboretum Systems with Ionizer, and Metric Halo Laboratories with SpectraFoo (previously only available for TDM). In addition, AudioEase, the company responsible for the BarbaBatch audio batch processing software, has developed the Rocket Science Bundle exclusively for the MAS platform; demonstrating another side to the MAS plug-in protocol, this bundle includes resonant hand-pass filter and MIDI-controllable vowel filter bank plug-ins.

Freeware and shareware developers can also create MAS plug-ins, though in contrast to the plentiful VST free-shareware >

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offerings MOTU's web site has only one such plug-in available, a ring modulator.

MOTU has implemented a MAS plug-in, AudioTap, which allows the stereo audio output from Steinberg-Propellerheads' ReBirth softsynth, or any other Apple Sound Manager-compatible software (for example BIAS Peak, SoundApp, RealAudio RealPlayer, and MacAmp) to be routed into Performer, Digital Performer or AudioDesk; MAS 2.0, which includes the AudioTap plug-in, ships with Digital Performer 2.6. In addition, the company has worked closely with BitHeadz Software to integrate the latter's Retro AS-1 virtual analogue softsynth and Unity DS-1 software sampler into the MAS recording and mixing environment, available again as of Digital Performer 2.6. You can use MIDI tracks within Digital Performer, for instance, to sequence parts on the AS-1 and DS-1, and have the instruments' audio outputs routed within the computer into Digital Performer's audio mixer channels, where they can have real-time MAS effects processing applied to them. Left and right channels of the stereo output from the AS-1 or DS-1 can be assigned to two mixer channels, or you can apply separate effects processing and mix automation to each MIDI multi-timbral part by routing a separate audio output from each part to its own mixer channel. The integration of software synths and other virtual instruments into MIDI + Audio computer-based virtual studio environments is becoming an expected feature, and MOTU is showing that it's up to speed in this latest development of the 'studio in a computer' concept.

Of course MOTU, in line with other MIDI + Audio developers, has implemented DAE support for Digidesign hardware from the early days of Digital Performer, when Digidesign was virtually the only game in town for serious audio hardware. More recently, MOTU was quick off the mark last year to add support for Digidesign's Direct I-O format, with an update to MAS introduced last August (MAS 1.31) giving Digital Performer v2.4 Direct I-O capabilities for supporting the full range of Digidesign hardware, from the Project II card up to Pro Tools 24 systems. In addition, the AudioDesk Mac software included in the 2408 and 1224 systems allows you to export your projects in OMF format, so they can be converted into Digidesign format using Digidesign's OMF Tool utility for importing into Pro Tools systems.

Finally it's worth looking at issues of pricing and copy protection which set

MOTU apart from its competitors. As discussed last month, Opcode has taken the bold (and possibly foolhardy) step of making their mid-range MIDI + Audio package, Vision DSP, available as an unsupported electronic download for just \$59.95 (albeit only to US purchasers), with a \$99.95 upgrade package providing the paper manuals and boxed extras plus one year's support for an overall saving of \$40 on the boxed price. In contrast, MOTU is sticking to a more traditional pricing strategy. So, Digital Performer costs £549 while Performer costs £349. This also means that MOTU has no MIDI + Audio product which could be called 'budget' in today's terms, while both Steinberg and Emagic have entry-level MIDI + Audio programs, and of course Opcode's Vision DSP electronic download is the most entry-level of all. Still, MOTU does at least provide a couple of cheaper routes to Digital Performer: educational users can get £100 off the full price, while a competitive upgrade option allows owners of other sequencing packages such as Cubase, Logic or Vision to get Digital Performer for a much more accessible £199.



Intriguingly, while MOTU is keeping it traditional on the pricing front, it's boldly going where the likes of Steinberg and Emagic have so far feared to tread when it comes to copy protection. No more for MOTU the paraphernalia and user hassles of dongles, key disks and challenge-response systems. Digital Performer, Performer, AudioDesk and FreeStyle all now implement a straightforward keycode system, while the next updates to Unisyn and Mosaic will also go over to keycodes.

What this means is that you get a keycode with your software package, and whenever you run an install you type in the code to enable the software. Apple's decision to leave behind the ADB port and built-in floppy disk drive when they introduced the iMac and blue-and-white G3 ranges has acted as a catalyst for a move away from dongles and key disks in music software. However, while other companies have opted for the still awkward challenge-response system, MOTU deserve credit for going the whole hog to a system which is simple, convenient and flexible for the user.

Like Opcode, MOTU has had to contend with the historical dominance of Steinberg and Emagic in MIDI and then MIDI + Audio software. But Digital Performer can hold its own in terms of 'studio power', functionality, versatility, user-friendliness and sheer professionalism against any of the competition, and the latest version of the program along with the 2408 and 1224 systems show just how far MIDI + Audio companies have come. ■

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Mamma Mia!

The timely staging of *Mamma Mia!*, the theatrical tribute to Abba, provided an equally timely opportunity to use new surround, automation and workstation developments.

Caroline Moss gets the name of the game

ONE OF THE BIGGEST productions to hit London's West End of late is a musical tribute to enduring seventies pop band Abba. *Mamma Mia!* opened to critical acclaim at the Prince Edward Theatre on 6th April, exactly 25 years after the band swept to fame by winning the Eurovision Song Contest. The show has managed to break box office records, with advance sales of over £400,000 on one single day during the first week of previews. Ticket sales now exceed £7m, covering the £3m production more than twice over, and it is currently impossible to book a seat for a Saturday matinee or evening performance before January 2000. So what's the big deal?

The show—based around a strong 'girl power' theme—is backed by the all-woman creative team of Judy Craymer (producer), Phillida Lloyd (director) and Catherine Johnson (author). It uses a total of 24 original Abba numbers, their lyrics changed—with varying degrees of subtly—to fit into the story-line. Such is the enthusiasm this trawl down memory lane engenders that by the encore the audience have left their seats and are clapping and dancing along to the music, regardless of whether they were five or 50 when the original came out.

Yet despite the retrospective slant of

the musical, *Mamma Mia!* represents some leaps forward where theatrical sound technology is concerned. Three new innovations are called into play, Out Board Electronics' matrix-based surround sound processor TiMax, new Sound Automation Manager (SAM) software for the Cadac console and DAR's TheatrePlay, plus an L-Acoustics V-DOSC speaker system never before used on a West End theatrical production.

The show's sound designers were Autograph Sound Recording's Bobby Aitken and the company's managing director Andrew Bruce. The latter had established a relationship with Abba's Bjørn Ulvaeus and Benny Andersson after working with them on two previous theatrical productions, *Abba-cadabra* in 1983 and *Chess* in 1986. Because of this connection, he was invited to a workshop in London last year to discuss *Mamma Mia!* and asked for his opinions regarding a sound system for the embryonic show.

Once chosen as sound designers, Aitken and Bruce travelled to Stockholm to meet Ulvaeus and Andersson and discuss the sound design further. While there they were taken to see another musical written by the duo called *Christina Fran Divemala*. Although this show scored a hit for them, it is a completely different type of musical

production to *Mamma Mia!*, being based on a Swedish folk tale. However it does feature an L-Acoustics V-DOSC and ARC sound system, Aitken and Bruce's first introduction to the French brand which had previously only been used for the concert touring market. They made the unanimous decision to use the system on *Mamma Mia!*, the first time it would be used in a West End theatre show.

Back in London the duo started assembling a kit around the L-Acoustics system, combining it with tried and tested components such as a Cadac theatre console and Sennheiser microphones and newer technology like TiMax, which uses the Haas effect to position sound effects within the auditorium, and DAR's OMR8 TheatrePlay system. The sound design uses three V-DOSC cabinets per side for the stalls, five per side for the stalls circle and upper tier and a compact centre cluster of ARCS. A pair of subs are located between the main arrays. The system is powered by Lab Gruppen LAB 4000 amplifiers and XTA Audiocore controllers, and the main system delays and EQ were preset using an RS-485-equipped laptop during technical rehearsals at the theatre.

TiMax was chosen after Aitken used it to design the sound system at a recent production of *Tosca* at the Royal Albert Hall. This time Autograph used the system more extensively. Sound effects sources arrive from the 8-track DAR TheatrePlay system directly into TiMax inputs, slaved to time code created by the TheatrePlay. The 8-input, >

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<8-output TiMax system is used for sound effects distribution from dedicated sound effects loudspeakers as well as from the main vocal reinforcement system.

An example of one of the sound effects is right at the beginning of the show, as the crashing of waves rolls across the auditorium, giving the impression of a small motor boat travelling from the back of the house to the front. There is also a nightmare scene that, according to Out Board Electronics' Robin Whittaker, was given an interesting and different spatial effect for each of the six tracks of audio coming from the DAR by using its ability to send each input to any output with a unique level-delay relationship. 'During this sequence SMPTE time code is fed from the DAR to TiMax which automatically triggers a series of several cues at precise points during the sound track,' explains Whittaker. 'This level of precision is necessary because the nightmare soundtrack is being accompanied by the band.'

Other TiMax cues are triggered from the Cadac show control computer using MIDI program changes. The TiMax system plays sources from the DAR OMR8 TheatrePlay which features a removable hard disk and is totally compatible with the DAR SoundStation back in the Autograph Sound Recording studio. During the show, TheatrePlay plays back different sound effects which were prerecorded on Autograph's Sound Station. A major advantage of TheatrePlay is that above and beyond being a playback and recording device, sound effects can also be edited on site.

Autograph Sound is a long-time user of Cadac theatre desks on its productions, and *Mamma Mia!* sees the debut of new Windows software known as SAM that the company developed with feedback from Autograph. Members of the sound design team developed a user interface during rehearsals while programming the desk, and then later at the theatre. The result is a user-friendly front end for the desk, showing all cues in great detail. Attests Bruce, 'Cadac were fantastic, they responded with speed and efficiency and delivered a fully functional product that will no doubt be an asset to all that use it in the future.'

For *Mamma Mia!*, SAM is being used across the fully automated 88-input J-type console which has 11 new programmable modules featuring dual inputs used for keyboard feeds, electric guitars and the five vocal booths. Four of these booths are off stage, and cast members not included in a particular scene sing backup to give the thickly layered sound the songs require. Up to five vocalists per booth, wearing AKG K270 headphones, sing into a stereo pair of KM100 mics fitted with a 'mic live' indicator which is controlled by cues from the Cadac.



Aitken and Bruce specified DPA4060 head-worn lavalier mics for the cast, hooked up to Sennheiser SK50 belt-packs and a 34-channel UHF system. Most of the principle characters are double microphoned. The duo, who had specified DPA4060s for previous productions, were satisfied with its performance with the new V-DOSC speaker system. 'The combination sounded just great, with full range, plenty of detail and complete clarity,' explains Aitken.

'In total, we are using 29 DPA4060s, with an SK50-1046 wireless system.'

The production schedule for *Mamma Mia!* was tight to say the least, with the sound design team spending one month in rehearsals taking notes before installation, then five weeks of technical rehearsals before the curtain went up for two weeks of previews. Now into its fourth month the hype is still running high, with *Mamma Mia!* on track for a long and successful run, and the strong possibility of transfers and touring versions as its renown spreads.

Says Bruce of the production, 'We are very excited to be involved in such a enjoyable and creatively written piece of musical theatre. It seems to be reaching out to yet another style of audience, who may not have had a taste of West End theatre before, and will hopefully return to try out other shows.' ■

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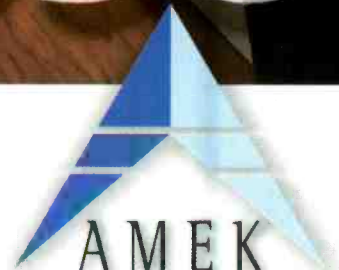
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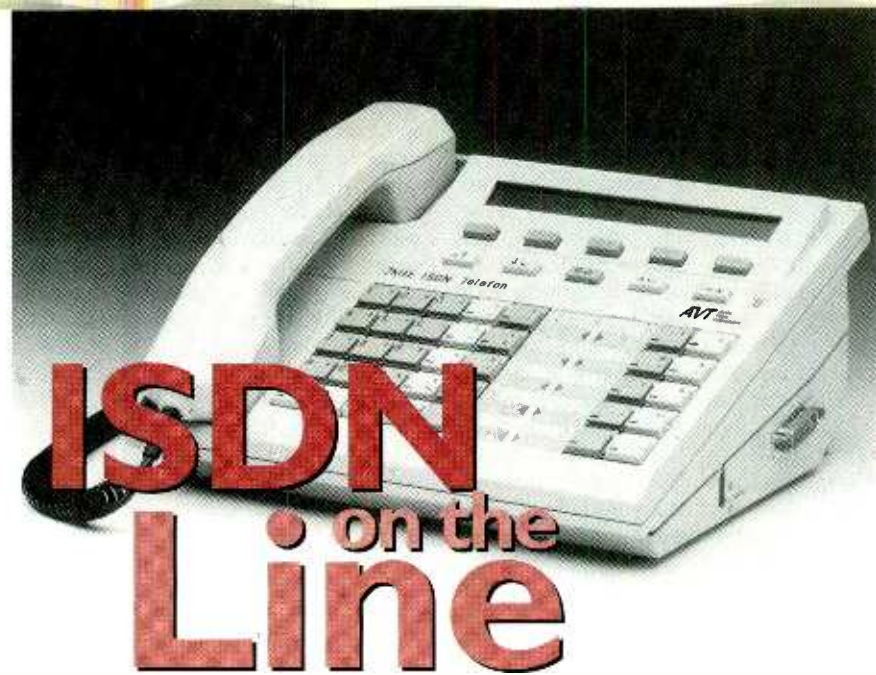
Jeff Cohen surveys the last 40 years of broadcast communications

EVERY SUNDAY LUNCHTIME back in 1959 the British nation tuned in to Family Favourites as Marjory Anderson in London and Cliff Michelmore in Cologne read record requests for and from servicemen in Germany. Some high-quality audio circuits did exist even then, but ordering them was an ordeal and an expense. Consequently, the line from Germany extended to about 8kHz and had the characteristic distant sound of lines in those days—and every so often the faint chirrup or ringing of an amplifier in a repeater station could be heard.

Look at the past 40 years, it has been in the past five or six years that the most important advances in audio communications technology and services have taken place. The emergence of digital telecommunications and data reduction schemes has revolutionised the way audio can be sent across the street or around the world. Use of ISDN means audio circuits from 7.5kHz mono to 15kHz stereo can be dialled up as easily as a telephone and to those of us who struggled to get high-quality audio ad hoc connections it has proved to be a dream come true. High-quality global audio communication has been opened up to all, from a freelance at home on a remote farm to studios of radio stations big and small.

Back in 1959 all sound circuits in Britain belonged to the Post Office and, as with other public broadcasters and PTTs all over Europe, they worked closely with their main customer, the BBC. With military efficiency, at 9 o'clock every morning a technical operator at London Control Room in Broadcasting House picked up a telephone handset which rang a bell at the Faraday exchange in the City and uttered the words 'good morning, posty'. There followed the routine daily lines test of the regional circuits in to and out of London and the schedule of that day's sound bookings was checked, and likewise BBC centres around the country carried out the same sort of procedure with their local Post Office.

There were few other users of lines providing a bandwidth of over 3kHz. Commercial television had begun in 1955 and possessed a handful of sound lines and pretty well the only other user was the relatively small British Forces Network. The BBC's principal require-



ments were for permanent circuits such as those to transmitter sites and the ones linking together studio centres. The medium wave transmitters generally had 6kHz lines from the nearest BBC regional centre and these were usually provided as a raw copper pair, known as a Local End, that a BBC engineer would have manually equalised to the required bandwidth. In the highly regimented style of post-war BBC Engineering Division the teaching of the essential art of line equalisation to staff was a formal affair. First the frequency response of the raw cable had to be measured with a tone generator at one end and a sound level meter at the other. The response was plotted on graph paper and the curve compared with standard ones in a manual. This would give the values of components needed to make filters that would provide the required frequency response when amplifiers of a specified gain were inserted. This procedure was also used at most outside broadcasts where the Post Office provided lines leading back to the nearest BBC control room. For permanent lines checking of the equalisation had to be repeated about every two years as the condition of the copper could deteriorate.

The BBC's VHF Frequency Modulated radio stations had started operation in 1955 and were generally fed by the equally new BBC-owned microwave links which gave about 20kHz audio.

In 1958 the BBC had started trial stereophonic transmissions for about an hour every Saturday morning using the Third Programme transmitters for the left channel and the TV sound for the right channel. As most people only had Medium Wave radios and the 405-line TVs in those days produced a wide scatter of RF noise, the results were pretty crude and no attempt could be made to ensure that the phase was correct. This approach was superseded in the 1960s by trials of the Zenith-GE Pilot Tone System on FM which was later

adopted world-wide. As far as lines were concerned stereo meant that matching had now to be carried out so that phase was also correct. Also compatibility of audio levels of both mono and A+B stereo signals had to be ensured.

The Post Office had equipment for making wide bandwidth lines of 10kHz on the trunk network between its main centres and these were used on permanent cross-country routes, and extra circuits could be booked by the BBC on an ad hoc basis when required. Abroad during the 1950s the European Broadcasting Union had persuaded the PTTs to install music lines between main cities and these could be booked given enough notice for all the telephone exchanges along the way to be telexed and told at what time to put in their jack. In fact, it was best to give several days notice and then allow an extra half-hour at the start so everyone along the line could be reached should they, by chance, overlook the telex.

As time progressed if you gave the Post Office enough notice they might be able to provide wide-band lines for special events such as sports and concerts. However in the main any overseas sports event was sent back on a 3kHz narrow-band telephone type line. The telephone, so commonplace for calls within programmes these days, was hardly used for broadcasting in 1959 and it was not until the early-1970s that telephone interface equipment was to be encountered in studios. News reports were taken by phone using a cumbersome 600Ω isolating transformer that could be plugged across the telephone line but it was not at all easy to broadcast a two-way conversation.

In the days before satellite and wide-spread networks of undersea cables the bulk of long distance communication was still by short-wave (HF). BBC correspondents often had to make an arduous journey to a remote HF station in order to file a report and either the Post Office or >

< the BBC Receiving station at Tatsfield in Kent would receive the transmissions. There was often no return cue line and the piece was read by the reporter in the hope that London was getting a satisfactory signal and the tape recorder was running. Results varied—as is the way with short-wave—but listening now to reports from the Vietnam war the quality is acceptable and much of the time the fading and atmospherics are not too noticeable.

Closer to home, VHF radio links were often used for outside broadcasts though the transmission equipment and aerials were very bulky and Post Office lines were preferred if available.

During the 1960s the Post Office started to use 48kHz circuits run on a copper wire to support the lines to the telephone switchboards of large companies and each cable would be connected to a large bank of bright yellow valve equipment that provided 12 telephone lines. In time the BBC was given a modified yellow box that gave, three lines of 15kHz instead of the 12 of 3.2kHz. In a few instances where only telephone-quality lines could be provided by the Post Office, such as to the BBC's short-wave transmitting station at Skelton in Cumberland, a special device was commissioned from BBC Design Department and put in the Bush House control room to provide 6.3kHz audio using split band techniques on two 3kHz lines.

The quest for better quality communications was a constant preoccupation. The basic problem was that it was only the BBC that required anything more than telephone quality and any alternative wide-band infrastructure would be prohibitively expensive. The Research Department at Kingswood Warren started work on enhancing the quality of telephone lines in the late-1960s and which carried on for over ten years. Mike Croll and his team published several reports on ways to synthesise the absent higher and lower frequencies to make narrow bandwidth lines sound wider but no practical equipment ever resulted.

At times it was necessary to resort to

using television communication facilities to get high-quality audio links for stereo when no dedicated sound lines were available. A special piece of equipment was used at outside broadcasts to put stereo audio on a standard 6MHz video circuit. From the seventies TV developed ways of getting satellite feeds from around the world but no such facilities existed for audio only and radio news material was often played during any spare minutes at the end of a TV satellite booking.

In the late-1950s some split-band equipment was used by the Post Office to provide a 6kHz line from New York to London for a special programme but the BBC would not commit to its regular use and it was, to the frustration of those who had laboured to supply it, not made available for general use. By the mid-1970s the growth in news coverage and programme outlets meant there was pressure at the BBC to get high-quality audio on-demand from places where journalist were frequently filing material as having to book circuits long in advance was impractical. Thus it became viable to lease on a permanent basis 10kHz incoming lines from places such as Paris and Brussels. When in the early-1980s the first digital Transatlantic circuit came into use the American firm IDB offered the BBC a 7kHz one-way line using early 192 kilobit per second encoding and decoding equipment.

IDB specialised in providing high-quality audio mainly by satellite and its sudden appearance was greatly appreciated by radio broadcasters. In the US, AT&T had long provided audio services by linking 'dry copper pairs' (local ends) at the Central Office (our telephone exchange) with long distance wide-band lines in order to get feeds of sports commentaries and news material. However the new Baby Bells and local phone companies decided not to continue the service of broadcast lines and new ways needed to be found. Some of the solutions adopted in the US helped other broadcasters around the

ISDN timeline

- **1990 CCS - Micro 64 codec (1991)**
This was the first G722 codec. It provided 7.5kHz mono audio bandwidth over a 64kbit/s data link. This unit required an external ISDN Terminal Adaptor, and came in a portable or rackmount format.
- **1992 CCS - CDQ2000 codec (1992)**
This was the world's first MPEG Layer 2 codec. It was developed by CCS even before the MPEG Layer 2 standard was finalised by the ISO. The CDQ2000 had to Inverse Multiplex (Bond) two 64kbit/s data channels together to enable Stereo 20kHz audio bandwidth to be sent over one ISDN-2 line. There was no standard at this time for the Inverse Multiplexing, so CCS developed its own process which has now become a de facto standard and has been reverse engineered by many other manufacturers. Also required an external ISDN Terminal Adaptor.
- **AVT - 7kHz ISDN Telephone (1992)**
Normal ISDN telephone with very easy operator interface. Standard 7kHz audio codec system in Germany. J.52 signalling procedure.
- **1993 Dolby - Dolby Fax (December 1993)**
Using Dolby AC-2 coding launched in the US. Dolby Fax enabled high quality audio, encoded with Dolby AC-2, to be transmitted between users around the world on dial-up ISDN lines. At that time the Dolby Fax system consisted of a Dolby AC-2 encoder (Model DP501), a decoder (Model DP502), and an ISDN terminal adaptor-inverse multiplexer made by Ascend, a market leader in telephone terminal equipment. Two ISDN-2 lines are required to send stereo audio via the Dolby Fax.
- **Nicral - NICA64 codec**
The UK independent Radio Stations favoured aptX100 coding, so Nicral developed the NICA64 codec capable of operating on one 64kbit/s ISDN channel. It could be provided with or without an Internal ISDN Terminal Adaptor and dial pad.
- **1994 Nicral - EasyCall Terminal Adaptor (1994)**
Nicral developed a much needed broadcaster-studio friendly ISDN Terminal Adaptor to use in conjunction with any codec. It has a dial pad display and could store numbers and names.
- **CCS - CDQ1000 codec (1994)**
A mono codec with G722 and MPEG Layer 2 coding to operate on one 64kbit/s channel.
- **CCS - CDQ2001 codec (1994)**
As the CDQ2000 but with improved noise figures and remote control.
- **APT - DSM100**
Pro-Link WorldNet system, the de facto audio communications standard in the post, film and music industries, provides a fully duplex digital audio codec with integral ISDN management for full bandwidth 22kHz stereo audio with time code.

world. For shorter range communications, improved portable VHF and UHF links appeared. Comrex Corporation, then a maker of radio-mics, worked to enhance the quality of the telephone line and manufactured quite effective frequency extenders which extended >

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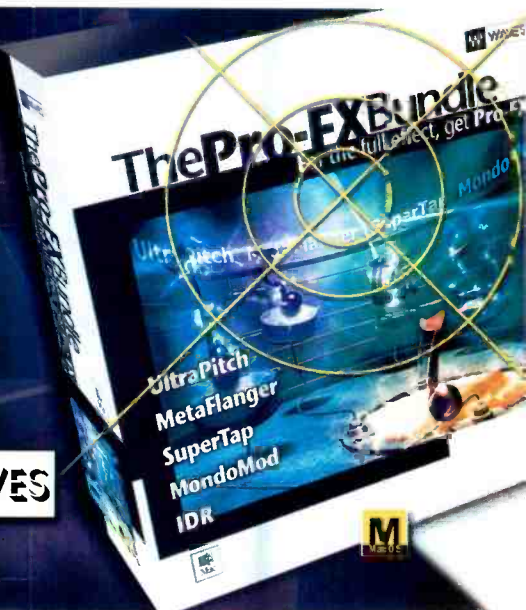
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< the lower limit from 300Hz to 3.2kHz and improved the top end with equalisation. At the sending end all frequencies were shifted up by 250Hz and then shifted down again at the receiving end and some general equalisation added to improve the top end. With the success of this device the company then went on to produce simple reporter operated multi-line split band equipment using two and three telephone lines to make 6kHz and 9kHz circuits. During the 1980s this was widely used for news coverage from the world's trouble spots.

The plain old telephone system (POTS) deserves a place in this history of audio communications as it is now responsible for a great many hours of speech radio broadcasting every day. In the sixties, before the advent of today's telephone balance units that cleverly separate incoming and outgoing audio, the Post Office kindly supplied broadcasters with 4-wire telephones with a Go and Return line. On pushing a 'divert' key each line passed through a hybrid coil for connection to the desk. Telephone equipment for studios came on the market in the seventies but for a long time phone calls were always liable to be crackly and distorted. Then in the eighties the telecommunications networks were gradually upgraded and importantly the telephone microphone moved from being carbon granule to electret capacitor based and the quality greatly improved.

In the eighties, various types of satellite circuits gradually became available ranging from analogue audio subcarriers of TV channels to narrow SCPC digital carriers. From 1991 the Inmarsat network supported high-speed digital connections and for the first time it was possible to go out and buy a small unit that could transmit back to base high-quality audio from any point on Earth.

In the early-1980s two types of digital circuit became available from BT; Kilo-stream at 64 kilobits per second and Megastream at 2 Megabits per second. The big innovation was that these and their

successors are general-purpose telecommunications services and suddenly those wanting to send high-quality audio were no longer a small band demanding they get something special. These lines were not of any immediate value for sound transmission as suitable coder-decoders (codecs) were not yet available, but by 1985 AETA in France began to manufacture a 7kHz codec using the ITU-T G.722 standard and the BBC installed a pair on a Kilostream line between London and Sydney. This triggered a lot of interest in codecs and in 1990 dial-up digital circuits started to be available and ISDN is now very widely used to transmit wide band with audio using several different data reduction schemes.

In 1988 it became known that a lot of success had been achieved by developers of audio data reduction algorithms and it was suggested that the International Standards Organisation (ISO) intervene to ensure that commercial considerations did not result in a proliferation of incompatible equipment using proprietary standards. In 1990 Swedish Radio hosted the first rounds of listening tests in Stockholm of what later became the MPEG family of standards.

Today, high-quality audio communication is generally far easier and cheaper. Looking to the future, the huge increase in telecommunications bandwidth that is around the corner will mean that data reduction techniques will not necessarily have to be used. BT is currently equipping its telephone exchanges to be able to provide high-bandwidth ADSL service to most customers. This is a technique that endows old-fashioned copper pairs with a bandwidth of several megabits between the subscriber and the exchange. It will inevitably bring down the cost of connection at 2Mb/s and allow studios to connect themselves together using AES-EBU.

The Internet is bound to be the standard professional tool and method of communication, and today's distinction between dial-up (circuit switched) and 'packetised IP' (packet switched) communication will inevitably blur. The pace

Dolby - DP523 2-channel digital audio encoder and DP524 2-channel digital audio decoder. (October 1994)

Replaced the Dolby DP501 and DP502 respectively. The key change was the addition of AES-EBU and SPDIF connections.

Nicral - NICA128 codec

The NICA64 was replaced by the NICA128 codec still only aptX100 coding but capable of 15kHz mono on one ISDN2 using APT's standard Inverse Multiplexing (MUCAS).

Nicral - ARC Master ISDN Control unit

Nicral began to tackle multiple users wanting to use one codec in a radio station environment. This was the first-generation ARC system which provided a Slave panel for each user in the studios to control the ISDN calls via the Master unit in the racks room.

You/com - RNC Radio News Centre

ISDN audio distributor for all regional broadcasters in the Netherlands. 19-inch rackmount system which connects to 30 Basic Rate ISDN lines, allowing 30 broadcasters to dial in with 128kbit MPEG Layer 2 codecs. Four codecs selectable through in-band signalling, with in-band authentication also implemented. Designed as a client-specific solution for the Dutch NOB.

• 1995 APT - DRT 128 Digital Reporter Terminal

A full-duplex digital audio codec for all voice talent, OB and field-based reporting applications over ISDN, offering exceptional audio quality and negligible coding delay. This codec operates on a single ISDN line to achieve bandwidths of 7.5kHz mono, 7.5kHz stereo and 15kHz mono.

Dolby - DP503 2-channel digital audio encoder and revised DP524 2-channel digital audio decoder.

These two units offered greater interoperability by including the popular AC-3 and MPEG Layer 2 coding algorithms.

CCS - CDQPrima codec range

CCS launched a new generation codec providing G722 coding, MPEG Layer 2 coding (later, MPEG Layer 3 was added) capable of operating on one to three ISDN lines (128k to 384k in steps of 64k). This meant the best ever audio quality was available over ISDN.

You/com - ReporterSet

First portable ISDN MPEG codec with built-in mixer.

You/com - TA2124MIDI

Real-time MIDI transceiver on ISDN for demonstration on Global '95 convention.

You/com - MDC/net

First complete ISDN lines and ISDN codecs management system

• 1996 AVT - MAGIC ISDN

High end ISO-MPEG Layer 2/3 audio codec for transmission data rates up to 384kbit/s using L52. Compatible to MusicTaxi, CDQPrima, CDQ1000,

at which audio broadcasting will become totally digital is currently uncertain but whether it is five, ten or 20 years the change from analogue will happen in some form or other. Next year the successor to GSM mobile communication will come into service and UMTS >

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< promises to support high-bandwidth digital connections. Broadcasters are now looking to see if it might be used as the basis of future ways that people can get radio and TV while on the move.

I believe one of the major changes in the future for the industry will be that the medium of communication will become transparent to the user. Up to now we have had to identify a suitable service, such as ISDN or satellite and so on, that will support what we want to do and then purchase it, but I predict the future will be 'system' rather than 'service' based. We will use systems that will communicate—probably via high-speed Internet—via a multitude of wireless and wired technologies that will be all around us but which we will not need to know very much about. Today physical distance is no longer such a barrier and performers in different parts of the

world can take part in a recording session. This trend will continue with perhaps the producer doing a mix that is physically running on a computer-based system thousands of miles away. Systems are now becoming available which permit radio programming to be compiled by staff either at the station or remotely via the Internet, and for example an advertising agency will be able to insert the latest commercials directly into a station's running order.

Back in 1959 sending audio was a very simple matter. Dear old analogue was dead simple but very limiting in what you could do with it. We now have to accept that both the communications and the audio standards in the digital world are very complicated and will continue to become more so but the possibilities they open up become more and more exciting. ■

Zephyr, Glensound, You.com, 7kHz ISDN Telephone and normal 3.1kHz telephones. Simultaneous transmission of MPEG audio signal and command channel.

• **1997 AVT—MAGIC Compact i2-7kHz**

3.1/7kHz audiocodec in 1U 19-inch housing. Distribution mode for simultaneous transmission of one 7kHz signal to four different locations. J52 signalling procedure.

AVT—MAGIC Compact i2-DD

Low-cost ISO-MPEG Layer 2/3 Decoder with J52. Two different line Interfaces (ISDN and E1) can be equipped simultaneously for ISDN backup purposes.

AVT - MAGIC Compact i2-DDC

Same function as i2-DD, with additional 7kHz command channel.

CCS - Roadrunner

Codec-mixer with three mic-line inputs. First portable reporter's unit capable of 15kHz (1 B channel) and 20kHz (2 B channel) mono using MPEG Layer 2, MPEG Layer 3 or G722 coding.

Maycom - ISYS (January 1997)

Isys is a PC-based ISDN audio codec for full duplex live communication. Additional feature is the ability to store all live communication onto PC hard disk automatically.

Nicral - ARC Multi Master ISDN control system Nicral developed a new generation ISDN codec control system capable of controlling up to 16 codecs with or without their own ISDN Terminal Adaptors. There can be 16 users on each system, and later on full audio routing was introduced.

Nicral - NICAX codec system (1998) Nicral's next-generation codec capable of aptX100, G722 and MPEG Layer 2 mono all in one box. Now more than just a codec but a codec system capable of providing links to transmitter sites with ISDN automatic reserve.

You.com - StudioSet

First ISDN telephone hybrid (G.711 codec).

• **1998 APT - BCF256 Broadcast**

Communications Frame (December 1998)

The broadcaster's choice for uncompromised audio communications, designed as the perfect solution for STLs, backhaul, studio networking and Outside Broadcast applications. The BCF256 assures the broadcaster of a highly robust unit together with negligible coding delay, and offers bandwidths up to 15kHz FM-quality stereo audio.

AVT - MAGIC ISDN ENCODER

Same function as MAGIC ISDN but only encoder in MPEG mode.

You.com - NewsDepot

First unattended outside reporter-to-broadcast automation system' recorder for telephone (G.711), G.722 and MPEG calls.

• **1999 AVT - MAGIC ISDN Telephone Hybrid (February 1999)**

ISDN telephone hybrid. Supports 7kHz audio coding, with operation via external keypad. Call-switching function between four partners.

CCS - CDQPRIMA 2MUX-M (Spring 1999)

High-end addition to the CDQPRIMA codec family. Modular 4U 19-inch 2MBit/s broadcast Audio Multiplexer System with support for L2, L3, G.722, J.41 and J.57 multiple standards and 24-bit A-D D-A.

CCS - Mayah SendIt (Spring 1999)

Worldwide first and only software audio codec, offering greater compatibility than hardware codecs (supports Telos, CCS, Dialog4). MPEG Layers 2 and 3 and G.722 available on a PC with sound card and ISDN TA card. Real-time and file-based transmission are supported. Works in conjunction with Mayah EditPro software for combined PC-based editing-transmission system.

Maycom - Easycorder (January 1999)

The Maycom Easycorder, awarded the Radio World Cool Stuff award '99, is a portable solid-state recorder with on-board graphical editing features. ISDN communication is an available option.

Sonifex - Courler portable hard disk recorder (September 1999)

Portable recorder designed as a complete journalist's tool - reporters can carry out their reports, edit them up and then send them back to the studio in real time or as a data file. Records to PCMCIA removable hard disk or flash memory card in AIFF, WAV, MPEG Layer II or ENCO-DAD formats. Built-in audio transfer capability via ISDN, standard telephone line or GSM mobile. Uses rechargeable camcorder batteries.

You.com - ReporterMare

Digital memory-card portable audio recorder with live ISDN file transfer capability.

Studio Condenser Microphones



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M 940 

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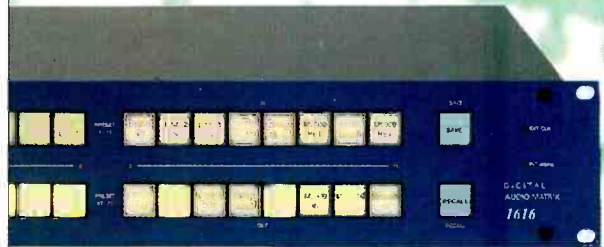
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Are you Listening?

The human hearing system must be the final arbiter of sound quality. **John Watkinson** looks at how hearing works and how it defines the related problems of delivering high-quality and monitoring to see if it has been achieved

THE ULTIMATE CRITERION for sound reproduction is that the human ear is fooled by the overall system into thinking it has heard the real thing. It follows that even to approach that ideal, the properties of human hearing have to form the basis for design judgements of every part of the audio chain. It is generally assumed that the more accurate some aspect of a reproduction system is, the more realistic it will sound, but this doesn't follow. In practice this assumption is only true if the accuracy is less than the accuracy of the hearing system. Once some aspect of an audio system exceeds the accuracy of the hearing system, further improvement is not only unnecessary, but it diverts effort away from other areas where it could be more useful.

Fig. 1a shows some criteria by which audio accuracy can be assessed. In each area it should be possible to measure the requirements of the listener using whatever units are appropriate in order to create a multi-criterion threshold. Fig. 1b shows that these criteria must be met equally despite the sum of all degradations in every stage of the audio chain from microphone to speaker. Fig. 1c shows that a balance must be reached in two dimensions so that each criterion is given equal attention in every stage through which the signal passes. This gives the best value for money whatever standard is achieved. Fig. 1d shows a more common approach, which is where the excess quality of some parts of the system is wasted because other weak parts dominate the impression of the listener. The most common error is that the electronic aspects of audio systems are over specified whilst the transducers are underspecified.

Various measurement techniques have evolved for audio equipment. The correct procedure is one in which an objective measurement is made and compared with some criterion based on subjective tests of human hearing. Unfortunately

these measurements are incomplete. Measurements of frequency response and nonlinear distortion are routinely made and have internationally agreed measurement units, whereas the importance of linear distortion is scarcely considered.

The mechanism by which humans determine sound direction and the accuracy to which it can be done are both established. Accordingly this ought to be the criterion for the spatial accuracy of a stereo or surround sound reproduction system. It is extraordinary that there are no agreed units for measuring the spatial accuracy of stereo reproduction systems, although other industries that deal with spatially disposed images evolved such units long ago.

If we purport to be professionals, it should be a matter of some embarrassment that loudspeakers displaying identical conventional measurements sound different from each other, confirming that existing measurements give an incomplete picture of performance. In the absence of a psychoacoustically based unit of spatial accuracy, the comparison of speakers becomes a minefield of subjectivism and any kind of progress is hampered.

Making objective measurements requires an accurate model of the human hearing system. In considering how human hearing works, it is convenient to consider first the operation of a single ear and then to extend the argument to directional hearing with a pair of ears. >

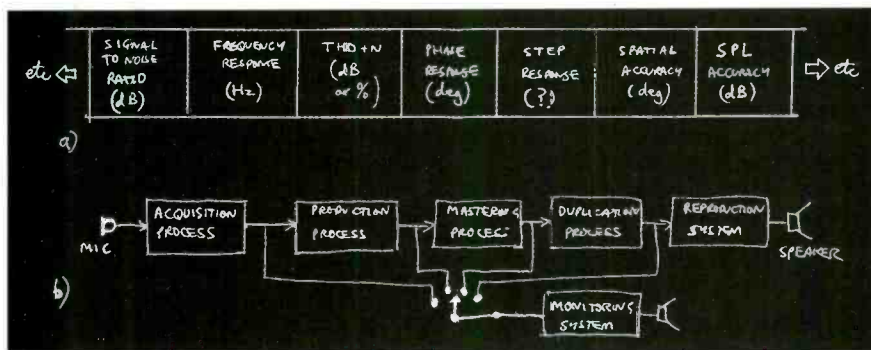


Fig. 1: Some quality considerations. At 1a an incomplete list of criteria that must be met for accurate reproduction. At 1b in a real-world system, the criteria of 1a must be met in all of the components in the chain. The monitoring system should be at least as good as the best anticipated consumer reproduction system

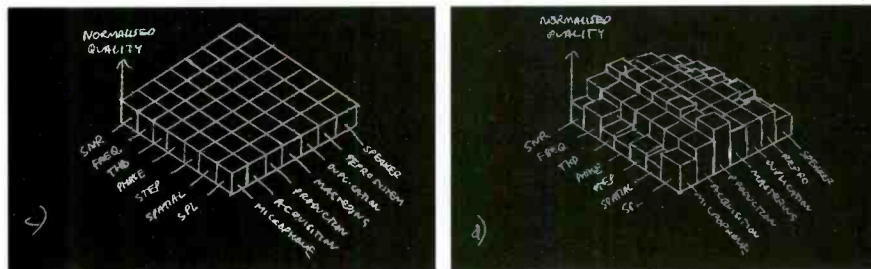


Fig. 1c and 1d: At c an ideal system has ideally equal performance in all stages. Real system at d has better performance in signal processing than in transducers. Excess performance is a waste of money

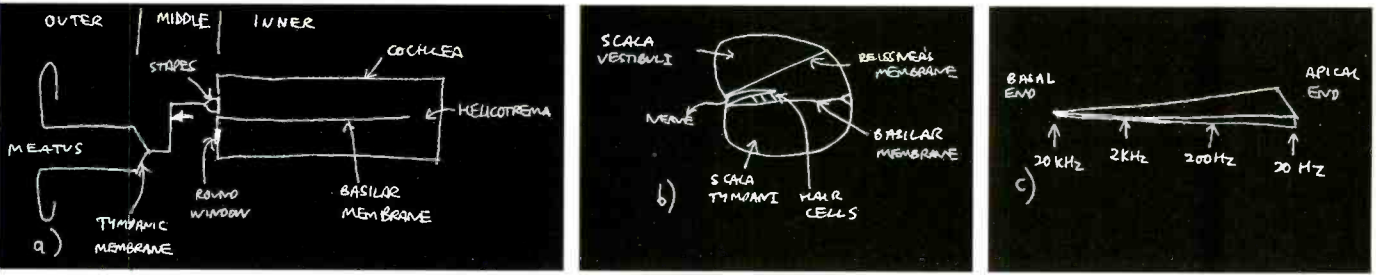


Fig.2a Simplified layout of the ear. 2b Cross-section of the cochlea. 2c Place theory of frequency analysis

< Fig.2 shows that the structure of the ear is divided into the outer, middle and inner ears. The inner ear or cochlea works by sound travelling through a fluid. Sound enters the cochlea via a membrane called the oval window. If airborne sound were to be incident on the oval window directly, the serious impedance mismatch would cause most of the sound to be reflected. The middle ear remedies that mismatch by providing a mechanical advantage. The tympanic membrane is linked to the oval window by three bones known as ossicles which act as a lever system such that a large displacement of the tympanic membrane results in a smaller displacement of the oval window but with greater force.

The cochlea is a tapering spiral cavity within bony walls, which is filled with fluid. This has been unrolled in Fig.2 for simplicity. The widest part, near the oval window, is called the base and the distant end is the apex. Fig.2b shows that the cochlea is divided lengthwise into three volumes by Reissner's membrane and the basilar membrane. The scala vestibuli and the scala tympani are connected by a small aperture at the apex of the cochlea known as the helicotrema.

Vibrations from the stapes are transferred to the oval window and become fluid pressure variations, which are relieved by the flexing of the round window. Effectively the basilar membrane is in series with the fluid motion and is driven by it except at very low frequencies where the fluid flows through

the helicotrema, bypassing the basilar membrane and determining the low frequency amplitude and phase response of the hearing mechanism at about 20Hz.

Above that frequency the hearing mechanism works in both the time and frequency domains. The time domain response works quickly, primarily aiding the direction sensing mechanism and is older in evolutionary terms. The frequency domain response works more slowly, aiding the determination of pitch and timbre and evolved later.

Fig.2c shows that the basilar membrane tapers in width and varies in thickness in the opposite sense to the taper of the cochlea. According to place theory, the part of the basilar membrane which resonates as a result of an applied sound is a function of the frequency. High frequencies cause resonance near to the oval window, and low frequencies cause resonance further away. The distance from the apex

allowing extremely good pitch discrimination of about one twelfth of a semitone, which is determined by the spacing of hair cells.

In one sense, the basilar membrane is a mechanical frequency analyser. A knowledge of the way it operates is essential to an understanding of musical phenomena such as pitch discrimination, timbre, consonance and dissonance, to auditory phenomena such as critical bands, masking and the precedence effect and technologies such as compression.

The basilar membrane works in a regenerative fashion so that the Q factor, or frequency selectivity, of the ear is higher than it would otherwise be. The deflection of hair cells in the organ of Corti triggers nerve firings and these signals are conducted to the brain by the auditory nerve.

Fig.3 shows an uncoiled basilar membrane with the apex on the left so that >

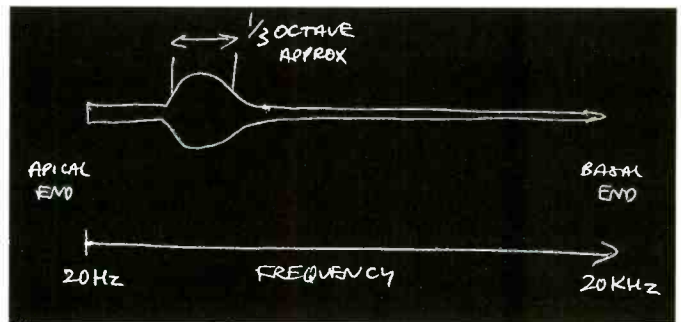


Fig.3 The resonant area of the basilar membrane cannot be infinitely small and spread over about a third of an octave, the result is masking

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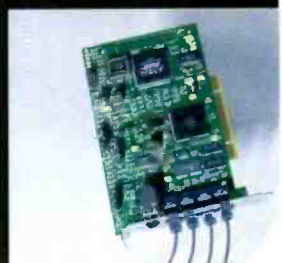
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< the usual logarithmic frequency scale can be applied. The envelope of displacement of the basilar membrane is shown for a single frequency. The vibration of the membrane in sympathy with a single frequency cannot be localised to an infinitely small area, and nearby areas are forced to vibrate at the same frequency with an amplitude that

monic distortion is particularly high.

The Heisenberg inequality teaches that the higher the frequency resolution of a transform, the worse the time accuracy. As the basilar membrane has finite frequency resolution measured in the width of a critical band, about one third of an octave, it follows that it must have finite time resolution. This also follows

given level at 1kHz. These equal loudness contours were originally measured by Fletcher and Munson and subsequently by Robinson and Dadson.

Many musical instruments and the human voice change timbre with level and the result of these contours reveals that there is only one level which sounds correct for the timbre. The correct tonal

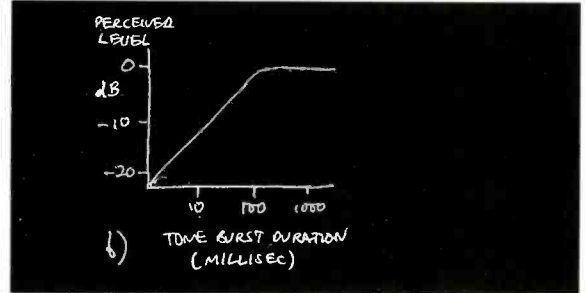
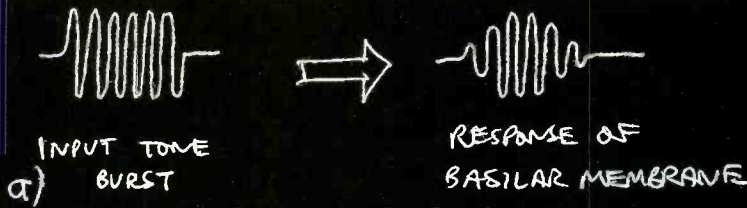


Fig.4: Resonant nature of basilar membrane results. 4a finite attack and decay times to tone burst. 4b perceived level depends on duration

decreases with distance.

In the presence of a complex spectrum, the finite width of the basilar vibration envelope, known as the critical bandwidth, means that the ear fails to register energy in some bands when there is more energy in a nearby band. Within those areas, other frequencies are mechanically excluded because their amplitude is insufficient to dominate the local vibration of the membrane. The Q factor of the membrane is responsible for the degree of auditory masking, defined as the decreased audibility of one sound in the presence of another.

Some delayed resonances in speakers may not be heard because of masking, and bit-rate reduction relies upon the artefacts it causes being masked. Harmonic distortion in any equipment is easily detected even in minute quantities because the first few harmonics fall in non-overlapping critical bands. The sensitivity of the ear to third har-

monics is particularly high. from the fact that the membrane is resonant, taking time to start and stop vibrating in response to a stimulus. There are many examples of this. Fig.4a shows the impulse response and Fig.4b shows the perceived loudness of a tone burst increases with duration up to about 200ms due to the finite response time.

The ear has evolved to offer intelligibility in reverberant environments, which it does by averaging all received energy over a period of about 30ms. Reflected sound which arrives within this time is integrated to produce a louder sensation, whereas reflected sound which arrives after that time can be temporally discriminated and is perceived as an echo.

The subjective response to level is called loudness and is measured in phons. The phon scale and the SPL scale coincide at 1kHz, but at other frequencies the phon scale deviates because it displays the actual SPL judged by a human subject to be equally loud as a

balance when playing a good recording can be obtained simply by setting the volume control to the level that sounds natural. Recordings that are mixed at an excessively high level will appear bass-light when played back at a normal level. Such recordings are more a product of self-indulgence than professionalism.

Turning now to the directional aspects of hearing, Fig.5 shows that the brain can examine several potential differences between the signals from the two ears. At Fig.5a a phase shift will be apparent. At Fig.5b the distant ear is shaded by the head resulting in a different frequency response compared to the nearer ear. At Fig.5c a transient sound arrives later at the more distant ear. The inter-aural phase, delay and level mechanisms vary in their effectiveness depending on the nature of the sound to be located. At some point a fuzzy logic decision has to be made as to how these mechanisms will be weighted. >

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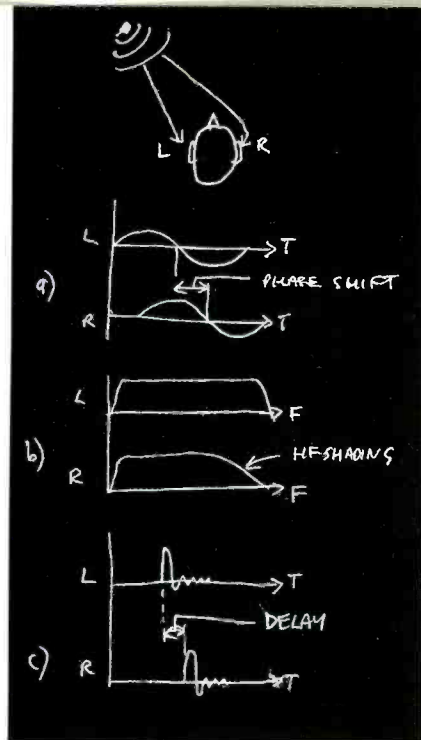


Fig. 5: Direction sensing methods

< There will be considerable variation with frequency in the phase shift between the ears. At a low frequency such as 30Hz, the wavelength is around 11.5m and so this mechanism must be quite weak at low frequencies. At high frequencies the ear spacing is many wavelengths producing a confusing and complex phase relationship. This suggests a frequency limit of around 1500Hz, which has been confirmed by experiment.

At low and middle frequencies sound will diffract round the head sufficiently well that there will be no significant difference between the level at the two ears. Only at high frequencies does sound become directional enough for the head to shade the distant ear causing what is called an inter-aural intensity difference (IID). Phase differences are only useful at low frequencies and shading only works at high frequencies. Fortunately real-world sounds are timbral or broadband and often contain transients. Timbral, broadband and transient sounds differ from tones in that

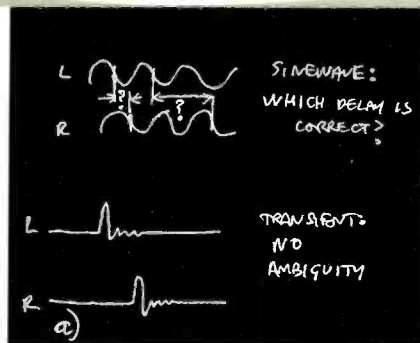


Fig. 6a: Transients give better ability to assess direction. 6b: Single transient carries a lot of information. System must have linear phase to avoid corruption of this information.

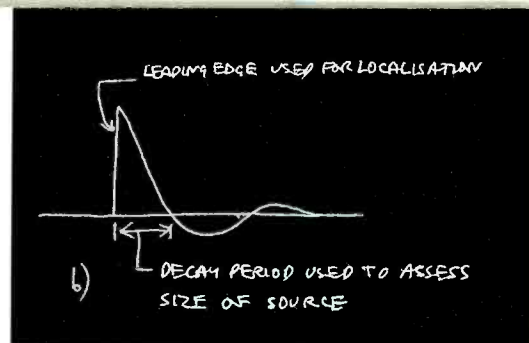
they contain many different frequencies.

A transient has a unique aperiodic waveform which Fig. 6a shows has the advantage that there can be no ambiguity in the inter-aural delay (IAD) between two versions. Note that a 1degree change in sound location causes an IAD of around 10µs. The smallest detectable IAD is a remarkable 6µs. This should be the criterion for spatial reproduction accuracy.

A timbral waveform is periodic at the fundamental frequency but the presence of harmonics means that a greater number of nerve firings can be compared between the two ears. As the statistical deviation of nerve firings with respect to the incoming waveform is about 100µs the only way an IAD of 6µs can be perceived is if the timing of many nerve firings is correlated in some way in the brain.

Transient noises produce a one-off pressure step whose source is accurately and instinctively located. Fig. 6b shows an idealised transient pressure waveform following an acoustic event. Only the initial transient pressure change is required for location. The time of arrival of the transient at the two ears will be different and will locate the source laterally within a processing delay of around 1ms.

Following the event, which generated the transient, the air pressure equalises. The time taken for this equalisation varies and allows the listener to establish the likely size of the sound source. The larger the source, the longer the pressure equalisation time.



The above results suggest that anything in a sound reproduction system which impairs the reproduction of a transient pressure change will damage localisation and the assessment of the pressure equalisation time. Clearly in an audio system, which claims to offer any degree of precision, every component must be able to reproduce transients accurately and must have at least a minimum phase characteristic if it cannot be phase linear.

In a real listening situation, the ear is presented with a variety of virtual sound sources at various places between the speakers in a stereo system and from (in principle) any angle in a surround sound system. Several milliseconds after that, the ear is bombarded with a complex sound field resulting from the interaction of the radiation of the speakers with the room. This doesn't differ from hearing a real sound source.

In a monophonic system, all of the sound is emitted from a single point and psychoacoustic masking operates to its fullest extent. Lossy audio compression techniques that rely on masking work well in mono. However, in stereophonic and surround sound applications different criteria must apply. In addition to the timbral information describing the nature of the sound sources, stereophonic and surround systems also contain spatial information describing their location. In other words, there is more information in a stereo signal pair than in a pair of mono signals and pro rata for surround sound.

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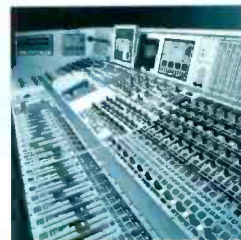


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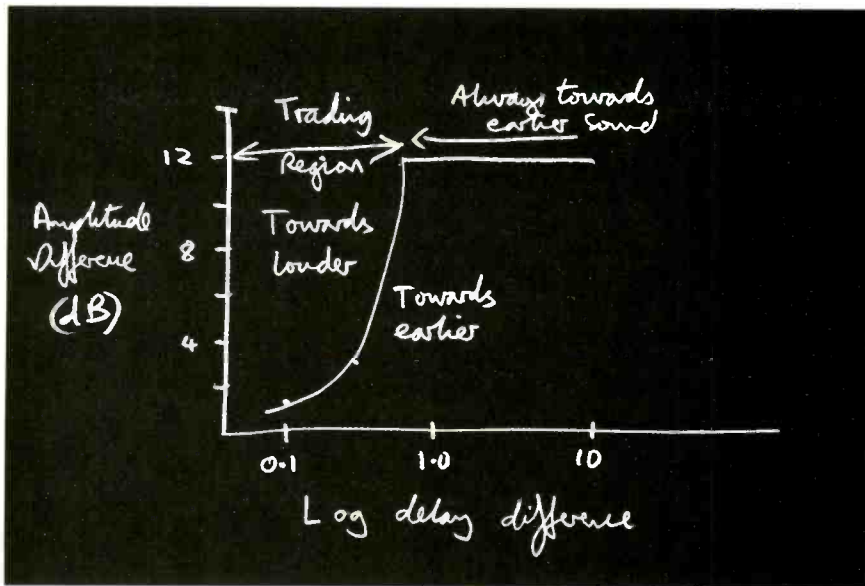


Fig.7: Time/Intensity Trading works up to about 0.7ms. This is the sort of delay caused by sharp edges in loudspeakers

< that in stereophonic and surround systems, masking is not as effective. When two sound sources are in physically different locations, the degree of masking is not as great as when they are co-sited. Unfortunately all of the psychoacoustic masking models used in today's lossy compressors assume co-siting. When used in stereo or surround systems, the artefacts of the compression process can be revealed. This was first pointed out by the late Michael Gerzon who introduced the term unmasking to describe the phenomenon.

The mechanism behind unmasking is that human hearing can identify the different positions of a number of simultaneous sound sources. The hearing mechanism is constantly comparing excitation patterns from the two ears with different relative delays. Strong correlation will be found where the delay corresponds to the interaural

delay for a given source. Using a variable delay the hearing mechanism has an ability to concentrate on one sound source out of many. Sounds arriving from other directions are incoherent and are heard less well.

The principle is used in phased array radar antennae which can give the illusion of scanning with no mechanical movement. In human hearing the mechanism is known as attentional selectivity but it is more usually referred to as the cocktail-party effect. This is an unfortunate oxymoron because the consumption of alcohol actually diminishes much of the ear's acuteness. Perhaps one day instead of being asked to blow into a bag the police will simply measure critical bandwidth.

In all real listening situations, the first version of a transient sound to reach the ears must be the direct sound rather than a reflection. Consequently the ear

has evolved to attribute source direction from the time of arrival difference at the two ears of the first version of a transient. Later versions which may arrive from elsewhere after a period of milliseconds simply add to the perceived loudness but do not change the perceived location of the source.

The Dutch researcher Haas found that this precedence effect is so powerful that even when later arriving sounds are artificially amplified (a situation which does not occur in nature) the location still appears to be that from which the first version arrives.

Experiments have been conducted in which the delay and intensity clues are contradictory to investigate the way the weighting process works. The same sound is produced in two locations but with varying relative delay and shading dependent level. The way in which the listener perceives an apparent sound direction reveals how the directional clues are weighted.

Within the maximum interaural delay of about 700µs the precedence effect does not function and the perceived direction can be pulled away from that of the first arriving source by an increase in level. Fig.7 shows that this area is known as the time-intensity trading region. Once the maximum inter-aural delay is exceeded, the hearing mechanism knows that the time difference must be due to reverberation and the trading ceases to change with level.

It is important to realise that in real life the hearing mechanism expects a familiar sound to have a familiar weighting of phase, time of arrival and shading clues. A high-quality sound reproduction system must do the same if a convincing spatial illusion is to be had. Consequently a stereo system which attempts to rely on just one of these effects will not sound realistic. Worse still is a system which relies on >



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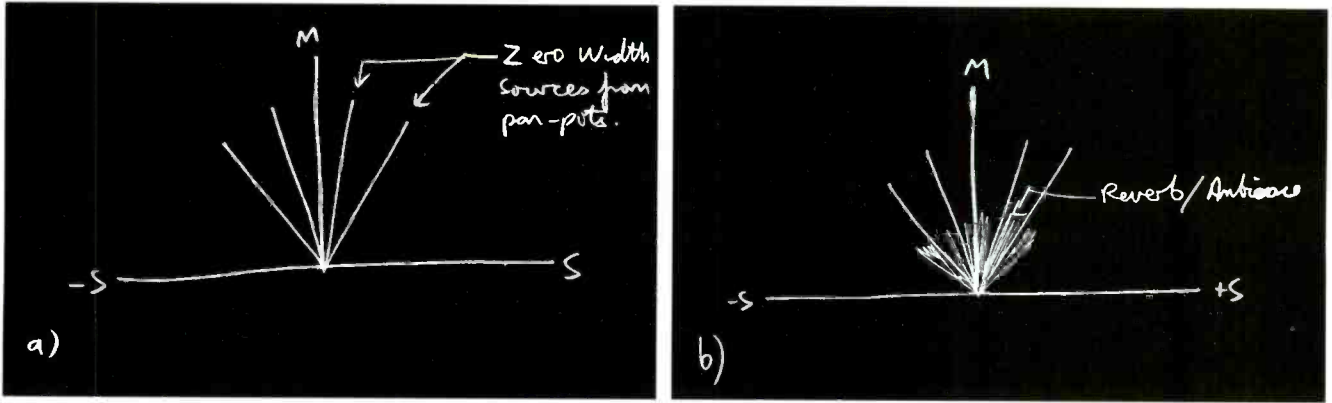


Fig.8: Vectorscope display of dry and reverberant mixes. 8a: Dry pan-potted mix. 8b: Mix with reverb

< one effect to be dominant but where another is contradictory. Time-intensity trading is an interesting insight into the operation of the hearing mechanism, but it cannot be used in quality sound reproduction because the ear is forced to resolve conflicting stimuli and the result is inevitably listening fatigue.

Intensity stereo, the type of signal format obtained with coincident microphones or pan pots, works purely by amplitude differences at the two loudspeakers. The two signals should be exactly in phase. As both ears hear both speakers the result is that the space between the speakers and the ears turns the intensity differences into time of arrival differences. These give the illusion of virtual sound sources.

A virtual sound source from a pan pot has zero width and on ideal loudspeakers would appear as a virtual point source. Fig.8a shows how a pan-potted dry mix should appear spatially on an audio vectorscope. Fig.8b shows what happens when artificial stereo reverb is added. This is also what is obtained with real sources using a coincident pair of high quality mics. In this case the sources are the real sources and the sound between is reverb-ambience.

If the loudspeaker system can't reproduce the same spatial relationship then it is inadequate. Fig.9a show how a test might be performed. The test signal can

be any dry pan-potted mix with sound sources in various places across the image. This is displayed on a vectorscope. The test signal is supplied to the speakers under test under anechoic conditions and the results are picked up by a precision coincident microphone connected to a second vectorscope.

Most legacy speakers perform appallingly badly in this test, giving a vectorscope display similar to that in Fig.9b. The line vectors of the test signal have been spread in a mechanism called smear. The apparent direction from which the sound comes is a function of frequency. Smear can be due to many factors, but impedance changes at sharp enclosure corners are a major offender. The reflections these cause interfere with the direct sound such that in the time domain a single transient is presented to the ear as a bunch of transients whose relative energy is frequency dependent. The time between the transients of a typical sized legacy square box speaker is right in the middle of the time-intensity trading region so the ear gets frequency-dependent time-of-arrival information which causes any sound source to smear.

Another term for smear is spatial masking. An original sound field such as shown in Fig.8b may have low level sound sources at a different subtended angle to high level sources. After loud- >

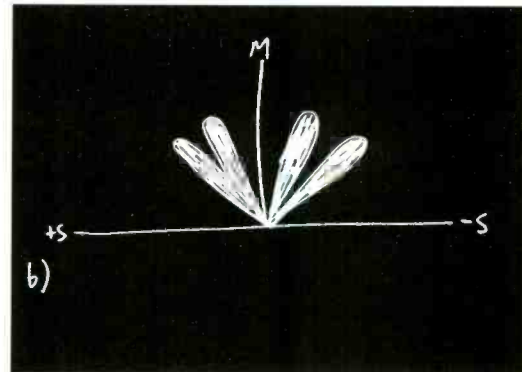
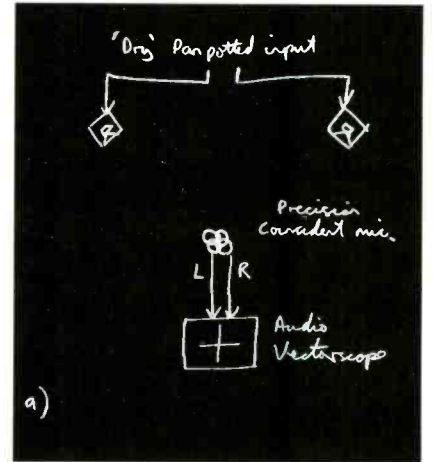


Fig.9a: Smear test for loudspeakers. 9b: Smear vector display due to poor loudspeakers

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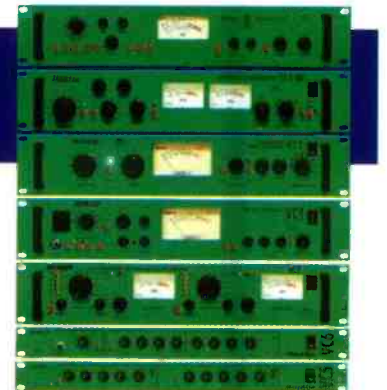


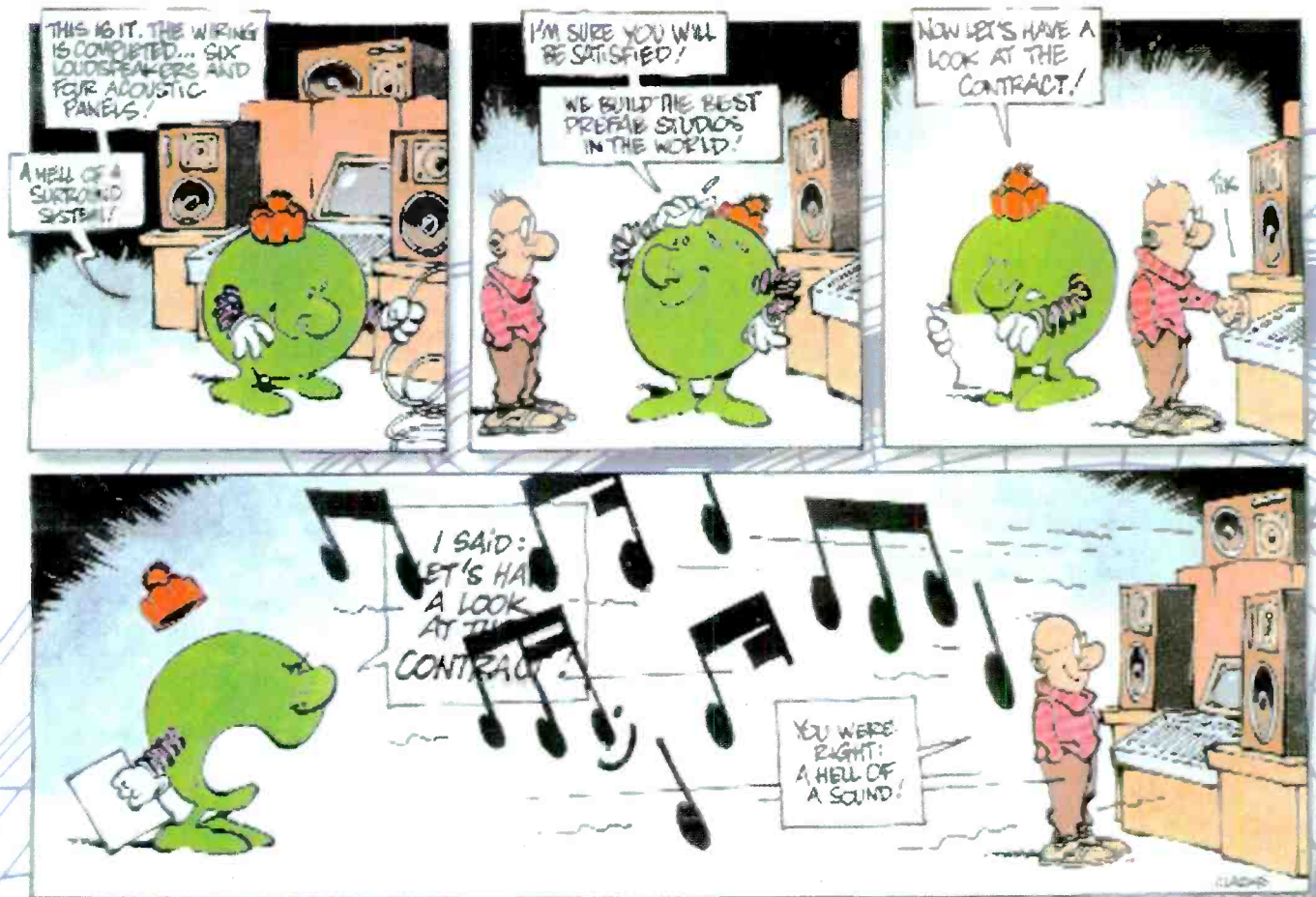
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<speaker smearing the high level source has spread so that the low level source is simply masked out. The consequence of listening on smeared speakers is that a substantial amount of the information in the audio signal isn't audible. Note that spatial masking in a speaker must be added to the temporal masking which takes place due to delayed resonances in the structure.

Masking in speakers works both ways. A noise or interference which shouldn't be there may go unnoticed, or a sound which should be there but has for some reason gone will not be missed. This is not monitoring.

Once it is established that loudspeakers are capable of masking, it is a small conceptual step to appreciate that they act as information channels of limited capacity. If the information capacity of the speaker is less than the information capacity of the ear, the loudspeaker isn't monitoring the incoming signal at all. In fact it is preventing the ear monitoring of the signal.

In all disciplines the quality of work produced is usually a function of how stringently the output is assessed. If that photograph isn't sharp, if that paint finish isn't flawless, it gets rejected. The audio professional who is trying to assess the quality of his output work is at a disadvantage when compared to the photographer or the painter, because he can't hear the quality of his work. All that the audio professional can hear is the result of his work in series with a loudspeaker system and a listening room. If that inseparable combination of speakers and room were transparent, there wouldn't be a problem. Unfortunately the state of the industry at the moment is that the majority of professional audio monitoring is not done with a transparent system, but with a system which contains elements that basically give the documented needs of the human hearing system the finger.

The situation may be getting worse. The acceleration of recording and signal processing technology has meant

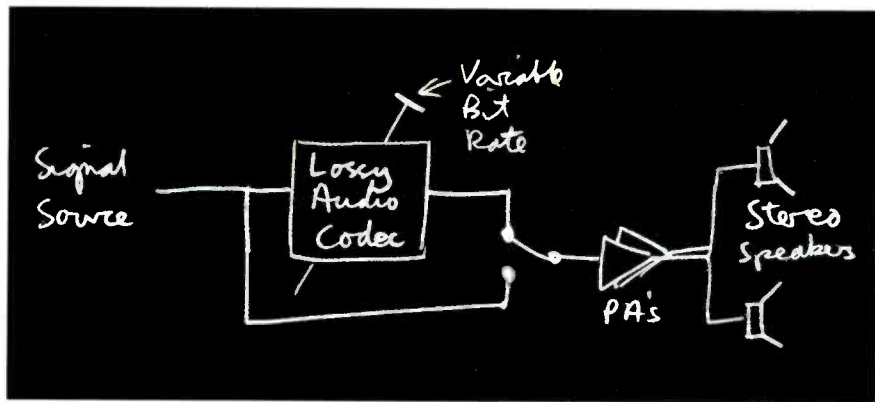


Fig.10: Is the masking in the codec or the speakers?

that the cost of most of the technology in a recording studio has fallen, making the personal studio a reality. The great exception to this is in the transducers. Loudspeakers and microphones simply don't inhabit the performance curve of microelectronics and they haven't matched the increase in performance over cost that recorders and consoles have exhibited, nor will they. Many people don't realise that in any overall budget the proportion to be spent on the transducers should today be greater than at any earlier time. The result is that too little is spent on the speakers so that meaningful assessment of the other parts of the system is impossible. Lack of accuracy in a monitoring loudspeaker system allows sub-standard work to leave undetected and disappoints the consumer who today could well have better speakers than were used in the production process.

There is an immediate parallel between the deliberate use of masking in lossy compressors and the accidental occurrence of masking in the loudspeaker. Fig.10 shows the information flow. A high quality audio source is supplied to a lossy compressor whose output is then decoded and monitored. If there is any masking going on in the sound from the monitors, who is to say where it took place?

The ear has finite information capac-

ity and this is the origin of masking. Consequently a certain amount of masking in loudspeakers and in compressors is acceptable. The question is how much?

Suppose we want to test the compressor of Fig.10 by switching it in and out of circuit. If the masking of the loudspeakers is significant, there will be no difference if the compressor is in or out of circuit and we conclude (wrongly) that the compressor is transparent. In this case an audibly flawed compressor is allowed into service because of a flawed pair of loudspeakers.

For the above reasons, the conclusions of many of the listening tests carried out on lossy audio compressors are simply invalid. The author has read descriptions of many such tests, and in almost all cases little is said about the loudspeakers used or about what steps were taken to measure their spatial accuracy. It can safely be assumed that most of them used legacy speaker technology which suffered from smear. This is simply unscientific and has led to the use of compression being more widespread than is appropriate. The common mistake was that it was thought that the speakers were testing the compressor when in fact the compressor was testing the speakers. It follows immediately that here is a practical and simple way of testing loudspeakers in areas which legacy technology has >

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< neglected. The arrangement of Fig. 10 is used. Practical audio compressors can output a variable bit rate. Starting with the highest bit rate possible, the speakers are switched between the source material and the output of the codec. The compression factor is increased until the effects noted above are heard. When the effects are just audible, the bit rate of the compressor is at the information capacity of the loudspeakers. This turns out to be a very good way of testing speakers because it can be done in situ without anechoic conditions and it gives an objective quality parameter measured in bits per second. This is not an unreasonable unit when it is considered that the information capacity is being measured.

Domestic bookshelf loudspeakers measure approximately 100kbits/sec. Legacy square box hi-fi speakers mea-

sure around 200kbits/sec, but a good pair of electrostatics will go above 500kbits/sec. Given that our channel capacity is fundamentally limited by loudspeaker technology to figures of this kind, it seems to me utterly pointless to go to higher sampling rates and word lengths when the higher information rate that results cannot get through a speaker.

It is particularly interesting that loudspeakers which show a high bit rate or information capacity on this test also score highly on the vectorscope test and tend to be more revealing of source defects.

So why does it work? Fig. 8b shows that a real sound stage consists of dominant sources and reverberation-ambience filling in the spaces. As the bit rate of a compressor falls, it saves data by omitting low-level energy which it thinks

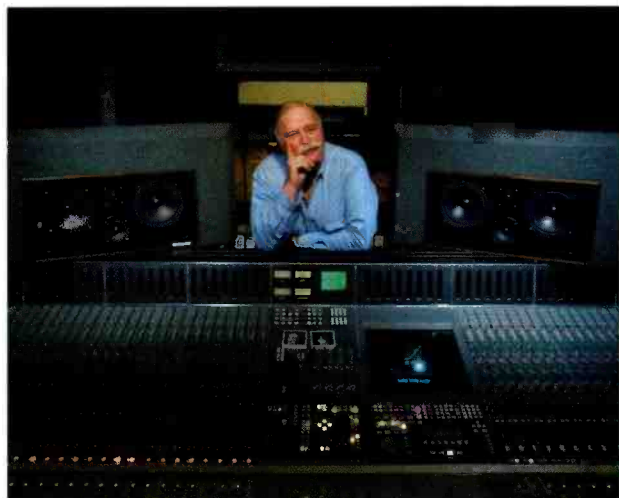
is masked. The result resembles Fig. 8a where the dominant sound sources remain but the ambience has gone. If the speakers smear the sound sources, as in Fig. 9b, the missing ambience will not be noticed. Thus the less smear a speaker suffers from, the higher the bit rate at which artefacts will be heard.

When using speakers designed to meet psychoacoustic criteria in the time-intensity trading region, there isn't a lossy audio codec that can't be plainly heard even at the highest bit rates available. I have tried MPEG, AC-3 and Mini-Disc (ATRAC) codecs and find the first two more or less level pegging but ATRAC a long way behind.

While lossy compression may be adequate to deliver postproduced audio to a consumer with mediocre loudspeakers, these results underline that it has no place in a high-quality production environment. When assessing codecs, legacy loudspeakers having poor diffraction design will conceal artefacts. When mixing for a compressed delivery system, it will be necessary to include the codec in the monitor feeds so that the results can be compensated. Where high quality stereo or surround is required, either full bit rate PCM or lossless (packing) techniques must be used. ■

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Active crossovers

Tweeters with rare earth magnets

Speakers with flowing shapes or rounded corners

Speakers that reveal how many parts were used in a multitracked vocal

Avoid:

Speakers with reflex ports, ABRs or transmission lines

Speakers with sharp corners and flat panels

Speakers with lots of narrow band drive units and steep crossovers

Speakers that make a noise when a panel is rapped with the knuckles

Speakers that won't reveal the difference between a MiniDisc and the CD of the same recording

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To Be or not To Be?

A new computer operating system can be the making or breaking of a product or system. **Martin Polon** takes a small step for a man but a giant leap for the American BeOS

IT IS A CURIOSITY that two of the three new software operating systems—Linux being the third—being developed as alternatives to Windows 98/2000 or to NT 4.0/5.0/2000, owe their gestation and emergence to the efforts of former and current Apple employees. The intellectual connection is not a small one, as Apple co-founder Steve Jobs (in the case of Next) and Jean-Louis Gassé (in the case of Be) have played their part in ensuring that all three systems are compatible with the Macintosh.

In many ways, BeOS may well be the most interesting of the three operating systems—certainly so for those who operate recording studios, postproduction houses and a broad range of specialist facilities, as well as those who are developing new processes. This is because Be's OS has been designed to take advantage of the power of both multiprocessing and multitasking while providing an especially tactile platform for digital audio, video and multimedia.

Jean-Louis Gassé founded Be in 1990. Before this, Gassé learned his craft at Exxon Office Systems, Data General and Hewlett Packard. Later he spent nearly ten years with Apple Computer, 'being there' nearly from the beginning through the gestation period of Lisa and the initial Macintosh. He was personally responsible for starting Apple's French subsidiary, after which Apple moved him to the Cupertino, California campus to direct its product development unit. In this role, as president of the Apple products division, he assumed global responsibility for all product marketing, manufacturing and perhaps most important Apple's research and development.

It is important to recognise that all three of the new and current non-Microsoft operating systems in vogue today were influenced in one way or another by ATT's original Unix system and subsequent developments, and perhaps more so by the strength of personality of the driving force behind

them. Jean-Louis Gassé in the development of Be, Steve Jobs as the mastermind of Next and the subsequent porting of it to the Macintosh (especially for OS X) and lastly Linus Torvalds as the force behind Linux (*Studio Sound*, November 1998).

In the same way that the Next developed as an operating system built around advanced computer technology hardware (and showing it's Apple Mac pedigree as well), the BeBox was the soul of the original Be Development. During its short life-span in some form or another, the BeBox pushed the envelope then defined by Macintosh and Windows computers. The 66MHz BeBox began production in October of 1995 and was manufactured until December of 1996. The 133MHz BeBox began shipping at the end of 1996, and was discontinued at the end of January, 1997. During that time frame, Be sold around 1,000 66MHz BeBoxes and a little over 800 133MHz BeBoxes. Most of these went to those interested in software development according to information supplied by Be, with the balance going to those interested in being at the leading edge of multiprocessing, audio-multimedia computing. After 30th January 1997, Be announced that it was going to get out of the business of producing the BeBox itself—continuing the development of software, but not of its dedicated hardware.

The BeBox used 603/603e Power PC chips running at 66MHz, with many upgraded to 133MHz. However, the BeBox did not run the Mac OS or Macintosh software. It used two such 603 PPC processors on the BeBox without level 2 (L2) cache. The processors were directly mounted on the motherboard. Since the system did not have to run or emulate Macintosh 68000 code, the lack of cache on the multiprocessing system was not proven a hindrance. Today, used BeBoxes are available quite reasonably, but are not necessarily appropriate platforms for audio usage despite

the advantages of the Be for studio applications. The dual 603s are very effective with audio applications and can mix up to 16 channels at 16 bits, 44kHz—limited only by the Crystal codec. But many BeBoxes still in use cannot run the latest Be operating system software, unless they are from the most recent production runs (rev 6), since the flash RAM is too small to house all of the necessary code. According to Be, the way to check a BeBox for flash RAM suitability is 'You need to open your BeBox, and look on the logic board right underneath the stencilled Be logo, between the PCI and the ISA slots. You will see a sequence of numbers that begins with 'ASSY' and ends with a '-' and then a 2-digit number. That number is your BeBox' revision level, so for example something with a '-06' at the end of the ASSY sequence is a rev 6 BeBox.'

The current, much refined BeOS operating system software will run on Intel or Power PC processors. Windows-based PCs or Mac PCs can run the BeOS, although newer Macs are not necessarily compatible since Apple has not been willing to share specifics about the G3s or their processors with Be. Be calls its software, 'A high-intensity platform for digital media'.

We are told that BeOS was designed to satisfy the higher processing and memory requirements of today's digital media on standard PC-type computer hardware, without any risk of speed slow down or having the application freeze. BeOS is designed to expand to meet the users' needs. By adding another processor, you can boost overall performance and system productivity by a margin of almost 100%. Be claims that it is the only available operating system that can take complete advantage of an installed base (on a PC) of one to as many as eight processors in a system—with no readjustment or software reconfiguration needed.

The Be OS boasts boot statistics of >



< under 20s and, using BeOS, each open application runs in its own protected memory space. Any crashes will be unique only to the unstable application. You can install the BeOS on a common desktop or notebook computer in parallel with Windows, Linux, UNIX, Mac OS, or other operating systems. By using the built-in Be boot manager at startup, you may then specify whatever operating system you want to run. Data from files created in other operating systems can be read by BeOS, since common file types and disk formats can be imported without difficulty. Be claims that BeOS will install its OS in no more than 15 minutes on any platform. BeOS comes complete with a Web browser, email client, media player, utilities, translators, integrated development environment with source-level debugger, 3D audio mixer, and other

application demos.

Commonality with other OS features and browser technologies means that there is virtually no learning curve with BeOS. Nearly 1,000 applications are available—audio, development apps, games, graphics, Internet, multimedia, networking, office productivity, utilities, video, and more. Be developers are constantly creating more applications. Be developer's conferences have been much more affordable for fledgling as well as seasoned developers than those of Microsoft or Apple. Be maintains an online archive of past and current developer's newsletters as well as high quality system documentation (at www.be.com/).

Identifying those PowerPC systems capable of running BeOS is a question that has more to do with industrial politics than with actual technology. Essen-

tially, the base for Power PC computers is BeOS Release 4.5 for PowerPC, as of 17th June 1999. BeOS does run on older Mac PPC systems except for the earliest 601 processor PPCs with NuBus connectivity. But the Be operating system will not run on any of the 'new' Mac G3 or iMac systems, for which Apple does actively support and collaborate with development of the free-ware Linux environment.

Many long-time observers of the computer business will comment that current Apple 'interim' leader Steve Jobs has not shown any love lost for Jean-Louis Gassé, either before or after Jobs' replacement at Apple by Pepsi marketer John Scully or for the later compe-

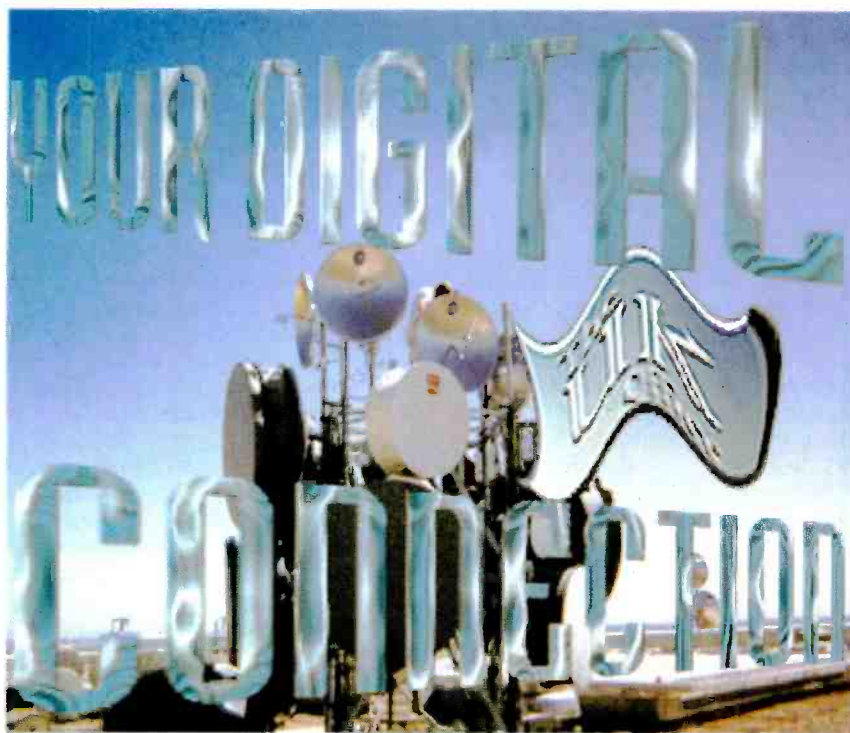
System Requirements

THE MINIMUM HARDWARE requirements for a BeOS-ready PowerPC System include 16Mb of RAM, with more RAM highly recommended, minimum 160Mb SCSI or IDE hard disk or hard disk partition (a minimum 100Mb partition on some removable storage options may be viable, but on a Zip drive this option is not recommended by Be), a SCSI or IDE CD-ROM drive, keyboard and 2-button mouse hardware compatible with the platform to be mounted with the Be. A built-in or bundled graphics circuitry or card is also required and a multisync type monitor is strongly recommended. Network connections using Ethernet or PPP (modem, serial ISDN, etc.) are again strongly recommended.

A curious addendum to all of this is that a software called SheepShaver, a MacOS run-time environment for BeOS developed by Christian Bauer and Mar'c' Hellwig, will allow users of PowerPC-based BeOS systems to run MacOS applications at native speed inside the BeOS multitasking environment. This means that both BeOS and MacOS applications can run at the same time and data can be exchanged between the two.

The future of Be is closely linked to Intel Architecture systems capable of running BeOS. By now, it must be clear that despite whatever historical connections exist linking BeOS to the Macintosh environment, the further development of BeOS today is much more dependent on the technology hosted by processors, motherboards and chip sets produced by Intel and the family of computers available in the PC environment.

All information provided here is correct for the BeOS release 4.5 for Intel Architecture, as of June 17, 1999... according to Be. The minimum hardware requirement for a BeOS-ready PC includes a compatible microprocessor such as (Intel Celeron, Intel Pentium MMX—Pro-II, II Xeon-III-III Xeon, AMD K6-K6-2-



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tion run by then Apple head Doctor Gilbert Amelio between Jobs' Next system technology and that of Gassé's Be to assume the mantle of software development for the Mac. Jobs' software approach was considered superior by Amelio and staff—Jobs returned to Apple triumphant—and the rest is Mac and Imac history.

To the question whether the BeOS will run on Apple's G3 Power Macs and IMacs, which use the Motorola-built PowerPC 750 (or G3) microprocessor chips, Be itself comments in an online Be FAQ: 'No, the BeOS is not compatible with Apple's G3 systems. We have requested from Apple the detailed technical specifications we would need to

provide support for these systems, and Apple has declined our requests.'

'This information, concerning the design of the logic board (including information about address spaces, custom logic chips, and so on), is available only from Apple. It is available only under non-disclosure, and only to 'Mac OS licensees.' The necessary information is much more detailed than the 'technical specs' information Apple puts on their net-site. Trust us, we haven't 'missed' something tucked in some corner of their site. Apple does not make this information public at all anymore, because there are no more Mac OS licensees. Without this detailed technical information, it is impossible for us to support new Power Macintosh hardware from Apple.' At any rate, the Be is currently compatible only with pre-G3 Macs and post-601 Power Macs.

Available audio software for use with the BeOS includes at least 20 variations for audio editing, well over 50 for audio playback, over 20 for MIDI playback, over 10 for MIDI sequencing, again over 10 for MP3 playback, 15 for audio recording and over 20 for miscellaneous audio functions. Some of these applications have multiple functions and may be listed in several categories but any operating system that supports over 100 different and functional applications cannot be viewed as anything other than audio friendly. Again, detailed descriptions can be found on the Be Web-site (<http://www-classic.be.com/beware/Audio.html>).

The unique nature of Be and its product has meant that this article could not have been written, without the help of information provided by the Be on their public net-site. ■

K6-III, Cyrix 686MX, 686GXm (but not the M1) and several others. In addition, there must be at least 16 megabytes of RAM, with significantly more recommended. Also necessary is an IDE or SCSI hard disk or hard disk partition sized to at least 160Mb of available space and an IDE/ATAPI or SCSI CD-ROM drive. There must be a graphics card capable of VESA graphics with a USB, PS/2, or serially connected mouse and keyboard.

Be carefully notes that 'as with other operating systems, these are the absolute minimum specifications. Also like other operating systems, getting work done on the minimum specifications is difficult. Running BeOS on such a minimal system will leave you wanting for more. Wherever possible, use more or better hardware to enhance your experience.'

'The world of Intel Architecture computers is very large and diverse. This diversity makes it difficult or impossible to list every possible system configuration which is compatible with BeOS.' A trip on the Internet to the Be Web site will yield a detailed and accurate list of Intel and Intel-related and compatible hardware options including support for multi-processing (http://www-classic.be.com/support/guides/beosreadylist_1intel.html).

The following audio cards are indicated by Be as being supported by the BeOS. SoundBlaster PCI 16/32/ 64/ 128/512, SoundBlaster Vibra PnP, SoundBlaster AWE32-AWE64-AWE64 Gold, E-mu APS, Ensoniq AudioPCI, I/O Magic MagicSound, 16-Magic-Sound PCI, NewClear PCI 128, Turtle Beach Daytona and the Yamaha Waveforce 192XG

The following audio chip sets, used for built-in audio on many computer motherboards, are also supported by the BeOS. Crystal 4235-4236-4237 chip sets, ES 137x chip set, ESS 1938 (Solo-1) chip set, OPTi931 chip set, S3 SonicVibes chip set and the Yamaha YMF715-YMF724 chip sets.

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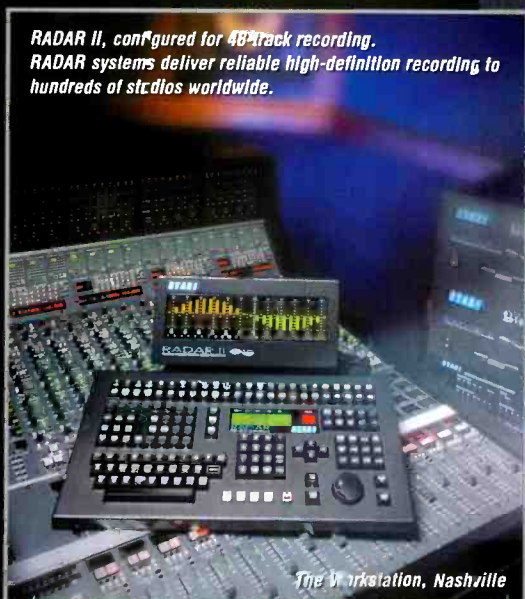
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Home to the Swedish audio phenomenon, Stockholm has much to commend it as **Zenon Schoepe** discovers

SWEDEN ENJOYS an unprecedented position in the world music market as an originator of groups that is way in excess of its international stature. It's also has a spectacularly high hit rate for a thinly spread population that amounts to the equivalent of a handful of good sized European cities.

Part of this has to do with the Swedes' proven abilities as exporters. It remains incongruous that a nation this size should have impacted on the world motor trade with the SAAB and Volvo brands, or that it should have exported its interior design and furnishing tastes into the home style magazines of the world, or that ABBA should have emerged from the Eurovision Song Contest of all places to make such a difference and open the flood gates for a steady stream of English singing and supremely transferable popular music.

It's clear that what the Swedes do they tend to do well and longevity is built in. Big country, small population and with a proportionally tiny audio fraternity it is perhaps inevitable that certain names, brands and themes crop up repeatedly. With audio activity epicentred on the Stockholm capital there is much to recommend it and many show-case facilities.

Located centrally in the capital, the Stockholm City Theatre is typical of the sort of sophisticated Government supported cultural people's entertainment palace that is so representative of cities throughout the Scandinavian region. The landmark building has seven stages none of which are particularly enormous, ranging from the biggest seating around 900 right down to cafe style stages of 150.

It's history is interesting having been built in 1970, a date that happily coincided with a period of Governmental reform in which the two original chambers were combined into one. As the old Parliament buildings were being renovated the seat of power was housed

in the theatre for some ten years. With decisions still pending on whether to give the building over to the City Theatre the site played host to a United Nations Peace conference and a Security conference among many others.

Some real theatrical activity had been established at the venue on a low key but the real thespian takeover wasn't completed until the middle of the 1980s.

All workshops are supporting theatre services are located in the building giving a degree of self sufficiency in the middle of a busy city that would probably be envied by other countries. The requirement to commit space for studio areas to generate the music, sound effects and sound design for the productions had been identified from the onset with sound engineers setting up shop in mildly converted and largely inadequate office areas and enduring this until the creation of two dedicated studios some two years ago. The Theatre's first DAW was a Studer Dyaxis, and a full-blown MultiDesk version at that, but it moved on to the world's first two Fairlight FAMEs with the new facilities. Both systems have 16-fader work-surfaces and operate in rooms that are identical but for one running with 24 channels of Neve mic preamps while the other is equipped with only four channels of the same. The FAMEs are said to fit in well with the quick reconfigurations required by the different operators working on different projects. Room design is by Sweden's leading and most highly regarded acoustician Ingemar Ohlsson. Genelec monitoring was unanimously decided on by the theatre's engineers who had been using 1034s previously while working in the converted office areas where they were deemed a little too powerful for the environment. The control rooms are built around 1038s which the team are extremely pleased with and there is still palpable delight among the engineers

that they have properly designed rooms built specifically for sound to work in. One of the smartest and, it has to be said, very Scandinavian aspects of the FAMEs is that they are mounted on hydraulics that allow the worksurface to be raised or dropped and allowing the engineer to stand and work if he wants to. It was an in-house idea in response to engineers working long hours right up to a premiere which permits them to move around and remain more alert than the alternative of slow-death in-chair vegetation. The two rooms have small associated recording areas but also have access to a large rehearsal room nearby when necessary.

The theatre has historically had a strong Genelec connection as the main theatre uses the company's monitors for its PA and surround effects system. They use 1035s and 1034s for the front system and seeing these monsters modified with rigging brackets perched up high above the stage is a sight to behold. The engineers maintain that they are extraordinarily clean, the dispersion is well suited to the area and they have easily enough power for the job being asked of them. In fact they argue that in a critical and controlled listening environment like a theatre they make a lot of sense. Even more interesting is a massive batch of one-off custom Genelecs used for the surround system. Not identified by any specific model type or number they are referred to in-house as 'birdhouse speakers'. They are 2-way and unusually passive and were designed specifically for the job by Lars-Olof Jantlod, now sales and marketing director for Genelec, but who at the time of the installation was Swedish distributor for the brand. An incredible 50 are installed around the main theatre area driven by QSC amps. Three Lexicon LARES systems are strung together to drive this exceptionally sophisticated multichannel surround playback system from a pool of ten >



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< 480s at the theatre. The FOH desk is a TAC SR6000 with a Yamaha O2R sidetar complete with surround joystick options.

Regardless of what the Record company policies were like in Sweden in the past, someone somewhere has changed their outlook and is now discovering and creating artists with a repeat hit rate and appeal that is otherwise unknown outside of the UK and US. And if ever a studios name reflected its character then it does with Little Big Room. Located in the Stockholm suburbs an easy 15-minute drive from the city centre, the studio, designed again by Ingemar Ohlsson, opened three years ago with an AMS Neve VR48 and serves pop and rock artists for the likes of EMI, Warner, and PolyGram. Music for film is also produced here and the area in front of the VR is dominated by a beautiful flat screen monitor. Multitracks are an amazing ATR124, and 16-track MM1100 and MM1200 plus a Mitsubishi X880 with Apogee filters and a 48 I-O Pro Tools. All are synchronised via Timeline Lynx. Reliability on the old analogue giants is not a problem 'providing you use them,' says studio manager Mats Lindfors. 'If you leave them standing for three months then they will break down. You've got to keep the parts moving and the power on.'

The racks are stuffed with vintage and modern classics, the basement area is full of vintage guitar amps and the mic collection extends to old rare ribbons. There's daylight throughout and it goes out for less than £400 per day.

'There really aren't that many options for studios in Stockholm but because I'm a little bit crazy and had the funds this place started off as an idea for a home studio outside of my country house,' explains owner Lars Enochson. 'I came to Mats to ask advice, he had a room here in this building and then we lost control. Studios here for financial reasons haven't been able to update gear so they're sitting on old equipment and it's not attractive vintage gear it's just old,' he continues. 'If you want to work there you end up having to hire in a lot of the outboard gear. We charge less per day than they do but I can't remember the last time we had to hire anything in.'

At the time of my visit the team were entertaining the thought of installing a reconditioned and updated Helios console in a new room being built on the floor above the Neve. Plans have since changed and they've now opted for a Euphonix CS3000. The new control room has a good sized live area associated with it and all areas are tie lined together. Monitoring is 1033s in the >



Mastering

IN LINE WITH most specialist mastering operations, one of Stockholm's premier mastering houses has forsaken the trappings of the studio complex and chosen instead to centre its activities around an altogether more informal domestic environment. The father and son team of Rune and Claes Persson at CRP have created a relaxed mastering space in the basement of their home in the Stockholm suburbs.

Industry veteran Rune Persson built Metronome, one of the city's oldest facilities, and later while freelance was first to get in to CD mastering in the country. They told me I was crazy and that it would never catch on and for some time it was quite hard,' he remembers, 'but then everything changed very quickly but because I had the only system in Sweden they all came to me and hired the equipment.'

His son Claes masters but also records and mixes on a regular basis and works for most of the Swedish labels. The workstation is Sonic Solutions and is accompanied by a fine selection of analogue and digital outboard and Rune prides himself on being able to playback every format from wire onwards. They opened the room two years ago and were unsure about its permanence but haven't looked back since. 'We designed it together using our ears and our experience and the Genelec people have been along and measured it and were quite surprised that it only needed minor tuning,' says Claes.



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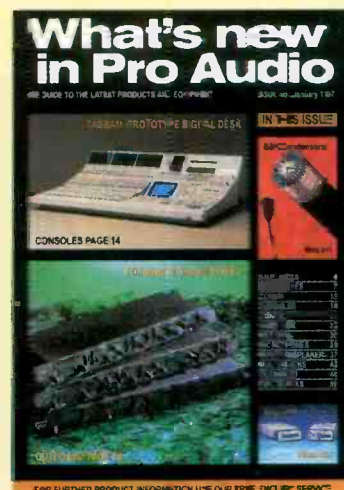
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5.1 SURROUND MONITORING



Pangljud

< Neve room and 1032s in the new one. 'One of the things that is great about this studio is the Genelecs because we wouldn't be taken seriously without them,' adds Enochson. 'We have never gone out and PRed ourselves by approaching the record companies,' he claims. 'That might sound silly but we were keen to build the business up gradually hand to mouth. It's meant that the old Scandinavian stars come here and the new ones that can afford it. Record companies are clearly putting more into the mixing stage of productions again and we've seen a move away from kitchen productions.'

'You have to remember that Sweden is a small country with limited resources and if you can offer anything on top for the same money you remove their need to go elsewhere. Many of the big export Swedish acts record around the world but they often do at least part of the production in Sweden. They have the money and could work anywhere but Swedes are a bit weird like that and they feel comfortable, secure and at home when they work here. There's also the consideration that many of them want to work with the same people that they worked with in the past because it gives them continuity. 'We get a lot of Danish and Norwegian artists here but the question that we still have to resolve is whether anybody would come from England to record here,' he continues. 'I don't have a good answer to that. I don't think our £500 relative discount is going to make that difference for a big act production. But we do stand a very good chance of catching most of the business from Scandinavia because our studio is superior.'

Lindfors says that with the Neve room busy there will be obvious scope for expansion into other areas with the new room. 'The Neve room covers ours costs but we could look into the sound for video market a little more seriously because it is opening up,' he states. 'The new studio will be the one that will bring the profit in for us.'

Lindfors comments are substantiated by a general feeling that sound for picture is under served in Stockholm. Pangljud (Swedish for smashing sound) is Stockholm's largest audio post company which is busy increasing its number of rooms to seven to keep up with demand following a move to its new premises. Four rooms were operational at the time of my visit—one with multichannel mon-

itoring and three smaller suites. It's adding another large multichannel mix room with a Foley area and three additional small suites with surround monitoring.

The facility has standardised completely on Pro Tools Mix+ DAWs with ProControls for the big rooms and HUI controllers in the smaller suites. The facility was started 10 years ago and switched to Digidesign in 1993 from analogue to handle cartoon dubbing and corporate work. TV work was minimal then in comparison to what the facility does now—TV channels have increased from two to eight in the last ten years—and there has been a commensurate increase with the advent of commercial radio and the rolling potential of CD-ROM and multimedia work. Throughput is divided equally between dubbing, TV programmes and mixing multimedia, film and TV commercials. The new rooms will boost the potential for film work and the facility handles projects from other Scandinavian countries.

The rooms are built with an uncanny similarity as operators move between them and standardisation is desirable. Genelec 1031 are found throughout with twin subwoofers in the mix room.

It employs seven full time engineers and nine freelancers and offers supplementary facilities such as Digital Betacam, a Voice Agency, and 50,000 sound effects library.

The expansion is a remarkable one as MD and owner Hans-Henrik Engstrom explains. 'Sweden has gone from practically no requirement for quality sound production to an enormous need in a very short period of time. Stockholm doesn't really have a concentration of post activity in one area, it's all spread out but because the city is not that big getting around is not a problem. Our competitors do just dubbing or just TV commercials or just TV programmes and we are unusual in covering all these areas.'

'The post industry in Sweden is mostly built on freelancers and it is possible to create a business based on them which we have done and it's also the reason why we can do so many different things,' he says. 'In Sweden the requirement for quality audio postproduction is greater than the pool of expertise that can deliver it.'

While the expertise pool for feature film mixing does exist in Sweden, the film industry at the time of my visit was in state of freeze and looking for a solution

to the particular way in which national film is supported by the Government in the country. 'You need to have Government support to make a Swedish film as it is essential given the size of the population,' explains Lars Lundberg of CinePost, the leading sound-for-film company in Sweden. 'This process is regulated between the Government and the film industry and that agreement ceased a year ago and is late for renewal and everyone is waiting for the outcome. The producers are scared to start new films because of the uncertainty and that has impacted on the whole film industry in the country. 'We do around 20 to 25 Swedish film features a year so you can imagine the implications for us. We have tried to take up the slack with TV work but there is only the state television that produces films, the other channels buy from abroad, and the State channels try to do the work in house.'

CinePost was started in 1979 by two of the most well known sound engineers in the country, Berndt Frithiof and Kjell Westman. Frithiof is still one of the company owners and the most experienced dubbing mixer in Scandinavia with several hundred feature films and television series under his belt. The facility moved in 1996 to a 19th century brewery building in the very middle of Stockholm overlooking lake Malaren and the city hall across the water. The studios are located in the part of the brewery in which ice used to be kept and has thus inherited walls that are incredibly thick.

It installed a Harrison Series Twelve in its mixing stage two years ago, claimed to be largest mixing console in Scandinavia. The machine room is filled with RCA perms and DA-88s. The projectors are 16mm and 35mm as well as a big video projector connected to Beta SP or U-matic. The stage can handle everything from mono to 6-track Dolby

Digital or DTS. This is supplemented by two editing rooms with Fairlight MFX3Plus and to fit in with the majority of film freelancers in the country who have their own systems it also has three empty suites. The film industry in Sweden is almost entirely based on freelance labour and CinePost is well connected to all sound-crew contacts and increasingly takes over complete production duties on films.

'The problem is that even if the clearance and decision to make, say, ten films was announced tomorrow it would still be some time before we would see the work but there will be no production decisions made until this matter is cleared up,' concludes Lundberg. ■

CONTACT

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WEISS

Setting a standard in the region's audio standards, Hong Kong's postproduction industry is desperate for recognition. **Caroline Moss** gets the big picture

HONG KONG'S FILM INDUSTRY came into being in 1913 with *Chuang Tze Tests His Wife*, the first movie to be made on the island. Resources were reputedly so limited that director Li Beihai was obliged to play the female lead himself. Since these humble beginnings the market has grown and evolved steadily to become the third largest in the world after India and Hollywood, with two of its biggest names, actor Jackie Chan and director John Woo, attaining international acclaim in their respective Hollywood outings.

Despite the much-chronicled downturn in Asia's economy, the demand for high-quality soundtracks to accompany Hong Kong's film output has not flagged. Many of the big budget films are increasingly being mixed in Dolby Stereo and, according to Kinson Tsang—managing director of Media Business Services (MBS) which has a main postproduction studio on Hong Kong Island as well as two music recording studios in Kowloon—around 70% of them pass through his facilities.

'It's getting much more common to mix in Dolby Stereo, and we're also moving into Dolby Digital,' he explains. 'A lot of the film buyers, including those from Singapore and Malaysia, now have a preference for at least a stereo soundtrack, so this is the direction we've been increasingly heading in.'

In common with film markets across Asia and other parts of the world, this trend has only become apparent in the last couple of years. 'I started the studio in 1992, and our first stereo movie was in 1994,' Tsang adds.

'At first we were mixing maybe only three films a year in stereo, but now it's pretty much all the time. For example, from late April to June we worked on two digital soundtracks, two stereos and one or two monos. Even when the economy turned really bad, people still wanted this. They are looking for quality now.'

Spurring on this demand for quality is the advanced level of audio equipment now available on the consumer market, which has raised the public's expectations. 'People had no real alternative until recently, but if you look at home equipment these days, there are surround sound systems available that can easily rival the sound in any cinema,' Tsang reasons. 'The public is thinking, "Why should I go to the cinema if it's not that much of an experience?'. Now, especially with the advent

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of DVD which is also raising the expectations of better sound, cinema needs to be improved in a big way in order to provide that viewing experience.'

Although studios such as MBS are gearing up to provide the latest in cinema sound, Tsang is frustrated by his belief that cinemas themselves are lagging behind the studios. 'Many of these cinemas don't align their sound systems properly, which means that the soundtrack doesn't get heard to its best advantage,' he bemoans.

However, the wheels of technology are turning and MBS is now embarked on an irreversible quest for international audio standards. Coupled with technology upgrades is the growing awareness on behalf of the producers and directors of the process of making a film in Dolby Stereo or Digital. And Tsang is working closely with the main players to ensure they achieve the results they want.

Tsang's own story began in Canada where he became a sound engineer after leaving school, before returning to Hong Kong to join the state's leading broadcaster HKTVB as a trainee engineer. He stayed at the network until 1989, and his final project was to build a TV city incorporating nine TV Studios, three main variety studios and associated facilities.

'After that I decided to start my own business instead of continuing with a formulaic TV career,' he remembers. 'So I started the studio back in 1990. When we first began we recorded mainly music. We worked with a lot of Japanese artists who came over to record live albums. But then the market changed, nobody was hiring live musicians very much, and everybody began playing around with keyboards and computers, sampling everything. I started to think they didn't really need me, so I decided to cross over into film, because I'd been getting a lot of requests to help out on projects. I liked the challenge

that film presented, there are a lot more elements in terms of mixing, and it's a tougher environment altogether.'

His choice of console for music recording—a Neve VRP 60—indicated that a move into film hadn't been far from his mind. 'I've always been a Neve man since I learned on one in Montreal, and I've always preferred the sound,' he says. 'I always thought mixing in surround would be the future, so when I started looking at consoles I decided to get a postproduction version. All the joysticks, the surround channels and the matrix were incorporated when we bought it five years ago.'

The console, which is now installed at the MBS postproduction studio at Clearwater Bay, Hong Kong Island, was recently sent back to AMS Neve's UK factory for a thorough overhaul and upgrade, with modules being replaced. The desk has Flying Faders automation, and a little customisation of its monitoring has equipped it with 5.1 capability. And although Tsang acknowledges there's still room for future upgrades to handle 96kHz, 24-bit work for DVD releases, he's more than happy with its current capacity for film mastering applications.

Over in Kwun Tong on Kowloon, the other two facilities specialise in music mixing and dialogue respectively, and both are installed with Yamaha 02R digital consoles. 'We chose the 02Rs for the time being, because we are not sure what direction the industry will move in,' says Tsang, who points out that compatibility and flexibility are key to his operations; as property on Hong Kong island in particular is 'like gold', the facilities have to be capable of handling different types of projects. All three studios are also installed with Avid digital audio workstations, 'so all the work can be transported, which makes sense because we're not in the same complex, so we use removable drives so we can take it across town. We started with >

125

< digital workstations back in 1995. At that time everybody was being really vague about working on DAWs, thinking that DAT was the direction, now everybody's using them.'

The postproduction studio also has two Saturn 624 24-track analogue multitracks which these days tend to sit in the corner. However Tsang is a big fan of valve equipment and a frequent user of TL Audio's Classic mic pre-amplifier. 'It's really useful to warm things up, because our Chinese language is really pulsey and staccato, and tube equipment is needed to smooth things out a bit.'

Tsang has been spearheading something of a revolution in Hong Kong's soundtrack market where location

recording is concerned.

'People always thought in mono days that location sound was the king, but the standards are really bad around here,' he attests. 'It's not the recordists' fault, it's the tight production schedule, and the environment is usually so noisy.' Inspired by certain films coming out of America, where much of the location

sound and dialogue was dubbed during postproduction, Tsang has responded to the challenge. 'The picture, Seven, had a lot of its lines and ambient sounds dubbed, and

that's the way it's going,' he states. 'Since the invention of digital people have begun to manipulate the ambience a lot more, and it's playing an increasingly important part. You can use really strong

ambient sound to create a mood, like they did with the scene in Seven when it was raining outside. It just makes sense, because if the location recording sounds really bad, with lots of background noise, what are you going to do about it?'

Automatic dialogue replacement is also becoming increasingly common. 'For example with this picture we're working on now, a Dolby SR production called Tempting Heart, the director really took the initiative, dubbing a lot of bad lines, so much of it is being replaced. And the artists have now become really practised at ADR; they recognise it's for their own good. One of our biggest actors, Chow Yun Fat, always insists on overdubbing his lines, and that makes a statement. And there's more time to work these days. There was a time when the cast would have nine or 10 productions happening at the same time, so there was no time to go back and do lines over again.' However despite the ongoing technical improvements, Hong Kong's film industry has been suffering of late, with the amount of films produced annually dropping from 164 in 1994 to just 94 in 1997. The recession is only part of the problem; another factor is the widespread availability of pirated VCDs, which means that films are available for less than a third of the price of a cinema ticket, and can often be obtained the day after the film's official premiere. But it is Asia's financial slump which has taken the heaviest toll, according to Tsang. 'If you look at the economy, it's a wonder that we've survived. Nobody's managed to expand or upgrade, everyone's stayed where they are. But the world goes on, and when everything starts moving, you have to go with it or get left behind. Things are now picking up a little bit but people are scared to invest.' Tsang foresees that the main factor which will turn around Hong Kong's film industry is the opening up of the world's biggest market—China. 'We're talking about a market which is easily on the scale of Hollywood,' he says. 'The reason why Hollywood is so huge is that it's got all its export markets as well as the domestic market—which is big enough. If we can start exporting our films to China then this will turn the industry around. In China today there are still a lot of political worries, but on the exhibition side it's become much easier. The censors will look at the picture, and if they think there are no negative political implications, they'll go with it.'

'Now that the Asian economy is beginning to show the first green shoots of recovery, with Hong Kong leading the way out of recession, it is to be hoped that the worst is over for the beleaguered film industry. One can almost guarantee that having weathered the worst of it, MBS will be heading up the revival as it happens. ■

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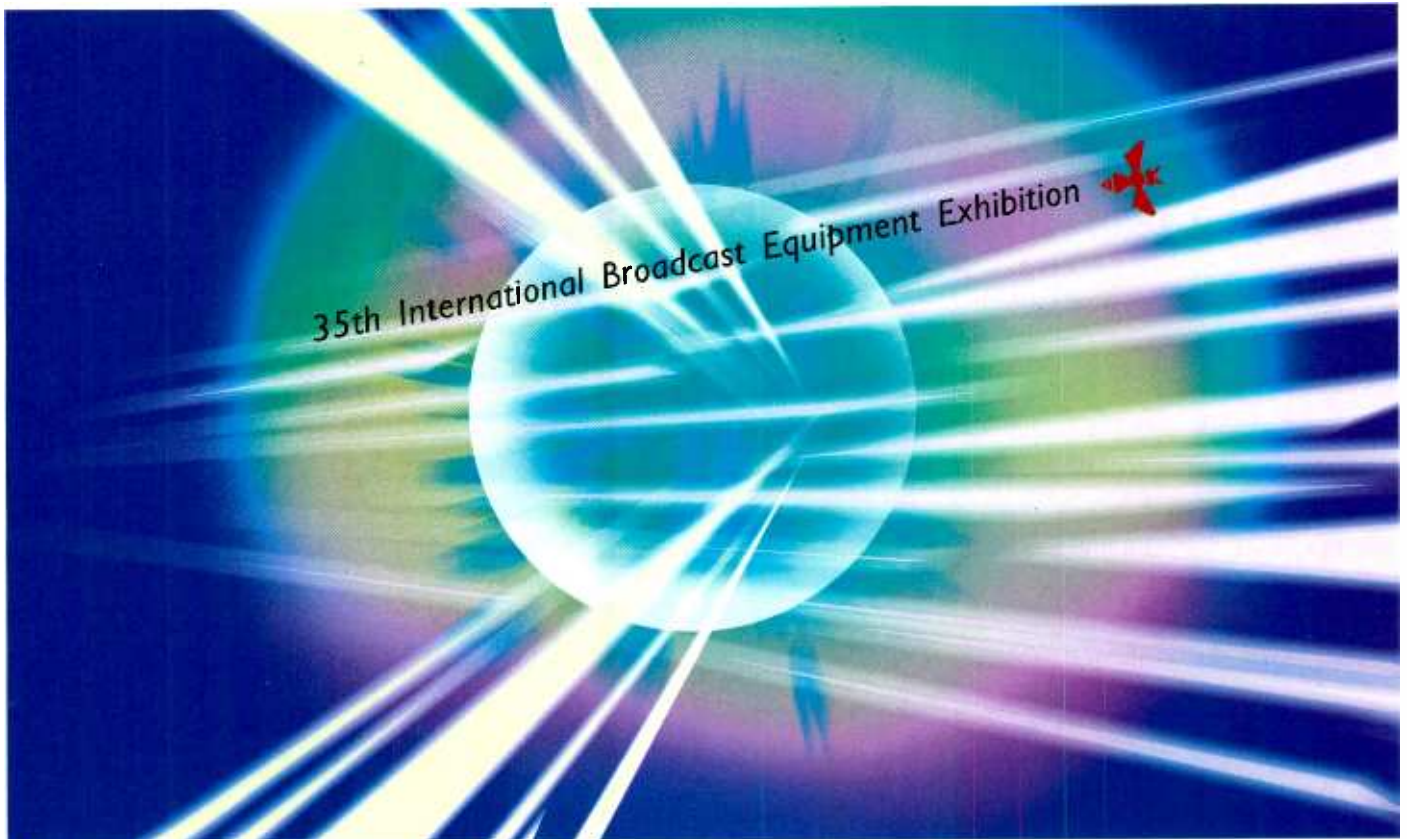
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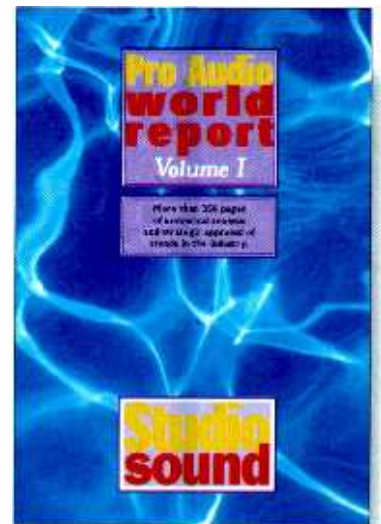
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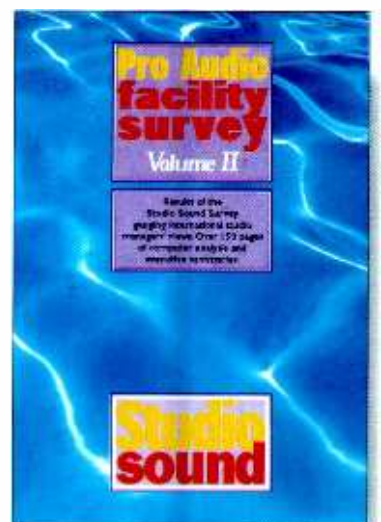


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US: Hanging on to your hit

When the studio business takes its lead from musical styles it can expect to be treated as another fashion accessory writes **Dan Daley**

MAKE ABSOLUTE statements neither often nor lightly, but I'm convinced that the next wave in the US is going to come crashing over the shores of Miami, and while the water may be only as deep as it was over Seattle, Minneapolis and Nashville in past years, it will be just as wet. South Beach, the raucous strip of Art Deco ocean front that has acted as the core of Miami's renaissance, is attracting a new generation of recording studios, most of which, like the recently opened DigiNote, are the archetype for the next iteration of facilities—hard-disk-based studios with tracking rooms, but no conventional consoles, only controllers and a variety of A-D converters and plug-in processors.

We have seen this crescendo build before, most recently in Nashville. And that brings to mind a useful comparison in Ricky Martin and Billy Ray Cyrus—twin sons of different mothers. (Apologies to Dan Fogelberg and Tim Weisberg.)

Consider this: In 1992, Billy Ray Cyrus had a big hit with a novelty tune called 'Achy Breaky Heart' that brought with it a dance craze and which, more importantly, was a watershed event in crossing country music over to mainstream charts. In 1999,

Ricky Martin, late of Menudo, had a big hit with 'Livin' La Vida Loca' a novelty tune that brought with it a dance craze and which, more importantly, was a watershed event in... You get the idea. These records were pivotal events in the ascending influence of a particular genre of music, once considered marginal, moving into and significantly influencing mainstream music for a time. And that puts Miami today where Nashville was in 1992.

First, know that nothing lasts forever, and in *fin de siecle* America, it lives ever more briefly. Popular taste is fleeting and attention spans are short. Nashville thought its new-found cultural legitimacy would go on and on, fuelled by media like cover pieces in the LA Times that made Nashville out to be the next mecca of music. I recall that issue: four cute blondes cruising in a convertible across the Shelby Street Bridge was the epitome of the American Dream. Seven years hence, the Shelby Street Bridge has been condemned, literally. Nashville cheered when Peter Frampton and Michael McDonald moved to town; it was only in retrospect that people realised that their best years were no longer ahead of them. And in that time, Nashville's studio infra-

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structure underwent a radical and massive renovation and expansion, with pricey new facilities opening up on a regular basis. Several of those are now defunct, and a wave of consolidation has swept through the studio community, already in often dire straits due to the inevitable downward rate pressures that such proximity entails.

Miami faces a similar scenario now. Its studio community is expanding rapidly on all fronts, conventional and private. Like in Nashville, most major record company operations now have autonomous divisions there to exploit the new fascination with Latino music. (They have to be autonomous; few of the MBAs that now run the music business speak Spanish, even fewer are able to communicate in the South.) And big studios are already establishing beach-heads in Miami, such as the purchase in

UK: Comms wars

With ADSL about to become a viable alternative to ISDN and the world watching the British try to implement it, the time is right for a little cooperation writes **Barry Fox**

ADSL COULD FINALLY knock some economic sense into those phone companies that lease ISDN lines, and the manufacturers selling ISDN audio codecs. I currently pay BT well over a £100 a quarter, just to rent an ISDN line. Although the same line could, in theory, support all my analogue phone numbers, they are in different 'clusters' at the exchange so my speech line cannot be switched. If I changed to another phone company, BT would be obliged to transfer the number. But other phone companies do not offer ISDN.

My ISDN account has been handled by BT's Business Division, while my analogue services are handled by Residential. The two divisions compete, and have no access to each other's computers. It's a nightmare.

The price of ISDN codecs remains a joke. In Europe there are two standards, G722 and apt-X. The BBC has chosen G722, but all the commercial stations have opted for apt-X. A dual-standard codec costs at least £2500. The codecs work at 64kilobits/second for FM quality mono. Although modern PC modems can receive data at 56kbit/s, the send rate is stuck at 33.6kbit/s. These rates only hold up if the lines are clean and they are never good enough for

studio speech quality.

North American phone companies have already lost interest in ISDN, and are promoting ADSL, the Asymmetric Digital Subscriber Line or Loop. Whereas ISDN works with on-off voltage pulses, which sit above the 4kHz analogue band used for Plain Old Telephony Services, ADSL uses discrete multi-tone modulation of several hundred narrow carriers (typically 256) which range up to 10MHz. Each subscriber needs a modem in the home and another at the telephone exchange dedicated to their line. But data rates on ordinary twisted pair lines are phenomenal.

A standard set by the International Telecommunications Union (G.992.1) provides downstream data at up to 8Mbit/s, and an upstream return path of up to 800kbit/s, depending on how far the subscriber is from the exchange. In practice the downstream rate is limited to around 2Mbit/s. The slower, asymmetric, return path is adequate for data transmission, still pictures or low-quality video.

Variants of ADSL, usually known as Lite (ITU G.992.2), cut costs by using simpler circuitry and no HF-LF splitter to separate the POTS and DSL signals. This reduces downstream data rates to between

DSL technology was developed for VHS-quality video on demand, but is ideal for the Internet. In the US, where Lite Internet access at 1.5Mbit/s is on offer in major cities for \$50 a month, Compaq builds DSL modems into its top-end PCs in the US

750kbit/s - 1.5Mbit/s, and return rates of 128kbit/s. Future systems, high and very high data rate DSL, will use frequencies up to 300MHz to give data rates up to 50Mbit/s.

DSL technology was developed for VHS-quality video on demand, but is ideal for the Internet. In the US, where Lite Internet access at 1.5Mbit/s is on offer in major cities such as New York and Washington for \$50 a month, Compaq builds DSL modems into its top-end PCs in the US. Texas Instruments has now announced a Lite modem chip for under \$10.

The ITU standards leave services free to

January of Criteria Recording by New York's The Hit Factory, just as LA's Ocean Way opened an operation in Nashville.

Given the transient nature of such boom and bust cycles, what should Miami do? The only real advice is to be aware of it. Know that America's love affair with Latino music will fade. (There's already a growing fan base for klezmer music in New York. Farfetched, but you never know.) Make sure that any business and- or technology moves are made not based on the glitzy yet ephemeral euphoria of the moment, but on what's real in Miami. Build a business for the long term, establishing relationships with those who come to Miami (and the influx has already begun) for the long haul, not—as Southerners in Nashville would call them—the carpetbaggers of the music industry, who will flit off to the Next Big Thing in two years. Base capital outlays on numbers you'd see in the worst of times, not the best. Most new studios won't be able to compete with The Hit Factory on a dollar-for-dollar basis; don't fool yourself into believing you can. You're better off investing in a permanent parking spot on Collins Avenue. Learn Spanish, at least conversationally; not only will you deepen your personal relationships in the Latino music business, but you'll be better prepared for when the boom is over. And learn to like mojitos, the Cuban martini. You'll be drinking a lot of those in Miami before this is over.

juggle frequencies and data capacities to suit the length of copper wire. The UK's telecoms watchdog OfTel wants to let BT's competitors use BT's lines, with their preferred flavour of DSL. BT and OfTel agree that this risks crosstalk interference between mismatched services as they run close together in underground ducts. BT's answer is to control the technology. OfTel prefers to work with the Radiocommunications Agency on a Spectral Management Plan which matches competing systems.

OfTel thinks it can do this in time for BT's competitors to launch in July 2001. BT believes it will take longer and is getting in early by spending £5bn on upgrading its network. BT has now contracted Fujitsu and Alcatel to equip 400 exchanges, serving six million homes, by Spring 2000.

OfTel believes the US government was wrong to create free competition in 1996, without a DSL spectrum management plan. As unregulated services proliferate they will start interfering and corrupting data.

'You can't have a complete free for all,' says OfTel's Director of Technology, Peter Walker. 'That is why the rest of the world is watching and waiting to see what happens in the UK.'

Wouldn't it be nice if, while OfTel sorts out the DSL spectrum, the audio industry worked to recommend a single standard for studio quality sound by DSL, to avoid a rerun of the G722 vs apt-X nonsense. Yes, it would be nice—but highly unlikely.

Dumber and dumber

It's bitter out, writes **Kevin Hilton**, bitter! But who wants to stay home and watch TV these days?

TELEVISION is a relatively large part of modern life. Even if a person does not watch that much TV, they are still bombarded by its influence. Newspapers, at least in the UK, carry a large proportion of stories about so-called TV personalities and their love lives, careers or their deeply profound thoughts. In among this, there will be reports about the BBC, either another politician accusing its journalists of being aggressive or biased or, as in recent months, the news has been about its financial and philosophical future.

This may sound like the build-up to a parochial column, but what is happening to the BBC must be of interest to other public service broadcasters, many of which modelled themselves on the BBC in the first place. Those famous initials, as you know, stand for the British Broadcasting Corporation—but, at the moment, it seems that they stand for the Barely Broadcasting Corporation. As discussed last month, the BBC has lost many prestige sporting events to its satellite and terrestrial rivals in the commercial sector.

A further blow came when ITV Sport lured away the presenter who has come to personify BBC coverage over the years. Desmond Lynam leaves the Corporation after 30 years, although he has played down the money (a £500,000 4-year contract) and the decline in the BBC's sport portfolio, saying instead that he needed a new challenge.

The director-general in waiting, Greg Dyke, has vowed to reverse such set-backs and, in particular, to win back some of the prestige sports events. The build-up to the Dyke appointment was covered heavily in the UK and arguments continue as to his suitability. Like the present incumbent, Sir John Birt, Dyke comes from the commercial sector, where he gained a reputation as a great populist. However, nobody can question his credentials as a journalist and a broadcast executive; he has already made it clear that he wants to do away with the focus groups and management-speak that personifies 'Birtism'.

Dyke has also made a commitment to concentrate on programme making and the values on which the BBC is based. These come from the first director-general, Lord Reith, who believed that radio and television should educate, inform and entertain. These intentions were initially lost amid the furore concerning Dyke's political affiliations; the Conservative opposition took exception to revelations that the future head of the BBC had donated £55,000 to the Labour (currently in government office), despite Dyke's statement that he would be impartial.

The new D-G's first innovation will be the creation of a new channel, BBC3, which will aimed at young families. This

heads a £100 million investment that will include a new digital children's channel, more money for the BBC Knowledge and interactive learning programmes. Its implementation depends on the government agreeing to a £2-a-month supplement to the licence fee for viewers of the Beeb's digital services.

This is central to a report prepared by economist Gavyn Davies, which further proposes that BBC Worldwide and BBC Resources should be privatised and that advertising and sponsorship should not be introduced on the Corporation's main services. It also recommends that there should be more government scrutiny of financial records. John Birt, who had asked for an extra £650 million to fund new digital channels, agreed with some sections of the report, but dismissed the licence fee increase, the recommendation for greater outside scrutiny and the call to privatise.

Birt also took exception to Davies' contention that the BBC has 'dumbed down' in a bid to win ratings battles. However, under Birt, the BBC has pioneered the docu-soap, a genre of programme that has disproved humourist Alan Coren's comment that if people were more interesting than television, we would have a person standing in the corner of our living rooms. Now we have lots of uninteresting people on the TV set in the corner of our living rooms.

The ITV companies are to campaign against any increase in the licence fee. A spokesperson for one company said, 'The proposal goes totally counter to government policy, which is to encourage people to go to digital.' BSkyB has been even more forthright. Newly appointed chief executive Tony Ball said, 'BBC News 24 competes with Sky News and, according to the most recent figures, Sky is four times as popular. People should not be forced to pay for something they don't value.'

BBC News 24, which is only available on cable, digital terrestrial and in the early hours on analogue, is a source of argument within the BBC itself. BBC war correspondent turned politician Martin Bell has said it is madness to have a news service that is only available to a small number of people. Insiders think that new programming could be funded if the service was terminated.

Greg Dyke says he's committed to the old principles, but will bring a commercial edge with him. What is important is that quality programming is well funded and that news and current affairs remain independent. The commercial channels are what they are partly because of what the BBC was; broadcasting in general needs balance and that can only remain by public service broadcasters sticking to their values.

Power handling

Oft quoted but eternally misleading, loudspeaker power handling figures promise distortion and disillusion. **John Watkinson** dispels a loudspeaker myth

IT IS UNDERSTOOD that direct-radiating moving-coil loudspeakers are doomed to be forever inefficient. In any inefficient device, the wasted power almost always shows up as heat and the loudspeaker is no exception, with the energy loss appearing initially in the coil. Most manufacturers rate their loudspeakers by the amount of power, measured in Watts, which they can handle without sustaining damage. This is known as the 'power-handling' figure and it is absolutely meaningless.

The power-handling figure is a physical survival figure, not a reproduction-without-distortion figure. Consequently at full rated handling power the loudspeaker output will invariably be distorted beyond recognition. There is some sense in this because it means that the speaker will never be damaged by any smaller signal it can reproduce without distortion, but it gives the user no idea how much smaller that signal needs to be, or what acoustic power can be delivered by that smaller signal.

The power-handling figure becomes more meaningless the more closely it is examined. Firstly the listener is only interested in the quantity and quality of the actual sound output. In order to estimate the sound output potential, the efficiency figure will need to be consulted. However, dividing the power-handling figure by the efficiency does not yield the undistorted acoustic power output.

Most speaker specifications are relatively reticent about distortion, possibly because alongside other pieces of audio equipment the figures are generally unimpressive. Consequently the only way to proceed is to estimate the maximum acoustic power the speaker can radiate from fundamentals. This will be limited by the diameter and the available linear travel of the diaphragm at the lowest useable frequency. In the case of a woofer, this can be taken to be the fundamental resonant frequency.

From the maximum possible undistorted acoustic output, the necessary order of amplifier power can then be calculated using the efficiency figure for the speaker in question. This might be called the useful power and it is astonishing how much smaller this figure is than the power-handling figure.

A further twist is that the power-handling figure is not the power actually dissipated. In fact it is the power that would be dissipated by the same amplifier with the same input signal but driving a resistor having the same resistance as the nominal impedance of the speaker. As

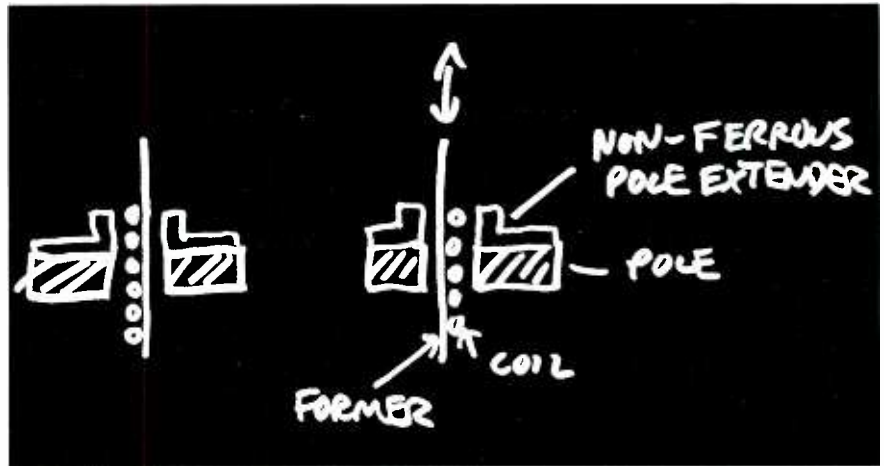


Fig.1: Most heat is lost by radiation to poles

Although recent developments in former, insulation and adhesive materials have allowed coils to run at higher temperatures, this only allows an improvement in robustness

a drive unit is a complex or reactive load as well as being temperature dependent, the actual power delivered by the amplifier will be substantially less than the power delivered to a fixed and non-inductive resistor.

As power is dissipated, the increase in temperature increases the resistance of the coil. The temperature coefficient of resistance of copper and aluminium is about 0.4% per degree C. A temperature rise of 250°C will double the resistance of the coil. This has the effect of halving the voltage sensitivity and thus the output of the speaker. A 200W rated loudspeaker may actually only be drawing 100W on the same drive voltage when the coil has fully warmed up, as well as producing half as much sound power. When the coil resistance has doubled, the dominant electromagnetic damping of the resonance has halved and thereby altered the tonality of the speaker. Note that efficiency and Q factor are normally quoted with a cold coil. In other words the spec, tells you what the speaker's characteristics are when it's not being used.

Coil heating causes an effect known as compression. It is most noticeable on transients where the dynamic tempera-

ture and resistance rise of the coil actually modulates the current and so distorts the waveform.

I suspect that the whole raison d'etre of high power-handling speakers is that the uninformed purchaser will go for the more powerful one because it has a bigger number on it. High power handling thus becomes a marketing feature, but the poor driver designer is backed into a corner by the thermal and mechanical survival requirement. The cone will have to be stronger and heavier to survive the mechanical ordeal, and may be yet heavier still to allow for the coil heat weakening it. More moving mass means that the speaker will be less efficient. This means that more heat will be developed to get the same sound power, which in turn means that the coil temperature will rise and the coil will expand.

A 250° rise in coil temperature could cause a 50mm voice coil to expand in diameter by 0.4mm. This requires a greater clearance in the outer pole piece, raising the reluctance of the gap and reducing the BL product, further reducing efficiency. Consequently high-power handling speakers are seldom very efficient and therefore need to consume that high power and suffer more from thermal compression.

Although recent developments in former, insulation and adhesive materials have allowed coils to run at higher temperatures, this only allows an improvement in robustness. Unfortunately, the improved heat resistance of a coil is often used to raise the power-handling figure even further beyond the useful power. This only results in even greater thermal compression effects. Consequently a precision loudspeaker for quality monitoring purposes does not

actually need high temperature coil technology except to survive abuse. The fact that the coil reaches a high temperature is enough to rule a driver out for quality applications on the grounds of distortion and uncontrolled Q factor.

For quality, moving coil drivers must be designed with effective cooling measures so that the coil temperature excursion is minimised. Fig.1 shows that the coil can shed heat by radiation and by conduction. Conduction is limited because the coil former is generally very thin.

A large diameter coil will be able to cool itself more effectively than a small one, adding to the list of arguments in favour of large diameter coils in woofers.

Heat can be lost to the air around the coil, but if this is static the air temperature will simply rise. Some ventilation of the coil area is necessary. The pumping action of the coil entering the magnet or of the spider or both can be used, but this must be approached with caution. With large excursions, the airflow may become turbulent resulting in 'chuffing' where the speaker produces program modulated noise. Air passages with sharp corners act in a nonlinear fashion and may partially rectify. At high level a poorly designed speaker may act as a unidirectional pump and displace its own neutral point.

Radiation loses heat to the pole pieces and these can be advantageously blackened to improve their absorption. The coil and former can also be blackened. The pole pieces can be extended in the vicinity of the coil using aluminium plates which will act as heat sinks for the overhung part of the coil without

Ferrofluid became available around 1974, and consists of a colloid of magnetic particles of about 0.01mm in diameter suspended in a low vapour pressure diester

affecting the magnetic field. Ultimately the magnet assembly must shed the heat and this can be assisted with external fins, or a thermal path to a cast aluminium chassis.

The ultimate cooling method is ferrofluid, a magnetic liquid shown in Fig.2 which is retained in the magnet gap by the magnetic field itself and conducts heat to the pole pieces. Ferrofluid became available around 1974, and consists of a colloid of magnetic particles of about 0.01mm in diameter suspended in a low vapour pressure diester.

Loudspeakers cannot use ferrofluid indiscriminately, they must be designed to use it. A speaker designed to use coil pumping for cooling cannot use ferrofluid as the fluid would block the air path. The pumping action of the coil would force bubbles through the ferrofluid and make noises unless suitable ventilation was provided.

The speaker with massive power-handling capacity which actually produces less SPL than a unit which can handle less power is a triumph of marketing and ignorance over acoustics. When active speakers are considered, the amount of power consumed by the transducers and the power developed in the amplifiers are both the problem of the designer. The only parameter the user needs to know is the output sound power.

When the goal is to create a system producing a certain acoustic power, the system designer can then make balanced choices. For every efficiency improvement in the transducer, which might incur a cost, a smaller amplifier and power supply can be used. The saving there could well pay for the small extra cost in the transducer. The fact that the amplifier in use is under the control of the designer means that over specified power handling is unnecessary and a further gain of efficiency can be realised. When a loudspeaker and amplifier are designed together in this way, the overall cost will actually be less than that of a passive speaker driven by a generic amplifier. Once there is an economic advantage as well as a technical advantage, active technology becomes inevitable. ■

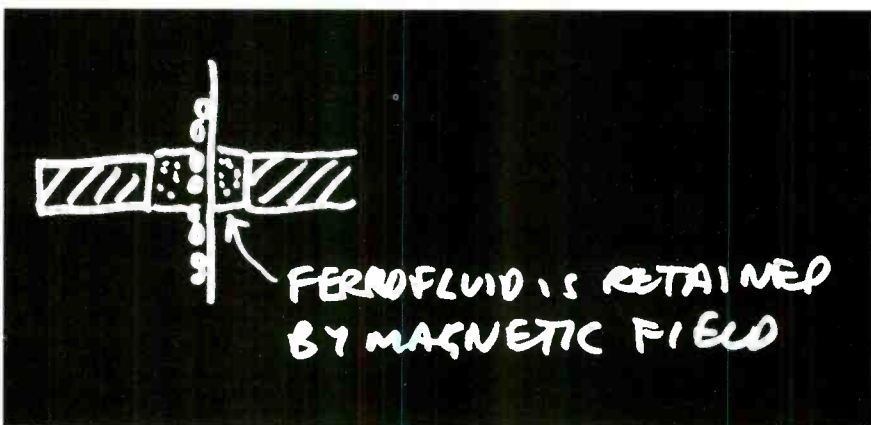


Fig.2: Ferrofluid acts as heat conductive path to pole

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Advance, stranger

The opportunities offered to pro-audio by the Internet are still largely unrecognised, writes **Howard Thomas**, managing director of Alice Soundtech

THE AUDIO INDUSTRY has established a deserved reputation for being quick to innovate and has long been at the forefront of developing new technologies. Our industry can take credit for breaking new technical ground on a regular basis over the past few decades—in all of its facets whether recording, transmission, broadcast or postproduction research and development. We all know that changes occur rapidly and businesses within the audio industry must be ready to adapt to changing circumstances and be ready to embrace new, innovative technologies.

Probably the greatest innovation of the 1990s is the Internet and the World Wide Web. The implications of the Internet for the audio industry may not be immediately apparent. From a manufacturing, installation, supply and service point of view the advantages of utilising the Internet are staggering and are already having an effect.

As a case study, six months ago Alice Soundtech started to develop its own web-site (www.aliceshop.com), with a view to having a corporate presence on the net. Halfway through its development we realised that the opportunities for using the Internet to improve our service and expand our business and client base were enormous. When the web-site came online in May it offered much more than an opportunity for us to talk about our company and illustrate a range of the products that we are able to supply, as was originally intended. In fact, we believe that it has become the first audio industry interactive web-site in the world.

The first use that has major implications for any audio engineers, is the ability to list complete equipment installation instructions on our site. Rather than carrying around several different heavy manuals for each separate product all the information is now accessible through a computer. Step-by-step installation instructions can be printed out locally for the engineer to follow. Specifications can be produced at the click of a mouse. Problem-solving charts and on-line help are all available to make the installation process as quick and simple as possible.

One of the reasons for the current spectacular growth of Internet usage, and the prices of shares in Internet companies, is the enormous potential of e-commerce and Internet shopping. It is often said that the days of paper catalogues and product directories are almost over, and it is easy to see why. Our

100-page web-site is now a virtual shopping mall for all radio equipment. Not only our products, but those of other manufacturers can be purchased and 60 new lines are being added every week. Customers are provided with photographs of the products, detailed specifications, performance criteria, delivery details and easy payment facilities, which can even add or subtract the VAT according to which country you are from.

The major advantage of Internet shopping is that it is 24-hour trading. Web-sites do not operate on a 9-to-5 basis, so while we in England are at

One of the reasons for the current spectacular growth of Internet usage, and the prices of shares in Internet companies, is the enormous potential of e-commerce and Internet shopping. It is often said that the days of paper catalogues and product directories are almost over, and it is easy to see why

home asleep, customers from the States can still be purchasing our products. Rather than looking through a thick catalogue that becomes out of date the moment the ink dries, the Internet shopping site can be updated almost immediately. New products can be launched and old, out of stock products can be removed, to offer the customer the best quality of service.

After only two months of being on line the site is currently receiving over 40,000 'hits' a month. We are trading with countries that we have never dreamed of marketing to such as Romania, Russia and even Papua New Guinea. Perhaps most importantly from an industry point of view we can tell which products customers have been looking at. Without conducting costly

market research we can get an indication of the popular products, the adaptations that people would find most useful and can feed this information into our research and development team.

A major innovation that will soon be appearing on the web-site is a chat forum. This will serve two purposes. First, it will allow engineers and users direct access to our experts to discuss any problems that they may encounter. Secondly it will provide people in the industry with a forum to liaise with others from around the world, discuss specific issues, talk about new developments and gossip about mutual acquaintances. We will be able to receive quicker feedback from the users, which in turn will make product development quicker.

By having other manufacturers products on the web-site we hope to provide a 'one-stop-shop' for anyone around the world interested in purchasing audio equipment. A recently franchised radio station could purchase every piece of equipment necessary to broadcast the web-site, from decks to mics, processors and CD machines. Currently all the goods are priced in Euro, but we will soon be providing the ability to purchase goods in \$US or £GB.

For customers who do not have access to the Internet, the whole web-site can be reproduced on CD-rom. They can receive an up-to-date list of all the products rather than getting an old catalogue in which some of the lines have been discontinued, some are out of stock... The service to the customer has been improved, and the customer is the audio industry.

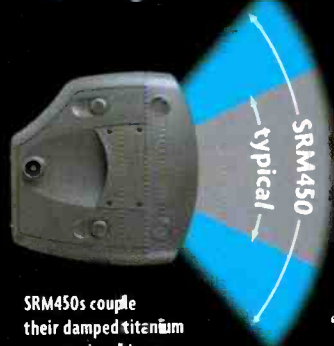
The audio industry has always been high-tech and leading-edge in its product development and anticipation of new requirements from users. Online shopping and online help will enable the industry to catch up some of the ground that has been lost in product delivery and on-going service. The Internet has ensured that the audio industry can now provide up-to-date specifications, immediate help and advice, a full product range in one area, a forum for individuals in the industry to discuss current topics, 24-hour shopping and improved information availability as well as state of the art equipment.

The days of mailing out thousands of paper catalogues, finding non attended help desks, and installations being held up due to misplaced manuals should now be over. And all to the benefit of all of us who work in the audio industry. ■

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