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Studio Sound

THE INTERNATIONAL TECHNICAL MAGAZINE FOR
PRO AUDIO, POSTPRODUCTION & BROADCAST



EXCLUSIVES

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Drawmer 1962

Nightpro EQ3D

Oktava MK319

LA Audio Classic

SPL Tube Vitaliser

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INNOVA SON SENSORY

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4

Editorial

Enduring technologies and enduring media face the future

6

Soundings

Essential pro-audio news stories gathered from around the globe

10

World Events

Coming shows and conferences

Reviews

12

Innova Son Sensory

Exclusive: French digital desk

16

Yamaha O3D

Exclusive: digital mixing's latest

21

Lexicon PCM90

High-end signal processor

25

Drawmer 1962

Prize preamp and A-D convertor

29

New Technologies

More new kit than the armed services—showcased here

29

LA Audio Classic Compressor

Great effects: great price

30

Sony DPS-V77

Quality meets quantity in DSP



Frances McDormand plays a tense moment in Joel and Ethan Coen's low-budget masterpiece, *Fargo*. See page 58

32

OptoMedia Kestrel

Studio-volume CD replicator

34

SPL Tube Vitaliser

Alternative valve signal processor

36

Nightpro EQ3D

A good deal from NTT's EQ deck

38

Marantz CDR620

Powerful studio CD-R machine

40

Oktava MK319

Exclusive: latest Russian mic

Features

45

Dynamic mics

Usually taken for granted, but regularly essential to the recording studio session, the dynamic mic attracts the attention of Dave Foister

53

D-A and A-D convertor guide

A complete roundup of outboard convertors and John Watkinson's key account of their operation

58

Postproduction: Fargo

Behind the scenes of a low-budget feature film. Richard Buskin celebrates excellence in all aspects of its production

65

Broadcast: Five Nations Rugby

Alongside the sweat and dirt of Europe's finest rugby, Kevin Hilton finds a winning broadcast

71

Interview: Trevor Horn

The definitive 1980s pop producer speaks to Phil Ward on 1990s technology—and beyond

79

Facility: Hans Dreijer Audio

Moving away from its Dutch base, Zenon Schoepe finds HDA tackling the German post market

85

Recording: Glen Ballard

A revealing look at the recording of Alanis Morissette's massive *Bitter Little Pill* album

Comment

96

International comment

Informed comment on pro-audio news and developments from both sides of the Atlantic

97

Broadcast

Kevin Hilton studies British broadcasting's move away from single-site transmitter working

106

Open Mic

If SA&V's Ted Heyton is right, a real solution to media file exchange problems is here

Technology

99

Dr John

John Watkinson takes us back to basics with a look at the workings of the deciBel

103

Fire Wire

A practical look into the main contender for the next generation of general interface

Dynamic mic roundup; HDA postproduction studio profile; Five Nations rugby broadcast spotlight



45



79



65

Resist if you must

IT HAD TO happen. That most neglected of audio products—my cassette machine—recently reached the end of its useful life after years of uncomplaining wear-it-to-death use and I was faced with the task of replacing it. As is always the case when you are content with an item of equipment that serves you well, your knowledge of the relevant market falls away steeply from the highly informed state of consciousness you had reached at the time of purchase. After some eight years of satisfied ownership I emerged from a catatonic state in to a market that is now sadly devoid of the selection of suitable machines I was convinced it would still be littered with.

The choice is actually paltry as many of the big names that used to supply 'pro' cassette machines have turned their attentions to other formats. However, the real eye opener was the price. Given the decidedly old technology being courted, the same money would have got me DAT or MD even though the R&D that went in to creating the MCC device must have been written off at least a decade ago.

What is wrong with this picture? Only that older technology is being side lined in favour of funkier newer stuff—not to the total exclusion of the older formats, you understand, but just enough to make it increasingly difficult to resist change.

Examples of such encouraged obsolescence can be found in every sound chain—users want something they're perfectly happy with but is hard to find, while the manufacturers try to sell them something else. Build what people want, sell them what you can. I bought another cassette machine.

Zenon Schoepe, executive editor

Old Masters

WHEN ONE OF the old masters signed off a canvass, his job was essentially done. His art had been given its head and stood or fell on its own merits—there was no equivalent complication to that of getting it PQ encoded, glass mastered and copied in its thousands, and certainly no question promotion or distribution problems.

Attempting to compare such a situation with that of today's recording artists is complicated but enlightening. Consider, for example, that 16th—18th century painters were free from the kind of 'three painting deal' that would be analogous to a modern record contract, and it's easy to see how damaging the modern attitude to 'career development' can be. Consider also that when a painting was complete, it belonged to the artist...

Many points of comparison, like impoverished painters reusing old canvasses, are of curiosity value only. The most informative comparisons, however, arise when you introduce the term 'media'. We're not talking PR now, we're talking canvass as against high-output tape; oils as against tape binder. When that painting dried, its merit—along with its worth—lay in a single item. When you look at an original Rembrandt, you're looking at a work that has survived some 300 years.

Other aspects of the painting-recording pairing that are telling include the relative worth of each. Certainly painters copied their own work, but this bears no comparison to the way in which copies of a recording sustain the record market. Ultimately the value of a recording is in thousands of low-cost copies rather than a precious original. That's the way the record companies have been used to reading the vinyl market, anyway. Then came CD and reissue mania.

Suddenly music's old masters were back in demand. And they weren't generally looking as if they were going to make it to their 300th birthday. Enter the restoration brigade and with them many of the same questions facing the restorers of old paintings: how far to take the restoration, whether to use materials (outboard) not contemporary to the original work, how the restored version will age, and so on. The principal problems are probably older than our original recordings—and may point the way to the best solutions.

Anybody fancy making a comparison of forgery and piracy?

Tim Goodyer, editor

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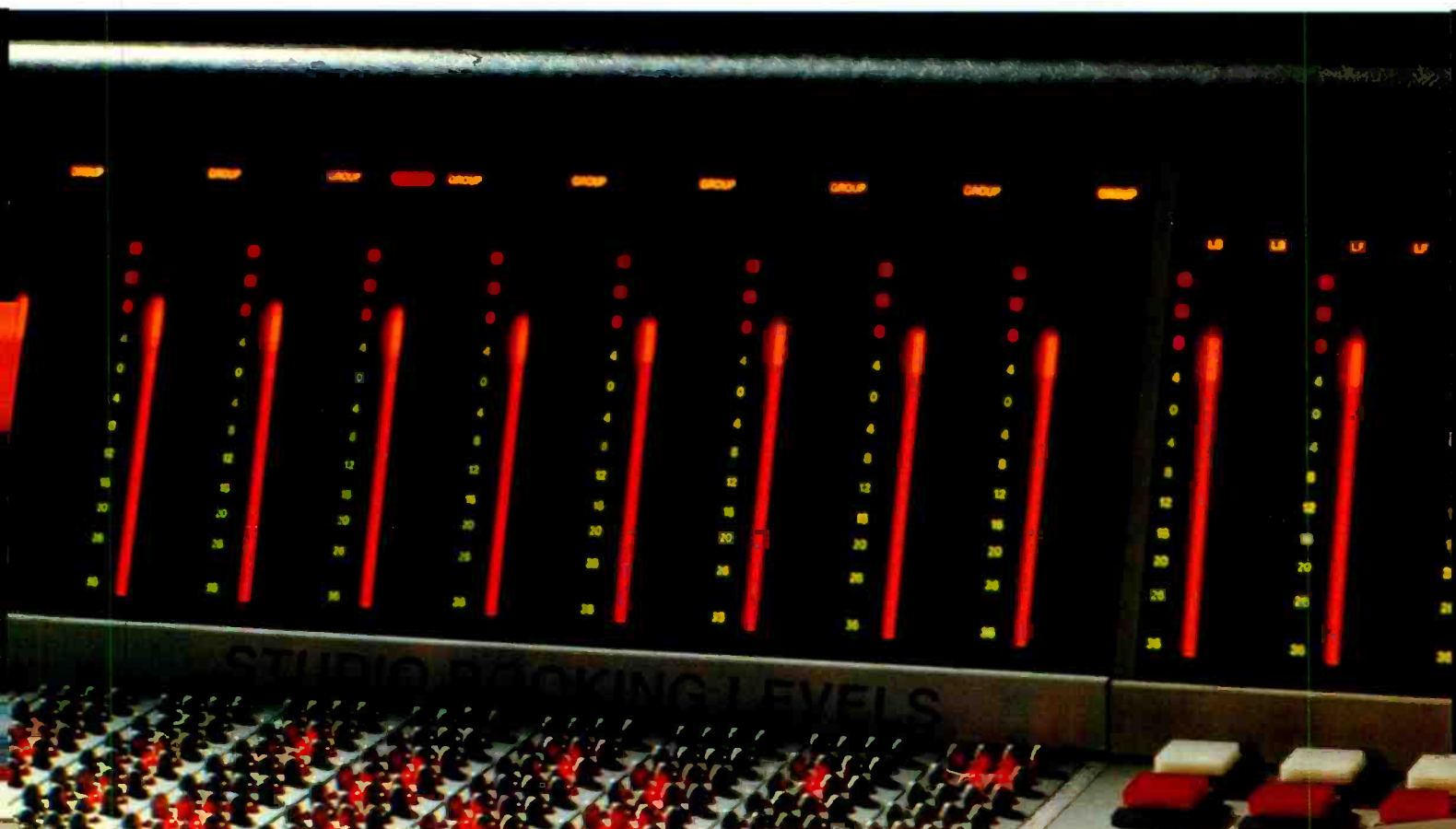
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AES and NAB: the audio perspective

UK-US: Comparing and contrasting the AES in Munich and the Las Vegas extravaganza that is NAB is actually easier than it would at first seem. Given the disparities in scale and grandeur, the biggest difference is in the relative importance attributed to audio. In Munich it was total, at NAB it was predictably partial at best.

Fortunately for the Europeans who didn't make it out to Vegas, the greater proportion of equipment releases had been reserved for the earlier Bavarian audio fest and NAB saw only a rerun, for the benefit of the Americans.

Even so, among the jungle of picture related equipment in Nevada, audio was high in profile. Walk up or sit down at the average NAB demo and your accompanying audience would soon be tapping its feet, nodding its head or finger drumming in time to the grab-the-attention soundtrack that accompanied the manufacturer's show reel. Remove the audio quotient of these staggering multisense experiences and the whole thing would limp into a deflated light show. In these times of ever more dramatic visual effects, computer generation and virtual sets, audio is more important than it's ever been because it makes the rest work so don't let anyone tell you otherwise.

It was Munich that presented the most significant number of new product releases for a good few years. Stars of the show were SSL's Altimix (*Studio Sound*, April) and Soundtracs' DPC11 (also *Studio Sound*, April) but an encouraging development was that manufacturers are getting together and talking. Alesis' Meridian next generation Type II ADAT was joined at the show by a version from Studer called the V Eight. Amek's announcement of its STARgate protocol for integrating DAW's with its DMS was a smart move—Amek

has no immediate plans to get into hard disk editing, while most DAW manufacturers are disinclined to embark on large-scale digital desk creation.

A-D convertor technology took a significant step forward with the announcement from Crystal Semiconductor of a single-chip 24-bit, 96kHz convertor solution. The ramifications of its release have yet to come. Technology also took a sideways step in the form of a monitor loudspeaker from the Professional Monitor Company that incorporates a flat (read piston) 250mm bass driver made from carbon fibre and Nomex. The new driver is light, rigid and lead many observers to conclude that the cabinet had a cover over the bass driver. The IBIS is a transmission line design aimed at critical listening situations and sounded good—in the context of an exhibition hall.

But not everyone was chasing futuristic technology. Prism Sound, renowned for their digital convertor technology, had gone into production with a high-spec analogue mastering EQ, the Maselec MEA-2 Precision Stereo Equaliser. And there are more analogue releases in the Maselec line to come.

Munich created an up-beat mood, according to its organisers, with attendance just busting the last European Convention high in Paris a few years back to around 6900 visitors who came to see more exhibition space than any European event has ever taken. NAB was a monster of a show although with its Convention Centre and Sands exhibition areas it is a difficult show to get to and from and between. If you contrast this state of affairs with the altogether more efficient arrangement at the IBC in Amsterdam there are perhaps lessons to be learnt.

Zenon Schoepe



Old news

Europe: Soundfield Studios has announced the completion of a mobile studio equipped with vintage recording equipment. A flavour of the project can be gleaned from name checking the equipment listing: EMI TG12345 (1969) and Neve BCM10 (1970) class-A consoles; Studer A80 Mk.III 24 16-track and C37 2-track valve recorders; and a selection of classic microphones including Neumann U47, U48, AKG C12, C28, MG UM92s valve mics; STC 4038 ribbon mics and AKG D25. Outboard units include EMT, Ursa Major, AMS, Joemeek, Lexicon, Eventide, dbx and so on. Monitoring options cover B&W 801 and Acoustic Energy AEs.

As the pet project of engineers Simon Woolf and Jonathon Miles, the new mobile is aimed exclusively at music recording—to the exclusion of film and television work—and offers British artists the opportunity of recording at a chosen Continental location and gaining tax advantages into the bargain.

Soundfield Studio, UK.
Tel: +44 181 875 9712.

◀ **US:** When producer Hugh Padgham set out to do his first mix in country music's

home town earlier this year, he ended up in Carl Tatz's Recording Arts studio working on a new MCA artist named Kami Lyle. The absence of critical comment from the producer, along with the full body massage service received from one of the studio's staff suggest that the project was a success

BBC and NTL on DAB

Europe: Eureka-147 has claimed its first successful European satellite DAB transmission. Staged jointly by the BBC's R&D and CBST departments, the broadcast was made from from CBST in Wood Norton, England to the EBU HQ in Geneva, Switzerland as part of a presentation to the World DAB Forum.

As part of its DAB activities, NTL has announced 'an ambitious development plan' for its products and services. As the transmission service provider to the British ITV, G4 and new C5 television channels, NTL can also claim to be instrumental in the introduction of DAB to the UK. Appropriately to both digital systems and service innovation, the new initiative embraces advanced digital data handling, signal distribution and transmission equipment including PAD (programme-associated data) into broadcasts, multiplex management control, digital studio-to-transmitter links and a multimedia programme production system. Still to come is a range of virtual receiver interfaces intended to 'demonstrate the future consumer capabilities of the DAB system'.

BBC, UK, +44 1386 420216.
NTL, UK, +44 1962 823434.

Akai's perfect post

US: New York post house, Sound One Corporation, recently completed the Twentieth Century Fox film, *Picture Perfect*, using Akai DD8s on pre-dubs and final dubs.

Chief engineer Jonathan Porath said the time was right for a tech-



▲ **UK:** 'We're on a mission from God' was the cry when Marquee Audio supplied a 56-channel Yamaha PM3500 console for the Tribute to the Blues Brothers tour currently making its way around Britain. The PM3500 has subsequently proved itself equally capable of handling both kinds of music: country and western.

▼ **UK:** Liverpool's prestigious LIPA establishment has commissioned a new MIDI suite and 'entry level' studio to complement its existing three studios—the main Amek Galileo-equipped studio is pictured here. The MIDI suite is modelled around an Apple 7200 Power Mac, while the entry level studio will house a 24-channel Soundcraft Ghost, Tascam DA-38s, Lexicon, dbx, Drawmer, TL Audio, Aphex, Yamaha, BSS and Behringer outboard



Studio Sound May 1997

nology transition in dubbing. 'It functions so like mag that if it weren't for the instant locating, our mixers would never know they weren't dealing with mag,' he said. Sound One used no less than 12 DD8s controlled over Ethernet by an Akai DL1500 on the film—four as recorders, the rest as playback machines.

Akai, US. Tel: +1 408 662 8981.

Studio reverberations

US-UK: Assorted international studio moves sees the opening two new mastering suites—one either side of the Atlantic. The States has been awaiting the opening of Doug Sax' second suite for some time now, and has been rewarded with a partner for the established and respected Mastering Lab room in Los Angeles. Originally opened in 1967, the Mastering Lab made much of its independence and custom-built equipment, much of which came from Sax' brother, Sherwood. As such, the facility won favour with the likes of Al Schmitt. Sax, meanwhile, is talking about a 2026 opening for a third suite.

A similar enduring pedigree can be claimed by Sonix' Bob Hill who, before setting up a new CD mastering and editing facility at the London Nomis complex, includes time at Trident Studios. Trillion Video and management of the Burning Sound record label. He also claims to have instigated the practice of 'inscribing' lacquers inside the run-off groove.

Sonix' equipment profile includes a SADiE Mk.II system running v3 software, an Audio Design ProBox 15 D-A converter and ProBox 12 AES wordclock generator, two Sony PCM-7040 DAT machines, a Studer A-807 1/2-inch analogue machine and Mission 731F monitoring driven by Omniphonics S-150 Footprint amps.



▲ **US:** When the Record Plant's President Rose Mann-Cherney offered engineer Matt Forger, Bill Bottrell, Mick Guzauski, programmer Matt Carpenter and the studio's Amy Burr a desk job, they took her at her word. That the incident was documented on film as an example of acute Californian cabin fever is in no way a reflection of the Michael Jackson recording project that prompted it, nor the 96-input SSL 8000 G+ console that facilitated it. All participants are now back on their feet and reconciled to the fact that the main picture in last month's *Studio Sound* feature on the Electric Ladyland studio incorrectly identified Studio B's SSL 9000j as an early Focusrite.

Mastering can be directed to Exabyte or DAT.

More UK activity concerns the purchase and refurbishment of London's Hot Night studio by Pete Lorentz' Cross Town Productions. The studio now boasts a Soundtracs II 4832 with Tracmix II automation, DynaudioAcoustics M1.5 monitors, a Soundscape v2 system and a selection of mics and outboard including Neumann Uai 87s, Urei 1176, dbx 160, Drawmer 1960 and 1961, and Lexicon 4001.

Meanwhile the US-based World Studio Group has added Reflection Sound Studios (Charlotte, Carolina) and National Public Radio (Washington DC) to its strength. Reflection's three studios feature a 60-channel Neve V with Flying Faders and NPR's Studio 4A has an SSL 4048 G+ and will accommodate some 50 musicians.

The Mastering Lab, US.

Tel: +1 213 466 8589.

Sonix at Nomis, UK.

Tel: +44171 602 6351.

Cross Town, UK.

Tel: +44 171 385 2862.

World Studio Group, US.

Tel: +1 213 465 7697.

Defusing the Bomb

UK: Lending its weight to the seriousness of the impending problem, the British Government's CCTA (Central Computer and Telecommunications Agency) has produced a comprehensive set of guides to 'help organisations and businesses defuse the Millennium Bomb'.

The guide, generally entitled Tackling the Year 2000, takes the form of six volumes—An Executive Overview, Managing the Programme, Kick-starting the Organisation, Assessing the Size of Your Problem, Testing and Compliance, The Legal Implications—addresses the likely consequences of certain computers' clocks inability to correctly register the year date '2000'. Certainly the guide is aimed at business considerations rather than technical situations, but given the immunity of the Macintosh to the problem and the two platforms' significance in pro-audio, this is where the majority of the action will take place.

More information may be obtained from, and orders placed on Tel: +44 800 146020.

■ **Bob Ludwig's** Portland, Maine-based Gateway Mastering has purchased a Sonic DVD Creator system, taking its mastering operations into the DVD arena. The new system has been added to Gateway's established SonicStudio workstations whose 24-bit, 96kHz capability is also held in readiness for the ratification of the DVD standard.

Sonic Solutions, US.
Tel: +1 415 893 8000.

■ **Tokyo's** New National Theatre has ordered an AMS Neve AudioFile to provide sound effects for its live productions. The facility was achieved through AudioFile's Jukebox function. Elsewhere in Tokyo, Syn Studios has installed further Boxer monitors to aid them in their work on television commercials and film soundtracks.

General Traders, Japan.
Tel: +81 3 3291 2761.

■ **Coastal Acoustics, UK.**
Tel: +44 1753 631022.

■ **Poland's** first Fairlight MFX3 Plus has been delivered to Warsaw-based Odeon Productions where it will be paired with a Yamaha O2R digital mixer. Odeon's operations are presently orientated around a Quantel HAL Express system with which it serves television programming

and commercial needs.

Fairlight, UK.
Tel: +44 171 267 3323.

■ **Yamaha-Kemble Music, UK.**
Tel: +44 1908 366700.

■ **London's** Grand Central post house has replaced its custom foldback mixing system with four Spirit Folio SXs. The new setup serves the facility's four Logic 2-equipped sound rooms. Also new to Grand Central are two BSS Omnidrive loudspeaker management systems which will be used to optimise the monitoring in Studio 4 when the Harris Grant-designed glass isolation wall is raised and lowered.

Spirit, UK.
Tel: +44 1707 665000.

■ **BSS, UK.** Tel: +441707 660667.

■ **Texas'** new Blue World Music studio has opened with the first installation of an SSL 4000 G+ SE console. The 96-fader, 28-input console boasts Ultimotion, Total Recall and surround panning, and will work with Studer tape machines and a 32-track Pro Tools system using Studer converters.

Blue World Music, US.
Tel: +1 512 264 3308.

■ **SSL, US.** Tel: +1 212 315 1111; +1 213 463 4444.

■ **Spain's** Sintonia recording and post house has installed a

16-channel DAR Delta Plus DAW. The investment accompanies the refurbishment of four of the facility's studios and includes upgrading three of the facility's existing SoundStations. Other Spanish activity for DAR includes another 16-channel Delta Plus going into Madrid's Escuela de Sonido e Imagen CES—for 'sound and image schooling'.

Broadcast Meditel, Spain.
Tel: +34 1527 1145.

■ **New York City** equipment rental company, The Toy Specialists, has opened an audio transfer room based around Otari UFC-24 digital format converters. The room is aimed at accommodating transfer between the many digital audio formats incorporated into the likes of DASH, PD, ADAT, DA-88, and DAT recorders.

Otari, US. Tel: +1 415 341 5900.

■ **French** post facility, GLPIPA, has claimed the first AMS Neve Logic DFC. The Digital Film Console will be installed in the Audi 1 room along with an AudioFile Spectra where it will be used in conjunction with a THX monitoring system.

AMS Neve, UK.
Tel: +44 1282 457011.

■ **New London** radio station, XFM, will see an Audionics ACE Mk.IV mixer installed in each of

its two on-air studios. Both mixers will be customised to meet XFM's specific requirements.

Audionics, UK.
Tel: +44 114 242 2333.

■ **Tustin-based** Eloy Productions has ordered a second 40-input Oram BEQ Series 24 console. The Californian studio has two identical control rooms now with identical desks running

Audiomate automation software, and specialises in music for film and animation. Recording duties are handled by 32 tracks of ADAT.

Oram Pro Audio, UK.
Tel: +44 1474 815300.

■ **Californian** postproduction complex Skywalker Ranch has installed JBL 6208 bi-amplified monitors in its editing suites. The new monitors serve conventional stereo film post duties as well as LCR for commercial broadcast spot production.

JBL, US. Tel: +1 818 830 7802.

■ **Italian** state broadcaster, RAI, has ordered four Dynaudio Acoustics M4 monitoring systems complete with two DCA 650 amplifiers and crossovers. The new monitors will be installed in RAI's new digital control rooms.

TDS, Italy. Tel: +39 2 33400350.

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Akai digital is the answer, what was the question?

Is there an affordable digital MTR that syncs to anything at any speed with instantaneous lock-up, has proven reliability, records on random access Disks, is compatible with a wide range of products and conforms entire programs in seconds?

There is now, the Akai DD8. A self contained 8 track disk-based random access digital recorder which can replace existing tape or mag machines in any film-dubbing or television production environment. It uses an uncompressed 16-bit linear format and records to a user choice of Magneto Optical or removable Hard Disks.

Akai introduced the World's first audio editor using M/O storage in 1990 with the DD1000, and the mighty DD1500 16 track Digital Audio Workstation is probably the world's fastest system available, with zero loss editing via fast dedicated buttons, digital mixing and EQ and a beautifully clear on-screen display. Now shipping with two years worth of software development including the unique EDL package which allows conforming of EDLs from tape or even from Akai project disks; with this amazing feature the DD1500 can conform entire programs in an instant from studio recordings or rushes on disk. Since 1994, the entire product range has been gradually expanded to provide a family of compatible products, tried and tested. A worldwide digital standard.

The latest addition, the DD8, is the perfect ultra-reliable tool for all professional sound recording requirements without the endless frustrations of tape transport limitations. It's ideal for syncing rushes, recording footsteps, foley or ADR, pre-mixing or mastering: in fact any recording task. It will synchronise to bi-phase or timecode in any direction or at any speed (including slow-motion). It can be fully remote controlled via GPIO or RS422 or even the legendary DL1500 system controller. Tracks can be slipped, nudged, and of course there is full audio scrub.

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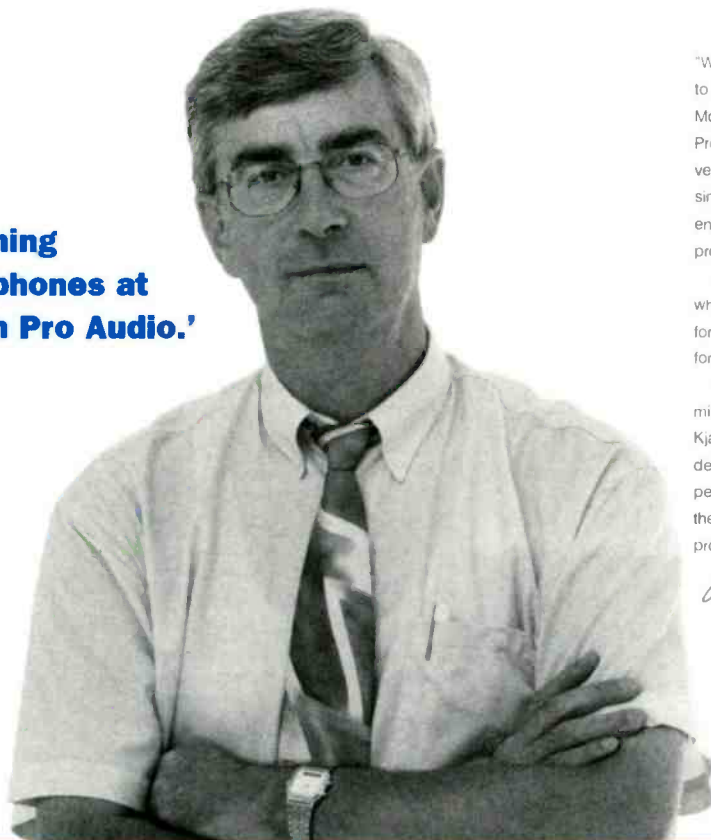
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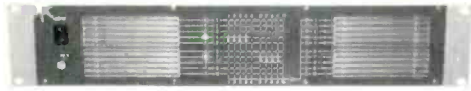
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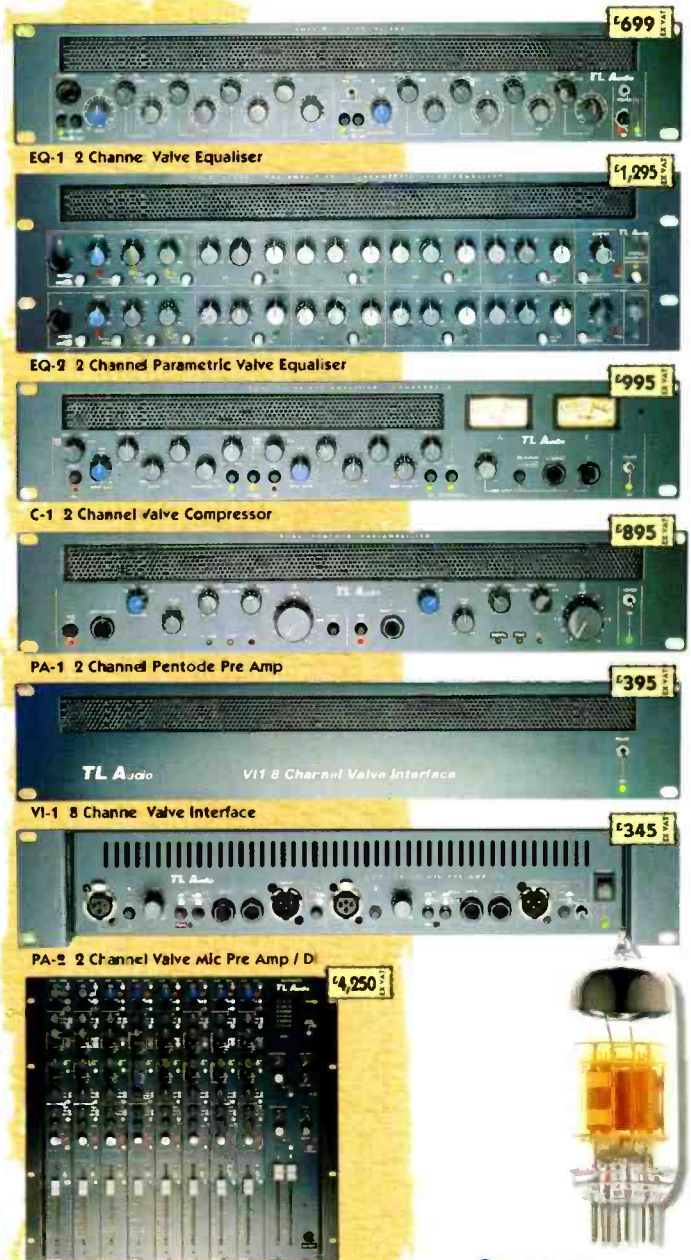
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Innova Son Sensory

The horizons of competitive console design are expanding rapidly. **Zenon Schoepe** discovers an innovative and refreshing French digital desk that is already out and about

INNOVA SON IS a French company based in Brittany that many a discerning pro would easily have missed on a typical exhibition stroll. This is because it is relatively new and emerged for the first time at the last Paris AES. Yet in around four years the company has come out with a sophisticated digital routing and distribution system (Muxipaire), a digital desk (Sensory) and has placed its products in some 25 installations. In all instances the emphasis is on live audio applications live sound or live broadcast—Innova Son majors on the application of digital technology in real time.

Among its users are French hire companies, who work its equipment hard, while there are now a total of six Sensory digital desks in operation including two in OB vans with French broadcasters and another two in mobile vans.

The core of the company's technology lies in the Muxipaire system—a routing and distribution solution that has a Stage Box containing converters that communicates digitally via co-ax (rather than fibre optic because it is easy to use and prepare) to a Mix Box at the mixing position with D-A converters. The lot is controlled via PC and the system can be used to feed extra mix boxes or additional stage boxes can be run in to grow the size. However, it is the addition of DSP to the Muxipaire that puts the French company into the spotlight as mixing capability fronted again by PC or, most significantly, by the Sensory control surface that gives the world another digital desk and quite an ingenious one.

The result is a smart digital console with good I-O resources, moving faders and snapshot automation that fits its intended purpose of live production admirably.

Of course, France has an illustrious history in console production most notably through Lafont and the once ground-breaking Saje company and its extremely clever Memory digitally-controlled analogue console, which incidentally also majored on live sound and spotted the need for resetability in the live environment a good many years sooner than most would care to admit.

What you're looking at with Innova Son is a company that has arrived at digital mixing via digital routing and distribution due to a desire to create solutions for live production needs. Christian Royer, who co-founded the company with his brother and system

Christian Royer claims that manufacturers in the live environment have missed the true potential of digital, as it is in wiring replacement that most benefits can be accrued

designer Philippe, says he watched the trend develop at the beginning of this decade towards large multimedia presentations having worked on many himself as a sound engineer. He identified the multicore as a particularly archaic interconnecting system and it was this limiting factor that the Muxipaire is aimed at addressing

by answering the regular requirement to take a set of signals and send them in three different directions. They chose digital as the medium knowing that its performance was below the capabilities of the analogue sections connected at either end but because it was the more elegant solution. Christian Royer claims that manufacturers in the live environment have missed the true

potential of adopting digital as it is in its role as a wiring replacement that most benefits can be accrued even if the signals are then reconverted back to analogue at the mixing console.

Innova Son is keen to stress that because it is a young company it has no past and is thus able to place its whole emphasis on digital out of choice rather than from the pressure of having to do it to stay competitive and exciting. With no history of products to integrate and support it claims it could make a fresh stab at problems and was not restricted by the fact that anything new it produced either replaced something in its range or had to be integrated with something else. It has a point.

THE INNVA SON co-ax, which is so crucial to the system, carries a digital transmission protocol that is similar in principle to MADI but one of the other main features of the set-up is its size. Stage Boxes, Mix Boxes, the computer and the Sensory control surface can all be accommodated comfortably in the back of an estate car—just like digital always promised you could—and can be installed and connected by one clued-up individual in about 15 minutes.

Of course, you don't have to go for the full Sensory-equipped digital mixer approach—you can buy a plain old Muxipaire—but a good sized and specified Sensory system starts for around £50,000 (UK) while an all-singing, all-dancing system for a theatre with four Stage Boxes, and dynamic automation will weigh in at around £100,000. One of the beauties of the approach is that upgradability



A good sized and specified Sensory system starts for around £50,000 (UK) while an all-singing, all-dancing system for a theatre with four Stage Boxes, and dynamic automation will weigh in at around £100,000

is easy, even if you only start with the most basic Muxipaire.

As a digital console the Sensory control surface uses the Muxipaire as its I-O resource with a PC sitting betwixt the control surface (serial port) and the Mix box (parallel port). Convertors can be 18-bit or 20-bit and DSP is 32-bit floating point.

Up to 64 mic-line signals arriving at the Stage Box after being amplified and digitised can be sent down one coax and these signals can be split to four separate mixing stations with definable master slave statuses.

The current limits of Muxipaire is 64 inputs to 64 outputs but as already implied how you employ these is really up to the application—Innova Son promotes a 18:32 configuration to cover most eventualities.

The DSP for the mixing functions is contained within the Muxipaire. As already explained, the PC sits between the Mix Box and the Sensory surface and drives a video card for the display and stores snapshots but you can run the whole system entirely by mouse if you want to. PC and Sensory adjustments are reflected in the other and control is fully bidirectional. This can serve as an alter-

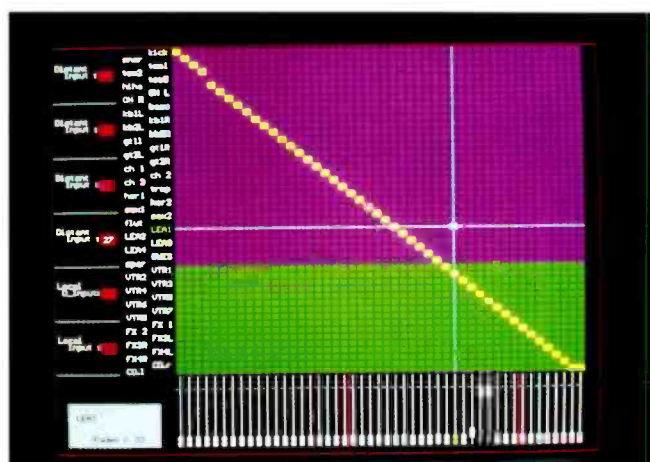


native method of operation but in line with the company's goal of fail-safing for live production, if the PC fails the system continues to pass audio in a frozen state allowing the user to reboot or even swap computers, while if the control surface goes down then you can take over on the PC. Cards in the rack can be changed while the thing is live—the system freezes and continues to pass audio depending on which card is being replaced—and then kicks back in where it left off when the new one is slotted in. Basically the PC monitors what's going on, handles storage, and intercepts and instigates various activity.

Each channel path has access to a gate, compressor, auxes (the number depends on the how many to allocate from the available outputs), and 4-band EQ (the photos show the old 3-band arrangement). Channels can be supplemented by effects line returns, again depending on the configuration and the I-O specification ordered. Similarly the number of outputs can be split between groups, auxes, outputs and monitoring buses. Outputs can be presented in analogue or digital format.

Innova Son is working on making equalizers and dynamics available on the output buses in addition to surround panning and dynamic automation. These are future developments and should not detract from the workability and stability of the present system which in its current form is already in field

use. It also points to the company's willingness to keep the product moving and to add application-specific functions. For example, it has designed a small keyboard control surface for sports commentator use.



Matrix routing: The system can be operated entirely from the Sensory, the only time you will really need to touch the computer keyboard is during the snapshot saving routine, which is a deliberate design feature. Channel routing is determined from the matrix page which also permits source inputs to be switched as part of a snapshot

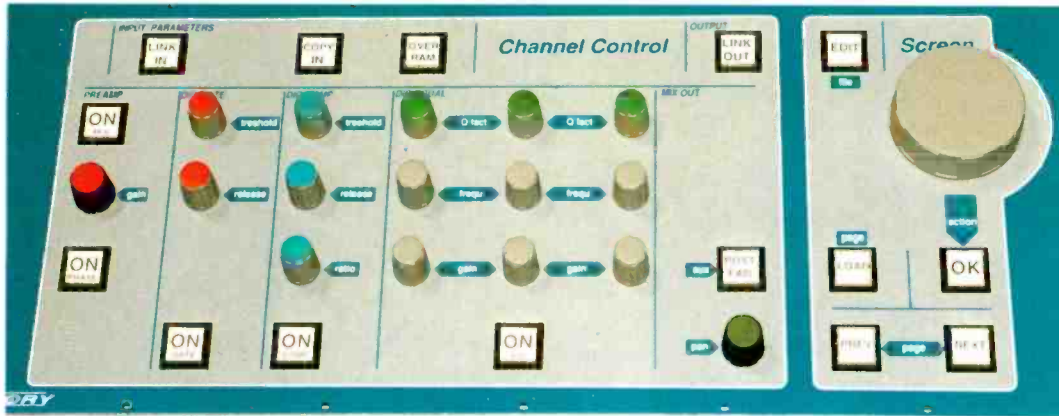
THE SENSORY CONTROL surface is modular in construction and is surprisingly compact given the number of faders being offered on the 48:32 version being looked at here. There are 20-fader channel blocks, aux, group and master fader blocks, a channel control panel plus utilities and custom panel sections.

The system can be operated entirely from the Sensory, the only time you will really need to touch the computer keyboard is during the snapshot saving routine and that's only because its designers consider saving a snapshot as a significant event that requires a deliberate action. Channel routing is determined from the matrix page which incidentally also permits source inputs to be switched as part of a snapshot. For all intents and purposes each channel path (with Mute, Cue PFL, and name) has an Access switch which predictably assigns it to the Sensory's channel control panel where you have a continuous rotary knob and switch per function and all adjustment is reflected on the PC's screen.

There's a Gain pot, Phase Reverse and phantom power, Gate Threshold and Release pots and Bypass, Compressor Bypass, Threshold, Release and Ratio, Gain (± 15 dB), Q and frequency (20Hz–20kHz on all bands) for each band and EQ Bypass, plus a pan pot. Once a channel is accessed you are also free to alter its aux send levels on dedicated faders and decide whether each is pre or post.

An associated panel takes care of recalling snapshots with PREVIOUS and NEXT buttons and also incorporates a tracker ball and key for cursor movement on the monitor. The output section incorporates group faders and main output faders depending on what combination you have chosen to create.

In addition to this there is a Utilities panel that includes talkback, oscillator and access to an off-line mode that warrants explanation. Given that the Sensory is aimed predominantly at live production work it is snapshot automated for all functions—the number of snapshots is limited by the computer hard disk size. In such a scenario it is common to arrange a cue list of snapshots in advance which can be stepped through and fine tuned >page 14



< page 13 on the fly in performance. The aforementioned Off-line mode operates as a type of 'local-off' mode in which the console's current settings are retained and continue to process while the whole console surface and PC are disconnected from the system allowing

the desk to be altered, snapshots to be programmed and the cue list to be edited. When you go back on-line the surface switches back immediately to the state it was in prior to Off-line being activated. This is a true bonus for rehearsal snapshot preparation.

the zero point, not so much that you can't glide through it in either direction but enough to let you find the zero point with alarming accuracy with your eyes closed. It is quite excellent.

There's a monitoring section that allows direct selection of loudspeakers, a level pot, dim function, and the selection of solo in place and exclusive solo modes. A custom panel provides a row of preprogrammable buttons that can be assigned to such functions as group mutes for monitoring and even fader starts.

I have to admit that this is the easiest to operate digital desk I have ever encountered. Much of this has to do with its basic split arrangement which it achieves without occupying the usual three meters of real estate. It is blatantly simple to operate—the learning curve can be measured in minutes. The layout is a lesson in ergonomics because there are no hidden functions—what you see is what you have, albeit in the context of an assignable channel control panel. The EQ is superbly smooth and the provision of dedicated aux faders would be a luxury on an analogue board. You really don't want anything too ornate or fancy when you're doing it live and for real.

Cynics would draw attention to the lack of some of the features now commonly associated with digital desks, most notably dynamic automation. Point taken, but Innova Son has chosen to target live production where snapshots are more relevant plus it has the operational units to prove it. Significantly it is also at that interesting stage of a manufacturer's evolution where it is still openly receptive to user input and purchasers' requests. It also has the incredibly clever Muxipaire system as a snake replacement to base its business on—there may now be a selection of digital desks available but there are not nearly as many alternatives to the multicore for live and location broadcast installations.

This is a remarkable find. An advanced, well thought out and mature family of scalable products from a company that defies its small size. Innova Son is a reassuringly confident and capable organisation that smacks of the type of ingenuity, enthusiasm and creativity that used to be the mainstay of this industry. Check out and watch these Brettons. □

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Yamaha 03D

The latest release from Yamaha's digital console stable combines postpro surround mixing facilities, comprehensive automation and high-quality signal processing with ever-keener pricing. **Rob James** tracks the success story of the 0-series

YAMAHA has enjoyed huge success with its ProMix 01 and 02R compact digital mixing consoles. The formula is now well known: a ridiculously high 'bang for the buck' ratio traded off against user interface and slightly inflexible I-O.

In keeping with the earlier models, the 03D offers unrivalled functionality at the price—24 mono inputs, one stereo input, 18 outputs (including eight on an optional YGDAL, Yamaha General Digital Audio Interface card), 40 dynamics processors, 40, 4-band, parametric equalisers and two very high-quality onboard stereo multieffects processors. In addition, there are scene memories and full dynamic automation.

There is also a mouse port for the first time on a Yamaha mixer and an ESAM-II port for connection to a VT edit controller (software not yet available) and a 'host' RS-422 mini DIN for connection to a PC without a MIDI interface.

The control surface has a total of 39 buttons for control functions plus two buttons associated with each of the 19 fader strips. The faders are 60mm throw motorised units. There are also latching switches for 26dB pads on channels 1-8 and a latching MONITOR ON/T switch which selects between 2-track in-solo. The parameter wheel, which is arguably the busiest control on the surface, has excellent feel and well chosen ballistics. The bright LCD is a 320 x 240 dot matrix and is complemented by a stereo LED meter ladder.

You pay for all this low cost power in a learning curve which tends to the vertical—don't expect to sit down and do a session on day one. That said, the 03D handsomely repays the time spent learning to drive it. Once you know your way around, the lack of dedicated channel strip controls is no real handicap and parameter changes can be achieved with speed and finesse.

The control model is a mixture of assignable and layered so for many functions there are two or more methods of achieving the same end. Sometimes it is quicker to select options to change with the mouse while setting parameters with the wheel while at other times selecting with buttons and setting parameters with the mouse feels more natural. Result: every operator will establish their own preferred method of doing things.

Even when you become accustomed to expecting a huge feature set from Yamaha they still spring surprises. The 03D comes as

standard with three surround panning modes. There are a few more mixers around these days with surround panning but nothing else even close to this price point let alone with full automation. The three modes offer quadraphonic or 2+2 with, as you would expect, L-R front and L-R rear channels; 3+1 (LCRS); and 3+2+1 (LCR front channels, Left and Right Rear plus Subwoofer) for Dolby AC-3. Within these assignments, a mono or stereo source can be flown around on any of seven basic trajectories with endless variations or simply moved around the soundstage with the mouse. The trajectories can be recorded, dynamically, using Automix, and what happens to the L-R components of a stereo signal can be chosen from eight Pattern options. The display shows position with mini bar graphs for level on each of the surround outputs. There is divergence control available—CSR ratio in Yamaha speak—which controls the amount of centre channel sound sent to the left and right speakers.

When the desk is in 3+2+1 surround mode, the panner outputs are fed as follows: front L-R from the Stereo out. Centre from Bus Out 1, Sub from Bus Out 2 rear LR from Bus Out 3&4. Surround monitoring arrangements are up to you.

This is a very powerful and flexible surround panning tool, so much so it would be worth considering using an 03D as a surround panning addition to an existing film console.

The effects units use the same chips as Yamaha's outboard processor, the ProR3 (see Studio Sound, March 1997) and offer 64 preset and 32 user-definable memories for further effects. The reverb is startlingly convincing, highly complex with tails fading to black and none of the mushy mess usually found on low-price units. Two of the programs are only available on effect two. These are the very useful Freeze (sampling) program with nearly three seconds of storage and the HQ.Pitch programme which is a mono pitch changer with long delay.

The phaser effects, which I greatly enjoyed, are deep and can be spine-tingling.

I co-opted a friend with a Fender Strat to experiment with the guitar effects. He usually plays with no effects and relies on the amp to achieve the sound he wants. We were both impressed with what could be achieved with the strat plugged straight into the 03D. With a little care it is perfectly possible to get a convincing result without the bother of miking

Once you know your way around, the lack of dedicated channel strip controls is no real handicap and parameter changes can be achieved with speed and finesse



The 03D control surface has a total of 39 buttons for control functions plus two buttons associated with each of the 19 fader strips. The faders are 60mm throw motorised units.

the amp and messing about with DI boxes.

In summary the onboard effects enable a battery of wild effects to be achieved and or very natural and convincing enhancements to real world sounds. All of this quickly and with little effort. If this isn't enough to whet your appetite effects changes can be recalled by the automation.

The 03D can be used to remote control MIDI functions on external kit. Templates are included for Yamaha 01, 03D and 02R digital mixers, Rev 500 and ProR3 effects, XG or General MIDI tone generators and Digidesign Pro Tools. Other MIDI devices can be controlled with user definable MIDI commands operated with the 03D's faders and on buttons.

Channels 1-16 are analogue inputs with 20-bit linear 64x oversampling converters. Channels 17-24 are digital inputs type dependent on which optional YGDAL card you have installed. The stereo input can be either analogue or AES



the usual favourites are available, soft or hard-knee compression, gating, expansion, limiting and ducking. The presets are good but if you want to get your hands dirty it is trivial to set up your own parameters and store them in a user memory.

EQ follows the dynamics philosophy and wherever there are dynamics available there is also an equaliser. There are four bands each with 18dB of boost and cut, frequency variable 21Hz–20.1kHz and Q 0.1–10 the low and high bands can be used as shelves or HP-LP filters respectively. There is EQ in-out switching and an attenuator on the input so if you want to apply ludicrous amounts of boost you can do so without overshoot. The EQ page has meters so you can see what is going on including gain reduction if there are dynamics in the path. As with the dynamics there are 40 preset programmes and to get you going and a further

digital. There is an additional unbalanced 2-track analogue input for monitoring.

Channels 1 and 2 have unbalanced inserts on 1/4-inch stereo jacks following the usual tip-end, ring-return convention. Channels 1–8 have XLR and jack balanced inputs, switchable 48V phantom powering and gain variable from -16dB to -60dB with an additional 24dB pad. Channels 9–16 and the analogue stereo input have balanced jacks and a gain range of +10dB to -20dB. Adjacent odd and even channels from 1–24 can be paired for stereo as can buses and auxes.

All input channels can be phase reversed and they all have a maximum of 200ms delay available useable as delay, echo or slap echo. This delay can be used to compensate for mic placement or simply as an effect.

There is an ON button associated with each channel which functions as a mute and is also used when selecting solos, while the SELECT button calls the assignable controls attention to the channel. The fader controls Aux and Effect send levels as well as input depending on status. Aux and Effects sends can be pre or post fader.

MOST CHANNEL SETTINGS (other than EQ and Dynamics, analogue gain and pad) can be stored in one of 49 user memories and recalled or copied from one channel to any other equivalent channel, similarly aux, bus outs, stereo out and effects returns settings can be stored and recalled to their respective sections.

If you run out of dynamics on O3D I would be very surprised. Processors are available on all input channels, the stereo output, aux sends, onboard effects returns and the four main bus outs. There are 40 presets and 40 user memories. The key here, as with many of other aspects of O3D, is flexibility. The dynamics can be triggered in any of four ways: the programme signal Post EQ or Pre EQ, Aux 1 or 2 out Pre EQ or by any other mono channel or either the left or right leg of the stereo channel. In use, the dynamics have the kind of surgical precision that only high quality digital devices supply. Unless you want to hear them working you don't have to—they simply solve problems and let you concentrate on what you are trying to do. All

40 user memories. Settings can be also be copied between channels.

Without previous experience of this degree of assignability I had thought the lack of at least one knob per band would prove frustrating. In practice, it becomes second nature to use the access buttons and parameter wheel and, if anything, it can be quicker than discrete controls.

The main stereo output is available on XLRs in analogue and as SPDIF and AES-EBU digital. The analogue Stereo Out and Monitor Out have 20-bit 8x oversampling D–As while the bus outs have 18-bit D–As. The four bus and four aux outs are available in analogue on balanced 1/4-inch jacks, or in digital via the optional YGDAI card which alternatively carries channel direct outs selected from channels 1–16. The AES-EBU and YGDAI ports output 24-bit wordlength. Dither is provided to reduce this gracefully to anything down to 16 bits independently on each output. There are two unbalanced analogue outs which can be either Stereo Out or Bus 1 and Bus 2 Outs.

Delay of up to 45.4ms (at 44.1kHz) can be applied independently to the bus >page 18

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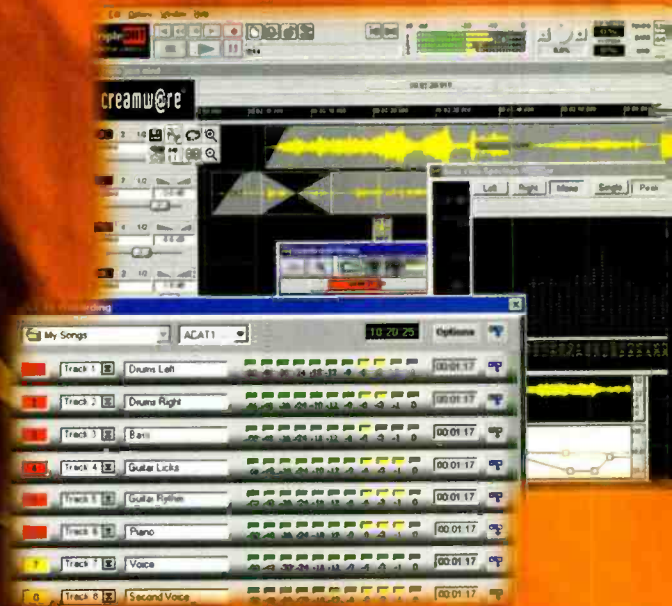
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Lexicon PCM90

In the wake of a deluge of 'affordable' digital reverberation and multi-effects units, the high-end is fighting back with Lexicon's PCM90. **George Shilling** weighs up the latest heavyweight



LEXICON'S top of the range 480L and its predecessor the 224X have, for over ten years, occupied the high ground in the battle of the reverb units. No high-end studio looks complete without LARC remote control perched on top of its console. And it's fair to note that many studio owners feel obliged to equip with one or more of these vastly expensive reverb units for its prestige as for sound much as quality. With these points in mind, the PCM90 makes an interesting review prospect particularly as, although significantly cheaper than the 480L, it is Lexicon's latest dedicated high-end reverb unit.

Backracking a little, Yamaha popularised assignable controls with their DX7 FM synthesiser. Ever since this took off in the early-1980s, equipment manufacturers have not felt obliged to put more than one or two knobs on anything, from synth modules to reverb units. This is understandable from a cost point of view, or even from a practical and technological standpoint, but it is somewhat contrary to both our instincts and experience. So while synth manufacturers now flaunt instruments loaded with sliders and switches, reverb and multi-effects units have yet to break away from the assignability path. And the PCM90 is possibly the worst offender I have encountered.

Specifically, there are just two knobs on the front panel (SELECT and ADJUST), and nudge buttons for navigating the menu structure. These are what you use to do almost everything on this unit, and there is an awful lot you can do.

THE OPERATING SYSTEM of the PCM90 closely resembles the PCM80 (see *Studio Sound*, April 1995). Since I reviewed it, this particular unit has undergone some minor changes: the rear panel now sports XLR output connectors, and combined jack-XLR input connectors. The rear panel of the PCM90 is identical, and the only difference at the front is a slightly different paint job. This deep 1U-high box has a sturdy feel, and is truly feature-packed. A PCMCIA card slot on the front panel can be used to store edited effects if you run out of internal registers (which have 100 locations) or for new preset-algorithm cards issued by Lexicon—who has recently made available a

card that features split programs and Dolby Pro-Logic surround effects. Cards issued for the PCM80 will not work.

Unlike that master-of-all-trades the PCM80, this box specialises in reverberation. Lots of it. There are—as with the PCM80—250 presets across five program banks logically divided into Halls, Rooms, Plates, Post and Splits. Each bank is subdivided into groups of ten programs for different types of application, such as Live Sound, Vocal, Instrument and Spatial. In order to make finding suitable programs quicker, Lexicon has introduced a new feature which enables a KeyWord search. This appears after the last program bank. The default setting gives you an A-Z listing by program name: when you get to Z though, you cannot carry on through to A again but instead have to wind the knob all the way back. You can easily change this listing to one based on one of the KeyWords such as Acoustic, Bright, Keyboard, Large... There is a long list of keywords, and four spaces for user settings. Each preset is assigned up to four KeyWords for this purpose, and, of course, these are fully editable. Another feature not found on the 80 is the History of Effects Loaded which memorises the last ten effects loaded into the unit, useful for back-tracking where you have been.

There are other small differences from the PCM80 operating system, such as the way the programs scroll through the different banks continuously instead of staying on the same bank. Also, the ADJUST knob, (which has been assigned one main parameter of each program) shows a slightly more explanatory display when turned. There are still two edit modes: Go and Pro, with Go mode controls chosen to be the most useful for any given

program. On the PCM90 some parameters are customised with the new Custom Controls with cute graphical displays of their adjustments, and amusing and helpful descriptions as they change. Ranges of adjustment can also be defined to give, say, five different filter frequencies. There is provision for four of these Custom Controls for each preset.

All the effects are derived from one of four algorithms: Random Hall, Ambience, Rich Plate, Concert Hall, and Chamber-Room which provide two independent reverbs by virtue of the two Lexchip 2 processors. Lexicon's designers have worked hard to make

these algorithms mimic the sound of the real space, and heard with a solo instrument in isolation they are very convincing indeed, with all the smoothness and lack of grain that you expect from a top-of-the-range reverb unit. Although all programs are primarily reverb-type effects, the algorithms include EQ, delay and modulation adjustments. The Concert Hall algorithm includes a digital compressor, where, oddly, you set a threshold level below which signals are boosted. You also have the full Output Width control of the PCM80 which gives

you infinite adjustment of stereo image and phase. Spinning Room for example modulates this control, rapidly inducing nausea, but rather uselessly fading in and out when Mono'd. Not included on the PCM80 but featured here is a corresponding Input Width control which, for example, could be set to 90 to exclude any centre (mono) signal from the reverberator.

THOROUGH PATCHING is implemented, which can give you many hours of amusement trying to make the reverb brighter when the left **page 22 >**

One useful set of programs is of Outdoor effects, handy for dialogue dubbing for TV and film.

Although the unit primarily provides proper grown-up reverberation, there are a few special effects including ring modulation and odd multiple delays.

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< page 21 input level is higher, or somesuch thing. Does anyone ever do this? MIDI implementation is very thorough, with all controllers received and understood, and several SysEx options. Included are the Tempo features of the PCM80: you can tap tempo in, or set it to follow MIDI clock. The PCM90 will also generate MIDI clock. Like the PCM80, SPDIF digital input and output are available on the back panel.

The unit comes with a shiny quick-reference card, and a handy fold-out list of programs. This is repeated in the manual with longer summaries which include a description of the Adjust Knob function and a list of associated KeyWords. The manual is very comprehensive, explaining every feature, although it can be hard to find something quickly with no alphabetical index.

One useful set of programs is of Outdoor

It provides unequalled refinement and flexibility. It is priced slightly higher than the PCM80, probably because of its higher processing power—two Lexchip 2 processors. Compared to the 480L it looks like exceptional value. However, at double the price of the MPX1, you really have to want the best. Embedded in a track, who is going to notice the difference in quality? The way things stand I wonder if I might prefer two PCM80s and a set of algorithm-preset cards, rather than one PCM80 and one PCM90. However, we will have to wait and see what benefits future expansion cards bring.

The PCM90 is a complex piece of equipment that demands some study to get the best out of it. It offers an alternative, and dare I suggest, equal to the 480L in terms of sound quality and effects

The PCM90 is a complex piece of equipment that demands some study to get the best out of it. It offers an alternative, and dare I suggest, equal to the 480L in terms of sound quality and effects. It surpasses the 480L with many of its features. However, compared to



effects, handy for dialogue dubbing for TV and film. Although the unit primarily provides proper grown-up reverberation, there are a few special effects including ring modulation and odd multiple delays. Included are Generic presets giving the user blank page versions of effect algorithms (with no Go mode softrow or Adjust knob assignments) for creating effects from scratch. It was a nice surprise to find a re-creation of the PCM60 Room, complete with choice of four decay settings. A recent re-acquaintance with the PCM60 provided a stark contrast to this feature-packed marvel of modern technology and assignability. There are many situations where when tracking or overdubbing I would prefer to have available the quick and simple 60 instead of this potentially time-consuming beast.

The PCM90 is truly a high-end machine.

the 480L it is fiddly to use, with such extensive menus that a novice may have trouble finding a particular setting. The Go mode feature

compensates to a certain extent, but you still have to guess where a particular parameter is, and, of course, the one you want might only be available in Pro mode. For me, the PCM90 needs more tactile control, a bigger display, and simpler menus. If you are going to cram in so much, it is frustrating having just one adjust knob and only one parameter visible at a time. People do not work that way. There are many

features included that I know I would never use, or perhaps would not have time to explore in a time-is-money situation. It is a very impressive unit, but I hope in the future to see a Lexicon unit with more of a Fisher-Price approach to design instead of the DX7s they keep producing. ■

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Drawmer 1962

In the wake of the deluge of 'affordable' digital reverberation and multieffects units, the high-end is fighting back with Lexicon's PCM90. **George Shilling** weighs the latest heavyweight

FOR DRAWMER'S eponymous company is historically linked with analogue signal processing, but it has also established its digital credentials with forays into various areas of technology. Before digital control of analogue circuitry was as familiar an idea as it is now, Drawmer was doing it with the M500, a multi-faceted dynamics processor with a single VCA under digital control, and actual digital signal handling has been successfully explored with the Drawmer Dynamics package for the TDM bus.

None of which really prepares you for the 1962 preamp, the latest in the range of valve signal processors but with digital as well as analogue outputs. At first glance it's simply a logical partner to the 1960 and 1961 compressor and EQ, both of which focus Drawmer's analogue expertise on the central character of a valve. It would be easy to dismiss the incorporation of an analogue-to-digital converter as the icing on the cake, or an attempt to jump on this particularly unlikely bandwagon, but looking deeper reveals that there's somewhat more to it.

But before we get to that there's also more to the preamp itself than might be expected. For a start it has three inputs on each of its two channels, XLRs on the back for balanced line and microphone sources and a front-panel 2-pole instrument jack. A single control adjusts gain for all three, using white and yellow scales to show the calibrations; PHANTOM and PHASE switches are provided for the mic input, while the instrument jack has switches for BRIGHTNESS and 20dB of additional gain. One of the longest pairs of LED meters I have ever seen accompanies this stage, and actually shows the level at the converter inputs so has 0dB digital full scale at the top. The large

number of steps gives unusually fine resolution across the range with helpful indications at low levels.

There is a long-running argument about how traditional analogue signal levels should correspond to digital full scale—an argument which shows no signs of being resolved. Some DAT machines and other devices are calibrated with 0vu being represented by -18dBFS, some -15, some -20 and some -12. The trading of headroom against optimum use of the available bits has led to a minefield of

potential level mismatches. Drawmer has chosen to ignore them all and do its own thing, making 0dBm correspond to 0dBFS with the input gain at unity—much higher than anything else I've encountered. The point is that there's enough margin in the preamps to allow the input gain to be backed off by a large amount before any overload is likely, making the whole system headroom driven, some would say the only sensible approach when dealing with a digital recorder. This degree of pushing is made more comfortable by the presence of two protection devices further down the line.

The performance of the preamps themselves is exemplary, with extremely quiet mic amps and complete transparency. It should be noted that they are entirely solid state; the valve comes later, very much under user control.

This good a preamp coupled with a decent A-D converter would be enough for some people; on the 1962 it's just the beginning. No less than five processing elements are available in the chain, although as each one is individually switchable the path is never

This good a preamp coupled with a decent A-D converter would be enough for some people; on the 1962 it's just the beginning. No less than five processing elements are available in the chain, although as each one is individually switchable the path is never longer than absolutely necessary.

longer than absolutely necessary. The first thing the signal hits is a peak limiter, with its threshold linked to the preamp's headroom and an LED showing limiting activity. One of the configurations Drawmer recommends is to have this running as hard as possible without audible detriment to make the most of the preamp capabilities, but this is unlikely to appeal to the classical fraternity. The limiter operates smoothly and is very effective in protecting the rest of the signal path from unexpected excursions at the input, but is not necessary for clamping the converter inputs as there is a soft clipper permanently in circuit at the far end of the chain. A STEREO LINK switch acts on the limiters' side chains, but nothing else; the manual warns that for stereo use care must be taken to match processing control settings.

High-pass and low-pass filters are fully sweepable, with a range big enough for surgical purposes but not so big as to make fine adjustment difficult. These are independent of the following EQ section, a simple 3-band equaliser with fixed frequencies and slopes. Drawmer explains that it is intended for sweetening rather than as a replacement for console EQ, and on those terms it is just the ticket. The overall sound is musical and natural, and the chosen slopes give just the kind of broad-band adjustment the situation demands, sounding smooth and unobtrusive even at the extremes.

The enhancer stage is something of a surprise. A subtle but effective HF enhancer circuit, fully variable to add the required amount of sparkle and thickening, is joined by an independent LF enhancer to do similar things to the bottom end. Both are worth having, offering a general increase in perceived loudness in a way that EQ alone could not manage.

The next step is the optional introduction of the valve. All the building blocks so far are purely solid state; the valve is simply an additional gain stage for the sole purpose of adding its characteristic to the signal path if required. A single control adjusts the valve drive without affecting the level passing through the stage; clearly it decreases its output level to track the increase in **page 22 >**





< page 25 input level, giving variable valve distortion at constant unity gain. The amount of distortion available goes further than some such units, making sense of the instrument input on the front panel, but not so far as to offer itself as a fuzz box.

At this point the two channels have their own separate outputs, complete with level controls and LED meters, but there is also a simple stereo mixer, provided with a pan control for each channel, an overall output level knob and twin LED output meters. As supplied, the mixer is fed pre the channel output controls, although there is an internal jumper which allows this to be switched to post at the expense of a little bit of noise and some calibration compromises.

Besides the XLRs for line and mic inputs, channel outputs and mixer outputs, the rear panel carries a set of 3-pole stereo jacks, one for output and three inputs, for cascading multiple 1962s or adding further signals to the mix bus. This analogue flexibility, remarkable as it is, is rather overshadowed by the optional digital facilities.

The 1962 can be fitted with a D62 digital interface card, and two types are available. Both have AES-EBU and SPDIF outputs, with a switch to select the format, and both have an additional 8-channel interface, the two versions tying up with ADAT optical or Tascam TDIF formats. Whichever is chosen, the AES-EBU signal can be up to 24 bits in length, with a huge selection of dither and noise shaping characteristics for the 16-bit, 18-bit and 20-bit output formats. Twelve options are offered, differing in the frequency the noise is shifted to and the amount it is boosted. The 'standard' setting Drawmer recommends for general use places the dither above 18kHz at 30dB

above the quantise noise floor, and the other extreme puts it above 10kHz at +10dB. Straightforward white noise dither and truncation are also available. The converter can be synced to an external word clock, or can generate a master clock; it will also refresh an incoming clock and retransmit it on its output socket.

The reason for the 8-track interface is not just to send 16-bit stereo to the MDM; it also introduces Drawmer's proprietary high-resolution recording format, allowing 23-bit stereo to be recorded across three tracks of the machine. Four switch settings allow various playback modes, including 16-bit off any pair of tracks or 23-bit, which can be delivered intact to the AES-EBU output or shaped down to 16, 18 or 20 bits using the 'standard' shape. No analogue output is available from this format, so an external high-bit D-A is required to get the best out of it, but it interfaces quite happily with a 24-bit capable DAW such as SADiE for high-bit editing. The whole thing works impeccably and transparently, providing a highly unexpected bonus from an already well-featured unit.

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With all the scrambling to find easy ways of recording beyond 16 bits, this facility alone is worth having a 1962 for, and Drawmer would do well to promote the system in its own right. Coupled with the quality of the mic preamps it makes an ideal package for classical recording, and every time you add one of its other features it gains another potential market. It's unusual to find a box that genuinely has something for everyone, and rarer still to find one that does it all so well. This is one light that Drawmer definitely shouldn't hide under a bushel. ■

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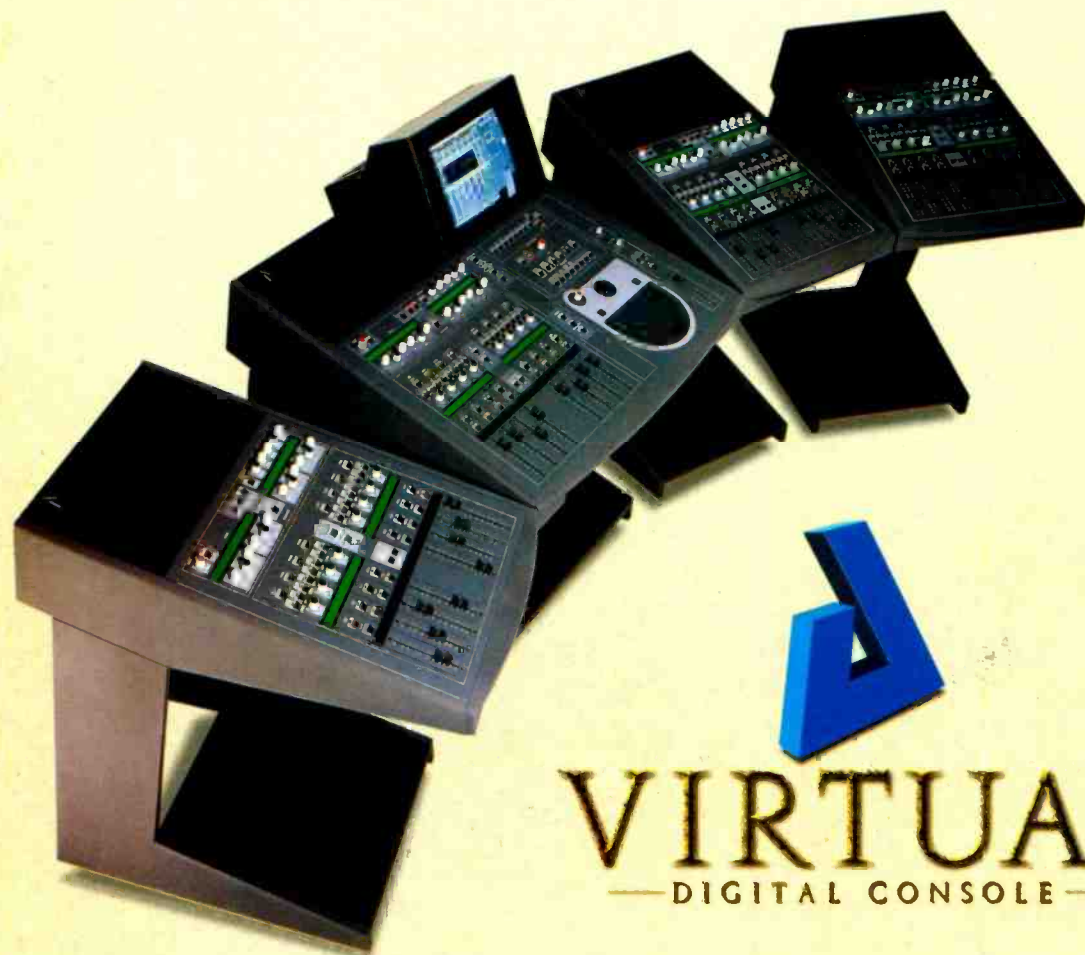


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Studio.

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Pete Bellotte - Writer
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The Munich AES and NAB shows were rich in new product pickings. Studio Sound collates some of the highlights

MDM choices step up

FOLLOWING THE ANNOUNCEMENT of a 'next generation' ADAT Type II Meridian machine from Alesis (Studio Sound, April 1997 p46), Studer has said that it will produce its own version called the V Eight with a number of enhancements.



Meridian

The Studer machine adds a monitor mixer, analogue and digital converters based on those in the D827 DASH machine, higher gain inputs and outputs, a parallel port and Sony 9-pin. The V Eight will start shipping at the end of the year for 15% more than the \$7000 for the Meridian.

The news coincided with Tascam's unveiling of the DA-98 which adds features for the same price as the current DA-88 and has onboard sync, MMC, and Sony P2 protocol. A 37-pin D-sub connector allows parallel interfacing. The machine has 20-bit resolution, 64x oversampled A-Ds with switchable dither plus 20-bit 8x oversampled D-As.



DA-98

Cosmetically the machine adds a large LCD with dedicated function keys, individual monitor select switches and confidence monitoring. The machine can be combined with existing DTRS machines in a system.

Tascam has also shown the DA-302 dual DAT recorder which combines two independent transports in a 3U-high chassis. Individual and common I-Os are available. Normal and high speed digital dubbing is supported including ABS time, subcode and PCM data. The machine has a fluorescent display and error rate, running time, copy ID, input selection and peak hold indicators.

Teac UK: +44 1923 819630.

Studer, Switzerland: +41 1 870 7511

Smart C2

THE SMART C2 compressor reviewed last month is distributed in Europe by Sounds Incorporated.

Tel: +44 1892 861099.

Studio Sound May 1997

LA Audio Classic Compressor

It's easy to design a few valves into a dynamics processor and give it a 'classic' tag; but it's harder to deliver a 'classic' performance. Difficult but not impossible, as **George Shilling** discovers

FOR THOSE who desire them, there are currently many compressors and other outboard devices available which use valves. Many, however, carry fairly hefty price tags, and, as some have a limited range of useful features or lack the qualities of vintage valve designs, it is a breath of fresh air to encounter the LA Audio Classic Compressor. The reason is simple: the Classic Compressor is intended to emulate vintage equipment, but without the use of valves, and without costing the earth.

The Classic Compressor is a 2U-high, twin-channel compressor that uses discrete FET gain control devices (rather than proprietary VCA ICs) in an effort to emulate the sound of Urei, dbx and Fairchild compressors—suggested uses are on vocals and across a whole mix. The unit has been available for some time already, but has recently gained an optional extra in the form of an A-D converter, allowing direct connection to a digital console, multitrack or mastering machine such as a DAT recorder.

The unit has a sturdy, professional feel to it, with a no-nonsense grey-painted front panel, featuring black plastic pots and switches. These all worked well, although the actual knobs felt a little cheap. There are pots for control of Input Gain (with centre detent and input clip LEDs), Threshold, Attack, Release and Output Gain. The RATIO control has six positions: soft knee at 1.5, 2, 3 and 5; hard knee at 10 and 20. Each channel has a RELAY BYPASS switch with LED, a DS switch that adds a sibilance filter side chain, and also a METER SELECT switch to display either Gain Reduction or Output Level. Additionally, a STEREO LINK switch disables some of Channel 2's controls. The vu meters are large and clear, but they have no external trim adjustment. Between them are two red LEDs which light up a couple of dBs before overload of the A-D output. This is useful as a warning and generally any serious attempt to optimise the digital level will have to be achieved using meters on the device connected to the digital output. The front panel also sensibly sports a power switch with a LED. When you switch on, there is a short delay before the relays close and connect the outputs.

The rear panel features inputs and outputs on standard XLR connectors, with side-chain send and return jacks for each channel. There

is a switch for +4dB and -10dB switching. A small panel contains the new A-D converter and there are standard sockets for SPDIF (phono), Optical EIAJ and AES-EBU (XLR) formats, along with a set of tiny DIP switches for setting format and sampling rate. These are a little inconvenient, being mounted on the back panel. However, in most setups they will be set, then left in the same position. Unfortunately, although there is a switch marked INT-EXT there is not yet a way of syncing the converter to an external clock, which may be a limitation for certain applications. The manual for the converter is somewhat preliminary, and hints that this feature may be implemented in the future. I couldn't help wondering if the R&D department are working on a D-A converter, for future inclusion of a digital input.



In use, it is possible to get fairly close to the sound of a Urei 1176 or 1178 and by setting the appropriate attack and release you can emulate something like the compression of a dbx 165. However, with no auto attack and release settings the variable characteristics of the often used dbx auto mode are not really attainable. Having said that, the overall character of the compression more closely resembles the more severe dbx than the Urei. The attack and release settings cover a wide range, and it is easy to set the release too fast giving a distorted sound. I also thought that it was somewhat rash of the manual to claim that the unit could emulate a Fairchild. When you consider that a Fairchild 670 was recently advertised for sale for £12,500 (UK), then it is

not surprising that a unit costing just over one twentieth of that does not quite have the same magic... Generally though, I found the quality of the unit to be very high, and I would be happy to use this unit for certain applications, especially bass guitar, or across a mix (depending on programme).

The manual is clear and helpful, even explaining the principles of compression for the inexperienced. The digital out option will certainly appeal to many especially at the competitive price at which it is being marketed. I would have no hesitation in recommending this as a very good value, high quality unit. ■

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Sony DPS-V77

Sony has designed an attractive unit in the versatile and powerful DPS-V77. **Dave Foister** assesses its qualities and its compromises

A COUPLE OF years ago Sony scored a quiet hit with a range of effects processors collectively known as the DPS-7 series. So elaborate and detailed were the algorithms and the programming capabilities that several models were needed to cover the full palette of effects—there was the R7 reverb, the D7 delay, the M7 modulator for pitch-based effects, and the F7 filter unit. Each went where no processor had gone before in terms of the minutiae of adjustment, and the quality was superb, but the need to buy four boxes where others squeezed the algorithms into one perhaps counted against them.

The DPS-V77 bridges the gap logically by distilling the highlights of the original range into a single unit. It adds new capabilities, and does a commendable job of improving access to the processing power.

It sometimes seems that as effects processors generally have progressed, the factor that can determine a particular model's success is how easy it is to use. The original DPS range tried hard to be friendly, but its dedicated keys and rather squidgy dial didn't quite meet

for moving user effects around to allow logical grouping.

An important addition is digital I/O (AES-EBU or SPDIF), found on a mini DIN connector requiring an optional breakout lead. All combinations of analogue and digital inputs and outputs are possible, including the simultaneous use of both inputs with simple mixing. This means, of course, that the unit can be used as a converter in either direction, with a 20-bit D-A and a 64x oversampling A-D claiming 24-bit resolution. The default sample rate using digital connections is 48kHz, and the only way to force it to 44.1kHz is by feeding it with an appropriate digital input.

The quality of the effects themselves surely remains the most important aspect, and here the DPS-V77 scores very highly indeed. Many of the reverbs positively sparkle, and the hall, church and room simulations are impressively convincing. The reverbs all appear to operate in proper stereo, where the early reflections help to localise the sound in its original spatial position while the main reverb

the challenge of harnessing the huge power of the units. Sony has clearly thought long and hard about the issue, and the V77 has a jog-shuttle wheel arrangement, a numeric keypad, six soft keys and nudge buttons to get round its clear and graphic menus, which should cover just about everyone's preferences. It also has the facility to select any six of the parameters for a given effect to be live on-screen together, which should prove extremely useful—particularly for live work.

The layout of the signal path has been greatly simplified. Every program has two independent effects blocks, each with its own associated EQ block that can be placed before or after it. The two blocks can be used in series, in parallel, or independently on the two input channels with a mixed stereo output. New to the V77 is a Morphing mode, allowing seamless transitions between effects types, and use of this means only one effect block is available at a time. A time-saving feature inherited from the earlier models is the ability to copy settings from one block to another across presets, allowing bits of existing effects to be combined with new ideas in new programs. Memory organisation is comprehensive, with 198 each of factory presets and user memories (four banks of 99 altogether), with facilities

bloom comes at you from all angles. Special effects cover the entire gamut from simple delay through complex chorus and flange algorithms to dynamic filters and outrageous pitch shifting. The morphing is quite spectacularly effective, allowing smooth changes between the most unlikely pairs of effects. The possibilities are very well represented by the factory programs, with some being so intriguing as to make you want to explore how they were done. It is to Sony's credit that the exploration is as helpfully navigated as it is, with fast intuitive access to the nuts and bolts of the effects. The borrowing of the jog and shuttle combination is inspired, as it is already familiar and gives a convenient pairing of speed and precision that would be hard to achieve any other way. This is all helped enormously by the display, with graphics and icons which are obvious where others prefer to be cryptic and a lot of information presented clearly at once. The layout of the controls reinforces this, even if some of them are inevitably on the small side.

The DPS-V77 succeeds in bringing the DPS range up to date. There can't be much that the originals could do that this can't, and it does it all so much more easily and quickly that any sacrifices in molecular level editing are undoubtedly worth making. ■

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NEW TECHNOLOGIES

Telex

NAB SAW A host of releases from Telex with the introduction of the Radiocom BTR600 2-channel encrypted digital and BTR500 2-channel UHF wireless intercom. The former has a UHF transmitting belt pack and receiving base station and is full duplex. The EDAT digital master editing and duplication system addresses the need for high speed compact cassette copies from digital sources and consists of a PCI sound card with software on a Windows 95 PC. It accepts inputs via analogue and digital and also accepts .WAV files.

CamLink II series wireless video system includes an upgrade to Telex's AutoPhase diversity system that detects and avoids multipath interference. New Audiocomp products include the SS2000 speaker, SS2000P and SS2000U speaker stations, WM1000 and WM2000 headset stations, US2000A user station and the PS2000L power supply.

The PAM100 production audio monitor is 2U-high and consists of two separate listen-only keypanels, each of which has eight assignable listen keys with an indicator and 4-character display. LCP100 and LCP20 level control accessories for the ADAM matrix intercom systems add level control on a per-channel basis.

Telex, US: +1 612 884 4051.

Equi-Tech

THE MODEL ET1R is Equi-Tech's smallest balanced AC distributor with a capacity of 1000W. Use of the units is claimed to produce noise-free video and lower error rates in digital broadcast and recording.

The device has ten outlets and can handle 8.3A and has EMI-RFI filtering and super-isolator options.

Equi-Tech, US: +1 541 597 4448.

E-mail: mg@equitech.com

HHB CD-R

HAVING GONE INTO manufacture with DAT machines and recording media, HHB has introduced a CD-R machine for around £1299 (UK). Rackmounting, the CD800 has a variety of analogue I-Os, AES/EBU digital input, and optical and coaxial I-Os. The device has an on-board



sample rate converter with automatic index conversion from DAT. HHB has also established a Canadian office headed by Dave Dysart

HHB UK: +44 181 962 5000.

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OptoMedia Kestrel

Pro-audio was kind to CD-R; now it is CD-R's turn to be kind to pro-audio. **Tim Frost** test drives a duplicator that's relevant to studios

THE PRO-AUDIO business more or less kept CD-R going when nobody else could think of a serious use for it. Now as drive prices drop through the floor, the computer industry is returning the favour by giving studios and broadcasters low-cost blank CD media and a range of CD duplicators that can create half a dozen copies in a couple of hours.

Several small specialist system integrators have started selecting choice CD-ROM and CD-R drives and adding dedicated micro-processor control to create stand-alone CD duplication systems. Unlike PC-based writers, these need to be connected to nothing more complex than the mains socket and require no more technical expertise to operate than knowing which way up to put in a CD.

UK-based OptoMedia have come up with a range of CD copiers to fit this definition. There are two OptoMedia series relevant to the pro-audio user: the entry-level manual-loading Falcon series and the Kestrel, which includes a robotically controlled 12-disc autoloader.

OptoMedia take what they term as a 'zero-button' approach; the essential copying functions are controlled by just two buttons using an LCD to keep you informed to what's going on.

In simple mechanical terms, the process of copying a dozen discs means putting blanks into caddies and loading them into the Kestrel's 12-slot magazine. The master, created on your existing Mac or PC gold disc mastering systems, goes in the tray-loading CD-ROM drive at the top of the unit. The number of copies you want are keyed in and off it goes; four hours later you have a dozen copies that took only a couple of minutes effort to generate.

The simplicity of operation happens because of a lot of firmware-controlled checking inside the copier. When the master is loaded, the firmware first checks what sort of data the CD contains. This could be CD-DA, or any of the ten variants of CD format that are currently in use. Having established the content type, Kestrel copies a data image of the CD onto its internal hard disk, checking first that it conforms fully to specification. It will automatically correct problems generated by some of the older versions of not-quite-conforming CD mastering software. Error correction is also done at the read stage, creating a clean, corrected CD image on the hard disk. The CD-ROM drive reads at up to 12x real time, so the

time overhead to go into this intermediate hard-disk stage is minimal—a five or six minutes for a full CD. Having said that, most audio users would prefer not to try and read a disc quite that fast, so the ROM drive can be run at 4x instead. At 4x it takes around 15 minutes to transfer the disc's content to hard-disk and you can use some of that time to load the CD magazine with blank discs.

The Kestrel uses disc caddies which are loaded into a 12-slot magazine that in turn slots into the unit's disc bay. Several magazines can be preloaded with blanks so it only takes a few seconds to pull out a dozen finished discs and load in another 12 blanks ready for copying. Once loaded into the Kestrel, a 10mm lockable Perspex door secures the magazine so the copies remain secure.

In Copy mode, the robotics selects the first blank disc, loads it into the internal CD-R drive and starts copying at 4x speed, and the data transfer throughout the system is through dedicated SCSI channels. With no PC or Mac operating system to get in the way, there is no opportunity for buffer under-run—where the data flow to the CD writer is terminally interrupted, screwing up the copy entirely.

When the disc is copied, the robotics returns it to its place in the magazine and extracts the next blank and so on.

There is a separate mode for copying multi-disc sets and plenty of options to alter the system's setup. Track-at-once copying is available so that compilations of individual tracks can be loaded onto the hard-disk master from a number of separate CD sources.

On the critical question of CD media, OptoMedia sticks to following the CD-R drive (Yamaha) manufacturer's recommendations, so it's Yamaha or TDK. The 'wrong' media not only means more failures, but also poorer-sounding copies. Discussing the sound of CD copies may take us into as yet uncharted territory, however the weight of evidence infers that despite being digitally identical, CD-R copies are far from being perfect audio clones. While not claiming to have taken an audiophile approach, OptoMedia is audio-aware.

Although it looks and acts more like an IT department system than a studio recorder, the Kestrel is a convenient and simple to use solution to heavy duty multiple CD-R copying. And if automation isn't needed, then the smaller manual loading Falcon works in the same way but at around half the cost of the £7500 (UK) Kestrel. ■



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NEW TECHNOLOGIES

Neutrik patch

NEUTRIK HAS INTRODUCED a 1/4-inch stereo patch panel with 48 front and rear connectors. The NYS-SPP has PCBs connecting the front and rear jacks that are securely mounted and jacks are colour



coded grey and black to give indication of normalised or non-normalised selection which is achieved by rotating the PCB through 180 degrees.

Neutrik, Liechtenstein: +4 75 2372424

Amek STARgate

AMEK HAS RELEASED a public domain protocol called STARgate that permits integration of any brand DAW to its DMS digital console.

The general command sets include Sync-Lock machine control; TimeTransfer for combining timelines from the DMS and DAW; AutoEvent channel segment information interchange between the DAW and the DMS; and RemoteSave single file saving facility for complete project storage of DAW and DMS settings and automation in either one.

The Rupert Neve-designed 9098 dual mic amp and 9098 compressor-limiter are described as "realistically priced" dual-channel units. The former has separate gain, trim, phantom power, phase reverse, mute and high-pass filter and an 8-segment bargraph meter plus stereo AB and MS circuitry with an width control. Each channel also has a DI input.

The compressor features 'virtual class-A' circuitry and follows the designer's philosophy developed in the 2254 device of the late 1960s. It adds an Ambience mode which is claimed to remove or reduce excessive ambience and unwanted reverberation from signals. The compressor section has variable ratio (up to 20:1), threshold, output gain make-up, attack and release times, plus autorelease and hard/soft knee selection. The limiter section has threshold adjustable from 0dB to +23dB, variable release time and a switch selected fast attack mode. Vu meters display gain reduction, input, output and sidechain signals.

Amek, UK: +44 161 834 6747.

E-mail: amek@console-city.com

Production metering

CREATIVE MASTERING HAS introduced the APM96 audio production meter which combines peak level and phase correlation meters and a 1/3rd octave spectrum analyser with a choice of analogue and digital inputs. Functions include peak hold and audio snapshot memories.

Creative Mastering, Austria

Tel: +43 1 408 6276.

E-mail: c.mang@creative-mastering.com

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The range of Pythagoras Audio Software currently supports 8 separate audio paths. It can access over 30 separate processor types and allows you to construct chains of processors in each channel.

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SPL Tube Vitaliser

Known for its unorthodox approach to signal-processing, SPL now uses valves. **George Shilling** enters the German twilight zone

THE TUBE VITALIZER looks impressive. With a nod towards vintage valve equipment, it comes inside a workman-like 2U steel box, with a bare metal front panel sporting plenty of black knobs, and three grilles protecting its glowing tubes—actually, most of the glow comes from the lamps illuminating the little vu meters. Below these, are two old-fashioned black knobs labelled ATTENUATOR. Buttons light up red when pressed in, apart from a couple of metal toggles, and there are blue LEDs to indicate high and low-frequency compression.

When you switch on, your attention is drawn to two LEDs, proudly labelled TUBE STATUS, with the WARM UP one glowing for 45 seconds before a relay kicks the unit into Active mode. During this 45 second period the circuitry slowly builds up to 250V to increase the life of the valves. This is sensible, but I am not sure that the LEDs are really necessary.

The back panel features XLR connectors and also plastic balanced jacks for inputs and outputs. The unit runs at +6dB instead of the



more usual +4dB. Jacks are also set to +6dB operation, unfortunately without a switch to enable -10dB operation.

The PROCESS LEVEL control works like the LOUDNESS button on your hi-fi. Above a frequency set with the HIGH-MID FREQUENCY control (22kHz down to 1kHz) it applies a shelving EQ boost. Simultaneously there is a low-frequency boost centred at approximately 50Hz, and a mid cut centred at about 1.5kHz. The manual states that the process achieves mid damping by 'amplitude-controlled phase shifting', and claims that this improves the perception of loudness, clarity and bass punch. It sounded little different from conventional EQ in practice. There is some explanation of Fletcher-Munson curves in the manual, which then makes the astonishing claim that 'The Tube Vitalizer alters the frequency spectrum in such a way that the balance is maintained between all frequency ranges even at varying monitor volumes'. This is hard to swallow, as most of you will know that Fletcher-Munson curves show the ear perceiving less HF and LF as volume decreases.

There is a DRIVE knob to control the intensity of the processing which adds a warmth and subtle distortion when increased.

The BASS control is labelled SOFT to the left and TIGHT to the right. Turning the knob in either direction should intensify the bass

sound, but this is not what I perceived. TIGHT seemed to boost the low end, but SOFT seemed to decrease bass content of the signal. BASS COMP compresses only the low frequency content of the signal. There is an LC filter that adds a passive coil-condenser filter to the resistor-condenser filter network. There is some enrichment of the sound with this added, mid-range as well as low frequencies seemingly affected.

Unlike some 'exciters' the Tube Vitalizer's High EQ and harmonic filters do not add distortions to the original signal. So what do they do? Well, SPL doesn't say exactly, but claims that the processor extracts all the information needed from the original signal 'by influencing the phase relationship in an intelligent fashion, the filtering emphasises the perception of high and harmonical frequencies'.

The INTENSITY knob adds HF gain, and the HF control apparently sets the shelving frequency. The manual claims that this section picks out particular frequencies, but the accompanying graph (tracing response with INTENSITY and FREQUENCY both set at 10) shows a plain 4dB shelf boost from about 4kHz upwards, or 2kHz when the adjacent LC filter switch is pressed. The third knob in this section is labelled HIGH COMP and compresses only the high frequencies. It is possible to brighten the signal and then compensate with this knob, giving little audible change except for some subtle compression.

Pressing ACTIVATE TUBES switches the output stage over from solid-state circuitry. In this mode you can use the attenuator knobs to compensate for any gain during processing. The valves add a pleasant warmth and depth to the signal. Each channel has a toggle switch labelled ATEN LIMIT. The manual states that in Limit mode all signals above the 0dB mark will be softly limited. Audibly, signals below this point are affected by distortion, and the sound is not dissimilar to a guitar overdrive pedal. Despite the switch labelling, the attenuate knobs still attenuate.

With a piece of equipment such as this you need to hear it yourself to evaluate whether you like it. I could imagine using it on particular instruments in a mix, or when recording, to bring them forward. It usefully adds a bit of sparkle to a part in need of something special, but I am not sure I would want to use it across an entire mix: amazingly the manual itself admits that the brain soon acclimatizes to changes of timbre, which surely defeats the object. The manual is full of pseudo-scientific claims and techno-babble but as the unit is of German origin, perhaps it loses something in the translation. Not essential, but for something a bit different, on occasion this might be your box. ■

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NEW TECHNOLOGIES

Hafler

HAFLE'S P1000 1U-HIGH amp is based on Transconductance Active Nodal Amplifier topology which operates the output stage with its full voltage gain and allows the



input stage to operate from a low voltage regulated supply. The signal is then shifted up in level to the high voltage section by the driver stage which forms an active node at ultrasonic frequencies. An additional system computes the allowable device current for the device voltage and clamps the gate drive when the actual current exceeds this value.

Hafler, US. Tel: +1 602 9673565
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SMP from AEA

AUDIO ENGINEERING Associates has two versions of its Stereo Microphone Positioner which provide secure and repeatable positioning of mic arrays. Users include Abbey



Road Studios, Steve Albini and Tony Faulkner.

The company's SCM2 stereo confidence monitor and MS38 Mk.II stereo processor are tools for evaluating and correcting mono, stereo and surround stereo compatibility problems and AEA also produces a compact battery-powered LD2020 'Winky Blinky' stereo scope and the MS38 Lite stereo headphone amp and M-S decoder.

AEA, US. Tel: +1 818 798 9128
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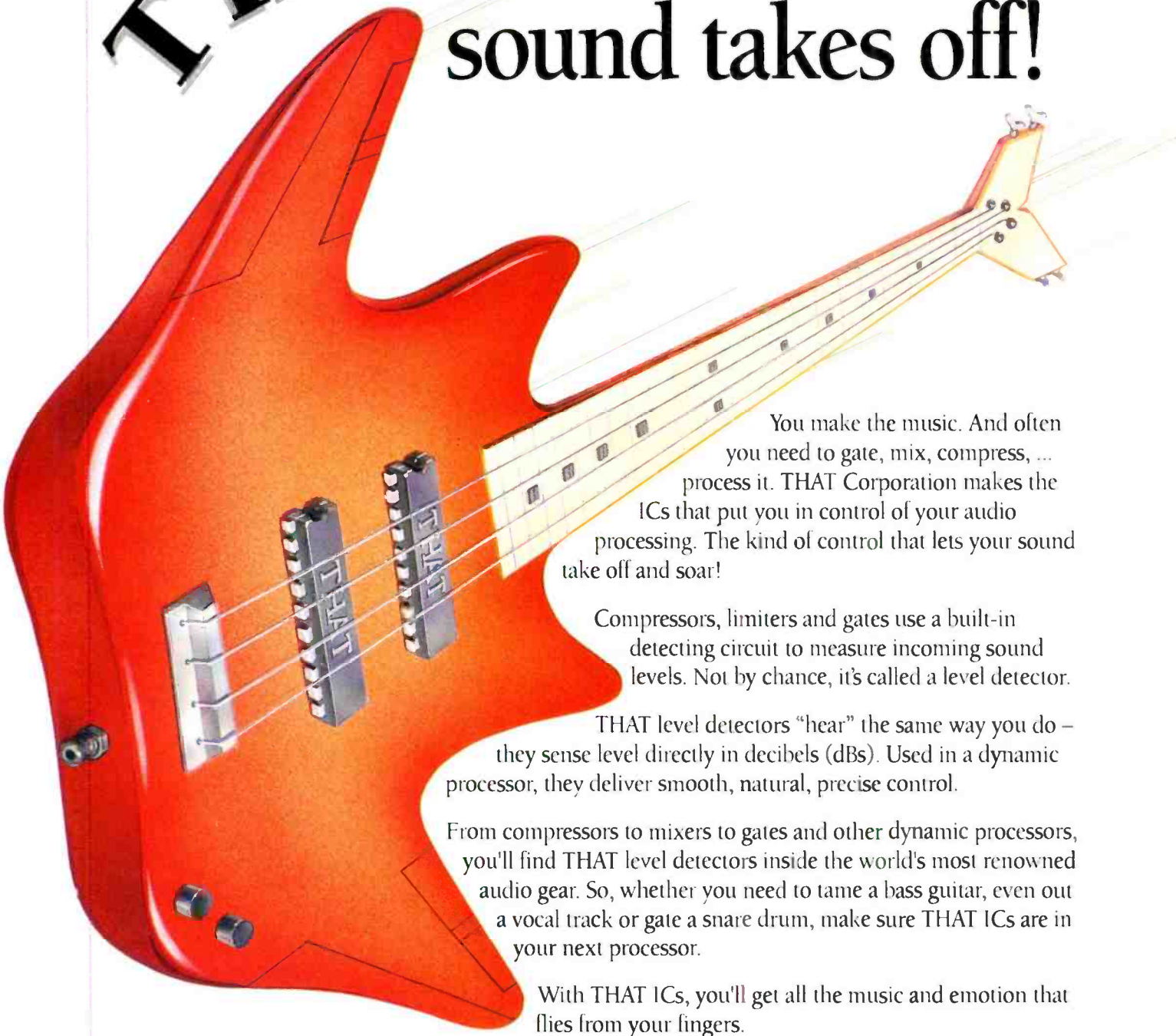
Omnya

THE AM40871 IS a low-cost automixer-pre-amp aimed at small systems with up to seven mics and three aux line inputs. It can drive one or more power amps. Inputs include individual phantom power, two insert connectors for EQ and feedback suppressers, and circuits that count and limit the number of open mics to keep output level constant.

The AM40881 is a modular automixer with eight mic channels which opens engaged mic channels only and keeps the others closed while keeping the mixer's output level at its preset value when the number of open mic channels changes.

Quattroitalia, Italy. Tel: +39 49 8806366.

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Nightpro EQ3D

NTI has fused the features of the EQ3 and PreQ3 equalisers in one dual-channel device. **Zenon Schoepe** finds the new dawn of NTI

NTI, THE AMERICAN manufacturer of the original Air Band EQ3 equaliser, has re-entered the fray. The new baby is a dual-channel EQ that draws heavily on the earlier unit and combines its principles with some of the facilities offered on the company's PreQ3 mic preamp. The latter had the distinction of offering five switchable 'Air Band', or VariBand, frequencies in addition to a pot giving around 12.5dB of boost. Air Band is the title NTI gives to this high-frequency shelving EQ and VariBand is what it calls a switchable frequency Air Band.

How the feature sets of these two units are combined in the EQ3D is interesting—but first a recap. The EQ3 is a dual-channel 6-band EQ with four extremely broad peaking bands, a reciprocal shelf and the aforementioned Air Band centred at around 10kHz which is boost only. The EQ3D, on the other hand, is a dual-channel



6-band EQ made up from the aforementioned VariBand boost only circuit in the PreQ3 and the five lower circa ± 15 dB bands from the EQ3.

The manufacturer makes much of the fact that its circuitry works by summing band passes which in the EQ3D are centred at 10Hz, 40Hz, 160Hz, 650Hz and 2.5kHz while the VariBand is switchable between off, 2.5, 5, 10, 20, and 40kHz. Most importantly, the EQ3D is substantially more affordable than NTI gear has been before.

Each of the five bands is available on a pot while the VariBand gets a boost and a switched rotary. You get nothing else apart from individual channel bypass switches, an overload LED per channel and the knowledge that each band's width is around 2.5 octaves. Connections are on XLRs and internally jumpered for unbalanced or balanced operation.

Like the PreQ3, the new unit is finished in a fetching shade of metallic light blue and the general build and feel quality is good. The five ordinary band pots are not centre detented which might have been a problem on ordinary EQs but the EQ3D is one of those units that really needs to be able to deliver the slightest of nudges either side of 12 noon because it can make a difference.

Operation of this box is quite unlike that of any other typical EQ because it has none of the parametric controls that are commonly expected on a device that purports to shape sound. You are stuck with what you're given and expected to tailor by interacting hands. This is a little easier than it would at first seem and is driven by most people's acknowledgement of the concept that 'broad is best and sharp is generally nasty' when it comes to EQ.

The breadth of the bands and the sort of mother of all broad bands that can be created by combining boosts adds up to smooth and flattering responses. This is not an EQ that can be used with surgical precision as it's just not fine enough to doctor little segments even though it can restrain boominess or peaky harshness, what it is best at is contouring in the general sense.

The quoted centre frequencies are only part of the picture because they are pretty meaningless once you've wound on a couple of dBs and made the bell pronounced as the area of influence is large. This accounts for the relatively low end concentration of the centre frequencies which in practice are actually quite well spread. The 10Hz, or Sub band as NTI likes to call it, functions more as a type of roll-off or roll-on filter and performs at its best when winding off super-low-end clutter or adding wallop to clean and controlled feeds. The remaining four bands take care of the rest of the spectrum with the last

three of these having the most apparent influence on overall clarity and definition—the 40Hz control seems specially able and tuned to unseat woofers. This last comment is not delivered lightly as the EQ3D has a phenomenal ability to pile on gain and you'll not get many opportunities to run bands at anywhere near flat out but that's part of the charm—the permutations available from combining degrees of lift and cut are immense.

The VariBand deserves a few words: the 40kHz, and even the 20kHz, settings may seem a little far fetched as operating frequencies but the nature of the band's long and slow slope mean that things are caused to happen further down in old-man's-ears territory. I'll be the first to admit that the former only begins to register at its most extreme boost. Both require damn good clean material to really make a difference with. 10kHz and 5kHz are extremely usable 'crystal layer' creators while 2.5kHz requires a bit of respect as it can take your head off as well as build in rather classy presence. However, it's the channel's ability to work as a whole that is most lasting and the way the VariBand's complements and finishes off the rest of the EQ. It's a surprisingly complete equaliser.

I have to admit to being significantly more impressed with the EQ3D than I was with the original EQ3, but the not inconsiderable cost of the latter probably has much to do with this. It's actually a very interesting

equaliser that is bound to be unlike anything else you already have. Excellent for mix sweetening but a good box to have around alongside your other outboard EQ when tracking or just jobbing. Try one. ■

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NEW TECHNOLOGIES

More from Denon

Denon Professional has introduced a new CD player and MiniDisc player-recorder both of which include large internally illuminated operation buttons, comprehensive synchronisation, SMPTE and a jog/shuttle wheel.



MD

The DN-M1050R MiniDisc features 'undo' edit which undoes two editing operations, front panel keyboard socket (PS2), 20 'hot starts' option, varipitch, sample rate converter option, RS232C-422A and parallel ports, and Sony protocol and word sync control options. It also has ATRAC version 4.0 and auto level record start which can be tagged on the end of an incoming line feed for syndicated programmes.



CD

Features of the DN-C680 CD player include instant start of 0.01 seconds, index search, bargraph display of playout position, SRC option, programme play, enhanced display, varipitch, balanced-unbalanced digital and analogue outputs, serial and parallel ports, Sony protocol and word sync control options.

Denon, UK. Tel: +44 1753 888447

Mix on the move

Professional Sound Corporation's M8 portable audio mixer has been specifically designed for feature film and other types of location sound recording.

Features include eight inputs, condenser microphone powering, 3-band parametric EQ, high pass filters, fully adjustable compressor-limiters, prefade listen, individual channel line output and insert points, complete channel assignment and panning controls to the four main and two auxiliary outputs.

The output section contains four main outputs, two auxes, four selectable headphone feeds, reference oscillator, bargraph meters, built-in stereo monitor speakers and communications monitoring.

PSC, US. Tel: +1 805 295 9395

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The Compressor

The tradition · The pedigree

System 9098

Dual Compressor/Limiter

by Rupert Neve the Designer



The addition of a new Compressor/Limiter to my SYSTEM 9098 product family is justified by the continuing popularity of the famous old 2254 devices I designed in the late 1960s. More than 25 years later, their performance undeniably still brings benefits to engineers and producers seeking inconspicuous control over the dynamic range of microphone signals. Just as importantly, they are used today in digital recording to manage critical levels, to preclude the effects of hard, unforgiving clipping and to impart warmth.

In those days, the Compressor/Limiter had to be almost all things to all men. Controls had to be accurately calibrated for the broadcaster and have the right subjective 'feel' for the music engineer. Attack and decay times, the rate of change of slope, the order of harmonics generated by the non-linear transfer characteristic etc. were arrived at empirically after a lot of listening with golden-eared people. The result was a Compressor/Limiter, the 2254 and its later derivatives, which sounded right and over the years achieved an amazing reputation.

The same principles have been applied to the new SYSTEM 9098 Compressor-Limiter. Considerable advances have been made in technology and I am now able to provide a much more flexible device which retains all of the character and musicality of the original design while incorporating some exciting new features.

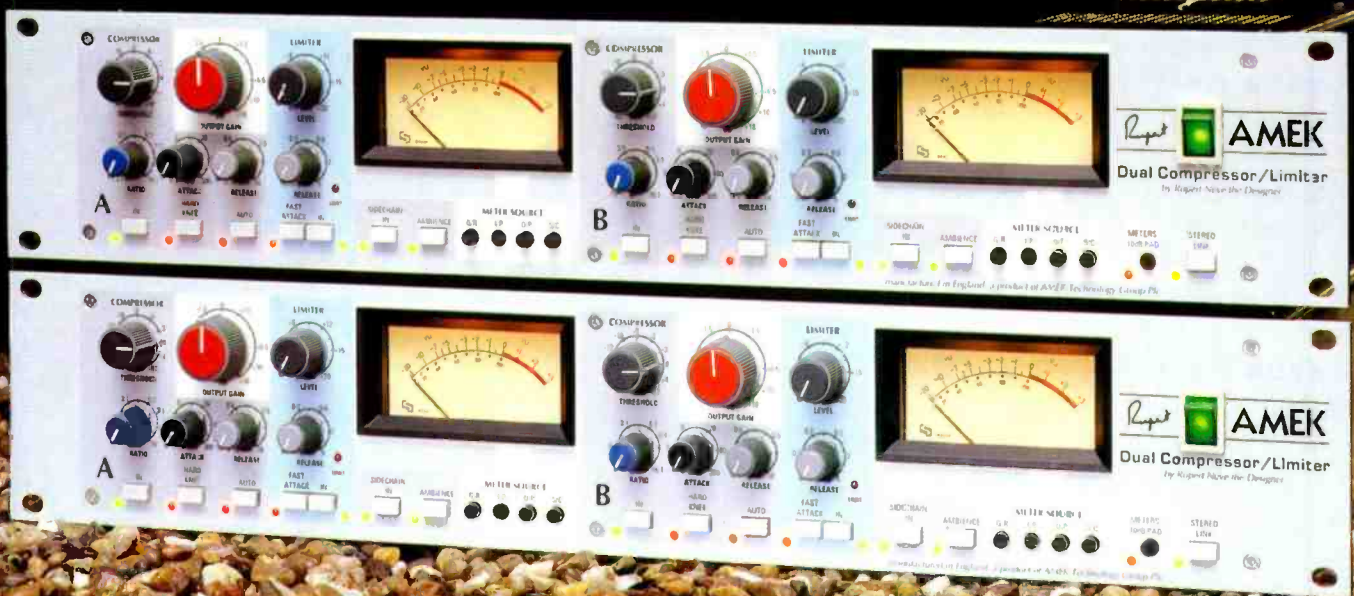
Ratio, Threshold, Attack and Release are familiar controls with recognisable ancestry but an important new feature called Ambience has been introduced.

Operating the Ambience switch does not affect signals above the threshold but reduces or mutes signals below the threshold level. The effect is rather like a Gate but is much more subtle. Not only steady background noise but fluctuating ambience and apparent reverberation time can be reduced at will with the Gain control. For example unwanted environmental sound can be re-balanced, or even eliminated, from speech recorded out of doors. The Ambience control will also regulate reverberation - for example, a large reverberant studio can be made to sound like a small speech booth.

The 9098 Compressor-Limiter has a totally analogue signal path which employs transformers at both the input and the output. For the highest possible performance, input and output interfaces must be insensitive to anything other than the signal we want to receive - or there is little point in striving for excellence in the unit itself.

The heart of a Limiter or Compressor is the gain controlling device. The original 2254 used a diode bridge in a classic balanced ring modulator configuration. A very similar technique is used in the 9098 Compressor/Limiter except that semiconductor devices and amplifiers have greatly improved in the last 30 years. For example the original 2254 design had a noise floor of about -55 dBu. Noise performance of the 9098 unit is 35 to 40 dB better.

I believe that the new SYSTEM 9098 Compressor-Limiter continues the rich heritage of earlier designs and its flexibility and extremely high standard of performance will find many satisfied owners in all areas of audio production, whether recording, post-production, mastering or live performance.



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Marantz CDR620 CD-R

Recordable CD is coming of age. **Zenon Schoepe** investigates a CD-R machine which counts its extras as standard

ASIDE FROM live performance, nothing focuses the mind quite so acutely as working directly to CD-R. In these times of undo, repass, reconstitution and recall, we live with the comfort of knowing that pretty much anything can be repaired or fixed at any time other than the present. In such a culture, nothing hoists the seat of the pants up as hard and as high in order to fly as the single pass of CD-R.

It's a reconnection to a primeval instinct that was there in huge quantities in our ancestors as they coped with the pressures of recording direct to disc. Evolution has struggled to conquer this adrenaline rush and mankind has invested the greater proportion of its energies in attempting to swing the odds in the favour of the fallible human complete with concentration lapses and a tendency towards digital indexterity when under pressure.

Yes, CD-R has a lot going for it if you want to inject a little excitement into your life. The cost of the wasted media is no longer the issue because prices have dropped substantially, it

UPC or EAN codes can be entered in addition to ISRC and this machine also has a SCSI II interface for connecting it directly to a computer running relevant software for double-speed recording of CD-DA, CD-ROM(XA), CD-Bridge Multisession, CD-i, Video-CD and Photo-CD in track at once, disc at once and multisession methods. The specifics for the setup to handle this is governed by DIP switches. The same interface additionally permits double-speed copying between two CDR620s. Finally, the machine has a built-in delay which allows the audio to be incrementally delayed (by up to 4000ms) relative to the subcode.

Connector-wise we have balanced XLR I-Os, the aforementioned two type of digital I-O and, significantly, an interface to the RC620 remote. Although the CDR620 can operate entirely from its front panel there is more pleasure and convenience to be gleaned when using the wired controller. There's also a touch more functionality.

Aside from traditional transport controls there's bidirectional fast search, track increment search plus track increment and index increment keys used for entering these values on the fly while recording. The remote benefits from a keypad—used for entering disc codes—that also permits direct track access. Metering, is more elaborate than the main unit's and features peak hold and remaining available headroom displays.

The main attribute of any CD-R machine is that it must be as reassuring to use as possible given the gravity and permanence of mistakes made during the recording procedure. Without doubt the features presented on the CDR620 smooth this process and make the machine confidence inspiring because with a bit of careful forward planning it looks after itself.

The sample-rate converter is a real bonus and can function as an interface box while the audio delay can give that little bit of extra time needed when attempting manually to enter track increments tightly. I'll admit that I'm not a fan of auto track level incrementing or for that matter digital fade in and outs but I'm sure that they have their place and the CDR620 can perform them. Importantly, record mute time is adjustable from 2s–5s in 0.5s intervals.

There's not very much more to be said as all in all the CDR620 gives back what is put in to it and the whole process is remarkably painless with a 2-button press committing the finalise procedure. It's a nice machine that sounds good (it has a particularly sweet headphones circuit), is nicely put together and worked faultlessly throughout some fairly heavy use. It's an extremely pleasant piece of gear to use. ■



is just the principle of cocking-up badly on CD-R that is so offensive. You burn a CD because it's a universally playable high-quality medium that, we are assured, is long-term and archivable. When you mess up at 65 minutes those benefits still apply leaving zeros and ones for future generations, we are told, to mock. And can you bring yourself to trash it when the disc is so pretty? The trick is to pre-master but try recording to it live if you need a thrill.

Perhaps the biggest question concerns the price of hardware for while media prices are still dropping, standalone hardware costs have not followed. Can we ever expect this to change?

Marantz was in at the very beginning with standalone CD-Rs although the CDR620 addresses many of the limitations of the early machines and does away with the sort of ancillary boxes and gadgetry once required to roll your own. Most notably, it has a built in sample-rate converter which converts any incoming digital source on SPDIF or AES-EBU to 44.1kHz to disc or via the AES-EBU output in a standby mode. The box will also convert DAT, CD, DCC and MD indexes in to automatic CD increments—something that once required an add-on on early machines and was regarded as a big deal. You can also set increments manually or have them triggered by level.

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NEW TECHNOLOGIES

Symetrix

AN UPGRADE OF the 528E voice processor, the 628 digital voice processor combines a mic preamp, 20-bit A-D converter, de-esser, downward expander-gate, compressor/limiter and parametric EQ in 1U. Users can store 117 presets and access 11 factory presets. AES-EBU or SPDIF outputs are switch selectable.



528E

The company has also released the 562E expander-gate which employs AutoWindowing as a means of better controlling the envelope parameters. It also has high and low key filters and a side chain feature that moves the statistical energy centre of the gated signal forward to eliminate clicks that can be created with ultra-fast attack times.

In a nod towards retroism, Symetrix has also announced the 606 delay-fx machine with hard controls for mix, time, feedback



606

and modulation rate for two separate delay sections that can be run in dual mono, stereo or series modes. There's even filtering to emulate tape echoes. There are 99 user programs and 10 factory patches with MIDI dumping and parameter control.

Symetrix, US. Tel: +1 206 7873222.
Web: <http://www.symetrixaudio.com>

GP SoundPals

FIVE NEW PRODUCTS in the digital, modular SoundPals range are a no-frills, 4-channel mixer (DMIX-41), a 2-channel fader (DFADE-2), 20-bit D-A and A-D converters (DAC-20 and ADC-20), and a 20-bit mic preamp (DMIC-20) with a built-in 20-bit A-D. The products will be priced from \$299 to \$999.

Several SoundPals can be configured to perform a variety of functions and are claimed to provide affordable processing to those who can forego a console-based interface. Shipping is expected in the third quarter this year.

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

Merging Technologies

The AIU8 8-channel A-D/D-A converter is capable of 16–24bit digital audio and is designed to function with Merging Technologies' Pyramix digital audio workstations and ADAT tape machines via optical interconnection. The company has also announced a link with Cedar Audio which will allow it to incorporate a version of Cedar De-hiss into Pyramix.

Merging Europe. Tel: +41 21 931 5011.
Web: <http://www.merging.com>

Others are proud of their many buttons...

... on the On-Air 2000 you can get by with three keys and one fader per channel unit.

Studer On-Air 2000: This is the name of the digital audio mixer for broadcast applications that features a completely new, simple, and intuitive user interface based on the "Touch 'n Action" concept (pat. pend.):

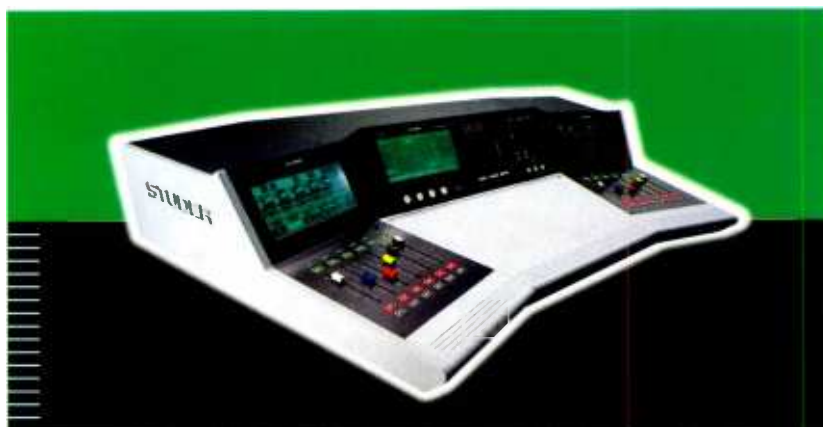
■ The most important settings of each input channel can be seen at a glance on the screen. Only three keys (On, Off and PFL) and one fader are needed.



The modular mixing console features 6, 12, 18 or 24 input channels (each assignable to 2 sources)



On-Air 2000 offers the convenience of central operation as well as a synoptic status overview of all channels.



■ Simply touch the corresponding area of the screen with your finger - and you can process all settings on the central control monitor and save them either as global snapshots or individual Mic settings (integrated PCMCIA slot!).

■ The four incremental encoders for setting the parameters have a tactile feedback: the stops and detent points are set individually, depending on the function area. The ergonomic convenience of an analog mixing console is now surpassed by the digital technology!

On-Air 2000: The mixing console for state-of-the-art broadcast automation with DJ mode. Sounds interesting? Please do not hesitate to contact us! ■



Touch 'n Action also means: Quick access to all functions without navigation through complex menu trees.



Incremental encoders with software-controlled stops and detent points optimize the operating convenience.



STUDER

PROFESSIONAL AUDIO EQUIPMENT

H A Harman International Company

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<http://www.studer.ch/studer>

Oktava MK319 microphone

The Russian invasion continues. **Dave Foister** reports on his experiences with the follow up to the memorable Russian MK219.

OKTAVA'S SUCCESS is a heartening reassurance that this business will still buy things because they are good value rather than because they are the flavour of the month. The rather odd Russian microphones came quietly into the West with a ludicrously low price tag, matched perhaps by their appearance and finish but certainly not by their performance. Now the most familiar, the Dalek-like MK219, has been followed by a new model, the MK319, still a large-diaphragm side-fire condenser but physically very different.

One could be charitable and suppose that the bizarre appearance of the MK219 was a brilliant marketing ploy to get the microphone noticed, but it seems far more likely that it was dictated by Russian aesthetics and available manufacturing techniques. The new model is almost as remarkable, and retains the impression that it was designed and built decades ago, perhaps even under the hardships of wartime shortages. Its black crackle finish is reminiscent of an early box Brownie camera, or the kind of equipment you used to find in an optician's. Its shape is far more conventional and classically styled, however, being more or less cylindrical with a big flat area for the switches and a domed top.

The kit as supplied to me was remarkably comprehensive, packaged neatly in a black plastic carrying case - for once the microphone looks smarter than its box. A swivelling stand mount is attached to the base of the body with a screw-on collar, and can be removed in favour of a cat's-cradle mount of the type supplied with similar-sized BPM and Rode models. Mechanically it all seems pretty solid, and the built-in stand mount provides all the positioning flexibility you could want together with a good enough clamp to support the weight in whatever attitude it ends up in. Best of all, in place of the usual foam sock a proper separate two-layer wind-screen is provided, complete with stand clamp and goose-neck to hold it in place.

Since the polar pattern is fixed at cardioid, there are only two switches on the body, one for LF cut and the other for a 10dB pad. Some manufacturers seem to think such things should be virtually tamper proof: many's the happy hour I've spent trying to find a suitable implement to switch a pad in with a lever that makes the average DIP switch look user-friendly. Not so Oktava - these are

big slide switches arranged so that the sliding bit reveals the current state of the switch, engraved in gold to Oktava's usual standard. Fortunately the Russian for 10dB is recognisable as being 10dB.

The original Russian manual is supplied with the MK319, and is a fascinating document. It looks as though it's printed on some old thermal fax paper that somebody found screwed up in a bin, but it does include complete circuit diagrams and an individual frequency response plot glued in at the back. This is completely unlabelled, but can be assumed to show the on-axis response with and without the bass cut, and the response at

180 degrees. Both are reasonably presentable, but without a scale it's hard to be sure; in any case, they could not of course be a substitute for listening to the microphone.

Which shows that, surprise surprise, Oktava has done it again. Forget the appearance, the finish, the army surplus image; this is an extremely capable microphone that can hold its head up in the

company of familiar favourites. It has a full and open sound, with a trace of presence lift which is small enough to be subtly useful without becoming obtrusive. An interesting test was a solo cello, an instrument which can be very revealing of microphone problems. Any hint of hardness can reduce the warmest of cellos to a scratchy grating sound, and putting the depth across comfortably is more than some microphones can manage. The Oktava presented the instrument very well indeed, suffering from neither of these difficulties and delivering a very pleasing and natural representation of the acoustic sound in the studio. This is undoubtedly the hallmark of a very good all-rounder, and it is hard to envisage many circumstances in which the MK319 would feel less than comfortable. The fact that it is a fixed cardioid will be a restriction from time to time, but even that it does well; the rear pickup is impressively small, with a reasonably uncoloured response which makes what little spill there is less of a problem than it would otherwise be.

Oktava deserves to do very well with the MK319. The novelty value of the Cyrillic characters and the incomprehensible manuals is wearing off, and may be an obstacle to wider acceptance, but it shouldn't be; it's the performance that counts, and underneath it all the MK319 is a star performer. ■



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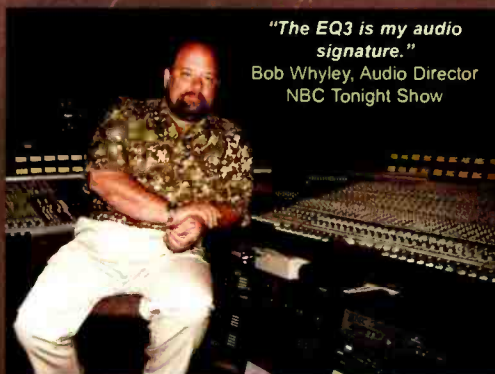
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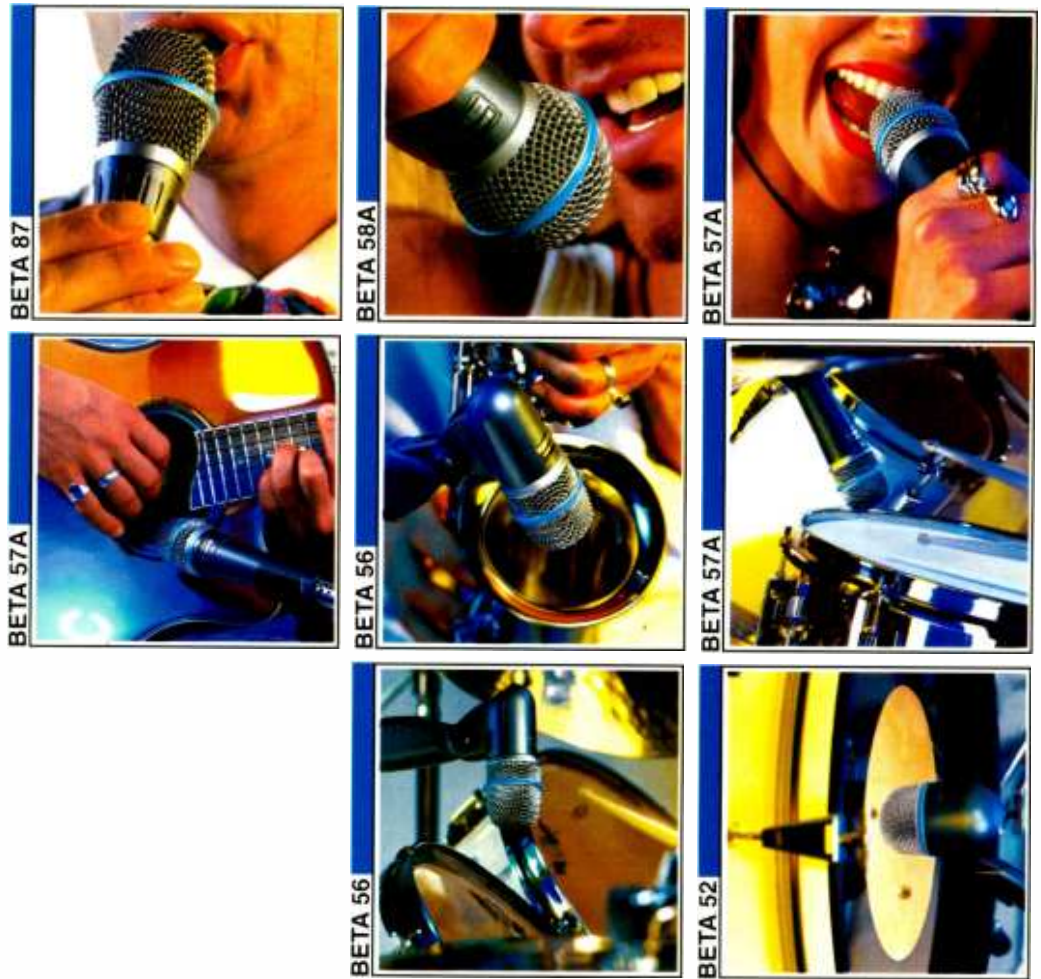
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Dynamic dealing

They may not be as glamorous or as expensive as exotic studio condensers, but there's no disputing the importance of the role of dynamic mics both on stage and in the professional studio.

Dave Foister presents an up-to-date roundup of worthy dynamic microphone

HOWEVER much condenser microphone technology develops, however pristine the quality becomes, however much money we're prepared to spend on it, there will always be a place in the recording or broadcast studio for the dynamic microphone. This roundup looks at microphones from major and minor players, old hands and new ones, aimed both at the studio and at the live performance market. Before anyone questions the relevance of a PA mic in the studio, remember the original function of the ubiquitous SM57. Its attributes made it ideal for certain jobs, and similarly-targeted dynamics should therefore be similarly suitable for those jobs.

All these microphones share certain common dynamic characteristics. All are mechanically robust; all can handle high SPLs; all are extremely quiet; all are relatively inexpensive. The surprise is the variety on offer, and



Audio Technica ATM61HE

how much specialisation is possible within a relatively crude and dated technology. It's easy to assume that matching a dynamic to a job is a question of identifying its faults and finding those things that benefit from them, but many of the microphones under consideration here show that those faults need not be inherent in the technology and that flexible tailoring may be a matter of careful design rather than default.

Some general comments find me on old hobby horses; too many stand mounts, as supplied, were not up to supporting the weight of their microphones, and too many American models had no adaptors for European stand threads. For the sake of a few cents the microphone could be useable right out of the box anywhere in the world, without the aggravation of digging an adaptor out of the junk cupboard, and those of us this side of the pond would feel we mattered as much as the home market.

Grumbles aside, listening to this many microphones is an illuminating experience, showing why certain models verge on the legendary and just what some of the others have

to offer. I used a C114 as a central reference, not because I expected the dynamics to match it but because it ought to represent a benchmark against which to judge the deviations from flat shown by the review samples. To my surprise, some come much closer than I would have anticipated.

AKG has arguably the largest range of microphones in production of any manufacturer. It covers the whole gamut from budget beginners' mics to top-end studio specialists, and includes an unusually wide selection of dynamic models. It is sufficiently long-established to have inevitably produced its own crop of standards, of which the D12 was a particularly good example. Its successor, the D112, quickly acquired the same status in its intended role of bass drum microphone, but with a difference: the Egg's frequency response is that little bit more extended than that of its predecessor, giving it a broader palette of applications, without sacrificing the full bass and mid rise that won it the job in the first place.

More of a surprise is the D230, a familiar sight on TV, but not something I'd tried before. This is a general-purpose microphone with particular attributes for reporting work; its long grey body is intended to be unobtrusive when used in shot for interviews, but its performance is nowhere near as anonymous. For a start it's one of the very few omnidirectional dynamics available—perfect for interviews—which is accompanied by the anticipated lack of proximity effect. It also happens to have an astonishingly flat and extended frequency response, giving it probably the closest approach to the sound of the 114 of the whole batch—quite amazing given its modest price. It could hardly be expected to go up quite as high, but it has a bloody good try, and its bass end and overall flatness match very impressively.

From the ranks of AKG's unashamedly PA range come two dedicated vocal microphones. The D3800 gives its roots away straight away; its presence is hard enough to cut through most things, but it does stop short of harshness and remains a viable proposition. The D880 is supercardioid where the 3800 is hypercardioid, and lends itself to a wider range of uses by virtue of its fuller sound, missing the up-front poke of the 3800.

AUDIO-TECHNICA'S acceptance into the high-end studio fold is comparatively recent, and seems to have spurred the company on to greater achievements right across the board. Not long ago we looked at the Six-Pack, a collection of affordable microphones covering most requirements and including a dynamic particularly

suitable for bass drum, the ATM25. Also available are two other dynamic models, the more conventional of which is the ATM61HE. This is a general-purpose hypercardioid which sits well in the studio thanks to an overall natural sound with a good presence.

Much more of a surprise is the AT 804, apart from the AKG D230 the only omni in this survey. Its sound is also surprisingly impressive for such an anonymous package; it's very smooth and complete with a notably good LF extension. A-T is not specific about applications but point out all the advantages of an omni pattern where circumstances allow its use; the 804 would undoubtedly perform very well under all such conditions.

THE BEYERDYNAMIC name reminds us that this is the company's home territory. Hardly surprising then that one of its longest-standing models is one of those elite dynamics whose status is almost as legendary as our favourite condensers. The M201 needs no introduction, and is a very flat, natural hypercardioid microphone whose home was always the studio. Its low coloration gives it a similar character to a decent condenser, which combined with the dynamic range advantages should make it even more useful in certain circumstances. Joining it is the M88, another general purpose hypercardioid which shares its smoothness, but adds a distinct presence in a package which looks much more like a conventional dynamic mic.

The high SPLs produced by a kick drum have traditionally made a dynamic the microphone of choice, and beyer has its **page 46 >**



Beyerdynamic TG-X 50

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Sennheiser MD504

< page 45 own specialised offering in the shape of the TG-X 50. This is a big side-firing lump of a microphone with plenty of the desired depth at the bottom end coupled with a low mid lift ideally suited to the task. Its undeniable warmth is not at the expense of its high end, which is sufficiently well represented to suggest many other uses.

Another beyer specialist is the TG-X 5, a miniature clip-on microphone designed to be used within four inches of the source instrument. Here the potential for acoustic tailoring shows, as the low end falls off to compensate for the inevitable proximity effect. At conventional distances it sounds decidedly thin, but used as intended the bottom end is all there, still with a bright presence. The microphone comes on a short flexible gooseneck attached to a fierce, but soft-surfaced spring clamp, making attaching and positioning it very straightforward.

WITHOUT ELECTRO-VOICE, no look at dynamic microphones would be complete since the company's reputation for rugged dynamics is second only to Shure's. If you need to knock a nail in and you haven't got an SM58 handy, there are plenty of E-V's that will do the job and are also pretty good as microphones.

The RE-20 is not only a standard—and one which established itself remarkably quickly—but a TV star as well. The familiar big cylindrical microphone is a popular choice for a wide range of applications from bass drums to broadcast presenters, being one of the elite models whose sound belies its dynamic nature. This is of course reflected in the price, which is also not typical of a dynamic microphone.

Much more in the mainstream is the RE36, a cardioid vocal model using the neodymium alloy magnet technology that Electro-Voice did so much to promote. Its success was such that neodymium now drives a large proportion of the microphones in this survey. A particular feature of the RE36 is its use of E-V's Variable-D concept, as found on the RE-20, which is designed to dramatically reduce proximity effect; the spec claims a 9dB rise at 100Hz at a quarter of an inch, where a typical conventional design would give 18dB.

Back up market and further outside the

bounds of convention is the RE38, which lists recording, broadcast and sound reinforcement (in that order) as its applications. Its physical design is very unusual, resembling the sawn-off top part of a conventional hand-held, attached to a swivelling stirrup arm or yoke which in turn is held by a stand clamp. It's not small, but this arrangement makes it easy to manage in awkward positions and easy to make delicate adjustments to. More remarkable though is its facility for on-board equalisation to suit

the job in hand.

Here it outdoes the Sennheiser 421 for choice, with no less than 16 settings affecting both high and low ends of the spectrum. Adjustment is performed with a rotary screwdriver-operated switch set into the back of the microphone, for which E-V thoughtfully provides a suitable tool—nothing special, so no panic if and when it gets lost, but a nice gesture anyway. Eight of the positions alter the low-frequency roll-off, and the variations affect both the amount of cut and the shape of the curve, giving a choice of turnover frequency as well as attenuation. The other eight settings have the same set of LF curves but with a brighter top end, with a smooth lift centred on 6kHz. The resulting flexibility is enormous, made the more useful by the excellent quality delivered by the microphone when flat. Worth a second look even without its eye-catching shape.

MILAB'S microphone portfolio is already so full of novelties and off-the-wall approaches that it comes as no surprise to find a dynamic with high aspirations in there as well. The D-37 is a general-purpose cardioid which the literature recommends as being equally at home in the studio and in the hand of a singer on stage. It has a good smooth top end without any trace of harshness, and smacks of quality all the way from its finish to its polished sound. Like other Milab models it deserves a wider audience.

SAMSON is best known for affordable wireless microphone systems, but of course it makes its own microphone elements and also offers them as wired models. Two were sent for review, both revealing themselves as intended for live use but with definite advantages in certain studio situations.

The S12 is a hypercardioid neodymium model which makes no claims for studio suitability, and sounds indisputably like a typical vocal PA microphone. At the same time it lacks nothing in clarity, and the expected presence has undoubted uses. The physically similar Q MIC offers itself for project studio applications and matches its vocal projection role with an even brighter sound. An unusual feature is an extra **page 48 >**

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Shure Beta range

< page 46 acoustic filter in the centre of the windshield basket for reducing sibilance.

SENNHEISER, too, has been in this business a lot of years, and is father to a classic in the distinctive shape of the MD421, which has been going at least 30 years—I remember seeing Roger Daltrey singing into one on *Top of the Pops*. The decades have seen a few detail changes, and the microphone is now called the MD421-II in recognition of its progress, but the fundamental shape and character remain. It's now slightly shorter and lighter, but physical features like the click-in stand mount are still there. It also retains a facility that as far as I am aware is almost unique (only one other in this survey has such a feature) among dynamics—its rotating switch around the base collar for selecting bass roll-off filters. Five settings are available, graduated from Music (flat) to Speech (maximum LF cut).

Joining it is the MD425, a more conventional-looking vocal microphone with handheld use in mind. Its supercardioid pattern and strong presence lift are clearly geared towards this use, but will also be handy elsewhere. Far less conventional is the fairly recently introduced MD504, a truly astonishing little microphone at a stupidly low price.

This is a miniature general purpose cardioid with a body barely big enough to enclose the capsule and connector, and an integral swivelling stand mount that makes it look like a scaled-down 2CV headlight. It is small enough to poke into the most awkward corners and otherwise inaccessible bits of a drum kit, helped by the range of accessories which is beginning to appear: this one was supplied with an ingenious clip for attaching it to the rim of a drum, using a resilient plastic hook to snap it on without having to tighten any screws. But don't be fooled into thinking that this convenience is

at the expense of the sound. It has an extraordinary depth coupled with a natural and extended top end, and is well worth calling on even when its compact size is not required. A little gem.

SHURE, surely, can be said to be inextricably linked to the dynamic microphone above any other manufacturer. The force behind more dynamic classics than any other, the company continues to shine so brightly in this area that its highly successful condenser ventures tend to get left in the shadows.

Two of those classics are the SM57 and SM58. There can't be many dynamics that get such wide use in the studio as the 57, and while the 58 may not be quite as versatile off stage it has its uses and is probably the most familiar microphone in the world. A straight comparison of the two of them with the rest showed the expected characteristics—the smoothness, tolerance and presence of the 57 and the extra brightness of the 58. Not content to rest on its laurels Shure memorably uprated both to Beta versions some years ago while continuing production of the originals. Both the Beta 57 and Beta 58 sit in the same relation to their inspirations, both having a generally bigger, clearer and more open sound. Those characteristics which made the original 57 such a popular choice are there in abundance in both the Beta models, suggesting they may in time become just as familiar a sight in the studio.

These are part of a much larger Beta range, two more of which were supplied for this roundup. The Beta 52 seems to want to emulate the AKG D112, with a similar overall shape and the same intended target but a chunky integral stand mount. Its bass designs would be hard to guess from its sound, which is surprisingly bright: it is therefore capable of bringing out the attack **page 50 >**

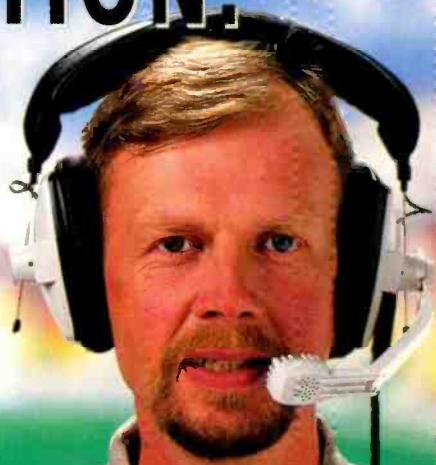
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< page 48 in even the dullest bass or kick sounds without losing the bottom end punch.

Looking for all the world like a miniature Beta 52 is the Beta 56, which despite its dinky presentation gives a surprisingly good account of itself. It shares the 52's built-in stand mount and locking screw, and the arrangement whereby the signal is passed to the mount by a spring-protected cable and is terminated in an XLR in the casing next to the mounting bush. Unfortunately the inserted XLR on both fouled the locking rings on my standard K&M stands, but to their credit all the Beta models came with 1/8-inch thread adaptors. The area of operation Shure suggests for the 56 is much wider than the 52, making it even more potentially useful in the studio despite its live intentions. On the showing of these six microphones Shure's position at the forefront of rugged versatile dynamic design is assured.

SONY'S world-class status derives hardly at all from its microphones, which however good they are always get overshadowed by the fancy digital and video hardware. But there have been some notable offerings, such as the valve G800, the impressive C18, the ubiquitous ECM50 and others old and new, some of which have acquired classic status particularly in the US.

Meanwhile Sony quietly continues to make more modest microphones, spurred on partly by its wireless models. A couple of years ago we looked at the suite of dynamics closely linked to the wireless range, the F-700 series. At that time new models had been launched

representing significant improvements on the existing small range, and further development has taken place since.

Of most relevance to the studio are the top-of-the-range F-740 and F-780. These have both had new capsules since their introduction, in line with the radio versions, bringing the performance up still further. The 740 is intended for general instrumental use, and is unusually compact and unobtrusive. It has an impressive breadth of sound with overall smoothness, but a hint of presence boost, and sounds surprisingly similar to the 780. This is in fact meant for vocal use, but the strong presence of the earlier version seems to have been smoothed out somewhat in favour of a fuller, more natural sound.

These two are supported by three further microphones, the original 720 and 730 and the 710, introduced alongside the two top models. These, too, do a creditable job, with the 20 and 30 perfectly acceptable for general use, but outshone by the smoother more extended F-710.

STEDMAN'S N90 comfortably occupies the 'distinctly unusual' slot in the company's dynamic range. This is one of the few side-firing dynamics around, and is very deliberately styled to resemble a studio condenser. It makes no attempt to sell



Sony F-700 series

itself for live use, staking instead a strong claim for a place in the studio, with an optimistic belief that it sounds like a condenser. It doesn't, quite, but it does have a character all its own which is different from the expected dynamic behaviour and which I found very pleasing and useful. It's mellow and full, but with a gentle mid brightness, a combination that adds an instant vintage flavour to everything it touches. If there are more Stedmans, I'd like to try them. ■

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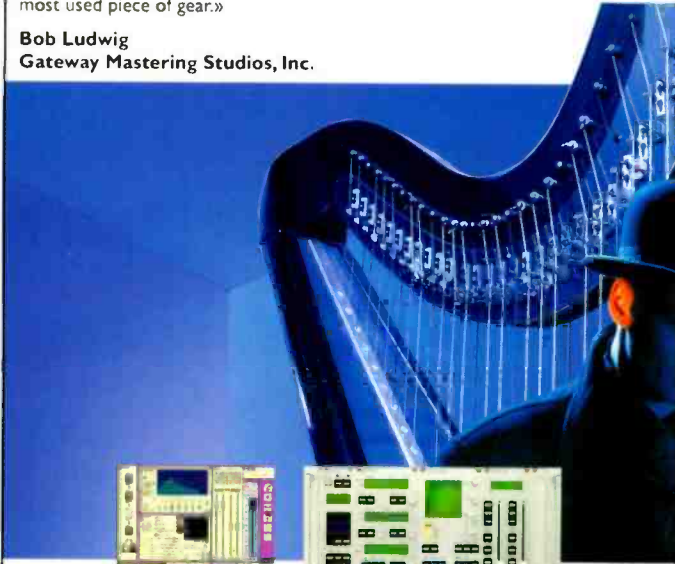
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Studio Sound presents a comprehensive guide to outboard A-D and D-A converters. And since no useful roundup would be complete without an explanation of convertor operation, **John Watkinson** leads a guided tour

HIGH QUALITY AUDIO relies on sufficiently accurate reproduction of analogues of both the time axis and the pressure-voltage axis. The time axis in digital audio is handled by sampling, or periodic measurement, and the pressure-voltage axis is handled by quantising which is simply expressing a variable value by the nearest whole number.

In analogue audio, the time axis can be impaired by wow and flutter whereas in the digital domain these can be eliminated by RAM buffering leaving only convertor clock jitter as a critical issue. The pressure-voltage domain can be impaired by signal dependent artefacts such as linear and nonlinear distortion and signal independent artefacts such as noise. In digital systems the intelligent application of error correction ensures that the whole numbers are faithfully replicated, leaving noise and distortion in the converters as a critical issue. As digital audio is just another analogue of the acoustic waveform it follows that converters should also be phase linear so that the waveform is preserved.

In audio, one of the most important requirements is linearity. In all real audio signals a number of sounds are simultaneously present and, unless the system is perfectly linear, intermodulation will occur which reduces the timbral realism in mono, and in addition damages spatial realism in stereo. A good test of any audio system is its ability to resolve simultaneous signals. In other words, it should be possible to tell immediately, for example, whether the vocalist on a multitrack recording is double or triple tracked or whether in a coincident miked recording one vocalist is behind another.

If such a system is available it should be possible to insert an A-D D-A combination without impairing those abilities. Clearly without a monitoring system of sufficient quality no meaningful decisions can be made about the quality of the converters. The development of converters has been impaired by the lack of availability of really low distortion loudspeakers, but this is no longer need be the case.

Fig.1 shows the simplest approach to audio conversion. After the anti-alias filter the audio is sampled in a track-and-hold stage, followed by quantising and then coding to a two's complement value. The performance of the convertor is determined by two factors. The sampling rate and wordlength set a limit to the quality and the skill of the designer determines how closely the limit is approached.

The sampling rate determines the bandwidth available and the cut-off of the anti-aliasing filter, whereas the wordlength

Conversion Technology

determines the maximum SNR. Within the audio band sampling is theoretically lossless whereas quantising causes an error. It is now well established that quantisers must use dither to render them sufficiently linear for audio applications. When dither is correctly applied, a quantised system can be perfectly linear, having essentially infinite resolution, more so than analogue tape. It is important not to confuse resolution with wordlength. In a correctly dithered A-D the wordlength only controls the noise floor, but the signal remains linear even when it is far below the signal independent noise. Consequently, when building a convertor, the problem is not resolution. The problem is driving the noise floor down enough so that the desired wordlength is justified.

In addition to the theoretical limits, practical converters suffer from implementation errors. The anti-aliasing filter may cause linear distortion and passband ripple. It is almost impossible to make a phase linear analogue filter. The sampling clock may have excessive jitter causing program modulated noise. The quantising steps may not all be identical in size causing nonlinearity.

Sampling clock jitter must be kept to extremely low levels by good engineering. This requires an extremely well damped Phase Locked Loop in the reference input and very-low-noise clock circuitry. Most commercially available A-Ds are deficient in clock jitter. It is easy to demonstrate a change in

sound quality by using a longer clock cable which has no effect on a well engineered unit.

Many of the implementation problems are eased by using oversampling A-Ds (OSADCs) which employ a temporary raising of the sampling rate well beyond what sampling theory requires. **Fig.2** shows that in an OSADC the major stages are not confined to one quality bottleneck but are distributed.

The anti-aliasing filter is divided in two: the analogue stage simply prevents aliasing at the high sampling rate and its cut-off is so high that it has no effect on the audio band. The real band-limiting is done in the digital filter after the quantiser. Following the band limiting in the digital filter, the required output sampling rate can be obtained. The digital filter can be built to any degree of precision required and can be made perfectly phase linear—a key advantage of oversampling.

The quantising process is also distributed in an OSADC. It is begun in the quantiser proper, and extended in accuracy in the digital filter. It is not immediately obvious why this should be. **Fig.3a** shows a correctly dithered non-oversampled A-D. This has a flat noise floor up to the edge of the audio band where just under 6dB SNR is obtained for every bit of wordlength. **Fig.3b** shows a correctly dithered 4x OSADC with the same quantiser. The noise floor at the quantiser is at the same level as in **Fig.3a**, but extends over four times the bandwidth. As the OSADC is correctly dithered, the noise is uniform. Consequently **page 56**

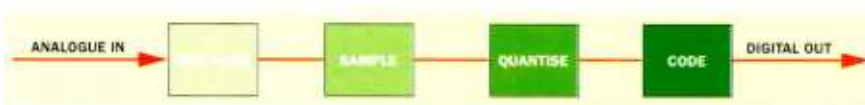


Fig.1: Simple ADC

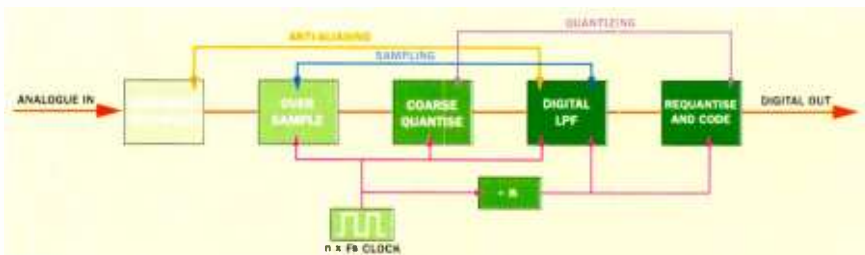


Fig.2: Oversampling spreads the critical processes easing implementation

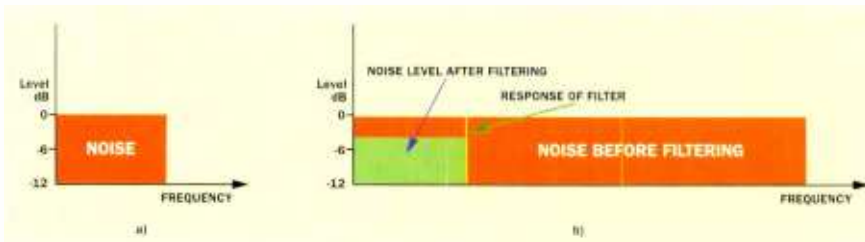


Fig.3: With uniform noise floor, filtering to one quarter bandwidth gives 6dB drop in noise level

Manufacturer	Model	Type	Channels	Sample Rates	Word Length	Conversion method	Contact
Aardvark	Aardverter	AD/DA	2+2	32kHz, 44.1kHz, 48kHz plus varispeed 25kHz-50kHz	16 bits	ΣΔ 16x oversampled	Tel: +1 313 665 8899 Fax: +1 313 665 0694
Apogee Electronics	AD1000	AD	2	32kHz, 44.056kHz, 44.1kHz, 47.952kHz, 48kHz, 48.048kHz plus varispeed 32kHz-54kHz	20 bits	not advised	Tel: +1 310 915 1000 Fax: +1 310 391 6262
Audio Design	DA1000E-20 Probox 4 Probox 4/20	DA AD AD	2 2 2	32kHz, 44.1kHz, 48kHz plus varispeed 27kHz-52kHz	20 bits 16 bits, 18 bits	8x o/s ΣΔ	Tel: +44 1734 844545 Fax: +44 1734 842 604
Chord	Probox 15 DSC 1500	DA DA	2 2	32kHz, 44.1kHz, 48kHz plus varispeed 27kHz-52kHz	16 bits, 20 bits	ΣΔ	
dB Technologies	AD122-96	AD	2	44.1kHz, 48kHz, 88.2kHz, 96kHz plus varispeed 40kHz-51kHz	16-24 bits	Proprietary converter	Tel: +44 171 403 3808 Fax: +44 171 403 0957 Tel: +1 206 527 2049
dCS	DA 924 900D 902D	DA AD AD	2 2 2	44.1kHz, 48kHz, 88.2kHz 32kHz, 44.1kHz, 48kHz 32kHz, 44.1kHz, 48kHz,	16-24 bits 16, 20, 24 bits 16, 20, 24 bits	Triple segmented multibit Proprietary 5-bit 64x o/s Proprietary 5-bit 64x o/s	Fax: +1 206 527 1948 Tel: +44 1799 531 999 Fax: +44 1799 531 681
Focusrite	950 952 Blue 245 Blue 260	DA DA AD DA	2 2 2 2	88.2kHz, 96kHz 32kHz, 44.1kHz, 48kHz 32kHz, 44.1kHz, 48kHz 32kHz, 44.1kHz, 48kHz	to 24 bits to 24 bits 16, 20 bits 20 bits	Proprietary 5-bit 64x o/s Proprietary 5-bit 64x o/s	Tel: +44 1494 462 246 Fax: +44 1494 459 920
Genesis Pro Systems	ADC 20.16/2 ADC 20.16/4 DAC 20.16/2 DAC 20.16/4 ADA 20.16	AD AD DA DA AD/DA	2 4 2 4 2+2	32kHz, 44.1kHz, 48kHz plus varispeed 30kHz-55kHz 32kHz, 44.1kHz, 48kHz 32kHz, 44.1kHz, 48kHz 32kHz, 44.1kHz, 48kHz 32kHz, 44.1kHz, 48kHz	16 bits, 20 bits 16 bits, 20 bits 16-20 bits 16-20 bits	ΣΔ 128x o/s ΣΔ 64x o/s ΣΔ 64x o/s sign-magnitude 8x o/s sign-magnitude 8x o/s ΣΔ 64x o/s (AD) sign-magnitude 8x o/s	Tel: +44 1954 210 194 Fax: +44 1954 210 194
Jungler	C04	AD	2	44.1kHz, 48kHz plus varispeed	20 bits	o/s	Tel: +49 30 6392 6145 Fax: +49 30 6392 6146
Lake People	ADC F44	AD	2	32kHz, 44.1kHz, 48kHz, 96kHz	20, 24 bits	not supplied	Tel: +49 75 31 73 678
Leitch	DAC F46 ADDAC F45 ADC 6880 ADC 880 DAC 6880 DAC 880	DA AD/DA AD AD DA DA	2 2+2 2 2 4 4	32kHz, 44.1kHz, 48kHz, 96kHz 32kHz, 44.1kHz, 48kHz, 96kHz 44.1kHz, 48kHz 44.1kHz, 48kHz 32kHz, 44.1kHz, 48kHz 32kHz, 44.1kHz, 48kHz	20, 24 bits 20, 24 bits 20 bits 20 bits 20 bits 20 bits	not supplied not supplied ΣΔ 64x o/s ΣΔ 64x o/s ΣΔ 128x o/s ΣΔ 128x o/s	Fax: +49 75 31 74 998 Tel: +44 1256 880 088 Fax: +44 1256 880 428
Lucid Technology	ADA 1000	AD/DA	2+2	32kHz, 44.1kHz, 48kHz plus varispeed	20 bits	ΣΔ o/s	Tel: +1 206 742 1518.
Prism Sound	AD124	AD	2	32kHz, 44.1kHz, 48kHz plus varispeed	16, 20, 24 bits	Proprietary, inc DSP and Multi o/s	Tel: +44 1223 424 988
Stage Tech	DA1 Referencing Mastering AD	DA AD AD	2 2 2	32kHz, 44.1kHz, 48kHz 32kHz, 44.1kHz, 48kHz plus varispeed	16, 18, 20, 24 bits 20, 24 bits	Prop o/s using multiple modulators ΣΔ 64x o/s	Fax: +44 1223 425 023 Tel: +49 951 972 25 25 Fax: +49 951 972 25 32
Symetrix	620	AD	2	22.05kHz, 32kHz, 44.1kHz, 48kHz plus varispeed	20 bits	ΣΔ	Tel: +1 206 787 3222 Fax: +1 206 787 3211
Tekniche	Genesis 6124 Genesis 6132	AD DA	1 1	32kHz, 44.1kHz, 48kHz 32kHz, 44.1kHz, 48kHz	20 bits 20 bits	ΣΔ 64x o/s 3-bit 128x o/s	Tel: +44 1483 728 006 Fax: +44 1483 770 195
Weiss Engineering	ADC1	AD	2	44.1kHz, 48kHz	20 bits	Gain range	Tel: +41 1 940 2006 Fax: +41 1 940 2214
Yamaha	AD2x AD8x DA2x DA8x	AD DA AD DA	2 8 2 8	44.1kHz, 48kHz 44.1kHz, 48kHz 32kHz, 44.1kHz, 48kHz 32kHz, 44.1kHz, 48kHz	19 bits 19 bits 20 bits 20 bits	ΣΔ 8x o/s Sign and Magnitude 8x o/s	Tel: +44 1908 366 700 Fax: +44 1908 366 872

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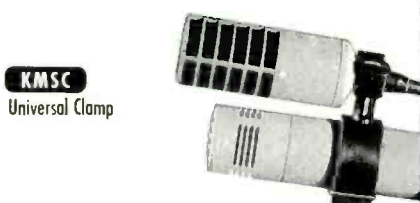
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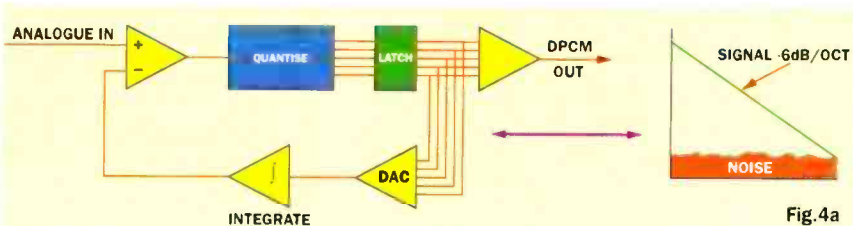


Fig. 4a

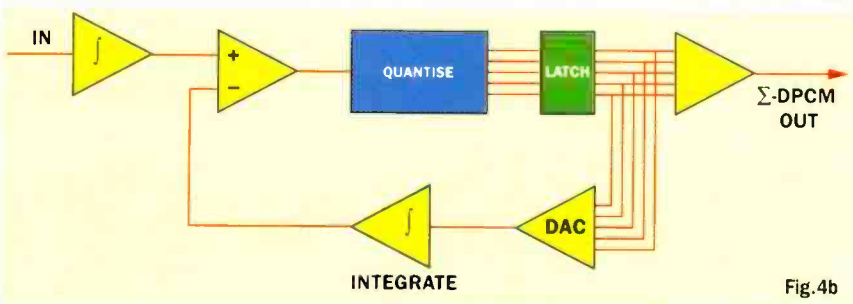


Fig. 4b

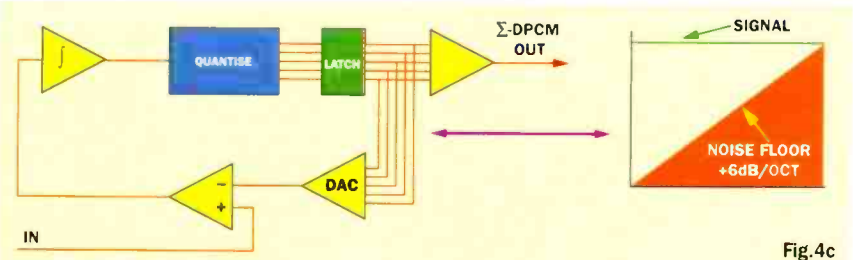


Fig. 4c

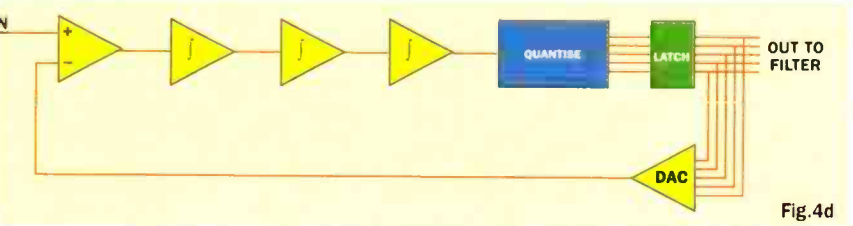


Fig. 4d

Fig. 4: The genesis of noise shaping see text for details

< page 53 after the digital filter reduces the bandwidth to normal, only one fourth of the noise power is left. As power goes as the square of level, then only half the noise level remains. Thus at the output of the digital filter, the SNR has improved by 6dB, the equivalent of having one extra bit in the quantiser, provided that the clock jitter is suitably controlled.

Now one extra bit is not much, but then this is a simple example to show the principle. With greater complexity, a greater increase in SNR can be obtained as will be seen in a moment. The point to grasp is that we have a way of trading sampling rate and wordlength. Using this trading principle we can extend the effective wordlength to make high performance OSADCs, or we can get the same performance with a shorter wordlength converter element which is cheaper to make and more stable.

Further use of oversampling requires a non-uniform noise floor, hence the term noise-shaping. Fig. 4a shows a differential A-D where the output is the difference between successive samples, known as DPCM. The output is converted back to analogue and integrated to produce a local version of the previous input. This is subtracted from the current input to obtain the sample difference. This type of converter is slope limited rather than amplitude limited, so the allowable signal amplitude falls at (6dB) octave down to the flat noise floor.

Fig. 4b shows that if an integrator were

placed at the input, the amplitude limit would be constant and the noise floor would rise with frequency. At the same time the output is no longer differential and is called Sigma-DPCM. It is a small extra step to common the two integrators as in Fig. 4c. When using such a converter with oversampling, the noise is concentrated at high frequencies and the low-pass digital filter removes a disproportional amount of the noise power.

A further improvement can be obtained by increasing the order of the noise shaping. This requires extra low-pass filtering integrators in the feedback loop as shown in Fig. 4d which have the effect of giving the forward path a high-pass characteristic.

A great advantage of noise shaping converters is that the actual quantiser element can be realised with very short wordlength, enormously easing the accuracy requirement and giving a device which is less prone to drift.

Although complex, the noise shaping OSADC is an ideal candidate for fabrication on a chip. The low-pass filter-decimator in which the output wordlength is extracted from the high speed input can also be integrated on the same chip in most cases, giving a relatively low-cost solution. In equipment such as portable DAT machines space for conventional steep-cut analogue low-pass filters is simply not available and noise shaping is really the only technique which is viable. ■

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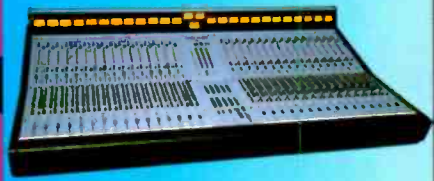
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Fargo

The Oscar awards judges have finally seen through the veil of visual effects and discovered quality scripts and direction. **Richard Buskin** talks to *Fargo*'s sound mixer, supervising sound editor and rerecording mixer about a little film that has made big waves

IT DOESN'T have eye-bulging, ball-grabbing special effects. It doesn't have raging fires, zapping laser guns, erupting volcanoes or sweeping desert landscapes. Neither does it have an exploding White House. What it does have, on the other hand, is an intriguing story, an entertaining script, imaginative direction and first-rate acting—not to mention the incomparable production, writing and directing team of Joel and Ethan Coen, and a hand-picked, highly experienced production crew.

It is *Fargo*: the tale of a loser's bungled attempt to extort money out of his wealthy father-in-law by arranging to have his wife kidnapped, and the tragedy that ensues when he places this assignment in the hands of a pair of mindless killers.

Based on a series of events that actually took place in Fargo, North Dakota in 1987, this low-budget black comedy has managed to make its mark in a year when independent films dominated the Academy Awards and when one of them, *The English Patient*, walked

off with no less than nine of the little gold statuettes. Running against the odds, *Fargo* scooped two Oscars of its own, Frances McDormand winning for Best Actress and the Coens getting the vote for Best Original Screenplay. All in all a family affair—McDormand is Joel Coen's wife.

While mind-blowing special effects invariably require much technical expertise behind the scenes (and plenty of money from the financiers' pockets), from the sound perspective it is often the quieter, seemingly more straightforward scenes which demand special attention. After all, those unwelcome glitches have nothing to hide behind.

'*Fargo* was a very simple setup,' confirms sound mixer Allan Byer. 'I went out and bought a tent in Canada, because I knew it would be cold...' Although perhaps not quite cold enough.

WHEN THE REQUIRED 'Fargo snow' began to melt, the film unit had to move further north to Grand Forks, North Dakota, where there was 16 inches of pristine ground cover. Within a couple of days this also disappeared. It was the same story in Minneapolis. Such are the trials and tribulations of relying on the elements, albeit that Byer was well prepared in his tent when conditions were conducive to filming.

'I had a little heater in there,' he says. 'I took my normal package of equipment and I was fine.'

The 'normal package of equipment' that

May 1997 **Studio Sound**

Byer uses on location has not changed all that much over the last 15 years. He owns a Nagra analogue machine with a Dolby unit—something which he acquired for the Coens' 1991 movie *Barton Fink*—as well as an HHB Porta-DAT time-code recorder, yet he states that he still prefers the Dolby sound.

"It's also a lot more forgiving, and it goes hand in hand with the Nagra, which is more durable," he says. "I took it to the jungles of Venezuela and it more than survived all of the humidity, dust and heat. I mean, some people have used Nagras and they've backed them up with something or used DAT machines and backed them up with a Nagra, but when I'm using a Nagra I don't have to back it up. If something should happen I'll just go and get another Nagra from the truck."

"At the moment I still prefer analogue. If it was a case of DAT versus Nagra without the Dolby then I would be using DAT, but because of the interface that I have I prefer the analogue. There again, I'm expecting some changes. In a couple of years I think we'll all be recording on disc or using some sort of hard drive in a multitrack format. You see, another reason why I haven't gone to DAT is that it's still two tracks, and while I know that Nagra has come out with a 4-track digital machine it costs \$25,000. It's a beautiful machine, but postproduction people normally don't like to work with it because it's not readily available to do re-transfers and so on."

Anyway, the reality is that when you're recording out in the middle of the street nobody sitting in the theatre is going to tell

'At the moment I still prefer analogue. If it was a case of DAT versus Nagra without the Dolby then I would be using DAT, but because of the interface that I have I prefer the analogue. In a couple of years I think we'll all be recording on disc or using some sort of hard drive in a multitrack format.'

you if it was done on DAT or with Dolby. We're talking about dialogue here, although most people who record music also prefer Dolby analogue over DAT. A lot of producers think that digital means clean tracks, but I just go with a reliable format that is easy to use.

"So, with the Nagra I have two tracks, and then I have two additional tracks which, if I need them, I'll put on the DAT which has the same time code as the Nagra. On *Fargo* it was rare that I needed those extra tracks; there were a lot of scenes in the car dealership where you can see the highway behind, with cars passing by. Now, in these kinds of cases

some sound editors don't care if you get the dialogue. To hell with the dialogue—they'll dub it later—they're more impressed if you captured the sound of the cars. So, I ran a stereo background on the DAT, and although it wasn't transferred until postproduction it was at least there to work with.

"It wasn't a multitrack situation like [director Robert] Altman does, where he puts a wire on everyone. That's different. I do backups. I'll do two booms off-camera and I do the on-camera because of overlapping, maybe I'll put radios on DAT just in case—and because I have it—and basically I like to give the person doing the tracks some options. A lot of people mix for dailies—I've worked with Joel and Ethan for 11 years, and I'll go to them at the end of the night and say, "Tomorrow when you watch the dailies you're not going to hear this, this, this and this, but it's there", and they'll say, "Oh fine, no problem". On the other hand, there are some producers and studio heads who will sit there and say, "We don't hear this", and "We don't hear that", and so maybe I'll mix it in a slightly different way. It also depends on the relationship that I have with the director."

Byer states that the shooting scripts that the Coen boys have concocted are among the best that he has ever read during his 25-year career, and that their clarity of vision in turn helps to make his job a lot easier.

"Sometimes there may be a complicated scene," he explains. "There will be characters crossing, perhaps, and then of course you're dealing with the lighting and so > page 60



< page 59 forth, and in that kind of case some people will want to play the whole scene on a master [shot] with very little coverage, but that takes a really experienced director. An inexperienced director will shoot that master 20 times and I'll be tearing my hair out trying to get a good sound, whereas Joel and Ethan know that they are going to use the first three seconds of this master and then, boom, they're going to pop in for another shot. It's all storyboarded and so I know what I'm doing. Or, if I'm having difficulties, they'll say "We'll take it from there". I mean, you want the master to sound wonderful, but it's just dailies. Even if it sounds wonderful, 90% of the time they're going to take the close-up sounds and pop them in. So, it's not always worth making yourself crazy.'

HAVING WORKED in extreme temperatures and under less-than-ideal conditions, Allan Byer was glad to work in the relative wilderness of *Fargo* where he did not have to deal with traffic noise or constantly resort to the use of radio mics. 'It was like working in a studio,' he confirms.

him on another track. I don't have to use it, but it's there, it's a backup. You know, he can do a 6-page dialogue scene and 99% of it sounds fantastic, but then on one line he looks down or away. Well, if it's on another track you can tweak it to just give it a little boost.

'What they used to try to get away with was inserting a dubbed line, but within the context of a scene—or even a sentence—it would stand out like a sore thumb unless it was really done right. I've done postproduction and I've mixed in studios, and I know that you have to spend a lot of time dubbing sounds properly, and that may even involve applying reverb for an exterior scene. Having that extra track makes it simpler.'

'There was some looping to replace the odd line where the actors weren't on mic for some reason, but the bulk of the material was very straightforward,' says Skip Lievsay, who was not only the Supervising Sound Editor for *Fargo* but also sat at the console at Sound One in New York, mixing alongside rerecording engineer Michael Barry.

'Allan did a really good job and that made our lives a hell of a lot easier.'



'My basic microphone package consists of the new Sennheiser MKH70 long shotgun mike for exterior situations and the old H16, while my wirelesses are Microns, which most people aren't using anymore but which I've always thought have the best quality. In fact I just bought five new UHF Diversity units, and I also use Trans and Sankens.'

'I haven't had a bit of trouble with these microphones. I've recorded in New York City with them and not had to worry about being in front of the Empire State Building or the World Trade Center which are filled with RF. Occasionally there'll be a little glitch but it's rare. My preference is not to use radios but sometimes you have to, and if you're doing multitrack recording why not use another track? That's how I record. I mean, if an actor hates doing any kind of dubbing and he doesn't mind me putting a mic on him, then I'll put

'I also prefer analogue SR over the other formats,' he adds. 'I think it's warmer, it gives a more realistic sound and it has a good range.'

'The dialogue was processed through a Focusrite equaliser,' adds Skip Lievsay. 'It may not always need EQ, but I think that with production tracks you do need to do something, whether that means just rolling off a little bit at the bottom or whatever.'

LIEVSAY'S SOUND design associate, Eugene Gearty, took care of editing most of the sound effects along with Lewis Goldstein and Glenfield Payne, while the FX recordists were Ken Johnson and Ben Cheah. Foley editors were Bruce Pross, Frank Kern and Steven Visscher, and the Foley mixer was Ezra Dweck.

'Eugene and I cut all of the sound effects on Avids and Synclaviers.' > page 62

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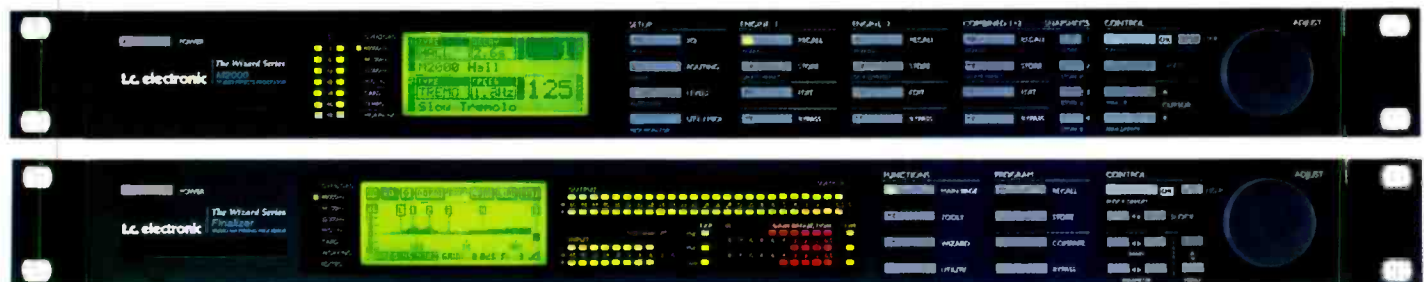
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< page 60 Lievsay says, 'while in terms of the Foley we record directly to Tascams and then edit on Avid. Dialogue and ADR is edited using Sonic Solutions. For *Fargo* all of that material was transported onto the Tascam [at C5 in New York] and brought to Sound One, where it was recorded onto Sony 3348. During the final mix it was then dubbed onto another 3348, at which point Michael [Barry] ran the mix and I was sort of his associate mixer.'

'We've done this quite a bit, attacking it in two passes: Michael does the dialogue and I do some of the looping on the first pass, and then we go back and do the Foley, backgrounds and various sound effects. During the final mix Michael does the dialogue stem and the music stem live and I do the sound effects stem, and it works out really well that way! It's fun for me to be up at the board, and I think the Coen brothers appreciate having two people whacking it out that much faster.'

'In New York that's not the standard approach. There's usually one mixer, whereas it's the opposite in California, where there'll be two or three people on the go. That's largely down to the type of pictures that are done here [in New York]; mostly dialogue pictures. The emphasis here is on smoothing out the bad tracks and creating good sound mixes to support the dialogue. It's not very often that sound effects play a big part.'

In actual fact, due to a packed work schedule for the New York FX crew, many of the sound effects that were featured in *Fargo* had to be recorded in California. Others were captured during production. Those passing cars, the driving snow... And the plentiful gunshots that are perpetrated by the film's main anti-heroes, not to mention the wood-chipper that one of them puts to charming use when trying to grind up the body of one of the innocent victims.

'Eugene spent quite a lot of time putting that effect together,' confirms Lievsay. 'A combination of chainsaws and juicers—you get quite a lot of mileage out of fruit-juicers! All of that gave it a nice sort of bone-mincing sound.'

Not that it would occur to anyone to use the grunts and groans of an actual wood-chipper, I suppose.

'Well, yes, two wood-chippers were also used in the mix.'

Alright. Well, at least that makes it more authentic.

'Eugene edited all of that material on the Synclav and I'm sure it took quite a few ingredients to come up with the exact sound that Joel wanted.'

An automated 60-input Neve VR with Flying Faders was employed in conjunction with the 3348 for the mix at Sound One. Starting with the dialogue and

effects premixing, everything was done reel by reel in about three and a half weeks.

'It was a quick mix,' says Lievsay. 'Usually we have a little bit more time.'

'It was a fairly modest project, and so we didn't need to spend a huge amount of time and money on the postproduction,' adds Michael Barry. 'We were actually all surprised that the picture did so well. After all, we didn't know if some people would get upset about a film that makes fun of Mid-Westerners.'

'It's a very stark picture,' concurs Lievsay.

'It was shot in a very straightforward manner, we were working with a lot of master shots, and so there wasn't anything that required a dramatic effort... or a dramatic budget!'

'Still, the things that do take time are not always all that obvious,' says Barry. 'You may not notice all that much background stuff going on in a picture like *Fargo* but that can be quite deceptive. For instance, creating that desolate, cold atmosphere and the wind in

the background did take quite a while.'

'Mike and I have done this kind of thing on a couple of pictures now,' points out Lievsay. 'We take a lot of elements and constantly fade different, shifting sounds up and down. That's how we did *Fargo*. We had several tapes of howling winds, whistling winds, heavy winds, light wispy winds, blowy snowy winds and so on, and we would just go ahead and put up five or six Tascams to mix them all together and create a constantly shifting version of all of those chosen tracks. We feel that's the best way to address that kind of effect, because I personally loathe it when you have just one particular sound going on and on. It sounds kind of hokey. You know, the howling wind that's supposed to make a place feel scary.'

If you create a very natural-sounding atmosphere with the different winds and natural background sounds, then you can also incorporate the more Gothic sounds in a more subtle way. Unfortunately, the Coen brothers are very Gothic in their tastes—they're always saying, 'Oh, we need more howling', or 'We need more whistling', and so we try to accommodate their wishes as best we can.

'We've really got that technique down well, where the elements come to us and we make a pre-mix. We can undo that pre-mix by going back just one step, and it's all laid out to make that kind of going back easy. If we want to change something we can just pop a new element in the Tascam, call that mix up with the automation and there it is.'

'I don't think the sound ever hides what's going on in a picture,' says Michael Barry. 'You have to look at the script if you want to talk in those terms. I think the sound adds to the picture in every way. You know, you don't just put the faders up and let the sound be there. You actually utilise it to be supportive rather than to massacre the storyline.' ■

'In New York that's not the standard... There's usually one mixer, whereas it's the opposite in California, where there'll be two or three people on the go. The emphasis here is on smoothing out the bad tracks and creating good sound mixes to support the dialogue. It's not very often that sound effects play a big part.'

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Five Alive

Excellence, exhaustion and elation are just a few of the emotions captured in a successful sports broadcast—and in the case of the rugby Five Nations championship you can add an international itinerary and rampant nationalism. **Kevin Hilton** enters dangerous territory



Photos: Mike Hewitt

Champions in the making: France's Abdelatif Benazzi on the way to the Grand Slam

RUGBY has always been a volatile sport. Described as 'a game for ruffians played by gentlemen', it developed out of football (described as 'a game for gentlemen played by ruffians') when, in 1823, William Webb Ellis, a pupil at Rugby school, picked up the ball during a soccer match and started running with it. Since then the game has split into two codes (Union and League) but 1995 saw the restrictions on players moving between the two relaxed. The latest in a series of wrangles over this globally popular and lucrative sport involves television coverage.

Rupert Murdoch's Sky team have cast greedy eyes on the major tournaments, in particular the International Championship—better known as the Five Nations. Instituted in 1884, this competition takes place annually between England, France, Ireland, Scotland and Wales and is based on the number of wins (or points amassed). The overall victor is awarded the Grand Slam, while there is also the Triple Crown, won this year by England.

Like all major sporting events at one time,

the Five Nations is a highpoint in the terrestrial TV sports schedule. Naturally it is avidly watched in the competing countries, with coverage on the public service broadcasters in each: the BBC in England, Scotland and Wales, RTE in Ireland and France's France 2. During the tournament, matches are played at the national stadium of the participating countries, meaning that the host broadcaster will provide the bulk of the technical coverage—vision and background audio (crowd and pitch effects)—while 'guest' broadcasters will send technicians to tailor things for their own requirements.

This year's Five Nations had already guaranteed itself plenty of media coverage: aside from the arguments over who will eventually acquire television rights to broadcast matches live and the involvement of League players in some of the teams, the tournament bade farewell to two of its venues, Parc des Princes in Paris and Wales' National Stadium. Better known as Cardiff Arms Park, this arena is to be demolished and rebuilt in time for the millennium.

The other venues are Lansdowne Road in Dublin, Edinburgh's Murrayfield **page 66 >**



FIVE NATIONS FINAL POSITIONS 1997

	Played	Won	Drew	Lost	For	Against	Points
France	4	4	0	0	129	77	8
England	4	3	0	1	141	55	6
Wales	4	1	0	3	94	106	2
Scotland	4	1	0	3	90	132	2
Ireland	4	1	0	3	57	141	2

< page 65 and Twickenham in West London, the headquarters of the English Rugby Union. This last venue was partially rebuilt a few years ago, which not only improved facilities for both players and spectators, but also aided the television coverage. Extensions have given more space between the pitch and the stands, while the addition of new roofs has enabled BBC engineers to place microphones there to capture the ambient sound of the crowd.

Audience reaction is a crucial part of most sporting events and in rugby the cheers of supporters urging on their particular team gives an important indication of the atmosphere to those who are watching on sets in their front rooms. The advent of stereo TV in the late-1980s was seen as a particular boon for sports coverage, with the action in the middle and the crowd extending to either side of the viewer.

A strong advocate of the technique is BBC sound supervisor John Nottage, who has worked on rugby matches for the Corpora-

tion for around 20 years, or at least since the days before the building of new stands at Twickenham. He began mixing matches during the 1980s and is a Twickenham veteran, covering not only Five Nations and other international clashes, but also club fixtures. Coverage of England's home games are handled by BBC Outside Broadcasts, using a standard setup of a Type 8 scanner, where Nottage prepares the main mix of crowd, commentators and 'flash' interviews (before and after the match and during half-time), and a Type 7 link van, which deals with the presenter links for the BBC's flagship sports programme, *Grandstand*.

Type 8s are equipped with a 44-channel stereo Calrec desk, which offers the necessary capacity of the various feeds. Desks are usually configured to have effects mics on the left-hand section, with the remainder containing the commentator and interview feeds.

The foundation of the effects mix is the stereo crowd input, which comes from one pair of Sennheiser 816s on the roof of the

Five Nations 1997 results

18 January

Scotland 19 Wales 34 (Murrayfield)
Ireland 15 France 32 (Lansdowne Road)

1 February

England 41 Scotland 13 (Twickenham)
Wales 25 Ireland 26 (Cardiff Arms Park)

15 February

Ireland 6 England 46 (Lansdowne Road)
France 27 Wales 22 (Parc des Princes)

1 March

Scotland 38 Ireland 10 (Murrayfield)
England 20 France 23 (Twickenham)

16 March

Wales 13 England 34 (Cardiff Arms Park)
France 47 Scotland 20
(Parc des Princes)

West Stand and another pair on a rostrum in the East. 'We did intend to put mics on the roof of the North Stand to get a true perspective,' comments Nottage, 'but there are floodlights there in close proximity and that would have given us problems with hum'.

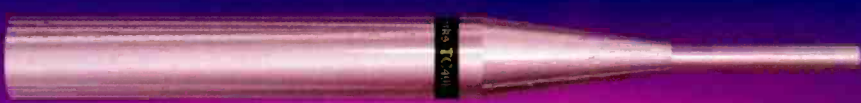
Six mic stands are placed around the pitch (peaking over the advertising hoardings) for mono spot effects and are used to fill in any gaps. 'I like to have a big crowd,' enthuses Nottage, 'it's one of the main areas where stereo TV holds its own. But I am very wary of the distractions that you can get with stereo, like extraneous noises, so we are careful with the way everything is miked. As it all takes place in the middle of the screen, I make the crowd nice and wide. Years ago we worked with a stereo mic on the boat [a construction in the East stand that contains the commentators' position] but that gives you a sensation of the players running back and forth, as it's right in the middle of the stand.'

Additionally, two runners are positioned on either side of the pitch with radio microphones to give 'close-ups' of more static set pieces, like scrums and line-outs. Nottage explains, 'The runners just follow the action. The people I use are riggers on these productions and I rely on the fact that they enjoy doing it and are keen rugby fans. It's very successful.'

There are a further six assorted microphones, mounted variously on cameras or hand-held, which are used for the presentation of trophies, the teams coming out of the tunnel and onto the pitch, and the flash interviews. Although major sports stadiums have been more accommodating to broadcasting organisations in recent years, if only out of expediency, they are still not broadcast-friendly environments. Of the flash interviews Nottage says, 'There is a wonderful little concrete cubicle that is used for these. And it sounds exactly like a concrete cubicle.'


Microphones are routed back to the Type 8 scanner on a 7-core multiway ready for Nottage to prepare the mix. 'I have done rugby matches here for many years,' he says, 'and have so built up the experience. I set all the mic coarse gains before we start—in addition to the TV output, I send splits to radio and the link truck so that they have a feed of the

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crowd. When we start, the crowd mics are faded up, but you have to be careful with ball games because if you have too many mics pointed at the action you could end up with double hits. This means that we have to place crowd mics carefully: we have to be reasonably careful with the runners as well because we could hear more running than action. But we can use the spot mics to fill in gaps."

Something sound supervisors have to watch out for is inadvertently picking up the conversation of the ball boys, who sit on the edge of the pitch and gossip (apparently it's rarely about rugby).

Working from the foundation of the crowd mics, the commentators are mixed on top. "Once we've had kick off we bring in the crowd as appropriate," Nottage observes. As is to be expected, the matches can be dynamic, not only from the crowd's point of view—crowds can reach upwards of 100dB in the heat of excitement—but even in the more controlled environment of the commentary box. Of the regular commentators, Nigel Starmer-Smith, who presides over the England matches and is himself a former England international, has a habit of dropping his voice in the build up to kicks and then raising it once the kick has been taken. By comparison, his Scottish counterpart, Bill McLaren, has a more constant, stoic delivery. Each commentator and second-seat expert has a specific EQ setting, which is preset.

DESPITE the number of feeds involved, the trend is still towards an analogue stereo desk, rather than an assignable desk. Of mixing the matches, Nottage says, "The key is keeping everybody happy, but sometimes having eight arms would be handy." He adds that while groups are used for some of the inputs he rarely mixes on groups. "I'm not one for that," he says. Processing is kept to a minimum, but, as with most applications, it is used where necessary. "I do use EQ," Nottage confirms, "but it's nothing very subtle, just tiny tweaks to make things sound nicer—there is, however, plenty of EQ used on the concrete cubicle. As far as overall processing goes, there is limiting and a bit of compression on the commentators."

As Nottage's long association with this event shows, a key to establishing a good working routine is building up a consistent team, which also includes deputy sound supervisor Paul Stewart. "We work with pretty much the same crew because it makes it easier when there are good people who have done this sort of thing before," says Nottage, although he plays down the bulk of the broadcast. "The effects and match itself are fairly straightforward," he says. "The difficult bit is the routing and communications."

The Type 8 scanner is also the hub for these functions, as it offers more facilities (including switchable talkback) than the Type 7, which is used primarily for the in-vision presenter links. The coverage is formed from two lines, one with the match on it, the other with the *Grandstand* links. This last connection comes from the Type 7 and is fed into the Type 8 through a matrix. Vision is mixed in a VT 6 truck and the combined output of vision and audio is routed from Twickenham through the 8. page 68>



Photo: Dave Rogers

Bill McLaren (left) and Bill Beaumont in the commentary box at Twickenham

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Photo: Mike Hewitt



French sights set high in the 1997 Five Nation Championship

< page 67 During matches at this venue there are 32 outgoing lines, a combination of music and 4-wire circuits, the latter carrying the bulk of the connections, including clean effects. A variety of links are used, including NICAM (which are usually in the majority), single video lines and multiband connections. Using whichever means the signals are sent back to the East Tower at BBC Centre in West London; the sound is routed to the control room, from where it is sent on over a web of circuits covering Europe. Satellite delivery is also used in some circumstances.

For games played at Twickenham, Murrayfield and Cardiff Arms Park, the BBC provides the basic crowd effects and visuals to the overseas broadcasters. In the case of Irish, French and Spanish (Canal+) coverage, the respective broadcasters will send their own commentators and reporters, who are fed back to their TV centres over 4-way circuits, which gives full talkback to and from the venue in addition to the broadcast spec voice circuits. Others, primarily stations in the Southern Hemisphere where rugby is hugely popular and their teams are generally considered the best in the world, take clean effects and vision, with commentary added later by a reporter working to a screen.

For matches at Lansdowne Road and Parc

des Princes, RTE and France 2 provide similar basic coverage, with the BBC sending technicians over to tailor things to their particular needs. In the case of matches at Murrayfield and Cardiff, BBC Scotland and BBC Wales will supply the bulk of the facilities, with London OBS sending a Type 7 if the Grandstand links are to come from one of those venues.

'I've been to the other grounds for matches,' says Nottage, 'and it is much the same kind of thing. The basic requirement is a Type 8 and Type 7 (or their equivalent) it's a general setup.' When not running the overall mix, Nottage works the links scanner.

Although the BBC, RTE and France 2 will continue to cover the Five Nations for the foreseeable future, there are changes ahead. The French national team will have a new home for the next tournament, while it is likely that Wales will be playing its home games at Wembley Stadium in London. There is also the chance that the championship itself will change: Italy is keen to join in, something that is welcomed by observers, who suggest that they should replace Ireland. While the Irish regrettably picked up the wooden spoon this year, those of us of a green persuasion would like to see the Six Nations. If only to add more broadcast circuits. ■

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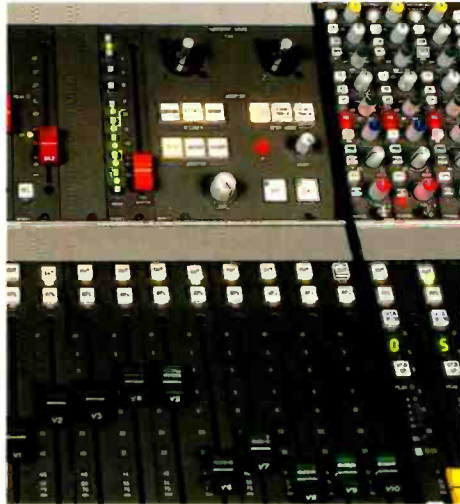
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As singer in The Buggles, Trevor Horn infused the novelty single with social comment. As a major record producer he defined the 1980s. Now, as producer, studio owner and artist manager, he talks to **Phil Ward**



I'M struggling with a particular track at the moment—I was up till four this morning so I don't much feel like I know what it's all about right now...' Trevor Horn is talking about record production, something he doesn't talk about, in public, very often. But the reticence disguises an encyclopaedia of experience, and the modesty is acceptably false.

It's easy to see Trevor Horn as the apotheosis of the cult of the producer. During an astonishing period in the mid-1980s, the effect he had on the recordings in his charge was opaque and dramatic, as his wilfully experimental techniques collided with the new generation of studio technology that had exploded onto the scene.

The story goes that, during the first session with protégées Frankie Goes To Hollywood, he urged the band to kick things off by jumping into the swimming pool. The resulting splash was duly sampled and became part of the orgasmic crescendos which characterise the debut single 'Relax'. No wonder Horn is often credited with finally closing the gap between performance and production.

But although his calling card may once have been such flamboyant sonics—a hugely reverberant synth stab, or a snare gated like a Rotweiler on a short leash—there has always been so much more, much of it subtle and eclectically musical.

This is the man who concocted the madrigal-style round chorus in the Band Aid single 'Do They Know It's Christmas?'. And who played bass with Tina Charles, and sang with Yes. And who collected the township rhythms of West Africa—plus much more besides—for Malcolm McLaren's *Duck Rock* project. And who did a hip-hop version of *Madama Butterfly*. And then there's the go-go band recycled in

Performance and production

'Slave To The Rhythm'. And the real strings grafted onto the machine-driven backing tracks of ABC's *Lexicon Of Love*. And... oh, all right. Better stop there, I suppose.

In recent years, of course, his work has sustained longer-established artists like Rod Stewart and Mike Oldfield, and has become less iconoclastic—as though the recording industry around him has caught up a bit. But SARM, his group of recording studios dotted around England and California, remains at the very forefront.

It's also a pool of talent, as the careers of graduates Steve Lipson, Gary Langan, Julian Mendelsohn and many others testify. From roots in the independent, hi-tech label scene of the early-1980s, SARM Productions is now a company that manages engineers and producers. It also tries to bridge the gap between production technology and the record industry—to show what can be done with the latest developments. But behind the shining edifice of the studios, Trevor Horn maintains some surprisingly traditional values.

'The kind of stuff that we're showing people today is how much things have changed, really,' he says, before a workshop at SARM West to show record company execs the full glory of Pro Tools. 'The reality of how, with a computer in the corner of your room—and I mean your office in your record company or production company—you can actually

change records after you've made them. I don't think that's really been possible before, not in the same way.

'When you finish a record, it's quite easy to run off a split of the song—drums, bass, vocals all separate—and on a basic computer available from your local retailer you can adjust the balance further, and change the length.

'What's interesting is being able to change the master of a mix—the actual master, without having to go back into the studio and recall the whole mix. That's of some value. You know, when you have a mix and everyone likes it except for one part—it may be too quiet, or a guitar part has been missed—it's possible to go back and fix it.

'That's quite a difficult idea to grasp at first. It's a little bit like, if you remember the first time we had 48-track recording with two 24-tracks locked together, on the face of it you might think that that was just a way of getting more information onto a record so you could make a bigger sounding record. But the real difference that 48-track recording made was that you could use slave reels. You could comp vocals, which you could never really do before 48-track because you would generally be working on one 24-track, and by the time the guy came to sing it you'd be lucky if you had only one track left so you'd just be dropping him in. When 48 came in you could make a slave and you could do >page 72



Frankle Goes To Hollywood's Welcome To The Pleasuredome and ABC's The Lexicon Of Love put Horn on the map

<page 71 ten takes of the vocal and you could bounce them down.

That was just one of the benefits, and not the most obvious benefit, of that technology. I think that with this direct-to-disk technology, with its built-in mixing capabilities, there are a lot of possibilities that people who work in record companies aren't aware of. And I guess the purpose of what we're trying to do today is to show them some of those things.

And to sell them some of the expertise available at SARM, of course. Which isn't difficult.

I think we have some of the best staff in the business here at SARM,' Horn claims. 'People I've worked with in America have often commented on how well-trained the staff here are, and with a studio that's really the most important thing. The equipment's there, but anyone can go and buy the equipment. You can't "buy" the staff. You have to train them, and we're one of the few places

that really offers a comprehensive training to young people. We train them how to be recording engineers. The business is full of people who started here. That, primarily, is the most important thing about SARM.

'We're also now the first studio in England to have two J-series SSLs. And in Studio One we've got the first set of Allen Sides monitors outside of the US. That may not mean a lot to the average person, but these monitors are reckoned to be the best in the world. And they're also the most expensive! Just listening to Sgt Pepper on them is really exciting —listening to any CD you know on them is an experience.'



at work which challenge such a position of influence.

It's possible these days to make records at home very easily. The quality of the equipment for home use is really quite remarkable—far better than it's ever been. It's difficult to know where the cutting edge really is. Maybe it's in the really cheap equipment that you can use at home, and in making the whole record and mastering it yourself. But once you start to record live instruments, musicians and people singing, it's important to be in the right environment with accurate acoustics, air conditioning, full-time maintenance staff, facilities to deal with lots of peo-

ple. That's why people still use recording studios, I suppose.

'One of the things that has changed over the past few years, with the advent of multitrack direct-to-disk recording being available in something other than a £100,000 postproduction facility, is that it's possible to make more interesting loops and other things with live playing. I've been in the business of producing records for 20 years now, and I have to say that records are sounding better than ever at the moment. In terms of competition, records are sounding amazing.'

In purely technical terms, what made Trevor Horn recordings so special in 1985 is now commonplace.

The first time you could do anything like this was with the Fairlight, which in 1981-82 cost £18,000. That's still a lot of money. There was no kind of sampling available for the average person. That's what's really changed: everyone has access to all of the technology. And the cheap end of the market is only marginally inferior to the high end. You can pay as much as you like. We have a new J-series SSL, which is a fabulous piece of equipment, but I would be lying if I was to say that the average person in the street could tell the difference between that and a Mackie. They probably couldn't. But you'd have a job mixing a band and a full orchestra on a Mackie, the buses wouldn't take it and there isn't the headroom there. But if you're making a dance record full of samples, the Mackie's fine.'

SARM has 11 studios: four in Notting Hill; one each at Hook End and SARM East; three workshops in Willesden, the new budget programming facility; one in Horn's basement at home, containing a Neve; and SARM West Coast, in a house in Bel Air.

The workshops are aimed at giving people a reasonable facsimile of a proper recording environment,' Horn explains. 'They have air conditioning, patchbays, Mackie mixers and various bits and pieces—a fair old range of old keyboards.'

> page 74

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One of SARM's two SSL 9000 J Series.

<page 72 Faced with such a wealth of choice, the pressure is on to make the right decision when it comes to pairing an artist with the most appropriate recording facility.

'We have a range to choose from,' Horn agrees, 'but our artists don't necessarily have to record in our studios. There are other studios available. I guess I'm always aware of the fact that the artist is paying for it, so wherever they want to go... But if it's a live band, there's Studio One at SARM West, or Hook End. But most records these days are hybrids. There's a bit of everything on them.'

'The studios are a stand-alone business. We as producers and engineers are a separate, but complementary, business. For example, I especially like Allen Sides' Ocean Way Studios in Los Angeles. I'm a big admirer of Allen's audio sensibility. He's one of those

guys who is a complete sound nut—we've nicknamed him the high priest of hi-fi. If you go to Ocean Way he has the most incredible collection of microphones, going back to the '30s. But I've always really liked the monitors in his studios, so when we redid Studio One they were first choice. Funnily enough, I ended up sitting next to him on a plane going back to LA. I'd met him once before, but we spent the first eight hours of the journey not speaking to each other—as one does, on an aeroplane. But I eventually realised who it was, and he realised who I was, so of course we spent the remaining four hours talking non-stop.

'Allen has about six studios, some amazing studios, and I was saying how I hadn't heard a decent pair of big monitors in donkey's years, apart from the ones in Studio Two at

SARM West which are unique. And he said that part of his business was now selling his monitors to other people, and he basically sold me a pair before we landed! I was sold on them before, really, because I'd used his studios so much. They're all vintage components bought from obscure places in America and put together in a quite unique way.

'I've just been working with a kid from Manchester called Lee Griffiths, and when each session finished he and his band would sit and listen to some classic album on the monitors, just because they'd never heard anything like them.'

The monitoring is not the only thing which distinguishes SARM. Horn is quick to add,

'There are lots of good studios in London,' he says. 'We are not alone in providing good studios. But I do think we have >page 76

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<page 74 the best staff, personally. I think Lola, who runs the studios, does a terrific job of training people. There are lots of people all over the business that came from here and learned their trade with us. I think, in a way, that's the most important thing.'

'Making records has never really been about hi-fi. There's a story somebody told me which illustrates this, about a guy who played bass guitar in a band and bought an 18-inch speaker. He went to local hi-fi shop and asked the guy for specifications to build the cabinet for it, and the guy gave him these extraordinary dimensions the size of a family wardrobe in order to get the correct wave from the 18-inch speaker. So he built this huge cabinet, and had two guys help him carry it to the first gig. There were two hands on, and the other bass player had a Vox Foundation bass, and his 18-inch speaker was in a crappy little cabinet. And of course, when he started playing, it sounded far better than the wardrobe, because in actual fact the wardrobe gave him all those frequencies which he didn't really want, all round about 30kHz.

'I always think there's a lot to be learned from that story, because most of the time making records you're looking to get some kind of acceptable distortion rather than a clear and clean signal. And these days it gets harder and harder. The better the equipment, the harder it is to get an interesting drum sound. It sounds so clean you end up buying, renting and borrowing stuff to apply some colour. I just bought a pair of Neumanns from 1952, old valve things, because they sound peculiar. That's what we're all looking for.'

Personality.

It sounds like fidelity at first, a bit like Trevor Horn's records of the mid-1980s. But they themselves now sound like... Trevor Horn's records of the mid-1980s, and that's their charm. It's also what made them sound exciting at the time, although we thought it was 'fidelity'. The ear is always fooled into believing that some new recording technique has somehow brought us closer to the artist,

Trevor Horn on consoles

WE WERE the first people in the UK to put a Euphonix into a commercial studio, and as a matter of fact we have two of them—one in SARM West Studio Four, and one in SARM East. We've got a pretty interesting collection of boards at the moment: Euphonix, SSL E, SSL J, Neve.

'The Euphonix is an amazing piece of equipment. The digital control of the analogue is the key. I don't care what anybody says, I don't see a digital board doing it in the next few years, for different reasons. None of the really good technology for altering sound exists in the digital domain. If you take a small Yamaha digital board and put it with, say, an Otari RADAR—and I use RADAR a lot, it's got brilliant A-D converters and is the best standalone direct-to-disk system purely for multitracking (Pro Tools is essentially an editing system, and it's perfect for that)—and you play back your track, it'll sound okay but try doing anything to it: try EQ'ing it, compressing it or whatever, I defy you to get anywhere. Within five minutes it'll sound horrible. It just will, because it's not up to it.

'Now, take the same tracks off the RADAR and put it through a little Mackie 8-bus, and screw a bit of EQ onto it and put in a couple of inserts, and it'll sound great. That's at the low end of the market. And believe me, Mackie aren't paying me anything to say that. And unfortunately, I can't see any difference in the stuff at the opposite end, the high end.

'I'm curious to see what happens with Sony's Oxford R3 digital board. That one seems to me to be the one with the most promise, because it has incredibly detailed architecture inside it. But the fact is, to get really decent EQ and compression you have to go analogue. So if you're monitoring digitally, you have to go through the D-A converters and back again. It doesn't knock me out. I haven't been convinced by any of them, yet, I think we're going to be analogue for a little while.

'The top end on the SSL J-series is the most clean, clear and immaculate that you've ever heard. It really is a step forward from the E-series, sonically. I always had a lot of affection for the old SSL 'crunch', it was always a favourite of mine. I haven't heard the new Neve. I've got a Neve V in my basement, and I'm a big fan. But the Euphonix is amazing, particularly the programmable compressors and the way you can totally recall a mix with all the compression and the routing and the whole bit. Combine that with its sonic qualities, and it's amazing.

the original performance. Maybe that's the producer's job: to excite the listener by creating 'proximity' to the artist.

'We're in the entertainment business.' Horn agrees. 'The technology is going nowhere. Why should it be going anywhere? We're just making records, having fun and earning a living, not heading for some Holy Grail when we make the ultimate record and then pack it in.

'When Elvis first made hit records, one of the reasons they sounded so great was that slap-back tape echo. He was a great

singer, but that made the record interesting. If it had been bone dry it wouldn't have been a hit. Nothing's really changed much since then.

'The artist must have something to say and the means to say it. The producer is only the translator of ideas, unearthing the ideas inherent in the performer's psyche. We also guard against the pitfalls of technology. Producers aren't necessarily there to bang loads of technology on your track. Quite often they're just there to remind you of what your original idea was in the first place.' ■

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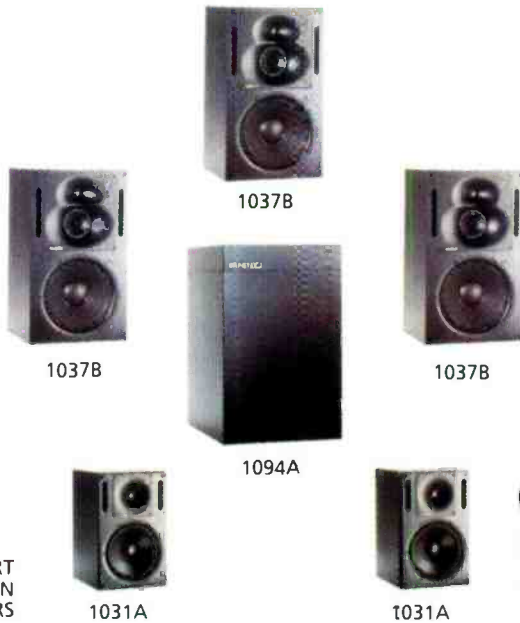


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Hans Dreijer Audio



The AMS Neve Logic 2 desk at HDA's base in Hilversum

A successful Dutch postproduction operation opens a new facility across the border in Germany—and incorporates picture editing along the way. **Zenon Schoepe** discovers the hows and whys of international posting

HANS DREIJER AUDIO has joined the rather exclusive band of postproduction facilities that have managed to expand out of their native countries into others. Significantly, it has not achieved this by the usual route of acquisition but by building from the ground up. Perhaps the most intriguing part is that HDA—with its base in Hilversum, Holland—chose Cologne in Germany as its new target market.

Established originally more than ten years ago, the new German operation was opened in late 1995 to concentrate on TV drama in line with expertise accumulated in Holland, but with the inclusion of picture editing facilities which have now been adopted similarly in Hilversum. Director Hans Dreijer started in the business more than 22 years ago, originally as a musician, but worked for Casio's

short-lived pro design department for eight years. While investigating the potential of producing a video to supplement the company's equipment manuals, Dreijer uncovered a lack of post facilities in Holland at the time. His answer was to open a studio of his own which led eventually to a merger with a video company in the same building.

Business picked up leading over the years to an increasing amount of trade with German production companies for whom the distances involved eventually became an issue. Cologne is a good boom town venue, according to Dreijer, and while the facility opened with three audio studios, client pressure was quickly emerged for it to buy an Avid system—within seven months the operation had three.

Two more Avids have recently been

installed in Hilversum with the promise of more to follow. Dreijer had previously observed that there were benefits to be had from combining picture and audio in a team and it was an appropriate strategy for breaking into Germany.

'What you see in the media business is that Avid off-line, and off-line systems in general, are used together with on-line systems which is ridiculous because on-line is basically a machine room where no creative process takes place,' Dreijer explains. 'It's in off-line that you're supposed to be creative and creativity is also involved in audio post which is why they fit together well.'

The point about it is that the picture editing and sound editing never normally communicate with each other. Picture editors feel that they should deliver the whole project while sound editors know that audio editing is a completely different discipline. But if you can combine the two in one building, these people end up eating with each other at the same table and slowly an understanding develops between them. Sound editors sit-in with the picture editors and understand the problems that they face and why > page 80



Hans Dreijer: 'Everybody in Holland said we were mad and that we would go bankrupt. We basically almost did a couple of times but we took the risk.'

> page 79 they deliver the sound so badly and the audio editor's problems are also understood.'

Dreijer adds that creativity increases purely from this basic communication and that both parties develop better ways of preparing material for the other as they know how the other works. The client is the one who benefits in absolute terms because as the facility produces the sound and the picture together it can guarantee that the two will work together.

Dreijer further claims that hard disk is a key element in the equation and he was the first to buy an AudioFile in Holland more than ten years ago. This resulted from his having been turned on to digital through sampling at Casio—he completed his first commercial using five FZIs.

'We became very successful with the AudioFile although at the time everybody in Holland said we were mad and that we would go bankrupt,' he recalls. 'We basically almost did a couple of times but we took the risk.'

The AMS Neve connection has continued: in Hilversum HDA have an AMS Neve Logic 2 with 24-track AudioFile and three Logic 3 AudioFile packages while Cologne boasts a Logic 1 16-track AudioFile and two Logic 3 AudioFiles.

'AudioFile may not at this time be the system with all the tricks and bits and pieces, but then lots of the stuff that other systems can do is not necessary for us—reliability is a big issue for us. We cannot afford to lose time because we are the last stage and the produc-

tion has probably been losing time all over the place. We can't have a system that is unreliable,' he states.

AudioFile-Avid interconnectivity allows drives to be transferred from the picture process to the audio process and this speeds the flow. 'One of the mistakes people make if they go in to off-line video editing is that they forget that sound is always on-line unless you start rerecording or redigitising original material which is inefficient,' Dreijer says.

'There is a logic to all this because to get into this business and to work the way we work is different to the way most broadcasters view postproduction which is still quite traditional,' he continues. 'For us to break in to the system we had to be in at the very beginning of the production process otherwise they turn up with their tapes at the end—everyone starts thinking about audio post around about the time that the programme is due to be broadcast.

'Our services are quite expensive in comparison to other companies in the area and the only reason the production companies can afford to use us is when they save money on the rest of the process. That's been the idea and we've been successful in Holland because we found ways to save clients a lot of money at the front of the process.'

However, Dreijer concedes that clients are not predisposed to the concept of paying more for a service, no matter how much more technically advanced it might be. 'You have to prove yourself to them as they don't understand the technical side and they don't trust you, particularly if you come from

'AudioFile may not at this time be the system with all the tricks and bits and pieces, but then lots of the stuff that other systems can do is not necessary for us—reliability is a big issue for us'

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AUDIO MEDIOCRITY?



> page 82 Holland,' he laughs. 'Their experiences of postproduction is that the facilities always try to get as much money out of them as possible. The only thing you can do is give them a guarantee—this is what you pay and we guarantee that the audio will be 100% and it will get through the technical approval and they will never pay more. There is no way you could sell a studio in this manner, you have to sell the whole project price and that's an enormous risk especially if they're not used to working in this way.'

'You do the first episode and you probably lose a lot of money but they realise that you're honest and you've done the job so you get the second episode,' he adds.

Part of the package that HDA offers is a postproduction planning services and it takes over the technical side of productions on behalf of the client that often extends to incorporating the shooting into the schedule. By controlling and policing the schedule, some of the conflicts and overlaps that make hitting deadlines difficult can be dodged.

'We regard it as part of the education process because often the person who is scheduling the production doesn't have a clue what is happening on the technical side and can't make correct estimates for how long things take,' Dreijer explains. 'It also lets us stay on top of a project and predict when problems could arise. This is important because in the end it will all come back on us if it doesn't work so we do have a responsibility. It's a way of covering ourselves.'

'People say that audio post will disappear because the Avids and other machines now have so many possibilities are becoming so powerful but that's just not true. When dealing with a complicated soundfield you can't expect a video editor or film editor or Avid cutter to cope with their own increasingly complicated systems and at the same time do the sound mixing'

Surround sound work, while prevalent at HDA in Holland, is still to make an impression on the German facility's worksheets but Dreijer is confident that the arrival of advanced multichannel sound bodes well for the dedicated audio facility worldwide.

'People say that audio post will disappear because the Avids and other machines now have so many possibilities are becoming so powerful but that's just not true. When dealing with a complicated soundfield you can't expect a video editor or film editor or Avid cutter to cope with their own increasingly complicated systems and at the same time do the sound mixing. If they have to concentrate on the sound then their creativity with the picture will be compromised, which is defeating the object. Plus, budgets are coming down for

productions so the goal is to try and work more efficiently.'

THE MATTER OF efficiency begs Dreijer's opinions on whether digital post gets the same job done quicker or whether the client stays as long but leaves with a better result. 'Our clients leave earlier but this comes down to a matter of philosophy,' he answers. 'It's where it goes wrong in many facilities because they try to sell as many hours as is possible to one client. We believe we should supply a production company with efficiency and speed so that they save money because that's the only reason in the long-term for them to come back.'

Dreijer already has plans for further expansion—100% expansion in Germany in the next two years and some more for Holland—but this is dependent on finding the right people with the required technical experience and creativity.

'Every large company can afford to set up a sound studio for 1m DM but what they can't afford is getting the right people to run it,' he explains. 'The tools should be reliable and that's the only thing they should be.'

His attitude to the type of people he is looking for is typically Dutch and progressive.

'You have to build your people up from the start,' he begins. 'Before operators can work with a client they have to have been with us at least a year. All our audio editors are musicians because I think it's very important that they have musical experience. The reason is simple, if you have to cut a voice-over you need experience in rhythm to know if certain things are possible. In drama you can have the best composer you can get but you still have to be able to cut into the music and make your own compositions—especially in drama series because they can't afford completely new music for every episode. You have to work with existing music that was composed for another episode and if you're good you can save a lot of time—cutting music is about 60% of my time.'

He adds that an operator's personal attitude is paramount especially when working on soap operas. 'We have three days in Holland where we do 15 episodes and it's vital to recognise that for the director every episode is equally important, to him each episode is a Jurassic Park,' he says. 'It's not enough for an

engineer to just do the job, they have to want to do the best they can and only then will they be able to work 20 hours in one day to get the best result.

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'We believe that our colleagues are also our clients and if an assistant is digitising or synchronising for the picture editor, when they do a bad job then it will emerge at every stage in the postproduction. The picture editor's job is to cut creatively and not have to worry about things not being in sync. So the assistant is as important as the cutter and that's an attitude that many facilities don't have,' adds Dreijer. 'Assistants generally have no responsibility—but if you give them responsibility then you can save days.' ■



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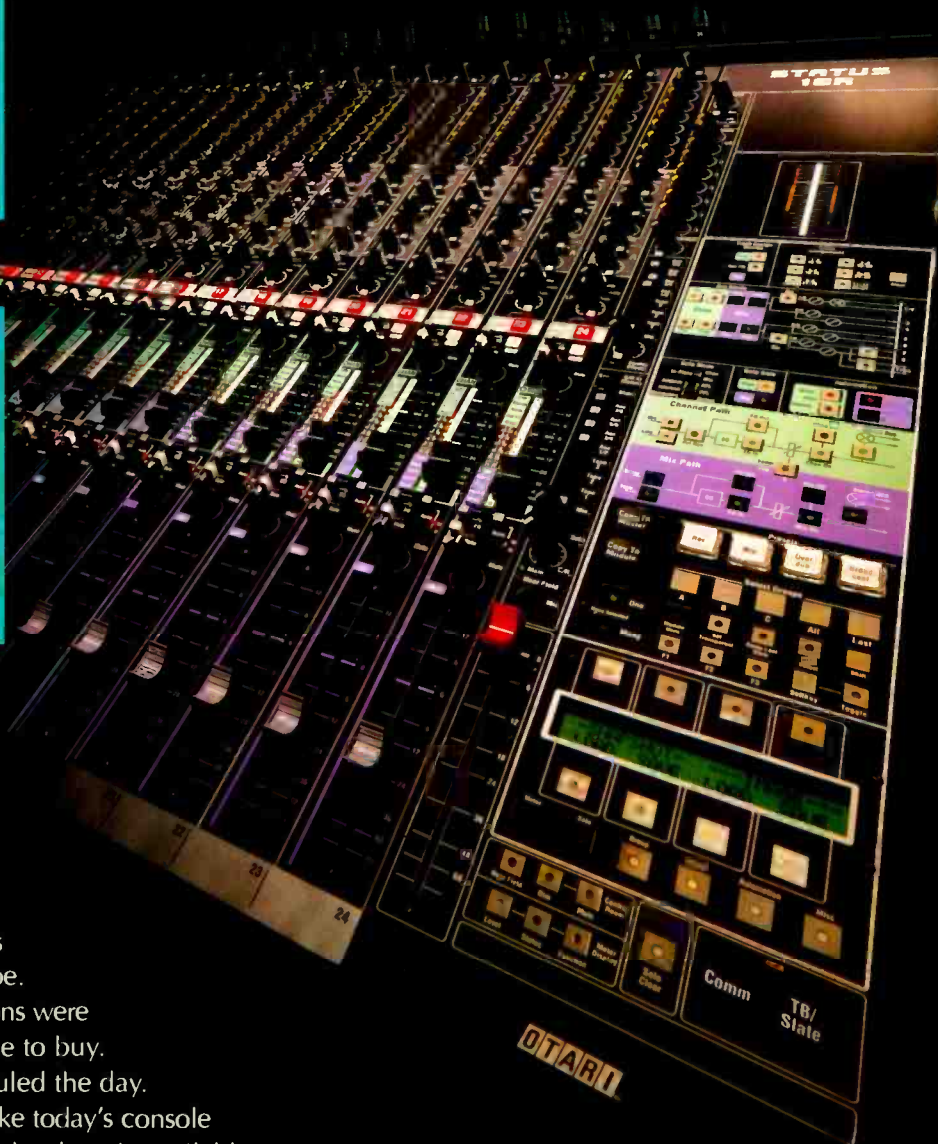
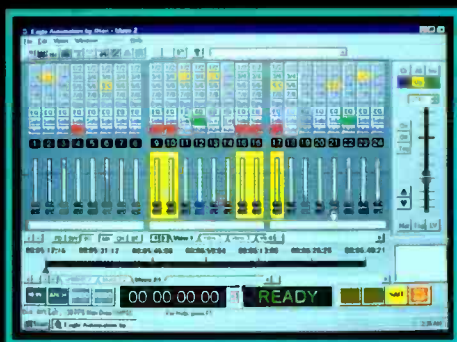
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The conception and recording of *Jagged Little Pill* marked an unusual working relationship for Alanis Morissette, Glen Ballard and Chris Fogel.

RICHARD BUSKIN explores the making of Alanis Morissette's 25-million selling album

WE HAD A CUP OF TEA and went straight to work," says Glen Ballard of his initial encounter with Alanis Morissette, the Canadian singer-songwriter whose record-breaking debut album, *Jagged Little Pill*, has already sold in the region of 25m units worldwide, 15m of these in the United States alone. "I picked up a guitar and, when the smoke had cleared, we'd written a song that I thought was very special. It never made it onto the album but to me it was a foretaste of her potential and what we could accomplish together."

Home for Ballard is Encino, California, and he describes his studio there as a small workshop, albeit one that's pretty powerful. It features a Euphonix console, a Sony analogue JH24 multitrack, eight ADAT machines, loads of synths, ten acoustic and electric guitars, a good selection of vintage tube mics and quite a bit of outboard gear.

"I'm really fond of the Euphonix because," he explains, "it's a digitally-controlled analogue console. I get the best of both worlds. The components are not unlike those that you find in a Neve console, it has a very short signal path, it's extremely warm and clean, and yet you have the digital control over it so you can automate everything. I'm sort of going forward into the digital age with as much analogue as I can bring with me, and so the Euphonix satisfies that requirement. It is at the centre of everything that I do, and it really has made it easy for me to work."

Although not necessarily always by choice, Ballard is often fairly heavily involved in the engineering chores as well as those that take place on the other side of the board.

"So many times when I'm writing with someone we're the only two people around," he explains. "So it falls to me to record a lot of what we do and then that quite often ends up being on the finished album. I certainly understand the process and I'm more or less qualified to do it, and as a result I sometimes find myself playing, programming, writing, engineering and producing all at once. Because I understand equipment I'm able to do all that, but I have to say that I do prefer having an engineer there and that's always the case when we're no longer involved with the writing process."

Starting with the writing process, we first encounter Ballard *sans* engineer, with guitar in hand as well as sequencers to produce a beat, come up with a chord sequence and modify the melodies to fit Morissette's voice. She in

Jagged Edge

turn is writing the lyrics.

"It was incredible," Ballard exclaims. "We would walk into the studio with nothing planned. She had a notebook full of poetry and ideas, and I always had bits and pieces of music lying around, but it was never a case of "Okay, here's the lyric," or "Here's some music". It was always created on the spot, and I'm still amazed by how quickly we did it."

"We'd write a song and record it on the same night. Her lead vocal would be done last, it would require one or two takes, and without exception those were the vocals that made it onto the album. She never touched them again, and that still blows my mind—the ink wasn't even dry on the page! She'd be singing through the melody all day long as we were writing, but the lyrics wouldn't be complete until later in the day or maybe after dinner and then she'd go out and have total command of this material. It was quite remarkable. We never changed anything and she wouldn't even let me change any of my parts. It was like, "This is the moment", coming right off of my guitar, right out of her mouth. I've worked with a lot of talented people, but I'd never worked that quickly before."

"In fact, on 'You Oughta Know' I didn't have the vocal level right and I distorted it when I was getting it down on tape, but the performance was so good that we thought we'd just leave it that way with a couple of hot-spots. Afterwards people were asking me, "How did you get that effect?" and I had to tell them that it was unintentional distortion. I couldn't do it again if I tried."

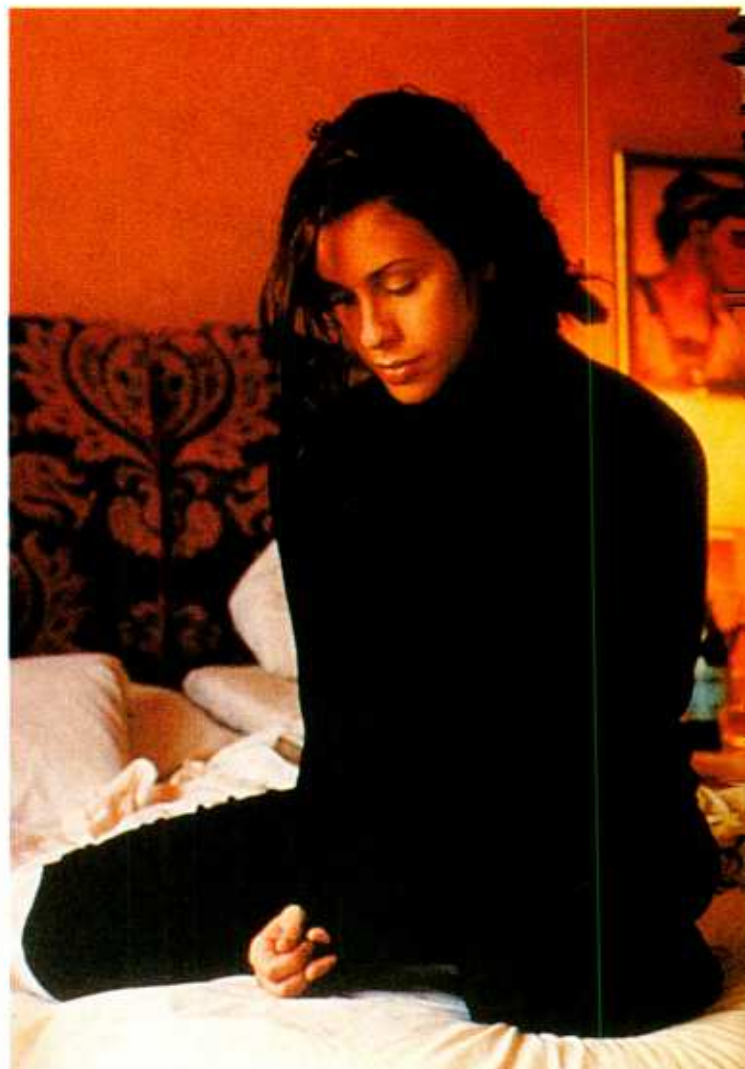
It wasn't really until about two months and a fair number of songs into their working relationship that producer and artist acknowledged that they were actually making a record destined for commercial release. Prior to that they had just been writing, recording and having a good time with the music.

"I don't think we ever went over 24-track on anything, and in some cases 12 or 13 tracks were enough, because it was real simple," says Ballard. "I played my guitar parts in one take, usually to a drum machine, and I'd have an idea in my head as to how the track should turn out. Then we'd layer it, one thing at a time, and

within a couple of hours we would have a track that she could sing to. In large measure that is how the album was done."

THE RECORDING *modus operandi* was to start off with a drum pattern and sequenced bass using a Linn 9000 in conjunction with a Minimoog that has been modified to receive MIDI. Ballard would then add perhaps a couple of guitars—his mainstay in this respect is a black 1979 Fender Strat with humbucking pickups, alongside a Martin B28 acoustic, a Telecaster and a Gibson Les Paul—going straight to tape through a Matchless amplifier that was miked with either a Shure SM57 or AKG C141. A couple of Hammond B3 samples that Ballard has stored in his Akai S1000 often made their way onto a recording, yet aside from the occasional keyboard parts and the odd loop most of the tracks were predominantly guitar-based. Alanis Morissette recorded > page 86

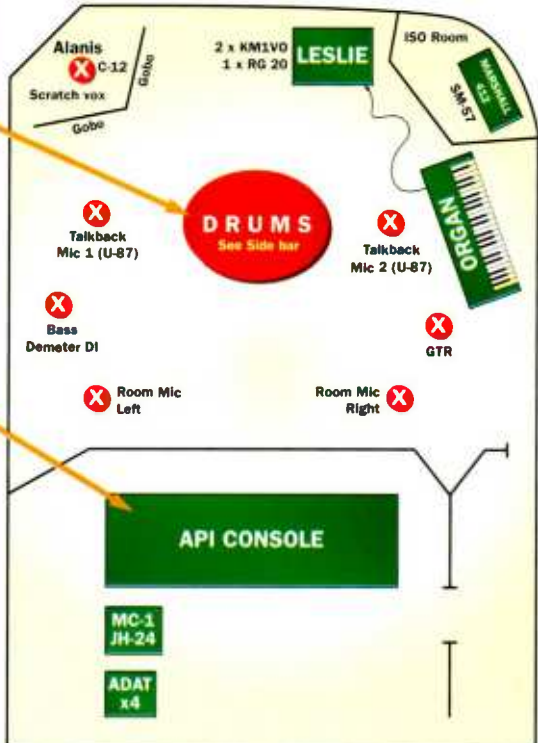
RECORDING



Alanis Morissette



- Drums**
- Kick = ATM-25
 - Snare Top = SM57
 - Snare Bottom = AKG 452
 - Hat = KM-84
 - Toms (x3) = SM-57s
 - Ride = KM-84
 - O-H = Neumann Stereo KM-140s
 - Room = U-87
- API In-Out list**
- 1 = Kick → Track 1
 - 2-3 = Snare → Vox → Track 2
 - 4 = Hat → Track 3
 - 5-7 = Toms → Tracks 4-5
 - 8 = Ride → Track 6
 - 9-10 = O-H → Track 7-8
 - 11, 12 = Room → Track 9-10
 - 13 = Bass → Track 11
 - 14 = GTR → Track 12
 - 15 = Vox → Track 15
 - 23-24 = Talkback mics



< page 85 her vocals in a small booth, standing in front of a mid-1950s AKG C12 through a Demeter preamp into a Teletronics LA2A valve limiter and straight to tape.

The C12 has a clarity and a warmth to it, and, being that she was giving me so much anyway, the mic was able to capture her natural singing style,' says Ballard.

Producer and artist would complete the recording of each individual song before moving onto the next. Overdubs mainly took place at MCA Music's own basement studio, equipped with a 40-input API Legacy desk, behind which engineer Chris Fogel took care of the technology.

'On two songs, 'Ironic' and 'Perfect', the drummer was a fellow named Rob Ladd,' Fogel recalls, 'and then everything else with live drums on it—'Right Through You', 'You Oughta Know', 'Mary Jane' and 'Forgiven'—featured Matt Laug. He was playing a Yamaha kit, and this was miked with an Audio Technica ATM25 on the kick, a Shure SM57 on the top of the snare with an AKG 452 underneath, a KM84 on the hi-hat, a KM84 on the ride cymbal, SM57s on the toms and stereo-mounted Neumann KM140s as overheads. I also put up some U87s for the room sound, but I ended up scrapping that. The room was just too small.

'My reason for using the KM140s wasn't so much their audio quality—although they were fantastic—but the fact that I could get a perfectly phased and coherent stereo setup from them. Ninety percent of the problem with an overhead sound is phase, and because they were in phase it ended up sounding great. Those mics are also really good on the top end. Their high-transient response is phenomenal. I could have used a pair of tube 67s,

but the KM140s were fantastic.

'I used all of the API mic pre's on the kit, and I always compressed the snare through a dbx 160X. All of the songs with live drums also had Lance Morrison playing live bass which was going through a Demeter tube DI, compressed with an LA2A.'

While everything else was recorded digitally, the guitar overdubs were recorded at Westlake Audio using a Trident 80c console together with Ampex 456 2-inch tape on a Sony APR 24 analogue machine. 'We had Michael Landau playing a gut-string acoustic on 'Forgiven' which I miked with a KM140,' says Chris Fogel. 'He also played some power guitar parts on a Strat which went through a Bradshaw rig, amplified by a VHT

'I used my KM140s on the horn, not on the sides of the Leslie, but at a 45° angle at the front of the cabinet. That way it didn't cancel itself out'

through a pair of Marshall 412s and miked with a single SM57 on each cabinet. Then Joel Shearer played a Telecaster on 'Right Through You', and that went through a JCM 800 and a Marshall 412 with a single 57 on just one cone.'

While Glen Ballard performed a lot of the keyboard parts Benmont Tench was brought into the MCA studio with his Hammond B3. Playing on all of the songs in just one day, his contributions were eventually used on about half of the album.

'I used my KM140s on the horn, not on the sides of the Leslie, but at a 45° angle at the front of the cabinet,' explains Fogel. 'That way it didn't cancel itself out. On the bottom of the Leslie I put an RE20, and then I mixed them down to a stereo pair.'

Vocal overdubs were recorded at Ballard's own studio, and the most effort expended in this respect was on a song such as 'All I Really Want' which required 16 tracks of backing vocals.

'Alanis also changed a verse on > page 88



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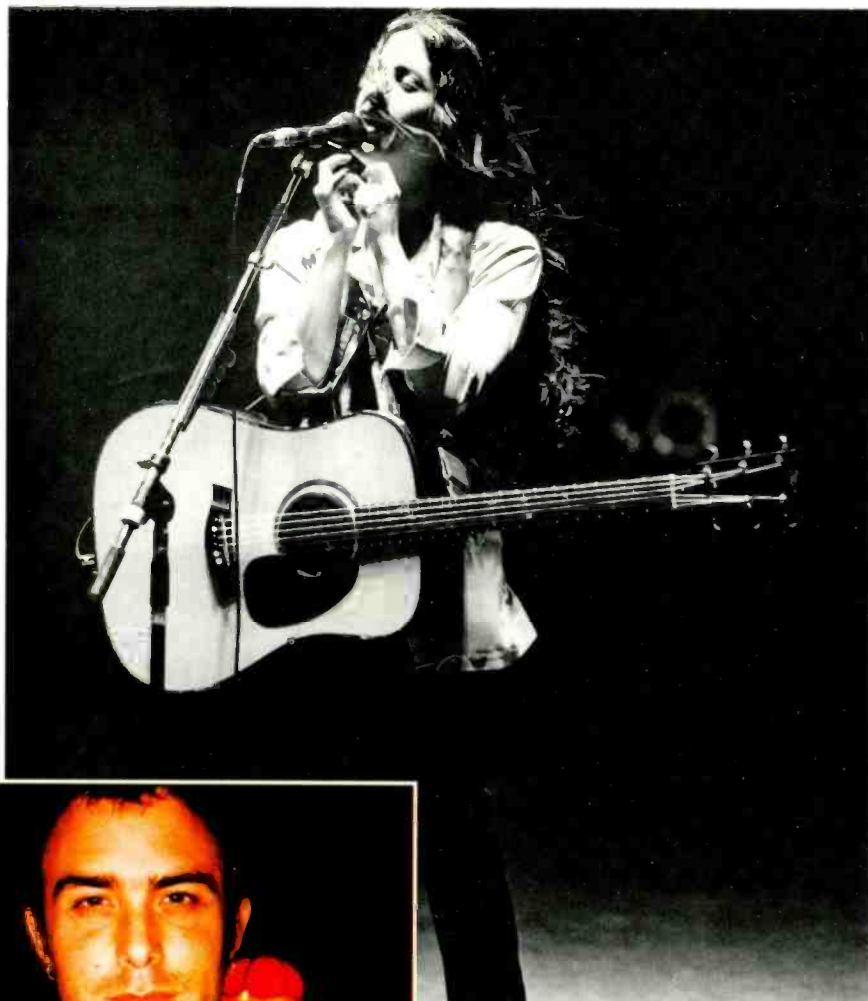
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LEFT: Chris Fogel behind the board

< page 86 'Ironic', and so, of course, we went back and had her re-sing that verse," points out Fogel. "She also sang 'Mary Jane' a second time just because she was unhappy with her original performance, but all told, including original performances, she never sang any song more than three times."

IN LINE with everything else about the *Jagged Little Pill* project, the mixing process was pretty fast: roughly a day for each track. With the exception of two songs—'Forgiven', which was mixed on a Neve VR at Signet Sound, and 'Right Through You', which used the Trident board (with the automation turned off as it sounded so bad!) at Westlake—all of the mixes were carried out using Glen Ballard's Euphonix console. Once again, Chris Fogel was, for the most part, the man behind the board; Francis Buckley mixed 'Perfect' and Ballard himself took care of 'Hand In My Pocket'.

"I ran every mix though a TL Audio C1 stereo compressor," says Fogel who has since taken a TL Audio 205 voice processor for use on Morissette's live work. "That was basically just to fatten up the bottom and to get more control on the top, and I think it worked really well. That stereo compressor was fantastic. I had just gotten it and I ended up using it on everything."

"I would usually compress Alanis through a dbx 160X, and while I also ran the snare drum through a 160X I left the rest of the kit alone. Glen's Euphonix wasn't one of the full-blown ones at that time. We didn't have any of the dynamics; it was basically just a stripped-down CS2, so we had two pairs of EQ on each channel and that was about it. There was no external Euphonix compression—I think that their in-line compressors are awesome—and so there really wasn't a lot of trickery in the mix. The guitars were basically untouched, the drums were basically untouched, and the bass was just compressed through an LA2A and EQ'd through a Pultec MEQ."

"For Alanis' vocal processing I would use the Yamaha SPX990s stock vocal doubler program on almost everything and then I would find a small, wooded-room sort of reverb. On 'Mary Jane' I used a thin or fat plate from the 480L, but with the exception of that track—on which we were after a more pristine sound—there weren't a load of expensive reverbs. I'm always getting asked about how I achieved the vocal effect in the bridge section on 'Ironic', but that was just the SPX90 symphonic program together with the 990 doubling program, and a basic flange. It produced a timed-phasing sweep, but I really sort of stumbled upon it by accident."

"For the most part we were after a sort of rough, over-compressed, in-your-face vocal sound, and I think we got it. However, it was also pretty sibilant at times, and so **page 90>**

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< page 88 I tried using a de-esser, but Alanis is so in tune with her voice that she would immediately hear this and say, "Take that de-esser off my voice". Even if there was only slight de-essing I would never get away with it. She thought it was unnatural, and so I would just have to use some EQ. Her voice is sibilant, she wanted it to remain that way and I think she was right. In the end it was good that her vocals were still a little zingy—but I did try.'

THE MASTERING engineer on *Jagged Little Pill* was Chris Bellman at Bernie Grundman Mastering in Hollywood, and Glen Ballard is quick to express his respect for Bellman's abilities.

'We bring the material into his studio and it sounds different because it's almost a clinical setting,' he says. 'There's no hyping of any frequencies and it's kind of this perfect listening environment, but Chris really helps us to get the most out of what we've got. He's a

Glen Ballard

GLEN BALLARD is nothing if not versatile. As a songwriter, producer, musician and engineer he has found success at the top of the pop, alternative, R&B, adult contemporary, jazz and country charts. He has worked with artists such as Michael Jackson, Quincy Jones, Van Halen, Aretha Franklin, Aerosmith, Natalie Cole, George Strait and Barbra Streisand, and in the process amassed seven Number One 'Billboard' singles, 100 million record sales, nine Grammy nominations and four Grammy Awards.

Five of these nominations were for Ballard's work as producer and co-composer on Alanis Morissette's *Jagged Little Pill*. He missed out as the 1996 Producer of the Year as well as the producer/co-composer of Song of the Year nominee 'You Oughta Know'. Nevertheless, this track did get the nod as Best Rock Song, and Ballard then also went on to scoop another two awards as producer of the Best Rock Album and the Album of the Year, adding to the statuette that he won in 1990 for his work on Quincy Jones' *Back On The Block*. The co-writing and production of a second album with Morissette is currently in the works.



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valuable member of the team, and I'm always sure to be there when he's working.'

As for the new album, while Ballard does not any obligation to work at the same song-a-day pace, he predicts that things will still turn out similarly. All of this in spite of the obvious danger that, in trying to follow-up on the massive success of a debut album like *Jagged Little Pill*, things can get bogged down in a welter of detail and over-refining.

'I don't want to get too intellectual about the second record,' says Ballard. 'What was special about what we did was that we were channeling this wonderful energy. I certainly don't want to spend a year and a half in the studio going over ten or twelve songs, dotting every 'i' and crossing every 't'... although I've made records that way too. The pure power of Alanis singing from her heart and soul has to be the most important element. I've got to make sure that I'm providing these complex lyrics and emotions with the right support.'

'This voice and these words are just stunning, so that makes it easy for me to see what should be at the centre of it all. I mean, when I hear her singing it sort of solves a lot of problems. On this first record I always felt that it was important to have her vocal out front and intelligible, because the lyrics were great and she articulates wonderfully. One reason why it's reached a lot of people is because they can actually understand what she's saying.'

'We weren't trying to do anything other than what we do, and so every month we've tried to remind ourselves of what is important about how we made the first record. Alanis has a wonderful band now and we certainly will utilise them to the fullest, but we have to get into a room together and write the songs.'

'It should be a fun process,' adds Chris Fogel, who is also looking forward to working on the second album. 'I think we need to go in there and have a meeting to really figure out what we did wrong on the first record so that we don't do it again. Why hasn't it sold 30m copies yet? I can remember sitting in the studio just as we finished the first album and I said, "I think this is great! It'll probably sell a couple of million!" Glen and Alanis said, "Man, you keep thinking that! Because if that happens, then we're definitely making a second record..."'

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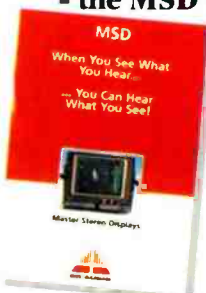


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US: the Return of the MIDI

The resurgence currently being enjoyed by certain 'old' technologies extends well beyond the familiar ground of valves and mics writes **Dan Daley**

IVE BEEN so overwhelmed on this side of the Puddle by the return of studio palaces that we've missed another, quieter, but equally significant phenomenon that's occurring.

Some of the existing palaces have refocused their attention on that eternal cockroach of the pro-audio business, MIDI.

There was a time when MIDI was considered high end by American studios. In the late-1970s and early-1980s, a few facilities made it a point to become not only MIDI-savvy but MIDI-obsessed. Studios like Unique Recording in Manhattan, a facility which went on an acquisitional tear during that period, buying up virtually every new piece of MIDI gear as it became available. And in the days before the personal or project studio was common, the recording studio in general was

looked at as the leading-edge ferreter, purchaser and repository of state-of-the-art technology by both musicians and engineers. In the course of the next couple of years, however, it became quite clear that no one could ever hope to keep up with the flood of MIDI-based technologies. It was at that point that MIDI lost its charm for the big-studio set.

Large facilities in recent years have addressed MIDI in some form or another, but generally at a relatively low level. Like their grudging inclusion of ADATs and DA-88s as interfaces with the Great Unwashed home studio population, MIDI was there to accommodate certain clients and projects. But it never acquired the patina that SMPTE—real time code—did at the upper levels. Aside from the technical aspects of the matter, there remained also an attitudinal one—MIDI and all it conjured up for them was in a class below where many upper-end studios saw themselves belonging.

But some studios have been rethinking this. Classic motherships such as Avatar (formerly Power Station) in New York have recently added or plan to add MIDI suites. And because American studios have in the past few years become very much more sensitive to client demands—to the point where they must to some degree or another try to anticipate them—the reasons for MIDI's rehabilitated image are varied.

On the technical level, sheer numbers demand an acknowledgement of the 'if you can't beat 'em join 'em' philosophy. Project studios, home studios—whatever you want to

call them, the notion of doing substantial parts of records in a personal space has become an entrenched and ingrained aspect of pro-audio life in America. Beyond simply accommodating personal gear when it's transferred to the traditional facility, studio owners and managers are moving towards the idea that they can provide as nice and well-equipped a place to do off-line composing, recording and editing as musicians themselves can, and do it with considerably better maintenance than most personal environments can provide. The new suites are nicer looking and more homey than the stark cubicles that characterised this trend the first time around. It's all part of an increasingly common strategy to keep more of the project under the studio's roof.

Another factor might be that music that is heavily MIDI-based is getting popular outside of the trendy clubs of New York and LA, Europe's long-running techno culture has made inroads here, with acts like Blur and Oasis showing up higher on the American charts. And with the proper pop-music attachments, acts like the Spice Girls bring a differently dressed disco—one of the original *agent provocateurs* of MIDI—out onto the Great Plains.

Another interesting sidelight to this return to MIDI is that certain pieces of gear have acquired a vintage caché, something that is generally held to be reserved for analogue equipment. Items like the Roland TR808 and TB303 drum and bass machines, the Yamaha MEP-4 effects processor, and the KMX (later Ensoniq) MIDI Central Switcher have

Europe: The return of CD-E

With MO recorders looking thin on the ground, the chase is on to establish rewritable CD as a professional format writes **Barry Fox**

WHATEVER HAPPENED to the idea of using optical discs instead of tapes to make studio recordings? Decca has gone silent since Tony Griffiths departed. Deutsche Grammophon has been silent since the misguided plan to make 4D a household word. Both companies have now been hit by PolyGram's cutbacks, sorry 'downsizing'. Sony has gone curiously quiet on its optical recorder, too.

The cost of blanks was one of the main obstacles. Two recent developments suggest the time is coming right for a rethink. Eraseable CDs are now ready for the PC market, and the standard for DVD-RAM, an eraseable version of DVD, will soon be set. Once blank CDs and DVDs are mass-produced for the consumer market, professional uses can ride in on the back of the reduced costs. The business model is CD-ROM. All those factories built to press music discs found they could equally well press CD-ROMs.

Hewlett Packard, Mitsubishi, Philips, Ricoh, Sony and Yamaha recently agreed the standard for CD-ReWritable (formerly CD-E), using a phase change coating.

The standard for CD-RW specifies 20%

reflection from the alloy in its crystalline state and 5% in amorphous state. The recorder can use an inexpensive 10mW laser. But the player must have a more sensitive sensor. So the standard also defines a Multiread player with automatic gain control AGC in the circuit that amplifies the signal from the light sensor. If the disc is a pressed CD or CD-R, the amplifier gain is turned down; if the disc is a CD-RW with lower reflection, the gain automatically increases.

The Multiread standard has now been endorsed by all the major manufacturers of CD-ROM drives. Around one third of the latest models in the shops, known as 12x drives which run at 12x normal speed, already have AGC. Once makers have sold off their old stock, all new drives will conform. Some old ROM drives and even CD audio players may, by happy chance, have sufficiently sensitive optics to play CD-RW recordings. Philips's CD-RW recorder will cost \$900 (US), with 650Mb blank discs costing \$25. Hardware and disc prices should soon fall to around half.

The Consortium of ten companies which sets the standards for DVD has been considering three proposals for eraseable DVDs. All use a blank 12cm disc, coated with phase

change material. In each case the blank disc is embossed with a pre-groove. Each disc has a capacity of 2.6Gb, equal to four CD-ROMs.

Matsushita (Panasonic) and Toshiba propose a technique called land and groove. The recording is made as a double spiral, which covers both the groove and the land between the grooves. The laser records one turn on the land, then one turn in the groove, and so on. This uses disc space efficiently but the laser must continually switch focus and position. The data which the user records, alternates with the reference data in 2kb bursts. This makes the system susceptible to surface blemishes; caddies may be necessary. Philips and Sony, with support from the computer industry, use a single spiral alongside a groove with a continuous FM signal to provide the reference information. This makes read-out easier and more reliable. The recorded data pits must be packed more tightly but this gets easier as laser optics technology develops.

Hitachi has proposed a compromise. The disc uses the land and groove system from Matsushita and Toshiba, but the continuous wobble from Philips and Sony.

Most companies have rejected the first proposal. Some like the second but the Consortium looks likely to vote for the compromise, third proposal. Computer companies may, however, ignore any agreement they do not like, and try and create a *de facto* standard by market forces. Either way DVD-RAM becomes a mass market product. Toshiba, the company pushing the new format, estimates that the market for DVD-RAM will be worth \$244bn by 2000.

taken on the same mythological dimensions for some segments of pro audio as a prewar German microphone has for others.

After a long tack towards large recording rooms and rootsy, bluesy music (notice how in retrospect the two went hand-in-hand?), both studios and the music culture they support are moving, pendulum-like, back towards the precise chop of sequenced, programmed music, the purview of MIDI.

The implication of this observation is that the course that studios follow has become ever more based on culture. The empowerment of so many more people by personal recording technology has pulled pro audio into mass culture. And if you're a studio owner, you have no choice but to acknowledge that. It doesn't mean that everyone has to follow momentary trends—that would be as undesirable as it is impossible. But it does mean that more sensitively tuned business antennae are necessary, and that reading material shouldn't be limited to the technical trade books. (It shouldn't anyway. Try Elmore Leonard and Kingsley Amis.)

So listen to the radio and leave your windows down as you drive through the 'hood. And make some mental notes about what you hear, it could have an effect on what goes onto the inventory list next week. And ponder also that the arrival of the studio palaces, like the advent of the palatial luxury liners of 50 years ago, could presage the end of an era. ■

Colonel Tom Parker, Elvis Presley's manager, died recently. He was a Dutchman, who stowed away on a ship and joined a carnival when he reached the US. He was never a Colonel and never had a US passport which is why Elvis did not tour abroad. Parker feared he might not get back into America. He was believed to have taken at least 50% of Presley's earnings in commission. Elvis always appeared at the Hilton in Las Vegas (formerly the International) and by chance I was staying there two years ago when the hotel celebrated his 60th birthday. Parker lived in Vegas and the hotel arranged a 2-hour 'I remember Elvis' session with his 'friend and manager'. To get in I stood in line with a collection of Elvis impersonators, several people who said they 'knew Elvis well', and a man with a miracle cure for old age. He had brought some sales literature for the 85 year Colonel to read.

When we got inside it turned out not to be the question and answer session I had expected. The Colonel sat at a table and we all had the chance to pay \$6 for a flimsy fanzine which he would then sign. I made my excuses and left, but on the way out tried to take a photo of the old man while he was posing with yet another sideburned impersonator. Obviously the Colonel still had very sharp vision. The moment he spotted my camera he had a Las Vegas thug tell me that if I wanted a picture I would have to pay the Colonel for one. Somehow there seemed little point in asking for an interview for Studio Sound about Presley's recording career. ■

Moving home

Channel 5 and European broadcasting's consideration of a single-site solution for the Eurovision Song Contest.

Kevin Hilton ponders the subtleties of geography

YOU KNOW when you really look forward to something and when it comes it lasts for only a short time? Well, the situation with Channel 5, the new and last national terrestrial TV service to be launched in the UK, is completely the opposite. A fifth service has been promised since 1990 but nobody much relished the thought; then it was on, then it was off and now, after being put back from January, it is finally here.

Despite the best efforts of the station chiefs to create some excitement about the new channel, everyone seems to have greeted it with apathy. Some couldn't even get that worked up. You knew that things had got desperate when the Spice Girls were wheeled out for the official switch on. It is rumoured that the group's management is concerned that the pop sensations (sic) were in danger of over-exposure; sure, these people would go to the opening of an envelope if they thought they could get some publicity out of it.

The blatantness of this stunt was underlined by interviews with Sporty, Scary, Baby, Ginger and the Other One (Lardy?), who waxed lyrical about how they had all been retuned and what brilliant picture quality they were receiving. These endorsements haven't stopped the stream of Channel 5 jokes, one of which is 'What does C5 have in common with the Tate Gallery [substitute own local controversial art institution]?' 'They both display bad pictures.'

From the outset C5 knew that it was squeezing into an increasingly crowded frequency spectrum and would only cover a proportion of the UK's total population. It also knew that the band it had been allocated could cause interference on or suffer interference from video players and satellite receivers. Hence the provision for retuning made in the tender proposals. Once everything was in place, C5 began a publicity campaign, emphasising how it was training an army of retuners, who would make sure that everyone who could, would receive the service.

Things went wrong when a consumer affairs programme on one of the existing, rival stations sent a researcher to apply to C5 as a retuner. He reported that his only training was watching a video and getting a few verbal instructions; he and his colleagues were sent out on the streets, amid complaints from viewers that their retuned equipment no longer worked properly.

When I tuned in to get the test signals, the picture could be politely described as 'soft' but as reception in my area isn't that hot on some of the other channels, I considered that I was doing pretty well.

The real issue behind this is the move away from the once rigid policy of co-siting, where signals for different channels would be transmitted from the same antenna, meaning that home aerials could all be pointed in one direction and receive everything. The advent of C5 has seen a break with this; the new service's signals for the Greater London area are being broadcast from NTL's Croydon facility and although this is only a few miles down the road from Crystal Palace, the source of everything else, it is just that little bit out. Still, that seems to sum up Channel 5 pretty well anyway.

IT'S THE MONTH of May and that means the Eurovision Song Contest (among other things, but nothing else significant presents itself). Once more held in Dublin, apparently now the trendiest place in Europe (despite all this nonsense about London being a really swinging spot), the event is being hosted by the blonde one from Boyzone and, if Ireland wins again, it could bring the Emerald Tiger economy crashing back down again.

My Irish mother is convinced that every other country involved in Eurovision is out to get 'us', which is a little paranoid but the string of wins can't be based on any more musical quality than the other national entries.

Public service broadcaster RTE is once again casting around for equipment to cover the show, which, for some reason, has to be an extravaganza. Talking to an Irish colleague of mine, he said that one way out was to do things so badly that the EBU wouldn't dare trust RTE with it but there's probably too much professional pride there for that.

The other way out is to move away from English as the *lingua franca*, most of the winners sing in that language as pop music sounds ridiculous in any other tongue. So maybe Gaelic could be the answer; the trouble is that it's a very beautiful, ethereal language and doesn't approach the levels of 'Bingy bingy boing' that some entries attain.

Perhaps the biggest laugh this year is that the British entry is performed by Katrina and the Waves. Now I remember them when they were a proper pop band. ■

Things went wrong when a consumer affairs programme on one of the existing, rival stations sent a researcher to apply to C5 as a retuner

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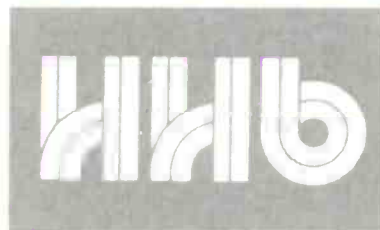
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Learning to love the deciBel

John Watkinson begins a new tutorial series by looking at why the deciBel tends to be universally misunderstood

TELEPHONY was the first extensive application of audio engineering. As a result, as soon as long telephone wires were erected between towns it became clear that they had quite different characteristics to the short wires in a lab. This is because they were acting as transmission lines. It was discovered that the power available from the other end fell logarithmically with distance. Before a complete understanding was available, comparative measurements were made using a 'mile of standard cable' or MSC. This consisted of a mile of 'twenty pound' copper wire which had a loop resistance of around 88Ω (Ohms) and a capacitance of about 5nF (nanoFarads) per mile. Tests showed that such a cable would output just under 80% of the input power when measured at a mid-band (for speech) frequency of 800cps (cycles per second, now Hertz). Clearly if several such MSCs are connected in tandem, the output power will be $0.8 \times 0.8 \times 0.8 \dots$ of the input, hence the logarithmic characteristic.

Fig.1 shows the principle of the logarithm. To give an example, if it is clear that 10^2 is 100 and 10^3 is 1000, then there must be a power between 2 and 3 to which 10 can be raised to give any value between 100 and 1000. That power is the logarithm to base 10 of the value. For example, $\log_{10} 300 = 2.5$ approx. Note that 10 to the power of zero is 1.

Logarithms were developed by mathematicians before the availability of calculators or computers to ease calculations such as multiplication, squaring, division and extracting roots. The advantage is that armed with a set of log tables, multiplication can be performed by adding, division by subtracting. **Fig.1** shows some examples. It will be clear that squaring a number is performed by adding two identical logs and the same result will be obtained by multiplying the log by 2.

The slide rule shown in **Fig.1** is an early

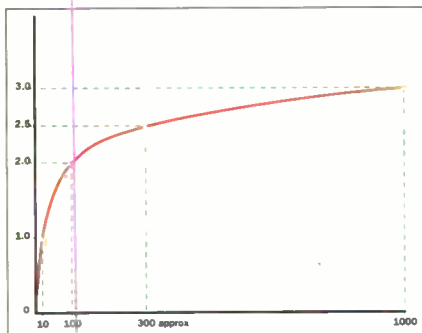


Fig.1: Log principles and a slide rule



solar-powered solid-state calculator which consists of two logarithmically engraved scales in which the length along the scale is proportional to the log of the engraved number. By sliding the moving scale two lengths can easily be added or subtracted and as a result multiplication and division is readily obtained.

By 1923 the physics of the telephone transmission mechanism were understood and Bell Telephone engineers proposed a 'transmission unit' defined as the output power being one tenth the input. Following international consultation the unit was named the Bel in honour of Alexander Graham Bell [1]. Human hearing (and indeed other senses) also has a logarithmic response with respect to sound pressure level (SPL). In order to relate to the subjective response audio signal level measurements have also to be logarithmic and so the deciBel was adopted for audio level display and signal measurement.

The Bel was (and is) defined as shown in the Panel as the logarithm to base 10 of the ratio of input power to output power. It is useful to remember that one Bel is a 10:1 power ratio. It must be stressed that the dB is dimensionless because it is a ratio. The Bel is fine for long telephone lines where heavy attenuation is experienced, but for other purposes it is a large unit. As with large units like the Farad it was diminished by a prefix, the most common being 'deci', meaning one tenth, hence the deciBel, abbreviated dB and pronounced dee-bee. One of the factors which encouraged the adoption of the dB was that the loss in an MSC was very nearly 1dB. The solution was to raise the test frequency to 886cps so that the loss increased slightly to make the MSC have exactly 1dB of loss.

Thus the loss in a cable in dB could be quoted by measuring the input power and the output power and multiplying the log of the ratio by ten. When the two ends of the cable are miles apart it makes sense to have a standard power so one engineer can insert a standard amount of power and his mate can measure it in the next town.

One milliWatt (1mW) was chosen as a practical standard. To show that the measurement is not a ratio of two measurements but the ratio between a single measurement and a fixed reference, the unit has to be qualified. Thus where the reference is 1mW, the units will be dB(m). In radio engineering, the dB(W) will be found which is power relative to one Watt.

A device such as an amplifier can have a fixed power gain which is independent of signal level and this can be measured in pure dB. However, when measuring the power of a single signal, it must be appreciated that the deciBel is a ratio and to quote the number of dBs without stating the reference is about as senseless as describing the height of a mountain as 2,000 without specifying whether this is feet or metres.

In long cables the distributed series inductance and the parallel capacitance interact to give the line a characteristic impedance. In telephones this turned out to be about 600Ω. In transmission lines the best power delivery occurs when the source and the load impedance are the same; this is the process of matching. Thus a standard condition against which signals could be compared was the dissipation of one milliwatt in 600Ω. The side bar shows that the dissipation of 1mW in 600Ω will be

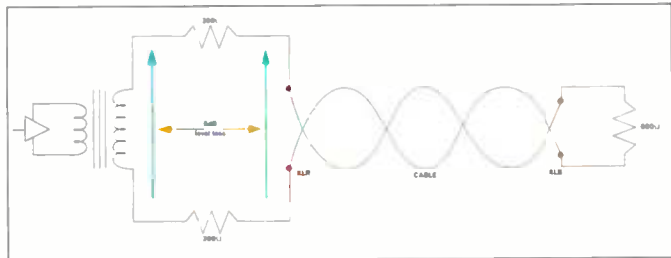


Fig.2a: Impedance matching is undesirable

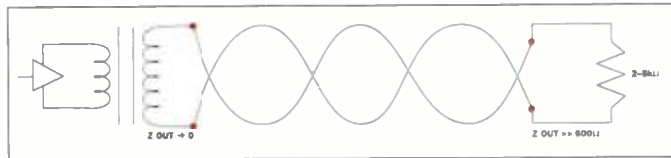


Fig.2b: Proaudio – sources have lowest output impedance

due to an applied voltage of 0.775V rms.

The side bar also shows that as the power is proportional to the square of the voltage, the power ratio will be obtained by squaring the voltage ratio. As squaring in logs is performed by doubling, the squared term of the voltages can be replaced by multiplying the log by a factor of two. To give a result in decibels, the log of the voltage ratio now has to be multiplied by 20.

While 600Ω matched impedance working is essential for the long distances encountered with telephones, it is quite inappropriate for audio wiring in a studio. The wavelength of audio in wires at 20kHz is 15 kilometres. Most studios are built on a smaller scale than this and clearly analogue audio cables are not transmission lines and they do not have a characteristic impedance. Readers should treat anyone who attempts to sell exotic analogue audio cables by stressing their transmission line characteristics as free entertainment.

In professional audio systems impedance matching is unnecessary and undesirable. **Fig.2a** shows that when impedance matching is required the output impedance of a signal source must be artificially raised so that a potential divider is formed with the load. > page 100

Power Gain in BELS = $\log_{10} \frac{P_{in}}{P_{out}}$
Power Gain in dB = $10 \log_{10} \frac{P_{in}}{P_{out}}$
 Assuming 1mW power reference
Power in dB(m) = $10 \log_{10} \frac{Power}{1/1000} = 10 \log_{10} (Power \times 1000)$
 As Power $P = V^2/R$ and $V = \sqrt{RP}$
Power Gain (dB) = $10 \log_{10} \frac{V_{in}^2/R}{V_{out}^2/R} = 10 \log_{10} \frac{V_{in}^2}{V_{out}^2} = 20 \log_{10} \frac{V_{in}}{V_{out}}$
 If $P = 1mW$ and $R = 600\Omega$
 $V = \sqrt{RP} = \sqrt{600 \times 0.001} = \sqrt{0.6} = 0.77459.. V_{rms}$
Level in dB(u) = $20 \log_{10} \frac{Voltage_{rms}}{0.77459}$

In digital systems there is no audio voltage, power or impedance. Level is measured in dB (Fs) shown here as largest sine wave which fits quantizing range

< page 99 The actual drive voltage must be twice that needed on the cable as the potential divider effect wastes 6dB of signal level and requires unnecessarily high power supply rail voltages in equipment. A further problem is that cable capacitance can cause an undesirable HF roll-off in conjunction with the high source impedance.

In modern professional audio equipment, shown in Fig.2b, the source has the lowest output impedance practicable. This means that any ambient interference is attempting to drive what amounts to a short circuit and can only develop very small voltages. Furthermore, shunt capacitance in the cable has very little effect. The destination has a somewhat higher impedance (generally a few kΩ) to avoid excessive currents flowing and to allow several loads to be placed across one driver.

In the absence of a fixed impedance it is now meaningless to consider power. Consequently, only signal voltages are measured. The reference remains at the historically derived 0.775 volts, but power and impedance are irrelevant. Voltages measured in this way are expressed in dB(u): the commonest unit of level in modern audio systems. Most installations boost the signals on interface cables by 1dB. As the gain of receiving devices is reduced by 1dB, the result is a useful noise advantage without risking distortion due to the drivers having to produce high voltages.

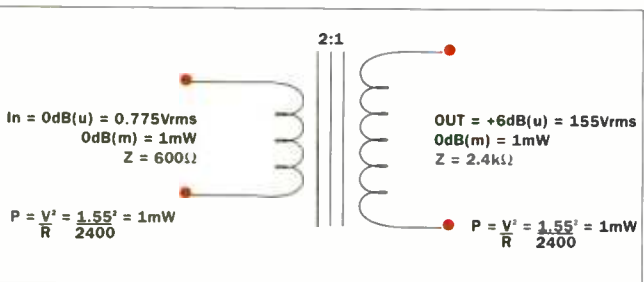


Fig.3: Lossless matching transformer

In order to make the difference between dB(m) and dB(u) clear, consider the lossless matching transformer shown in Fig.3. The turns ratio is 2:1 therefore the impedance matching ratio is 1:1. As there is no loss in the transformer, the power in is the same as the power out so that the transformer shows a gain of 0dB(m). However, the turns ratio of 2:1 provides a voltage gain of 6dB(u). The doubled output voltage will develop the same power in to the quadrupled load impedance.

In the digital domain there is no audio impedance, voltage or power; only numbers. Consequently, the dB(m) and the dB(u) are of no use at all. Instead digital level is measured as shown in the side bar by the ratio of the signal amplitude to the largest possible sinusoidal amplitude which is defined as 0dB(Fs) or full scale.

In acoustic measurements, the sound pressure level (SPL) is measured in decibels relative to a reference pressure of 2×10^{-5} Pascals (Pa) rms. In order to make the reference clear the units are dB(SPL). In measurements that are intended to convey an impression of subjective loudness, a weighting filter is used prior to the level measurement that approximates the frequency response of human hearing which is most sensitive in the mid range. The most common standard frequency response is the so-called A-weighting filter, hence the term dB(A) used when a weighted level is being measured. At high or low frequencies, a lower reading will be obtained in dB(A) than in dB(SPL). ■

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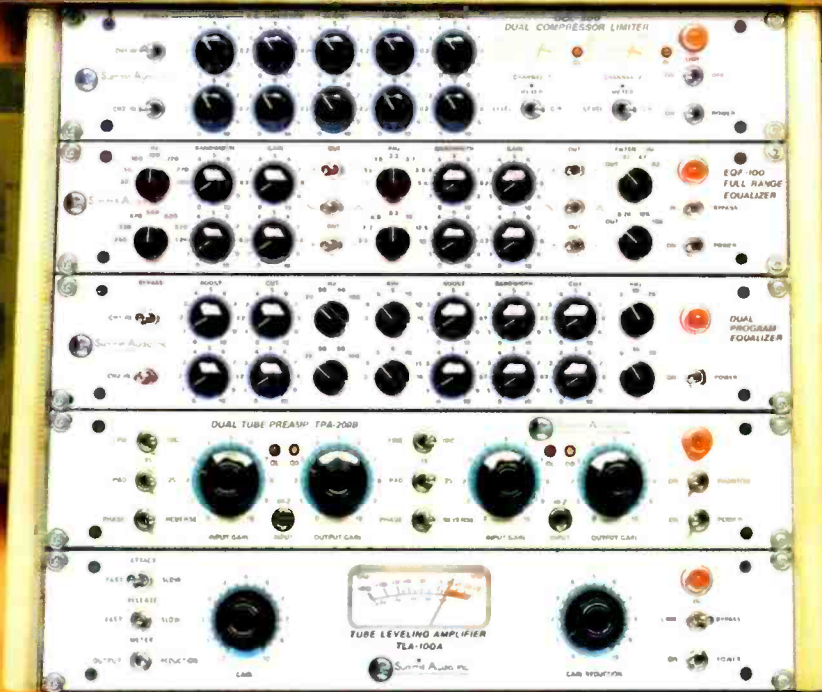
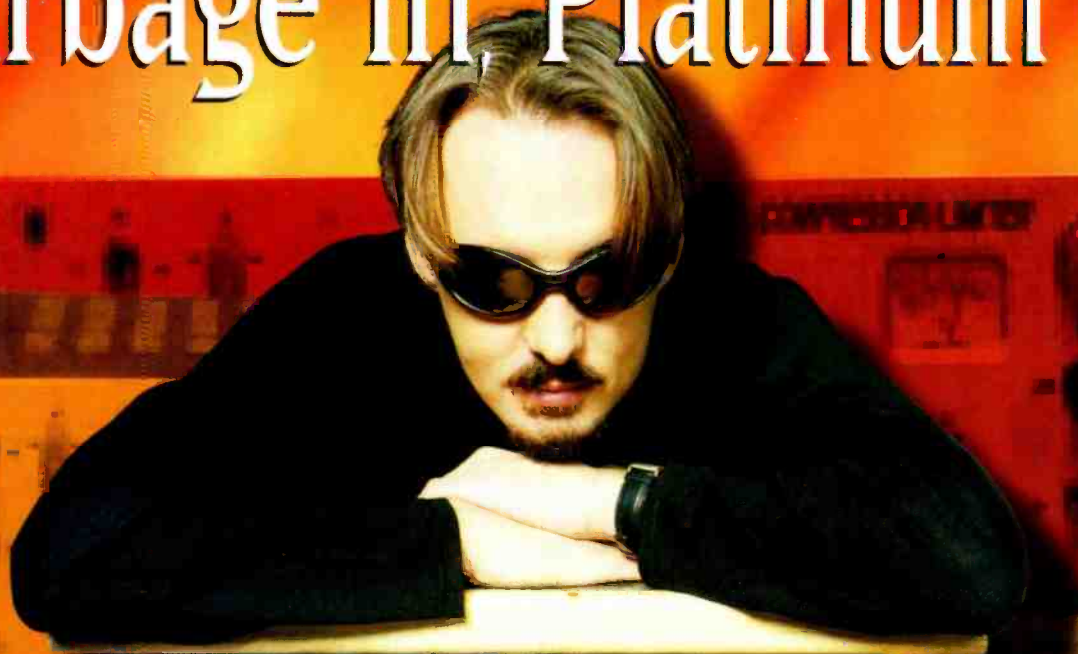
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Fireworks

Is Fire Wire a 'MIDI line' for digital audio? **Tim Frost** takes a practical look at one of interconnection's futures with help from those who are ready to implement it

THE DEVELOPMENT OF FIRE WIRE dates back to the mid-1980s and Apple's attempts to reduce the range of connection systems needed to link personal computers to printers, modems, external disk drives, scanners, and other peripherals. Apple's ideas were eventually adopted by the IEEE Standards Board in December 1995 under the formal title of IEEE 1394, but it also has the Fire Wire trade name that Apple had coined (see *Studio Sound*, February 1997 for a technical description).

This winter's Comdex show witnessed the first tranche of Fire-Wire-equipped consumer products. Primarily, these were digital camcorders, but as other consumer areas go digital—TV, satellite and cable systems, digital audio systems consumer and prosumer digital mixers and titlers—they will also get the Fire Wire treatment.

Currently, there are just a small number of PC-based systems being brought to market, mainly to complement the digital camcorders, and spear-headed by Adaptec. But it is early days yet, and all the majors in the computer industry from IBM to Apple, Sun, Compaq and SGS Thomson have given their backing to the format. It seems to them to be the ideal convergence tool between computers and consumer audio-video just at a time when multimedia is becoming the major driving force for computing into the next century.

It is this support by both the consumer and computer markets that will contribute to a Fire Wire culture, helped, no doubt, by the rapidly reducing cost of implementing Fire Wire as the number of consumer-computer peripherals climbs into the millions. Fire Wire chipsets from the likes of Texas Instruments and Philips are available at the \$50 mark, and we are just at the start of the market. Introducing Fire Wire into some peripherals will also mean a certain amount of cost saving since they can do away with the large levels of internal buffer memory needed to smooth out the erratic delivery of audio or video data delivered on asynchronous systems.

FIRE WIRE FORMAT seems to offer a lot of what has been missing in a digital link for audio and video. It is a relatively high capacity carrier, but even at its slowest, Fire Wire can deliver the same as

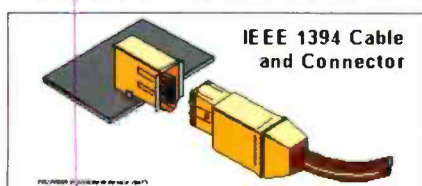


Fig.3: Fire Wire connector

Studio Sound May 1997

most SCSI-2 ports. More significantly for A-V applications it is the way it can be used to deliver a mix of audio, video and other data in a single stream.

Most data delivered on a computer network is asynchronous—this is fine for file and programme data, but for digital audio and video it presents problems. Synchronous systems like AES-EBU supply a properly timed stream of data, but do not lend themselves to carrying more than one signal stream at a time. This is fine for one-to-one connections, but not for multiple interconnects to lots of different devices, or for delivering audio, video and MIDI simultaneously on the one wire. It is Fire Wire's isochronous delivery that makes it interesting. Isochronous behaviour creates a



Fig.2: Fire Wire connects anything digital

single continuous data stream on the cable like a fast-moving conveyor belt. You can slot onto that conveyer, channels of audio, video, MIDI, control information or simple file data and everything will be delivered in a totally controlled time-frame. No single stream is interrupted or interfered with by other channels of data loaded onto the same data stream conveyor-belt. It can be compared to MIDI connect since it can send data to a number of

different units all hanging on the same cable.

Fire Wire doesn't care what the data it is carrying describes. So the data stream can contain MIDI, digital audio and digital video elements at the same time, controlling each 'channel' of information so that it guarantees a given level of continuous bandwidth to each device you connect up to it.

This is a half-way house between full networking and one-to-one connection. It is should be made clear that Fire Wire is not multitasking—you can only transmit from one device at a time. But that transmission can be from any one of up to 63 units connected on a single Fire Wire system, and that one device

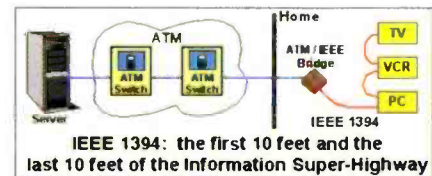


Fig.1: Fire Wire ports in an out of a networked audio-video production system

can be transmitting this mix of as much audio, video, MIDI and plain computer data as the total capacity of the connection will take. Although it may originate from a single source, the data can be delivered to different units on the Fire Wire network: the audio to the recorder, the video to a VTR and the MIDI to a sequencer.

Connectivity is another notable feature about the Fire Wire. It has advantages over SCSI, which is its nearest equivalent, which can only be serially daisy-chained and each SCSI device has to be preset with its own specific address at connection time. Fire Wire on the other hand doesn't care how it is connected, and it can be configured serially, in star or branch formats, or in a mix of connections. Each unit is addressed dynamically and automatically so there is no need for setting up a device with a preset address. It is also hot-pluggable—units can be added or removed while the system is up and running.

More attractively still, Fire Wire is a peer-to-peer connection. There are no such things as master or slave units. Any Fire Wire device, no matter how humble, has enough > page 104

Isonchronous, synchronous and asynchronous

MOST DATA delivered on a computer network is asynchronous—it is not locked into a specific time frame. Bits of data streams from various devices are loaded onto the network cables and bits of data fly around the system in erratic bursts as and when there is a gap. This is fine for file and program data where it doesn't matter if bits of the files arrive in short bursts, or there is a few ms delay in parts of the files arriving. But for digital audio and video, which rely on accurate timing, and an uninterrupted stream of data for audio and video, this presents problems. Synchronous systems like AES-EBU supply a properly timed stream of data, but do not lend themselves to carrying more than one signal stream at a time—fine for one-to-one connections but not for multiple interconnects. Isochronous connections like Fire Wire fill the gap in the middle. It can carry data to multiple devices, but controls it in a way that guarantees a certain level of continuous bandwidth to each device you connect up to it. The total bandwidth is not variable.

As each new peripheral is connected it tells the Fire Wire connection what data rate it needs as a minimum. If you are near the limit of the Fire Wire line when you try and add another device that takes the system over its capacity it is simply refused connection.

Fire Wire will also integrate with established network protocols such as ATM, porting signal streams in and out of a 'proper' network development.

Advertiser's Index

A & F MACKAY	67
AKAI	9
ALESIS/SOUND TECHNOLOGY	89
AMEK	37
AMS NEVE	IFC
APHEX	OBC
ASAP EUROPE	98
AUDIO PRECISION	20
AUDIO TECHNICA	50
BAG END	101
BEHRINGER	75
BEYERDYNAMIC	49
CALREC	70
CREAMWARE	19
DANISH PRO AUDIO	10, 51
DENON	INSERT 50, 51
DIGIDESIGN	69
DRAWMER	64
DYNAUDIO ACOUSTICS	47
EUPHONIX	73
FAIRLIGHT	43
FOCUSRITE	81
GENELEC	77
GHIEMETTI	11
HARMAN AUDIO	23
HHB	27, 55, 72, 74, 76, 98
JBL	84
JOEMEER	14
LYDCRAFT	90
MACKIE	IBC
MERGING TECHNOLOGIES	87
MEYER SOUND	24
MICROTECH GEFELL	18
MJQ/NTI	42
NEATO	11
NEOTEK	22
NEUTRIK	8
ORAM	57
PENNY & GILES	33
PRECO	INSERT 66, 67
PRISM	46
PROJECT AUDIO...	INSERT 82, 83
PROTAPE	INSERT 50, 51
PROTAPE	INSERT 66, 67
RICHMOND FILM SERVICES ...	52
S.S.I INTERNATIONAL	105
SCHOEPS	56
SCV/AUDIX	63
SCV/LA AUDIO	41
SENNHEISER	15
SHURE BROS EUROPE	44
SOUNDTRACS	28
SPENDOR	INSERT 82, 83
SSL	5, 78
STAGETEC	52
STUDER	39
SUMMIT AUDIO	102
TASCAM	31
TC ELECTRONIC	61
THAT CORP	35
TL AUDIO	11
UNITY AUDIO	66
WHIRLWIND	106
WEISS ENGINEERING	52

Fire Wire connection

THE LINK uses a 6-conductor cable and connectors (don't laugh) derived from those used on the Nintendo *Gameboy*. The cable, similar to the type used for Ethernet, uses two twisted conductor pairs, one pair each for sending and receiving data. The two other conductors are a power pair (8V-40V to a maximum of 1.5A) to power the Fire Wire connection when the unit is in standby mode, or directly power a low consumption peripheral.

This power pair can be dropped in the consumer applications of Fire Wire, leaving the domestic version as a 4-wire system.

One of the major disadvantages for Fire Wire is the cable length that it allows with the official limit between devices being under 5m. This is partially due to the losses in the power pair, and also the attenuation of the data signal caused by cable capacitance that will particularly affect the high data rate S400 system.

At the S100 and S200 data rates, cable lengths can double and a 'thick' cable version that increases the diameter of the signal pairs, and adds low-loss insulation while at the same time decreasing the weight of the power-carrying conductors, is also part of the standard.

Even so, the maximum of 10m to 14m between units may prove difficult in many studio situations. An optical-fibre version to significantly extend cable runs is currently under development.

< page 103 built-in intelligence for it to be connected and function without the need for additional control. So a digital mixer can be connected directly to a stand-alone Fire Wire hard-disk and start recording directly onto it without the need to put a computer in the middle. Conner and other hard-drive manufacturers are already developing Fire Wire drives that will do this. It is expected that they will initially carry something like a \$100 premium over similarly sized non-Fire Wire versions.

But is Fire Wire really set to be a serious application in the pro-audio market? On paper it can deliver 16 or 32 audio channels down a single thin cable, making it an ideal

uninterrupted streams of audio; although we will have to wait and see how that will work in reality when you have a fully loaded network. But it is only just moving from TI being the only source of chips, and the cost is still quite high. It is around £40 for the chipset and that is before you start adding the microprocessors to control it. Teac's Bob Thomas reflects more of the 'let's wait till it exists' view.

'It is not something that most manufacturers are worrying about quite yet. But as soon as it becomes commercially available that will be different. As soon as it gets cheap it will get used.'

There is another clutch of manufacturers of desks, recording systems and sound reinforcement electronics that are evidently developing for Fire Wire for 1998 releases, but are reluctant to talk too overtly and dent confidence in their existing proprietary D-to-D connection systems.

One commented, 'It seems it will do everything that a product like "ours" will want it to do. But the problem with most manufacturers is that if they have got plans for Fire Wire product its going to be a year or so down the line so you will get a fairly non-committal response. Even if they are developing products they are not going to let on.'

Since it can only deliver a signal, albeit a combined one, from one source at a time, Fire Wire is no alternative to the audio or video network, nor will it, in its current form at least, be usable for long-run audio installations. So the most likely scenario is that as the interface electronics get cheap enough, Fire Wire connects will start appearing on the back of all sorts of gear in addition to, rather instead of, proprietary connects.

With no pretensions to being the ultimate professional system, Fire Wire should be considered as the universal digital equivalent of the phono socket. With the next generation or two of low-cost chips, it will start appearing on everything from a digital stills camera to multichannel DAWs, offering a workable and universal digital connection at least, and then moving rapidly onto becoming a standard for professional mixed-media interconnects. ■

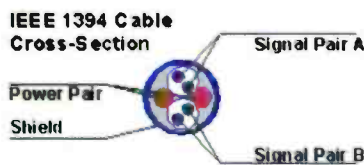


Fig.4: Pro Fire Wire cable

connect between digital mixer and digital recorder. Yamaha are being the most open about the issue and are working on MLAN, a protocol that will carry both audio and control data over Fire Wire, and is also developing Fire Wire chipsets that will be commercially available.

'The ability to carry a lot of channels in a single connection from a digital mixer to a digital recording with a single low-cost connector is very attractive application,' comments Yamaha's Terry Holton. He quotes the 02R mixer as a prime contender for a Fire Wire connection. 'At the moment the 02R needs four channel slots to get 32 channels in, and 32 channels out of it. If you put in four ADAT or T-DIF cards the cost is going to be around £1,200 (UK). In the future you could see that happening in a single Fire Wire connection that will cost a fraction of that.'

Allen & Heath's Yan Speake is equally supportive.

'We are keeping a close eye on it, and it seems a good idea for the industry. It certainly isn't an *ad hoc* standard, and the important thing is that it guarantees to deliver

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Audio Sound International

Riding the wave

The long sought-after solutions to the problems presented by file interchange for post are finally within our reach observes **Ted Hayton**, International Marketing Manager at Studio Audio & Video

Since the adoption of digital technology, the audio industry has been craving file formats that can be easily interchanged between Digital Audio Workstations. When DAWs first came onto the market, manufacturers devised proprietary file formats to suit their own particular hardware configurations with only a few supporting any common formats. With the advent of nonlinear picture editing, DAWs have become widely used in postproduction, however the audio is likely to be worked on a number of different makes of DAWs throughout the postproduction process. The problems of non interchange of file formats and the massive storage needed for most productions have led to a plethora of techniques throughout the world for handling the audio, and in my experience it is rare to find two facilities that employ exactly the same process.

By default, the ubiquitous DAT tape with time code has become the means of passing the audio along the postproduction chain even though the transfer in and out of any particular system takes place in real time. Nonlinear picture editing has also spawned new problems for audio production that have, in turn, caused confusion and premature baldness. Recently, however, some light has appeared at the end of the tunnel.

The EBU standards committee at the end of 1996 adopted a RIFF WAVE-based file format as a common format standard for the broadcast industries, it is called Broadcast Wave Format (BWF). This is simply a wave file with an added chunk of data that contains information such as title, recording report notes and copyright. It seems to make sense to use wavefiles as a standard interchange format and in some areas of the industry they have already been as such for a long time. Consequently, it may not be such a daunting task for manufacturers to support, as most DAWs today offer some level of wavefile handling even though they may be alien to their own native format. There is a proposal to add a further chunk for the film industry called FilmWave. This chunk contains such information as field time codes, telecine time codes and a whole host of other film production information. The data can be added to and/or modified as

the wave file progresses through the postproduction process. The real advantage is that we can have audio clips with a history attached.

None of what I have so far described is of much use unless once digitised, these files can be easily stored and accessed by all the elements of the postproduction process that

In Soho, London, a group of post facilities have started Sohonet, a high-speed ATM network also operating at 155Mbits/sec. Members of Sohonet are already transferring high quality film and video pictures between themselves and Hollywood

need them. If the syncing of the rushes (dailies), off-line editing, autoconform, tracklay and dub all occurred on the same site then the audio could be networked to a fast central server. The technology already exists to do this where either the audio is quickly down-

loaded to the postproduction unit requiring it or the audio is worked remotely on the server. Studio Audio manufactures a SCSI to ATM (Asynchronous Transfer Mode) switch called SASCiA which runs at 155Mbits/sec which can handle at least 100 channels of uncompressed real-time audio. However, I don't know of any postproduction companies that achieve everything under one roof, so to achieve this goal we need to look toward a super fast network infrastructure and somewhere safe to store all of this audio.

This isn't science fiction. In Soho, London, a group of post facilities have started Sohonet, a high-speed ATM network also operating at 155Mbits/sec. Members of Sohonet are already transferring high quality film and video pictures between themselves and Hollywood. Although to my knowledge, Sohonet does not connect to a central server system there is no reason why that isn't possible. All over the world there are large companies running data vaults whose sole function is to ensure that data is stored safely and securely on a massive scale; in fact the commercial world has been using these sorts of facilities for a number of years. The mental image of a building stacked full of hard disk drives in safety RAID arrays is not a pipe dream. These services are already available through the Internet and as our world wide telecommunication infrastructure is replaced by technologies with astronomically high bandwidths then what I have described could become reality.

In the end, of course, it will all come down to cost—in the short term, like all new technologies, this may be too high for many production companies to contemplate. However, as we all get high speed data links into our homes which are capable of these sorts of bandwidths, these concepts will inevitably become an economic proposition.

I feel that the benefits of these technologies will be enormous to the Film & TV postproduction industries and almost certainly the rest of the audio community. Surely the one terror that all computer-orientated industries fear is the loss of data, but if that data is being piped directly to a safe and secure data vault, then confidence in computer technology as a whole is bound to grow. ■

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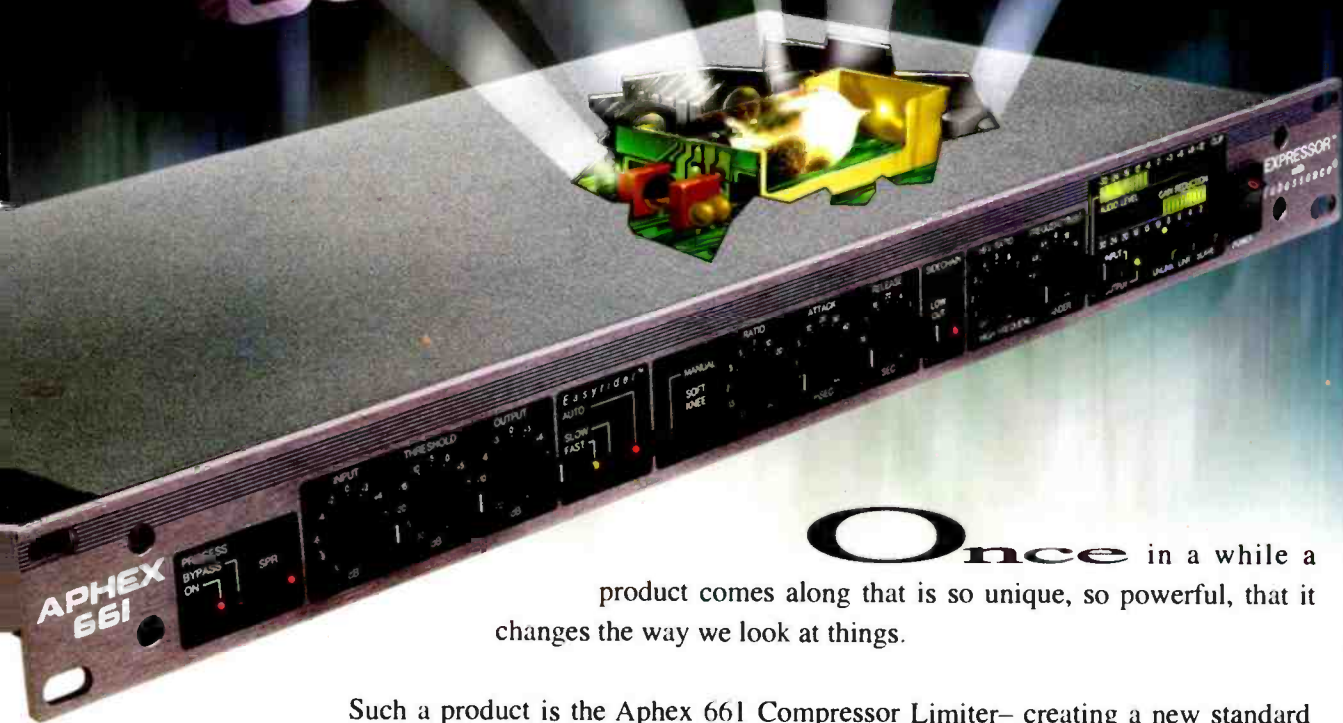
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